

Centrum Energetických a Environmentálních Technologií – Explorer (CEETe)

Projektová dokumentace pro provádění stavby

SO 01.1 Budova CEETe

Statický výpočet

01.1.21 Stavebně konstrukční řešení - OK

Archivní číslo	:	20-026-5 / 01.1.21-03
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Datum	:	04 / 2020

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04/2021

Vypracoval: Ing. Jeżowicz

ZATÍŽENÍ

1. STÁLÉ

1.1 Vlastní hmotnost konstrukce generována z průřezových ploch prvků

1.2 Fotovoltaická stěna (panely)

Fotopanely (25 kg/m ²)	0,25
Podkonstrukce (10kg/m ²)	0,10
	<u>g_{foto,k} = 0,35 kN/m²</u>

1.3 Zelená stěna

Zelená fasáda (62 kg/m ²)	0,65
Podkladní Cetris deska 12mm (17kg/m ²)	0,17
	<u>g_{foto,k} = 0,82 kN/m²</u>

1.4 Stěny fasádních arkýřů

Tenkovrstvá omítka 5mm (4 kg/m ²)	0,04
Kamenná vlna 200mm (100 kg/m ³)	0,20
SDK 2x 15mm (13.44 kg/m ²)	0,27
Minerální vlna 150mm (50 kg/m ³)	0,08
SDK 2x 12.5mm (11.2 kg/m ²)	0,22
	<u>g_{foto,k} = 0,81 kN/m²</u>

1.5 Podlahové rošty

Rošt 30*3 (35 kg/m ²)	0,35
	<u>g_{30*3k} = 0,35 kN/m²</u>

Rošt 30*11 (47 kg/m ²)	0,47
	<u>g_{30*11} = 0,35 kN/m²</u>

Součinitel zatížení $\gamma_f=1.35$

2. PROMĚNLIVÉ

2.1 Sníh

sněhová oblast II (Ostrava) $s_k = 1.0 \text{ kN/m}^2$

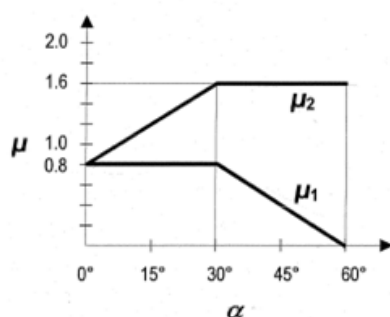
tepelný součinitel $C_t = 1.0$

součinitel expozice $C_e = 1.0$

a) střecha objektu

tvarový součinitel μ

ČSN EN 1991-1-3



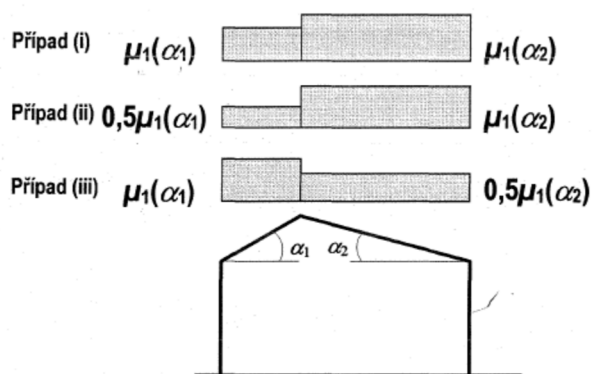
Obrázek 5.1 – Tvarové součinitele zatížení sněhem

(2) Hodnoty uvedené v tabulce 5.2 platí, pokud není zabráněno sklouzávání sněhu ze střechy. Pokud jsou na střeše sněžníky nebo jiné překážky nebo je dolní okraj střechy ukončen atikou (nadezdívkou), potom hodnota tvarového součinitele zatížení sněhem nemá klesnout pod 0,8.

Tabulka 5.2 – Tvarové součinitele zatížení sněhem

úhel sklonu střechy α	$0^\circ \leq \alpha \leq 30^\circ$	$30^\circ < \alpha < 60^\circ$	$\alpha \geq 60^\circ$
μ_1	0,8	$0,8(60 - \alpha)/30$	0,0
μ_2	$0,8 + 0,8\alpha/30$	1,6	—

(3) Uspořádání zatížení podle obrázku 5.2 se má použít pro zatížení nenavátým i navátým sněhem.



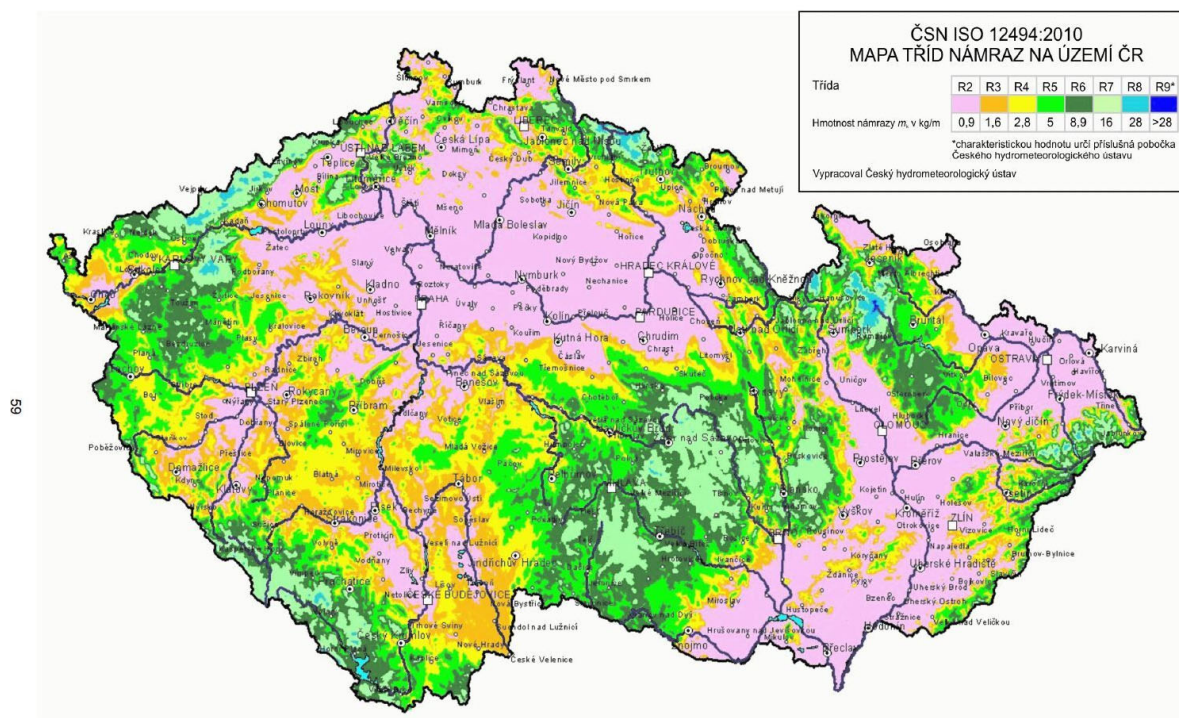
$\alpha = 0^\circ \rightarrow \mu_1 = 0.8, \mu_2 = 0.8 + 0.8 \cdot 0/30 = 0.80 \text{ kN/m}^2$

$s_{1,k} = s_k \cdot C_t \cdot C_e \cdot \mu_1 = 1.0 \cdot 1 \cdot 1 \cdot 0.8 = 0.80 \text{ kN/m}^2$ (zelená stěna)

2.2 Námraza (dle ČSN ISO 12494)

Třída námrazyR2

Hmotnost námrazy $m_k=0.9 \text{ kg/m}$

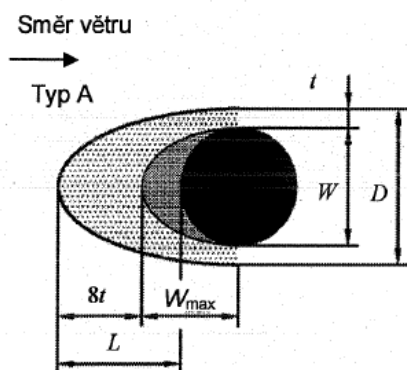


Obrázek NA.1 – Mapa tříd námraz pro území České republiky

ČSN ISO 12494

Tabulka 5 – Rozměry námrazy na profilech typů A a B
(platí pouze pro námrazu z oblačnosti, objemová hmotnost námrazy = 500 kg/m^3)

Tvary průřezů typů A a B									
Šířka profilu [mm]		10		30		100		300	
IC	Hmotnost námrazы m [kg/m]	Rozměry námrazы [mm]							
		L	D	L	D	L	D	L	D
R1	0,5	54	22	34	35	13	100	4	300
R2	0,9	78	28	54	40	23	100	8	300
R3	1,6	109	36	82	47	41	100	14	300
R4	2,8	150	46	120	56	67	104	24	300
R5	5,0	207	60	174	70	106	114	42	300
R6	8,9	282	79	247	88	165	129	76	300
R7	16,0	384	105	348	113	253	151	136	300
R8	28,0	514	137	478	146	372	181	217	317
R9	50,0	694	182	656	190	543	223	344	349
R10	Používá se pro extrémní námrazу								



Parametry tvorby námrazy:

$W = 2.5 \text{ mm}$, $L = 78 \text{ mm}$,

IC R2 - $\rightarrow D = D(10\text{mm}) - W(10\text{mm}) + D = 28 - 10 + 2.5 = 20.5 \text{ mm}$

$t = (D - W)/2 = (20.5 - 2.5)/2 = 9 \text{ mm}$, $L = 78\text{mm}$

Prodyšnost plochy pletivaítě 50x50/2.5 při námraze :

$(50-2.5-2 \times 9)^2/50^2 = 0.348 - \rightarrow \text{cca } 35\%$

Tabulka 27 – Součinitel pro snížení tlaku větru

ICG	k	ICR	k
G1	0,40	R1	0,40
G2	0,45	R2	0,45
G3	0,50	R3	0,50
G4	0,55	R4	0,55
G5	0,60	R5	0,60
		R6	0,70
		R7	0,80
		R8	0,90
		R9	1,00

ICR = R2 -> Součinitel snížení tlaku větru $k=0.45$

Hmotnost námrazy na 1 bm lana sítě -> 0.9 kg/bm

Hmotnost námrazy na 1 m^2 plochy sítě $> 40 \text{ ks} \times 0.9 \text{ kg/m}^2 = 36 \text{ kg/m}^2$.

Součinitel zatížení $\gamma_f=1.5$

VÝPOČET ZATÍŽENÍ VĚTREM PODLE ČTN EN 1991-1-4

Větrová oblast

místo: Ostrava

odečteno z mapy větrových oblastí ČR

$V_{b,0} = 25$ m/s

výchozí základní rychlost větru

Základní rychlost větru

$V_b = V_{b,0} \cdot C_{dir} \cdot C_{season} = 25$ m/s

základní rychlost větru 4.2 (4.1)

$C_{dir} = 1$

součinitel směru větru NA.2.6.

$C_{season} = 1$

součinitel ročního období NA.2.7.

Kategorie terénu

Příloha A.1

$z_0 = 0,3$ m

tab.4.1

$z_{min} = 5,00$ m

tab.4.1

$z_{max} = 200$ m

$z_{e1} = 10,00$ m

referenční výška 7.2.2 (1)

$z_{e2} = 0$ m

Součinitel terénu

$k_r = 0,19 \cdot (z_0/z_{0,II})^{0,07} = 0,215$

součinitel terénu 4.3.2 (4.5)

$z_{0,II} = 0,05$

kat. terénu II tab.4.1

Součinitel drsnosti terénu

$c_r(z_{e1}) = k_r \cdot \ln(z/z_0) = 0,755$

4.3.2 (4.4)

$c_r(z_{e2}) = k_r \cdot \ln(z/z_0) =$

Součinitel orografie

$c_0(z) = 1$

4.3.1.

Střední rychlost větru

$v_m(z_{e1}) = c_r(z) \cdot c_0(z) \cdot v_b = 18,88 \text{ ms}^{-1}$

4.3.1 (4.3)

$v_m(z_{e2}) = c_r(z) \cdot c_0(z) \cdot v_b = \text{ms}^{-1}$

Intenzita turbulence

$I_v(z_{e1}) = k_t/c_0(z) \cdot \ln(z/z_0) = 0,285$

$k_t = 1$

součinitel turbulence 4.4 (4.7)

$I_v(z_{e2}) = k_t/c_0(z) \cdot \ln(z/z_0) =$

Maximální dynamický tlak větru

$q_p(z_{e1}) = [1+7I_v(z)] \cdot 0,5\rho \cdot v_m(z)^2 =$

668 Nm⁻²

=

0,668 kNm⁻²

4.4 (4.8)

$q_p(z_{e2}) = [1+7I_v(z)] \cdot 0,5\rho \cdot v_m(z)^2 =$

Nm⁻²

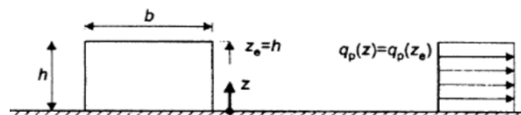
=

kNm⁻²

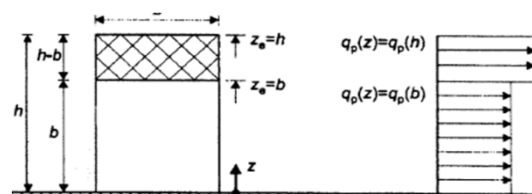
Rozměry objektu

$h =$	10,00 m	výška stavby
$b =$	17,60 m	rozměr kolmo na hřeben - délka štítu
$l =$	56,40 m	rozměr rovnoběžně s hřebenem
$l_1 =$	6,00 m	vzdálenost rámu
$l_2 =$	6,00 m	vzdálenost štítových sloupů
$l_3 =$	6,00 m	vzdálenost vaznic

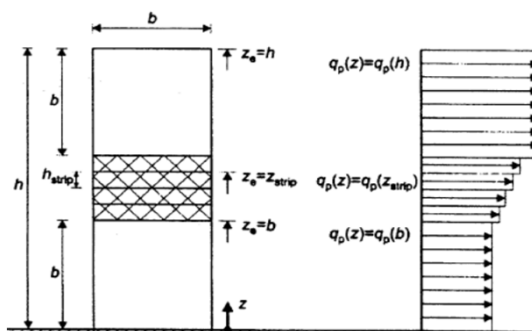
(1)		výška průběh	
$z_{e1} =$	10 m	0 až h konst.	$h < b$



(2)			
$z_{e1} = h$	10 m	b až h konst.	$b < h < 2b$
$z_{e2} = b$	17,6 m	0 až b konst.	



(3)			
$z_{e1} = h$	10 m	$(h - b)$ a konst.	$h > 2b$
$z_{es} = h$	m	b až $(h \cdot \text{lin.})$	
$z_{e2} = b$	17,6 m	0 až b konst.	



PLATÍ 1.PŘÍPAD

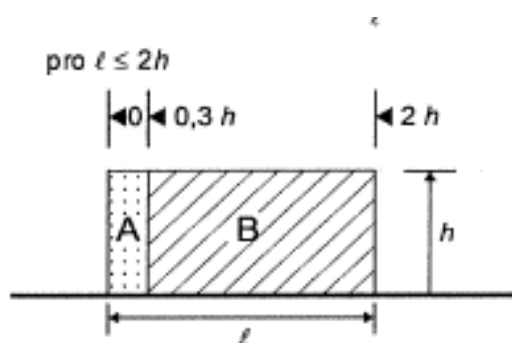
2.3.1 Volně stojící stěna (zelená stěna, fotovoltaika)

max. dynamický tlak $q_p = 0.668 \text{ kN/m}^2$

součinitel plnosti (prodyšnost 0%)..... $\varphi = 1.0$

délka - zelená stěna $\ell = 15.7 \text{ m}$, $h = 12.8 \text{ m}$

- fotovoltaika $\ell = 28 \text{ m}$, $h = 12.8 \text{ m}$



ČSN EN 1991-1-4 ed. 2

Tabulka 7.9 – Doporučené hodnoty součinitelů tlaku $c_{p,net}$ pro volně stojící stěny a zděná zábradlí

Součinitel plnosti	Oblast		A	B	C	D
$\varphi = 1$	Bez vedlejšího průčelí	$\ell/h \leq 3$	2,3	1,4	1,2	1,2
		$\ell/h = 5$	2,9	1,8	1,4	1,2
		$\ell/h \geq 10$	3,4	2,1	1,7	1,2
	S vedlejšími průčelími s délkou $\geq h^a$		2,1	1,8	1,4	1,2
$\varphi = 0,8$			1,2	1,2	1,2	1,2

^a Pro vedlejší průčelí s délkami mezi 0,0 a h lze použít lineární interpolaci.

^a Pro vedlejší průčelí s délkami mezi 0,0 a h lze použít lineární interpolaci.

Součinitel tlaku pro oblast A s vedlejším průčelím

$$c_{p,net} = 2.1 \rightarrow \text{tlak větru } w = q_p \cdot c_{p,net} = 0.668 \times 2.1 = 1.40 \text{ kN/m}^2$$

Součinitel tlaku pro oblast B s vedlejším průčelím

$$c_{p,net} = 1.8 \rightarrow \text{tlak větru } w = q_p \cdot c_{p,net} = 0.668 \times 1.8 = 1.20 \text{ kN/m}^2$$

VÝPOČET ZATÍŽENÍ VĚTREM PODLE ČTN EN 1991-1-4

Větrová oblast



místo: Ostrava

odečteno z mapy větrových oblastí ČR

$V_{b,0} = 25$ m/s

výchozí základní rychlost větru

Základní rychlost větru

$V_b = V_{b,0} \cdot C_{dir} \cdot C_{season} = 25$ m/s

základní rychlost větru 4.2 (4.1)

$C_{dir} = 1$

součinitel směru větru NA.2.6.

$C_{season} = 1$

součinitel ročního období NA.2.7.

Kategorie terénu



Příloha A.1

$z_0 = 0,3$ m

tab.4.1

$z_{min} = 5,00$ m

tab.4.1

$z_{max} = 200$ m

$z_{e1} = 4,00$ m

zadej $z = z_{min}$

referenční výška

7.2.2 (1)

$z_{e2} = 0$ m

Součinitel terénu

$k_r = 0,19 \cdot (z_0/z_{0,II})^{0,07} = 0,215$

součinitel terénu 4.3.2 (4.5)

$z_{0,II} = 0,05$

kat. terénu II tab.4.1

Součinitel drsnosti terénu

$c_r(z_{e1}) = k_r \cdot \ln(z/z_0) = 0,558$

4.3.2 (4.4)

$c_r(z_{e2}) = k_r \cdot \ln(z/z_0) =$

Součinitel orografie

$c_0(z) = 1$

4.3.1.

Střední rychlost větru

$v_m(z_{e1}) = c_r(z) \cdot c_0(z) \cdot v_b = 13,95 \text{ ms}^{-1}$

4.3.1 (4.3)

$v_m(z_{e2}) = c_r(z) \cdot c_0(z) \cdot v_b = \text{ms}^{-1}$

Intenzita turbulence

$I_v(z_{e1}) = k_t/c_0(z) \cdot \ln(z/z_0) = 0,386$

$k_t = 1$

součinitel turbulence

4.4 (4.7)

$I_v(z_{e2}) = k_t/c_0(z) \cdot \ln(z/z_0) =$

Maximální dynamický tlak větru

$q_p(z_{e1}) = [1+7I_v(z)] \cdot 0,5\rho \cdot v_m(z)^2 =$

450 Nm^{-2}

$=$

$0,45 \text{ kNm}^{-2}$

4.4 (4.8)

$q_p(z_{e2}) = [1+7I_v(z)] \cdot 0,5\rho \cdot v_m(z)^2 =$

Nm^{-2}

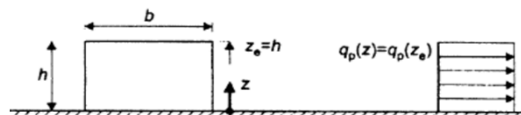
$=$

kNm^{-2}

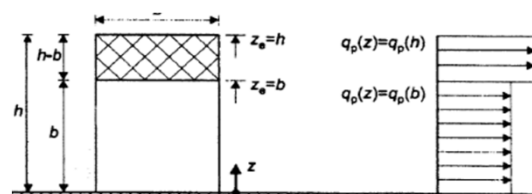
Rozměry objektu

$h =$	4,00 m	výška stavby
$b =$	17,60 m	rozměr kolmo na hřeben - délka štítu
$l =$	56,40 m	rozměr rovnoběžně s hřebenem
$l_1 =$	6,00 m	vzdálenost rámu
$l_2 =$	6,00 m	vzdálenost štítových sloupů
$l_3 =$	6,00 m	vzdálenost vaznic

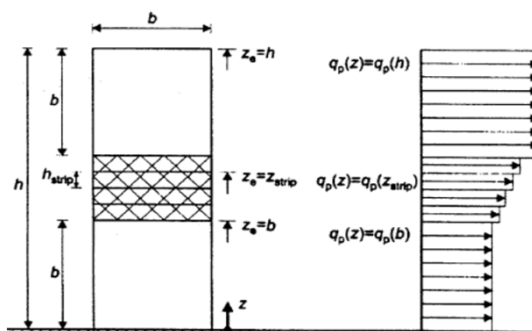
(1)		výška průběh	
$z_{e1} =$	4 m	0 až h konst.	$h < b$



(2)			
$z_{e1} = h$	4 m	b až h konst.	$b < h < 2b$
$z_{e2} = b$	17,6 m	0 až b konst.	



(3)			
$z_{e1} = h$	4 m	(h - b) a konst.	$h > 2b$
$z_{es} = h$	m	b až (h · lin.)	
$z_{e2} = b$	17,6 m	0 až b konst.	



PLATÍ 1.PŘÍPAD

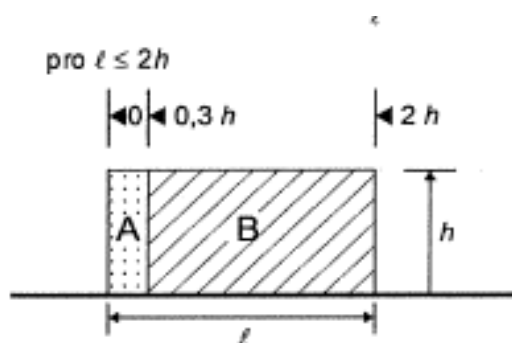
2.3.2 Volně stojící stěna (schodiště)

max. dynamický tlak $q_p = 0.45 \text{ kN/m}^2$

součinitel plnosti (prodyšnost 0%)..... $\varphi = 1.0$

délka - podélná stěna $\ell = 7.3 \text{ m}$, $h = 4.0 \text{ m}$

- příčná stěna $\ell = 2.45 \text{ m}$, $h = 4.8 \text{ m}$



ČSN EN 1991-1-4 ed. 2

Tabulka 7.9 – Doporučené hodnoty součinitelů tlaku $c_{p,net}$ pro volně stojící stěny a zděná zábradlí

Součinitel plnosti	Oblast		A	B	C	D
$\varphi = 1$	Bez vedlejšího průčelí	$\ell/h \leq 3$	2,3	1,4	1,2	1,2
		$\ell/h = 5$	2,9	1,8	1,4	1,2
		$\ell/h \geq 10$	3,4	2,1	1,7	1,2
	S vedlejšími průčelími s délkou $\geq h^a$		2,1	1,8	1,4	1,2
$\varphi = 0,8$			1,2	1,2	1,2	1,2

^a Pro vedlejší průčelí s délkami mezi 0,0 a h lze použít lineární interpolaci.

Součinitel tlaku pro oblast A s vedleším průčelím

$$c_{p,net} = 2.1 \rightarrow \text{tlak větru } w = q_p \cdot c_{p,net} = 0.45 \times 2.1 = 0.945 \text{ kN/m}^2$$

Součinitel tlaku pro oblast B s vedleším průčelím

$$c_{p,net} = 1.8 \rightarrow \text{tlak větru } w = q_p \cdot c_{p,net} = 0.45 \times 1.8 = 0.81 \text{ kN/m}^2$$

2.4 Zatížení jeřábem (mezi řadami 8-9)

Mostový jeřáb 4t - technické údaje od jeřábů:

Nosnost	$m_{(v)}$	=	4000	kg
Hmotnost jeřábu s kočkou	m	=	1580	kg
Hmotnost kočky	m_k	=	363	kg
Hmotnost jeřábu bez kočky	m_j	=	1220	kg
Rychlost pojezdu jeřábu	v_x	=	40	m/min
Rychlost zdvihu břemene	v_y	=	4	m/min
Rychlost pojezdu kočky	v_k	=	30	m/min
Nosnost pomoc. zdvihu	v_y	=	-	t
Rychlost pom. zdvihu břemene	v_y	=	-	m/min

VÝPOČET ZATÍŽENÍ OD JEŘÁBU PODLE ČSN-EN-1991-1-3

NOSNOST:	4 t	Dojezd kočky	0,588 m	Tíha jeřábu	12,2 kN
Rozpětí L =	8,05 m	Rozvor kol a =	2 m	Tíha kočky	3,63 kN

SVISLÉ KOLOVÉ SÍLY

$Q_{\max} =$	23,27 kN	... Max. svislá kolová síla
$Q_{(r\max)} =$	4,64 kN	... Odpovídající kolová síla na druhé větvi JD
$Q_{\min} =$	3,18 kN	... Min. svislá kolová síla
$Q_{(r\min)} =$	4,73 kN	... Odpovídající kolová síla na druhé větvi JD

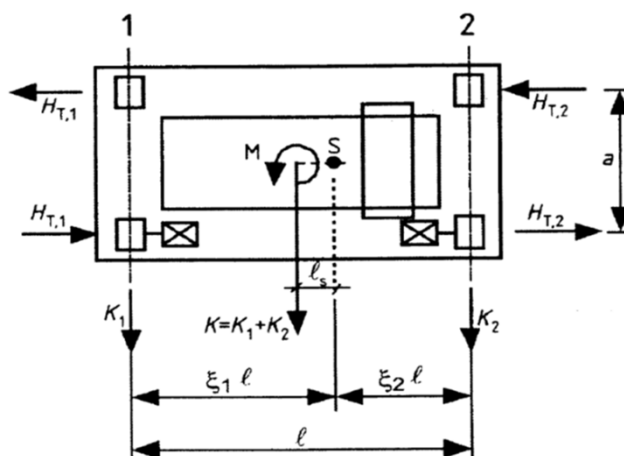
VODOROVNÉ SÍLY OD ZRYCHLENÍ A ZPOMALENÍ JEŘÁBU

Podélné síly

μ	0,2	... součinitel tření
$m_w =$	2,0	... počet pohonů jednotlivých kol
$K =$	1,3	... hnací síla
$\varphi_5 =$	1,5	... dyn. Součinitel
$H_{L,1} =$	0,6 kN	$H_{L,1} \cdot \varphi_5 =$ 1,0 kN
$H_{L,2} =$	0,6 kN	$H_{L,2} \cdot \varphi_5 =$ 1,0 kN

Příčné síly

$\xi_1 =$	0,834	
$\xi_2 =$	0,166	
$L_s =$	2,69 m	
$M =$	3,42 kNm	
$\varphi_5 =$	1,2	
$H_{T,1} =$	0,28 kN	$H_{T,1} \cdot \varphi_5 =$ 0,43 kN
$H_{T,2} =$	1,43 kN	$H_{T,2} \cdot \varphi_5 =$ 2,14 kN



VODOROVNÉ SÍLY OD PŘÍČENÍ JEŘÁBU

úhel přičení

$\alpha = \alpha_F + \alpha_v + \alpha_0 =$	0,015 rad	$b =$	0,12 m	... šířka hlavy kolejnice
$\alpha_F =$	0,150 rad	$x =$	0,002 m	... vůle mezi kolejnicí a vedením
$\alpha_v =$	1,200 rad	$y = 0,1b =$	0,012 m	... opotřebení kolejnice
$\alpha_0 =$	0,001 rad	$a_{\text{ext}} =$	0,01 m	... mezera mezi nákolky kol

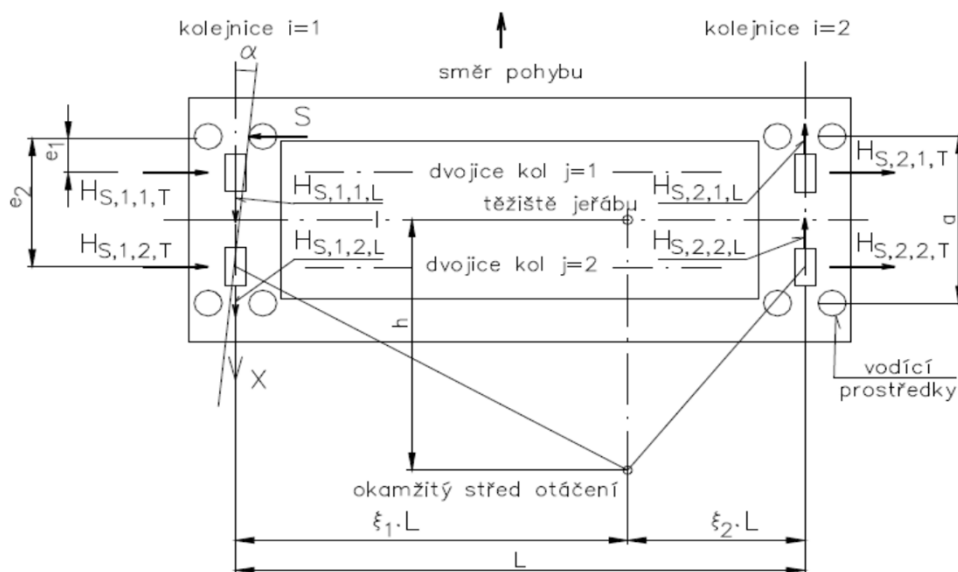
součinitel reakcí při přičení

$$f = 0,3(1 - e^{-250\alpha}) = 0,29 < 0,3 \Rightarrow 0,29$$

(ve směru JD)

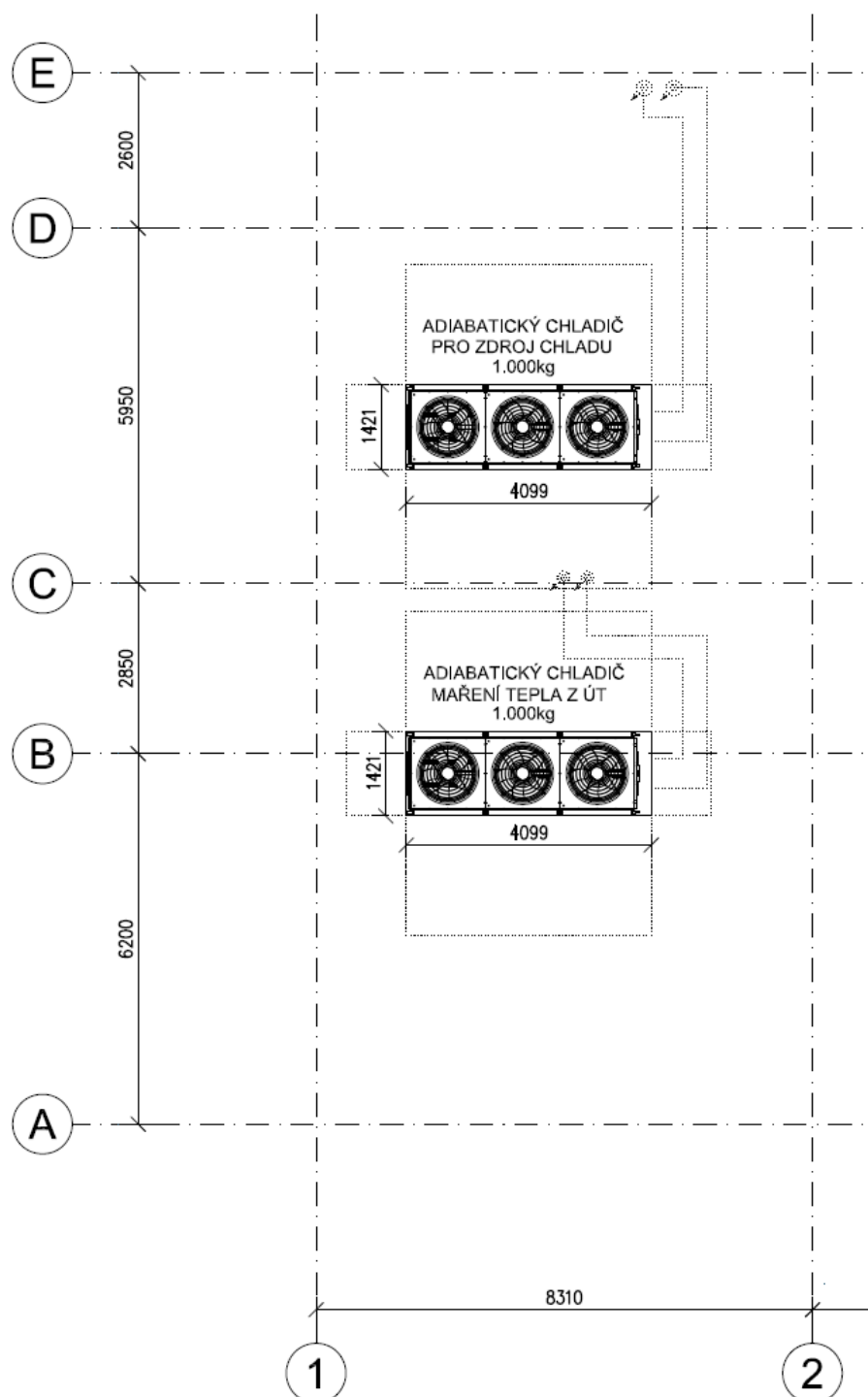
$e_1 =$	0,55 m
$e_2 =$	2,55 m
$h =$	2 m
$n =$	2 ... počet dvojic kol

$\lambda_{s,1,T} =$	0,062	$H_{s,1,1,T} =$	1,02 kN	... dvojkolí 1
$\lambda_{s,2,T} =$	0,312	$H_{s,2,1,T} =$	5,11 kN	model IFF - nezávislé uložení kol
$\lambda_{s,1,T} =$	-0,013	$H_{s,1,2,T} =$	-0,22 kN	... dvojkolí 2
$\lambda_{s,2,T} =$	-0,067	$H_{s,2,2,T} =$	-1,10 kN	
$\lambda_s =$	0,5	$S =$	8,18 kN	



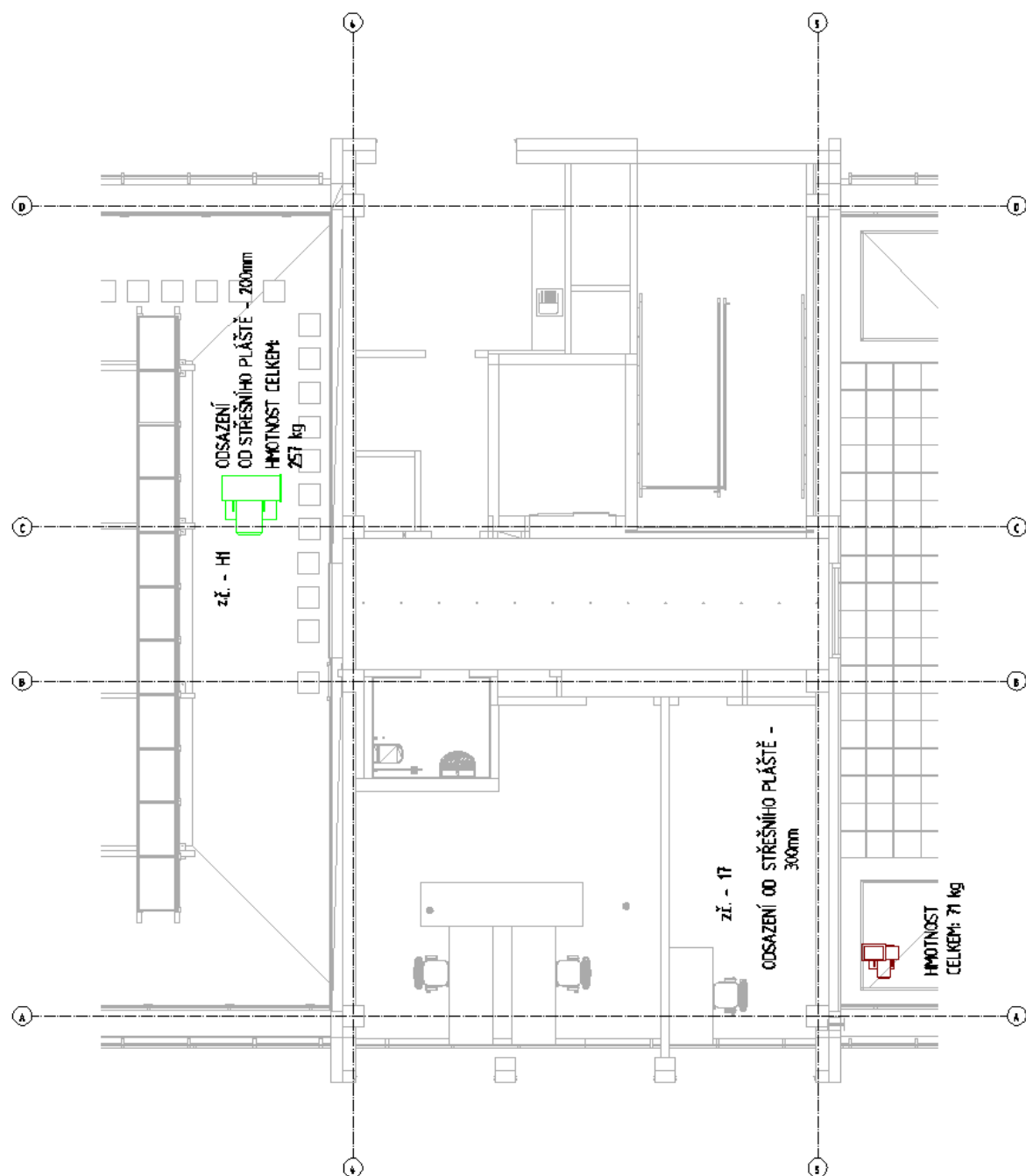
2.5 Jednotky VZT a jednotky chladu

Jednotka chladu (1000 kg)..... $P_{chill} = 10 \text{ kN}$



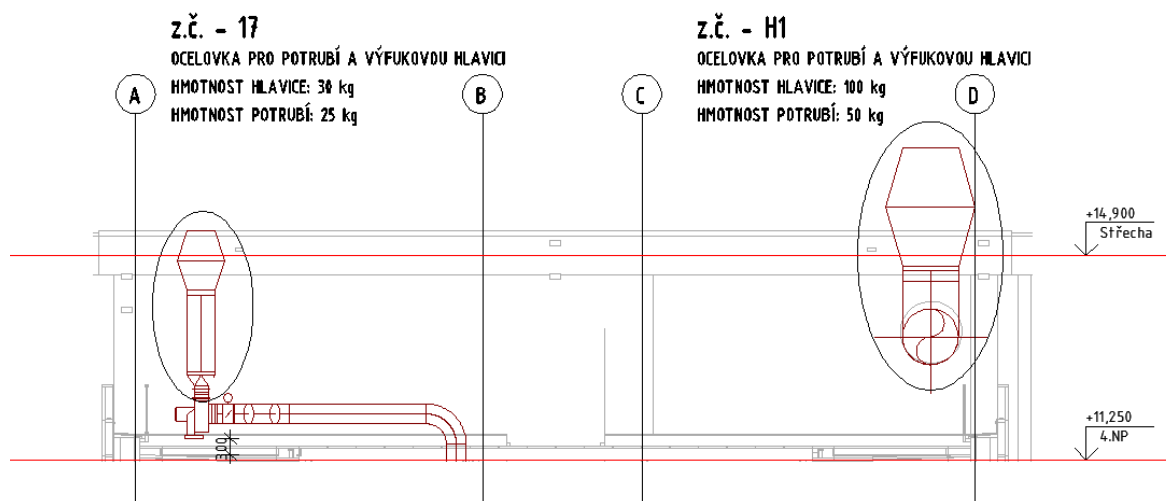
Ventilátor na střeše z.č.17 (71kg)..... $P_{vent17} = 0.71 \text{ kN}$

Ventilátor na střeše z.č.H1 (257kg)..... $P_{ventH1} = 2.57 \text{ kN}$

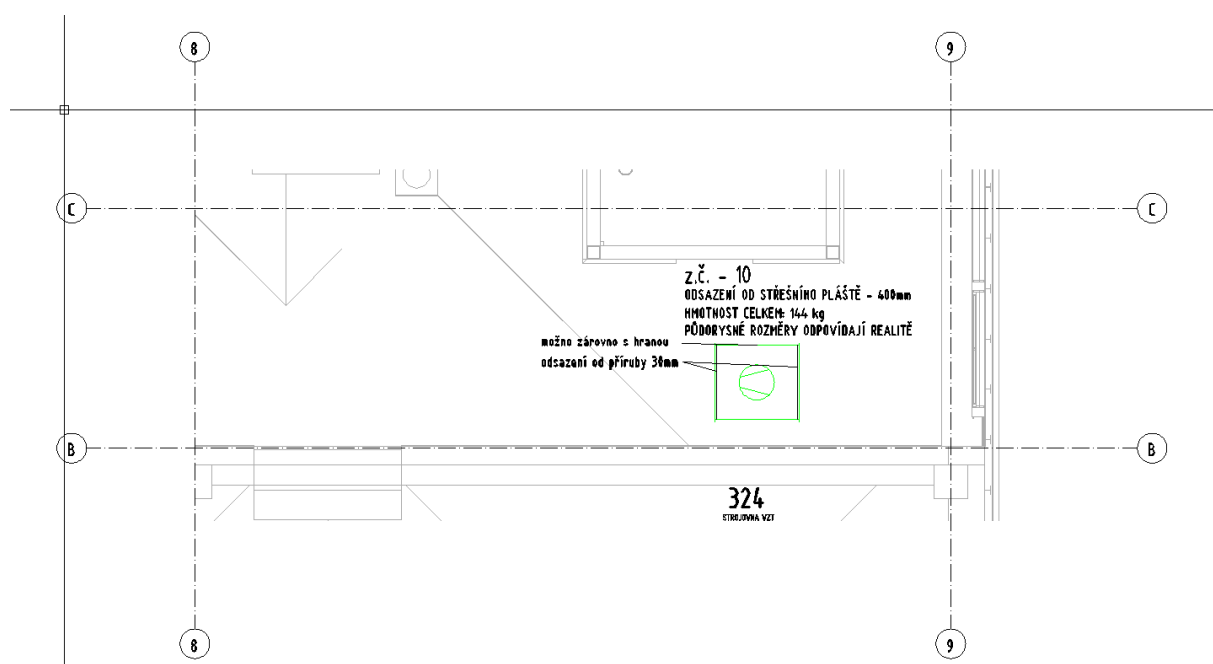


VZT potrubí včetně hlavice k z.č.17 (55kg)..... $P_{VZT17} = 2.57 \text{ kN}$

VZT potrubí včetně hlavice k z.č.H1 (150kg)..... $P_{VZT17} = 1.50 \text{ kN}$

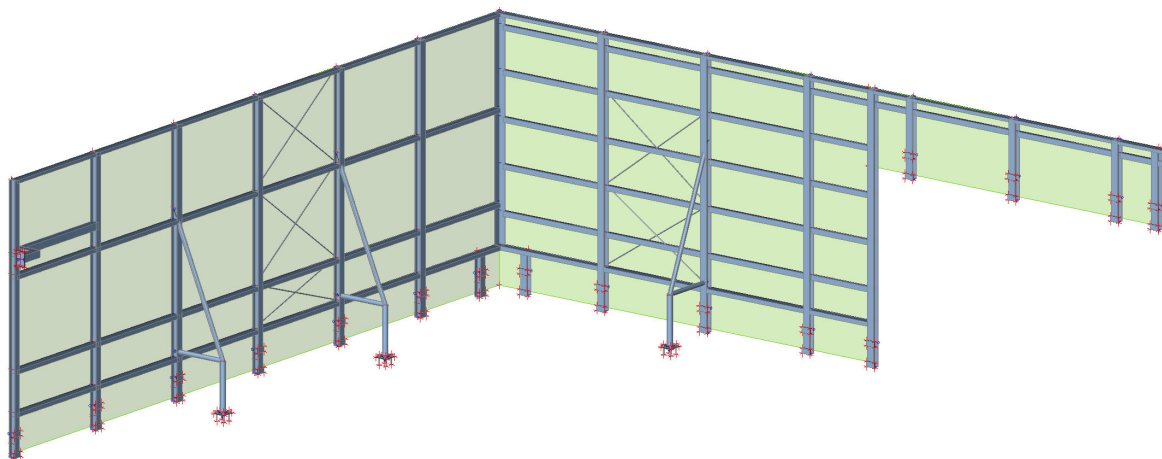


VZT zařízení č.10 (144kg)..... $P_{ventH1} = 1.44 \text{ kN}$

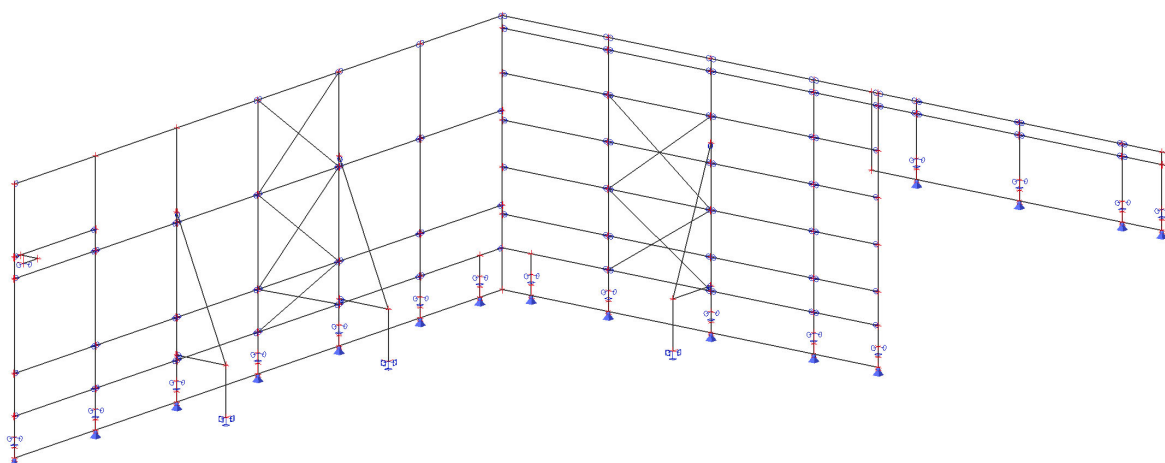


KONSTRUKCE STĚNY PRO FOTOVOLTAIKU A ZELENÉ STĚNY

3D MODEL OF STRUCTURE



Structural model



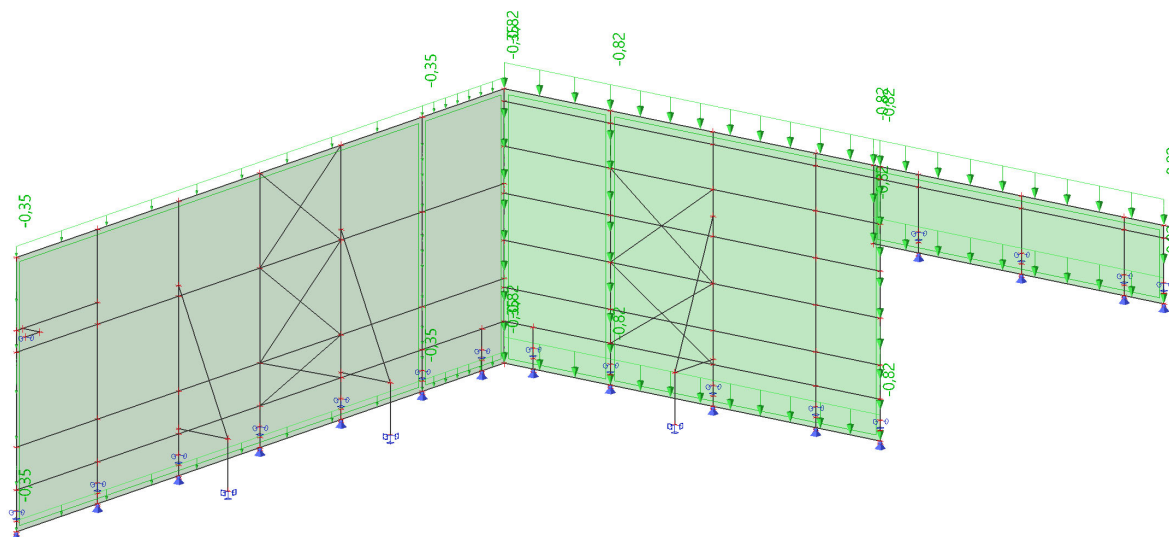
Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

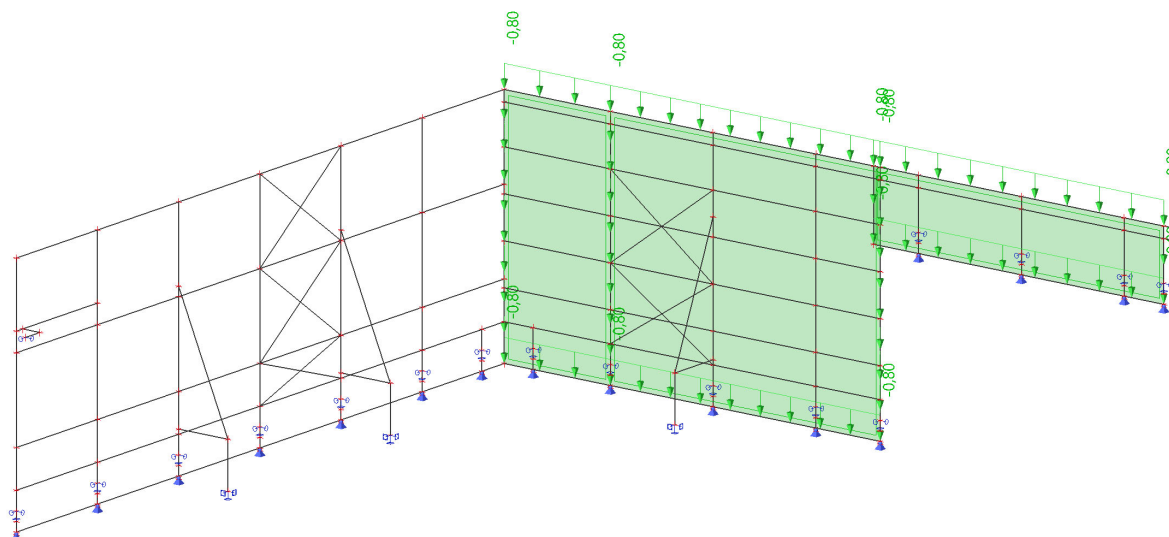
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

