

STATISCHE BEREKENING

DOC Kaas B.V.


**Engineering ondersteuningsconstructie
t.b.v. rookgascondensor**

Staalconstructie

Projectnummer 23337

Opdrachtgever : **DOC Kaas B.V.**

Constructeur : **D. van der Linden**

Gezien : **P. van** 

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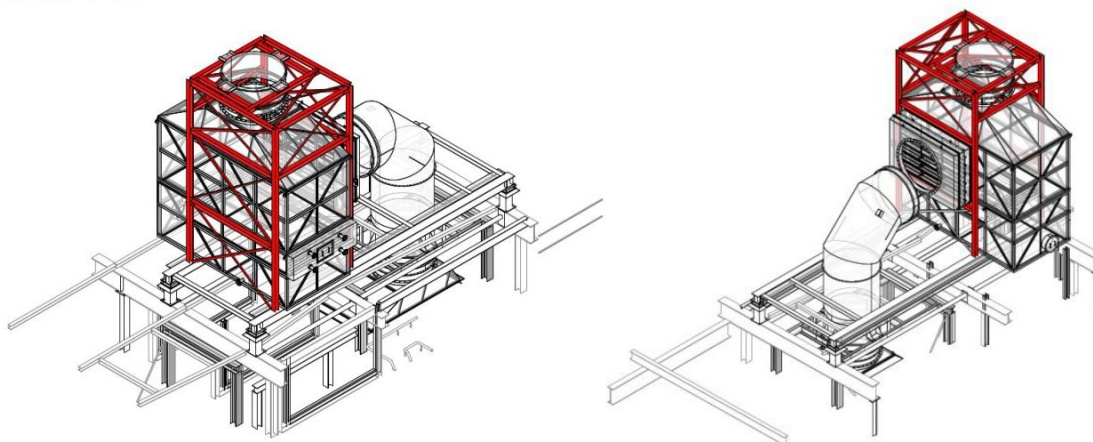
Bijlage A Computeruitvoer Scia Engineer

1. INLEIDING

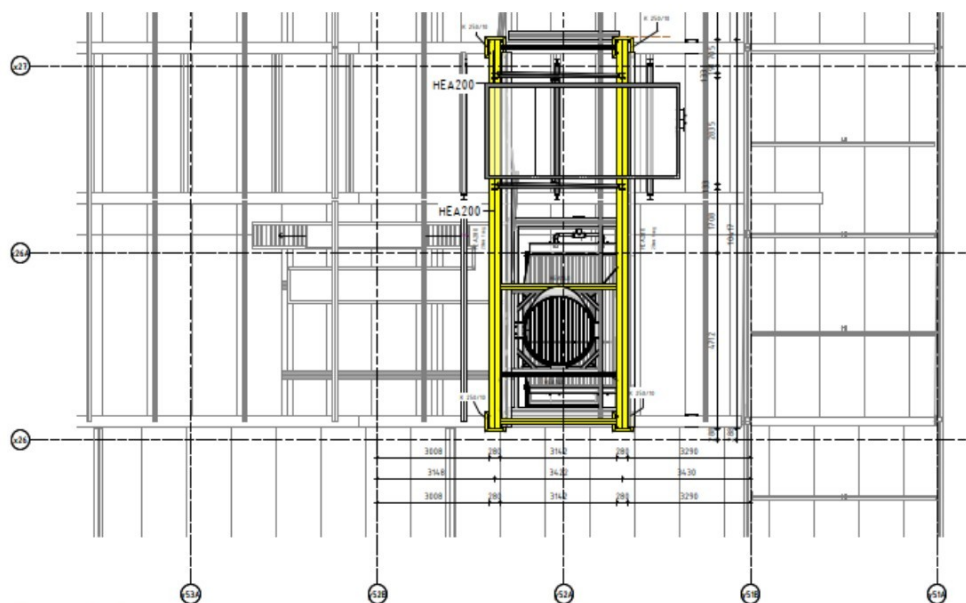
1.1 Projectomschrijving

Vanuit DOC Kaas B.V. te Hoogeveen is opdracht gegeven om een hulpconstructie en ondersteuningsconstructie te ontwerpen ten behoeve van een rookgascondensor. De condensor wordt op de bestaande dakconstructie geplaatst van het Energiegebouw.

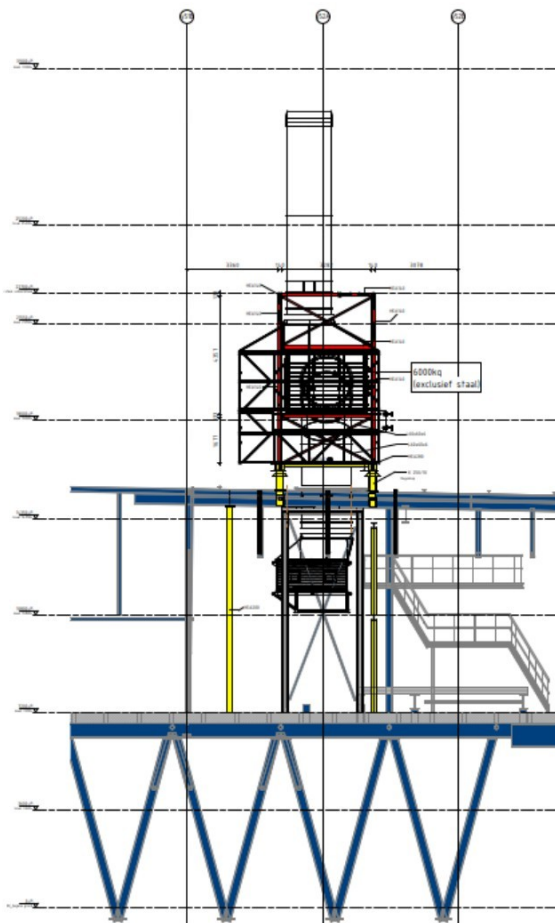
Figuur 1 toont het 3D-aanzicht van de rookgascondensor met de hulpconstructie (rood). In Figuur 2 is de plattegrond weergegeven van de ondersteuningsconstructie (geel). Deze dient ter ondersteuning van zowel de rookgascondensor als de hulpconstructie. Daarnaast worden enkele kolommen bijgevoegd voor de krachtsafdracht naar de verdiepingvloer op 7.200+Peil.



Figuur 1: 3D-aanzicht rookgascondensor en hulpconstructie (rood)



Figuur 2: Plattegrond ondersteuningsconstructie (geel)



Figuur 3: Langsdoorsnede rookgascondensor, ondersteuningsconstructie en bestaande staalconstructie

1.2 **Constructieve opzet**

De nieuwe rookgascondensor met de hulpconstructie heeft afmetingen ca 3,1 x 2,8 x 6,3 m¹ (lxbxh) met een schoorsteen van 1,9 x 0,5 x 6,7 m¹ (lxbxh). De schoorsteen wordt niet afgeschoord naar de dakconstructie en dient de optredende krachswerking volledig zelfstandig naar de dakconstructie af te dragen middels het schematische principe van een uitkraging met een momentvaste verbinding ter plaatse van de koppeling met de rookgascondensor.

De condensor met hulpconstructie wordt geplaatst op een ondersteuningsconstructie met afmetingen ca 10,0 x 3,4 x 1,0 m¹ (lxbxh). Als gevolg van de beperkte overcapaciteit van de bestaande dakliggers worden 4 kolommen bijgeplaatst naar de onderliggende verdiepingvloer op 7.200+Peil.

Conform opgave opdrachtgever is gebleken dat de verdiepingvloer op 7.200+Peil ontworpen is op (zeer) hoge belastingen en een nadere controle voor de rookgascondensor hiervoor niet benodigd is.

Voor een volledig overzicht wordt verwezen naar de tekeningen.

1.3 Normen en voorschriften

Uitgangspunt voor de berekening is gebaseerd op de laatste uitgave van de volgende Europese normen met Nederlandse Nationale Bijlagen:

- NEN-EN 1990 & NB Grondslagen van het constructief ontwerp
- NEN-EN 1991 & NB Belastingen op de constructies
- NEN-EN 1992 & NB Betonconstructies
- NEN-EN 1993 & NB Staalconstructies
- NEN-EN 1994 & NB Staal-betonconstructies
- NEN-EN 1995 & NB Houtconstructies
- NEN-EN 1996 & NB Constructies van metselwerk
- NEN-EN 1997 & NB Geotechnische ontwerp
- NEN-EN 1998 & NB Aardbevingsbestendige constructies
- NEN-EN 1999 & NB Aluminiumconstructies

1.4 Gebruikte programma's

- Word
- Excel
- Scia Engineer

1.5 Gebruikte documenten

Tabel 1: Overzicht gebruikte documenten

Documentnummer	Omschrijving	Datum
45KS-203	Energiegebouw – 3D-view	12-12-2002
45KS-209	Energiegebouw – merken overzicht onderbouw	23-01-2003
45KS-214	Energiegebouw – 3D view bovenbouw	13-02-2003
45AO-001	Energiegebouw - Doorsneden	13-10-2003
DO-45KS-005	BD45 – Toevoegen rookgascondensor Frame 3D	21-12-2023
DO-45KS-001	BD45 – Toevoegen rookgascondensor Plattegrond 7.200+	21-12-2023
DO-45KS-010	BD45 – Toevoegen rookgascondensor Frame aanzicht/doorsnede (dwars)	21-12-2023
DO-45KS-011	BD45 – Toevoegen rookgascondensor Frame plattegrond (bovendaks)	21-12-2023
DO-45KS-002	BD45 – Toevoegen rookgascondensor Dakplattegrond (overzicht)	21-12-2023

1.6 Aannames en onzekerheden

Op basis van het bureauonderzoek zijn de volgende aannames en observaties gedaan:

- a) Er wordt vanuit gegaan dat de constructie in de bestaande situatie voldoende capaciteit heeft om te voldoen aan de minimale eisen met betrekking NEN 8700;
- b) Op tekening "DO-45KS-005, d.d. 21-12-2023" zijn de windverbanden deels aangegeven. Hierin bestaat een deel uit profielen L60/60/6 en een deel uit profielen L60/60/10. Voor deze rapportage wordt conservatief uitgegaan van profielafmetingen L60/60/6 voor alle windverbanden.

2. GRONDSLAGEN

2.1 Grondslagen van het ontwerp

Type constructie	:	Gebouw
Ontwerplevensduurklasse	:	4
Ontwerplevensduur	:	50 jaar
Betrouwbaarheidsklasse	:	RC1
Gevolgsklasse	:	CC1 ($K_{FI} = 0.9$)

2.2 Combinatiefactoren

Een overzicht van de gehanteerde combinatiefactoren is weergegeven in Tabel 2.

Tabel 2: Overzicht gehanteerde combinatiefactoren

Belasting	Ψ_0	Ψ_1	Ψ_2
Categorie E – industrie	1,0	0,9	0,8
Sneeuwbelasting	0,0	0,2	0,0
Windbelasting	0,0	0,2	0,0

2.3 Materialien

Tenzij anders vermeld worden de hieronder aangegeven materiaalspecificaties gehanteerd voor zowel de bestaande als nieuwe constructiedelen:

- Staal S235 (profielstaal en buis- en kokerprofielen)
- Bouten 8.8
- Ankers 4.6 gerolde draad

2.4 Duurzaamheid

Specifieke aspecten met betrekking tot duurzaamheid, zoals milieuklasse, betondekking, conservering e.d. worden (indien nodig) vermeld in specificaties, tekeningen en materiaal gebonden berekeningen. In deze rapportage wordt ervanuit gegaan dat er geen sprake is van enige materiaaldegradaties die de constructieve samenhang kunnen beïnvloeden. Mocht gedurende de werkzaamheden blijken dat (delen van) de constructie aantastingen of onvolkomenheden bevat, dan dient dit ter beoordeling te worden voorgelegd.

2.5 Veiligheidsfactoren uiterste grenstoestanden

De veiligheidsfactoren worden aangehouden conform de Eurocode-normen op basis van de van toepassing zijnde betrouwbaarheidsklasse. Indien nodig, wordt voor bestaande constructiedelen tevens een controle uitgevoerd op basis van de gereduceerde veiligheidsfactoren op "verbouwniveau" conform NEN8700.

Tabel 3: Rekenwaarden van belastingen nieuwe constructies (Eurocode - groep B)

Blijvende en tijdelijke ontwerp situaties	Blijvende belastingen		Overheersende veranderlijke belasting	Veranderlijke belastingen gelijktijdig met de overheersende	
	Ongunstig	Gunstig		Belangrijkste (zo nodig)	Andere
(verg. 6.10a)	1,22 $G_{kj,sup}^a$	0,90 $G_{kj,inf}$			$1,35\Psi_{0,i}Q_{k,i}$ ($i>1$)
(verg. 6.10b)	1,08 $G_{kj,sup}^b$	0,90 $G_{kj,inf}$	$1,35 Q_{k,1}$		$1,35\Psi_{0,i}Q_{k,i}$ ($i>1$)

^a Bij vloeistofdrukken met een fysiek beperkte waarde mag zijn volstaan met $1,2 G_{kj,sup}$

^b Deze waarde is berekend met $\xi = 0,89$

2.6 Veiligheidsfactoren bruikbaarheidsgrenstoestanden

De veiligheidsfactoren voor de bruikbaarheidsgrenstoestanden voor de controles op doorbuigingen en verplaatsingen worden aangehouden conform de Eurocode-normen.

Tabel 4: Rekenwaarden van belastingen voor gebruik in belastingcombinaties

Combinaties	Blijvende belastingen		Veranderlijke belastingen	
	Ongunstig	Gunstig	Ongunstig	Gunstig
Karakteristiek	$1,0 G_{kj,sup}$	$1,0 G_{kj,inf}$	$1,0\Psi_{0,i}Q_{k,i}$	$1,0\Psi_{0,i}Q_{k,i}$
Frequent	$1,0 G_{kj,sup}$	$1,0 G_{kj,inf}$	$1,0\Psi_{1,i}Q_{k,i}$	$1,0\Psi_{1,i}Q_{k,i}$
Quasi-blijvend	$1,0 G_{kj,sup}$	$1,0 G_{kj,inf}$	$1,0\Psi_{2,i}Q_{k,i}$	$1,0\Psi_{2,i}Q_{k,i}$

3. BELASTINGEN

3.1 Blijvende belastingen

3.1.1 Eigen gewicht

Conform Tabel A1 t/m A12 van NEN-EN 1991-1-1
Conform Scia Engineer computeruitvoer

3.1.2 Dakconstructie

Conform opgave opdrachtgever

Geperforeerde stalen dakplaten, type onbekend	0,25 kN/m ²
Isolatie, dikte onbekend	0,10 kN/m ²
Topplaat 18mm	0,15 kN/m ²
Kunststof dakbedekking	0,15 kN/m ²
Leidingwerk	1,00 kN/m ²
Totaal G _k	1,65 kN/m²

3.1.3 Rookgascondensor

Conform opgave opdrachtgever

Gewicht	135,0 kN
Afmetingen	2,97 x 3,42 m ¹
Totaal G _k	13,3 kN/m²

3.2 Veranderlijke belastingen

3.2.1 Dakconstructie

Categorie H – onderhoudsbelasting	1,00 kN/m ² op 10m ²
Totaal Q _k	1,00 kN/m² op 10m²

3.3 Sneeuwbelasting

Sneeuwbelasting op daken volgens NEN-EN 1991-1-3

Sneeuwbelasting	$\mu_1 * C_e * C_t * s_k$
Sneeuwbelasting op de grond (s _k)	0,70 kN/m ²
Blootstellingscoëfficiënt (C _e)	1,0
Warmtecoëfficiënt (C _t)	1,0
Hellingshoek 0° (μ ₁)	0,80
Totaal Q _k	0,56 kN/m²

3.4 Windbelasting

Windbelasting op gevels en daken volgens NEN-EN 1991-1-4

Maximale hoogte	29,4 m ¹	
Windgebied	III	
Bebouwd/onbebouwd	onbebouwd	
Extreme stuwdruk	0,91 kN/m ²	
Uitwendige drukcoëfficiënt (C_{pe}) $C_{pe;D} = 0,80$ en $C_{pe;E} = 0,50$		
Inwendige drukcoëfficiënt (C_{pi})	niet van toepassing	
Totaal $Q_{;K}$		1,18 kN/m²

3.5 Regenwaterbelasting

Bij bestaande constructies wordt ervanuit gegaan dat er voldoende rekening is gehouden met noodoverlaat-voorzieningen, zodat wateraccumulatie niet kan optreden. Mocht in een later stadium blijken dat er wél sprake is van wateraccumulatie, dan dient hiervoor een separate beoordeling te worden uitgevoerd.

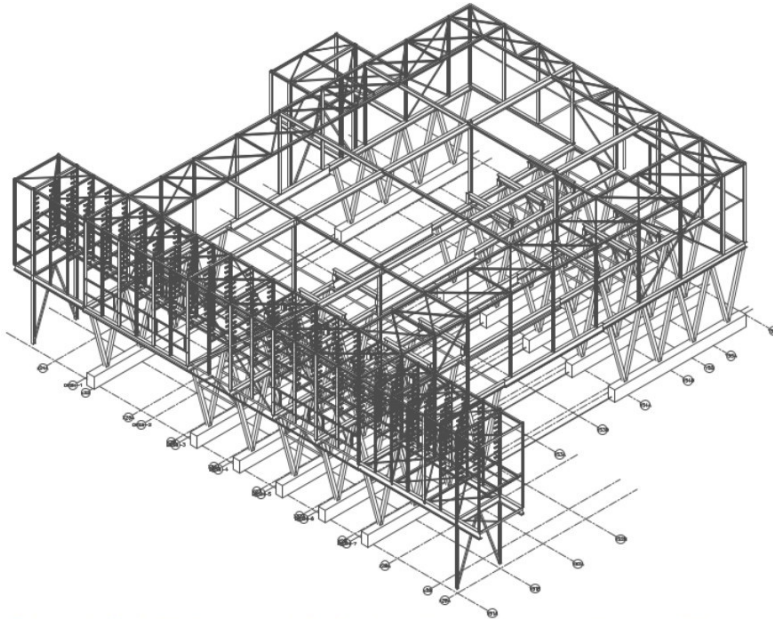
3.6 Thermische belasting

Er wordt geen rekening gehouden met thermische belastingen.

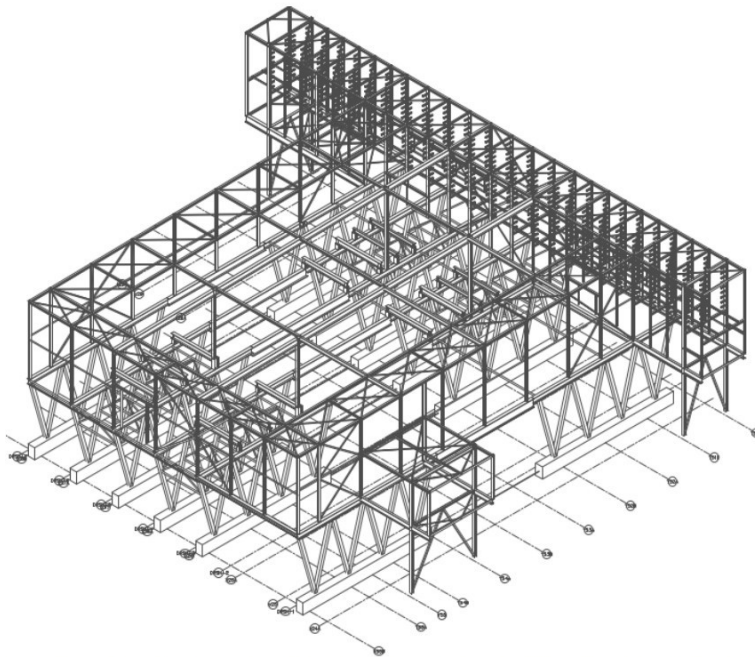
4. STABILITEIT

Als gevolg van de windbelasting op de rookgascondensor is er sprake van een zeer geringe toename ten opzichte van de totale windbelasting op het gehele bouwwerk. Hierdoor wordt een aanvullende stabiliteitsberekening van het bouwwerk niet nodig geacht. De hulpconstructie en ondersteuningsconstructie dienen de windbelastingen over te dragen naar de hoofddraagconstructie en maken wel onderdeel uit van deze rapportage.

