B03a
Compressorgebouw

SPA WNP Ingenieurs
Constructieberekening
1. Compressorgebouw

22000596.B03a
Yara Sluiskil - Project CCS

Plant Description **Carbon Capture Storage Plant, Sluiskil**	
Linde Project No. **3710 A3T8**	Client Project No. **16471**
Linde Project Code **Sluiskil**	Client Project Code **CACTUS**
Linde Doc. No. **0542FA5490-2001 N-CS 1001 (EN)**	Client Doc. No. **16471-Y16-00003** / Client Revision **00**

STRUCTURAL PRE-CALCULATION for MACHINE HOUSE

	Vendor Doc. No.	
	Vendor Revision	

IFD	2	23-11-2022	5.1.2.e [redacted]	5.1.2.e [redacted]	5.1.2.e [redacted]	
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Status	**Issue**	**Date**	**Prepared**	**Reviewed**	**Approved**	**Remarks**

0. Table of content

Annex

1. Constructive principles

1.1. General principles

1.1.1. Basic

This document contains the preliminary design calculation for the steelstructure and foundation/floor of the Machine Hall of the "YARA CCS" project at the YARA SLUISKIL PLANT. The following principles are applied:

- Calculations are performed in 3D as much as possible, with 2D controls.
- The main calculation of the structure is preformed by using the 3D finite element program Scia Engineer
- Detail calculations are preformed by using programs as GEO5 (piling), IDEA StatiCA (steel connections)
- The cross-section and stability checks of the various beam and plate elements are performed within the program according to Eurocode. Which are supplemented with checks via verified Excel worksheets.

In this report, in addition to a description of the further design principles, a description is given of the structural design, whereby the design of the supporting structure is recorded by means of images.

In addition to the profiles for the main construction, the starting points for the final design are provided.

1.1.2. General project data

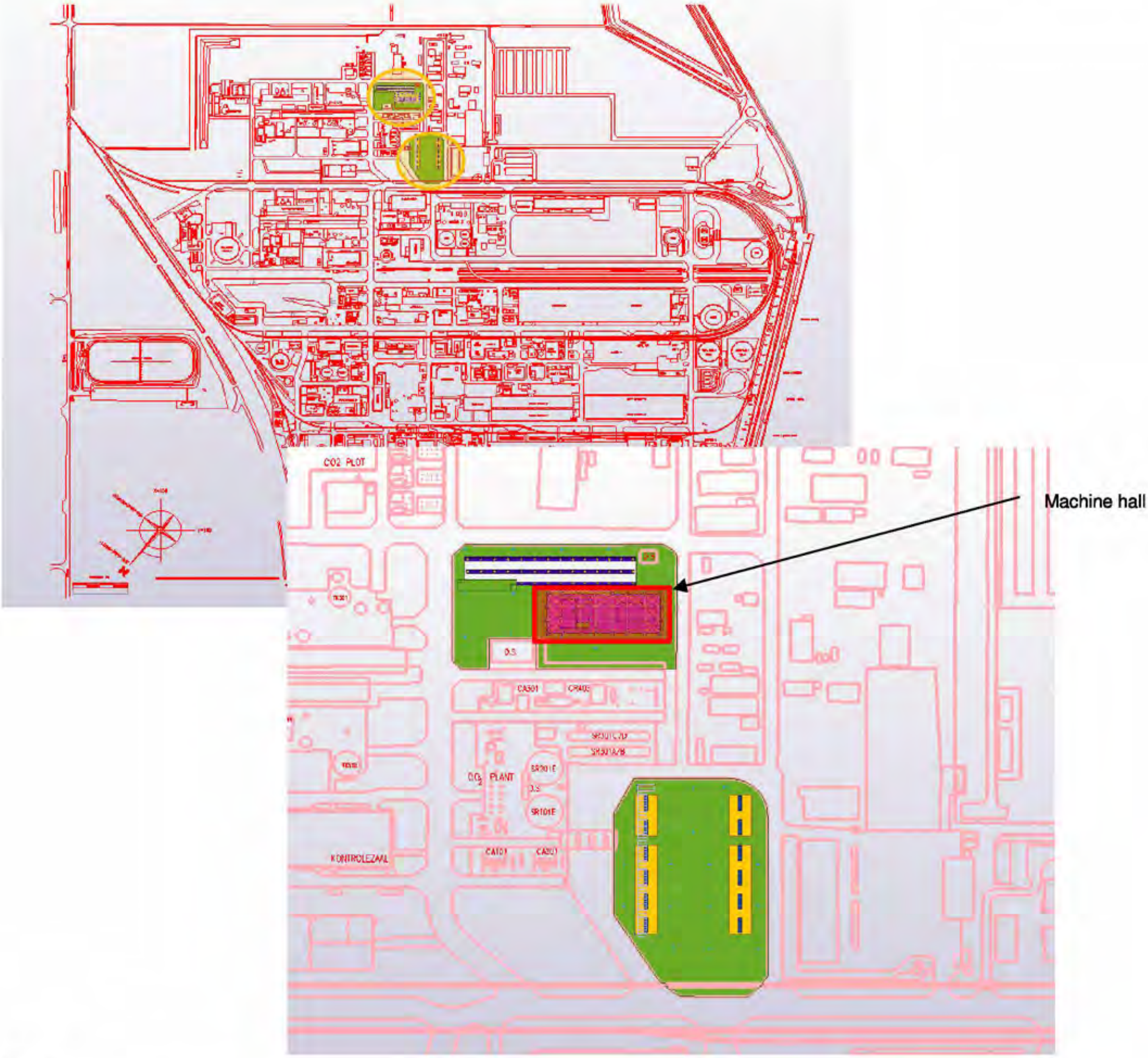
As part of the larger YARA CCS project, partial reports are prepared of construction parts for the tender phase in wich this project curently is.

The design in this document contains the steelstructure of the machine hall in combination with foundation / floorslab and pile design of the CCS project. The compressorfoundations inside the machine hall are not part of this document. They are reported in a secondary document.

The Machine hall is located on the plant north side of the project area, to the south of the coolerbanks

In this calculation, a global test is made of the construction, whereby the principles are checked for feasibility. In addition, a preliminary design of the basic reinforcement is made, which is the basis for the kg/m³ ratio for the tender documents.

Plant north



1.1.3. Definition

The advisory task of Konstruktis in this report relates to the aspects of the structural support structure of the project. The following definitions are used for the work to be carried out:

Structural support structure

The structural support structure is understood to be the elements as described in En 1990 + NA & the dutch Bouwbesluit

Definition according to EN 1990 + NA:

art. 1.5.1.6. construction

Systematic assembly of interconnected structural elements designed to withstand loads and provide sufficient rigidity.

art. 1.5.1.7. structural element (structural elements)

part of a structure that can be distinguished physically, eg a column, a beam / beam, a plate, a foundation pile

Definition according to the Bouwbesluit

- Building construction: part of a building that is intended to bear loads

Building construction intended for bearing horizontal loads, with the exception of stabilizing elements are not part of the structural bearing structure. E.g. handrails etc.

1.1.4. Set-up structure

The foundation consists of:

Type of foundation: Foundation on piles
Beams: 1000x800 mm² / 600x500 mm²
Slab: d = 300 mm
Approximate pile size: Fundexpiles ø460-560

The walls consists of:

Purlins + steel cladding

The roofs consists of:

Purlins + steel cladding

The set-up of the various components is in accordance with the main calculation.

The determination of the weights, and other structures according to weight calculation §"5. Loads on structure".

1.1.5. Mechanics of the structure

The structure is considerd to be staticly undetermined, due to the springsupports for the foundationpiles, as wel as the continius foundationbeam. Also the foundation slab is modelled as 2D element.

1.2. Purpose of the report / Principles of calculation / Execution Requirements

1.2.1. Purpose of the report / Principles of calculation

The purpose of the underlying document is to show that the calculated structure complies with the conditions laid out by the applicable Laws/codes/company standards. For this the following principles are applied:

The distribution of forces in the beams and the reaction forces are determined by a finite element model, consisting of all primary components (columns, beams and bracings).

Eccentricity and offsets of bars are modelled if these differences between the actual operating points is greater than 25% of the column or beam size.

Checks of deflection, displacement, etc. are performed by the calculaton program. Additional checks are provided where required, by means of Excel sheets of orther programs. The forces / displacements used in these checks are according to the results of the main 3D model.

1.2.2. Execution requirements

1.2.2.1. Steel

Basic execution in accordance with EN 1090-1 + NA & EN 1090-2 + NA

Material -> according to EN 10025 + NA, min. quality according to §4.1.

Bolts -> calculated acc. ISO 4017 (fully threaded), execution with bolts acc. ISO 4014 (partially threaded)

Nuts -> nuts grade 8 for 8.8 bolts, grade 10 for 10.9 bolts

According EN 1993-1-8 3.6.1 +NA (12) the max. shim thickness of ⅓ * bolt diameter may be used unless the calculations specifies a larger value.

For instance, the maximum shim thicknes for a M30 is 30/3 = 10 mm.

Connections are categorized in Category A and/or Category D of EN 1993-1-8 3.4 + NA.

If prestressed connections are applied then these categorized in Category C and Category E of EN 1993-1-8 3.4 + NA.

1.2.2.2. Concrete

Concrete works should be carried out in accordance with EN 13670 + NA

Material -> according to EN 206-1 +NA, min. quality according to §4.1.

The workability of the concrete is determined by the contractor. The chosen plasticity should be attuned to the implementation method , however, taking into account the permissible water / cement ratio with respect to the environmental class .

Finishes of the various elements, if applicable must be included on the drawings and should take minimum concrete cover into account.

1.2.2.3. Foundations

Pile foundations must be carried out in accordance with EN 1997-1 +NA, in combination with the requirements of the NEN 6742 and the implementation of the chosen pile type standard.

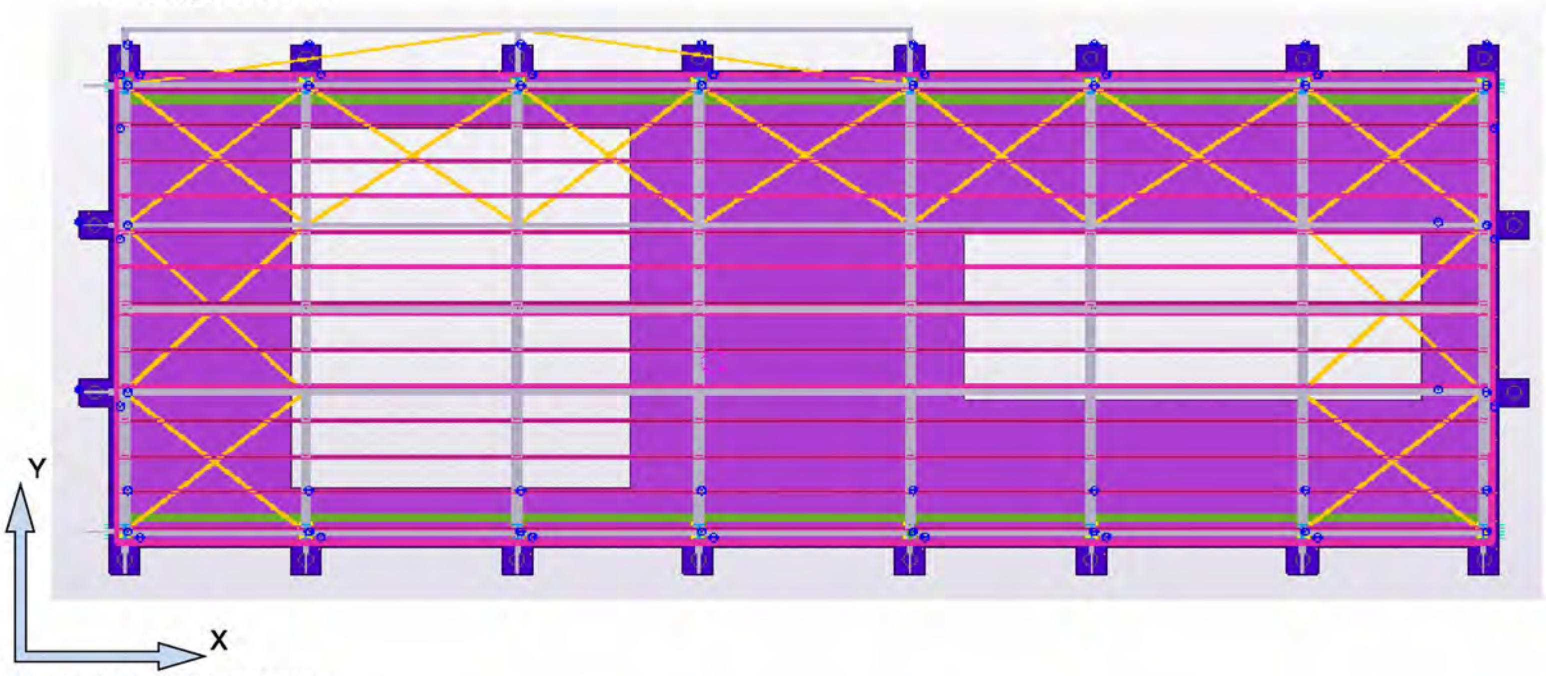
For further requirements see §10.2.4. Execution of foundation on piles

1.3. Software

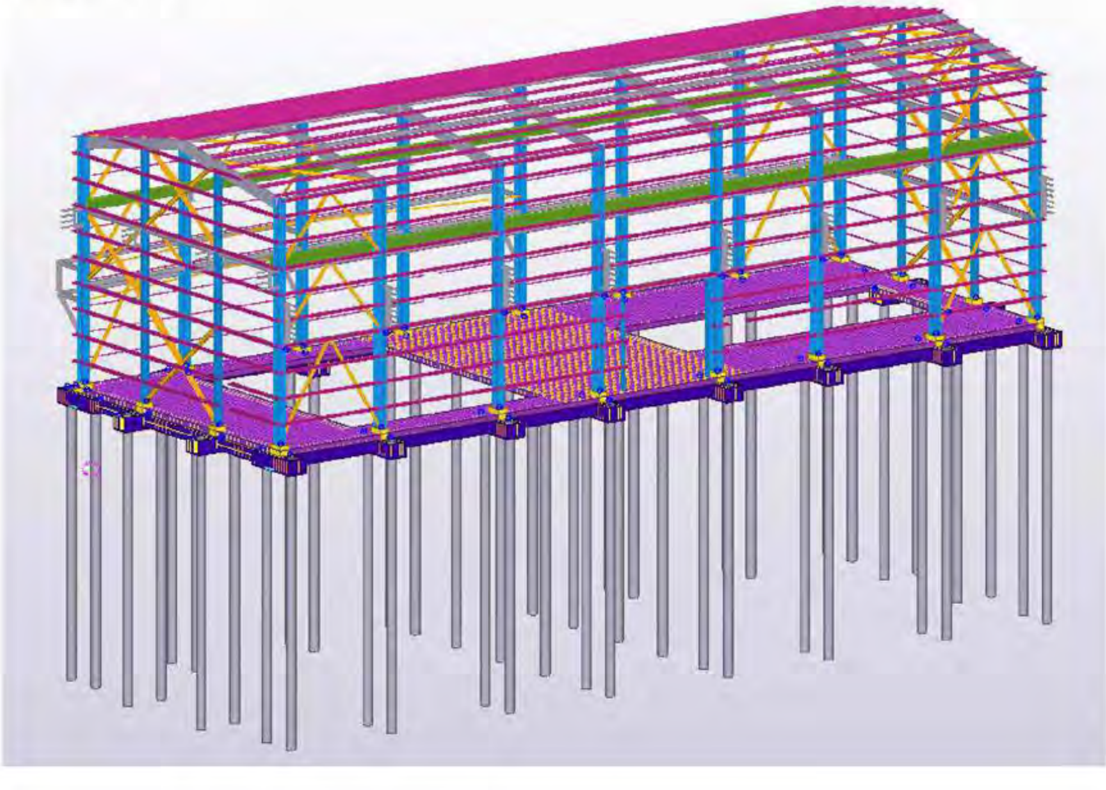
The following software is used in the execution of the work:

Microsoft Office Excel
Microsoft Office Word
Scia Engineer — See output for current version
GEO5 Pile CPT — See output for current version
IDEA StatiCa CONNECTION — See output for current version

1.4. Design overview



oriëntation of the project for loading scheme



2. General

2.1. Remarks

This report contains constructive calculations and principle sketches and constraints.

These calculations are both (in if possible) in 3D done with any 2D controls for the most accurate possible understanding of the structure, the forces and displacements.

It is recommended to mention these principle sketches and conditions on the relevant applicable drawings before start of construction. So that the instructions in this document are properly handled on site.

The overall alignment and accuracy on the basis of the data have being issued to us is outside of our responsibility.

The assumptions made in this report should be monitored (on site) and, if necessary, be fed back.

If abnormalities are found with this report, or unexpected findings on site are established, these should be reported as soon as possible to the structural engineer His instructions with regard to these findings should be followed, or a suitable alternative is to be provide as an alternative, which is to be submitted for approval.

The builders of the project are expected to work with skill and good constructive insight. They must be aware of all the applicable performance standards.

On all our advice set out in both calculations, mail or telephone are the standard conditions of our tender applicable in respect to of the relationship between the client and advisory engineering : The DNR 2011 with the supplement provision, as stated in the quote / on the website.

2.2. System of units / coordinate system

2.2.1. Used system of units

Unless noted otherwise the following units are used throughout this calculation:

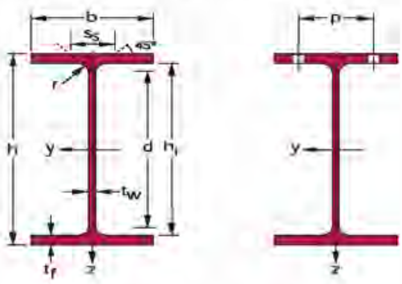
General dimensioning	in mm
Spans	in m^1
Areas	in mm and/or mm^2
Loads	in kN/m^2, in kN/m and/or in kN
Spring constant	in kN/m and/or in MNm/rad
Stress	in N/mm^2 and/or Mpa
Section modulus	in mm^3
Deflections	in mm and/or mrad

2.2.2. Coordinate system

The coordinate system used for 3D calculation consists of the X-axis and Y-axis in the horizontal plane and the Z-axis as the vertical axis

2.2.3. Notation of forces

Direction of force			Unit
+ N	=	Tension in connection / beam	kN
- N	=	Compression in connection / beam	kN
Vy	=	Shear in weak axis connection / beam	kN
Vz	=	Shear in strong axis connection / beam	kN
Mx	=	Torsion in connection / beam	kNm
My	=	Moment in strong axis of connection / beam	kNm
Mz	=	Moment in weak axis of connection / beam	kNm



2.3. Applicable Standards / Literature

The calculations are preformed in accordance with the Eurocode (EN) in concjuction with the applicable National Annex (NA)

The applicable main standards (bold & italic) are:

EN 1990 +NA	***Basic code for structural design***
EN 1991 +NA	***Code for Actions/Loads on structures***
EN 1992 +NA	***Code for design of Concrete structures***
EN 1993 +NA	***Code for design of Steel structures***
EN 1994 +NA	Code for Hybride Steel-Concrete design
EN 1995 +NA	Code for design of Timber structures
EN 1996 +NA	Code for design of Masonry structures
EN 1997 +NA	***Code for Geotechnical design***
EN 1998 +NA	Code for design of Earthquake resistance
EN 1999 +NA	Code for design of Aluminium structures

A full overview of the applicable main / sub codes are provided in appendix F

Also in appendix F an overview of the applicable standards for excecution, materials and connections, as well as an overview of the used professional literature can be found.

In some instances the calculation will refere to the NA of other countries / old codes. Thise is done for special cases, where design data (such as ψ-values for, for example, excecution) are missing. In these cases the National Annex / Codes of other countries / withdrawn codes are used.

Yara Specifications:

Nr.	Name	Rev.:	Date:
10000-Y50-00026	SPECIFICATION FOR CIVIL AND STRUCTURAL STEEL DESIGN	5.0	22-2-2021
10000-Y50-00028	SPECIFICATION FOR ARCHITECTURAL DESIGN	7.0	22-2-2021
10000-Y50-00029	SPECIFICATION FOR PILING	6.0	10-10-2019
10000-Y50-00032	SPECIFICATION FOR ACID PROOFING	4.0	7-5-2021
10000-Y50-00033	SPECIFICATION FOR ANCHORING IN CONCRETE	03M	8-10-2019
10000-Y50-00034	SPECIFICATION FOR CLADDING	4.0	18-6-2021
10000-Y50-00035	SPECIFICATION FOR CONCRETE WORKS	8.0	5-5-2021
10000-Y50-00036	SPECIFICATION FOR GRP GRATING, LADDERS AND HANDRAILS	8.0	22-2-2021
10000-Y50-00037	SPECIFICATION OF INFRASTRUCTURE	01M	31-10-2018
10000-Y50-00038	SPECIFICATION FOR STRUCTURAL STEEL	2.0	16-6-2021
10000-Y50-00042	SPECIFICATION FOR SURFACE PROTECTION	6.0	27-4-2021
10000-Y50-00044	SPECIFICATION FOR STEEL FIRE PROOFING	1.0	22-2-2021
10000-E50-00003	DESIGN AND INSTALLATION OF PROTECTIVE EARTHING	6.0	1-7-2021

2.4. Referentie drawings and documents

Drawings/doc.:	Discription:	Rev.:	Date:
crane loads 40 to .pdf	Load data crane	-	30-09-2022
SG0201 pdf	Overview printscreens	-	30-09-2022
SG0201 xls	Load data building	-	13-10-2022
Traffic_Loads_Floor Slab.pdf	Traffic loads on floor	-	30-09-2022

3. Design principles of the construction

3.1. General assumptions

This chapter sets out the design principles that form the basis for the constructive elaboration of the project.
The calculations are carried out in accordance with the standards specified in §2.3. "Applicable Standards / Literature".
In addition, the design data are included that follow from the interaction between the various design disciplines that apply to the work.

3.2. Function construction, consequence class and design life

3.1.1. Function construction

		design lifetime class	concequence class	category of use	combination value of variable loads	frequent value of variable loads	quasi-permanent value of variable loads	correction factor for design lifetime F_t/F_{t0}
Industrial building					ψ_0	ψ_1	ψ_2	ψ_t
main function =	Machine housing	3	CC2	E2	1.0	0.9	0.8	1
1st add. function =	Industrial floor	3	CC2	E2	1.0	0.9	0.8	1
2nd add. function =	Foundation	3	CC2	E2	1.0	0.9	0.8	1
3rd add. function =								
4th add. function =								
	maatgevend =	3	CC2					1

ψ ***value according EN 1990, annex A + NA***		ψ_0	ψ_1	ψ_2	
A	Domestic, residential areas	0.4	0.5	0.3	
B	Office areas	0.5	0.5	0.3	
C	Congregation areas	0.4 / 0.6 **	0.7	0.6	
D	Shopping areas	0.4	0.7	0.6	
E1	Storage areas	1	0.9	0.8	
E2	Industrial use	1	0.9	0.8	
F	Traffic area, vehicle weight ≤ 30kN	0.7	0.7	0.6	
G	Traffic area, 30kN < vehicle weight ≤ 160kN	0.7	0.5	0.3	
H	Roofs, not accessible, or only for maintance (H1 angle a<15°, H2 angle 15°<a<20°, H3 angle a > 20°)	0	0	0	
I	Roofs, accessible according to category A t/m D	0	0	0	
J	Roof, special use	0	0	0	
K	Roof, landing area for helicopters	0	0	0	
S	Snow	0.5	0.2	0	
Wa	Water accumulation	0	0	0	
Wi	Wind loads	0	0.2	0	
T	Temperature (non fire)	0	0.5	0	
Sp	Special loads during construction	1	1	0.2	Acc. NA Belgium
Z	Settlements	1	1	1	Acc. NA Germany

3.1.2. Scope of application

Design lifetime class	Primary structure	=	3		According EN 1990 + NA, § A1.1
Design lifetime		=	50	years	According EN 1990 + NA, § A1.1
Reduced design lifetime		=		years	
Applied design lifetime		=	50	years	According EN 1990 + NA, § A1.1
Design lifetime for snow/wind		=	50	years	According EN 1991-1-6 + NA
Design lifetime class	Secondary construction	=	3		According EN 1990 + NA, § A1.1
Design lifetime		=	50	years	According EN 1990 + NA, § A1.1

The following constructions fall under the secondary construction:

- Handrails
- Ladders / cage ladders
- Non-primary bearing parts

3.1.3. Concequence- & Reliability class

		Main construction	Secondary construction	
Concequence class	=	CC2	CC1	according EN 1990 + NA, § B3.1
Reliability class	=	RC2	RC1	according EN 1990 + NA, § B3.2
K_{fi}-factor	=	1.0	0.9	according EN 1990 + NA, § B3.3
Reliability factor	=	3.8	3.3	according EN 1990 + NA, § B3.2

Description MC = medium consequence for loss of human life, economic, social or environmental consequences considerable

Description SC = low consequence for loss of human life, and economic, social or environmental consequences small or negligible

3.1.4. Design & Inspection level

Design supervision level = DSL2 According EN 1990 + NA, § B4
(combined with RC2, normal supervision)
medium consequence for loss of human life, economic, social or environmental consequences considerable

Inspection level = IL2 According EN 1990 + NA, § B5
(combined with RC2, normal supervision)
Inspection according to the working method of the organization

3.1.5. Performance classes

3.1.5.1. Steel main construction

Load category	=	BC1	According EN 1993-1-1 + NA, §C
Production category	=	PC1	According EN 1993-1-1 + NA, §C
Excecution class	=	EXC2	According EN 1993-1-1 + NA, §C

3.1.5.2. Steel secondairy construction

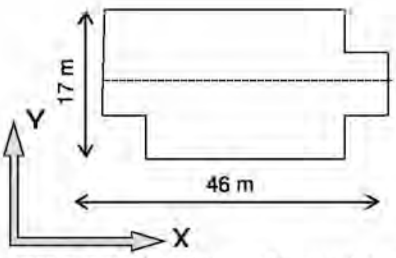
Load category	=	BC1	According EN 1993-1-1 + NA, §C
Production category	=	PC1	According EN 1993-1-1 + NA, §C
Excecution class	=	EXC1	According EN 1993-1-1 + NA, §C

3.1.5.3. Concrete

Design lifetime	=	50 years
Construction class	=	S4

3.1.6. Dimensions

Number of levels		=	1	stk
Level height		=	8800	mm
Width of structure	X-axis	=	46000	mm
Depth of structure	Y-axis	=	17000	mm
Height of structure		=	15500	mm
Gutter height		=	14000	mm
Height of structure above level 0+		=	0	mm
Pitch of roof		=	10	°
Roofarea		=	782	m²



project orientation for loads, general illustration for how dimensioning is applied

3.3. Loadcombinations + factors

3.3.1. New construction according to EN 1990, Annex A + NA

Limit state	Favorable / unfavorable	Permanent loads	Leading variable load	Variable loads, simultaneous with the leading variable load
Ultimate Limit State EQU (set A)	Favorable	$1.1 * G_k$	$+ 1.5 * Q_k$	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
	Unfavorable	$0.9 * G_k$	$+ 1.5 * Q_k$	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
Ultimate Limit State STR/GEO (set B)	Favorable	$1.35 * G_k$	$+ 1.5 * Q_k$	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
	Unfavorable	$0.9 * G_k$	$+ 1.5 * Q_k$	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
	Favorable	$1.35 * G_k$	+	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
	Unfavorable	$1.2 * G_k$	+	$+ 1.5 * \psi_{0,i} * Q_{k,i}$
Ultimate Limit State STR/GEO (set C)	Favorable	$1 * G_k$	$+ 1.3 * Q_k$	$+ 1.3 * \psi_{0,i} * Q_{k,i}$
	Unfavorable	$1 * G_k$	$+ 1.3 * Q_k$	$+ 1.3 * \psi_{0,i} * Q_{k,i}$

Limit state	Permanent loads	Accidental load / earthquake	Leading variable load	Variable loads, simultaneous with the leading variable load
Ultimate Limit State accidental loads	$1 * G_k$	$+ \quad 1 * Q_{kb}$	$+ \quad 1 \quad * \psi_{1,1} * Q_{k,1}$	$+ \quad 1 \quad * \psi_{2,i} * Q_{k,i}$
Ultimate Limit State earthquake	$1 * G_k$	$+ \quad 1 * Q_{ka}$	$+ \quad 1 \quad * \psi_{2,1} * Q_{k,1}$	$+ \quad 1 \quad * \psi_{2,i} * Q_{k,i}$

3.3.2. Combinations for serviceability

Serviceability Limit State	Permanent loads	Leading variable load	Variable loads, simultaneous with the leading variable load
Characteristic	$1 * G_k$	$+ \quad 1 * Q_k$	$+ \quad \Sigma \quad 1 * \psi_{0,i} * Q_{k,i}$
Frequent	$1 * G_k$	$+ \quad 1 * \psi_{1,1} * Q_{k,1}$	$+ \quad \Sigma \quad 1 * \psi_{2,i} * Q_{k,i}$
Quasi-permanent	$1 * G_k$	$+ \quad 1 * \psi_{2,1} * Q_{k,1}$	$+ \quad \Sigma \quad 1 * \psi_{2,i} * Q_{k,i}$

3.4. Deflection requirements

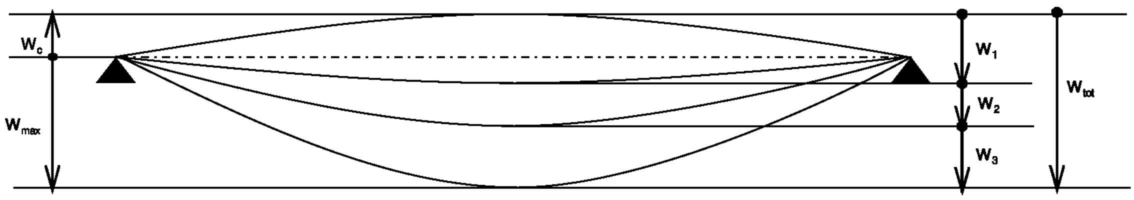
The building must meet the requirements for deflection, to accomodate a safe feeling.
For elements not coverd by the YARA specifications, the following basic requirements are set:

Determination vertical deflection beams / floors

General requirement	L/300	(L/150 voor uitkraging)
Floorbeams with intensive use by people	L/333.33	(L/166.665 voor uitkraging)
Beam that carries partitions	L/500 **	(L/250 voor uitkraging)
Roofbeams with intensive use by people	L/333.33	(L/166.665 voor uitkraging)
Other roofbeams	L/250	(L/125 voor uitkraging)
Column general	L/300	(L/150 voor uitkraging)
Facade column	L/300	(L/150 voor uitkraging)
Secondary column	L/300	(L/150 voor uitkraging)
Purlin	L/250	(L/125 voor uitkraging)
Support beams for cranes	L/600	(L/300 voor uitkraging)

** For floors and beams that carry partitionwalls a limited deflection of maximum 15 mm is adviced. The additional deflections for cantilevers should be limited to 10 mm.

According to EN-1990 + NA nl A1.4.3 + EN-1993-6 + NA



W_c = The calculated value of the camber for the structural component in serviceability limit state (SLS);

W_{max} = Permanent total deflection minus the camber;

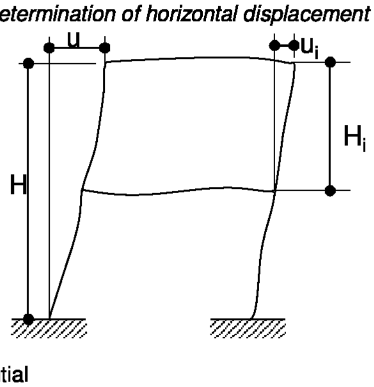
W_1 = Initial part of the deflection under permanent loads from the applicable load combinations according to the formulas (6.14a) to (6.16b) determined by the short-term properties;

W_2 = Long-term part of the deflection under the permenent loads equal to the deflection at the quasi-permanent load combination determined by long-term proberties, minus the deflection athe the quasi-permanent load combination determined by short-term properties of the quasi-permanent load combination (effects of creep);

W_3 = Additional part of the deflection caused by the variable loads from the applicable load combination determined by the short-term properties;

W_{tot} = The calculated value of the total deflection of the structure or structural component in the serviceability limit state.

Determination of horizontal displacement



H = height of building
Hi = height of 1 floorlevel
u = total horizontal displacement
u1 = displacement of 1 floorlevel

Allowable for buildings with 1 level:
h/150 for industrial buildings
h/300 for all others

Allowable for buildings with more than 1 level
h/300 per level
h/500 for total building

According to EN-1990 + NA nl A1.4.3

Handrails / railings

The deflections must meet the following requirements:

All deformations should remain elastic.

The vertical deflection of the top edge, or bottom edge and the top egde, or bottom line must be smaller than L/150 of the distance between 2 supportpoints.

At floor partitions, the horizontal deflection of the upper edge may not be greater than 20 mm.

According to EN-1990 + NA nl A1.4.3

3.5. Load arrangements

In EN 1991-1-1 art. 6.2.1. and 6.2.2. the following rules are set:

Art. 6.2.1: Floors, beams and roofs (also applies to foundations):

1.) For the design of a floor structure within one storey or a roof, the imposed load shall be taken into account as a free action applied at the most unfavourable part of the influence area of the action effects considered.

2.) Where the loads on other storeys are relevant, they may be assumed to be distributed uniformly (fixed actions).

3.) To ensure a minimum local resistance of the floor structure a separate verification shall be performed with a concentrated load that, unless stated otherwise, shall not be combined with the uniformly distributed loads or other variable actions.

Art. 6.2.2: Columns and walls (also applies to foundation piles):

For the design of columns and walls, the imposed load should be placed at all unfavourable locations.

2.) Where imposed loads from several storeys act on columns and walls, the total imposed loads may be reduced by a factor α_n according to 6.3.1.2(11) and 3.3.1(2)P.

3.6. Imperfections

The following imperfections must be taken into account in the design and elaboration:

Foundation piles	Tubular piles	Non; Installation deviation smaller than 1/8 of the diameter of the steel tubular pile is considered to fall within the margin of the calculations and does not have to be designed separately.
Concrete structures		Imperfections are included in the calculation method. Dimensional deviations from the implementation must fall within the dimension tolerances of the applicable standards. Deviations that fall outside of this must be reported and checked if the structure complied with the standards.
Steel structures		Imperfections are included in the calculation method in accordance with art. 5.3 of EN 1993-1-1 +NA. Dimensional deviations from the implementation must fall within the dimension tolerances of the applicable standards. Deviations that fall outside of this must be reported and checked if the structure complied with the standards.

4. Applied Materials & Sustainability

4.1. Materials

For the materials that are used, unless otherwise noted, the following principles apply:

Steel structures	->	Structural steel	->	Standard structural steel		S235JR
				Crane rails		S355J2G3
		Connections	->	End / base plates		S235JR
				Bolts		8.8
				Anchors		8.8 with plate 80x80*15
				Welding	min. a =	4 mm
Concrete structures	->	Poured into the work				C35/45
		Reinforcement steel		Bars		B500B
				Point-welded reinforcement nets		B500A
		Cement type				Hoogovencement CEM III/B 42,5 LH/HS
Grouting	->					Low shrink grouting min. K70 grade

Properties of materials according to Annex A

4.2. Sustainability / conservation

4.2.1. Steel

Basic execution in accordance with EN 1090-1 + NA & EN 1090-2 + NA

Material -> according to EN 10025 + NA, min. Quality according to the above.

The following operations must be applied (at least) to preserve the structure, unless otherwise specified for the specific part:

Group	Location		Treatment	Corrosion speed (mm / year) if untreated
0	Steel in concrete		apply untreated	
1	Steel in indoor environment	C1	mean	0.005-0.03
2	Steel in indoor environment	C2	hot dip galvanized + coating	0.03-0.08
3	Steel outside	C3	hot dip galvanized + coating	0.08-0.12
4	Steel in chemical environment	C4	hot dip galvanized + coating	0.12-0.15
4	Steel in industry	C5-I	hot dip galvanized + coating	0.012-0.15
5	Steel on the coast	C5-M	galvanized	0.015-0.20
-	preserved steel in concrete		chromated	

Climate class	Location	quality environment	examples	
C1	Within	not very aggressive	heated building	
C2	Within	moderately aggressi	unheated building	(including steel in cavity)
C3	Outside	not very aggressive	business premises with high humidity	
C4	Industry	moderately aggressi	chemical company, swimming pool and the like.	
C5-I	Industry	aggressive	industrial area with high humidity and corrosive atmosphere	
C5-M	Industry	aggressive	coastal area with high salinity, offshore	

Surface treatments of all parts are according to Yara specification 10000-Y50-00042

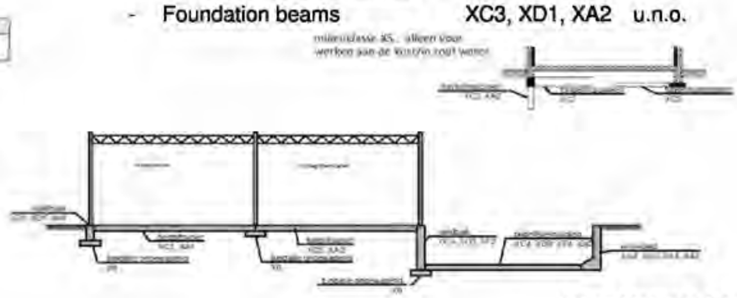
4.2.2. Concrete

4.2.2.1. Environmental class & concrete cover

For the composition of the concrete and detail of the reinforcement, the following environmental classes + cover must be used:

Others, not shown in picture:

- Foundation piles XC2, XA2 u.n.o.
- Floor (production building) XC1, XA1 u.n.o.
- Floor (storage) XC3, XA2 u.n.o.
- Foundation (not reinforced) XC0
- Foundation beams XC3, XD1, XA2 u.n.o.



Part	Construction class	Environmental classes, u.n.o. on drawings	c_{minb} [mm]	c_{mindur} [mm]	Δc_{dev} [mm]	c_{nom} required [mm]	c_{nom} applied [mm]
Foı Funderingspalen							
Drilled	S4	XC2 / XA3	16	40	5	45	50
Foundation beams							
Top	S4	XC4 / XD3 / XF2 / XA3	16	50	10	60	60
Side	S4	XC2 / XD3 / XF2 / XA3	16	50	10	60	60
Bottom	S4	XC2 / XA 3	16	45	10	55	60
Ground floor							
Top	S3	XC4 / XD3 / XF2 / XA3	16	40	10	50	50
Side	S3	XC2 / XD3 / XF2 / XA3	16	40	10	50	50
Bottom	S3	XC2 / XA 3	16	40	10	50	50

4.2.2.2. General remarks

Concrete works must be carried out in accordance with EN 13670 + NA;

Concrete works must also comply with 10000-Y50-00035;

Material -> acc. EN 206-1 + NA, min. grade in acc. to §4.1.

The workability of the concrete is determined by the contractor. The chosen plasticity should be attuned to the implementation method , however, taking into account the permissible water / cement ratio with respect to the environmental class .

Finishes of the various elements, if applicable must be included on the drawings and should take minimum concrete cover into account.

Piling design (Dimensions and reinforcement) to be checked by contractor

For all new concrete KOMO Certification is Mandatory for New Concrete

5. Loads on structure

5.1. Dead and imposed floorloads according EN 1991-1-1 + NA

5.1.1. General, summary table

The self-weight of the modeld structure is calculated by Scia.

These loads are determined based on the following secific mass:

Concrete	dry	unreinforced	=	2400	kg/m³
	wet	unreinforced	=	2500	kg/m³
	dry	reinforced	=	2500	kg/m³
	wet	reinforced	=	2600	kg/m³
Rebar			=	7850	kg/m³
Construction steel			=	8000	kg/m³
Stainless steel			=	8000	kg/m³

The remaining permanent loads are entered according to the schedule below.

Part	Description	g_k [kN/m²]	q_k [kN/m²]	Q_k [kN]	ψ_0	area pointload mm²
V01	Roof	0.30	1.00	1.50	0	100*100
V02	Floor		3.00	7.00	1	50*50
W01	Walls	0.30				

5.1.2. Floors

V01 Roof		h/d [mm]	g_k kN/m²	q_k kN/m²	Q_k kN
Floor type:	steel sandwich panel	150 mm	0.30		
Category:	H a < 0 a < 15	H1		1.00	1.50
	ψ_0 = 0	150	0.30	1.00	1.50
	Area Q_k : 100*100 mm²				

V02 Floor		h/d [mm]	g_k kN/m²	q_k kN/m²	Q_k kN
Floor type:	massive slab	300 mm	by Scia		
Category:	E2 industrial use	E2		3.00	7.00
	ψ_0 = 1	300		3.00	7.00
	Area Q_k : 50*50 mm²				

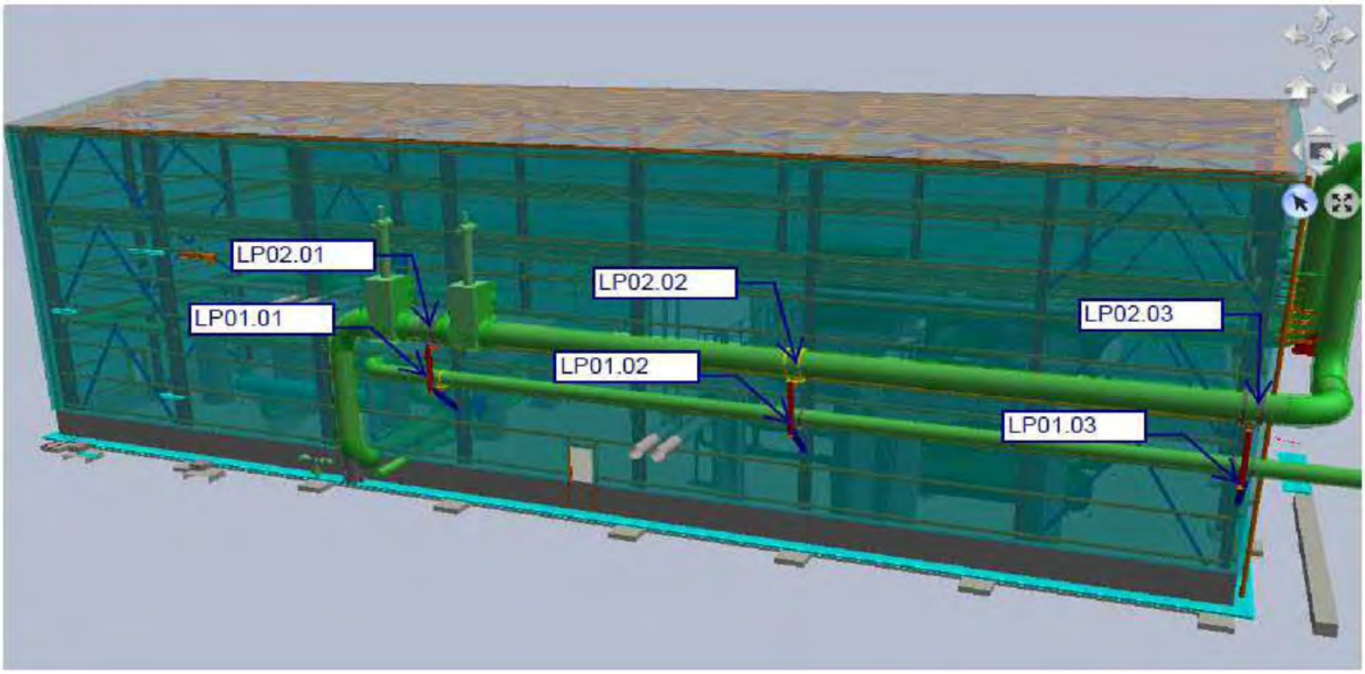
5.1.3. Walls

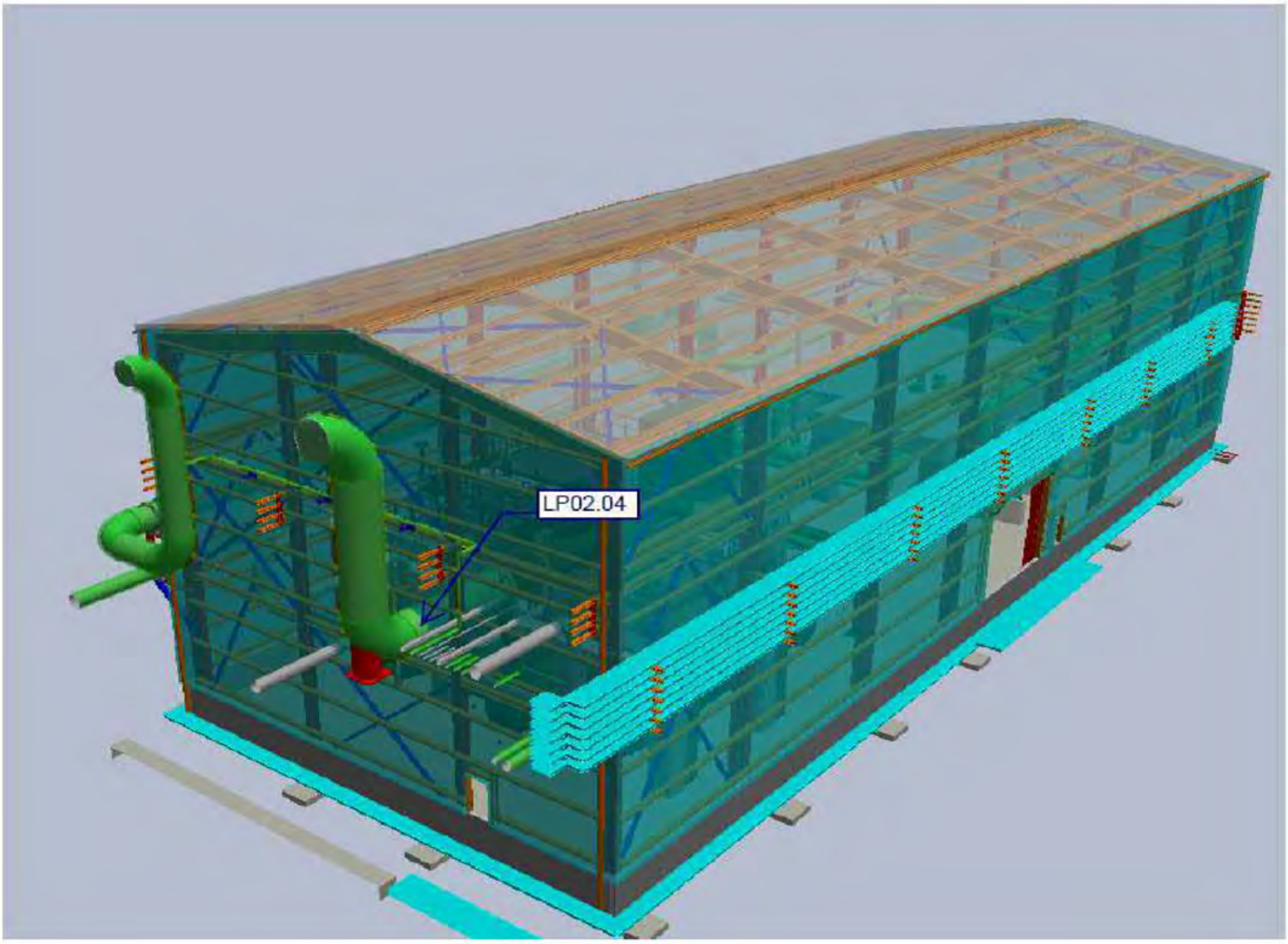
W01 Walls		h/d (mm)	G_k (kN/m²)
Outher finish:	sandwich panel	150 mm	0.30
		150	0.3

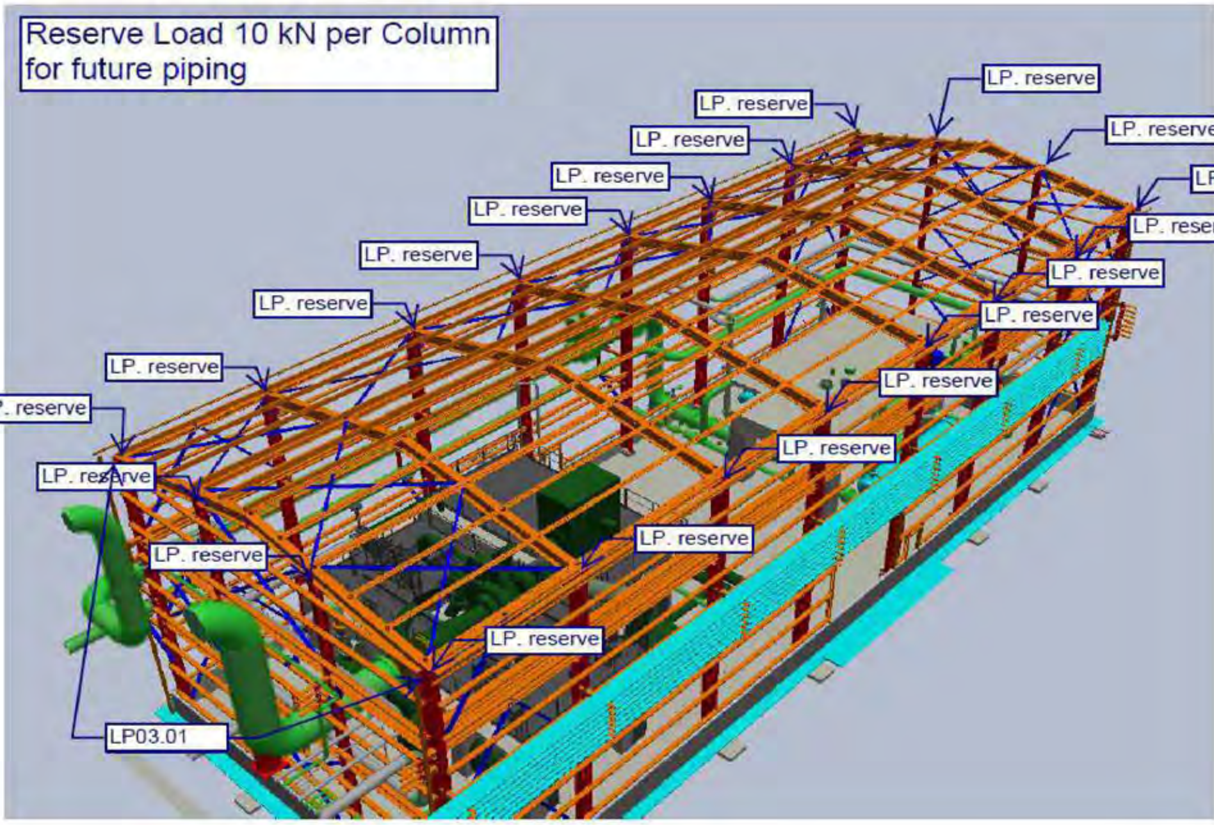
5.1.4. Beam elements

Determined by Scia

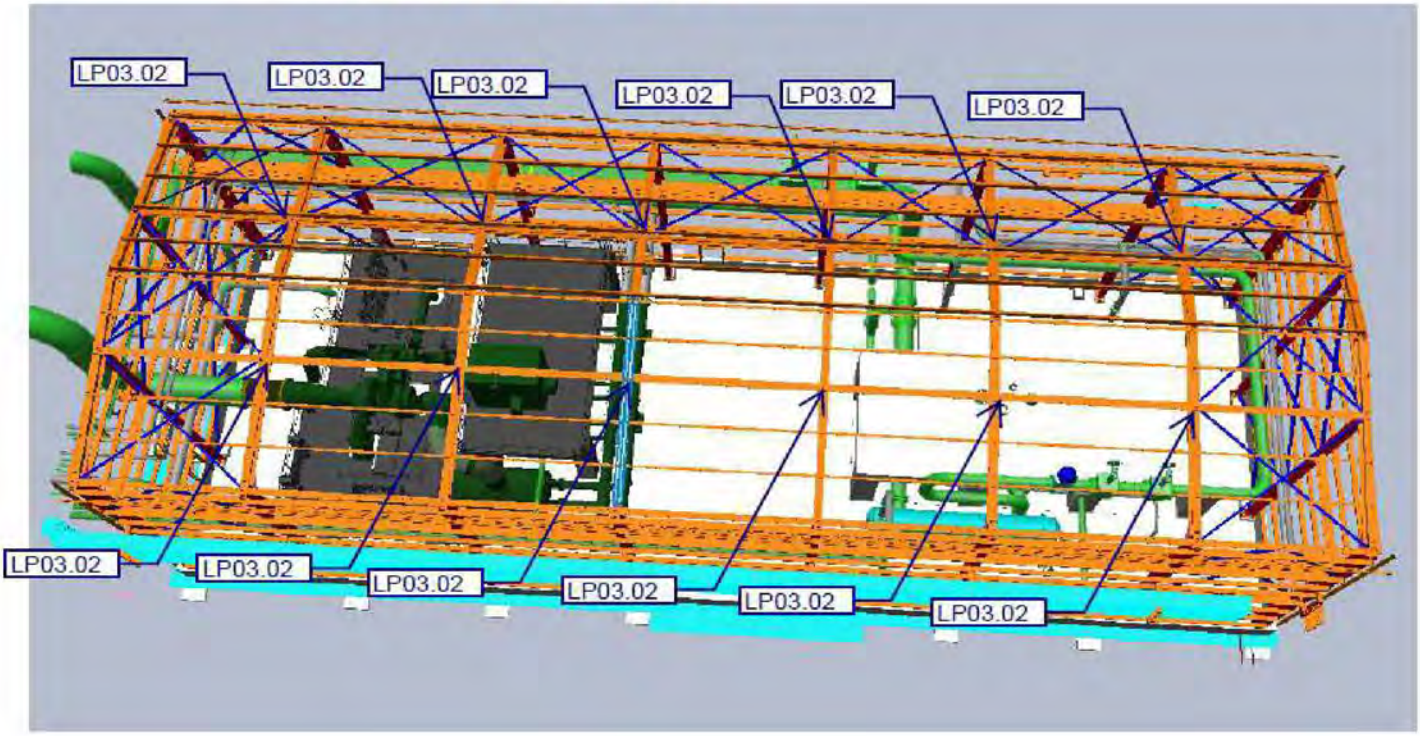
5.1.5. Loads provided by client







Reserve Load 10 kN per Column for future piping
LP. reserve
LP03.01



LP03.02

CONCENTRATED LOADS (LOCATION SEE DRAWING)

LOADS RESULTING FROM CONNECTED PIPING ARE INCLUDED

+H ELEVATION [m]	MARKED LOAD POINT NO. OR EQP NO.	VERTICAL LOAD (-V / +V) V_D [KN]	 V_O [KN]	 V_T [KN]	HORIZONTAL LOAD ($+H_N$ / $+H_E$) H_N [KN]	 H_E [KN]	GLOBAL ('X' - MARK)	REMARKS
+4.550	L01.01	+ 30.0	+ 40.0	+ 50.0	only wind	+/-4	X	48"-CAJR01
+4.550	L01.02	+ 30.0	+ 40.0	+ 50.0	only wind	+/-10	X	
+4.550	L01.03	+ 30.0	+ 40.0	+ 50.0	only wind	+/-4	X	
+6.380	LP02.01	+ 100.0	+ 120.0	+ 220.0	only wind	+/-12	X	test load will be not act thogether with LP 01.01
+6.380	LP02.02	+ 100.0	+ 120.0	+ 220.0	only wind	+/-36	X	test load will be not act thogether with LP 01.02
+6.380	LP02.03	+ 50.0	+ 60.0	+ 170.0	only wind	+/-5	X	test load will be not act thogether with LP 01.03
+6.380	LP02.04	+ 40.0	+ 50.0		+/-4	+/-4	X	
+10.150	Crane		+ 400.0				X	see data sheet, only maintenance crane
+13.530	LP03.01					+/-20	X	reserve load
+14.270	LP03.02	+ 5.0	+ 5.0				X	reserve load
+13.530	LP. reserve	+ 10.0	+ 10.0				X	reserve load

AREA LOADS (AS MARKED IN THE DRAWING)

LEVEL	PIPING LOADS					LIVE LOADS VERTICA	CONCEN-TRATED LOAD	Remarks
	VERTICAL			HORIZONTAL				
ELEVATION [m]	g_R [kN/m²]	p_R [kN/m²]	q_R [kN/m²]	h_N [kN/m²]	h_E [kN/m²]	q [kN/m²]	P [KN]	
Roof								acc. to YARA Specification
Cabletrays								acc. to YARA Specification
Explosion Load								acc. to YARA Specification

NOTE 1 : CONSIDER CABLE TRAY SUPPORTING PORTION FULLY OCCUPIED

V_D = DEAD LOAD (EMPTY WEIGHT WITH INSULATION AND ATTACHMENTS)

V_O = OPERATING LOAD (V_D + OPERATING, FILLING WITH OPERATING MEDIUM)

V_T = PRESSURE TEST LOAD (V_D + FILLING WITH WATER)

H_N / H_E = HORIZONTAL LOAD IN OPERATION (N= NORTH, E=EAST) FOR LOCAL DESIGN IF NOT MARKED AS GLOBAL

gR = DEAD LOAD - PIPELINE

PR = LIVE LOAD + gR

qR = TEST LOAD = gR + PRESSURE TEST LOAD (WITHOUT INSULATION)

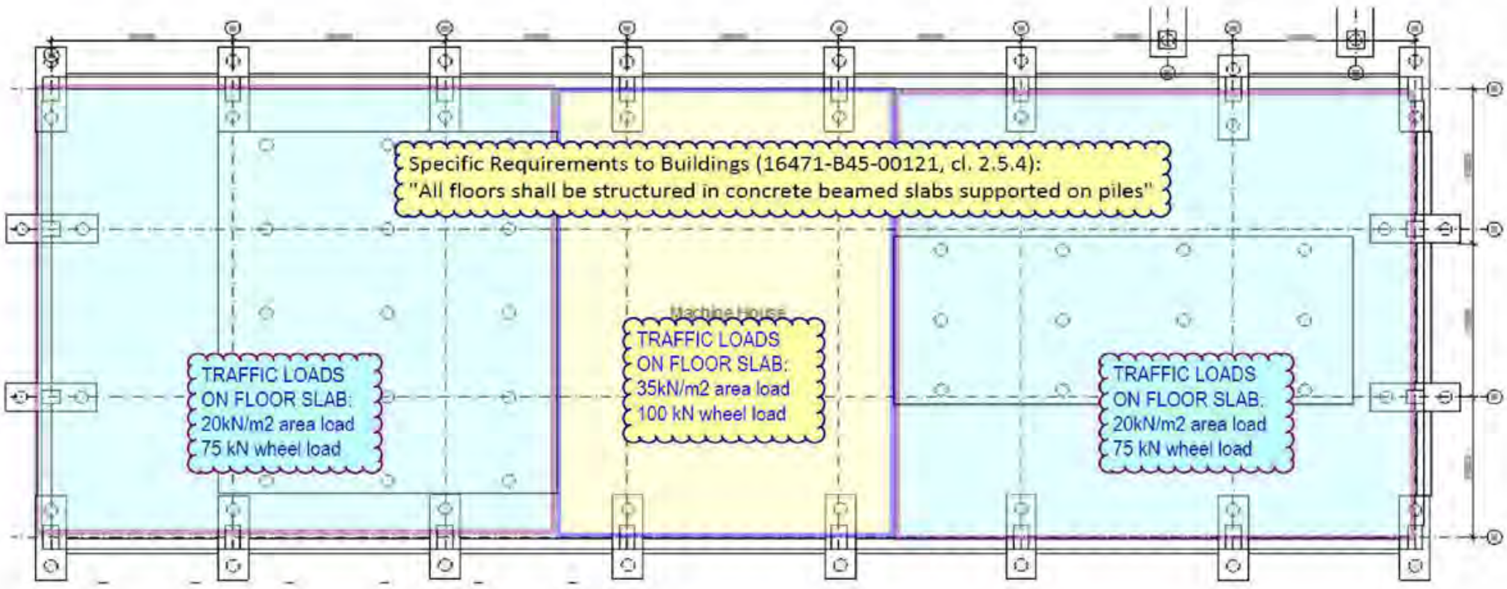
hN = PIPE THRUST NORTH

hE = PIPE THRUST SOUTH

q = LIVE LOAD IN AREAS WITH GRATING

P = CONCENTRADED SINGLE LIVE LOAD ON PLATFORM FOR LOCAL DESIGN

ENVIRONMENTAL LOADS ON EQUIPMENT, STRUCTURE, PIPES, CABLE TRAYS AND SO ON ARE NOT INCLUDED IN THIS TABLE AND SHALL BE ADDED PROPERLY BY THE ENGINEER WHO PREPARES THE STATIC CALCULATION



5.1.6. Loads due to imperfections

In accordance with EN 1993-1-1 +NB art. 5.3.1 (3) a general imperfection of frames and local imperfections of steel profiles/members must be taken into account. The local imperfections are incorporated in the formulas for resistance to buckling of bars in accordance with EN 1993-1-1+NB art. 5.3.4 (1). The general imperfections of frames must be taken up by means of the following equivalent horizontal forces on each column, in accordance with EN 1993-1-1 +NB art. 5.3.2 (7).

The formula (5.5) of EN 1993-1-1 +NB art. 5.3.2 (3) applies:

$\phi = \phi_a * \alpha_h * \alpha_m$

in wich

ϕ_a	=	1/200	basic value according to EN 1993-1-1 +NB 5.3.2 (3)		
α_h	=	$2/\sqrt{h}$	but $2/3 \le \alpha_h \le 1$	=	0.67
h	=	height structure	=	15.5 m	
α_m	=	$\sqrt{0.5 * (1 + 1/m)}$	=	0.87	
m	=	is the number of columns in a row, which have a vertical load not less than 50% of the average vertical force on the columns in the considered vertical plane.			
m	=	2 stk			
ϕ	=	0			

5.2. Horizontal load on partitions: handrails/railings according to EN 1991-1-1 +NB

Category: = E2 q_k = 0.80 kN/m

F_k = 1.00 kN

5.3. Special floor load according to EN 1991-1-1 +NB

Not applicable

5.4. Special floorloads due to vehicles acc. EN 1991-1-1 +NA

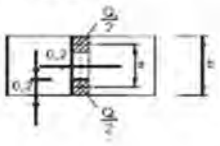
Loads due to vehicles are divided in 2 parts: 1.) Forklifts; 2.) Transportvehicles that are not acc. categorie F or G of art. 6.3.3.1 from the EN 1991-1-1 + NA.

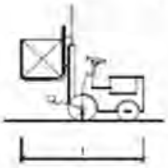
1.) Forklift:

Type	Netto weight (kN)	hoistload (kN)	axis load Q_k (kN)	axis width b (m)	width b_2 (m)	length (m)
FL5	90	60	140	1.50	1.20	2.20

The static axelloads need to be multiplied by the dynamic factor which depends on the type of tires.

Used type of tire: Air-filled tires Factor φ = 1.4 Q_k = 196.0 kN axel load



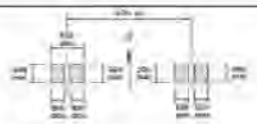


2.) Transportvehicles

Standard truck acc. EN 1991-2 + NA, table 4.7

Type 2 is used   3 axis

	dist.	Load				Tire type
	4,20 1,30	70 120 120	5,0	10,0	5,0	A B B

WIEL-ASTYPE	OMSCHRIJVING VAN DE GEOMETRIE
A	
B	

5.5. *Loads due to fire acc. EN 1991-1-2 +NA*

Loads due to fire are not checked in this calculation.

Effects due to fire / fire protection need to be checked in final design.

5.6. *Snowloads acc. EN 1991-1-3 +NA*

Snow loads as determined in Annex B. The loads that are applicable are:

Loads for pitched roofs are q_{sn1} = 0.56 kN/m²

q_{sn2} = 0.56 kN/m²

5.7. *Wateraccumulation acc. EN 1991-1-3 +NA*

Wateraccumulation is considderd not applicable if there are no roof edges that are ubstructed (h < 70 mm), combined with a sloop of 16 mm/m1.

Wateraccumulation is considerd not applicable for gable roofs with an incline > 5°

5.8. *Windloads acc. EN 1991-1-4 +NA*

Windloads are determined in Annex C, following the basic points:

Country	=	Nederland
Location	=	Sluiskil
Windarea	=	2
Ref. height	=	15.5 m
The windpressure that follows	=	0.99 kN/m²

Other factors are acc. to Annex C.

The structure is a closed 3D building. This is applied in Scia that automatically calculates the applicable windloadfactors in acc. to the applicable codes.

5.9. *Temperature loads acc. EN 1991-1-5 +NA*

Loads due to temperature other than fire are:

acc. to: EN-1991-1-5 + NA:

Assumption for absorbency   0.7 light-colored

T_{min}	=	-25 °C	T_3	=	20 °C	T_{out}	=	60 °C
T_{max}	=	30 °C	T_4	=	30 °C	ΔTu	=	85 °C
			T_5	=	45 °C			
assembly temperature			T_0	=	10 °C			
difference 1				=	-35.0 °C => input for calculation			
difference 2				=	50.0 °C => input for calculation			

For the concrete structure the temperature loads are not applicable, as the concrete is surrounded by soil, it is provided with an initial insulation so that no strong temperature fluctuations are to be expected. Only the steel-elements that are not within the thermal shell are applicable to thermal loads. For this design the load is therefor ignored and needs to be applied in final design.

5.10. Impact loads EN 1991-1-7 +NA

The following applies to the impact load on the construction:

The design value of the equivalent static force is:

Courtyards and parking garages with truck access > 3.5 Ton

F_{dx} = 200 kN

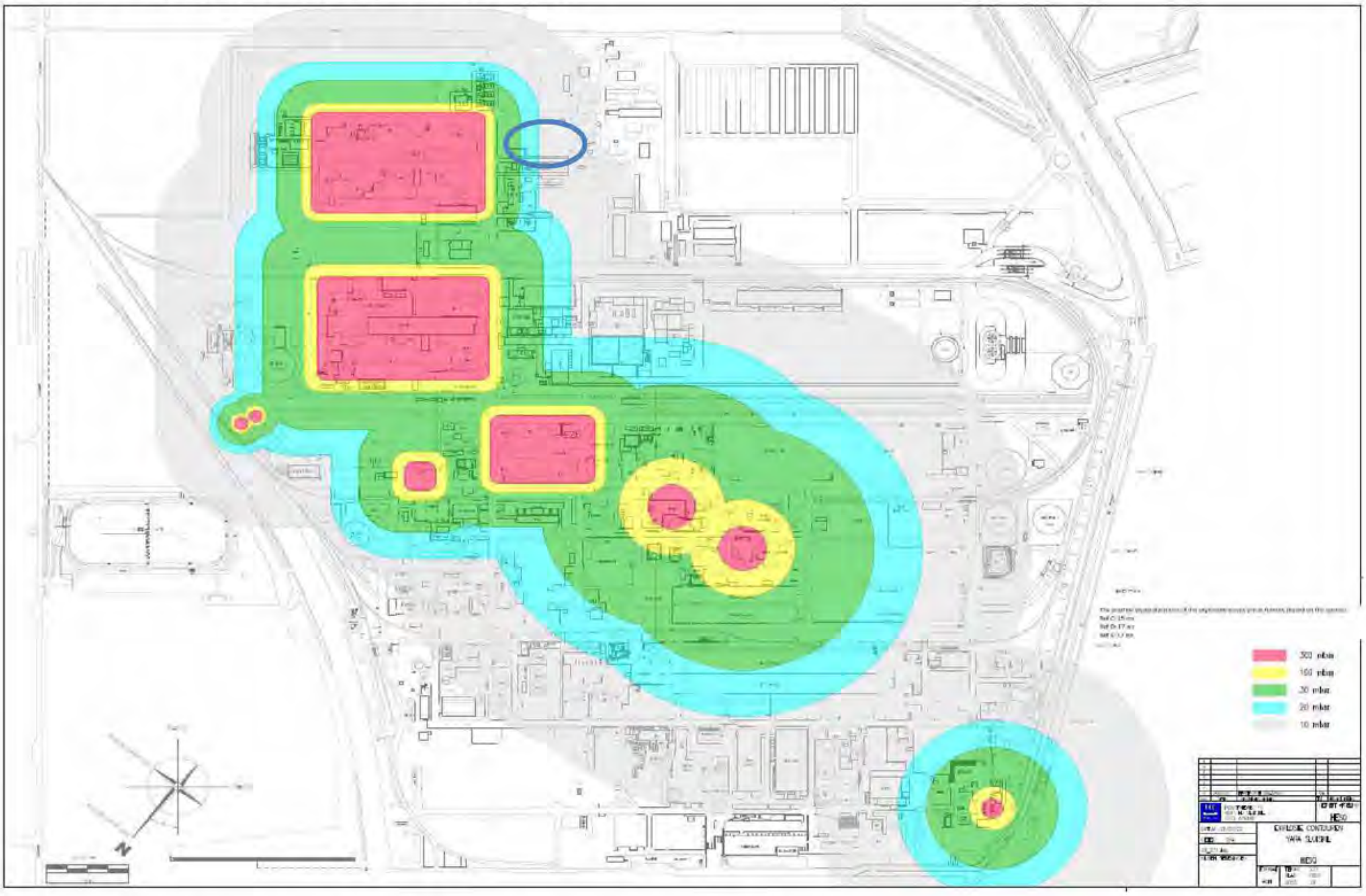
F_{dy} = 100 kN

d_b = 5 m

h = 1.2 m above road surface

Loads due to impact are not applied. A soutable system to prevent a collision need to be applied at the doors / machine foundations.

5.11. Explosive force according to EN 1991-1-7 +NB



The loads from an explosion are in the ranges of 2 zones: 20 mbar = 2 kN/m² and 10 mbar = 1 kN/m²

The explosionloads are an ALS combination, as the loads are similar to the windloads the explosionloading are not taken in to account. Windloads are calculated with a higher safety factor and lower steelresistance, hench they are normative 90% of the building.

In addition the purlins will be designed with a sufficient deformation that the loads are reduced to be simelar to the wind load.

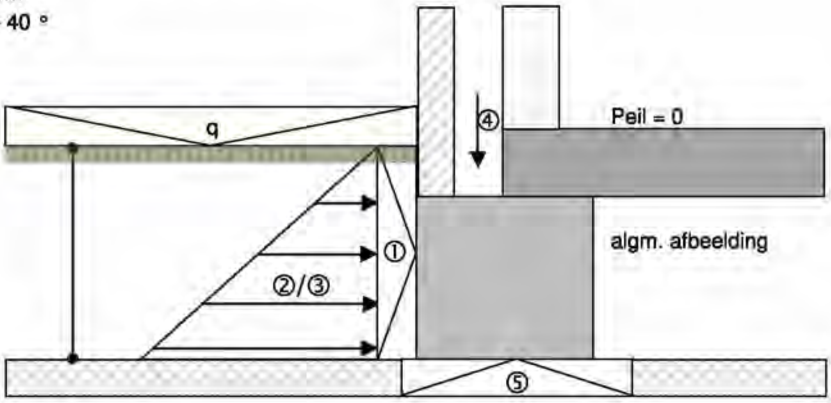
5.12. Load due to geotechnical causes

5.12.1. Load due to earth pressure according to EN 1991-1-1 +NA / EN 1997-1 +NA

Ground replenishment data:

Material *(names acc. to NEN 6740)*		=	zand, schoon, vast, natuurlijk vochtgehalte	
			min.	max.
Mass	γ	=	19 -	20 kN/m³
Calculated with	γ	=	20 kN/m³	
Angle of inclination natural slope	ϕ	=	35 - 40 °	
Used	ϕ	=	40 °	
k-factor	k	=	0.84	

ground level	=	-100 t.o.v. Peil
B.O.C.	=	-1000 t.o.v. Peil
h	=	900 mm
groundwater level	=	-1300 t.o.v. Peil



Overload on ground = E2 industrieel gebruik

Calculated with q = 3 kN/m²

Load on beam: $\sigma_h = k * \sigma_v$

① due to overload σ_h = 2.5 kN/m²

② ground pressure tot -1000

σ_v = 24 kN/m²

σ_h = 20.1 kN/m²

③ water pressure 0.0 kN/m²

④ own weight construction = Determined by calculation program, the standard test for the upward check is a factor of 0.9 in the combinations.

⑤ water pressure = 0.0 kN/m²

5.12.2. Earthquake load EN 1991-1-1 +NA / EN 1997-1 +NA / EN 1998-1 +NA

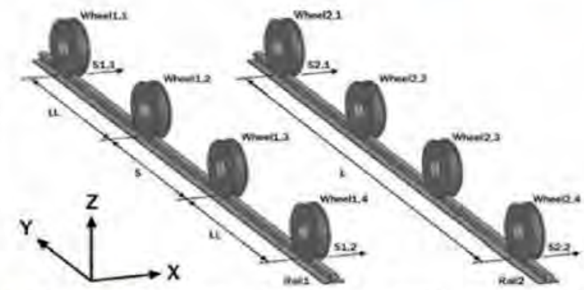
For this location and construction it is not vital to calculate with an earthquake load.