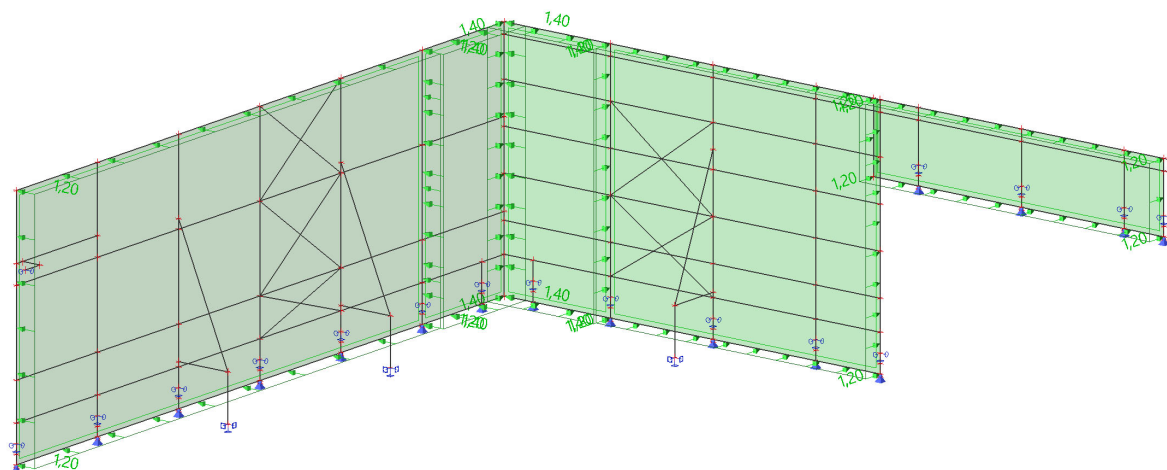
LC2 / Tot. value



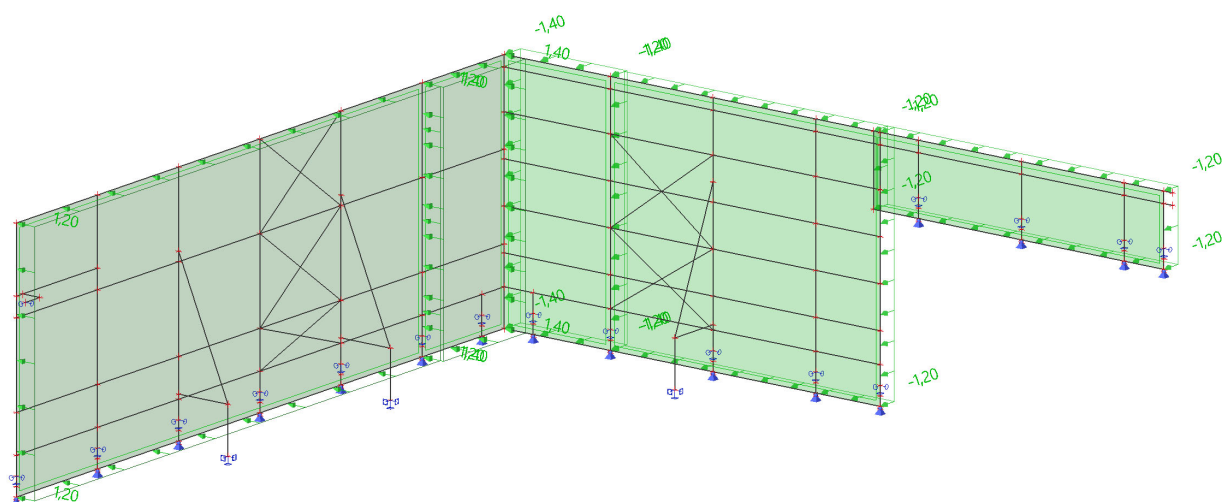
LC3 / Tot. value



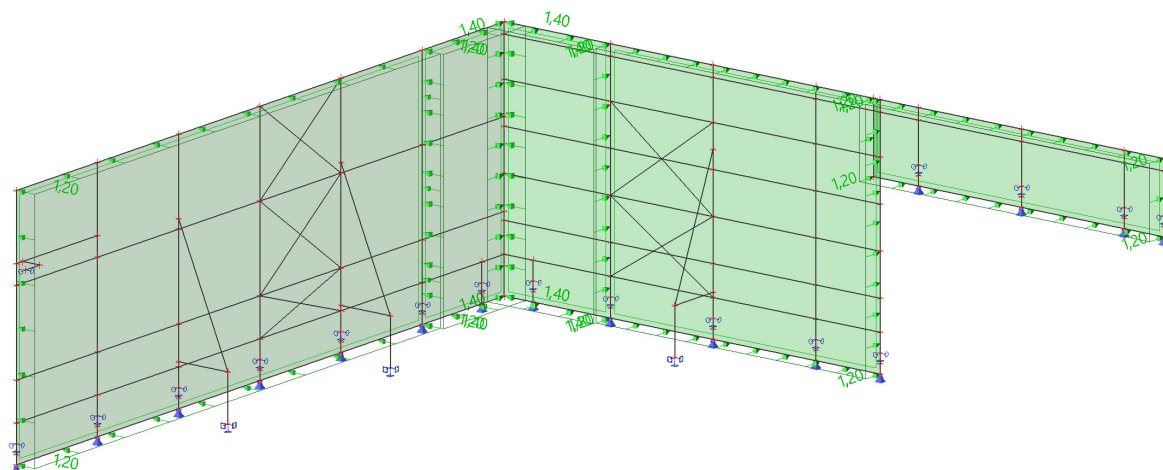
LC4 / Tot. value



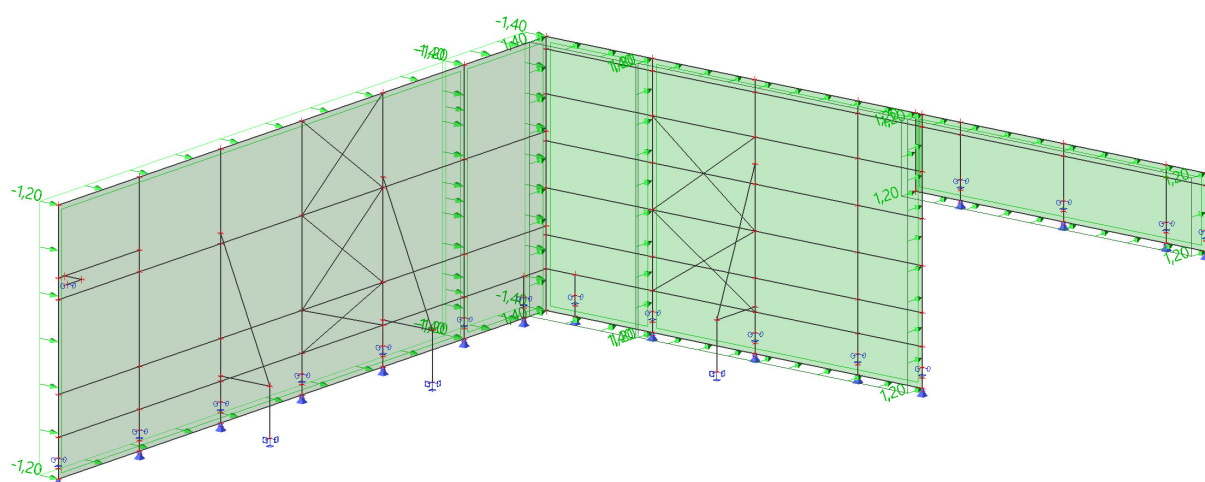
LC5 / Tot. value



LC6 / Tot. value



LC7 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Combinations

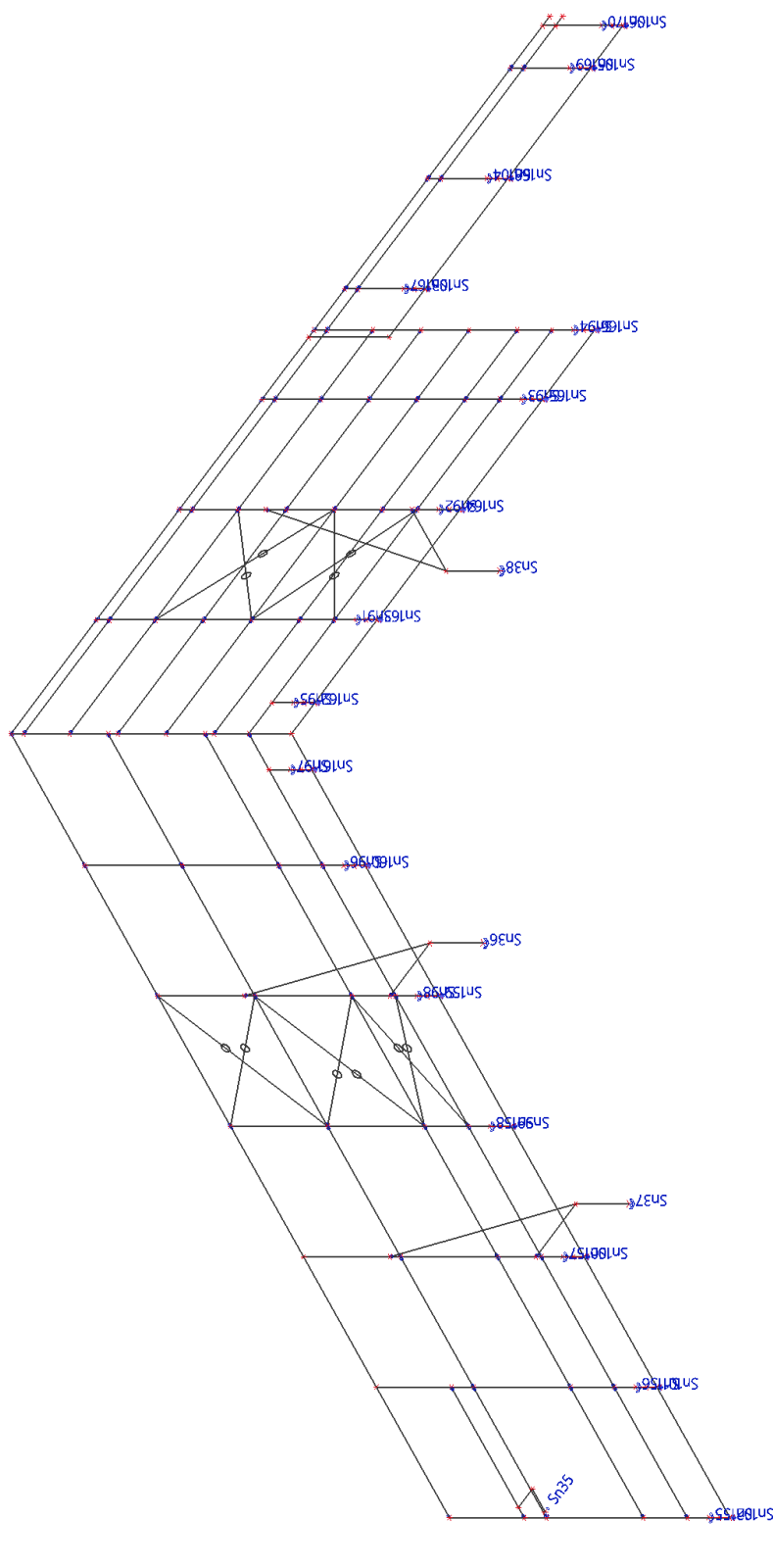
Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B Rmax + - Envelope - ultimate Rmax - - Envelope - ultimate Mmax + - Envelope - ultimate Mmax - - Envelope - ultimate CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic Mmax +def - Envelope - serviceability Mmax -def - Envelope - serviceability

REACTIONS

Numbers of supports



Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None

R1 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z, M_x, M_y, R_z, R_y, R_x

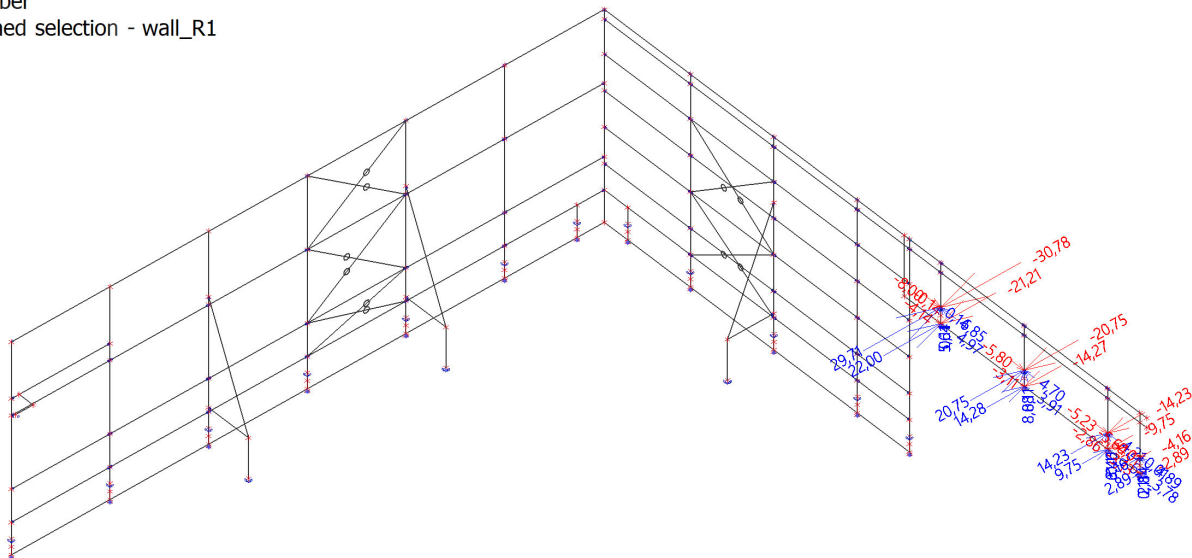
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R1



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R1

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn103/N294	CO1/1	21,22	-4,14	0,08	0,00	0,00	0,00	0,0	0,0
Sn103/N294	CO1/2	22,00	4,97	0,09	0,00	0,00	0,00	0,0	0,0
Sn103/N294	CO1/3	0,01	0,43	0,11	0,00	0,00	0,00	0,0	0,0
Sn103/N294	CO1/4	-21,21	4,61	0,08	0,00	0,00	0,00	0,0	0,0
Sn104/N300	CO1/1	-20,75	4,70	3,97	0,00	0,00	0,00	0,0	0,0
Sn104/N300	CO1/4	20,75	-5,16	3,97	0,00	0,00	0,00	0,0	0,0
Sn104/N300	CO1/5	0,00	-0,49	8,88	0,00	0,00	0,00	0,0	0,0
Sn104/N300	CO1/2	-20,75	-5,80	6,72	0,00	0,00	0,00	0,0	0,0
Sn105/N316	CO1/2	9,75	3,62	0,09	0,00	0,00	0,00	0,0	0,0
Sn105/N316	CO1/1	9,75	-2,86	0,08	0,00	0,00	0,00	0,0	0,0
Sn105/N316	CO1/6	5,85	2,27	0,11	0,00	0,00	0,00	0,0	0,0
Sn105/N316	CO1/4	-9,75	3,08	0,08	0,00	0,00	0,00	0,0	0,0
Sn106/N439	CO1/1	2,89	-3,13	0,08	0,00	0,00	0,00	0,0	0,0
Sn106/N439	CO1/2	2,89	3,78	0,09	0,00	0,00	0,00	0,0	0,0
Sn106/N439	CO1/7	1,74	-1,82	0,11	0,00	0,00	0,00	0,0	0,0
Sn106/N439	CO1/4	-2,89	3,23	0,08	0,00	0,00	0,00	0,0	0,0
Sn167/N289	CO1/1	-29,73	6,85	2,63	0,00	0,00	0,14	0,0	0,0
Sn167/N289	CO1/5	-0,01	-0,85	5,64	0,00	0,00	0,00	0,0	0,0
Sn167/N289	CO1/2	-30,78	-8,00	4,33	0,00	0,00	0,14	0,0	0,0
Sn167/N289	CO1/4	29,71	-7,68	2,63	0,00	0,00	-0,14	0,0	0,0
Sn168/N305	CO1/1	14,27	-3,11	0,08	0,00	0,00	0,00	0,0	0,0
Sn168/N305	CO1/2	14,28	3,91	0,09	0,00	0,00	0,00	0,0	0,0

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn168/N305	CO1/3	0,00	0,28	0,11	0,00	0,00	0,00	0,0	0,0
Sn168/N305	CO1/4	-14,27	3,42	0,08	0,00	0,00	0,00	0,0	0,0
Sn169/N311	CO1/4	14,23	-4,49	3,40	0,00	0,00	0,00	0,0	0,0
Sn169/N311	CO1/1	-14,23	4,21	2,12	0,00	0,00	0,00	0,0	0,0
Sn169/N311	CO1/8	-8,54	-3,30	6,46	0,00	0,00	0,00	0,0	0,0
Sn169/N311	CO1/2	-14,23	-5,23	5,35	0,00	0,00	0,00	0,0	0,0
Sn170/N444	CO1/9	-4,16	4,89	2,61	0,00	0,00	0,01	0,0	0,0
Sn170/N444	CO1/10	-4,16	-5,64	0,53	0,00	0,00	0,01	0,0	0,0
Sn170/N444	CO1/11	-2,49	2,97	2,84	0,00	0,00	0,01	0,0	0,0
Sn170/N444	CO1/2	-4,16	-5,62	1,21	0,00	0,00	0,01	0,0	0,0
Sn170/N444	CO1/4	4,16	-4,86	0,65	0,00	0,00	-0,01	0,0	0,0

R2 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

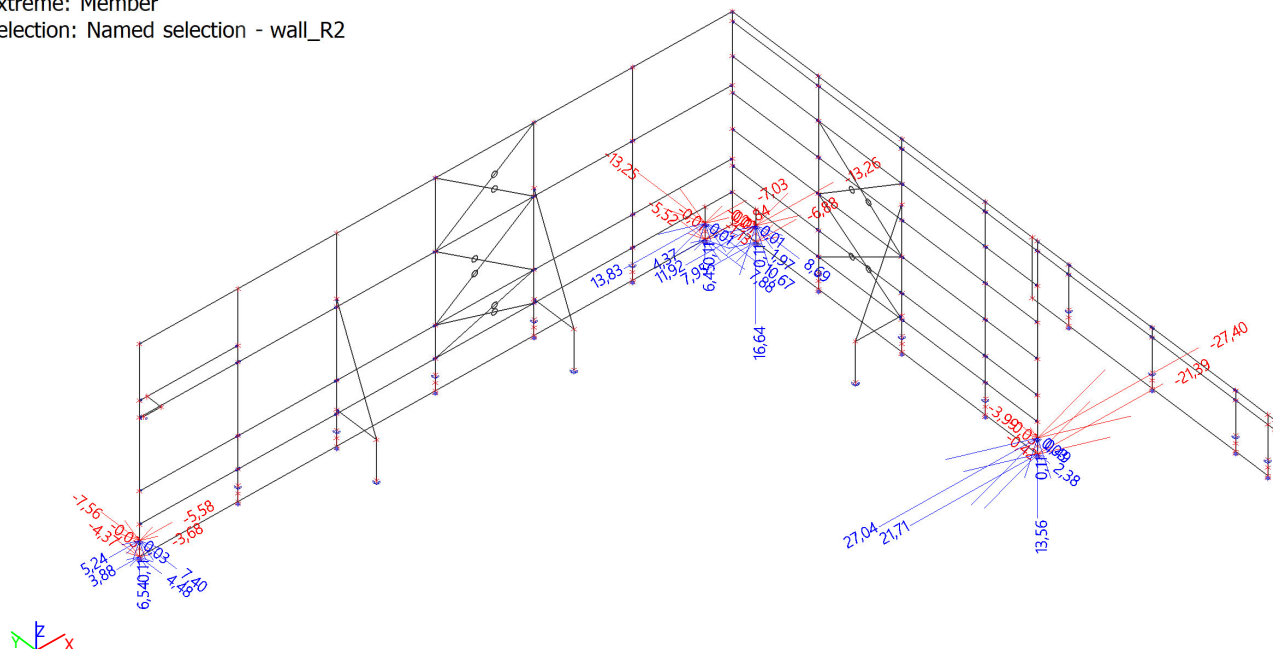
Linear calculation

Combination: C01

System: Global

Extreme: Member

Selection: Named selection - wall_R2



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R2

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn166/N283	CO1/1	21,44	-0,42	0,08	0,00	0,00	0,00	0,0	0,0
Sn166/N283	CO1/2	21,71	2,38	0,09	0,00	0,00	0,00	0,0	0,0
Sn166/N283	CO1/3	0,05	1,20	0,11	0,00	0,00	0,00	0,0	0,0
Sn166/N283	CO1/4	-21,39	1,83	0,08	0,00	0,00	0,00	0,0	0,0
Sn94/N284	CO1/1	-27,09	0,49	6,49	0,00	0,00	0,03	0,0	0,0
Sn94/N284	CO1/5	-0,06	-2,32	13,56	0,00	0,00	0,00	0,0	0,0
Sn94/N284	CO1/2	-27,40	-3,99	10,50	0,00	0,00	0,03	0,0	0,0
Sn94/N284	CO1/4	27,04	-2,97	6,49	0,00	0,00	-0,03	0,0	0,0
Sn162/N347	CO1/6	7,95	-1,04	0,09	0,00	0,00	0,00	0,0	0,0
Sn162/N347	CO1/1	7,73	-1,13	0,08	0,00	0,00	0,00	0,0	0,0
Sn162/N347	CO1/2	5,96	1,97	0,09	0,00	0,00	0,00	0,0	0,0
Sn162/N347	CO1/7	5,12	-0,48	0,11	0,00	0,00	0,00	0,0	0,0
Sn162/N347	CO1/4	-6,88	1,49	0,08	0,00	0,00	0,00	0,0	0,0
Sn95/N348	CO1/4	11,92	0,58	7,45	0,00	0,00	0,01	0,0	0,0
Sn95/N348	CO1/8	-8,49	8,69	16,64	0,00	0,00	0,00	0,0	0,0
Sn95/N348	CO1/6	-13,26	8,66	13,47	0,00	0,00	-0,01	0,0	0,0
Sn95/N348	CO1/9	-10,52	-0,07	7,78	0,00	0,00	-0,01	0,0	0,0
Sn95/N348	CO1/10	11,64	2,41	12,09	0,00	0,00	0,01	0,0	0,0
Sn161/N382	CO1/6	4,37	-5,03	0,09	0,00	0,00	0,00	0,0	0,0
Sn161/N382	CO1/10	-3,72	7,88	0,09	0,00	0,00	0,00	0,0	0,0
Sn161/N382	CO1/1	4,25	-5,52	0,08	0,00	0,00	0,00	0,0	0,0
Sn161/N382	CO1/11	-2,06	5,49	0,11	0,00	0,00	0,00	0,0	0,0

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn161/N382	CO1/4	-3,84	7,39	0,08	0,00	0,00	0,00	0,0	0,0
Sn97/N383	CO1/10	13,83	-13,25	5,77	0,00	0,00	0,01	0,0	0,0
Sn97/N383	CO1/12	11,08	-8,95	6,45	0,00	0,00	0,00	0,0	0,0
Sn97/N383	CO1/1	-7,03	10,67	3,02	0,00	0,00	-0,01	0,0	0,0
Sn97/N383	CO1/6	-5,52	10,14	4,50	0,00	0,00	-0,01	0,0	0,0
Sn97/N383	CO1/4	12,32	-12,72	4,30	0,00	0,00	0,01	0,0	0,0
Sn102/N437	CO1/6	3,88	-4,36	0,09	0,00	0,00	0,00	0,0	0,0
Sn102/N437	CO1/13	3,87	-4,37	0,08	0,00	0,00	0,00	0,0	0,0
Sn102/N437	CO1/14	-3,67	4,48	0,09	0,00	0,00	0,00	0,0	0,0
Sn102/N437	CO1/15	0,11	0,07	0,11	0,00	0,00	0,00	0,0	0,0
Sn102/N437	CO1/4	-3,68	4,47	0,08	0,00	0,00	0,00	0,0	0,0
Sn155/N438	CO1/4	5,24	-7,55	4,82	0,00	0,00	-0,03	0,0	0,0
Sn155/N438	CO1/16	0,89	-7,08	4,77	0,00	0,00	-0,02	0,0	0,0
Sn155/N438	CO1/17	-3,40	4,38	6,54	0,00	0,00	0,02	0,0	0,0
Sn155/N438	CO1/6	-5,58	7,39	5,57	0,00	0,00	0,03	0,0	0,0
Sn155/N438	CO1/14	5,22	-7,56	5,53	0,00	0,00	-0,03	0,0	0,0
Sn155/N438	CO1/13	-5,56	7,40	4,86	0,00	0,00	0,03	0,0	0,0

R3 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z, M_x, M_y, R_z, R_y, R_x

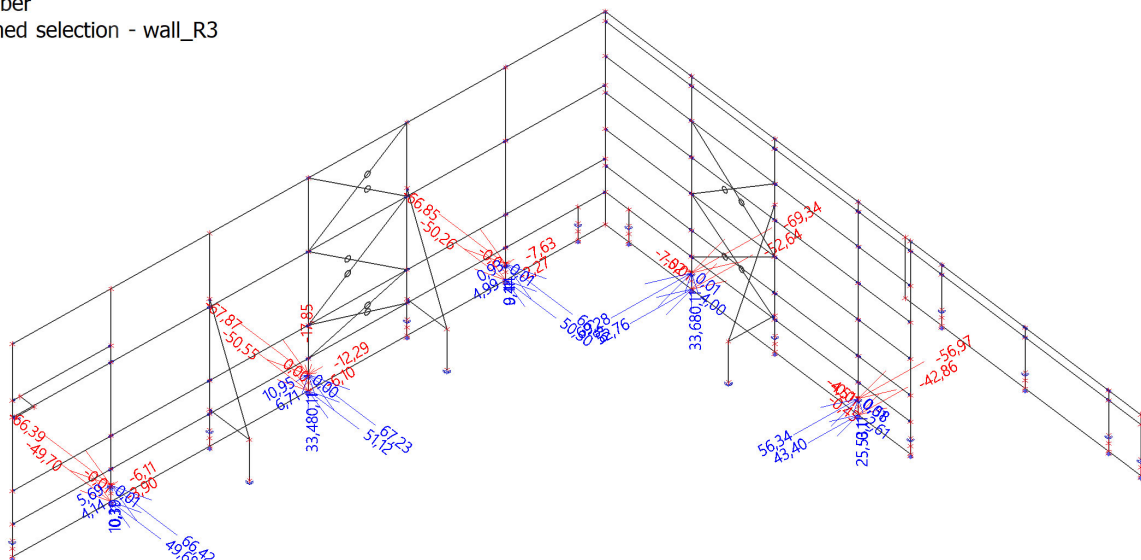
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R3



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R3

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn93/N273	CO1/1	-56,50	0,58	11,49	0,00	0,00	0,01	0,0	0,0
Sn93/N273	CO1/2	-0,17	-2,61	25,53	0,00	0,00	0,00	0,0	0,0
Sn93/N273	CO1/3	-56,97	-4,51	19,36	0,00	0,00	0,01	0,0	0,0
Sn93/N273	CO1/4	56,34	-3,37	11,49	0,00	0,00	-0,01	0,0	0,0
Sn93/N273	CO1/5	-56,55	-0,13	19,36	0,00	0,00	0,01	0,0	0,0
Sn96/N371	CO1/4	0,93	-66,85	7,04	0,00	0,00	0,01	0,0	0,0
Sn96/N371	CO1/6	-6,93	40,13	6,81	0,00	0,00	-0,01	0,0	0,0
Sn96/N371	CO1/7	-1,40	-40,11	9,44	0,00	0,00	0,01	0,0	0,0
Sn96/N371	CO1/5	-7,63	66,86	7,85	0,00	0,00	-0,01	0,0	0,0
Sn96/N371	CO1/8	-7,24	66,86	6,83	0,00	0,00	-0,01	0,0	0,0
Sn96/N371	CO1/9	-1,78	-58,54	7,99	0,00	0,00	0,01	0,0	0,0
Sn99/N404	CO1/5	6,71	-50,54	0,09	0,00	0,00	0,00	0,0	0,0
Sn99/N404	CO1/9	-1,13	51,12	0,09	0,00	0,00	0,00	0,0	0,0
Sn99/N404	CO1/8	6,67	-50,55	0,08	0,00	0,00	0,00	0,0	0,0
Sn99/N404	CO1/7	-3,49	30,46	0,11	0,00	0,00	0,00	0,0	0,0
Sn99/N404	CO1/4	-6,10	50,68	0,08	0,00	0,00	0,00	0,0	0,0
Sn101/N426	CO1/5	4,14	-49,70	0,09	0,00	0,00	0,00	0,0	0,0
Sn101/N426	CO1/10	0,12	0,00	0,11	0,00	0,00	0,00	0,0	0,0
Sn101/N426	CO1/4	-3,90	49,68	0,08	0,00	0,00	0,00	0,0	0,0
Sn163/N250	CO1/5	52,76	0,96	0,09	0,00	0,00	0,00	0,0	0,0
Sn163/N250	CO1/3	42,71	4,00	0,09	0,00	0,00	0,00	0,0	0,0
Sn163/N250	CO1/1	52,73	0,23	0,08	0,00	0,00	0,00	0,0	0,0

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn163/N250	CO1/11	25,66	3,58	0,11	0,00	0,00	0,00	0,0	0,0
Sn163/N250	CO1/4	-52,64	2,71	0,08	0,00	0,00	0,00	0,0	0,0
Sn91/N251	CO1/1	-69,32	-1,22	11,00	0,00	0,00	-0,01	0,0	0,0
Sn91/N251	CO1/12	-35,04	-7,26	33,68	0,00	0,00	-0,01	0,0	0,0
Sn91/N251	CO1/5	-69,34	-2,66	20,32	0,00	0,00	-0,01	0,0	0,0
Sn91/N251	CO1/3	-58,35	-7,52	28,71	0,00	0,00	-0,01	0,0	0,0
Sn91/N251	CO1/4	69,28	-4,65	16,02	0,00	0,00	0,01	0,0	0,0
Sn165/N272	CO1/1	43,00	-0,45	0,08	0,00	0,00	0,00	0,0	0,0
Sn165/N272	CO1/3	43,40	2,61	0,09	0,00	0,00	0,00	0,0	0,0
Sn165/N272	CO1/13	0,13	1,33	0,11	0,00	0,00	0,00	0,0	0,0
Sn165/N272	CO1/4	-42,86	2,00	0,08	0,00	0,00	0,00	0,0	0,0
Sn160/N370	CO1/5	4,99	-50,26	0,09	0,00	0,00	0,00	0,0	0,0
Sn160/N370	CO1/8	4,84	-50,26	0,08	0,00	0,00	0,00	0,0	0,0
Sn160/N370	CO1/14	-2,11	50,30	0,09	0,00	0,00	0,00	0,0	0,0
Sn160/N370	CO1/10	1,43	0,03	0,11	0,00	0,00	0,00	0,0	0,0
Sn160/N370	CO1/4	-2,27	50,30	0,08	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/4	10,95	-67,37	32,40	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/9	1,90	-67,87	14,01	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/8	-12,22	67,23	-17,85	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/1	-11,99	67,23	-17,85	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/15	10,65	-67,39	33,48	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/5	-12,29	67,22	-16,78	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/14	10,88	-67,39	33,48	0,00	0,00	0,00	0,0	0,0
Sn158/N405	CO1/16	1,75	-67,86	12,94	0,00	0,00	0,00	0,0	0,0
Sn156/N427	CO1/4	5,69	-66,39	7,70	0,00	0,00	-0,01	0,0	0,0
Sn156/N427	CO1/16	0,84	-60,70	7,61	0,00	0,00	-0,01	0,0	0,0
Sn156/N427	CO1/7	3,29	-39,83	10,39	0,00	0,00	0,00	0,0	0,0
Sn156/N427	CO1/5	-6,11	66,42	8,81	0,00	0,00	0,01	0,0	0,0
Sn156/N427	CO1/3	0,81	-60,70	8,74	0,00	0,00	-0,01	0,0	0,0
Sn156/N427	CO1/1	-6,01	66,40	7,68	0,00	0,00	0,01	0,0	0,0

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn159/N393	CO1/1	-5,50	27,84	0,09	0,00	0,00	0,00	0,0	0,0
Sn159/N393	CO1/2	6,68	-27,55	0,08	0,00	0,00	0,00	0,0	0,0
Sn159/N393	CO1/11	-0,19	16,70	0,11	0,00	0,00	0,00	0,0	0,0
Sn159/N393	CO1/5	-5,57	27,82	0,08	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/5	7,25	-56,83	74,66	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/1	7,21	-56,86	75,76	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/2	-7,89	56,46	-59,70	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/4	-7,93	56,43	-58,60	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/6	1,14	-56,48	74,59	0,00	0,00	0,00	0,0	0,0
Sn157/N416	CO1/8	-7,77	56,46	-59,70	0,00	0,00	0,00	0,0	0,0

R5 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

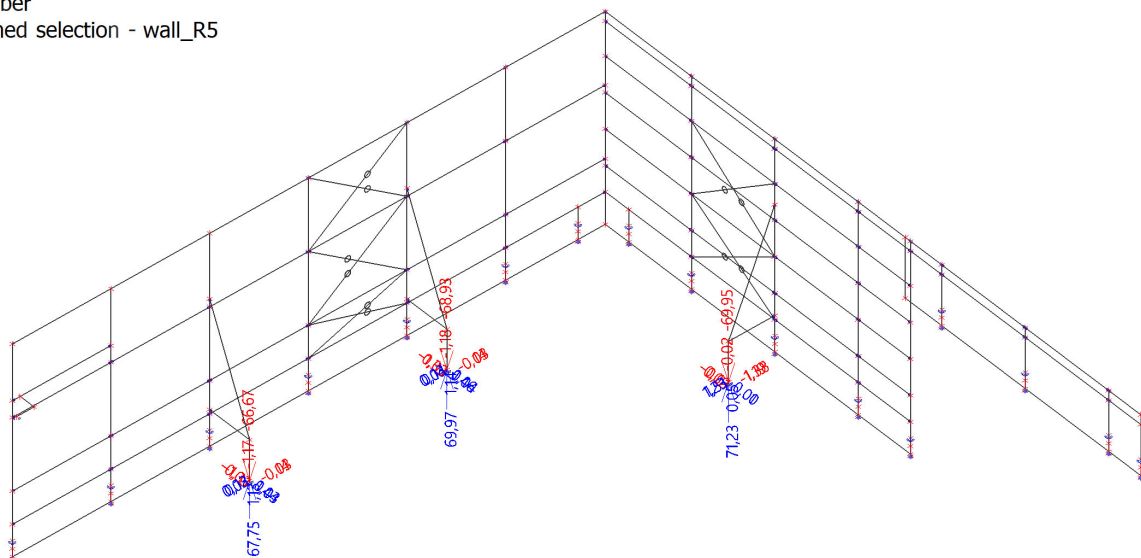
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R5



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R5

Nodal reactions

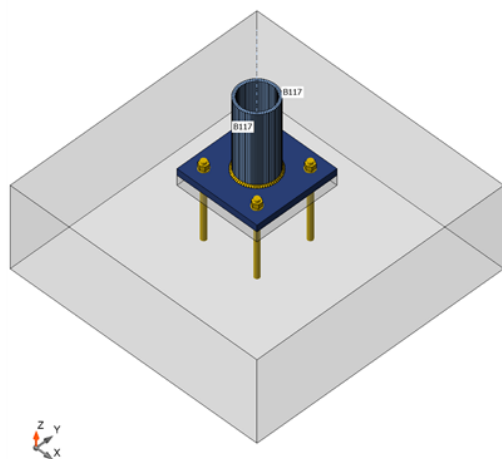
Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn36/N450	CO1/1	-0,03	1,46	69,97	-1,18	-0,14	0,04	-16,8	-2,1
Sn36/N450	CO1/2	0,03	-1,33	-68,93	1,14	0,14	-0,03	-16,6	-2,0
Sn37/N457	CO1/1	-0,03	1,44	67,75	-1,17	-0,14	0,03	-17,3	-2,0
Sn37/N457	CO1/2	0,02	-1,31	-66,67	1,13	0,13	-0,03	-17,0	-2,0
Sn38/N461	CO1/3	1,51	-0,01	71,23	0,05	1,23	-0,02	0,7	17,2
Sn38/N461	CO1/4	-1,38	0,00	-69,95	-0,02	-1,19	0,01	0,3	17,0
Sn38/N461	CO1/5	-1,37	0,00	-69,88	-0,02	-1,19	0,01	0,3	17,1
Sn38/N461	CO1/6	1,51	-0,01	71,16	0,05	1,23	-0,02	0,7	17,2
Sn38/N461	CO1/7	-1,34	-0,01	-60,78	0,04	-1,15	-0,02	-0,7	18,9

Con N461

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β - Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B117	1 - RO108X8	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C30/37 (EN)
Bolts	M16 8.8

Foundation block

CB 1

Dimensions	740 x 740	mm
Depth	250	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B117	70,1	0,0	1,4	0,0	-1,2	0,0
CO1(2)	B117	-71,4	0,0	-1,5	0,0	1,2	-0,1
CO1(3)	B117	60,9	0,0	1,3	0,0	-1,1	-0,1
CO1(4)	B117	70,0	0,0	1,4	0,0	-1,2	0,0
CO1(5)	B117	69,9	0,0	1,4	0,0	-1,2	0,0
CO1(6)	B117	-71,3	0,0	-1,5	0,0	1,2	-0,1
CO1(7)	B117	-71,2	0,0	-1,5	0,0	1,2	-0,1
CO1(8)	B117	61,1	0,0	1,3	0,0	-1,2	0,0
CO1(9)	B117	70,0	0,0	1,4	0,0	-1,2	0,0
CO1(10)	B117	-71,3	0,0	-1,5	0,0	1,2	-0,1
CO1(11)	B117	-0,8	0,0	-0,1	0,0	0,0	0,0
CO1(12)	B117	-43,2	0,0	-0,9	0,0	0,7	0,0
CO1(13)	B117	-0,6	0,0	-0,1	0,0	0,0	0,0
CO1(14)	B117	61,0	0,0	1,3	0,0	-1,1	0,0
CO1(15)	B117	-0,7	0,0	-0,1	0,0	0,0	0,0

Project: CEETe - TU Ostrava
Project no: Kw1
Author: Ing. Jeřowicz

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	93,9 < 100%	OK
Welds	41,7 < 100%	OK
Concrete block	9,8 < 100%	OK
Buckling	Not calculated	

Project: CEETe - TU Ostrava
 Project no: Kw1
 Author: Ing. Jeřowicz

Project item Con N461

Design

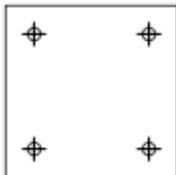
Name Con N461
 Description
 Analysis Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	740 x 740	mm
Depth	250	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P20,0x240,0-240,0 (S 235)		1	Fillet: a = 4,0	314,0	M16 8.8	4

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Fillet	S 235	4,0	5,7	314,0

Anchors

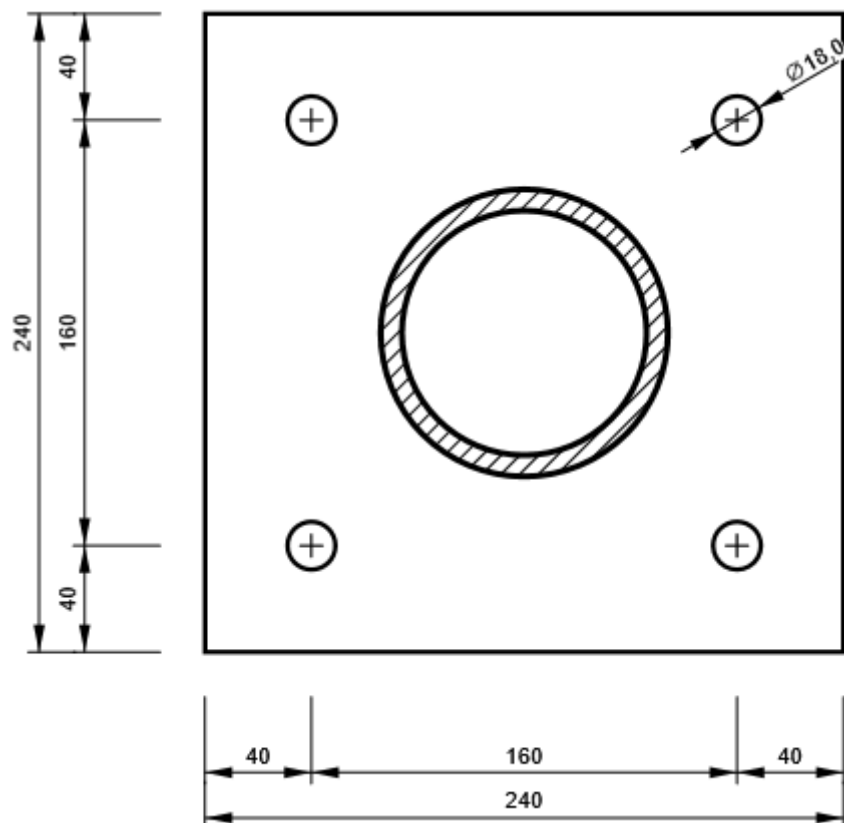
Name	Length [mm]	Drill length [mm]	Count
M16 8.8	210	160	4

Drawing

BP1

Project: CEETe - TU Ostrava
Project no: Kw1
Author: Ing. Jeřowicz

P20,0x240-240 (S 235)



R6 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

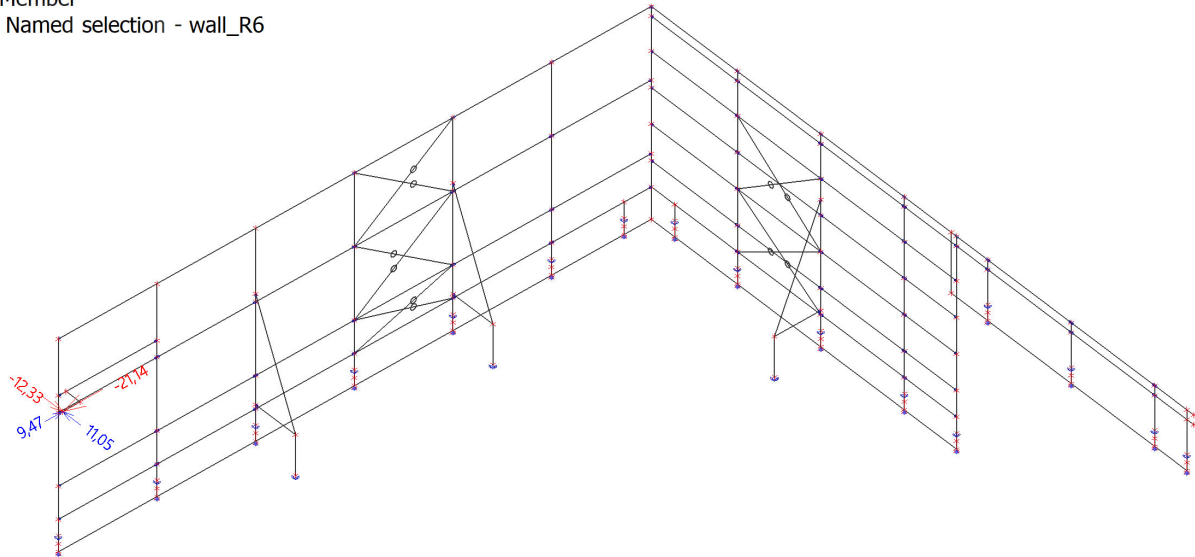
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R6



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - wall_R6

Nodal reactions

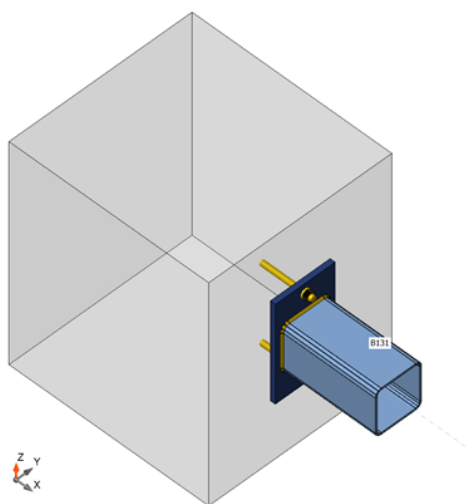
Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn35/N521	CO1/1	9,47	11,05	0,00	0,00	0,00	0,00	-	-
Sn35/N521	CO1/2	-21,13	-12,33	0,00	0,00	0,00	0,00	-	-
Sn35/N521	CO1/3	9,45	11,05	0,00	0,00	0,00	0,00	-	-
Sn35/N521	CO1/4	-21,14	-12,33	0,00	0,00	0,00	0,00	-	-

Con N521

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β - Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B131	1 - VHP140/140x6.0	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M16 8.8

Foundation block

CB 1

Dimensions	550 x 670	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	115	mm
Shear force transfer	Anchors	

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B131	25,7	0,0	-15,2	0,0	0,0	0,0
CO1(2)	B131	-15,3	0,0	14,4	0,0	0,0	0,0
CO1(3)	B131	0,3	0,0	0,0	0,0	0,0	0,0
CO1(4)	B131	0,2	0,0	0,0	0,0	0,0	0,0
CO1(5)	B131	15,7	0,0	-14,4	0,0	0,0	0,0
CO1(6)	B131	-15,2	0,0	14,4	0,0	0,0	0,0

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	53,0 < 100%	OK
Welds	26,4 < 100%	OK
Concrete block	1,8 < 100%	OK
Buckling	Not calculated	

Project: CEETe, VŠB TUO
 Project no: wall_01
 Author: Ing. Jeřowicz

Project item Con N521

Design


Name Con N521
 Description
 Analysis Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	550 x 670	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	115	mm
Shear force transfer	Anchors	

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P15,0x180,0-300,0 (S 235)		1	Double fillet: a = 4,0	509,2	M16 8.8	2

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Double fillet	S 235	4,0	5,7	509,2

Anchors

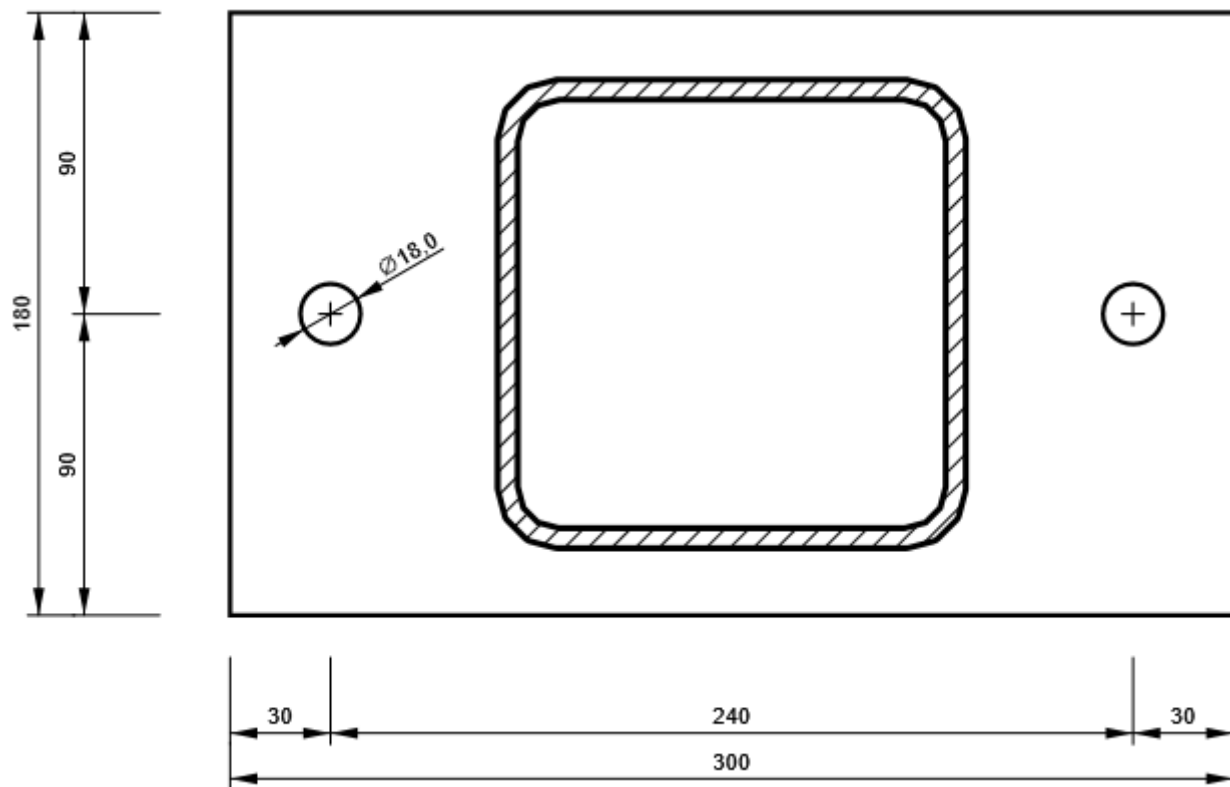
Name	Length [mm]	Drill length [mm]	Count
M16 8.8	130	115	2

Drawing

BP1

Project: CEETe, VŠB TUO
Project no: wall_01
Author: Ing. Jeřowicz

P15,0x300-180 (S 235)



DEFORMATIONS

1D deformations; u_x

Values: u_x

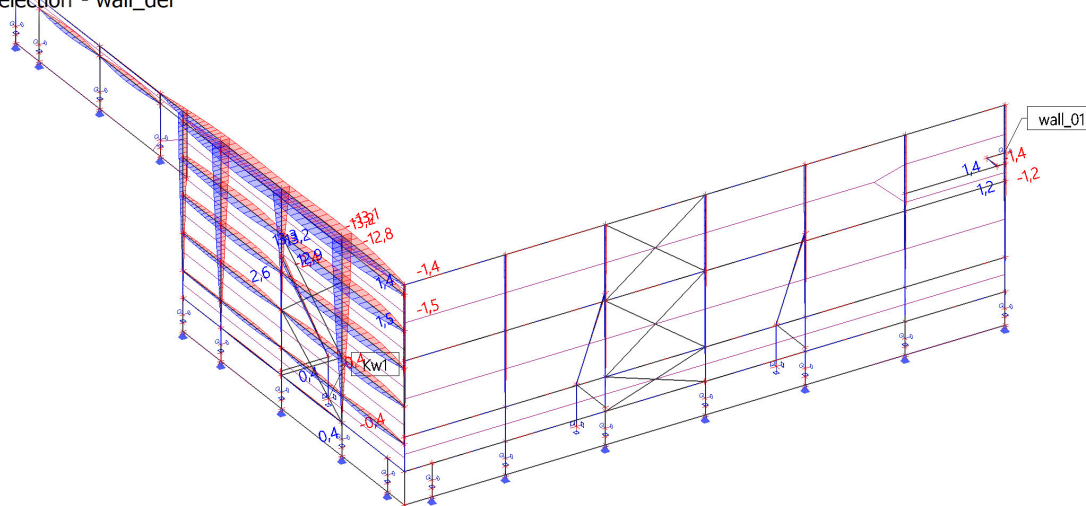
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - wall_def



1D deformations; u_y

Values: u_y

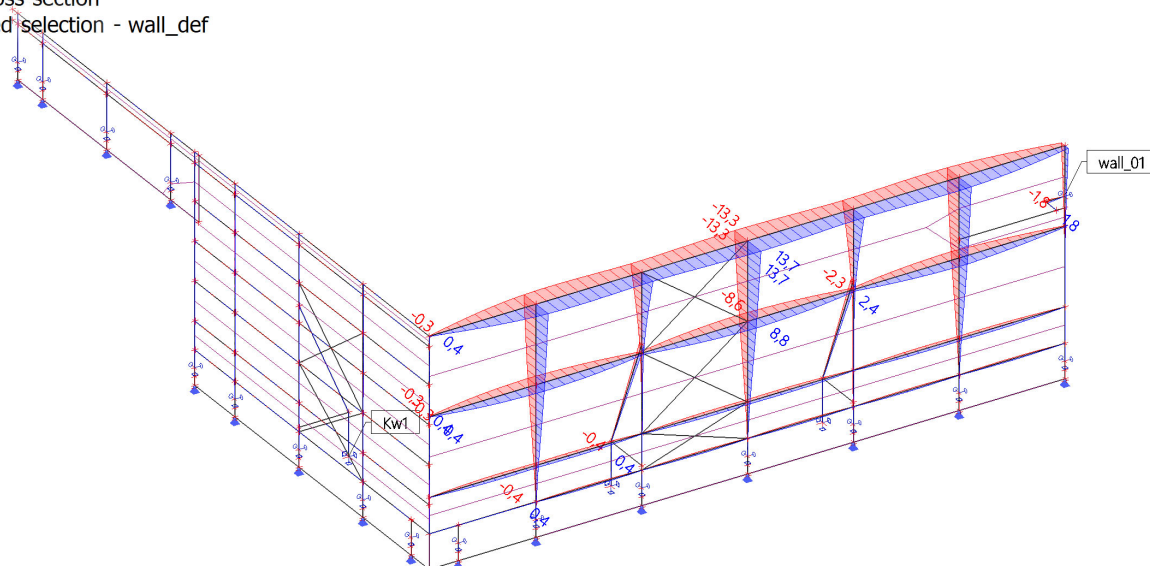
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - wall_def



Deformations on member

Linear calculation, Extreme : Global

Selection : Named selection - wall_def

Combinations : CO2

Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B131	830,080	CO2/1	-1,8	0,0	1,4	0,2	-3,5	1,4	2,3
B131	830,080	CO2/2	1,8	0,0	-1,4	0,2	3,4	-1,3	2,3
B64	1438,200	CO2/1	-0,2	-13,3	-1,1	3,5	-0,5	-0,3	13,4
B64	1677,900	CO2/2	0,3	13,2	-0,6	-3,1	-0,5	-0,3	13,2
B40	7344,000	CO2/1	1,4	0,0	-13,3	2,3	0,1	-1,1	13,4
B40	7344,000	CO2/3	-0,2	0,0	13,7	-2,4	0,1	-1,3	13,7
B41	2448,000	CO2/2	-1,3	0,1	11,5	-6,6	-0,1	-2,2	11,6
B41	2448,000	CO2/1	1,4	-0,1	-11,4	6,6	0,1	-2,2	11,5
B91	5300,000	CO2/2	-0,1	-1,3	11,5	0,1	-6,6	-0,1	11,6
B91	5300,000	CO2/1	0,1	1,4	-11,4	-0,1	6,6	0,1	11,5
B50	2478,000	CO2/2	0,3	1,4	-0,7	-0,3	-1,3	-9,2	1,6
B50	2478,000	CO2/1	-0,3	-1,4	-0,8	0,3	-2,0	9,2	1,7

STRESS ANALYSIS OF CROSS SECTIONS

CS11 - 1D internal forces; N

Values: **N**

Linear calculation

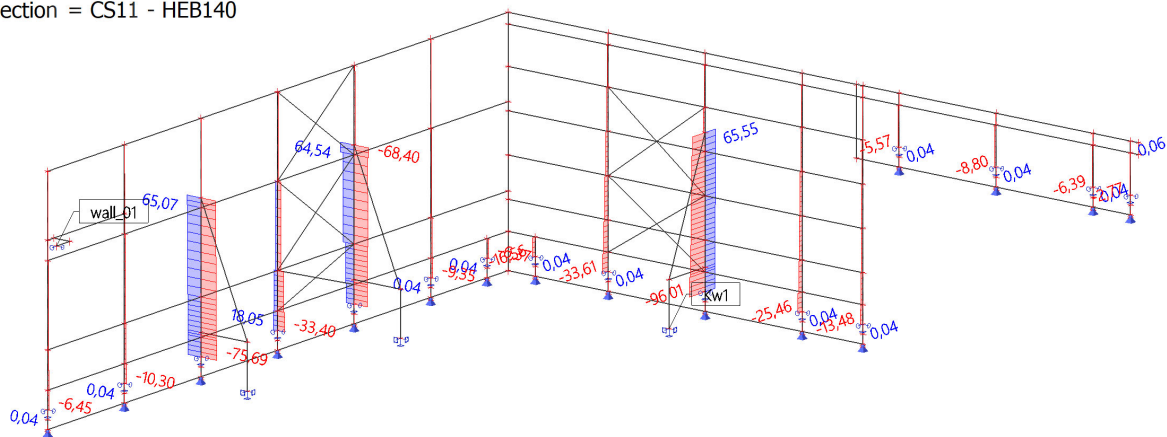
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS11 - HEB140



CS11 - 1D internal forces; M_y

Values: **M_y**

Linear calculation

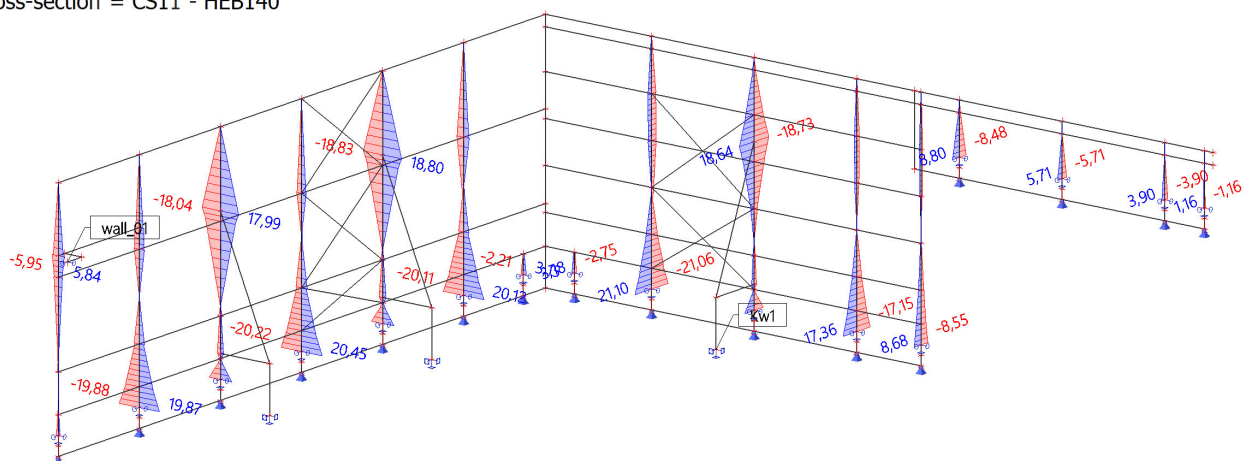
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

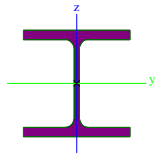
Selection: All

Filter: Cross-section = CS11 - HEB140



Cross-sections

Cross-sections - CS11

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
	Detailed						
CS11	HEB140	S 235	rolled	b	c		European wide flange beam

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS11 - HEB140

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B81	450,000+	CO1/1	CS11 - HEB140	-96,01	0,10	-29,77	0,00	11,76	0,02
B81	3685,000-	CO1/2	CS11 - HEB140	65,55	-0,40	-14,41	0,00	-18,70	0,24
B90	450,000+	CO1/3	CS11 - HEB140	-5,69	10,11	-5,36	0,01	3,15	-1,49
B81	450,000+	CO1/4	CS11 - HEB140	-88,61	-0,23	-29,78	0,00	11,73	0,17
B81	450,000+	CO1/5	CS11 - HEB140	52,09	2,62	29,69	0,00	-11,52	-1,22
B84	450,000+	CO1/2	CS11 - HEB140	-2,57	3,07	8,50	-0,14	-8,48	-1,84
B84	450,000+	CO1/6	CS11 - HEB140	-4,26	3,03	-8,79	0,14	8,80	-1,99
B8	450,000+	CO1/2	CS11 - HEB140	-15,95	1,94	16,63	0,01	-21,06	-1,08
B8	450,000+	CO1/1	CS11 - HEB140	-20,24	1,70	-16,58	-0,01	21,10	-0,38
B88	850,000	CO1/7	CS11 - HEB140	-16,41	-8,23	-3,28	0,00	0,77	-3,11
B94	3900,000+	CO1/6	CS11 - HEB140	-1,79	-2,44	1,73	-0,01	-2,41	2,94

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/2	LC1 + LC2 + 1.50*LC5
CO1/3	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC7
CO1/5	LC1 + LC2 + 0.75*LC3 + 1.50*LC5
CO1/6	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4
CO1/7	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC7

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS11 - HEB140

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B81	950,000+	CO1/1	CS11 - HEB140	S 235	0,80	0,09	0,80

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7

CS12 - 1D internal forces; N

Values: **N**

Linear calculation

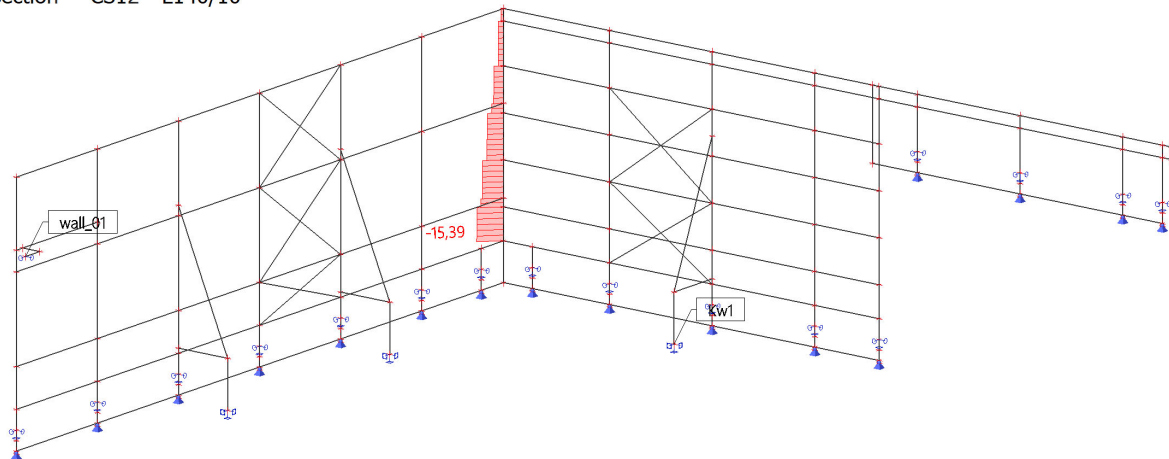
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