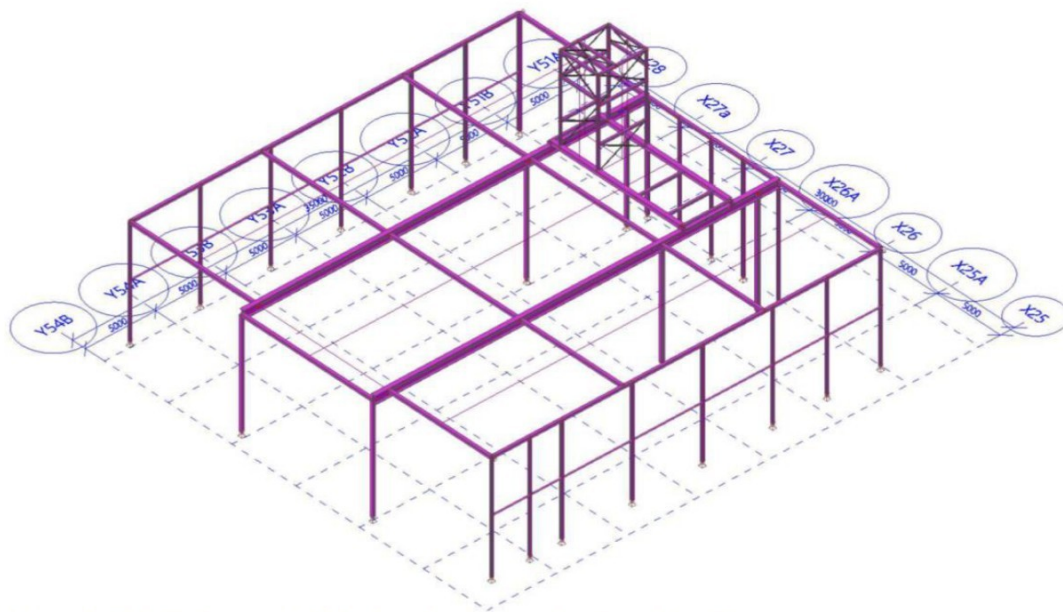
Een overzicht van de constructie wordt getoond in Figuur 4.



Figuur 4: Stabiliteit – overzicht bestaande staalconstructie voorzijde



Figuur 5: Stabiliteit – overzicht bestaande staalconstructie achterzijde

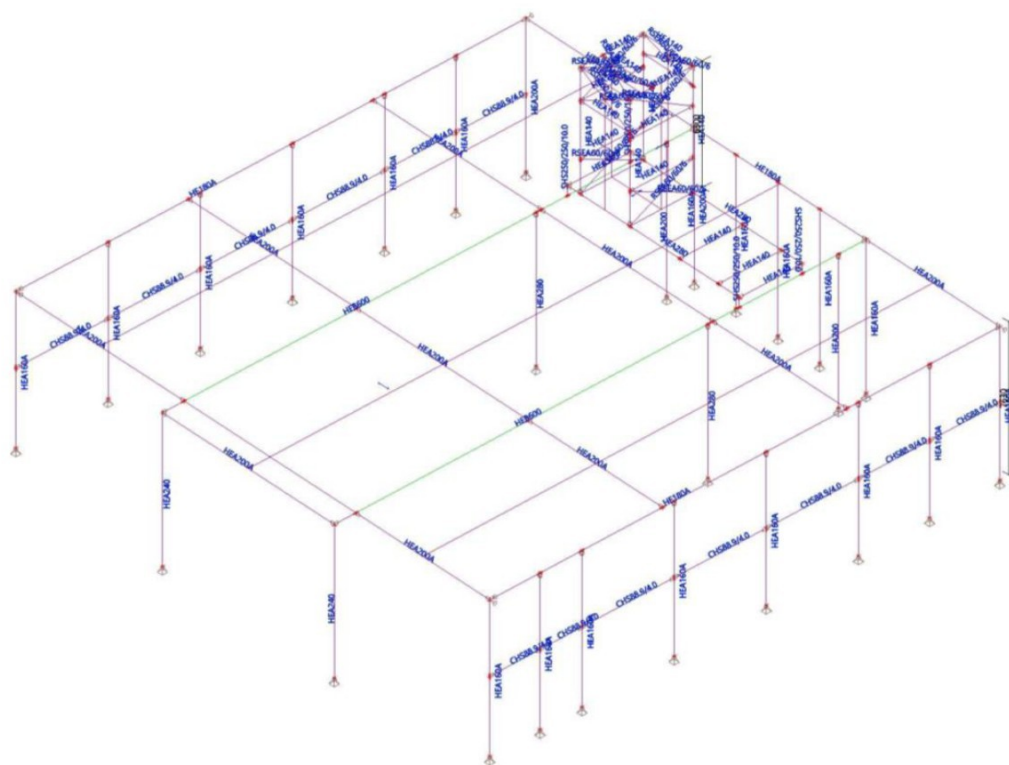


Figuur 6: Stabiliteit – overzicht bestaande staalconstructie achterzijde

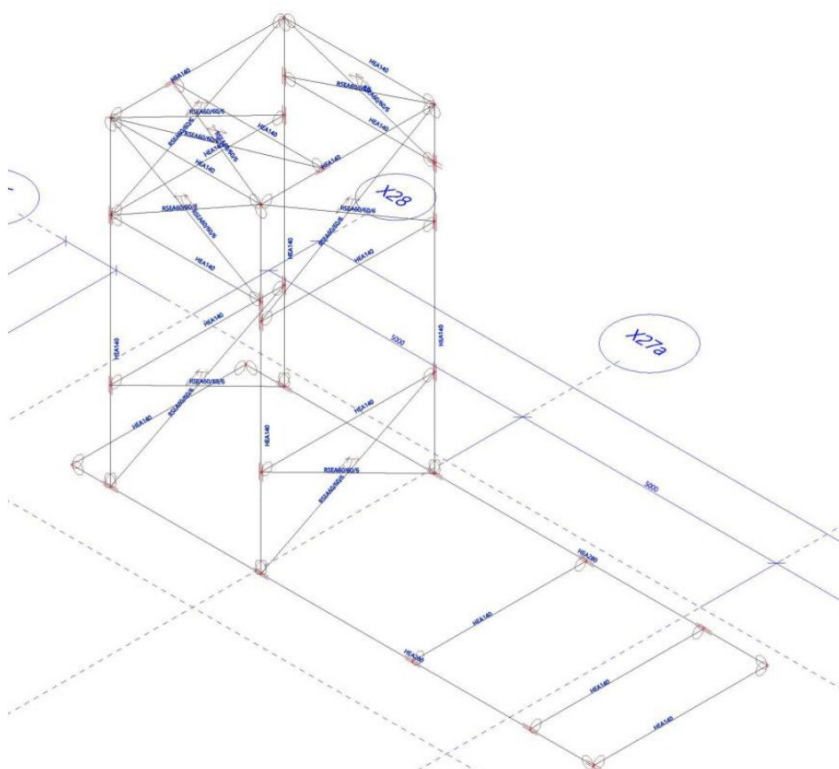
5. STAALCONSTRUCTIE

5.1 Geometrie en profielafmetingen

De geometrie en profielafmetingen van de staalconstructie zijn weergegeven in Figuur 7 en de SCIA computeruitvoer in Bijlage A. Een nadere uitsplitsing van de profielafmetingen per categorie is opgenomen in de computeruitvoer.



Figuur 7: Profielafmetingen staalconstructie compleet



Figuur 8: Profielafmetingen staalconstructie hulpconstructie

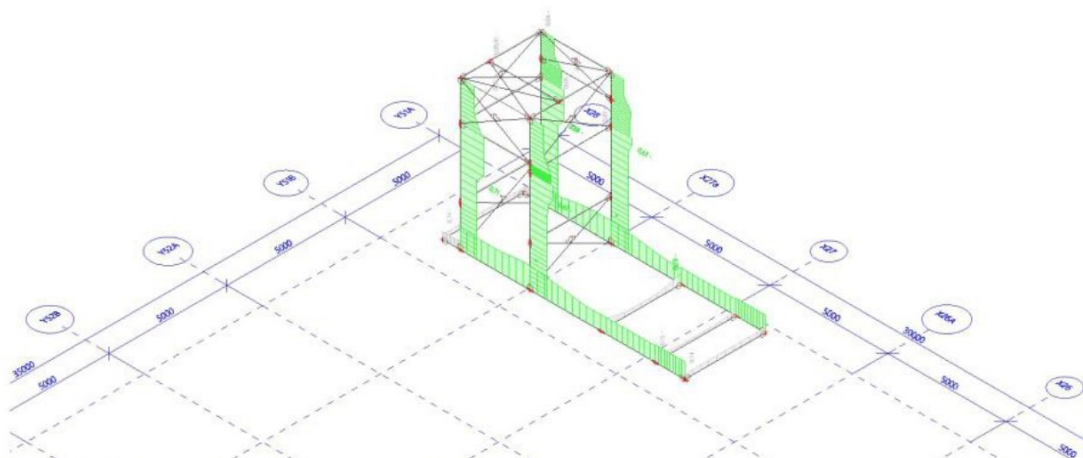
5.2 Controle staalprofielen

Een uitgebreid overzicht van de resultaten is weergegeven in de Scia computeruitvoer in Bijlage A. De controles op sterkte voor de hulpconstructie en bestaande kolommen zijn tevens weergegeven in Figuur 9 en Figuur 10.

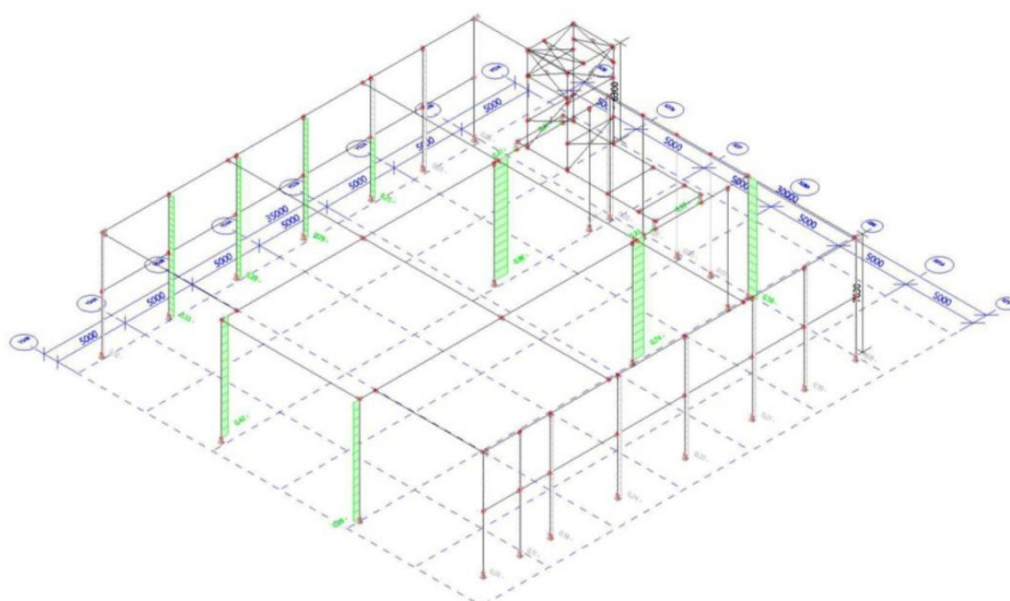
De bestaande kolommen HEA240 ter plaatse van stramien y52B/X27 voldoen niet op knikstabiliteit conform de vigerende Eurocode of op basis van het gereduceerde veiligheidsniveau voor bestaande constructies op “verbouwniveau” conform NEN8700. De kolommen dienen te worden versterkt tot minimaal de knikstabiliteit en doorsnedecapaciteit van een HEA280. Een voorstel hiertoe dient ter goedkeuring te worden voorgelegd.

Tabel 5: Overzicht unity checks constructiedelen

Onderdeel	Veiligheidsniveau	U.C.	Conclusie
Hulpconstructie	Eurocode	0,71	akkoord
Schoren	Eurocode	0,72	akkoord
Nieuwe kolommen	Eurocode	0,08	akkoord
Bestaande kolommen HEA240	Eurocode	1,49	niet akkoord
	NEN8700	1,34	niet akkoord
Versterkte kolommen HEA240 → HEA280	Eurocode	0,96	akkoord



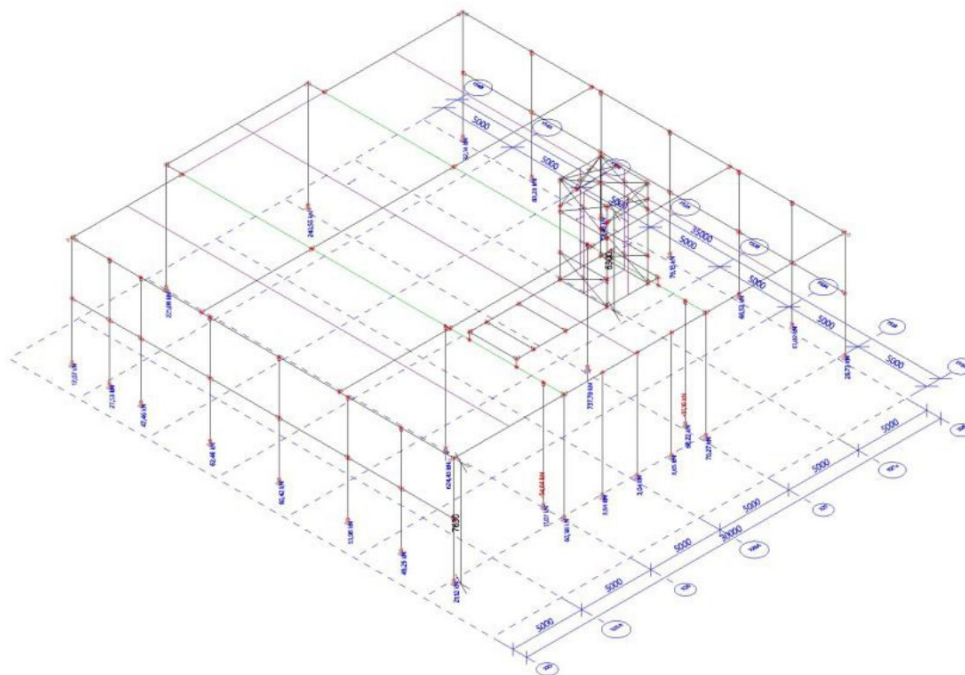
Figuur 9: Controle op sterkte – hulpconstructie



Figuur 10: Controle op sterkte – bestaande en versterkte kolommen

6. REACTIEKRACHTEN

De reactiekrachten op de verdiepingsvloer op 7.200+ worden inzichtelijk gemaakt. Een overzicht van de maximaal optredende reacties in de uiterste grenstoestand en bruikbaarheidsgrenstoestand is weergegeven in de Scia computeruitvoer in Bijlage B en in Figuur 11 en Tabel 6.



Figuur 11: Reactiekrachten

Tabel 6: Overzicht maximale reactiekrachten in UGT en BGT

Belastingcombinatie	Verticaal druk F_z [kN]	Verticaal trek F_z [kN]	Horizontaal F_x [kN]	Horizontaal F_y [kN]
Uiterste grenstoestand	990,4	92,5	-	-
Bruikbaarheids- grenstoestand	830,8	23,7	-	-

Geadviseerd wordt, de maximaal optredende reactiekrachten te verifiëren met de capaciteit van de bestaande verdiepingsvloer en funderingsconstructie.

7. CONCLUSIE

De profielaftmetingen van de staalconstructie zijn als volgt:

- Kolommen HEA140 en HEA200
- Liggers HEA140
- Onderslagliggers HEA280
- Schoren Hoekstaal L60/60/6

De 2 bestaande kolommen HEA240 ter plaatse van stramien y52B/X27 voldoen niet op knikstabiliteit conform de vigerende Eurocode of op basis van het gereduceerde veiligheidsniveau voor bestaande constructies op "verbouwniveau" conform NEN8700. De kolommen dienen te worden versterkt tot minimaal de knikstabiliteit en doorsnedecapaciteit van een HEA280. Een voorstel hiertoe dient ter goedkeuring te worden voorgelegd.

Geadviseerd wordt, de maximaal optredende reactiekrachten te verifiëren met de capaciteit van de bestaande verdiepingvloer en funderingsconstructie.

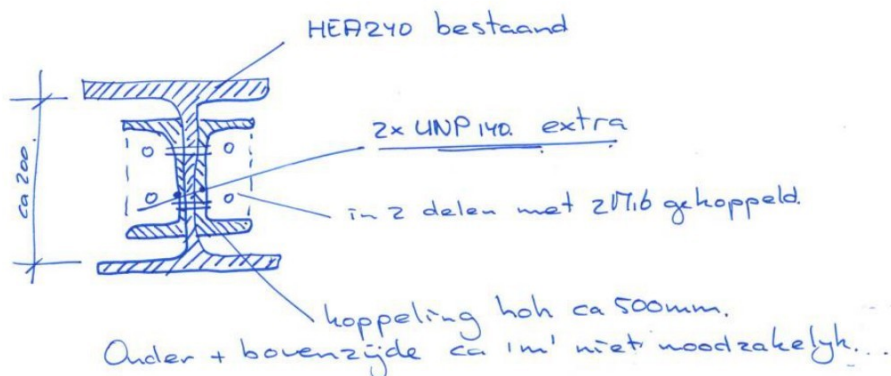
- Maximale reactiekracht 990,4 kN
- Maximale trekkracht 92,5 kN

7.1 Kolomversterking

986,13 / 0,37	=	2.665 kN
(2665 x 1000)/235	=	13.440 mm ²
Bestaande kolom	=	7.680 mm ²
Nieuwe profielen 13.440 – 7.780	=	3.660 mm ²

1x UNP220 of 2x UNP 140

DOC Hoogeveen kolomversterking ketelhuis.