5.13. *Loads due to cranes acc. EN 1991-3 +NA*

<u>Radlasten gemäß EN 1991-3 Tabelle 2.2</u>

DEMAG

Angebotsnummer	Altern.40t DE-224-01403073_Linde/
Erstell-Datum	07.09.2022
Hublast [kg]	40 000
Spannweite, [m]	15,000
Radstand, L, [mm]	3 680
End carriage wheel load, LL, [mm]	
Distance between inner wheels, S, [mm]	880
Schienentyp / Abstand Spurkränze, [mm]	80*60 / 94
Kraneinstufung	U4/Q3



Schwingbeiwerte nach EN 13001-2

ϕ_1	1,10	Auf die Masse des Kranes einwirkende Beschleunigung aus Anheben und Gravitation
ϕ_2	1,11	Trägheit und Gravitation beim Anheben einer unbehinderten Last vom Boden
ϕ_3	1,00	Trägheit und Gravitation beim plötzlichen Loslassen eines Teils der Hublast
ϕ_4	1,00	Lasten aus Fahren über Unebenheiten
$\phi_{5, Katz}$	1,20	Lasten aus Beschleunigung von Katzfahrwerken
$\phi_{5, Kran}$	1,20	Lasten aus Beschleunigung von Kranfahrwerken
ϕ_6	1,06	Prüflasten
ϕ_7	1,25	Lasten aus Pufferkräften

Vertikale Radlasten (Die angegebenen Radlasten beinhalten keine Schwingbeiwerte oder Teilsicherheitsbeiwerte)

Lasteinwirkung / Komponente	**Rad1,1**	**Rad1,2**	**Rad1,3**	**Rad1,4**	**Rad2,1**	**Rad2,2**	**Rad2,3**	**Rad2,4**
Eigengewicht des Kranes (tp1), $F_{z,i,j}$	-18,3 kN	-14,4 kN	-14,5 kN	-16,8 kN	-13,0 kN	-9,26 kN	-9,25 kN	-11,3 kN
Eigengewicht des Kranes (tp2), $F_{z,i,j}$	-13,2 kN	-9,43 kN	-9,42 kN	-11,5 kN	-18,2 kN	-14,2 kN	-14,3 kN	-16,6 kN
Hublast (tp1), $F_{z,i,j}$	-105 kN	-111 kN	-74,0 kN	-70,4 kN	-5,57 kN	-15,8 kN	-10,6 kN	-3,74 kN
Hublast (tp2), $F_{z,i,j}$	-5,04 kN	-15,3 kN	-10,2 kN	-3,39 kN	-106 kN	-111 kN	-74,3 kN	-70,7 kN
Prüflast (tp1), $F_{z,i,j}$	-116 kN	-121 kN	-81,3 kN	-77,4 kN	-6,12 kN	-17,3 kN	-11,6 kN	-4,11 kN
Prüflast (tp2), $F_{z,i,j}$	-5,54 kN	-16,8 kN	-11,2 kN	-3,73 kN	-116 kN	-122 kN	-81,7 kN	-77,7 kN

(tp1 = Fahrwerksposition nah an Schiene 1, tp2 = Fahrwerksposition nah an Schiene 2)

Horizontale Radlasten (Die angegebenen Radlasten beinhalten keine Schwingbeiwerte)

Lasteinwirkung / Komponente	**Rad1,1**	**Rad1,2**	**Rad1,3**	**Rad1,4**	**Rad2,1**	**Rad2,2**	**Rad2,3**	**Rad2,4**
Beschleunigung des Kranes (tp1), $F_{x,i,j}$	-7,48 kN	0 kN	0 kN	7,48 kN	-1,38 kN	0 kN	0 kN	1,38 kN
Beschleunigung des Kranes (tp1), $F_{y,i}$	Gesamte Längskräfte an Schiene 1 = -3,16 kN				Gesamte Längskräfte an Schiene 2 = -3,16 kN			
Beschleunigung des Kranes (tp2), $F_{x,i,j}$	1,37 kN	0 kN	0 kN	-1,37 kN	7,54 kN	0 kN	0 kN	-7,54 kN
Beschleunigung des Kranes (tp2), $F_{y,i}$	Gesamte Längskräfte an Schiene 1 = -3,16 kN				Gesamte Längskräfte an Schiene 2 = -3,16 kN			
Schräglauf des Kranes (tp1), (Schiene 1 führend), $F_{x,i,j}$, $S_{1,1}$=30,0 kN	-19,2 kN	-9,33 kN	-2,10 kN	4,99 kN	-2,88 kN	-1,87 kN	-0,470 kN	0,861 kN
Schräglauf des Kranes (tp2), (Schiene 1 führend), $F_{x,i,j}$, $S_{1,1}$=30,0 kN	-2,83 kN	-1,84 kN	-0,467 kN	0,851 kN	-19,3 kN	-9,35 kN	-2,10 kN	5,00 kN
Schräglauf des Kranes (tp1), (Schiene 2 führend), $F_{x,i,j}$, $S_{2,1}$=30,0 kN	-19,2 kN	-9,33 kN	-2,10 kN	4,99 kN	-2,88 kN	-1,87 kN	-0,470 kN	0,861 kN
Schräglauf des Kranes (tp2), (Schiene 2 führend), $F_{x,i,j}$, $S_{2,1}$=30,0 kN	-2,83 kN	-1,84 kN	-0,467 kN	0,851 kN	-19,3 kN	-9,35 kN	-2,10 kN	5,00 kN
Beschleunigung Fahrwerk(e), $F_{x,i,j}$	-0,715 kN	-0,675 kN	-0,492 kN	-0,397 kN	-0,643 kN	-0,676 kN	-0,492 kN	-0,469 kN
Wind im Betrieb (tp1), $F_{y,i}$	Gesamte Längswindkräfte an Schiene 1 = 0 kN				Gesamte Längswindkräfte an Schiene 2 = 0 kN			
Wind im Betrieb (tp2), $F_{y,i}$	Gesamte Längswindkräfte an Schiene 1 = 0 kN				Gesamte Längswindkräfte an Schiene 2 = 0 kN			
Sturm, $F_{y,i}$	Längskräfte an der Sturmsicherung 1 = 0 kN				Längskräfte an der Sturmsicherung 2 = 0 kN			
Kran Pufferaufprall (tp1), $F_{B,i}$	Pufferkräfte an Schiene 1 = 39,1 kN				Pufferkräfte an Schiene 2 = 26,2 kN			
Kran Pufferaufprall (tp2), $F_{B,i}$	Pufferkräfte an Schiene 1 = 26,6 kN				Pufferkräfte an Schiene 2 = 38,7 kN			

($F_{x,i,j}$ = Querkraft am Rad j auf Schiene i, $F_{y,i}$ = Längskräfte an Schiene i, $F_{z,i,j}$ = vertikale Kraft am Rad j auf Schiene i, S_1 = Richtkraft auf Schiene 1, S_2 = Richtkraft auf Schiene 2)

5.14. *Loads on piperacks*

Acc. to client documents

5.15. *Load due to water flow acc. EN 1991-1-6 +NA*

Not applicable

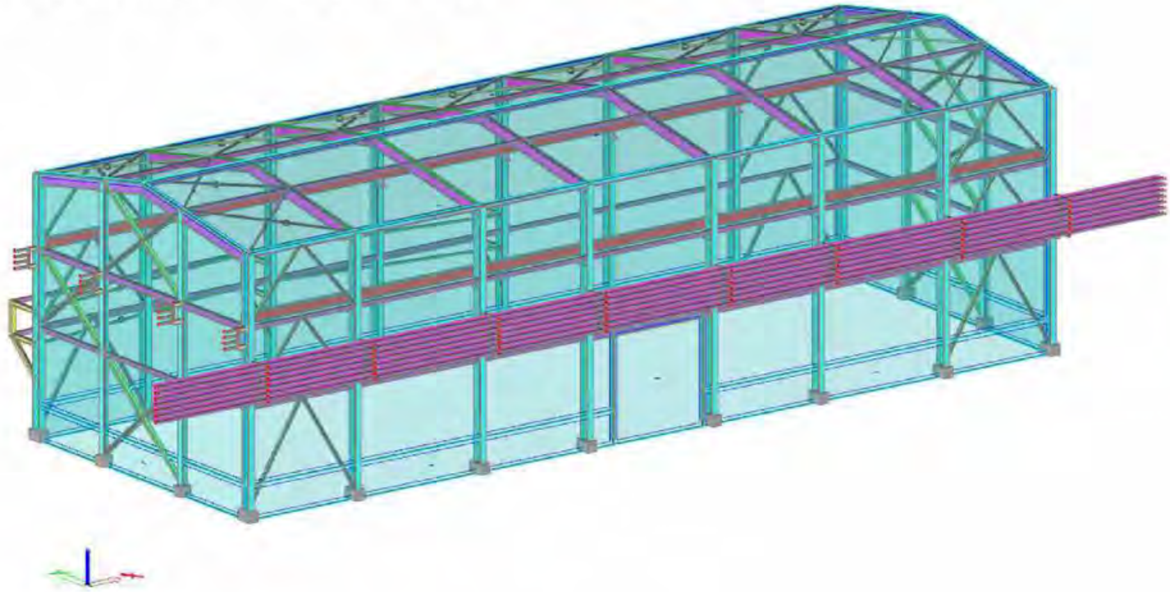
6. Calculation model

6.1. Model setup

6.1.1. General

For this design the checks are diveded in 4 parts:

- Steelstructure design a 3D Scia model
- Purlin design 2D hand calculation
- Floor design 3D Scia model
- Foundation design Simplified 2D model



6.1.2. Building

6.1.2.1. 1D & 2D elements

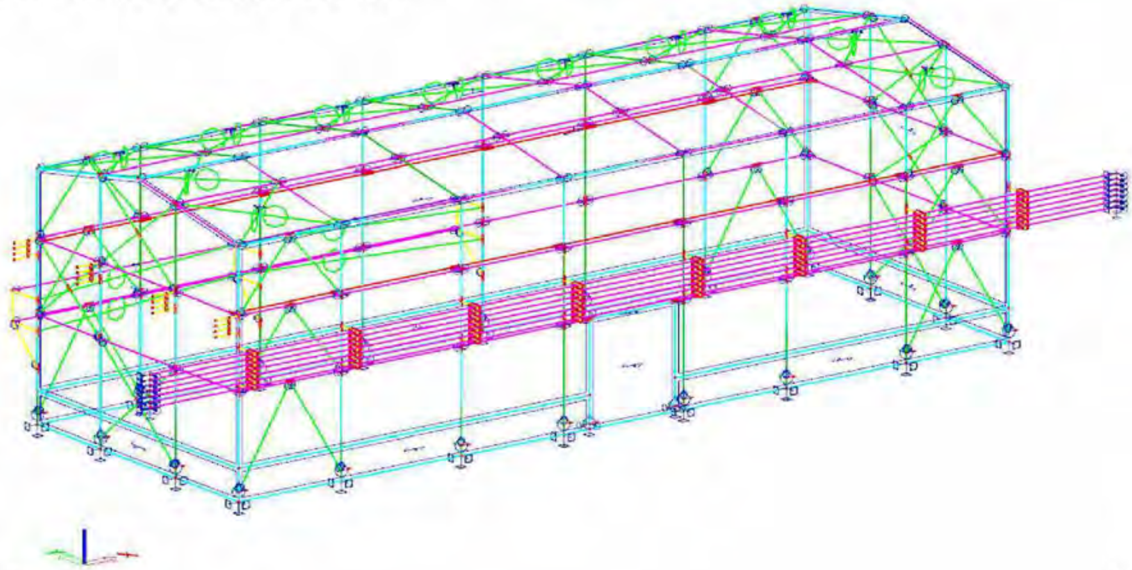
The stucture is set up as a 3D model with only 1D elements for the members.
For the application of the loads, load panels are applied.
Als to model the loads on the cable tray's an element of equal strengt is applied.

6.1.2.2. Hinges & beamproperties

Al elements are considerd where posible with hinges. The braces are applied as truss.
In the Y-axis, the frames are modeld as momentresistand portals.

6.1.2.3. Supports

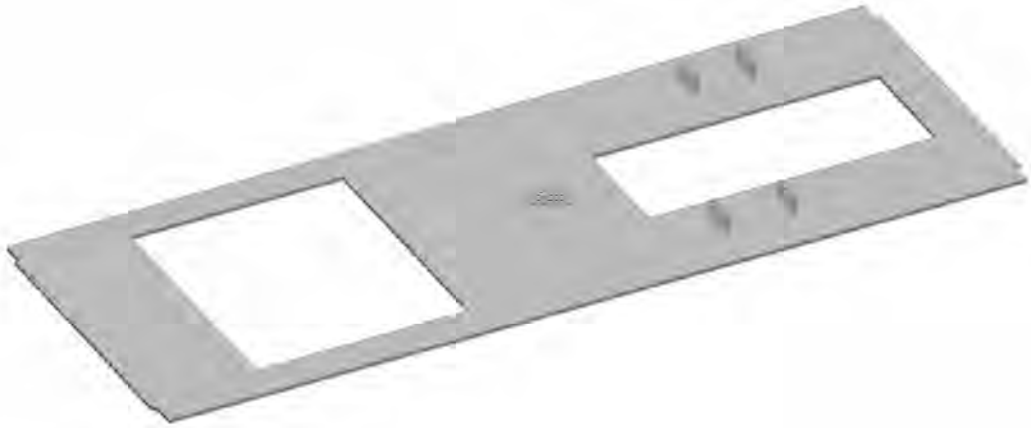
The supports are considerd as fixed for the connections to the concrete.
At the baseplates the connections are hinged.



6.1.3. Floor

6.1.3.1. 1D & 2D elements

The floor is designed as 1 plate element. With an internal edge that is supported.



6.1.3.2. Supports

All edges are considerd as simple supported, where the internal edges are moddeled as sliding.

6.2. Loadcases

6.2.1. Building

In the model te following loadcases are applied:

Name	Description	Action type	Load group	Load type	Master load case	Specification	Duration
BG101	Self weight	Permanent	LG1	Self weight			
BG102	Deadloads	Permanent	LG1	Standard			
BG111	Snow a	Variable	LG2	Static	None	Standard	Short
BG112	Snow b1	Variable	LG2	Static	None	Standard	Short
BG113	Snow b2	Variable	LG2	Static	None	Standard	Short
BG121	Piping	Variable	LG5	Static	None	Standard	Short
BG122	Cabletrays	Variable	LG3	Static	None	Standard	Short
BG123	Reserve	Variable	LG3	Static	None	Standard	Short
BG131	Crane pos 1	Variable	LG4	Static	None	Standard	Short
BG132	Crane pos 2	Variable	LG4	Static	None	Standard	Short
BG133	Crane pos 3	Variable	LG4	Static	None	Standard	Short
BG134	Crane pos 4	Variable	LG4	Static	None	Standard	Short
BG135	Crane pos 5	Variable	LG4	Static	None	Standard	Short
BG136	Crane pos 6	Variable	LG4	Static	None	Standard	Short
BG137	Crane pos 7	Variable	LG4	Static	None	Standard	Short
BG138	Crane pos 8	Variable	LG4	Static	None	Standard	Short
BG139	Crane pos 9	Variable	LG4	Static	None	Standard	Short
BG140	Crane pos 10	Variable	LG4	Static	None	Standard	Short
BG141	Crane pos 11	Variable	LG4	Static	None	Standard	Short
BG142	Crane pos 12	Variable	LG4	Static	None	Standard	Short
BG151	Piping testload	Variable	LG5	Static	None	Standard	Short
BG152	Piping testload	Variable	LG5	Static	None	Standard	Short
3DWind1	0, + CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind2	0, + CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind3	0, - CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind4	0, - CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind5	90, + CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind6	90, + CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind7	90, - CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind8	90, - CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind9	180, + CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind10	180, + CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind11	180, - CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind12	180, - CPE, - CPI	Variable	LG6	Static	None	Static wind	

3DWind13	270, + CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind14	270, + CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind15	270, - CPE, + CPI	Variable	LG6	Static	None	Static wind	
3DWind16	270, - CPE, - CPI	Variable	LG6	Static	None	Static wind	
3DWind17	90, +/- Cpe, + CPE, + C	Variable	LG6	Static	None	Static wind	
3DWind18	90, -/+ Cpe, + CPE, + C	Variable	LG6	Static	None	Static wind	
3DWind19	90, +/- Cpe, + CPE, - CP	Variable	LG6	Static	None	Static wind	
3DWind20	90, -/+ Cpe, + CPE, - CP	Variable	LG6	Static	None	Static wind	
3DWind21	90, +/- Cpe, - CPE, + CP	Variable	LG6	Static	None	Static wind	
3DWind22	90, -/+ Cpe, - CPE, + CP	Variable	LG6	Static	None	Static wind	
3DWind23	90, +/- Cpe, - CPE, - CP	Variable	LG6	Static	None	Static wind	
3DWind24	90, -/+ Cpe, - CPE, - CP	Variable	LG6	Static	None	Static wind	
3DWind25	270, +/- Cpe, + CPE, + (	Variable	LG6	Static	None	Static wind	
3DWind26	270, -/+ Cpe, + CPE, + (	Variable	LG6	Static	None	Static wind	
3DWind27	270, +/- Cpe, + CPE, - C	Variable	LG6	Static	None	Static wind	
3DWind28	270, -/+ Cpe, + CPE, - C	Variable	LG6	Static	None	Static wind	
3DWind29	270, +/- Cpe, - CPE, + C	Variable	LG6	Static	None	Static wind	
3DWind30	270, -/+ Cpe, - CPE, + C	Variable	LG6	Static	None	Static wind	
3DWind31	270, +/- Cpe, - CPE, - C	Variable	LG6	Static	None	Static wind	
3DWind32	270, -/+ Cpe, - CPE, - C	Variable	LG6	Static	None	Static wind	

6.2.2. Floor

In the model te following loadcases are applied:

Name	Description	Action type	Load group	Load type	Master load case	Specification	Duration
BG101	Self weight	Permanent	LG1	Self weight			
BG102	Permanent	Permanent	LG1	Standard			
BG111	Area loads	Variable	LG2	Static	None	Standard	Short
BG112	Area 1	Variable	LG2	Static	None	Standard	Short
BG113	Area 2	Variable	LG2	Static	None	Standard	Short
BG114	Area 3	Variable	LG2	Static	None	Standard	Short
BG121	Traffic load weelloads 1	Variable	LG3	Static	None	Standard	Short
BG122	Traffic load weelloads 2	Variable	LG3	Static	None	Standard	Short
BG123	Traffic load weelloads 3	Variable	LG3	Static	None	Standard	Short
BG124	Traffic load weelloads 4	Variable	LG3	Static	None	Standard	Short
BG125	Traffic load weelloads 5	Variable	LG3	Static	None	Standard	Short
BG126	Traffic load weelloads 6	Variable	LG3	Static	None	Standard	Short
BG127	Traffic load weelloads 7	Variable	LG3	Static	None	Standard	Short
BG131	Traffic load Type 3 1	Variable	LG3	Static	None	Standard	Short
BG132	Traffic load Type 3 2	Variable	LG3	Static	None	Standard	Short
BG133	Traffic load Type 3 3	Variable	LG3	Static	None	Standard	Short
BG134	Traffic load Type 3 4	Variable	LG3	Static	None	Standard	Short
BG141	Equipment	Variable	LG4	Static	None	Standard	Short

6.3. *Combinaties*

Due to the large number of load cases, which lead to a large number of load combinations, only a summary table of the main combinations is given in the overview below.

	Comb ID		1	2	3
	Type		ULS	BGT	BGT
LC Name	LC Description	Name	UGT-Set B	BGT-Kar	BGT-quasi
BG101	Self weight		1.00	1.00	1.00
BG102	Deadloads		1.00	1.00	1.00
BG111	Snow a		1.00	1.00	1.00
BG112	Snow b1		1.00	1.00	1.00
BG113	Snow b2		1.00	1.00	1.00
BG121	Piping		1.00	1.00	1.00
BG122	Cabletrays		1.00	1.00	1.00
BG123	Reserve		1.00	1.00	1.00
BG131	Crane pos 1		1.00	1.00	1.00
BG132	Crane pos 2		1.00	1.00	1.00
BG133	Crane pos 3		1.00	1.00	1.00
BG134	Crane pos 4		1.00	1.00	1.00
BG135	Crane pos 5		1.00	1.00	1.00
BG136	Crane pos 6		1.00	1.00	1.00
BG137	Crane pos 7		1.00	1.00	1.00
BG138	Crane pos 8		1.00	1.00	1.00
BG139	Crane pos 9		1.00	1.00	1.00
BG140	Crane pos 10		1.00	1.00	1.00
BG141	Crane pos 11		1.00	1.00	1.00
BG142	Crane pos 12		1.00	1.00	1.00
BG151	Piping testload		1.00	1.00	1.00
BG152	Piping testload		1.00	1.00	1.00
3DWind1	0, + CPE, + CPI		1.00	1.00	1.00
3DWind2	0, + CPE, - CPI		1.00	1.00	1.00
3DWind3	0, - CPE, + CPI		1.00	1.00	1.00
3DWind4	0, - CPE, - CPI		1.00	1.00	1.00
3DWind5	90, + CPE, + CPI		1.00	1.00	1.00
3DWind6	90, + CPE, - CPI		1.00	1.00	1.00
3DWind7	90, - CPE, + CPI		1.00	1.00	1.00
3DWind8	90, - CPE, - CPI		1.00	1.00	1.00
3DWind9	180, + CPE, + CPI		1.00	1.00	1.00
3DWind10	180, + CPE, - CPI		1.00	1.00	1.00
3DWind11	180, - CPE, + CPI		1.00	1.00	1.00
3DWind12	180, - CPE, - CPI		1.00	1.00	1.00
3DWind13	270, + CPE, + CPI		1.00	1.00	1.00
3DWind14	270, + CPE, - CPI		1.00	1.00	1.00
3DWind15	270, - CPE, + CPI		1.00	1.00	1.00
3DWind16	270, - CPE, - CPI		1.00	1.00	1.00
3DWind17	90, +/- Cpe, + CPE, + CPI		1.00	1.00	1.00
3DWind18	90, -/+ Cpe, + CPE, + CPI		1.00	1.00	1.00
3DWind19	90, +/- Cpe, + CPE, - CPI		1.00	1.00	1.00
3DWind20	90, -/+ Cpe, + CPE, - CPI		1.00	1.00	1.00
3DWind21	90, +/- Cpe, - CPE, + CPI		1.00	1.00	1.00
3DWind22	90, -/+ Cpe, - CPE, + CPI		1.00	1.00	1.00
3DWind23	90, +/- Cpe, - CPE, - CPI		1.00	1.00	1.00
3DWind24	90, -/+ Cpe, - CPE, - CPI		1.00	1.00	1.00
3DWind25	270, +/- Cpe, + CPE, + CPI		1.00	1.00	1.00

3DWind26	270, -/+ Cpe, + CPE, + CPI		1.00	1.00	1.00
3DWind27	270, +/- Cpe, + CPE, - CPI		1.00	1.00	1.00
3DWind28	270, -/+ Cpe, + CPE, - CPI		1.00	1.00	1.00
3DWind29	270, +/- Cpe, - CPE, + CPI		1.00	1.00	1.00
3DWind30	270, -/+ Cpe, - CPE, + CPI		1.00	1.00	1.00
3DWind31	270, +/- Cpe, - CPE, - CPI		1.00	1.00	1.00
3DWind32	270, -/+ Cpe, - CPE, - CPI		1.00	1.00	1.00

		Comb ID	1	2	3
		Type	ULS	BGT	BGT
LC Name	LC Description	Name	UGT-Set B	BGT-Kar	BGT-quasi
BG101	Self weight		1.00	1.00	1.00
BG102	Permanent		1.00	1.00	1.00
BG111	Area loads		1.00	1.00	1.00
BG112	Area 1		1.00	1.00	1.00
BG113	Area 2		1.00	1.00	1.00
BG114	Area 3		1.00	1.00	1.00
BG121	Traffic load weelloads 1		1.00	1.00	1.00
BG122	Traffic load weelloads 2		1.00	1.00	1.00
BG123	Traffic load weelloads 3		1.00	1.00	1.00
BG124	Traffic load weelloads 4		1.00	1.00	1.00
BG125	Traffic load weelloads 5		1.00	1.00	1.00
BG126	Traffic load weelloads 6		1.00	1.00	1.00
BG127	Traffic load weelloads 7		1.00	1.00	1.00
BG131	Traffic load Type 3 1		1.00	1.00	1.00
BG132	Traffic load Type 3 2		1.00	1.00	1.00

7. Results

7.1. Strength control

7.1.1. General

For all strength checks, the basic requirement is that all Unity Checks (u.c.'s) must be less than or equal to 1.00.
E.e.a. in accordance with the requirements of formula (6.8) of EN 1990 + NB.

7.1.2. Steel design

For the profile check, the following maximum u.c.s per cross-section apply:

Staaf	Cross-Section	dx [m]	BG	Material	$uc_{max.}$ [-]	uc_{snede} [-]	$uc_{stabiliteit}$ [-]	E/W/N	
S25	ST-11 - HEA550	0	UGT-Set B/1	S 235 JR	0.53	0.14	0.53		
S5	ST-14 - HEA300	0	UGT-Set B/2	S 355 JR	0.82	0.1	0.82		
S386	ST-12 - HEA200	0	UGT-Set B/3	S 235 JR	0.92	0.28	0.92		**
S41	ST-13 - I + rail (HEA500, SA75)	20.660-	UGT-Set B/4	S 355 JR	0.8	0.29	0.8	W30	
S80	ST-21 - HEB300	0.500+	UGT-Set B/5	S 355 JR	0.49	0.49	0.43		
S48	ST-15 - HEA500	0	UGT-Set B/6	S 235 JR	0.59	0.59	0	W30	
S78	ST-24 - HEA220	1.200+	UGT-Set B/7	S 235 JR	0.79	0.47	0.79		
S66	ST-16 - UNP280	0.7	UGT-Set B/8	S 235 JR	0.79	0.17	0.79	W30	
S82	ST-22 - HEA200	0	UGT-Set B/9	S 355 JR	0.78	0.18	0.78		
S90	ST-23 - HEA280	6.500+	UGT-Set B/10	S 235 JR	0.37	0.16	0.37		
S113	ST-17 - HEA140	0	UGT-Set B/11	S 235 JR	0.99	0.22	0.99		
S139	ST-18 - L100X10	8.657	UGT-Set B/12	S 235 JR	0.57	0.57	0		**
S166	ST-20 - HEB220	0	UGT-Set B/13	S 235 JR	0.84	0.84	0		
S256	ST-19 - HEA100	0.8	UGT-Set B/14	S 235 JR	0.5	0.43	0.5	W30	

Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151
UGT-Set B/2	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind25
UGT-Set B/3	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG134 + 1.50*3DWind10
UGT-Set B/5	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/8	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/9	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/11	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/13	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/14	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind25

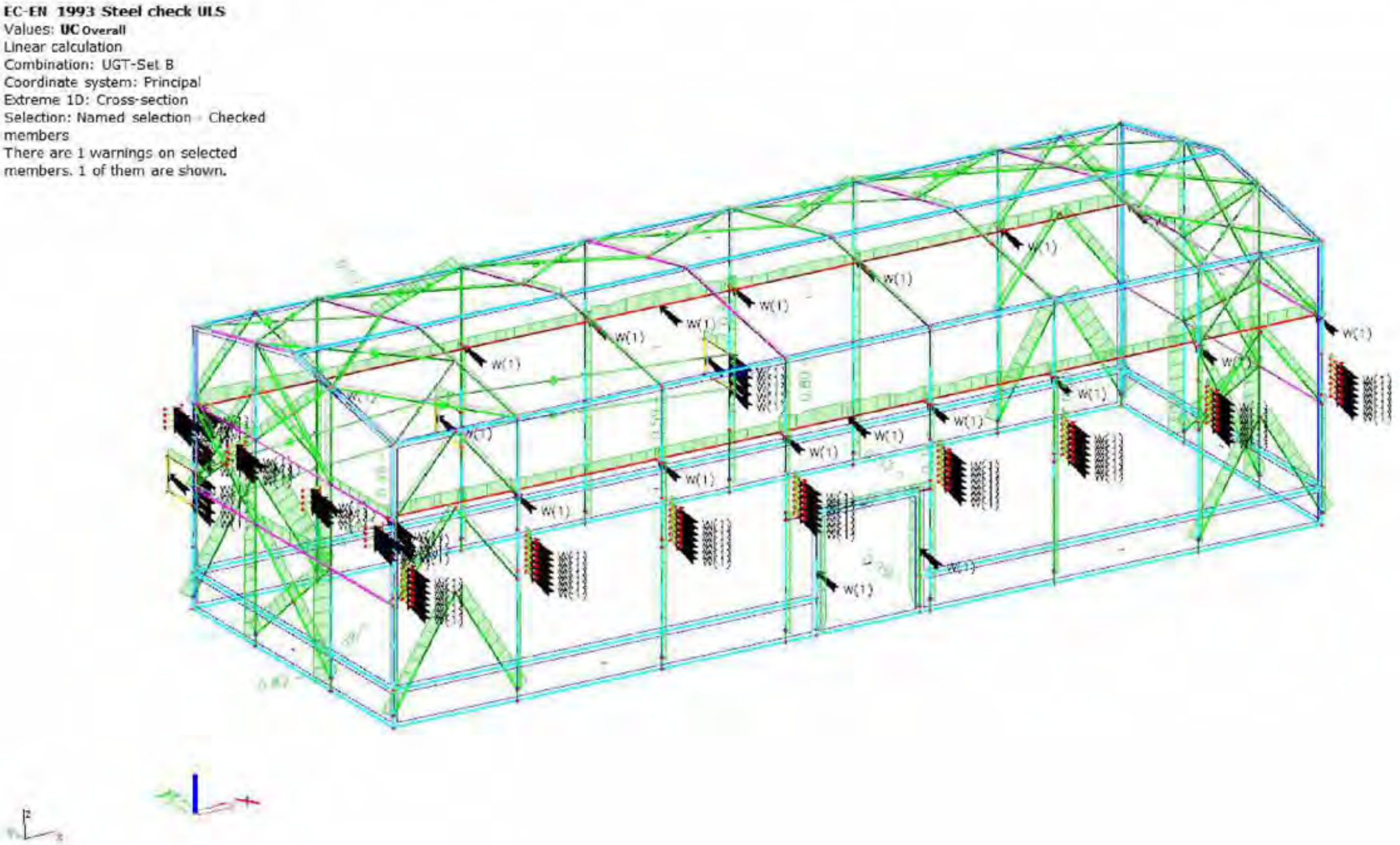
E/W/N	Description
W30	Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.

The above warnings are given in Scia as a result of the check performed.

Warning W30 is a standard warning which refers to the check for buckling, where Mcr must be determined according to the standard situations described in art. NB.NB.1 of NEN-EN 1993-1-1. However, for the beams for which the W30 warning applies, the standard situations prove to be inadequate to be able to determine Mcr, and therefore the more conservative method of the basic EuroCode is used.

* Purlin design is added in §9.

** Windbracings in roof and members are checked for tension/compression. The L100x10 are not sufficient on buckling. But will be applied as tensionmembers. A check for both cross-section in tension (incl. boltreduction) and the beams for compresion are applied in the detail check §9.



7.1.3. Concrete design

See chapter §8. for the concrete design

7.2. *Deformations Steel*

7.2.1. General

The requirements for checking the permissible deformation are in accordance with §"3.4. Deflection requirements" applicable.
This is tested on 3 different parts:

- Node displacement — Testing against the maximum displacement of the structure in SLS situation.
- Relative displacement — Primary test for distortion in the uz of the profile, in accordance with the requirements
  Secondary test for deformation in the uy of the profile, whereby the permissible values in accordance with the uz are observed.
- 3D displacement — No direct testing, mainly for insight into how the profiles deform, are no direct requirements for the applicable standards.

7.2.2. Node displacement

Node	BG	U_x [mm]	U_y [mm]	U_z [mm]	Fi_x [mrad]	Fi_y [mrad]	Fi_z [mrad]	U_{total} [mm]
K96	BGT-kar/1	-42.9	-1.5	-0.1	0.2	-3.3	-1.3	43
K95	BGT-kar/2	42.3	0	-0.2	0.1	3.1	-1.1	42.3
K63	BGT-kar/3	0.5	-31.2	-0.4	0.5	-0.2	0.4	31.2
K70	BGT-kar/4	0.2	32.4	-0.5	-0.5	0	-0.2	32.4
K28	BGT-kar/5	0.1	-1.4	-18.2	-0.2	0.1	0.1	18.2
K328	BGT-kar/6	-36.1	3.1	6.3	-1.2	4.3	1.6	36.7
K85	BGT-kar/7	0	0	0	-9.6	-0.1	0	0
K85	BGT-kar/8	0	0	0	7.7	0.1	0	0
K123	BGT-kar/9	-5.1	23.3	-3.1	0.6	-45.8	8.1	24
K120	BGT-kar/9	5.3	23.1	-4.3	0.6	46.2	-8.2	24.1
	min. verpl.	**-42.9**	**-31.2**	**-18.2**	**-9.6**	**-45.8**	**-8.2**	**0**
	max. verpl.	**42.3**	**32.4**	**6.3**	**7.7**	**46.2**	**8.1**	**43**

The permitted displacements determined in accordance with EN 1993-1-1+NA, chapter 7.
Height construction 15500 mm
The allowed horizontal displacement is 51.7 mm 1/300
The maximum displacement is 42.9 mm, the uc is 0.83

Max. span is 16000 mm
The allowable vertical displacement is 53.33 mm 1/300
The maximum displacement is 18.2 mm, the uc is 0.34

7.2.3. Relative displacement

Beam	Section	Combination	dx [mm]	u_y [mm]	u_z [mm]	$u_{y,rel}$ [1/xx]	$u_{z,rel}$ [1/xx]	u.c.	cambre [mm]
S21	ST-11 - HEA550	BGT-kar/1	0	-0.4	-0.3	11.8	29.7	0.72	-
S35	ST-14 - HEA300	BGT-kar/2	6.718	0	0	-45	13.7	0.95	-
S41	ST-13 - I + rail (HEA500, S/	BGT-kar/3	22.060-	4.9	4.8	-5.9	14	0.35	-
S43	ST-21 - HEB300	BGT-kar/4	2.25	5.5	5.3	0	15	0.36	-
S53	ST-15 - HEA500	BGT-kar/5	0	0	0	-2	1.7	0.6	-
S78	ST-24 - HEA220	BGT-kar/6	2.571	-2.5	-2.5	-12.5	20	0.63	-
S65	ST-16 - UNP280	BGT-kar/7	2.800+	0	0	-7.2	18.7	0.39	-
S429	ST-22 - HEA200	BGT-kar/8	0	-1.5	-1.4	0	21.6	0.07	-
S90	ST-23 - HEA280	BGT-kar/9	2.929	13.1	13.1	0.2	23.3	0.56	-
S116	ST-17 - HEA140	BGT-kar/10	4.798	-5.6	-7.9	0	32	0.25	-
S143	ST-18 - L100X10	BGT-kar/11	3.935-	0	0	0	26.2	0	-
S166	ST-20 - HEB220	BGT-kar/12	1.000-	0	0	-1.5	6.7	0.22	-
S306	ST-19 - HEA100	BGT-kar/13	0.8	-2.3	-2.3	3.5	9	0.67	-

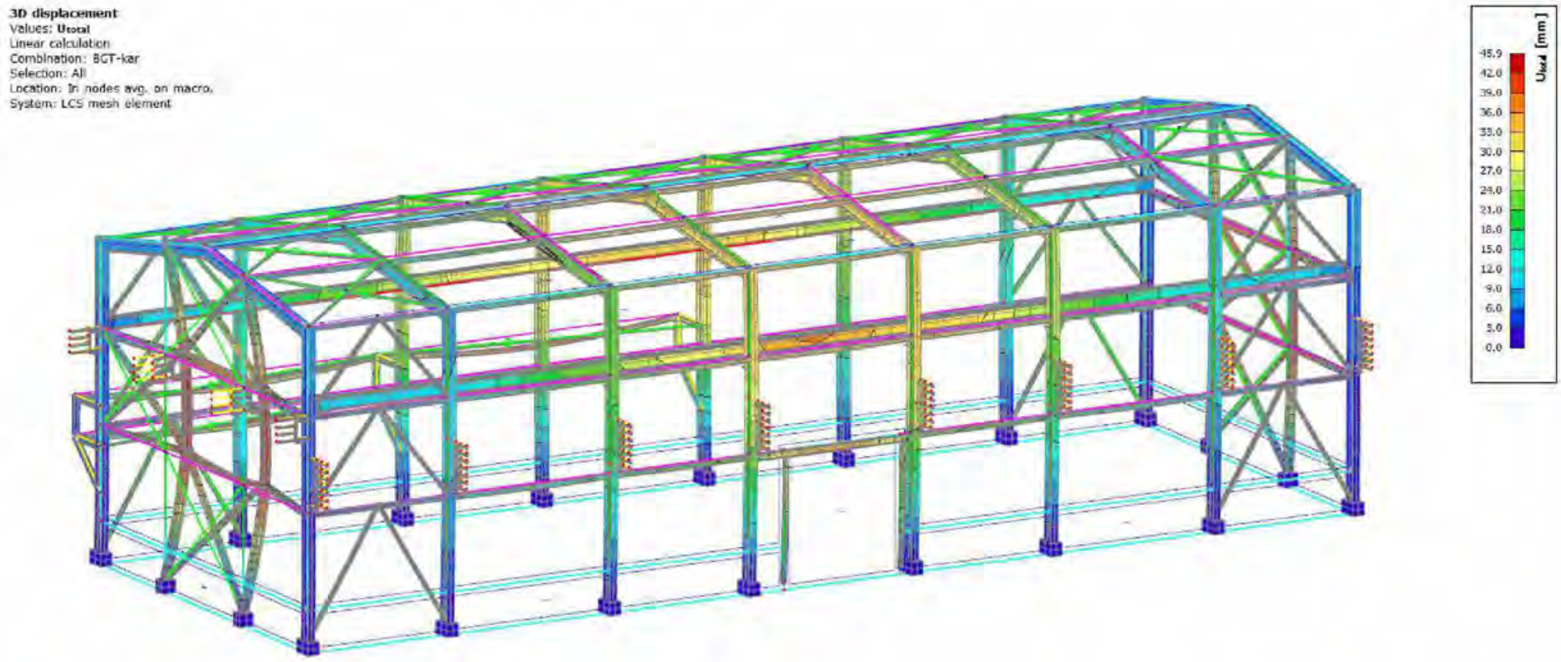
Name	Combination key
BGT-kar/1	BG101 + BG102 + BG123 + BG142 + BG151 + 3DWind5
BGT-kar/2	BG101 + BG102 + BG136 + BG151 + 3DWind17
BGT-kar/3	BG101 + BG102 + BG134 + BG151 + 3DWind19
BGT-kar/4	BG101 + BG102 + BG123 + BG135 + BG151 + 3DWind5
BGT-kar/5	BG101 + BG102 + BG122 + BG123 + BG142 + BG151 + 3DWind25
BGT-kar/6	BG101 + BG102 + BG121 + BG122 + BG139 + 3DWind28
BGT-kar/7	BG101 + BG102 + BG122 + BG135 + 3DWind8
BGT-kar/8	BG101 + BG102 + BG123 + BG133 + BG151 + 3DWind17
BGT-kar/9	BG101 + BG102 + BG123 + BG134 + BG151 + 3DWind6
BGT-kar/10	BG101 + BG102 + BG122 + BG140 + 3DWind16
BGT-kar/11	BG101 + BG102 + BG122 + BG123 + BG140 + BG152 + 3DWind13
BGT-kar/12	BG101 + BG102 + BG122 + BG139 + BG151 + 3DWind16
BGT-kar/13	BG101 + BG102 + BG122 + BG123 + BG138 + 3DWind25

The full list is acc. to annex

7.2.4. 3D displacement

Name	dx [mm]	fiber	LC	ux [mm]	uy [mm]	uz [mm]	φx [mrad]	φy [mrad]	φz [mrad]	U global [mm]
S186	0	1	BGT-kar/1	0	0	0	0	0	0	0
S78	2.571	15	BGT-kar/2	0.2	-44	-13	3.1	0.2	0.3	45.9

Name	Combinationkey
BGT-kar/1	BG101 + BG102
BGT-kar/2	BG101 + BG102 + BG121 + BG122 + BG123 + 3DWind2

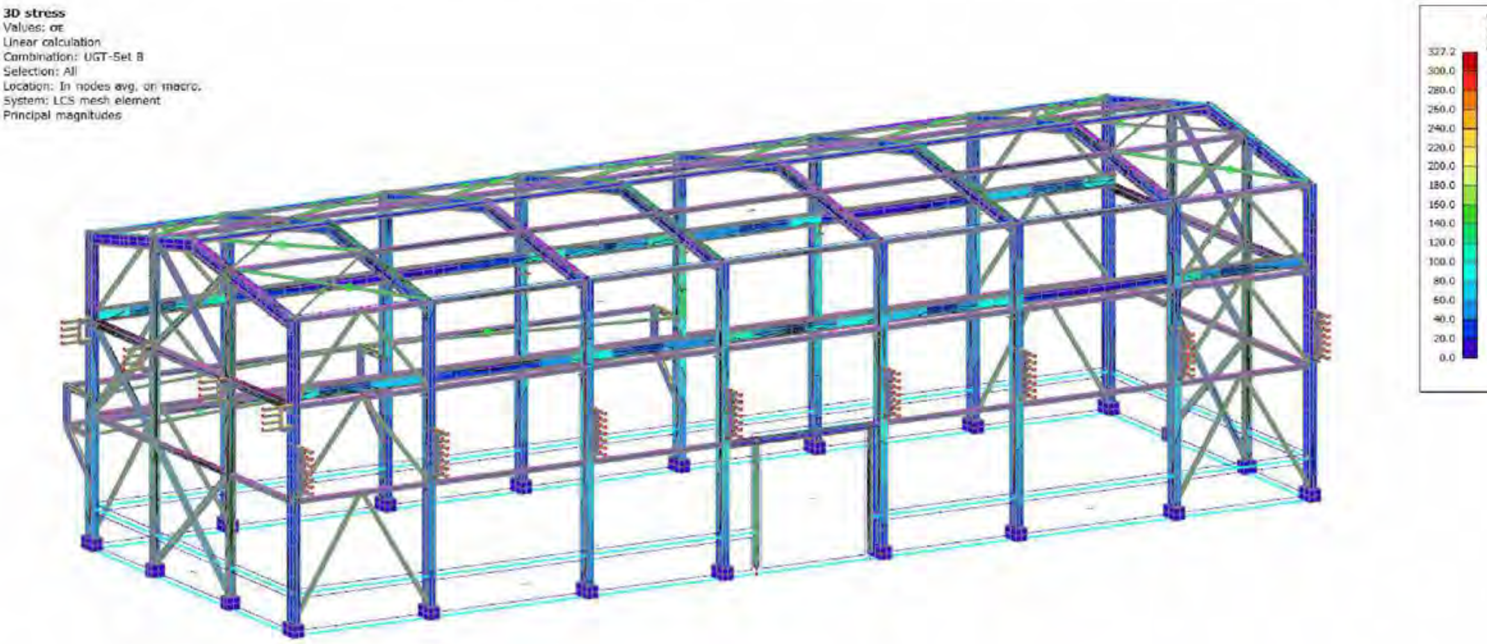


7.3. Internal forces and stresses

7.3.1. 3D stresses

Name	dx [mm] [mm]	fiber	CSS	Combination	σE [MPa]	σ1 [MPa]	σ2 [MPa]	τtot [MPa]
S21	6.130+	15	ST-11 - HEA550	UGT-Set B/1	131.2	0	-131.2	0.1
S35	5.350-	15	ST-14 - HEA300	UGT-Set B/2	147.6	0	-147.6	0.5
S245	0.7	21	ST-12 - HEA200	UGT-Set B/3	140.5	35.4	-119.4	65
S44	2.560+	1	ST-13 - I + rail (HEA500	UGT-Set B/4	178.1	178.1	0	1.7
S80	0.500+	15	ST-21 - HEB300	UGT-Set B/5	327.2	0	-327.1	2.8
S48	0	8	ST-15 - HEA500	UGT-Set B/6	192.5	112.1	-110.2	111.2
S78	1.200-	1	ST-24 - HEA220	UGT-Set B/7	179	179	0	0.1
S65	5.6	3	ST-16 - UNP280	UGT-Set B/8	183.1	100.3	-111.1	105.5
S82	4.019+	13	ST-22 - HEA200	UGT-Set B/9	82.1	82.1	0	0.9
S90	1.500-	1	ST-23 - HEA280	UGT-Set B/10	133.5	0	-133.5	1.1
S113	2.726	14	ST-17 - HEA140	UGT-Set B/11	55.2	0	-55.2	0.1
S139	8.657	1	ST-18 - L100X10	UGT-Set B/12	134.4	134.4	0	0
S166	0	19	ST-20 - HEB220	UGT-Set B/1	255.7	218.4	-62.8	117.1
S201	0	3	CT-16 - Rechthoek (850	UGT-Set B/13	3.5	0	-3.5	0
S203	0	7	CT-17 - Rechthoek (600	UGT-Set B/14	8.8	8.8	0	0

Name	Combinationkey
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/2	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind25
UGT-Set B/3	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind5
UGT-Set B/5	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind17
UGT-Set B/8	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind19
UGT-Set B/9	1.20*BG101 + 1.20*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/11	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/13	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/14	0.90*BG101 + 0.90*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/15	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25



7.3.2. Reactions

Support	BG	Rx [kN]	Ry [kN]	Rz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
Sn17/K170	UGT-Set B/1	42.99	-283.69	-524.41	156.03	22.82	0
Sn18/K171	UGT-Set B/2	-40.01	-212.86	-703.6	117.07	-21.52	0
Sn15/K168	UGT-Set B/3	21.47	34.35	1212.33	-19.1	11.33	-0.05
Sn17/K170	UGT-Set B/4	22.97	256.71	625.28	-141.19	12.17	0
Sn15/K168	UGT-Set B/5	-92.38	9	3.88	-5.3	-50	0
Sn9/K160	UGT-Set B/6	69.28	-7.62	294.68	3.84	37.29	0.03
Sn1/K152	UGT-Set B/7	56.86	12.14	323.25	-6	30.76	-0.25
Sn6/K157	UGT-Set B/8	0.13	23.57	232.45	-13.54	0.07	0.24
	min. Force	**-92.38**	**-283.69**	**-703.6**	**-141.19**	**-50**	**-0.25**
	max. Force	**69.28**	**256.71**	**1212.33**	**156.03**	**37.29**	**0.24**

Baseplate forces

Name	Node(s)	Beam(s)	Case	Rx [kN]	Ry [kN]	Rz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
FC18	K44	S33, S124	UGT-Set B/1	-66.33	6.35	-289.42	0	0	-0.03
FC2	K3	S2, S112	UGT-Set B/2	89.43	-10.26	1.38	0	0	0
FC3	K6	S5, S82	UGT-Set B/3	-21.22	-256.72	-621.56	0	-0.01	0
FC3	K6	S5, S82	UGT-Set B/4	-39.9	283.69	529.37	0	-0.03	0
FC2	K3	S2, S112	UGT-Set B/5	-19.72	-35.11	-1205.3	0	0	0.05
FC19	K45	S35, S69	UGT-Set B/6	38.13	212.86	707.31	0	0.03	0
FC6	K14	S9, S113	UGT-Set B/7	-5.11	50.2	-452.17	0	0	0.12
FC16	K39	S29, S125	UGT-Set B/8	-10.09	-55.82	-171.34	0	0	0.05
FC4	K8	S6, S83	UGT-Set B/9	-40.96	-100.86	84.79	0	-0.03	0
FC3	K6	S5, S82	UGT-Set B/10	40.44	-16.71	-148.3	0	0.03	0
FC13	K32	S23	UGT-Set B/11	-0.13	-25.65	-227.19	0	0	-0.24
FC1	K1	S1, S106	UGT-Set B/12	-54.98	-9.69	-316.23	0	0	0.25

7.3.3. Beam endforces

Beam	Crosssection	BG	dx [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]	C/R
S2	ST-11 - HEA550	UGT-Set I	0	**-1181.09**	-6.58	-34.93	0	0	0	
S2	ST-11 - HEA550	UGT-Set I	0	**257.18**	-13.87	-27.15	0	0	0	
S1	ST-11 - HEA550	UGT-Set I	0	-121.01	**-14.14**	7.3	0	0	0	
S33	ST-11 - HEA550	UGT-Set I	0	88.92	**14.29**	-8.39	0	0	0	
S27	ST-11 - HEA550	UGT-Set I	13.2	-111.57	1.04	**-134.37**	0	-207.78	5.6	
S25	ST-11 - HEA550	UGT-Set I	13.2	-98.52	6.55	**90.85**	0	117.14	18.88	
S14	ST-11 - HEA550	UGT-Set I	0	-60.46	-6.52	-0.31	**-5**	41.75	-13.85	
S26	ST-11 - HEA550	UGT-Set I	0	-57.85	6.44	-4.08	**5**	35.16	13.7	
S7	ST-11 - HEA550	UGT-Set I	13.2	-111.8	-2.56	-82.57	0	**-226.64**	-6.51	
S20	ST-11 - HEA550	UGT-Set I	8.149	11.7	0.4	7.84	0	**226.76**	1.12	
S25	ST-11 - HEA550	UGT-Set I	13.2	-30.92	-6.39	-4.97	0	74.43	**-25.48**	
S13	ST-11 - HEA550	UGT-Set I	13.2	-7.66	6.47	-30.52	0	35.8	**24.98**	
S35	ST-14 - HEA300	UGT-Set I	0	**-645.23**	-0.41	21.24	0	0	0	
S35	ST-14 - HEA300	UGT-Set I	0	**517.6**	0.13	37.88	0	0	0	
S35	ST-14 - HEA300	UGT-Set I	14.169	-22.4	**-3.76**	-21.09	0	2.49	-10.41	
S35	ST-14 - HEA300	UGT-Set I	14.169	-13.7	**3.79**	-33.92	0	-13.13	10.38	
S6	ST-14 - HEA300	UGT-Set I	0	-4.35	0.22	**-40.77**	0	0	0	
S5	ST-14 - HEA300	UGT-Set I	0	-132.45	-0.13	**40.31**	0	0	0	
S36	ST-14 - HEA300	UGT-Set I	0	-608.65	0.19	35.74	**0**	0	0	
S35	ST-14 - HEA300	UGT-Set I	0	-405.55	-0.22	39.25	**0**	0	0	
S35	ST-14 - HEA300	UGT-Set I	14.169	-1.7	3.37	-34.19	0	**-13.49**	8.97	
S5	ST-14 - HEA300	UGT-Set I	14.169	-62.91	-2.07	34.56	0	**13.32**	-0.29	
S35	ST-14 - HEA300	UGT-Set I	14.169	18.11	-3.68	-36.2	0	-1.72	**-10.48**	
S35	ST-14 - HEA300	UGT-Set I	14.169	-54.22	3.72	-18.82	0	-8.92	**10.45**	
S386	ST-12 - HEA200	UGT-Set I	0	**-359.92**	0	1.36	0	0	0	
S386	ST-12 - HEA200	UGT-Set I	0	**404.45**	0	1.81	0	0	0	
S223	ST-12 - HEA200	UGT-Set I	0	27.39	**-6.22**	-56.17	0	4.77	**3.76**	
S235	ST-12 - HEA200	UGT-Set I	0.7	-25.73	0.68	**-78.19**	0	-43.38	0.19	
S304	ST-12 - HEA200	UGT-Set I	0	-0.08	0	**39.01**	0	-21.82	0	
S254	ST-12 - HEA200	UGT-Set I	0	-33.09	-1.2	23.38	**-1**	-8.01	-0.12	
S224	ST-12 - HEA200	UGT-Set I	0	-34.2	1.28	23.87	**1**	-8.1	0.12	
S245	ST-12 - HEA200	UGT-Set I	0.7	-24.02	-0.9	-78.08	0	**-43.85**	-0.3	
S305	ST-12 - HEA200	UGT-Set I	0	0.08	0	-37.96	0	**21.09**	0	
S253	ST-12 - HEA200	UGT-Set I	0	23.22	**6.15**	-58.43	0	3.77	**-3.7**	
S41	ST-13 - I + rail (HEA	UGT-Set I	0	-118.61	**-47.67**	66.19	0	-55.24	60.25	
S41	ST-13 - I + rail (HEA	UGT-Set I	0	107.7	**16.6**	-15.86	0	50.09	-54.44	
S44	ST-13 - I + rail (HEA	UGT-Set I	45	-207.05	-7.48	**-261.24**	-1	-83.33	-23.02	
S44	ST-13 - I + rail (HEA	UGT-Set I	0	-213.4	4.9	**317.42**	0	-99.97	-10.7	
S41	ST-13 - I + rail (HEA	UGT-Set I	0	25.3	8.42	244.84	**-1**	-2.23	-39.93	
S44	ST-13 - I + rail (HEA	UGT-Set I	0	46.68	-4.68	242.52	**1**	7.75	31.32	
S44	ST-13 - I + rail (HEA	UGT-Set I	0	**-215.4**	5.09	317.38	0	**-100.95**	-11.33	
S41	ST-13 - I + rail (HEA	UGT-Set I	0	**178.72**	-29.22	43.72	0	**82.58**	-19.86	
S41	ST-13 - I + rail (HEA	UGT-Set I	45	69.09	-31.24	-49.99	0	31.34	**-79.55**	
S44	ST-13 - I + rail (HEA	UGT-Set I	0	62.92	-16.78	296.06	0	28.07	**76.08**	
S81	ST-21 - HEB300	UGT-Set I	0	**-164.06**	0	3.22	0	0	0	
S81	ST-21 - HEB300	UGT-Set I	0	**165.19**	0	4.3	0	**0**	**0**	
S80	ST-21 - HEB300	UGT-Set I	0	27.47	**-176.82**	**401.8**	0	0	0	
S42	ST-21 - HEB300	UGT-Set I	5	19.21	**191.59**	-288.84	1	0	0	
S42	ST-21 - HEB300	UGT-Set I	5	20.37	170.55	**-405.97**	0	0	0	
S43	ST-21 - HEB300	UGT-Set I	5	57.14	86.3	-386.37	**-1**	0	0	
S42	ST-21 - HEB300	UGT-Set I	5	-111.01	-42.95	-270.95	**1**	0	0	

S49	ST-15 - HEA500	UGT-Set I	0	**-38.84**	-44.33	89.95	0	-22.86	0.11	
S52	ST-15 - HEA500	UGT-Set I	0	**62.57**	-29.37	547.41	-1	-308.19	0.02	
S53	ST-15 - HEA500	UGT-Set I	0.5	8.63	-48.68	**-530.41**	-1	-268.57	-0.2	
S58	ST-15 - HEA500	UGT-Set I	0	15.44	-7.77	-409.31	**-1**	-9.35	3.78	
S50	ST-15 - HEA500	UGT-Set I	0	13.97	33.79	370.28	**1**	-192.28	-0.35	
S48	ST-15 - HEA500	UGT-Set I	0	37.3	-11.63	**580.29**	0	**-309.83**	-0.36	
S48	ST-15 - HEA500	UGT-Set I	0	-7.25	35.83	-53.39	0	**30.65**	0.34	
S52	ST-15 - HEA500	UGT-Set I	0.5	38.33	**-116.88**	514.58	-1	-21.12	**-58.15**	
S51	ST-15 - HEA500	UGT-Set I	0.5	-14.63	**116.91**	95.67	0	8.04	**59.2**	
S79	ST-24 - HEA220	UGT-Set I	0	**-189.4**	0	1.16	0	0	0	
S79	ST-24 - HEA220	UGT-Set I	0	**235.34**	0	1.55	0	**0**	**0**	
S78	ST-24 - HEA220	UGT-Set I	6	28.96	**-1.2**	**-15.88**	0	0	0	
S78	ST-24 - HEA220	UGT-Set I	0	34.96	**4.8**	**57.28**	0	0	0	
S62	ST-24 - HEA220	UGT-Set I	0	-19.74	0	1.16	**0**	0	0	
S70	ST-24 - HEA220	UGT-Set I	0	-22.16	0	1.16	**0**	0	0	
S66	ST-16 - UNP280	UGT-Set I	0	**-61.84**	0.05	0	0	0	0	
S66	ST-16 - UNP280	UGT-Set I	5.6	**1.4**	0	-21.6	0	-3.13	-0.03	
S65	ST-16 - UNP280	UGT-Set I	0	-23.88	0	29.88	**0**	0	0	
S66	ST-16 - UNP280	UGT-Set I	0	-41.93	0.01	-23.74	**0**	0	0	
S65	ST-16 - UNP280	UGT-Set I	5.6	-3.92	0.01	**-34.1**	0	**-4.66**	0.05	
S66	ST-16 - UNP280	UGT-Set I	5.6	-26.44	0.05	**33.18**	0	**4.82**	0.26	
S65	ST-16 - UNP280	UGT-Set I	5.6	-4.18	**-0.03**	26.16	0	3.57	**-0.17**	
S66	ST-16 - UNP280	UGT-Set I	5.6	-25.94	**0.07**	-10.02	0	-1.43	**0.41**	
S82	ST-22 - HEA200	UGT-Set I	0	**-343.18**	0.18	0.66	0	0	0	
S82	ST-22 - HEA200	UGT-Set I	8.039	**382.79**	0.18	-0.33	0	0	0	
S429	ST-22 - HEA200	UGT-Set I	0	-246	**-0.55**	0.6	0	0.14	1.78	
S86	ST-22 - HEA200	UGT-Set I	0	287.69	**0.56**	0.86	0	0	0	
S68	ST-22 - HEA200	UGT-Set I	4.019	263.76	-0.19	**-1.23**	0	-1.84	-0.75	
S87	ST-22 - HEA200	UGT-Set I	0	-42.48	-0.4	0.48	**0**	0	0	
S87	ST-22 - HEA200	UGT-Set I	0	148.16	0.41	0.38	**0**	0	0	
S432	ST-22 - HEA200	UGT-Set I	0	270.56	0.24	**1.28**	0	**-2.03**	-0.98	
S87	ST-22 - HEA200	UGT-Set I	3.235	-247.23	0.55	-0.04	0	**1.44**	1.79	
S85	ST-22 - HEA200	UGT-Set I	3.815	168.86	-0.38	-0.67	0	-0.33	**-1.45**	
S87	ST-22 - HEA200	UGT-Set I	3.235	-247.34	0.56	-0.35	0	0.97	**1.81**	
S90	ST-23 - HEA280	UGT-Set I	7	**-8.85**	38.11	14.99	0	0	0	
S90	ST-23 - HEA280	UGT-Set I	0	**22.75**	18.59	-0.43	0	**0**	**0**	
S90	ST-23 - HEA280	UGT-Set I	0	-0.71	**-29.16**	-0.72	0	0	0	
S90	ST-23 - HEA280	UGT-Set I	7	-4.06	**38.12**	22.13	0	0	0	
S90	ST-23 - HEA280	UGT-Set I	7	13.76	-24.7	**-2.57**	0	0	0	
S90	ST-23 - HEA280	UGT-Set I	7	6.4	0.01	**26.84**	0	0	0	
S90	ST-23 - HEA280	UGT-Set I	7	14.79	-24.71	4.3	**0**	0	0	
S90	ST-23 - HEA280	UGT-Set I	7	-0.54	38.12	10.72	**0**	0	0	
S113	ST-17 - HEA140	UGT-Set I	0	**-160.52**	0	0.45	0	0	0	
S112	ST-17 - HEA140	UGT-Set I	6.134	**156.32**	0	-0.34	0	0	0	
S106	ST-17 - HEA140	UGT-Set I	6.134	-3.08	0	**-0.51**	0	0	0	
S106	ST-17 - HEA140	UGT-Set I	0	-4.89	0	**0.51**	0	0	0	
S121	ST-17 - HEA140	UGT-Set I	0	-64.71	0	0.45	**0**	0	0	
S109	ST-17 - HEA140	UGT-Set I	0	-60.48	0	0.45	**0**	0	0	
S144	ST-18 - L100X10	UGT-Set I	0	**-234.58**	0	0	0	0	0	
S139	ST-18 - L100X10	UGT-Set I	8.657	**257.56**	**0**	**0**	**0**	**0**	**0**	
S163	ST-20 - HEB220	UGT-Set I	0	**-128.18**	0.01	18.85	0	-1.47	-0.01	
S164	ST-20 - HEB220	UGT-Set I	0	**167.1**	-0.01	29.01	0	-20.16	0.02	
S162	ST-20 - HEB220	UGT-Set I	2	-1.36	**-26.84**	-35.17	0	0.78	-0.07	
S162	ST-20 - HEB220	UGT-Set I	0	-5.21	**27.26**	72.02	0	-35.17	-0.56	
S166	ST-20 - HEB220	UGT-Set I	2	-22.6	0.05	**-122.46**	0	-31.49	0.01	
S163	ST-20 - HEB220	UGT-Set I	0	-45.78	1.03	-4.96	**0**	7.26	-0.36	
S163	ST-20 - HEB220	UGT-Set I	0	-47.92	0.02	9.46	**0**	-4.06	-0.02	
S166	ST-20 - HEB220	UGT-Set I	0	14.66	-0.03	**233.47**	0	**-164.02**	0.05	
S167	ST-20 - HEB220	UGT-Set I	1.68	-125.82	0.01	22.6	0	**33.97**	0.01	
S162	ST-20 - HEB220	UGT-Set I	0	2.66	27.26	97.3	0	-69.98	**-0.57**	
S163	ST-20 - HEB220	UGT-Set I	1.68	-56.36	1.07	10.99	0	13.87	**1.41**	

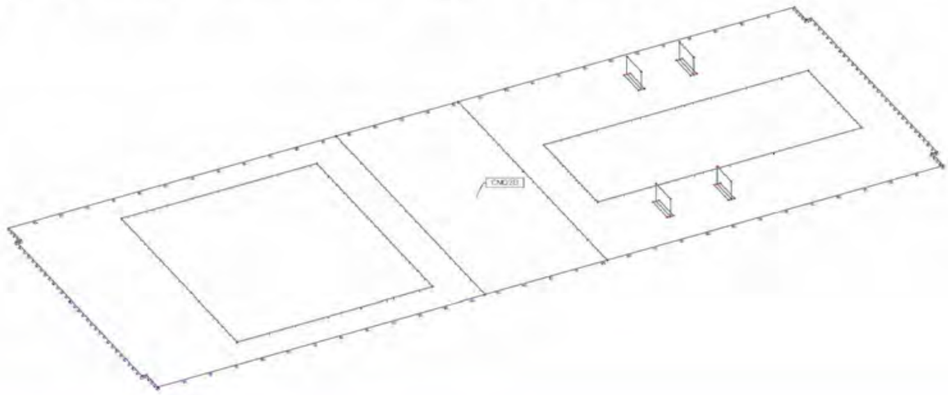
S201	CT-16 - Rechthoek (	UGT-Set I	0	**-1212.33**	-21.47	-34.35	0	19.1	11.33	
S201	CT-16 - Rechthoek (	UGT-Set I	0.55	**259.92**	12.93	-31.01	0	0	0	
S194	CT-16 - Rechthoek (	UGT-Set I	0	-294.68	**-69.28**	7.62	0	-3.84	**37.29**	
S317	CT-16 - Rechthoek (	UGT-Set I	0	-448.15	-0.11	**-91.71**	0	**49.3**	0.06	
S186	CT-16 - Rechthoek (	UGT-Set I	0	-323.25	-56.86	-12.14	**0**	6	30.76	
S191	CT-16 - Rechthoek (	UGT-Set I	0	-232.45	-0.13	-23.57	**0**	13.54	0.07	
S189	CT-16 - Rechthoek (	UGT-Set I	0	-118.34	0.01	**76.36**	0	**-41.14**	-0.01	
S201	CT-16 - Rechthoek (	UGT-Set I	0	-3.88	**92.38**	-9	0	5.3	**-50**	
S204	CT-17 - Rechthoek (	UGT-Set I	0	**-860.71**	234.33	22.75	0	-12.04	-128.88	
S204	CT-17 - Rechthoek (	UGT-Set I	0.55	**707.31**	-212.86	38.13	0	-0.03	0	
S203	CT-17 - Rechthoek (	UGT-Set I	0	524.41	**-283.69**	-42.99	0	22.82	**156.03**	
S202	CT-17 - Rechthoek (	UGT-Set I	0	76.39	114.77	**-44.06**	0	**23.41**	-63.12	
S205	CT-17 - Rechthoek (	UGT-Set I	0	-815.36	-224.73	37.37	**0**	-20.06	123.6	
S204	CT-17 - Rechthoek (	UGT-Set I	0	-768.44	214.42	41.01	**0**	-21.73	-117.93	
S205	CT-17 - Rechthoek (	UGT-Set I	0	640.08	204.28	**43.6**	0	**-23.16**	-112.35	
S203	CT-17 - Rechthoek (	UGT-Set I	0	-625.28	**256.71**	-22.97	0	12.17	**-141.19**	
S296	ST-19 - HEA100	UGT-Set I	0	**-34.87**	0	0.26	0	0.18	0	
S303	ST-19 - HEA100	UGT-Set I	0.9	**38.67**	0	-0.08	0	-0.38	0	
S227	ST-19 - HEA100	UGT-Set I	0.8	0.41	**-4.72**	-12.79	0	-5.14	0.16	
S257	ST-19 - HEA100	UGT-Set I	0.8	-0.58	**4.64**	-12.76	0	-5.07	-0.16	
S207	ST-19 - HEA100	UGT-Set I	0.8	1.14	-1.75	**-13.11**	0	-5.31	0.06	
S310	ST-19 - HEA100	UGT-Set I	0	-9.7	0	**0.8**	0	-0.29	0	
S212	ST-19 - HEA100	UGT-Set I	0.8	1.31	1.31	-13.03	**0**	-5.29	0.14	
S221	ST-19 - HEA100	UGT-Set I	0.8	-0.56	-0.95	-12.78	**0**	-5.08	0.04	
S206	ST-19 - HEA100	UGT-Set I	0.8	2.74	-0.19	-13.08	0	**-5.39**	1.52	
S310	ST-19 - HEA100	UGT-Set I	0.9	-4.57	-0.01	0.72	0	**0.34**	-0.01	
S256	ST-19 - HEA100	UGT-Set I	0.8	-0.72	0.26	-12.76	0	-5.06	**-3.5**	
S226	ST-19 - HEA100	UGT-Set I	0.8	0.36	-0.22	-12.8	0	-5.14	**3.55**	

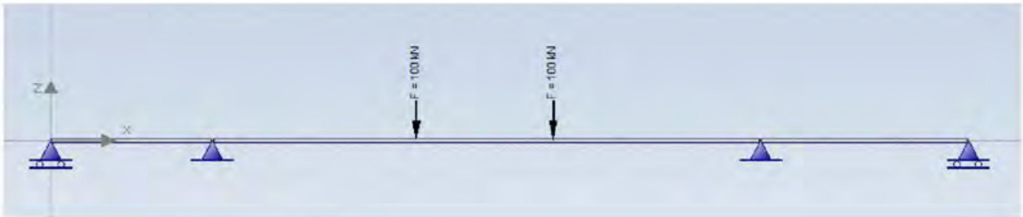
C/R connections/remarks according §9.2. Details

8. Concrete design

8.1. Slabdesign

The slab is designd as a 2D plate, and in addition also as a 1D element:

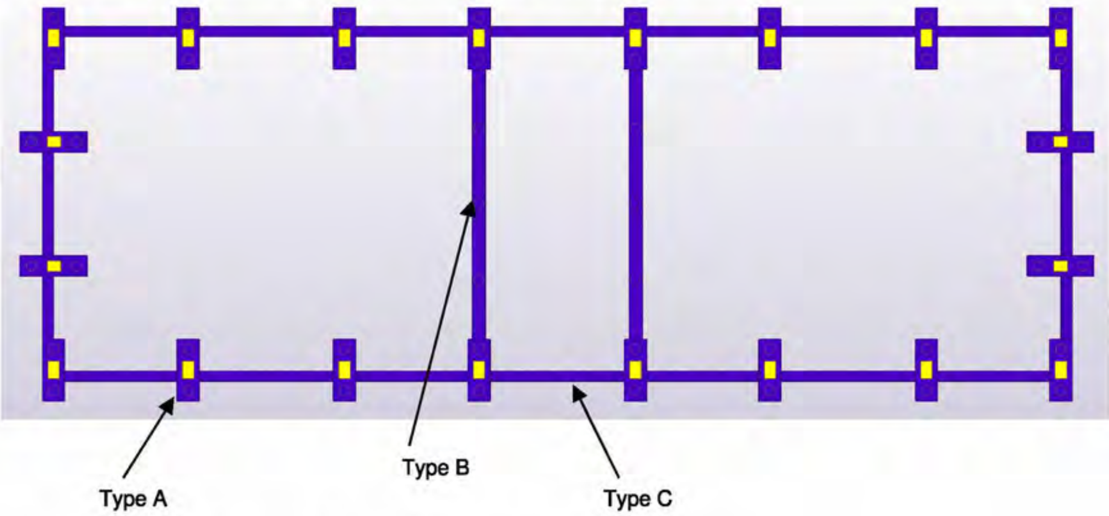




Design according to annex D.4 and D.5

8.2. Foundation beams

For the first draft design of the foundation beams a simple design is made.

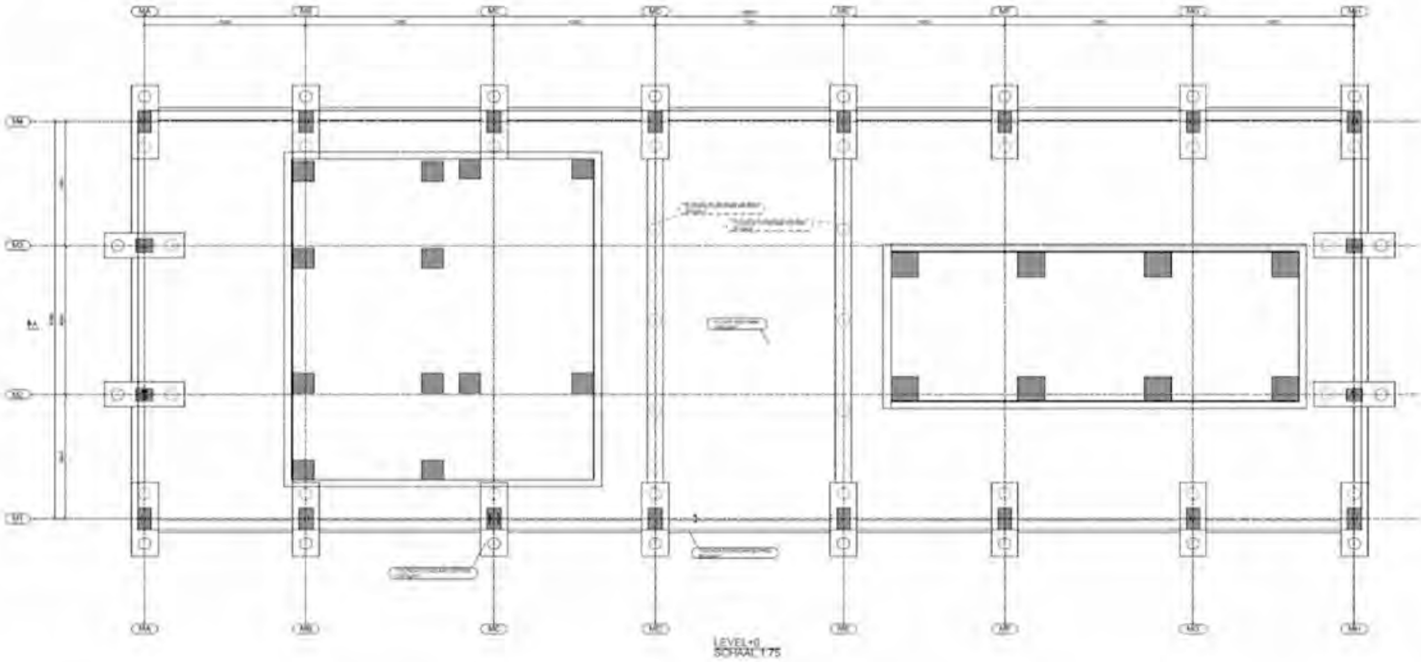


Type A is designed in annex D.6

Type B is considerd as a beam on 5 supports, supporting the floorslab.
For this purpose a practical beam design is used, which results in a basic reinforcement of 5ø12 t/b is tested and sufficient.
This results in a rebar of 50 kg/m³, for the tender a weight of 80 kg/m³ is advised.

Type C are practical beams supporting the concreate plinth.

8.3. Rebar



Floor	=	100 kg/m³
Beams type A	=	120 kg/m³
Beams type B	=	80 kg/m³
Beams type C	=	60 kg/m³

9. Details

9.1. General

9.1.1. Explanation used abbreviations of compounds

MC	=	Moment connection	BP	=	Baseplate	CON	=	General connection
VC	=	Shear connection	WVB	=	Windbrace			
SP	=	Beam/column splice	GV	=	Welded connection			

9.1.2. General assumptions

- Bolts -> calculation according to ISO 4017 (full thread), version with bolts according to ISO 4014 (bolt with shank)
- Nuts -> starting point for nuts is strength quality 8 at 8.8 bolts, and quality 10 at 10.9 bolts
- In accordance with EN 1993-1-8 3.6.1 (12) +NB, unless otherwise stated in the calculation, a maximum shim thickness of ⅓ of the nominal bolt diameter must be used.
- For e.g. M30 is the maximum allowed shim 30/3 = 10 mm u.n.o.
- Connections are categorized by default in Category A and/or Category D of EN 1993-1-8 3.4 + NA.

Nominal hole diameters, according to Table 11 of EN 1090-2+NB, (mm)									
nom. Diameter	M6	M8	M10	M12	M14	M16	M20	M24	M27 en grote
Normal round holes	+1					+2			+3
Large round holes	+3					+4		+6	+8
Short slotted holes, along the length	+4					+6		+8	+10
Long slotted holes, along the length	1.5 * d								

- For coated connectors may be increased by 1 mm for diameters ≤ 14
- For slotted holes, the dimensions according to normal holes must be used across the width

Basic strength for bolts

General		Shear				Tension		Punch	
	d_m	8.8 by tension surface	8.8 by stem	10.9 by tension surface	10.9 by stem	8.8 by tension surface	10.9 by tension surface	Plate S235	Plate S355
M12	19.0	32.4	43.4	33.7	54.3	48.6	60.7	10.3 * t	14 * t
M16	24.0	60.3	77.2	62.8	96.5	90.4	113.0	13 * t	17.7 * t
M20	30.0	94.1	120.6	98.0	150.8	141.1	176.4	16.3 * t	22.2 * t
M24	36.0	135.6	173.7	141.2	217.1	203.3	254.2	19.5 * t	26.6 * t
M27	41.0	176.3	219.9	183.6	274.8	264.4	330.5	22.3 * t	30.3 * t
M30	45.0	215.4	271.4	224.4	339.3	323.1	403.9	24.4 * t	33.3 * t
M36	54.0	313.7	390.9	326.8	488.6	470.6	588.2	29.3 * t	39.9 * t
M42	65.0	430.5	532.0	448.4	665.0	645.7	807.1	35.3 * t	48 * t
M48	75.0	565.6	694.9	589.2	868.6	848.4	1060.6	40.7 * t	55.4 * t

		Minimum distances, bearing normative				bearing strength		Minimum distances, bearing not normative				bearing strength	
	d_0	$e_1 \pm 1.2 \cdot d_0$	$e_2 \pm 1.2 \cdot d_0$	$p_1 \pm 2.2 \cdot d_0$	$p_2 \pm 2.4 \cdot d_0$	Plate S235	Plate S335	$e_1 \pm 2 \cdot d_0$	$e_2 \pm 1.5 \cdot d_0$	$p_1 \pm 3 \cdot d_0$	$p_2 \pm 3 \cdot d_0$	Plate S235	Plate S335
	[mm]	[mm]	[mm]	[mm]	[mm]			[mm]	[mm]	[mm]	[mm]		
M12	14.0	20.0	20	35	35	2.96 * t	4.03 * t	30.0	25	45	45	6.17 * t	8.4 * t
M16	18.0	25.0	25	40	45	3.84 * t	5.23 * t	40.0	30	55	55	8.53 * t	11.61 * t
M20	22.0	30.0	30	50	55	4.71 * t	6.41 * t	45.0	35	70	70	9.82 * t	13.36 * t
M24	26.0	35.0	35	60	65	5.58 * t	7.6 * t	55.0	40	80	80	12.18 * t	16.58 * t
M27	30.0	40.0	40	70	75	6.22 * t	8.47 * t	60.0	45	90	90	12.96 * t	17.64 * t
M30	33.0	40.0	40	75	80	5.91 * t	8.05 * t	70.0	50	100	100	15.27 * t	20.79 * t
M36	39.0	50.0	50	90	95	7.58 * t	10.31 * t	80.0	60	120	120	17.72 * t	24.12 * t
M42	45.0	55.0	55	100	110	8.49 * t	11.55 * t	90.0	70	135	135	20.16 * t	27.44 * t
M48	51.0	65.0	65	115	125	10.17 * t	13.84 * t	105.0	80	155	155	23.72 * t	32.28 * t

For slotted holes, a reduction in compression strength of 0.6 times the resistance must be applied.
For large holes this is a reduction of 0.8 times the resistance.

Assumptions for welds:

Steel grade	f_y N/mm²	f_u N/mm²	β	Simplified method $f_{vw,d} = f_u / \beta / \sqrt{3} / \gamma_{M2}$			Combined stress method $f_{w,d} = f_u/(\beta^*\gamma_{M2})$	
S235	235	360	0.8	$f_{vw,d}$ =	207.8	N/mm²	360.0	N/mm²
S275	275	430	0.85	$f_{vw,d}$ =	233.7	N/mm²	404.7	N/mm²
S355	355	490	0.9	$f_{vw,d}$ =	251.5	N/mm²	435.6	N/mm²
S450	440	550	1	$f_{vw,d}$ =	254.0	N/mm²	440.0	N/mm²
S275 N/NL	275	390	0.85	$f_{vw,d}$ =	211.9	N/mm²	367.1	N/mm²
S355 N/NL	355	490	0.9	$f_{vw,d}$ =	251.5	N/mm²	435.6	N/mm²
S420 N/NL	420	520	1	$f_{vw,d}$ =	240.2	N/mm²	416.0	N/mm²
S460 N/NL	460	540	1	$f_{vw,d}$ =	249.4	N/mm²	432.0	N/mm²

Simplified method:

$\sqrt{(N^2 + Vy^2 + Vz^2)} < l_{las} * f_{vw,d} * a$

Other requirements/principles according to annex E.1.

9.2. Details

9.2.1. General

The final forces of the Scia model are used as starting points for the details.

Torsional forces < 0.5 kNm are neglected for the purpose of the detailed calculation.

When o.g. is indicated at a connection, this stands for "Or Equivalent".

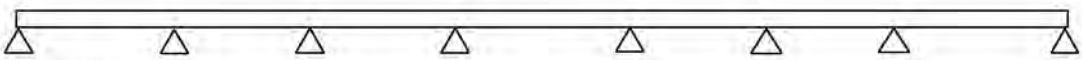
Connections labeled as Practical must be made with at least 2 M16 8.8, Lip t =10 mm with weld a = 4 mm, or double angle L100x10, or end plate t=10 mm with welds a = 4 mm.

For all checks, the basic requirement is that all Unity Checks (u.c.'s) must be less than or equal to 1.00 (100%).