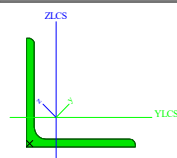
Selection: All

Filter: Cross-section = CS12 - L140/10



Cross-sections

Cross-sections - CS12

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS12	Detailed L140/10	S 235	rolled	b	b		Leg angle

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS12 - L140/10

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B16	0,000	CO1/1	CS12 - L(CSN)140/10	-15,39	-3,11	-3,00	0,01	1,91	1,84
B16	4450,000	CO1/2	CS12 - L(CSN)140/10	-0,90	0,18	2,38	0,00	0,00	0,00
B16	2450,000+	CO1/3	CS12 - L(CSN)140/10	-3,91	-4,80	-0,05	-0,02	-0,16	0,17
B16	2450,000+	CO1/4	CS12 -	-5,63	4,91	-0,01	0,02	0,14	-0,17

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			L(CSN)140/10						
B16	0,000	CO1/5	CS12 - L(CSN)140/10	-15,39	-2,91	-3,39	-0,01	2,47	1,82
B16	2450,000+	CO1/2	CS12 - L(CSN)140/10	-3,91	-0,63	4,38	0,00	0,49	-0,12
B16	820,000+	CO1/6	CS12 - L(CSN)140/10	-6,30	-1,40	0,33	0,02	0,36	0,56
B16	3350,000+	CO1/7	CS12 - L(CSN)140/10	-2,57	-0,36	0,60	-0,02	-0,75	0,57
B16	2635,000+	CO1/3	CS12 - L(CSN)140/10	-2,96	2,06	-0,23	-0,02	-0,47	-1,02

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC5
CO1/2	LC1 + LC2 + 1.50*LC4
CO1/3	LC1 + LC2 + 1.50*LC7
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/5	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC7
CO1/6	LC1 + LC2 + 1.50*LC5
CO1/7	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7

EC-EN 1993 Steel check ULS

Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: All
 Filter: Cross-section = CS12 - L140/10

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B16	0,000	CO1/1	CS12 - L(CSN)140/10	S 235	0,27	0,23	0,27

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC7

CS13 - 1D internal forces; N

Values: **N**

Linear calculation

Combination: CO1

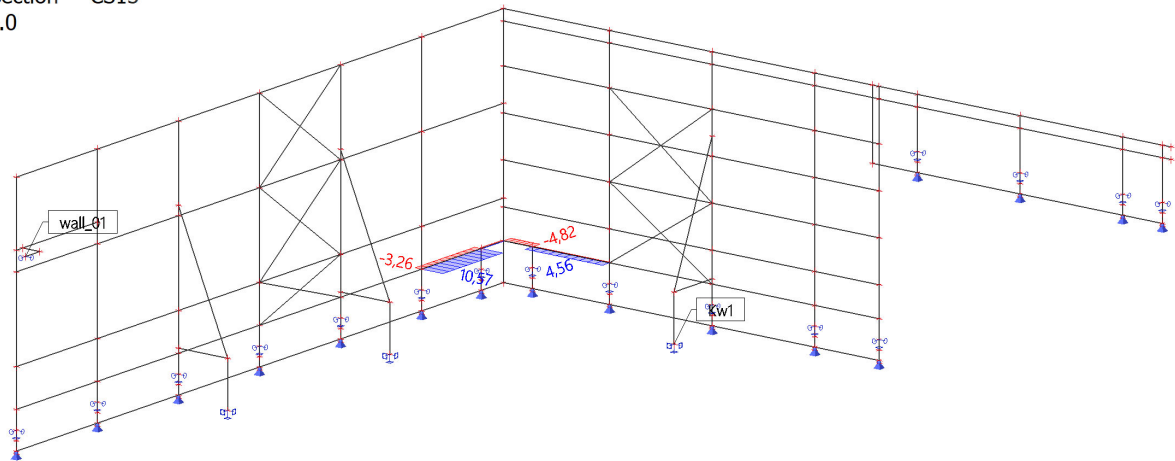
Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS13 -

VHP140/80x6.0



CS13 - 1D internal forces; M_y

Values: **M_y**

Linear calculation

Combination: CO1

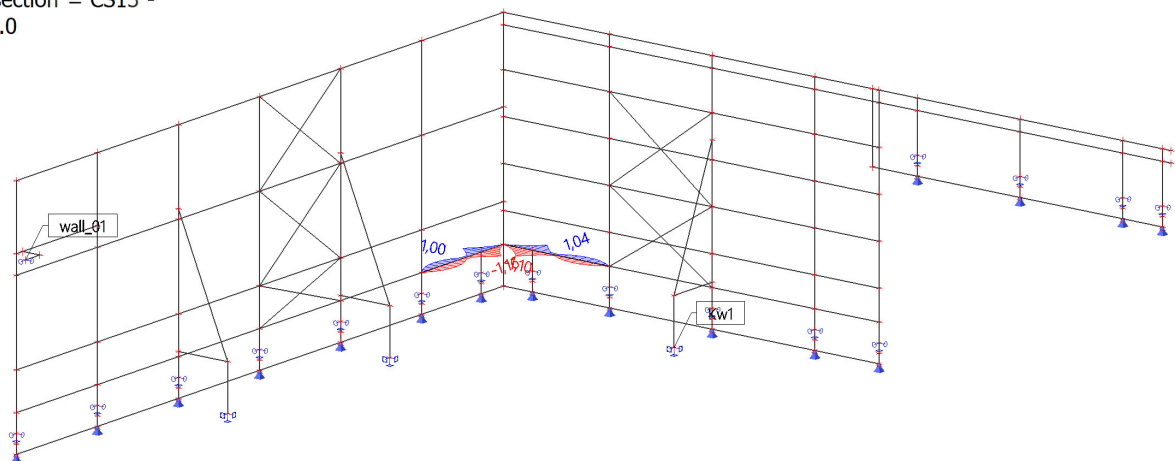
Coordinate system: Principal

Extreme 1D: Member

Selection: All

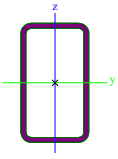
Filter: Cross-section = CS13 -

VHP140/80x6.0



Cross-sections

Cross-sections - CS13

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
	Detailed						
CS13	VHP140/80x6.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS13 - VHP140/80x6.0

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B47	562,500-	CO1/1	CS13 - VHP140/80x6.0	-4,82	-12,06	1,14	-0,05	0,41	-3,05
B17	1799,000+	CO1/1	CS13 - VHP140/80x6.0	0,27	5,27	1,54	0,66	-0,69	-3,40
B17	1799,000-	CO1/2	CS13 - VHP140/80x6.0	10,57	-0,87	-2,89	-0,49	-1,10	-0,44
B17	1799,000-	CO1/3	CS13 - VHP140/80x6.0	-3,26	-0,87	2,84	0,51	1,00	-0,59
B47	0,000	CO1/4	CS13 - VHP140/80x6.0	-3,06	-9,56	-0,93	-0,55	0,02	3,15
B17	1799,000+	CO1/5	CS13 - VHP140/80x6.0	-0,30	4,41	-1,32	0,68	0,54	-2,82
B47	675,000+	CO1/4	CS13 - VHP140/80x6.0	4,56	2,37	2,77	0,51	-1,16	-1,12
B47	675,000+	CO1/6	CS13 - VHP140/80x6.0	-0,84	1,41	-2,70	-0,53	1,04	-0,75
B47	675,000-	CO1/5	CS13 - VHP140/80x6.0	-4,17	-13,22	-1,59	-0,46	-0,74	-4,61
B47	0,000	CO1/5	CS13 - VHP140/80x6.0	-4,17	-11,45	-0,64	-0,46	0,01	3,72

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC5
CO1/2	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/3	LC1 + LC2 + 1.50*LC7
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/5	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC7
CO1/6	LC1 + LC2 + 1.50*LC5

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS13 - VHP140/80x6.0

Overall Unity Check

Project Centrum Energetických a Enviromentálních Technologíí

Part SO 01.1 Objekt CEETe

Description Ocelová konstrukce - DPS

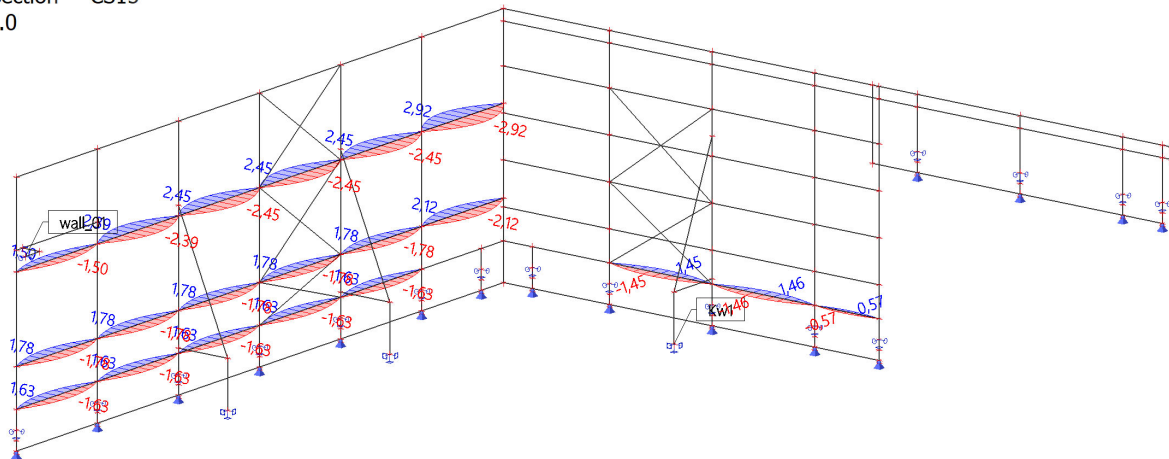
Author Ing. Jeřowicz

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B47	675,000-	CO1/1	CS13 - VHP140/80x6.0	S 235	0,27	0,27	0,13

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC3 + 0.90*LC7

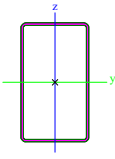
CS15 - 1D internal forces; M_y

Values: M_y
Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS15 -
VHP140/80x3.0



Cross-sections

Cross-sections - CS15

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS15	Detailed VHP140/80x3.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS15 - VHP140/80x3.0

Name	dx [mm]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
B33	0,000	CO1/1	CS15 - VHP140/80x3.0	-7,74	0,93	-3,57	0,05	0,00	0,00
B33	0,000	CO1/2	CS15 - VHP140/80x3.0	17,55	0,81	3,57	0,00	0,00	0,00
B68	2400,000	CO1/3	CS15 - VHP140/80x3.0	1,00	-3,02	0,00	0,00	0,00	0,00
B68	0,000	CO1/3	CS15 -	1,00	3,02	0,00	0,00	0,00	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP140/80x3.0						
B48	2474,001	CO1/4	CS15 - VHP140/80x3.0	-5,13	-1,04	-4,71	-0,42	0,00	0,00
B48	0,000	CO1/4	CS15 - VHP140/80x3.0	-5,13	1,04	4,71	-0,42	0,00	0,00
B29	0,000	CO1/5	CS15 - VHP140/80x3.0	-1,08	0,68	2,90	-0,46	0,00	0,00
B29	0,000	CO1/6	CS15 - VHP140/80x3.0	1,66	0,78	-2,90	0,46	0,00	0,00
B48	1237,000-	CO1/7	CS15 - VHP140/80x3.0	4,98	0,00	0,00	0,42	-2,92	0,56
B48	1237,000-	CO1/4	CS15 - VHP140/80x3.0	-5,13	0,00	0,00	-0,42	2,92	0,64
B68	1200,000-	CO1/3	CS15 - VHP140/80x3.0	1,00	0,00	0,00	0,00	0,00	1,81

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC7
CO1/2	LC1 + LC2 + 0.75*LC3 + 1.50*LC4
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC3
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/5	LC1 + LC2 + 1.50*LC5
CO1/6	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/7	LC1 + LC2 + 1.50*LC7

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS15 - VHP140/80x3.0

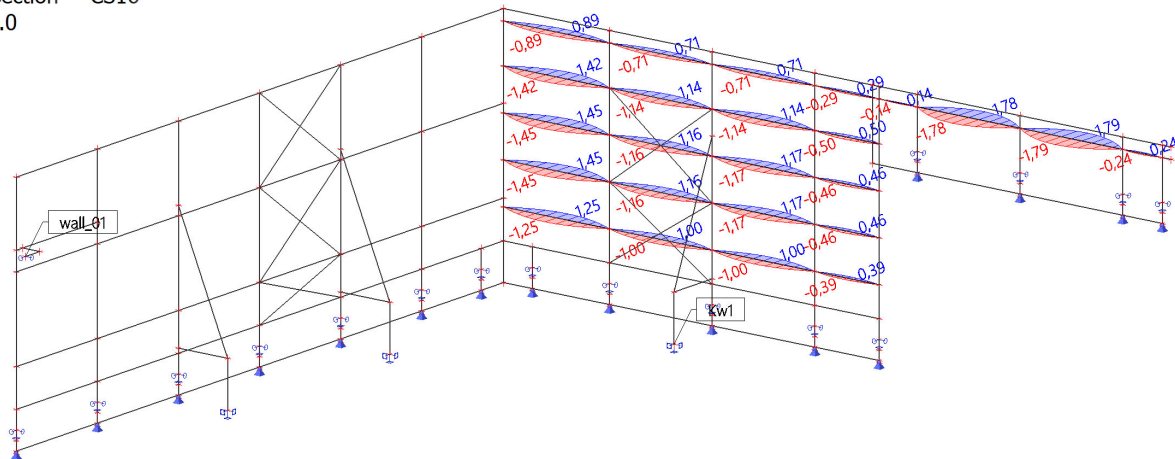
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B48	1237,000-	CO1/1	CS15 - VHP140/80x3.0	S 235	0,33	0,21	0,33

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5

CS16 - 1D internal forces; M_z

Values: **M_z**
 Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Member
 Selection: All
 Filter: Cross-section = CS16 -
 VHP100/60x4.0



Cross-sections

Cross-sections - CS16

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS16	Detailed VHP100/60x4.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: All
 Filter: Cross-section = CS16 - VHP100/60x4.0

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B70	0,000	CO1/1	CS16 - VHP100/60x4.0	-8,82	0,70	0,36	-0,02	0,00	0,00
B70	0,000	CO1/2	CS16 - VHP100/60x4.0	10,43	-0,70	0,64	0,02	0,00	0,00
B72	2400,000	CO1/1	CS16 - VHP100/60x4.0	-1,24	-2,98	-1,47	-0,01	0,00	0,00
B72	0,000	CO1/1	CS16 -	-1,24	2,98	1,47	-0,01	0,00	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP100/60x4.0						
B72	2400,000	CO1/3	CS16 - VHP100/60x4.0	0,17	0,00	-3,67	0,00	0,00	0,00
B72	0,000	CO1/3	CS16 - VHP100/60x4.0	0,17	0,00	3,67	0,00	0,00	0,00
B64	0,000	CO1/2	CS16 - VHP100/60x4.0	1,69	-1,19	1,14	-0,34	0,00	0,00
B64	0,000	CO1/4	CS16 - VHP100/60x4.0	2,42	1,19	0,65	0,40	0,00	0,00
B73	200,000+	CO1/5	CS16 - VHP100/60x4.0	0,29	1,19	1,68	-0,05	-0,60	-0,04
B72	1200,000-	CO1/3	CS16 - VHP100/60x4.0	0,17	0,00	0,00	0,00	2,20	0,00
B72	1200,000-	CO1/2	CS16 - VHP100/60x4.0	1,46	0,00	0,00	0,01	1,61	-1,79
B72	1200,000-	CO1/1	CS16 - VHP100/60x4.0	-1,24	0,00	0,00	-0,01	0,88	1,79

Name	Combination key
CO1/1	LC1 + LC2 + 1.50*LC7
CO1/2	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC3
CO1/4	LC1 + LC2 + 1.50*LC4
CO1/5	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS16 - VHP100/60x4.0

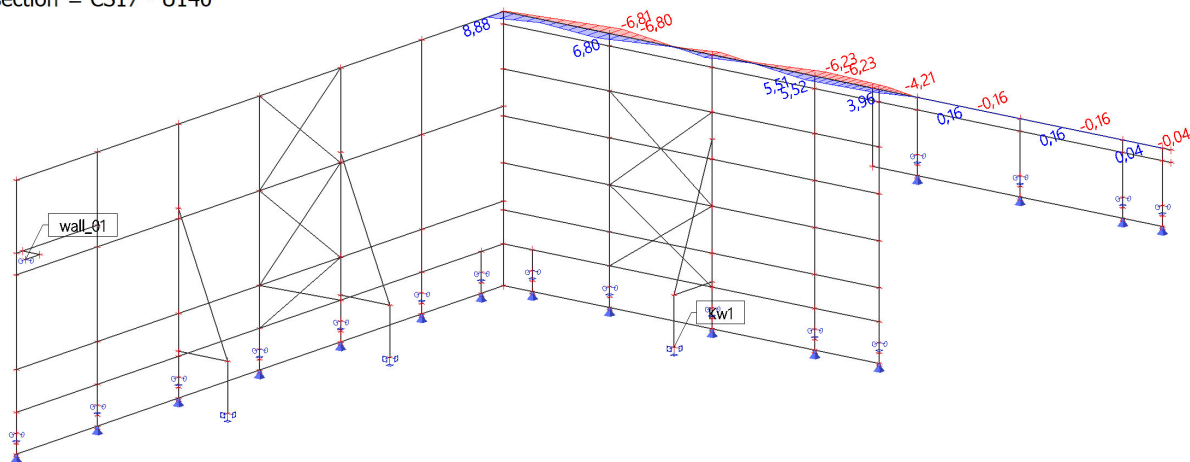
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B71	1200,000-	CO1/1	CS16 - VHP100/60x4.0	S 235	0,38	0,29	0,38

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7

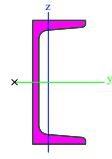
CS17 - 1D internal forces; M_y

Values: M_y
Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS17 - U140



Cross-sections

Cross-sections - CS17

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS17	Detailed U140	S 235	rolled	c	c		European standard channel

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS17 - U140

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B44	0,000	CO1/1	CS17 - U140	-5,05	-0,41	-2,77	0,01	-0,71	0,00
B44	0,000	CO1/2	CS17 - U140	5,61	-0,36	-5,59	0,00	8,87	0,00
B44	0,000	CO1/3	CS17 - U140	0,00	-0,54	-0,01	0,00	0,03	0,00
B44	2478,000	CO1/3	CS17 - U140	0,00	0,54	-0,01	0,00	0,00	0,00
B44	0,000	CO1/4	CS17 - U140	5,60	-0,45	-5,59	0,00	8,88	0,00
B77	897,000	CO1/4	CS17 - U140	-0,75	0,16	4,95	0,00	0,14	0,00
B74	0,000	CO1/5	CS17 - U140	3,96	-0,44	-4,28	-0,01	6,80	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B74	0,000	CO1/6	CS17 - U140	4,83	-0,31	2,49	0,01	-4,20	0,00
B44	2478,000	CO1/1	CS17 - U140	-5,05	0,41	-2,15	0,01	-6,81	0,00
B44	1239,000-	CO1/3	CS17 - U140	0,00	0,00	-0,01	0,00	0,01	-0,34
B79	925,000-	CO1/7	CS17 - U140	-2,07	0,38	0,07	0,00	-0,03	0,20

Name	Combination key
CO1/1	LC1 + LC2 + 0.75*LC3 + 1.50*LC7
CO1/2	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC3
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4
CO1/5	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/6	LC1 + LC2 + 1.50*LC4
CO1/7	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS17 - U140

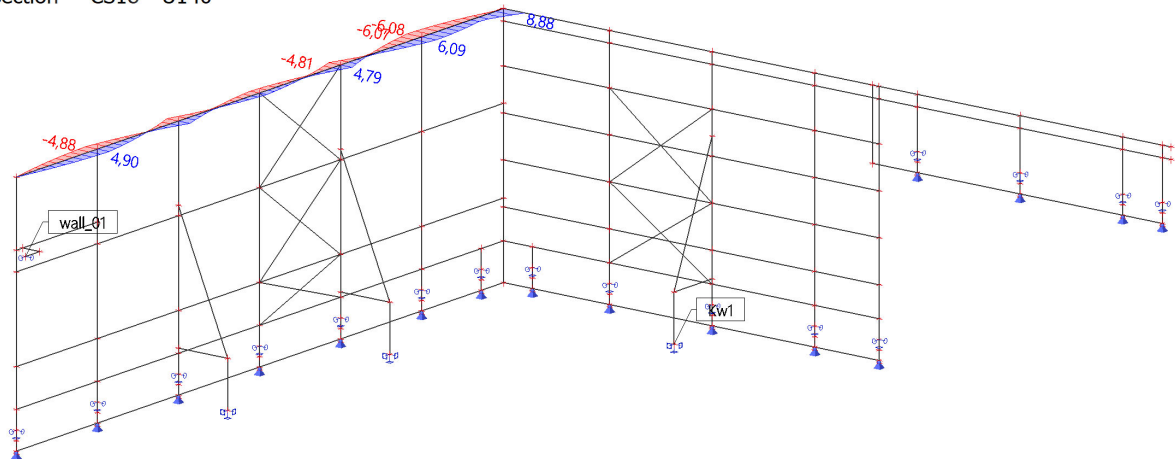
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B44	0,000	CO1/1	CS17 - U140	S 235	0,54	0,37	0,54

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4

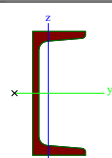
CS18 - 1D internal forces; M_y

Values: **M_y**
Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS18 - U140



Cross-sections

Cross-sections - CS18

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS18	Detailed U140	S 235	rolled	c	c		European standard channel

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS18 - U140

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B40	4896,000+	CO1/1	CS18 - U140	-1,39	-0,98	3,14	0,01	-2,90	0,47
B40	4896,000-	CO1/2	CS18 - U140	2,62	0,88	3,27	0,01	2,69	0,42
B42	0,000	CO1/3	CS18 - U140	-5,01	-0,58	-6,44	-0,01	4,79	0,00
B42	0,000	CO1/4	CS18 - U140	7,00	-0,67	-4,91	-0,01	3,50	0,00
B42	0,000	CO1/5	CS18 - U140	5,04	-0,58	6,45	0,01	-4,81	0,00
B43	0,000	CO1/3	CS18 - U140	-4,84	-0,59	0,41	-0,01	-6,08	0,00
B43	2474,001	CO1/6	CS18 - U140	7,15	0,67	7,42	0,00	8,88	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B43	1237,000-	CO1/7	CS18 - U140	0,02	0,00	0,00	0,00	0,01	-0,49
B40	2448,000-	CO1/6	CS18 - U140	1,86	0,77	-0,12	0,00	-4,04	0,51

Name	Combination key
CO1/1	1.35*LC1 + 1.35*LC2 + 0.90*LC7
CO1/2	1.35*LC1 + 1.35*LC2 + 0.75*LC3 + 0.90*LC4
CO1/3	LC1 + LC2 + 1.50*LC5
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/5	LC1 + LC2 + 0.75*LC3 + 1.50*LC7
CO1/6	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4
CO1/7	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

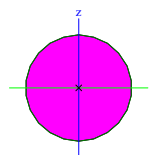
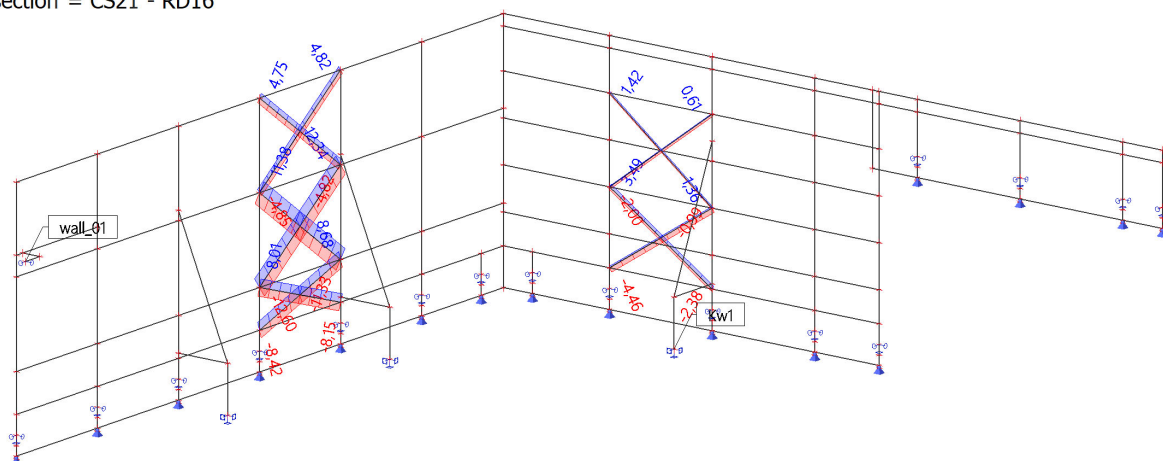
Selection: All

Filter: Cross-section = CS18 - U140

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B43	2474,001	CO1/1	CS18 - U140	S 235	0,54	0,38	0,54

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4



Name	Combination key
CO1/1	$1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5$
CO1/2	$LC1 + LC2 + 1.50*LC7$

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS21 - RD16

There are 2 warnings on selected members. 2 of them are shown.

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]	Errors, warnings, notes
B101	0,000	CO1/1	CS21 - RD16	S 235	0,30	0,27	0,30	W2, W9

CS22 - 1D internal forces; N

Values: **N**

Linear calculation

Combination: CO1

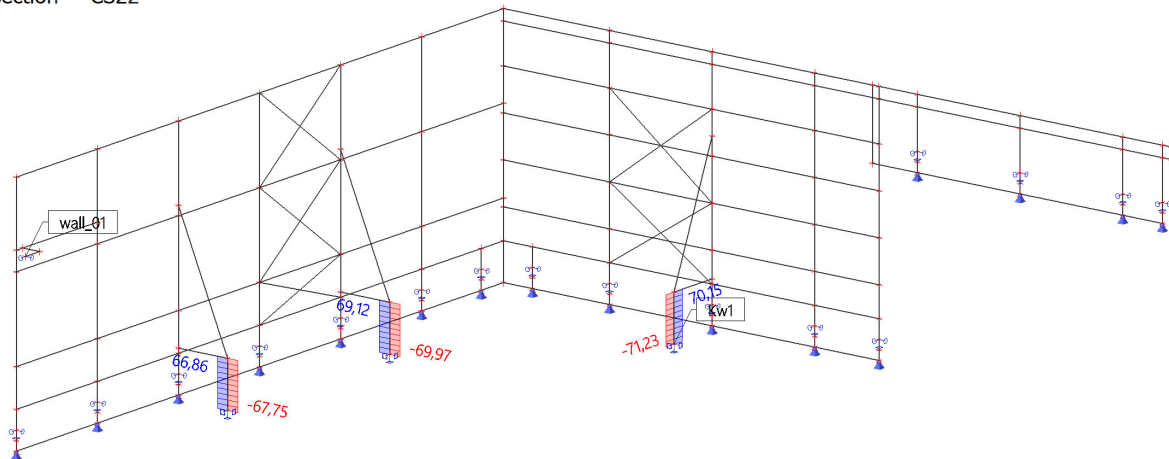
Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS22 -

RO108X8



Cross-sections

Cross-sections - CS22

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS22	RO108X8	S 235	rolled	a	a		Circular hollow section

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS22 - RO108X8

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B117	0,000	CO1/1	CS22 - RO108X8	-71,23	0,01	1,51	-0,02	-1,23	-0,05
B117	1000,000	CO1/2	CS22 - RO108X8	70,15	0,00	-1,38	0,01	-0,18	0,02
B109	0,000	CO1/3	CS22 - RO108X8	-69,97	-0,03	1,46	0,04	-1,18	0,14
B117	0,000	CO1/4	CS22 - RO108X8	-71,16	0,01	1,51	-0,02	-1,23	-0,05
B117	0,000	CO1/5	CS22 - RO108X8	69,88	0,00	-1,37	0,01	1,19	0,02
B109	0,000	CO1/6	CS22 - RO108X8	68,93	0,03	-1,33	-0,03	1,14	-0,14

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/2	LC1 + LC2 + 1.50*LC7
CO1/3	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC5
CO1/5	LC1 + LC2 + 0.75*LC3 + 1.50*LC7
CO1/6	LC1 + LC2 + 1.50*LC5

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS22 - RO108X8

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B117	0,000	CO1/1	CS22 - RO108X8	S 235	0,18	0,12	0,18

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			RO82.5X5						
B115	1149,956	CO1/3	CS23 - RO82.5X5	-28,13	-0,01	-0,31	0,00	0,00	0,00
B111	0,000	CO1/4	CS23 - RO82.5X5	27,67	0,01	0,31	-0,05	-0,29	-0,01
B111	0,000	CO1/5	CS23 - RO82.5X5	-27,75	0,00	-0,19	0,05	0,28	0,00
B115	0,000	CO1/1	CS23 - RO82.5X5	28,14	-0,01	0,32	0,03	-0,30	0,01
B115	0,000	CO1/2	CS23 - RO82.5X5	-28,13	0,00	-0,19	0,00	0,29	0,01
B112	0,000	CO1/2	CS23 - RO82.5X5	-72,85	0,03	0,05	0,00	0,02	-0,08

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5
CO1/2	LC1 + LC2 + 1.50*LC7
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC7
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/5	LC1 + LC2 + 1.50*LC5

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS23 - RO82.5X5

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B116	0,000	CO1/1	CS23 - RO82.5X5	S 235	0,49	0,27	0,49

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5

CS10 - 1D internal forces; N

Values: **N**

Linear calculation

Combination: CO1

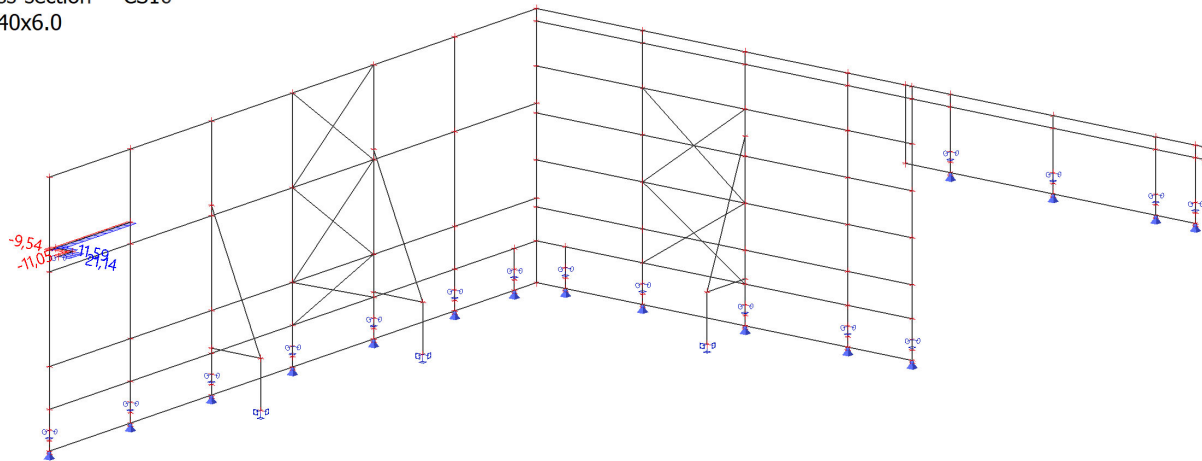
Coordinate system: Principal

Extreme 1D: Member

Selection: All

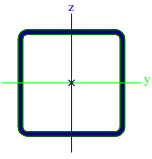
Filter: Cross-section = CS10 -

VHP140/140x6.0



Cross-sections

Cross-sections - CS10

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS10	Detailed VHP140/140x6.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS10 - VHP140/140x6.0

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B131	0,000	CO1/1	CS10 - VHP140/140x6.0	21,14	0,00	12,33	0,00	0,00	0,00
B759	2448,000	CO1/2	CS10 - VHP140/140x6.0	0,13	-1,09	0,02	0,02	0,00	0,00
B759	0,000	CO1/2	CS10 - VHP140/140x6.0	0,02	1,19	0,03	-0,06	0,00	0,00
B131	430,000+	CO1/1	CS10 -	12,33	-0,12	-21,14	-0,03	5,30	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP140/140x6.0						
B131	0,000	CO1/3	CS10 - VHP140/140x6.0	21,13	0,00	12,33	0,00	0,00	0,00
B759	0,000	CO1/4	CS10 - VHP140/140x6.0	4,42	1,01	8,55	-0,98	0,00	0,00
B759	194,000+	CO1/5	CS10 - VHP140/140x6.0	5,23	0,66	2,21	0,94	-0,79	0,16
B131	430,000+	CO1/6	CS10 - VHP140/140x6.0	-11,05	-0,12	9,45	-0,03	-4,75	0,00
B131	430,000+	CO1/3	CS10 - VHP140/140x6.0	12,33	-0,10	-21,13	-0,02	5,30	0,00
B131	830,079	CO1/2	CS10 - VHP140/140x6.0	-0,01	-0,27	-0,10	-0,03	-0,05	-0,08
B759	1321,000-	CO1/2	CS10 - VHP140/140x6.0	0,13	-0,08	0,02	0,02	-0,02	0,58

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4
CO1/2	1.35*LC1 + 1.35*LC2
CO1/3	LC1 + LC2 + 0.75*LC3 + 1.50*LC4
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/5	1.15*LC1 + 1.15*LC2 + 1.50*LC5
CO1/6	1.15*LC1 + 1.15*LC2 + 1.50*LC7

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS10 - VHP140/140x6.0

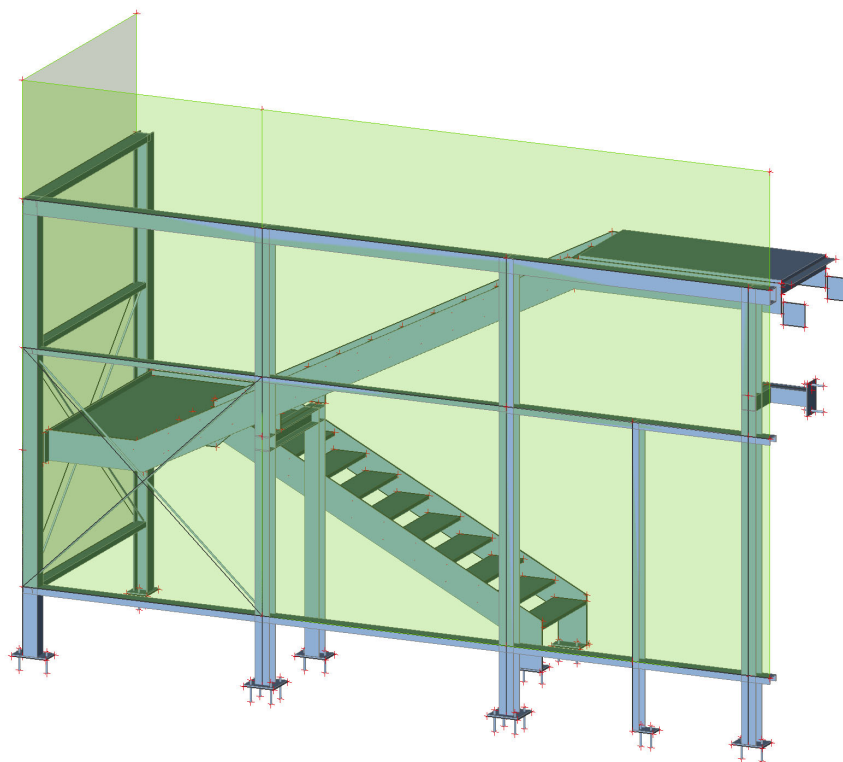
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B131	430,000-	CO1/1	CS10 - VHP140/140x6.0	S 235	0,15	0,15	0,00

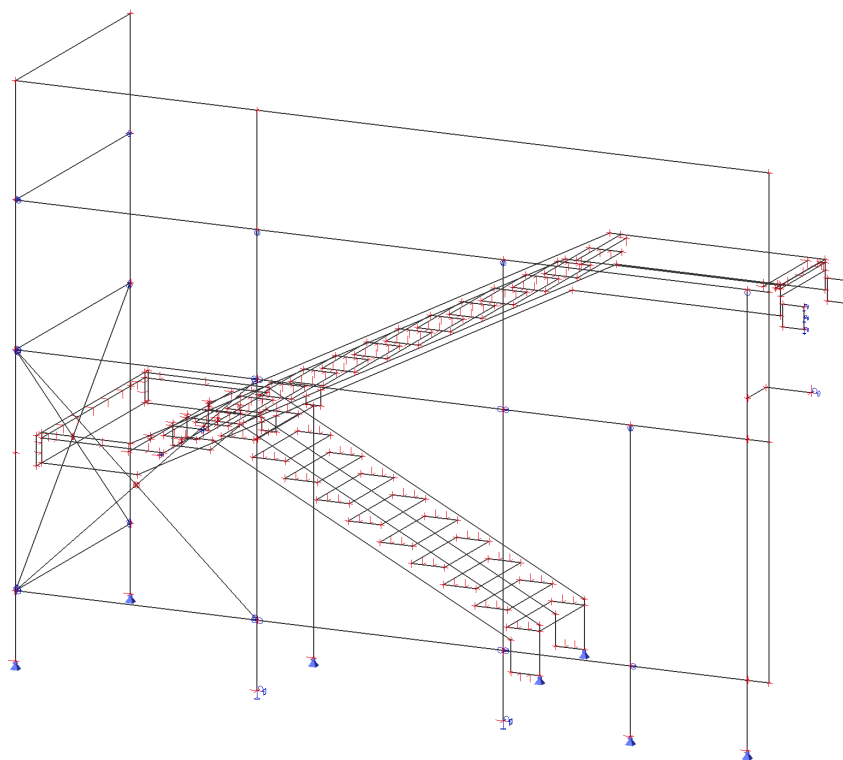
Name	Combination key
CO1/1	LC1 + LC2 + 0.75*LC3 + 1.50*LC4

VENKOVNÍ SCHODY 4-5/D-E

3D MODEL OF STRUCTURE



Structural model



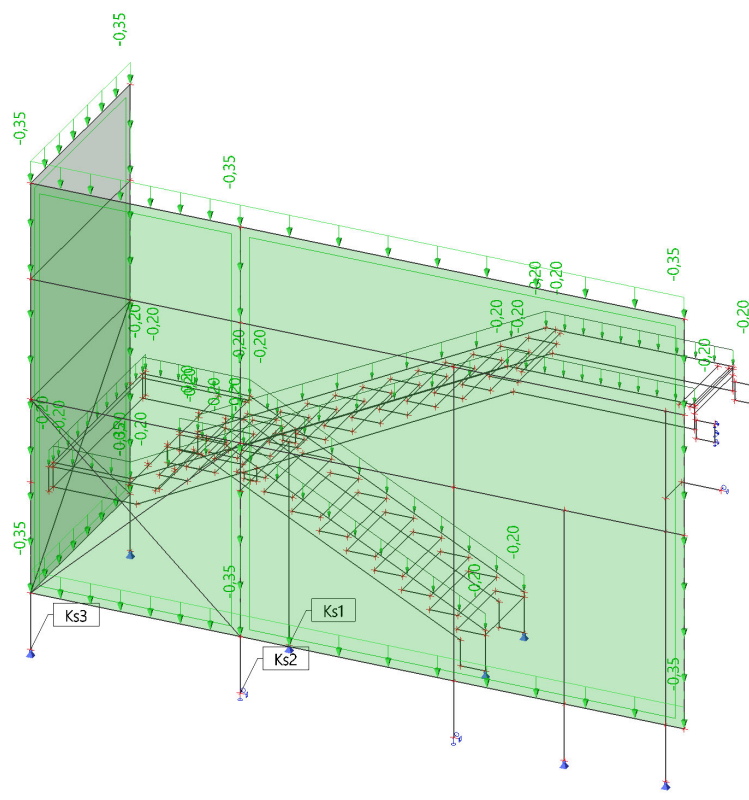
Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

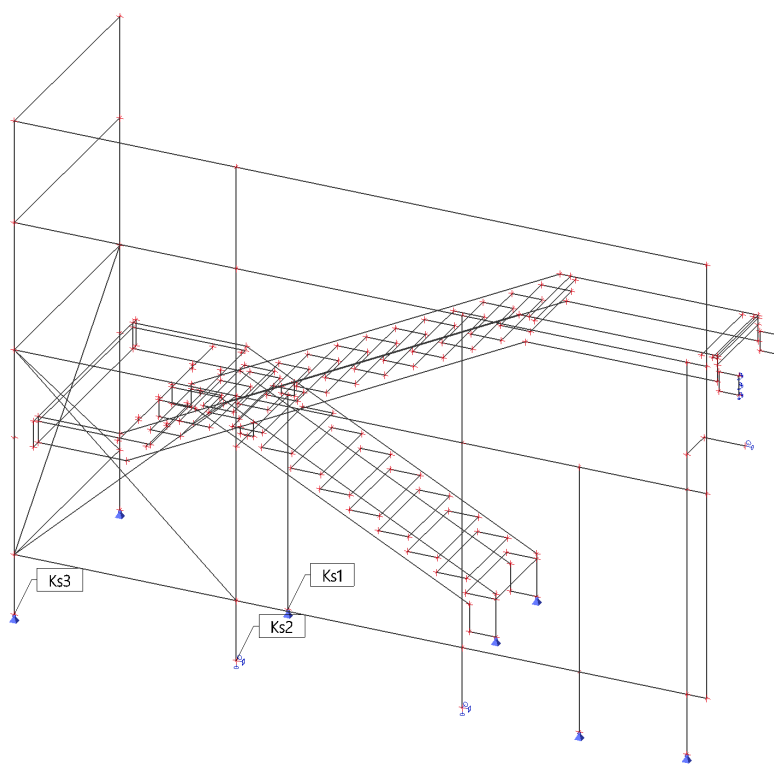
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

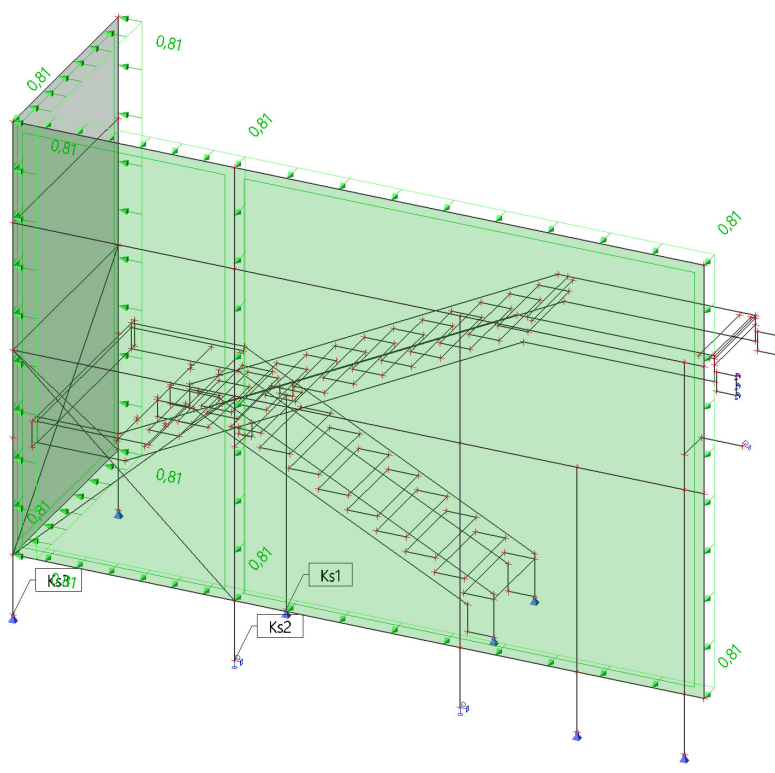
LC2 / Tot. value



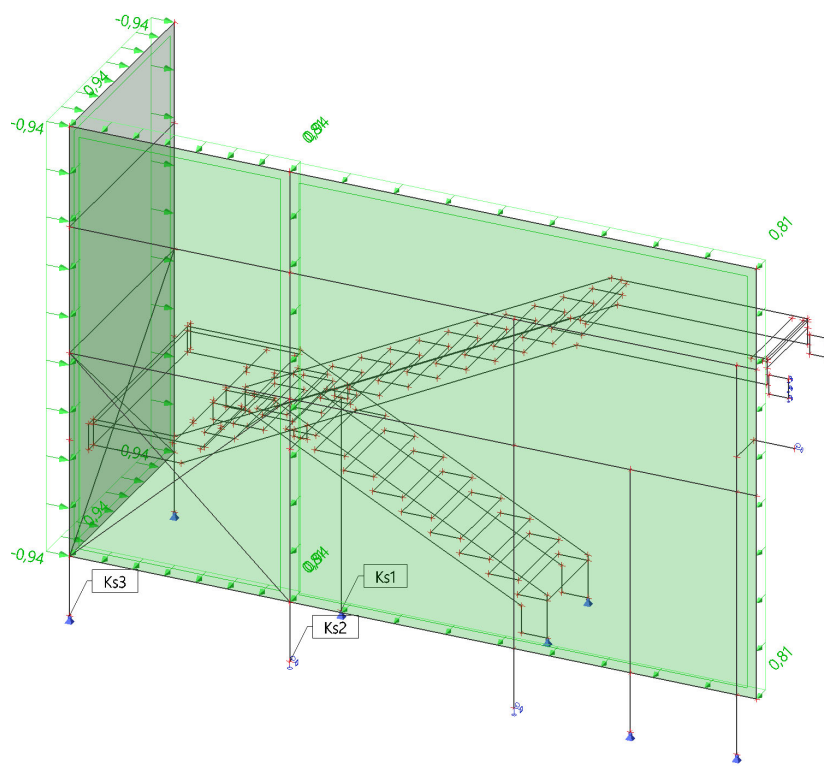
LC3 / Tot. value



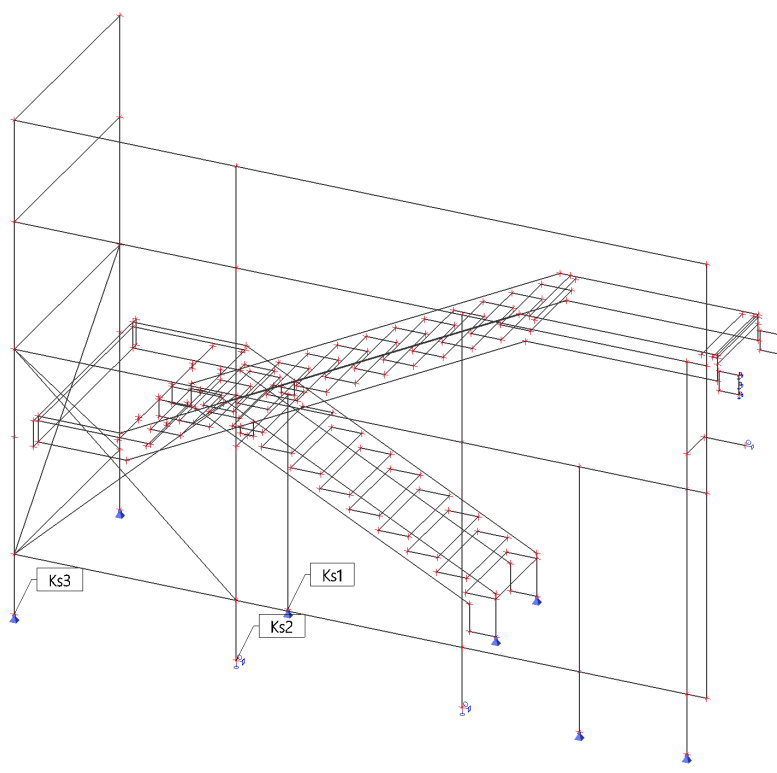
LC4 / Tot. value



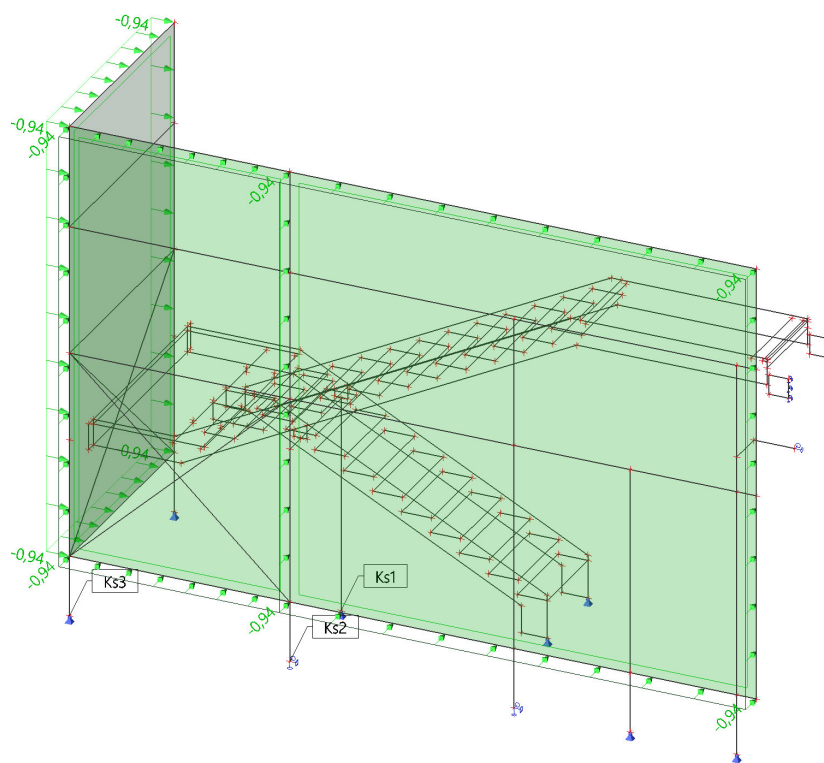
LC5 / Tot. value



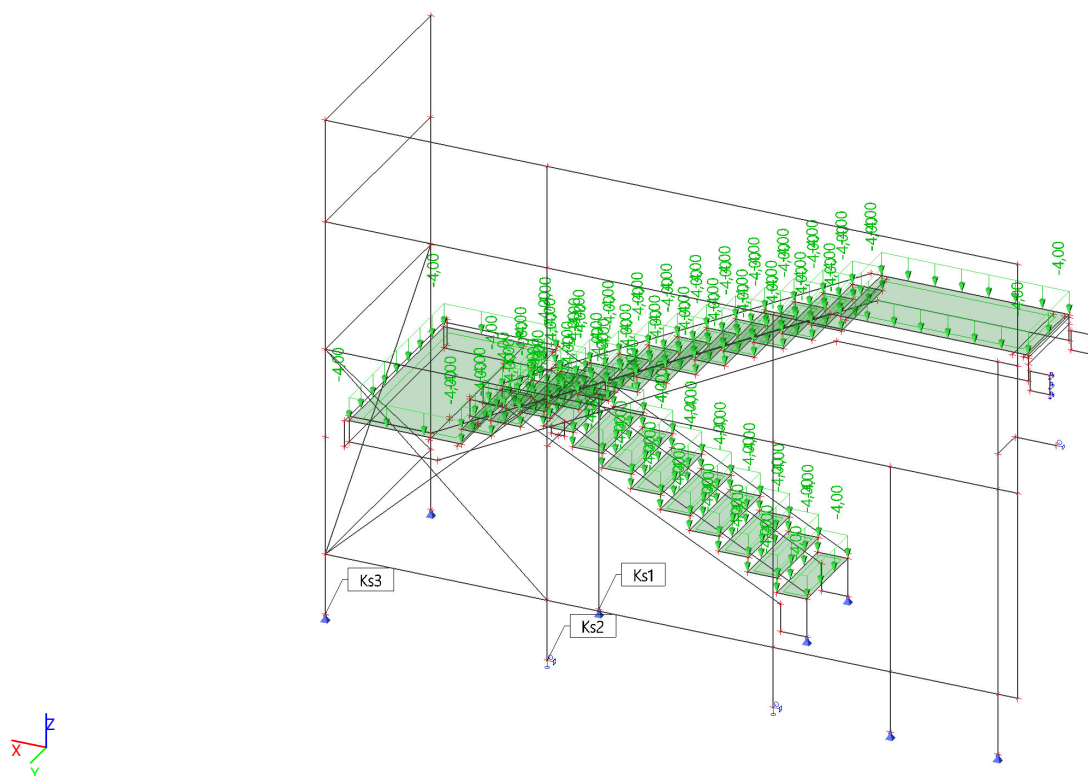
LC6 / Tot. value



LC7 / Tot. value



LC8 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50

Name	Description	Type	Load cases	Coeff. [-]
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B
	Rmax + - Envelope - ultimate
	Rmax - - Envelope - ultimate
	Mmax + - Envelope - ultimate
	Mmax - - Envelope - ultimate
	CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic
	Mmax +def - Envelope - serviceability
	Mmax -def - Envelope - serviceability

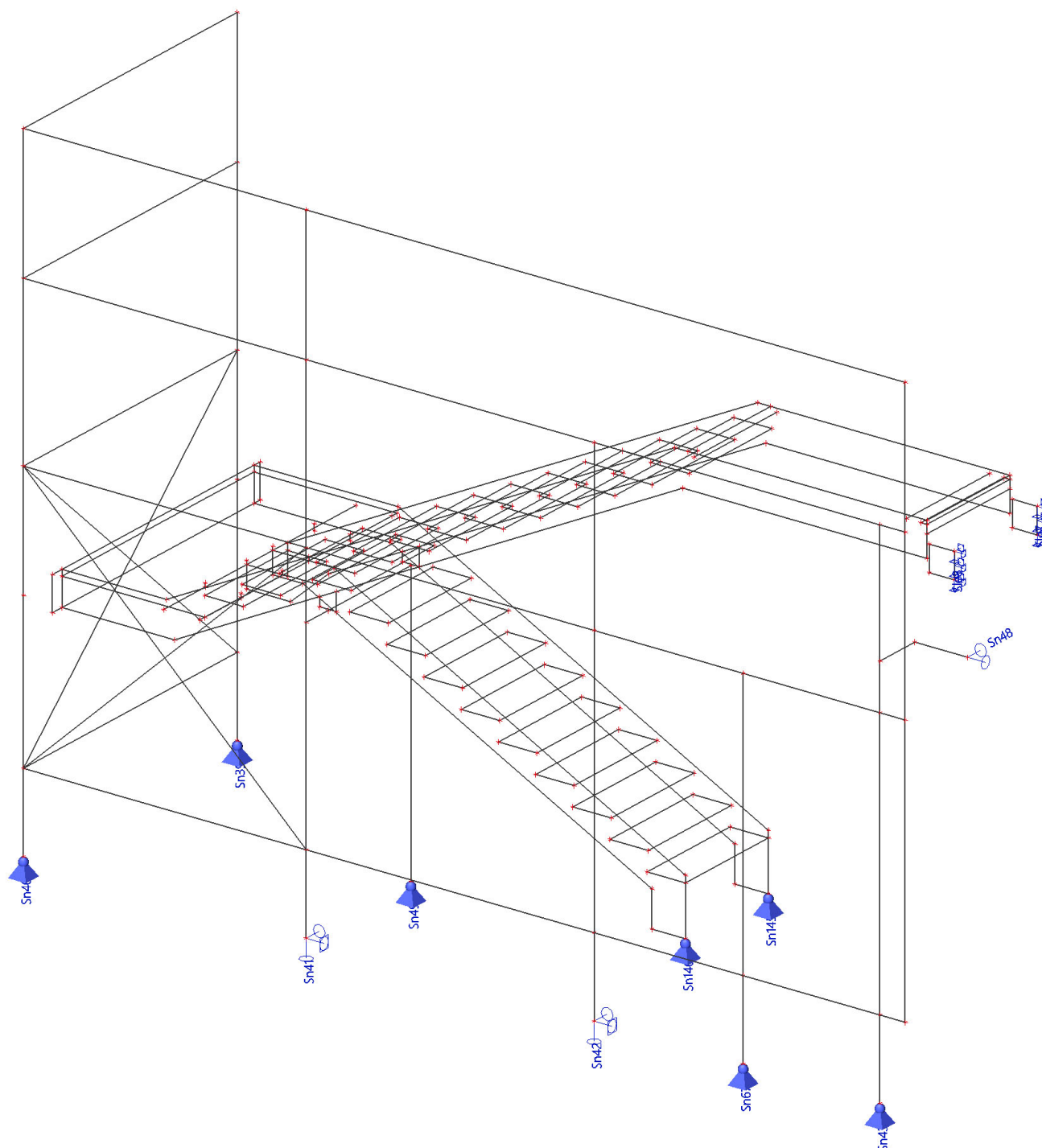
Combination key

Combination key

Name	Description of combinations
1	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC7*1,00
2	LC1*1,00 +LC2*1,00 +LC5*1,00
3	LC1*1,00 +LC2*1,00 +LC4*1,00