Principe detail kolomversterking

Figuur 12

BIJLAGE A

1. Project

Licence user	info@vorm4.nl
Project	231216_H4K_DOC Hoogeveen_Condensor [23337]
Part	Condensor
Description	Steel calculation
Author	
Date	28-6-2024
Structure	General XYZ
No. of nodes :	116
No. of beams :	95
No. of slabs :	0
No. of solids :	0
No. of used profiles :	12
No. of load cases :	9
No. of used materials :	1
Acceleration of gravity [m/s ²]	9,810
National code	EC - EN

2. Table of contents

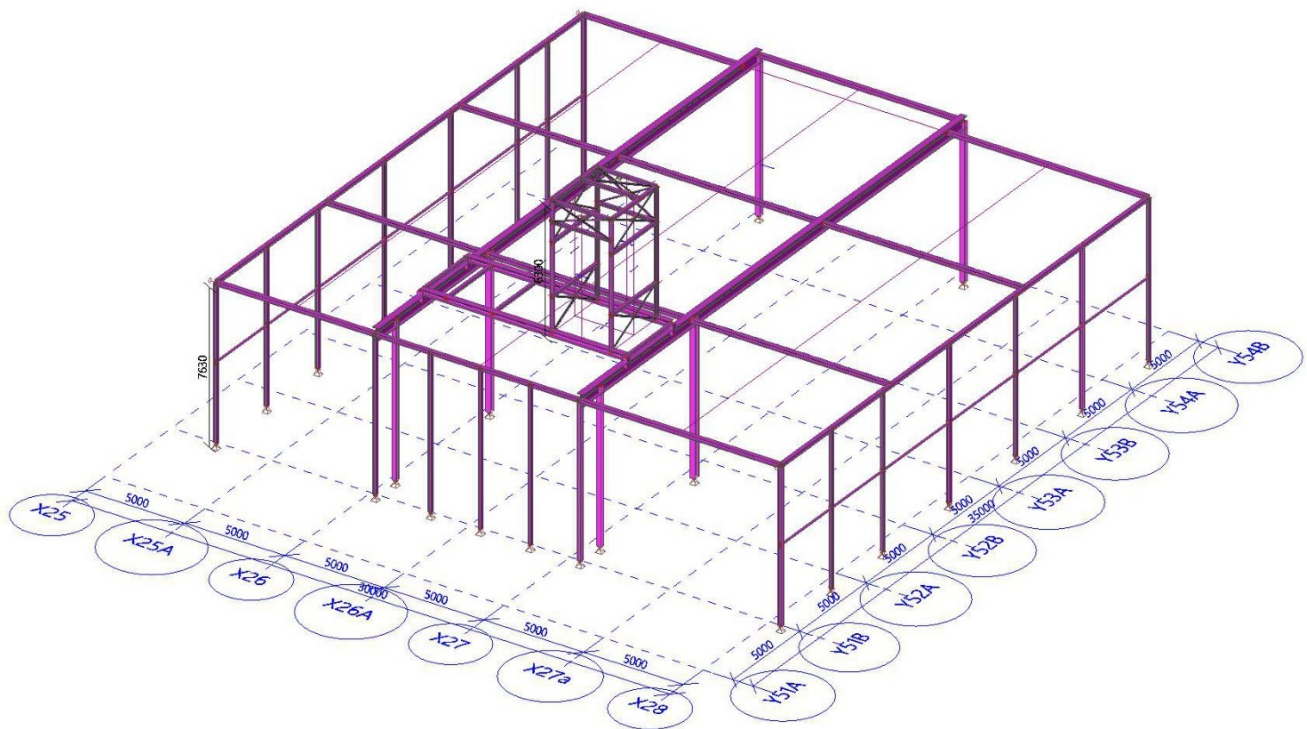
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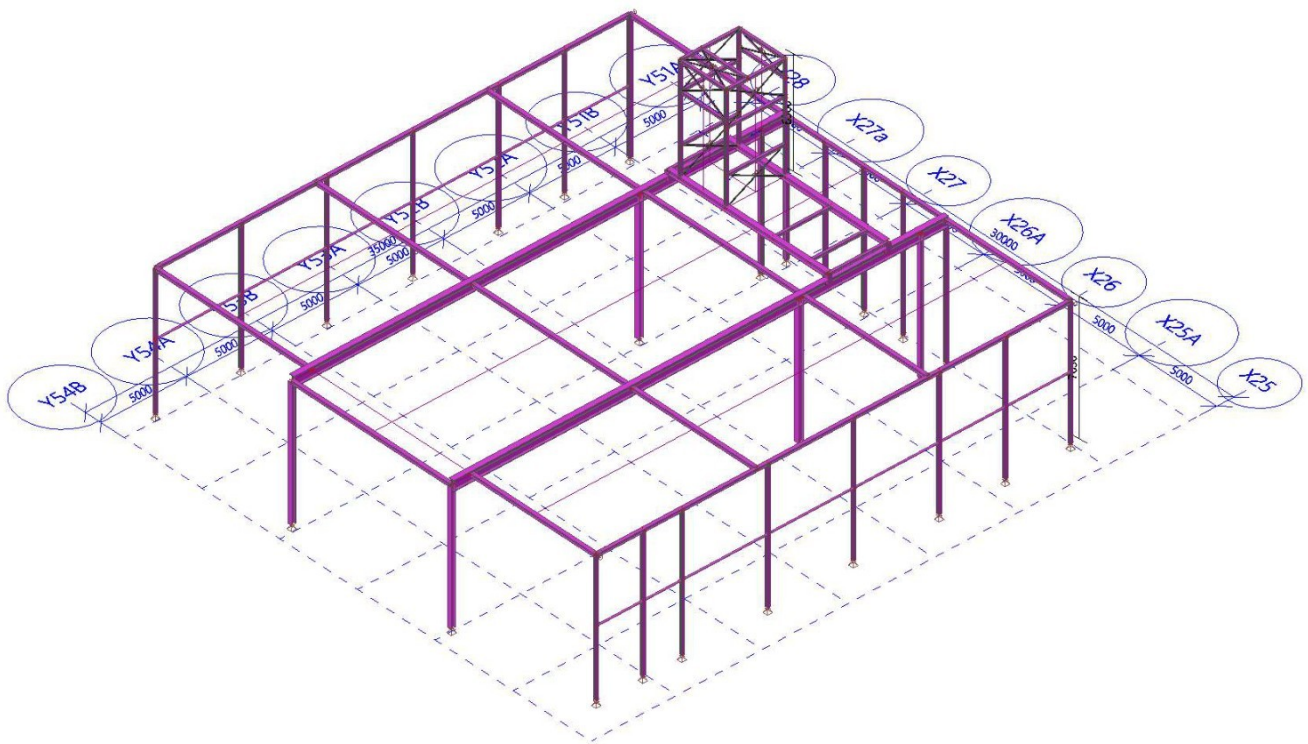
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3. Overall project description

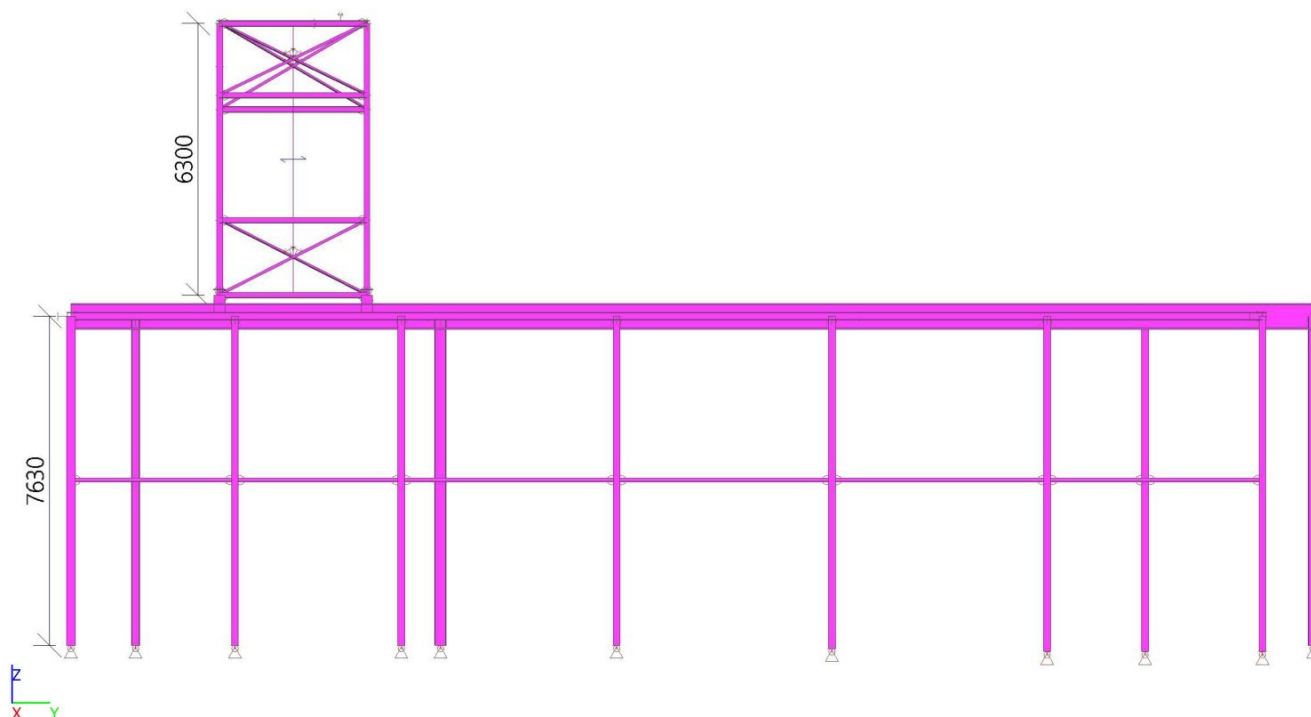
3.1. Isometric view



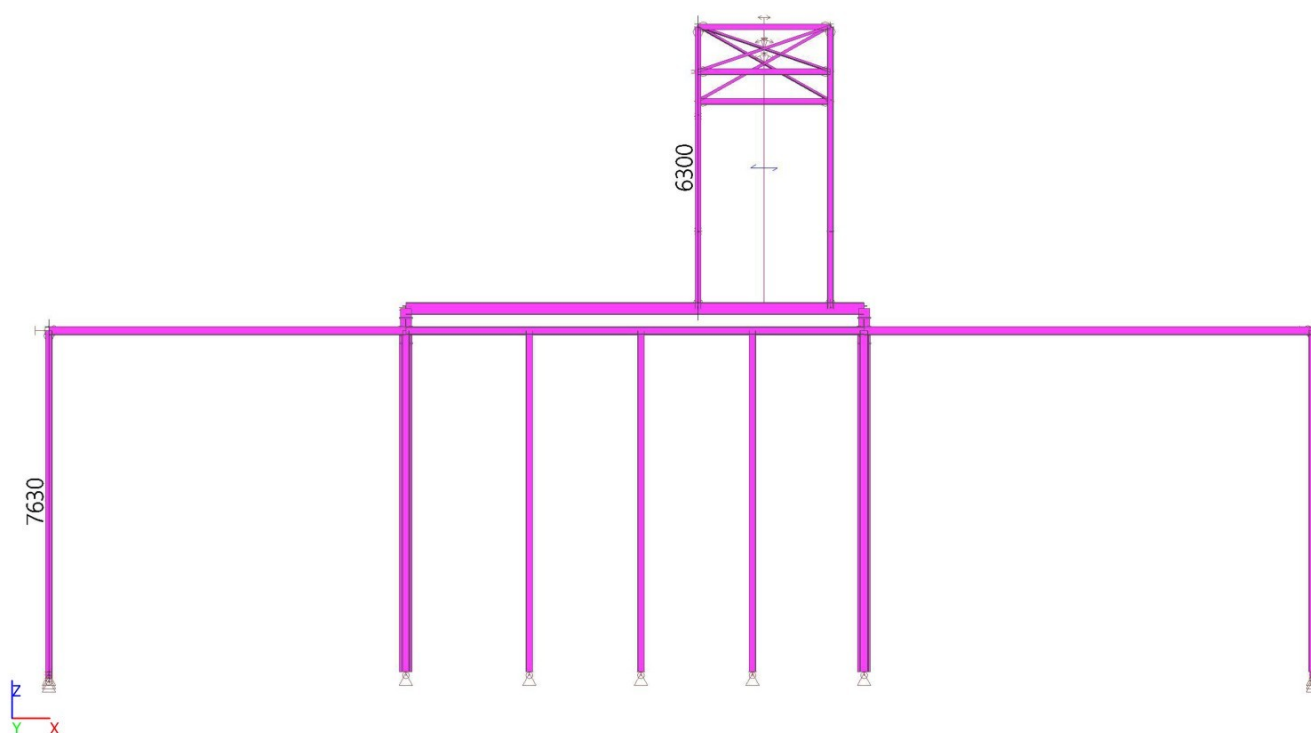
3.2. Izometric view



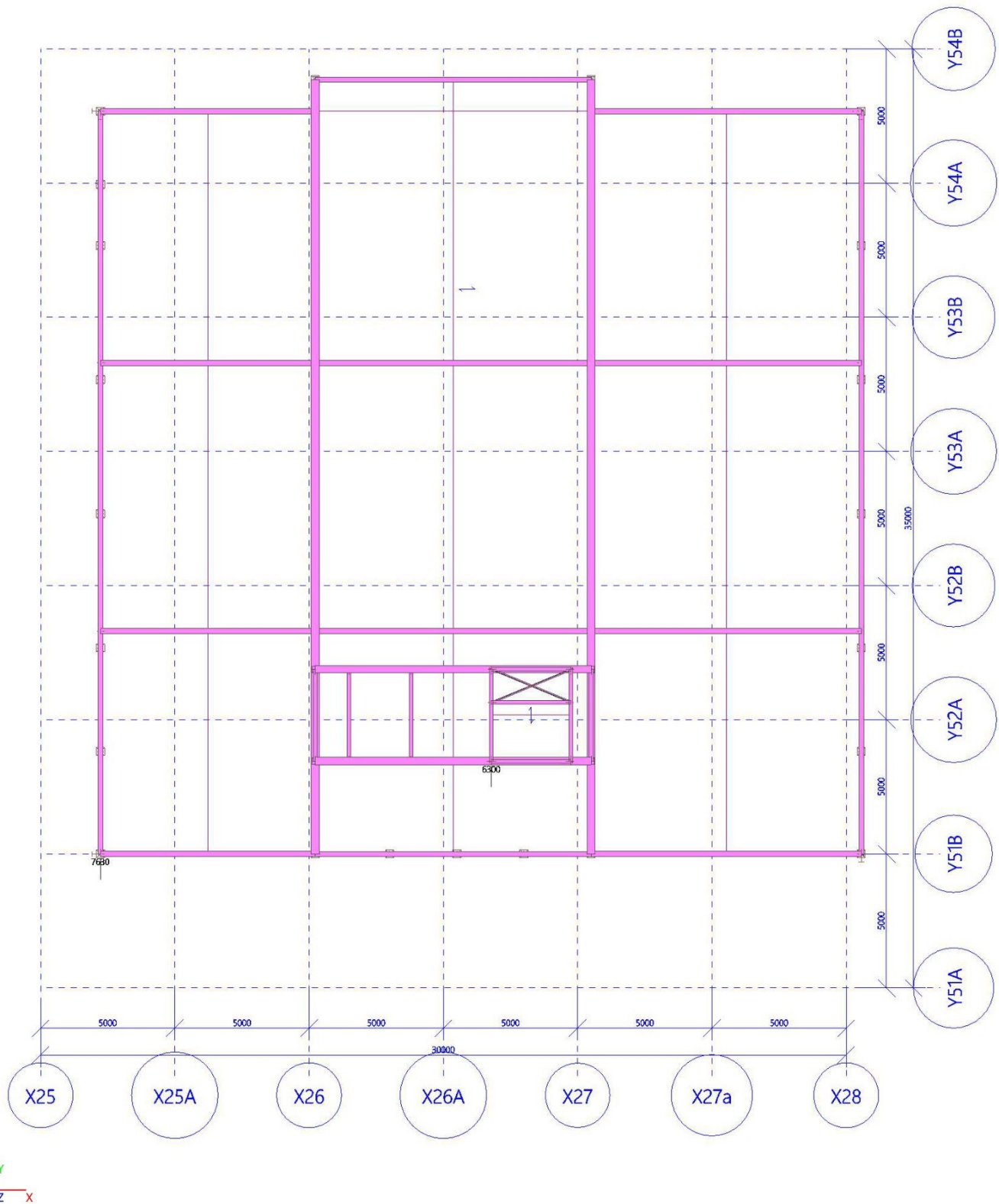
3.3. X view



3.4. Y view



3.5. Z view

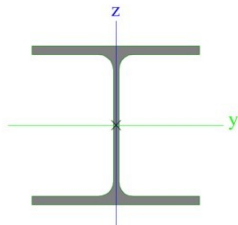


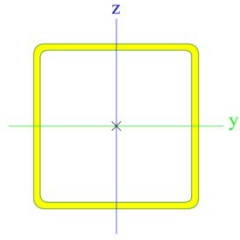
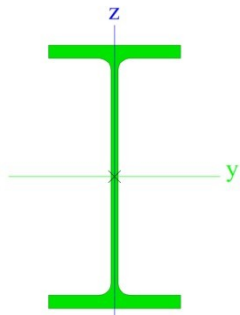
3.6. Materials

Steel EC3

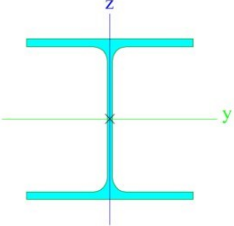
Name	Unit mass [kg/m ³]	E mod [MPa] G mod [MPa]	Poisson - nu Thermal exp [m/mK]	Lower limit [mm]	Upper limit [mm]	Fy (range) [MPa]	Fu (range) [MPa]
S 235	7850,00	2,1000e+05 8,0769e+04	0.3 0,01e-003	0,00 40,00	40,00 80,00	235,0 215,0	360,0 360,0

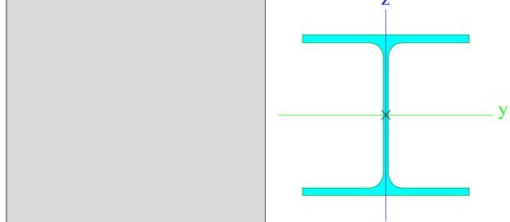
3.7. Cross-sections

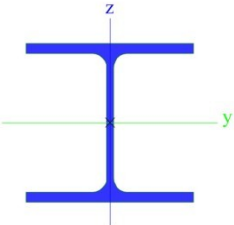
CS1		
Type	HEA200	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [mm ²]	5,3800e+03	
A _y [mm ²], A _z [mm ²]	3,8781e+03	1,3287e+03
I _y [mm ⁴], I _z [mm ⁴]	3,6900e+07	1,3400e+07
W _{ely} [mm ³], W _{elz} [mm ³]	3,8900e+05	1,3400e+05
W _{ply} [mm ³], W _{plz} [mm ³]	4,2917e+05	2,0375e+05
I _w [mm ⁶], I _t [mm ⁴]	1,0800e+11	2,1000e+05
d _y [mm], d _z [mm]	0,00	0,00
c _{yucs} [mm], c _{zucs} [mm]	100,00	95,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	101024052,22	101024052,22
M _{plz+} [Nmm], M _{plz-} [Nmm]	47909059,64	47909059,64
AL [m ² /m], AD [m ² /m]	1,1400e+00	1,1360e+00
β y [mm], β z [mm]	0,00	0,00
Picture		
CS2		
Type	SHS250/250/10.0	
Formcode	2 - Rectangular hollow section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	a	a
A [mm ²]	9,4900e+03	
A _y [mm ²], A _z [mm ²]	4,7454e+03	4,7454e+03
I _y [mm ⁴], I _z [mm ⁴]	9,0550e+07	9,0550e+07
W _{ely} [mm ³], W _{elz} [mm ³]	7,2400e+05	7,2400e+05
W _{ply} [mm ³], W _{plz} [mm ³]	8,5100e+05	8,5100e+05
I _w [mm ⁶], I _t [mm ⁴]	8,1380e+11	1,4110e+08
d _y [mm], d _z [mm]	0,00	0,00
c _{yucs} [mm], c _{zucs} [mm]	125,00	125,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	199851841,91	199851841,91
M _{plz+} [Nmm], M _{plz-} [Nmm]	199851841,91	199851841,91
AL [m ² /m], AD [m ² /m]	9,7400e-01	1,8769e+00

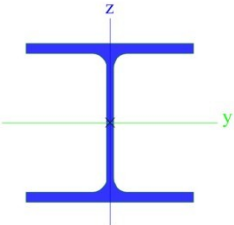
β_y [mm], β_z [mm]	0,00	
Picture		
CS3		
Type	HEB600	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	a	b
A [mm ²]	2,7000e+04	
A _y [mm ²], A _z [mm ²]	1,7556e+04	9,4190e+03
I _y [mm ⁴], I _z [mm ⁴]	1,7100e+09	1,3530e+08
W _{ely} [mm ³], W _{elz} [mm ³]	5,7010e+06	9,0200e+05
W _{ply} [mm ³], W _{plz} [mm ³]	6,4250e+06	1,3910e+06
I _w [mm ⁶], I _t [mm ⁴]	1,0965e+13	6,6720e+06
d _y [mm], d _z [mm]	0,00	0,00
c _{yUCS} [mm], c _{zUCS} [mm]	150,00	300,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	1510616844,60	1510616844,60
M _{plz+} [Nmm], M _{plz-} [Nmm]	326946488,13	326946488,13
AL [m ² /m], AD [m ² /m]	2,3200e+00	2,3224e+00
β_y [mm], β_z [mm]	0,00	0,00
Picture		
CS4		
Type	HEA280	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c

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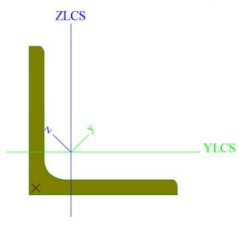
A [mm ²]	9,7300e+03	
A _y [mm ²], A _z [mm ²]	7,0049e+03	2,3104e+03
I _y [mm ⁴], I _z [mm ⁴]	1,3700e+08	4,7600e+07
W _{ely} [mm ³], W _{elz} [mm ³]	1,0100e+06	3,4000e+05
W _{ply} [mm ³], W _{plz} [mm ³]	1,1125e+06	5,1667e+05
I _w [mm ⁶], I _t [mm ⁴]	7,8537e+11	6,2100e+05
d _y [mm], d _z [mm]	0,00	0,00
C _{yUCS} [mm], C _{zUCS} [mm]	140,00	135,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	261616652,19	261616652,19
M _{plz+} [Nmm], M _{plz-} [Nmm]	121788568,51	121788568,51
AL [m ² /m], AD [m ² /m]	1,6000e+00	1,6026e+00
β _y [mm], β _z [mm]	0,00	0,00
Picture		