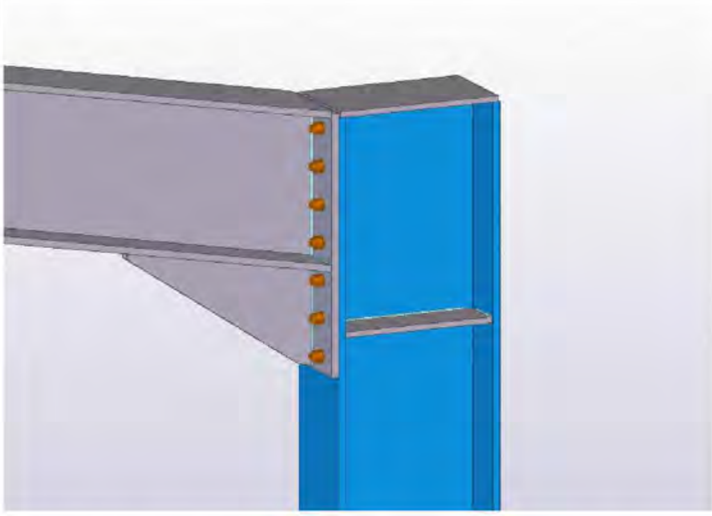
The details / sketches which have not been calculated manually below are included in attachment E.

Overview of these details according to below.

9.2.2. Checks

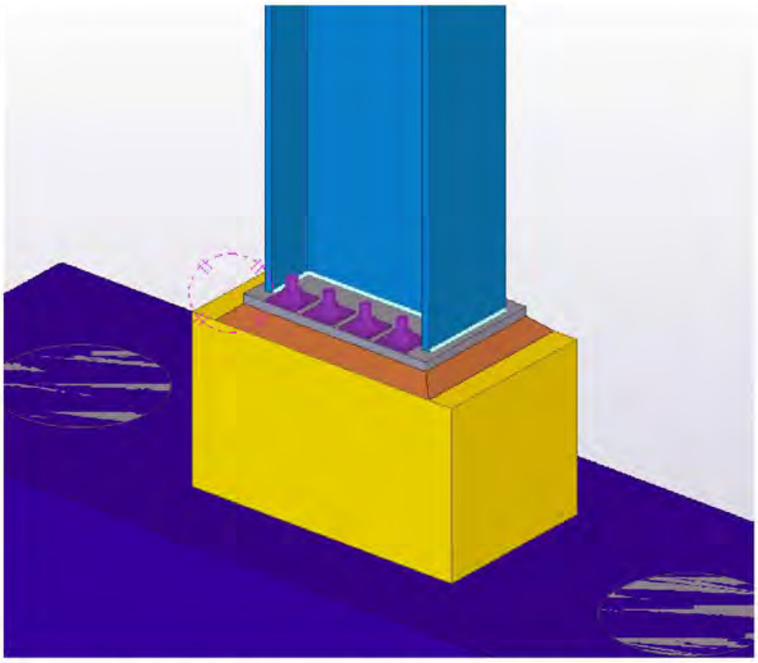
Beams/connections	Discription
Bracings	The basic windbraces are designed in Scia as an L100x10. A simpel check is preformed, adding the max. tension and compression = 490 kN. As checked in annex E.2. a member L150x15 is needed, with 6 M20 8.8. Gussetplate t = 15 mm.  For the beams the compression is max. 360 kN * 2 = 720 kN (conservative) Max. length is 7 m use a HEA240 S235 ($N_{b,Rd}$) = 750 kN.
Purlins	The purlins need to be disigned for: Wind = 2.25 kN/m² SAB Z240-2 mm Purlins S350GD+Z Explosion = 2 kN/m²  c.t.c. 1300 mm max. Max. line load = 2.93 kN/m M = 15.2 kNm $W_{ben.}$ = 43.4 cm³ W_{pl} = 45 cm³

Basic moment connection



With IDEA Statica a first simpel design is made in Annex E.4 the results are added.

Basic baseplate design



In annex E.3. a basic calculation for the anchors is made.

10. Conclusion

10.1. Conclusions

10.1.1. Conclusion rev. -

The basic steelstructure is designed in this document, all cross-sections are provided, in addtion the purlins are checked and a pre-design of the foundationbeams with a basic rebar amount is provided.

10.2. Remarks

10.2.1. General u.n.o.

- The calculation only includes the following parts of the main structure::
  - Main steel, steelframe;
  - Foundation on piles
- The calculation does not include provisions for architectural "ornamental" elements;
- The details shown are largely schematic, and must be worked out into workable details, taking into account the requirements from Annex E.1.;
- All prefabricated / order parts must be processed according to manufacturer's instructions;
- Where specific branded products are specified in the calculation (indicated by o.e.), the executive party is always allowed to apply an Or Equivalent product. The contractor must, however, demonstrate that the product used is actually equivalent;
- Where necessary, the construction must be covered with fire-resistant material according to instructions;
- Stability during assembly must be ensured through the chosen assembly sequence, possibly to be demonstrated by means of calculations preformed by the contractor;

10.2.2. Steelstructure u.n.o.

- Steelwork execution in accordance with EN 1090-1 +NA & EN 1090-2 +NA / EN 1090-4 +NA
- Roofing plates shall be staggered to ensure an equal load for the support structure and to provide in-plane contribution. They shall be connected in such a way that they can provide buckling support. Calculation by manufacturer;
- Connections of sandwich panels for roofing and/or walls acc. specifications of manufacturer;
- The manufacturer of the roofing plates needs to take into account the extra loads caused by snow accumulation where applicable;
- When installing all edges and corners of roof and facade panels, the supplier must take into account increased wind load factors $C_{pe,1}$ instead of $C_{pe,10}$ in his calculations;
- Pre-cambers in this calculation do not include pre-cambers to provide for fall, if such is neccasary;

10.2.3. Concretestructures u.n.o.

- Concrete works must be carried out in accordance with EN 13670 + NA;
- Finishing of the various concrete elements must be indicated on the drawing. In the calculated concrete cover, e.e.a. has been determined on the basis of the known data. If special finishes are applied, appropriate measures must be applied, in consultation with the manufacturer.
- The workability of the concrete is determined by the contractor. The chosen consistency must be adjusted to the execution method, taking into account the permissible water/cement factor in relation to the environmental class.
-If a hollow-core slab floor has a stone-like finish, it must be provided with a pressure layer d = 50 mm, with a cross net B335 (# ø8-150) B500A
- Drawings with the course of the pipes must be sent to both the constructor and the floor supplier for checking/adjustment.
- System floors must be calculated/signed by the supplier, taking into account the basic principles set out in this document.

10.2.4. Execution of foundation on piles

- Pile reinforcement according to calculation supplier;
- Piles should be drilled accurately in place;
- Checking of piles after insertion should be done, if one of the following situations occurs this must be reported to the engineer:
  - Deviations larger than 50 mm must be stated on the drawing and must be reported;
  - If there is doubt as to whether a pile has been driven, it must be measured acoustically and if broken please mention this.
- Piling operations must be carried out in accordance with EN 1997-1 + NB. In doing so, also adhere to the guidelines and principles of NEN 6742;
- First pile serves on the probing to be driven at depth. The payment made here is for all other piles. When several probes are present, the piles must be driven first at these locations and the average balancing must be used for the most distant piles.

Annex A
Overview material properties

Content

A. Overview material properties

A.1. Overview steel

General data for steel

Mass per unit	m =	7850 kg/m³	calculationmodel 8000 kg/m³
Modulus of elasticity	E =	210000 N/mm²	
Shear modulus	G =	80769 N/mm²	
Poisson coëfficient	ν =	0.3	
Linear thermal expansion coefficient	α =	0.000012 per °C (voor T ≤ 100 °C)	

Name	Lower limit [mm]	Upper limit [mm]	f_y [N/mm²]	f_u [N/mm²]	
S 235 JR S 235 J0 S 235 J2 (for thickness 250-400) acc. EN 10025-2	0	3	235	360	
	3	16	235	360	
	16	40	225	360	
	40	63	215	360	
	63	80	215	360	
	80	100	215	360	
	100	150	195	350	
	150	200	185	340	
	200	250	175	340	
	250	400	165	330	** alleen S 235 J2
S 355 JR S 355 J0 S 355 J2 S 355 K2 acc. EN 10025-2	0	3	355	510	
	3	16	355	470	
	16	40	345	470	
	40	63	335	470	
	63	80	325	470	
	80	100	315	470	
	100	150	295	450	
	150	200	285	450	
	200	250	275	450	
	250	400	265	450	** alleen S 355 J2 & S 355 K2

A.2. Overview Aluminium

n.a.

A.3. Overview Wood

n.a.

A.4. Overview Concrete & Rebar

Concrete

Name	cylinder pressure strength f_{ck} MPa	cube compressive strength $f_{ck,cube}$ MPa	design value cylinder pressure strength f_{cd} MPa	average cylinder compressive strength f_{cm} MPa	characteristic tensile strength f_{ctm} MPa	design value tensile strength f_{ctd} MPa	Secant modulus of elasticity at 0.4 fcm E_{cm} MPa	min. reïnforcement percentage ρ_{min} %	max.reïnforcement percentage ρ_{max} %	α	β	
C12/15	12	15	8	20	1.57	0.73	27000	0.13	0.62	0.75	0.39	=> concrete for basefloor
C16/20	16	20	10.7	24	1.9	0.89	29000	0.13	0.82	0.75	0.39	
C20/25	20	25	13.3	28	2.21	1.03	30000	0.13	1.03	0.75	0.39	=> standard concrete
C25/30	25	30	16.7	33	2.56	1.2	31000	0.13	1.29	0.75	0.39	
C30/37	30	37	20	38	2.9	1.35	33000	0.15	1.55	0.75	0.39	=> standard concrete
C35/45	35	45	23.3	43	3.21	1.5	34000	0.17	1.8	0.75	0.39	
C40/50	40	50	26.7	48	3.51	1.64	35000	0.18	2.06	0.75	0.39	
C45/55	45	55	30	53	3.8	1.77	36000	0.2	2.32	0.75	0.39	=> standard prefabricated concrete
C50/60	50	60	33.3	58	4.07	1.9	37000	0.21	2.58	0.75	0.39	
C53/65	53	65	35.3	61	4.16	1.94	38000	0.22	2.12	0.72	0.38	
C55/67	55	67	36.7	63	4.21	1.97	38000	0.22	2.1	0.71	0.37	
C60/75	60	75	40	68	4.35	2.03	39000	0.23	2.1	0.67	0.36	
C70/85	70	85	46.7	78	4.61	2.15	41000	0.24	2.22	0.62	0.35	
C80/95	80	95	53.3	88	4.84	2.26	42000	0.25	2.28	0.58	0.34	
C90/105	90	105	60	98	5.04	2.35	44000	0.26	2.49	0.56	0.34	

Rebar

General data for steel			
Mass per unit	m =	7850	kg/m³
Modulus of elasticity	E =	210000	MPa
Shear modulus	G =	80769	MPa
Poisson coëfficient	ν =	0.3	
Linear thermal expansion coëfficient	α =	0.000012	per °C (voor T ≤ 100 °C)

name	f_{yk} MPa	f_{yd} MPa	
FEB200	220	191	=> only for excisting concrete
B 400A	400	348	
B 500A	500	435	=> for basic pointweldednets
B 600A	600	522	
B 400B	400	348	
B 500B	500	435	=> standard for rebar beams/stirups
B 600B	600	522	
B 400C	400	348	
B 500C	500	435	=> standard for earthquake area's
B 600C	600	522	

A.5. Overview of bolts and anchors

name	f_{yb} MPa	f_{tb} MPa	
4.6	240	400	
4.8	320	400	=> not applicable in the Netherlands in accordance with NEN-EN 1993-1-8
5.6	300	500	
5.8	400	500	=> for Hilti Lijmankers, otherwise not applicable in the Netherlands in accordance with NEN-EN 1993-1-8
6.8	480	600	
8.8	640	800	
10.9	900	1000	
12.9	1080	1200	
A4-50	210	500	
A4-70	450	700	
A4-80	600	800	

A.6. Overview masonry

n.a.

A.7. Overview Stainless Steel

n.a.

Annex B
Determining snowloads

Content

B.1. *Snowloads acc. Eurocode EN-1991-1-3 + NA*

B.1.1. Basic snow load

Characteristic value snow	=	ρ_{sk} =	0.7 kN/m²
Exposure coëfficient	=	C_e =	1
Thermal coëfficient	=	C_t =	1
Design lifetime	=	n =	50 jr.
Probability factor	=	P_n =	0.020
Variance coëfficient	=	V =	0.8

Factor for frequent value of a variable action:

$$\psi_t = \frac{1 - V * \sqrt{6} / \pi * (\ln(-\ln(Pn)) + 0.5722)}{1 + 2.5923 * V} = 1.001$$

Basic snow load = ρ_{sn} = **0.70** kN/m²

B.1.2. Roof shape coëfficients

B.1.2.1. Algemene bepalingsmethode voor coëfficienten

Roof angle/pitch α	for 0° ≤ α ≤ 30°	for 30° < α ≤ 60°	for α ≤ 60°
μ_1	0.8	0.8 * (60 - α) / 30	0
μ_2	0.8 + 0.8 * α / 30	1.6	0

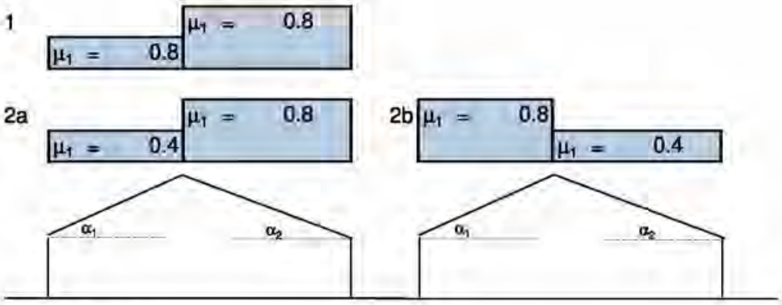
B.1.2.2. Monopitch roofs according to EN-1991-1-3 + NA, § 5.3.2

B.1.2.3. Saddle roofs according to EN-1991-1-3 + NA, § 5.3.3

α_1	=	10 °
$\mu_1(\alpha_1)$	=	0.8
α_2	=	10 °
$\mu_1(\alpha_2)$	=	0.8
$q_{snow}(\alpha_1)$	=	**0.56** kN/m²
$q_{snow}(\alpha_2)$	=	**0.56** kN/m²

case 1

case 2a



B.1.2.4. Roofs with more than one span, according to EN-1991-1-3 + NA, § 5.3.4

B.1.2.5. Cylinder roofs according to EN 1991-1-3 + NA, § 5.3.5

B.1.2.6. Roofs adjacent to higher buildings, according to EN-1991-1-3 + NA, § 5.3.6

B.1.2.7. Snow accumulation at protruding part/obstacles, according to EN-1991-1-3 + NA, § 6.2

Annex C
Determining windloads

Content

C.1. *Windloads acc Eurocode EN-1991-1-4 + NA*

C.1.1. General data for winddesign

Country		=	Nederland	
Location		=	Sluiskil	
Windarea		=	2	
Terrain category		=	2	
Shape of structure		=	b	
nr. of floors		=	1	
Building width	b_{gem} / x-as	=	46	m
Building depth	d_{gem} / y-as	=	17	m
Heigth above level 0+	h_1	=	0	m
Building height	h	=	15.5	m
Total building height	z_i	=	15.5	m
Angle of roof		=	10	°
Type of structure		=	Steel buildings	

Terrain category

		z_0	z_{min}
0	Sea or coastal area exposed to the open sea.	0.01	1
1	Lakes or flat and horizontal area with negligible vegetation and without obstacles.	n.v.t.	n.v.t.
2	Area with low vegetation such as grass and isolated obstacles (trees, buildings) with separations of at least 20 obstacle heights.	0.2	4
3	Gebied met regelmatige begroeiing of Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain, permanent forest).	0.5	7
4	Area in which at least 15 % of the surface is covered with buildings and their average height exceeds 15 m.	n.v.t.	n.v.t.

General shapes of structures

		z_s
a	vertical structures such as buildings etc.	0.6*h > z_{min}
b	parallel oscillator, i.e. horizontal structures such as beams etc.	h_1+h/2 > z_{min}
c	pointlike structures such as signboards etc.	h_1+h/2 > z_{min}
d	other structures	h

roughness length, acc. to terrain category	z_0	=	0.2	m
minimum value for heigt	z_{min}	=	4.0	m
maximum value for heigt	z_{max}	=	200	m
reference height for building factor, according to Figure 6.1 of EN-1991-1-4	z_s	=	7.8	m
normative value for calculation height	z	=	15.5	m

C.1.2. Wind pressure

basic windspeed § 4.2

v_b	=	$C_{prob} * C_{dir} * C_{season} * v_{b0}$	=	27.0 m/s
C_{dir}	=			1
C_{season}	=			1
v_{b0}	=			27.0 m/s
C_{prob}	=	$\left(\frac{1 - K * \ln(-\ln(1-p))}{1 - K * \ln(-\ln(0.98))}\right)^n$	=	1.0
K	=			0.2
n	=			0.5
p	=	1 / reference time	=	0.02

average windspeed § 4.3

$v_{m(z)}$	=	$c_{r(z)} * c_{o(z)} * v_b$	=	24.59 m/s
$c_{o(z)}$	=		=	1
v_b	=		=	27.00 m/s
$c_{r(z)}$	=	$k_r * \ln(z/z_0)$ for $z_{min}<z<z_{max}$; $c_r(z_{min})$ for $z<z_{min}$		
k_r	=	$0.19*(z_0/0.05)^{0.07}$	=	0.21
$c_{r(z)}$	=		=	0.91

wind turbulence § 4.4

$I_{v(z)}$	=	$(k_r*v_b*k_I)/v_{m(z)}$	=	0.23
k_I	=			1.00

extreme trust § 4.5

$q_{p(z)}$	=	$(1+7*I_{v(z)}) * 0.5 * \rho * v_{m(z)}^2$	=	0.99 kN/m²
ρ	=			1.25 kg/m³

C.1.3. Determination of CsCd

Determination according to § 6.3.1 + Annex B

Wind direction			X-axis	Y-axis
c_sc_d	=	$(1 + 2 * k_p * I_{v(zs)} * (B^2 + R^2)^{0.5})/(1 + 7 * I_{v(zs)})$ =	0.88	1.01
B^2	=		0.47	0.57
R^2	=		0.13	0.32
k_p	=		3.66	3.73
$I_{v(zs)}$	=		0.27	0.27

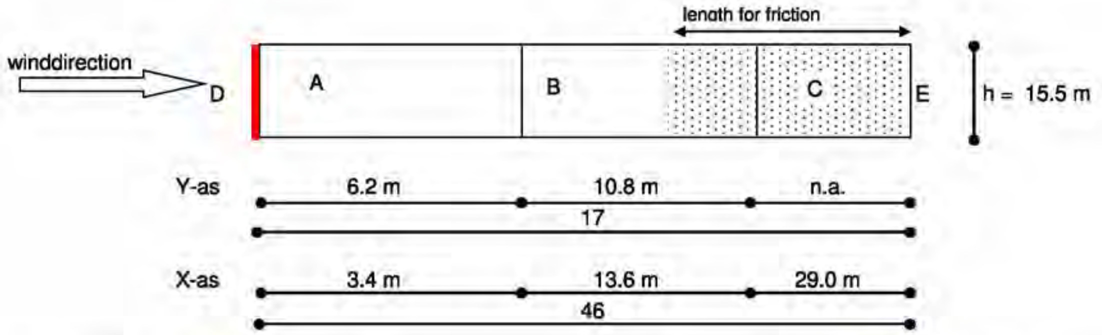
C.2. *Wind form factors according to EN-1991-1-4 + NA*

C.2.1. General wind data

building width	b_{gem} / x-as	=	46 m	ratio X-axis	=	0.34
depth building	d_{gem} / y-as	=	17 m	ratio Y-axis	=	0.91
height relative to level	$h_{w.r.t.\ 0+}$	=	0 m	wind pressure on X axis	=	0.86 kN/m²
building height	h_{gb}	=	15.5 m	wind pressure on Y axis	=	0.99 kN/m²
total building height	h_{gem}	=	15.5 m	e_{vg}= min(x ; 2*h)	=	31 m
roof slope		=	10 °	e_{zg}= min(y ; 2*h)	=	17 m
	z	=	0 m			
	A	=	713 m²	Factors for Under pressure	=	-0.30
				Over pressure	=	0.20

C.2.2. Determination Cpe value on facades

C.2.2.1. *External windpressure coefficient for buildings + windfriction coefficient, acc. § 7.2.2 + fig. 7.5 + § 7.5*



Vallue for wind on front facade (y-axis)

		length:	
C_{pe10} = D =	0.80		
C_{pe10} = E =	-0.50		
C_{pe10} = A =	-1.20	6.20	m
C_{pe10} = B =	-0.80	10.80	m
C_{pe10} = C =	0.00	n.a.	m

Vallue for wind on side facade (x-axis)

		length:	
C_{pe10} = D =	0.80		
C_{pe10} = E =	-0.50		
C_{pe10} = A =	-1.20	3.40	m
C_{pe10} = B =	-0.80	13.60	m
C_{pe10} = C =	-0.50	29.00	m

Conform remark 7.2.2 (3) if the factors D and E are applied simultaneously, a factor for correlation may be used in the calculation. Conservativly assumed, this factor has been set at 1, where 0.85 may be used.

C_{fr} for roof			C_{fr} for facade		
Area	=	ruw	Area	=	ruw
C_{fr}	=	0.02	C_{fr}	=	0.02

length on which applicable is min. 2*b; 4*h; d 17.00 m

		under pressure, y-axis				over pressure, y-axis			
D	=	0.80 -	-0.30 *	0.86 =	0.95 kN/m²	0.80 -	0.20 *	0.86 =	0.52 kN/m²
E	=	-0.50 -	-0.30 *	0.86 =	-0.17 kN/m²	-0.50 -	0.20 *	0.86 =	-0.61 kN/m²
A	=	-1.20 -	-0.30 *	0.86 =	-0.78 kN/m²	-1.20 -	0.20 *	0.86 =	-1.21 kN/m²
B	=	-0.80 -	-0.30 *	0.86 =	-0.43 kN/m²	-0.80 -	0.20 *	0.86 =	-0.86 kN/m²
C	=	0.00 -	-0.30 *	0.86 =	0.00 kN/m²	0.00 -	0.20 *	0.86 =	0.00 kN/m²

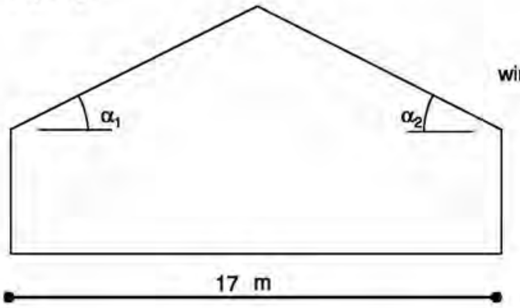
		under pressure, x-axis				over pressure, x-axis			
D	=	0.80 -	-0.30 *	0.99 =	1.09 kN/m²	0.80 -	0.20 *	0.99 =	0.60 kN/m²
E	=	-0.50 -	-0.30 *	0.99 =	-0.20 kN/m²	-0.50 -	0.20 *	0.99 =	-0.69 kN/m²
A	=	-1.20 -	-0.30 *	0.99 =	-0.89 kN/m²	-1.20 -	0.20 *	0.99 =	-1.39 kN/m²
B	=	-0.80 -	-0.30 *	0.99 =	-0.50 kN/m²	-0.80 -	0.20 *	0.99 =	-0.99 kN/m²
C	=	-0.50 -	-0.30 *	0.99 =	-0.20 kN/m²	-0.50 -	0.20 *	0.99 =	-0.69 kN/m²

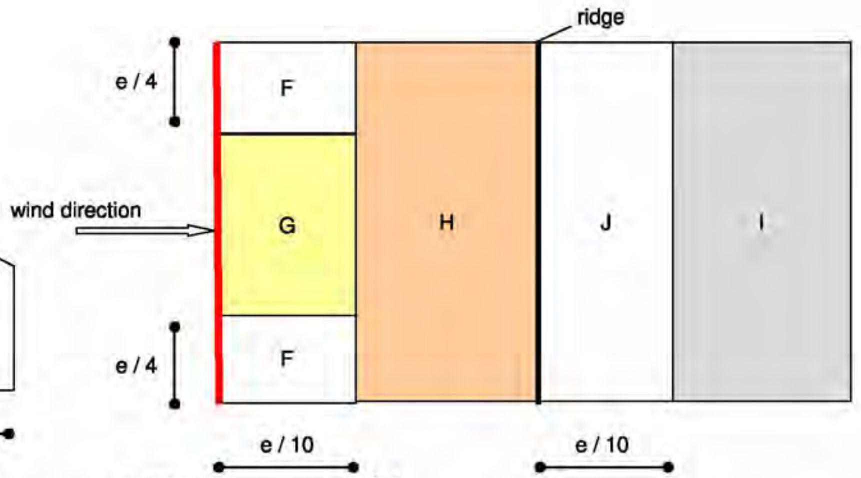
C.2.3. Determination C_{pe} on Roof

C.2.3.3. Value for gable roof acc. § 7.2.5

Wind angle $\Theta = 0°$, relative to frontfacade
for slopes $\alpha > 5$

slope α_1 = 10 °
slope α_2 = 10 °



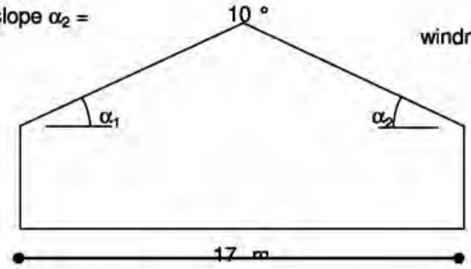


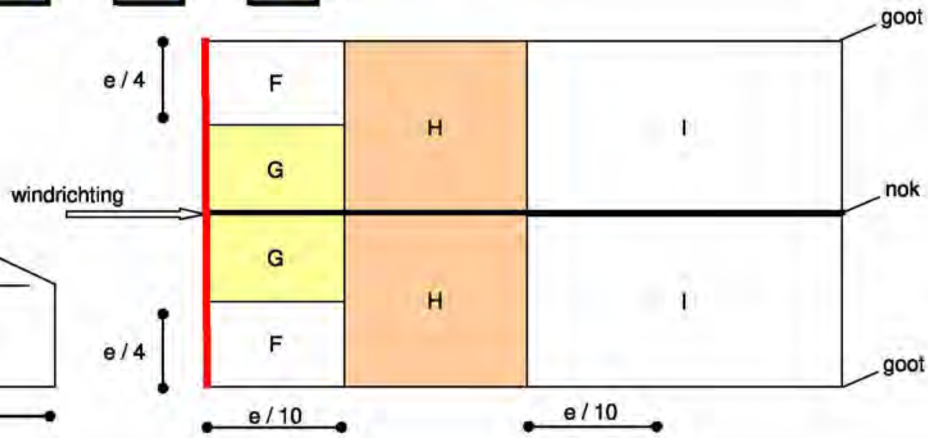
Zone	value at α = 10 ° -F	+F	-G	+G	-H	+H	value at α = 10 ° -I	+I	-J	+J	
$C_{pe,10}$	-1.30	0.10	-1.00	0.10	-0.45	0.10	-0.50	0.00	-0.80	0.10	
under pressure	-1.00	0.40	-0.70	0.40	-0.15	0.40	-0.20	0.30	-0.50	0.40	
over pressure	-1.50	-0.10	-1.20	-0.10	-0.65	-0.10	-0.70	-0.20	-1.00	-0.10	
y-as und.	-0.86	0.35	-0.61	0.35	-0.13	0.35	-0.17	0.26	-0.43	0.35	kN/m²
y-as over	-1.30	-0.09	-1.04	-0.09	-0.56	-0.09	-0.61	-0.17	-0.86	-0.09	kN/m²
x-as und.	-0.99	0.40	-0.69	0.40	-0.15	0.40	-0.20	0.30	-0.50	0.40	kN/m²
x-as over	-1.49	-0.10	-1.19	-0.10	-0.64	-0.10	-0.69	-0.20	-0.99	-0.10	kN/m²

Value for e	e =	e/2 =	e/4 =	e/10 =
frontfacade =	31 m	16 m	8 m	3 m

Wind angle $\Theta = 90°$, relative to frontfacade
for slopes $\alpha > 5$

slope α_1 = 10 °
slope α_2 = 10 °





value at α = 10 °

Zone	-F	-G	-H	-I	
$C_{pe,10}$	-1.45	-1.30	-0.65	-0.55	
under pressure	-1.15	-1.00	-0.35	-0.25	
over pressure	-1.65	-1.50	-0.85	-0.75	
y-as und.	-0.99	-0.86	-0.30	-0.22	kN/m²
y-as over	-1.43	-1.30	-0.74	-0.65	kN/m²
x-as und.	-1.14	-0.99	-0.35	-0.25	kN/m²
x-as over	-1.64	-1.49	-0.84	-0.74	kN/m²

value at α = 10 °

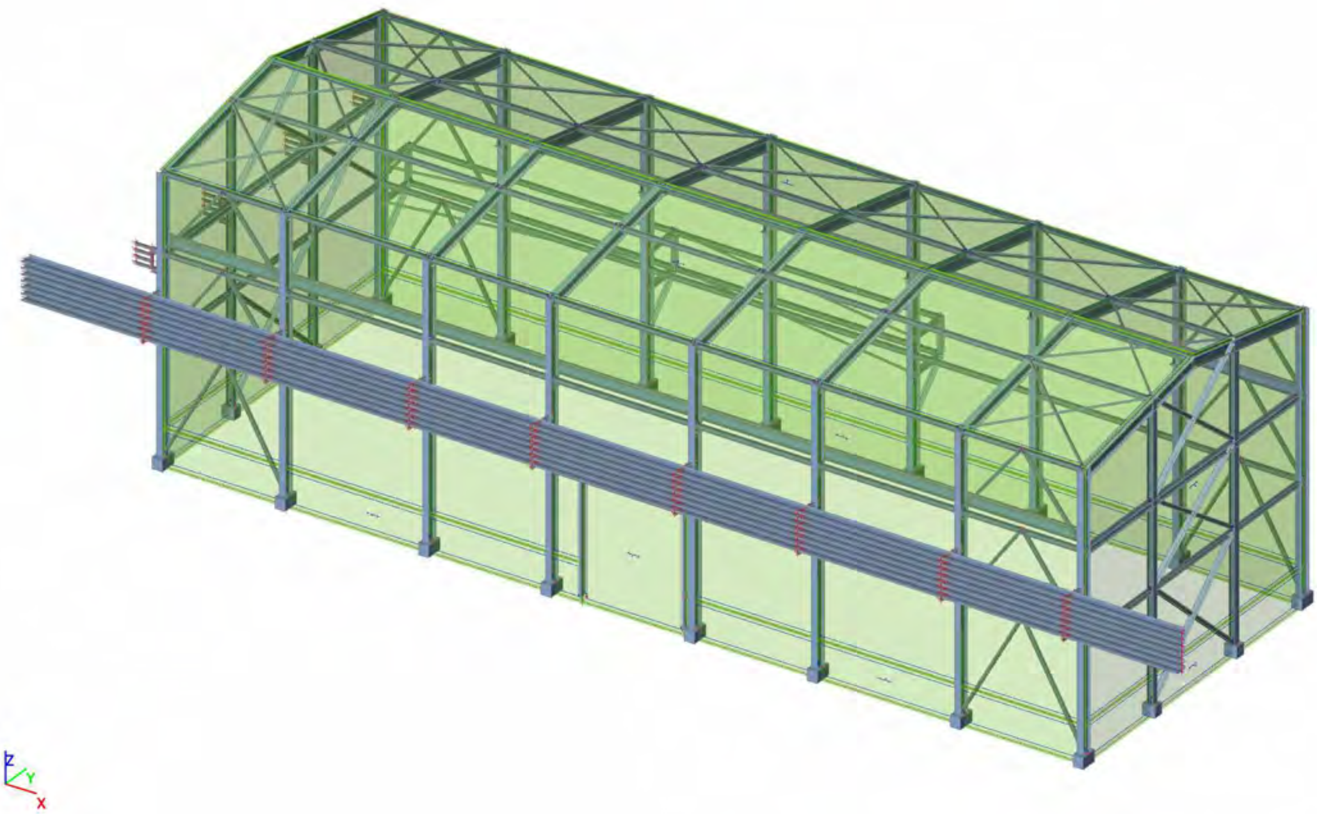
Zone	-F	-G	-H	-I	
$C_{pe,10}$	-1.45	-1.30	-0.65	-0.55	
under pressure	-1.15	-1.00	-0.35	-0.25	
over pressure	-1.65	-1.50	-0.85	-0.75	
y-as und.	-0.99	-0.86	-0.30	-0.22	kN/m²
y-as over	-1.43	-1.30	-0.74	-0.65	kN/m²
x-as und.	-1.14	-0.99	-0.35	-0.25	kN/m²
x-as over	-1.64	-1.49	-0.84	-0.74	kN/m²

Value for e	e =	e/2 =	e/4 =	e/10 =
frontfacade =	17 m	9 m	4 m	2 m

Annex D
Calculation reports

Content

Annex D.1.
Input Scia model



1. Table of contents

2. Calculation model

2.1. Setup manager

Combination setup

Category H loading not to be combined with snow or wind	✓

Psi factors

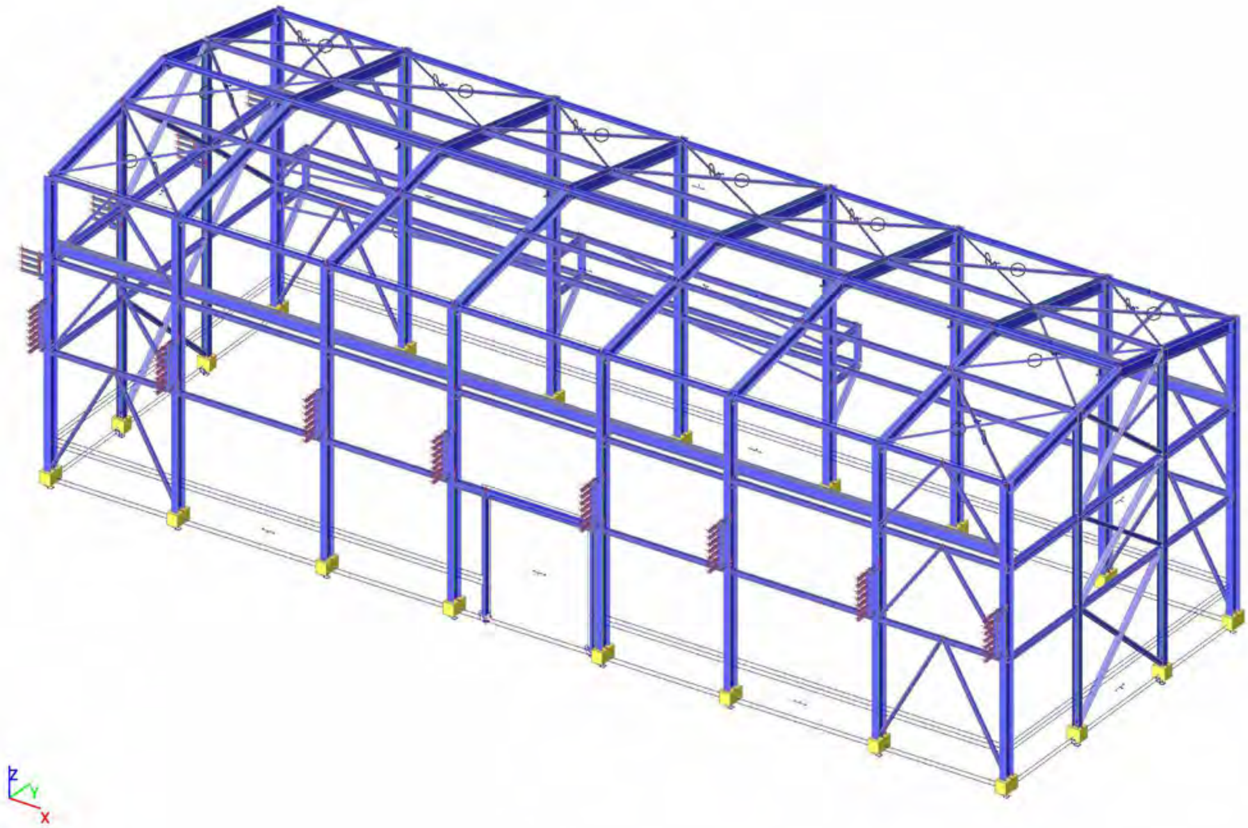
Load	Psi0	Psi1	Psi2
CategoryA	0.4	0.5	0.3
CategoryB	0.5	0.5	0.3
CategoryC	0.6	0.7	0.6
CategoryD	0.4	0.7	0.6
CategoryE	1	0.9	0.8
CategoryF	0.7	0.7	0.6
CategoryG	0.7	0.5	0.3
CategoryH	0	0	0
Snow	0	0.2	0
Wind	0	0.2	0
Temperature	0	0.5	0
Rain water	0	0	0
Construction loads	1	0	0.2

Load combination factors

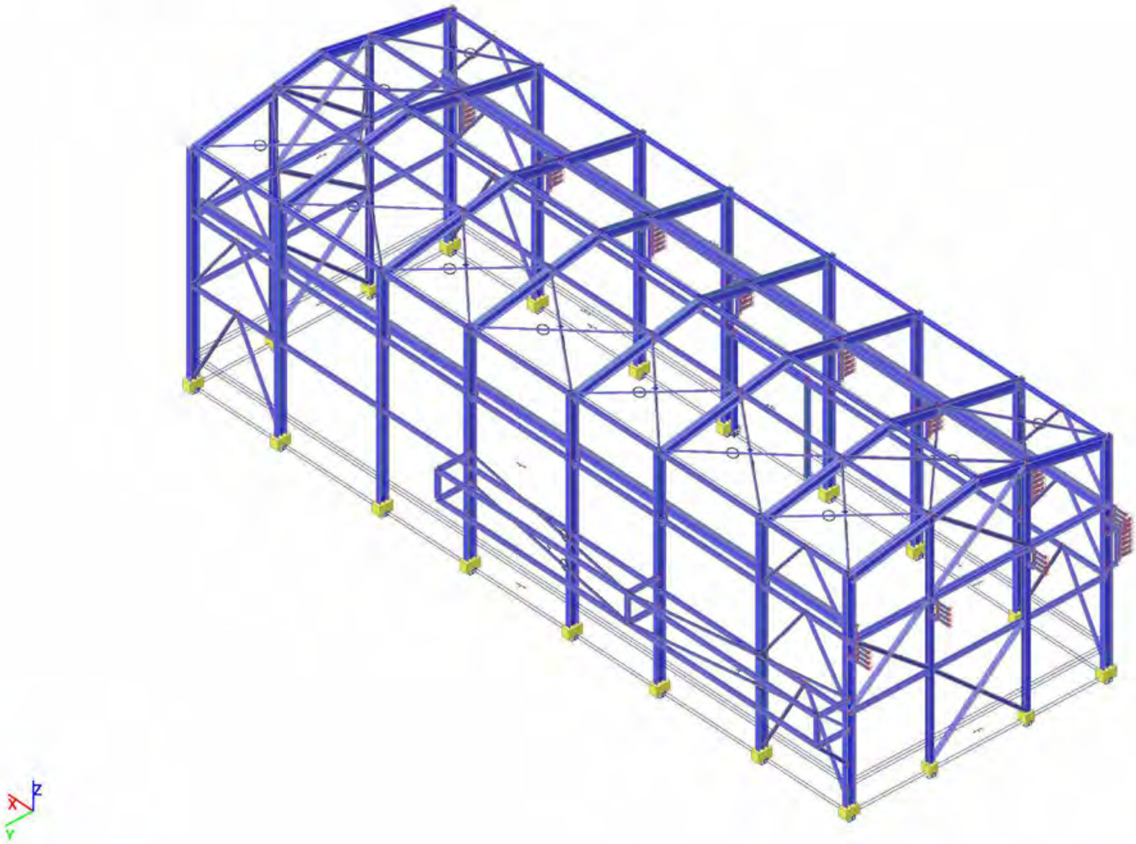
Permanent action - unfavorable	1.35
Permanent action - favorable [-]	0.90
Leading variable action	1.50
Accompanying variable action	1.50
Reduction factor ksi [-]	0.89
Permanent action - unfavorable	1.00
Permanent action - favorable	1.00
Leading variable action	1.30
Accompanying variable action	1.30

2.2. General model description

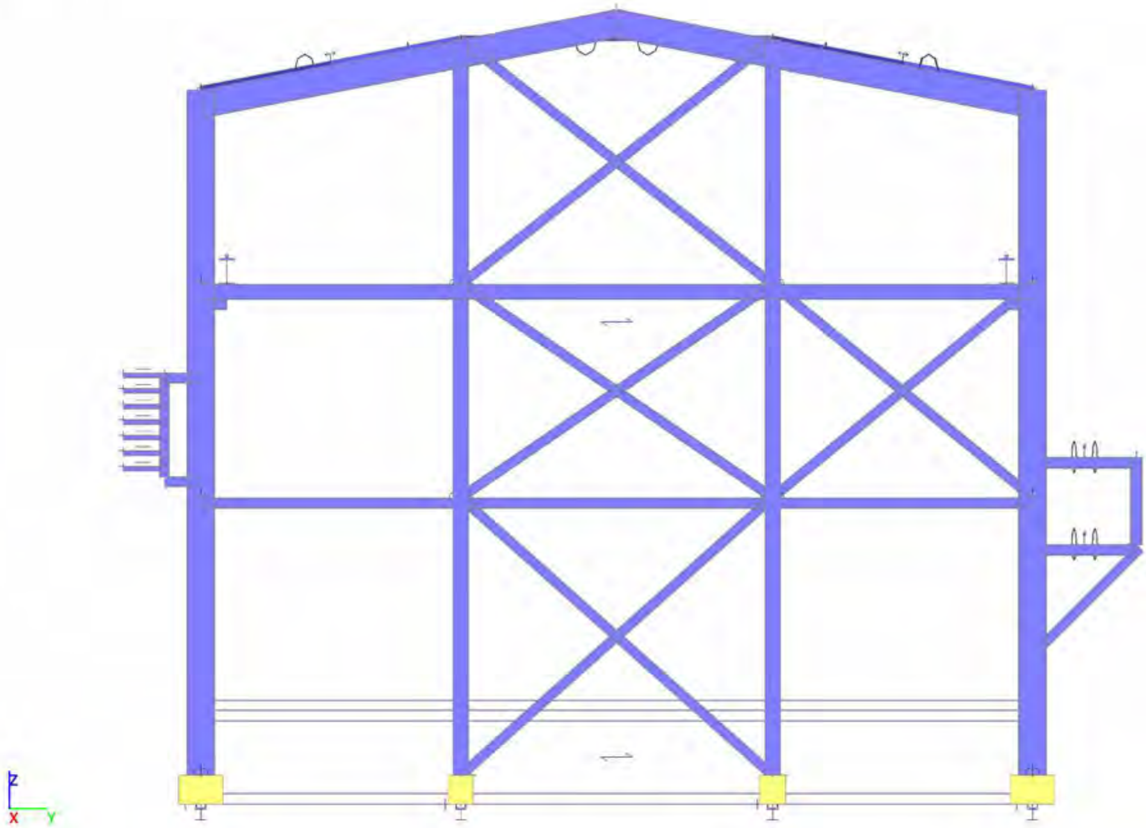
2.2.1. Isometric view



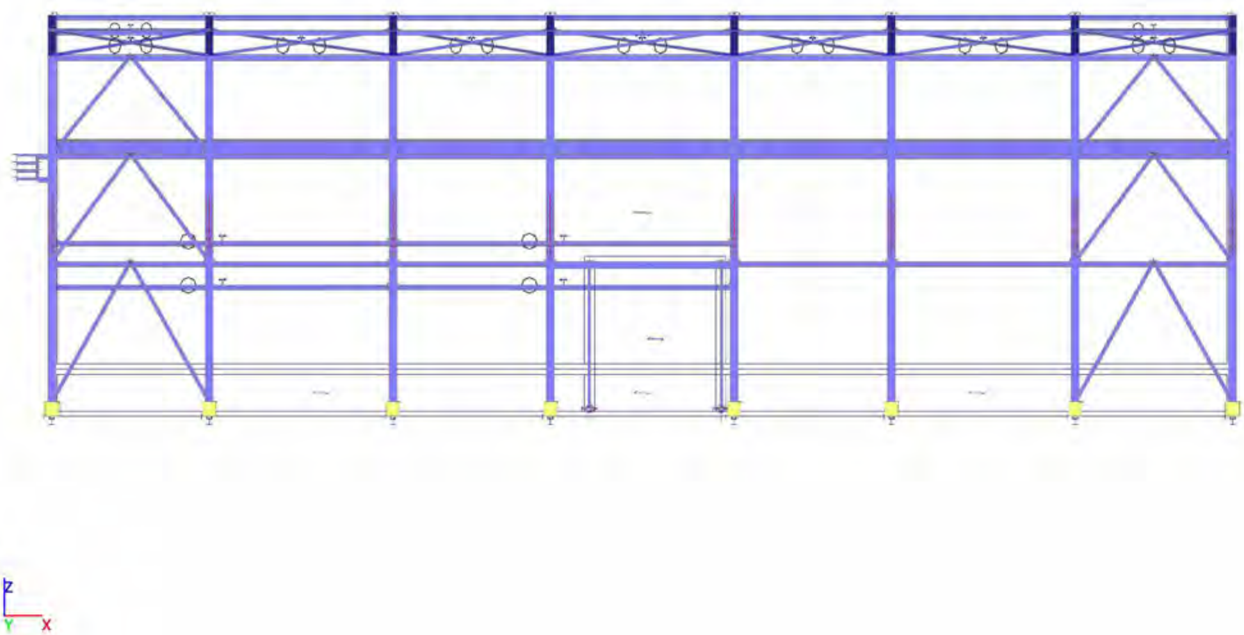
2.2.2. Isometric view



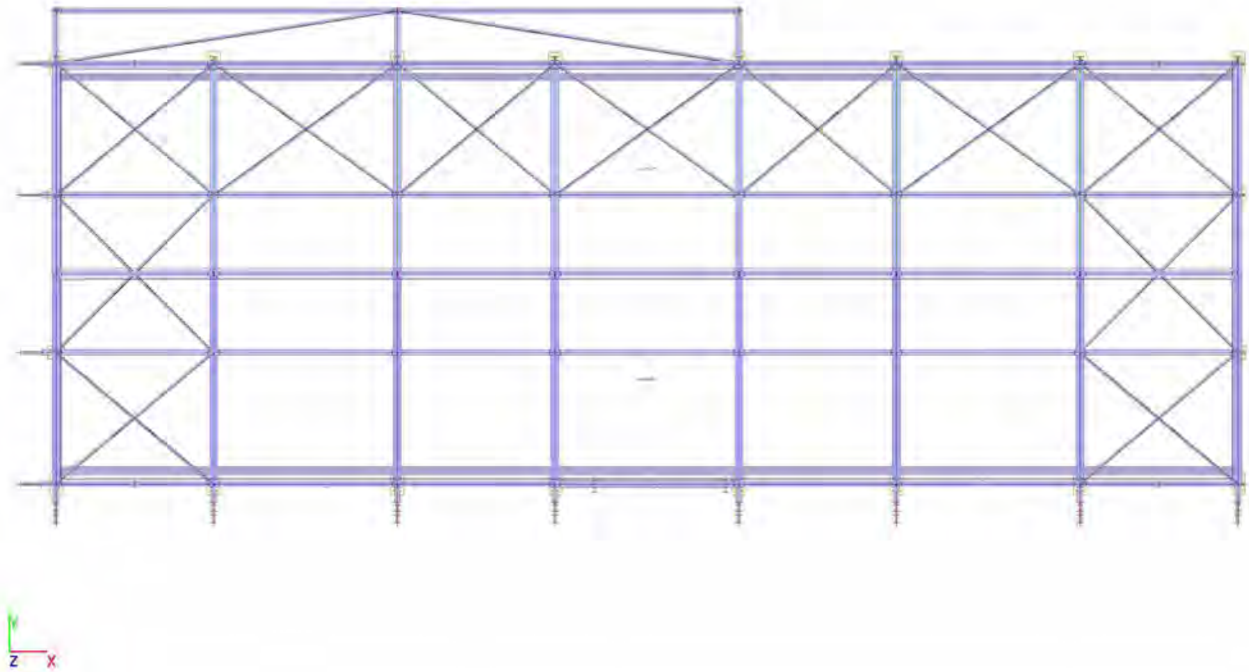
2.2.3. X view



2.2.4. Y view



2.2.5. Z view



2.2.6. Materials

Steel EC3

Name	Unit mass [kg/m³]	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 JR (EN 10025-2)	8000.0	2.1000e+05	0.3	0	3	235.0	360.0
		8.0769e+04	0.00	3	16	235.0	360.0
				16	40	225.0	360.0
				40	63	215.0	360.0
				63	80	215.0	360.0
				80	100	215.0	360.0
				100	150	195.0	350.0
				150	200	185.0	340.0
				200	250	175.0	340.0
S 355 JR (EN 10025-2)	8000.0	2.1000e+05	0.3	0	3	355.0	510.0
		8.0769e+04	0.00	3	16	355.0	470.0
				16	40	345.0	470.0
				40	63	335.0	470.0
				63	80	325.0	470.0
				80	100	315.0	470.0
				100	150	295.0	450.0
				150	200	285.0	450.0
				200	250	275.0	450.0
DUMMY STAAL	0.0	2.1000e+05	0.3	0	40	235.0	360.0
		8.0769e+04	0.00	40	80	215.0	360.0

Concrete EC2

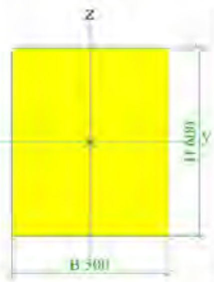
Name	Type	Unit mass [kg/m³]	E mod [MPa]	Poisson - nu	Thermal exp [m/mK]	Characteristic compressive cylinder strength fck(28) [MPa]
C35/45	Concrete	2500.0	3.4100e+04	0.2	0.00	35.00

Name / Type	E mod [MPa] / G mod [MPa]	Poisson - nu	Unit mass [kg/m³]	Log. decrement (non-uniform damping only)	Specific heat [J/gK]
Rigid General material	1.0000e+12 3.8462e+11	0.3	0.0	0.15	6.0000e-01

Explanations of symbols	
Log. decrement (non-uniform damping only)	This material damping property is used only in case non uniform damping is enabled for dynamic analysis (see project functionality). Please note, that non uniform damping require a specific license, which is not part of the standard dynamic pack.

2.2.7. Cross-sections

CT-16		
Type	Rechthoek	
Detailed	850; 500	
Shape type	Thick-walled	
Item material	C35/45	
Fabrication	concrete	
A [m²]	4.2500e-01	
A_y [m²], A_z [m²]	3.5478e-01	3.5438e-01
I_y [m⁴], I_z [m⁴]	2.5589e-02	8.8542e-03
W_{ely} [m³], W_{elz} [m³]	6.0208e-02	3.5417e-02
W_{ply} [m³], W_{plz} [m³]	0.0000e+00	0.0000e+00
I_w [m⁶], I_t [m⁴]	1.2979e-04	2.2378e-02
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	250	425
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	0.00e+00	0.00e+00
M_{plz+} [Nm], M_{plz-} [Nm]	0.00e+00	0.00e+00
AL [m²/m], AD [m²/m]	2.7000e+00	2.7000e+00
β y [mm], β z [mm]	0	0
Picture		

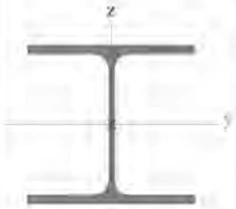
CT-17		
Type	Rechthoek	
Detailed	600; 500	
Shape type	Thick-walled	
Item material	C35/45	
Fabrication	concrete	
A [m²]	3.0000e-01	
A_y [m²], A_z [m²]	2.5034e-01	2.5024e-01
I_y [m⁴], I_z [m⁴]	9.0000e-03	6.2500e-03
W_{ely} [m³], W_{elz} [m³]	3.0000e-02	2.5000e-02
W_{ply} [m³], W_{plz} [m³]	0.0000e+00	0.0000e+00
I_w [m⁶], I_t [m⁴]	9.2159e-06	1.2440e-02
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	250	300
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	0.00e+00	0.00e+00
M_{plz+} [Nm], M_{plz-} [Nm]	0.00e+00	0.00e+00
AL [m²/m], AD [m²/m]	2.2000e+00	2.2000e+00
β y [mm], β z [mm]	0	0
Picture		

ST-11		
Type	HEA550	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	a	b
A [m²]	2.1200e-02	
A_y [m²], A_z [m²]	1.3867e-02	6.9256e-03
I_y [m⁴], I_z [m⁴]	1.1200e-03	1.0800e-04
W_{ely} [m³], W_{elz} [m³]	4.1500e-03	7.2100e-04
W_{ply} [m³], W_{plz} [m³]	4.6250e-03	1.1083e-03
I_w [m⁶], I_t [m⁴]	7.1889e-06	3.5200e-06
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	150	270
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.09e+06	1.09e+06
M_{plz+} [Nm], M_{plz-} [Nm]	2.60e+05	2.60e+05

AL [m^2/m], AD [m^2/m]	2.2100e+00	2.2084e+00
β y [mm], β z [mm]	0	0
Picture		

ST-12

Type	HEA200	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	5.3800e-03	
A_y [m^2], A_z [m^2]	3.8781e-03	1.3287e-03
I_y [m^4], I_z [m^4]	3.6900e-05	1.3400e-05
W_{ely} [m^3], W_{elz} [m^3]	3.8900e-04	1.3400e-04
W_{ply} [m^3], W_{plz} [m^3]	4.2917e-04	2.0375e-04
I_w [m^6], I_t [m^4]	1.0800e-07	2.1000e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	100	95
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.01e+05	1.01e+05
M_{plz+} [Nm], M_{plz-} [Nm]	4.79e+04	4.79e+04
AL [m^2/m], AD [m^2/m]	1.1400e+00	1.1360e+00
β y [mm], β z [mm]	0	0
Picture		

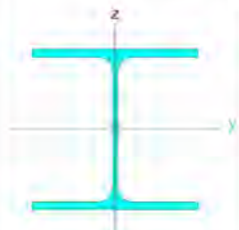


ST-13

Type	I + rail	
Detailed	HEA500, SA75	
Shape type	Thin-walled	
Item material	S 355 JR (EN 10025-2)	
Fabrication	welded	
Flexural buckling y-y, Flexural buckling z-z	c	c
A [m^2]	2.6374e-02	
A_y [m^2], A_z [m^2]	1.9655e-02	6.7449e-03
I_y [m^4], I_z [m^4]	1.2512e-03	1.1353e-04
W_{ely} [m^3], W_{elz} [m^3]	3.9831e-03	7.5684e-04
W_{ply} [m^3], W_{plz} [m^3]	4.9021e-03	1.2527e-03
I_w [m^6], I_t [m^4]	5.6431e-06	2.1757e-05
d_y [mm], d_z [mm]	0	-78
c_{YUCS} [mm], c_{ZUCS} [mm]	150	314
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.74e+06	1.74e+06
M_{plz+} [Nm], M_{plz-} [Nm]	4.45e+05	4.45e+05
AL [m^2/m], AD [m^2/m]	2.2763e+00	2.2763e+00
β y [mm], β z [mm]	51	0
Picture		

ST-14

Type	HEA300	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 355 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	1.1300e-02	
A_y [m^2], A_z [m^2]	8.1300e-03	2.6502e-03
I_y [m^4], I_z [m^4]	1.8300e-04	6.3100e-05
W_{ely} [m^3], W_{elz} [m^3]	1.2600e-03	4.2100e-04
W_{ply} [m^3], W_{plz} [m^3]	1.3833e-03	6.4167e-04
I_w [m^6], I_t [m^4]	1.1998e-06	8.5200e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	150	145
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	4.92e+05	4.92e+05
M_{plz+} [Nm], M_{plz-} [Nm]	2.28e+05	2.28e+05
AL [m^2/m], AD [m^2/m]	1.7200e+00	1.7164e+00
β y [mm], β z [mm]	0	0
Picture		



ST-15

Type	HEA500	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	a	b
A [m^2]	1.9800e-02	
A_y [m^2], A_z [m^2]	1.3276e-02	6.0562e-03
I_y [m^4], I_z [m^4]	8.7000e-04	1.0400e-04
W_{ely} [m^3], W_{elz} [m^3]	3.5500e-03	6.9100e-04
W_{ply} [m^3], W_{plz} [m^3]	3.9500e-03	1.0583e-03
I_w [m^6], I_t [m^4]	5.6431e-06	3.0900e-06
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	150	245
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	9.29e+05	9.29e+05
M_{plz+} [Nm], M_{plz-} [Nm]	2.49e+05	2.49e+05
AL [m^2/m], AD [m^2/m]	2.1100e+00	2.1094e+00
β y [mm], β z [mm]	0	0

Picture		

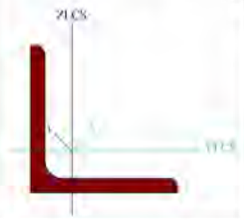
ST-16

Type	UNP280	
Formcode	5 - Channel section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	c	c
A [m^2]	5.3300e-03	
A_y [m^2], A_z [m^2]	2.7628e-03	2.7856e-03
I_y [m^4], I_z [m^4]	6.2800e-05	3.9900e-06
W_{ely} [m^3], W_{elz} [m^3]	4.4800e-04	5.7200e-05
W_{ply} [m^3], W_{plz} [m^3]	5.3200e-04	1.0900e-04
I_w [m^6], I_t [m^4]	5.5659e-08	3.1400e-07
d_y [mm], d_z [mm]	-57	0
c_{YUCS} [mm], c_{ZUCS} [mm]	25	140
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.25e+05	1.25e+05
M_{plz+} [Nm], M_{plz-} [Nm]	2.58e+04	2.58e+04
AL [m^2/m], AD [m^2/m]	8.9000e-01	8.9085e-01
β y [mm], β z [mm]	0	305
Picture		

ST-17

Type	HEA140	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	3.1400e-03	
A_y [m^2], A_z [m^2]	2.2882e-03	7.8192e-04
I_y [m^4], I_z [m^4]	1.0300e-05	3.8900e-06
W_{ely} [m^3], W_{elz} [m^3]	1.5500e-04	5.5600e-05
W_{ply} [m^3], W_{plz} [m^3]	1.7333e-04	8.5000e-05
I_w [m^6], I_t [m^4]	1.5064e-08	8.1300e-08
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	70	66
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	4.08e+04	4.08e+04
M_{plz+} [Nm], M_{plz-} [Nm]	1.99e+04	1.99e+04
AL [m^2/m], AD [m^2/m]	7.9400e-01	7.9430e-01
β y [mm], β z [mm]	0	0
Picture		

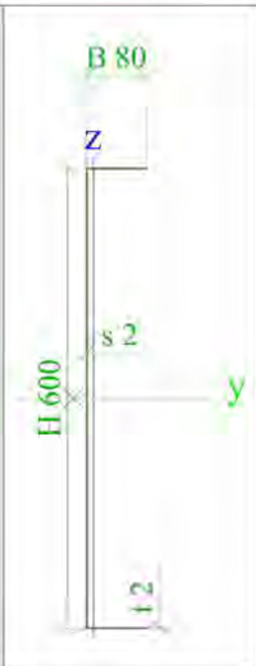
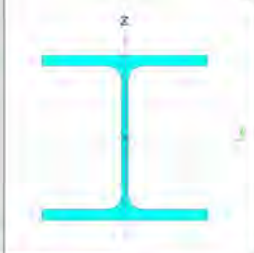
ST-18

Type	L100X10	
Formcode	4 - L section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	b
A [m^2]	1.9200e-03	
A_y [m^2], A_z [m^2]	1.6118e-03	1.6187e-03
I_y [m^4], I_z [m^4]	2.8000e-06	7.3300e-07
W_{ely} [m^3], W_{elz} [m^3]	3.9631e-05	1.8292e-05
W_{ply} [m^3], W_{plz} [m^3]	6.2946e-05	3.2343e-05
I_w [m^6], I_t [m^4]	0.0000e+00	6.6700e-08
d_y [mm], d_z [mm]	-34	0
c_{YUCS} [mm], c_{ZUCS} [mm]	28	28
α [deg]	45.00	
I_{YZLCS} [m^4]	-1.0362e-06	
M_{ply+} [Nm], M_{ply-} [Nm]	1.48e+04	1.48e+04
M_{plz+} [Nm], M_{plz-} [Nm]	7.60e+03	7.60e+03
AL [m^2/m], AD [m^2/m]	3.9000e-01	3.8965e-01
β y [mm], β z [mm]	0	132
Picture		

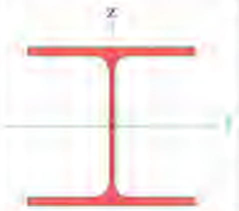
ST-19

Type	HEA100	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	2.1200e-03	
A_y [m^2], A_z [m^2]	1.6076e-03	5.3156e-04
I_y [m^4], I_z [m^4]	3.4900e-06	1.3400e-06
W_{ely} [m^3], W_{elz} [m^3]	7.2800e-05	2.6800e-05
W_{ply} [m^3], W_{plz} [m^3]	8.2917e-05	4.1125e-05
I_w [m^6], I_t [m^4]	2.5813e-09	5.2400e-08
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	50	48
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.95e+04	1.95e+04
M_{plz+} [Nm], M_{plz-} [Nm]	9.67e+03	9.67e+03
AL [m^2/m], AD [m^2/m]	5.6100e-01	5.6130e-01
β y [mm], β z [mm]	0	0

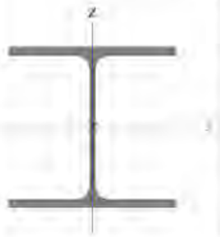
Picture		
ST-20		
Type	HEB220	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	9.1040e-03	
A_y [m^2], A_z [m^2]	6.7051e-03	2.2063e-03
I_y [m^4], I_z [m^4]	8.0910e-05	2.8430e-05
W_{ely} [m^3], W_{elz} [m^3]	7.3550e-04	2.5850e-04
W_{ply} [m^3], W_{plz} [m^3]	8.2700e-04	3.9390e-04
I_w [m^6], I_t [m^4]	2.9542e-07	7.6570e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	110	110
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.94e+05	1.94e+05
M_{plz+} [Nm], M_{plz-} [Nm]	9.26e+04	9.26e+04
AL [m^2/m], AD [m^2/m]	1.2700e+00	1.2700e+00
β y [mm], β z [mm]	0	0
Picture		
GEN-12		
Type	Kanaal	
Detailed	600; 80; 2; 2; 2	
Formcode	5 - Channel section	
Shape type	Thin-walled	
Item material	DUMMY STAAL	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	c	c
A [m^2]	1.5137e-03	
A_y [m^2], A_z [m^2]	2.8177e-04	1.1575e-03
I_y [m^4], I_z [m^4]	6.4048e-05	5.5486e-07
W_{ely} [m^3], W_{elz} [m^3]	2.1349e-04	7.8421e-06
W_{ply} [m^3], W_{plz} [m^3]	2.7381e-04	1.3042e-05
I_w [m^6], I_t [m^4]	3.9281e-08	2.0160e-09
d_y [mm], d_z [mm]	-26	0
c_{YUCS} [mm], c_{ZUCS} [mm]	9	300
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	6.43e+04	6.43e+04
M_{plz+} [Nm], M_{plz-} [Nm]	3.06e+03	3.06e+03
AL [m^2/m], AD [m^2/m]	1.5143e+00	1.5143e+00
β y [mm], β z [mm]	0	1155

Picture		
ST-21		
Type	HEB300	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 355 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	1.4910e-02	
A_y [m^2], A_z [m^2]	1.0963e-02	3.5436e-03
I_y [m^4], I_z [m^4]	2.5170e-04	8.5630e-05
W_{ely} [m^3], W_{elz} [m^3]	1.6780e-03	5.7090e-04
W_{ply} [m^3], W_{plz} [m^3]	1.8690e-03	8.7010e-04
I_w [m^6], I_t [m^4]	1.6878e-06	1.8500e-06
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	150	150
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	6.64e+05	6.64e+05
M_{plz+} [Nm], M_{plz-} [Nm]	3.09e+05	3.09e+05
AL [m^2/m], AD [m^2/m]	1.7300e+00	1.7314e+00
β y [mm], β z [mm]	0	0
Picture		
ST-22		
Type	HEA200	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 355 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	5.3800e-03	
A_y [m^2], A_z [m^2]	3.8781e-03	1.3287e-03
I_y [m^4], I_z [m^4]	3.6900e-05	1.3400e-05
W_{ely} [m^3], W_{elz} [m^3]	3.8900e-04	1.3400e-04
W_{ply} [m^3], W_{plz} [m^3]	4.2917e-04	2.0375e-04

I_w [m^6], I_t [m^4]	1.0800e-07	2.1000e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	100	95
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.53e+05	1.53e+05
M_{plz+} [Nm], M_{plz-} [Nm]	7.24e+04	7.24e+04
AL [m^2/m], AD [m^2/m]	1.1400e+00	1.1360e+00
β y [mm], β z [mm]	0	0
Picture		



ST-23		
Type	HEA280	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [m^2]	9.7300e-03	
A_y [m^2], A_z [m^2]	7.0049e-03	2.3104e-03
I_y [m^4], I_z [m^4]	1.3700e-04	4.7600e-05
W_{ely} [m^3], W_{elz} [m^3]	1.0100e-03	3.4000e-04
W_{ply} [m^3], W_{plz} [m^3]	1.1125e-03	5.1667e-04
I_w [m^6], I_t [m^4]	7.8537e-07	6.2100e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	140	135
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	2.62e+05	2.62e+05
M_{plz+} [Nm], M_{plz-} [Nm]	1.22e+05	1.22e+05
AL [m^2/m], AD [m^2/m]	1.6000e+00	1.6026e+00
β y [mm], β z [mm]	0	0
Picture		



ST-24		
Type	HEA220	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235 JR (EN 10025-2)	
Fabrication	rolled	
Flexural buckling y-y,	b	c
Flexural buckling z-z		
A [m^2]	6.4300e-03	
A_y [m^2], A_z [m^2]	4.6326e-03	1.5689e-03
I_y [m^4], I_z [m^4]	5.4100e-05	1.9600e-05
W_{ely} [m^3], W_{elz} [m^3]	5.1500e-04	1.7800e-04
W_{ply} [m^3], W_{plz} [m^3]	5.6667e-04	2.7042e-04
I_w [m^6], I_t [m^4]	1.9327e-07	2.8500e-07
d_y [mm], d_z [mm]	0	0
c_{YUCS} [mm], c_{ZUCS} [mm]	110	105
α [deg]	0.00	
M_{ply+} [Nm], M_{ply-} [Nm]	1.34e+05	1.34e+05
M_{plz+} [Nm], M_{plz-} [Nm]	6.36e+04	6.36e+04
AL [m^2/m], AD [m^2/m]	1.2600e+00	1.2550e+00
β y [mm], β z [mm]	0	0
Picture		

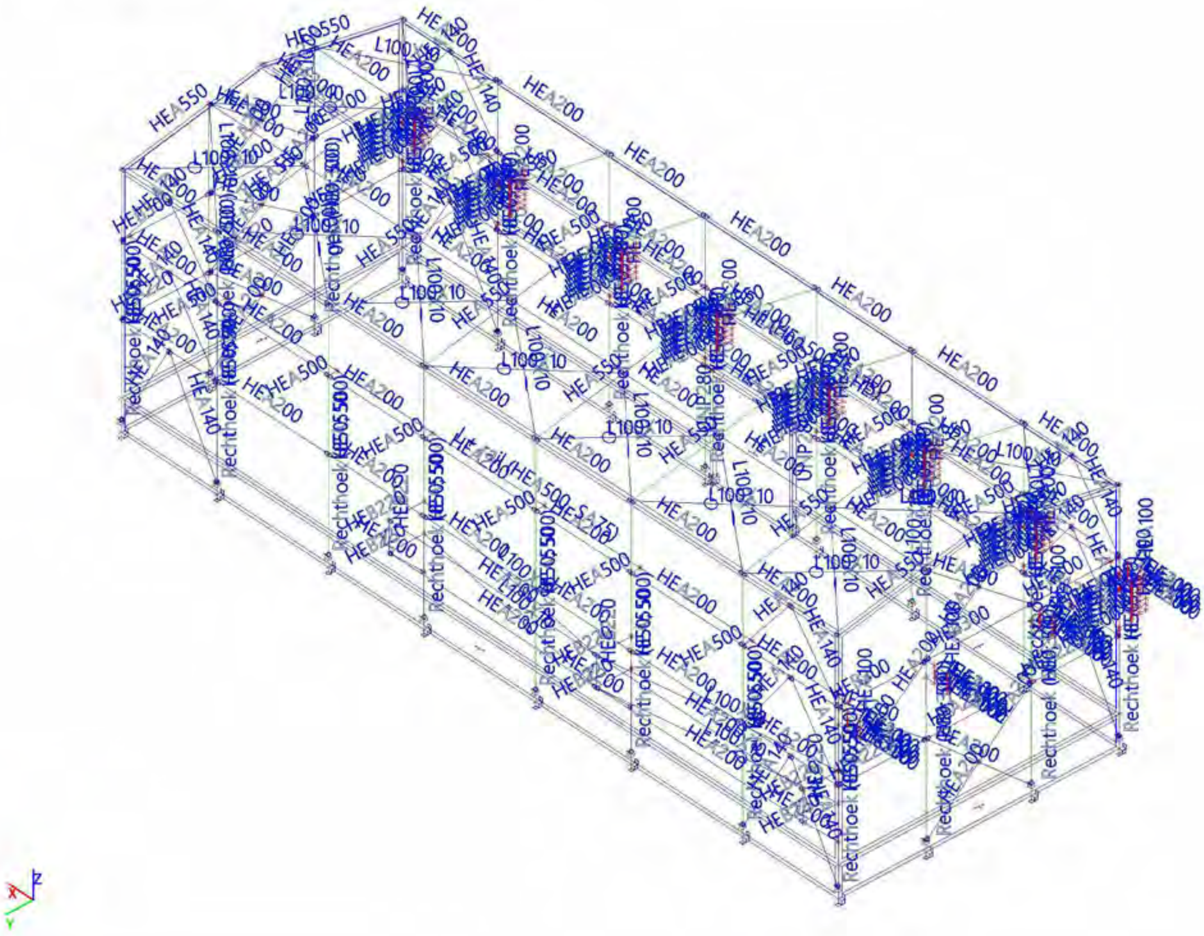
Explanations of symbols	
A	Area
A_y	Shear Area in principal y-direction - Calculated by 2D FEM analysis
A_z	Shear Area in principal z-direction - Calculated by 2D FEM analysis
I_y	Second moment of area about the principal y-axis
I_z	Second moment of area about the principal z-axis
W_{ely}	Elastic section 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 - Calculated by 2D FEM analysis

Explanations of symbols	
I_t	Torsional constant - Calculated by 2D FEM analysis
d_y	Shear center coordinate in principal y-direction measured from the centroid - Calculated by 2D FEM analysis
d_z	Shear center coordinate in principal z-direction measured from the centroid - Calculated by 2D FEM analysis
c_{YUCS}	Centroid coordinate in Y-direction of Input axis system
c_{ZUCS}	Centroid coordinate in Z-direction of Input axis system
α	Rotation angle of the principal axis system
I_{YZLCS}	Product moment of area in the LCS system
M_{ply+}	Plastic moment about the principal

Explanations of symbols	
	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

Explanations of symbols	
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

2.2.8. Analysis model



2.2.9. Layers

Name	Structural model only
Foundation	×
Crainebeam	×
Dummy	×
Kolommen	×
Ligger	×
Bracing	×
Support	×
Tabletop	×

2.2.10. UCS

Current UCS			
Type	vector		
X [m], Y [m], Z [m]	0.000	0.000	0.000
X-X, X-Y, X-Z	1	0	0
Y-X, Y-Y, Y-Z	0	1	0

Z-X, Z-Y, Z-Z	0	0	1

2.3. Model data

2.3.1. Mesh setup

Name	NetInstelling1
Minimal distance between definition point and line [m]	0.001
Average number of 1D mesh elements on straight 1D members	1
Average size of 2D mesh element [m]	1.000
Definition of mesh element size for panels	Manual
Average size of panel element [m]	1.000
Elastic mesh	✓
Use automatic mesh refinement	×
Minimal length of beam element [m]	0.100
Maximal length of beam element [m]	1000.000
Average size of tendons, elements on subsoil, nonlinear soil spring [m]	1.000
Generation of nodes in connections of beam elements	×
Generation of variable eccentricities on members instead of constant ones	×
Division on haunches and arbitrary members	5
Division for integration strip and 2D-1D upgrade	50
Mesh refinement following the beam type	None
Maximal out of plane angle of a quadrilateral [mrad]	30.0
Predefined mesh ratio	1.5

2.3.2. Solver setup

Name	SolverSetup1
Neglect shear force deformation (Ay, Az >> A)	×
Initial stress	×
Use IRS (Improved Reduced System) method	×
Apply property modifiers	✓
Number of thicknesses of rib plate	20
Maximum soil interaction iterations	10
Maximum iterations	500
Number of increments	1
Number of buckling modes	2
Number of sections on average member	10
Number of eigenmodes	10
Step for soil/water pressure [m]	0.500
C1x [MN/m ^{3}]	1.0000e-01
C1y [MN/m ^{3}]	1.0000e-01
C1z [MN/m ^{3}]	1.0000e+01
C2x [MN/m]	5.0000e+00
C2y [MN/m]	5.0000e+00
Coefficient for reinforcement	1
Warning when maximal translation is greater than [mm]	1000.0
Warning when maximal rotation is greater than [mrad]	100.0
Parallelism tolerance [deg]	10.00
Span length ratio Le/beff,i,max (1 side) [-]	8.00
Simply supported beam [-]	1.00
Inner span [-]	0.70
End span [-]	0.85
Cantilever [-]	2.00
Solver precision ratio	1
Soil combination	None
Plastic hinge code	No code
Bending theory of plate/shell analysis	Mindlin
Type of solver	Direct
Type of eigen value solver	Lanczos
Type of eigen value solver	Lanczos
Method of calculation	Picard

2.3.3. 1D

2.3.3.1. Nodes

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K1	12.500	4.750	0.250
K2	12.500	4.750	13.450
K3	12.500	20.750	0.250

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K4	12.500	20.750	13.450
K5	12.500	12.750	15.000
K6	12.500	9.750	0.250

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K7	12.500	9.750	14.419
K8	12.500	15.750	0.250
K9	12.500	15.750	14.419

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K10	18.500	4.750	13.450
K11	18.500	20.750	13.450
K12	18.500	4.750	0.250
K13	18.500	12.750	15.000
K14	18.500	20.750	0.250
K15	25.500	4.750	13.450
K16	25.500	20.750	13.450
K17	25.500	4.750	0.250
K18	25.500	12.750	15.000
K19	25.500	20.750	0.250
K20	31.500	4.750	13.450
K21	31.500	20.750	13.450
K22	31.500	4.750	0.250
K23	31.500	12.750	15.000
K24	31.500	20.750	0.250
K25	38.500	4.750	13.450
K26	38.500	20.750	13.450
K27	38.500	4.750	0.250
K28	38.500	12.750	15.000
K29	38.500	20.750	0.250
K30	44.500	4.750	13.450
K31	44.500	20.750	13.450
K32	44.500	4.750	0.250
K33	44.500	12.750	15.000
K34	44.500	20.750	0.250
K35	51.500	4.750	13.450
K36	51.500	20.750	13.450
K37	51.500	4.750	0.250
K38	51.500	12.750	15.000
K39	51.500	20.750	0.250
K40	57.500	4.750	13.450
K41	57.500	20.750	13.450
K42	57.500	4.750	0.250
K43	57.500	12.750	15.000
K44	57.500	20.750	0.250
K45	57.500	9.750	0.250
K46	57.500	9.750	14.419
K47	57.500	15.750	0.250
K48	57.500	15.750	14.419
K49	12.500	5.250	9.705
K50	57.500	5.250	9.705
K51	12.500	4.750	9.705
K52	12.500	20.750	9.705
K53	57.500	4.750	9.705
K54	57.500	20.750	9.705
K55	12.500	20.250	9.705
K56	57.500	20.250	9.705
K57	18.500	5.250	9.705
K58	18.500	4.750	9.705
K59	25.500	4.750	9.705
K60	25.500	5.250	9.705
K61	31.500	4.750	9.705
K62	31.500	5.250	9.705
K63	38.500	4.750	9.705
K64	38.500	5.250	9.705
K65	44.500	4.750	9.705
K66	44.500	5.250	9.705
K67	51.500	4.750	9.705
K68	51.500	5.250	9.705
K69	38.500	20.250	9.705
K70	38.500	20.750	9.705
K71	44.500	20.250	9.705
K72	44.500	20.750	9.705
K73	51.500	20.250	9.705
K74	51.500	20.750	9.705
K75	31.500	20.250	9.705
K76	31.500	20.750	9.705