REACTIONS

Structural model - number of supports



Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

R1 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z, M_x, M_y, R_z, R_y, R_x

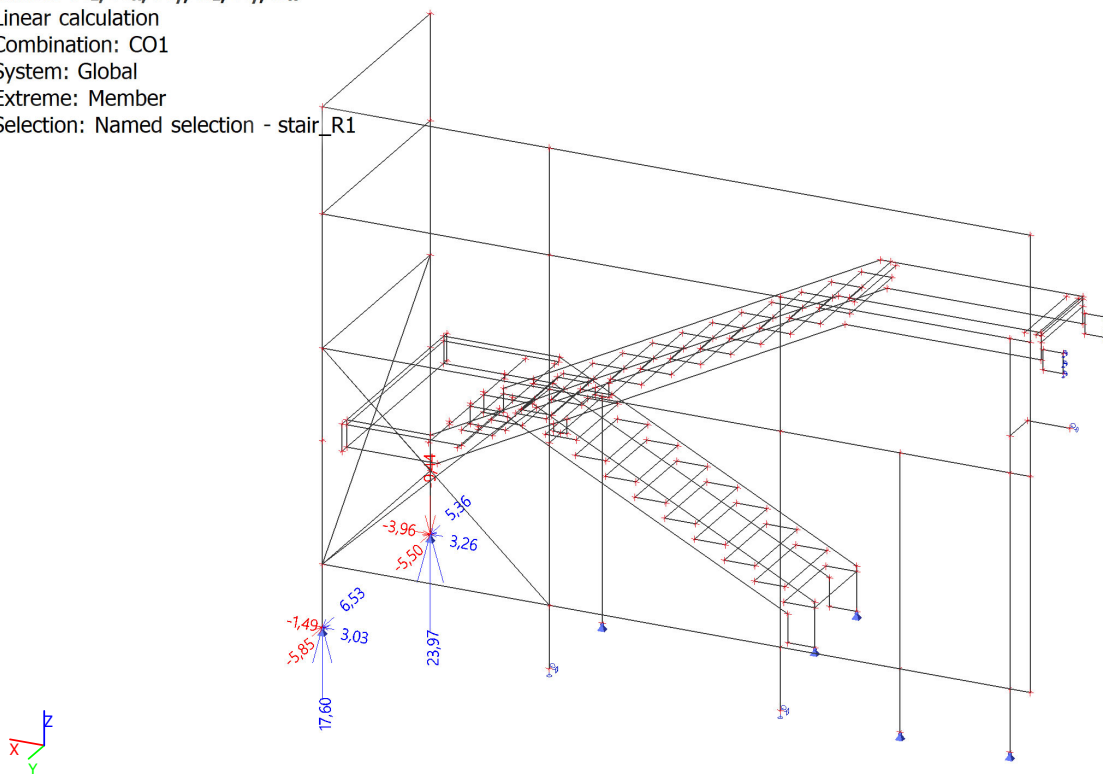
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R1



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R1

Nodal reactions

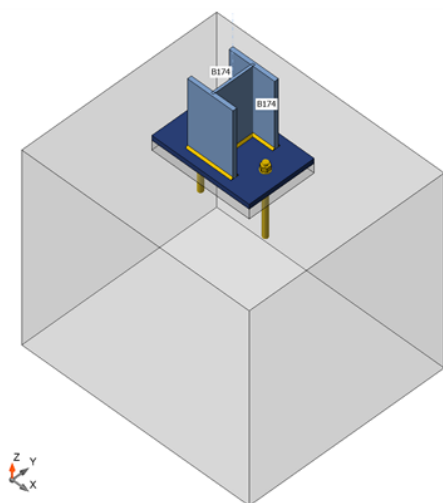
Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn39/N539	CO1/1	3,26	-4,71	-3,15	0,00	0,00	0,00	0,0	0,0
Sn39/N539	CO1/2	-3,84	5,36	17,22	0,00	0,00	0,00	0,0	0,0
Sn39/N539	CO1/3	-3,91	-5,30	-9,44	0,00	0,00	0,00	0,0	0,0
Sn39/N539	CO1/4	-3,88	5,16	23,97	0,00	0,00	0,00	0,0	0,0
Sn39/N539	CO1/5	-3,96	-5,50	-2,68	0,00	0,00	0,00	0,0	0,0
Sn40/N523	CO1/3	3,03	-5,75	5,40	0,00	0,00	0,00	0,0	0,0
Sn40/N523	CO1/5	2,49	-5,85	10,36	0,00	0,00	0,00	0,0	0,0
Sn40/N523	CO1/2	-0,95	6,53	1,07	0,00	0,00	0,00	0,0	0,0
Sn40/N523	CO1/6	-0,12	-5,78	17,60	0,00	0,00	0,00	0,0	0,0
Sn40/N523	CO1/4	-1,49	6,42	6,03	0,00	0,00	0,00	0,0	0,0

Con N750

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β - Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B174	1 - HEB140	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M16 8.8

Foundation block

CB 1

Dimensions	700 x 600	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B174	20,3	0,0	-3,6	0,0	0,0	0,0
CO1(2)	B174	-47,4	0,0	4,3	0,0	0,0	0,0

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	34,8 < 100%	OK
Welds	37,3 < 100%	OK
Concrete block	5,5 < 100%	OK
Buckling	Not calculated	

Project: CEETe - TU Ostrava
 Project no: Ks1
 Author: Ing. Jeřowicz

Project item Con N750

Design

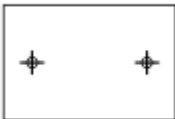
Name Con N750
 Description
 Analysis Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	700 x 600	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P15,0x300,0-200,0 (S 235)		1	Double fillet: a = 4,0	408,0	M16 8.8	2

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Double fillet	S 235	4,0	5,7	408,0

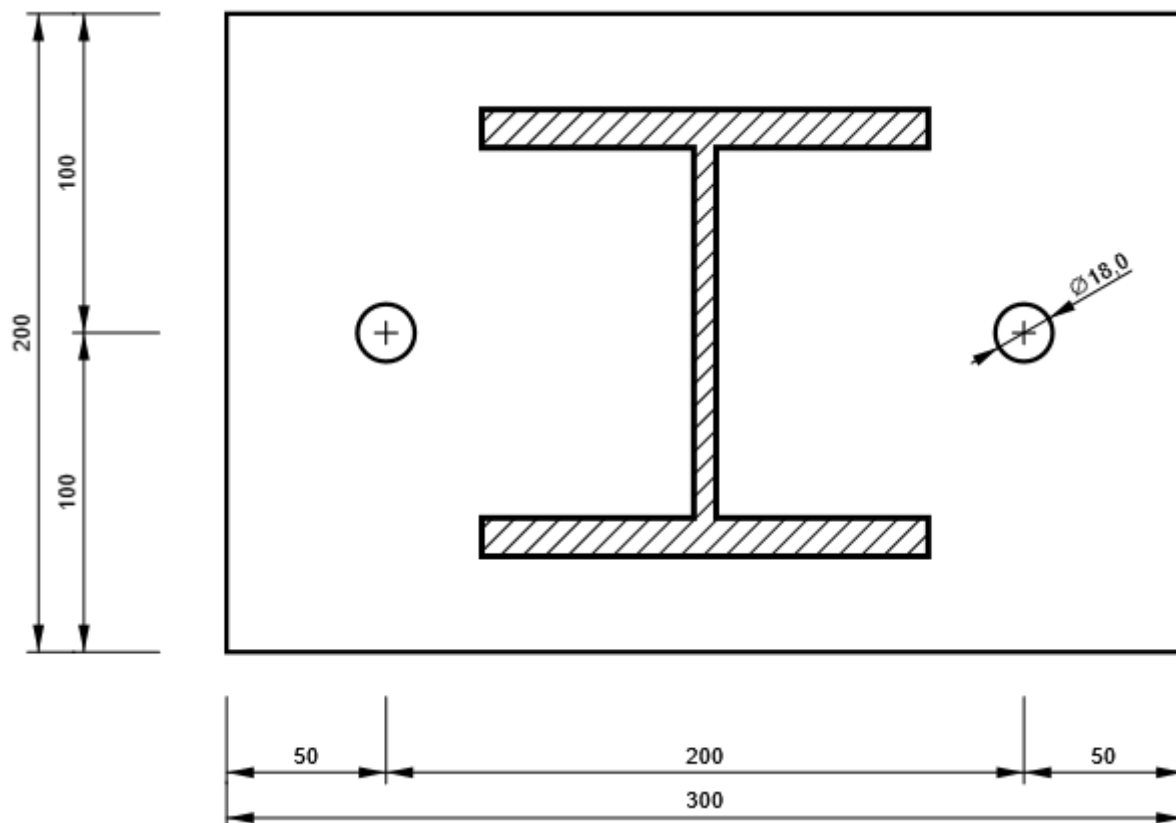
Anchors

Name	Length [mm]	Drill length [mm]	Count
M16 8.8	205	160	2

Drawing

BP1

P15,0x200-300 (S 235)



R2 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z, M_x, M_y, R_z, R_y, R_x

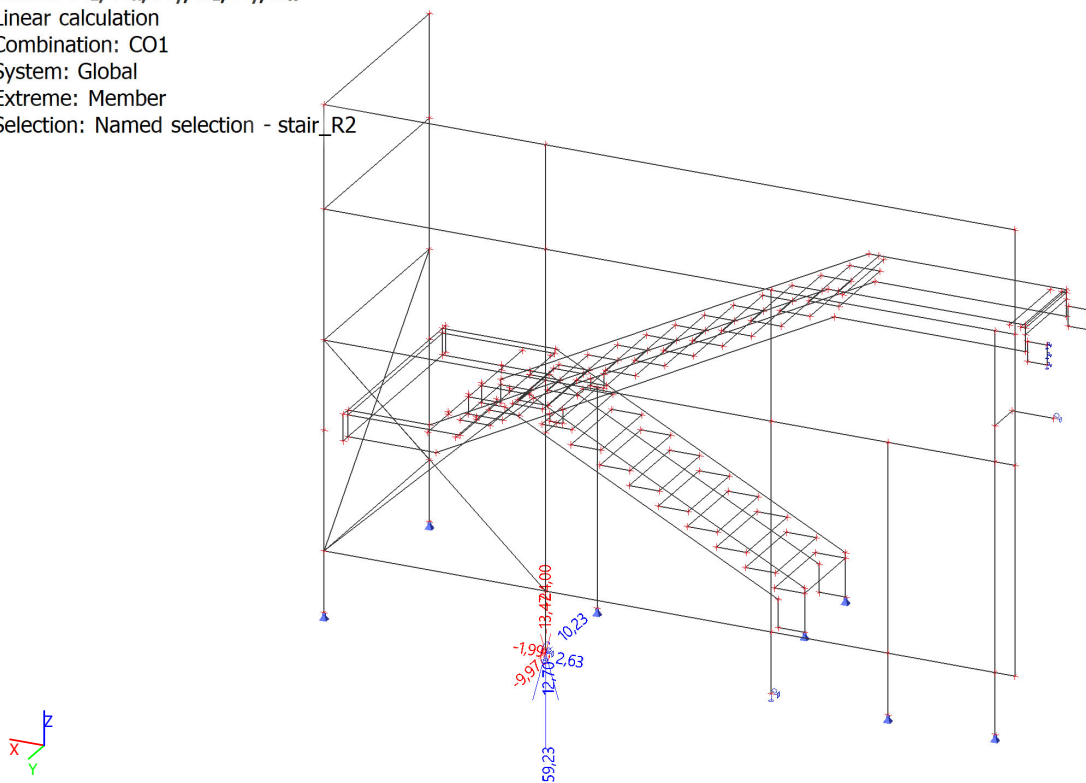
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R2



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R2

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn41/N738	CO1/1	2,40	-9,97	59,23	12,61	0,00	0,00	212,8	0,0
Sn41/N738	CO1/2	-1,77	10,23	-24,00	-13,38	0,00	0,00	557,6	0,0
Sn41/N738	CO1/3	2,63	-9,86	50,94	12,70	0,00	0,00	249,3	0,0
Sn41/N738	CO1/4	-1,99	10,12	-15,71	-13,47	0,00	0,00	857,9	0,0

R3 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

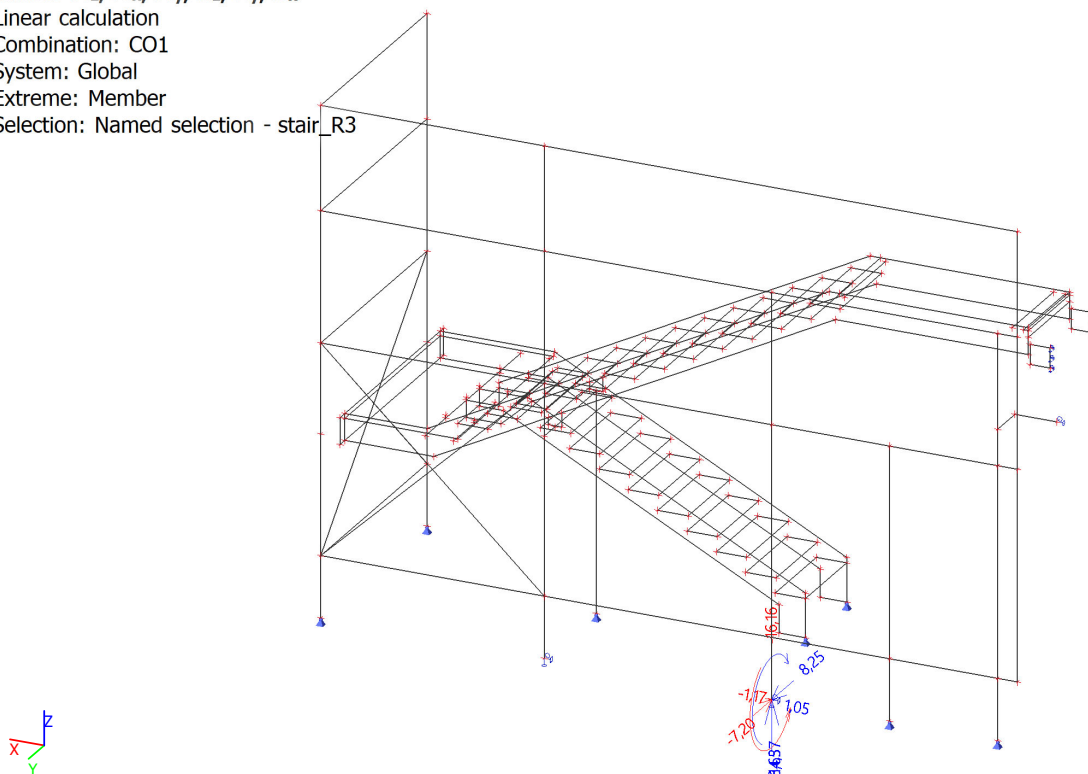
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R3



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R3

Nodal reactions

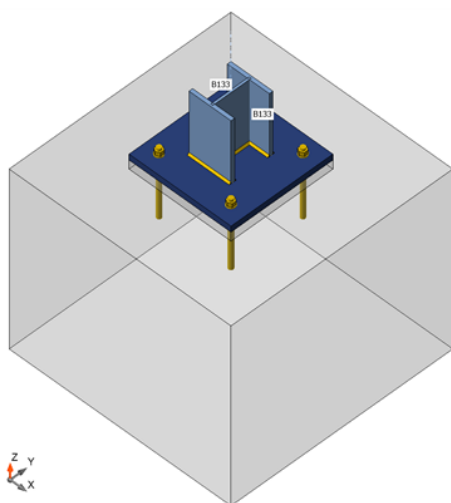
Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn42/N737	CO1/1	1,05	-7,20	6,45	14,37	0,00	0,00	2226,6	0,0
Sn42/N737	CO1/2	-0,55	8,17	6,14	-15,89	0,00	0,00	-2586,2	0,0
Sn42/N737	CO1/3	-0,03	-4,23	8,65	8,28	0,00	0,00	957,4	0,0
Sn42/N737	CO1/4	-1,09	8,25	7,15	-16,16	0,00	0,00	-2260,4	0,0
Sn42/N737	CO1/5	-1,17	5,02	7,23	-9,96	0,00	0,00	-1377,1	0,0

Con N738

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β - Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B133	1 - HEB140	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M16 8.8

Foundation block

CB 1

Dimensions	740 x 740	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B133	24,1	1,9	-10,3	0,0	13,3	0,0
CO1(7)	B133	-51,2	-2,8	9,9	0,0	-12,6	0,0
CO1(9)	B133	15,9	2,1	-10,2	0,0	13,4	0,0

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	78,0 < 100%	OK
Welds	98,3 < 100%	OK
Concrete block	34,2 < 100%	OK
Buckling	Not calculated	

Project: CEETe - TU Ostrava
 Project no: Ks2
 Author: Ing. Jeřowicz

Project item Con N738

Design

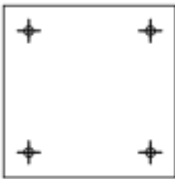
Name Con N738
 Description
 Analysis Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	740 x 740	mm
Depth	600	mm
Anchor	M16 8.8	
Anchoring length	160	mm
Shear force transfer	Anchors	
Mortar joint	30	mm

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P20,0x340,0-340,0 (S 235)		1	Double fillet: a = 4,0	408,0	M16 8.8	4

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Double fillet	S 235	4,0	5,7	408,0

Anchors

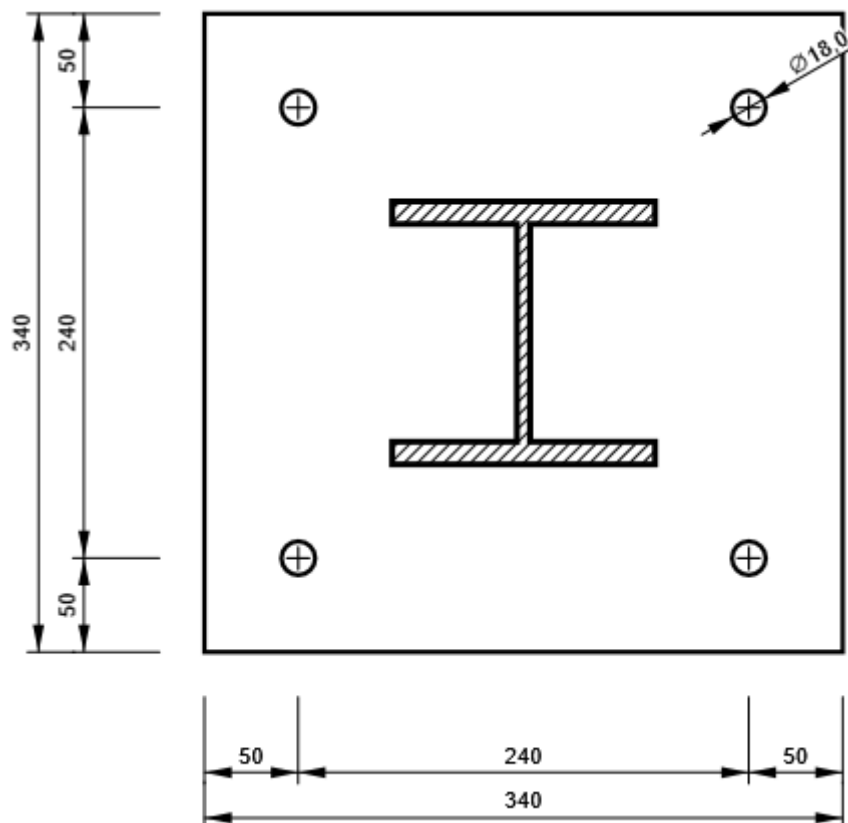
Name	Length [mm]	Drill length [mm]	Count
M16 8.8	210	160	4

Drawing

BP1

Project: CEETe - TU Ostrava
Project no: Ks2
Author: Ing. Jeřowicz

P20,0x340-340 (S 235)



R4 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

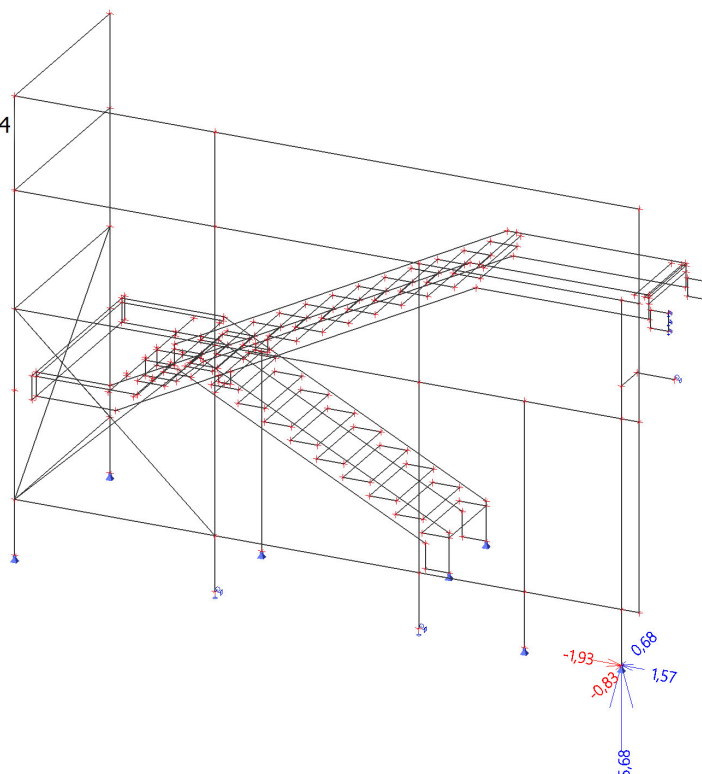
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R4



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R4

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn43/N736	CO1/1	1,57	0,65	4,77	0,00	0,00	0,00	0,0	0,0
Sn43/N736	CO1/2	0,79	0,68	4,19	0,00	0,00	0,00	0,0	0,0
Sn43/N736	CO1/3	-1,90	-0,83	3,20	0,00	0,00	0,00	0,0	0,0
Sn43/N736	CO1/4	0,82	0,38	5,68	0,00	0,00	0,00	0,0	0,0
Sn43/N736	CO1/5	-1,93	-0,83	3,76	0,00	0,00	0,00	0,0	0,0

R5 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

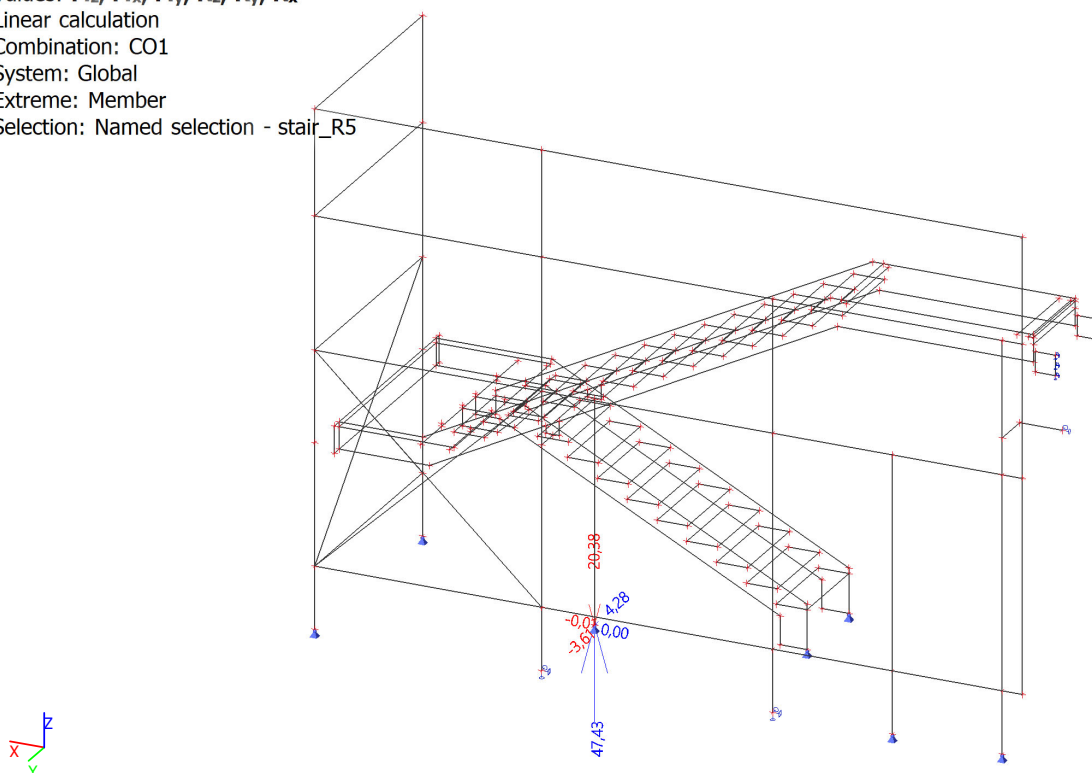
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R5



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R5

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn49/N750	CO1/1	0,00	4,06	31,29	0,00	0,00	0,00	0,0	0,0
Sn49/N750	CO1/2	-0,01	-3,61	-20,38	0,00	0,00	0,00	0,0	0,0
Sn49/N750	CO1/3	0,00	4,28	47,43	0,00	0,00	0,00	0,0	0,0
Sn49/N750	CO1/4	-0,01	-3,39	-4,23	0,00	0,00	0,00	0,0	0,0

R6_1 - Resultant of reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

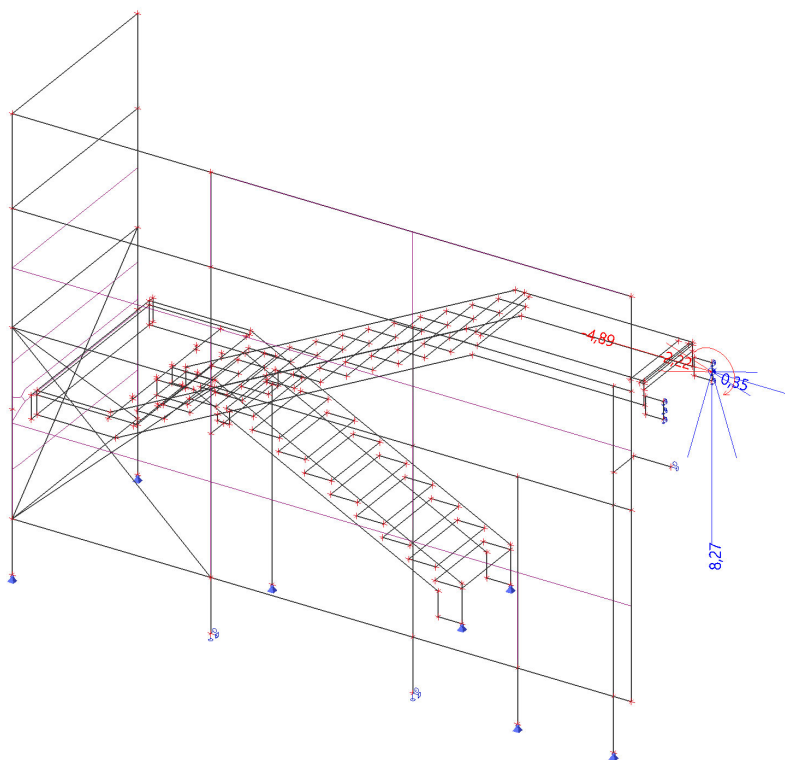
Linear calculation

Combination: CO1

Extreme: Global

Selection: Named selection - stair_R6_1

System: Global



Resultant of reactions

Linear calculation

Combination: CO1

Extreme: Global

Selection: Named selection - stair_R6_1

System: Global

x [mm]	y [mm]	z [mm]	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
21400,000	16800,085	3725,000	CO1/1	-4,89	0,03	6,54	0,00	-1,88	0,01
21400,000	16800,085	3725,000	CO1/2	0,60	0,39	5,92	-0,04	-1,17	0,08
21400,000	16800,085	3725,000	CO1/3	-4,63	0,17	8,27	-0,02	-2,22	0,04
21400,000	16800,085	3725,000	CO1/4	4,12	-0,19	0,41	0,02	0,35	-0,04

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC4 + 1.05*LC8
CO1/2	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7 + 1.05*LC8
CO1/3	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 0.90*LC4 + 1.50*LC8
CO1/4	LC1 + LC2 + 0.75*LC3 + 1.50*LC5

R6_2 - Resultant of reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

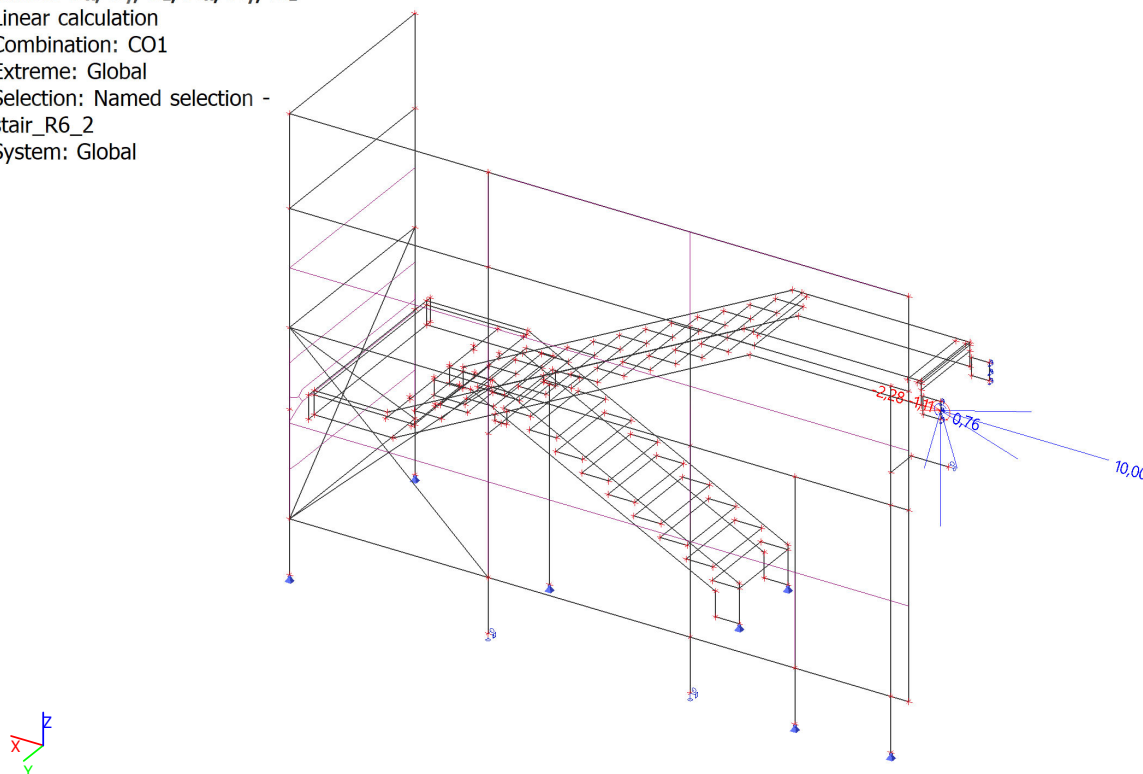
Linear calculation

Combination: CO1

Extreme: Global

Selection: Named selection - stair_R6_2

System: Global



Resultant of reactions

Linear calculation

Combination: CO1

Extreme: Global

Selection: Named selection - stair_R6_2

System: Global

x [mm]	y [mm]	z [mm]	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
21400,000	17750,085	3725,000	CO1/1	-2,28	0,20	2,02	-0,02	-0,66	0,04
21400,000	17750,085	3725,000	CO1/2	10,00	-0,28	3,56	0,03	0,31	-0,06
21400,000	17750,085	3725,000	CO1/3	7,20	-0,22	0,03	0,02	0,76	-0,05
21400,000	17750,085	3725,000	CO1/4	2,94	0,04	6,73	0,00	-1,10	0,01
21400,000	17750,085	3725,000	CO1/5	-2,14	0,20	2,23	-0,02	-0,69	0,04
21400,000	17750,085	3725,000	CO1/6	0,52	0,14	5,56	-0,01	-1,11	0,03
21400,000	17750,085	3725,000	CO1/7	9,86	-0,28	3,36	0,03	0,33	-0,06

Name	Combination key
CO1/1	LC1 + LC2 + 0.75*LC3 + 1.50*LC7
CO1/2	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC5 + 1.05*LC8
CO1/3	LC1 + LC2 + 0.75*LC3 + 1.50*LC5
CO1/4	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 0.90*LC7 + 1.50*LC8
CO1/5	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7
CO1/6	1.15*LC1 + 1.15*LC2 + 0.75*LC3 + 1.50*LC7 + 1.05*LC8
CO1/7	LC1 + LC2 + 0.75*LC3 + 1.50*LC5 + 1.05*LC8

R7 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

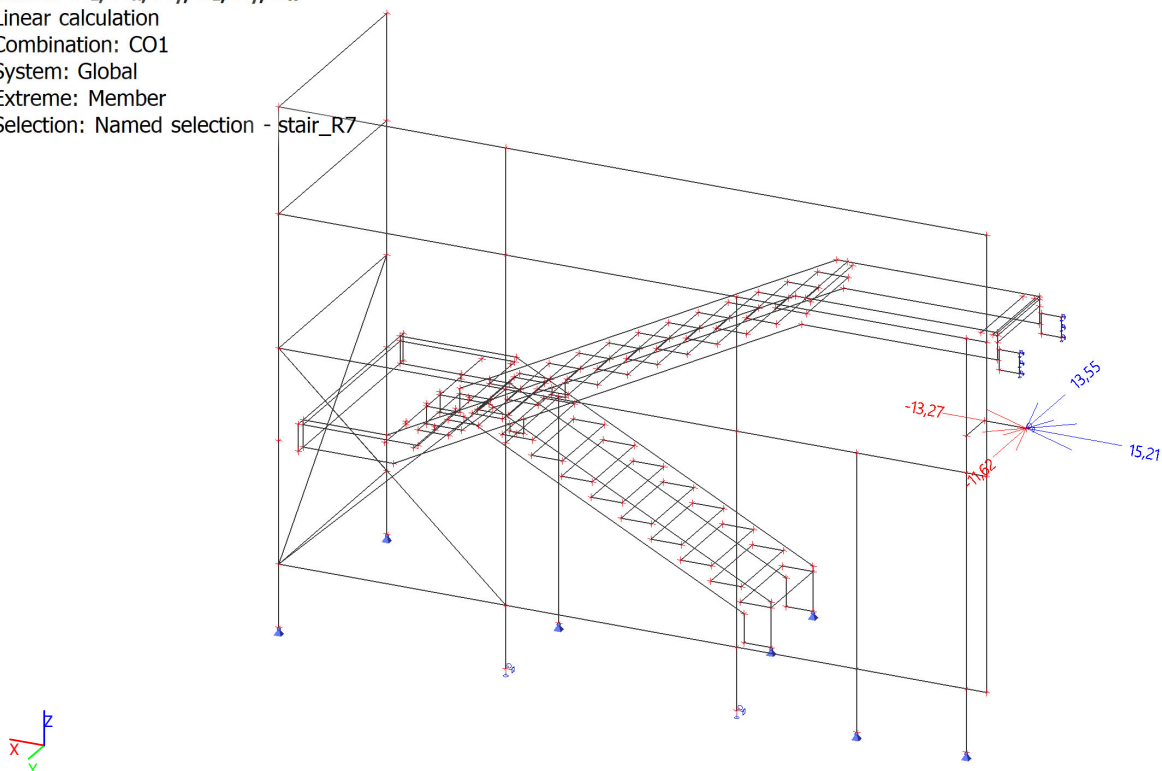
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R7



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R7

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn48/N4527	CO1/1	15,21	13,55	0,00	0,00	0,00	0,00	-	-
Sn48/N4527	CO1/2	-13,26	-11,62	0,00	0,00	0,00	0,00	-	-
Sn48/N4527	CO1/3	15,20	13,55	0,00	0,00	0,00	0,00	-	-
Sn48/N4527	CO1/4	-13,27	-11,62	0,00	0,00	0,00	0,00	-	-

R8 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z, M_x, M_y, R_z, R_y, R_x

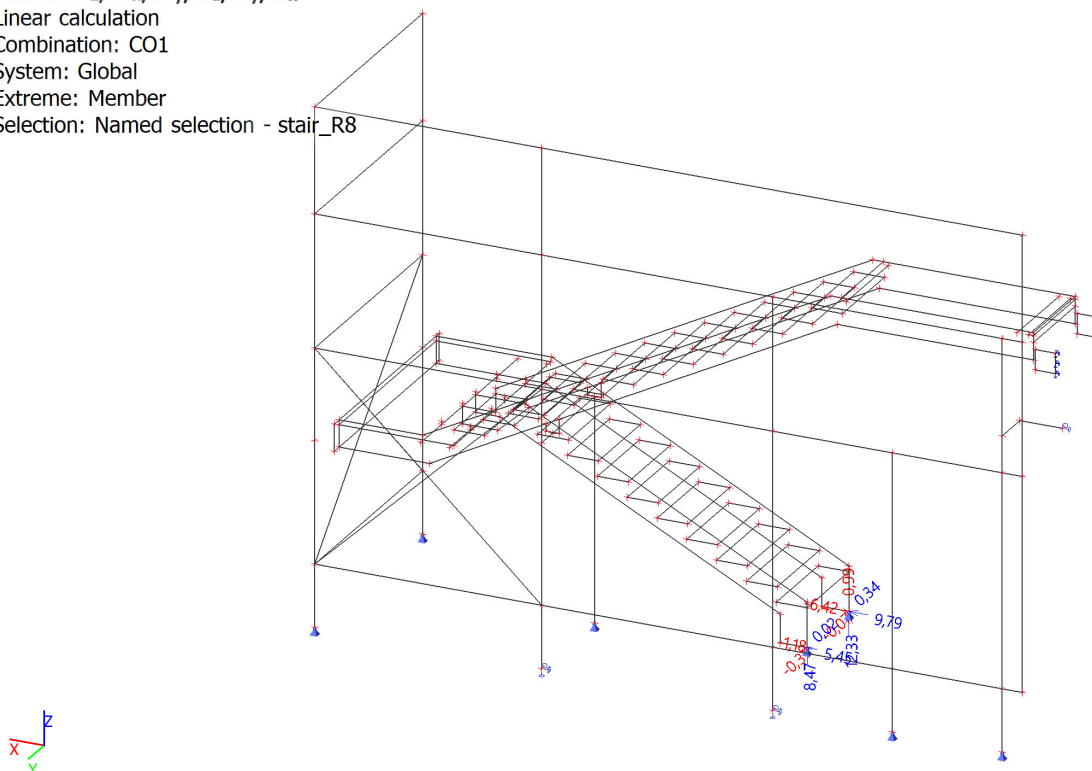
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R8



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_R8

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn145/N562	CO1/1	9,79	0,27	11,44	0,00	0,00	0,00	0,0	0,0
Sn145/N562	CO1/2	7,30	-0,07	4,83	0,00	0,00	0,00	0,0	0,0
Sn145/N562	CO1/3	7,08	0,34	12,33	0,00	0,00	0,00	0,0	0,0
Sn145/N562	CO1/4	-6,42	-0,01	-0,99	0,00	0,00	0,00	0,0	0,0
Sn146/N569	CO1/5	5,45	-0,27	8,08	0,00	0,00	0,00	0,0	0,0
Sn146/N569	CO1/6	3,24	-0,31	8,47	0,00	0,00	0,00	0,0	0,0
Sn146/N569	CO1/7	0,94	0,02	1,90	0,00	0,00	0,00	0,0	0,0
Sn146/N569	CO1/4	-1,15	-0,04	0,69	0,00	0,00	0,00	0,0	0,0
Sn146/N569	CO1/8	-1,18	-0,04	0,87	0,00	0,00	0,00	0,0	0,0

DEFORMATIONS

1D deformations; u_z

Values: u_z

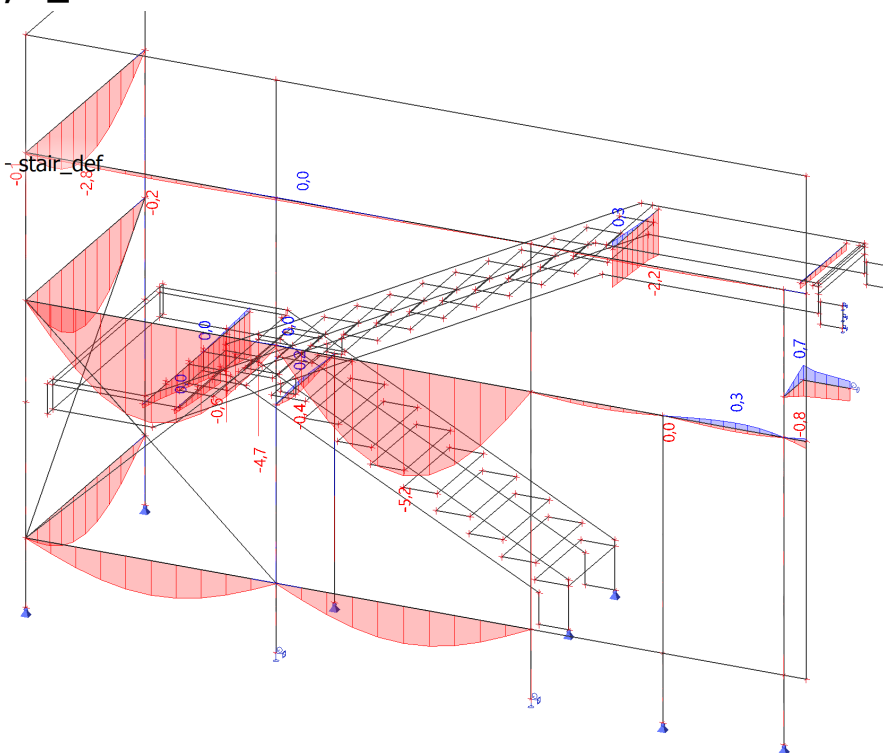
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - stair_def



1D deformations; u_x

Values: u_x

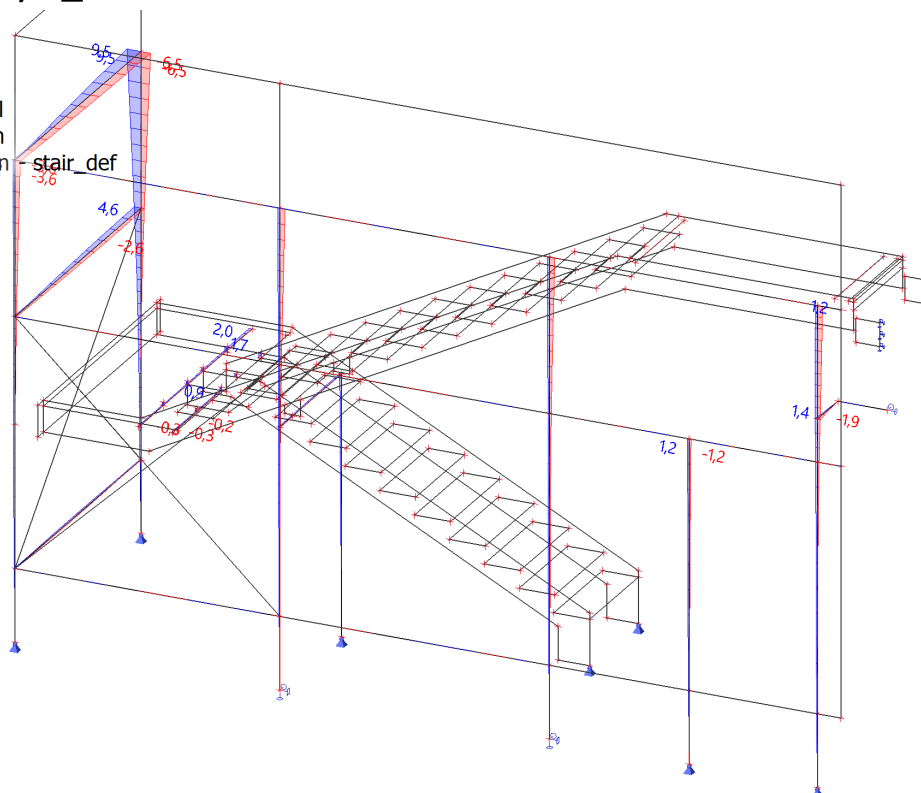
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - stair_def



1D deformations; u_y

Values: u_y

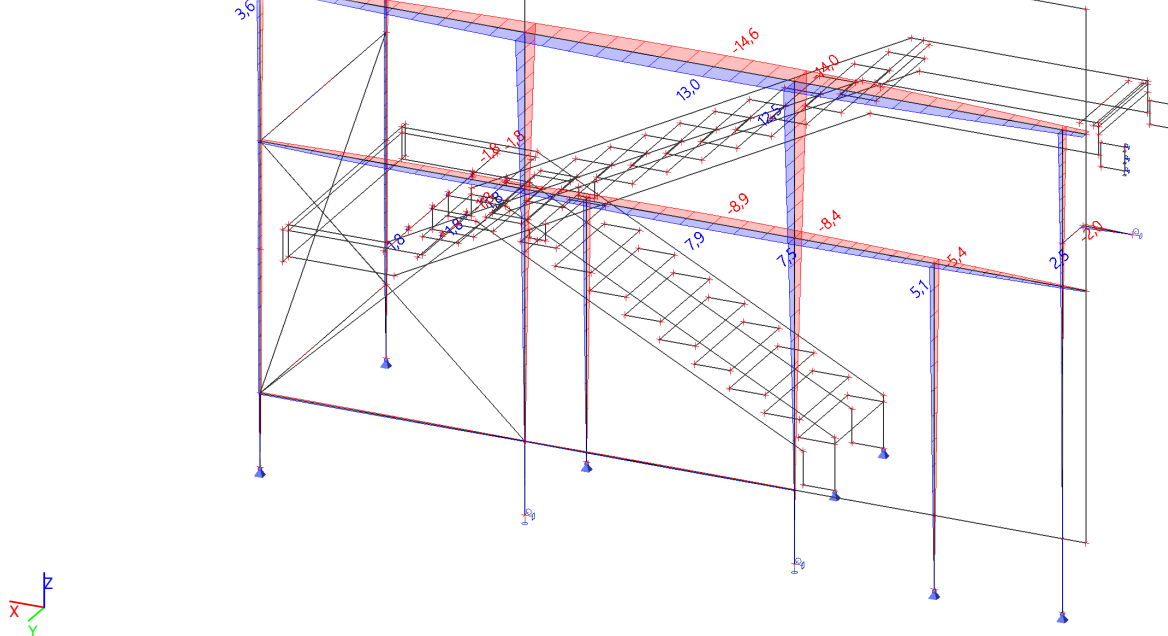
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection



Deformations on member

Linear calculation, Extreme : Global

Selection : Named selection - H2_def

Combinations : CO2

Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B319	0,000	CO2/4	-11,0	0,3	-0,1	-0,4	-0,6	-1,1	11,0
B439	649,410	CO2/5	11,2	0,2	2,0	0,0	-0,2	0,2	11,3
B252	4040,000	CO2/6	-2,2	-12,8	-0,2	0,0	-0,1	0,0	13,0
B350	1500,480	CO2/7	-0,3	20,6	0,1	-0,2	0,0	0,0	20,6
B471	1830,000	CO2/3	-0,1	4,6	-16,4	0,6	-0,5	0,0	17,0
B449	1225,000	CO2/6	1,6	2,3	15,1	-1,3	0,2	0,0	15,4
B330	0,000	CO2/6	0,1	0,0	2,5	-5,4	0,4	0,2	2,5
B306	260,010	CO2/8	0,0	0,0	-3,8	5,8	-0,2	0,0	3,8
B510	63,470	CO2/3	0,1	-0,1	-12,4	0,3	-44,0	-0,1	12,4
B463	63,470	CO2/5	0,1	0,7	7,4	-0,4	51,1	-0,1	7,4
B350	3000,950	CO2/9	-0,2	0,0	-0,1	0,2	0,0	-21,9	0,2
B350	0,000	CO2/10	0,3	0,0	0,0	0,0	0,0	21,9	0,3

DEFORMATIONS OF PLATE ELEMENTS

2D displacement; u_z Values: u_z

Linear calculation

Combination: CO2

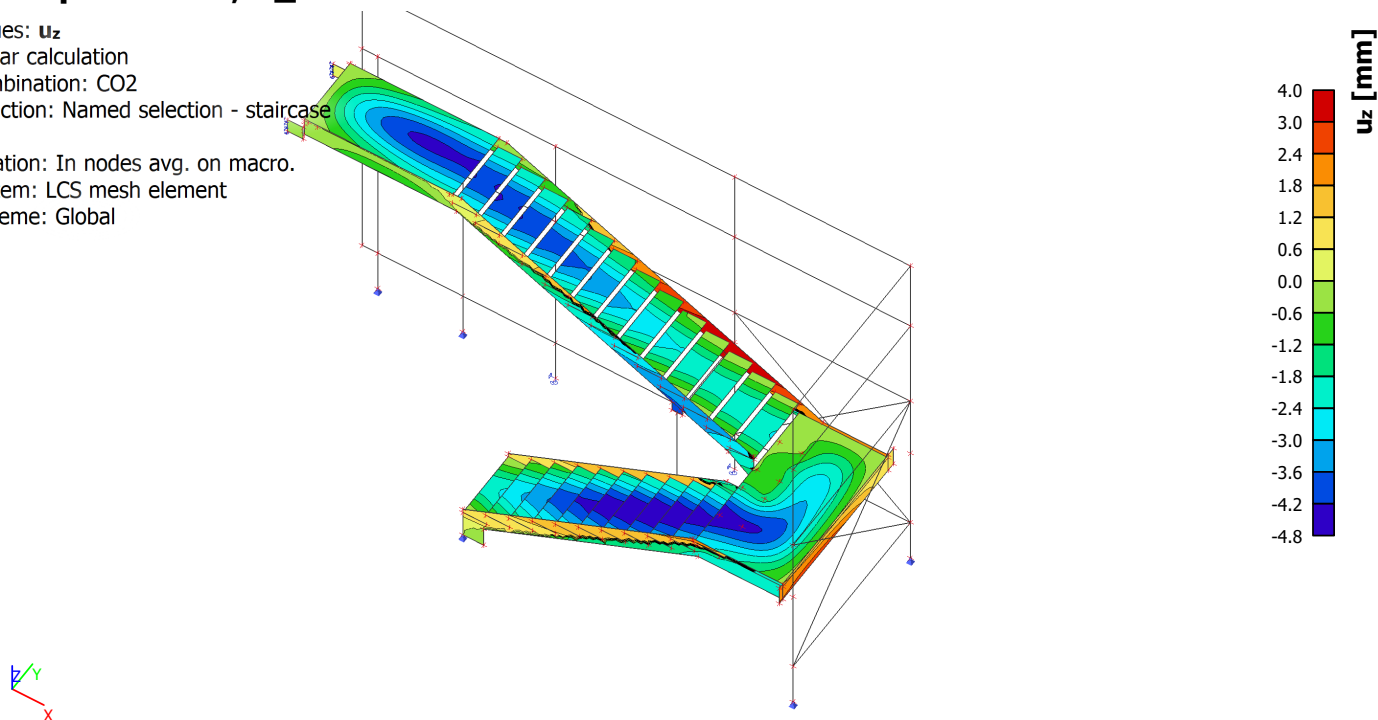
Selection: Named selection - staircase

2D

Location: In nodes avg. on macro.