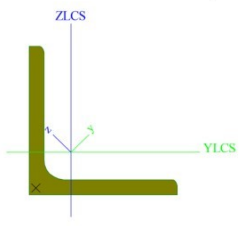
**CS5**

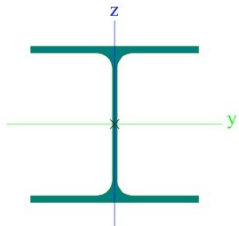
Type	HEA140	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	3,1400e+03	
A _y [mm ²], A _z [mm ²]	2,2882e+03	7,8192e+02
I _y [mm ⁴], I _z [mm ⁴]	1,0300e+07	3,8900e+06
W _{ely} [mm ³], W _{elz} [mm ³]	1,5500e+05	5,5600e+04
W _{ply} [mm ³], W _{plz} [mm ³]	1,7333e+05	8,5000e+04
I _w [mm ⁶], I _t [mm ⁴]	1,5064e+10	8,1300e+04
d _y [mm], d _z [mm]	0,00	0,00
C _{yUCS} [mm], C _{zUCS} [mm]	70,00	66,50
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	40800249,26	40800249,26
M _{plz+} [Nmm], M _{plz-} [Nmm]	19943235,38	19943235,38
AL [m ² /m], AD [m ² /m]	7,9400e-01	7,9430e-01
β _y [mm], β _z [mm]	0,00	0,00
Picture		

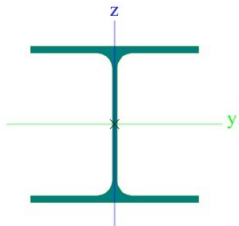
**CS9**

Type	RSEA60/60/6	
Formcode	4 - L section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	b
Flexural buckling z-z		
A [mm ²]	6,9500e+02	
A _y [mm ²], A _z [mm ²]	5,8463e+02	5,8786e+02

I _y [mm ⁴], I _z [mm ⁴]	3,6779e+05	9,6393e+04
W _{ely} [mm ³], W _{elz} [mm ³]	8,6689e+03	4,0174e+03
W _{ply} [mm ³], W _{plz} [mm ³]	1,3722e+04	7,0844e+03
I _w [mm ⁶], I _t [mm ⁴]	2,1441e-23	8,2080e+03
d _y [mm], d _z [mm]	-20,15	0,00
C _{yUCS} [mm], C _{zUCS} [mm]	16,97	16,97
α [deg]	45,00	
I _{yZLCS} [mm ⁴]	-1,3570e+05	
M _{ply+} [Nmm], M _{ply-} [Nmm]	3224759,32	3224759,32
M _{plz+} [Nmm], M _{plz-} [Nmm]	1664845,61	1664845,61
AL [m ² /m], AD [m ² /m]	2,3448e-01	2,3448e-01
β _y [mm], β _z [mm]	0,00	79,41
Picture		

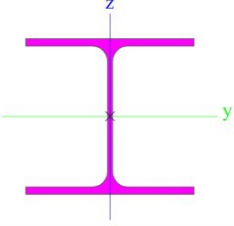
**CS11**

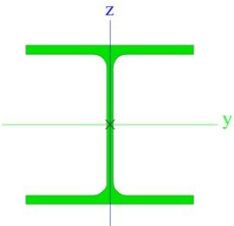
Type	HEA200A	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	4,4100e+03	
A _y [mm ²], A _z [mm ²]	3,1221e+03	1,1054e+03
I _y [mm ⁴], I _z [mm ⁴]	2,9400e+07	1,0700e+07
W _{ely} [mm ³], W _{elz} [mm ³]	3,1700e+05	1,0700e+05
W _{ply} [mm ³], W _{plz} [mm ³]	3,4708e+05	1,6333e+05
I _w [mm ⁶], I _t [mm ⁴]	8,4491e+10	1,2700e+05
d _y [mm], d _z [mm]	0,00	0,00
C _{yUCS} [mm], C _{zUCS} [mm]	100,00	93,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	81654177,22	81654177,22
M _{plz+} [Nmm], M _{plz-} [Nmm]	38355923,79	38355923,79
AL [m ² /m], AD [m ² /m]	1,1300e+00	1,1300e+00
β _y [mm], β _z [mm]	0,00	0,00
Picture		

**CS12**

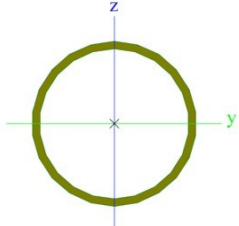
Type	HEA160A	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	3,0400e+03	
A _y [mm ²], A _z [mm ²]	2,1881e+03	7,2215e+02
I _y [mm ⁴], I _z [mm ⁴]	1,2800e+07	4,7900e+06
W _{ely} [mm ³], W _{elz} [mm ³]	1,7300e+05	5,9800e+04

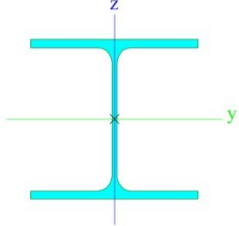
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W_{ply} [mm ³], W_{plz} [mm ³]	1,9042e+05	9,1250e+04
I_w [mm ⁶], I_t [mm ⁴]	2,3751e+10	6,3300e+04
d_y [mm], d_z [mm]	0,00	0,00
c_{yucs} [mm], c_{zucs} [mm]	80,00	74,00
α [deg]	0,00	
M_{ply+} [Nmm], M_{ply-} [Nmm]	44799078,44	44799078,44
M_{plz+} [Nmm], M_{plz-} [Nmm]	21476108,71	21476108,71
AL [m ² /m], AD [m ² /m]	9,0100e-01	9,0113e-01
β_y [mm], β_z [mm]	0,00	0,00
Picture		

CS14		
Type	HE180A	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	4,5300e+03	
A_y [mm ²], A_z [mm ²]	3,2772e+03	1,0992e+03
I_y [mm ⁴], I_z [mm ⁴]	2,5100e+07	9,2460e+06
W_{ely} [mm ³], W_{elz} [mm ³]	2,9360e+05	1,0270e+05
W_{ply} [mm ³], W_{plz} [mm ³]	3,2480e+05	1,5640e+05
I_w [mm ⁶], I_t [mm ⁴]	6,0210e+10	1,4880e+05
d_y [mm], d_z [mm]	0,00	0,00
c_{yucs} [mm], c_{zucs} [mm]	90,00	85,50
α [deg]	0,00	
M_{ply+} [Nmm], M_{ply-} [Nmm]	76399769,06	76399769,06
M_{plz+} [Nmm], M_{plz-} [Nmm]	36783343,34	36783343,34
AL [m ² /m], AD [m ² /m]	1,0241e+00	1,0241e+00
β_y [mm], β_z [mm]	0,00	0,00
Picture		

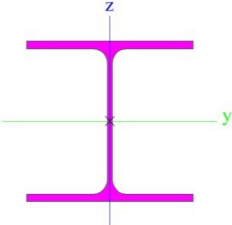
CS15		
Type	CHS88.9/4.0	
Formcode	3 - Circular hollow section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	a	a
Flexural buckling z-z		
A [mm ²]	1,0700e+03	
A_y [mm ²], A_z [mm ²]	6,7920e+02	6,7920e+02
I_y [mm ⁴], I_z [mm ⁴]	9,6300e+05	9,6300e+05
W_{ely} [mm ³], W_{elz} [mm ³]	2,1700e+04	2,1700e+04
W_{ply} [mm ³], W_{plz} [mm ³]	2,8398e+04	2,8398e+04

I_w [mm ⁶], I_t [mm ⁴]	2,6551e-24	1,9300e+06
d_y [mm], d_z [mm]	0,00	0,00
c_{yucs} [mm], c_{zucs} [mm]	44,45	44,45
α [deg]	0,00	
M_{ply+} [Nmm], M_{ply-} [Nmm]	6778477,47	6778477,47
M_{plz+} [Nmm], M_{plz-} [Nmm]	6778477,47	6778477,47
AL [m ² /m], AD [m ² /m]	2,7900e-01	5,3342e-01
β_y [mm], β_z [mm]	0,00	0,00
Picture		

CS17		
Type	HEA240	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	7,6800e+03	
A_y [mm ²], A_z [mm ²]	5,5540e+03	1,8522e+03
I_y [mm ⁴], I_z [mm ⁴]	7,7600e+07	2,7700e+07
W_{ely} [mm ³], W_{elz} [mm ³]	6,7500e+05	2,3100e+05
W_{ply} [mm ³], W_{plz} [mm ³]	7,4583e+05	3,5167e+05
I_w [mm ⁶], I_t [mm ⁴]	3,2849e+11	4,1600e+05
d_y [mm], d_z [mm]	0,00	0,00
c_{yucs} [mm], c_{zucs} [mm]	120,00	115,00
α [deg]	0,00	
M_{ply+} [Nmm], M_{ply-} [Nmm]	175143836,13	175143836,13
M_{plz+} [Nmm], M_{plz-} [Nmm]	82666467,47	82666467,47
AL [m ² /m], AD [m ² /m]	1,3700e+00	1,3688e+00
β_y [mm], β_z [mm]	0,00	0,00
Picture		

CS18		
Type	HEA280	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [mm ²]	9,7300e+03	
A_y [mm ²], A_z [mm ²]	7,0049e+03	2,3104e+03
I_y [mm ⁴], I_z [mm ⁴]	1,3700e+08	4,7600e+07
W_{ely} [mm ³], W_{elz} [mm ³]	1,0100e+06	3,4000e+05
W_{ply} [mm ³], W_{plz} [mm ³]	1,1125e+06	5,1667e+05
I_w [mm ⁶], I_t [mm ⁴]	7,8537e+11	6,2100e+05
d_y [mm], d_z [mm]	0,00	0,00

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CYUCS [mm], CZUCS [mm]	140,00	135,00
α [deg]	0,00	
M _{ply+} [Nmm], M _{ply-} [Nmm]	261616652,19	261616652,19
M _{plz+} [Nmm], M _{plz-} [Nmm]	121788568,51	121788568,51
AL [m ² /m], AD [m ² /m]	1,6000e+00	1,6026e+00
β_y [mm], β_z [mm]	0,00	0,00
Picture		

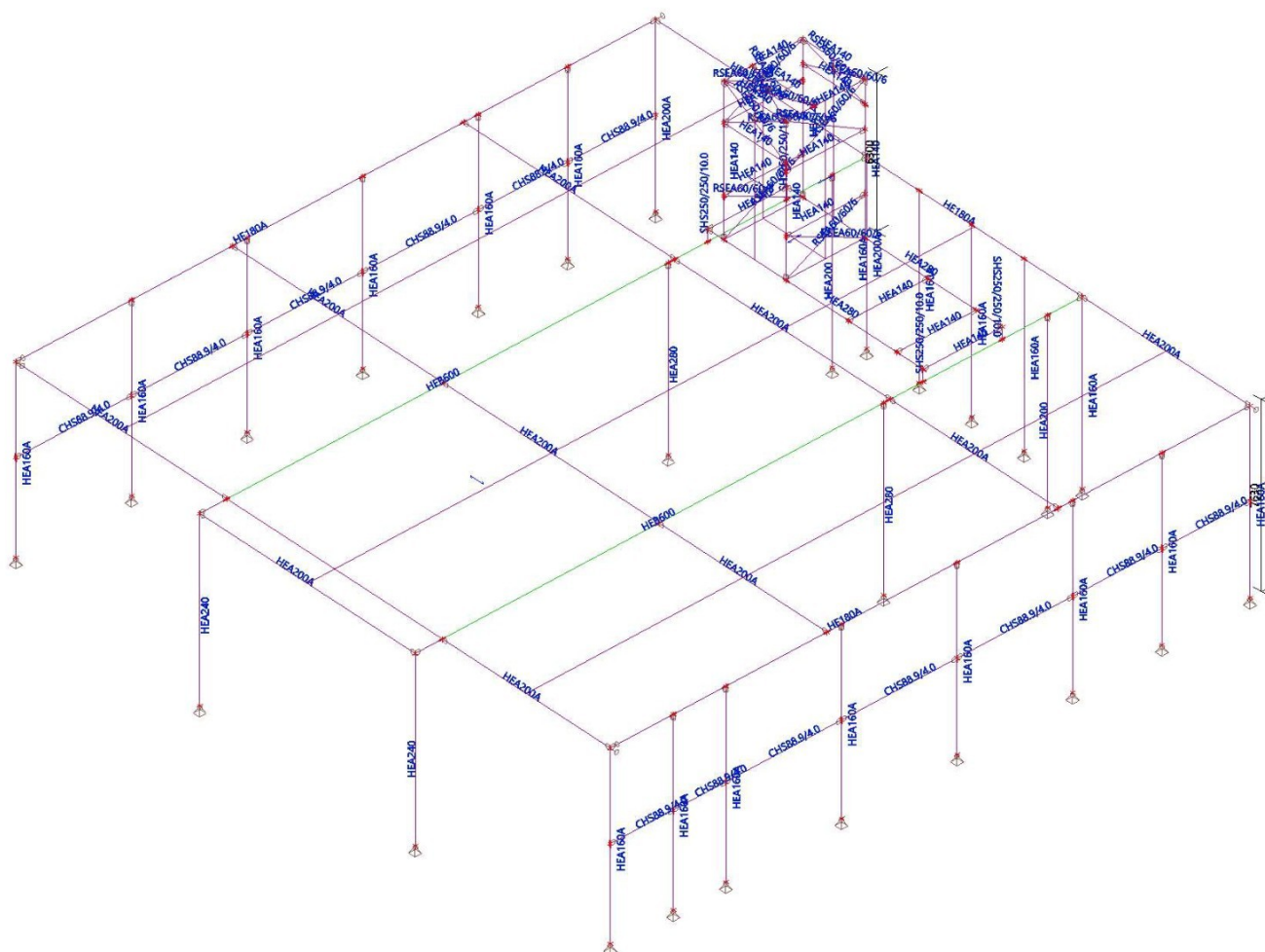
Explanations of symbols

Formcode	h - Height b - Flange width t - Flange thickness s - Web thickness r - Radius at flange root r1 - Radius at flange toe a - Flange slope W - Internal bolt distance wm - Unit warping at flange toe
A	Area
A _y	Shear Area in principal y-direction
A _z	Shear Area in principal z-direction
I _y	Second moment of area about the principal y-axis
I _z	Second moment of area about the principal z-axis
W _{ely}	Elastic section modulus about the principal y-axis
W _{elz}	Elastic section modulus about the principal z-axis
W _{ply}	Plastic section modulus about the principal y-axis
W _{plz}	Plastic section modulus about the principal z-axis
I _w	Warping constant
I _t	Torsional constant
d _y	Shear center coordinate in principal y-direction measured from the centroid

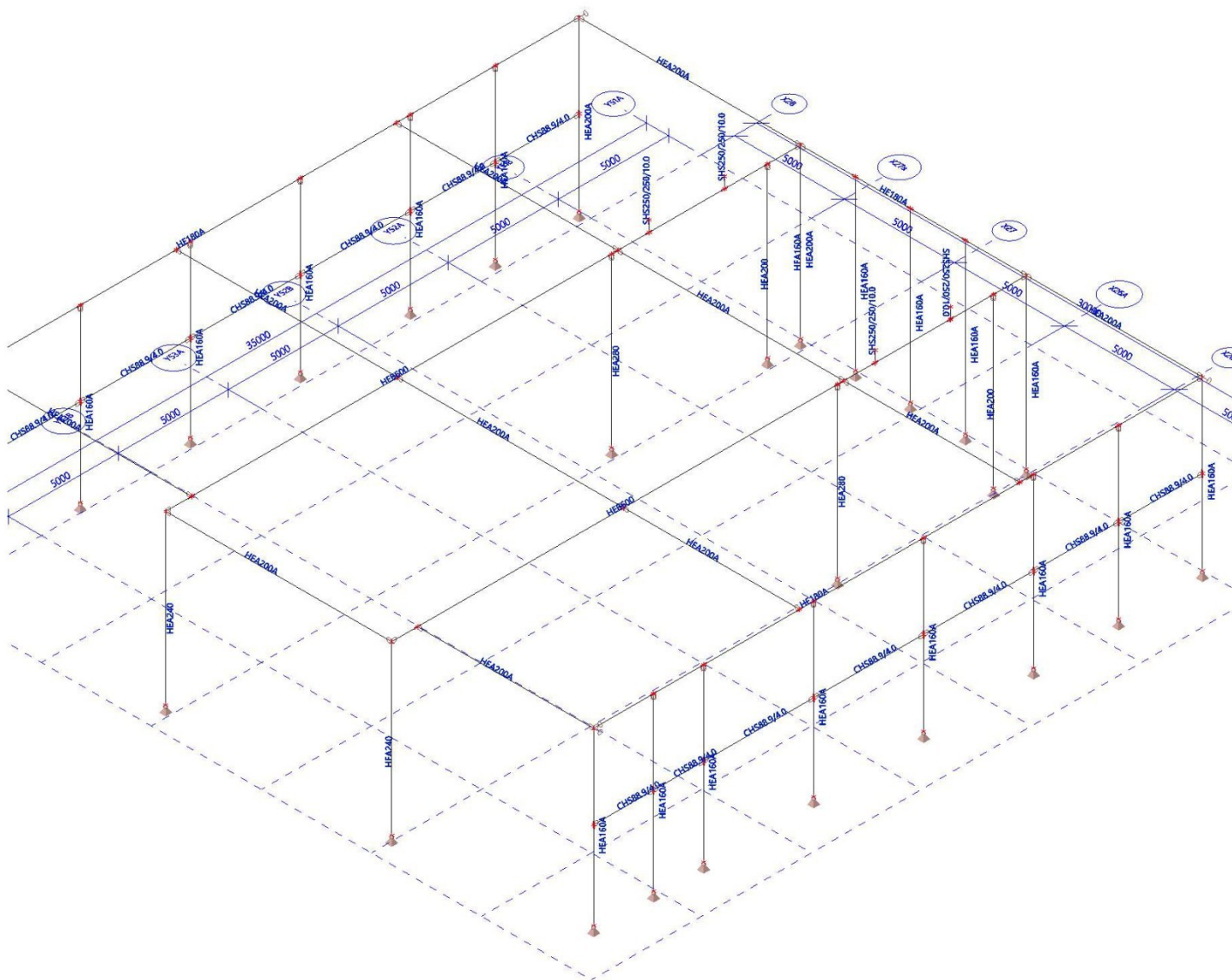
Explanations of symbols

d _z	Shear center coordinate in principal z-direction measured from the centroid
CYUCS	Centroid coordinate in Y-direction of Input axis system
CZUCS	Centroid coordinate in Z-direction of Input axis system
α	Rotation angle of the principal axis system
I _{vzLCS}	Product moment of area in the LCS system
M _{ply+}	Plastic moment about the principal y-axis for a positive My moment
M _{ply-}	Plastic moment about the principal y-axis for a negative My moment
M _{plz+}	Plastic moment about the principal z-axis for a positive Mz moment
M _{plz-}	Plastic moment about the principal z-axis for a negative Mz moment
AL	Circumference per unit length
AD	Drying surface per unit length
β_y	Mono-symmetry constant about the principal y-axis
β_z	Mono-symmetry constant about the principal z-axis