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K77	25.500	20.250	9.705
K78	25.500	20.750	9.705
K79	18.500	20.250	9.705
K80	18.500	20.750	9.705
K81	12.500	20.750	5.600
K82	57.500	20.750	5.600
K83	12.500	4.750	5.600
K84	57.500	4.750	5.600
K85	33.000	4.750	0.000
K86	33.000	4.750	5.600
K87	38.000	4.750	0.000
K88	38.000	4.750	5.600
K91	57.500	9.750	5.600
K92	57.500	15.750	5.600
K93	57.500	15.750	9.705
K94	57.500	9.750	9.705
K95	12.500	9.750	5.600
K96	12.500	15.750	5.600
K97	12.500	15.750	9.705
K98	12.500	9.750	9.705
K99	18.500	4.750	5.600
K100	25.500	4.750	5.600
K101	31.500	4.750	5.600
K102	38.500	4.750	5.600
K103	44.500	4.750	5.600
K104	51.500	4.750	5.600
K105	15.500	4.750	5.600
K106	15.500	4.750	9.705
K107	15.500	4.750	13.450
K108	15.500	20.750	5.600
K109	15.500	20.750	9.705
K110	18.500	20.750	5.600
K111	15.500	20.750	13.450
K112	54.500	4.750	5.600
K113	54.500	4.750	9.705
K114	54.500	4.750	13.450
K115	54.500	20.750	5.600
K116	54.500	20.750	9.705
K117	51.500	20.750	5.600
K118	54.500	20.750	13.450
K119	18.500	15.750	14.419
K120	25.500	15.750	14.419
K121	31.500	15.750	14.419
K122	38.500	15.750	14.419
K123	44.500	15.750	14.419
K124	51.500	15.750	14.419
K125	18.500	9.750	14.419
K126	51.500	9.750	14.419
K127	12.500	22.750	4.700
K128	12.500	20.750	4.700
K129	12.500	20.750	6.380
K130	12.500	22.750	6.380
K131	12.500	20.750	2.700
K133	25.500	20.750	6.380
K134	25.500	22.750	6.380
K135	25.500	22.750	4.700
K136	25.500	20.750	4.700
K137	25.500	20.750	2.700
K138	38.500	20.750	6.380
K139	38.500	22.750	6.380
K140	38.500	22.750	4.700
K141	38.500	20.750	4.700
K142	38.500	20.750	2.700
K143	25.500	9.750	14.419
K144	31.500	9.750	14.419
K145	38.500	9.750	14.419
K146	44.500	9.750	14.419

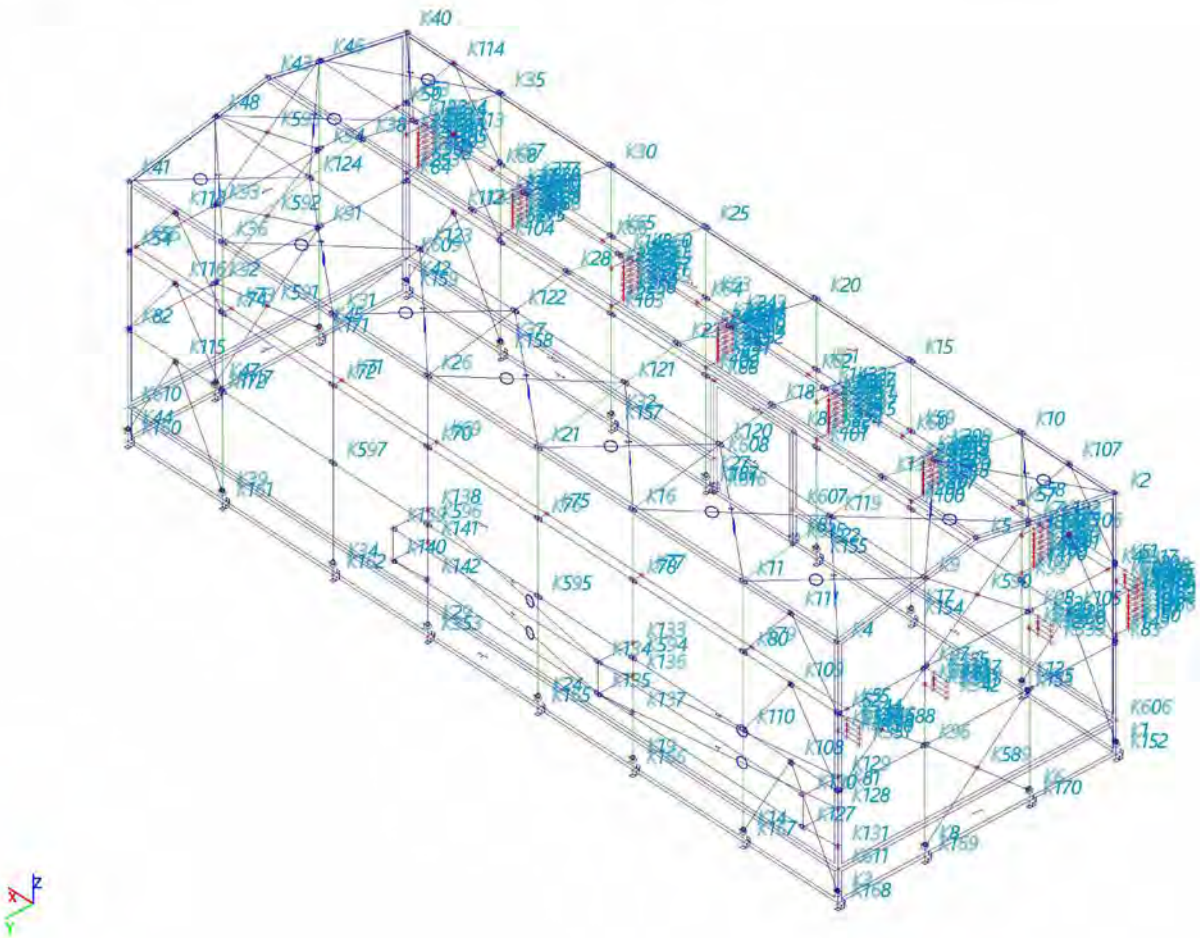
Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K147	12.500	4.750	8.000
K148	12.500	4.050	8.000
K149	12.500	4.750	6.000
K150	12.500	4.050	6.000
K152	12.500	4.750	-0.300
K153	18.500	4.750	-0.300
K154	25.500	4.750	-0.300
K155	31.500	4.750	-0.300
K156	38.500	4.750	-0.300
K157	44.500	4.750	-0.300
K158	51.500	4.750	-0.300
K159	57.500	4.750	-0.300
K160	57.500	20.750	-0.300
K161	51.500	20.750	-0.300
K162	44.500	20.750	-0.300
K165	31.500	20.750	-0.300
K166	25.500	20.750	-0.300
K167	18.500	20.750	-0.300
K168	12.500	20.750	-0.300
K169	12.500	15.750	-0.300
K170	12.500	9.750	-0.300
K171	57.500	9.750	-0.300
K172	57.500	15.750	-0.300
K175	12.500	3.250	8.000
K176	12.500	3.250	7.700
K177	12.500	4.050	7.700
K178	12.500	3.250	7.400
K179	12.500	4.050	7.400
K180	12.500	3.250	7.100
K181	12.500	4.050	7.100
K182	12.500	3.250	6.800
K183	12.500	4.050	6.800
K184	12.500	3.250	6.500
K185	12.500	4.050	6.500
K186	12.500	3.250	6.200
K187	12.500	4.050	6.200
K188	18.500	4.050	8.000
K189	18.500	4.750	8.000
K190	18.500	4.050	6.000
K191	18.500	4.750	6.000
K192	18.500	3.250	8.000
K193	18.500	3.250	7.700
K194	18.500	4.050	7.700
K195	18.500	3.250	7.400
K196	18.500	4.050	7.400
K197	18.500	3.250	7.100
K198	18.500	4.050	7.100
K199	18.500	3.250	6.800
K200	18.500	4.050	6.800
K201	18.500	3.250	6.200
K202	18.500	4.050	6.200
K203	18.500	3.250	6.500
K204	18.500	4.050	6.500
K205	25.500	4.050	8.000
K206	25.500	4.750	8.000
K207	25.500	4.050	6.000
K208	25.500	4.750	6.000
K209	25.500	3.250	8.000
K210	25.500	3.250	7.700
K211	25.500	4.050	7.700
K212	25.500	3.250	7.400
K213	25.500	4.050	7.400
K214	25.500	3.250	7.100
K215	25.500	4.050	7.100
K216	25.500	3.250	6.800
K217	25.500	4.050	6.800
K218	25.500	3.250	6.200

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K219	25.500	4.050	6.200
K220	25.500	3.250	6.500
K221	25.500	4.050	6.500
K222	31.500	4.050	8.000
K223	31.500	4.750	8.000
K224	31.500	4.050	6.000
K225	31.500	4.750	6.000
K226	31.500	3.250	8.000
K227	31.500	3.250	7.700
K228	31.500	4.050	7.700
K229	31.500	3.250	7.400
K230	31.500	4.050	7.400
K231	31.500	3.250	7.100
K232	31.500	4.050	7.100
K233	31.500	3.250	6.800
K234	31.500	4.050	6.800
K235	31.500	3.250	6.200
K236	31.500	4.050	6.200
K237	31.500	3.250	6.500
K238	31.500	4.050	6.500
K239	38.500	4.050	8.000
K240	38.500	4.750	8.000
K241	38.500	4.050	6.000
K242	38.500	4.750	6.000
K243	38.500	3.250	8.000
K244	38.500	3.250	7.700
K245	38.500	4.050	7.700
K246	38.500	3.250	7.400
K247	38.500	4.050	7.400
K248	38.500	3.250	7.100
K249	38.500	4.050	7.100
K250	38.500	3.250	6.800
K251	38.500	4.050	6.800
K252	38.500	3.250	6.200
K253	38.500	4.050	6.200
K254	38.500	3.250	6.500
K255	38.500	4.050	6.500
K256	44.500	4.050	8.000
K257	44.500	4.750	8.000
K258	44.500	4.050	6.000
K259	44.500	4.750	6.000
K260	44.500	3.250	8.000
K261	44.500	3.250	7.700
K262	44.500	4.050	7.700
K263	44.500	3.250	7.400
K264	44.500	4.050	7.400
K265	44.500	3.250	7.100
K266	44.500	4.050	7.100
K267	44.500	3.250	6.800
K268	44.500	4.050	6.800
K269	44.500	3.250	6.200
K270	44.500	4.050	6.200
K271	44.500	3.250	6.500

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K272	44.500	4.050	6.500
K273	51.500	4.050	8.000
K274	51.500	4.750	8.000
K275	51.500	4.050	6.000
K276	51.500	4.750	6.000
K277	51.500	3.250	8.000
K278	51.500	3.250	7.700
K279	51.500	4.050	7.700
K280	51.500	3.250	7.400
K281	51.500	4.050	7.400
K282	51.500	3.250	7.100
K283	51.500	4.050	7.100
K284	51.500	3.250	6.800
K285	51.500	4.050	6.800
K286	51.500	3.250	6.200
K287	51.500	4.050	6.200
K288	51.500	3.250	6.500
K289	51.500	4.050	6.500
K290	57.500	4.050	8.000
K291	57.500	4.750	8.000
K292	57.500	4.050	6.000
K293	57.500	4.750	6.000
K294	57.500	3.250	8.000
K295	57.500	3.250	7.700
K296	57.500	4.050	7.700
K297	57.500	3.250	7.400
K298	57.500	4.050	7.400
K299	57.500	3.250	7.100
K300	57.500	4.050	7.100
K301	57.500	3.250	6.800
K302	57.500	4.050	6.800
K303	57.500	3.250	6.200
K304	57.500	4.050	6.200
K305	57.500	3.250	6.500
K306	57.500	4.050	6.500
K308	12.500	4.750	8.805
K317	11.950	4.750	9.705
K318	11.950	4.750	8.805
K319	11.150	4.750	9.705
K320	11.950	4.750	9.405
K321	11.150	4.750	9.405
K322	11.950	4.750	9.105
K323	11.150	4.750	9.105
K324	11.150	4.750	8.805
K326	11.950	9.750	9.705
K327	11.950	9.750	8.805
K328	11.150	9.750	9.705
K329	11.950	9.750	9.405
K330	11.150	9.750	9.405
K331	11.950	9.750	9.105
K332	11.150	9.750	9.105
K333	11.150	9.750	8.805
K334	12.500	9.750	8.805

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K335	11.950	15.750	9.705
K336	11.950	15.750	8.805
K337	11.150	15.750	9.705
K338	11.950	15.750	9.405
K339	11.150	15.750	9.405
K340	11.950	15.750	9.105
K341	11.150	15.750	9.105
K342	11.150	15.750	8.805
K343	12.500	15.750	8.805
K344	11.950	20.750	9.705
K345	11.950	20.750	8.805
K346	11.150	20.750	9.705
K347	11.950	20.750	9.405
K348	11.150	20.750	9.405
K349	11.950	20.750	9.105
K350	11.150	20.750	9.105
K351	11.150	20.750	8.805
K352	12.500	20.750	8.805
K353	38.500	20.750	-0.300
K588	12.500	18.250	7.652
K589	12.500	12.750	2.925
K590	12.500	12.750	12.062
K591	57.500	12.750	2.925
K592	57.500	12.750	7.652
K593	57.500	12.750	12.062
K594	25.500	20.750	5.600
K595	31.500	20.750	5.600
K596	38.500	20.750	5.600
K597	44.500	20.750	5.600
K606	12.500	4.750	1.500
K607	33.000	4.750	1.500
K608	38.000	4.750	1.500
K609	57.500	4.750	1.500
K610	57.500	20.750	1.500
K611	12.500	20.750	1.500
K615	33.000	4.750	-0.300
K616	38.000	4.750	-0.300
K617	6.500	3.650	6.200
K618	63.000	3.650	6.200
K619	6.500	3.650	6.500
K620	63.000	3.650	6.500
K621	6.500	3.650	6.800
K622	63.000	3.650	6.800
K623	6.500	3.650	7.100
K624	63.000	3.650	7.100
K625	6.500	3.650	7.400
K626	63.000	3.650	7.400
K627	6.500	3.650	7.700
K628	63.000	3.650	7.700
K631	6.500	3.650	8.000
K632	63.000	3.650	8.000

2.3.3.2. Knopen



2.3.3.3. Members

Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S1	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K1	K2	column (100)
S2	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K3	K4	column (100)
S3	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K2	K5	beam (80)
S4	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K5	K4	beam (80)
S5	ST-14 - HEA300	S 355 JR (EN 10025-2)	14.169	K6	K7	column (100)
S6	ST-14 - HEA300	S 355 JR (EN 10025-2)	14.169	K8	K9	column (100)
S7	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K12	K10	column (100)
S8	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K10	K13	beam (80)
S9	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K14	K11	column (100)
S10	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K13	K11	beam (80)
S11	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K17	K15	column (100)
S12	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K15	K18	beam (80)
S13	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K19	K16	column (100)
S14	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K18	K16	beam (80)
S15	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K22	K20	column (100)
S16	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K20	K23	beam (80)
S17	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K24	K21	column (100)
S18	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K23	K21	beam (80)
S19	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K27	K25	column (100)
S20	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K25	K28	beam (80)
S21	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K29	K26	column (100)
S22	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K28	K26	beam (80)
S23	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K32	K30	column (100)
S24	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K30	K33	beam (80)
S25	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K34	K31	column (100)

Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S26	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K33	K31	beam (80)
S27	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K37	K35	column (100)
S28	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K35	K38	beam (80)
S29	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K39	K36	column (100)
S30	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K38	K36	beam (80)
S31	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K42	K40	column (100)
S32	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K40	K43	beam (80)
S33	ST-11 - HEA550	S 235 JR (EN 10025-2)	13.200	K44	K41	column (100)
S34	ST-11 - HEA550	S 235 JR (EN 10025-2)	8.149	K43	K41	beam (80)
S35	ST-14 - HEA300	S 355 JR (EN 10025-2)	14.169	K45	K46	column (100)
S36	ST-14 - HEA300	S 355 JR (EN 10025-2)	14.169	K47	K48	column (100)
S37	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K2	K10	beam (80)
S38	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K36	K41	beam (80)
S39	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K5	K13	beam (80)
S41	ST-13 - I + rail (HEA500, SA75)	S 355 JR (EN 10025-2)	45.000	K49	K50	beam (80)
S42	ST-21 - HEB300	S 355 JR (EN 10025-2)	5.000	K97	K52	beam (80)
S43	ST-21 - HEB300	S 355 JR (EN 10025-2)	5.000	K93	K54	beam (80)
S44	ST-13 - I + rail (HEA500, SA75)	S 355 JR (EN 10025-2)	45.000	K55	K56	beam (80)
S45	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K58	K57	beam (80)
S46	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K51	K58	beam (80)
S47	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K74	K54	beam (80)
S48	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K59	K60	beam (80)
S49	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K61	K62	beam (80)
S50	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K63	K64	beam (80)
S51	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K65	K66	beam (80)
S52	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K67	K68	beam (80)
S53	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K69	K70	beam (80)
S54	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K71	K72	beam (80)
S55	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K73	K74	beam (80)
S56	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K75	K76	beam (80)
S57	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K77	K78	beam (80)
S58	ST-15 - HEA500	S 235 JR (EN 10025-2)	0.500	K79	K80	beam (80)
S59	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K81	K110	beam (80)
S60	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K83	K99	beam (80)
S61	ST-24 - HEA220	S 235 JR (EN 10025-2)	5.000	K83	K95	beam (80)
S62	ST-24 - HEA220	S 235 JR (EN 10025-2)	5.000	K84	K91	beam (80)
S63	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K7	K125	beam (80)
S64	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K9	K119	beam (80)
S65	ST-16 - UNP280	S 235 JR (EN 10025-2)	5.600	K85	K86	column (100)
S66	ST-16 - UNP280	S 235 JR (EN 10025-2)	5.600	K87	K88	column (100)
S68	ST-22 - HEA200	S 355 JR (EN 10025-2)	4.019	K47	K591	wall bracing (0)
S69	ST-22 - HEA200	S 355 JR (EN 10025-2)	8.039	K45	K92	wall bracing (0)
S70	ST-24 - HEA220	S 235 JR (EN 10025-2)	5.000	K92	K82	beam (80)
S71	ST-24 - HEA220	S 235 JR (EN 10025-2)	6.000	K91	K92	beam (80)
S72	ST-21 - HEB300	S 355 JR (EN 10025-2)	5.000	K53	K94	beam (80)
S73	ST-21 - HEB300	S 355 JR (EN 10025-2)	6.000	K94	K93	beam (80)
S74	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.635	K92	K592	wall bracing (0)
S75	ST-22 - HEA200	S 355 JR (EN 10025-2)	7.270	K91	K93	wall bracing (0)
S76	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.815	K93	K593	wall bracing (0)
S77	ST-22 - HEA200	S 355 JR (EN 10025-2)	7.630	K94	K48	wall bracing (0)
S78	ST-24 - HEA220	S 235 JR (EN 10025-2)	6.000	K95	K96	beam (80)
S79	ST-24 - HEA220	S 235 JR (EN 10025-2)	5.000	K96	K81	beam (80)
S80	ST-21 - HEB300	S 355 JR (EN 10025-2)	5.000	K51	K98	beam (80)
S81	ST-21 - HEB300	S 355 JR (EN 10025-2)	6.000	K98	K97	beam (80)
S82	ST-22 - HEA200	S 355 JR (EN 10025-2)	8.039	K6	K96	wall bracing (0)
S83	ST-22 - HEA200	S 355 JR (EN 10025-2)	4.019	K8	K589	wall bracing (0)
S84	ST-22 - HEA200	S 355 JR (EN 10025-2)	7.630	K98	K9	wall bracing (0)
S85	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.815	K97	K590	wall bracing (0)
S86	ST-22 - HEA200	S 355 JR (EN 10025-2)	6.469	K96	K52	wall bracing (0)
S87	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.235	K81	K588	wall bracing (0)
S88	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K99	K100	beam (80)
S89	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K100	K101	beam (80)
S90	ST-23 - HEA280	S 235 JR (EN 10025-2)	7.000	K101	K102	beam (80)
S91	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K102	K103	beam (80)
S92	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K103	K104	beam (80)
S93	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K104	K84	beam (80)
S94	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K58	K59	beam (80)

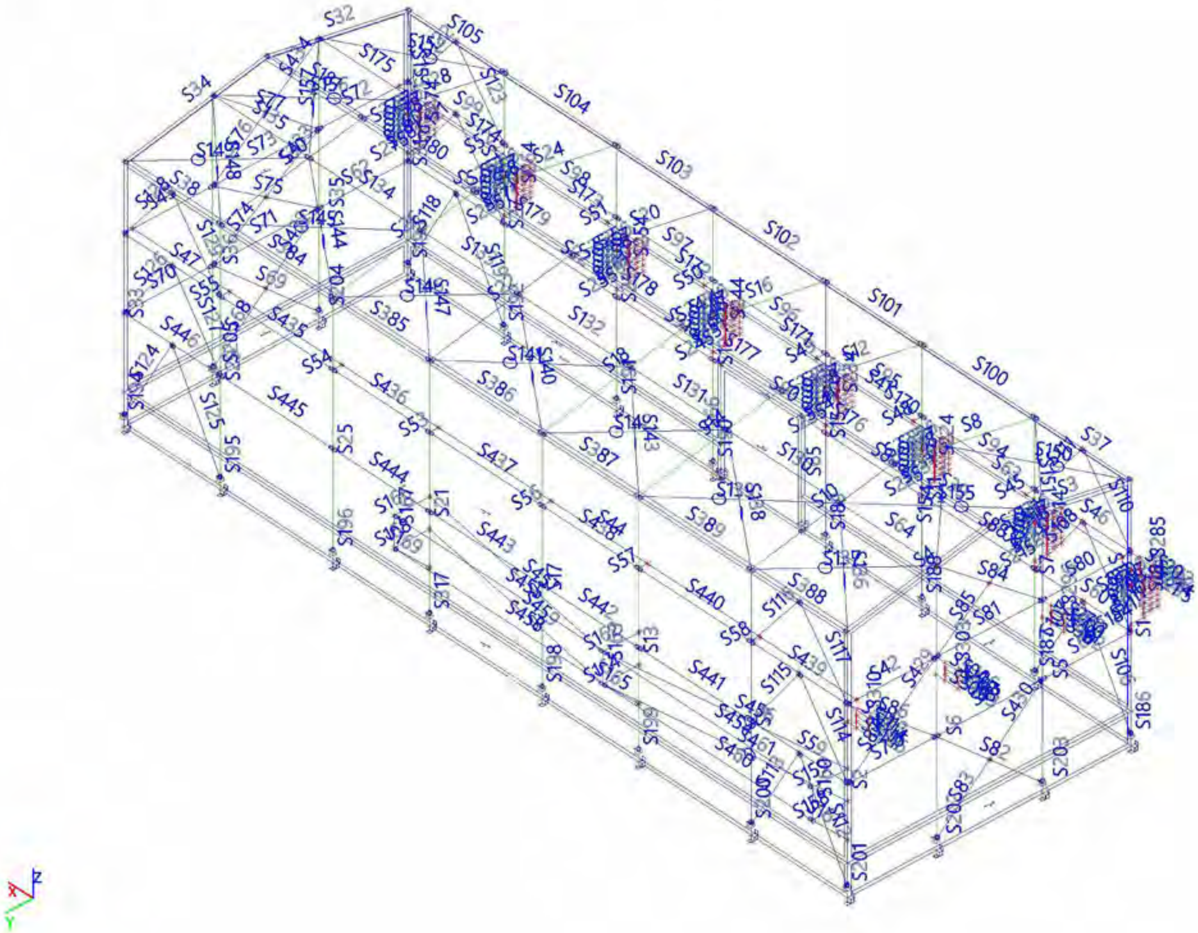
Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S95	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K59	K61	beam (80)
S96	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K61	K63	beam (80)
S97	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K63	K65	beam (80)
S98	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K65	K67	beam (80)
S99	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K67	K53	beam (80)
S100	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K10	K15	beam (80)
S101	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K15	K20	beam (80)
S102	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K20	K25	beam (80)
S103	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K25	K30	beam (80)
S104	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K30	K35	beam (80)
S105	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K35	K40	beam (80)
S106	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K1	K105	wall bracing (0)
S107	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K12	K105	wall bracing (0)
S108	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K99	K106	wall bracing (0)
S109	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K83	K106	wall bracing (0)
S110	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K51	K107	wall bracing (0)
S111	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K58	K107	wall bracing (0)
S112	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K3	K108	wall bracing (0)
S113	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K14	K108	wall bracing (0)
S114	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K81	K109	wall bracing (0)
S115	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K110	K109	wall bracing (0)
S116	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K80	K111	wall bracing (0)
S117	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K52	K111	wall bracing (0)
S118	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K42	K112	wall bracing (0)
S119	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K37	K112	wall bracing (0)
S120	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K104	K113	wall bracing (0)
S121	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K84	K113	wall bracing (0)
S122	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K53	K114	wall bracing (0)
S123	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K67	K114	wall bracing (0)
S124	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K44	K115	wall bracing (0)
S125	ST-17 - HEA140	S 235 JR (EN 10025-2)	6.134	K39	K115	wall bracing (0)
S126	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K82	K116	wall bracing (0)
S127	ST-17 - HEA140	S 235 JR (EN 10025-2)	5.084	K117	K116	wall bracing (0)
S128	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K54	K118	wall bracing (0)
S129	ST-17 - HEA140	S 235 JR (EN 10025-2)	4.798	K74	K118	wall bracing (0)
S130	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K119	K120	beam (80)
S131	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K120	K121	beam (80)
S132	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K121	K122	beam (80)
S133	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K122	K123	beam (80)
S134	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K123	K124	beam (80)
S135	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K124	K48	beam (80)
S136	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K4	K119	roof bracing (0)
S137	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K11	K9	roof bracing (0)
S138	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K11	K120	roof bracing (0)
S139	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K16	K119	roof bracing (0)
S140	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K21	K122	roof bracing (0)
S141	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K26	K121	roof bracing (0)
S142	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K21	K120	roof bracing (0)
S143	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K16	K121	roof bracing (0)
S144	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K31	K124	roof bracing (0)
S145	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.657	K36	K123	roof bracing (0)
S146	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K31	K122	roof bracing (0)
S147	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K26	K123	roof bracing (0)
S148	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K36	K48	roof bracing (0)
S149	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K41	K124	roof bracing (0)
S150	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K2	K125	roof bracing (0)
S151	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K10	K7	roof bracing (0)
S152	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K35	K46	roof bracing (0)
S153	ST-18 - L100X10	S 235 JR (EN 10025-2)	7.870	K40	K126	roof bracing (0)
S154	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.485	K125	K9	roof bracing (0)
S155	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.485	K7	K119	roof bracing (0)
S156	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.485	K126	K48	roof bracing (0)
S157	ST-18 - L100X10	S 235 JR (EN 10025-2)	8.485	K124	K46	roof bracing (0)
S158	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K128	K127	beam (80)
S159	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K129	K130	beam (80)
S160	ST-20 - HEB220	S 235 JR (EN 10025-2)	1.680	K127	K130	beam (80)
S161	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.828	K131	K127	beam (80)

Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S162	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K133	K134	beam (80)
S163	ST-20 - HEB220	S 235 JR (EN 10025-2)	1.680	K135	K134	beam (80)
S164	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K136	K135	beam (80)
S165	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.828	K137	K135	beam (80)
S166	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K138	K139	beam (80)
S167	ST-20 - HEB220	S 235 JR (EN 10025-2)	1.680	K140	K139	beam (80)
S168	ST-20 - HEB220	S 235 JR (EN 10025-2)	2.000	K141	K140	beam (80)
S169	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.828	K142	K140	beam (80)
S170	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K125	K143	beam (80)
S171	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K143	K144	beam (80)
S172	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K144	K145	beam (80)
S173	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K145	K146	beam (80)
S174	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K146	K126	beam (80)
S175	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K126	K46	beam (80)
S176	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K13	K18	beam (80)
S177	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K18	K23	beam (80)
S178	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K23	K28	beam (80)
S179	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K28	K33	beam (80)
S180	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K33	K38	beam (80)
S181	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K38	K43	beam (80)
S182	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K148	K147	beam (80)
S183	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K150	K148	beam (80)
S184	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K150	K149	beam (80)
S186	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K152	K1	column (100)
S187	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K153	K12	column (100)
S188	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K154	K17	column (100)
S189	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K155	K22	column (100)
S190	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K156	K27	column (100)
S191	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K157	K32	column (100)
S192	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K158	K37	column (100)
S193	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K159	K42	column (100)
S194	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K160	K44	column (100)
S195	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K161	K39	column (100)
S196	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K162	K34	column (100)
S198	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K165	K24	column (100)
S199	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K166	K19	column (100)
S200	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K167	K14	column (100)
S201	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K168	K3	column (100)
S202	CT-17 - Rechthoek (600; 500)	C35/45	0.550	K169	K8	column (100)
S203	CT-17 - Rechthoek (600; 500)	C35/45	0.550	K170	K6	column (100)
S204	CT-17 - Rechthoek (600; 500)	C35/45	0.550	K171	K45	column (100)
S205	CT-17 - Rechthoek (600; 500)	C35/45	0.550	K172	K47	column (100)
S206	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K175	K148	beam (80)
S207	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K176	K177	beam (80)
S208	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K178	K179	beam (80)
S209	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K180	K181	beam (80)
S210	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K182	K183	beam (80)
S211	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K184	K185	beam (80)
S212	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K186	K187	beam (80)
S213	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K188	K189	beam (80)
S214	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K190	K188	beam (80)
S215	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K190	K191	beam (80)
S216	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K192	K188	beam (80)
S217	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K193	K194	beam (80)
S218	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K195	K196	beam (80)
S219	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K197	K198	beam (80)
S220	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K199	K200	beam (80)
S221	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K201	K202	beam (80)
S222	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K203	K204	beam (80)
S223	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K205	K206	beam (80)
S224	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K207	K205	beam (80)
S225	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K207	K208	beam (80)
S226	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K209	K205	beam (80)
S227	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K210	K211	beam (80)
S228	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K212	K213	beam (80)
S229	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K214	K215	beam (80)
S230	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K216	K217	beam (80)

Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S231	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K218	K219	beam (80)
S232	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K220	K221	beam (80)
S233	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K222	K223	beam (80)
S234	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K224	K222	beam (80)
S235	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K224	K225	beam (80)
S236	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K226	K222	beam (80)
S237	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K227	K228	beam (80)
S238	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K229	K230	beam (80)
S239	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K231	K232	beam (80)
S240	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K233	K234	beam (80)
S241	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K235	K236	beam (80)
S242	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K237	K238	beam (80)
S243	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K239	K240	beam (80)
S244	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K241	K239	beam (80)
S245	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K241	K242	beam (80)
S246	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K243	K239	beam (80)
S247	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K244	K245	beam (80)
S248	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K246	K247	beam (80)
S249	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K248	K249	beam (80)
S250	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K250	K251	beam (80)
S251	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K252	K253	beam (80)
S252	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K254	K255	beam (80)
S253	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K256	K257	beam (80)
S254	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K258	K256	beam (80)
S255	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K258	K259	beam (80)
S256	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K260	K256	beam (80)
S257	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K261	K262	beam (80)
S258	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K263	K264	beam (80)
S259	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K265	K266	beam (80)
S260	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K267	K268	beam (80)
S261	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K269	K270	beam (80)
S262	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K271	K272	beam (80)
S263	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K273	K274	beam (80)
S264	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K275	K273	beam (80)
S265	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K275	K276	beam (80)
S266	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K277	K273	beam (80)
S267	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K278	K279	beam (80)
S268	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K280	K281	beam (80)
S269	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K282	K283	beam (80)
S270	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K284	K285	beam (80)
S271	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K286	K287	beam (80)
S272	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K288	K289	beam (80)
S273	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K290	K291	beam (80)
S274	ST-12 - HEA200	S 235 JR (EN 10025-2)	2.000	K292	K290	beam (80)
S275	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.700	K292	K293	beam (80)
S276	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K294	K290	beam (80)
S277	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K295	K296	beam (80)
S278	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K297	K298	beam (80)
S279	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K299	K300	beam (80)
S280	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K301	K302	beam (80)
S281	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K303	K304	beam (80)
S282	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K305	K306	beam (80)
S285	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.900	K318	K317	beam (80)
S290	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K51	K317	beam (80)
S291	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K308	K318	beam (80)
S292	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K317	K319	beam (80)
S293	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K320	K321	beam (80)
S294	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K322	K323	beam (80)
S295	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K318	K324	beam (80)
S296	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.900	K327	K326	beam (80)
S297	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K98	K326	beam (80)
S298	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K334	K327	beam (80)
S299	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K326	K328	beam (80)
S300	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K329	K330	beam (80)
S301	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K331	K332	beam (80)
S302	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K327	K333	beam (80)
S303	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.900	K336	K335	beam (80)

Name	Cross-section	Material	Length [m]	Beg. node	End node	Type
S304	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K97	K335	beam (80)
S305	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K343	K336	beam (80)
S306	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K335	K337	beam (80)
S307	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K338	K339	beam (80)
S308	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K340	K341	beam (80)
S309	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K336	K342	beam (80)
S310	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.900	K345	K344	beam (80)
S311	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K52	K344	beam (80)
S312	ST-12 - HEA200	S 235 JR (EN 10025-2)	0.550	K352	K345	beam (80)
S313	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K344	K346	beam (80)
S314	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K347	K348	beam (80)
S315	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K349	K350	beam (80)
S316	ST-19 - HEA100	S 235 JR (EN 10025-2)	0.800	K345	K351	beam (80)
S317	CT-16 - Rechthoek (850; 500)	C35/45	0.550	K353	K29	column (100)
S384	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K31	K36	beam (80)
S385	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K26	K31	beam (80)
S386	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K21	K26	beam (80)
S387	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K16	K21	beam (80)
S388	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K4	K11	beam (80)
S389	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K11	K16	beam (80)
S429	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.235	K588	K97	wall bracing (0)
S430	ST-22 - HEA200	S 355 JR (EN 10025-2)	4.019	K589	K95	wall bracing (0)
S431	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.815	K590	K7	wall bracing (0)
S432	ST-22 - HEA200	S 355 JR (EN 10025-2)	4.019	K591	K91	wall bracing (0)
S433	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.635	K592	K94	wall bracing (0)
S434	ST-22 - HEA200	S 355 JR (EN 10025-2)	3.815	K593	K46	wall bracing (0)
S435	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K72	K74	beam (80)
S436	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K70	K72	beam (80)
S437	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K76	K70	beam (80)
S438	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K78	K76	beam (80)
S439	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K52	K80	beam (80)
S440	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K80	K78	beam (80)
S441	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K110	K594	beam (80)
S442	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K594	K595	beam (80)
S443	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K595	K596	beam (80)
S444	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K596	K597	beam (80)
S445	ST-12 - HEA200	S 235 JR (EN 10025-2)	7.000	K597	K117	beam (80)
S446	ST-12 - HEA200	S 235 JR (EN 10025-2)	6.000	K117	K82	beam (80)
S381	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K617	K618	general (0)
S447	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K619	K620	general (0)
S448	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K621	K622	general (0)
S449	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K623	K624	general (0)
S450	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K625	K626	general (0)
S451	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K627	K628	general (0)
S453	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	56.500	K631	K632	general (0)
S454	ST-12 - HEA200	S 235 JR (EN 10025-2)	13.000	K130	K134	beam (80)
S455	ST-12 - HEA200	S 235 JR (EN 10025-2)	13.000	K134	K139	beam (80)
S456	ST-18 - L100X10	S 235 JR (EN 10025-2)	13.153	K129	K134	beam (80)
S457	ST-18 - L100X10	S 235 JR (EN 10025-2)	13.153	K134	K138	beam (80)
S458	ST-12 - HEA200	S 235 JR (EN 10025-2)	13.000	K135	K140	beam (80)
S459	ST-18 - L100X10	S 235 JR (EN 10025-2)	13.153	K135	K141	beam (80)
S460	ST-12 - HEA200	S 235 JR (EN 10025-2)	13.000	K127	K135	beam (80)
S461	ST-18 - L100X10	S 235 JR (EN 10025-2)	13.153	K128	K135	beam (80)

2.3.3.4. Staven



2.3.3.5. Hinges

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H41	S106 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H42	S68 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H43	S69 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H44	S74 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H45	S75 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H46	S76 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H47	S77 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H48	S82 Both	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H49	S83 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H50	S84 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H51	S85 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H52	S86 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H53	S87 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H54	S107 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H55	S108 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H56	S109 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H57	S110 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H58	S111 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H59	S112 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H60	S113 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H61	S114 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H62	S115 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H63	S116 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H64	S117 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H65	S118 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H66	S119 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H67	S120 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H68	S121 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H69	S122 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H70	S123	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
	Both						
H71	S124 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H72	S125 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H73	S126 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H74	S127 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H75	S128 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H76	S129 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H77	S429 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H78	S430 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H79	S431 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H80	S432 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H81	S433 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H82	S434 End	Rigid	Rigid	Rigid	Rigid	Free	Free
H83	S37 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H84	S38 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H85	S39 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H86	S46 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H87	S47 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H88	S59 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H89	S60 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H90	S61 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H91	S62 Both	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H92	S63 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H93	S64 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H94	S70 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H95	S71 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H96	S78 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H97	S79 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H98	S88 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H99	S89 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H100	S90 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H101	S91 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H102	S92 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H103	S93 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H104	S94 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H105	S95 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H106	S96 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H107	S97 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H108	S98 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H109	S99 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H110	S100 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H111	S101 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H112	S102 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H113	S103 Both	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H114	S104 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H115	S105 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H116	S130 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H117	S131 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H118	S132 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H119	S133 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H120	S134 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H121	S135 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H122	S170 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H123	S171 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H124	S172 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H125	S173 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H126	S174 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H127	S175 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H128	S176 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H129	S177 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H130	S178 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H131	S179 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H132	S180 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H133	S181 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H134	S384 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H135	S385	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
	Both						
H136	S386 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H137	S387 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H138	S388 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H139	S389 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H140	S1 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H141	S2 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H142	S7 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H143	S9 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H144	S11 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H145	S13 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H146	S15 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H147	S17 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H148	S19 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H149	S21 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H150	S23 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H151	S25 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H152	S27 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H153	S29 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H154	S31 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H155	S33 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H156	S5 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H157	S6 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H158	S35 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H159	S36 Begin	Rigid	Rigid	Rigid	Rigid	Free	Free
H160	S42 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H161	S43 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H162	S73 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H163	S81 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H164	S72 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H165	S80 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H166	S161 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H167	S165 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H168	S169 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H169	S435 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H170	S436 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H171	S437 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H172	S438 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H173	S439 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H174	S440 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H175	S441 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H176	S442 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H177	S443 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H178	S444 Both	Rigid	Rigid	Rigid	Rigid	Free	Free

Name	Member Position	ux Fun - ux Stiff - ux [MN/m]	uy Fun - uy Stiff - uy [MN/m]	uz Fun - uz Stiff - uz [MN/m]	fix Fun - fix Stiff - fix [MNm/rad]	fiy Fun - fiy Stiff - fiy [MNm/rad]	fiz Fun - fiz Stiff - fiz [MNm/rad]
H179	S445 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H180	S446 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H181	S454 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H182	S455 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H183	S458 Both	Rigid	Rigid	Rigid	Rigid	Free	Free
H184	S460 Both	Rigid	Rigid	Rigid	Rigid	Free	Free

2.3.3.6. Beam nonlinearity

Name	Member	Type
BN1	S152	Tension only
BN2	S153	Tension only
BN3	S136	Tension only
BN4	S137	Tension only
BN5	S138	Tension only
BN6	S139	Tension only
BN7	S140	Tension only
BN8	S141	Tension only
BN9	S142	Tension only

Name	Member	Type
BN10	S143	Tension only
BN11	S144	Tension only
BN12	S145	Tension only
BN13	S146	Tension only
BN14	S147	Tension only
BN15	S148	Tension only
BN16	S149	Tension only
BN17	S150	Tension only
BN18	S151	Tension only

Name	Member	Type
BN19	S154	Tension only
BN20	S155	Tension only
BN21	S156	Tension only
BN22	S157	Tension only
BN23	S456	Tension only
BN24	S457	Tension only
BN25	S459	Tension only
BN26	S461	Tension only

2.3.3.7. Cross-links

Name	1st member	2st member	Type
Kruis1	S206	S453	Fixed
Kruis2	S207	S451	Fixed
Kruis3	S208	S450	Fixed
Kruis4	S209	S449	Fixed
Kruis5	S210	S448	Fixed
Kruis6	S211	S447	Fixed
Kruis7	S212	S381	Fixed
Kruis8	S216	S453	Fixed
Kruis9	S217	S451	Fixed
Kruis10	S218	S450	Fixed
Kruis11	S219	S449	Fixed
Kruis12	S220	S448	Fixed
Kruis13	S221	S381	Fixed
Kruis14	S222	S447	Fixed
Kruis15	S226	S453	Fixed
Kruis16	S227	S451	Fixed
Kruis17	S228	S450	Fixed
Kruis18	S229	S449	Fixed
Kruis19	S230	S448	Fixed
Kruis20	S231	S381	Fixed
Kruis21	S232	S447	Fixed
Kruis22	S236	S453	Fixed
Kruis23	S237	S451	Fixed
Kruis24	S238	S450	Fixed
Kruis25	S239	S449	Fixed
Kruis26	S240	S448	Fixed
Kruis27	S241	S381	Fixed
Kruis28	S242	S447	Fixed

Name	1st member	2st member	Type
Kruis29	S246	S453	Fixed
Kruis30	S247	S451	Fixed
Kruis31	S248	S450	Fixed
Kruis32	S249	S449	Fixed
Kruis33	S250	S448	Fixed
Kruis34	S251	S381	Fixed
Kruis35	S252	S447	Fixed
Kruis36	S256	S453	Fixed
Kruis37	S257	S451	Fixed
Kruis38	S258	S450	Fixed
Kruis39	S259	S449	Fixed
Kruis40	S260	S448	Fixed
Kruis41	S261	S381	Fixed
Kruis42	S262	S447	Fixed
Kruis43	S266	S453	Fixed
Kruis44	S267	S451	Fixed
Kruis45	S268	S450	Fixed
Kruis46	S269	S449	Fixed
Kruis47	S270	S448	Fixed
Kruis48	S271	S381	Fixed
Kruis49	S272	S447	Fixed
Kruis50	S276	S453	Fixed
Kruis51	S277	S451	Fixed
Kruis52	S278	S450	Fixed
Kruis53	S279	S449	Fixed
Kruis54	S280	S448	Fixed
Kruis55	S281	S381	Fixed
Kruis56	S282	S447	Fixed

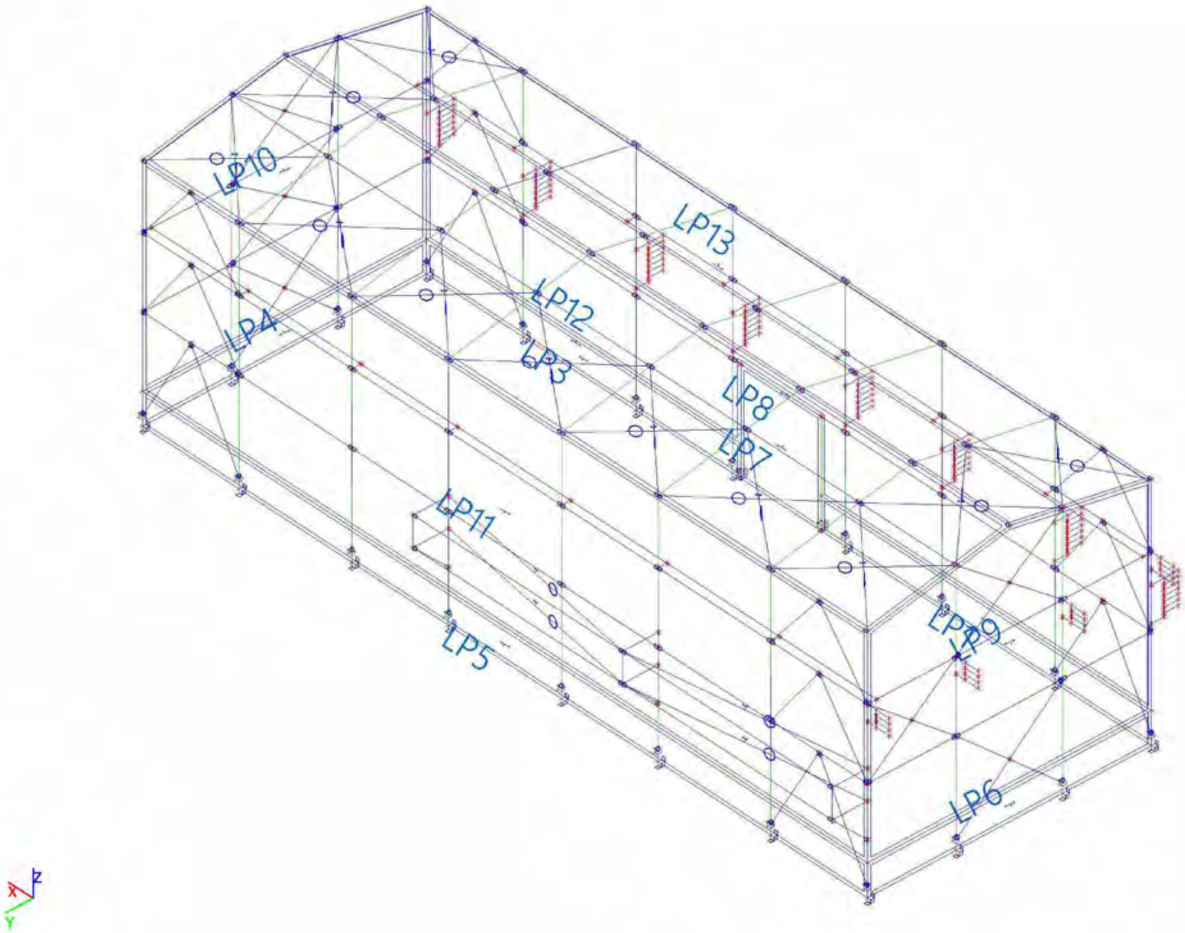
2.3.4. 2D

2.3.4.1. Load panels

Name	Panel type	Load transfer direction	Selection of entities
LP1	To panel edges and beams	X (LCS panel)	By type
LP3	To panel edges and beams	X (LCS panel)	By type
LP4	To panel edges and beams	X (LCS panel)	By type
LP5	To panel edges and beams	X (LCS panel)	By type
LP6	To panel edges and beams	X (LCS panel)	By type
LP7	To panel edges and beams	X (LCS panel)	All
LP8	To panel edges and beams	X (LCS panel)	All
LP9	To panel edges and beams	X (LCS panel)	All
LP10	To panel edges and beams	X (LCS panel)	All
LP11	To panel edges and beams	X (LCS panel)	All
LP12	To panel edges and beams	X (LCS panel)	All
LP13	To panel edges and beams	X (LCS panel)	All

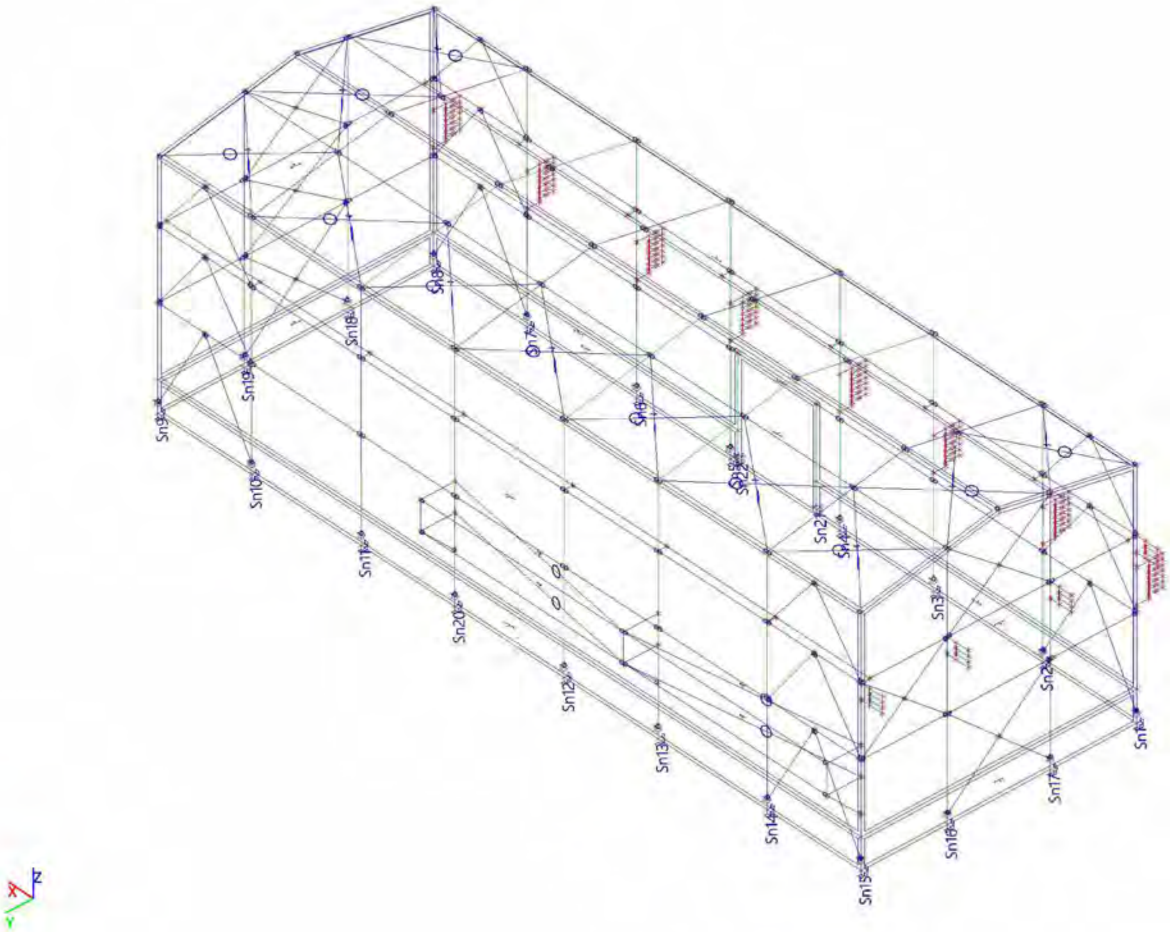
Explanations of symbols	
Selection of entities	All: selects all edges and beams that support the panel at the same place. Auto selection: in the cases where two or more supporting elements overlap, the selection omits edges that belong to 2D members that lie in the same plane as the panel. User selection: requires a manual selection of supporting edges and beams (by means of using an Action button). By type: only beam members of the types selected in the list are considered as supporting elements.

2.3.4.2. Platen



2.3.5. Supports

2.3.5.1. Steunpunten



2.3.5.2. Nodal supports

Name Node	System User UCS	Type Angle [deg]	X Stiffness X [MN/m]	Y Stiffness Y [MN/m]	Z Stiffness Z [MN/m]	Rx Stiffness Rx [MNm/rad]	Ry Stiffness Ry [MNm/rad]	Rz Stiffness Rz [MNm/rad]
Sn1 K152	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn2 K153	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn3 K154	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn4 K155	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn5 K156	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn6 K157	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn7 K158	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn8 K159	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn9 K160	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn10 K161	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn11 K162	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn12	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid

Name Node	System User UCS	Type Angle [deg]	X Stiffness X [MN/m]	Y Stiffness Y [MN/m]	Z Stiffness Z [MN/m]	Rx Stiffness Rx [MNm/rad]	Ry Stiffness Ry [MNm/rad]	Rz Stiffness Rz [MNm/rad]
K165								
Sn13 K166	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn14 K167	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn15 K168	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn16 K169	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn17 K170	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn18 K171	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn19 K172	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn20 K353	GCS	Standard	Rigid	Rigid	Rigid	Rigid	Rigid	Rigid
Sn21 K85	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Rigid
Sn22 K87	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Rigid
Sn23 K617	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn24 K619	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn25 K621	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn26 K623	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn27 K625	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn28 K627	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn29 K631	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn30 K618	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn31 K620	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn32 K622	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn33 K624	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn34 K626	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn35 K628	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free
Sn36 K632	GCS	Standard	Flexible 1.0000e+00	Flexible 1.0000e+00	Rigid	Rigid	Free	Free

3. Loads

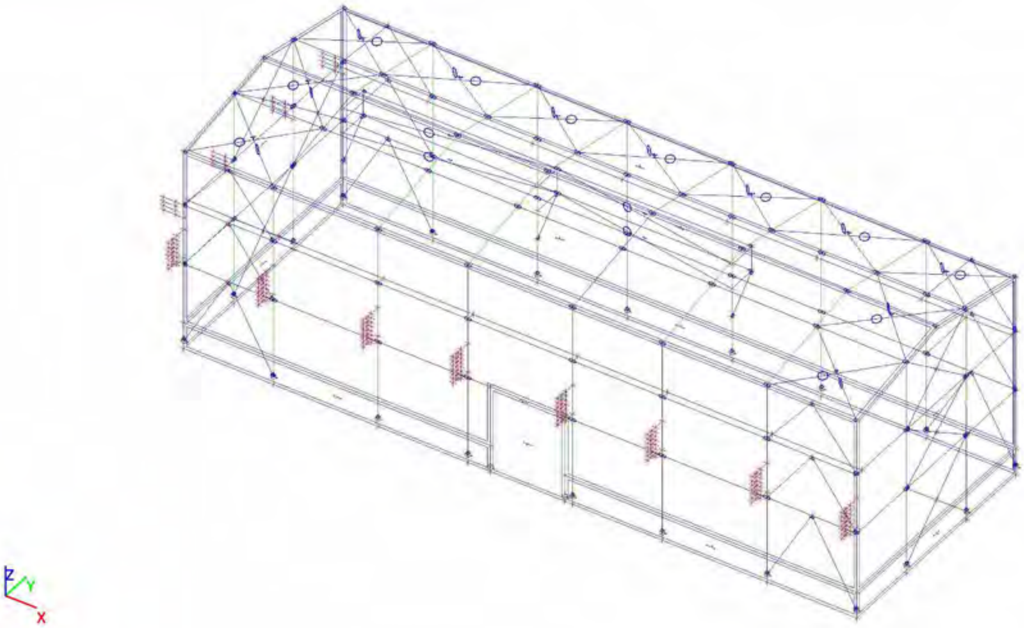
3.1. Load cases

Name	Description	Action type	Load group	Load type	Spec	Direction	Duration	Master load case
BG101	Self weight	Permanent	LG1	Self weight		-Z		
BG102	Deadloads	Permanent	LG1	Standard				
BG111	Snow a	Variable	LG2	Static	Standard		Short	None
BG112	Snow b1	Variable	LG2	Static	Standard		Short	None
BG113	Snow b2	Variable	LG2	Static	Standard		Short	None
BG121	Piping	Variable	LG5	Static	Standard		Short	None
BG122	Cabletrays	Variable	LG3	Static	Standard		Short	None
BG123	Reserve	Variable	LG3	Static	Standard		Short	None
BG131	Crane pos 1	Variable	LG4	Static	Standard		Short	None
BG132	Crane pos 2	Variable	LG4	Static	Standard		Short	None
BG133	Crane pos 3	Variable	LG4	Static	Standard		Short	None
BG134	Crane pos 4	Variable	LG4	Static	Standard		Short	None
BG135	Crane pos 5	Variable	LG4	Static	Standard		Short	None
BG136	Crane pos 6	Variable	LG4	Static	Standard		Short	None
BG137	Crane pos 7	Variable	LG4	Static	Standard		Short	None
BG138	Crane pos 8	Variable	LG4	Static	Standard		Short	None
BG139	Crane pos 9	Variable	LG4	Static	Standard		Short	None
BG140	Crane pos 10	Variable	LG4	Static	Standard		Short	None
BG141	Crane pos 11	Variable	LG4	Static	Standard		Short	None
BG142	Crane pos 12	Variable	LG4	Static	Standard		Short	None
BG151	Piping testload	Variable	LG5	Static	Standard		Short	None
BG152	Piping testload	Variable	LG5	Static	Standard		Short	None
3DWind1	0, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind2	0, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind3	0, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind4	0, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind5	90, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind6	90, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind7	90, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind8	90, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind9	180, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind10	180, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind11	180, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind12	180, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind13	270, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind14	270, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind15	270, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind16	270, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind17	90, +/- Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind18	90, -/+ Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind19	90, +/- Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind20	90, -/+ Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind21	90, +/- Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind22	90, -/+ Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind23	90, +/- Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind24	90, -/+ Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind25	270, +/- Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind26	270, -/+ Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind27	270, +/- Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind28	270, -/+ Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind29	270, +/- Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind30	270, -/+ Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind			None
3DWind31	270, +/- Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind			None
3DWind32	270, -/+ Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind			None

3.2. Load cases

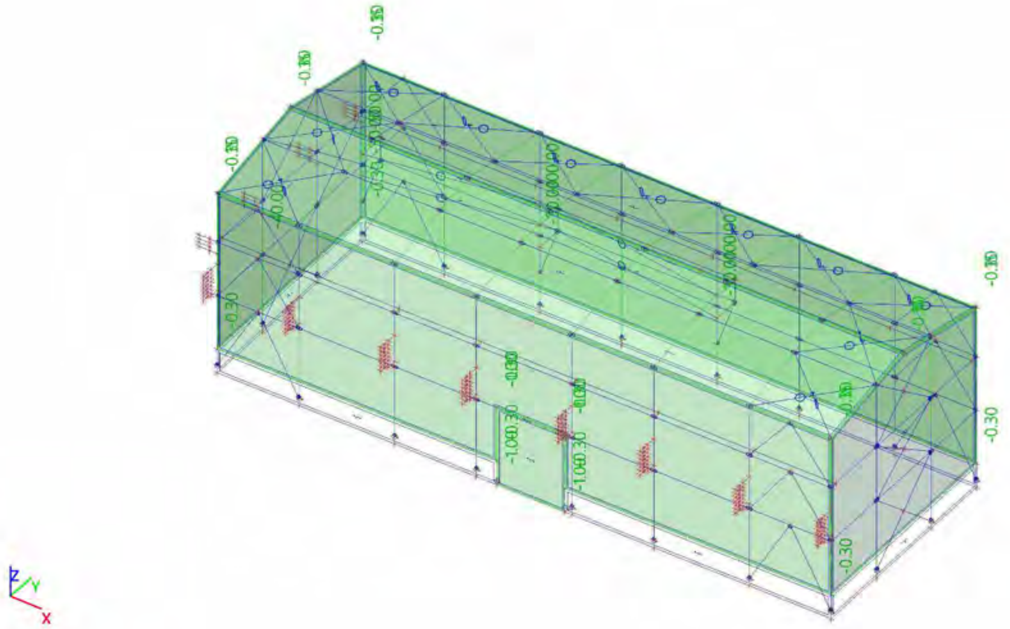
3.2.1. Load cases - BG101

Name	Description	Action type	Load group	Load type	Direction
BG101	Self weight	Permanent	LG1	Self weight	-Z



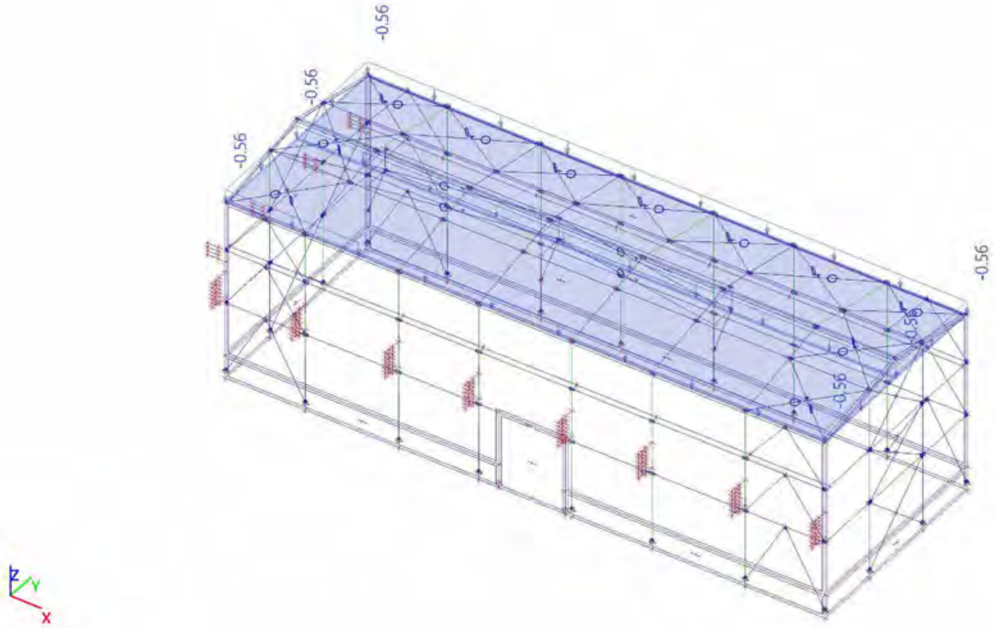
3.2.2. Load cases - BG102

Name	Description	Action type	Load group	Load type
BG102	Deadloads	Permanent	LG1	Standard



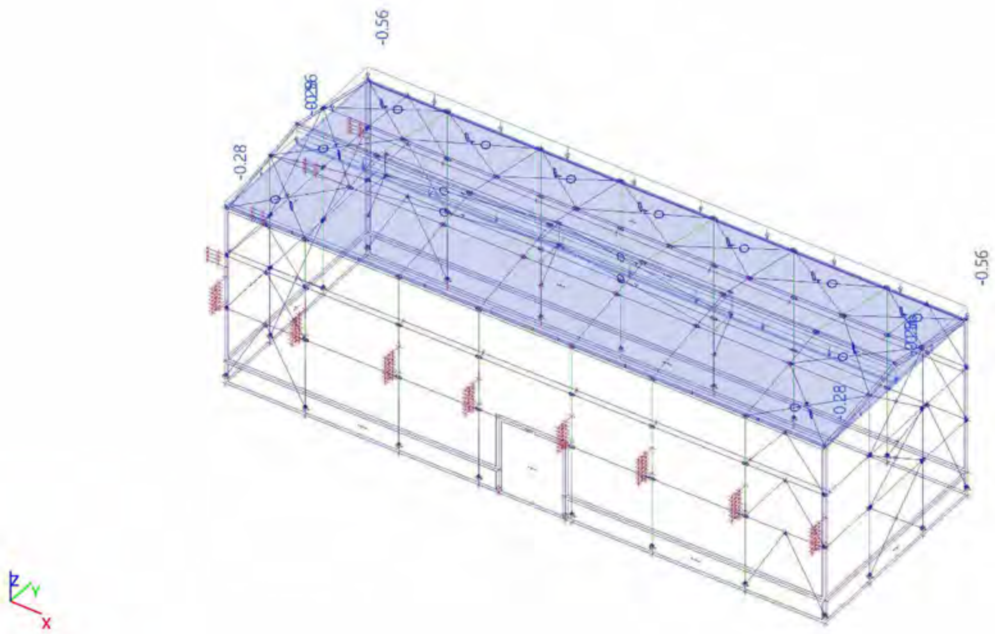
3.2.3. Load cases - BG111

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG111	Snow a	Variable	LG2	Static	Standard	Short	None



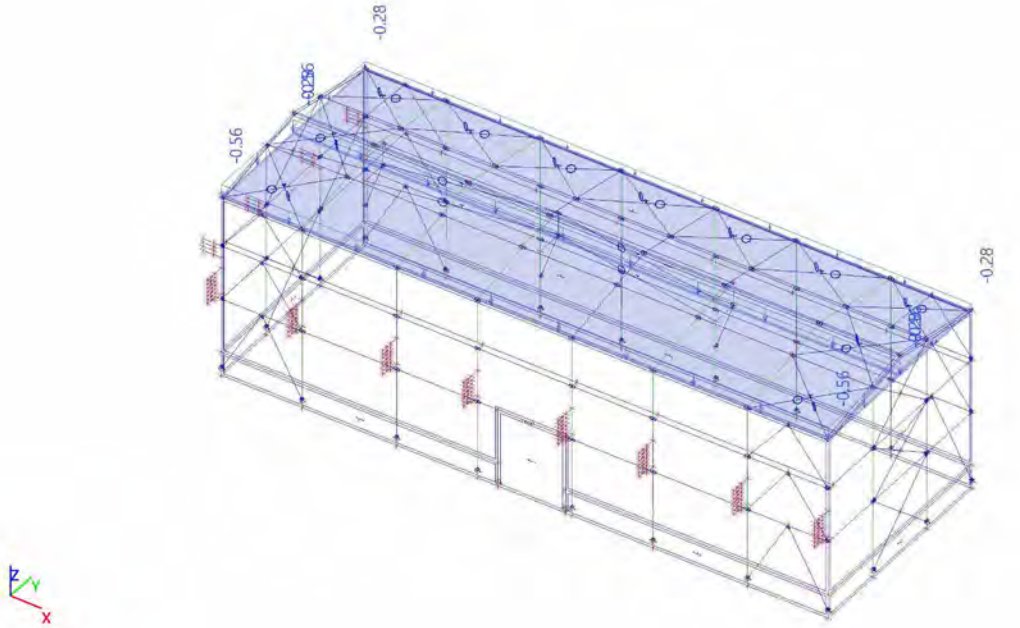
3.2.4. Load cases - BG112

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG112	Snow b1	Variable	LG2	Static	Standard	Short	None



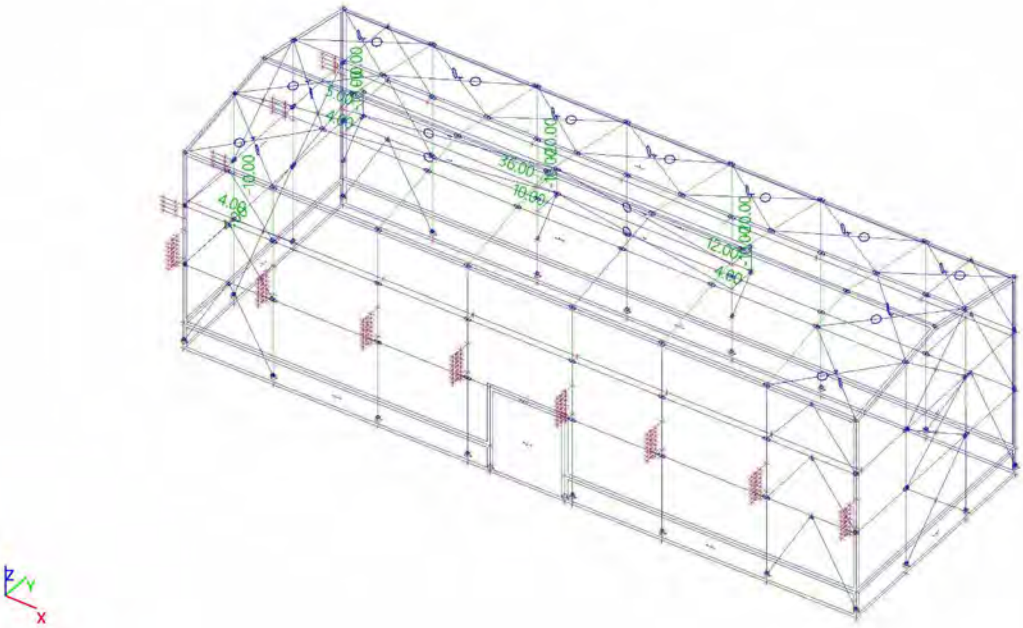
3.2.5. Load cases - BG113

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG113	Snow b2	Variable	LG2	Static	Standard	Short	None



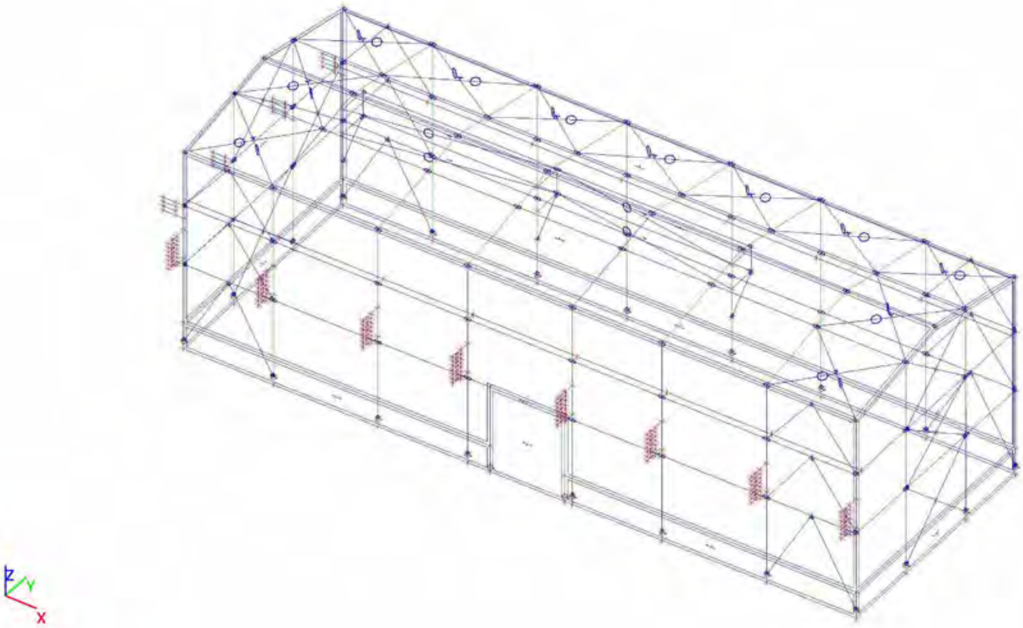
3.2.6. Load cases - BG121

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG121	Piping	Variable	LG5	Static	Standard	Short	None



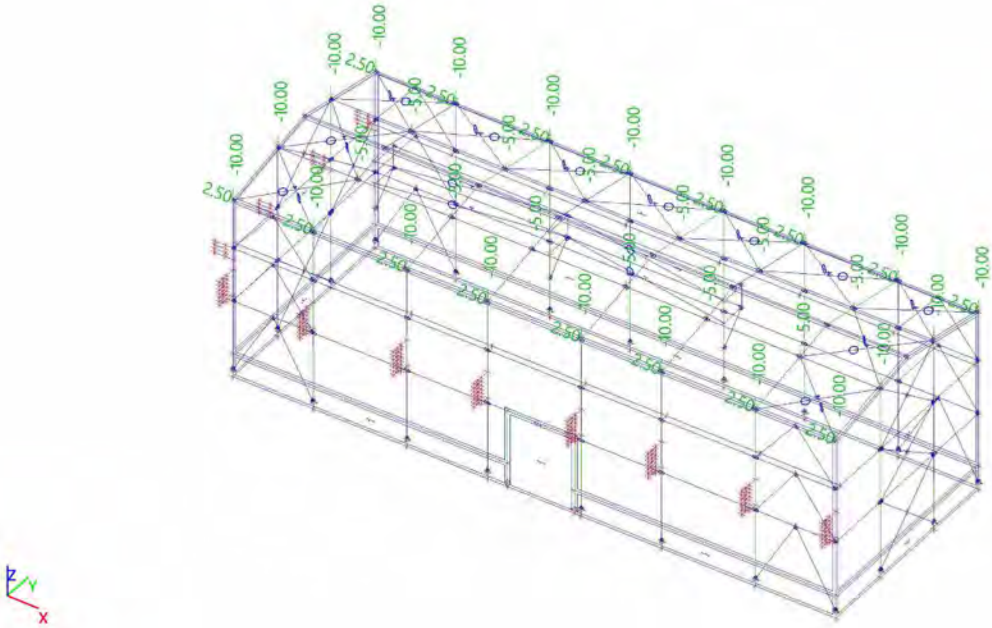
3.2.7. Load cases - BG122

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG122	Cabletrays	Variable	LG3	Static	Standard	Short	None



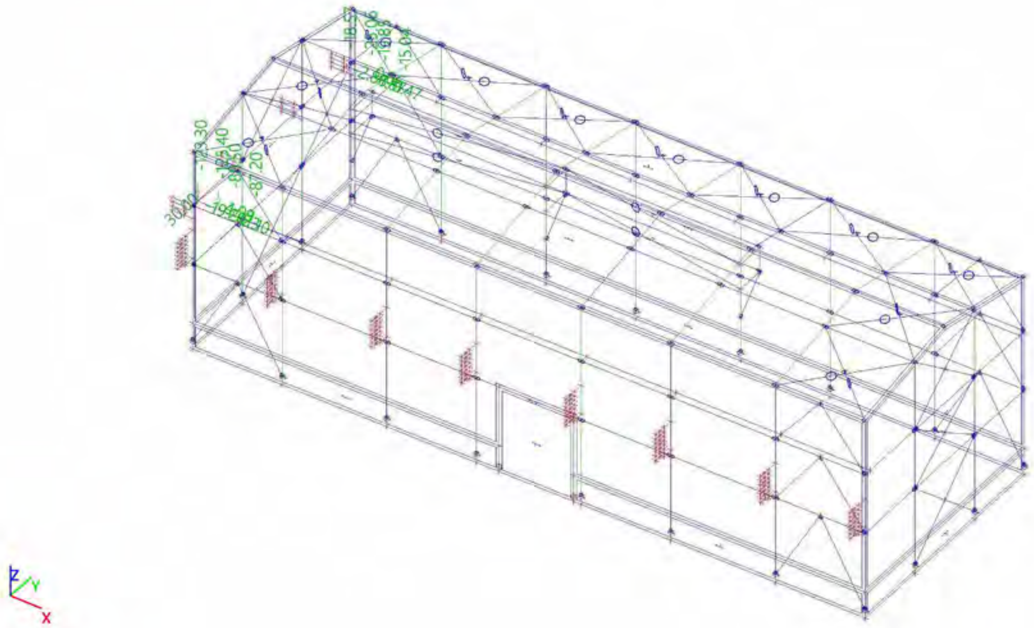
3.2.8. Load cases - BG123

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG123	Reserve	Variable	LG3	Static	Standard	Short	None



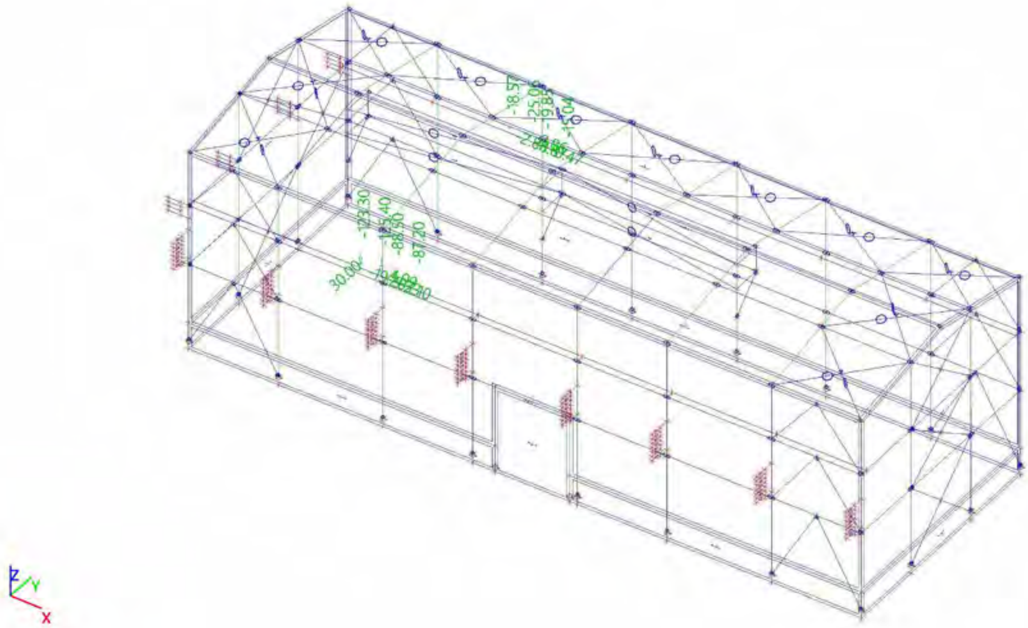
3.2.9. Load cases - BG131

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG131	Crane pos 1	Variable	LG4	Static	Standard	Short	None