System: LCS mesh element

Extreme: Global



2D displacement

Linear calculation

Combination: CO2

Selection: Named selection - staircase 2D

Location: In nodes avg. on macro. System: LCS mesh element

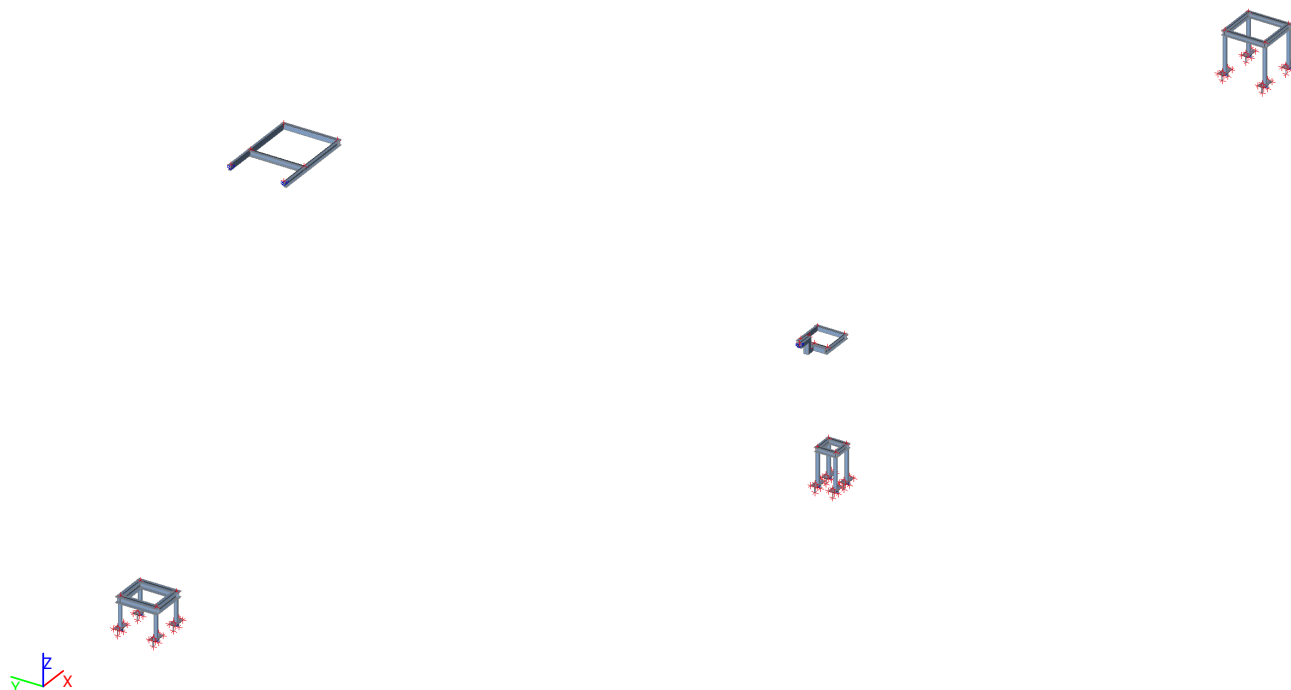
Extreme: Global

Name	Case	u_x [mm]	u_y [mm]	u_z [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U_{total} [mm]
S118	CO2/1	-2,0	0,0	-0,3	0,2	0,2	-0,1	2,8
S116	CO2/2	2,5	3,2	0,4	0,1	-0,5	-0,3	4,4
S82	CO2/3	0,8	-3,5	-0,1	-1,3	-0,1	0,9	4,4
S116	CO2/2	2,4	3,3	0,2	0,2	-0,5	0,1	4,4
S78	CO2/2	1,6	0,5	-4,8	-0,8	-2,9	0,7	5,7
S120	CO2/3	0,9	-0,3	4,0	-3,0	1,1	0,5	4,6
S113	CO2/4	0,2	0,0	-2,5	-8,1	1,1	0,0	2,6
S78	CO2/2	1,4	0,5	-2,8	9,5	-0,9	0,7	3,8
S78	CO2/2	1,5	1,2	-1,7	-0,3	-9,1	0,6	3,0
S78	CO2/2	1,3	0,8	-1,9	2,6	7,0	0,6	3,0
S116	CO2/2	2,5	0,5	1,2	-0,1	-0,4	-2,4	3,2
S116	CO2/2	0,0	0,0	0,0	1,3	0,4	3,2	0,0
S75	CO2/5	1,4	0,5	-4,0	0,0	-1,4	0,4	6,1

Name	Combination key
CO2/1	LC1 + LC2 + LC7
CO2/2	LC1 + LC2 + 0.60*LC4 + LC8
CO2/3	LC1 + LC2 + LC7 + 0.70*LC8
CO2/4	LC1 + LC2 + 0.60*LC7 + LC8
CO2/5	LC1 + LC2 + 0.60*LC5 + LC8

KONSTRUKCE PRO VZT ZAŘÍZENÍ

3D MODEL OF STRUCTURE



Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

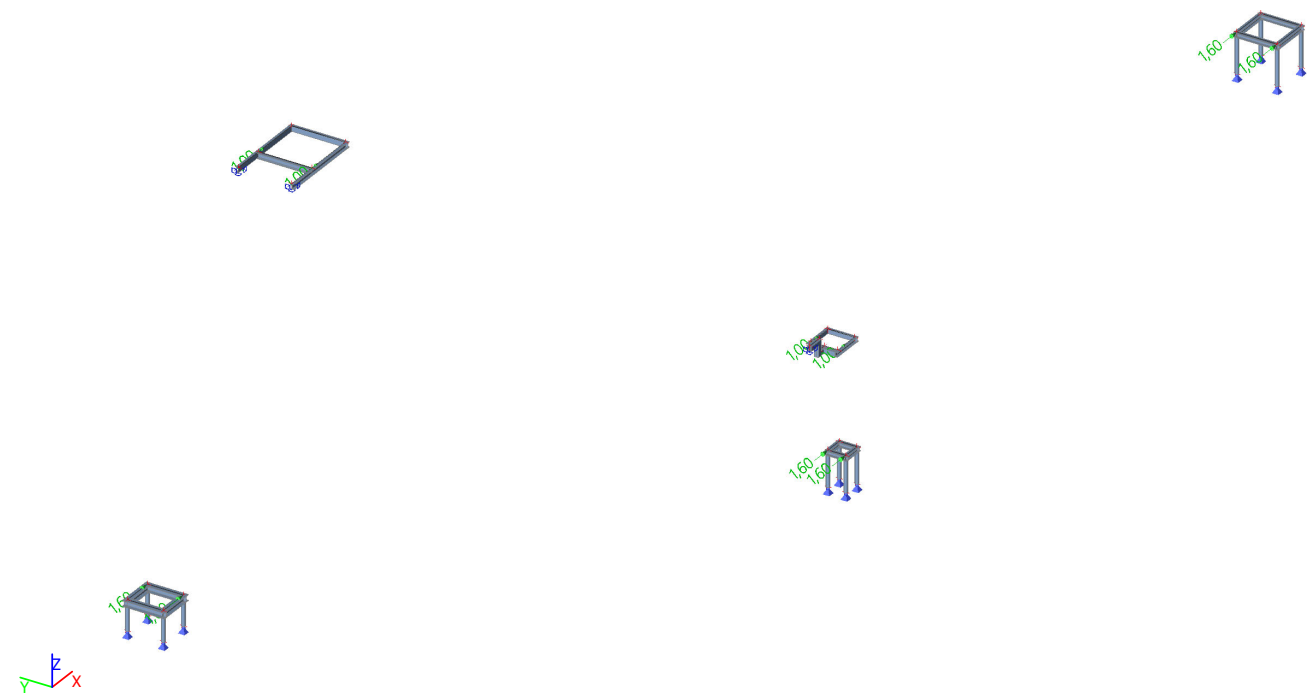
Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B Rmax + - Envelope - ultimate Rmax - - Envelope - ultimate Mmax + - Envelope - ultimate Mmax - - Envelope - ultimate CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic Mmax +def - Envelope - serviceability Mmax -def - Envelope - serviceability

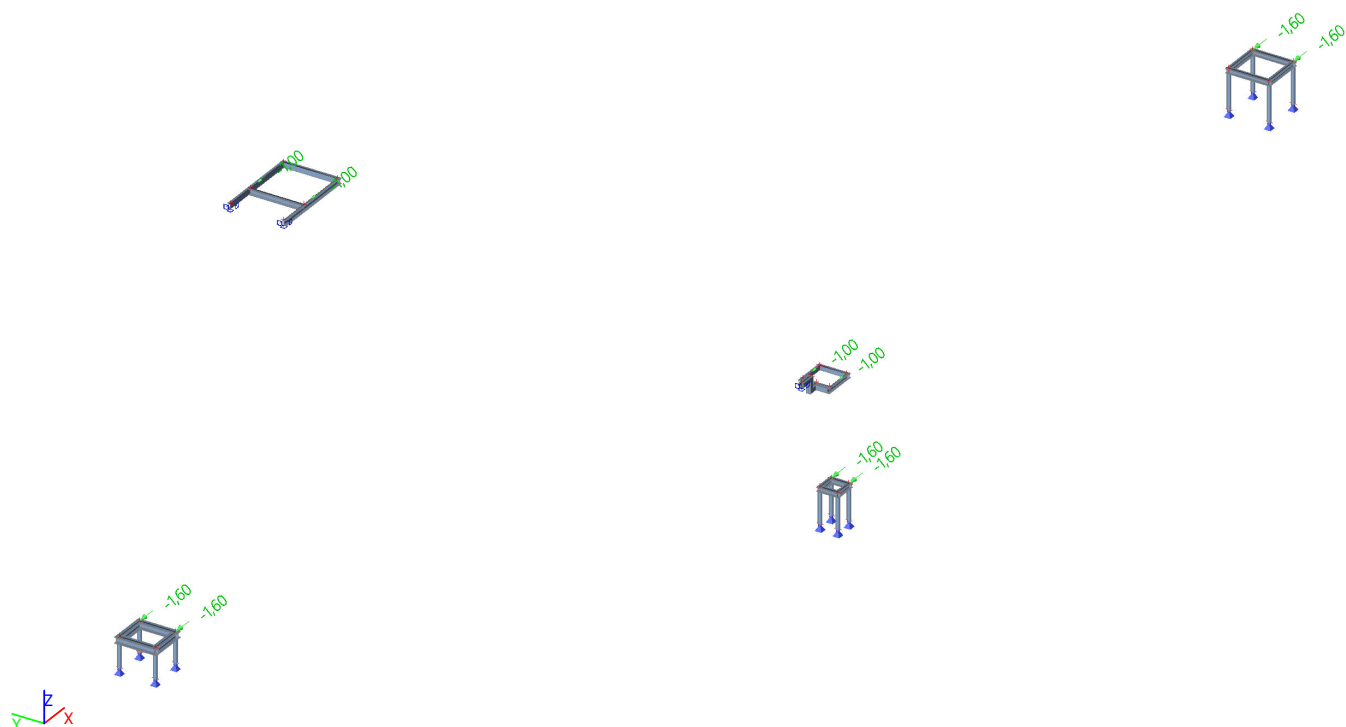
LC2 / Tot. value



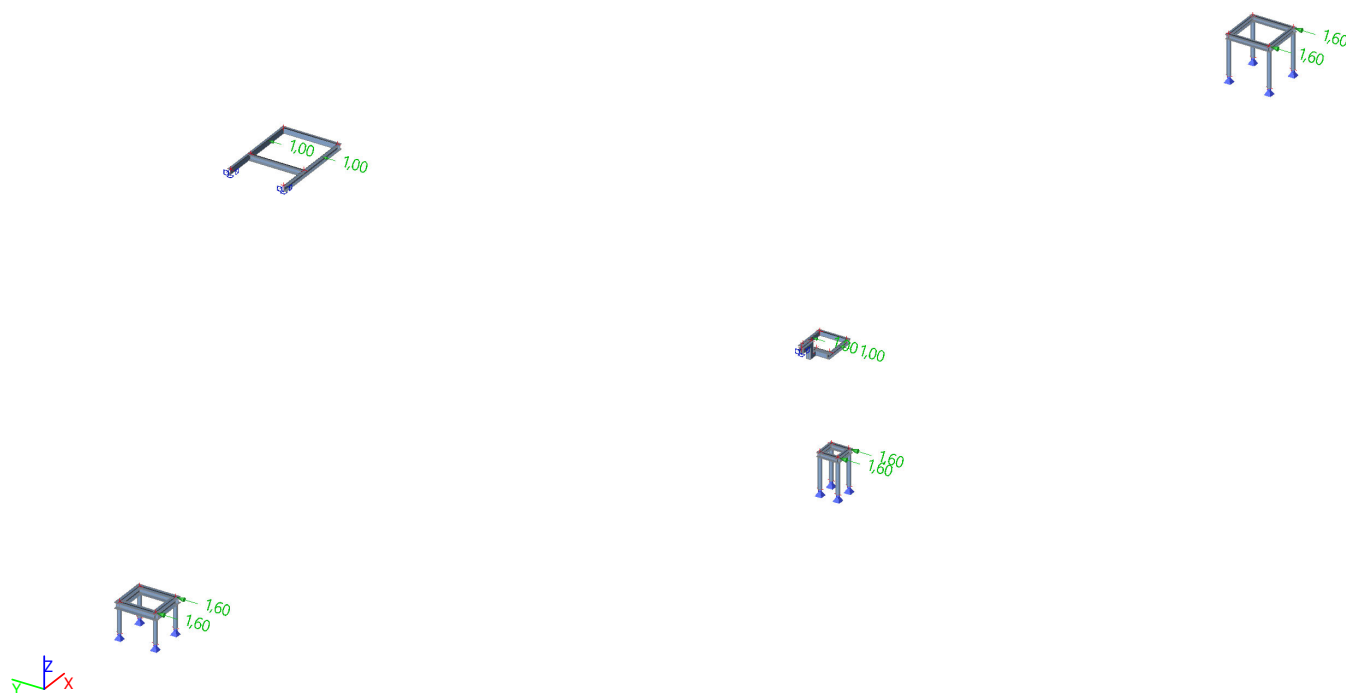
LC4 / Tot. value



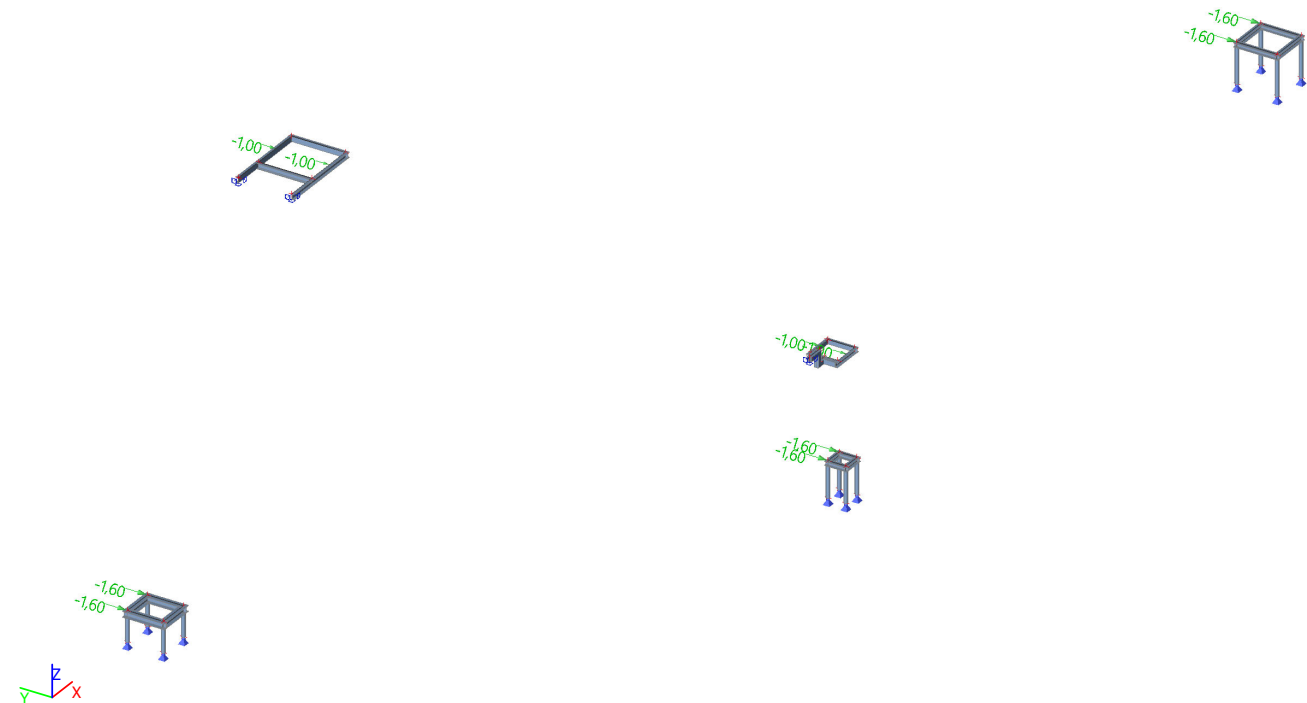
LC5 / Tot. value



LC6 / Tot. value

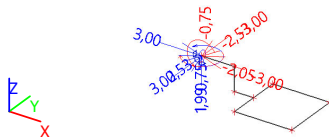
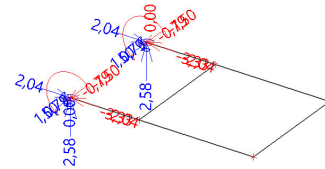


LC7 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN



Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn177/N4833	CO1/1	0,00	0,00	1,99	0,00	-1,53	0,00	0,0	-768,2
Sn177/N4833	CO1/2	3,00	0,00	1,69	0,00	-2,05	0,00	0,0	-1210,9
Sn177/N4833	CO1/3	-3,00	0,00	1,48	0,00	-0,38	0,00	0,0	-260,2
Sn177/N4833	CO1/4	0,00	-3,00	1,69	-0,75	-1,30	-2,53	-442,7	-768,2
Sn177/N4833	CO1/5	0,00	3,00	1,69	0,75	-1,30	2,53	442,7	-768,2
Sn178/N4817	CO1/6	-2,04	-1,50	1,91	0,00	-2,46	-0,79	0,0	-1291,5
Sn178/N4817	CO1/7	1,23	0,90	2,58	0,00	-3,33	0,47	0,0	-1291,5
Sn178/N4817	CO1/8	2,04	1,50	1,91	0,00	-2,46	0,79	0,0	-1291,5
Sn178/N4817	CO1/9	-1,23	-0,90	2,58	0,00	-3,33	-0,47	0,0	-1291,5
Sn178/N4817	CO1/10	-0,90	0,00	2,58	0,00	-3,33	0,00	0,0	-1291,5
Sn178/N4817	CO1/11	1,50	0,00	1,91	0,00	-2,46	0,00	0,0	-1291,5
Sn179/N4814	CO1/8	-2,04	1,50	1,91	0,00	-2,46	0,79	0,0	-1291,5
Sn179/N4814	CO1/9	1,23	-0,90	2,58	0,00	-3,33	-0,47	0,0	-1291,5
Sn179/N4814	CO1/7	-1,23	0,90	2,58	0,00	-3,33	0,47	0,0	-1291,5
Sn179/N4814	CO1/6	2,04	-1,50	1,91	0,00	-2,46	-0,79	0,0	-1291,5
Sn179/N4814	CO1/10	-0,90	0,00	2,58	0,00	-3,33	0,00	0,0	-1291,5
Sn179/N4814	CO1/11	1,50	0,00	1,91	0,00	-2,46	0,00	0,0	-1291,5

RvztH1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

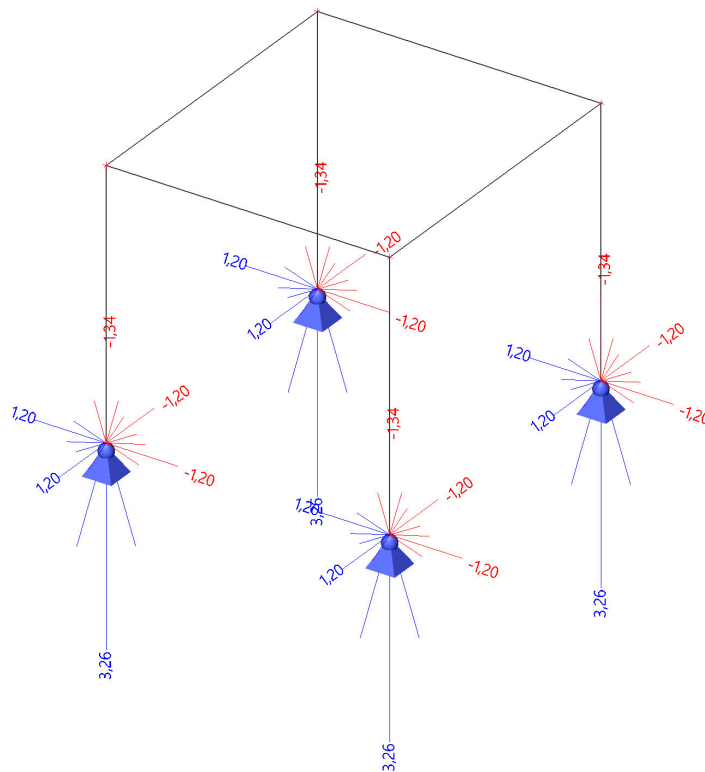
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - vzt_H1



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - vzt_H1

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn180/N5002	CO1/1	0,00	-1,20	-1,10	0,00	0,00	0,00	0,0	0,0
Sn180/N5002	CO1/2	0,00	1,20	3,03	0,00	0,00	0,00	0,0	0,0
Sn180/N5002	CO1/3	1,20	0,00	-1,34	0,00	0,00	0,00	0,0	0,0
Sn180/N5002	CO1/4	-1,20	0,00	3,26	0,00	0,00	0,00	0,0	0,0
Sn181/N4978	CO1/1	0,00	-1,20	-1,10	0,00	0,00	0,00	0,0	0,0
Sn181/N4978	CO1/2	0,00	1,20	3,03	0,00	0,00	0,00	0,0	0,0
Sn181/N4978	CO1/5	1,20	0,00	3,26	0,00	0,00	0,00	0,0	0,0
Sn181/N4978	CO1/6	-1,20	0,00	-1,34	0,00	0,00	0,00	0,0	0,0
Sn182/N5001	CO1/7	0,00	-1,20	3,03	0,00	0,00	0,00	0,0	0,0
Sn182/N5001	CO1/8	0,00	1,20	-1,10	0,00	0,00	0,00	0,0	0,0
Sn182/N5001	CO1/5	1,20	0,00	3,26	0,00	0,00	0,00	0,0	0,0
Sn182/N5001	CO1/6	-1,20	0,00	-1,34	0,00	0,00	0,00	0,0	0,0
Sn183/N5003	CO1/7	0,00	-1,20	3,03	0,00	0,00	0,00	0,0	0,0
Sn183/N5003	CO1/8	0,00	1,20	-1,10	0,00	0,00	0,00	0,0	0,0
Sn183/N5003	CO1/3	1,20	0,00	-1,34	0,00	0,00	0,00	0,0	0,0
Sn183/N5003	CO1/4	-1,20	0,00	3,26	0,00	0,00	0,00	0,0	0,0

Rvzt17 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

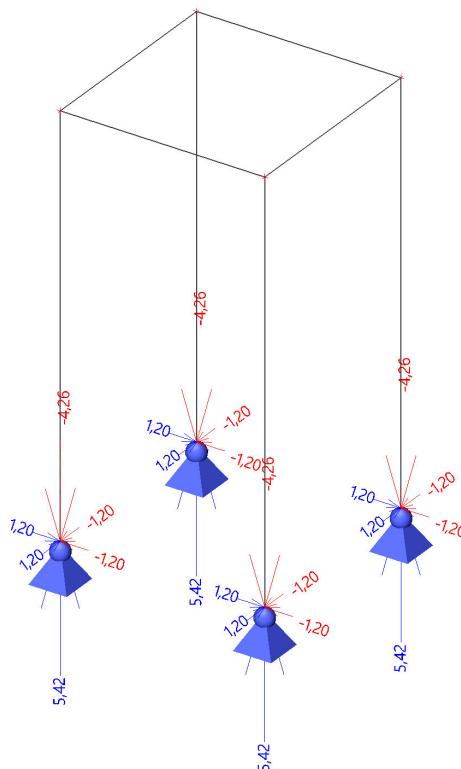
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: All



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - vzt_17

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn188/N5174	CO1/1	0,00	-1,20	-4,26	0,00	0,00	0,00	0,0	0,0
Sn188/N5174	CO1/2	0,00	1,20	5,42	0,00	0,00	0,00	0,0	0,0
Sn188/N5174	CO1/3	1,20	0,00	-4,26	0,00	0,00	0,00	0,0	0,0
Sn188/N5174	CO1/4	-1,20	0,00	5,42	0,00	0,00	0,00	0,0	0,0
Sn189/N5168	CO1/1	0,00	-1,20	-4,26	0,00	0,00	0,00	0,0	0,0
Sn189/N5168	CO1/2	0,00	1,20	5,42	0,00	0,00	0,00	0,0	0,0
Sn189/N5168	CO1/5	1,20	0,00	5,42	0,00	0,00	0,00	0,0	0,0
Sn189/N5168	CO1/6	-1,20	0,00	-4,26	0,00	0,00	0,00	0,0	0,0
Sn190/N5173	CO1/7	0,00	-1,20	5,42	0,00	0,00	0,00	0,0	0,0
Sn190/N5173	CO1/8	0,00	1,20	-4,26	0,00	0,00	0,00	0,0	0,0
Sn190/N5173	CO1/5	1,20	0,00	5,42	0,00	0,00	0,00	0,0	0,0
Sn190/N5173	CO1/6	-1,20	0,00	-4,26	0,00	0,00	0,00	0,0	0,0
Sn191/N5175	CO1/7	0,00	-1,20	5,42	0,00	0,00	0,00	0,0	0,0
Sn191/N5175	CO1/8	0,00	1,20	-4,26	0,00	0,00	0,00	0,0	0,0
Sn191/N5175	CO1/3	1,20	0,00	-4,26	0,00	0,00	0,00	0,0	0,0
Sn191/N5175	CO1/4	-1,20	0,00	5,42	0,00	0,00	0,00	0,0	0,0

Rvzt10 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

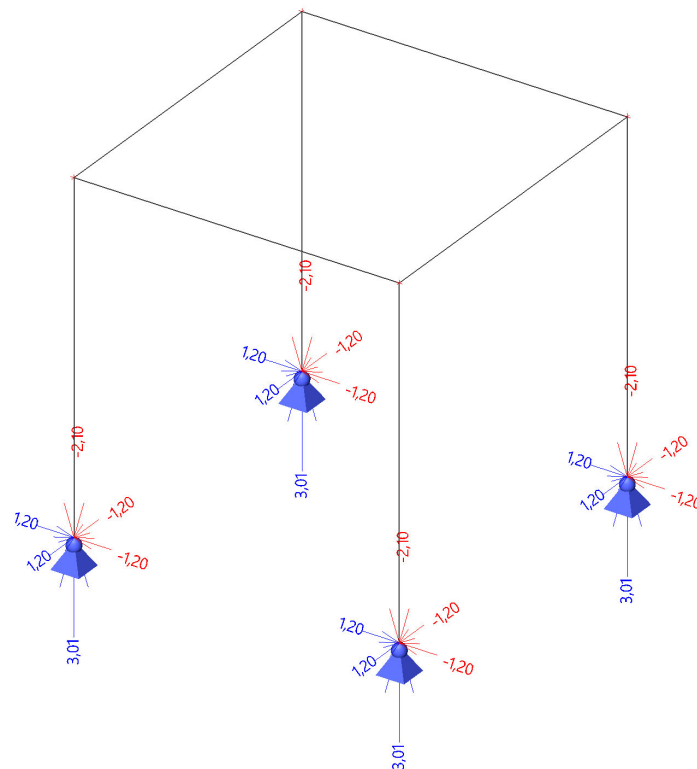
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - vzt_10



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - vzt_10

Nodal reactions

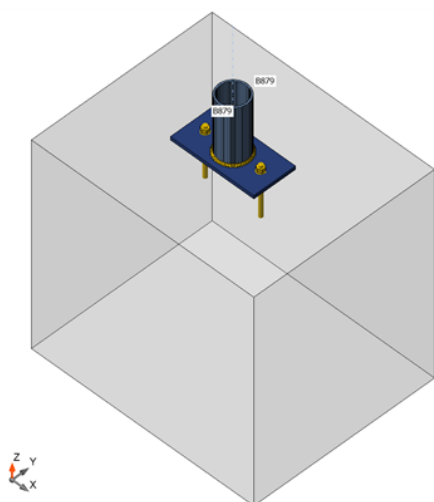
Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn184/N4876	CO1/1	0,00	-1,20	-1,97	0,00	0,00	0,00	0,0	0,0
Sn184/N4876	CO1/2	0,00	1,20	2,89	0,00	0,00	0,00	0,0	0,0
Sn184/N4876	CO1/3	1,20	0,00	-2,10	0,00	0,00	0,00	0,0	0,0
Sn184/N4876	CO1/4	-1,20	0,00	3,01	0,00	0,00	0,00	0,0	0,0
Sn185/N4843	CO1/1	0,00	-1,20	-1,97	0,00	0,00	0,00	0,0	0,0
Sn185/N4843	CO1/2	0,00	1,20	2,89	0,00	0,00	0,00	0,0	0,0
Sn185/N4843	CO1/5	1,20	0,00	3,01	0,00	0,00	0,00	0,0	0,0
Sn185/N4843	CO1/6	-1,20	0,00	-2,10	0,00	0,00	0,00	0,0	0,0
Sn186/N4877	CO1/7	0,00	-1,20	2,89	0,00	0,00	0,00	0,0	0,0
Sn186/N4877	CO1/8	0,00	1,20	-1,97	0,00	0,00	0,00	0,0	0,0
Sn186/N4877	CO1/3	1,20	0,00	-2,10	0,00	0,00	0,00	0,0	0,0
Sn186/N4877	CO1/4	-1,20	0,00	3,01	0,00	0,00	0,00	0,0	0,0
Sn187/N4875	CO1/7	0,00	-1,20	2,89	0,00	0,00	0,00	0,0	0,0
Sn187/N4875	CO1/8	0,00	1,20	-1,97	0,00	0,00	0,00	0,0	0,0
Sn187/N4875	CO1/5	1,20	0,00	3,01	0,00	0,00	0,00	0,0	0,0
Sn187/N4875	CO1/6	-1,20	0,00	-2,10	0,00	0,00	0,00	0,0	0,0

Con N5175

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B879	1 - RO82.5X5	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M12 8.8

Foundation block

CB 1

Dimensions	640 x 520	mm
Depth	600	mm
Anchor	M12 8.8	
Anchoring length	120	mm
Shear force transfer	Anchors	

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B879	4,3	-1,2	0,0	0,0	0,0	0,0
CO1(2)	B879	-5,5	1,2	0,0	0,0	0,0	0,0
CO1(3)	B879	-5,5	0,0	-1,2	0,0	0,0	0,0
CO1(4)	B879	4,3	0,0	1,2	0,0	0,0	0,0
CO1(5)	B879	-0,7	0,0	0,0	0,0	0,0	0,0
CO1(6)	B879	-5,4	1,2	0,0	0,0	0,0	0,0
CO1(7)	B879	4,2	-1,2	0,0	0,0	0,0	0,0

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	15,1 < 100%	OK
Welds	8,9 < 100%	OK
Concrete block	1,9 < 100%	OK
Buckling	Not calculated	

Project: CEETe - TU Ostrava
 Project no: Kz2
 Author: Ing. Jeřowicz

Project item Con N5175

Design

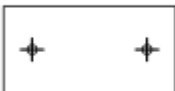
Name Con N5175
 Description
 Analysis Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	640 x 520	mm
Depth	600	mm
Anchor	M12 8.8	
Anchoring length	120	mm
Shear force transfer	Anchors	

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P10,0x240,0-120,0 (S 235)		1	Fillet: a = 4,0	243,4	M12 8.8	2

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Fillet	S 235	4,0	5,7	243,4

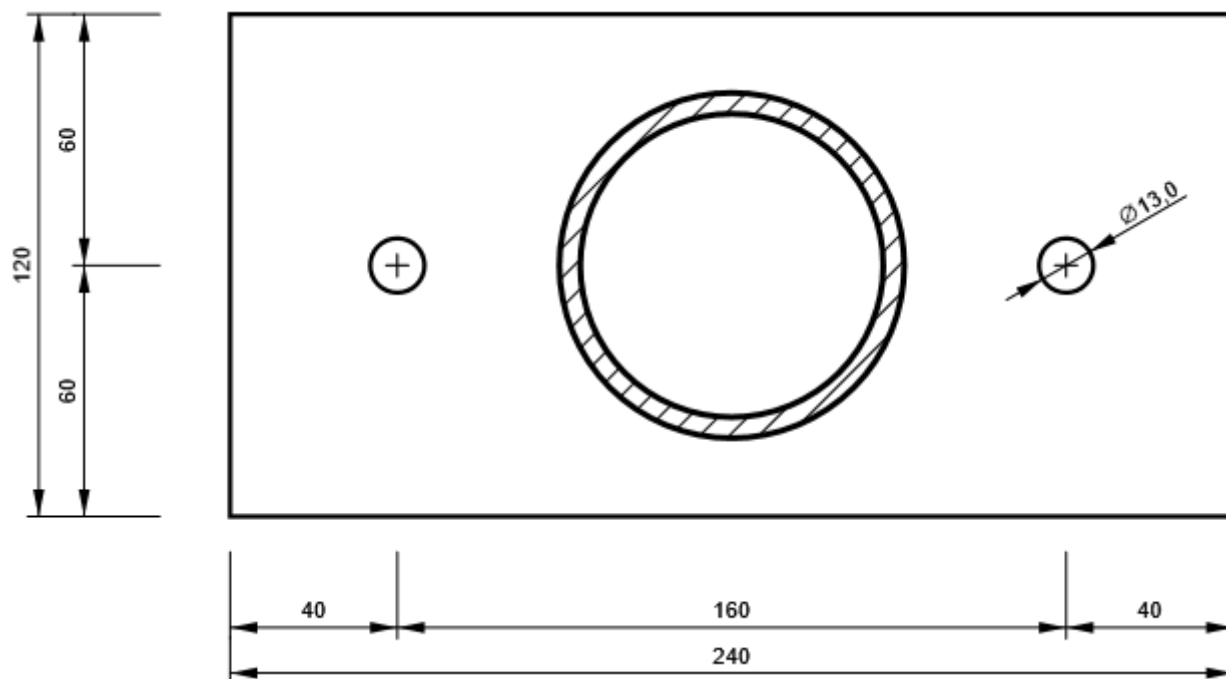
Anchors

Name	Length [mm]	Drill length [mm]	Count
M12 8.8	130	120	2

Drawing

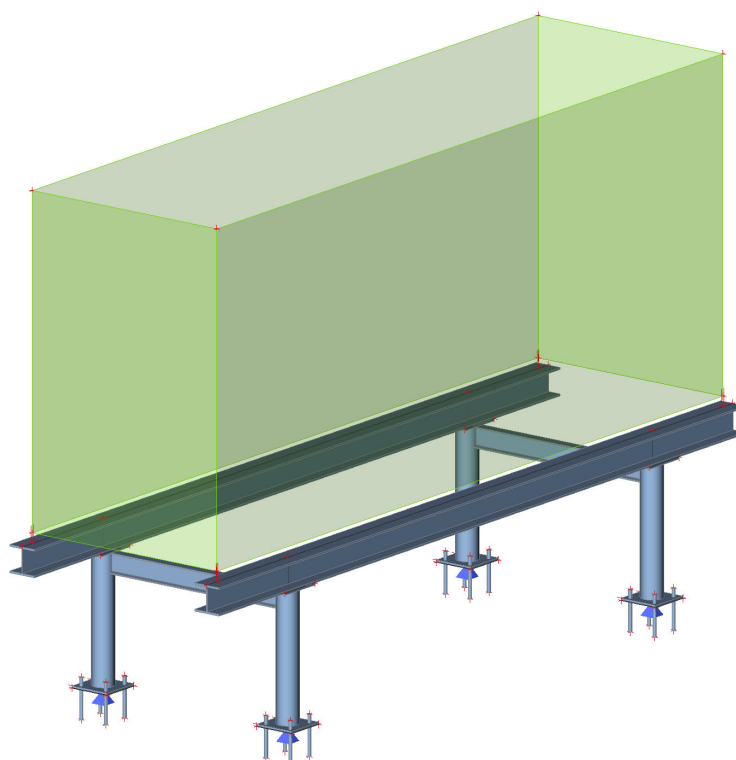
BP1

P10,0x120-240 (S 235)

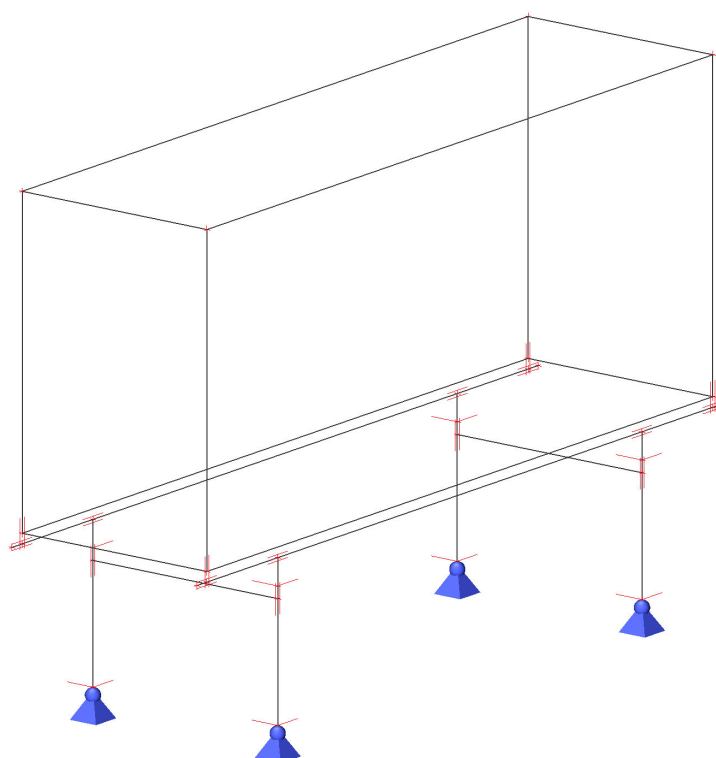


RÁMY POD JEDNOTKY CHLADU

3D MODEL OF STRUCTURE



Structural model



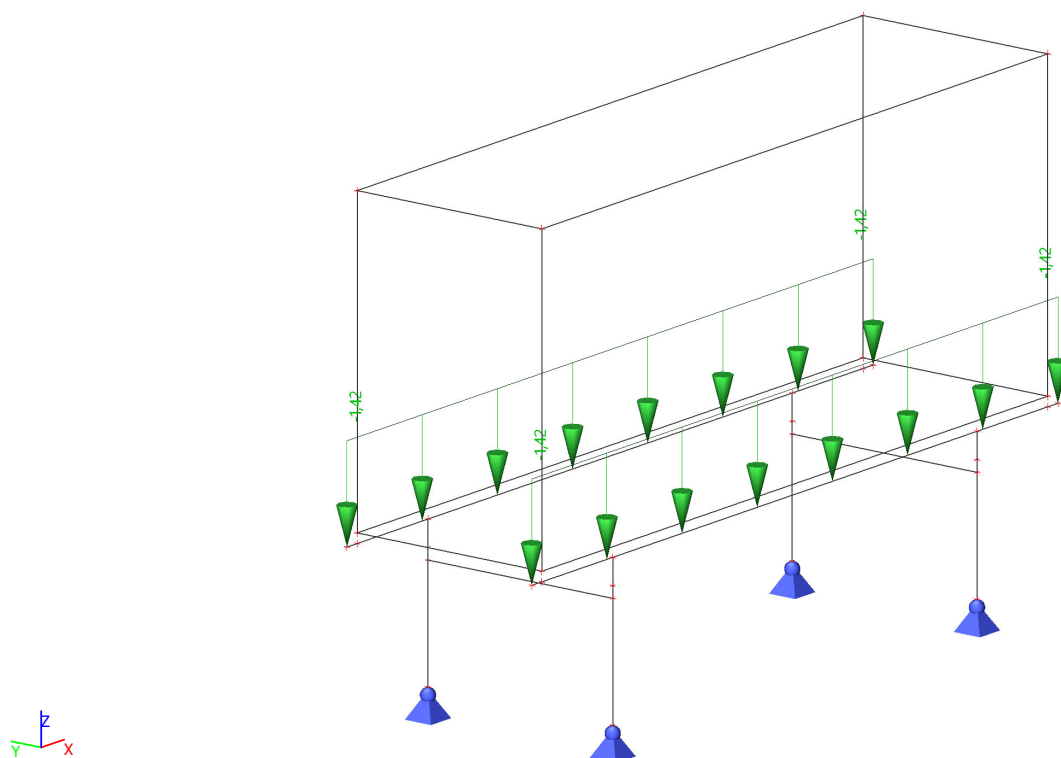
Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

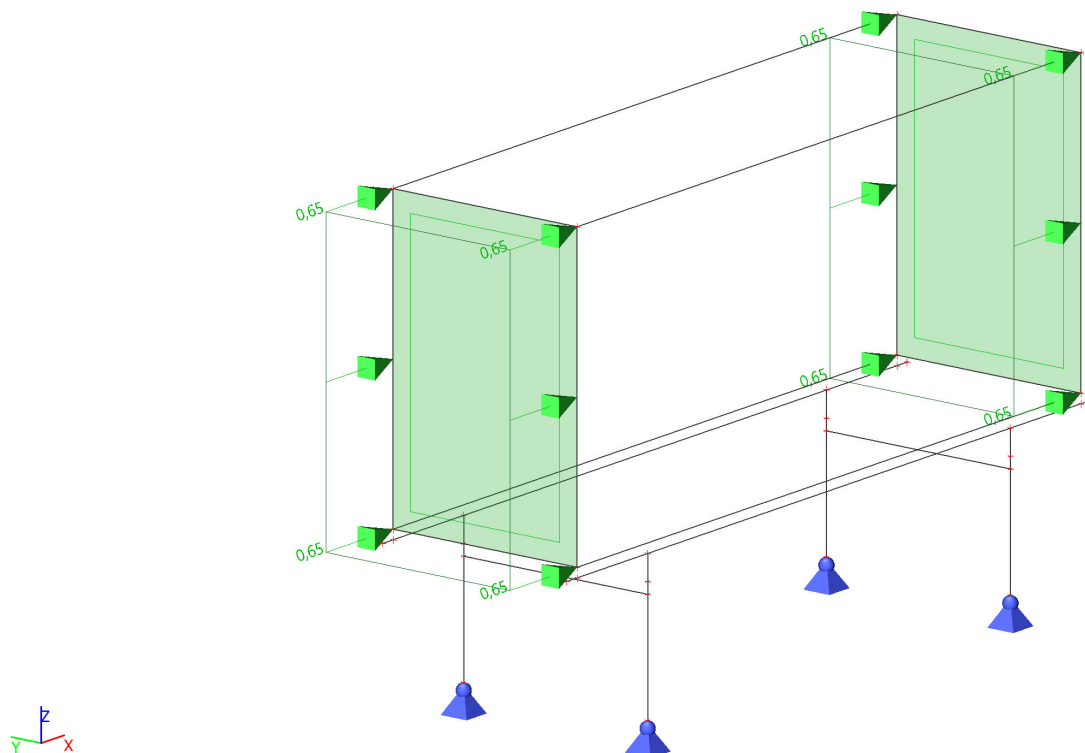
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

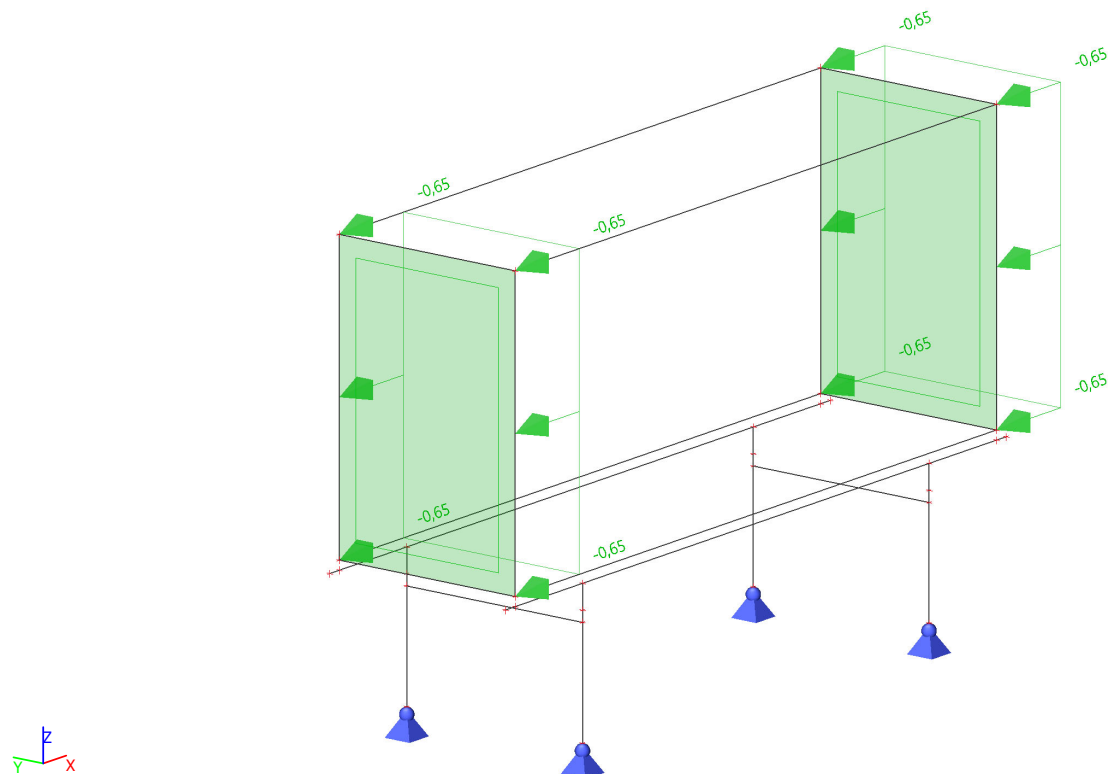
LC2 / Tot. value



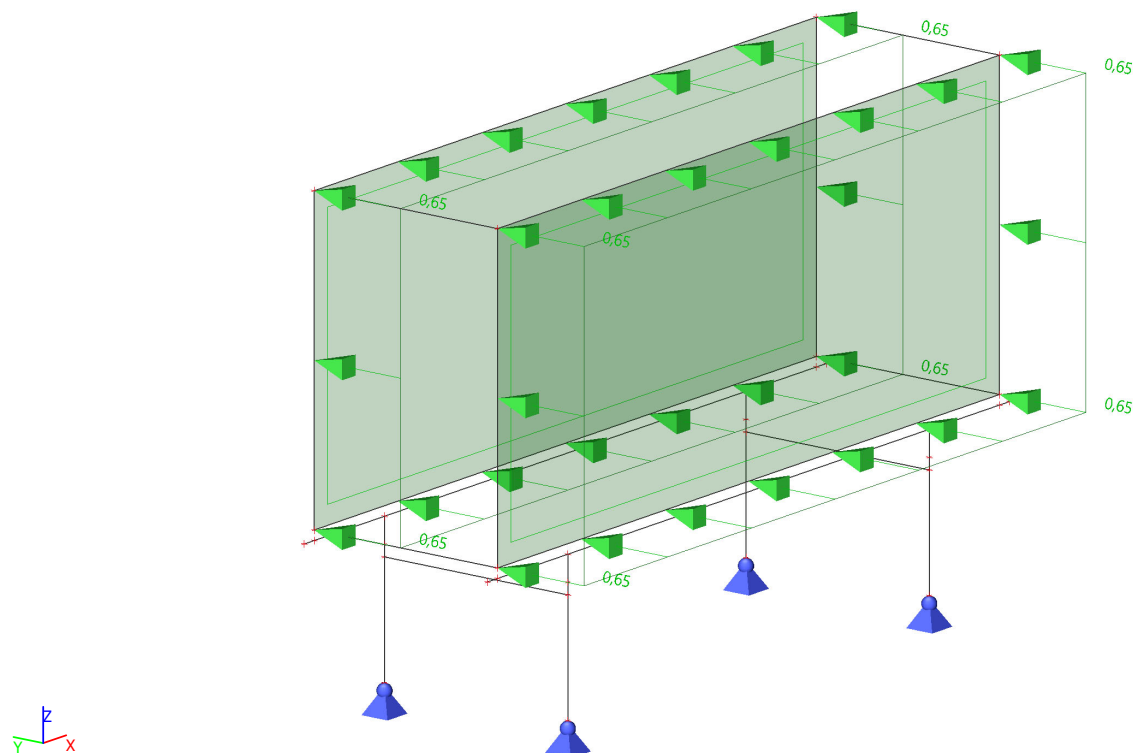
LC4 / Tot. value



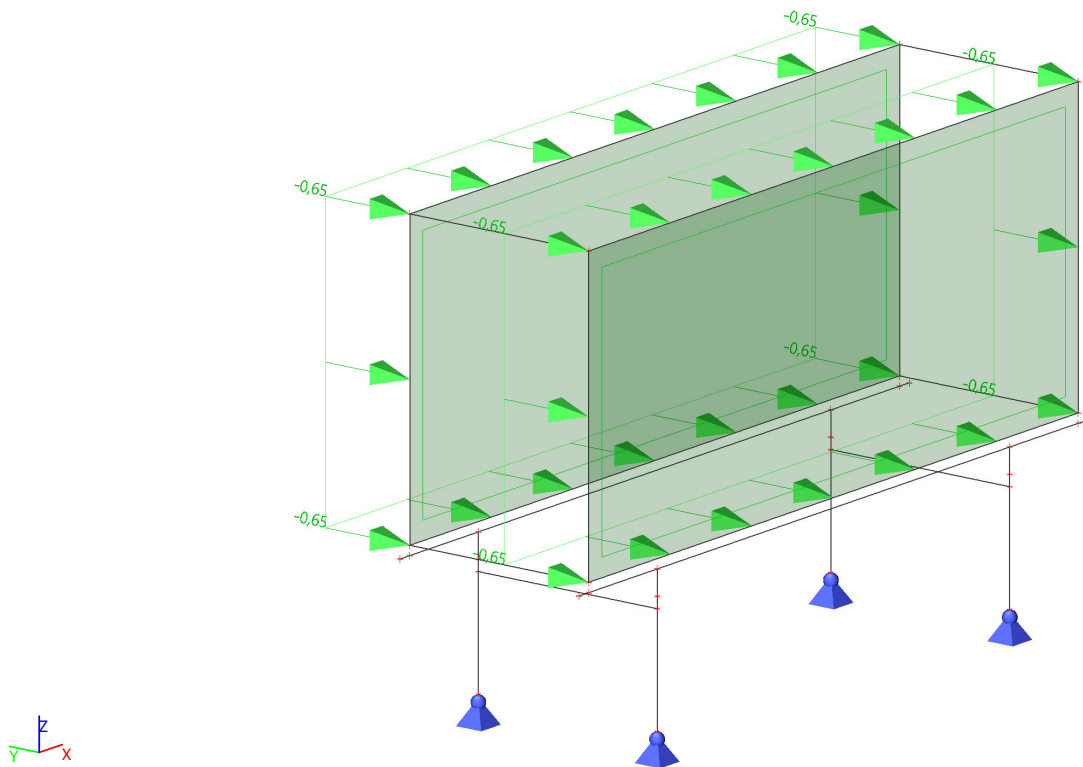
LC5 / Tot. value



LC6 / Tot. value



LC7 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B Rmax + - Envelope - ultimate Rmax - - Envelope - ultimate Mmax + - Envelope - ultimate Mmax - - Envelope - ultimate CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic Mmax +def - Envelope - serviceability Mmax -def - Envelope - serviceability

REACTIONS

R1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z Values: M_z , M_x , M_y , R_z , R_y , R_x

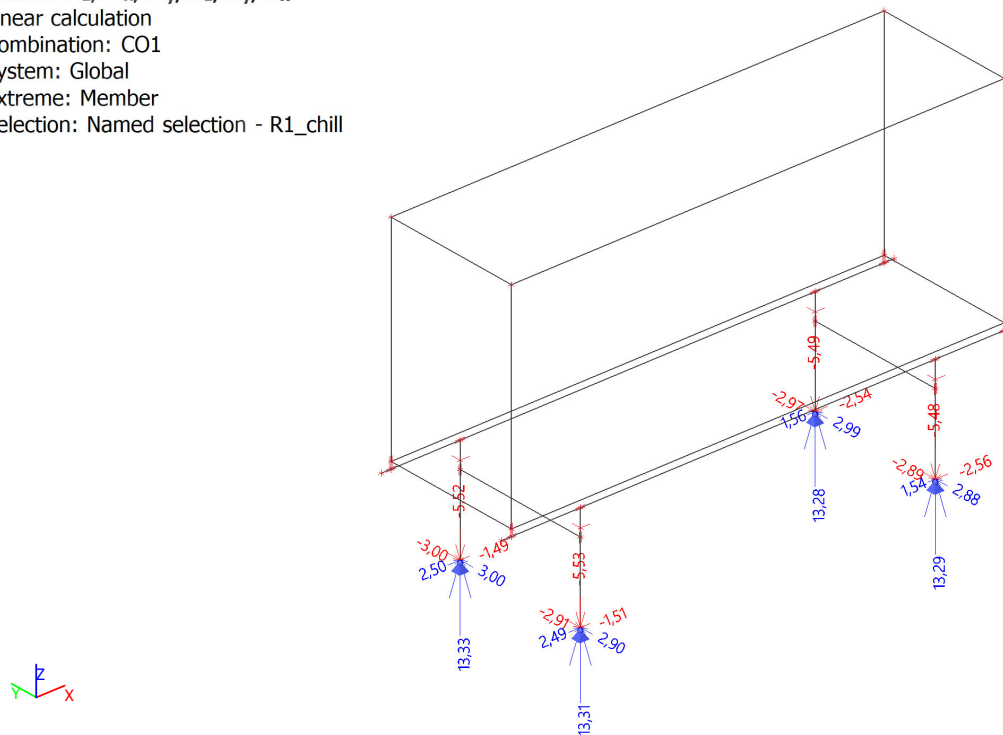
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - R1_chill



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - R1_chill

Nodal reactions

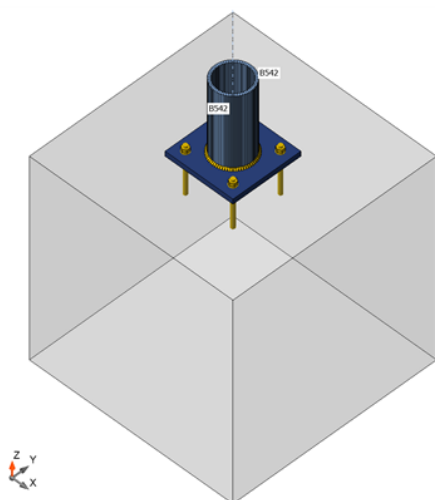
Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn147/N3960	CO1/1	2,49	-2,91	-5,00	0,00	0,00	0,00	0,0	0,0
Sn147/N3960	CO1/2	2,42	-2,91	-5,53	0,00	0,00	0,00	0,0	0,0
Sn147/N3960	CO1/3	-1,44	2,89	13,31	0,00	0,00	0,00	0,0	0,0
Sn147/N3960	CO1/4	-1,51	2,90	12,78	0,00	0,00	0,00	0,0	0,0
Sn148/N4016	CO1/3	2,50	3,00	-4,98	0,00	0,00	0,00	0,0	0,0
Sn148/N4016	CO1/4	2,43	3,00	-5,52	0,00	0,00	0,00	0,0	0,0
Sn148/N4016	CO1/1	-1,42	-3,00	13,33	0,00	0,00	0,00	0,0	0,0
Sn148/N4016	CO1/2	-1,49	-3,00	12,79	0,00	0,00	0,00	0,0	0,0
Sn149/N4034	CO1/2	1,56	-2,97	12,74	0,00	0,00	0,00	0,0	0,0
Sn149/N4034	CO1/4	-2,47	2,99	-5,49	0,00	0,00	0,00	0,0	0,0
Sn149/N4034	CO1/1	1,49	-2,97	13,28	0,00	0,00	0,00	0,0	0,0
Sn149/N4034	CO1/3	-2,54	2,99	-4,96	0,00	0,00	0,00	0,0	0,0
Sn150/N4052	CO1/4	1,54	2,88	12,75	0,00	0,00	0,00	0,0	0,0
Sn150/N4052	CO1/2	-2,49	-2,89	-5,48	0,00	0,00	0,00	0,0	0,0
Sn150/N4052	CO1/3	1,47	2,88	13,29	0,00	0,00	0,00	0,0	0,0
Sn150/N4052	CO1/1	-2,56	-2,89	-4,94	0,00	0,00	0,00	0,0	0,0

Con N3960

Analysis: Stress, strain/ loads in equilibrium

Beams and columns

Name	Cross-section	β - Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B542	1 - RO108X8	0,0	0,0	0,0	0	0	0	Position



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M12 8.8

Foundation block

CB 1

Dimensions	600 x 600	mm
Depth	600	mm
Anchor	M12 8.8	
Anchoring length	110	mm
Shear force transfer	Anchors	

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
CO1(1)	B542	6,6	2,9	1,9	0,0	0,0	0,0
CO1(2)	B542	-14,6	-2,9	-1,2	0,0	0,0	0,0

Summary

Name	Value	Status
Analysis	100,0%	OK
Plates	0,0 < 5,0%	OK
Anchors	14,6 < 100%	OK
Welds	5,5 < 100%	OK
Concrete block	2,6 < 100%	OK
Buckling	Not calculated	

Project: CEETe - TU Ostrava
 Project no: Kz1
 Author: Ing. Jeřowicz

Project item Con N3960

Design


Name: Con N3960
 Description:
 Analysis: Stress, strain/ loads in equilibrium

Foundation block

Item	Value	Unit
CB 1		
Dimensions	600 x 600	mm
Depth	600	mm
Anchor	M12 8.8	
Anchoring length	110	mm
Shear force transfer	Anchors	

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P15,0x200,0-200,0 (S 235)		1	Fillet: a = 4,0	314,0	M12 8.8	4

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Fillet	S 235	4,0	5,7	314,0

Anchors

Name	Length [mm]	Drill length [mm]	Count
M12 8.8	125	110	4

Drawing

BP1

IDEA StatiCa®
Calculate yesterday's estimates

Technical drawing of a square plate with a central hole and four corner holes. The plate has a total width and height of 200 units. The central hole has a diameter of 140 units. The four corner holes have a diameter of 13.0 units. The distance from the center of the plate to the center of each corner hole is 30 units. The distance from the center of the plate to the center of each corner hole is 30 units. The distance from the center of the plate to the center of each corner hole is 30 units. The distance from the center of the plate to the center of each corner hole is 30 units.