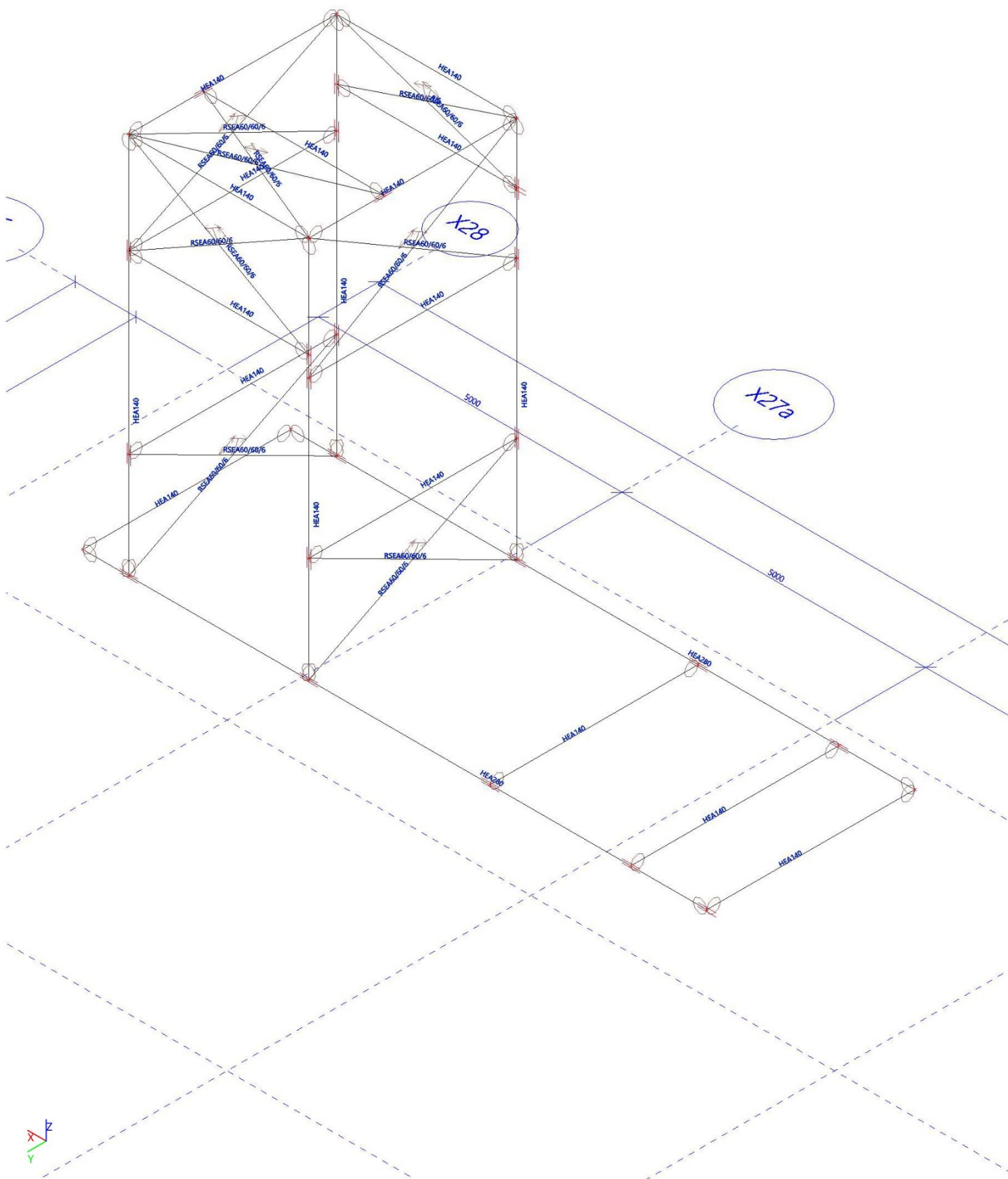
3.8. Analysis model



3.9. Analysis model



3.10. Analysis model



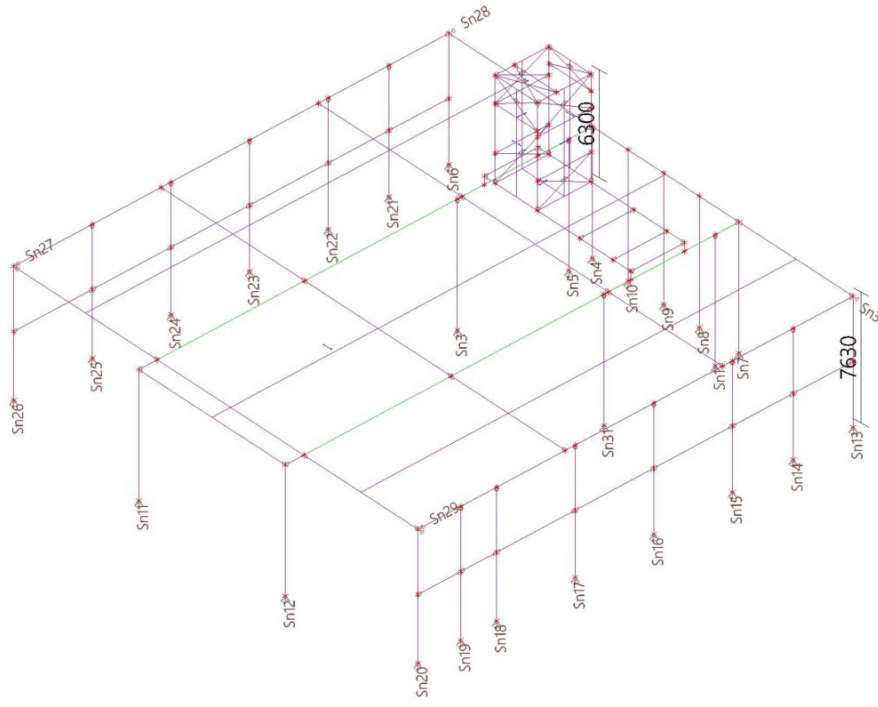
3.11. Layers

Name	Structural model only
Existing columns	X
Condensor beams	X
Bracing	X
New columns	X
Load panels	X
Supporting beams	X
Roof beams	X
Dimensions	X

4. Analysis

4.1. Supports

4.1.1. Boundary conditions



4.1.2. Nodal supports

Name	Node	System	Type	X	Y	Z	Rx	Ry	Rz
Sn1	N3	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn3	N1	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn4	N75	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn5	N86	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn6	N117	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn7	N129	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn8	N131	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn9	N133	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn10	N138	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn11	N188	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn12	N190	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn13	N197	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn14	N198	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn15	N202	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn16	N204	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn17	N206	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn18	N208	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn19	N210	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn20	N212	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn21	N213	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn22	N215	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn23	N217	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn24	N219	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn25	N222	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn26	N226	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn27	N221	GCS	Standard	Rigid	Rigid	Free	Free	Free	Free
Sn28	N118	GCS	Standard	Free	Rigid	Free	Free	Free	Free
Sn29	N195	GCS	Standard	Rigid	Rigid	Free	Free	Free	Free
Sn30	N196	GCS	Standard	Rigid	Free	Free	Free	Free	Free
Sn31	N252	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free

4.2. 1D

4.2.1. Hinges

Name	Position	ux	uy	uz	fix	fiy	fiz
H1	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H2	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H3	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H4	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H5	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H6	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H7	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H8	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H9	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H10	End	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H11	End	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H12	End	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H13	End	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H14	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H15	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H16	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H17	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H18	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H19	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H20	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H21	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H22	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H23	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H24	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H25	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H26	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H27	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H28	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H29	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H30	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H31	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H32	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H33	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H34	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H35	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid

Name	Position	ux	uy	uz	fix	fiy	fiz
H36	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H37	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H38	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H39	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H40	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H41	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H42	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H43	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H44	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H45	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H46	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H47	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H48	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H49	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H50	Both	Rigid	Rigid	Rigid	Rigid	Free	Rigid
H51	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H52	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H53	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H54	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H55	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H56	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H57	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H58	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H59	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H60	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H61	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H62	Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H63	Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H64	Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H65	Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H66	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H68	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H69	End	Rigid	Rigid	Rigid	Rigid	Free	Free
H70	End	Rigid	Rigid	Rigid	Rigid	Free	Free

5. Load definition

5.1. Load cases

Name	Description	Action type	Load group	Load type	Spec	Direction	Duration	Master load case
LC1	Self weight	Permanent	LG1	Self weight		-Z		
LC2a	Dead load existing	Permanent	LG1	Standard				
LC2b	Dead load new	Permanent	LG1	Standard				
LC3	Imposed load	Variable	LG2	Static	Standard		Short	None
LC4	Snow load	Variable	LG3	Static	Standard		Short	None
LC5[+x]	Wind load [+x]	Variable	LG4	Static	Standard		Short	None
LC5[-x]	Wind load [-x]	Variable	LG4	Static	Standard		Short	None
LC5[+y]	Wind load [+y]	Variable	LG4	Static	Standard		Short	None
LC5[-y]	Wind load [-y]	Variable	LG4	Static	Standard		Short	None

5.2. Load groups

Name	Load	Relation	Type
LG1	Permanent		
LG2	Variable	Standard	Cat E : Storage
LG3	Variable	Standard	Snow
LG4	Variable	Exclusive	Wind

5.3. Combinations

Name	Type	Load cases	Coeff. [-]
ULS-Set B (auto)	EN-ULS (STR/GEO) Set B	LC1 - Self weight	1,000
		LC2a - Dead load existing	1,000
		LC2b - Dead load new	1,000
		LC3 - Imposed load	1,000
		LC4 - Snow load	1,000
		LC5[+x] - Wind load [+x]	1,000
		LC5[+y] - Wind load [+y]	1,000
		LC5[-x] - Wind load [-x]	1,000
		LC5[-y] - Wind load [-y]	1,000
SLS-Char (auto)	EN-SLS Characteristic	LC1 - Self weight	1,000
		LC2a - Dead load existing	1,000
		LC2b - Dead load new	1,000
		LC3 - Imposed load	1,000
		LC4 - Snow load	1,000
		LC5[+x] - Wind load [+x]	1,000
		LC5[+y] - Wind load [+y]	1,000
		LC5[-x] - Wind load [-x]	1,000
		LC5[-y] - Wind load [-y]	1,000
SLS-Quasi (auto)	EN-SLS Quasi-permanent	LC1 - Self weight	1,000
		LC2a - Dead load existing	1,000
		LC2b - Dead load new	1,000
		LC3 - Imposed load	1,000
		LC4 - Snow load	1,000
		LC5[+x] - Wind load [+x]	1,000
		LC5[+y] - Wind load [+y]	1,000
		LC5[-x] - Wind load [-x]	1,000
		LC5[-y] - Wind load [-y]	1,000
ULS-Set B (NEN8700) [6]	Linear - ultimate	LC1 - Self weight	1,150
		LC2a - Dead load existing	1,150
		LC2b - Dead load new	1,150
		LC3 - Imposed load	1,100
		LC4 - Snow load	0,000
		LC5[+x] - Wind load [+x]	0,000
		LC5[-x] - Wind load [-x]	0,000
		LC5[+y] - Wind load [+y]	0,000
		LC5[-y] - Wind load [-y]	0,000
ULS-Set B (NEN8700) [1]	Linear - ultimate	LC1 - Self weight	1,050
		LC2a - Dead load existing	1,050
		LC2b - Dead load new	1,050
		LC3 - Imposed load	1,100
		LC4 - Snow load	1,100
		LC5[+x] - Wind load [+x]	0,000
		LC5[-x] - Wind load [-x]	0,000

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Name	Type	Load cases	Coeff. [-]
ULS-Set B (NEN8700) [2]	Linear - ultimate	LC5[+y] - Wind load [+y]	0,000
		LC5[-y] - Wind load [-y]	0,000
		LC1 - Self weight	1,050
		LC2a - Dead load existing	1,050
		LC2b - Dead load new	1,050
		LC3 - Imposed load	1,100
		LC4 - Snow load	0,000
		LC5[+x] - Wind load [+x]	1,200
		LC5[-x] - Wind load [-x]	0,000
		LC5[+y] - Wind load [+y]	0,000
ULS-Set B (NEN8700) [4]	Linear - ultimate	LC5[-y] - Wind load [-y]	0,000
		LC1 - Self weight	1,050
		LC2a - Dead load existing	1,050
		LC2b - Dead load new	1,050
		LC3 - Imposed load	1,100
		LC4 - Snow load	0,000
		LC5[+x] - Wind load [+x]	0,000
		LC5[-x] - Wind load [-x]	1,200
		LC5[+y] - Wind load [+y]	0,000
		LC5[-y] - Wind load [-y]	0,000
ULS-Set B (NEN8700) [3]	Linear - ultimate	LC1 - Self weight	1,050
		LC2a - Dead load existing	1,050
		LC2b - Dead load new	1,050
		LC3 - Imposed load	1,100
		LC4 - Snow load	0,000
		LC5[+x] - Wind load [+x]	0,000
		LC5[-x] - Wind load [-x]	0,000
		LC5[+y] - Wind load [+y]	1,200
		LC5[-y] - Wind load [-y]	0,000
ULS-Set B (NEN8700) [5]	Linear - ultimate	LC1 - Self weight	1,050
		LC2a - Dead load existing	1,050
		LC2b - Dead load new	1,050
		LC3 - Imposed load	1,100
		LC4 - Snow load	0,000
		LC5[+x] - Wind load [+x]	0,000
		LC5[-x] - Wind load [-x]	0,000
		LC5[+y] - Wind load [+y]	0,000
		LC5[-y] - Wind load [-y]	1,200

5.4. Result classes

Name	List
All ULS	ULS-Set B (auto) - EN-ULS (STR/GEO) Set B ULS-Set B (NEN8700) [6] - Linear - ultimate ULS-Set B (NEN8700) [1] - Linear - ultimate ULS-Set B (NEN8700) [2] - Linear - ultimate ULS-Set B (NEN8700) [4] - Linear - ultimate ULS-Set B (NEN8700) [3] - Linear - ultimate ULS-Set B (NEN8700) [5] - Linear - ultimate
All SLS	SLS-Char (auto) - EN-SLS Characteristic SLS-Quasi (auto) - EN-SLS Quasi-permanent
All ULS+SLS	ULS-Set B (auto) - EN-ULS (STR/GEO) Set B ULS-Set B (NEN8700) [6] - Linear - ultimate ULS-Set B (NEN8700) [1] - Linear - ultimate ULS-Set B (NEN8700) [2] - Linear - ultimate ULS-Set B (NEN8700) [4] - Linear - ultimate ULS-Set B (NEN8700) [3] - Linear - ultimate ULS-Set B (NEN8700) [5] - Linear - ultimate SLS-Char (auto) - EN-SLS Characteristic SLS-Quasi (auto) - EN-SLS Quasi-permanent
RC_NC_ULS-Set B (auto)	NC_ULS-Set B (auto).1 NC_ULS-Set B (auto).2 NC_ULS-Set B (auto).3 NC_ULS-Set B (auto).4 NC_ULS-Set B (auto).5

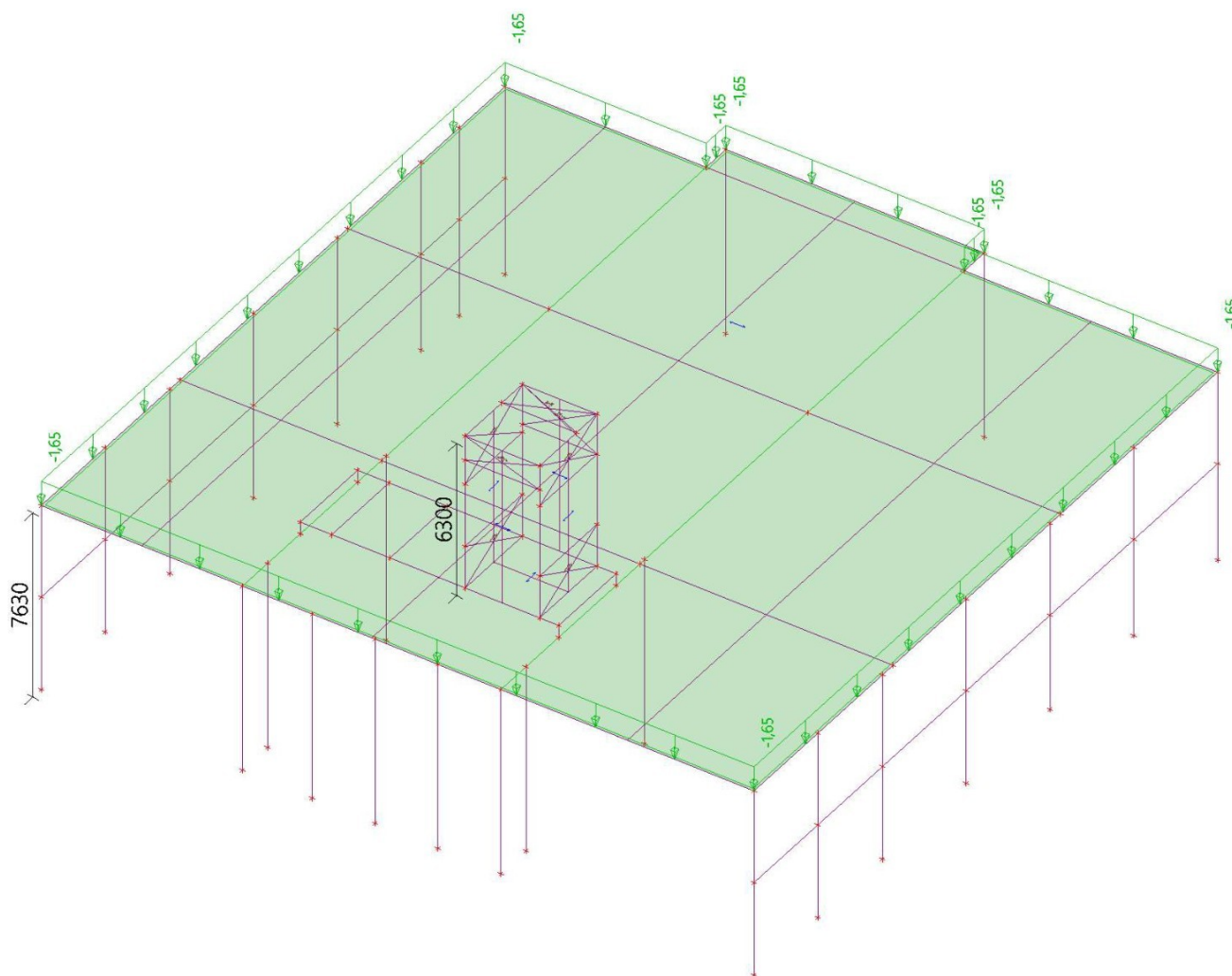
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Name	List
	NC_ULS-Set B (auto).6
	NC_ULS-Set B (auto).7
	NC_ULS-Set B (auto).8
	NC_ULS-Set B (auto).9
	NC_ULS-Set B (auto).10
	NC_ULS-Set B (auto).11
	NC_ULS-Set B (auto).12
	NC_ULS-Set B (auto).13
	NC_ULS-Set B (auto).14
	NC_ULS-Set B (auto).15
	NC_ULS-Set B (auto).16
	NC_ULS-Set B (auto).17
	NC_ULS-Set B (auto).18
ULS NEN8700	ULS-Set B (NEN8700) [1] - Linear - ultimate
	ULS-Set B (NEN8700) [2] - Linear - ultimate
	ULS-Set B (NEN8700) [3] - Linear - ultimate
	ULS-Set B (NEN8700) [4] - Linear - ultimate
	ULS-Set B (NEN8700) [5] - Linear - ultimate
	ULS-Set B (NEN8700) [6] - Linear - ultimate