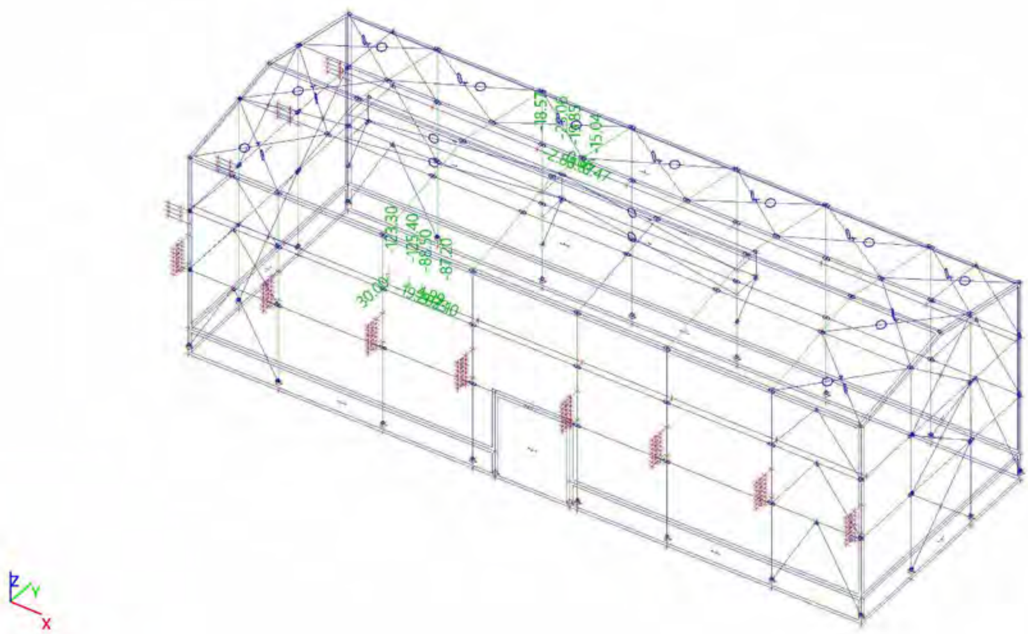
3.2.10. Load cases - BG132

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG132	Crane pos 2	Variable	LG4	Static	Standard	Short	None



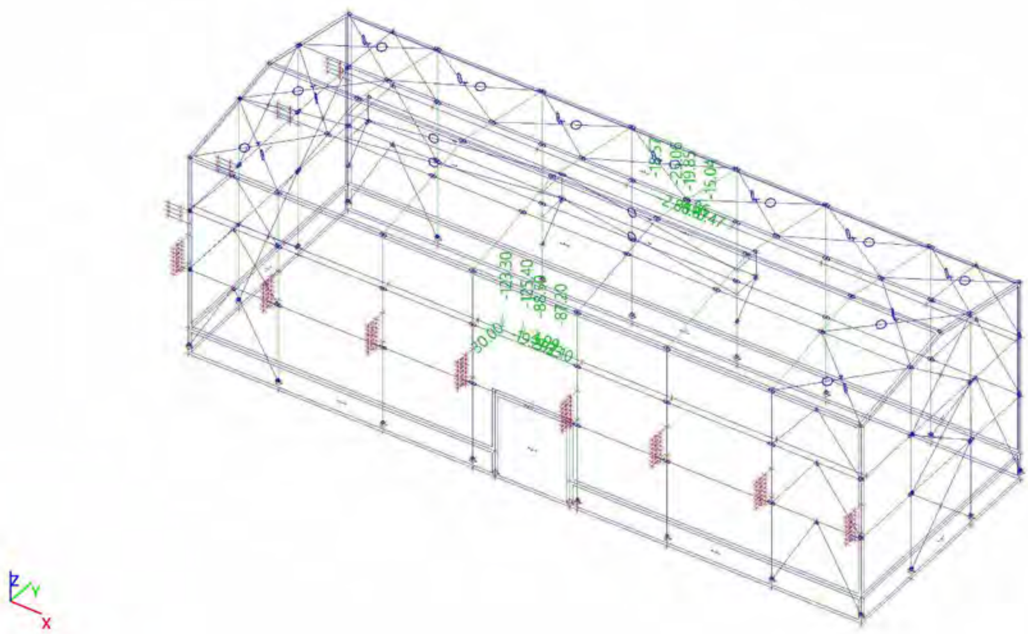
3.2.11. Load cases - BG133

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG133	Crane pos 3	Variable	LG4	Static	Standard	Short	None



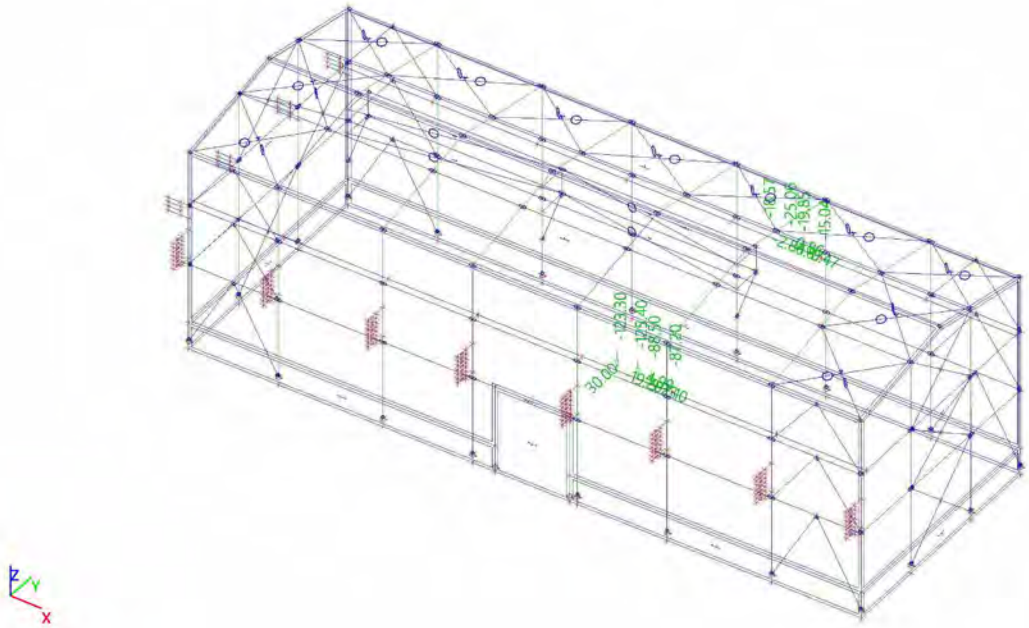
3.2.12. Load cases - BG134

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG134	Crane pos 4	Variable	LG4	Static	Standard	Short	None



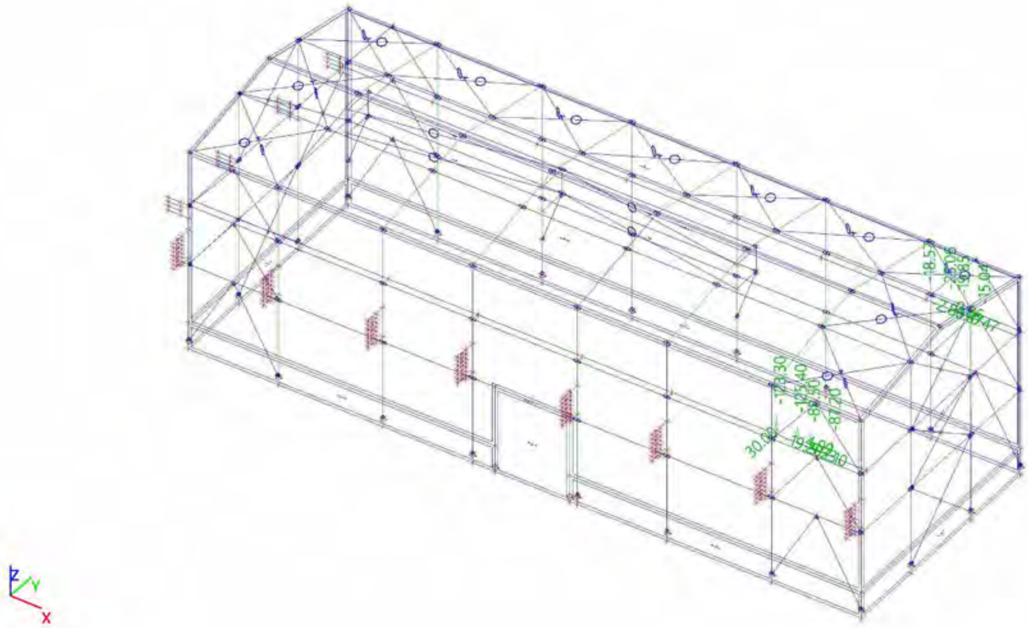
3.2.13. Load cases - BG135

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG135	Crane pos 5	Variable	LG4	Static	Standard	Short	None



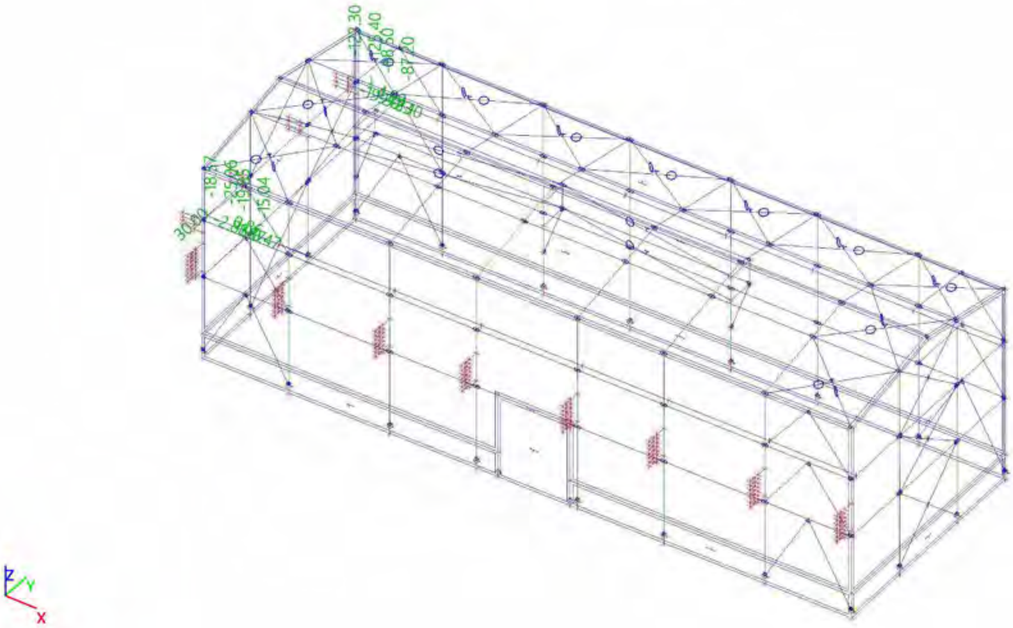
3.2.14. Load cases - BG136

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG136	Crane pos 6	Variable	LG4	Static	Standard	Short	None



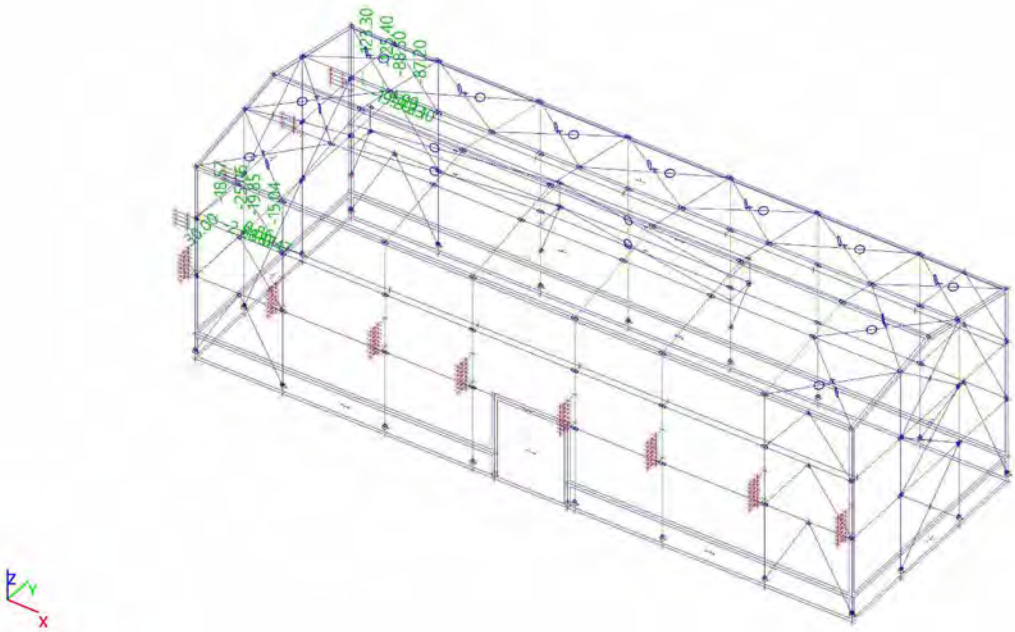
3.2.15. Load cases - BG137

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG137	Crane pos 7	Variable	LG4	Static	Standard	Short	None



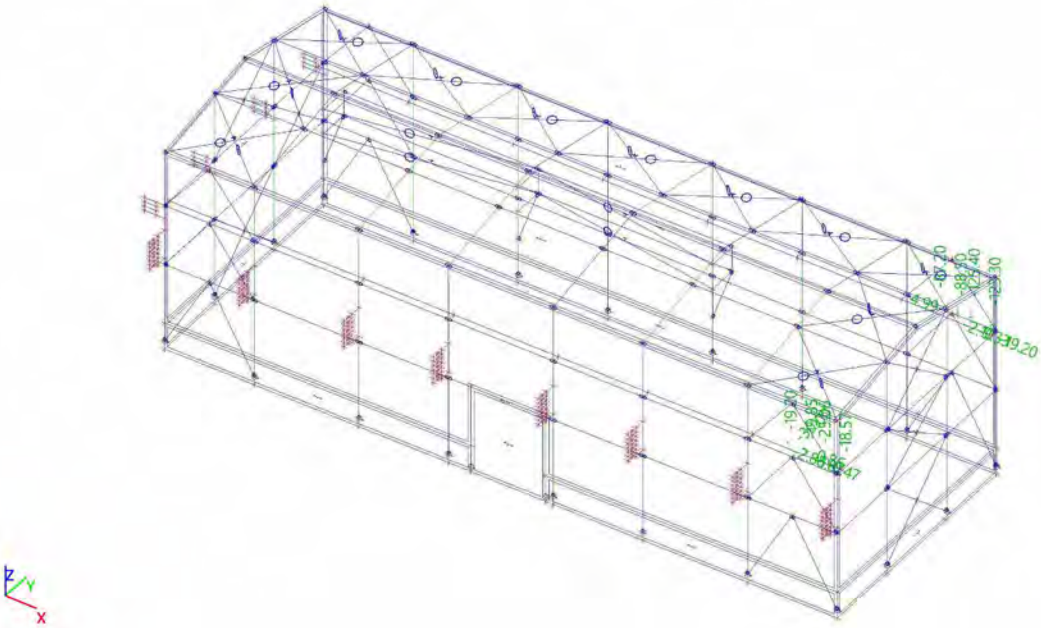
3.2.16. Load cases - BG138

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG138	Crane pos 8	Variable	LG4	Static	Standard	Short	None



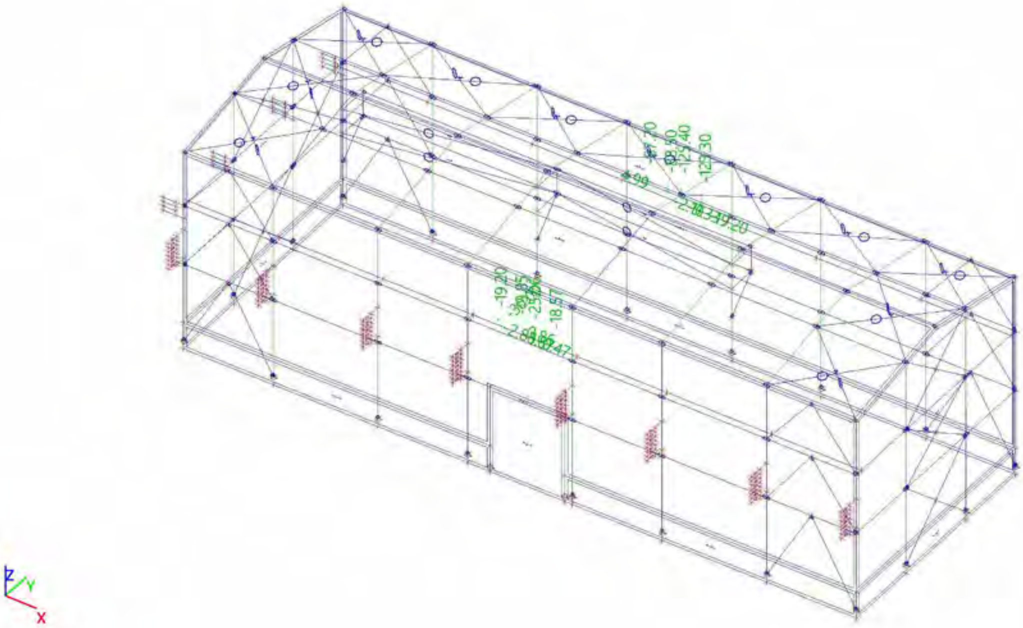
3.2.17. Load cases - BG139

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG139	Crane pos 9	Variable	LG4	Static	Standard	Short	None



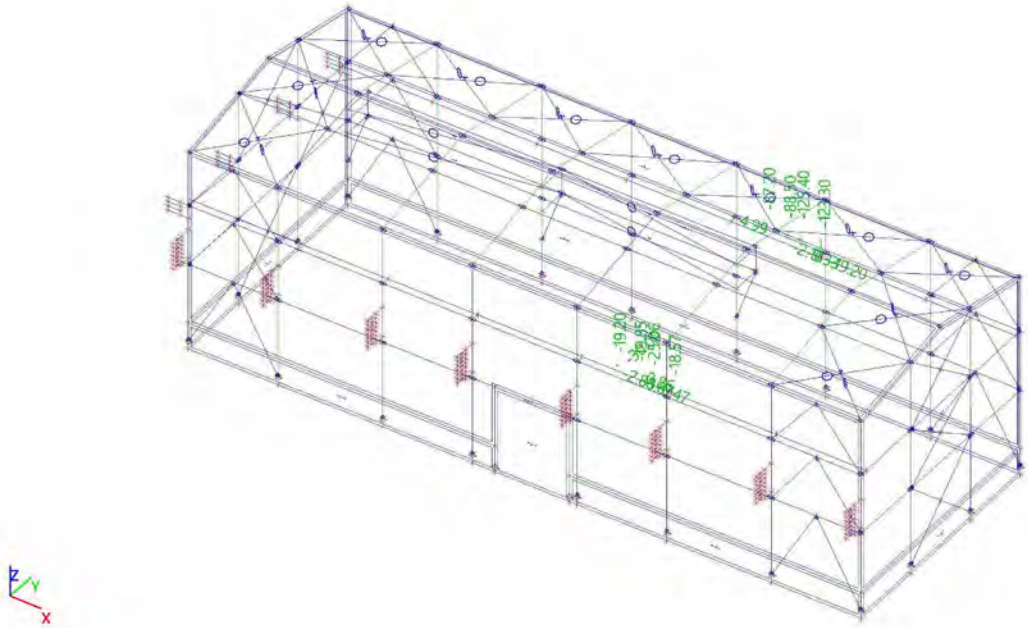
3.2.18. Load cases - BG140

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG140	Crane pos 10	Variable	LG4	Static	Standard	Short	None



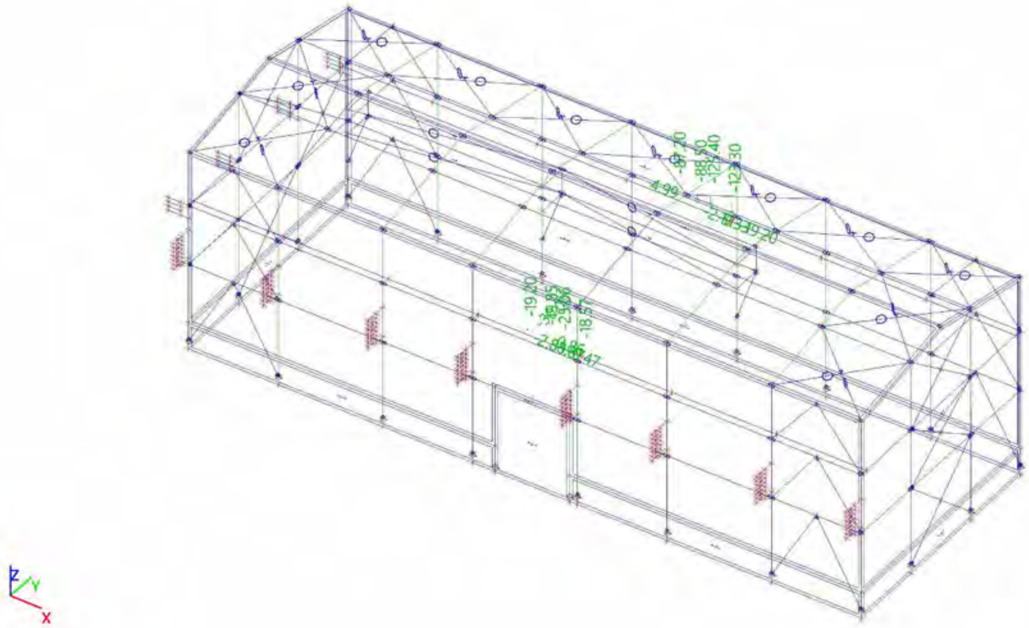
3.2.19. Load cases - BG141

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG141	Crane pos 11	Variable	LG4	Static	Standard	Short	None



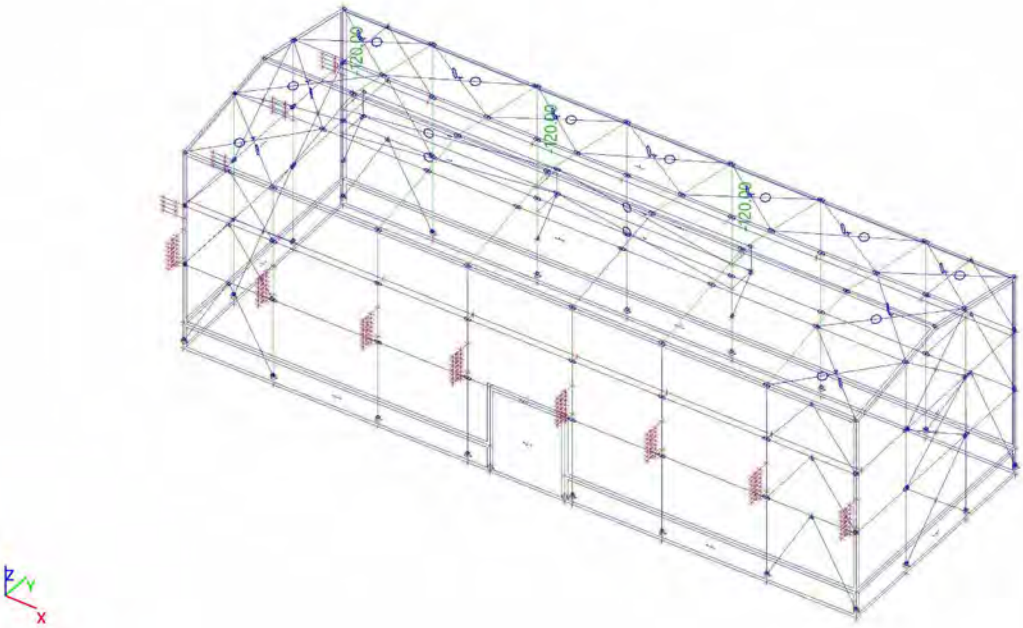
3.2.20. Load cases - BG142

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG142	Crane pos 12	Variable	LG4	Static	Standard	Short	None



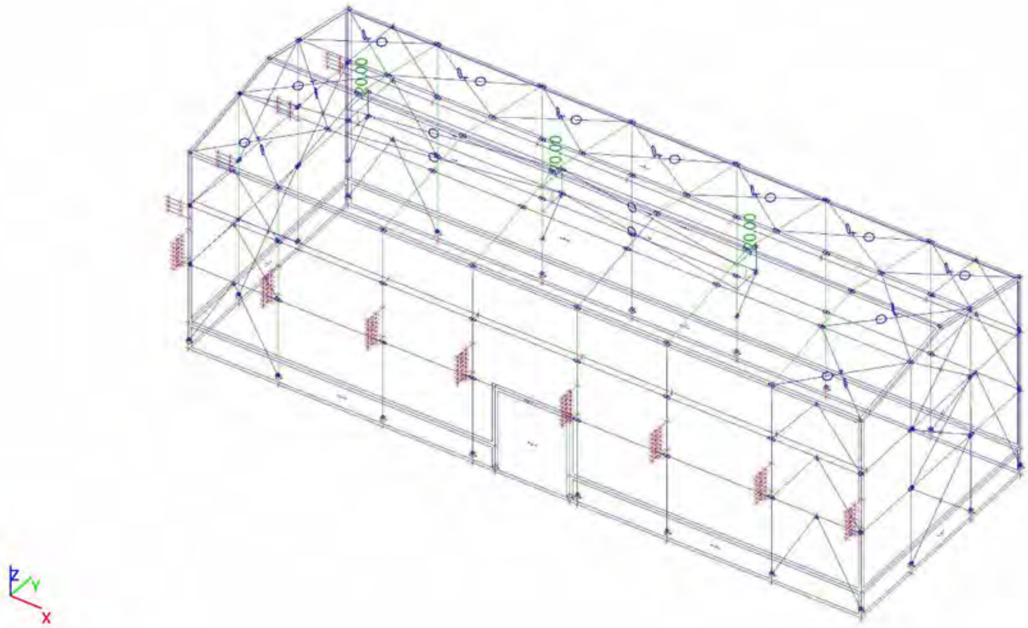
3.2.21. Load cases - BG151

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG151	Piping testload	Variable	LG5	Static	Standard	Short	None



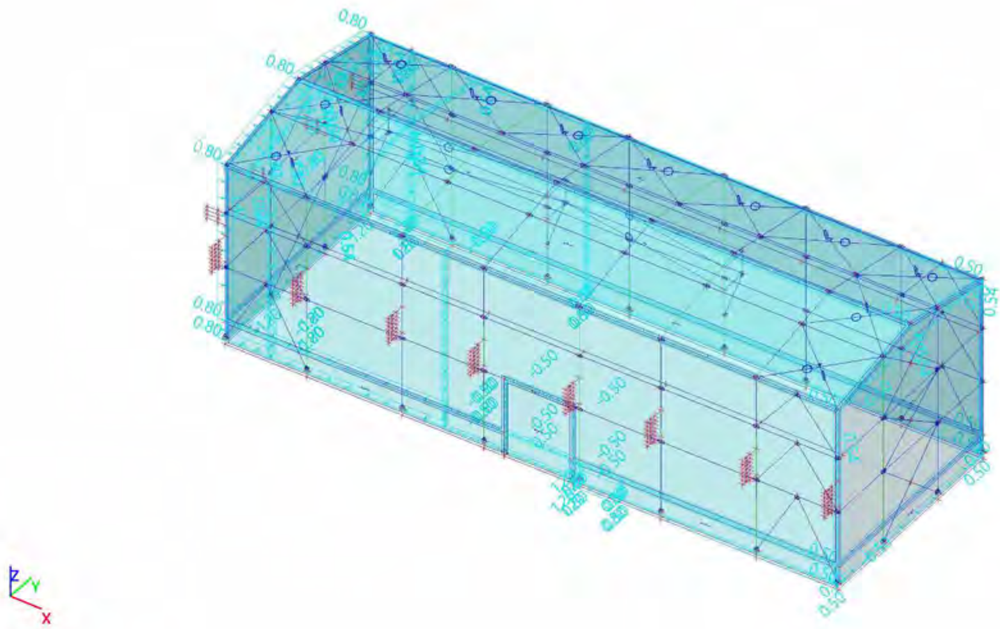
3.2.22. Load cases - BG152

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG152	Piping testload	Variable	LG5	Static	Standard	Short	None



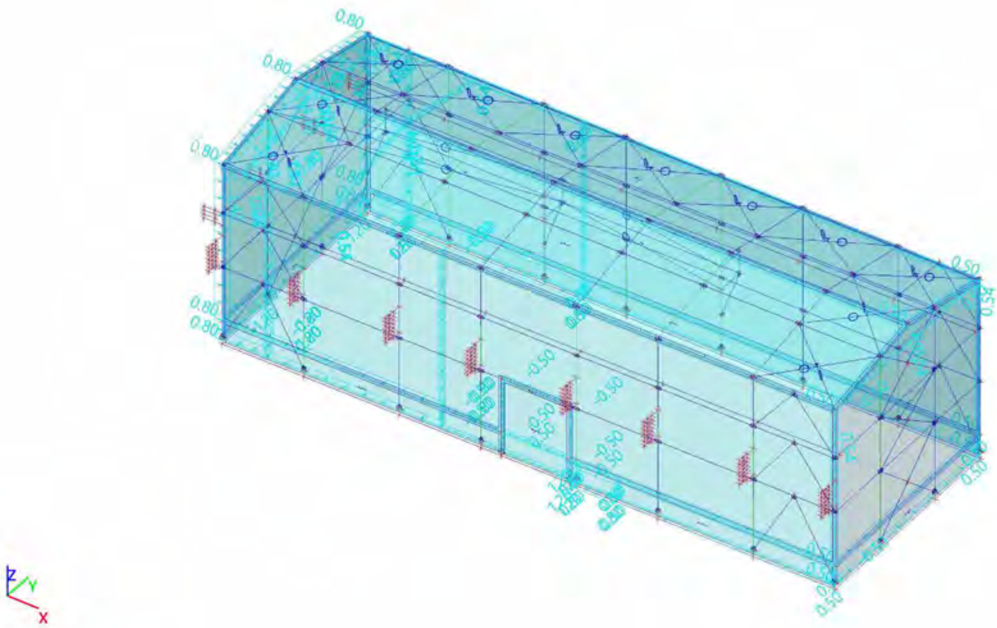
3.2.23. Load cases - 3DWind1

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind1	0, + CPE, + CPI	Variable	LG6	Static	Static wind	None



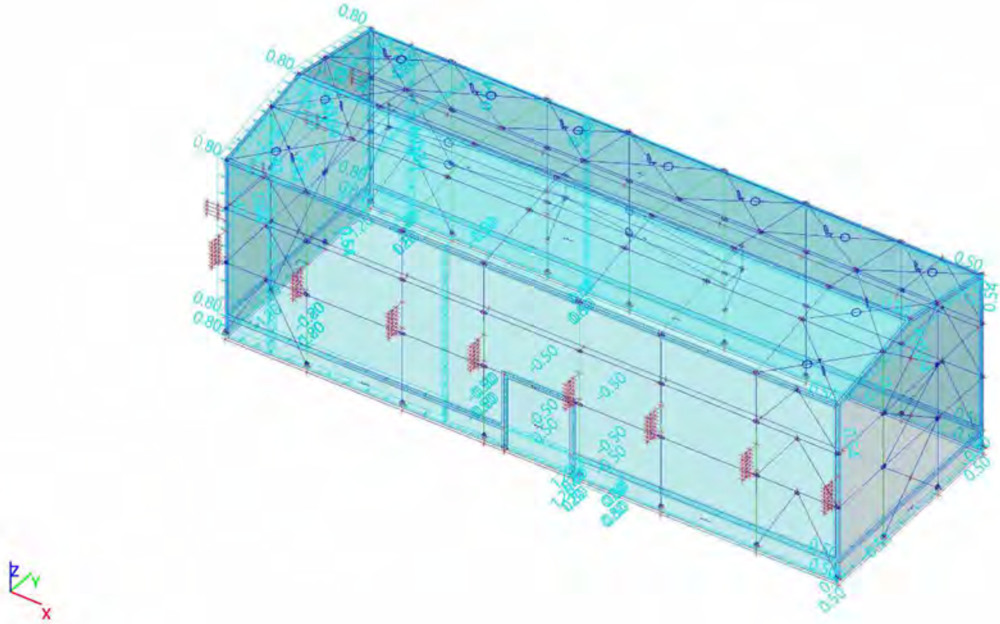
3.2.24. Load cases - 3DWind2

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind2	0, + CPE, - CPI	Variable	LG6	Static	Static wind	None



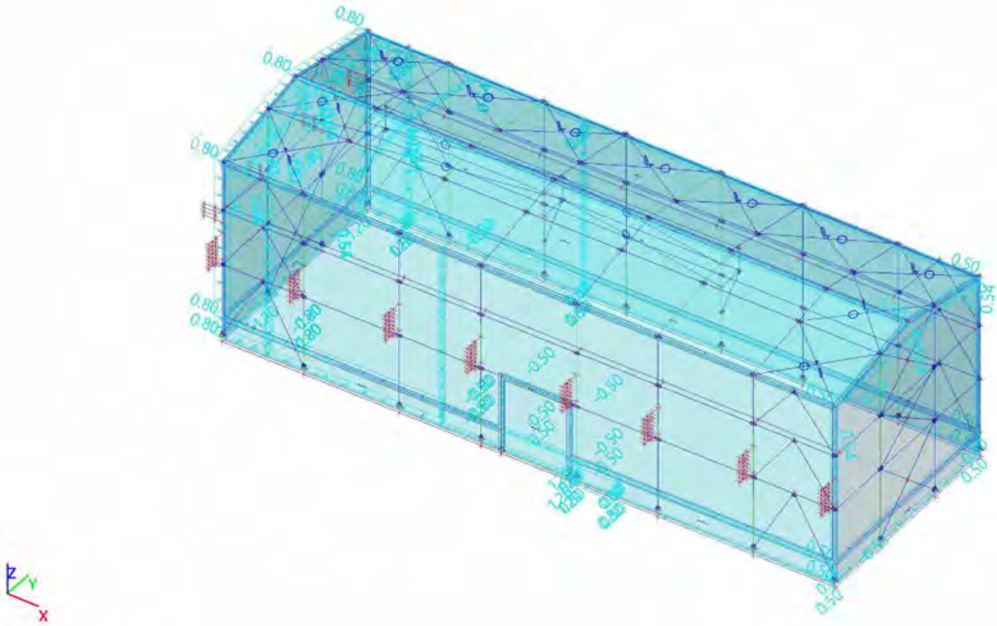
3.2.25. Load cases - 3DWind3

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind3	0, - CPE, + CPI	Variable	LG6	Static	Static wind	None



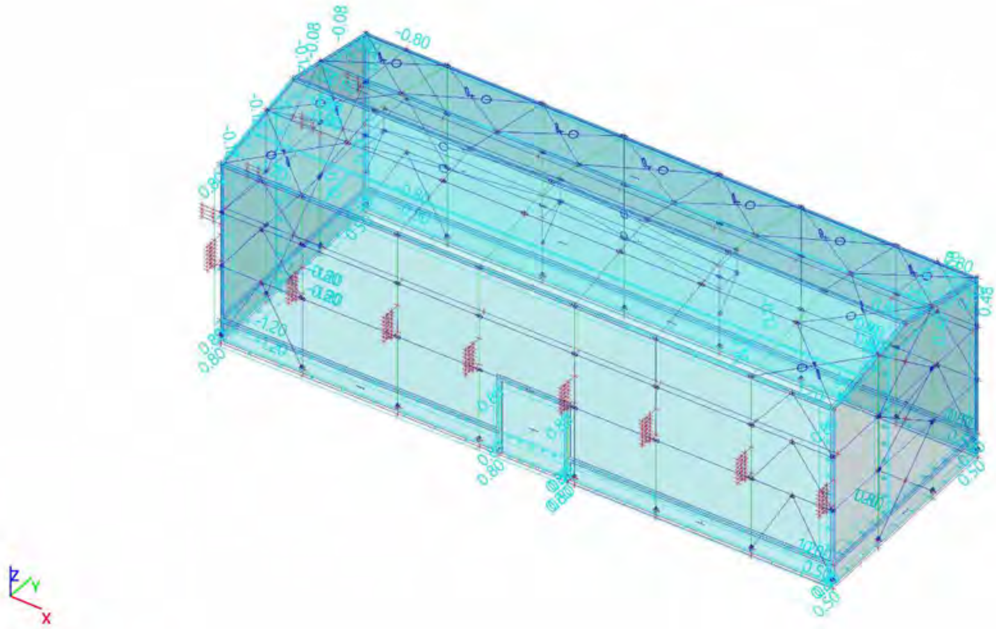
3.2.26. Load cases - 3DWind4

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind4	0, - CPE, - CPI	Variable	LG6	Static	Static wind	None



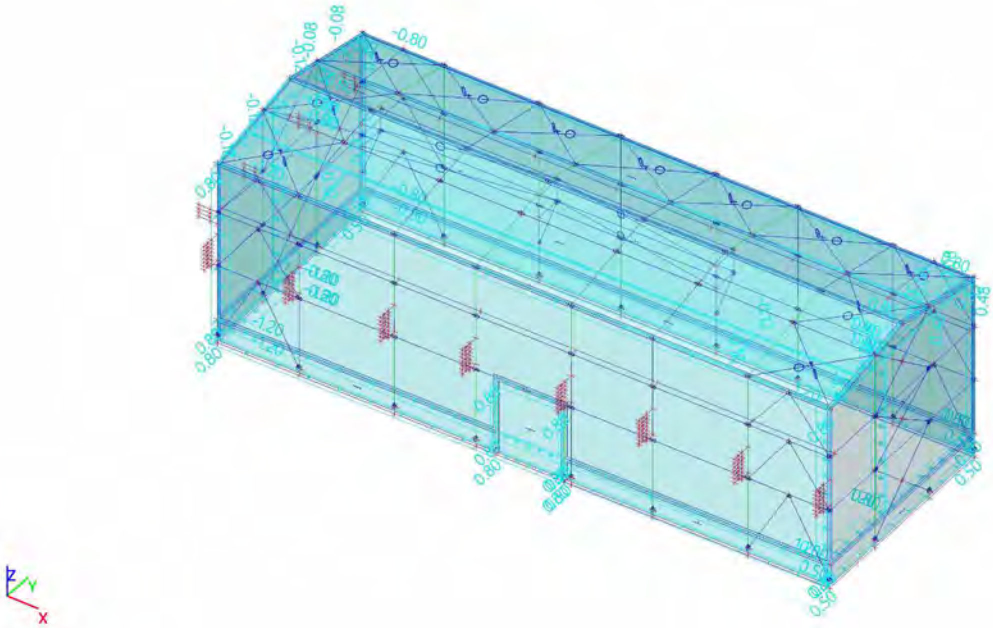
3.2.27. Load cases - 3DWind5

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind5	90, + CPE, + CPI	Variable	LG6	Static	Static wind	None



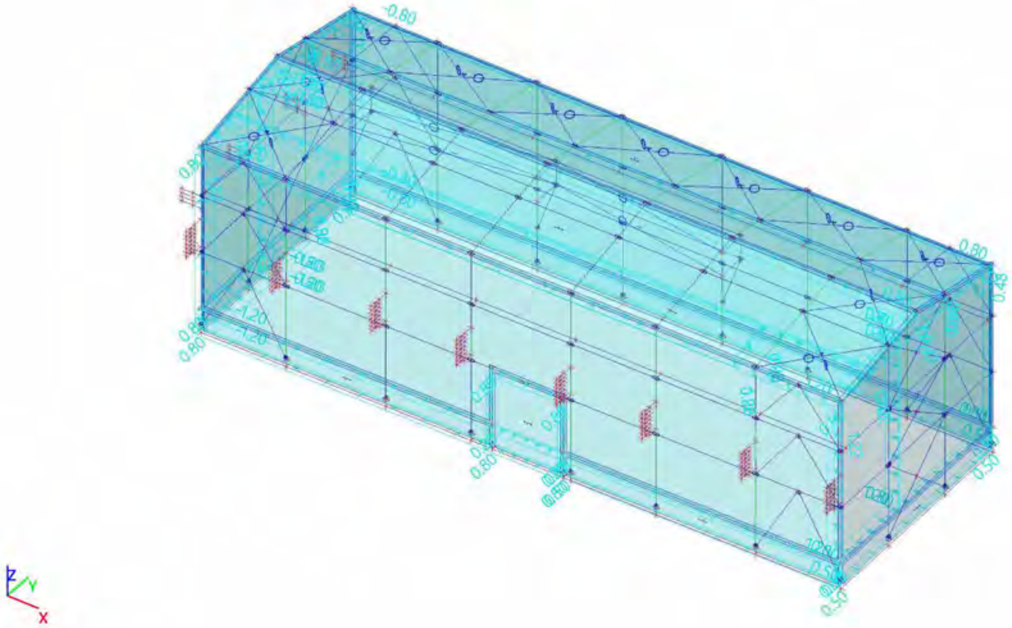
3.2.28. Load cases - 3DWind6

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind6	90, + CPE, - CPI	Variable	LG6	Static	Static wind	None



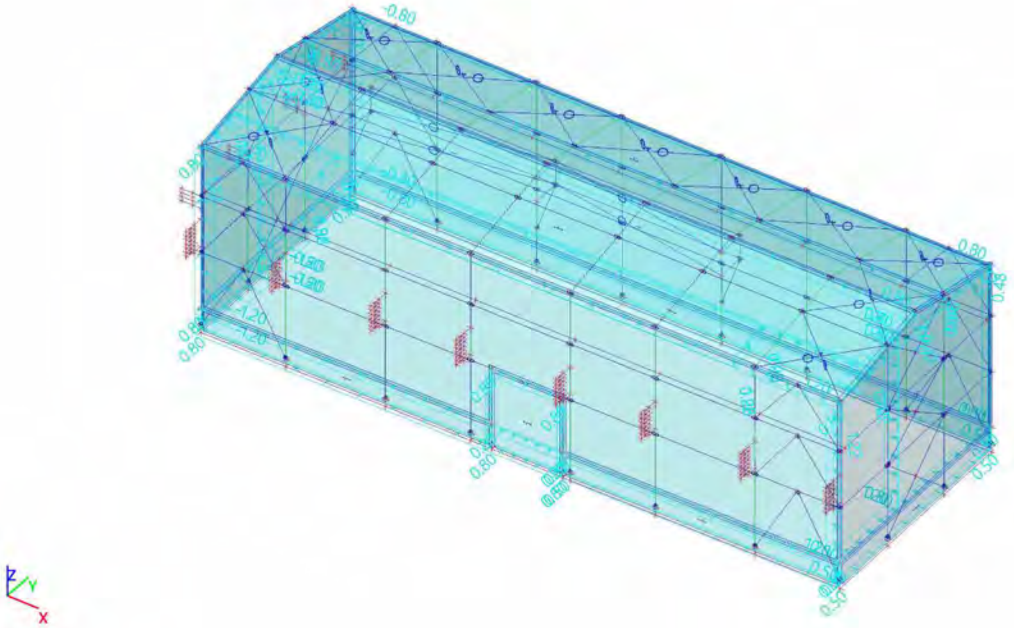
3.2.29. Load cases - 3DWind7

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind7	90, - CPE, + CPI	Variable	LG6	Static	Static wind	None



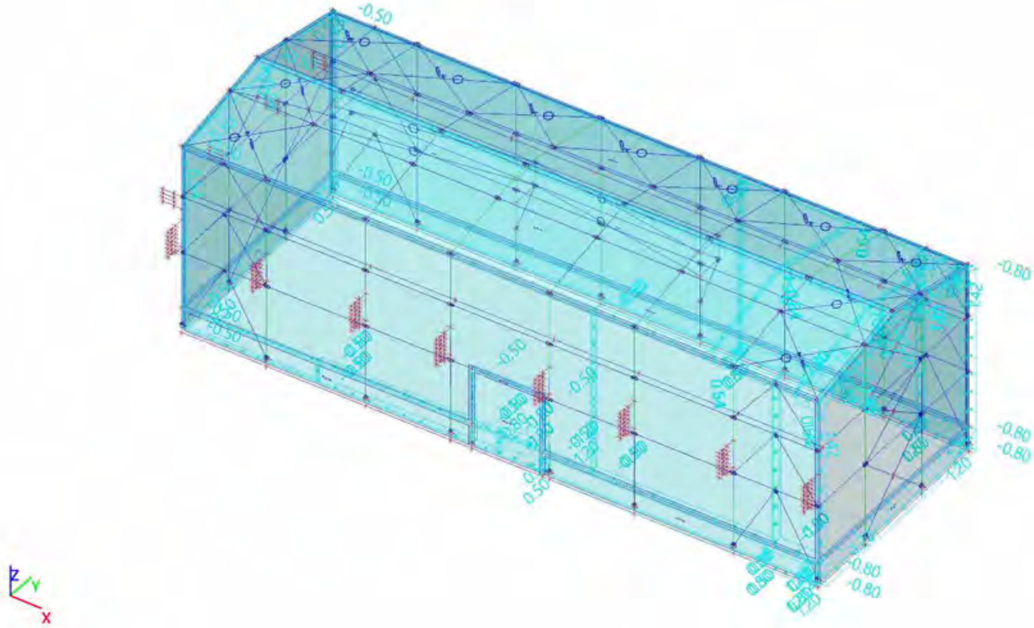
3.2.30. Load cases - 3DWind8

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind8	90, - CPE, - CPI	Variable	LG6	Static	Static wind	None



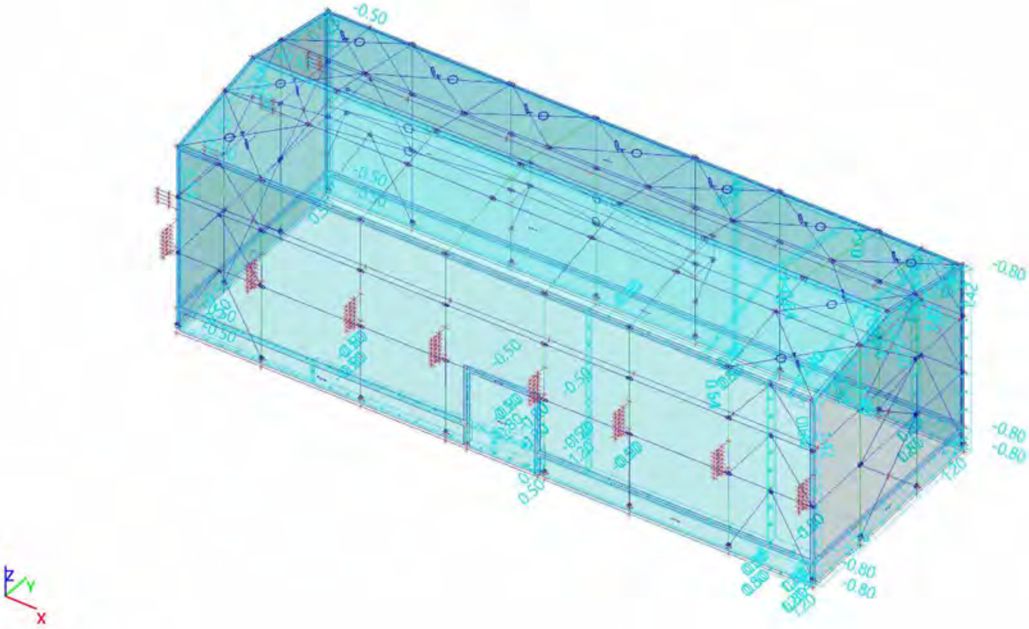
3.2.31. Load cases - 3DWind9

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind9	180, + CPE, + CPI	Variable	LG6	Static	Static wind	None



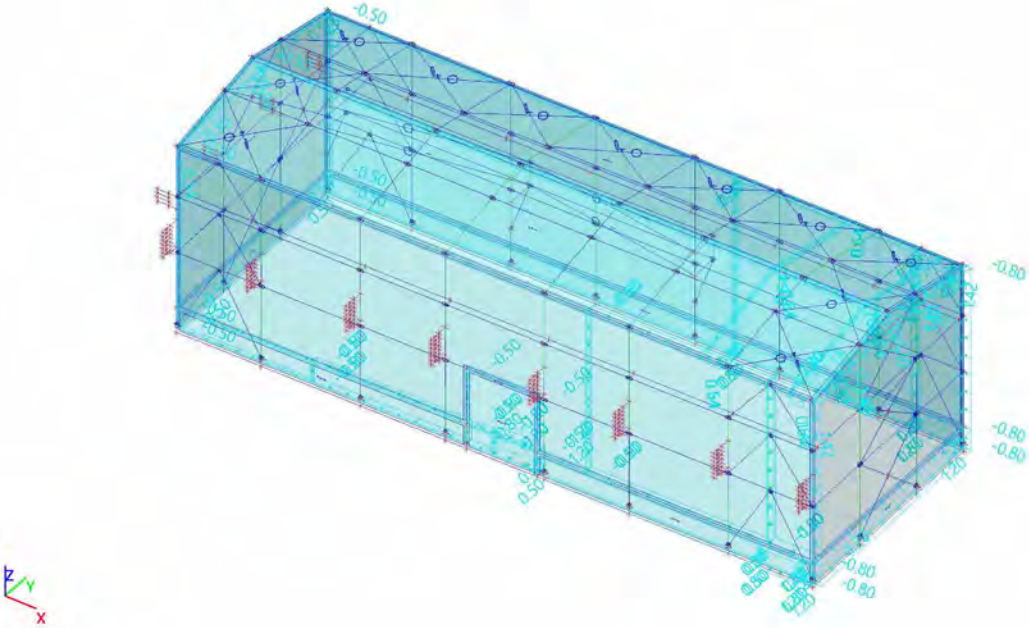
3.2.32. Load cases - 3DWind10

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind10	180, + CPE, - CPI	Variable	LG6	Static	Static wind	None



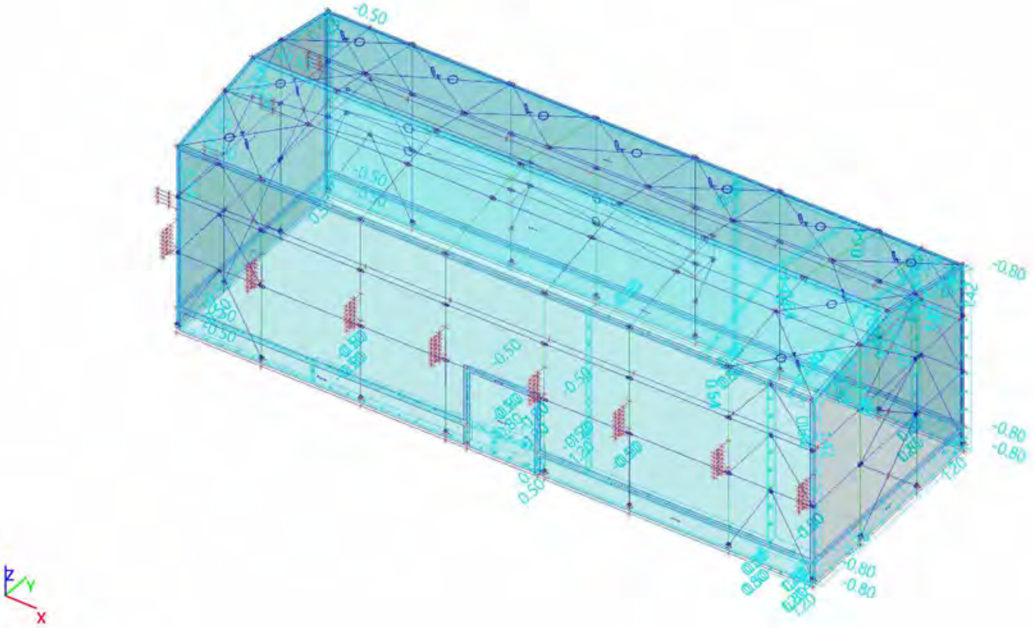
3.2.33. Load cases - 3DWind11

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind11	180, - CPE, + CPI	Variable	LG6	Static	Static wind	None



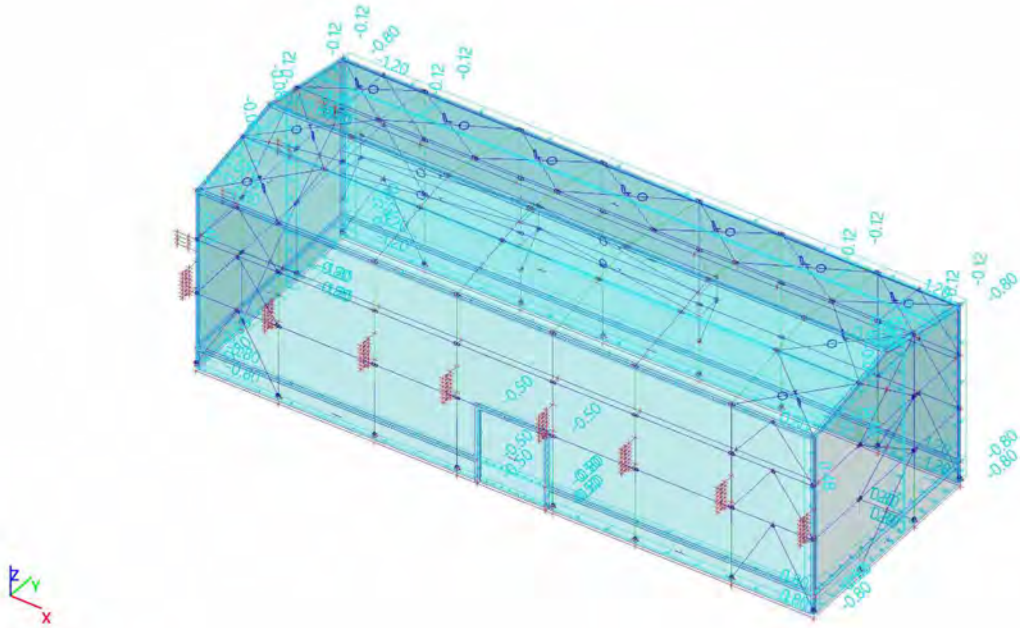
3.2.34. Load cases - 3DWind12

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind12	180, - CPE, - CPI	Variable	LG6	Static	Static wind	None



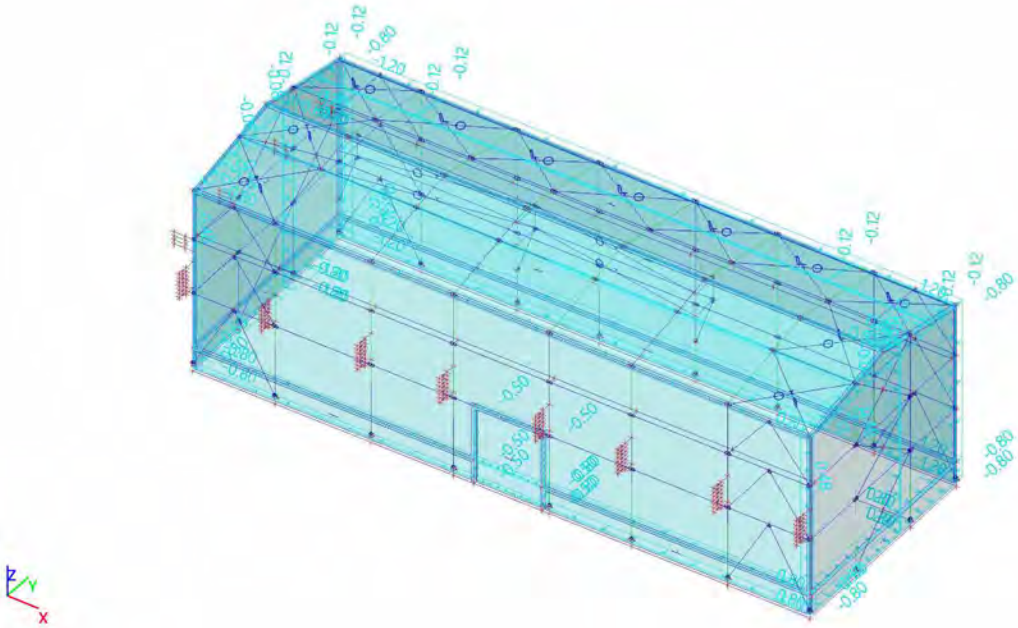
3.2.35. Load cases - 3DWind13

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind13	270, + CPE, + CPI	Variable	LG6	Static	Static wind	None



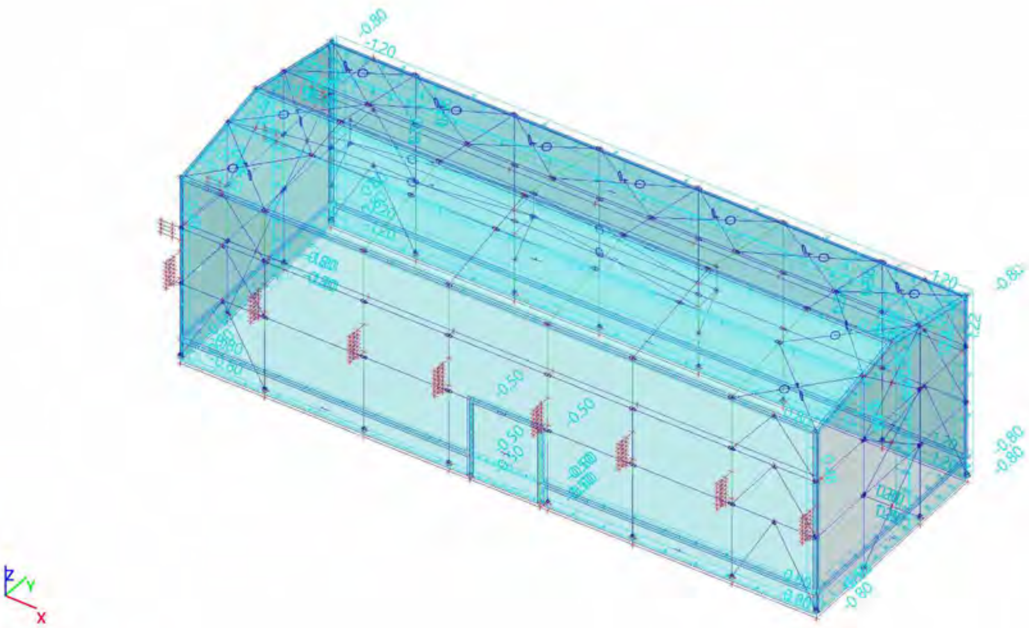
3.2.36. Load cases - 3DWind14

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind14	270, + CPE, - CPI	Variable	LG6	Static	Static wind	None



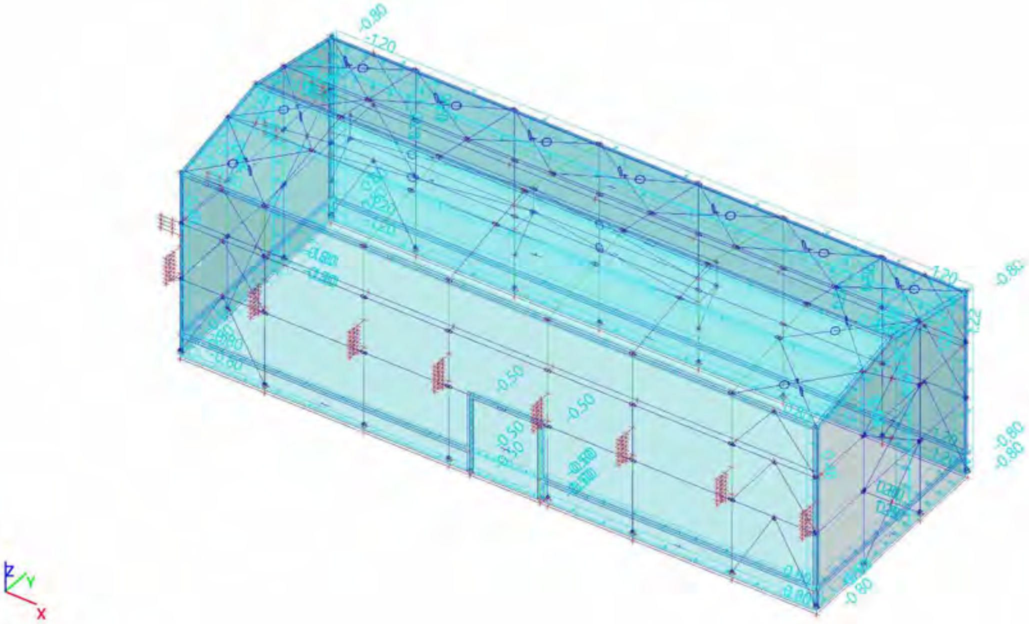
3.2.37. Load cases - 3DWind15

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind15	270, - CPE, + CPI	Variable	LG6	Static	Static wind	None



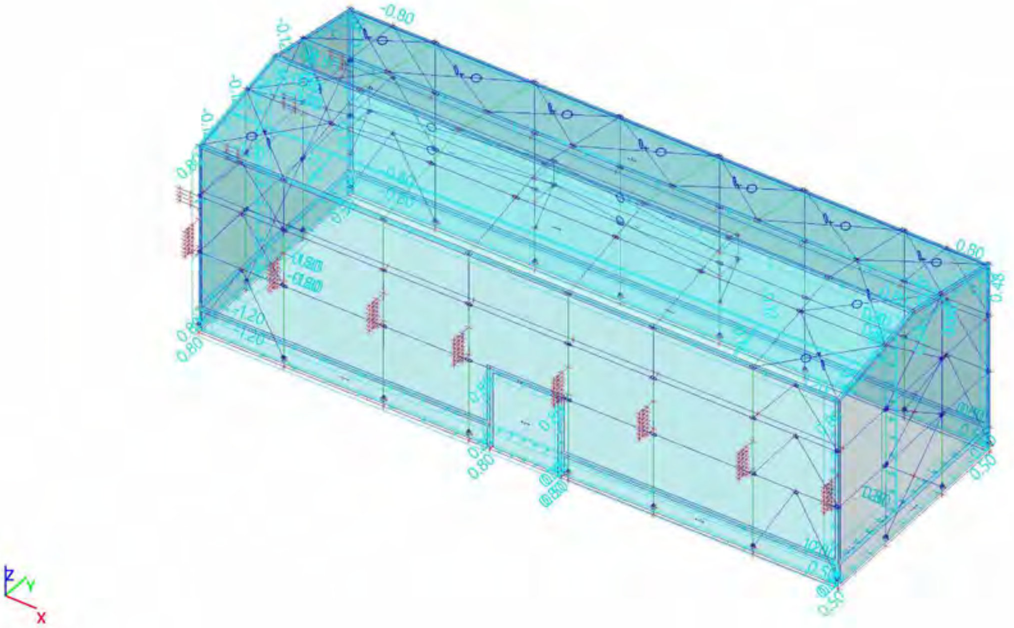
3.2.38. Load cases - 3DWind16

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind16	270, - CPE, - CPI	Variable	LG6	Static	Static wind	None



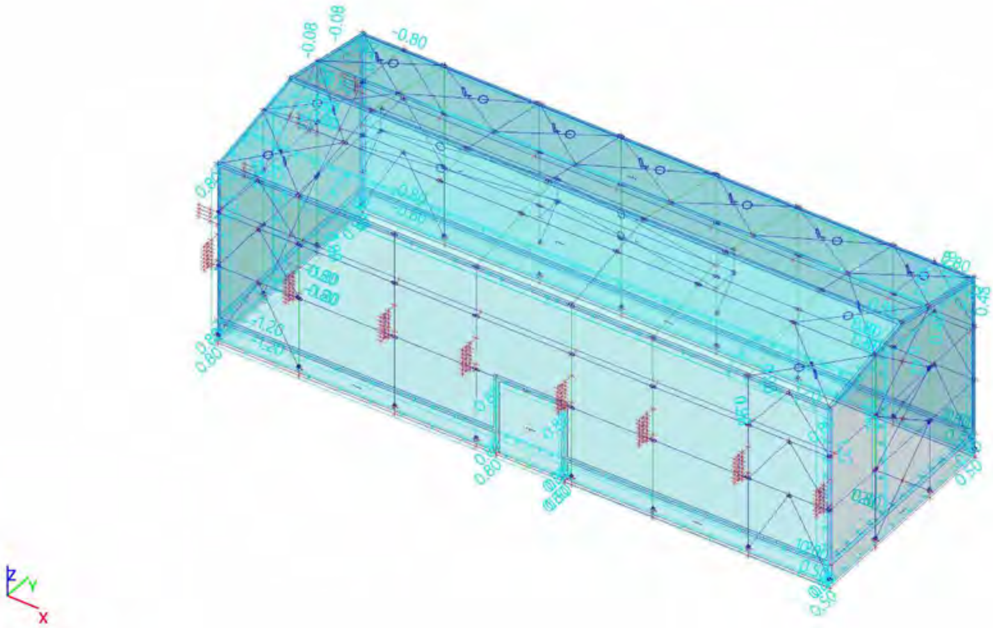
3.2.39. Load cases - 3DWind17

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind17	90, +/- Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind	None



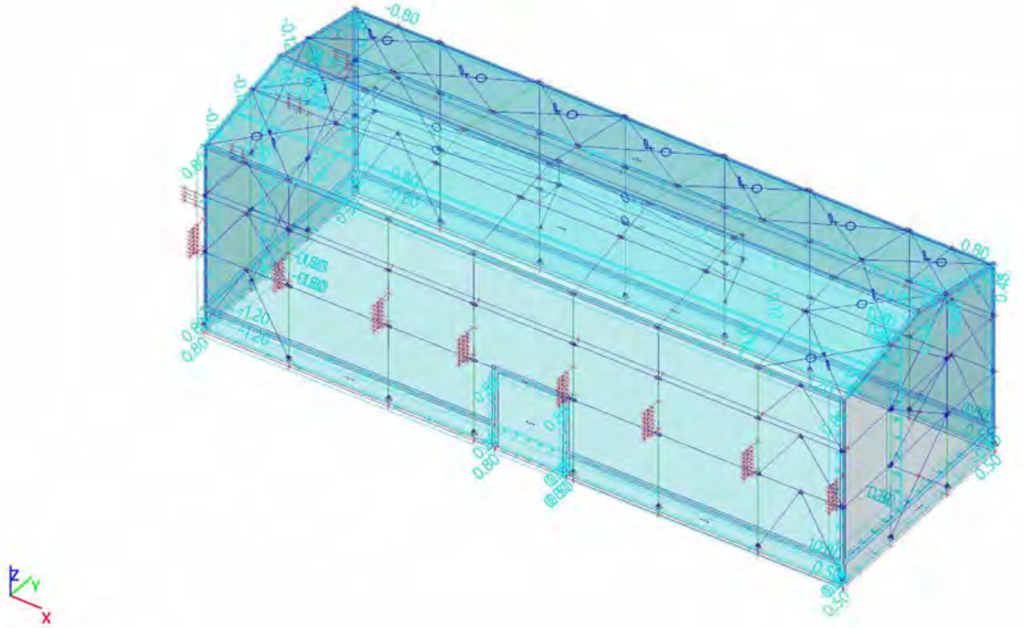
3.2.40. Load cases - 3DWind18

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind18	90, -/+ Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind	None



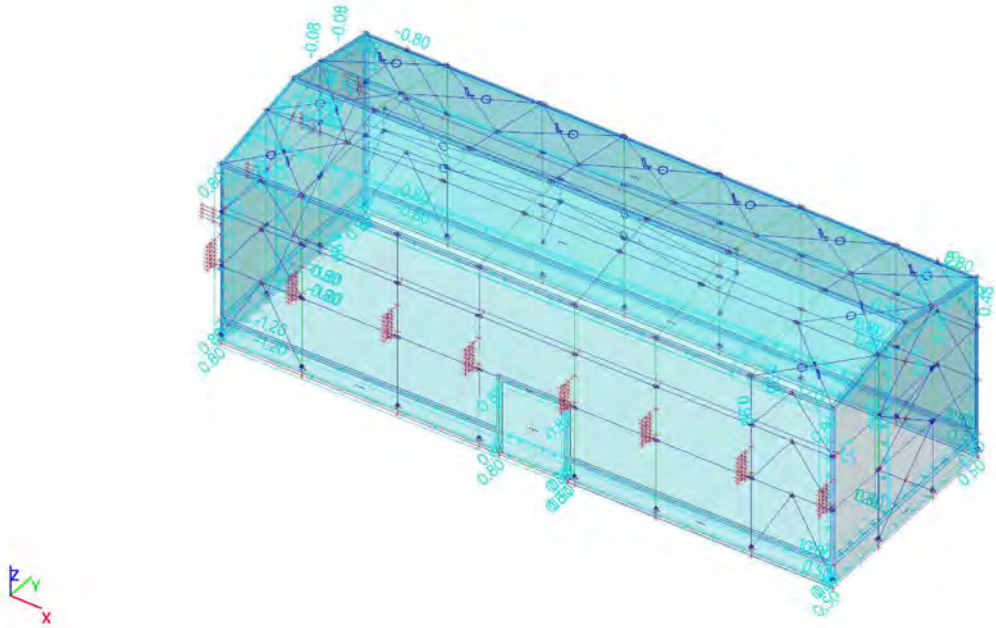
3.2.41. Load cases - 3DWind19

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind19	90, +/- Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind	None



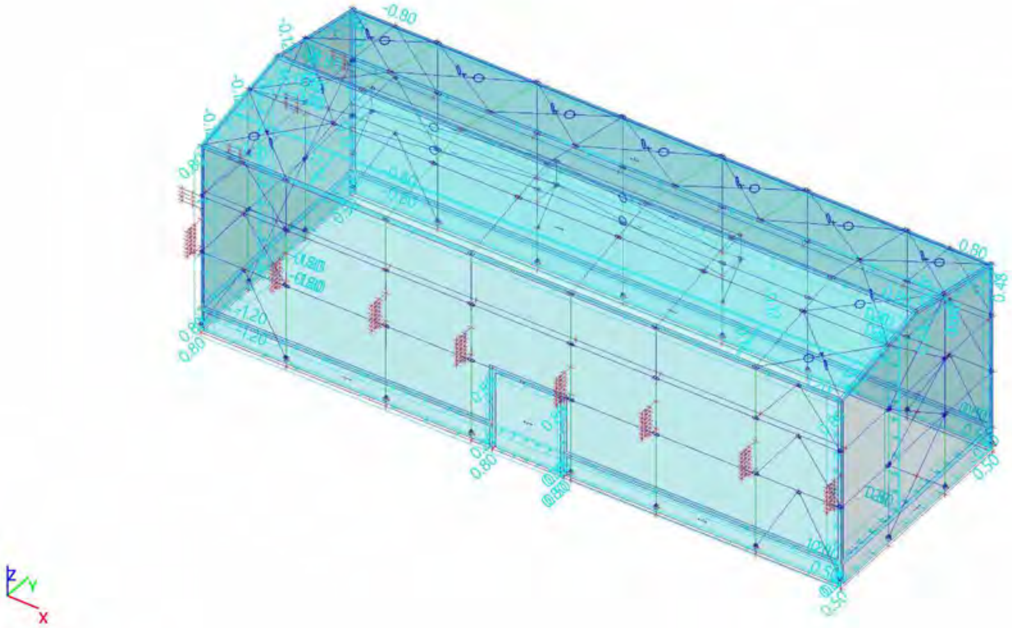
3.2.42. Load cases - 3DWind20

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind20	90, -/+ Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind	None



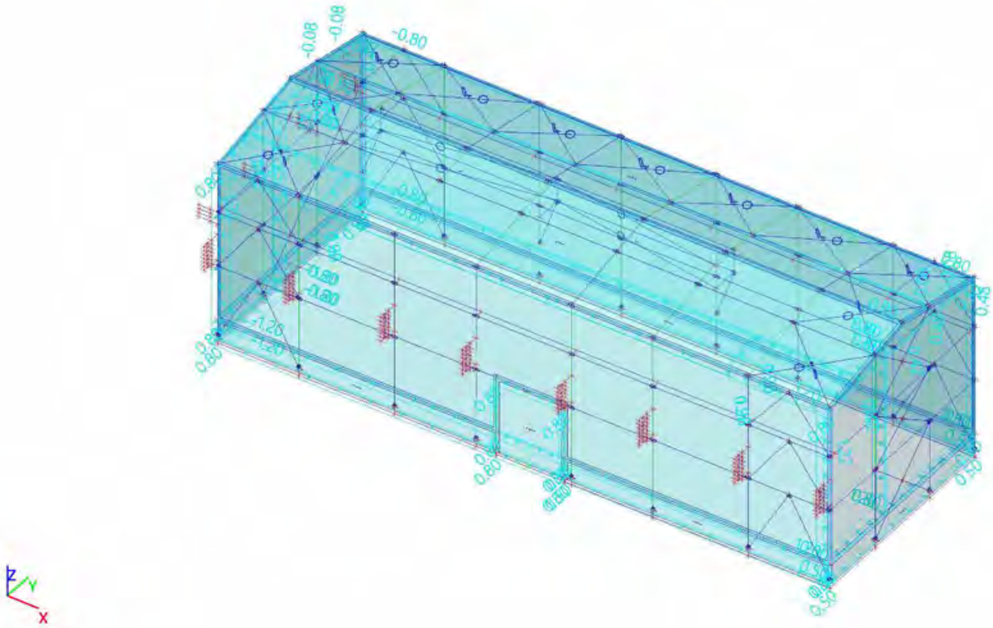
3.2.43. Load cases - 3DWind21

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind21	90, +/- Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind	None



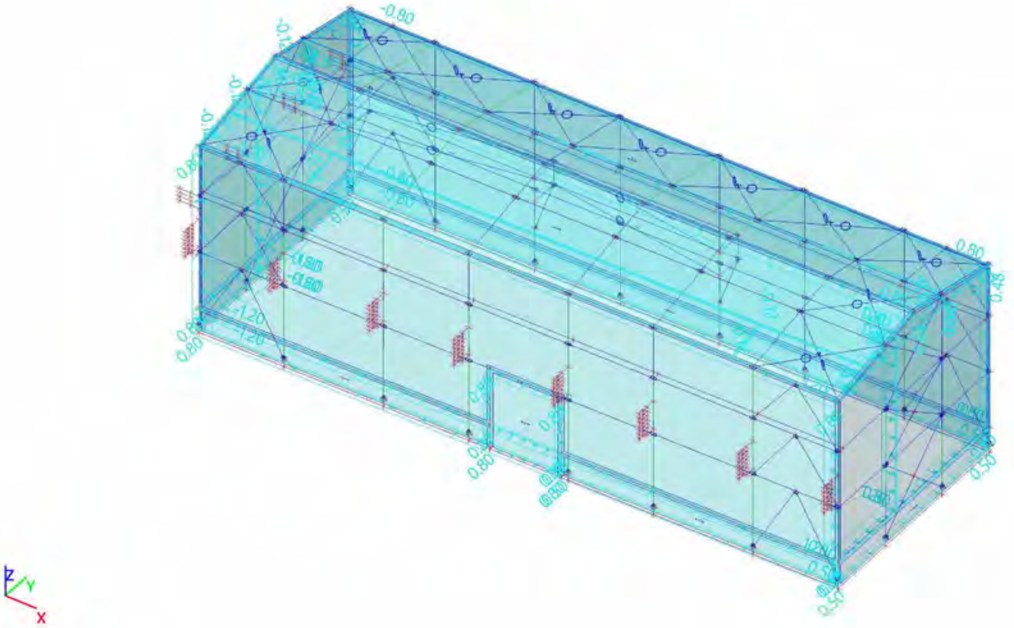
3.2.44. Load cases - 3DWind22

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind22	90, -/+ Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind	None