DEFORMATIONS

1D deformations; u_x

Values: u_z

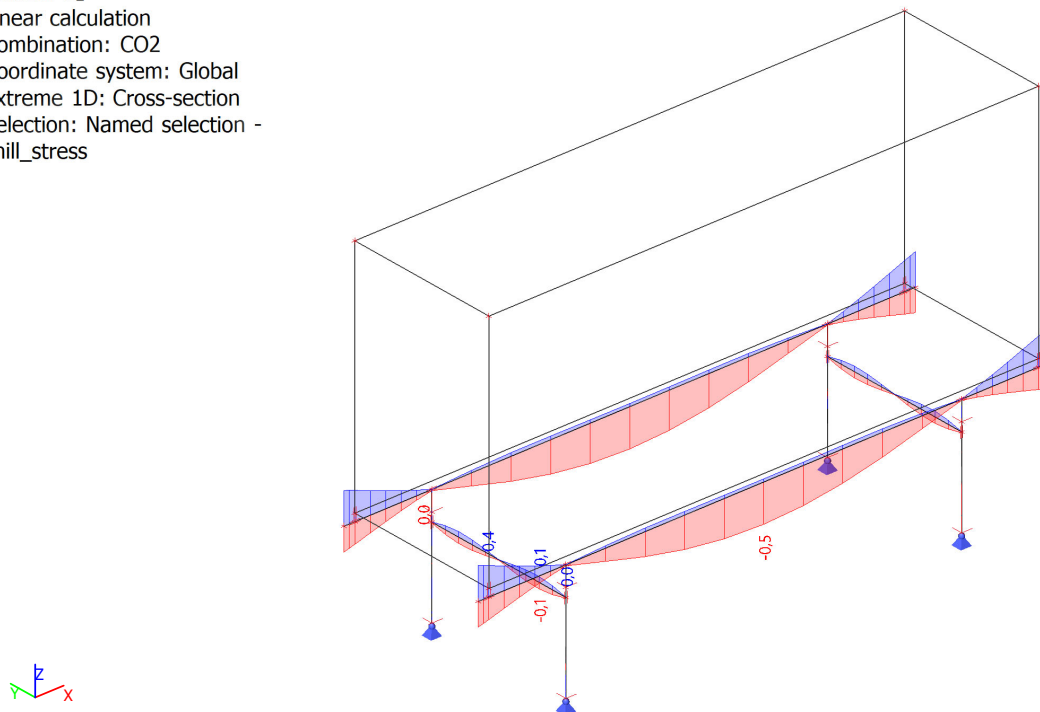
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - chill_stress



Deformations on member

Linear calculation, Extreme : Global

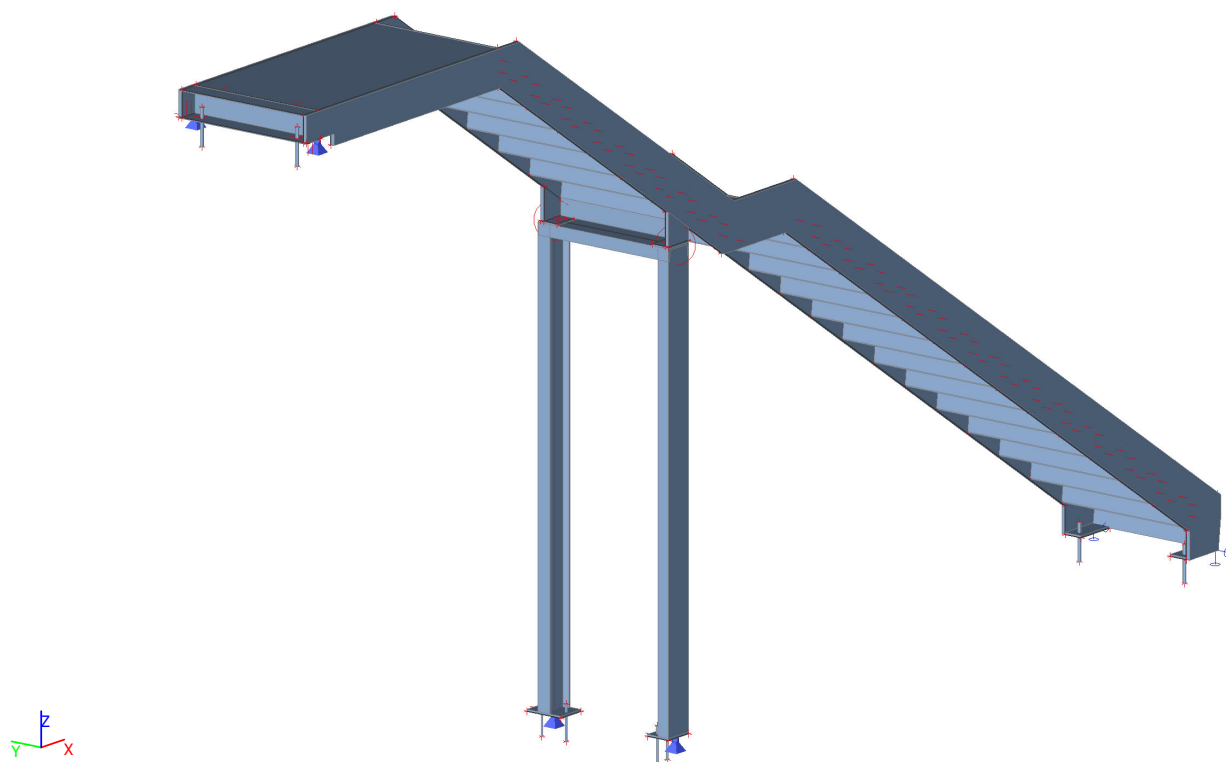
Selection : Named selection - chill_stress

Combinations : CO2

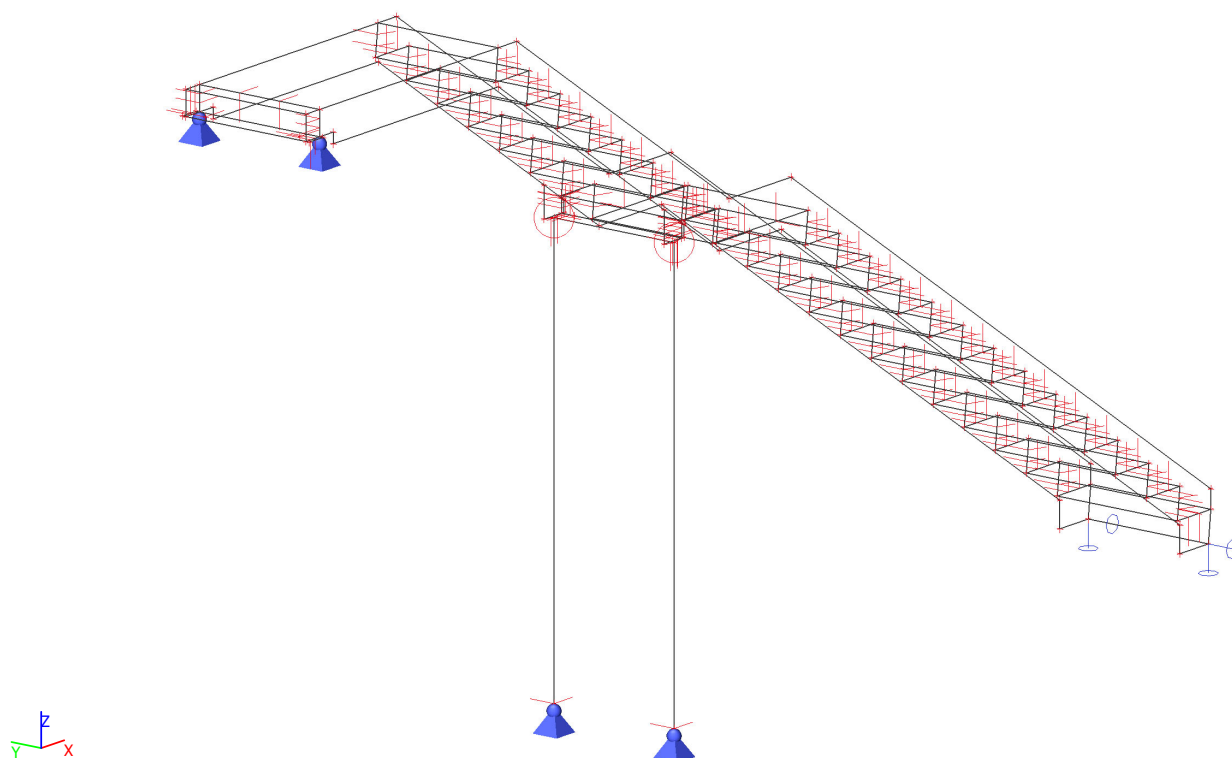
Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B688	1060,000	CO2/11	-0,7	-0,1	0,0	-0,2	-0,9	-1,3	0,7
B688	1060,000	CO2/12	0,7	0,0	0,0	0,1	0,9	1,4	0,7
B690	0,000	CO2/12	0,0	-1,9	-0,3	0,9	-0,5	1,7	1,9
B690	0,000	CO2/11	0,0	1,8	0,4	-0,9	0,7	-1,6	1,9
B690	1950,000	CO2/11	0,0	0,0	-0,5	-0,9	0,0	0,0	0,5
B730	790,000	CO2/12	0,0	-0,9	0,0	-1,4	0,3	-0,9	0,9
B542	790,000	CO2/12	0,0	-0,9	0,0	1,4	-0,3	-0,9	0,9
B690	3825,000	CO2/12	0,0	-1,8	-0,3	0,9	0,5	-1,7	1,8

VNITŘNÍ SCHODY

3D MODEL OF STRUCTURE



Structural model



Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

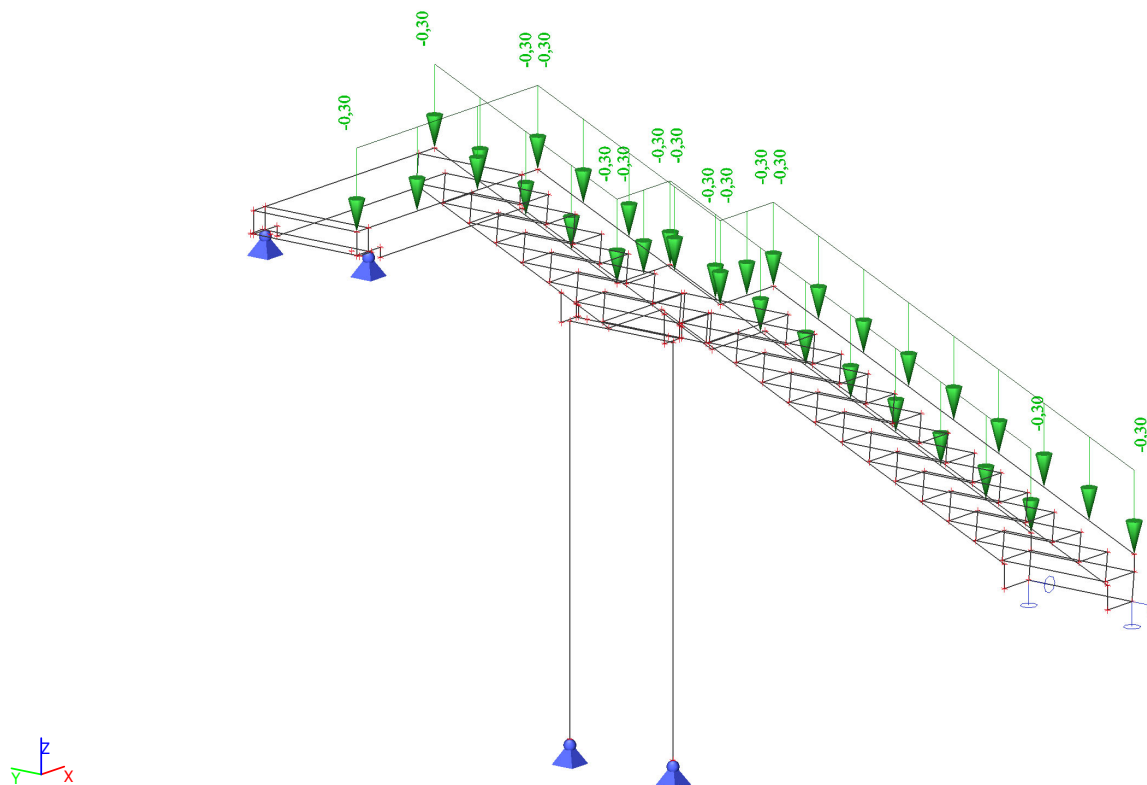
Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

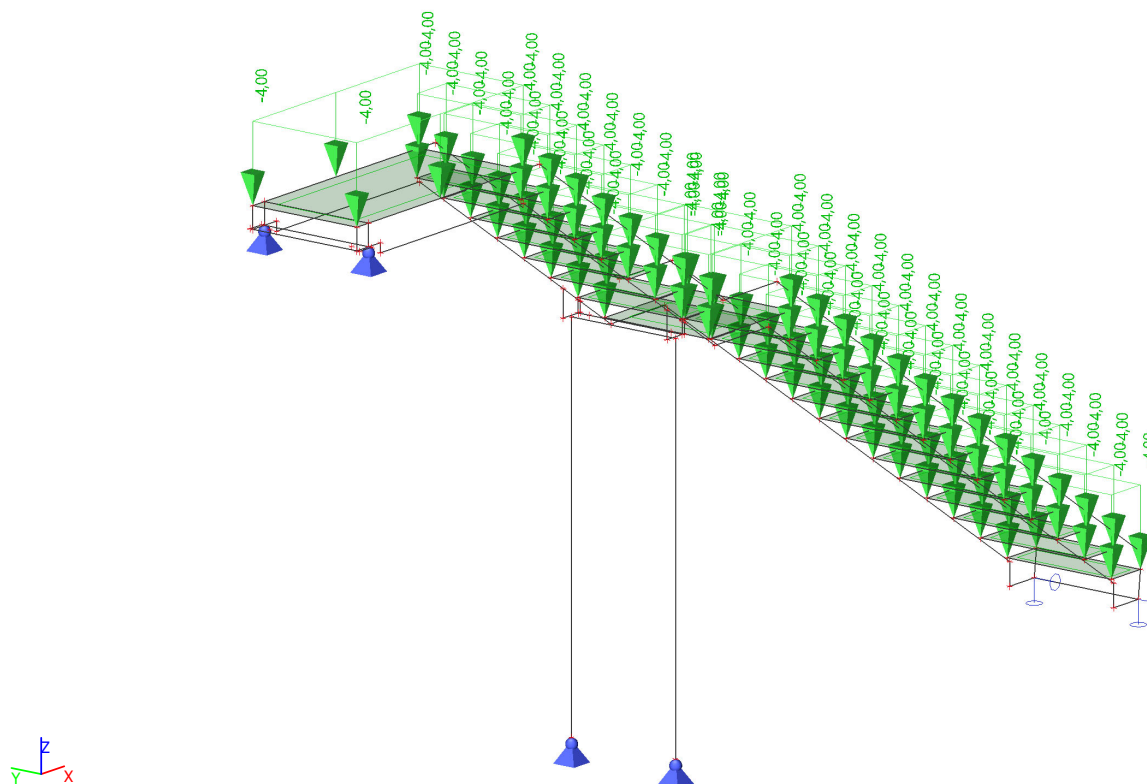
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

LC2 / Tot. value



LC8 / Tot. value



Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B Rmax + - Envelope - ultimate Rmax - - Envelope - ultimate Mmax + - Envelope - ultimate Mmax - - Envelope - ultimate CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic Mmax +def - Envelope - serviceability Mmax -def - Envelope - serviceability

REACTIONS

R1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

Linear calculation

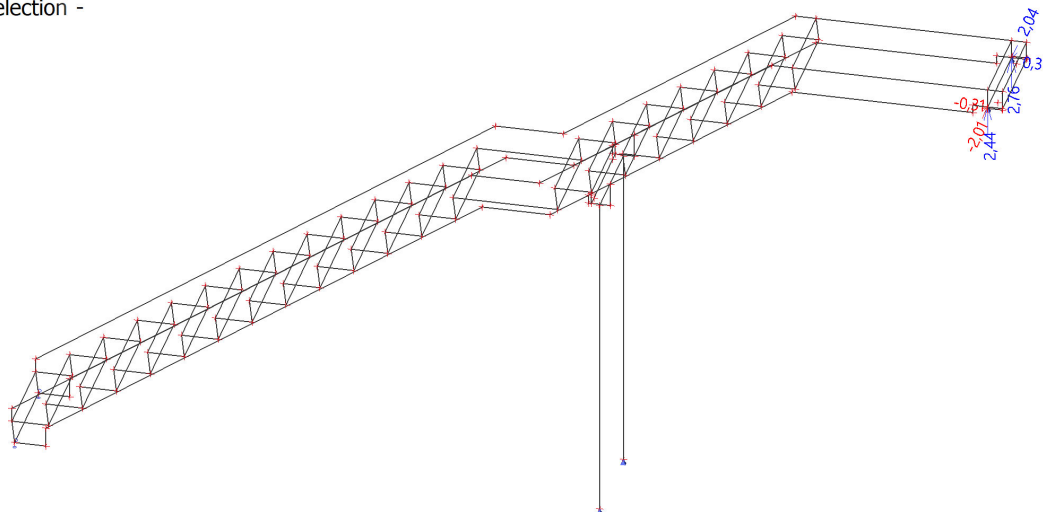
Combination: CO1

System: Global

Extreme: Member

Selection: Named selection -

R1_stair_IN



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - R1_stair_IN

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn175/N4730	CO1/1	-0,21	-1,98	2,38	0,00	0,00	0,00	0,0	0,0
Sn175/N4730	CO1/2	-0,24	-2,01	2,44	0,00	0,00	0,00	0,0	0,0
Sn175/N4730	CO1/3	-0,23	-0,17	0,36	0,00	0,00	0,00	0,0	0,0
Sn175/N4730	CO1/4	-0,31	-0,23	0,48	0,00	0,00	0,00	0,0	0,0
Sn176/N4731	CO1/4	0,31	0,26	0,85	0,00	0,00	0,00	0,0	0,0
Sn176/N4731	CO1/3	0,23	0,20	0,63	0,00	0,00	0,00	0,0	0,0
Sn176/N4731	CO1/2	0,24	2,04	2,76	0,00	0,00	0,00	0,0	0,0
Sn176/N4731	CO1/1	0,21	2,01	2,66	0,00	0,00	0,00	0,0	0,0

R2 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: R_x, R_y, R_z, M_x, M_y, M_z

Linear calculation

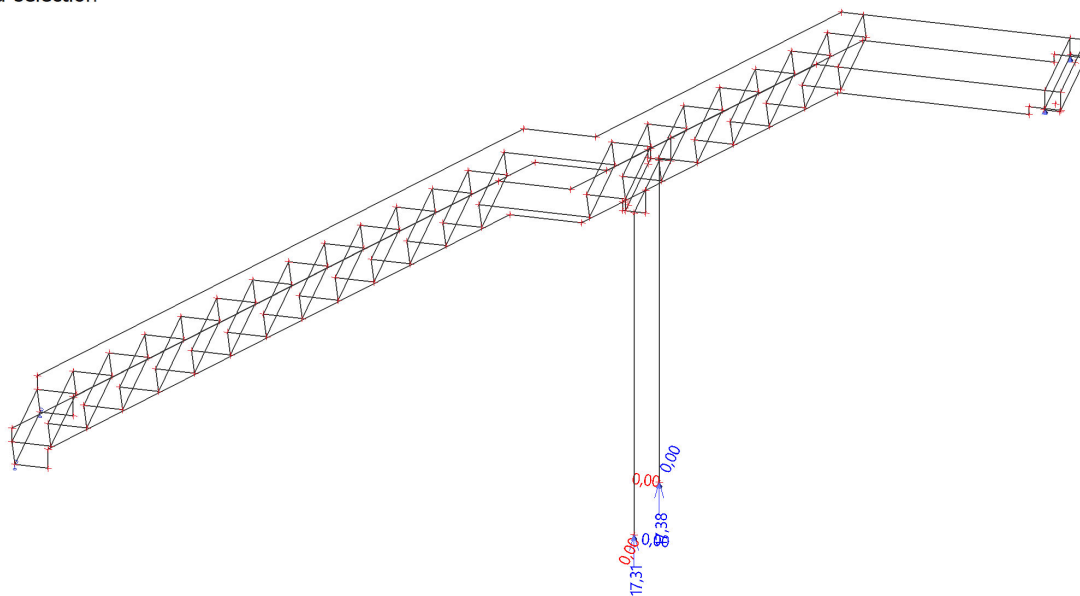
Combination: CO1

System: Global

Extreme: Member

Selection: Named selection -

stair_IN_R2



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_IN_R2

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn173/N4700	CO1/1	0,00	0,00	5,47	0,00	0,00	0,00	0,0	0,0
Sn173/N4700	CO1/2	0,00	0,00	17,38	0,00	0,00	0,00	0,0	0,0
Sn173/N4700	CO1/3	0,00	0,00	15,16	0,00	0,00	0,00	0,0	0,0
Sn174/N4705	CO1/3	0,00	0,00	15,09	0,00	0,00	0,00	0,0	0,0
Sn174/N4705	CO1/4	0,00	0,00	7,32	0,00	0,00	0,00	0,0	0,0
Sn174/N4705	CO1/5	0,00	0,00	16,51	0,00	0,00	0,00	0,0	0,0
Sn174/N4705	CO1/2	0,00	0,00	17,31	0,00	0,00	0,00	0,0	0,0
Sn174/N4705	CO1/1	0,00	0,00	5,42	0,00	0,00	0,00	0,0	0,0

R3 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

Linear calculation

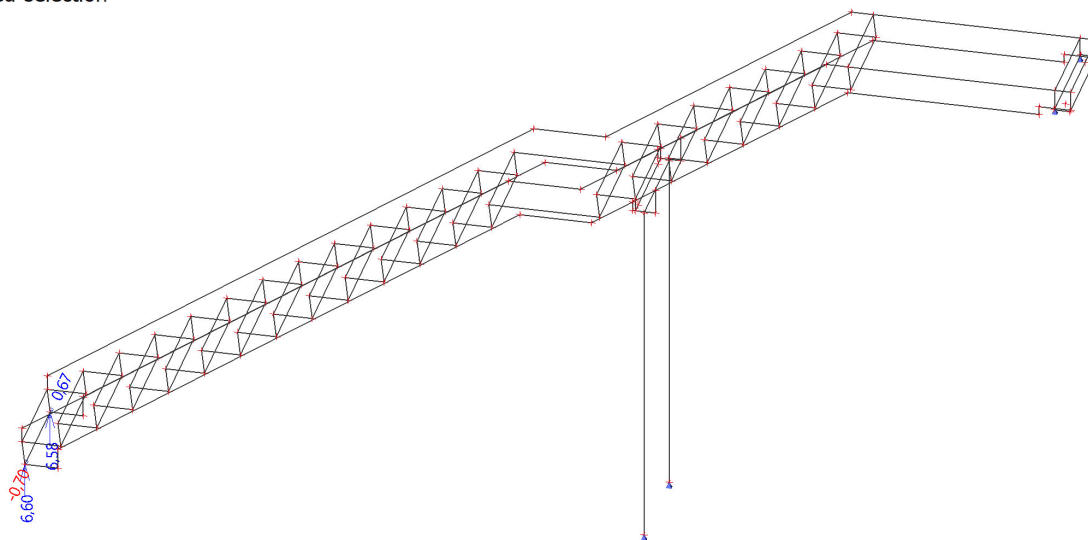
Combination: CO1

System: Global

Extreme: Member

Selection: Named selection -

stair_IN_R3



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - stair_IN_R3

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn171/N4574	CO1/1	0,00	-0,70	6,60	0,00	0,00	0,00	0,0	0,0
Sn171/N4574	CO1/2	0,00	-0,18	2,05	0,00	0,00	0,00	0,0	0,0
Sn172/N4573	CO1/2	0,00	0,15	2,04	0,00	0,00	0,00	0,0	0,0
Sn172/N4573	CO1/1	0,00	0,67	6,58	0,00	0,00	0,00	0,0	0,0

DEFORMATIONS

3D displacement; U_{total} Values: U_{total}

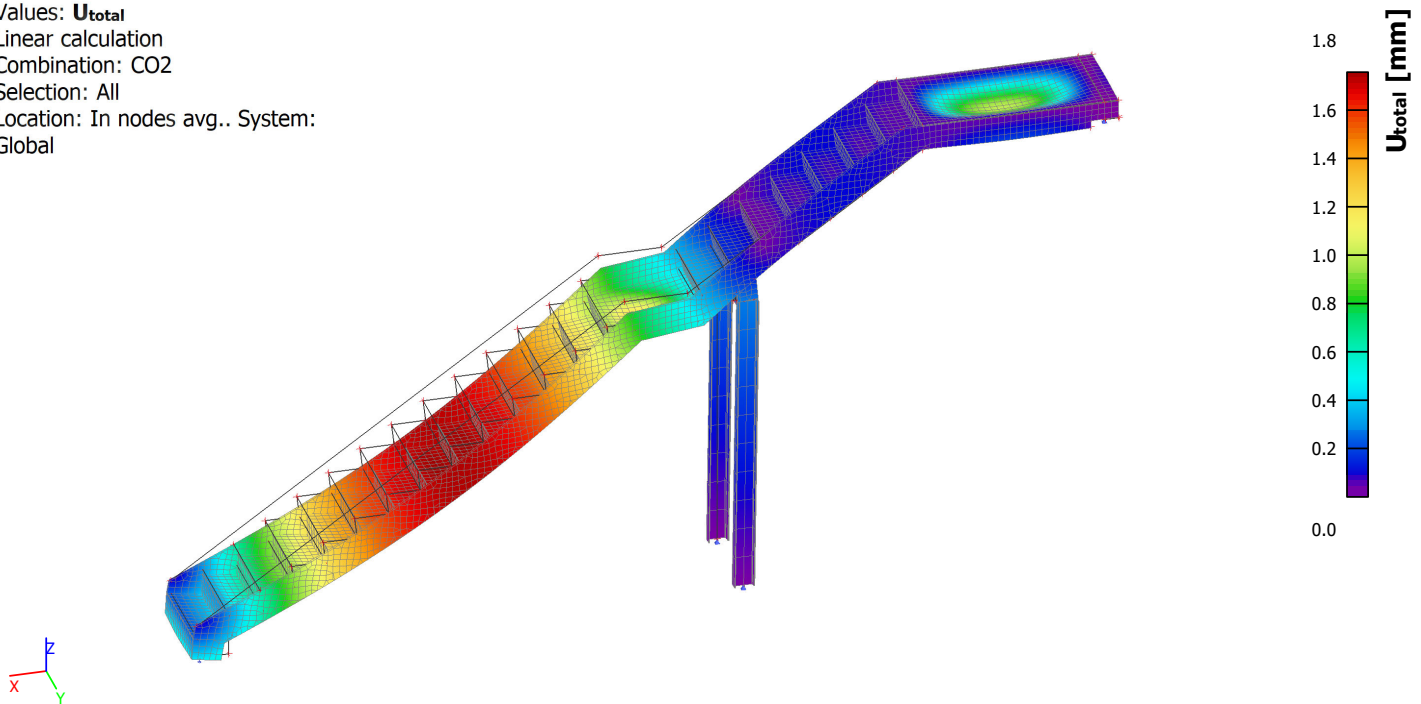
Linear calculation

Combination: CO2

Selection: All

Location: In nodes avg.. System:

Global



3D displacement

Linear calculation

Combination: CO2

Selection: Named selection - stair_in

Location: In nodes avg. on macro. System: LCS mesh element

Results on 1D member:

Extreme 1D: Global

Name	dx [mm]	Fibre	Case	u_x [mm]	u_y [mm]	u_z [mm]	ϕ_x [mrad]	ϕ_y [mrad]	ϕ_z [mrad]	U_{total} [mm]
B770	0,000	26	CO2/1	0,0	0,0	0,0	0,0	-0,1	0,0	0,0
B769	750,000	1	CO2/1	0,0	0,1	0,2	-0,1	0,0	0,0	0,3

Results on 2D member:

Extreme 2D: Global

Name	Mesh	Position [mm]	Case	u_{x+} [mm] u_{x-} [mm]	u_{y+} [mm] u_{y-} [mm]	u_{z+} [mm] u_{z-} [mm]	ϕ_x [mrad]	ϕ_y [mrad]	ϕ_z [mrad]	U_{total+} [mm] U_{total-} [mm]
S871	Element: 30520 Node: 31508	47271,400 5019,961 1513,787	CO2/1	-0,8 -0,8	-1,5 -1,5	0,0 0,0	0,0	0,0	-0,2	1,7 1,7
S871	Element: 31188 Node: 31692	47765,061 5019,961 1476,578	CO2/1	-0,8 -0,8	-1,5 -1,5	0,0 0,0	0,0	0,0	0,1	1,7 1,7
S843	Element: 28241 Node: 29235	47479,999 4819,961 1381,818	CO2/1	0,0 0,0	-1,6 -1,6	-0,6 -0,6	0,2	0,0	0,0	1,7 1,7
S826	Element: 26472 Node: 1342,908	47518,725 4269,961 1342,908	CO2/1	-0,8 -0,8	1,5 1,5	0,0 0,0	0,0	0,0	-0,1	1,7 1,7

Name	Mesh	Position [mm]	Case	ux+ [mm] ux- [mm]	uy+ [mm] uy- [mm]	uz+ [mm] uz- [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U total+ [mm] U total- [mm]
	27405									
S842	Element: 28193 Node: 29202	47587,999 4669,961 1381,818	CO2/1	-0,8 -0,8	0,0 0,0	-1,6 -1,6	0,0	0,1	0,0	1,8 1,8
S827	Element: 26372 Node: 27319	49479,999 4669,961 0,000	CO2/1	0,0 0,0	0,0 0,0	0,5 0,5	-1,6	0,0	0,0	0,5 0,5
S870	Element: 30183 Node: 31192	43054,827 4419,961 3800,000	CO2/1	0,0 0,0	0,0 0,0	-0,5 -0,5	-4,0	-0,1	0,0	0,5 0,5
S870	Element: 30192 Node: 31201	43054,827 4869,961 3800,000	CO2/1	0,0 0,0	0,0 0,0	-0,5 -0,5	4,0	-0,1	0,0	0,5 0,5
S870	Element: 30022 Node: 31031	43601,034 4619,961 3800,000	CO2/1	0,0 0,0	0,0 0,0	-0,3 -0,3	-0,2	-2,6	0,0	0,3 0,3
S854	Element: 29063 Node: 30072	45582,666 4669,961 2418,182	CO2/1	-0,3 -0,3	0,0 0,0	-0,5 -0,5	0,1	2,9	0,0	0,6 0,6
S826	Element: 26410 Node: 367	49479,999 4269,961 0,000	CO2/1	0,5 0,4	0,0 0,0	0,0 0,0	0,0	0,0	-1,4	0,5 0,4
S871	Element: 30451 Node: 368	49479,999 5019,961 0,000	CO2/1	0,5 0,4	0,0 0,0	0,0 0,0	0,0	0,0	1,4	0,5 0,4
S878	Element: 31545 Node: 489	42309,999 4269,961 3660,000	CO2/2	0,0 0,0	0,0 0,0	0,0 0,0	0,0	0,0	0,0	0,0 0,0

Name	Combination key
CO2/1	LC1 + LC2 + LC8
CO2/2	LC1 + LC2

STRESS ANALYSIS OF CROSS SECTIONS

CS98 - 1D internal forces; N_x

Values: **N**

Linear calculation

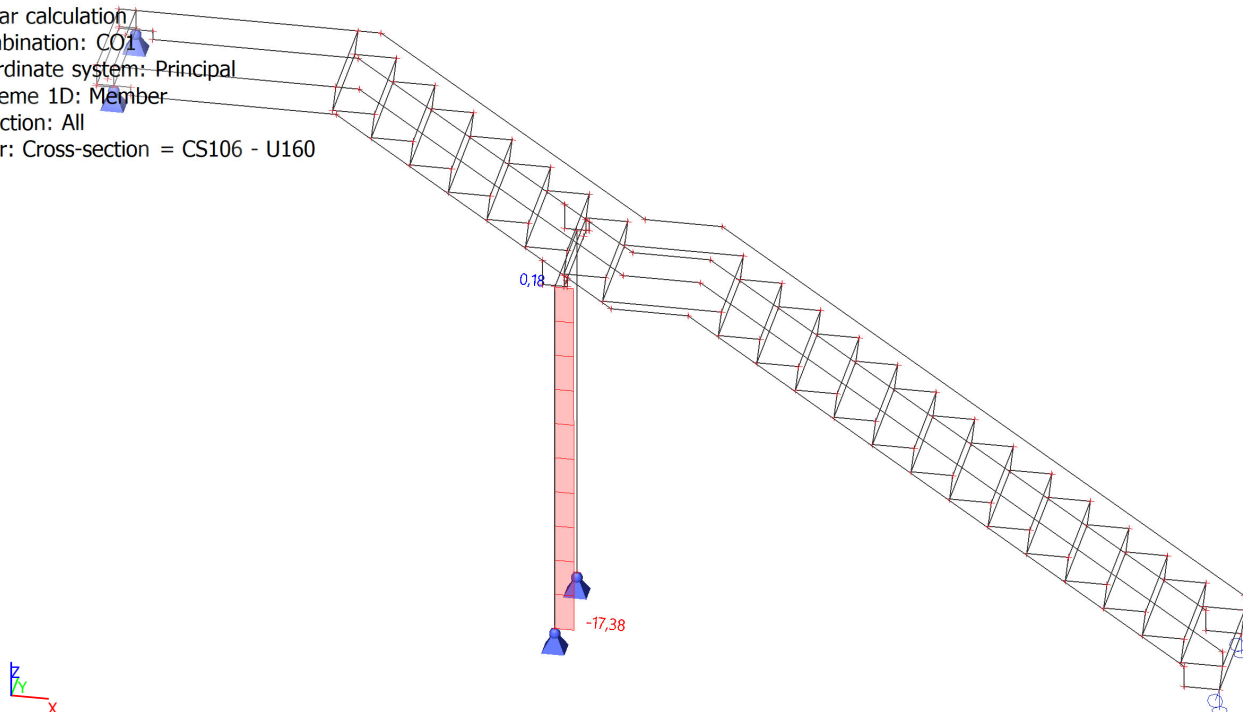
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

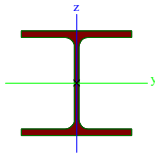
Selection: All

Filter: Cross-section = CS106 - U160



Cross-sections

Cross-sections - CS98

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS98	HEA140	S 235	rolled	b	c		European wide flange beam

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS98 - HEA140

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B690	600,000+	CO1/1	CS98 - HEA140	-2,11	0,00	2,56	0,00	0,15	1,22
B690	75,000+	CO1/2	CS98 - HEA140	1,80	-0,06	-0,65	0,00	0,00	-0,05
B690	3300,000+	CO1/3	CS98 - HEA140	0,00	3,19	6,12	0,00	-2,96	-1,53
B690	600,000+	CO1/4	CS98 - HEA140	-1,45	-0,03	1,92	0,00	0,01	0,01
B690	600,000+	CO1/2	CS98 - HEA140	0,43	0,03	2,89	0,00	-1,65	-0,07
B691	3300,000+	CO1/1	CS98 - HEA140	0,00	-2,82	6,13	0,00	-2,96	1,32
B690	3300,000+	CO1/5	CS98 - HEA140	0,00	-3,05	-3,57	0,00	2,10	1,46

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B690	600,000-	CO1/3	CS98 - HEA140	0,04	-3,20	-6,11	0,00	-2,95	-1,54
B690	600,000-	CO1/5	CS98 - HEA140	-0,08	3,08	3,55	0,00	2,09	1,47

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC6
CO1/2	LC1 + LC2 + 1.50*LC5
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC7
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/5	LC1 + LC2 + 1.50*LC6

EC-EN 1993 Steel check ULS

Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: All
 Filter: Cross-section = CS98 - HEA140

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B690	3300,000+	CO1/1	CS98 - HEA140	S 235	0,11	0,08	0,11

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC7

CS107 - 1D internal forces; N_x

Values: **N**

Linear calculation

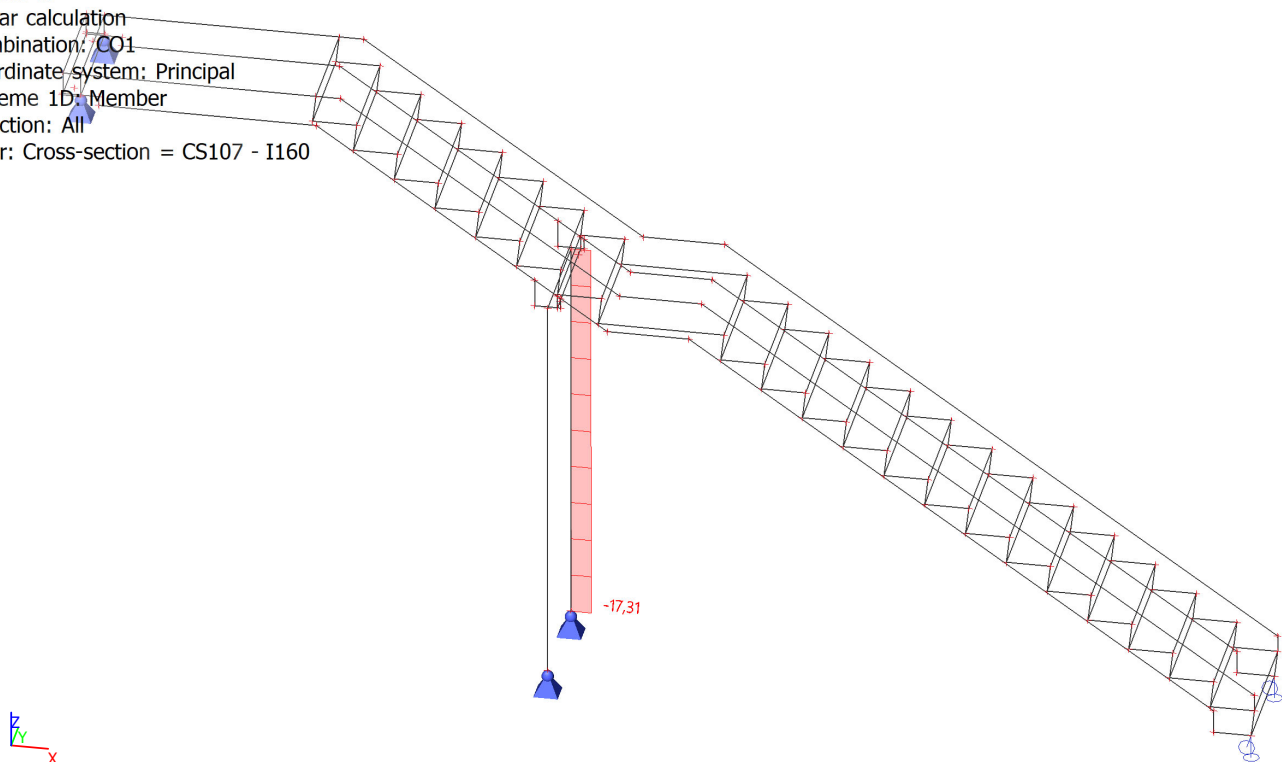
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS107 - I160



Cross-sections

Cross-sections - CS107

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS107	Detailed I160	S 235	rolled	a	b		European standard beam

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS107 - I160

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B770	2490,000	CO1/1	CS107 - I160	-4,99	0,00	0,00	0,00	0,00	0,00
B770	0,000	CO1/2	CS107 - I160	-16,51	0,00	0,00	0,00	0,00	0,00
B770	0,000	CO1/3	CS107 - I160	-17,31	0,00	0,00	0,00	0,00	0,00
B770	2490,000	CO1/4	CS107 - I160	-14,50	0,00	0,00	0,00	0,00	0,00
B770	2490,000	CO1/5	CS107 - I160	-6,73	0,00	0,00	0,00	0,00	0,00

Name	Combination key
CO1/1	LC1 + LC2
CO1/2	LC1 + LC2 + 1.50*LC8
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC8
CO1/4	1.35*LC1 + 1.35*LC2 + 1.05*LC8
CO1/5	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS107 - I160

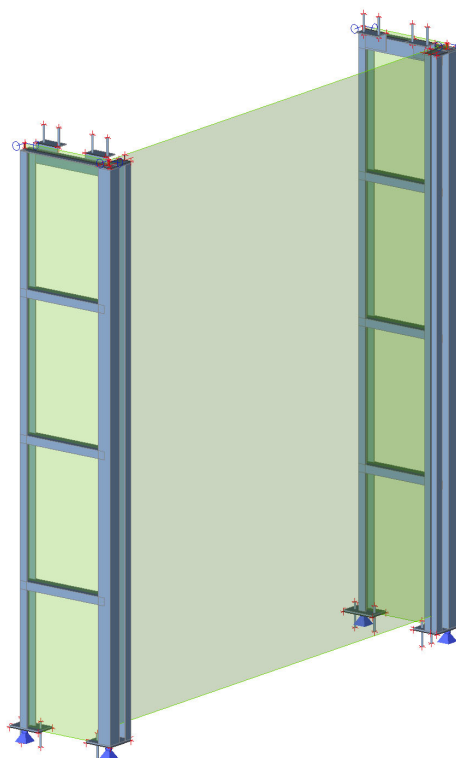
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B770	0,000	CO1/1	CS107 - I160	S 235	0,58	0,03	0,58

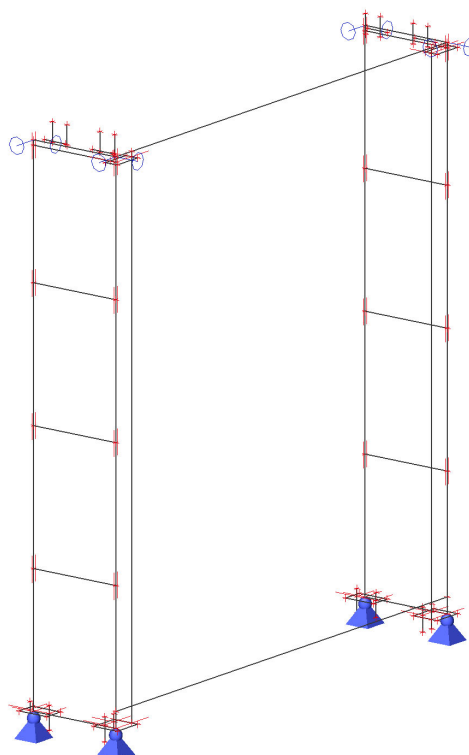
Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC8

KONSTRUKCE FASÁDNÍCH ARKÝŘŮ

3D MODEL OF STRUCTURE



Structural model



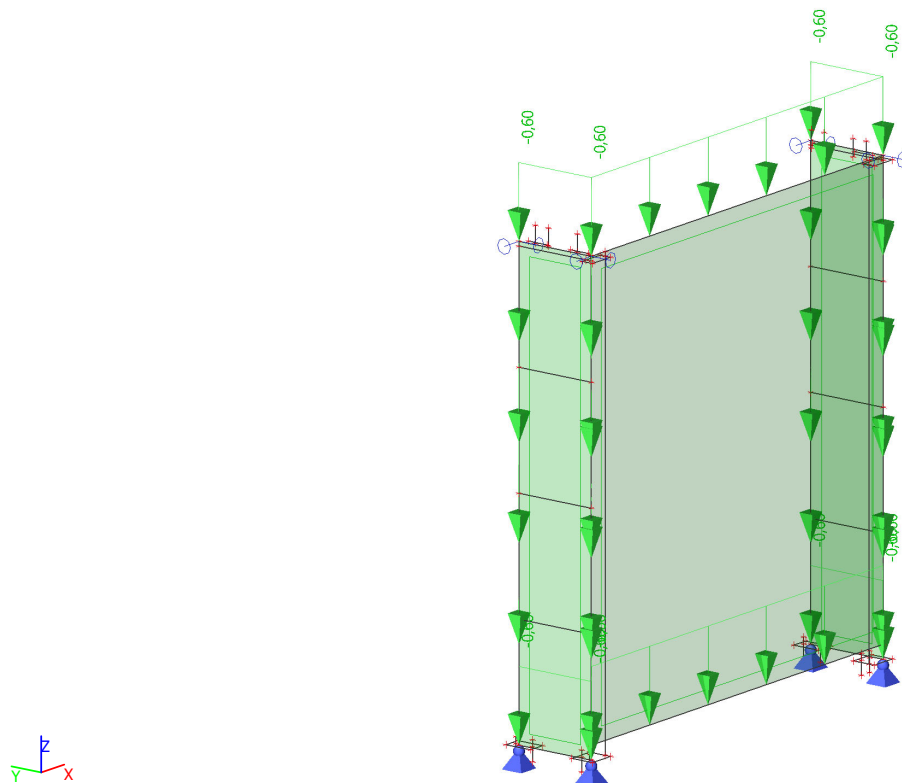
Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

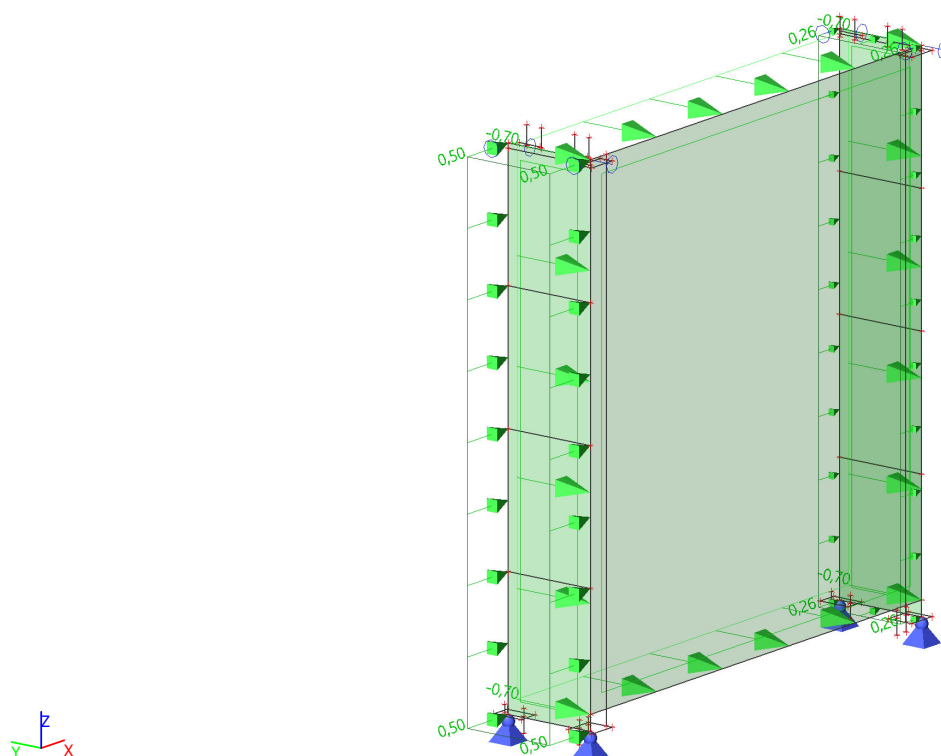
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

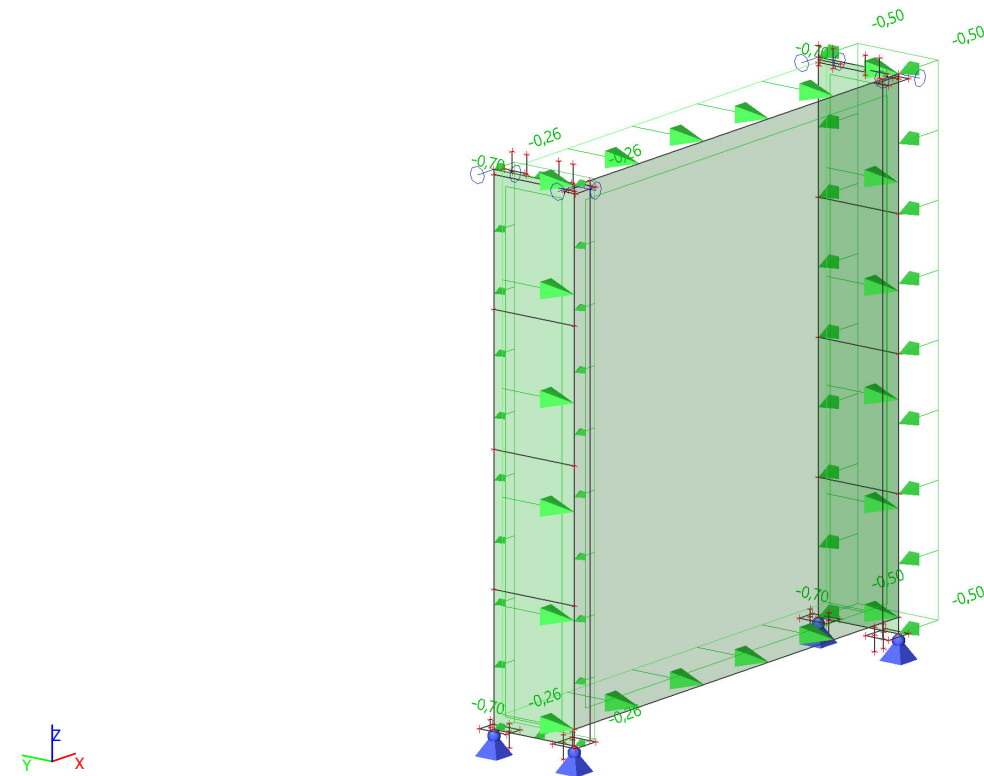
LC2 / Tot. value



LC4 / Tot. value



LC5 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B
	Rmax + - Envelope - ultimate
	Rmax - - Envelope - ultimate
	Mmax + - Envelope - ultimate
	Mmax - - Envelope - ultimate
	CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic
	Mmax +def - Envelope - serviceability
	Mmax -def - Envelope - serviceability

Combination key

Combination key

Name	Description of combinations
1	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC7*1,00
2	LC1*1,00 +LC2*1,00 +LC5*1,00
3	LC1*1,00 +LC2*1,00 +LC4*1,00
4	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC6*1,00 +LC8*0,70
5	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC4*1,00
6	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC6*1,00
7	LC1*1,00 +LC2*1,00 +LC3*1,00 +LC6*0,60
8	LC1*1,00 +LC2*1,00 +LC3*0,50 +LC5*0,60 +LC8*1,00
9	LC1*1,00 +LC2*1,00 +LC3*1,00 +LC5*0,60
10	LC1*1,00 +LC2*1,00 +LC3*1,00 +LC4*0,60

REACTIONS

R1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

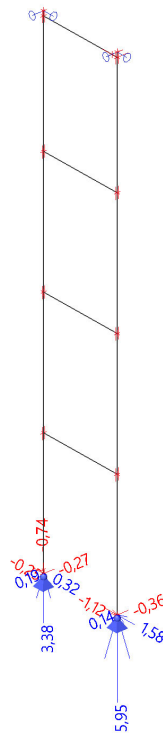
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - add_R1



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - add_R1

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn109/N3298	CO1/1	0,14	1,58	1,36	0,00	0,00	0,00	0,0	0,0
Sn109/N3298	CO1/2	0,02	-1,12	5,33	0,00	0,00	0,00	0,0	0,0
Sn109/N3298	CO1/3	0,14	1,58	1,90	0,00	0,00	0,00	0,0	0,0
Sn109/N3298	CO1/4	-0,36	1,58	1,35	0,00	0,00	0,00	0,0	0,0
Sn109/N3298	CO1/5	0,01	-0,67	5,95	0,00	0,00	0,00	0,0	0,0
Sn109/N3298	CO1/6	-0,36	1,58	1,89	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/3	0,19	0,32	3,36	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/7	-0,02	-0,25	-0,60	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/1	0,19	0,32	3,23	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/2	-0,02	-0,24	-0,74	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/6	-0,27	0,32	3,38	0,00	0,00	0,00	0,0	0,0
Sn110/N3300	CO1/4	-0,27	0,32	3,24	0,00	0,00	0,00	0,0	0,0

R2 - Reactions; R_x; R_y; R_z; M_x; M_y; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

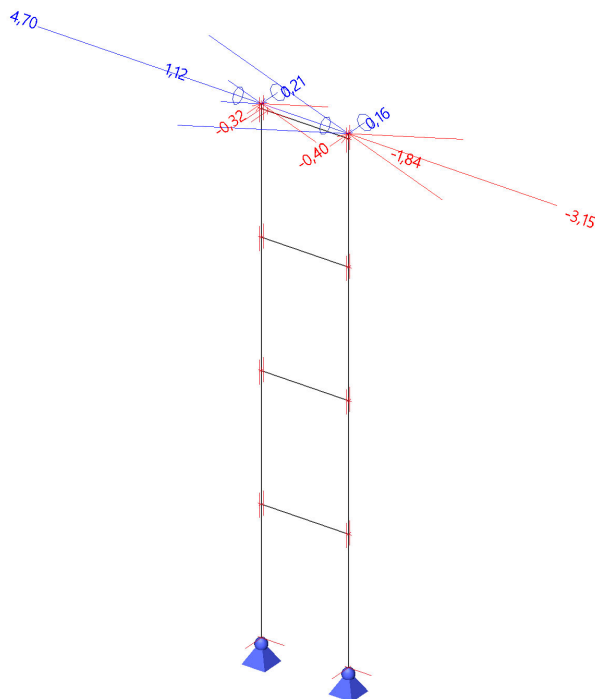
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - add_R2



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - add_R2

Nodal reactions

Name	Case	R _x [kN]	R _y [kN]	R _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]	e _x [mm]	e _y [mm]
Sn111/N3299	CO1/1	0,21	-1,84	0,00	0,00	0,00	0,00	-	-
Sn111/N3299	CO1/2	-0,02	1,12	0,00	0,00	0,00	0,00	-	-
Sn111/N3299	CO1/3	-0,32	-1,67	0,00	0,00	0,00	0,00	-	-
Sn112/N3301	CO1/4	0,16	4,68	0,00	0,00	0,00	0,00	-	-
Sn112/N3301	CO1/2	0,02	-3,15	0,00	0,00	0,00	0,00	-	-
Sn112/N3301	CO1/1	0,16	4,70	0,00	0,00	0,00	0,00	-	-
Sn112/N3301	CO1/5	-0,40	4,54	0,00	0,00	0,00	0,00	-	-

DEFORMATIONS

1D deformations; u_x

Values: u_x

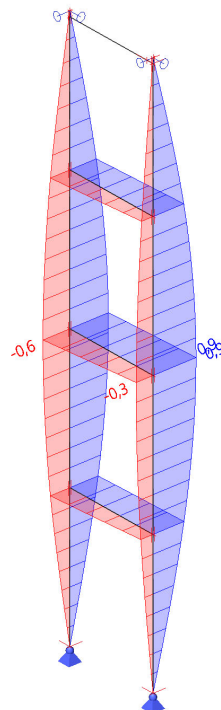
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - add



Deformations on member

Linear calculation, Extreme : Global

Selection : Named selection - add

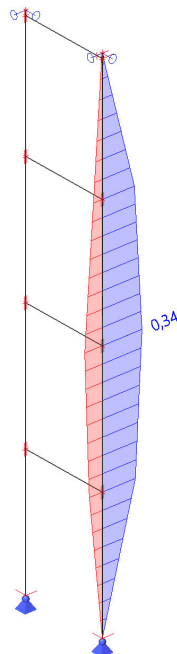
Combinations : CO2

Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B517	560,000	CO2/11	-1,0	0,0	-0,1	0,0	0,2	0,2	1,0
B517	560,000	CO2/2	1,4	0,0	-0,3	0,0	-0,4	-0,2	1,4
B514	1400,000	CO2/2	0,0	-1,4	0,3	0,3	-0,1	0,0	1,5
B515	1500,000	CO2/2	0,0	1,4	-0,5	0,4	0,0	0,1	1,5
B514	1600,000	CO2/3	0,0	-1,4	-0,9	0,1	0,0	0,2	1,7
B517	560,000	CO2/3	1,4	0,0	0,9	0,0	-0,1	-0,2	1,7
B516	560,000	CO2/3	1,2	0,0	0,6	-0,6	-0,1	0,8	1,3
B518	560,000	CO2/3	0,9	0,0	0,6	0,6	-0,2	-0,9	1,1
B514	3200,000	CO2/3	0,0	0,0	0,0	0,4	-0,9	0,9	0,0
B514	0,000	CO2/3	0,0	0,0	0,0	0,1	0,9	-1,8	0,0
B514	0,000	CO2/2	0,0	0,0	0,0	0,3	-0,3	-1,8	0,0
B515	0,000	CO2/2	0,0	0,0	0,0	0,2	0,6	2,0	0,0