5.5. Load cases

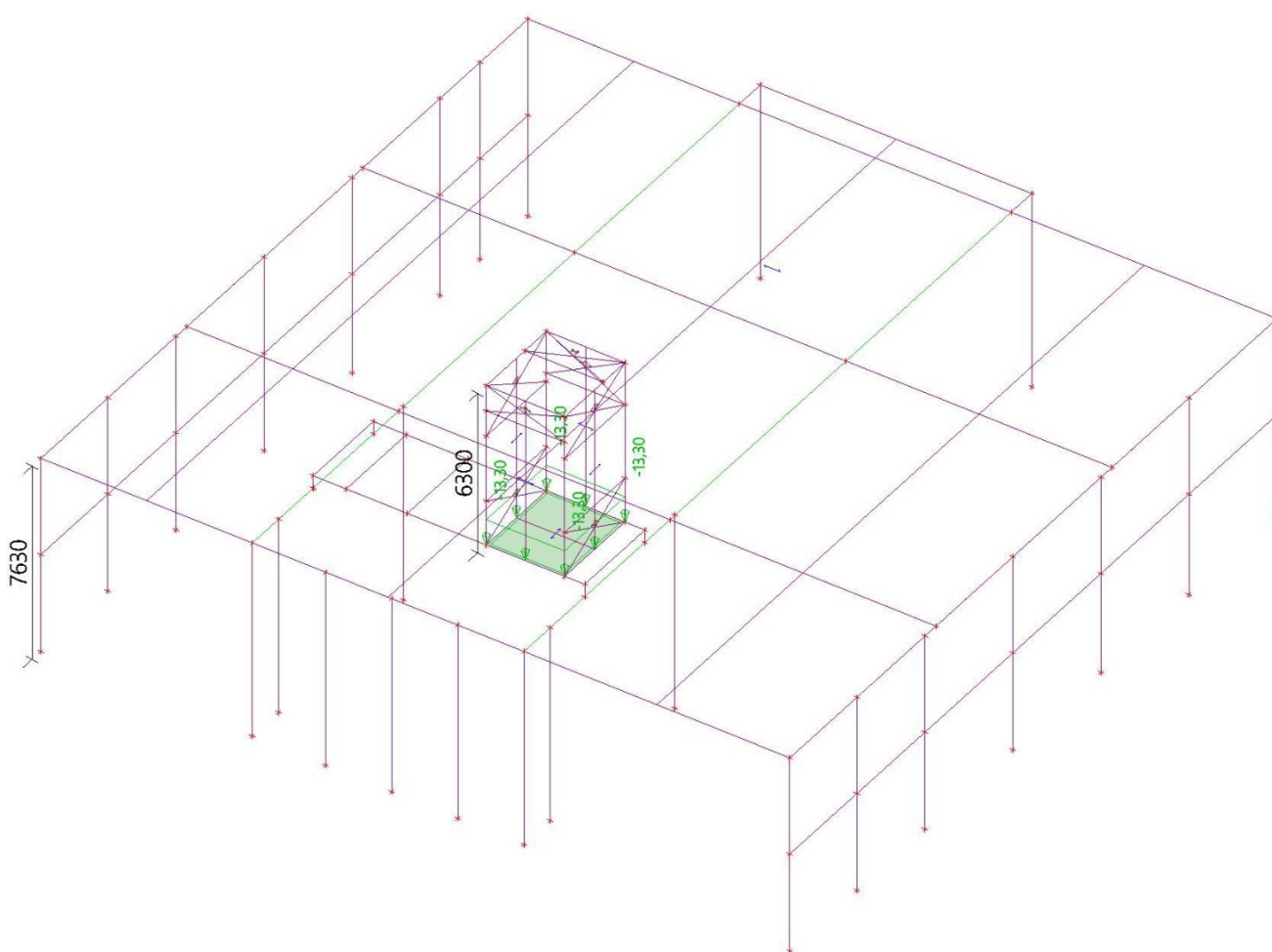
5.5.1. Load cases - LC2a

Name	Description	Action type	Load group	Load type
LC2a	Dead load existing	Permanent	LG1	Standard



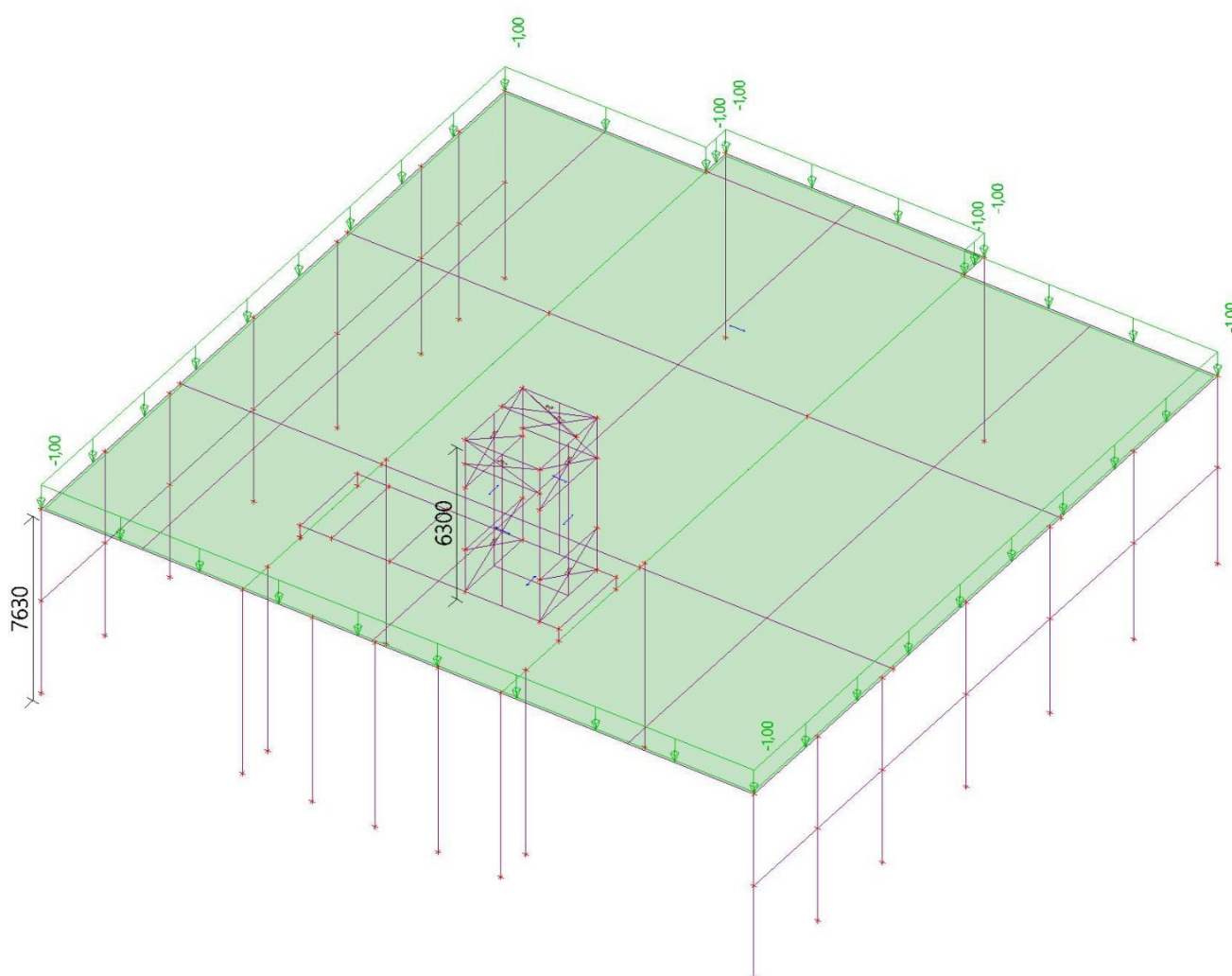
5.5.2. Load cases - LC2b

Name	Description	Action type	Load group	Load type
LC2b	Dead load new	Permanent	LG1	Standard



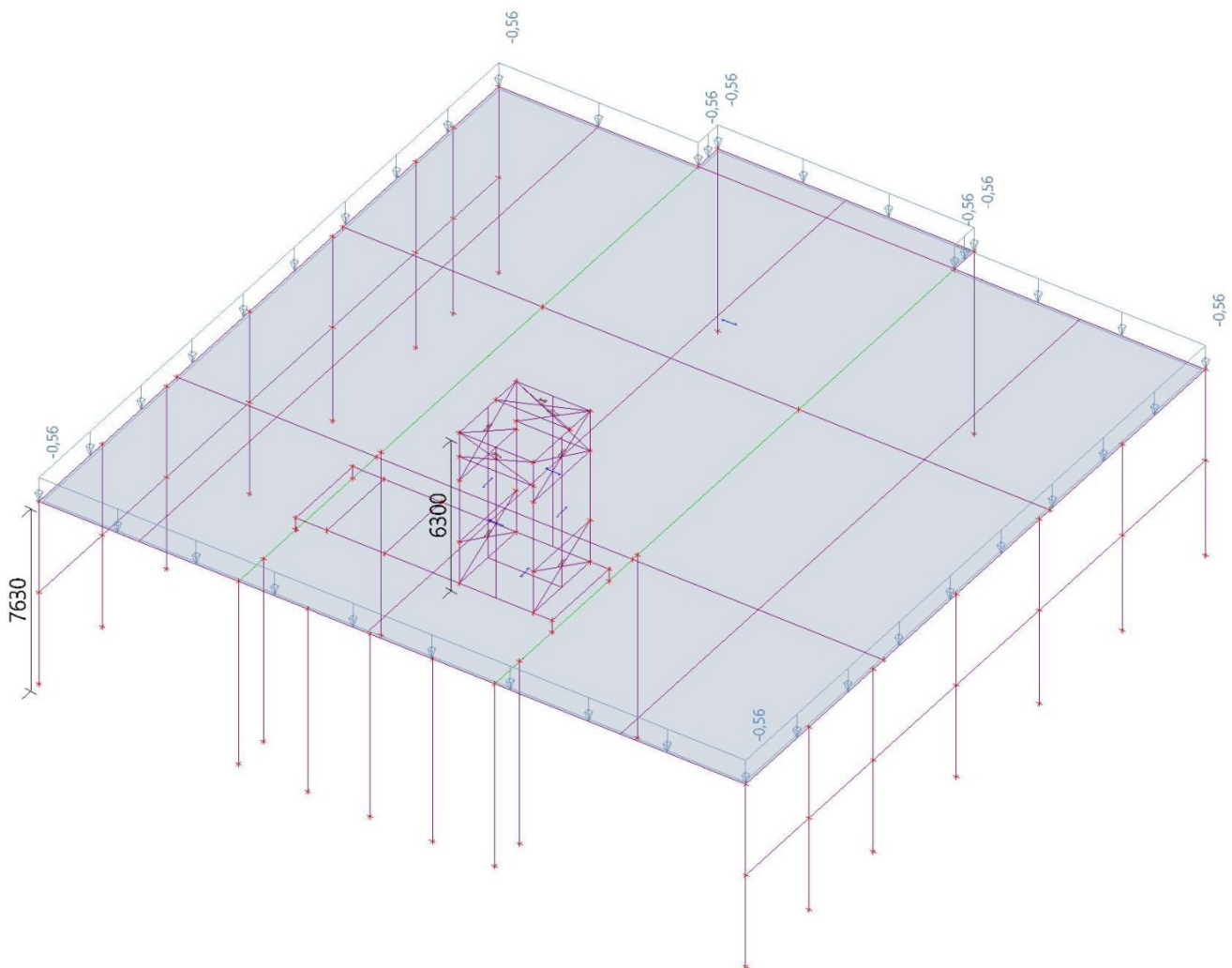
5.5.3. Load cases - LC3

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
LC3	Imposed load	Variable	LG2	Static	Standard	Short	None



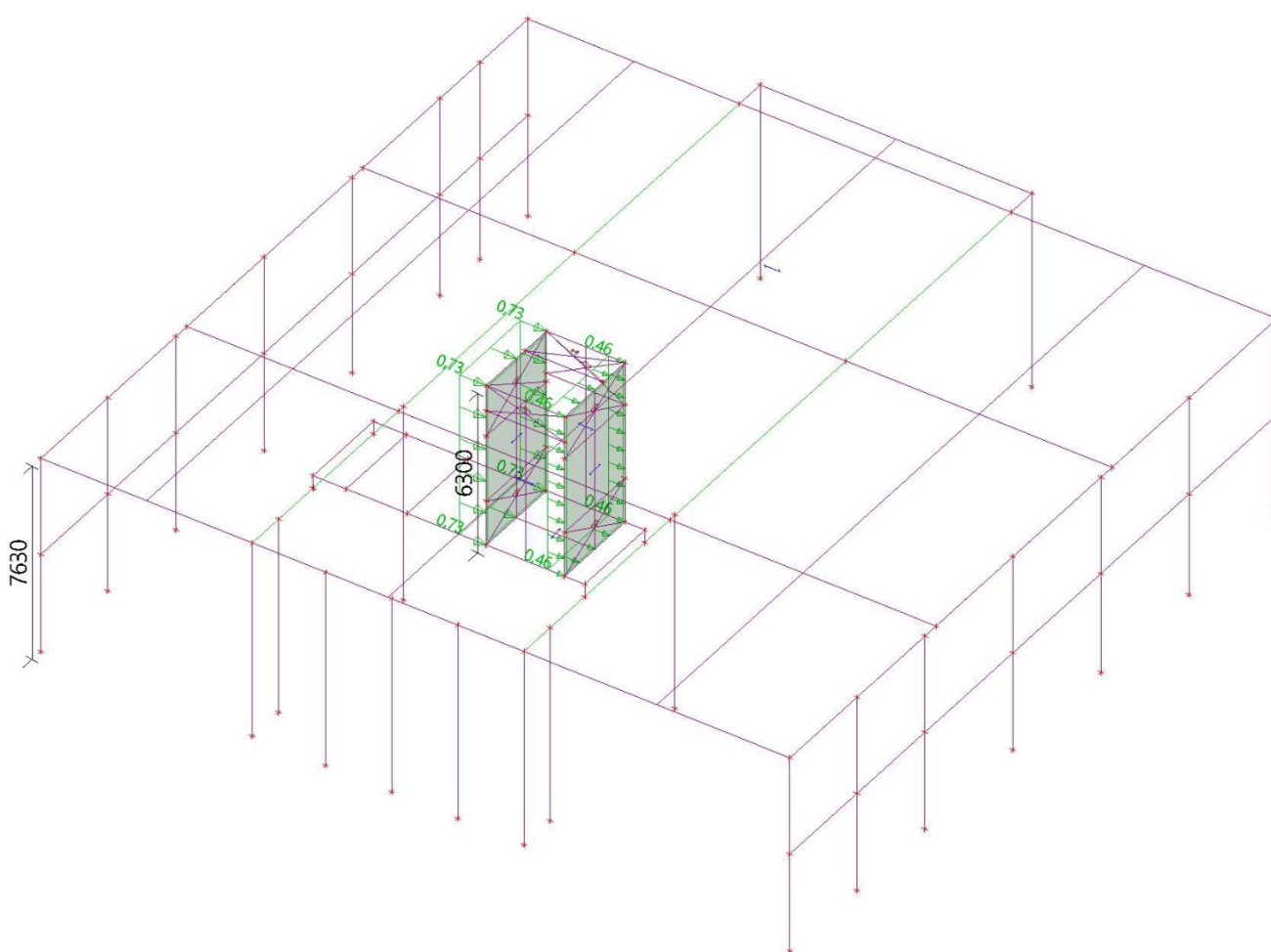
5.5.4. Load cases - LC4

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
LC4	Snow load	Variable	LG3	Static	Standard	Short	None



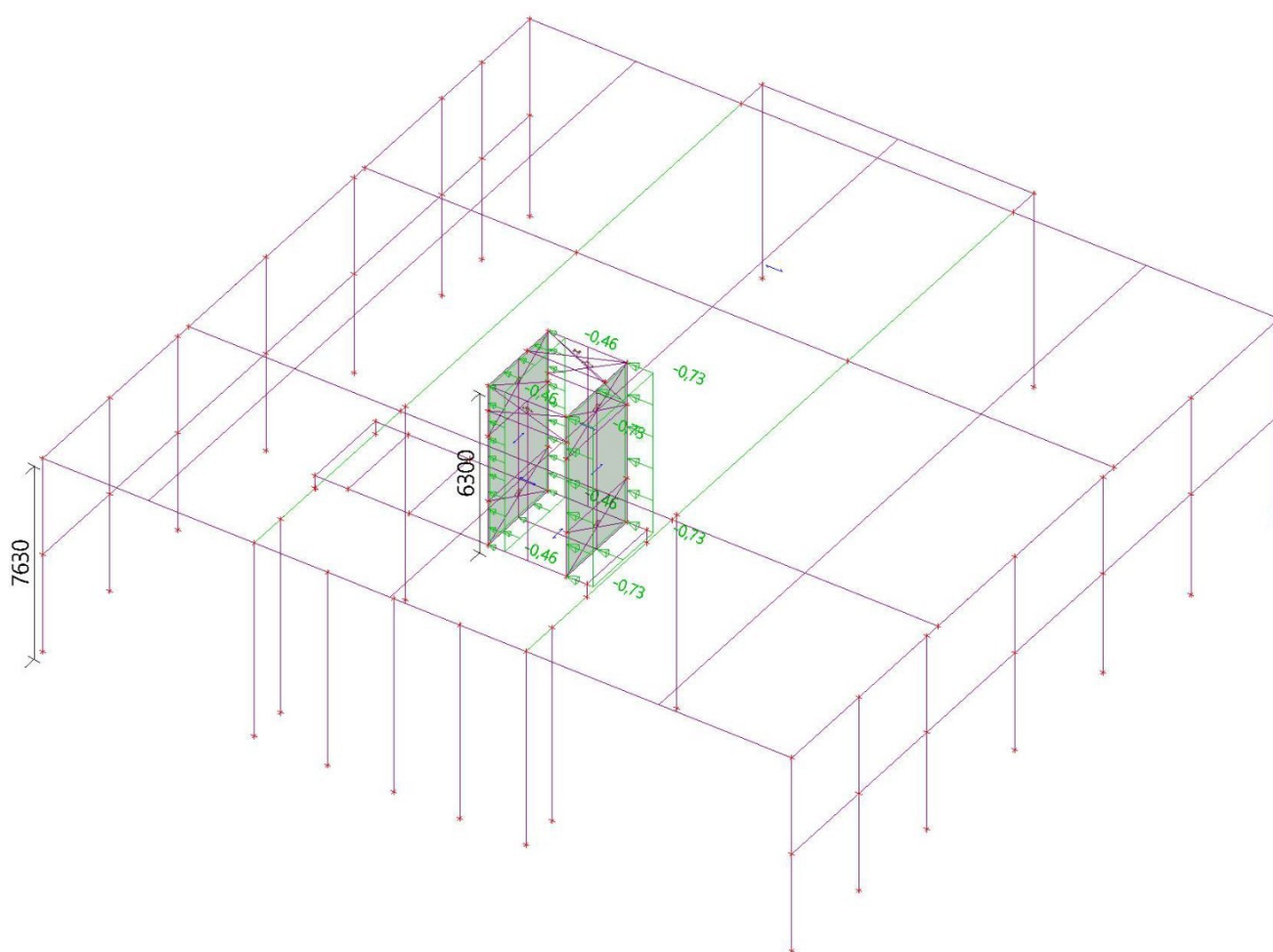
5.5.5. Load cases - LC5[+x]

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
LC5[+x]	Wind load [+x]	Variable	LG4	Static	Standard	Short	None



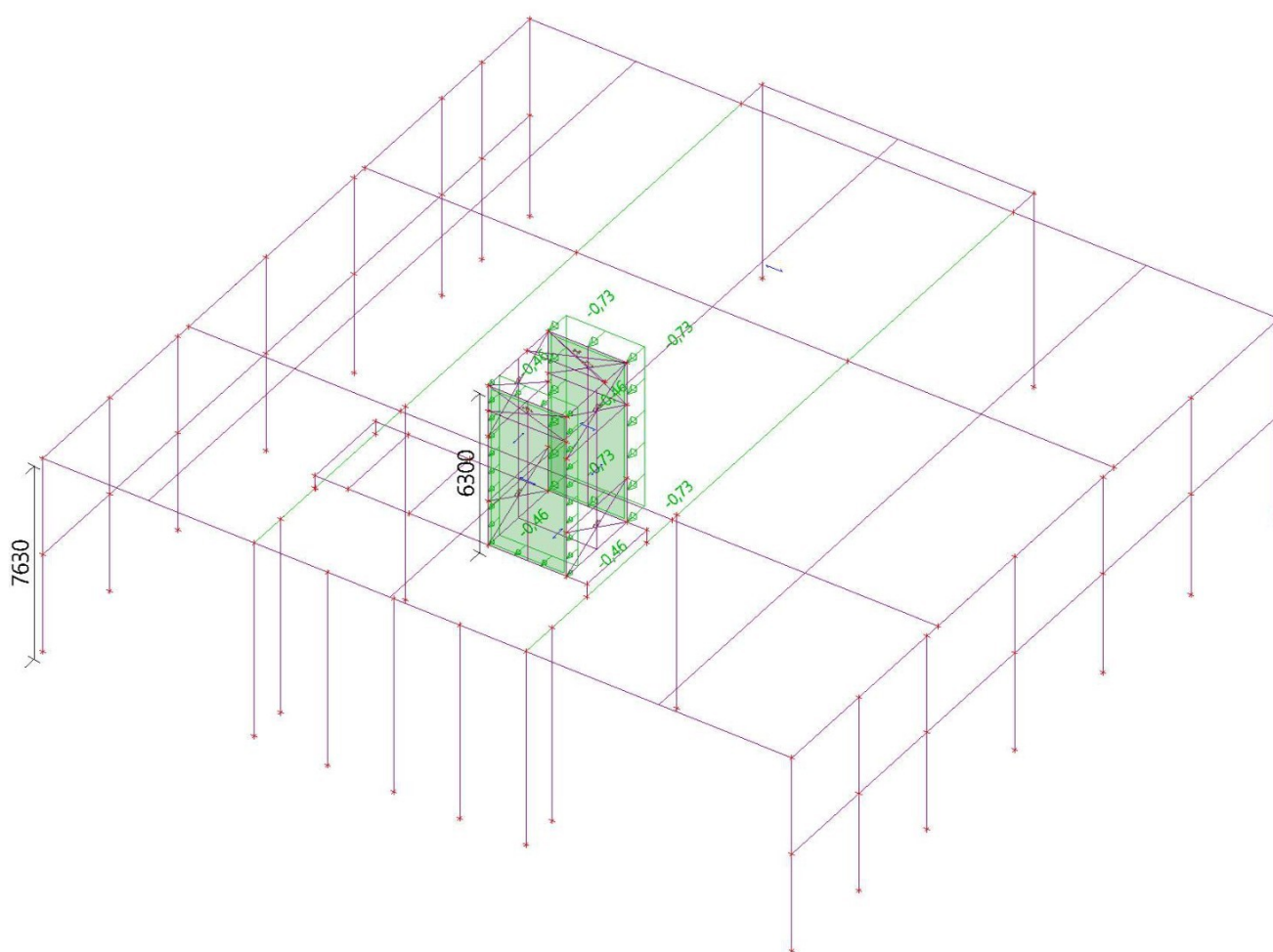
5.5.6. Load cases - LC5[-x]