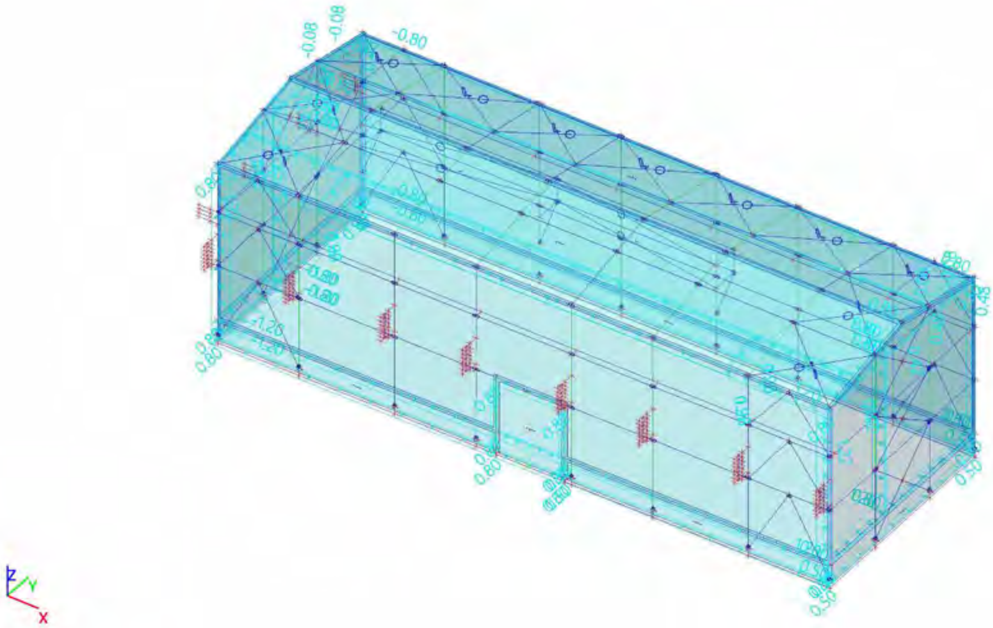
3.2.45. Load cases - 3DWind23

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind23	90, +/- Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind	None



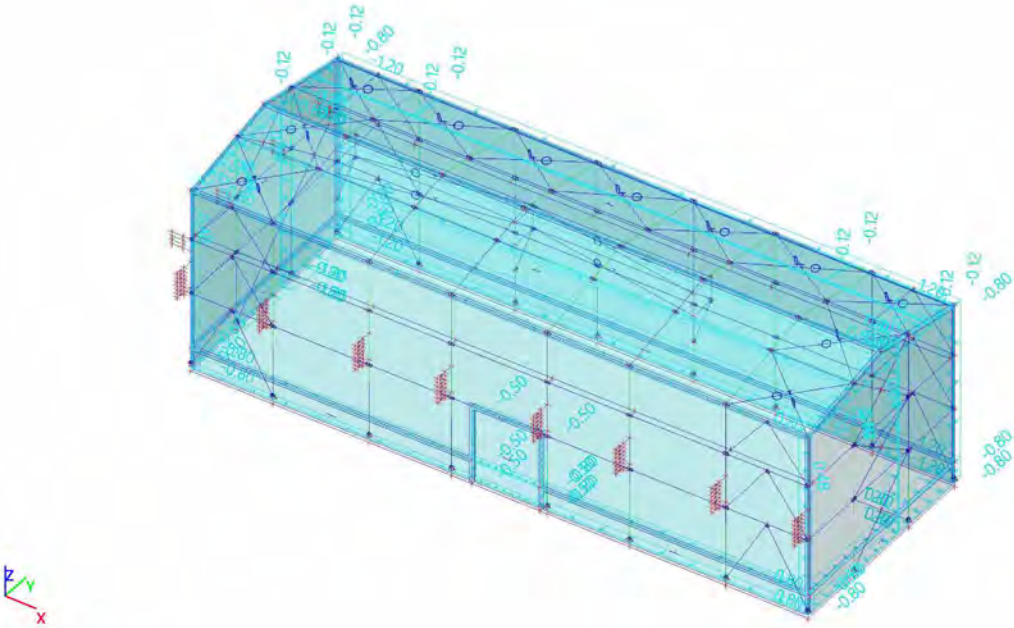
3.2.46. Load cases - 3DWind24

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind24	90, -/+ Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind	None



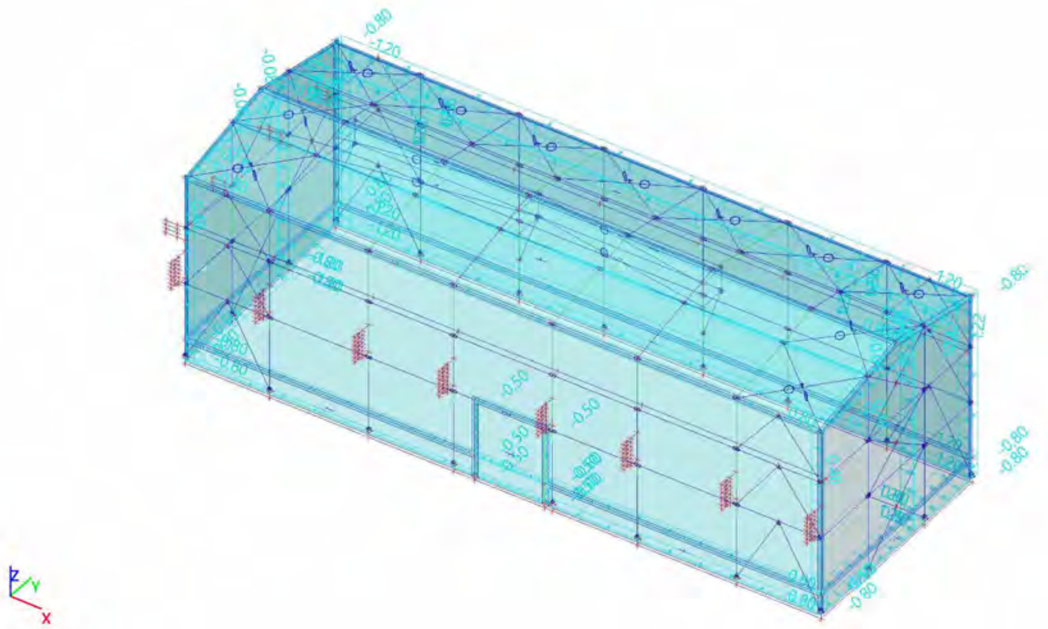
3.2.47. Load cases - 3DWind25

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind25	270, +/- Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind	None



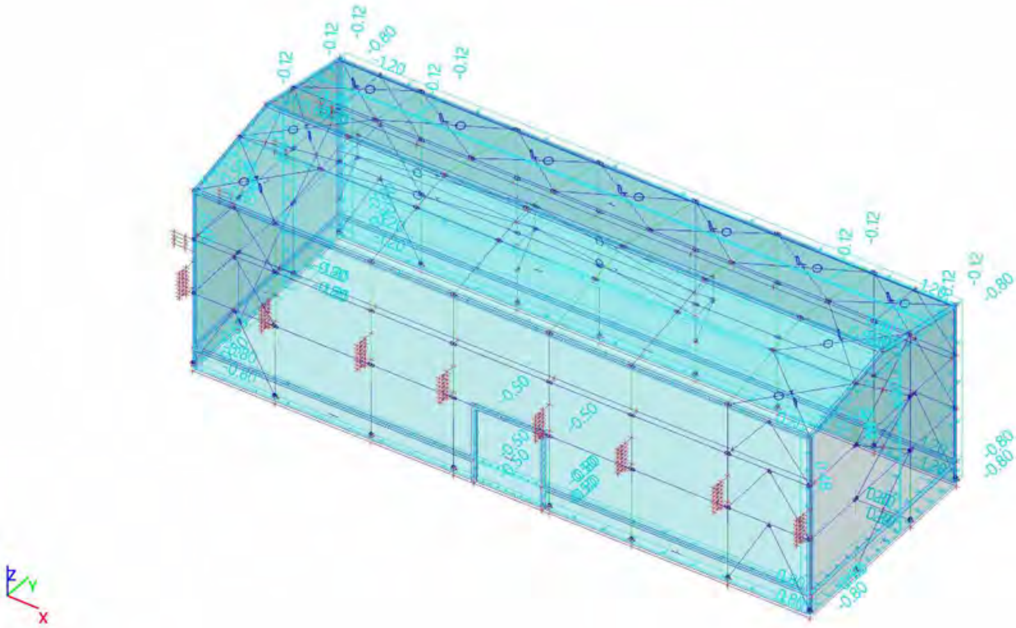
3.2.48. Load cases - 3DWind26

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind26	270, -/+ Cpe, + CPE, + CPI	Variable	LG6	Static	Static wind	None



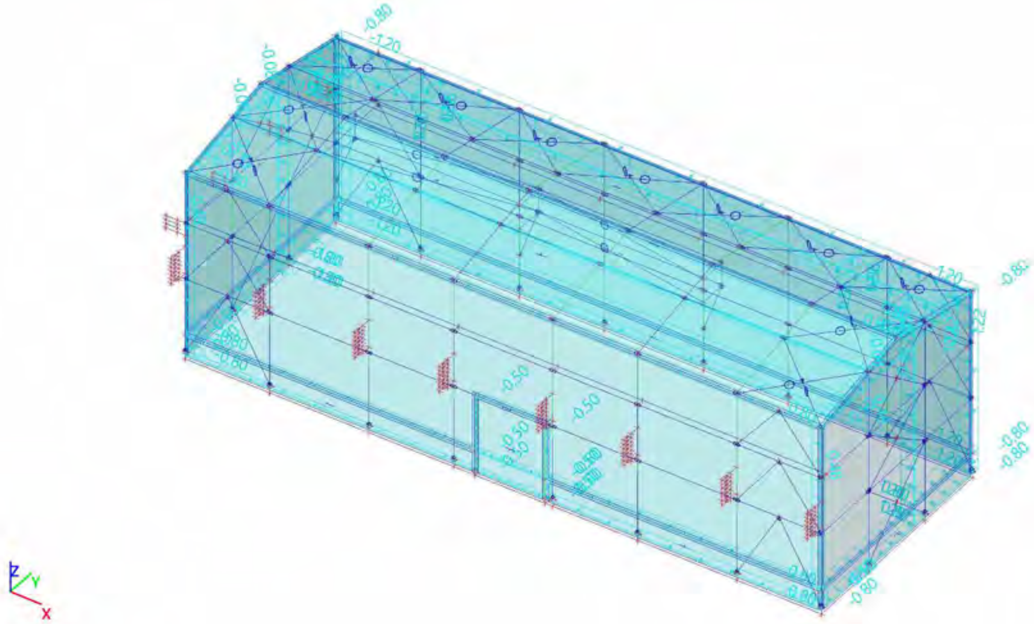
3.2.49. Load cases - 3DWind27

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind27	270, +/- Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind	None



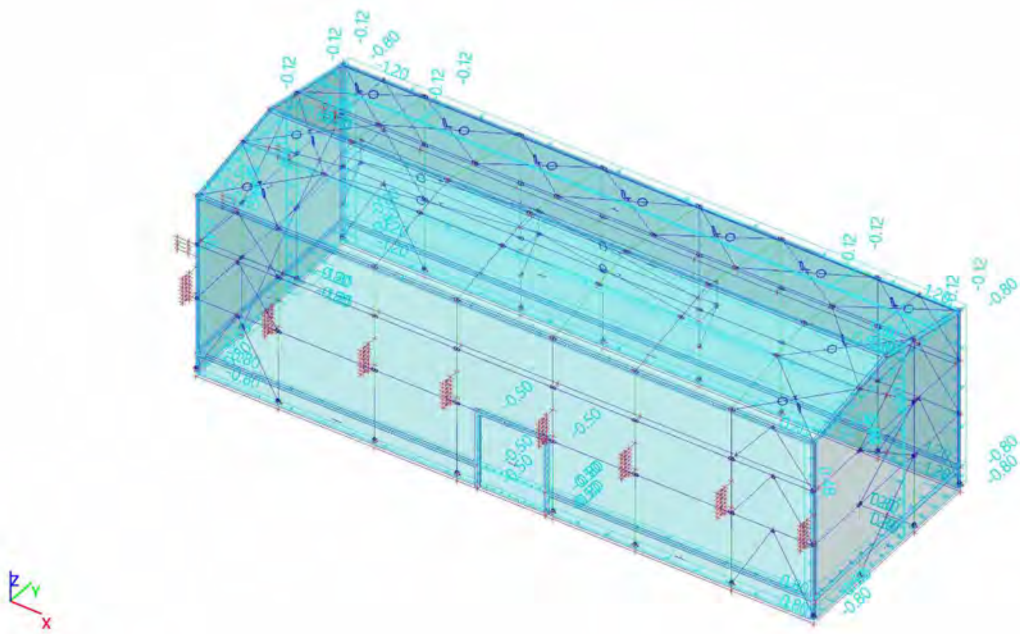
3.2.50. Load cases - 3DWind28

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind28	270, -/+ Cpe, + CPE, - CPI	Variable	LG6	Static	Static wind	None



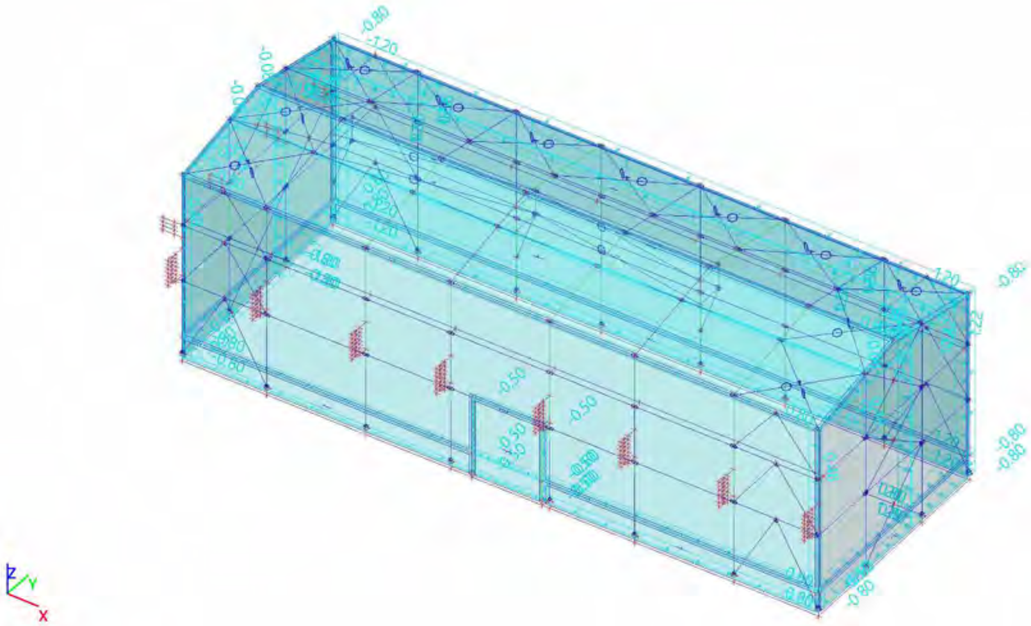
3.2.51. Load cases - 3DWind29

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind29	270, +/- Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind	None



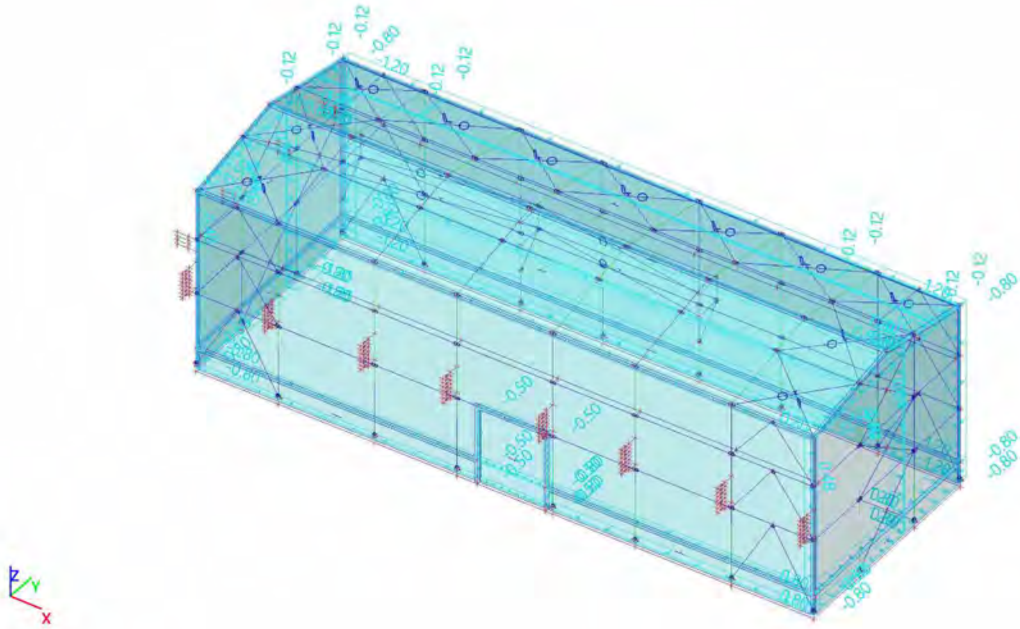
3.2.52. Load cases - 3DWind30

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind30	270, -/+ Cpe, - CPE, + CPI	Variable	LG6	Static	Static wind	None



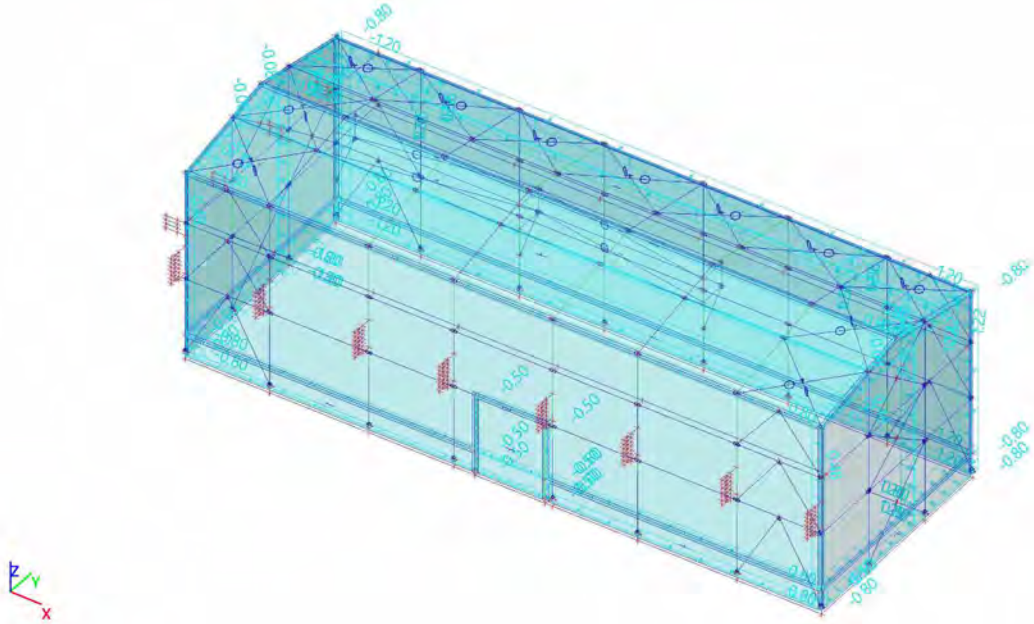
3.2.53. Load cases - 3DWind31

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind31	270, +/- Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind	None



3.2.54. Load cases - 3DWind32

Name	Description	Action type	Load group	Load type	Spec	Master load case
3DWind32	270, -/+ Cpe, - CPE, - CPI	Variable	LG6	Static	Static wind	None



3.3. Wind data

Name	Type	Roof type	Swap outer surface	Load direction	Region	Zones	+Cpe	-Cpe
WD1	Roof	Duopitch	×	0	1	F	-1.4209	-1.4209
					2	G	-1.3000	-1.3000
					3	H	-0.6403	-0.6403
					4	I	-0.5403	-0.5403
				90	1	J	0.0806	-0.8388
					2	I	-0.4806	-0.4806
				180	1	F	-1.4209	-1.4209
					2	G	-1.3000	-1.3000
					3	H	-0.6403	-0.6403
					4	I	-0.5403	-0.5403
				270	1	F1	0.1194	-1.2224
					2	F2	0.1194	-1.2224
					3	G	0.1194	-0.9612
					4	H	0.1194	-0.4209
WD2	Wall		✓	0	1	D	0.8000	0.8000
					2	D	0.8000	0.8000
				90	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	A	-1.2000	-1.2000
					4	B	-0.8000	-0.8000
				180	1	E	-0.5000	-0.5000
					2	E	-0.5000	-0.5000
				270	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	A	-1.2000	-1.2000
					4	B	-0.8000	-0.8000
WD3	Wall		✓	0	1	D	0.8000	0.8000
				90	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
				180	1	E	-0.5000	-0.5000
				270	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
WD4	Wall		×	0	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				90	1	E	-0.5000	-0.5000
				180	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				270	1	D	0.8000	0.8000
WD5	Wall		×	0	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				90	1	E	-0.5000	-0.5000
				180	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				270	1	D	0.8000	0.8000
WD6	Wall		✓	0	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				90	1	D	0.8000	0.8000
				180	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				270	1	E	-0.5000	-0.5000
WD7	Wall		×	0	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				90	1	E	-0.5000	-0.5000
				180	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				270	1	D	0.8000	0.8000
WD8	Wall		✓	0	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000

Name	Type	Roof type	Swap outer surface	Load direction	Region	Zones	+Cpe	-Cpe
					3	C	-0.5000	-0.5000
				90	1	D	0.8000	0.8000
				180	1	B	-0.8000	-0.8000
					2	C	-0.5000	-0.5000
				270	1	E	-0.5000	-0.5000
WD9	Roof	Duopitch	×	0	1	F	-1.4209	-1.4209
					2	G	-1.3000	-1.3000
					3	H	-0.6403	-0.6403
					4	I	-0.5403	-0.5403
				90	1	F1	0.1194	-1.2224
					2	F2	0.1194	-1.2224
					3	G	0.1194	-0.9612
					4	H	0.1194	-0.4209
				180	1	F	-1.4209	-1.4209
					2	G	-1.3000	-1.3000
					3	H	-0.6403	-0.6403
					4	I	-0.5403	-0.5403
				270	1	J	0.0806	-0.8388
					2	I	-0.4806	-0.4806
WD10	Wall		×	0	1	E	-0.5000	-0.5000
					2	E	-0.5000	-0.5000
				90	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	A	-1.2000	-1.2000
					4	B	-0.8000	-0.8000
				180	1	D	0.8000	0.8000
					2	D	0.8000	0.8000
				270	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	A	-1.2000	-1.2000
					4	B	-0.8000	-0.8000
WD11	Wall		✓	0	1	C	-0.5000	-0.5000
					2	C	-0.5000	-0.5000
				90	1	D	0.8000	0.8000
					2	D	0.8000	0.8000
				180	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000
					3	C	-0.5000	-0.5000
				270	1	E	-0.5000	-0.5000
					2	E	-0.5000	-0.5000
WD12	Wall		×	0	1	E	-0.5000	-0.5000
				90	1	E	-0.5000	-0.5000
				180	1	D	0.8000	0.8000
				270	1	A	-1.2000	-1.2000
					2	B	-0.8000	-0.8000

3.4. Load groups

Name	Load	Relation	Type
LG1	Permanent		
LG2	Variable	Exclusive	Snow
LG3	Variable	Standard	Cat E : Storage
LG4	Variable	Exclusive	Cat E : Storage
LG5	Variable	Exclusive	Cat E : Storage
LG6	Variable	Exclusive	Wind

3.5. Combinations

Name	Type	Load cases	Coeff. [-]
UGT-Set B	EN-ULS (STR/GEO) Set B	BG101 - Self weight	1.00
		BG102 - Deadloads	1.00
		BG111 - Snow a	1.00
		BG112 - Snow b1	1.00
		BG113 - Snow b2	1.00
		BG121 - Piping	1.00
		BG122 - Cabletrays	1.00
		BG123 - Reserve	1.00

Name	Type	Load cases	Coeff. [-]
		BG131 - Crane pos 1	1.00
		BG132 - Crane pos 2	1.00
		BG133 - Crane pos 3	1.00
		BG134 - Crane pos 4	1.00
		BG135 - Crane pos 5	1.00
		BG136 - Crane pos 6	1.00
		BG137 - Crane pos 7	1.00
		BG138 - Crane pos 8	1.00
		BG139 - Crane pos 9	1.00
		BG140 - Crane pos 10	1.00
		BG141 - Crane pos 11	1.00
		BG142 - Crane pos 12	1.00
		BG151 - Piping testload	1.00
		BG152 - Piping testload	1.00
		3DWind1 - 0, + CPE, + CPI	1.00
		3DWind2 - 0, + CPE, - CPI	1.00
		3DWind3 - 0, - CPE, + CPI	1.00
		3DWind4 - 0, - CPE, - CPI	1.00
		3DWind5 - 90, + CPE, + CPI	1.00
		3DWind6 - 90, + CPE, - CPI	1.00
		3DWind7 - 90, - CPE, + CPI	1.00
		3DWind8 - 90, - CPE, - CPI	1.00
		3DWind9 - 180, + CPE, + CPI	1.00
		3DWind10 - 180, + CPE, - CPI	1.00
		3DWind11 - 180, - CPE, + CPI	1.00
		3DWind12 - 180, - CPE, - CPI	1.00
		3DWind13 - 270, + CPE, + CPI	1.00
		3DWind14 - 270, + CPE, - CPI	1.00
		3DWind15 - 270, - CPE, + CPI	1.00
		3DWind16 - 270, - CPE, - CPI	1.00
		3DWind17 - 90, +/- Cpe, + CPE, + CPI	1.00
		3DWind18 - 90, -/+ Cpe, + CPE, + CPI	1.00
		3DWind19 - 90, +/- Cpe, + CPE, - CPI	1.00
		3DWind20 - 90, -/+ Cpe, + CPE, - CPI	1.00
		3DWind21 - 90, +/- Cpe, - CPE, + CPI	1.00
		3DWind22 - 90, -/+ Cpe, - CPE, + CPI	1.00
		3DWind23 - 90, +/- Cpe, - CPE, - CPI	1.00
		3DWind24 - 90, -/+ Cpe, - CPE, - CPI	1.00
		3DWind25 - 270, +/- Cpe, + CPE, + CPI	1.00
		3DWind26 - 270, -/+ Cpe, + CPE, + CPI	1.00
		3DWind27 - 270, +/- Cpe, + CPE, - CPI	1.00
		3DWind28 - 270, -/+ Cpe, + CPE, - CPI	1.00
		3DWind29 - 270, +/- Cpe, - CPE, + CPI	1.00
		3DWind30 - 270, -/+ Cpe, - CPE, + CPI	1.00
		3DWind31 - 270, +/- Cpe, - CPE, - CPI	1.00
		3DWind32 - 270, -/+ Cpe, - CPE, - CPI	1.00
BGT-kar	EN-SLS Characteristic	BG101 - Self weight	1.00
		BG102 - Deadloads	1.00
		BG111 - Snow a	1.00
		BG112 - Snow b1	1.00
		BG113 - Snow b2	1.00
		BG121 - Piping	1.00
		BG122 - Cabletrays	1.00
		BG123 - Reserve	1.00
		BG131 - Crane pos 1	1.00
		BG132 - Crane pos 2	1.00
		BG133 - Crane pos 3	1.00
		BG134 - Crane pos 4	1.00
		BG135 - Crane pos 5	1.00
		BG136 - Crane pos 6	1.00
		BG137 - Crane pos 7	1.00
		BG138 - Crane pos 8	1.00
		BG139 - Crane pos 9	1.00
		BG140 - Crane pos 10	1.00
		BG141 - Crane pos 11	1.00
		BG142 - Crane pos 12	1.00
		BG151 - Piping testload	1.00

Name	Type	Load cases	Coeff. [-]
		BG152 - Piping testload	1.00
		3DWind1 - 0, + CPE, + CPI	1.00
		3DWind2 - 0, + CPE, - CPI	1.00
		3DWind3 - 0, - CPE, + CPI	1.00
		3DWind4 - 0, - CPE, - CPI	1.00
		3DWind5 - 90, + CPE, + CPI	1.00
		3DWind6 - 90, + CPE, - CPI	1.00
		3DWind7 - 90, - CPE, + CPI	1.00
		3DWind8 - 90, - CPE, - CPI	1.00
		3DWind9 - 180, + CPE, + CPI	1.00
		3DWind10 - 180, + CPE, - CPI	1.00
		3DWind11 - 180, - CPE, + CPI	1.00
		3DWind12 - 180, - CPE, - CPI	1.00
		3DWind13 - 270, + CPE, + CPI	1.00
		3DWind14 - 270, + CPE, - CPI	1.00
		3DWind15 - 270, - CPE, + CPI	1.00
		3DWind16 - 270, - CPE, - CPI	1.00
		3DWind17 - 90, +/- Cpe, + CPE, + CPI	1.00
		3DWind18 - 90, -/+ Cpe, + CPE, + CPI	1.00
		3DWind19 - 90, +/- Cpe, + CPE, - CPI	1.00
		3DWind20 - 90, -/+ Cpe, + CPE, - CPI	1.00
		3DWind21 - 90, +/- Cpe, - CPE, + CPI	1.00
		3DWind22 - 90, -/+ Cpe, - CPE, + CPI	1.00
		3DWind23 - 90, +/- Cpe, - CPE, - CPI	1.00
		3DWind24 - 90, -/+ Cpe, - CPE, - CPI	1.00
		3DWind25 - 270, +/- Cpe, + CPE, + CPI	1.00
		3DWind26 - 270, -/+ Cpe, + CPE, + CPI	1.00
		3DWind27 - 270, +/- Cpe, + CPE, - CPI	1.00
		3DWind28 - 270, -/+ Cpe, + CPE, - CPI	1.00
		3DWind29 - 270, +/- Cpe, - CPE, + CPI	1.00
		3DWind30 - 270, -/+ Cpe, - CPE, + CPI	1.00
		3DWind31 - 270, +/- Cpe, - CPE, - CPI	1.00
		3DWind32 - 270, -/+ Cpe, - CPE, - CPI	1.00
BGT-quasi	EN-SLS Quasi-permanent	BG101 - Self weight	1.00
		BG102 - Deadloads	1.00
		BG111 - Snow a	1.00
		BG112 - Snow b1	1.00
		BG113 - Snow b2	1.00
		BG121 - Piping	1.00
		BG122 - Cabletrays	1.00
		BG123 - Reserve	1.00
		BG131 - Crane pos 1	1.00
		BG132 - Crane pos 2	1.00
		BG133 - Crane pos 3	1.00
		BG134 - Crane pos 4	1.00
		BG135 - Crane pos 5	1.00
		BG136 - Crane pos 6	1.00
		BG137 - Crane pos 7	1.00
		BG138 - Crane pos 8	1.00
		BG139 - Crane pos 9	1.00
		BG140 - Crane pos 10	1.00
		BG141 - Crane pos 11	1.00
		BG142 - Crane pos 12	1.00
		BG151 - Piping testload	1.00
		BG152 - Piping testload	1.00
		3DWind1 - 0, + CPE, + CPI	1.00
		3DWind2 - 0, + CPE, - CPI	1.00
		3DWind3 - 0, - CPE, + CPI	1.00
		3DWind4 - 0, - CPE, - CPI	1.00
		3DWind5 - 90, + CPE, + CPI	1.00
		3DWind6 - 90, + CPE, - CPI	1.00
		3DWind7 - 90, - CPE, + CPI	1.00
		3DWind8 - 90, - CPE, - CPI	1.00
		3DWind9 - 180, + CPE, + CPI	1.00
		3DWind10 - 180, + CPE, - CPI	1.00
		3DWind11 - 180, - CPE, + CPI	1.00
		3DWind12 - 180, - CPE, - CPI	1.00

Name	Type	Load cases	Coeff. [-]
		3DWind13 - 270, + CPE, + CPI	1.00
		3DWind14 - 270, + CPE, - CPI	1.00
		3DWind15 - 270, - CPE, + CPI	1.00
		3DWind16 - 270, - CPE, - CPI	1.00
		3DWind17 - 90, +/- Cpe, + CPE, + CPI	1.00
		3DWind18 - 90, -/+ Cpe, + CPE, + CPI	1.00
		3DWind19 - 90, +/- Cpe, + CPE, - CPI	1.00
		3DWind20 - 90, -/+ Cpe, + CPE, - CPI	1.00
		3DWind21 - 90, +/- Cpe, - CPE, + CPI	1.00
		3DWind22 - 90, -/+ Cpe, - CPE, + CPI	1.00
		3DWind23 - 90, +/- Cpe, - CPE, - CPI	1.00
		3DWind24 - 90, -/+ Cpe, - CPE, - CPI	1.00
		3DWind25 - 270, +/- Cpe, + CPE, + CPI	1.00
		3DWind26 - 270, -/+ Cpe, + CPE, + CPI	1.00
		3DWind27 - 270, +/- Cpe, + CPE, - CPI	1.00
		3DWind28 - 270, -/+ Cpe, + CPE, - CPI	1.00
		3DWind29 - 270, +/- Cpe, - CPE, + CPI	1.00
		3DWind30 - 270, -/+ Cpe, - CPE, + CPI	1.00
		3DWind31 - 270, +/- Cpe, - CPE, - CPI	1.00
		3DWind32 - 270, -/+ Cpe, - CPE, - CPI	1.00

3.6. Result classes

Name	List
GEO	UGT-Set B - EN-ULS (STR/GEO) Set B
Alle UGT	UGT-Set B - EN-ULS (STR/GEO) Set B
Alle BGT	BGT-kar - EN-SLS Characteristic BGT-quasi - EN-SLS Quasi-permanent
Alle UGT+BGT	UGT-Set B - EN-ULS (STR/GEO) Set B BGT-kar - EN-SLS Characteristic BGT-quasi - EN-SLS Quasi-permanent
RK_NC_UGT-Set B	
RK_NC_BGT-kar	

4. Calculation protocol

Linear calculation

Number of 2D elements	0
Number of 1D elements	958
Number of mesh nodes	738
Number of equations	4428
Bending theory	Mindlin
Load cases	BG101, BG102, BG111, BG112, BG113, BG121, BG122, BG123, BG131, BG132, BG133, BG134, BG135, BG136, BG137, BG138, BG139, BG140, BG141, BG142, BG151, BG152, 3DWind1, 3DWind2, 3DWind3, 3DWind4, 3DWind5, 3DWind6, 3DWind7, 3DWind8, 3DWind9, 3DWind10, 3DWind11, 3DWind12, 3DWind13, 3DWind14, 3DWind15, 3DWind16, 3DWind17, 3DWind18, 3DWind19, 3DWind20, 3DWind21, 3DWind22, 3DWind23, 3DWind24, 3DWind25, 3DWind26, 3DWind27, 3DWind28, 3DWind29, 3DWind30, 3DWind31, 3DWind32
Start of calculation	14.10.2022 12:42
End of calculation	14.10.2022 12:43

Sum of loads and reactions

Load case	Value	X [kN]	Y [kN]	Z [kN]
BG101	loads	0.00	0.00	-1345.56
	reaction in nodes	0.00	0.00	1345.56
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG102	loads	0.00	0.00	-958.17
	reaction in nodes	0.00	0.00	958.17
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG111	loads	0.00	0.00	-403.20
	reaction in nodes	0.00	0.00	403.20
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG112	loads	0.00	0.00	-302.40
	reaction in nodes	0.00	0.00	302.40
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG113	loads	0.00	0.00	-302.40
	reaction in nodes	0.00	0.00	302.40
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG121	loads	75.00	4.00	-90.00
	reaction in nodes	-75.00	-4.00	90.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG122	loads	0.00	0.00	-514.15
	reaction in nodes	0.00	0.00	514.15
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG123	loads	40.00	0.00	-260.00
	reaction in nodes	-40.00	0.00	260.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG131	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92

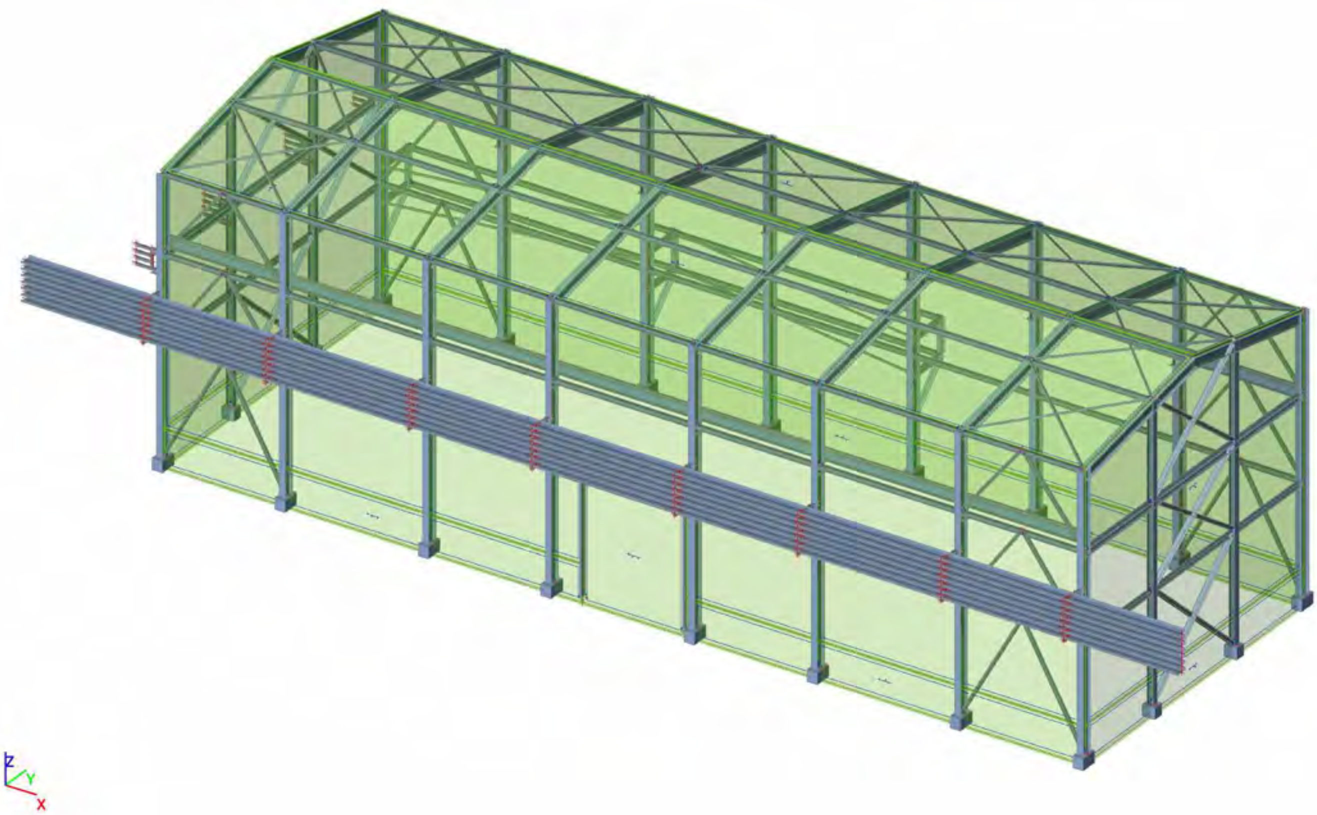
Load case	Value	X [kN]	Y [kN]	Z [kN]
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG132	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG133	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG134	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG135	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG136	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG137	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG138	loads	-30.00	30.00	-502.92
	reaction in nodes	30.00	-30.00	502.92
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG139	loads	-30.00	-30.00	-507.08
	reaction in nodes	30.00	30.00	507.08
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG140	loads	-30.00	-30.00	-507.08
	reaction in nodes	30.00	30.00	507.08
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG141	loads	-30.00	-30.00	-507.08
	reaction in nodes	30.00	30.00	507.08
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG142	loads	-30.00	-30.00	-507.08
	reaction in nodes	30.00	30.00	507.08
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG151	loads	0.00	0.00	-360.00
	reaction in nodes	0.00	0.00	360.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG152	loads	0.00	0.00	-60.00
	reaction in nodes	0.00	0.00	60.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00

Load case	Value	X [kN]	Y [kN]	Z [kN]
	contact 2D	0.00	0.00	0.00
3DWind1	loads	288.74	41.96	550.63
	reaction in nodes	-288.74	-41.96	-550.63
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind2	loads	288.74	13.42	199.32
	reaction in nodes	-288.74	-13.42	-199.32
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind3	loads	288.74	41.96	550.63
	reaction in nodes	-288.74	-41.96	-550.63
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind4	loads	288.74	13.42	199.32
	reaction in nodes	-288.74	-13.42	-199.32
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind5	loads	-10.61	797.19	193.48
	reaction in nodes	10.61	-797.19	-193.48
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind6	loads	-10.61	768.65	-157.82
	reaction in nodes	10.61	-768.65	157.82
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind7	loads	-10.61	767.87	587.06
	reaction in nodes	10.61	-767.87	-587.06
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind8	loads	-10.61	739.33	235.76
	reaction in nodes	10.61	-739.33	-235.76
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind9	loads	-288.74	41.96	550.63
	reaction in nodes	288.74	-41.96	-550.63
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind10	loads	-288.74	13.42	199.32
	reaction in nodes	288.74	-13.42	-199.32
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind11	loads	-288.74	41.96	550.63
	reaction in nodes	288.74	-41.96	-550.63
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind12	loads	-288.74	13.42	199.32
	reaction in nodes	288.74	-13.42	-199.32
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind13	loads	0.00	-791.49	193.48
	reaction in nodes	0.00	791.49	-193.48
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind14	loads	0.00	-820.03	-157.82

Load case	Value	X [kN]	Y [kN]	Z [kN]
	reaction in nodes	0.00	820.03	157.82
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind15	loads	0.00	-762.16	587.06
	reaction in nodes	0.00	762.16	-587.06
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind16	loads	0.00	-790.71	235.76
	reaction in nodes	0.00	790.71	-235.76
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind17	loads	-10.61	820.66	314.60
	reaction in nodes	10.61	-820.66	-314.60
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind18	loads	-10.61	744.41	465.94
	reaction in nodes	10.61	-744.41	-465.94
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind19	loads	-10.61	792.12	-36.70
	reaction in nodes	10.61	-792.12	36.70
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind20	loads	-10.61	715.86	114.64
	reaction in nodes	10.61	-715.86	-114.64
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind21	loads	-10.61	820.66	314.60
	reaction in nodes	10.61	-820.66	-314.60
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind22	loads	-10.61	744.41	465.94
	reaction in nodes	10.61	-744.41	-465.94
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind23	loads	-10.61	792.12	-36.70
	reaction in nodes	10.61	-792.12	36.70
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind24	loads	-10.61	715.86	114.64
	reaction in nodes	10.61	-715.86	-114.64
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind25	loads	0.00	-814.95	314.60
	reaction in nodes	0.00	814.95	-314.60
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind26	loads	0.00	-738.70	465.94
	reaction in nodes	0.00	738.70	-465.94
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind27	loads	0.00	-843.50	-36.70
	reaction in nodes	0.00	843.50	36.70
	reaction on lines	0.00	0.00	0.00

Load case	Value	X [kN]	Y [kN]	Z [kN]
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind28	loads	0.00	-767.24	114.64
	reaction in nodes	0.00	767.24	-114.64
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind29	loads	0.00	-814.95	314.60
	reaction in nodes	0.00	814.95	-314.60
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind30	loads	0.00	-738.70	465.94
	reaction in nodes	0.00	738.70	-465.94
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind31	loads	0.00	-843.50	-36.70
	reaction in nodes	0.00	843.50	36.70
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
3DWind32	loads	0.00	-767.24	114.64
	reaction in nodes	0.00	767.24	-114.64
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00

Annex D.2.
Export Scia Results



1. Table of contents

2. Results

2.1. Deformation

2.1.1. Displacement of nodes

2.1.1.1. Displacement of nodes

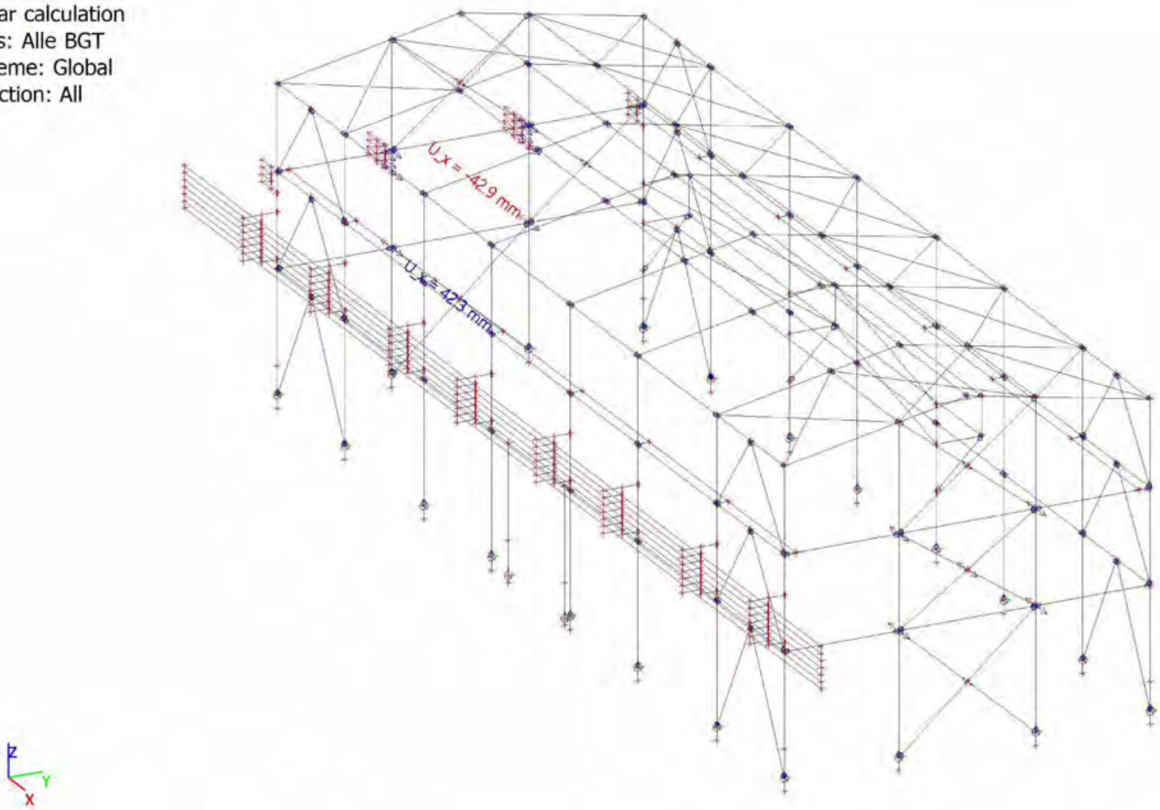
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All

Name	Case	U_x [mm]	U_y [mm]	U_z [mm]	Φ_x [mrad]	Φ_y [mrad]	Φ_z [mrad]	U_{total} [mm]
K96	BGT-kar/1	**-42.9**	-1.5	-0.1	0.2	-3.3	-1.3	**43.0**
K95	BGT-kar/2	**42.3**	0.0	-0.2	0.1	3.1	-1.1	42.3
K63	BGT-kar/3	0.5	**-31.2**	-0.4	0.5	-0.2	0.4	31.2
K70	BGT-kar/4	0.2	**32.4**	-0.5	-0.5	0.0	-0.2	32.4
K28	BGT-kar/5	0.1	-1.4	**-18.2**	-0.2	0.1	0.1	18.2
K328	BGT-kar/6	-36.1	3.1	**6.3**	-1.2	4.3	1.6	36.7
K85	BGT-kar/7	0.0	0.0	0.0	**-9.6**	-0.1	0.0	0.0
K85	BGT-kar/8	0.0	0.0	0.0	**7.7**	0.1	0.0	0.0
K123	BGT-kar/9	-5.1	23.3	-3.1	0.6	**-45.8**	**8.1**	24.0
K617	BGT-kar/10	-0.4	0.3	0.0	0.0	**59.8**	-0.2	0.5
K120	BGT-kar/9	5.3	23.1	-4.3	0.6	46.2	**-8.2**	24.1

Name	Combination key
BGT-kar/1	BG101 + BG102 + BG122 + BG138 + 3DWind15
BGT-kar/2	BG101 + BG102 + BG121 + BG122 + BG123 + BG140 + 3DWind2
BGT-kar/3	BG101 + BG102 + BG122 + BG123 + BG142 + 3DWind25
BGT-kar/4	BG101 + BG102 + BG123 + BG134 + BG151 + 3DWind17
BGT-kar/5	BG101 + BG102 + BG111 + BG122 + BG123 + BG142 + BG151
BGT-kar/6	BG101 + BG102 + BG123 + BG138 + BG151 + 3DWind17
BGT-kar/7	BG101 + BG102 + BG135 + BG151 + 3DWind8
BGT-kar/8	BG101 + BG102 + BG122 + BG123 + BG140 + 3DWind13
BGT-kar/9	BG101 + BG102 + BG123 + BG134 + BG151 + 3DWind19
BGT-kar/10	BG101 + BG102 + BG122 + BG123 + BG131 + 3DWind27

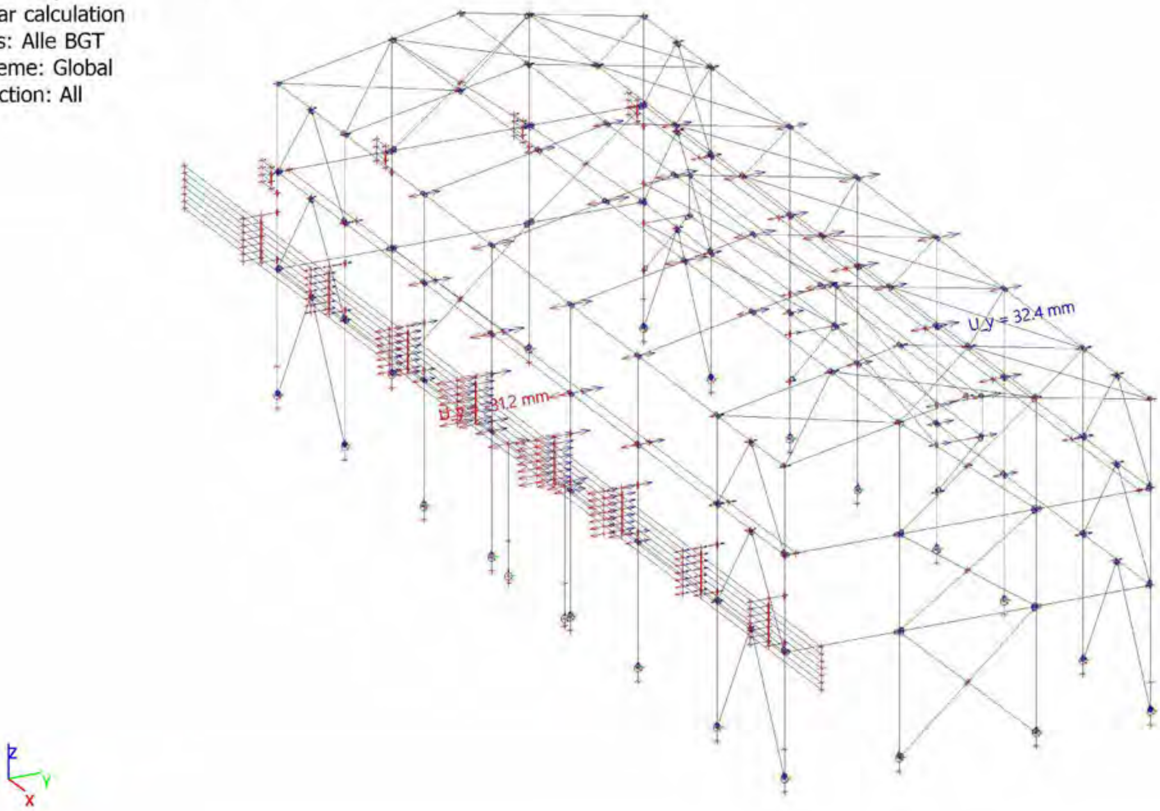
2.1.1.2. Resultaten - U_x

Values: **U_x**
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



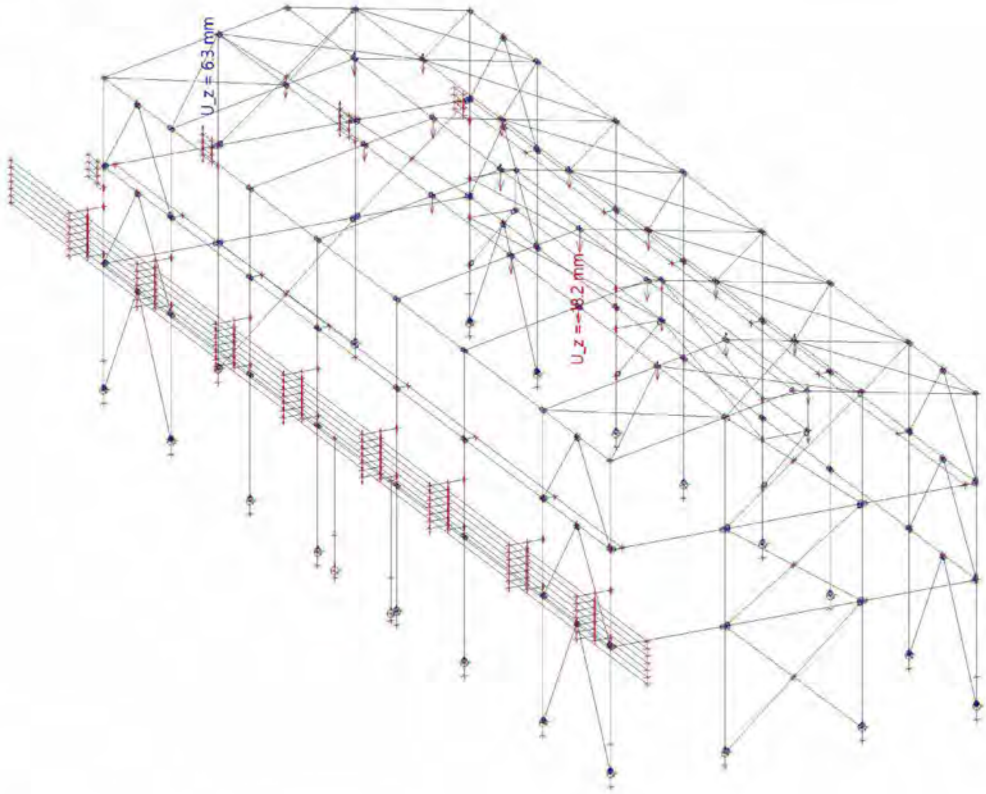
2.1.1.3. Resultaten - U_y

Values: **U_y**
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



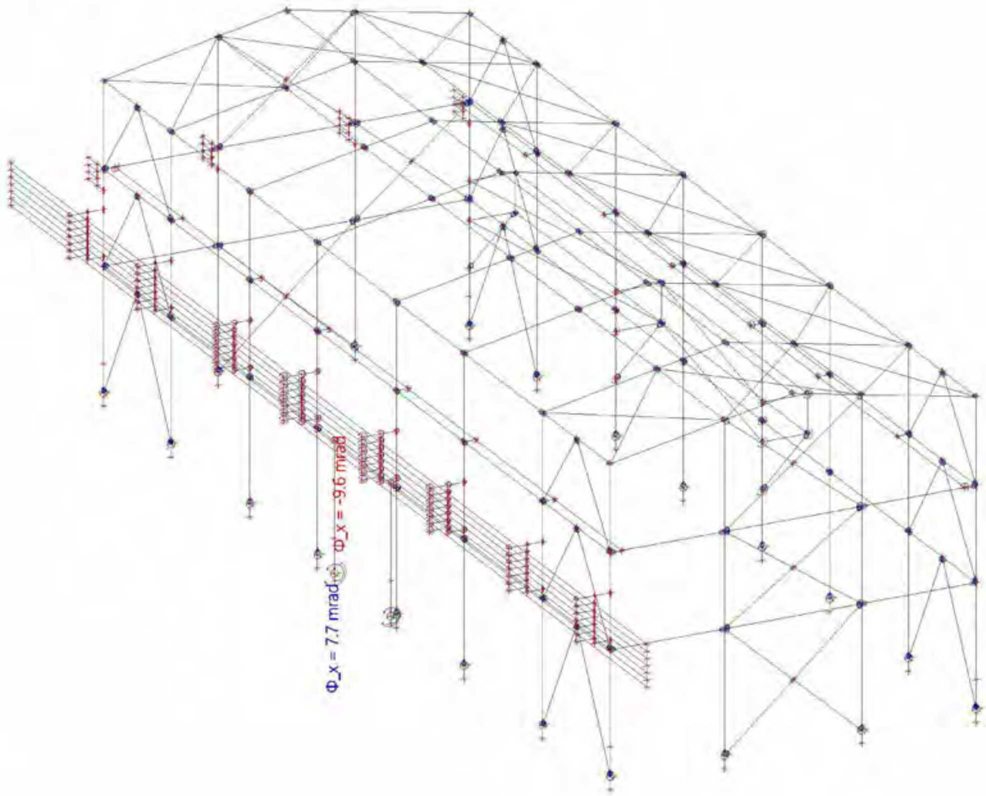
2.1.1.4. Resultaten - U_z

Values: **U_z**
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



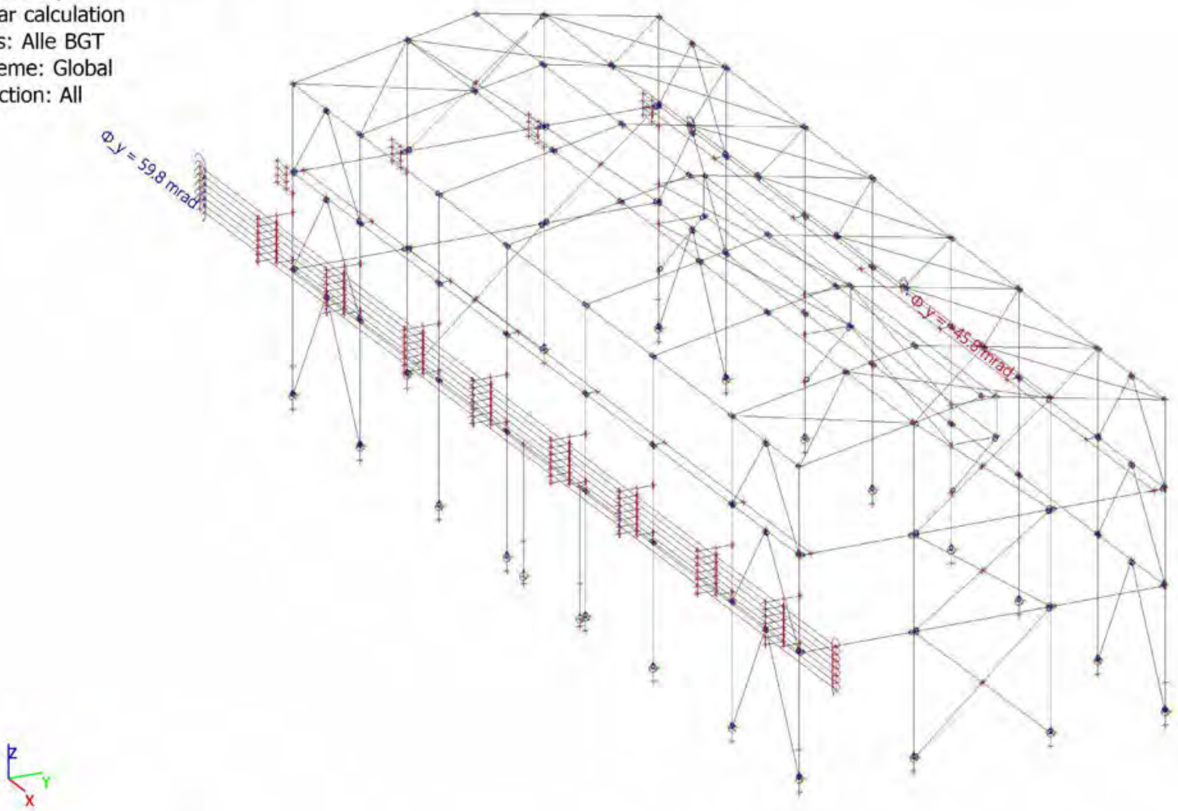
2.1.1.5. Resultaten - Φ_x

Values: **Φ_x**
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



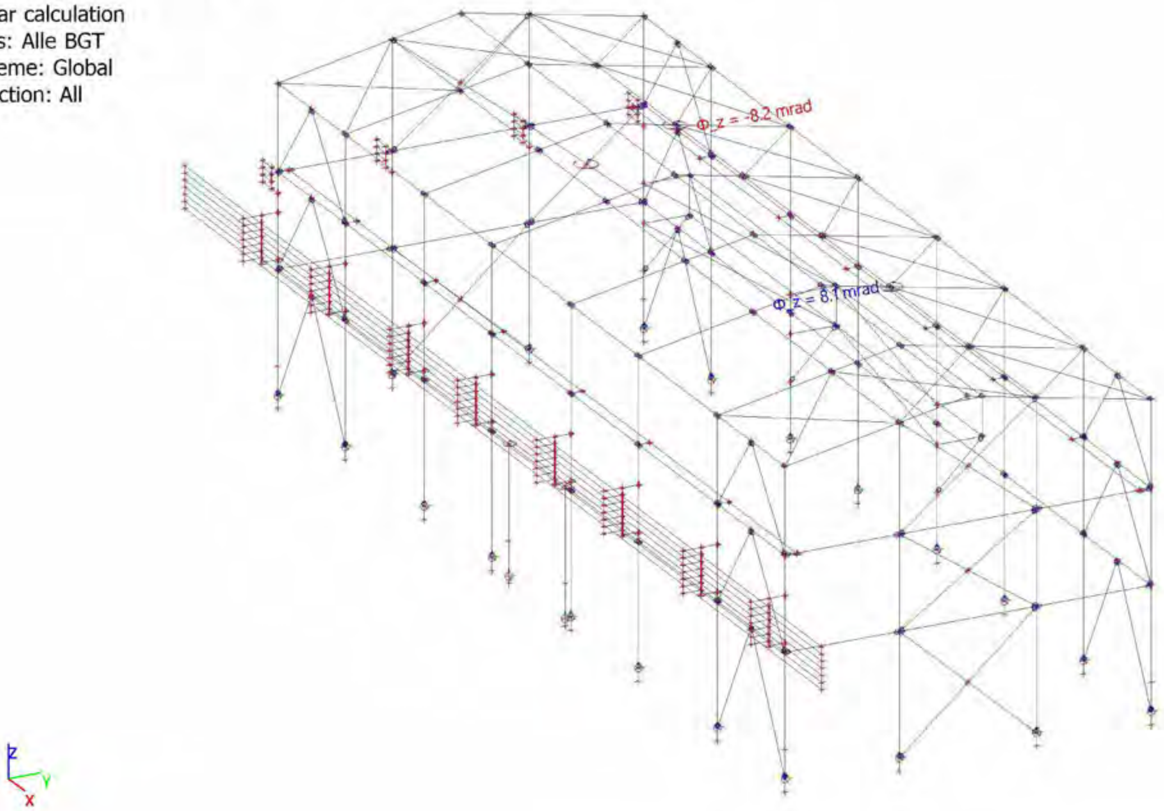
2.1.1.6. Resultaten - Φ_y

Values: Φ_y
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



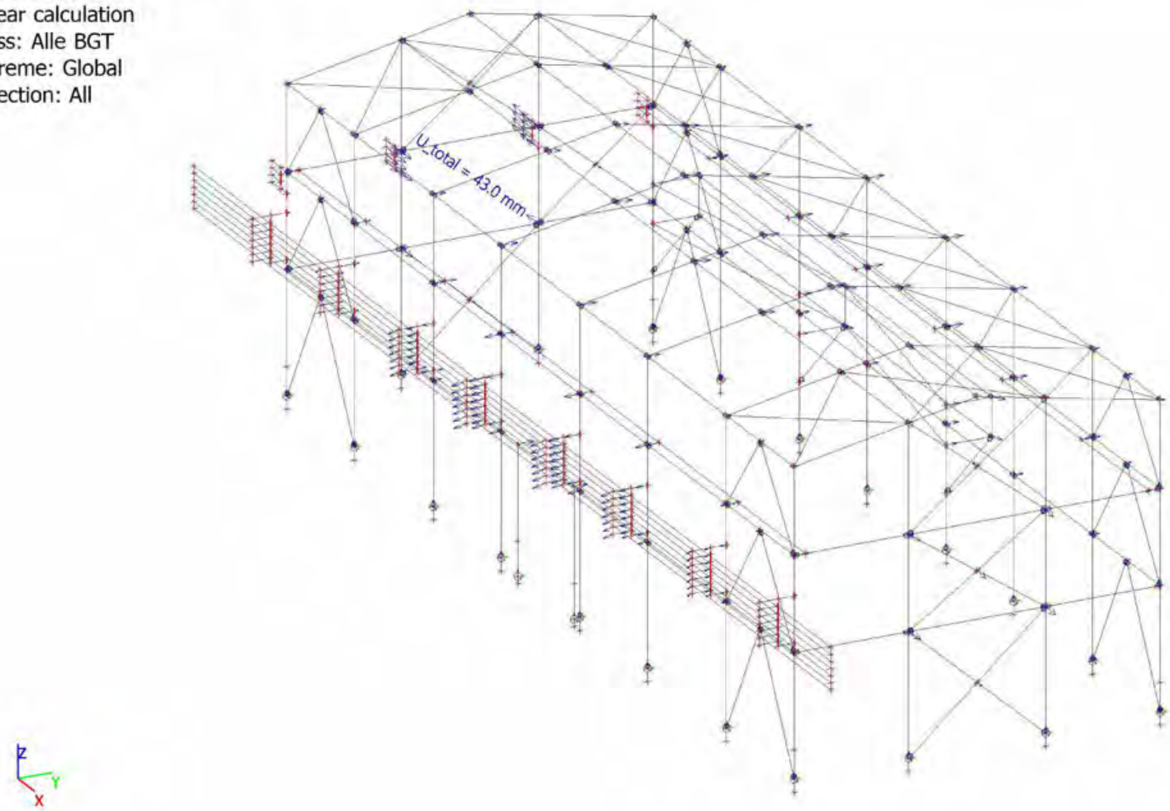
2.1.1.7. Resultaten - Φ_z

Values: Φ_z
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



2.1.1.8. Resultaten - U_total

Values: **U_{total}**
Linear calculation
Class: Alle BGT
Extreme: Global
Selection: All



2.1.2. 3D displacement

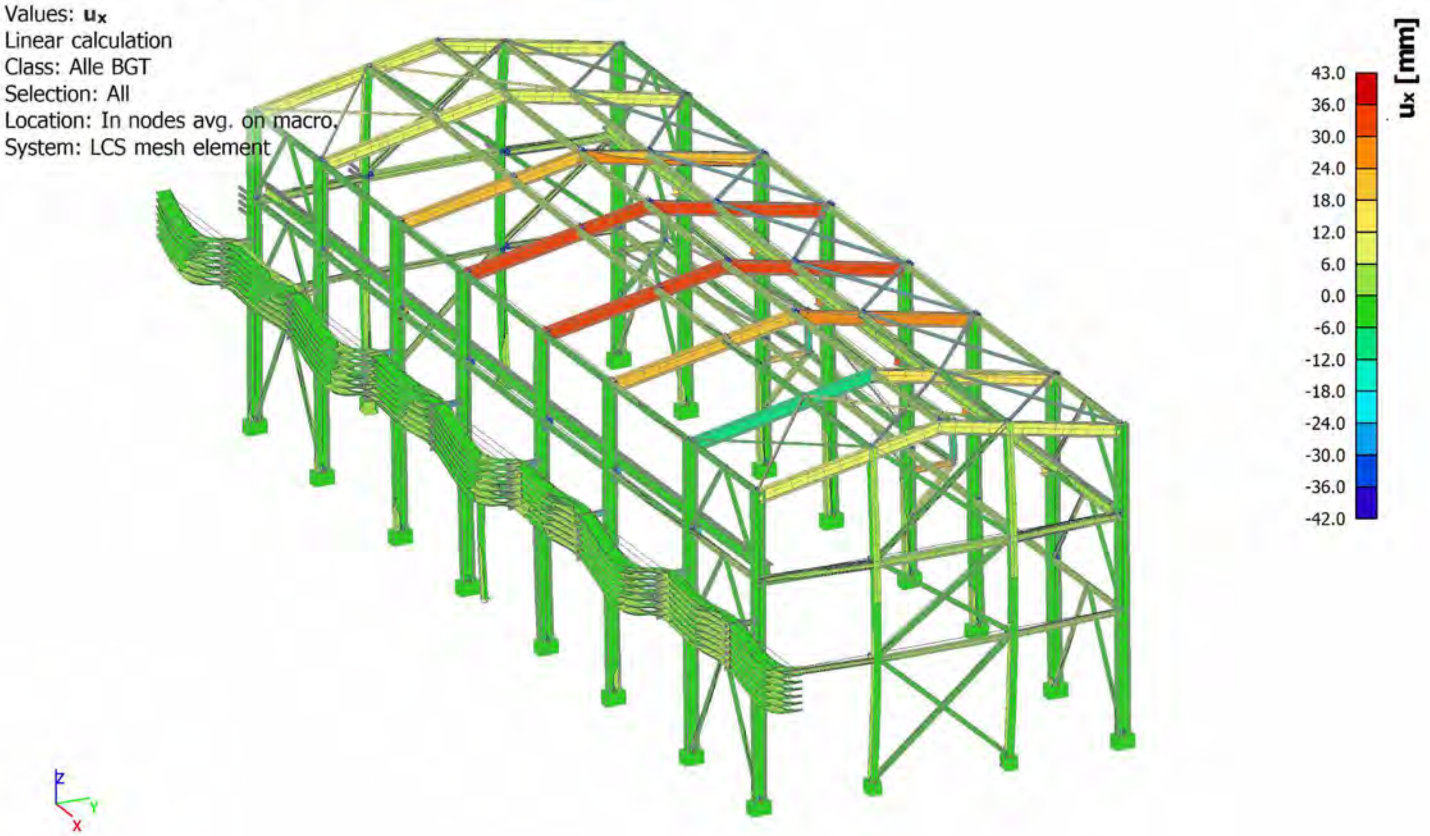
2.1.2.1. 3D displacement

Linear calculation
Class: Alle BGT
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element
Results on 1D member:
Extreme 1D: Global

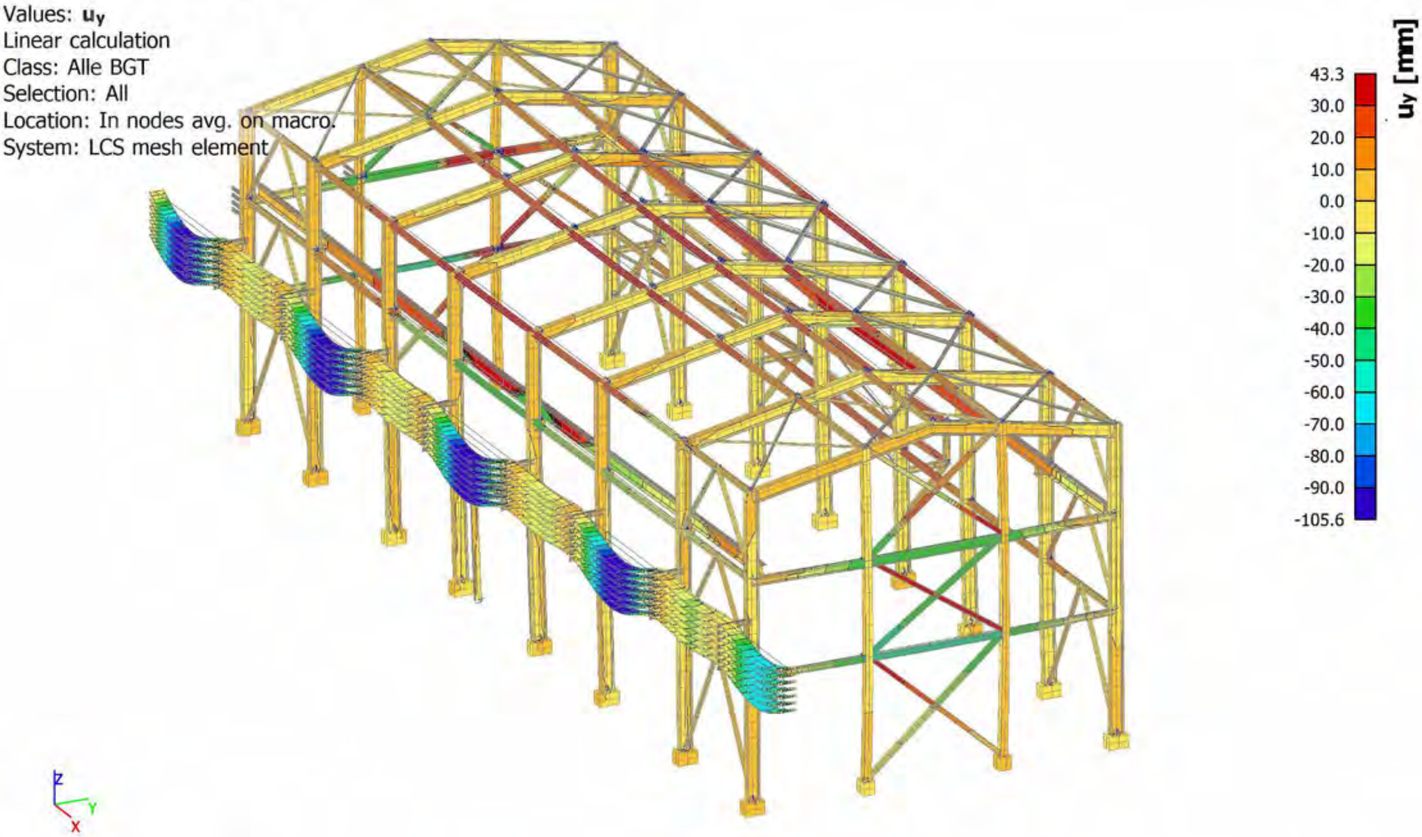
Name	dx [m]	Fibre	Case	u_x [mm]	u_y [mm]	u_z [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U_{total} [mm]
S186	0.000	1	BGT-kar/1	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
S453	28.500+	13	BGT-kar/2	0.1	-104.6	30.8	3.9	-0.2	0.0	**109.0**

Name	Combination key
BGT-kar/1	BG101 + BG102
BGT-kar/2	BG101 + BG102 + BG122 + BG123 + BG142 + 3DWind25