STRESS ANALYSIS OF CROSS SECTIONS

CS86 - 1D internal forces; M_y

Values: M_y
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS86 -
VHP80/80x5.0



Cross-sections

Cross-sections - CS86

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS86	Detailed VHP80/80x5.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS86 - VHP80/80x5.0

Name	dx [mm]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
B514	0,000	CO1/1	CS86 - VHP80/80x5.0	-5,95	-0,67	-0,01	0,00	0,00	0,00
B514	2400,000-	CO1/2	CS86 - VHP80/80x5.0	2,36	-1,25	-0,08	-0,01	0,28	0,02
B514	3170,000-	CO1/2	CS86 - VHP80/80x5.0	1,73	-2,06	-0,35	-0,07	0,01	-0,65
B528	3170,000-	CO1/3	CS86 -	1,73	2,06	-0,35	0,07	0,01	0,65

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP80/80x5.0						
B514	0,000	CO1/4	CS86 - VHP80/80x5.0	-1,89	1,58	0,36	0,00	0,00	0,00
B514	2400,000+	CO1/4	CS86 - VHP80/80x5.0	0,85	-0,88	-0,35	-0,07	0,28	0,48
B528	2400,000+	CO1/5	CS86 - VHP80/80x5.0	0,85	0,88	-0,35	0,07	0,28	-0,48
B514	1600,000+	CO1/3	CS86 - VHP80/80x5.0	1,56	-0,02	0,09	0,01	-0,15	0,53
B514	1600,000-	CO1/4	CS86 - VHP80/80x5.0	1,41	-0,60	0,07	-0,02	0,34	0,45
B528	800,000-	CO1/4	CS86 - VHP80/80x5.0	-1,09	-0,50	-0,14	0,00	-0,11	-0,88
B514	800,000-	CO1/5	CS86 - VHP80/80x5.0	-1,09	0,50	-0,14	0,00	-0,11	0,88

Name	Combination key
CO1/1	1.35*LC1 + 1.35*LC2 + 0.90*LC6
CO1/2	LC1 + LC2 + 1.50*LC4
CO1/3	LC1 + LC2 + 1.50*LC5
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/5	1.15*LC1 + 1.15*LC2 + 1.50*LC5

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS86 - VHP80/80x5.0

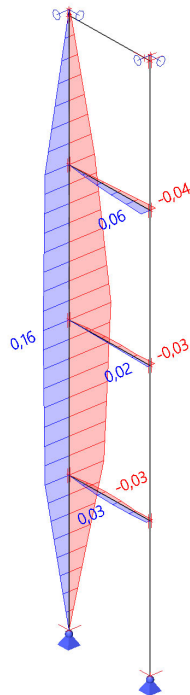
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B514	800,000-	CO1/1	CS86 - VHP80/80x5.0	S 235	0,09	0,09	0,08

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5

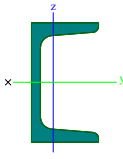
CS87 - 1D internal forces; M_y

Values: **M_y**
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS87 - U80



Cross-sections

Cross-sections - CS87

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS87	U80	S 235	rolled	c	c		European standard channel

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS87 - U80

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B515	800,000+	CO1/1	CS87 - U80	-4,36	-0,19	-0,05	0,00	-0,22	0,04
B515	2400,000-	CO1/2	CS87 - U80	2,09	-0,25	-0,02	0,00	-0,03	-0,07
B515	3170,000+	CO1/2	CS87 - U80	0,00	-3,15	-0,02	0,00	0,00	0,09
B515	3170,000+	CO1/3	CS87 - U80	0,00	4,70	-0,16	0,00	0,00	-0,14
B529	3170,000+	CO1/3	CS87 - U80	0,00	4,54	-0,40	0,00	0,01	-0,14
B515	3170,000+	CO1/1	CS87 - U80	0,00	4,54	0,40	0,00	-0,01	-0,14
B518	0,000	CO1/3	CS87 - U80	0,38	-1,72	0,17	0,00	0,00	0,41

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B532	336,000-	CO1/1	CS87 - U80	0,38	1,58	-0,10	0,00	0,03	0,04
B515	1600,000+	CO1/4	CS87 - U80	-3,76	0,39	0,13	0,00	-0,26	-0,19
B529	1600,000+	CO1/5	CS87 - U80	-3,76	0,39	-0,13	0,00	0,26	-0,19
B518	560,000	CO1/5	CS87 - U80	0,38	-1,39	0,00	0,00	0,05	-0,46
B516	560,000	CO1/3	CS87 - U80	0,13	1,58	-0,09	0,00	0,02	0,45

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/2	LC1 + LC2 + 1.50*LC6
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC5
CO1/4	LC1 + LC2 + 1.50*LC4
CO1/5	LC1 + LC2 + 1.50*LC5

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS87 - U80

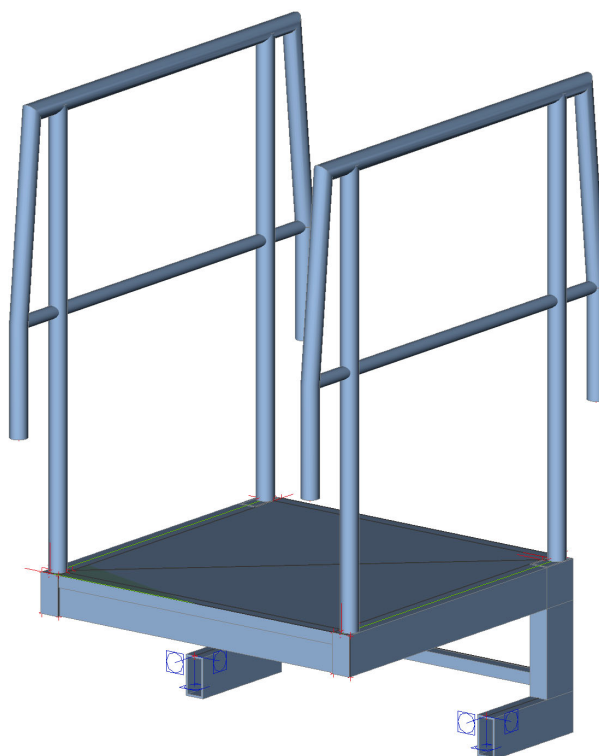
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B518	560,000	CO1/1	CS87 - U80	S 235	0,16	0,16	0,00

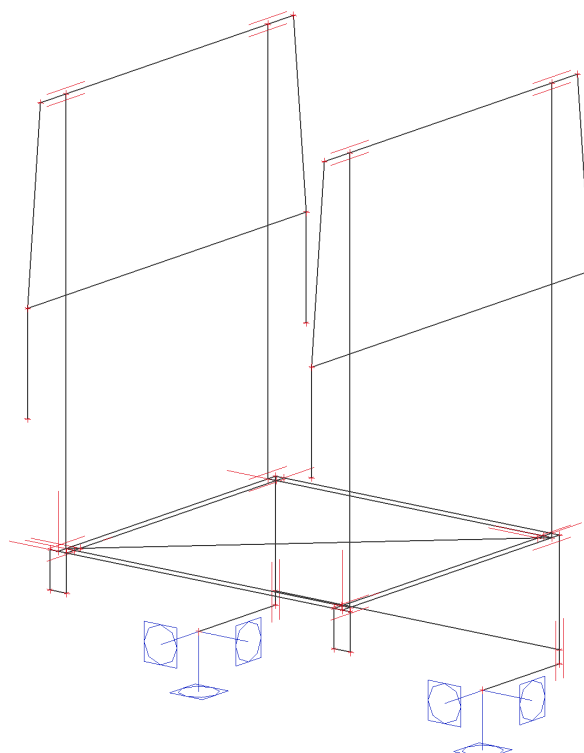
Name	Combination key
CO1/1	LC1 + LC2 + 1.50*LC4

PŘECHOD PŘES STŘECHU

3D MODEL OF STRUCTURE



Structural model



Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2720
No. of beams :	684
No. of slabs :	376
No. of solids :	567
No. of used profiles :	65
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

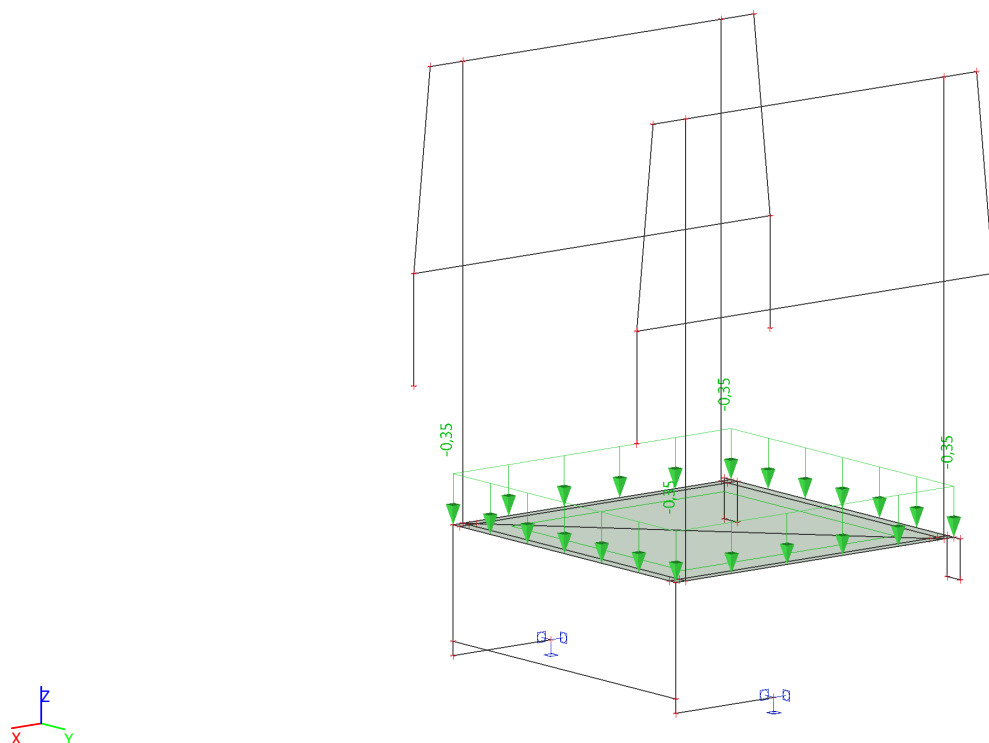
Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

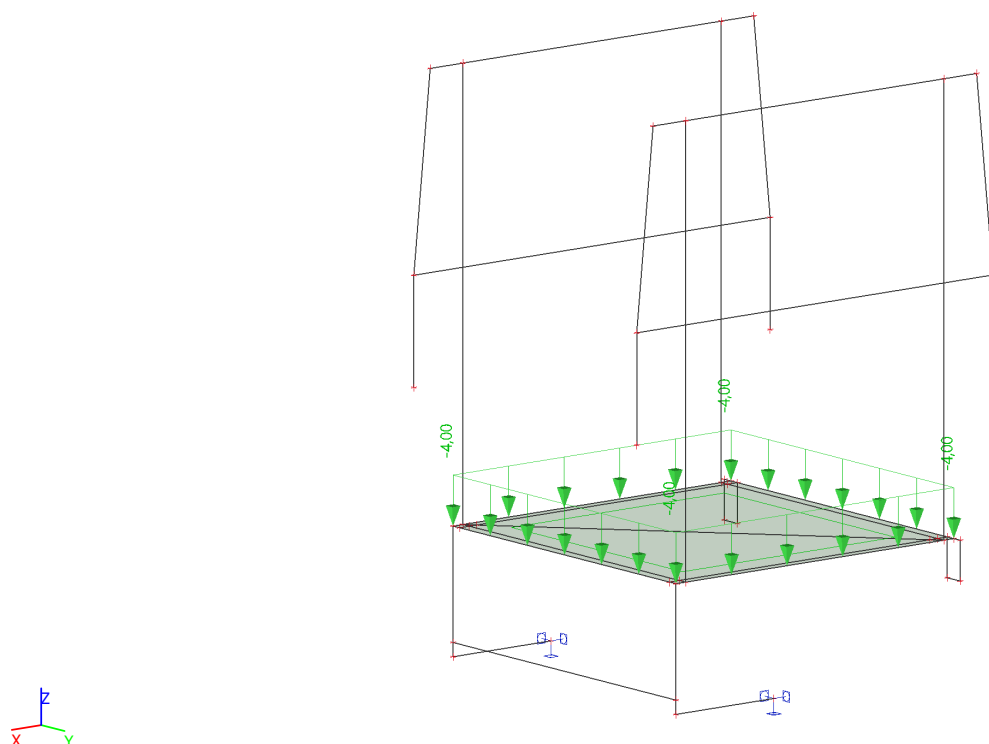
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

LC2 / Tot. value



LC8 / Tot. value



Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B Rmax + - Envelope - ultimate Rmax - - Envelope - ultimate Mmax + - Envelope - ultimate Mmax - - Envelope - ultimate CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic Mmax +def - Envelope - serviceability Mmax -def - Envelope - serviceability

REACTIONS

R1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

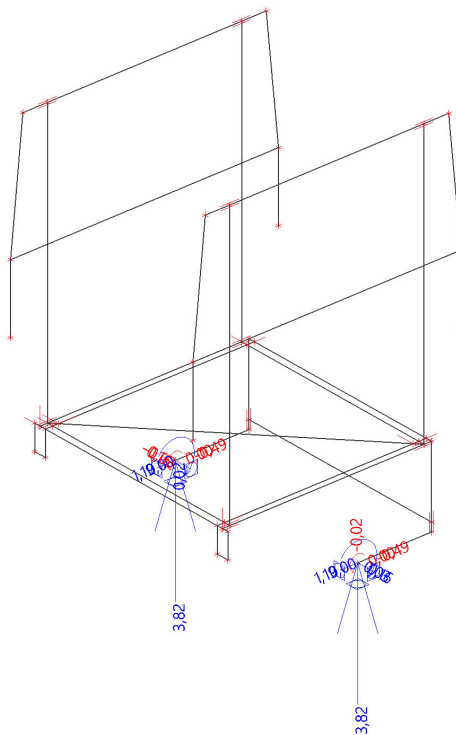
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - atic_stair



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - atic_stair

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn196/N5413	CO1/1	0,00	0,08	3,77	-0,01	1,19	0,02	-2,6	314,6
Sn196/N5413	CO1/2	0,00	0,01	0,48	0,00	0,02	0,00	-0,5	49,7
Sn196/N5413	CO1/3	0,00	0,16	3,82	-0,02	-0,29	0,03	-5,2	-77,1
Sn196/N5413	CO1/4	0,00	0,12	2,23	-0,01	-0,49	0,02	-6,6	-219,3
Sn196/N5413	CO1/5	0,00	0,08	3,82	-0,01	1,19	0,02	-2,6	311,0
Sn196/N5413	CO1/6	0,00	0,01	0,36	0,00	0,02	0,00	-0,5	49,7
Sn197/N5466	CO1/2	0,00	-0,01	0,48	0,00	0,03	0,00	1,3	52,3
Sn197/N5466	CO1/1	0,00	-0,08	3,76	0,01	1,18	-0,01	3,1	314,8
Sn197/N5466	CO1/6	0,00	-0,01	0,35	0,00	0,02	0,00	1,3	52,3
Sn197/N5466	CO1/4	0,00	-0,12	2,23	0,01	-0,49	-0,02	6,6	-218,5
Sn197/N5466	CO1/5	0,00	-0,08	3,82	0,01	1,19	-0,01	3,0	311,2
Sn197/N5466	CO1/3	0,00	-0,16	3,82	0,02	-0,29	-0,03	5,3	-76,7

DEFORMATIONS

1D deformations; u_x

Values: u_x

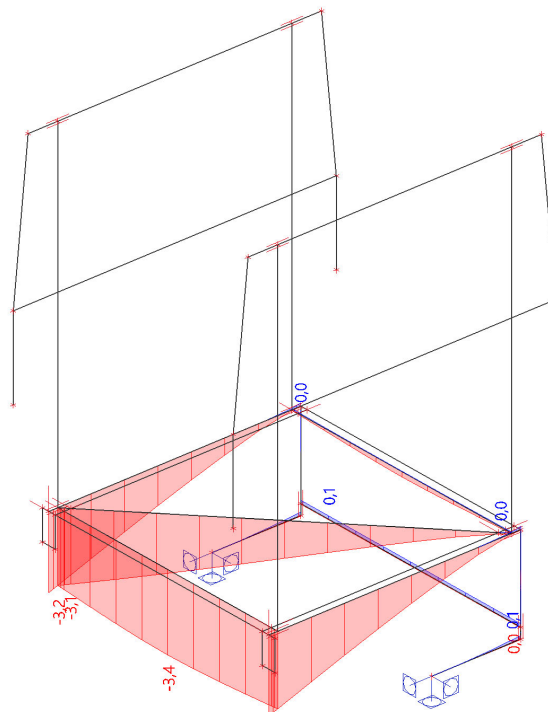
Linear calculation

Combination: CO2

Coordinate system: Global

Extreme 1D: Cross-section

Selection: Named selection - atic_stair



Deformations on member

Linear calculation, Extreme : Global

Selection : Named selection - atic_stair

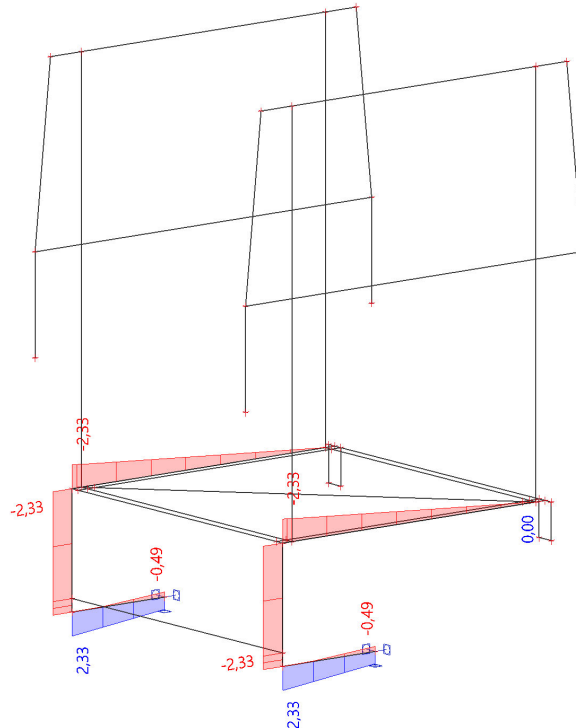
Combinations : CO2

Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B180	0,000	CO2/1	-0,6	0,0	-3,2	-0,9	-4,5	0,0	3,3
B186	0,000	CO2/1	0,4	0,3	0,3	-1,9	1,4	1,4	0,6
B184	430,000	CO2/1	0,0	-0,6	0,0	2,7	0,0	0,0	0,6
B186	1167,780	CO2/1	0,4	2,5	-1,9	-4,0	1,7	1,7	3,1
B185	430,000	CO2/1	0,0	-0,6	-3,4	4,5	0,0	0,0	3,4
B185	0,000	CO2/1	0,0	-0,6	-3,1	4,5	0,9	0,0	3,1
B181	0,000	CO2/1	-0,6	0,0	-3,2	0,9	-4,5	0,0	3,3
B186	583,890	CO2/1	0,4	1,4	-0,7	-2,9	2,1	2,1	1,6
B182	0,000	CO2/2	0,0	0,0	-0,1	0,0	-0,8	-0,3	0,1
B186	473,900	CO2/1	0,4	1,1	-0,5	-2,7	2,0	2,1	1,3

STRESS ANALYSIS OF CROSS SECTIONS

CS119 - 1D internal forces; M_y

Values: M_y
Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Filter: Cross-section = CS119 -
VHP100/50x5.0



Cross-sections

Cross-sections - CS119

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS119	Detailed VHP100/50x5.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS119 - VHP100/50x5.0

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B182	320,000	CO1/1	CS119 - VHP100/50x5.0	-3,78	-0,08	0,00	-0,01	-2,33	-0,01
B181	30,000+	CO1/1	CS119 - VHP100/50x5.0	0,01	-0,02	-2,75	0,15	0,00	0,00
B178	0,000	CO1/1	CS119 - VHP100/50x5.0	0,00	0,08	3,82	-0,01	1,19	-0,02
B180	820,000+	CO1/2	CS119 -	0,00	-1,41	-3,73	-0,39	-0,73	0,02

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP100/50x5.0						
B181	820,000+	CO1/2	CS119 - VHP100/50x5.0	0,00	1,41	-3,73	0,39	-0,73	-0,02
B180	850,000	CO1/1	CS119 - VHP100/50x5.0	0,00	-0,77	-3,74	-0,21	-2,33	-0,01
B178	300,000	CO1/1	CS119 - VHP100/50x5.0	0,00	0,08	3,78	-0,01	2,33	0,01
B183	0,000	CO1/2	CS119 - VHP100/50x5.0	-3,73	1,41	0,00	0,02	-0,85	-0,39
B182	0,000	CO1/2	CS119 - VHP100/50x5.0	-3,73	-1,41	0,00	-0,02	-0,85	0,39

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8
CO1/2	1.15*LC1 + 1.15*LC2 + 1.50*LC4 + 1.05*LC8

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS119 - VHP100/50x5.0

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B182	285,000-	CO1/1	CS119 - VHP100/50x5.0	S 235	0,24	0,24	0,24

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8

CS120 - 1D internal forces; M_y

Values: **M_y**

Linear calculation

Combination: CO1

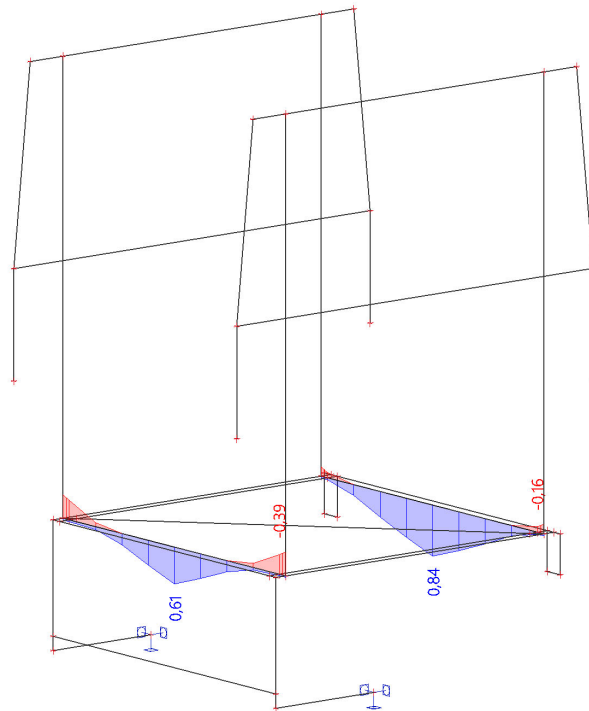
Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS120 -

VHP70/50x4.0



Cross-sections

Cross-sections - CS120

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS120	Detailed VHP70/50x4.0	S 235	cold formed	c	c		Rectangular hollow section

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS120 - VHP70/50x4.0

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B184	0,000	CO1/1	CS120 - VHP70/50x4.0	-0,78	0,00	0,88	0,00	-0,05	0,00
B185	0,000	CO1/2	CS120 - VHP70/50x4.0	0,00	0,00	0,09	0,00	0,00	0,00
B184	860,000	CO1/3	CS120 - VHP70/50x4.0	-1,43	0,00	-2,75	0,00	-0,39	0,01
B184	0,000	CO1/4	CS120 -	-0,77	0,00	0,87	0,00	-0,05	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			VHP70/50x4.0						
B185	0,000	CO1/1	CS120 - VHP70/50x4.0	0,01	0,00	2,75	0,00	-0,16	0,00
B184	0,000	CO1/3	CS120 - VHP70/50x4.0	-1,43	0,00	2,75	0,00	-0,39	0,01
B185	430,000-	CO1/1	CS120 - VHP70/50x4.0	0,01	0,00	1,88	0,00	0,84	0,00
B185	860,000	CO1/3	CS120 - VHP70/50x4.0	0,03	0,00	-0,87	0,00	0,00	0,00

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8
CO1/2	LC1 + LC2
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC4 + 1.05*LC8
CO1/4	LC1 + LC2 + 1.50*LC5 + 1.05*LC8

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS120 - VHP70/50x4.0

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B185	430,000-	CO1/1	CS120 - VHP70/50x4.0	S 235	0,18	0,18	0,00

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8

CS121 - 1D internal forces; N

Values: **N**

Linear calculation

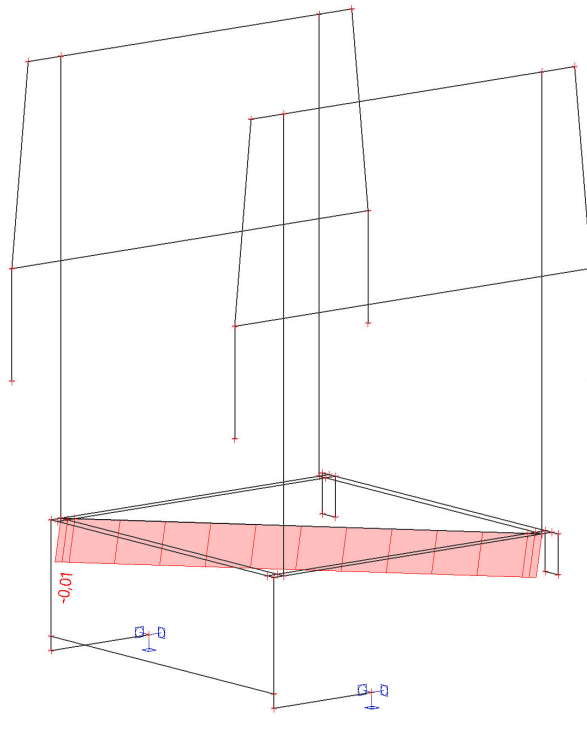
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

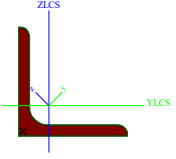
Selection: All

Filter: Cross-section = CS121 - L30/3



Cross-sections

Cross-sections - CS121

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS121	L30/3	S 235	rolled	b	b		Leg angle

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS121 - L30/3

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B186	0,000	CO1/1	CS121 - L(CSN)30/3	-0,01	-0,01	0,01	0,00	0,00	0,00
B186	1167,776	CO1/2	CS121 - L(CSN)30/3	0,00	0,01	-0,01	0,00	0,00	0,00
B186	0,000	CO1/3	CS121 - L(CSN)30/3	0,00	-0,01	0,01	0,00	0,00	0,00
B186	0,000	CO1/4	CS121 -	0,00	-0,01	0,03	0,00	-0,02	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B186	1167,776	CO1/5	L(CSN)30/3 CS121 - L(CSN)30/3	0,00	0,00	0,02	0,00	0,01	0,00

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC4 + 1.05*LC8
CO1/2	1.35*LC1 + 1.35*LC2 + 0.90*LC4
CO1/3	LC1 + LC2
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8
CO1/5	LC1 + LC2 + 1.50*LC5 + 1.05*LC8

EC-EN 1993 Steel check ULS

Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: All
 Filter: Cross-section = CS121 - L30/3

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B186	0,000	CO1/1	CS121 - L(CSN)30/3	S 235	0,06	0,06	0,05

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC5 + 1.05*LC8

3D model of structure



Structural model



Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologii
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - konzola jímací tyče
Author	Ing. Jeřowicz
Date	10. 06. 2020
Structure	General XYZ
No. of nodes :	7
No. of beams :	3
No. of slabs :	0
No. of solids :	0
No. of used profiles :	3
No. of load cases :	6
No. of used materials :	1
Acceleration of gravity [m/s ²]	9,810
National code	EC - EN

Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	wind +y Standard	Variable Static	wind		Short	None
LC4	wind -y Standard	Variable Static	wind		Short	None
LC5	wind +x Standard	Variable Static	wind		Short	None
LC6	wind -x Standard	Variable Static	wind		Short	None

Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind

LC2 / Tot. value

LC3 / Tot. value

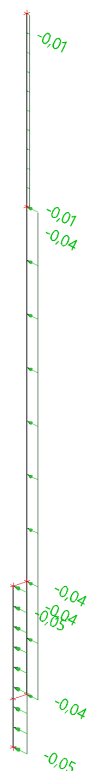


LC4 / Tot. value



LC5 / Tot. value





R1 - Reactions; R_x; R_y; R_z - R_A

Values: R_x , R_y , R_z

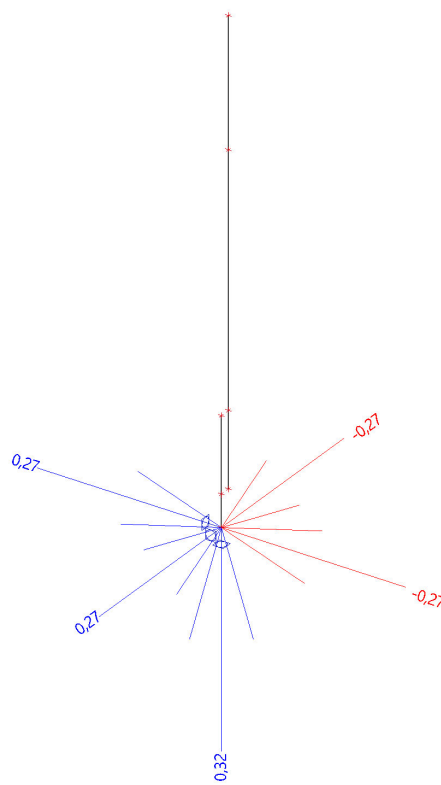
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - R1



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Global

Selection: Named selection - R1

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn1/N6808	CO1/1	0,00	-0,27	0,27	0,46	0,00	0,00	1697,3	0,0
Sn1/N6808	CO1/2	0,00	0,00	0,32	0,02	0,00	0,00	72,8	0,0
Sn1/N6808	CO1/3	0,00	0,27	0,23	-0,42	0,00	0,00	-1791,4	0,0
Sn1/N6808	CO1/4	-0,27	0,00	0,27	0,02	-0,44	0,02	72,8	-1624,5
Sn1/N6808	CO1/5	0,27	0,00	0,27	0,02	0,44	-0,02	72,8	1624,5

DEFORMATIONS

3D displacement; u_z

Values: u_z
Linear calculation
Combination: CO2
Selection: All
Location: In nodes avg.. System:
Global



3D displacement

Linear calculation
Combination: CO2
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element

Results on 1D member:

Extreme 1D: Global

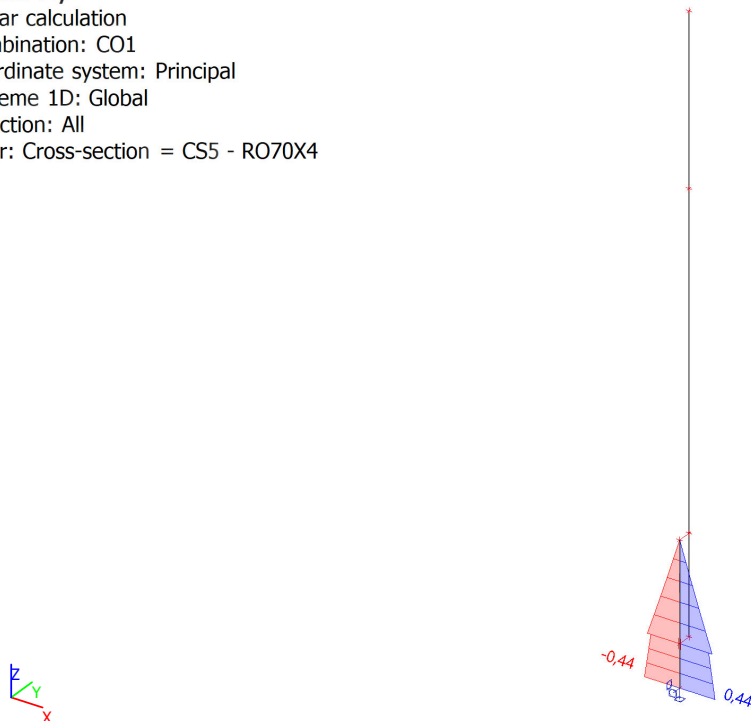
Name	dx [mm]	Fibre	Case	u_x [mm]	u_y [mm]	u_z [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U_total [mm]
B1215	0,000	1	CO2/1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
B1222	1198,276	2	CO2/2	0,1	0,3	44,8	0,1	-15,7	0,1	44,8

Name	Combination key
CO2/1	LC1 + LC2
CO2/2	LC1 + LC2 + LC6

STRESS ANALYSIS OF CROSS SECTIONS

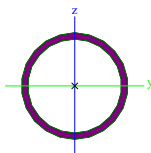
1D internal forces; M_y

Values: M_y
Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS5 - RO70X4



Cross-sections

Cross-sections - CS5

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
	Detailed						
CS5	RO70X4	S 235	rolled	a	a		Circular hollow section

1D internal forces

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS5 - RO70X4

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B1215	300,000+	CO1/1	CS5 - RO70X4	-1,93	0,65	0,00	0,00	0,00	-0,25
B1215	1000,000	CO1/2	CS5 - RO70X4	1,85	-0,60	0,00	0,00	0,00	-0,18
B1215	300,000+	CO1/2	CS5 - RO70X4	1,80	-0,65	0,00	0,00	0,00	0,25
B1215	300,000+	CO1/3	CS5 - RO70X4	-0,07	0,00	-0,60	-0,05	0,40	0,00
B1215	300,000+	CO1/4	CS5 - RO70X4	-0,07	0,00	0,60	0,05	-0,40	0,00
B1215	0,000	CO1/4	CS5 - RO70X4	-0,27	0,00	0,27	0,02	-0,44	0,02
B1215	0,000	CO1/3	CS5 - RO70X4	-0,27	0,00	-0,27	-0,02	0,44	0,02

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B1215	0,000	CO1/5	CS5 - RO70X4	-0,23	0,27	0,00	0,00	0,00	-0,42
B1215	0,000	CO1/6	CS5 - RO70X4	-0,27	-0,27	0,00	0,00	0,00	0,46

Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC4
CO1/2	LC1 + LC2 + 1.50*LC3
CO1/3	1.15*LC1 + 1.15*LC2 + 1.50*LC6
CO1/4	1.15*LC1 + 1.15*LC2 + 1.50*LC5
CO1/5	LC1 + LC2 + 1.50*LC4
CO1/6	1.15*LC1 + 1.15*LC2 + 1.50*LC3

EC-EN 1993 Steel check ULS

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS5 - RO70X4

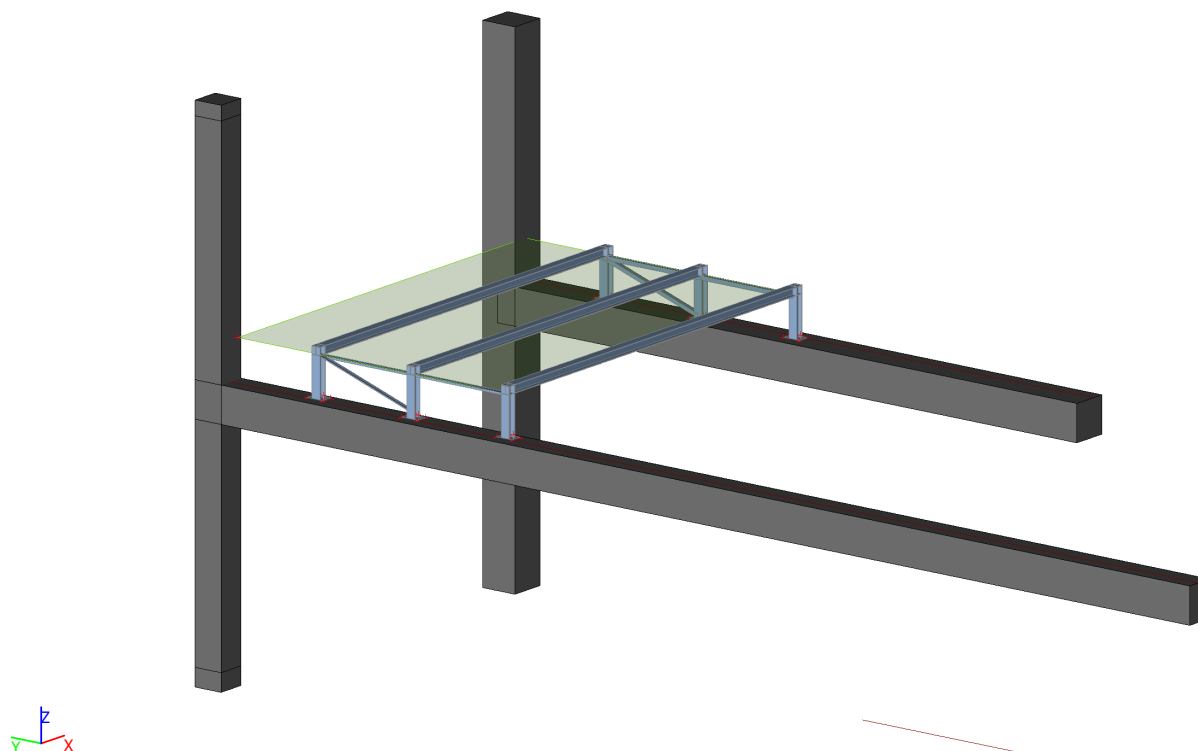
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B1215	0,000	CO1/1	CS5 - RO70X4	S 235	0,11	0,11	0,10

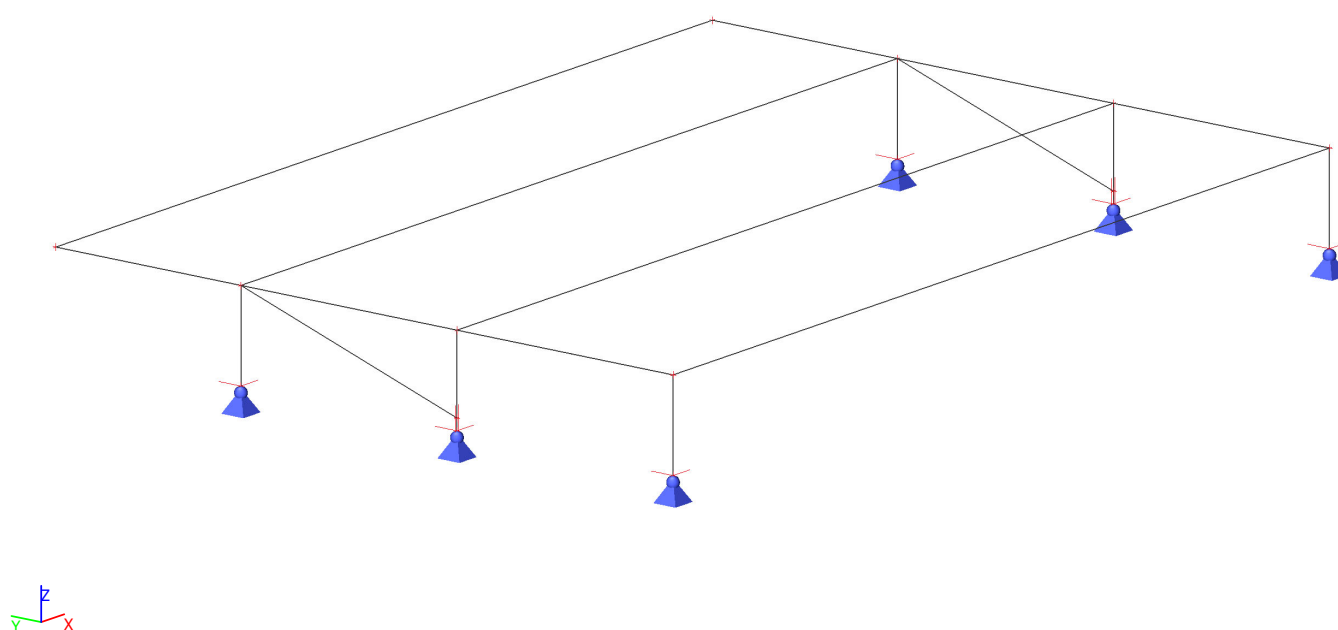
Name	Combination key
CO1/1	1.15*LC1 + 1.15*LC2 + 1.50*LC3

KONSTRUKCE PRO VRATA

3D MODEL OF STRUCTURE



Structural model



Project

Version	SCIA Engineer 17.1.2029
Licence number	555797
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2799
No. of beams :	709
No. of slabs :	382
No. of solids :	567
No. of used profiles :	67
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

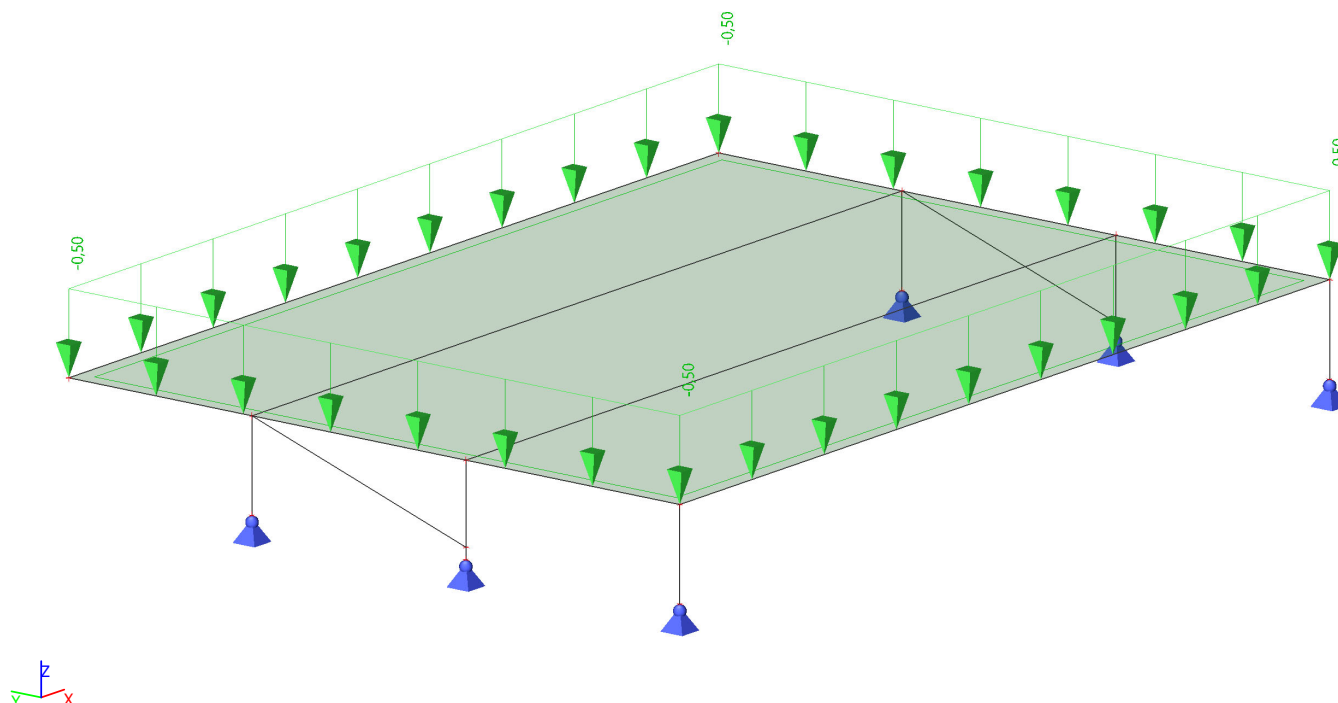
Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

LC2 / Tot. value



Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

REACTIONS

R1 - Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: R_x , R_y , R_z , M_x , M_y , M_z

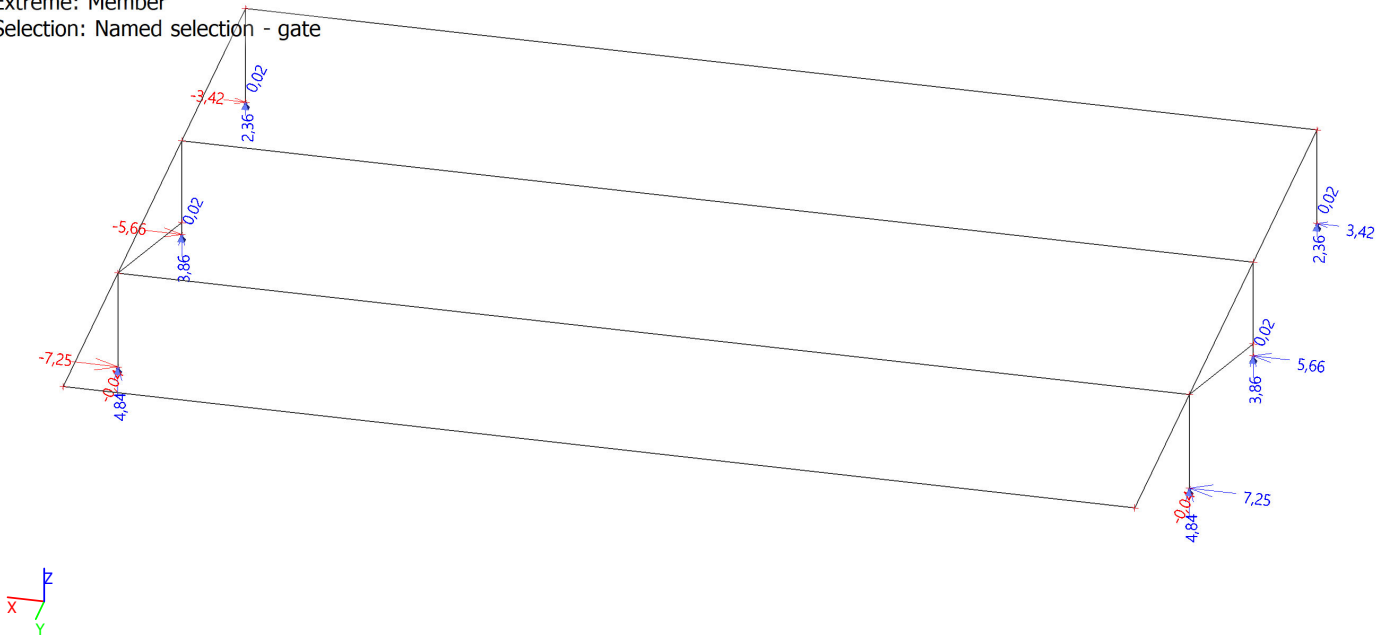
Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - gate



Reactions

Linear calculation

Combination: CO1

System: Global

Extreme: Member

Selection: Named selection - gate

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn198/N5557	CO1/1	7,25	-0,04	4,84	0,00	0,00	0,00	0,0	0,0
Sn198/N5557	CO1/2	5,37	-0,03	3,58	0,00	0,00	0,00	0,0	0,0
Sn199/N5561	CO1/1	5,66	0,02	3,86	0,00	0,00	0,00	0,0	0,0
Sn199/N5561	CO1/2	4,20	0,02	2,86	0,00	0,00	0,00	0,0	0,0
Sn200/N5565	CO1/1	3,42	0,02	2,36	0,00	0,00	0,00	0,0	0,0
Sn200/N5565	CO1/2	2,54	0,01	1,75	0,00	0,00	0,00	0,0	0,0
Sn201/N5563	CO1/2	-2,54	0,01	1,75	0,00	0,00	0,00	0,0	0,0
Sn201/N5563	CO1/1	-3,42	0,02	2,36	0,00	0,00	0,00	0,0	0,0
Sn202/N5559	CO1/2	-4,20	0,02	2,86	0,00	0,00	0,00	0,0	0,0
Sn202/N5559	CO1/1	-5,66	0,02	3,86	0,00	0,00	0,00	0,0	0,0
Sn203/N5555	CO1/2	-5,37	-0,03	3,58	0,00	0,00	0,00	0,0	0,0
Sn203/N5555	CO1/1	-7,25	-0,04	4,84	0,00	0,00	0,00	0,0	0,0

DEFORMATIONS

3D displacement; U_{total}

Values: U_{total}

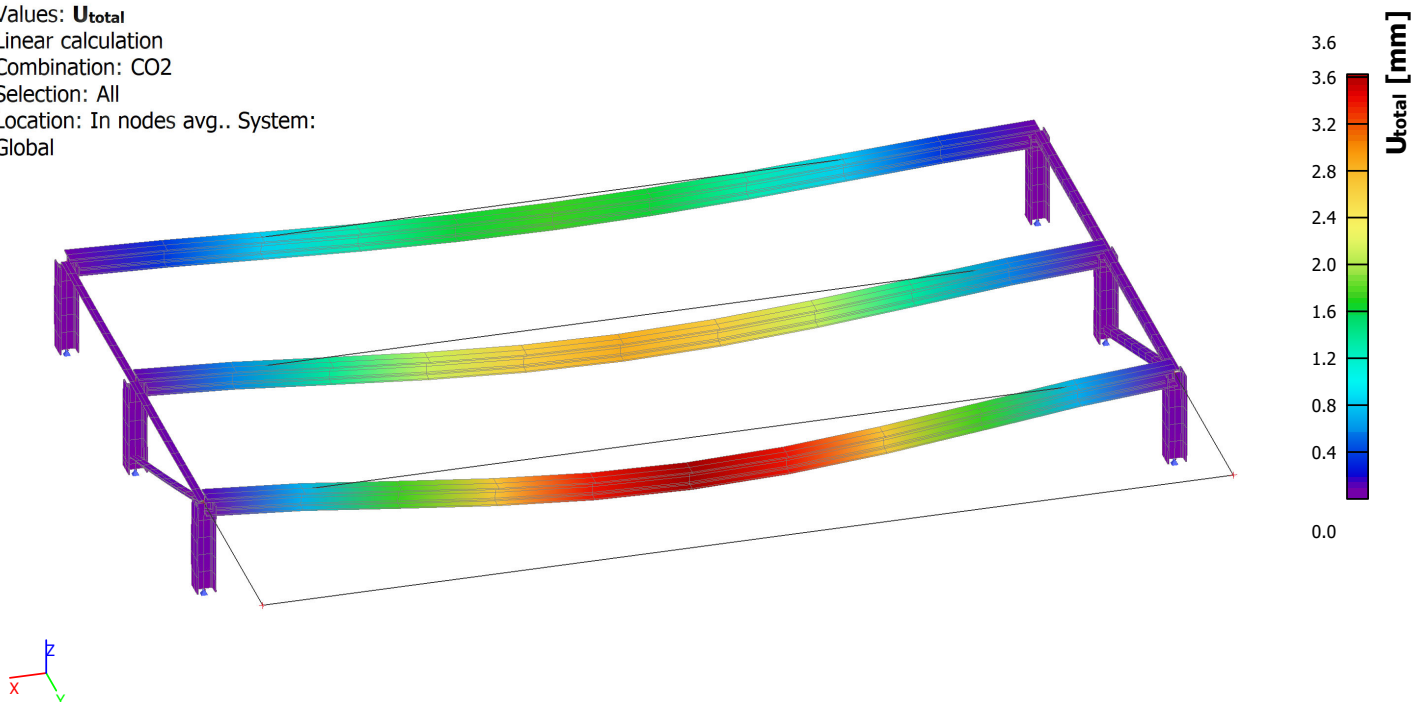
Linear calculation

Combination: CO2

Selection: All

Location: In nodes avg.. System:

Global



3D displacement

Linear calculation

Combination: CO2

Selection: Named selection - gate

Location: In nodes avg. on macro. System: LCS mesh element

Results on 1D member:

Extreme 1D: Global

Name	dx [mm]	Fibre	Case	u_x [mm]	u_y [mm]	u_z [mm]	ϕ_x [mrad]	ϕ_y [mrad]	ϕ_z [mrad]	U_{total} [mm]
B930	0,000	8	CO2/1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
B926	2875,000-	1	CO2/1	0,0	0,0	-3,6	0,0	0,0	0,0	3,6

Name	Combination key
CO2/1	LC1 + LC2

STRESS ANALYSIS OF CROSS SECTIONS

CS126 - 1D internal forces; N_x

Values: **N**

Linear calculation

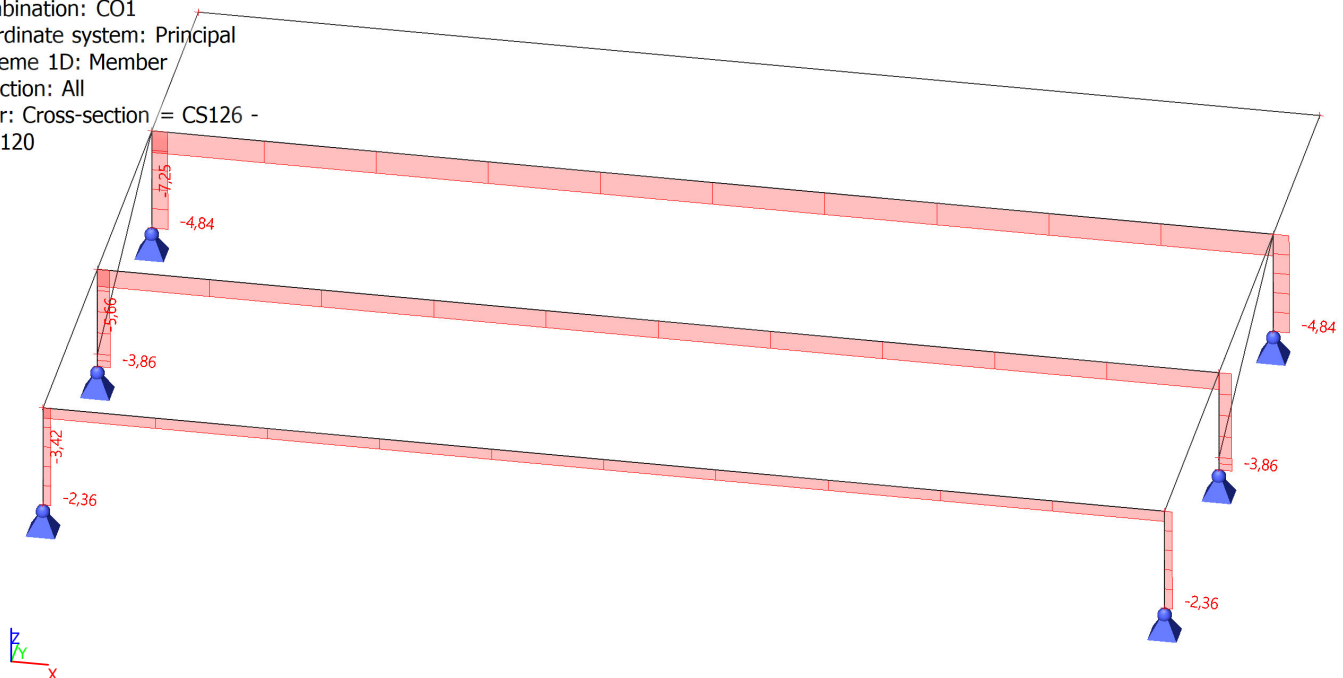
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

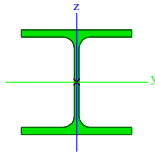
Selection: All

Filter: Cross-section = CS126 -
HEA120



Cross-sections

Cross-sections - CS126

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS126	Detailed HEA120	S 235	rolled	b	c		European wide flange beam

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS126 - HEA120

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B930	560,000	CO1/1	CS126 - HEA120	-1,64	0,01	2,54	0,00	1,42	0,01
B927	0,000	CO1/2	CS126 - HEA120	-3,86	0,02	5,66	0,00	0,00	0,00
B925	0,000	CO1/2	CS126 - HEA120	-4,84	-0,04	-7,25	0,00	0,00	0,00
B927	71,250+	CO1/2	CS126 - HEA120	-3,80	0,02	5,66	0,00	0,40	-0,01
B928	71,250+	CO1/2	CS126 - HEA120	-3,80	0,02	-5,66	0,00	-0,40	-0,01
B926	0,000	CO1/2	CS126 - HEA120	-7,25	0,00	4,61	0,00	-4,06	-0,01
B924	560,000	CO1/2	CS126 - HEA120	-4,69	-0,04	7,25	0,00	4,06	-0,02

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B930	560,000	CO1/2	CS126 - HEA120	-2,21	0,02	3,42	0,00	1,92	0,01

Name	Combination key
CO1/1	LC1 + LC2
CO1/2	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check ULS