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
LC5[-x]	Wind load [-x]	Variable	LG4	Static	Standard	Short	None



5.5.8. Load cases - LC5[-y]

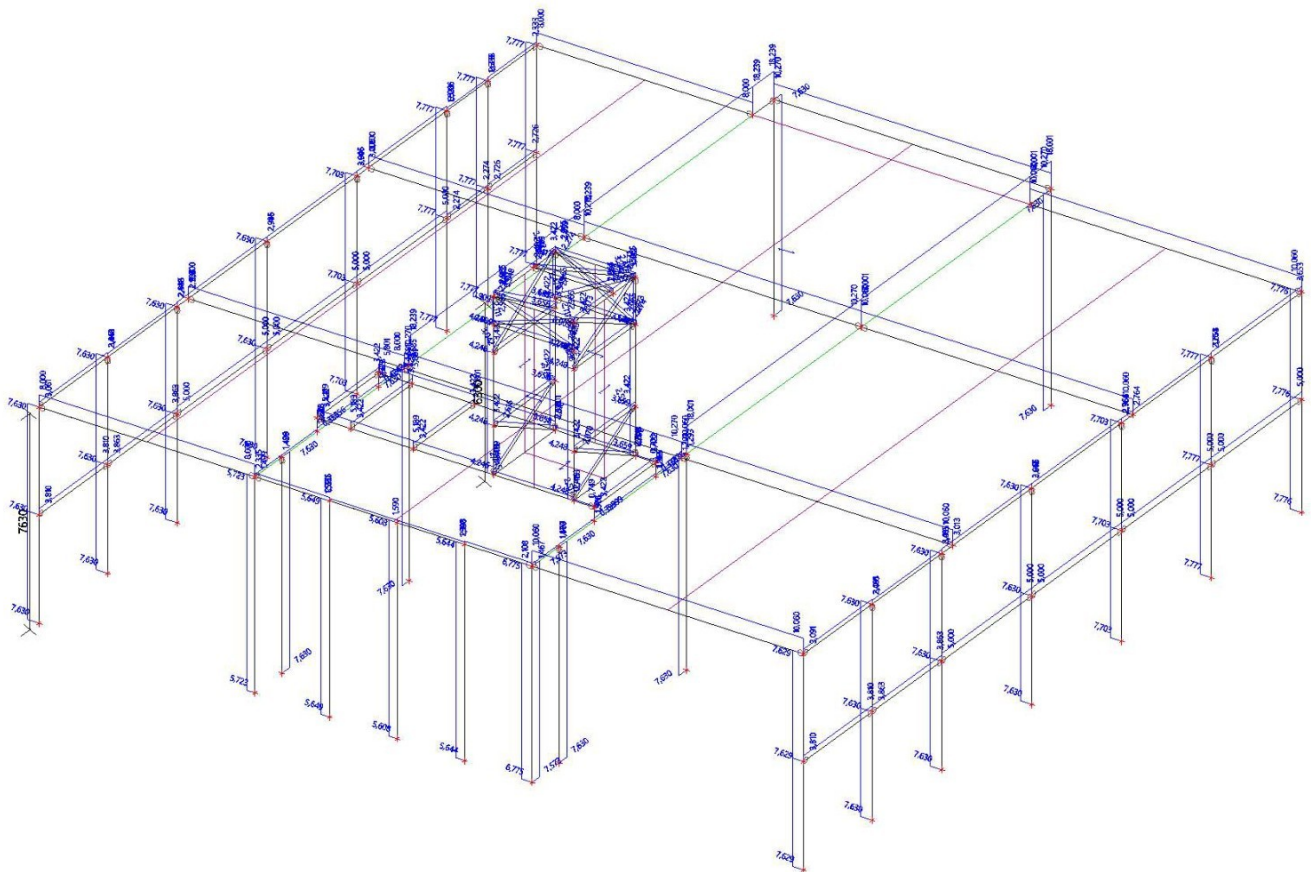
Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
LC5[-y]	Wind load [-y]	Variable	LG4	Static	Standard	Short	None



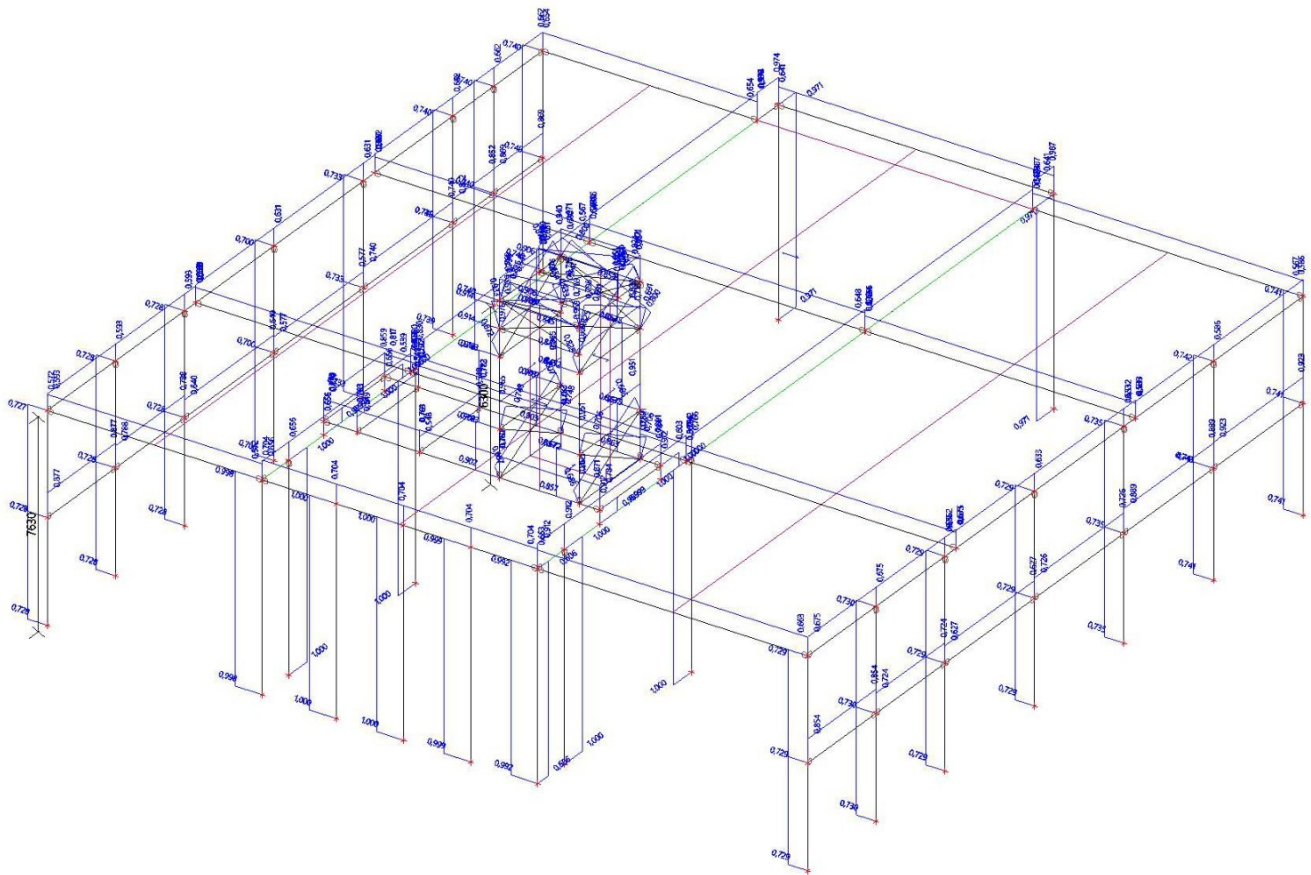
6. Steel structure

6.1. Slenderness

6.1.1. I_y



6.1.2. Iz



6.2. Hulpconstructie condensor**6.2.1. EC-EN 1993 Steel check ULS**Values: **UC_{Overall}**

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Member

Selection: Named selection - Steel structure (excl. bracing)

Filter: Layer = Condensor beams

Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B19	6,550-	ULS-Set B (auto)/1	CS4 - HEA280	S 235	0,64	0,64	0,42
B20	6,550-	ULS-Set B (auto)/2	CS4 - HEA280	S 235	0,61	0,61	0,40
B21	0,000	ULS-Set B (auto)/3	CS5 - HEA140	S 235	0,20	0,20	0,00
B22	0,000	ULS-Set B (auto)/4	CS5 - HEA140	S 235	0,15	0,15	0,00
B23	3,422	ULS-Set B (auto)/4	CS5 - HEA140	S 235	0,28	0,28	0,12
B24	0,000	ULS-Set B (auto)/3	CS5 - HEA140	S 235	0,19	0,19	0,00
B28	5,300-	ULS-Set B (auto)/2	CS5 - HEA140	S 235	0,63	0,63	0,50
B29	3,475	ULS-Set B (auto)/5	CS5 - HEA140	S 235	0,68	0,50	0,68
B30	3,185-	ULS-Set B (auto)/6	CS5 - HEA140	S 235	0,71	0,51	0,71
B31	4,047	ULS-Set B (auto)/1	CS5 - HEA140	S 235	0,70	0,60	0,70
B25	3,422	ULS-Set B (auto)/1	CS5 - HEA140	S 235	0,03	0,02	0,03
B32	0,000	ULS-Set B (auto)/5	CS5 - HEA140	S 235	0,01	0,01	0,01
B34	3,422	ULS-Set B (auto)/7	CS5 - HEA140	S 235	0,06	0,06	0,04
B35	1,230+	ULS-Set B (auto)/7	CS5 - HEA140	S 235	0,05	0,05	0,03
B36	1,230+	ULS-Set B (auto)/7	CS5 - HEA140	S 235	0,05	0,05	0,00
B37	2,965	ULS-Set B (auto)/7	CS5 - HEA140	S 235	0,04	0,04	0,02
B38	1,482	ULS-Set B (auto)/8	CS5 - HEA140	S 235	0,01	0,01	0,00
B39	2,965	ULS-Set B (auto)/9	CS5 - HEA140	S 235	0,05	0,05	0,00
B40	1,482	ULS-Set B (auto)/2	CS5 - HEA140	S 235	0,01	0,01	0,01
B41	3,422	ULS-Set B (auto)/2	CS5 - HEA140	S 235	0,04	0,02	0,04
B153	2,965	ULS-Set B (auto)/7	CS5 - HEA140	S 235	0,02	0,02	0,01

6.2.2. EC-EN 1993 Steel check ULSValues: **UC_{Overall}**

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Global

Selection: Named selection - Steel structure (excl. bracing)

Filter: Layer = Condensor beams

Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B30	3,185-	ULS-Set B (auto)/1	CS5 - HEA140	S 235	0,71	0,51	0,71

6.2.3. EC-EN 1993 Steel check ULS; Overall check

Values: **UC_{Overall}**

Linear calculation

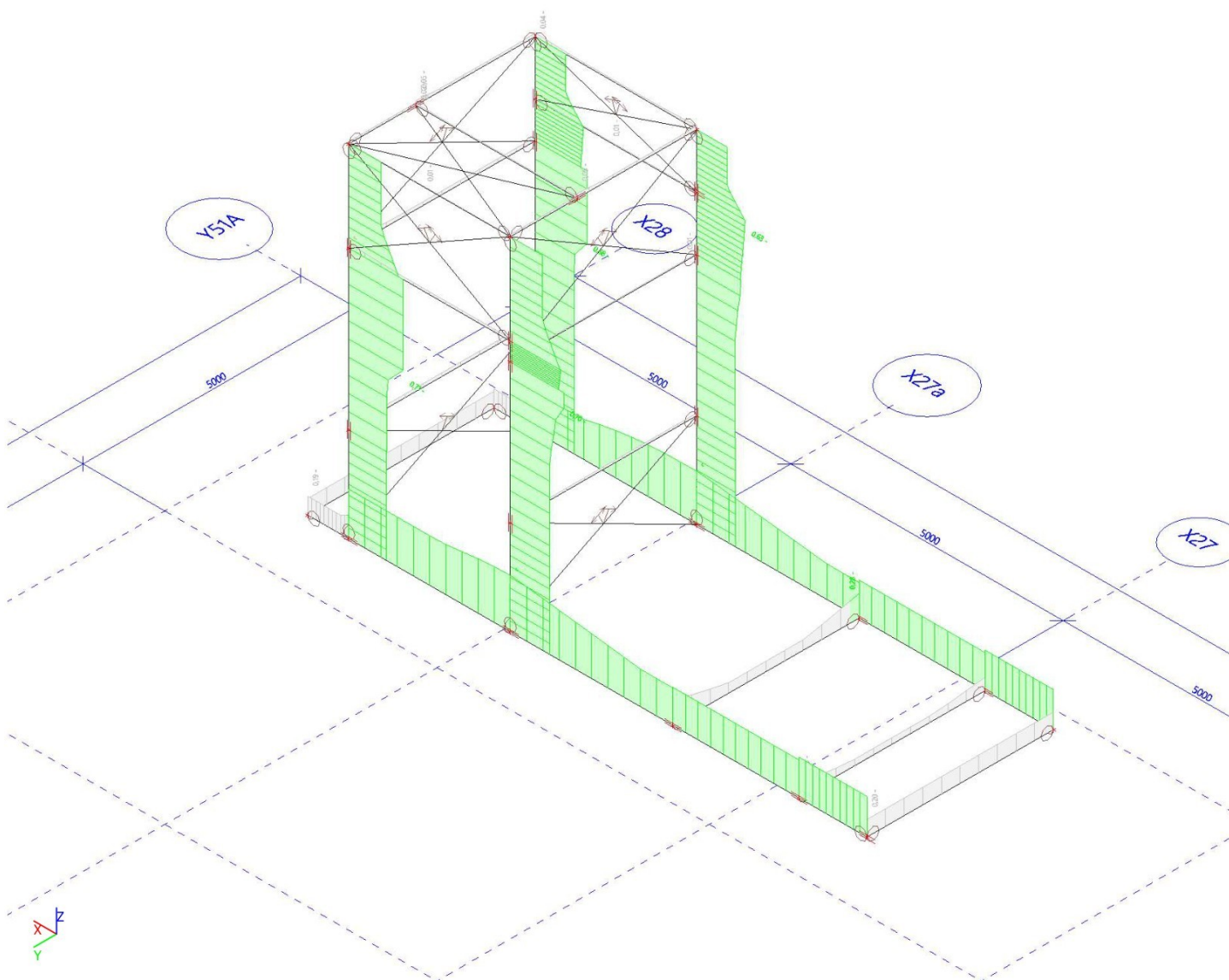
Class: All ULS

Coordinate system: Principal

Extreme 1D: Member

Selection: Named selection - Steel
structure (excl. bracing)

Filter: Layer = Condensor beams



6.3. Bracing hulpconstructie

6.3.1. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Nonlinear calculation

Class: RC_NC_ULS-Set B (auto)

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Layer = Bracing

There are 1 warnings on selected members. 1 of them are shown.

Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]	E/W/N
B46	3,837	NC_ULS-Set B (auto).16	CS9 - RSEA60/60/6	S 235	0,46	0,46	0,43	W30
B47	0,000	NC_ULS-Set B (auto).15	CS9 - RSEA60/60/6	S 235	0,37	0,31	0,37	W30
B48	0,000	NC_ULS-Set B (auto).14	CS9 - RSEA60/60/6	S 235	0,10	0,10	0,07	W30
B49	0,000	NC_ULS-Set B (auto).12	CS9 - RSEA60/60/6	S 235	0,19	0,12	0,19	W30
B50	0,000	NC_ULS-Set B (auto).15	CS9 - RSEA60/60/6	S 235	0,39	0,39	0,17	W30
B51	0,000	NC_ULS-Set B (auto).11	CS9 - RSEA60/60/6	S 235	0,27	0,25	0,27	W30
B52	0,313	NC_ULS-Set B (auto).16	CS9 - RSEA60/60/6	S 235	0,42	0,42	0,00	W30
B53	0,000	NC_ULS-Set B (auto).12	CS9 - RSEA60/60/6	S 235	0,19	0,18	0,19	W30
B54	0,000	NC_ULS-Set B (auto).13	CS9 - RSEA60/60/6	S 235	0,12	0,12	0,08	W30
B55	1,142	NC_ULS-Set B (auto).14	CS9 - RSEA60/60/6	S 235	0,14	0,14	0,00	W30
B57	0,000	NC_ULS-Set B (auto).12	CS9 - RSEA60/60/6	S 235	0,72	0,57	0,72	W30
B154	0,000	NC_ULS-Set B (auto).11	CS9 - RSEA60/60/6	S 235	0,07	0,07	0,00	W30
B155	1,284	NC_ULS-Set B (auto).11	CS9 - RSEA60/60/6	S 235	0,05	0,05	0,05	W30
B156	0,000	NC_ULS-Set B (auto).11	CS9 - RSEA60/60/6	S 235	0,45	0,41	0,45	W30

E/W/N	Present on members
W30	B154, B155, B156, B46, B47, B48, B49, B50, B51, B52, B53, B54, B55, B57

6.3.2. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Nonlinear calculation

Class: RC_NC_ULS-Set B (auto)

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Layer = Bracing

There are 1 warnings on selected members. 1 of them are shown.

Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]	E/W/N
B57	0,000	NC_ULS-Set B (auto).12	CS9 - RSEA60/60/6	S 235	0,72	0,57	0,72	W30

E/W/N	Present on members
W30	B46, B57

6.3.3. EC-EN 1993 Steel check ULS; Overall check

Values: **UC**_{Overall}

Nonlinear calculation

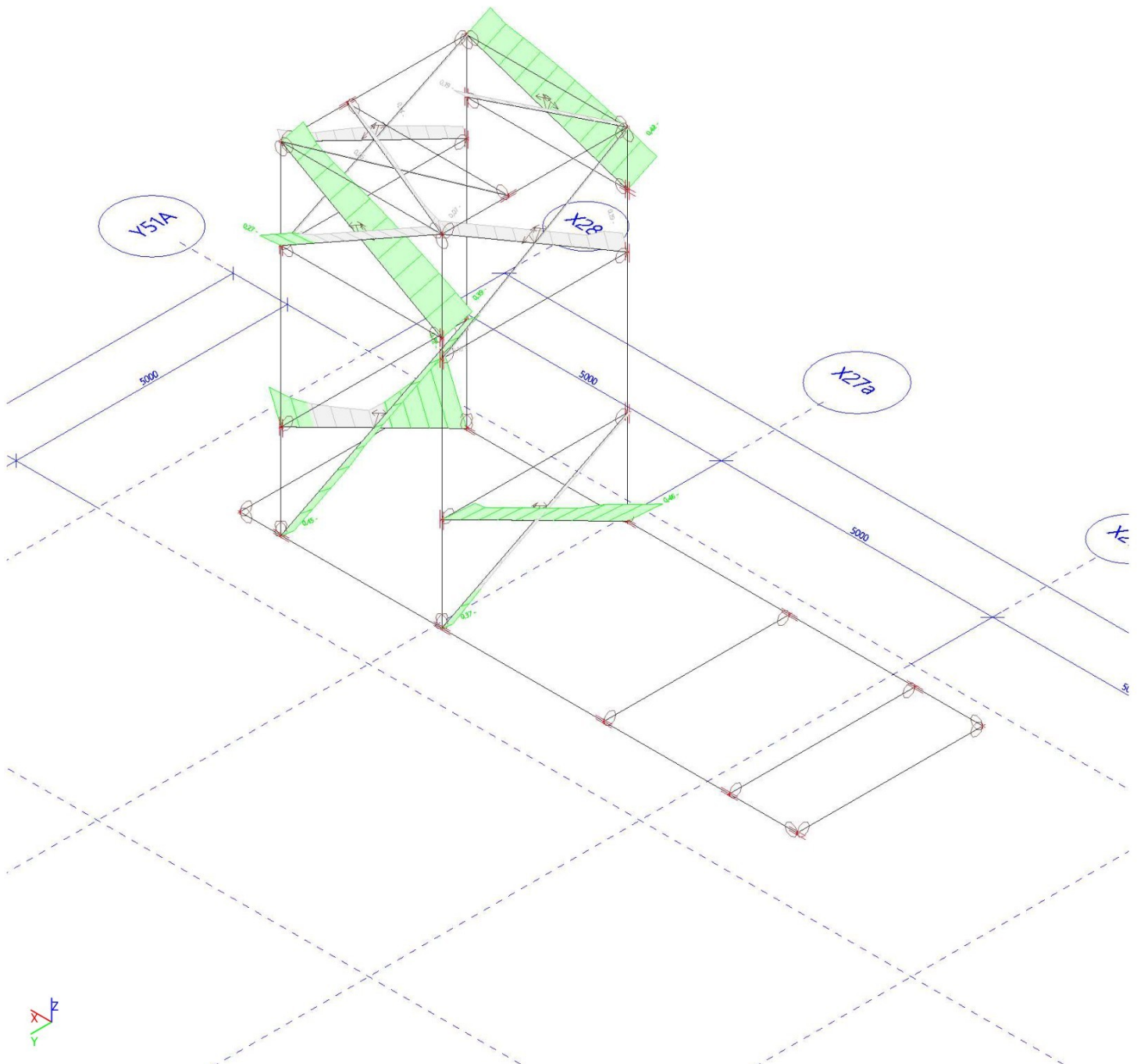
Class: RC_NC_ULS-Set B (auto)

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Layer = Bracing



6.5. Existing columns Eurocode

6.5.1. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Layer = Existing columns

EN 1993-1-1 Code Check

National annex: Dutch NEN-EN NA

Member B12	0,000 / 7,630 m	HEA240	Rolled	S 235	All ULS	1,49 -
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Combination key

All ULS / 1.08*LC1 + 1.08*LC2a + 1.08*LC2b + 1.35*LC3 + 1.35*LC4

Partial safety factors

Resistance of cross-sections	γ_{M0}	1,00
Resistance to instability	γ_{M1}	1,00
Resistance of net sections	γ_{M2}	1,25

Material

Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa

Section checks

Section is classified as Class 1

Section checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Compression	N_{Ed}	-986,13	kN	$N_{c,Rd}$	1804,80	kN	0,55

Combined section checks

Combined section checks	Unity check [-]
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Stability checks

Decisive position for stability classification: 0,000 m

Section is classified as Class 1

Buckling group : Default

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	1,00	7,630	2762,83		0,81	0,72
z-z	1,00	7,630	986,21		1,35	0,37
LTB	1,00	7,630		211,35	0,91	1,00

Stability checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Flexural buckling	N_{Ed}	-986,13	kN	$N_{b,Rd}$	662,85	kN	1,49

Combined stability checks

Interaction factors	k_{yy}	k_{yz}	k_{zy}	k_{zz}
Value	1,46	1,85	0,88	3,08

Maximum moment $M_{y,Ed}$ is derived from beam B12 position 0,000 m.Maximum moment $M_{z,Ed}$ is derived from beam B12 position 0,000 m.

6.5.2. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Linear calculation

Class: ULS NEN8700

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Layer = Existing columns

EN 1993-1-1 Code Check

National annex: Dutch NEN-EN NA

Member B12	0,000 / 7,630 m	HEA240	Rolled	S 235	ULS NEN8700	1,34 -
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Combination key

ULS NEN8700 / 1.05*LC1 + 1.05*LC2a + 1.05*LC2b + 1.10*LC3 + 1.10*LC4

Partial safety factors

Resistance of cross-sections	γ_{M0}	1,00
Resistance to instability	γ_{M1}	1,00
Resistance of net sections	γ_{M2}	1,25

Material

Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa

Section checks

Section is classified as Class 1

Section checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Compression	N_{Ed}	-885,57	kN	$N_{c,Rd}$	1804,80	kN	0,49

Combined section checks

Combined section checks	Unity check [-]
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Stability checks

Decisive position for stability classification: 0,000 m

Section is classified as Class 1

Buckling group : Default

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	1,00	7,630	2762,83		0,81	0,72
z-z	1,00	7,630	986,21		1,35	0,37
LTB	1,00	7,630		211,35	0,91	1,00

Stability checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Flexural buckling	N_{Ed}	-885,57	kN	$N_{b,Rd}$	662,85	kN	1,34

Combined stability checks

Interaction factors	k_{yy}	k_{yz}	k_{zy}	k_{zz}
Value	1,41	1,72	0,85	2,87

Maximum moment $M_{y,Ed}$ is derived from beam B12 position 0,000 m.

Maximum moment $M_{z,Ed}$ is derived from beam B12 position 0,000 m.

6.6. Strengthened columns Eurocode

6.6.1. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Layer = Existing columns

Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B12	0,000	ULS-Set B (auto)/1	CS18 - HEA280	S 235	0,96	0,43	0,96
B15	0,000	ULS-Set B (auto)/1	CS2 - SHS250/250/10.0	S 235	0,37	0,37	0,23
B16	0,000	ULS-Set B (auto)/1	CS2 - SHS250/250/10.0	S 235	0,37	0,37	0,23
B17	0,000	ULS-Set B (auto)/1	CS2 - SHS250/250/10.0	S 235	0,35	0,35	0,24
B18	0,000	ULS-Set B (auto)/1	CS2 - SHS250/250/10.0	S 235	0,35	0,35	0,24
B44	0,000	ULS-Set B (auto)/2	CS12 - HEA160A	S 235	0,15	0,05	0,15
B73	0,000	ULS-Set B (auto)/1	CS11 - HEA200A	S 235	0,03	0,03	0,03
B79	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,66	0,12	0,66
B80	0,000	ULS-Set B (auto)/3	CS12 - HEA160A	S 235	0,01	0,01	0,01
B81	0,000	ULS-Set B (auto)/4	CS12 - HEA160A	S 235	0,00	0,00	0,00
B82	0,000	ULS-Set B (auto)/1	CS11 - HEA200A	S 235	0,23	0,06	0,23
B84	0,000	ULS-Set B (auto)/2	CS12 - HEA160A	S 235	0,01	0,00	0,01
B109	0,000	ULS-Set B (auto)/1	CS17 - HEA240	S 235	0,48	0,18	0,48
B110	0,000	ULS-Set B (auto)/1	CS17 - HEA240	S 235	0,44	0,17	0,44
B114	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,09	0,04	0,09
B115	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,21	0,10	0,21
B117	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,23	0,10	0,23
B118	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,26	0,12	0,26
B119	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,27	0,12	0,27
B120	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,21	0,09	0,21
B121	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,12	0,05	0,12
B122	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,07	0,03	0,07
B124	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,28	0,13	0,28
B125	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,26	0,12	0,26
B126	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,33	0,15	0,33
B127	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,31	0,14	0,31
B128	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,37	0,16	0,37

Project 231216_H4K_DOC Hoogeveen_Condensor [23337]

Name	dx [m]	Case	Cross-section	Material	UC _{Overall} [-]	UC _{Sec} [-]	UC _{Stab} [-]
B130	0,000	ULS-Set B (auto)/1	CS12 - HEA160A	S 235	0,14	0,06	0,14
B157	0,000	ULS-Set B (auto)/1	CS18 - HEA280	S 235	0,82	0,37	0,82

6.6.2. EC-EN 1993 Steel check ULS

Values: **UC_{Overall}**

Linear calculation

Class: All ULS

Coordinate system: Principal

Extreme 1D: Global

Selection: All

Filter: Layer = Existing columns

EN 1993-1-1 Code Check

National annex: Dutch NEN-EN NA

Member B12	0,000 / 7,630 m	HEA280	Rolled	S 235	All ULS	0,96 -
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Combination key

All ULS / 1.08*LC1 + 1.08*LC2a + 1.08*LC2b + 1.35*LC3 + 1.35*LC4

Partial safety factors

Resistance of cross-sections	γ_{M0}	1,00
Resistance to instability	γ_{M1}	1,00
Resistance of net sections	γ_{M2}	1,25

Material

Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa

Section checks

Section is classified as Class 1

Section checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Compression	N_{Ed}	-990,37	kN	$N_{c,Rd}$	2286,55	kN	0,43

Combined section checks

Combined section checks	Unity check [-]
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Stability checks

Decisive position for stability classification: 0,000 m

Section is classified as Class 1

Buckling group : Default

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	1,00	7,630	4877,67		0,68	0,79
z-z	1,00	7,630	1694,72		1,16	0,45
LTB	1,00	7,630		363,84	0,85	1,00

Stability checks	Design force	Value	Unit	Resistance	Value	Unit	Unity check [-]
Flexural buckling	N_{Ed}	-990,37	kN	$N_{b,Rd}$	1034,72	kN	0,96

Combined stability checks

Interaction factors	k_{yy}	k_{yz}	k_{zy}	k_{zz}
Value	1,26	1,40	0,76	2,34

Maximum moment $M_{y,Ed}$ is derived from beam B12 position 0,000 m.Maximum moment $M_{z,Ed}$ is derived from beam B12 position 0,000 m.

6.6.3. EC-EN 1993 Steel check ULS; Overall check

Values: **UC_{Overall}**

Linear calculation

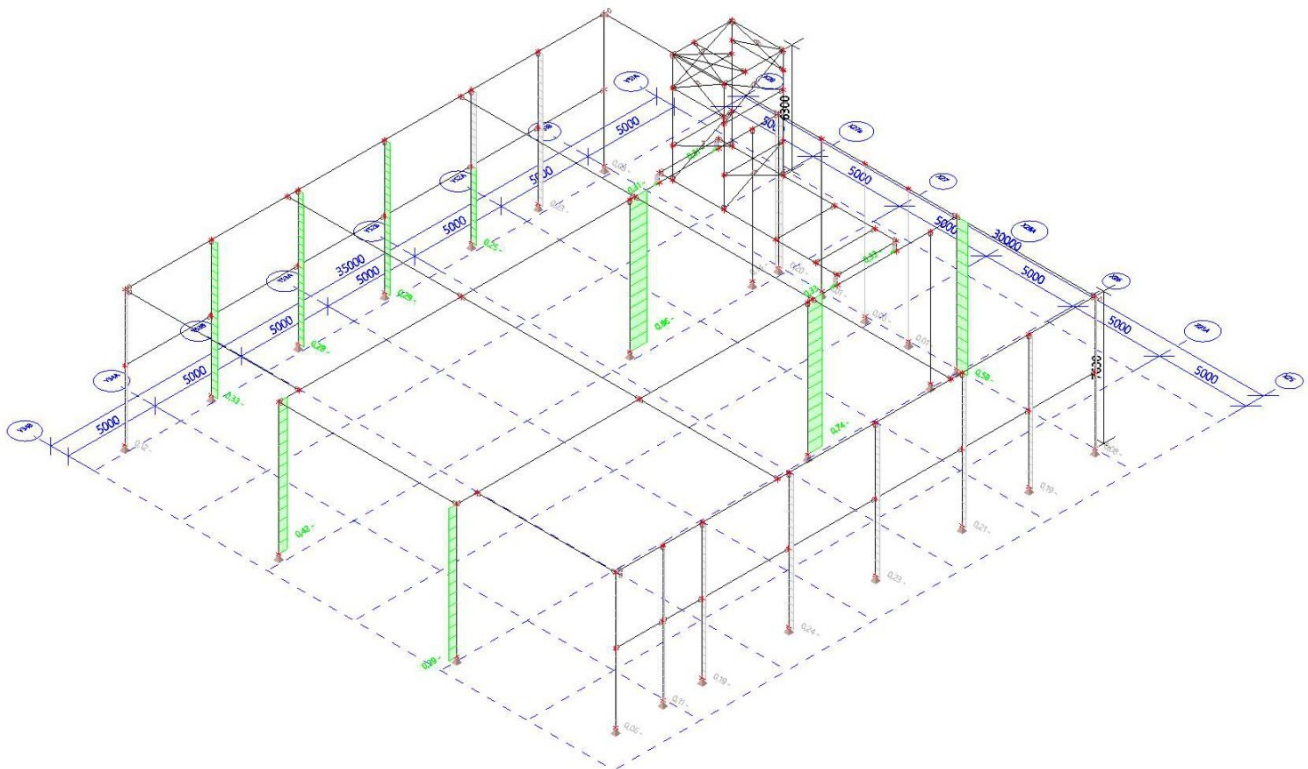
Class: ULS NEN8700

Coordinate system: Principal

Extreme 1D: Member

Selection: All

Filter: Layer = Existing columns



7. Reaction forces

7.1. Reactions

Linear calculation

Class: All ULS

System: Global

Extreme: Global

Selection: All

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]
Sn30/N196	ULS-Set B (auto)/1	-32,01	0,00	0,00	0,00	0,00	0,00	-	-
Sn30/N196	ULS-Set B (auto)/2	32,02	0,00	0,00	0,00	0,00	0,00	-	-
Sn29/N195	ULS-Set B (auto)/3	-2,88	-16,68	0,00	0,00	0,00	0,00	-	-
Sn29/N195	ULS-Set B (auto)/4	2,99	16,69	0,00	0,00	0,00	0,00	-	-
Sn1/N3	ULS-Set B (auto)/5	0,00	0,00	-92,54	0,00	0,00	0,00	0,0	0,0
Sn3/N1	ULS-Set B (auto)/5	0,00	0,00	990,37	0,00	0,00	0,00	0,0	0,0

Name	Combination key
ULS-Set B (auto)/1	0.90*LC1 + 0.90*LC2a + 0.90*LC2b + 1.35*LC5[+x]
ULS-Set B (auto)/2	1.08*LC1 + 1.08*LC2a + 1.08*LC2b + 1.35*LC3 + 1.35*LC5[-x]
ULS-Set B (auto)/3	0.90*LC1 + 0.90*LC2a + 0.90*LC2b + 1.35*LC5[+y]
ULS-Set B (auto)/4	1.08*LC1 + 1.08*LC2a + 1.08*LC2b + 1.35*LC3 + 1.35*LC5[-y]
ULS-Set B (auto)/5	1.08*LC1 + 1.08*LC2a + 1.08*LC2b + 1.35*LC3 + 1.35*LC4

7.2. Reactions; R_z

Values: R_z

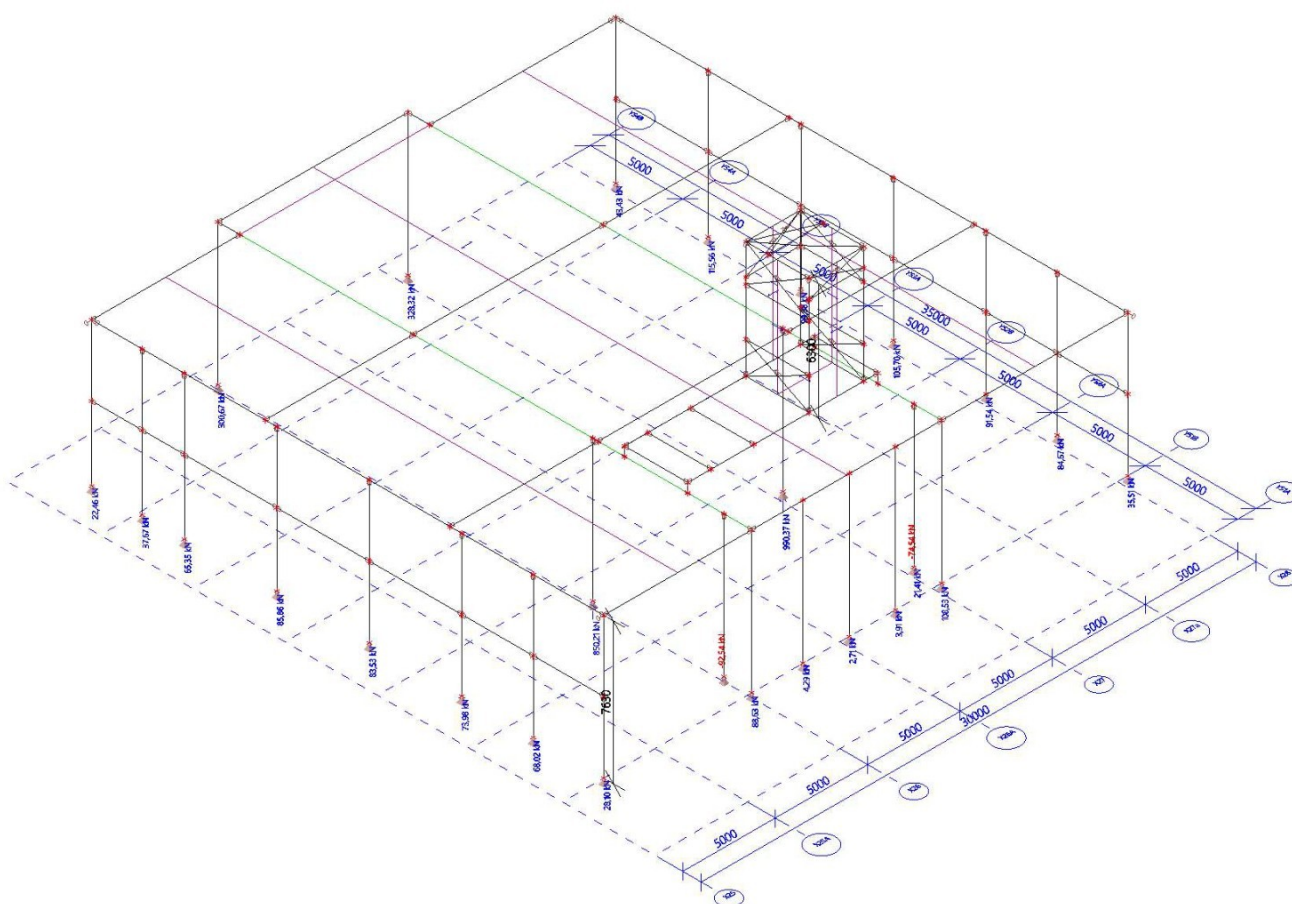
Linear calculation

Class: All ULS

System: Global

Extreme: Member

Selection: All



7.3. Reactions

Linear calculation

Class: All SLS

System: Global

Extreme: Global

Selection: All

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]
Sn30/N196	SLS-Char (auto)/1	-23,71	0,00	0,00	0,00	0,00	0,00	-	-
Sn30/N196	SLS-Char (auto)/2	23,72	0,00	0,00	0,00	0,00	0,00	-	-
Sn29/N195	SLS-Char (auto)/3	-2,12	-12,36	0,00	0,00	0,00	0,00	-	-
Sn29/N195	SLS-Char (auto)/4	2,22	12,36	0,00	0,00	0,00	0,00	-	-
Sn1/N3	SLS-Char (auto)/5	0,00	0,00	-74,09	0,00	0,00	0,00	0,0	0,0
Sn3/N1	SLS-Char (auto)/5	0,00	0,00	830,81	0,00	0,00	0,00	0,0	0,0

Name	Combination key
SLS-Char (auto)/1	LC1 + LC2a + LC2b + LC5[+x]
SLS-Char (auto)/2	LC1 + LC2a + LC2b + LC3 + LC5[-x]
SLS-Char (auto)/3	LC1 + LC2a + LC2b + LC5[+y]
SLS-Char (auto)/4	LC1 + LC2a + LC2b + LC3 + LC5[-y]
SLS-Char (auto)/5	LC1 + LC2a + LC2b + LC3 + LC4

7.4. Reactions; R_z

Values: R_z

Linear calculation

Class: All SLS

System: Global

Extreme: Member

Selection: All