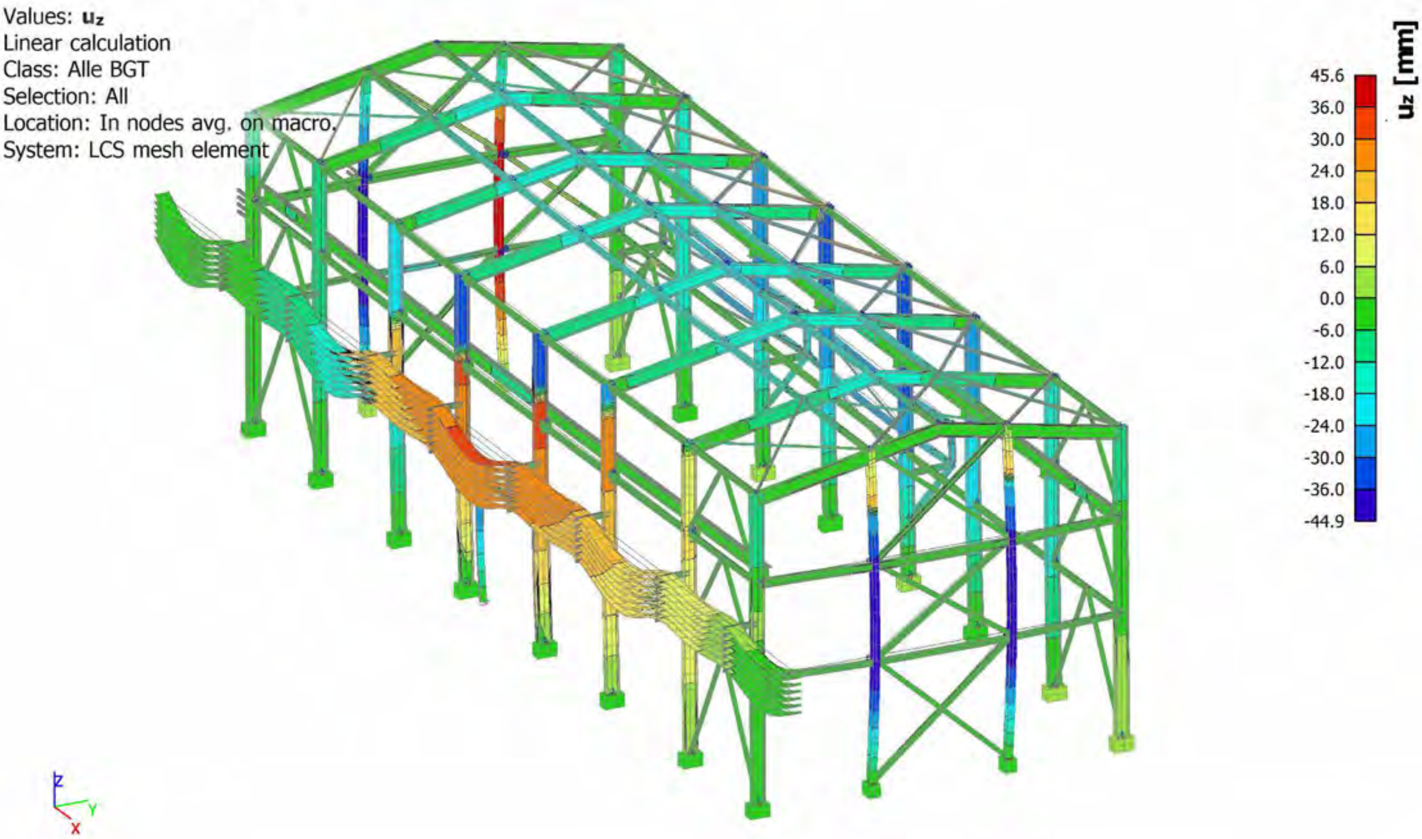
2.1.2.2. Resultaten - u_x



2.1.2.3. Resultaten - u_y

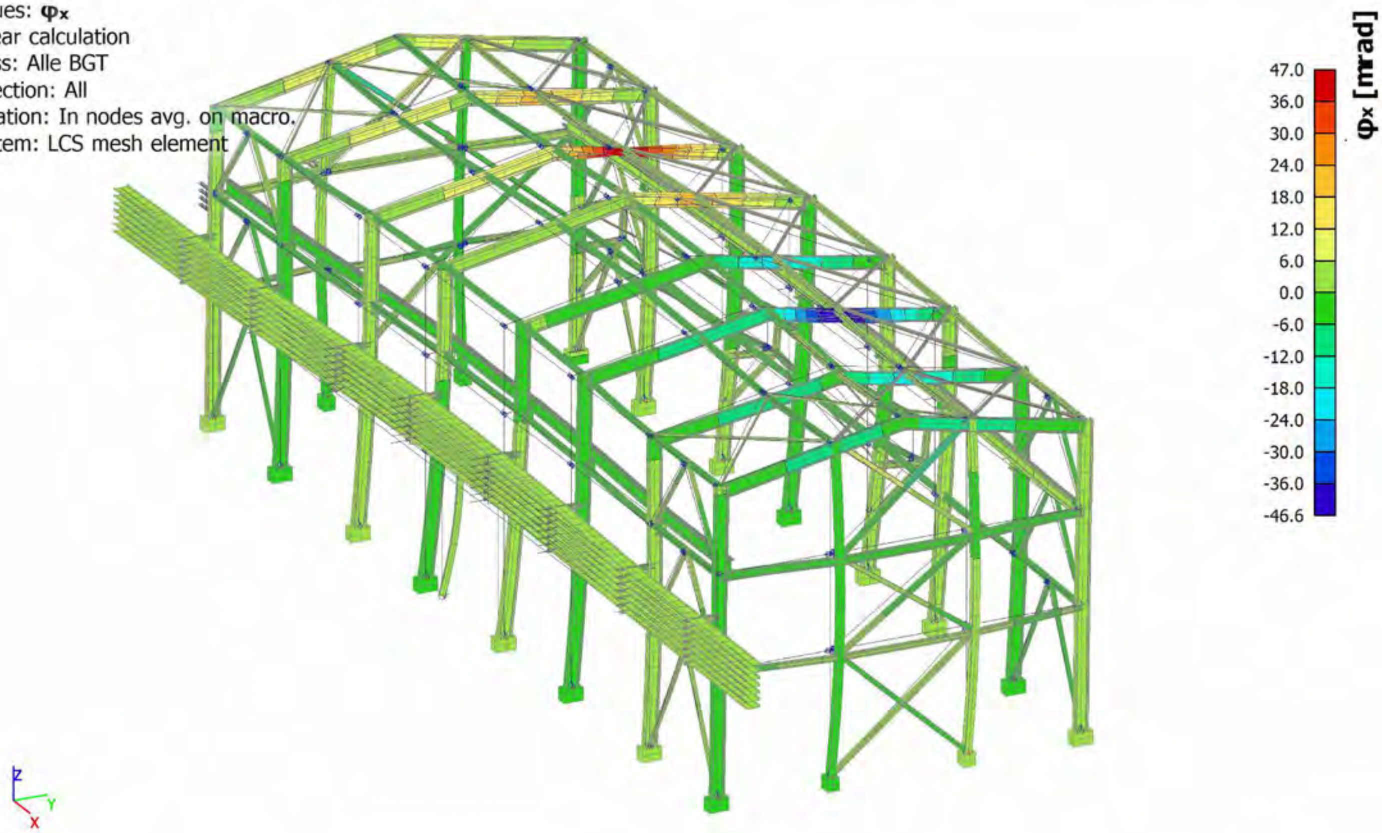


2.1.2.4. Resultaten - u_z



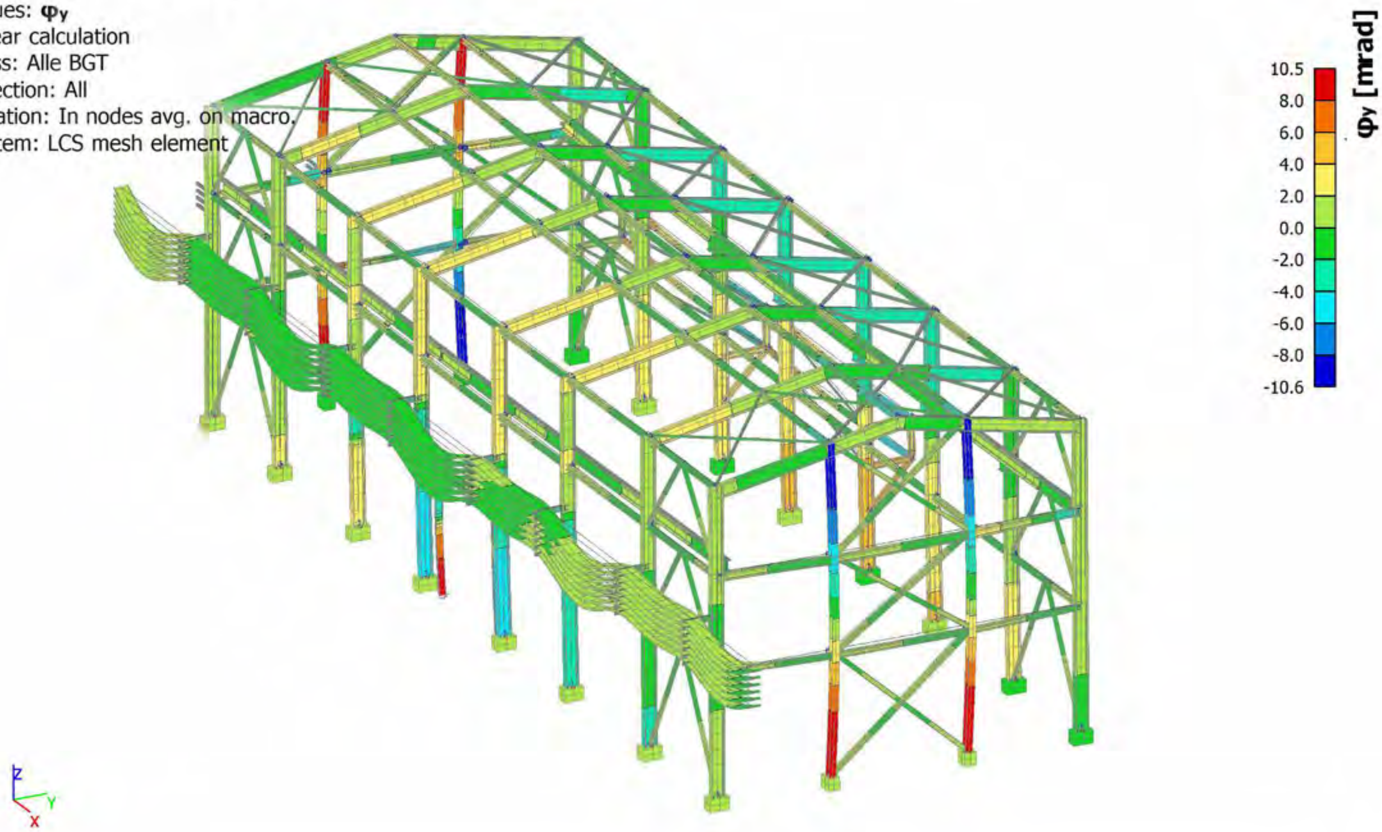
2.1.2.5. Resultaten - φ_x

Values: φ_x
Linear calculation
Class: Alle BGT
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



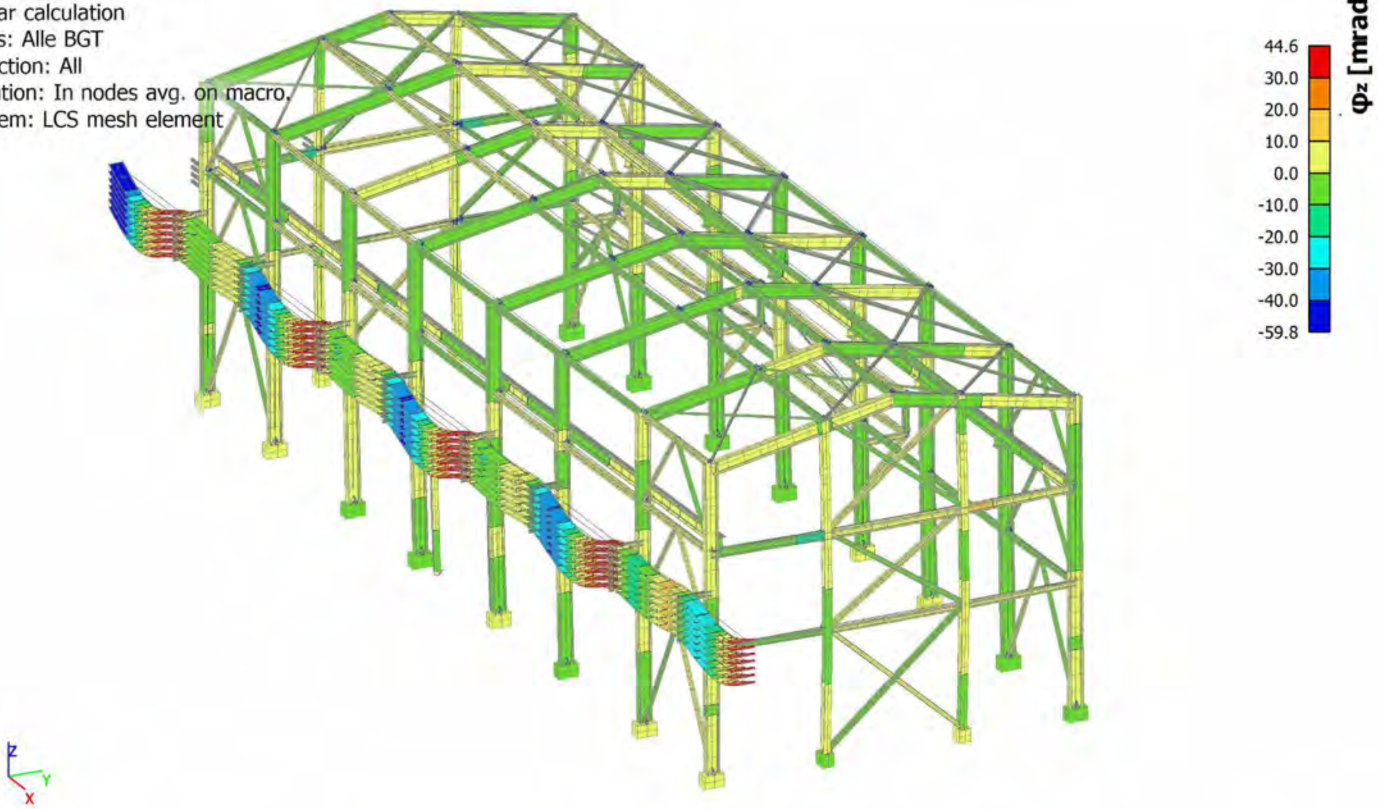
2.1.2.6. Resultaten - φ_y

Values: φ_y
Linear calculation
Class: Alle BGT
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



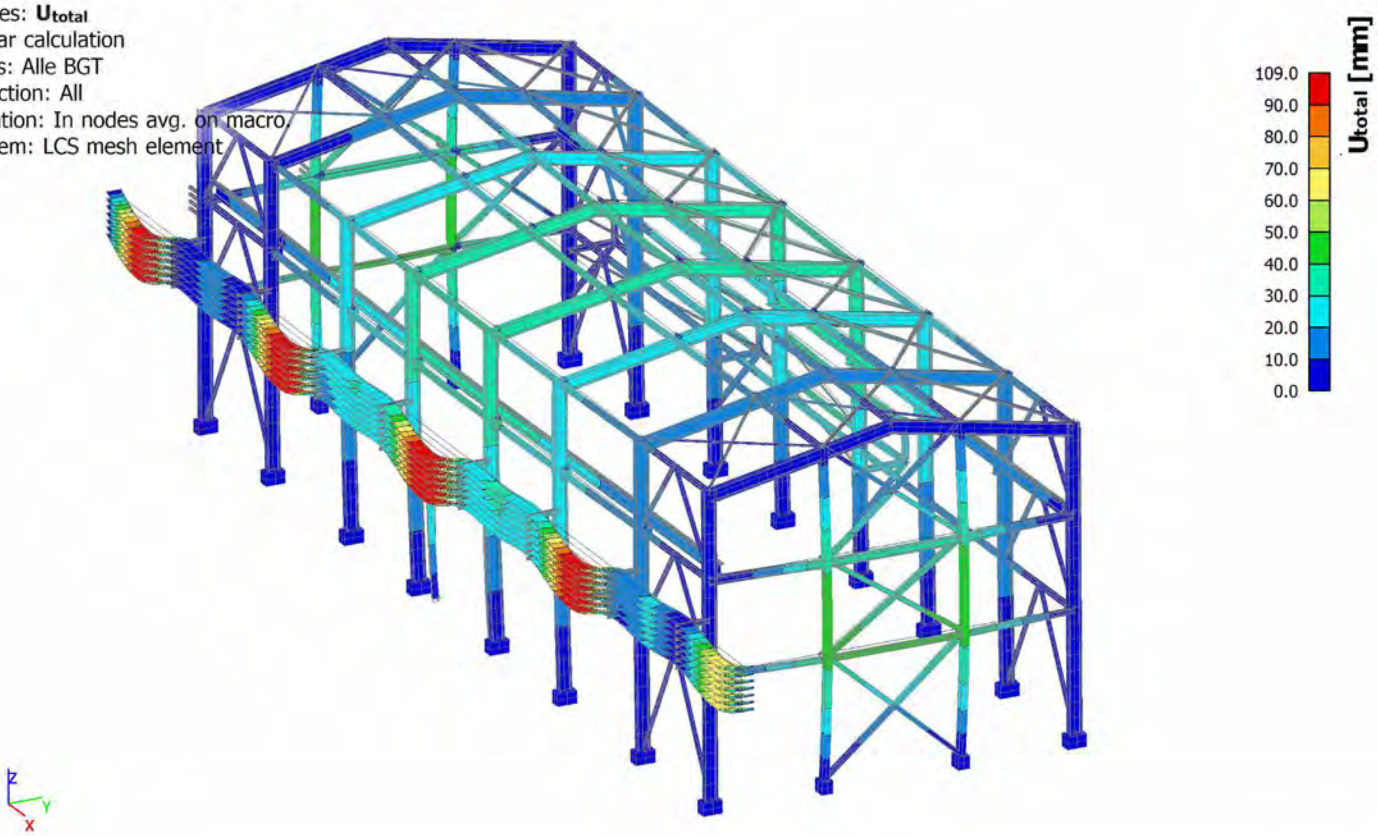
2.1.2.7. Resultaten - φ_z

Values: φ_z
Linear calculation
Class: Alle BGT
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



2.1.2.8. Resultaten - U_total

Values: U_{total}
Linear calculation
Class: Alle BGT
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



2.1.3. 1D-Deformation

2.1.3.1. 1D deformations

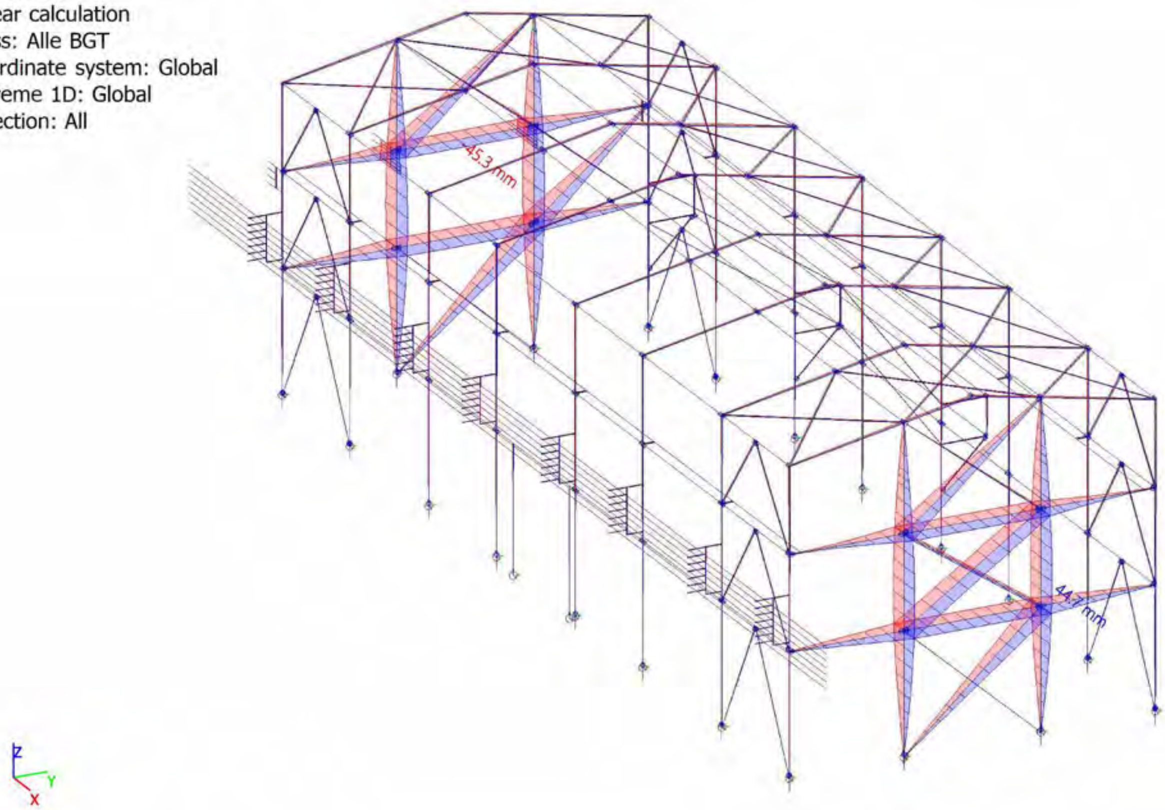
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All
Deformations

Name	dx [m]	Case	u_x [mm]	u_y [mm]	u_z [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U_{total} [mm]
S6	6.952-	BGT-kar/1	**-45.3**	-1.8	-0.1	0.2	0.3	-1.5	45.4
S36	6.718	BGT-kar/2	**44.7**	-3.1	0.6	0.6	0.3	1.5	44.8
S41	22.320-	BGT-kar/3	0.2	**-34.5**	-0.8	0.5	0.1	-0.3	34.5
S41	22.060-	BGT-kar/4	-0.4	**35.5**	-7.6	-1.7	0.4	-0.2	36.3
S381	28.500-	BGT-kar/5	0.1	-22.3	**-104.5**	3.8	0.0	0.1	106.9
S299	0.800	BGT-kar/6	-36.3	3.0	**6.3**	-1.2	4.3	1.6	36.9
S65	0.000	BGT-kar/7	0.0	0.0	0.0	**-9.6**	-0.1	0.0	0.0
S65	0.000	BGT-kar/8	0.0	0.0	0.0	**7.7**	0.1	0.0	0.0
S26	3.056-	BGT-kar/9	7.5	23.4	-3.2	0.6	**-45.8**	8.1	24.8
S381	0.000	BGT-kar/10	0.1	0.3	0.0	0.0	**59.8**	-0.2	0.3
S80	5.000	BGT-kar/11	35.7	0.7	-0.3	2.8	-4.5	**-10.7**	35.7
S43	0.000	BGT-kar/12	36.6	-4.8	0.9	-0.2	-4.8	**10.7**	36.9
S453	28.500+	BGT-kar/3	0.1	-30.5	-103.4	3.9	0.0	-0.2	**107.8**

Name	Combination key
BGT-kar/1	BG101 + BG102 + BG122 + BG138 + 3DWind15
BGT-kar/2	BG101 + BG102 + BG121 + BG122 + BG123 + BG139 + 3DWind15
BGT-kar/3	BG101 + BG102 + BG122 + BG123 + BG142 + 3DWind25
BGT-kar/4	BG101 + BG102 + BG134 + BG151 + 3DWind19
BGT-kar/5	BG101 + BG102 + BG122 + BG123 + BG140 + 3DWind27
BGT-kar/6	BG101 + BG102 + BG123 + BG138 + BG151 + 3DWind17
BGT-kar/7	BG101 + BG102 + BG135 + BG151 + 3DWind8
BGT-kar/8	BG101 + BG102 + BG122 + BG123 + BG140 + 3DWind13
BGT-kar/9	BG101 + BG102 + BG123 + BG134 + BG151 + 3DWind19
BGT-kar/10	BG101 + BG102 + BG122 + BG123 + BG131 + 3DWind27
BGT-kar/11	BG101 + BG102 + BG121 + BG122 + BG131 + 3DWind2
BGT-kar/12	BG101 + BG102 + BG122 + BG142 + 3DWind25

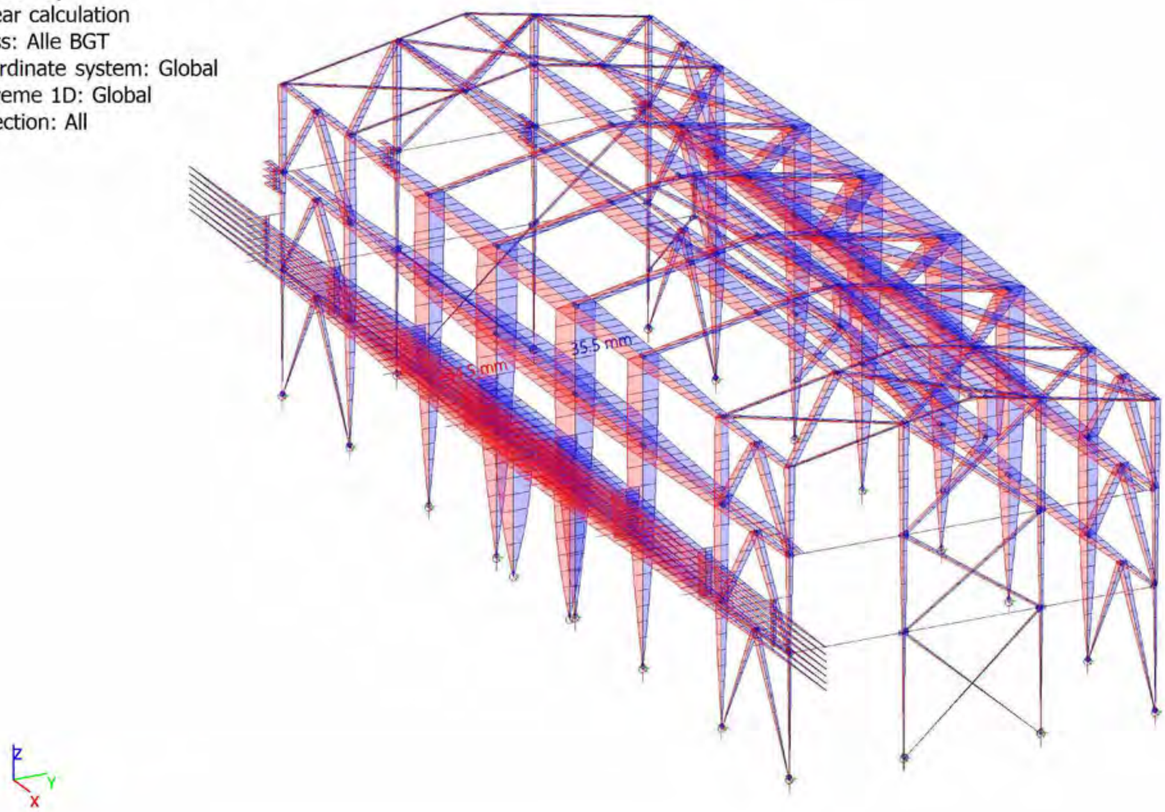
2.1.3.2. Resultaten - u_x

Values: u_x
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



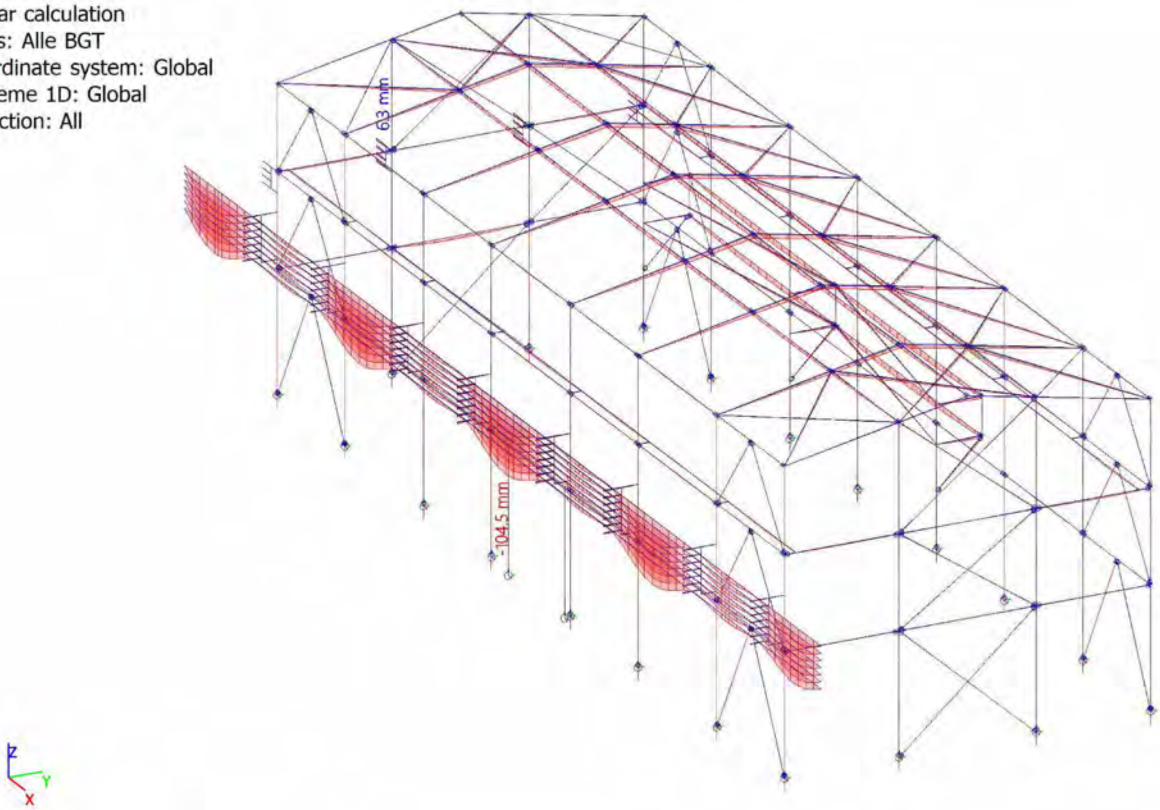
2.1.3.3. Resultaten - u_y

Values: u_y
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



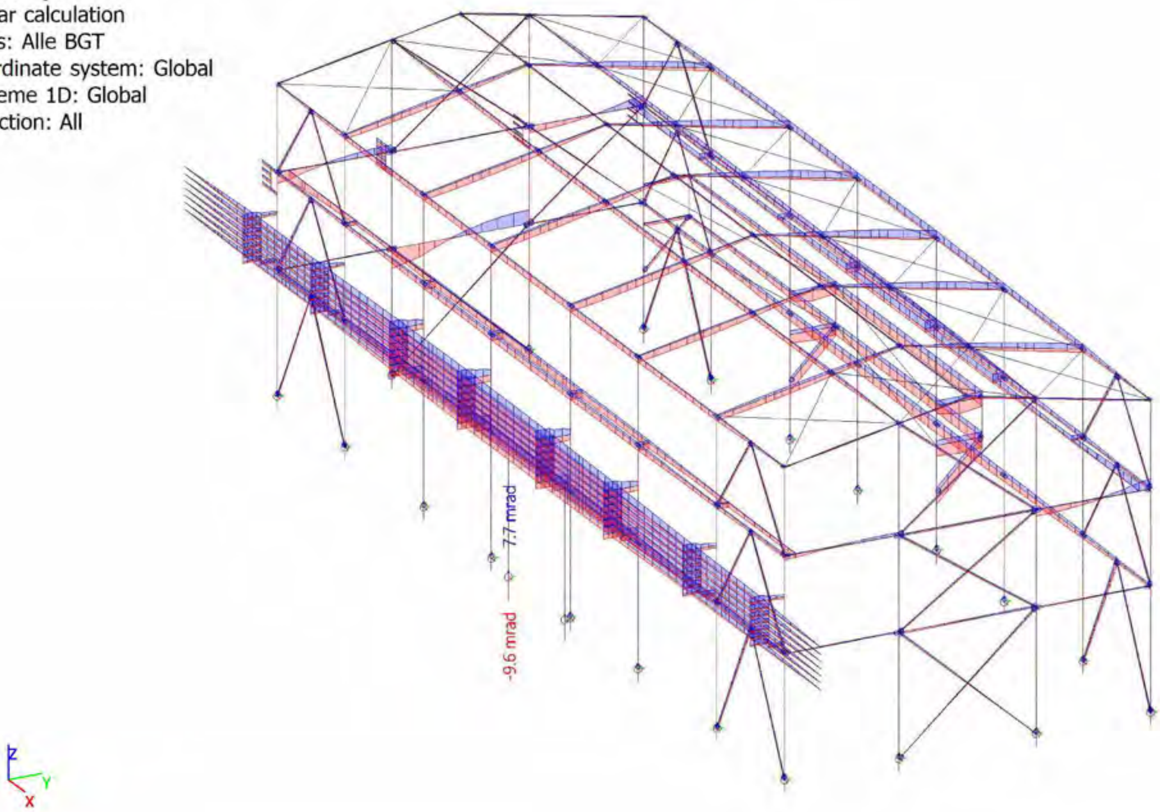
2.1.3.4. Resultaten - u_z

Values: $\mathbf{u_z}$
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



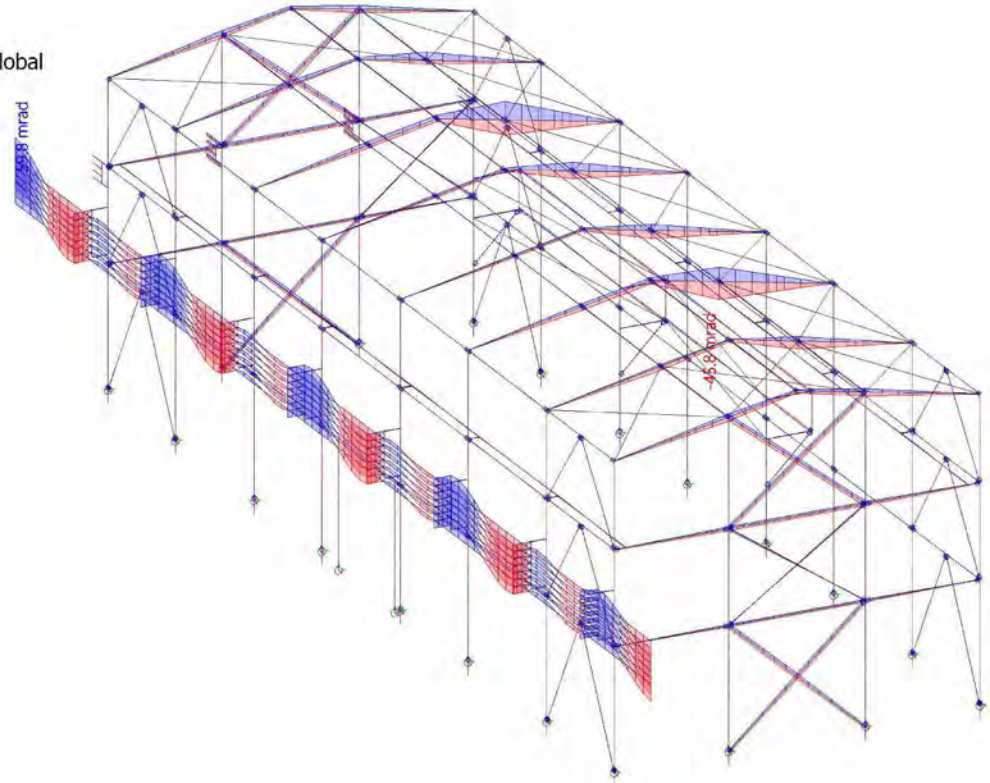
2.1.3.5. Resultaten - φ_x

Values: $\boldsymbol{\varphi_x}$
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



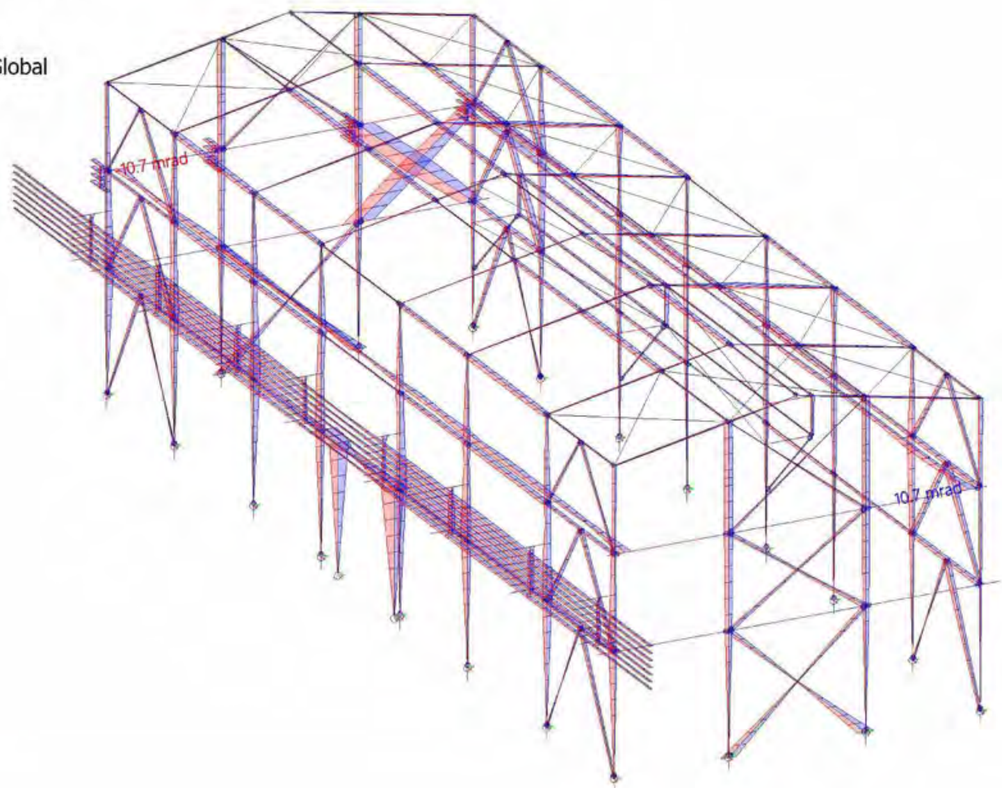
2.1.3.6. Resultaten - φ_y

Values: **φy**
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



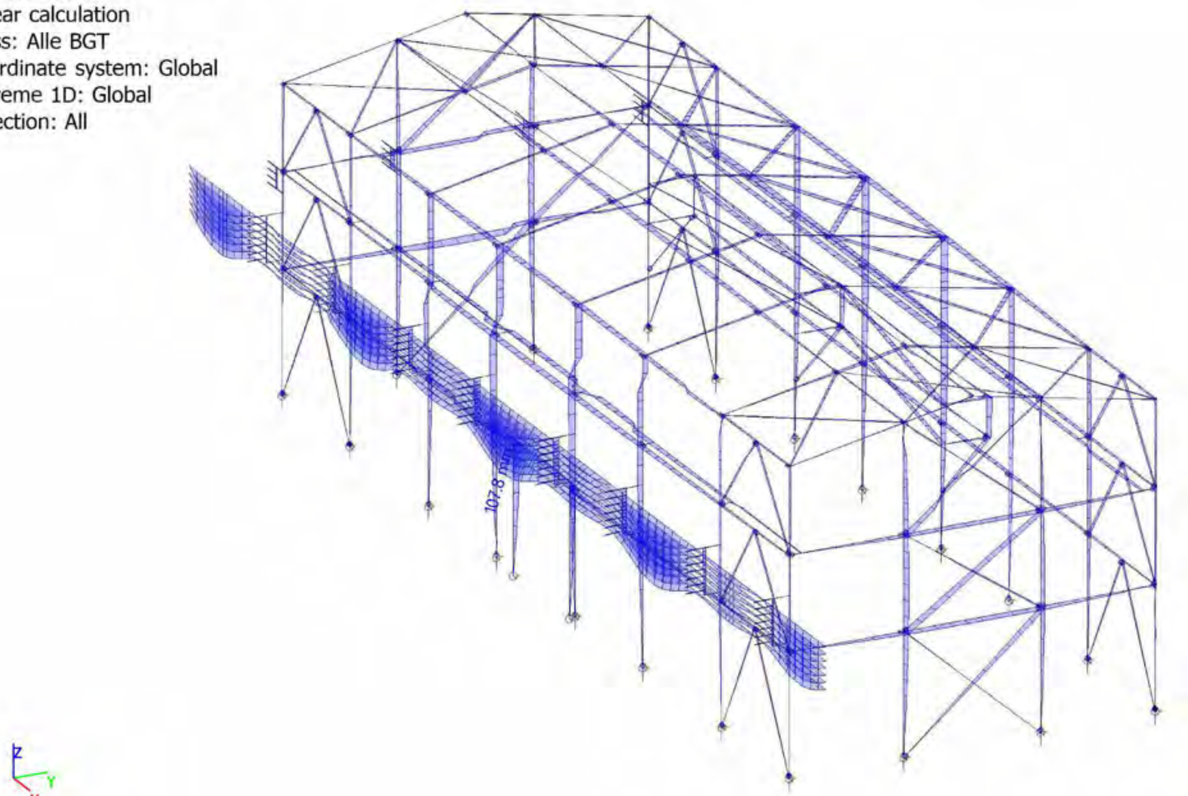
2.1.3.7. Resultaten - φ_z

Values: **φz**
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



2.1.3.8. Resultaten - U_total

Values: **U_{total}**
Linear calculation
Class: Alle BGT
Coordinate system: Global
Extreme 1D: Global
Selection: All



2.2. Forces

2.2.1. Reaction forces

2.2.1.1. Reactions

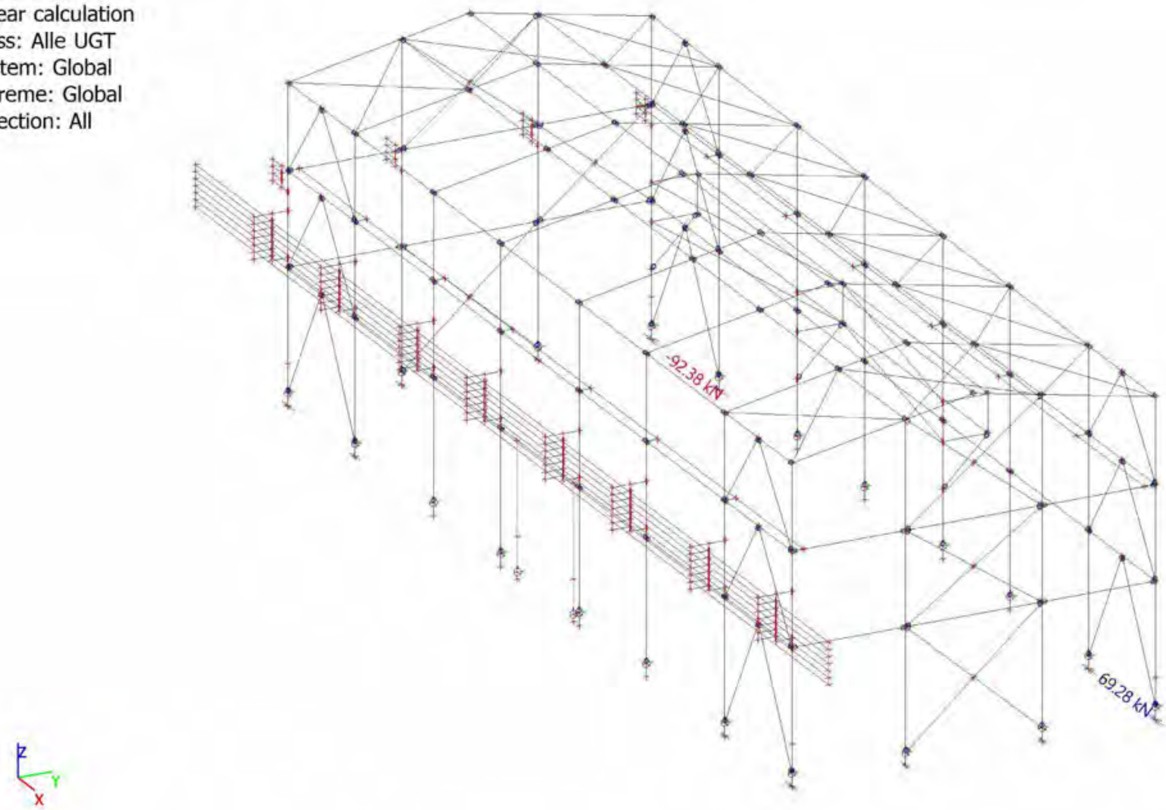
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All
Nodal reactions

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]
Sn17/K170	UGT-Set B/1	42.99	**-283.69**	-524.41	**156.03**	22.82	0.00	43.5	-297.5
Sn18/K171	UGT-Set B/2	-40.01	-212.86	**-703.60**	117.07	-21.52	0.00	-30.6	-166.4
Sn15/K168	UGT-Set B/3	21.47	34.35	**1212.33**	-19.10	11.33	-0.05	-9.3	-15.8
Sn17/K170	UGT-Set B/4	22.97	**256.71**	625.28	**-141.19**	12.17	0.00	-19.5	-225.8
Sn15/K168	UGT-Set B/5	**-92.38**	9.00	3.88	-5.30	**-50.00**	0.00	12900.5	-1366.5
Sn9/K160	UGT-Set B/6	**69.28**	-7.62	294.68	3.84	**37.29**	0.03	-126.6	13.0
Sn1/K152	UGT-Set B/7	56.86	12.14	323.25	-6.00	30.76	**-0.25**	-95.1	-18.6
Sn6/K157	UGT-Set B/8	0.13	23.57	232.45	-13.54	0.07	**0.24**	-0.3	-58.2

Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/2	0.90*BG101 + 0.90*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/3	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/4	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/5	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/6	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind9
UGT-Set B/8	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind1

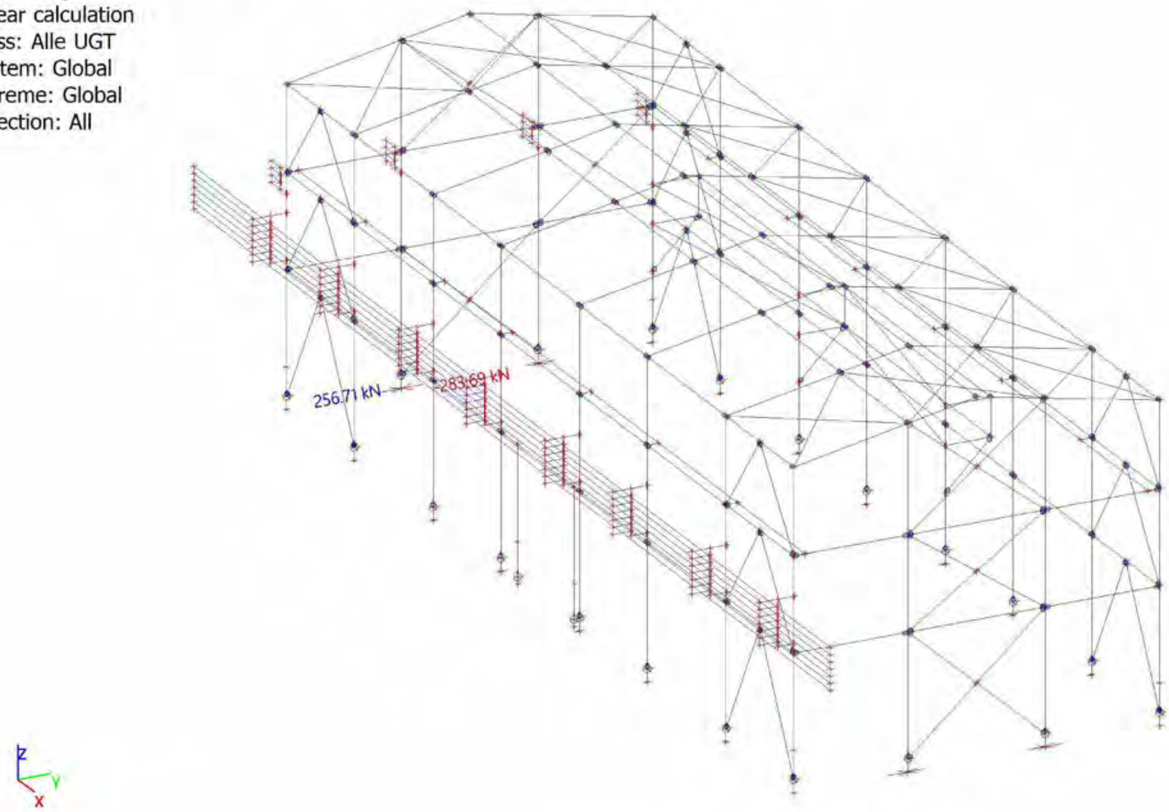
2.2.1.2. Resultaten - R_x

Values: **Rx**
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



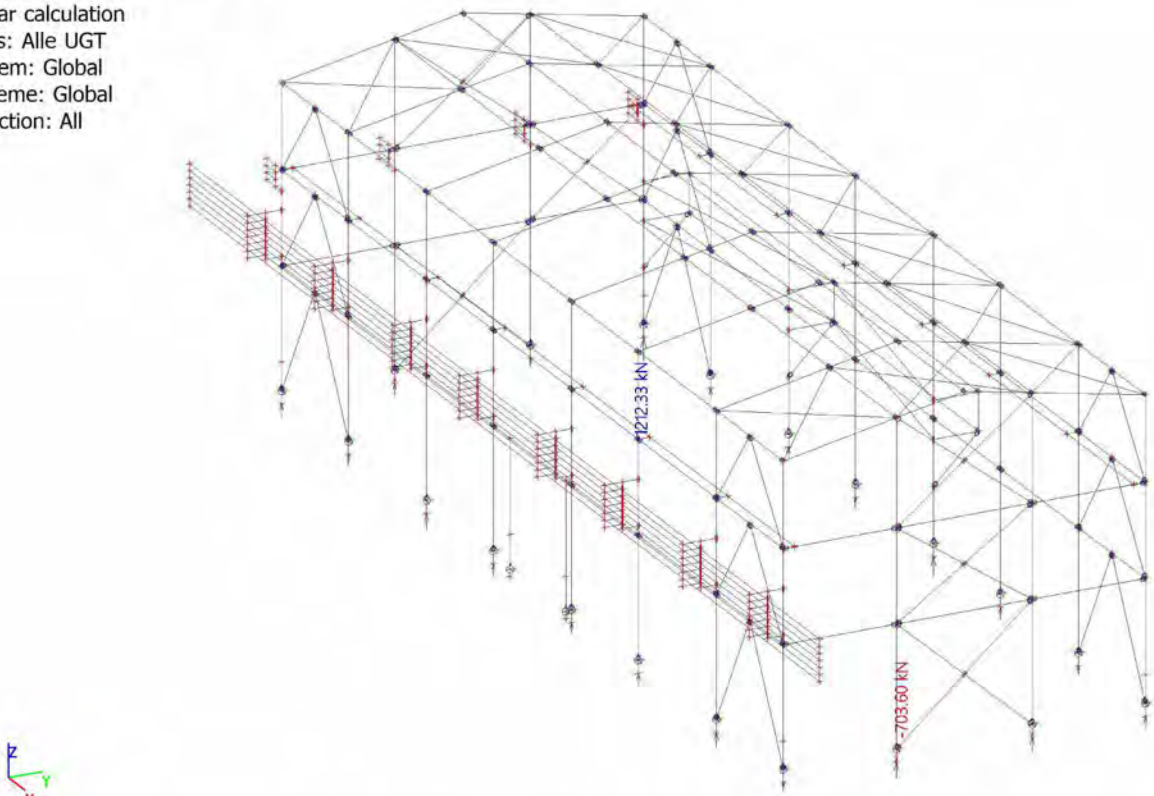
2.2.1.3. Resultaten - R_y

Values: **Ry**
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



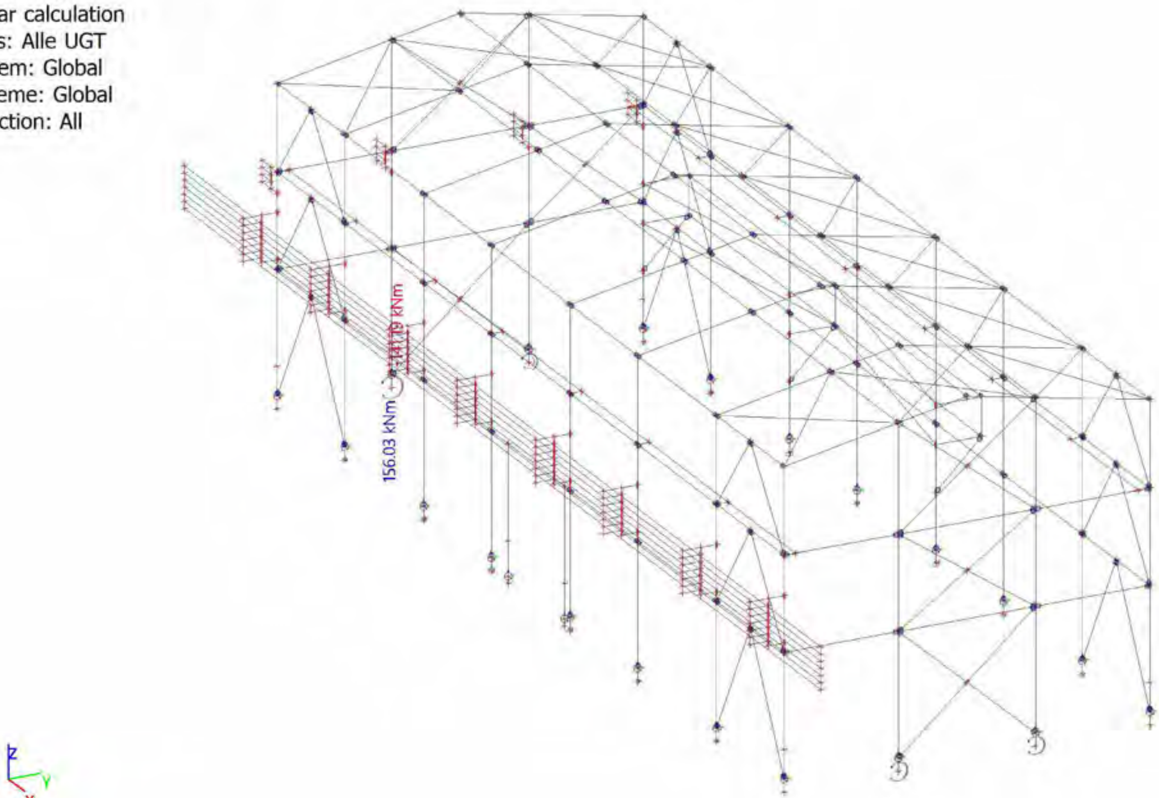
2.2.1.4. Resultaten - R_z

Values: $\mathbf{R_z}$
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



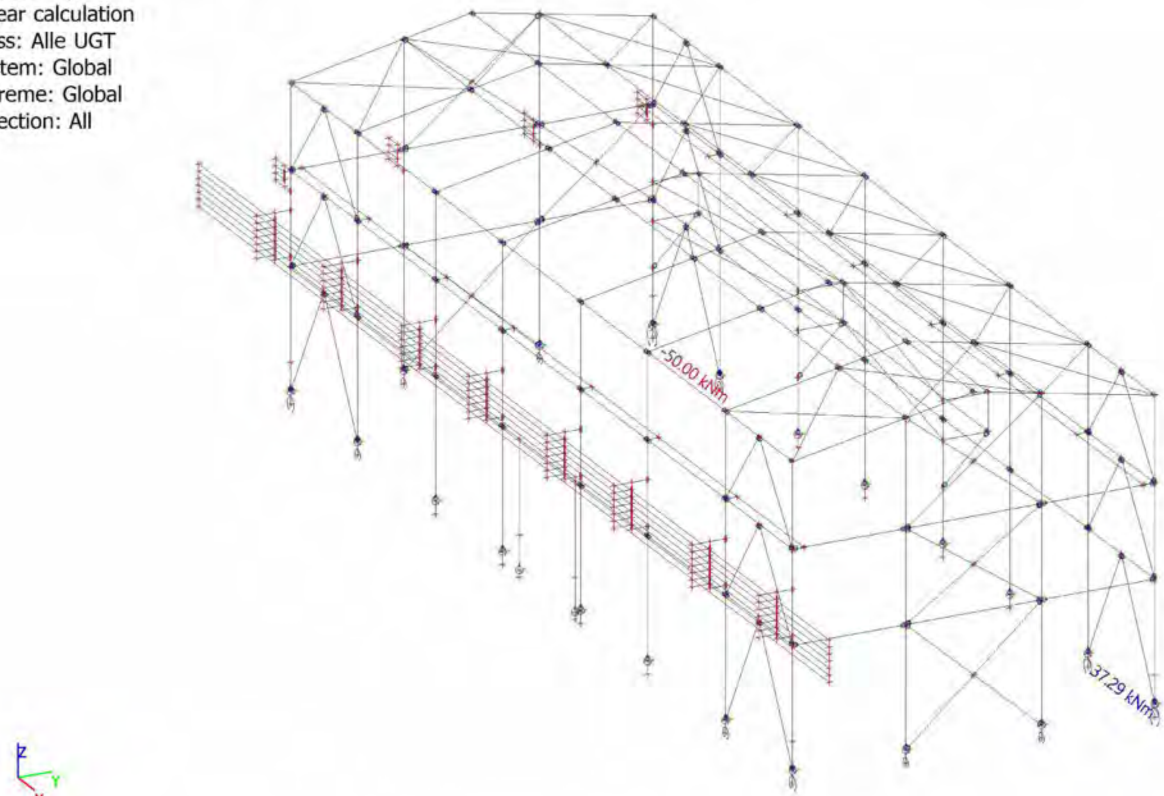
2.2.1.5. Resultaten - M_x

Values: $\mathbf{M_x}$
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



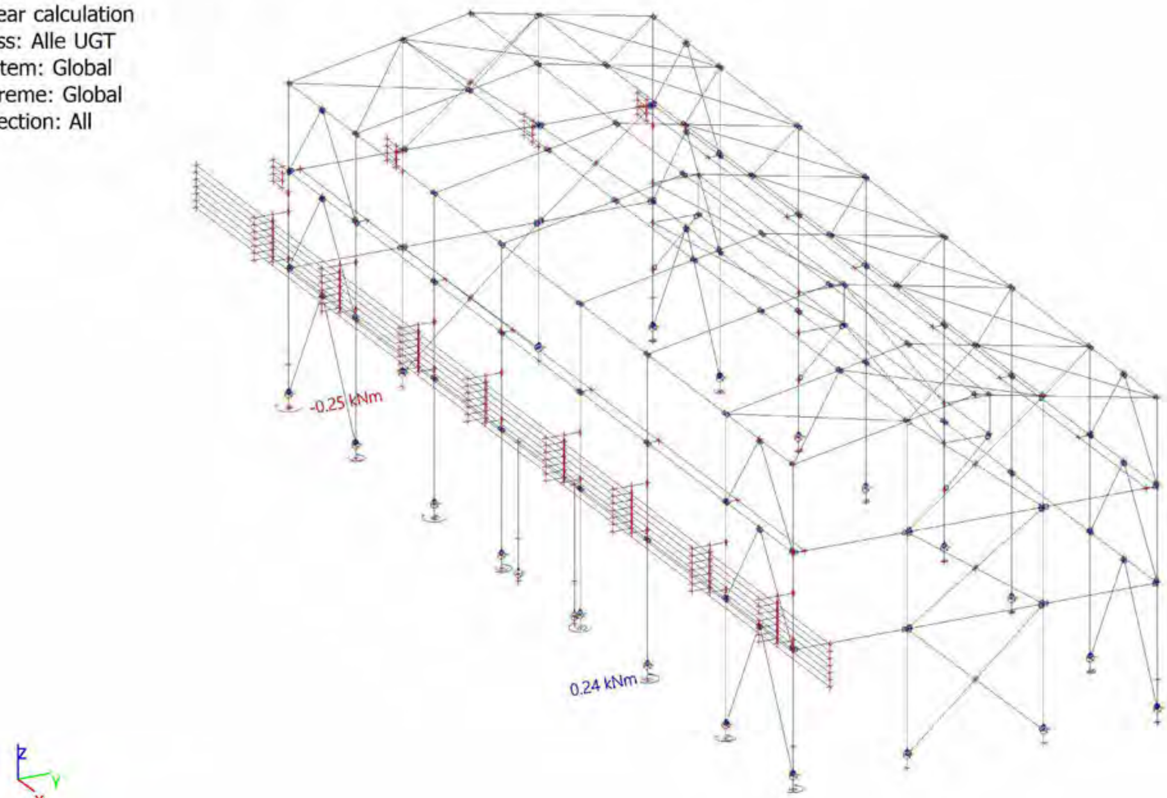
2.2.1.6. Resultaten - M_y

Values: **M_y**
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



2.2.1.7. Resultaten - M_z

Values: **M_z**
Linear calculation
Class: Alle UGT
System: Global
Extreme: Global
Selection: All



2.2.2. Internal forces

2.2.2.1. 1D internal forces

Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

Name	dx [m]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
S2	0.000	UGT-Set B/1	ST-11 - HEA550	**-1181.09**	-6.58	-34.93	-0.05	0.00	0.00
S2	5.350-	UGT-Set B/2	ST-11 - HEA550	**329.07**	27.13	-4.20	0.02	-4.64	22.52
S2	5.350-	UGT-Set B/3	ST-11 - HEA550	-176.75	**-39.14**	-34.90	0.04	5.01	-33.35
S2	5.350+	UGT-Set B/3	ST-11 - HEA550	-163.28	**52.17**	-8.65	0.07	11.57	-23.12
S27	13.200	UGT-Set B/4	ST-11 - HEA550	-111.57	1.04	**-134.37**	0.10	-207.78	5.60
S13	4.450-	UGT-Set B/5	ST-11 - HEA550	-443.56	-0.13	**100.56**	0.01	31.37	-0.57
S14	0.000	UGT-Set B/6	ST-11 - HEA550	-60.46	-6.52	-0.31	**-5.31**	41.75	-13.85
S26	0.000	UGT-Set B/6	ST-11 - HEA550	-57.85	6.44	-4.08	**5.26**	35.16	13.70
S15	7.750+	UGT-Set B/7	ST-11 - HEA550	-138.95	-2.78	1.01	-0.01	**-279.00**	-3.69
S21	6.130+	UGT-Set B/8	ST-11 - HEA550	-568.37	3.18	-14.45	0.02	**410.53**	-3.87
S14	3.056+	UGT-Set B/9	ST-11 - HEA550	9.98	7.08	-1.15	3.94	-4.65	**-36.88**
S26	3.056+	UGT-Set B/9	ST-11 - HEA550	-1.77	-7.03	-4.68	-3.90	-17.25	**36.58**
S35	0.000	UGT-Set B/10	ST-14 - HEA300	**-645.23**	-0.41	21.24	0.02	0.00	0.00
S35	5.350-	UGT-Set B/11	ST-14 - HEA300	**526.48**	0.13	5.34	0.03	124.54	0.70
S35	9.455+	UGT-Set B/12	ST-14 - HEA300	-34.47	**-3.76**	-2.71	0.00	58.60	7.31
S35	9.455+	UGT-Set B/13	ST-14 - HEA300	-22.75	**3.79**	-1.41	-0.01	70.14	-7.49
S6	0.000	UGT-Set B/14	ST-14 - HEA300	-4.35	0.22	**-40.77**	0.03	0.00	0.00
S5	0.000	UGT-Set B/15	ST-14 - HEA300	-132.45	-0.13	**40.31**	0.02	0.00	0.00
S36	0.000	UGT-Set B/16	ST-14 - HEA300	-608.65	0.19	35.74	**-0.03**	0.00	0.00
S35	0.000	UGT-Set B/17	ST-14 - HEA300	-405.55	-0.22	39.25	**0.03**	0.00	0.00
S6	6.151	UGT-Set B/14	ST-14 - HEA300	-11.17	0.12	-0.53	0.01	**-129.55**	-0.69
S5	5.350-	UGT-Set B/15	ST-14 - HEA300	-120.59	-0.13	6.58	0.02	**128.58**	-0.71
S5	9.455+	UGT-Set B/18	ST-14 - HEA300	80.88	2.96	2.09	-0.01	-86.35	**-13.31**
S5	5.350+	UGT-Set B/1	ST-14 - HEA300	78.73	-3.27	-3.07	-0.01	-71.06	**14.19**
S386	0.000	UGT-Set B/2	ST-12 - HEA200	**-359.92**	0.00	1.36	0.00	0.00	0.00
S386	0.000	UGT-Set B/6	ST-12 - HEA200	**404.45**	0.00	1.81	0.00	0.00	0.00
S223	0.000	UGT-Set B/2	ST-12 - HEA200	27.39	**-6.22**	-56.17	-0.02	4.77	**3.76**
S235	0.700	UGT-Set B/19	ST-12 - HEA200	-25.73	0.68	**-78.19**	0.00	-43.38	0.19
S304	0.000	UGT-Set B/14	ST-12 - HEA200	-0.08	0.00	**39.01**	0.00	-21.82	0.00
S254	0.000	UGT-Set B/20	ST-12 - HEA200	-33.09	-1.20	23.38	**-0.51**	-8.01	-0.12
S224	0.000	UGT-Set B/2	ST-12 - HEA200	-34.20	1.28	23.87	**0.53**	-8.10	0.12
S245	0.700	UGT-Set B/21	ST-12 - HEA200	-24.02	-0.90	-78.08	0.00	**-43.85**	-0.30
S305	0.000	UGT-Set B/14	ST-12 - HEA200	0.08	0.00	-37.96	0.00	**21.09**	0.00
S253	0.000	UGT-Set B/22	ST-12 - HEA200	23.22	**6.15**	-58.43	0.02	3.77	**-3.70**
S44	41.320+	UGT-Set B/23	ST-13 - I + rail (HEA500, SA75)	**-224.60**	-7.12	68.96	-0.96	245.90	4.17
S41	3.440+	UGT-Set B/24	ST-13 - I + rail (HEA500, SA75)	**186.55**	15.78	-58.04	-0.18	125.14	-17.77
S41	0.000	UGT-Set B/25	ST-13 - I + rail (HEA500, SA75)	-118.61	**-47.67**	66.19	-0.22	-55.24	60.25
S41	11.160+	UGT-Set B/26	ST-13 - I + rail (HEA500, SA75)	128.97	**40.74**	-131.38	0.15	182.93	-24.76
S44	6.000-	UGT-Set B/27	ST-13 - I + rail (HEA500, SA75)	109.44	-14.61	**-358.09**	0.38	-285.21	-17.90
S41	19.000+	UGT-Set B/28	ST-13 - I + rail (HEA500, SA75)	-35.71	-34.98	**347.22**	-0.03	-309.45	13.77
S41	0.000	UGT-Set B/29	ST-13 - I + rail (HEA500, SA75)	25.30	8.42	244.84	**-1.46**	-2.23	-39.93
S44	0.000	UGT-Set B/30	ST-13 - I + rail (HEA500, SA75)	46.68	-4.68	242.52	**1.49**	7.75	31.32
S44	19.000+	UGT-Set B/31	ST-13 - I + rail (HEA500, SA75)	-60.59	-3.07	314.14	-0.20	**-333.55**	18.61
S44	2.560-	UGT-Set B/32	ST-13 - I + rail (HEA500, SA75)	95.98	-16.05	103.89	0.37	**518.86**	32.86
S41	45.000	UGT-Set B/33	ST-13 - I + rail (HEA500, SA75)	69.09	-31.24	-49.99	0.04	31.34	**-79.55**
S44	0.000	UGT-Set B/34	ST-13 - I + rail (HEA500, SA75)	62.92	-16.78	296.06	0.33	28.07	**76.08**
S81	0.000	UGT-Set B/35	ST-21 - HEB300	**-164.06**	0.00	3.22	0.02	0.00	0.00

Name	dx [m]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
S81	0.000	UGT-Set B/36	ST-21 - HEB300	**165.19**	0.00	4.30	-0.01	0.00	0.00
S80	0.000	UGT-Set B/37	ST-21 - HEB300	27.47	**-176.82**	**401.80**	-0.30	0.00	0.00
S42	4.500+	UGT-Set B/38	ST-21 - HEB300	19.21	**191.59**	-288.12	0.69	144.24	-95.80
S42	5.000	UGT-Set B/39	ST-21 - HEB300	20.37	170.55	**-405.97**	0.35	0.00	0.00
S43	4.500+	UGT-Set B/40	ST-21 - HEB300	57.14	86.30	-385.65	**-1.02**	193.01	-43.15
S42	4.500+	UGT-Set B/41	ST-21 - HEB300	-111.01	-42.95	-270.23	**1.31**	135.30	21.48
S80	0.500+	UGT-Set B/42	ST-21 - HEB300	1.65	-21.71	5.36	-0.22	**-13.27**	97.69
S80	0.500+	UGT-Set B/43	ST-21 - HEB300	-25.41	24.35	-46.42	0.27	**223.39**	-109.58
S43	4.500-	UGT-Set B/44	ST-21 - HEB300	82.32	-25.72	-4.56	-0.20	-6.01	**-115.75**
S42	4.500-	UGT-Set B/45	ST-21 - HEB300	-96.47	25.41	-4.94	0.20	-7.71	**114.36**
S49	0.000	UGT-Set B/46	ST-15 - HEA500	**-38.84**	-44.33	89.95	-0.04	-22.86	0.11
S52	0.000	UGT-Set B/47	ST-15 - HEA500	**62.57**	-29.37	547.41	-0.92	-308.19	0.02
S53	0.500	UGT-Set B/48	ST-15 - HEA500	8.63	-48.68	**-530.41**	-0.83	-268.57	-0.20
S58	0.000	UGT-Set B/49	ST-15 - HEA500	15.44	-7.77	-409.31	**-1.29**	-9.35	3.78
S50	0.000	UGT-Set B/50	ST-15 - HEA500	13.97	33.79	370.28	**1.19**	-192.28	-0.35
S48	0.000	UGT-Set B/51	ST-15 - HEA500	37.30	-11.63	**580.29**	0.36	**-309.83**	-0.36
S48	0.000	UGT-Set B/52	ST-15 - HEA500	-7.25	35.83	-53.39	0.09	**30.65**	0.34
S52	0.500	UGT-Set B/53	ST-15 - HEA500	38.33	**-116.88**	514.58	-0.63	-21.12	**-58.15**
S51	0.500	UGT-Set B/13	ST-15 - HEA500	-14.63	**116.91**	95.67	-0.10	8.04	**59.20**
S79	0.000	UGT-Set B/54	ST-24 - HEA220	**-189.40**	0.00	1.16	-0.01	0.00	0.00
S79	0.000	UGT-Set B/55	ST-24 - HEA220	**235.34**	0.00	1.55	-0.02	**0.00**	**0.00**
S78	6.000	UGT-Set B/56	ST-24 - HEA220	28.96	-1.20	**-15.88**	0.00	0.00	0.00
S78	0.000	UGT-Set B/56	ST-24 - HEA220	34.96	**4.80**	**57.28**	0.00	0.00	0.00
S62	0.000	UGT-Set B/57	ST-24 - HEA220	-19.74	0.00	1.16	**-0.03**	0.00	0.00
S70	0.000	UGT-Set B/58	ST-24 - HEA220	-22.16	0.00	1.16	**0.03**	0.00	0.00
S78	1.200+	UGT-Set B/56	ST-24 - HEA220	28.96	**-1.20**	-12.55	0.00	**68.24**	**5.76**
S66	0.000	UGT-Set B/59	ST-16 - UNP280	**-61.84**	0.05	0.00	0.00	0.00	0.00
S66	5.600	UGT-Set B/60	ST-16 - UNP280	**1.40**	0.00	-21.60	-0.02	-3.13	-0.03
S65	5.600	UGT-Set B/61	ST-16 - UNP280	-3.92	0.01	**-34.10**	-0.03	-4.66	0.05
S66	5.600	UGT-Set B/62	ST-16 - UNP280	-26.44	0.05	**33.18**	0.04	4.82	0.26
S65	0.000	UGT-Set B/63	ST-16 - UNP280	-23.88	0.00	29.88	**-0.03**	0.00	0.00
S66	0.000	UGT-Set B/64	ST-16 - UNP280	-41.93	0.01	-23.74	**0.04**	0.00	0.00
S66	2.800+	UGT-Set B/65	ST-16 - UNP280	-19.14	0.01	-0.57	0.04	**-40.91**	0.03
S65	2.800+	UGT-Set B/19	ST-16 - UNP280	-11.26	0.00	-0.36	-0.03	**43.61**	0.00
S65	5.600	UGT-Set B/66	ST-16 - UNP280	-4.18	**-0.03**	26.16	0.02	3.57	**-0.17**
S66	5.600	UGT-Set B/67	ST-16 - UNP280	-25.94	**0.07**	-10.02	-0.01	-1.43	**0.41**
S82	0.000	UGT-Set B/68	ST-22 - HEA200	**-343.18**	0.18	0.66	0.02	0.00	0.00
S82	8.039	UGT-Set B/18	ST-22 - HEA200	**382.79**	0.18	-0.33	-0.02	0.00	0.00
S429	0.000	UGT-Set B/69	ST-22 - HEA200	-246.00	**-0.55**	0.60	0.00	0.14	1.78
S69	4.019-	UGT-Set B/16	ST-22 - HEA200	284.79	0.25	**-1.25**	-0.04	-1.91	1.02
S87	0.000	UGT-Set B/70	ST-22 - HEA200	-42.48	-0.40	0.48	**-0.04**	0.00	0.00
S87	0.000	UGT-Set B/71	ST-22 - HEA200	148.16	0.41	0.38	**0.04**	0.00	0.00
S69	4.019+	UGT-Set B/72	ST-22 - HEA200	283.46	-0.24	**1.29**	0.02	**-2.07**	0.97
S87	3.235	UGT-Set B/73	ST-22 - HEA200	-247.23	0.55	-0.04	0.04	**1.44**	1.79
S85	3.815	UGT-Set B/74	ST-22 - HEA200	168.86	-0.38	-0.67	0.00	-0.33	**-1.45**
S86	3.235-	UGT-Set B/69	ST-22 - HEA200	288.76	**0.56**	-0.44	0.01	0.68	**1.81**
S90	6.500+	UGT-Set B/75	ST-23 - HEA280	**-8.85**	38.11	15.34	0.29	-7.58	-19.06
S90	1.500+	UGT-Set B/76	ST-23 - HEA280	**22.76**	-3.11	1.43	0.01	-1.64	27.86
S90	6.500+	UGT-Set B/62	ST-23 - HEA280	-4.06	**38.12**	22.59	0.33	-11.18	-19.06
S90	6.500-	UGT-Set B/77	ST-23 - HEA280	2.55	0.00	**-4.84**	0.00	-11.11	0.00
S90	6.500+	UGT-Set B/78	ST-23 - HEA280	14.79	-24.71	4.65	**-0.24**	-2.24	12.35
S90	6.500+	UGT-Set B/79	ST-23 - HEA280	-0.54	38.12	11.19	**0.33**	-5.48	-19.06
S90	6.500+	UGT-Set B/80	ST-23 - HEA280	6.40	0.01	**27.31**	0.04	**-13.54**	0.00
S90	4.357	UGT-Set B/81	ST-23 - HEA280	14.61	-3.11	-0.13	0.01	**1.84**	18.99
S90	1.500-	UGT-Set B/82	ST-23 - HEA280	-0.71	**-29.16**	-2.12	-0.07	-2.13	**-43.74**
S90	1.500-	UGT-Set B/83	ST-23 - HEA280	3.84	22.31	-1.44	0.05	-1.37	**33.46**
S113	0.000	UGT-Set B/84	ST-17 - HEA140	**-160.52**	0.00	0.45	0.00	0.00	0.00
S112	6.134	UGT-Set B/85	ST-17 - HEA140	**156.32**	**0.00**	-0.34	0.00	**0.00**	**0.00**
S106	6.134	UGT-Set B/86	ST-17 - HEA140	-3.08	0.00	**-0.51**	0.00	0.00	0.00
S106	0.000	UGT-Set B/86	ST-17 - HEA140	-4.89	0.00	**0.51**	0.00	0.00	0.00
S121	0.000	UGT-Set B/87	ST-17 - HEA140	-64.71	0.00	0.45	**-0.01**	0.00	0.00
S109	0.000	UGT-Set B/88	ST-17 - HEA140	-60.48	0.00	0.45	**0.01**	0.00	0.00
S106	3.408	UGT-Set B/86	ST-17 - HEA140	-3.88	0.00	-0.06	0.00	**0.77**	0.00
S144	0.000	UGT-Set B/22	ST-18 - L100X10	**-234.58**	0.00	0.00	0.00	0.00	0.00
S139	8.657	UGT-Set B/89	ST-18 - L100X10	**257.56**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
S163	0.000	UGT-Set B/90	ST-20 - HEB220	**-128.18**	0.01	18.85	0.01	-1.47	-0.01
S164	0.000	UGT-Set B/91	ST-20 - HEB220	**167.10**	-0.01	29.01	-0.01	-20.16	0.02