Linear calculation
 Combination: CO1
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: All
 Filter: Cross-section = CS126 - HEA120

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B926	0,000	CO1/1	CS126 - HEA120	S 235	0,14	0,14	0,14

Name	Combination key
CO1/1	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check fire resistance

Linear calculation
 Combination: CO3
 Coordinate system: Principal
 Extreme 1D: Global
 Selection: Named selection - gate
 Filter: Cross-section = CS126 - HEA120

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Temperature} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B926	0,000	CO3/1	CS126 - HEA120	S 235	0,79	0,00	0,33	0,79

Name	Combination key
CO3/1	LC1 + LC2

CS127 - 1D internal forces; N_x

Values: **N**

Linear calculation

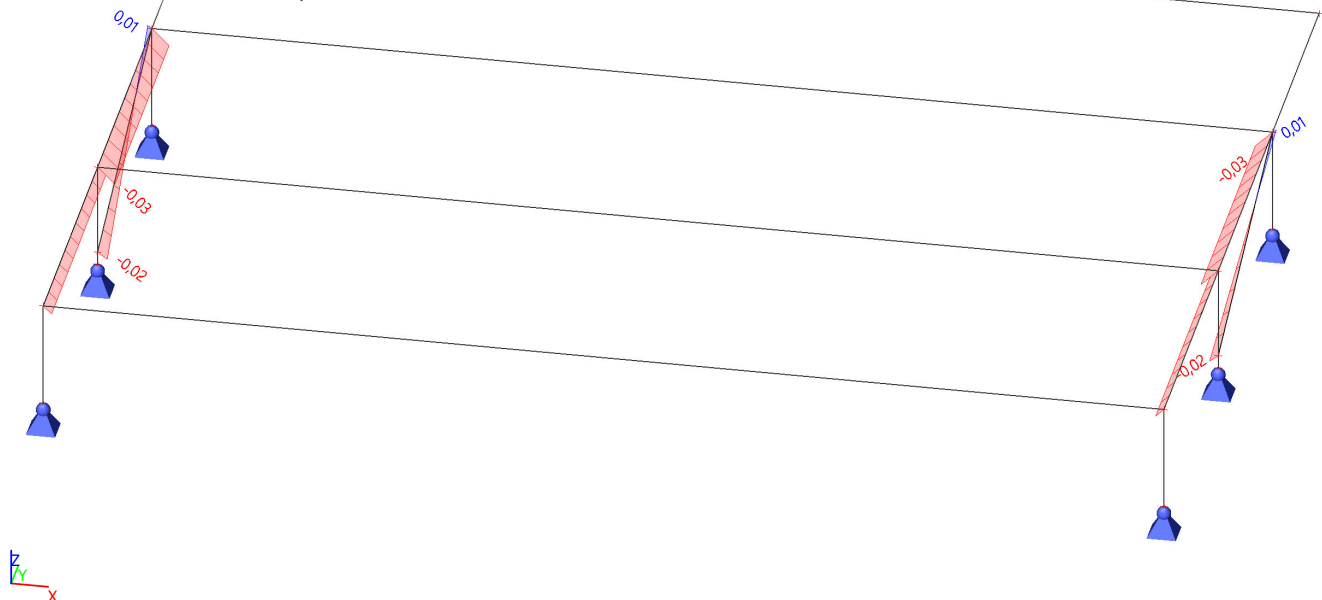
Combination: CO1

Coordinate system: Principal

Extreme 1D: Member

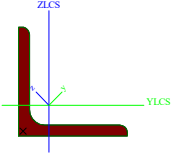
Selection: All

Filter: Cross-section = CS127 - L50/5



Cross-sections

Cross-sections - CS127

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS127	L50/5	S 235	rolled	b	b		Leg angle

1D internal forces

Linear calculation

Combination: CO1

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS127 - L50/5

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
B935	1544,377	CO1/1	CS127 - L(CSN)50/5	-0,02	0,03	-0,02	0,00	-0,01	0,01
B936	1544,377	CO1/1	CS127 - L(CSN)50/5	0,01	0,02	-0,03	0,00	-0,02	0,00
B936	0,000	CO1/1	CS127 - L(CSN)50/5	-0,02	-0,03	0,02	0,00	-0,01	0,01
B935	0,000	CO1/1	CS127 -	0,01	-0,02	0,03	0,00	-0,02	0,00

Name	dx [mm]	Case	Cross-section	N [kN]	V _y [kN]	V _z [kN]	M _x [kNm]	M _y [kNm]	M _z [kNm]
			L(CSN)50/5						
B933	2344,000-	CO1/1	CS127 - L(CSN)50/5	-0,03	0,01	0,00	0,00	0,00	0,00
B935	772,189-	CO1/1	CS127 - L(CSN)50/5	0,00	0,00	0,01	0,00	0,00	0,00
B933	2930,000	CO1/1	CS127 - L(CSN)50/5	-0,03	0,03	-0,02	0,00	0,00	0,01

Name	Combination key
CO1/1	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check ULS

Linear calculation
Combination: CO1
Coordinate system: Principal
Extreme 1D: Global
Selection: All
Filter: Cross-section = CS127 - L50/5

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B935	1544,377	CO1/1	CS127 - L(CSN)50/5	S 235	0,01	0,01	0,01

Name	Combination key
CO1/1	1.35*LC1 + 1.35*LC2

EC-EN 1993 Steel check fire resistance

Linear calculation
Combination: CO3
Coordinate system: Principal
Extreme 1D: Global
Selection: Named selection - gate
Filter: Cross-section = CS127 - L50/5

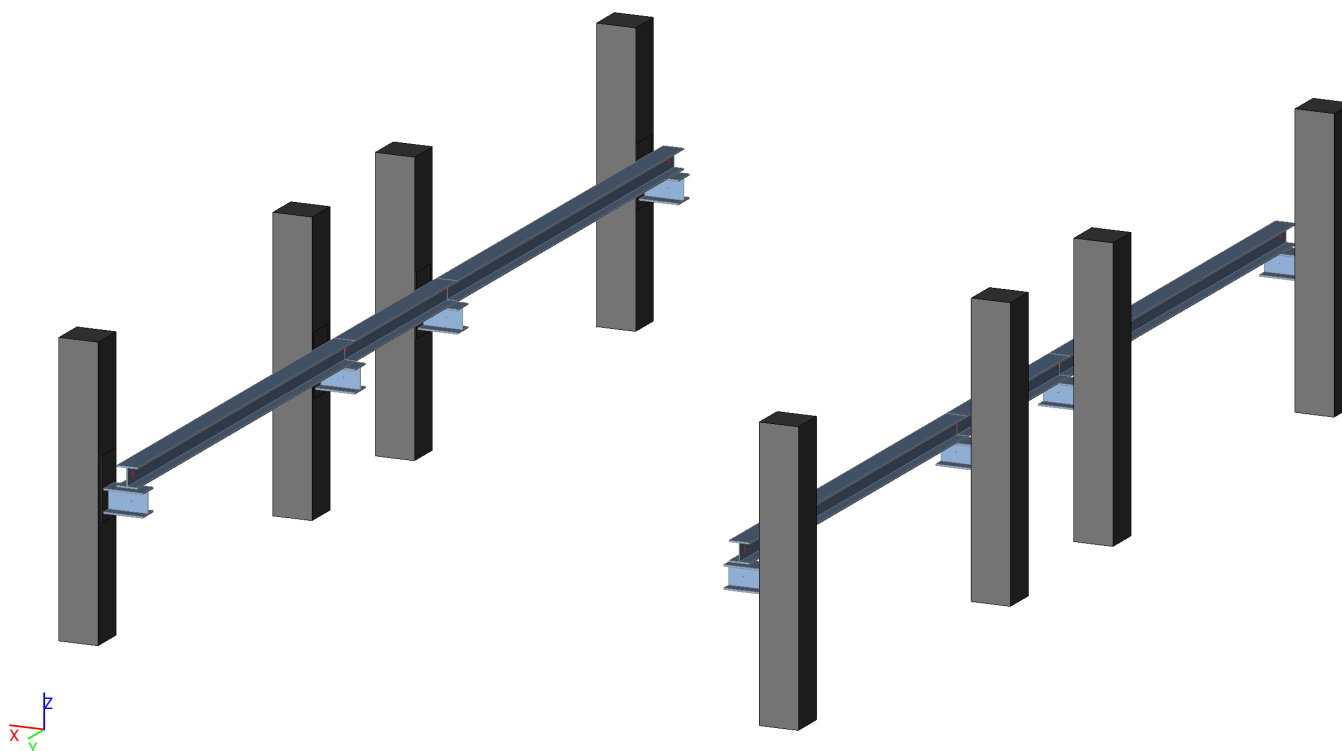
Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Temperature} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B935	0,000	CO3/1	CS127 - L(CSN)50/5	S 235	0,06	0,00	0,05	0,06

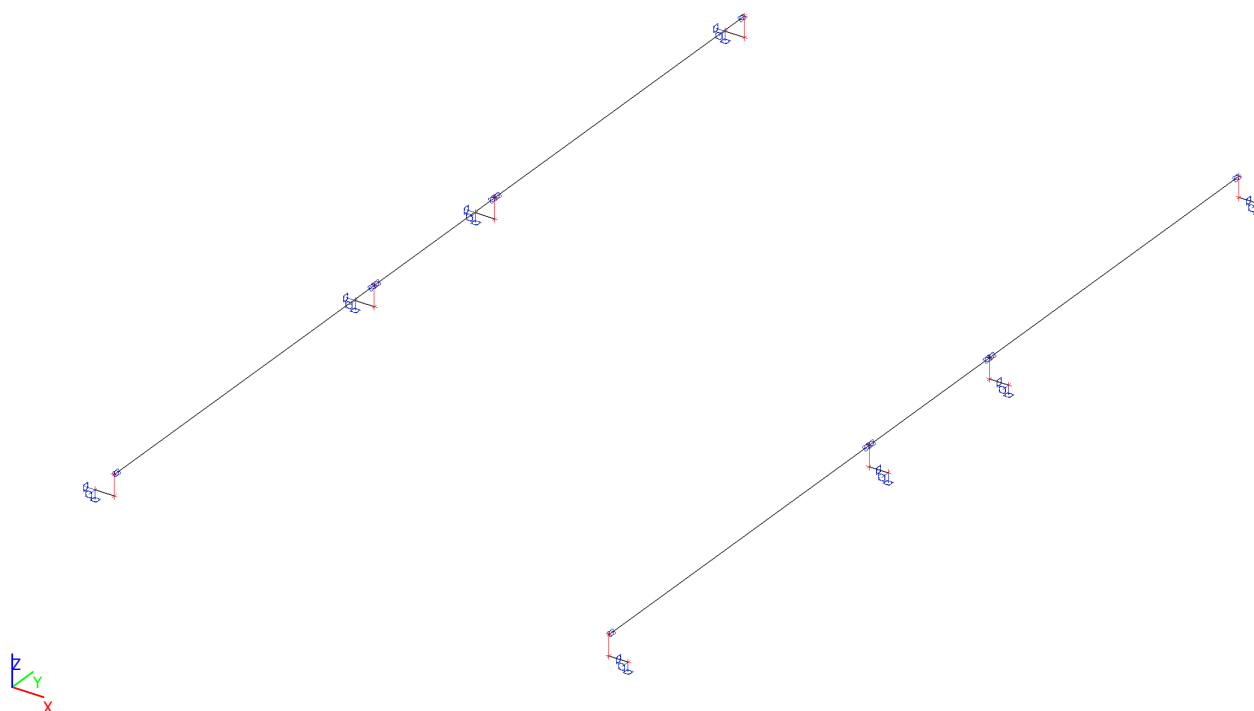
Name	Combination key
CO3/1	LC1 + LC2

JEŘÁBOVÁ DRÁHA 4t, +5.600

3D MODEL OF STRUCTURE



Structural model



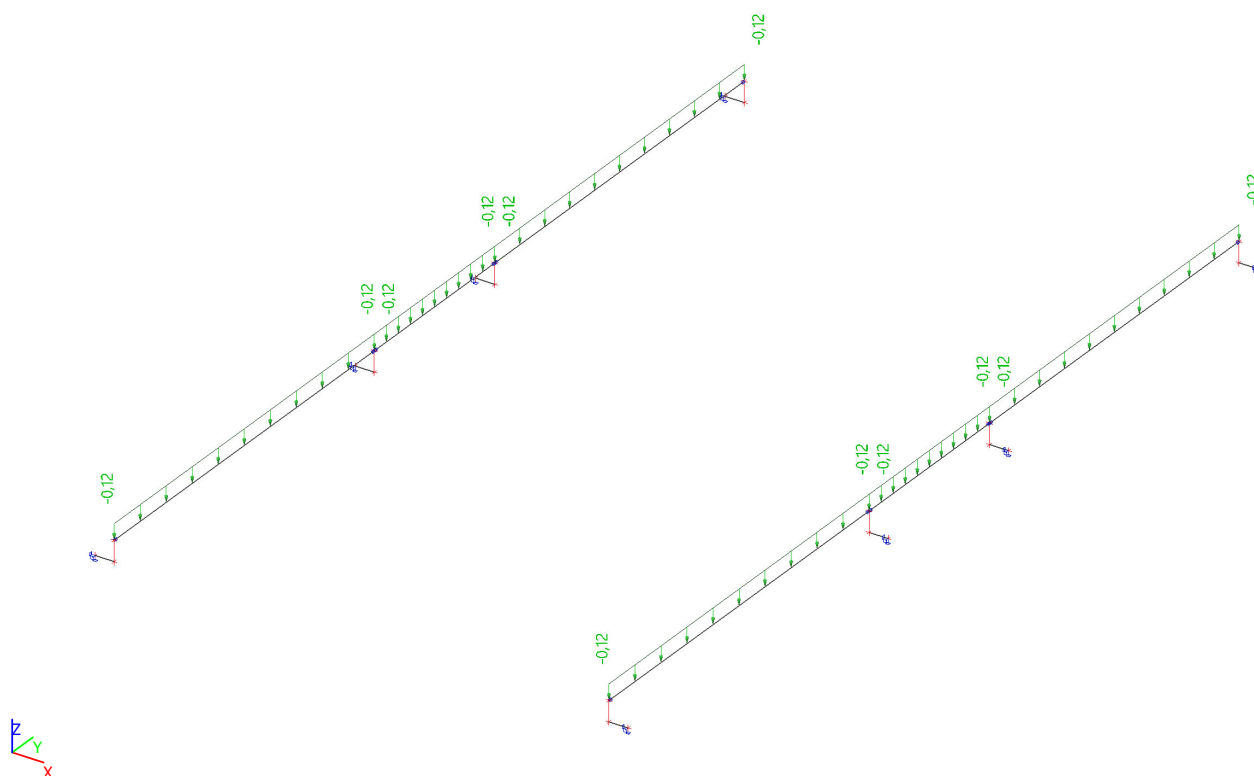
Project

Version	SCIA Engineer 17.1.2029
Licence number	555798
Project	Centrum Energetických a Enviromentálních Technologíí
Part	SO 01.1 Objekt CEETe
Description	Ocelová konstrukce - DPS
Author	Ing. Jeřowicz
Date	Date
Structure	General XYZ
No. of nodes :	2799
No. of beams :	709
No. of slabs :	382
No. of solids :	567
No. of used profiles :	67
No. of load cases :	14
No. of used materials :	3
Acceleration of gravity [m/s ²]	9,807
National code	EC - EN

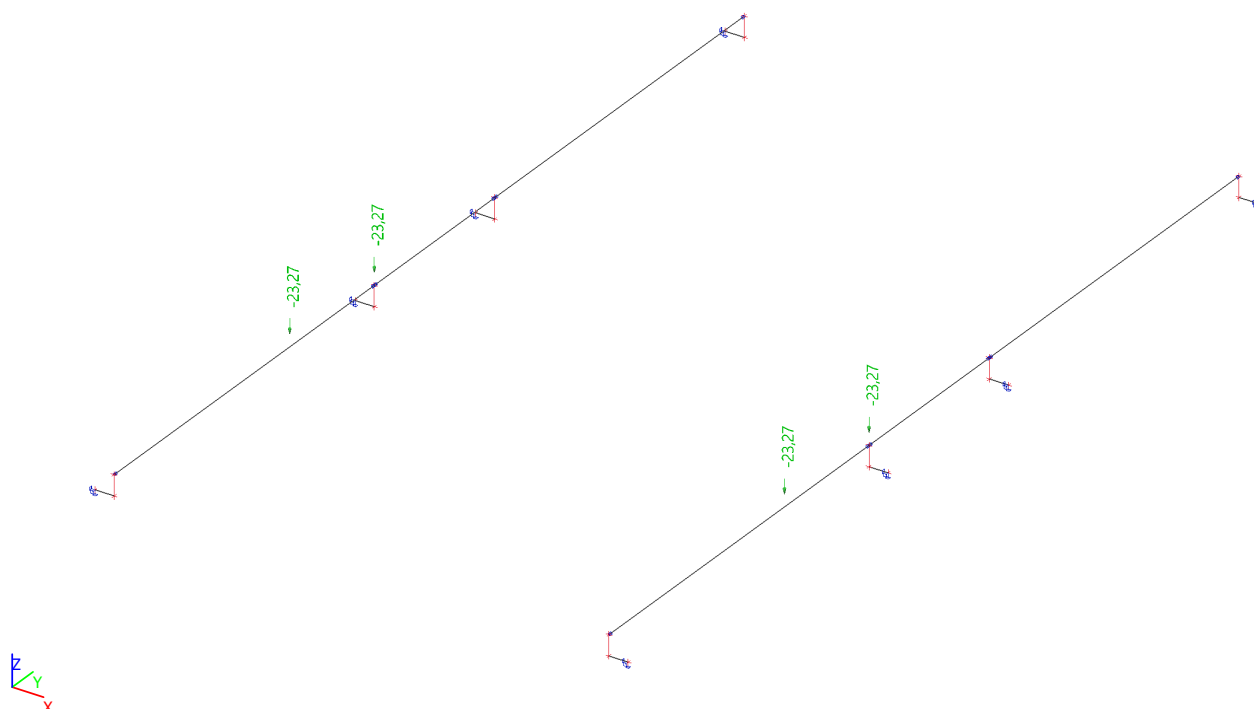
Load cases

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC1	self weight	Permanent Self weight	LG1	-Z		
LC2	dead load	Permanent Standard	LG1			
LC3	snow/rime Standard	Variable Static	snow		Short	None
LC4	wind +x Standard	Variable Static	wind		Short	None
LC5	wind -x Standard	Variable Static	wind		Short	None
LC6	wind +y Standard	Variable Static	wind		Short	None
LC7	wind -y Standard	Variable Static	wind		Short	None
LC8	live load Standard	Variable Static	live		Short	None
LC9	Rmax (C) Standard	Variable Static	crane		Short	None
LC10	Ht+Hl_Rmax (C) Standard	Variable Static	Ht+Hl		Short	None
LC11	Hs_Rmax (C) Standard	Variable Static	Hs		Short	None
LC12	Mmax (C-D) Standard	Variable Static	crane		Short	None
LC13	Ht+Hl_Mmax (C-D) Standard	Variable Static	Ht+Hl		Short	None
LC14	Hs_Mmax (C-D) Standard	Variable Static	Hs		Short	None

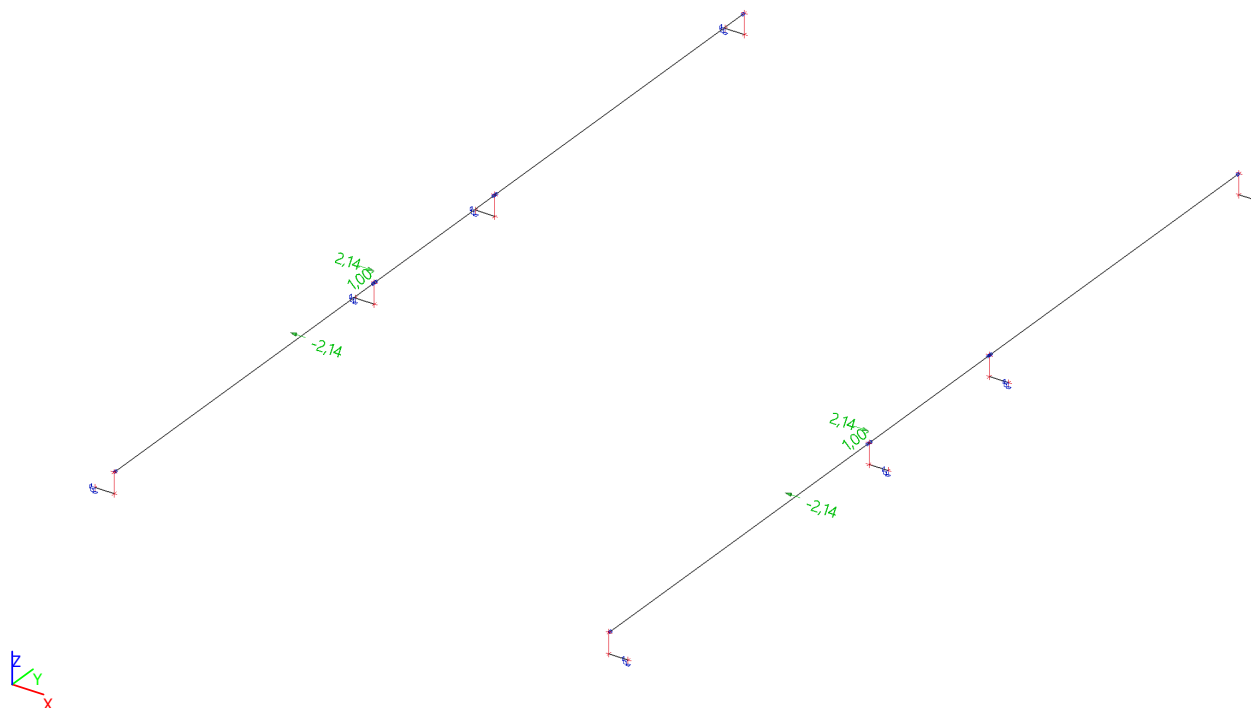
LC2 / Tot. value



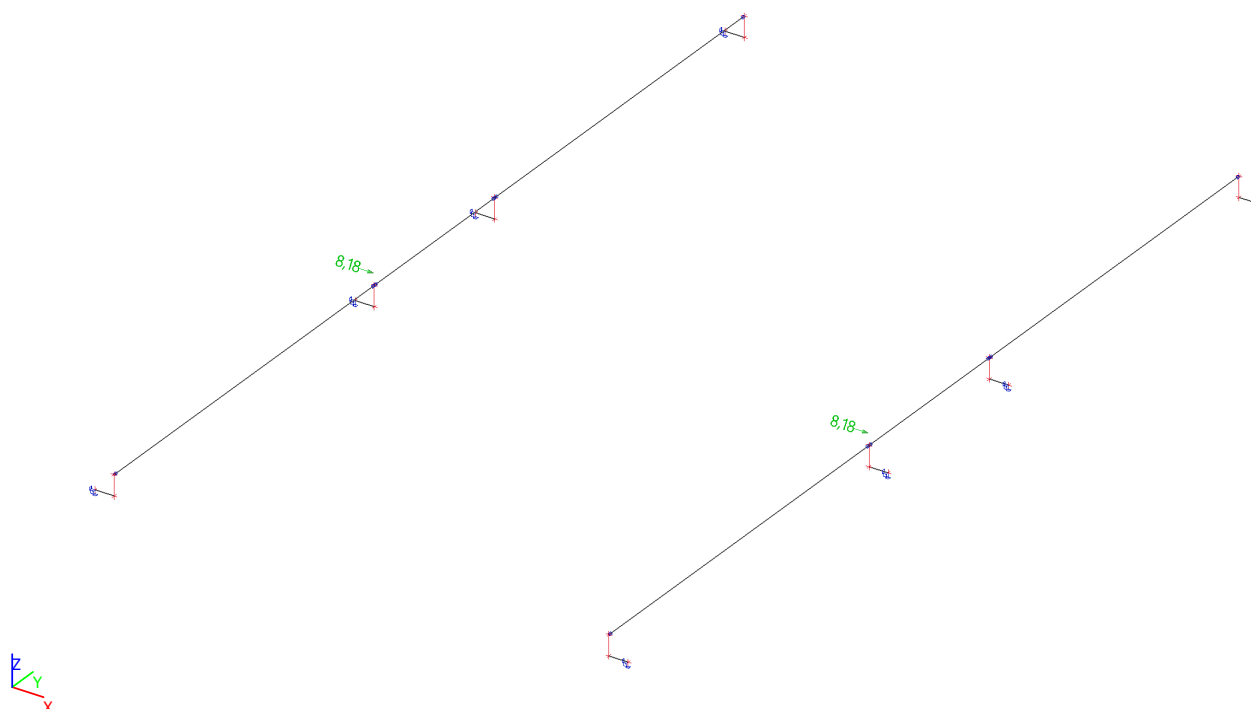
LC9 / Tot. value



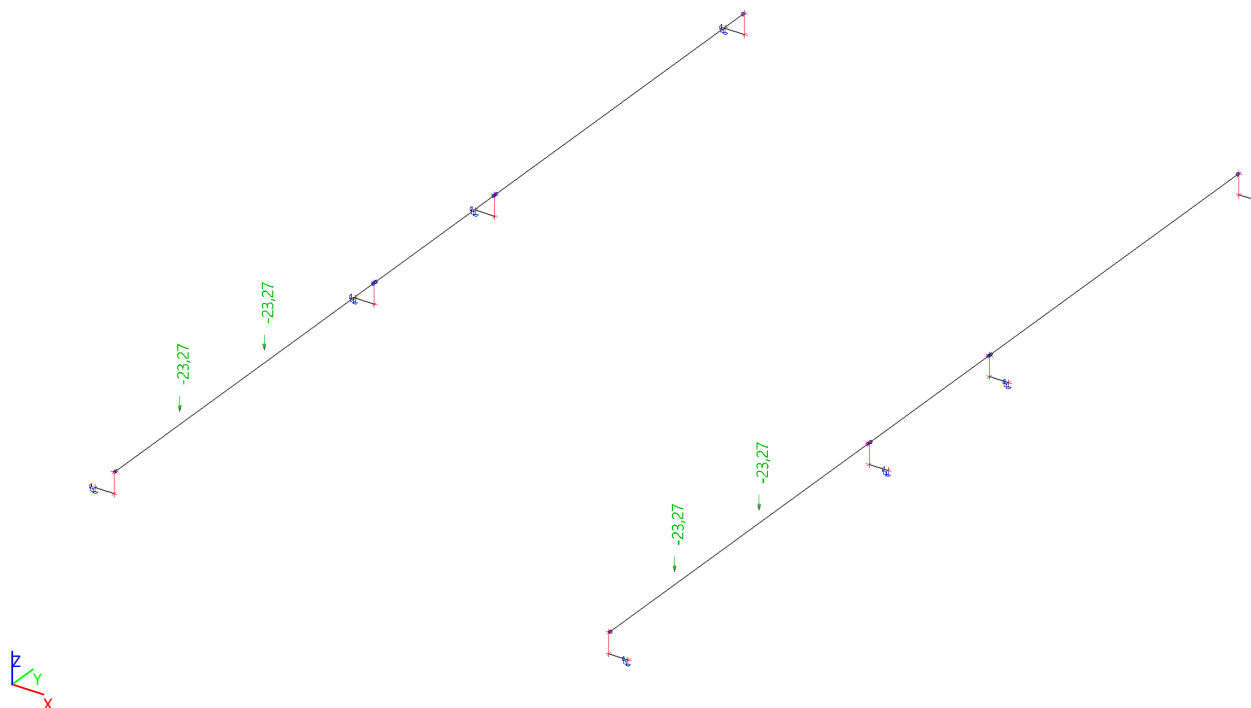
LC10 / Tot. value



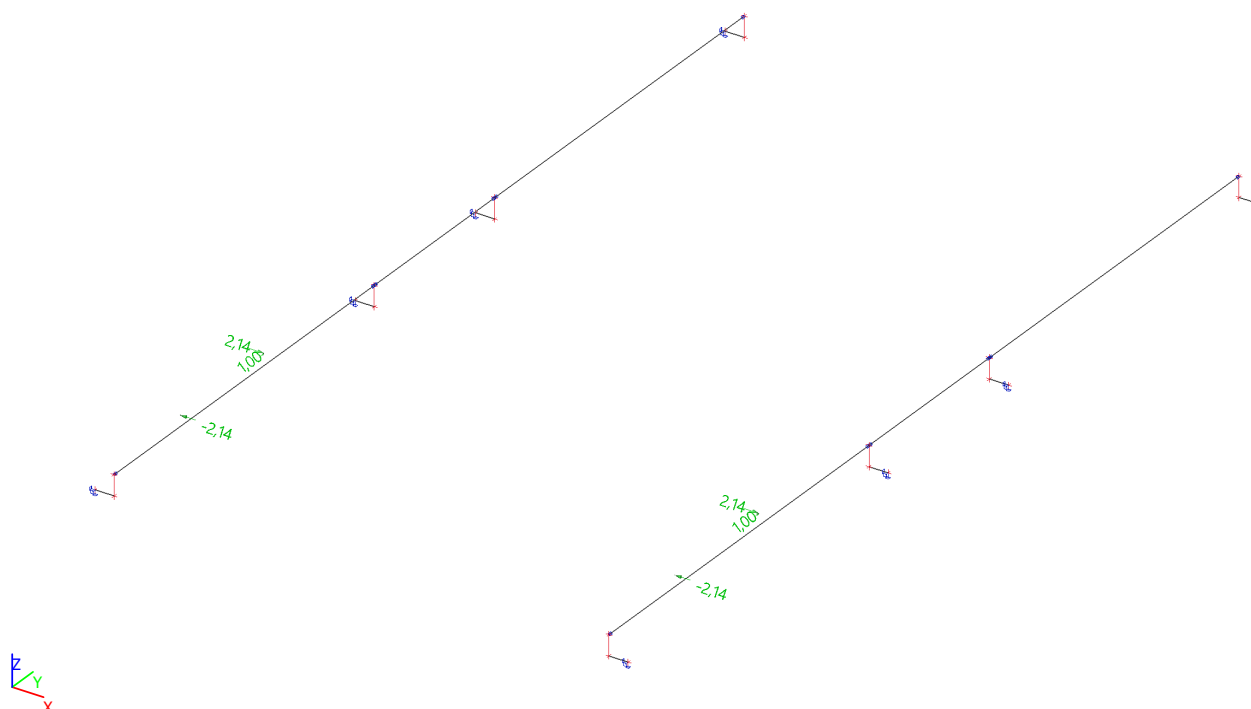
LC11 / Tot. value



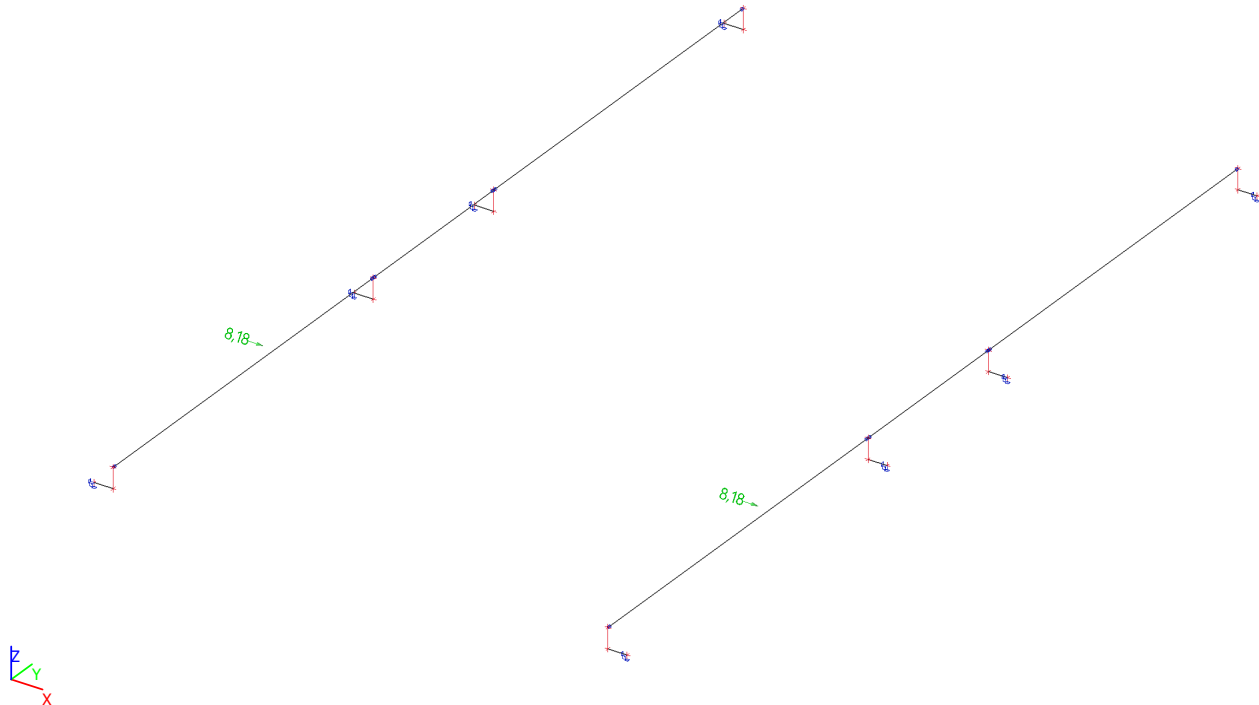
LC12 / Tot. value



LC13 / Tot. value



LC14 / Tot. value



Load groups

Name	Load	Relation	Type
LG1	Permanent		
snow	Variable	Exclusive	Snow
wind	Variable	Exclusive	Wind
live	Variable	Exclusive	Cat C : Congregation
crane	Variable	Exclusive	Cat F : Vehicle <30kN
Ht+Hl	Variable	Exclusive	Cat F : Vehicle <30kN
Hs	Variable	Exclusive	Cat F : Vehicle <30kN

Combinations

Name	Description	Type	Load cases	Coeff. [-]
CO1		EN-ULS (STR/GEO) Set B	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
CO2		EN-SLS Characteristic	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00
Rmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50

Name	Description	Type	Load cases	Coeff. [-]
			LC10 - Ht+Hl_Rmax (C)	1,35
			LC11 - Hs_Rmax (C)	1,35
Rmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC9 - Rmax (C)	1,50
			LC10 - Ht+Hl_Rmax (C)	-1,35
			LC11 - Hs_Rmax (C)	-1,35
Mmax +		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	1,35
			LC14 - Hs_Mmax (C-D)	1,35
Mmax -		Envelope - ultimate	LC1 - self weight	1,35
			LC12 - Mmax (C-D)	1,50
			LC13 - Ht+Hl_Mmax (C-D)	-1,35
			LC14 - Hs_Mmax (C-D)	-1,35
Mmax +def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	1,00
			LC14 - Hs_Mmax (C-D)	1,00
Mmax -def		Envelope - serviceability	LC1 - self weight	1,00
			LC12 - Mmax (C-D)	1,00
			LC13 - Ht+Hl_Mmax (C-D)	-1,00
			LC14 - Hs_Mmax (C-D)	-1,00
CO3		EN-Accidental 1	LC1 - self weight	1,00
			LC2 - dead load	1,00
			LC3 - snow/rime	1,00
			LC4 - wind +x	1,00
			LC5 - wind -x	1,00
			LC6 - wind +y	1,00
			LC7 - wind -y	1,00
			LC8 - live load	1,00

Result classes

Name	List
All ULS	CO1 - EN-ULS (STR/GEO) Set B
	Rmax + - Envelope - ultimate
	Rmax - - Envelope - ultimate
	Mmax + - Envelope - ultimate
	Mmax - - Envelope - ultimate
	CO3 - EN-Accidental 1
All SLS	CO2 - EN-SLS Characteristic
	Mmax +def - Envelope - serviceability
	Mmax -def - Envelope - serviceability

REACTIONS

Reactions; R_x ; R_y ; R_z ; M_x ; M_y ; M_z

Values: M_z , M_x , M_y , R_z , R_y , R_x

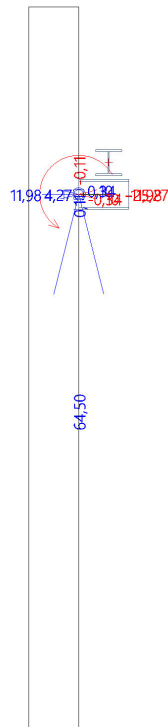
Linear calculation

Class: All ULS

System: Global

Extreme: Member

Selection: Named selection - R crane



Reactions

Linear calculation

Class: All ULS

System: Global

Extreme: Member

Selection: Named selection - R crane

Nodal reactions

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn85/N2721	CO1/1	0,00	0,00	4,97	0,00	-1,44	0,00	0,0	-289,6
Sn85/N2721	Rmax -/2	11,98	0,34	5,96	-0,11	4,27	0,10	-18,3	716,2
Sn85/N2721	Rmax +/3	-11,98	-0,34	64,50	0,11	-25,27	-0,10	1,7	-391,7

DEFORMATIONS

1D deformations; u_x

Values: u_x

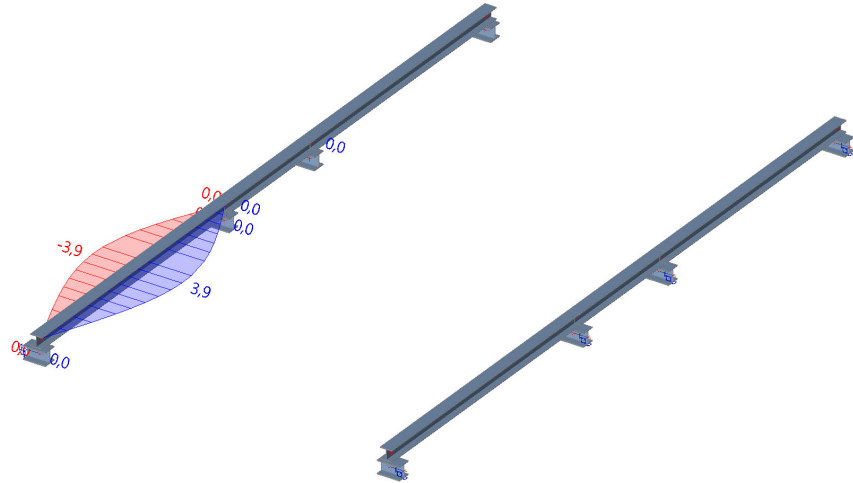
Linear calculation

Class: All SLS

Coordinate system: Global

Extreme 1D: Member

Selection: Named selection - def crane



1D deformations; u_z

Values: u_z

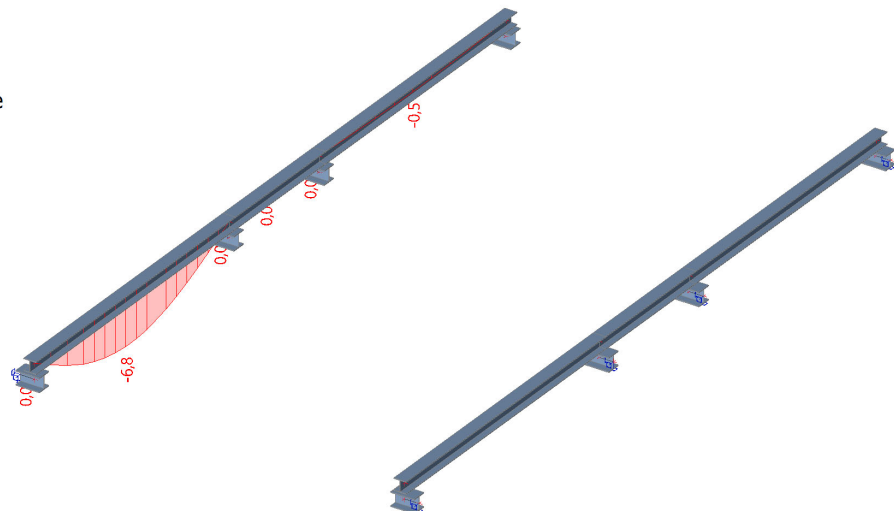
Linear calculation

Class: All SLS

Coordinate system: Global

Extreme 1D: Member

Selection: Named selection - def crane



Deformations on member

Linear calculation, Extreme : Global

Selection : Named selection - def crane

Class : All SLS

Member	dx [mm]	Case	ux [mm]	uy [mm]	uz [mm]	fix [mrad]	fiy [mrad]	fiz [mrad]	Resultant [mm]
B410	2600,000	Mmax +def/1	-0,1	0,3	-6,6	-3,3	0,9	0,0	6,6
B410	2600,000	Mmax -def/2	0,1	-0,3	-0,6	3,3	0,1	0,0	0,6
B410	2933,330	Mmax -def/3	0,1	-3,9	-0,6	22,4	0,0	0,1	3,9
B410	2933,330	Mmax +def/4	-0,1	3,9	-6,7	-22,4	0,3	-0,1	7,8
B410	3266,670	Mmax -def/5	0,1	-0,2	-6,8	1,5	-0,2	0,1	6,8
B413	300,000	Mmax -def/5	0,0	0,0	0,0	0,0	0,0	0,0	0,0
B410	2600,000	Mmax +def/4	-0,1	3,8	-6,6	-25,4	0,9	0,3	7,6
B410	2600,000	Mmax -def/3	0,1	-3,8	-0,6	25,4	0,1	-0,3	3,9
B410	6149,880	Mmax -def/5	0,1	0,0	0,0	0,0	-3,5	0,0	0,1
B410	0,000	Mmax -def/6	0,1	0,0	0,0	0,0	3,2	-2,0	0,1
B410	0,000	Mmax -def/3	0,1	0,0	0,0	0,0	0,3	-2,0	0,1
B410	0,000	Mmax +def/4	-0,1	0,0	0,0	0,0	3,2	2,0	0,1

STRESS ANALYSIS OF CROSS SECTIONS

CS76 - 1D internal forces; M_y

Values: M_y

Linear calculation

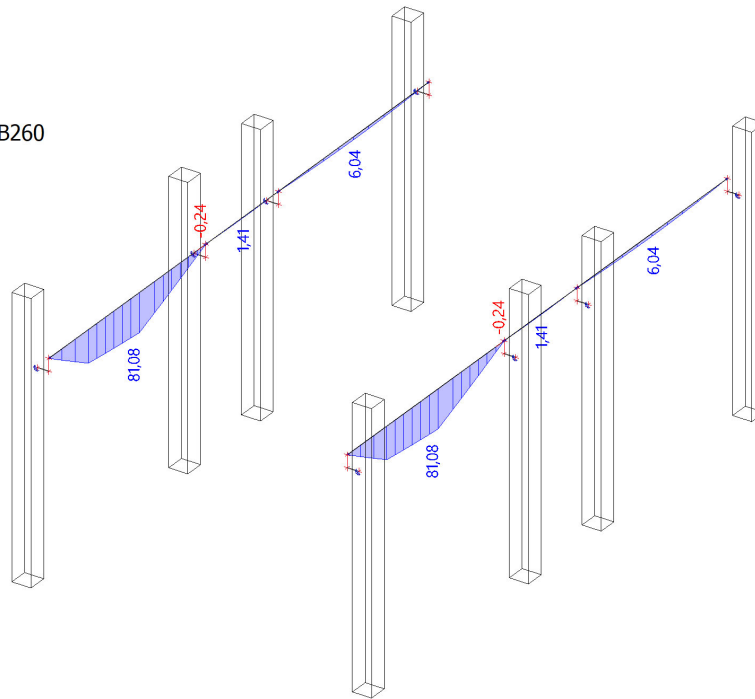
Class: All ULS

Coordinate system: Principal

Extreme 1D: Member

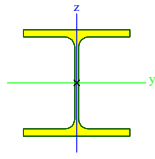
Selection: All

Filter: Cross-section = CS76 - HEB260



Cross-sections

Cross-sections - CS76

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS76	HEB260	S 235	rolled	b	c		European wide flange beam

EC-EN 1993 Steel check ULS

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS76 - HEB260

Overall Unity Check

Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B410	2600,000-	Mmax +/-	CS76 - HEB260	S 235	0,31	0,27	0,31

Name	Combination key
Mmax +/-	1.35*LC1 + 1.50*LC12 + 1.35*LC13 + 1.35*LC14

CS77 - 1D internal forces; M_y

Values: **M_y**

Linear calculation

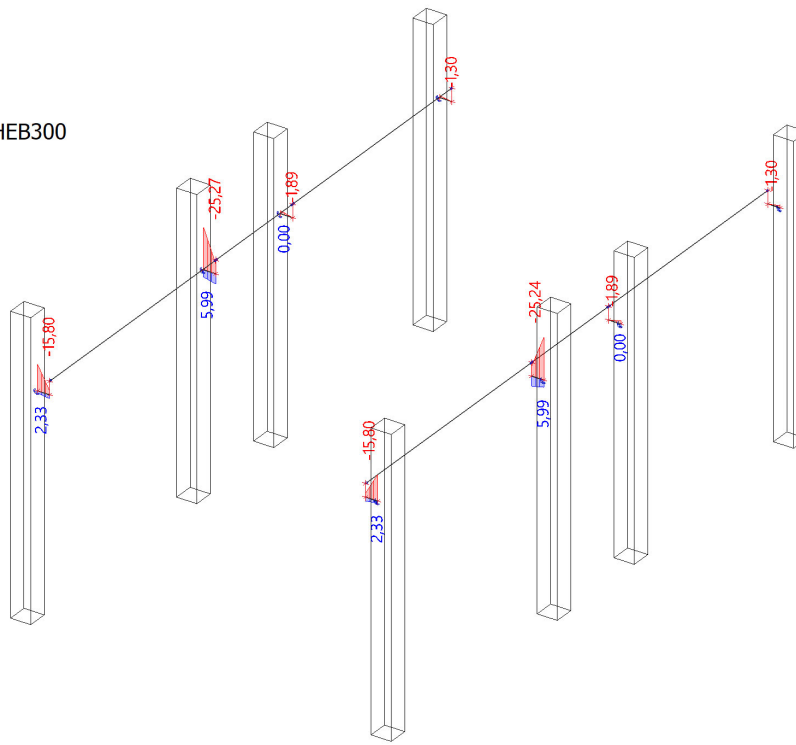
Class: All ULS

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Cross-section = CS77 - HEB300



Cross-sections

Cross-sections - CS77

Name	Type	Item material	Fabrication	buckling y-y	buckling z-z	Picture	Type description
CS77	HEB300	S 235	rolled	b	c		European wide flange beam

EC-EN 1993 Steel check ULS

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Cross-section = CS77 - HEB300

There are 2 warnings on selected members. 2 of them are shown.

Overall Unity Check

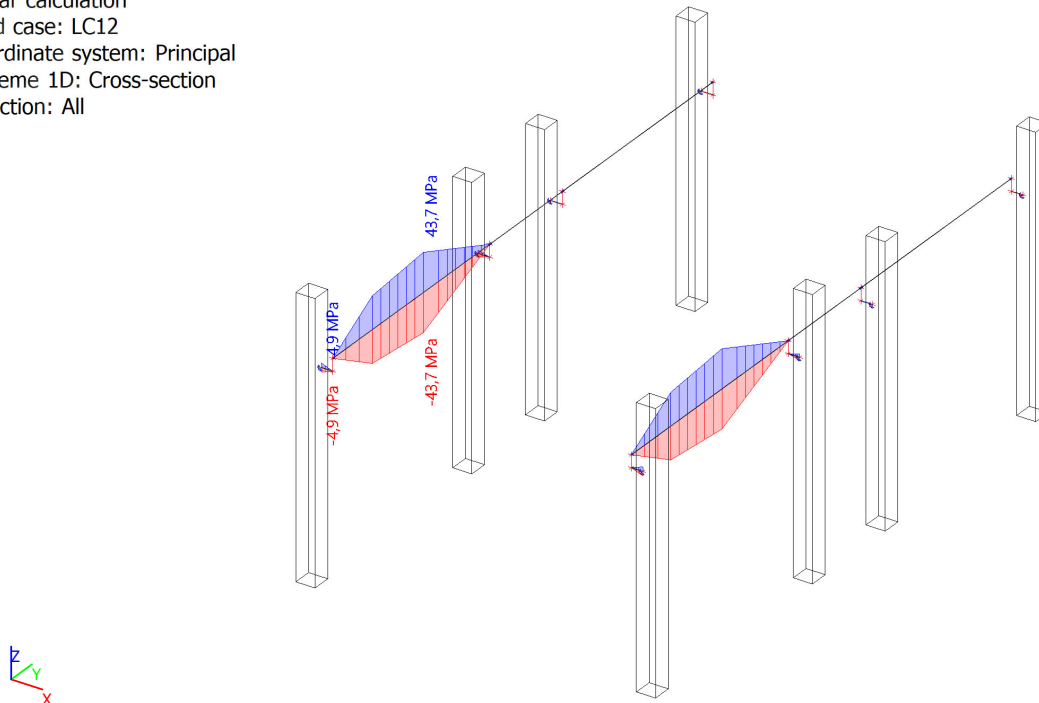
Name	dx [mm]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]	Errors, warnings, notes
B414	300,002	Rmax +/1	CS77 - HEB300	S 235	0,10	0,10	0,00	W19, W22

Name	Combination key
Rmax +/1	1.35*LC1 + 1.50*LC9 + 1.35*LC10

FATIGUE

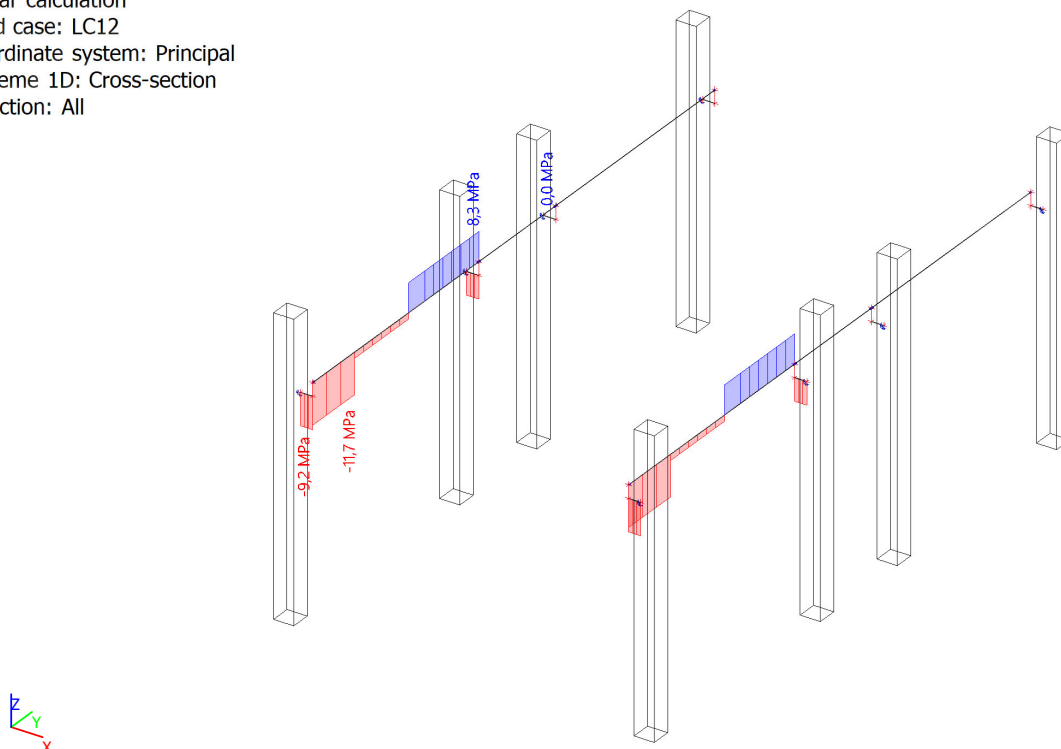
1D stresses; σ_x - fatigue

Values: σ_x
 Linear calculation
 Load case: LC12
 Coordinate system: Principal
 Extreme 1D: Cross-section
 Selection: All



1D stresses; τ_{xz} / τ_{xs} - fatigue

Values: τ_{xz} / τ_{xs}
 Linear calculation
 Load case: LC12
 Coordinate system: Principal
 Extreme 1D: Cross-section
 Selection: All



1D stresses

Linear calculation

Load case: LC12

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Name	dx [mm]	Fibre	Case	σ_x [MPa]	τ_{xy} / τ_{xs} [MPa]	τ_{xz} / τ_{xs} [MPa]
B410	2600,000-	13	LC12	-43,7	0,0	0,0
B410	2600,000-	1	LC12	43,7	0,0	0,0

1D stresses

Linear calculation

Load case: LC9

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Name	dx [mm]	Fibre	Case	σ_x [MPa]	τ_{xy} / τ_{xs} [MPa]	τ_{xz} / τ_{xs} [MPa]
B414	0,000	8	LC9	0,0	0,0	-13,1
B410	0,000	8	LC9	0,0	0,0	6,7

Mezní stav únavy FAT

Popis detailu	Odkaz na ČSN EN 1993-1-9	Kategorie detailu
Základní materiál horní pásnice v místě přivařených vodících plechů kolejnice	Tab. 8.3, č. 9	80
Základní materiál stojiny s přivařenou výztuhou v místě podpor	Tab. 8.4, č. 7	80

Posouzení pásnic pro rozkmit normálového napětí od ohybového momentu

- v místě přivaření kolejnice

Referenční únavová pevnost:

$$\Delta\sigma_c = 80 \text{ MPa}$$

$$\varphi_{fat,1} = \frac{1 + \varphi_1}{2} = \frac{1 + 1,1}{2} = 1,05$$

$$\varphi_{fat,2} = \frac{1 + \varphi_2}{2} = \frac{1 + 1,354}{2} = 1,177$$

Kategorie S	S ₀	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉
Normálové napětí	0,198	0,250	0,315	0,397	0,500	0,630	0,794	1,000	1,260	1,587
Smykové napětí	0,379	0,436	0,500	0,575	0,660	0,758	0,871	1,00	1,149	1,320

$$\lambda_\sigma = 0,630$$

$$\lambda_\tau = 0,758$$

Ekvivalentní únavové zatížení (viz. str.):

$$\Delta\sigma_{E2} = 43.70 \text{ MPa}$$

Únavové poškození:

- dílčí součinitel únavové pevnosti γ_{Mf}

Metoda hodnocení	Důsledky porušení	
	Mírné	závažné
Přípustná poškození	1,00	1,15
Bezpečná životnost	1,15	1,35

- dílčí součinitel únavového zatížení jeřáby $\lambda_{Ff} = 1,0$

$$D_\sigma = \gamma_{Ff}^3 \cdot \Delta\sigma_{E2}^3 \cdot \left(\frac{\gamma_{Mf}}{\Delta\sigma_c} \right)^3 = 1,0^3 \cdot 43.70^3 \cdot \left(\frac{1,35}{80} \right)^3 = 0,40 < 1,0 \Rightarrow \text{Vyhovuje}$$

Posouzení stojiny pro rozkmit hlavního napětí od ohybového momentu a posouvající síly

- v místě přivaření podporové výztuhy

Referenční únavová pevnost:

$$\Delta\sigma_c = 80 \text{ MPa}$$

$$\Delta\sigma_{E2} = 43.7 \text{ MPa}$$

$$\Delta\tau_{E2} = 13.1 \text{ MPa}$$

$$\Delta\sigma_{eq,E2} = \frac{1}{2} \left(\Delta\sigma_{E2} + \sqrt{\Delta\sigma_{E2}^2 + 4 \cdot \Delta\tau_{E2}^2} \right) = \frac{1}{2} \left(43,7 + \sqrt{43,7^2 + 4 \cdot 13,1^2} \right) = 47,3 \text{ MPa}$$

Únavové poškození:

$$D_\sigma = \gamma_{Ff}^3 \cdot \Delta\sigma_{eq,E2}^3 \cdot \left(\frac{\gamma_{Mf}}{\Delta\sigma_c} \right)^3 = 1,0^3 \cdot 47,3^3 \cdot \left(\frac{1,35}{80} \right)^3 = 0,50 < 1,0 \Rightarrow \text{Vyhovuje}$$

ZÁVĚR

Ocelové konstrukce **vyhovují na mezní stav pevnosti a mezní stav použitelnosti dle ČSN EN 1993-1-1.**