Name	dx [m]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
S162	1.000+	UGT-Set B/38	ST-20 - HEB220	-1.36	**-26.84**	-34.30	0.01	35.52	26.77
S162	0.000	UGT-Set B/92	ST-20 - HEB220	-5.21	**27.26**	72.02	-0.02	-35.17	-0.56
S166	2.000	UGT-Set B/93	ST-20 - HEB220	-22.60	0.05	**-122.46**	-0.01	-31.49	0.01
S163	0.000	UGT-Set B/94	ST-20 - HEB220	-45.78	1.03	-4.96	**-0.07**	7.26	-0.36
S163	0.000	UGT-Set B/95	ST-20 - HEB220	-47.92	0.02	9.46	**0.02**	-4.06	-0.02
S166	0.000	UGT-Set B/8	ST-20 - HEB220	14.66	-0.03	**233.47**	0.00	**-164.02**	0.05
S166	1.000+	UGT-Set B/93	ST-20 - HEB220	-22.60	0.05	-121.58	-0.01	**90.53**	-0.05
S162	0.000	UGT-Set B/96	ST-20 - HEB220	2.66	27.26	97.30	-0.01	-69.98	**-0.57**
S162	1.000-	UGT-Set B/97	ST-20 - HEB220	-0.99	27.17	115.15	0.00	35.73	**26.78**
S201	0.000	UGT-Set B/98	CT-16 - Rechthoek (850; 500)	**-1212.33**	-21.47	-34.35	-0.05	19.10	11.33
S201	0.550	UGT-Set B/99	CT-16 - Rechthoek (850; 500)	**259.92**	12.93	-31.01	0.07	0.00	0.00
S194	0.000	UGT-Set B/100	CT-16 - Rechthoek (850; 500)	-294.68	**-69.28**	7.62	0.03	-3.84	**37.29**
S317	0.000	UGT-Set B/93	CT-16 - Rechthoek (850; 500)	-448.15	-0.11	**-91.71**	0.03	**49.30**	0.06
S186	0.000	UGT-Set B/101	CT-16 - Rechthoek (850; 500)	-323.25	-56.86	-12.14	**-0.25**	6.00	30.76
S191	0.000	UGT-Set B/102	CT-16 - Rechthoek (850; 500)	-232.45	-0.13	-23.57	**0.24**	13.54	0.07
S189	0.000	UGT-Set B/19	CT-16 - Rechthoek (850; 500)	-118.34	0.01	**76.36**	0.11	**-41.14**	-0.01
S201	0.000	UGT-Set B/85	CT-16 - Rechthoek (850; 500)	-3.88	**92.38**	-9.00	0.00	5.30	**-50.00**
S204	0.000	UGT-Set B/10	CT-17 - Rechthoek (600; 500)	**-860.71**	234.33	22.75	0.00	-12.04	-128.88
S204	0.550	UGT-Set B/11	CT-17 - Rechthoek (600; 500)	**707.31**	-212.86	38.13	0.00	-0.03	0.00
S203	0.000	UGT-Set B/18	CT-17 - Rechthoek (600; 500)	524.41	**-283.69**	-42.99	0.00	22.82	**156.03**
S202	0.000	UGT-Set B/24	CT-17 - Rechthoek (600; 500)	76.39	114.77	**-44.06**	0.00	**23.41**	-63.12
S205	0.000	UGT-Set B/16	CT-17 - Rechthoek (600; 500)	-815.36	-224.73	37.37	**-0.01**	-20.06	123.60
S204	0.000	UGT-Set B/103	CT-17 - Rechthoek (600; 500)	-768.44	214.42	41.01	**0.01**	-21.73	-117.93
S205	0.000	UGT-Set B/104	CT-17 - Rechthoek (600; 500)	640.08	204.28	**43.60**	0.00	**-23.16**	-112.35
S203	0.000	UGT-Set B/68	CT-17 - Rechthoek (600; 500)	-625.28	**256.71**	-22.97	0.00	12.17	**-141.19**
S296	0.000	UGT-Set B/15	ST-19 - HEA100	**-34.87**	0.00	0.26	0.00	0.18	0.00
S303	0.900	UGT-Set B/14	ST-19 - HEA100	**38.67**	0.00	-0.08	0.00	-0.38	0.00
S227	0.400+	UGT-Set B/2	ST-19 - HEA100	0.41	**-4.72**	-12.73	-0.24	-0.04	2.05
S257	0.400+	UGT-Set B/22	ST-19 - HEA100	-0.58	**4.64**	-12.70	0.23	0.02	-2.02
S207	0.800	UGT-Set B/105	ST-19 - HEA100	1.14	-1.75	**-13.11**	-0.27	-5.31	0.06
S310	0.000	UGT-Set B/106	ST-19 - HEA100	-9.70	0.00	**0.80**	0.00	-0.29	0.00
S212	0.400+	UGT-Set B/85	ST-19 - HEA100	1.31	1.31	-12.97	**-0.29**	-0.09	-0.39
S221	0.400+	UGT-Set	ST-19 - HEA100	-0.56	-0.95	-12.72	**0.29**	0.02	0.42

Name	dx [m]	Case	Cross-section	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
		B/107							
S206	0.800	UGT-Set B/108	ST-19 - HEA100	2.74	-0.19	-13.08	-0.28	**-5.39**	1.52
S310	0.900	UGT-Set B/109	ST-19 - HEA100	-4.57	-0.01	0.72	0.00	**0.34**	-0.01
S256	0.400+	UGT-Set B/22	ST-19 - HEA100	-0.72	0.26	-12.70	0.25	0.03	**-3.61**
S226	0.400+	UGT-Set B/2	ST-19 - HEA100	0.36	-0.22	-12.74	-0.25	-0.03	**3.64**
S451	25.000+	UGT-Set B/110	GEN-12 - Kanaal (600; 80; 2; 2; 2)	**-6.87**	6.82	0.37	0.00	2.89	-7.16
S451	25.000+	UGT-Set B/111	GEN-12 - Kanaal (600; 80; 2; 2; 2)	**6.24**	0.00	-0.28	0.00	-3.69	0.02
S451	6.000-	UGT-Set B/112	GEN-12 - Kanaal (600; 80; 2; 2; 2)	0.19	**-7.06**	0.72	0.00	4.35	-7.27
S451	12.000+	UGT-Set B/113	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-3.43	**6.83**	0.30	0.00	-1.63	-7.16
S453	6.000+	UGT-Set B/114	GEN-12 - Kanaal (600; 80; 2; 2; 2)	0.80	0.00	**-2.02**	0.00	6.40	-0.01
S453	0.000	UGT-Set B/68	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-0.68	4.65	-0.27	**0.00**	0.00	-0.01
S453	51.000+	UGT-Set B/115	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-0.56	6.52	0.02	**0.00**	-0.12	-6.35
S453	45.000+	UGT-Set B/116	GEN-12 - Kanaal (600; 80; 2; 2; 2)	0.58	0.00	**2.31**	0.00	**-7.31**	0.01
S453	32.000+	UGT-Set B/117	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-0.82	5.86	-1.43	0.00	**7.50**	-6.86
S451	45.000-	UGT-Set B/118	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-3.00	-6.86	-0.81	0.00	-3.84	**-7.33**
S381	2.667	UGT-Set B/112	GEN-12 - Kanaal (600; 80; 2; 2; 2)	-0.25	-0.54	0.75	0.00	2.00	**5.48**

Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/2	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/3	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/5	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind14
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind13
UGT-Set B/8	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/9	1.20*BG101 + 1.20*BG102 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind27
UGT-Set B/11	0.90*BG101 + 0.90*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/13	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122

Name	Combination key
	+ 1.50*BG141 + 1.50*3DWind25
UGT-Set B/14	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG138 + 1.50*3DWind15
UGT-Set B/15	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind2
UGT-Set B/16	1.20*BG101 + 1.20*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/17	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind15
UGT-Set B/18	1.20*BG101 + 1.20*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/19	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind8
UGT-Set B/20	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind25
UGT-Set B/21	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/22	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind25
UGT-Set B/23	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind10
UGT-Set B/24	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG138 + 1.50*3DWind25
UGT-Set B/25	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG138 + 1.50*3DWind2
UGT-Set B/26	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*3DWind25
UGT-Set B/27	1.20*BG101 + 1.20*BG102 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/28	1.35*BG101 + 1.35*BG102 + 1.50*BG134
UGT-Set B/29	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG131 + 1.50*3DWind20
UGT-Set B/30	0.90*BG101 + 0.90*BG102 + 1.50*BG137 + 1.50*3DWind16
UGT-Set B/31	1.20*BG101 + 1.20*BG102 + 1.50*BG140 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/32	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind17
UGT-Set B/33	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/34	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind5
UGT-Set B/35	0.90*BG101 + 0.90*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/36	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/37	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/38	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind2
UGT-Set B/39	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG137 + 1.50*3DWind2
UGT-Set B/40	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/41	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG138 + 1.50*3DWind5
UGT-Set B/42	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind5
UGT-Set B/43	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/44	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/45	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/46	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG140 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/47	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind5

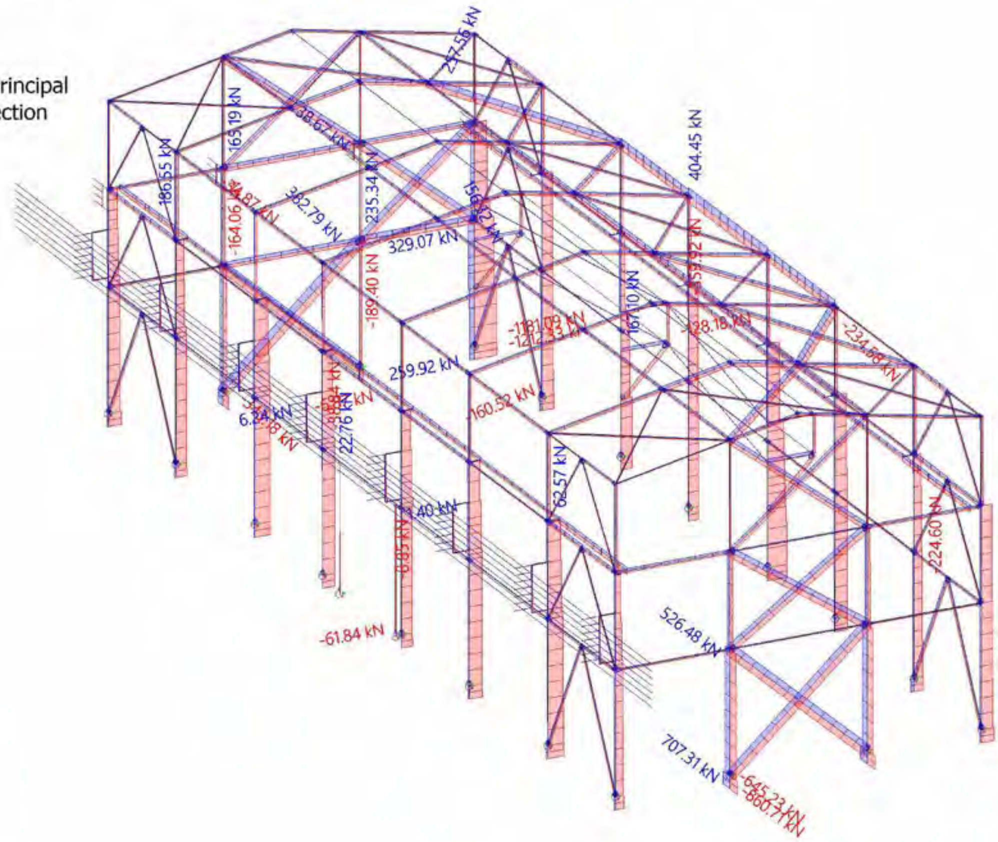
Name	Combination key
UGT-Set B/48	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142
UGT-Set B/49	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind25
UGT-Set B/50	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG134 + 1.50*3DWind2
UGT-Set B/51	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/52	0.90*BG101 + 0.90*BG102 + 1.50*BG134 + 1.50*3DWind5
UGT-Set B/53	0.90*BG101 + 0.90*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/54	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/55	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/56	1.35*BG101 + 1.35*BG102 + 1.50*BG121
UGT-Set B/57	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG136 + 1.50*3DWind7
UGT-Set B/58	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*3DWind15
UGT-Set B/59	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151
UGT-Set B/60	0.90*BG101 + 0.90*BG102 + 1.50*BG133 + 1.50*3DWind15
UGT-Set B/61	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG140 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/62	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/63	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind19
UGT-Set B/64	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind20
UGT-Set B/65	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG132 + 1.50*3DWind8
UGT-Set B/66	1.20*BG101 + 1.20*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/67	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/68	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/69	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/70	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/71	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind13
UGT-Set B/72	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/73	0.90*BG101 + 0.90*BG102 + 1.50*BG123 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/74	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG137 + 1.50*3DWind27
UGT-Set B/75	0.90*BG101 + 0.90*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/76	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind13
UGT-Set B/77	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151
UGT-Set B/78	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind15
UGT-Set B/79	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind6
UGT-Set B/80	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151
UGT-Set B/81	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*3DWind15
UGT-Set B/82	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123

Name	Combination key
	+ 1.50*BG140 + 1.50*3DWind6
UGT-Set B/83	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*3DWind9
UGT-Set B/84	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/85	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/86	1.35*BG101 + 1.35*BG102
UGT-Set B/87	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind1
UGT-Set B/88	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG131 + 1.50*3DWind9
UGT-Set B/89	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/90	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind16
UGT-Set B/91	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind16
UGT-Set B/92	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind15
UGT-Set B/93	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind16
UGT-Set B/94	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind2
UGT-Set B/95	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind15
UGT-Set B/96	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind7
UGT-Set B/97	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind10
UGT-Set B/98	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/99	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/100	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/101	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind9
UGT-Set B/102	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind1
UGT-Set B/103	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG139 + 1.50*3DWind13
UGT-Set B/104	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG139 + 1.50*3DWind25
UGT-Set B/105	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151
UGT-Set B/106	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*3DWind7
UGT-Set B/107	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind10
UGT-Set B/108	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind1
UGT-Set B/109	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind15
UGT-Set B/110	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/111	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind25
UGT-Set B/112	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/113	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/114	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind1
UGT-Set B/115	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*3DWind27
UGT-Set B/116	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind9

Name	Combination key
UGT-Set B/117	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind19
UGT-Set B/118	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind8

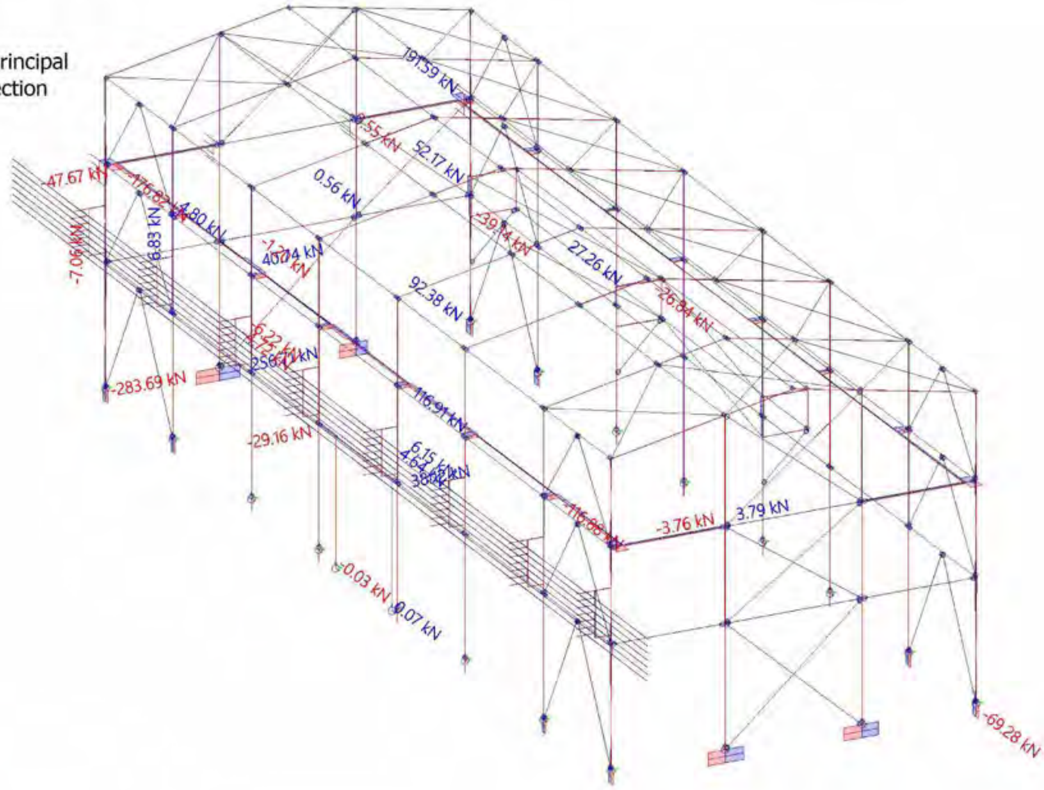
2.2.2.2. Resultaten - N

Values: **N**
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



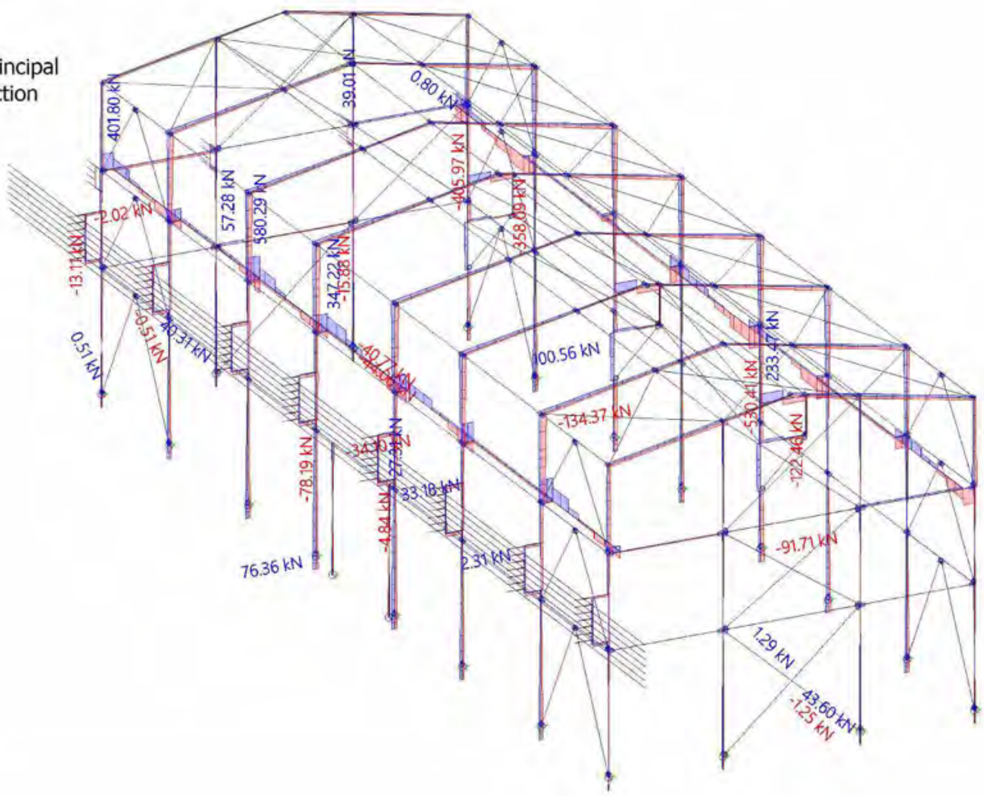
2.2.2.3. Resultaten - V_y

Values: **V_y**
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



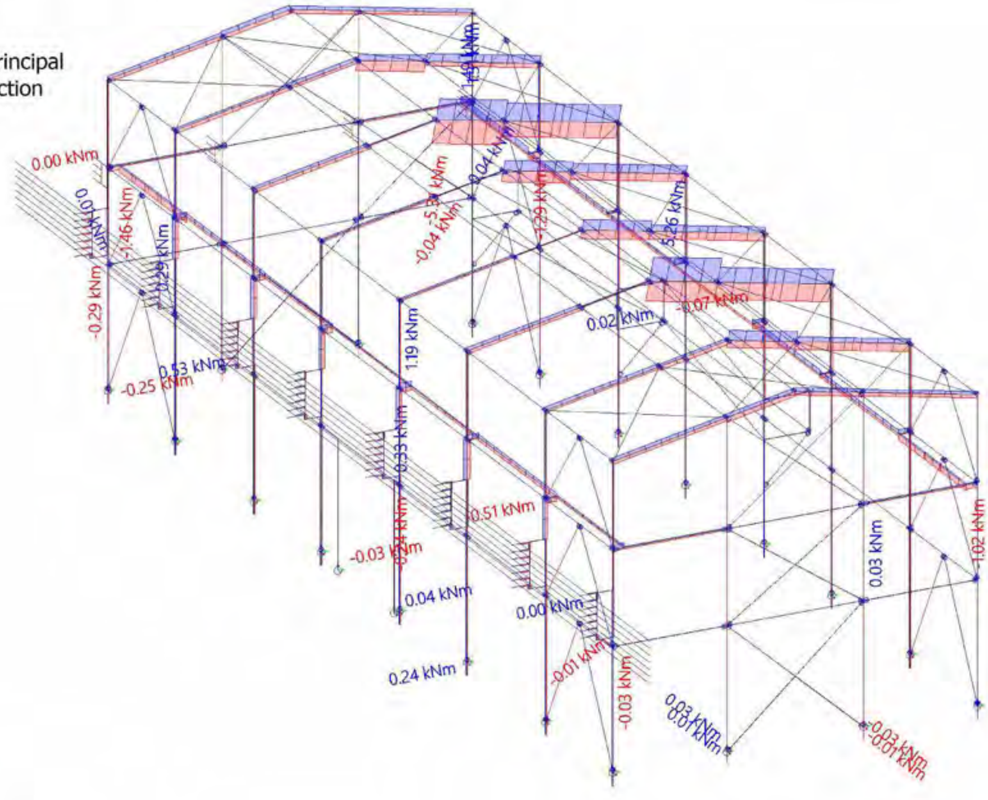
2.2.2.4. Resultaten - V_z

Values: **V_z**
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



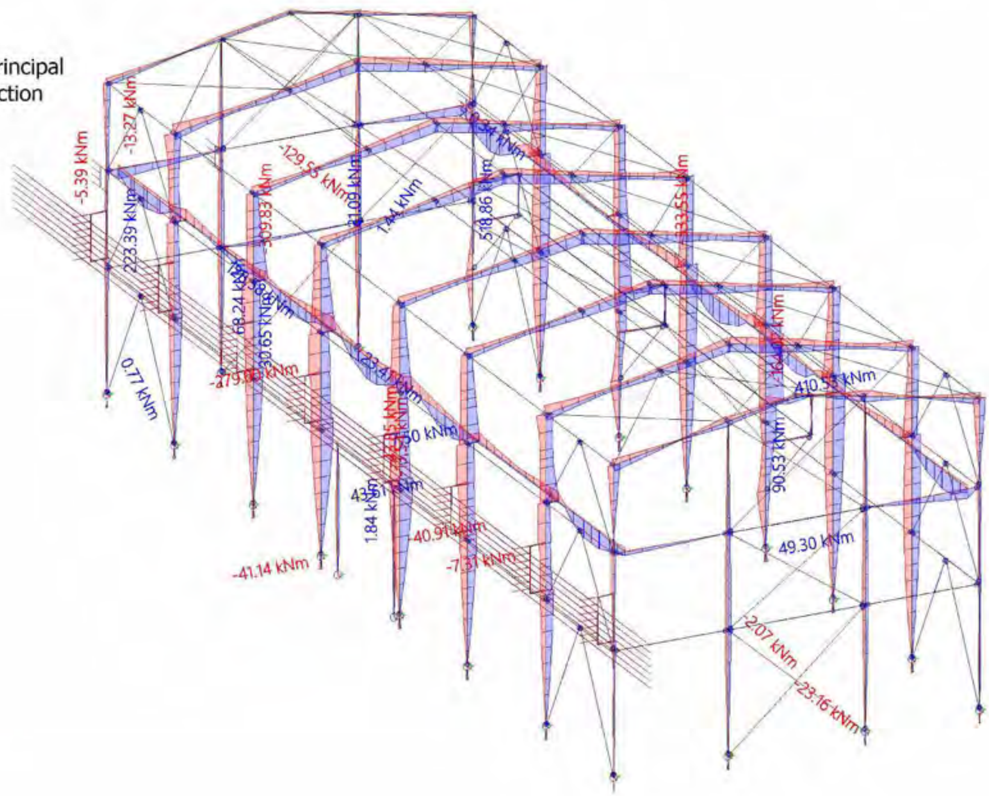
2.2.2.5. Resultaten - M_x

Values: M_x
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



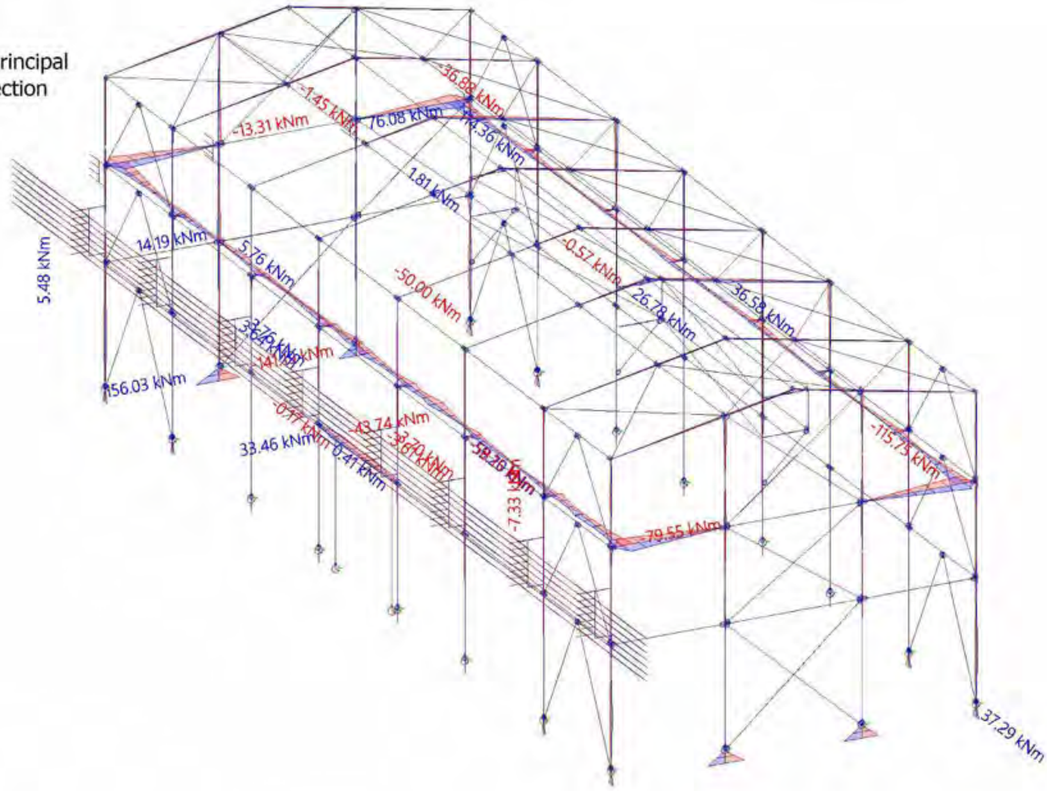
2.2.2.6. Resultaten - M_y

Values: M_y
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



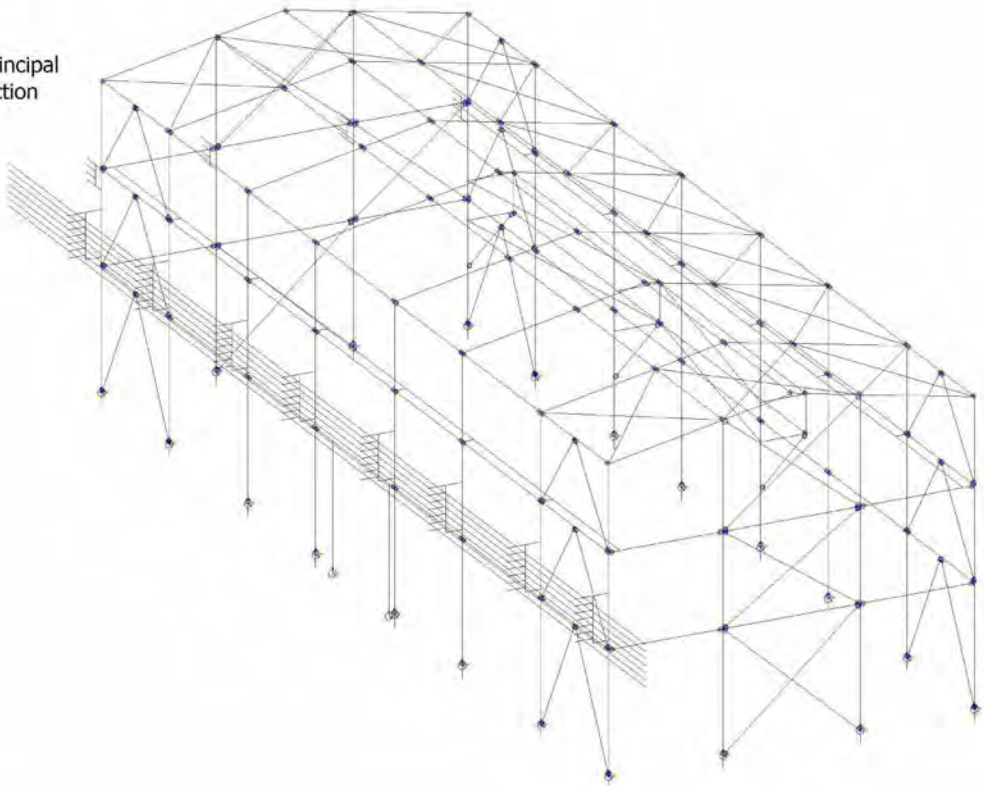
2.2.2.7. Resultaten - M_z

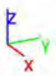
Values: $\mathbf{M_z}$
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



2.2.2.8. Resultaten - V_r

Values: $\mathbf{V_r}$
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All





2.2.3. 3D stress

2.2.3.1. 3D stress

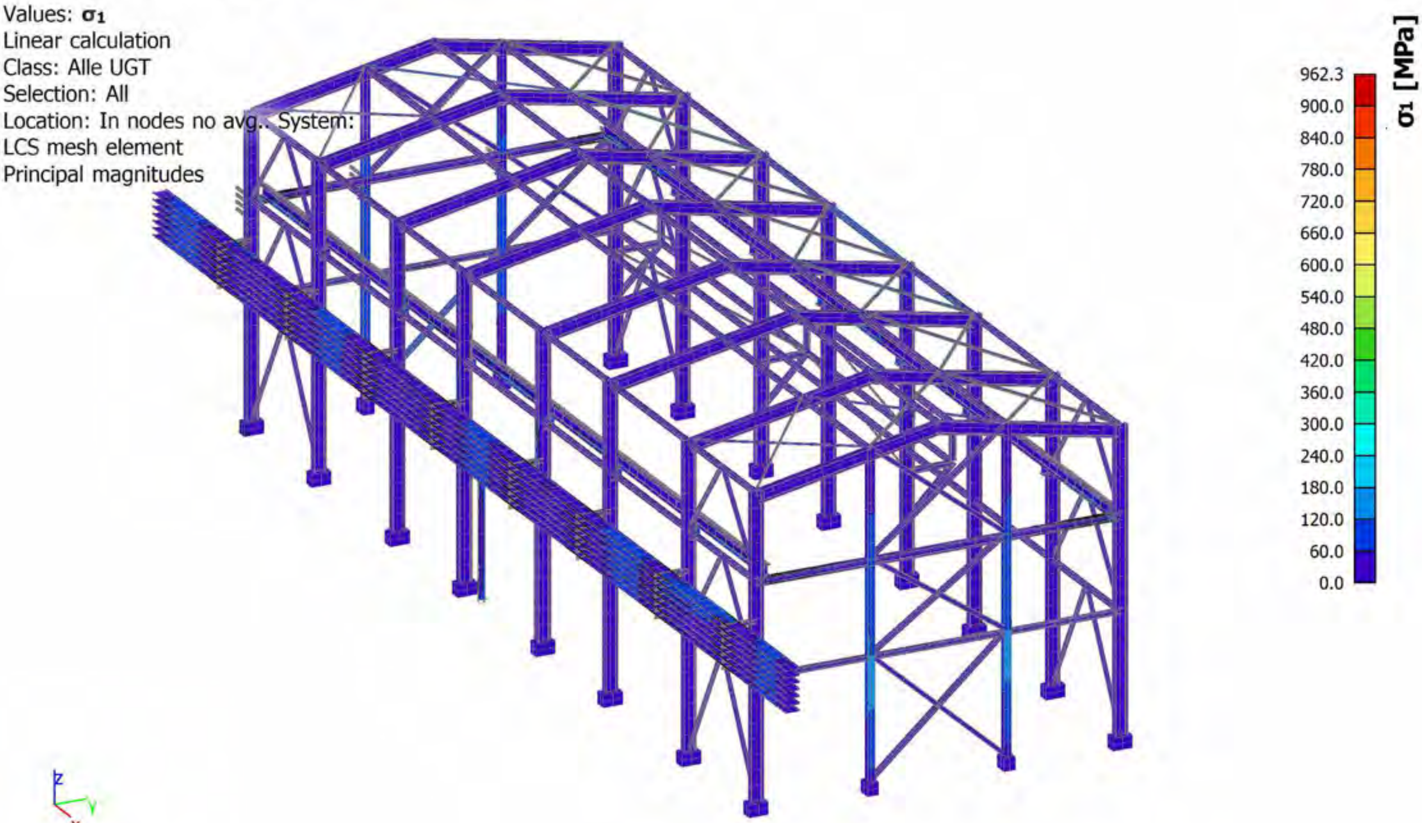
Linear calculation
Class: Alle UGT
Selection: All
Location: In nodes no avg.. System: LCS mesh element
Principal magnitudes
Results on 1D member
Extreme 1D: Cross-section

Name	dx [m]	Fibre	Case	Cross-section	σ_1 [MPa]	σ_2 [MPa]	τ_{tot} [MPa]	σ_E [MPa]
S21	6.130+	15	UGT-Set B/1	ST-11 - HEA550	0.0	-131.2	0.1	**131.2**
S35	5.350-	15	UGT-Set B/2	ST-14 - HEA300	0.0	-147.6	0.5	**147.6**
S245	0.700	21	UGT-Set B/3	ST-12 - HEA200	35.4	-119.4	65.0	**140.5**
S44	2.560+	1	UGT-Set B/4	ST-13 - I + rail (HEA500, SA75)	178.1	0.0	1.7	**178.1**
S80	0.500+	15	UGT-Set B/5	ST-21 - HEB300	0.0	-327.1	2.8	**327.2**
S48	0.000	8	UGT-Set B/6	ST-15 - HEA500	112.1	-110.2	111.2	**192.5**
S78	1.200-	1	UGT-Set B/7	ST-24 - HEA220	179.0	0.0	0.1	**179.0**
S65	5.600	3	UGT-Set B/8	ST-16 - UNP280	100.3	-111.1	105.5	**183.1**
S82	4.019+	13	UGT-Set B/9	ST-22 - HEA200	82.1	0.0	0.9	**82.1**
S90	1.500-	1	UGT-Set B/10	ST-23 - HEA280	0.0	-133.5	1.1	**133.5**
S113	2.726	14	UGT-Set B/11	ST-17 - HEA140	0.0	-55.2	0.1	**55.2**
S139	8.657	1	UGT-Set B/12	ST-18 - L100X10	134.4	0.0	0.0	**134.4**
S166	0.000	19	UGT-Set B/1	ST-20 - HEB220	218.4	-62.8	117.1	**255.7**
S201	0.000	3	UGT-Set B/13	CT-16 - Rechthoek (850; 500)	0.0	-3.5	0.0	**3.5**
S203	0.000	7	UGT-Set B/14	CT-17 - Rechthoek (600; 500)	8.8	0.0	0.0	**8.8**
S226	0.800	15	UGT-Set B/15	ST-19 - HEA100	210.7	-7.1	38.7	**214.4**
S451	45.000-	13	UGT-Set B/16	GEN-12 - Kanaal (600; 80; 2; 2; 2)	962.3	-1.1	32.6	**962.8**

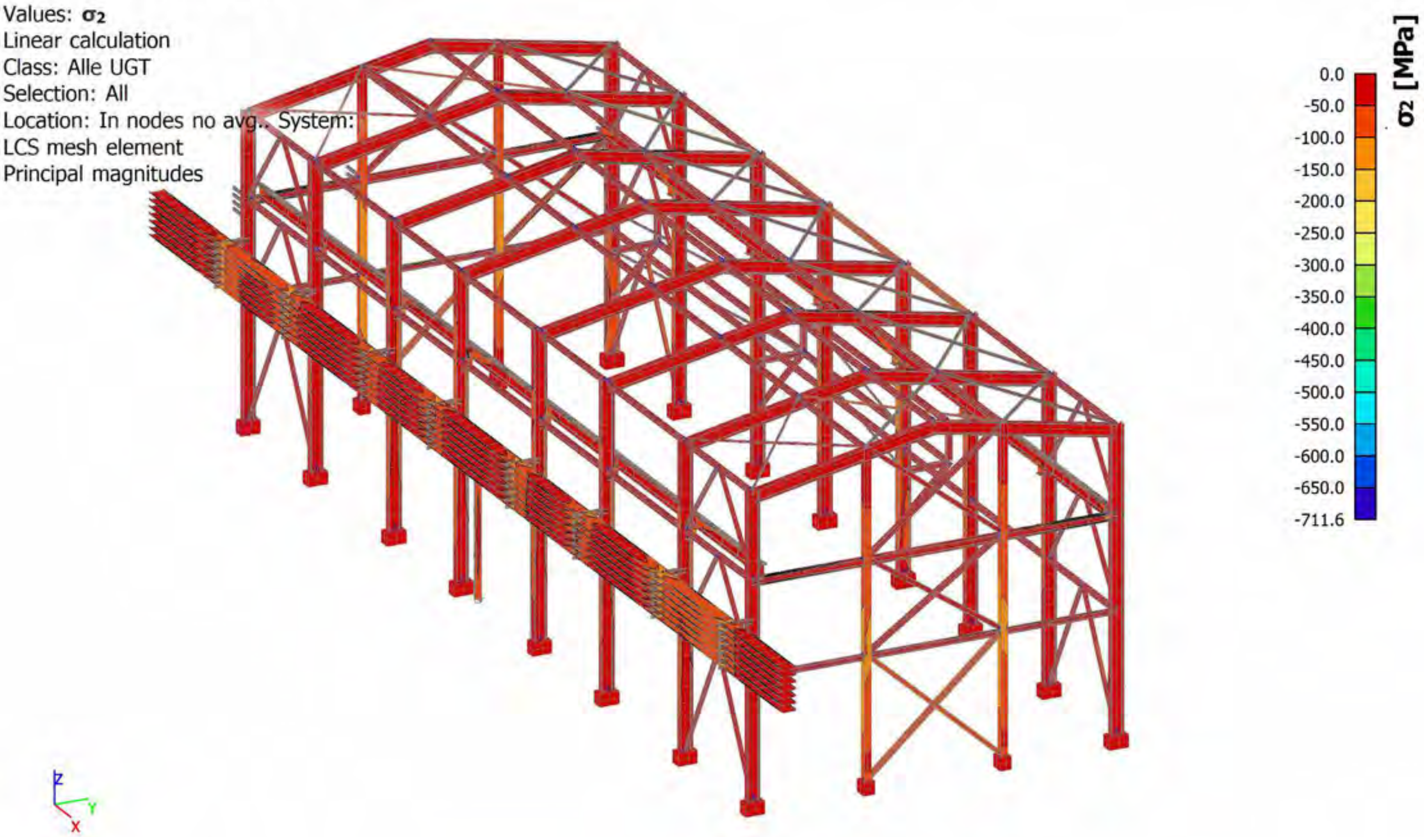
Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/2	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind25
UGT-Set B/3	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind5
UGT-Set B/5	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind17
UGT-Set B/8	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind19
UGT-Set B/9	1.20*BG101 + 1.20*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/11	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/13	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/14	0.90*BG101 + 0.90*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/15	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/16	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123

Name	Combination key
	+ 1.50*BG139 + 1.50*BG151 + 1.50*3DWind9

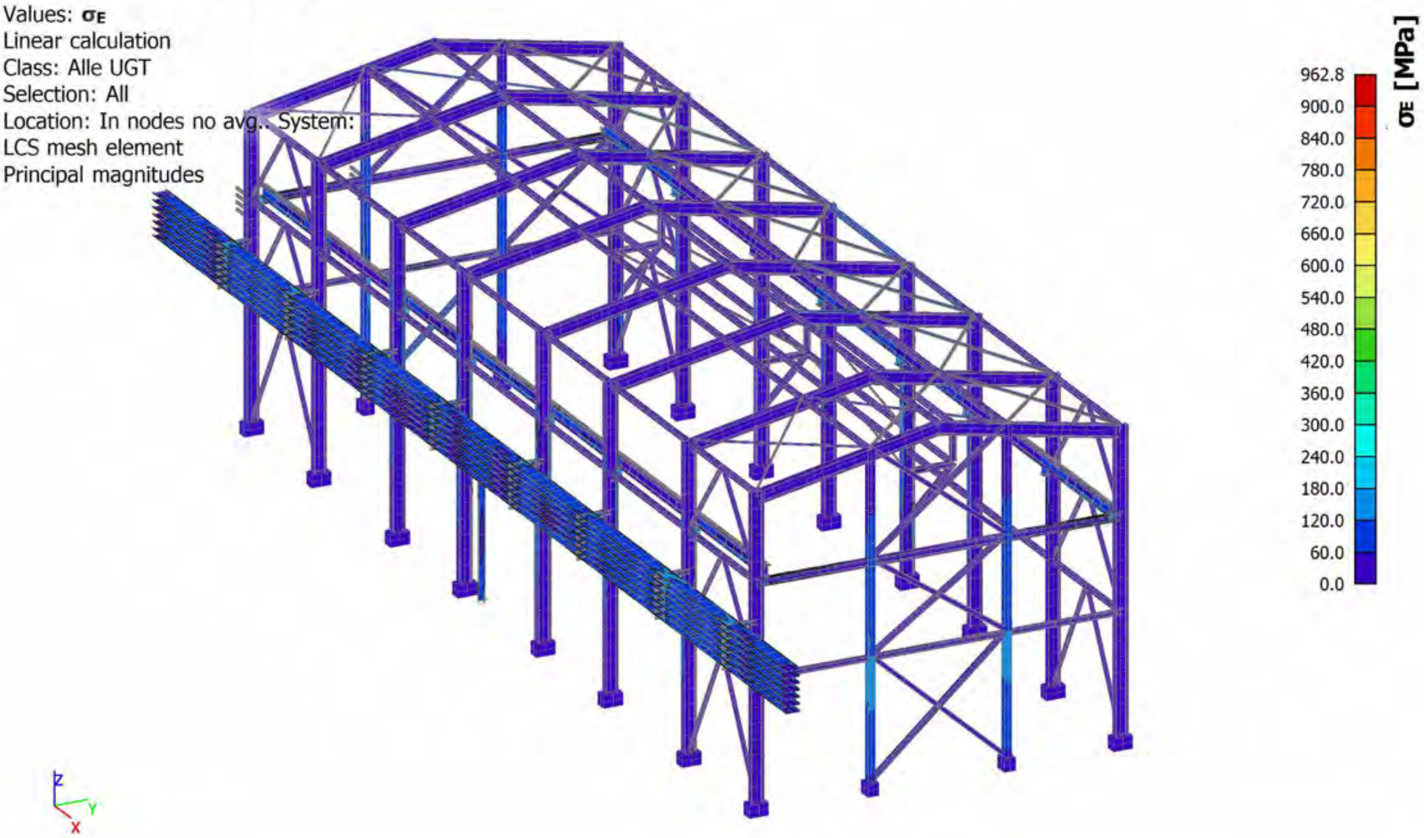
2.2.3.2. Resultaten - σ_1



2.2.3.3. Resultaten - σ_2

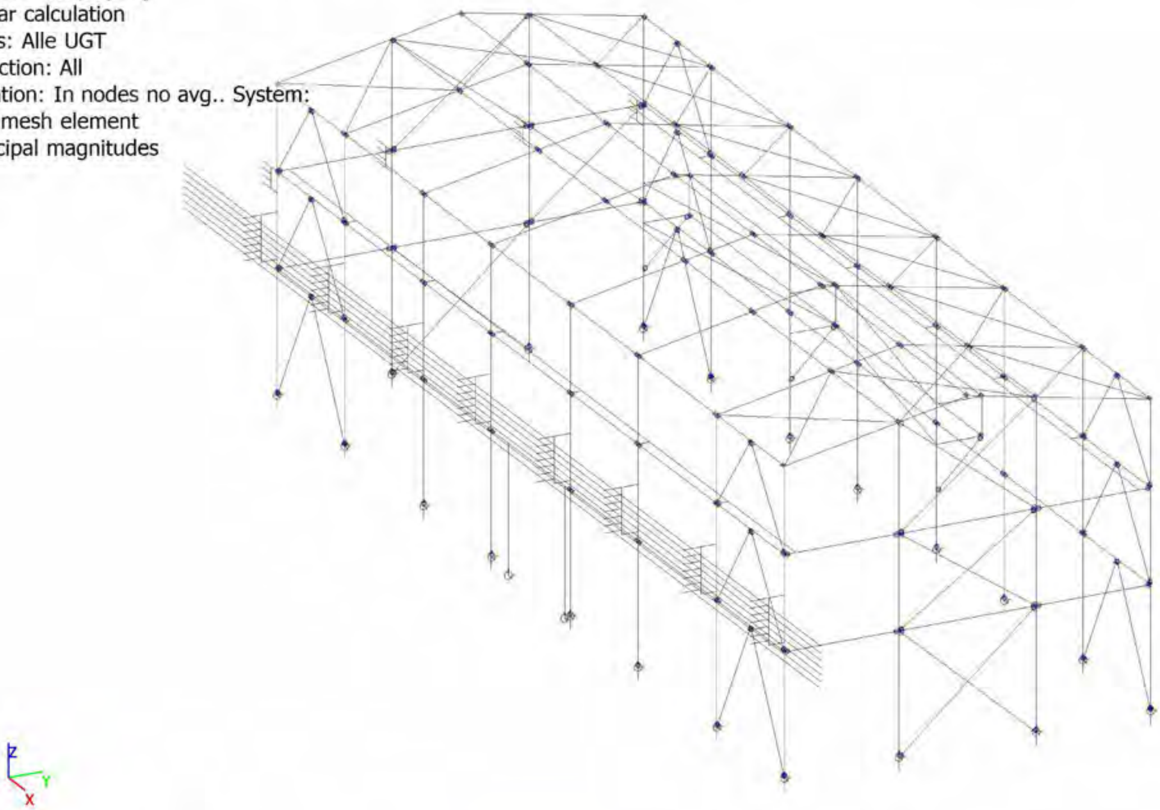


2.2.3.4. Resultaten - σ_E



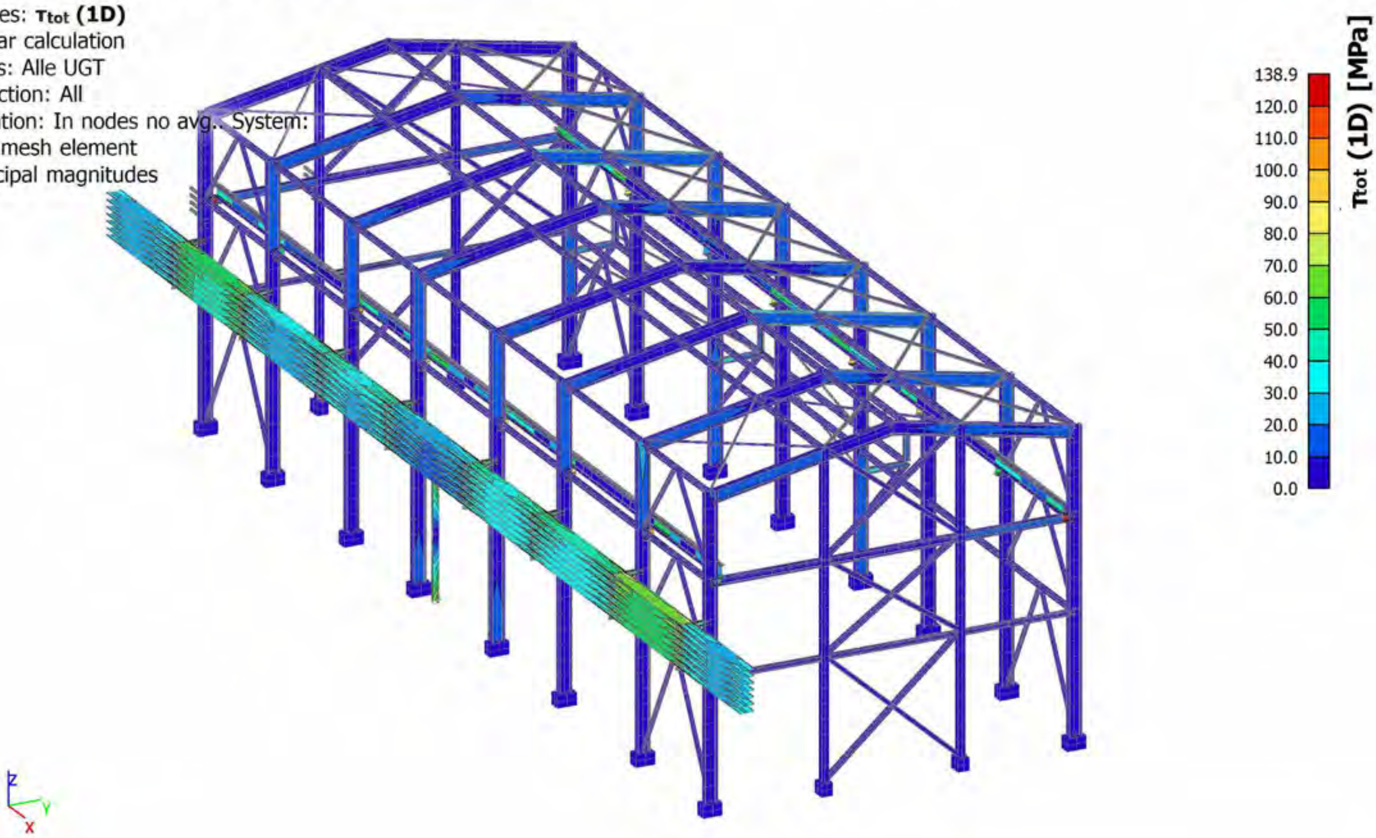
2.2.3.5. Resultaten - τ_max,b (2D)

Values: $\tau_{max,b}$ **(2D)**
Linear calculation
Class: Alle UGT
Selection: All
Location: In nodes no avg.. System:
LCS mesh element
Principal magnitudes



2.2.3.6. Resultaten - τ_tot (1D)

Values: τ_{tot} **(1D)**
Linear calculation
Class: Alle UGT
Selection: All
Location: In nodes no avg.. System:
LCS mesh element
Principal magnitudes



2.2.4. 1D stress

2.2.4.1. 1D stresses

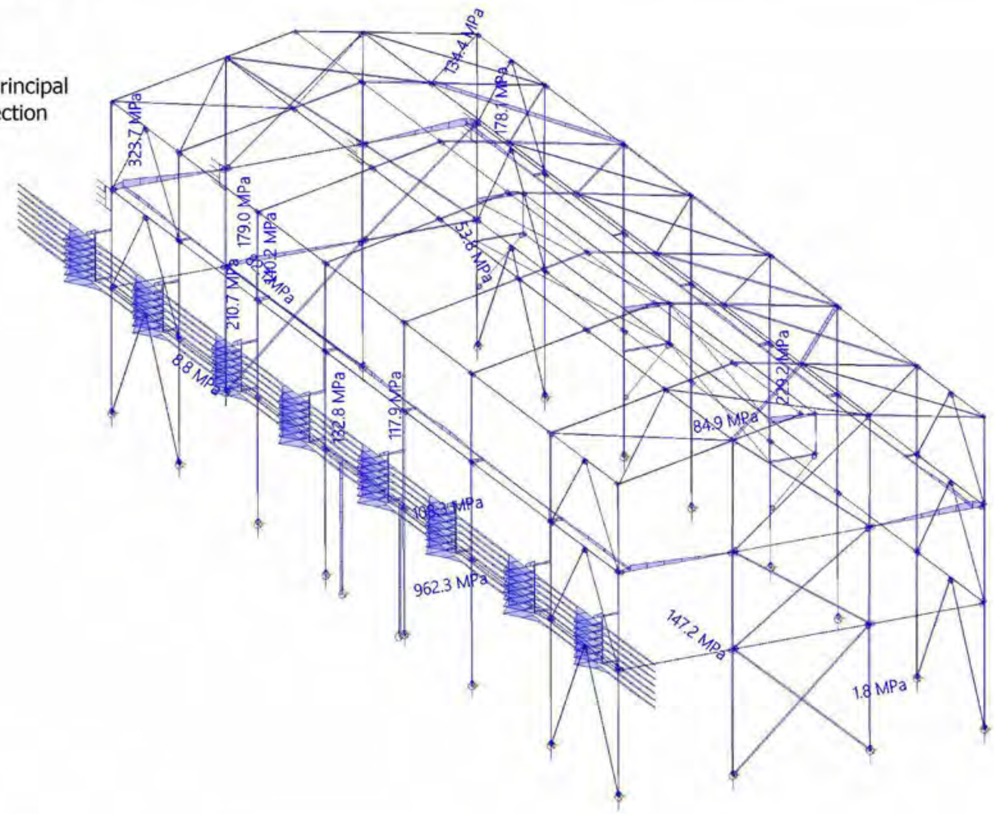
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

Name	dx [m]	Fibre	Case	Cross-section	σ_1 [MPa]	σ_2 [MPa]	τ_{tot} [MPa]	σ_E [MPa]
S21	6.130+	15	UGT-Set B/1	ST-11 - HEA550	0.0	-131.2	0.1	**131.2**
S35	5.350-	15	UGT-Set B/2	ST-14 - HEA300	0.0	-147.6	0.5	**147.6**
S245	0.700	21	UGT-Set B/3	ST-12 - HEA200	35.4	-119.4	65.0	**140.5**
S44	2.560+	1	UGT-Set B/4	ST-13 - I + rail (HEA500, SA75)	178.1	0.0	1.7	**178.1**
S80	0.500+	15	UGT-Set B/5	ST-21 - HEB300	0.0	-327.1	2.8	**327.2**
S48	0.000	8	UGT-Set B/6	ST-15 - HEA500	112.1	-110.2	111.2	**192.5**
S78	1.200-	1	UGT-Set B/7	ST-24 - HEA220	179.0	0.0	0.1	**179.0**
S65	5.600	3	UGT-Set B/8	ST-16 - UNP280	100.3	-111.1	105.5	**183.1**
S82	4.019+	13	UGT-Set B/9	ST-22 - HEA200	82.1	0.0	0.9	**82.1**
S90	1.500-	1	UGT-Set B/10	ST-23 - HEA280	0.0	-133.5	1.1	**133.5**
S113	2.726	14	UGT-Set B/11	ST-17 - HEA140	0.0	-55.2	0.1	**55.2**
S139	8.657	1	UGT-Set B/12	ST-18 - L100X10	134.4	0.0	0.0	**134.4**
S166	0.000	19	UGT-Set B/1	ST-20 - HEB220	218.4	-62.8	117.1	**255.7**
S201	0.000	3	UGT-Set B/13	CT-16 - Rechthoek (850; 500)	0.0	-3.5	0.0	**3.5**
S203	0.000	7	UGT-Set B/14	CT-17 - Rechthoek (600; 500)	8.8	0.0	0.0	**8.8**
S226	0.800	15	UGT-Set B/15	ST-19 - HEA100	210.7	-7.1	38.7	**214.4**
S451	45.000-	13	UGT-Set B/16	GEN-12 - Kanaal (600; 80; 2; 2; 2)	962.3	-1.1	32.6	**962.8**

Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/2	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind25
UGT-Set B/3	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind5
UGT-Set B/5	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind17
UGT-Set B/8	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG140 + 1.50*3DWind19
UGT-Set B/9	1.20*BG101 + 1.20*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/11	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/13	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/14	0.90*BG101 + 0.90*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/15	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/16	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind9

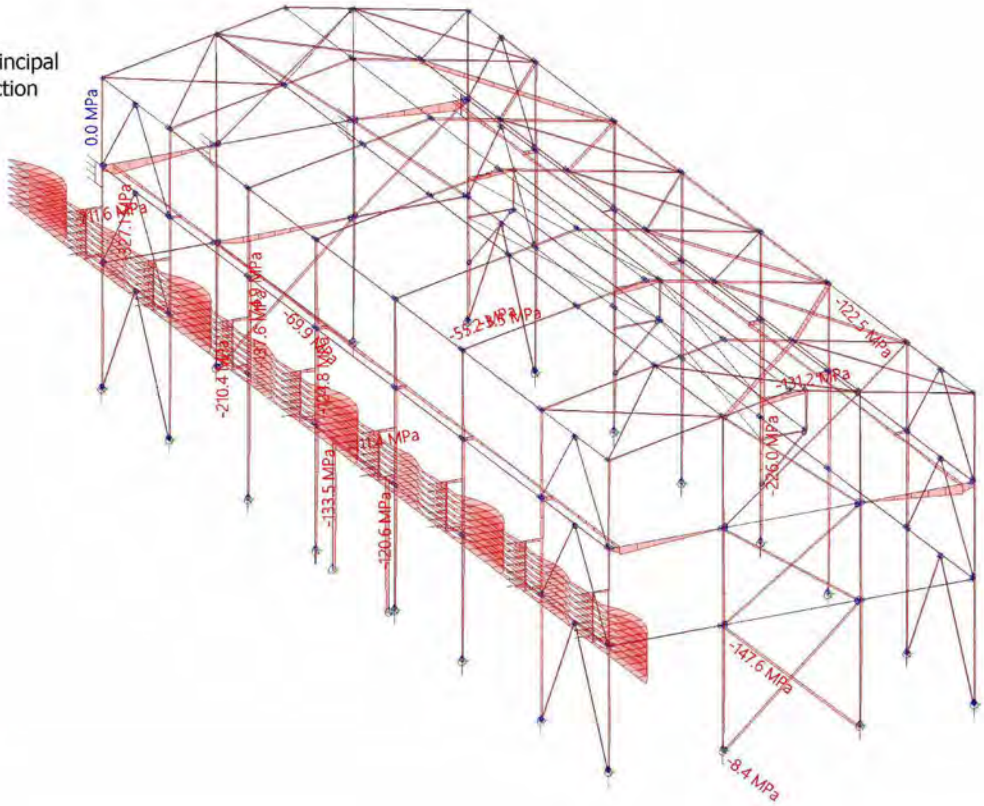
2.2.4.2. Resultaten - σ_1

Values: σ_1
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



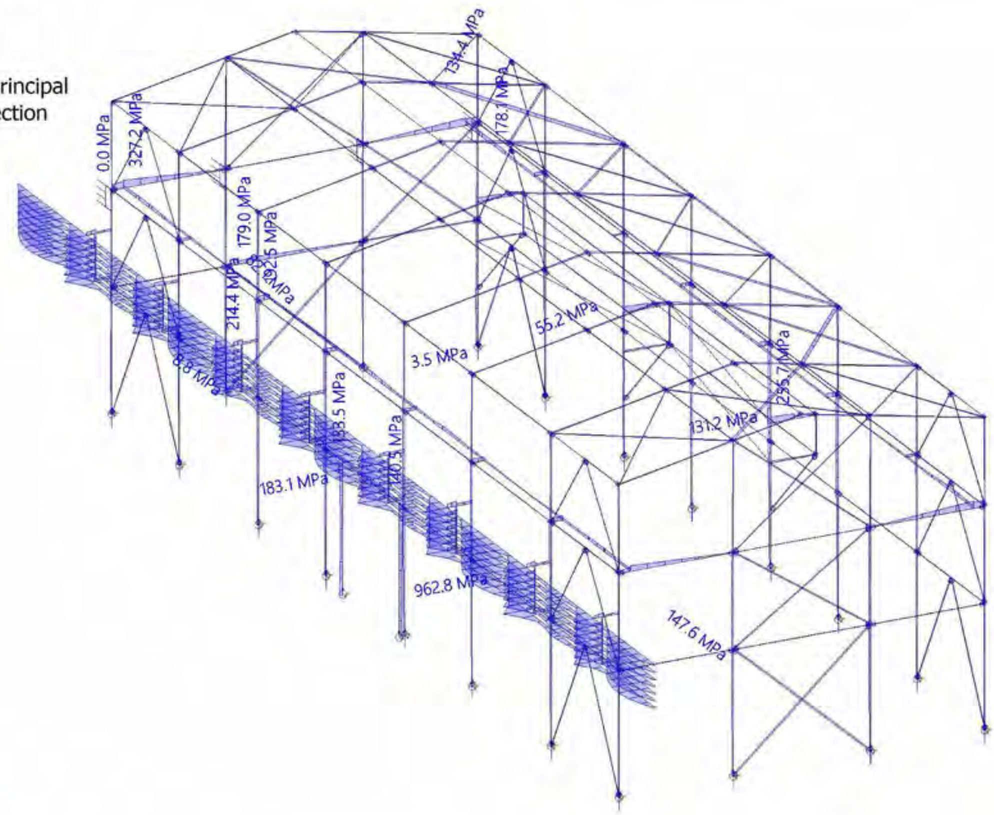
2.2.4.3. Resultaten - σ_2

Values: σ_2
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



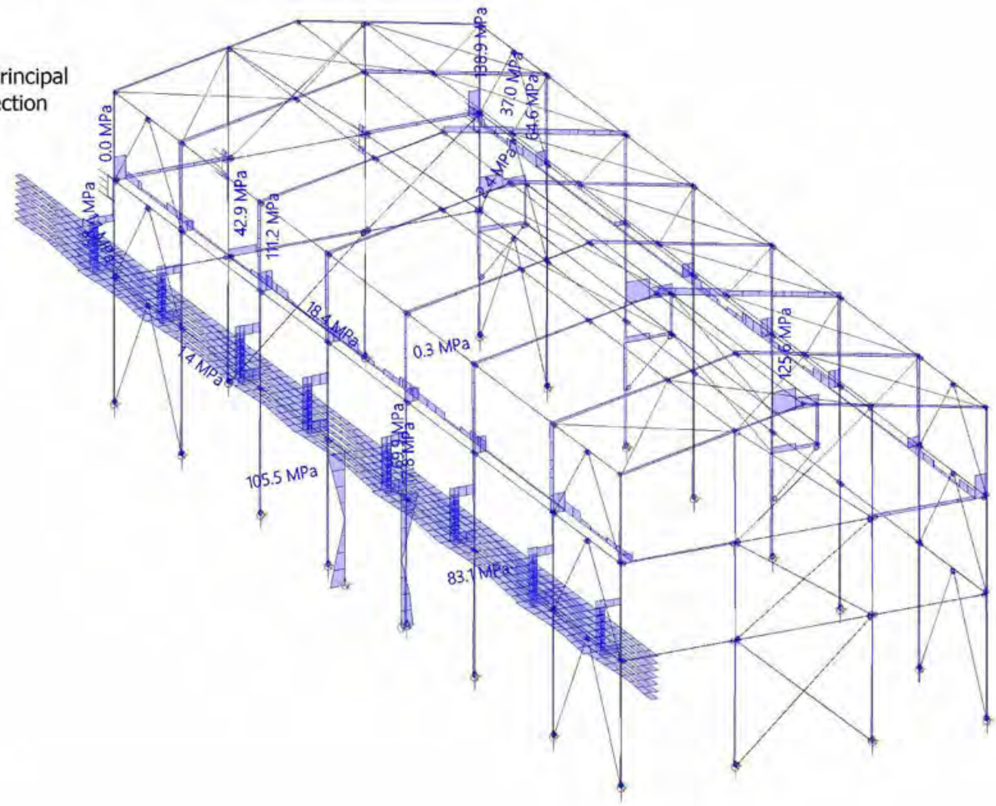
2.2.4.4. Resultaten - σ_E

Values: σ_E
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

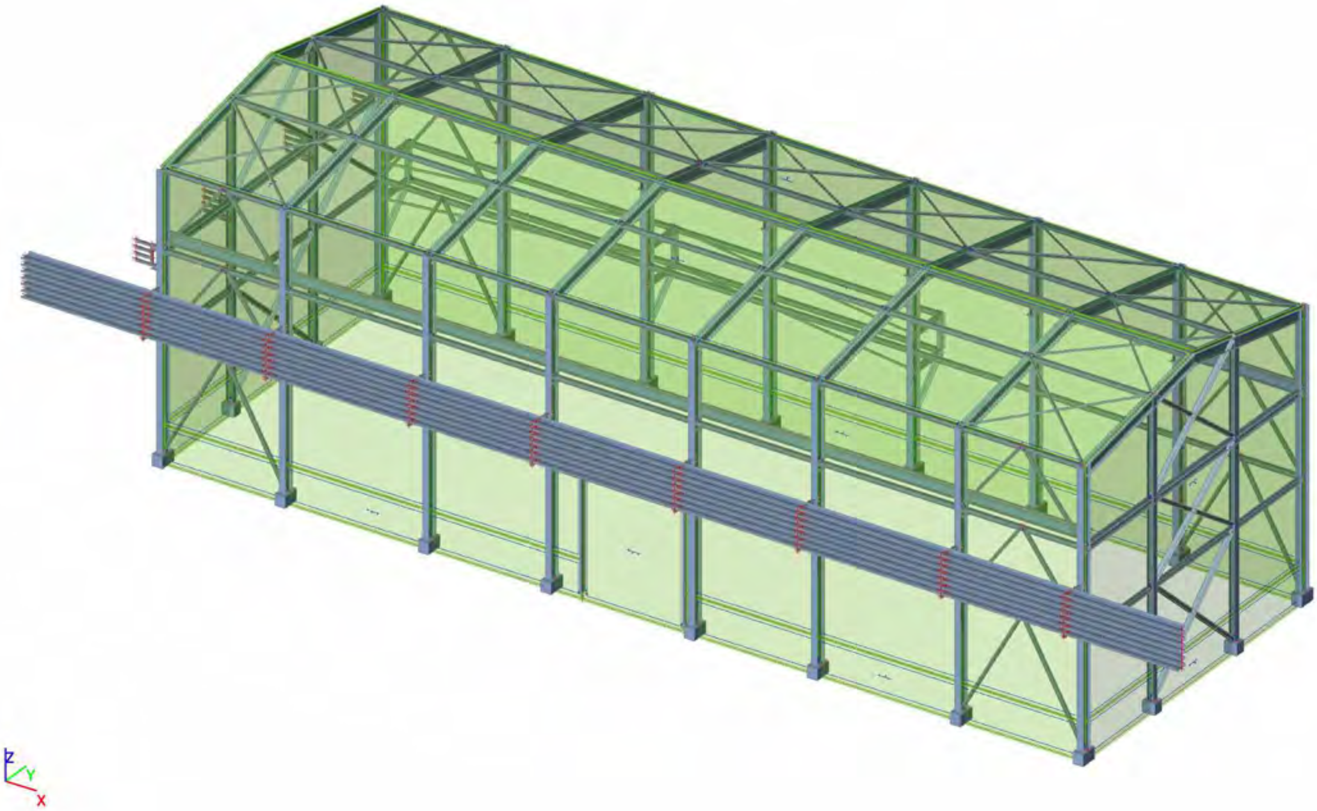


2.2.4.5. Resultaten - τ_tot

Values: τ_{tot}
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



Annex D.3.
Export Steeldesign



1. Table of contents

2. Steel

2.1. Steel slenderness

Linear calculation

Member	CS Name	Part	Sway y Sway z	Ly [m] Lz [m]	ky [-] kz [-]	ly [m] lz [m]	Lam y [-] Lam z [-]	lyz [m]	l LTB [m]
S1	ST-11	1	Yes	5.350	4.47	23.901	103.99	5.350	5.350
			No	5.350	0.85	4.571	64.05		
S1	ST-11	2	Yes	0.400	10.00	4.000	17.40	3.205	3.205
			No	3.205	0.93	2.978	41.72		
S1	ST-11	3	Yes	2.000	8.33	16.665	72.50	3.205	3.205
			No	3.205	0.93	2.978	41.72		
S1	ST-11	4	Yes	1.705	10.00	17.050	74.18	3.205	3.205
			No	3.205	0.93	2.978	41.72		
S1	ST-11	5	Yes	1.705	10.00	17.050	74.18	0.900	0.900
			No	0.900	0.95	0.855	11.98		
S1	ST-11	6	Yes	3.745	2.54	9.497	41.32	3.745	3.745
			No	3.745	0.86	3.221	45.12		
S2	ST-11	1	Yes	2.450	5.95	14.568	63.38	4.450	4.450
			No	4.450	0.83	3.681	51.57		
S2	ST-11	2	Yes	2.000	4.46	8.913	38.78	4.450	4.450
			No	4.450	0.83	3.681	51.57		
S2	ST-11	3	Yes	0.900	6.17	5.557	24.18	0.900	0.900
			No	0.900	0.84	0.760	10.65		
S2	ST-11	4	Yes	0.780	4.77	3.719	16.18	0.780	0.780
			No	0.780	0.91	0.706	9.90		
S2	ST-11	5	Yes	3.325	2.23	7.422	32.29	2.425	2.425
			No	2.425	0.84	2.026	28.38		
S2	ST-11	6	Yes	3.325	2.23	7.422	32.29	0.900	0.900
			No	0.900	0.84	0.757	10.60		
S2	ST-11	7	Yes	3.745	1.73	6.491	28.24	3.745	3.745
			No	3.745	0.79	2.960	41.47		
S3	ST-11	1	Yes	5.093	1.34	6.831	29.72	5.093	5.093
			No	5.093	0.75	3.807	53.34		
S3	ST-11	2	Yes	3.056	1.86	5.677	24.70	3.056	3.056
			No	3.056	0.72	2.189	30.66		
S4	ST-11	1	Yes	3.056	1.89	5.787	25.18	3.056	3.056
			No	3.056	0.74	2.273	31.85		
S4	ST-11	2	Yes	5.093	1.48	7.563	32.90	5.093	5.093
			No	5.093	0.76	3.885	54.44		
S5	ST-14	1	Yes	8.555	2.39	20.441	160.63	5.350	5.350
			No	5.350	0.93	4.953	66.28		
S5	ST-14	2	Yes	8.555	2.39	20.441	160.63	4.105	4.105
			No	4.105	0.71	2.896	38.76		
S5	ST-14	3	Yes	0.900	3.76	3.385	26.60	4.105	4.105
			No	4.105	0.71	2.896	38.76		
S5	ST-14	4	Yes	4.714	2.85	13.433	105.56	4.714	4.714
			No	4.714	0.67	3.151	42.17		
S6	ST-14	1	Yes	8.555	2.36	20.196	158.70	5.350	5.350
			No	5.350	0.73	3.899	52.17		
S6	ST-14	2	Yes	8.555	2.36	20.196	158.70	4.105	4.105
			No	4.105	0.66	2.720	36.40		
S6	ST-14	3	Yes	0.900	3.63	3.264	25.65	4.105	4.105
			No	4.105	0.66	2.720	36.40		
S6	ST-14	4	Yes	4.714	2.94	13.852	108.85	4.714	4.714
			No	4.714	0.64	3.031	40.56		
S7	ST-11	1	Yes	5.750	2.70	15.505	67.46	5.350	5.350
			No	5.350	0.85	4.573	64.07		
S7	ST-11	2	Yes	5.750	2.70	15.505	67.46	4.105	4.105
			No	4.105	0.97	3.975	55.69		
S7	ST-11	3	Yes	2.000	1.81	3.611	15.71	4.105	4.105
			No	4.105	0.97	3.975	55.69		
S7	ST-11	4	Yes	1.705	1.81	3.079	13.39	4.105	4.105
			No	4.105	0.97	3.975	55.69		
S7	ST-11	5	Yes	3.745	1.51	5.647	24.57	3.745	3.745
			No	3.745	0.77	2.888	40.46		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S8	ST-11	1	Yes	8.149	1.25	10.178	44.28	5.093	5.093
			No	5.093	0.76	3.864	54.14		
S8	ST-11	2	Yes	8.149	1.25	10.178	44.28	3.056	3.056
			No	3.056	0.74	2.261	31.68		
S9	ST-11	1	Yes	9.455	2.35	22.177	96.49	5.350	5.350
			No	5.350	0.86	4.598	64.42		
S9	ST-11	2	Yes	9.455	2.35	22.177	96.49	4.105	4.105
			No	4.105	0.84	3.433	48.10		
S9	ST-11	3	Yes	3.745	2.38	8.895	38.70	3.745	3.745
			No	3.745	0.71	2.656	37.21		
S10	ST-11	1	Yes	8.149	2.19	17.863	77.72	3.056	3.056
			No	3.056	0.97	2.979	41.74		
S10	ST-11	2	Yes	8.149	2.19	17.863	77.72	5.093	5.093
			No	5.093	0.96	4.886	68.46		
S11	ST-11	1	Yes	5.750	3.52	20.225	87.99	5.350	5.350
			No	5.350	0.87	4.634	64.93		
S11	ST-11	2	Yes	5.750	3.52	20.225	87.99	4.105	4.105
			No	4.105	0.82	3.371	47.23		
S11	ST-11	3	Yes	2.000	3.36	6.719	29.23	4.105	4.105
			No	4.105	0.82	3.371	47.23		
S11	ST-11	4	Yes	1.705	2.79	4.763	20.72	4.105	4.105
			No	4.105	0.82	3.371	47.23		
S11	ST-11	5	Yes	3.745	2.29	8.559	37.24	3.745	3.745
			No	3.745	0.77	2.888	40.47		
S12	ST-11	1	Yes	8.149	1.34	10.912	47.48	5.093	5.093
			No	5.093	0.77	3.900	54.64		
S12	ST-11	2	Yes	8.149	1.34	10.912	47.48	3.056	3.056
			No	3.056	0.71	2.177	30.50		
S13	ST-11	1	Yes	2.450	7.04	17.259	75.09	5.350	5.350
			No	5.350	0.83	4.442	62.24		
S13	ST-11	2	Yes	2.000	5.66	11.312	49.22	5.350	5.350
			No	5.350	0.83	4.442	62.24		
S13	ST-11	3	Yes	1.680	5.03	8.453	36.78	5.350	5.350
			No	5.350	0.83	4.442	62.24		
S13	ST-11	4	Yes	1.680	5.03	8.453	36.78	4.105	4.105
			No	4.105	0.83	3.391	47.51		
S13	ST-11	5	Yes	3.325	2.53	8.396	36.53	4.105	4.105
			No	4.105	0.83	3.391	47.51		
S13	ST-11	6	Yes	3.745	2.54	9.511	41.38	3.745	3.745
			No	3.745	0.81	3.045	42.66		
S14	ST-11	1	Yes	8.149	1.45	11.825	51.45	3.056	3.056
			No	3.056	0.81	2.469	34.59		
S14	ST-11	2	Yes	8.149	1.45	11.825	51.45	5.093	5.093
			No	5.093	0.80	4.076	57.10		
S15	ST-11	1	Yes	5.750	3.59	20.645	89.82	5.350	5.350
			No	5.350	0.87	4.661	65.31		
S15	ST-11	2	Yes	5.750	3.59	20.645	89.82	4.105	4.105
			No	4.105	0.91	3.722	52.15		
S15	ST-11	3	Yes	2.000	3.53	7.055	30.69	4.105	4.105
			No	4.105	0.91	3.722	52.15		
S15	ST-11	4	Yes	1.705	3.04	5.188	22.57	4.105	4.105
			No	4.105	0.91	3.722	52.15		
S15	ST-11	5	Yes	3.745	1.71	6.390	27.80	3.745	3.745
			No	3.745	0.89	3.317	46.47		
S16	ST-11	1	Yes	8.149	1.25	10.216	44.45	5.093	5.093
			No	5.093	0.92	4.660	65.30		
S16	ST-11	2	Yes	8.149	1.25	10.216	44.45	3.056	3.056
			No	3.056	0.87	2.671	37.43		
S17	ST-11	1	Yes	9.455	2.97	28.042	122.00	5.350	5.350
			No	5.350	0.87	4.674	65.48		
S17	ST-11	2	Yes	9.455	2.97	28.042	122.00	4.105	4.105
			No	4.105	0.83	3.393	47.54		
S17	ST-11	3	Yes	3.745	3.49	13.060	56.82	3.745	3.745
			No	3.745	0.92	3.446	48.27		
S18	ST-11	1	Yes	8.149	1.85	15.044	65.45	3.056	3.056

Member	CS Name	Part	Sway y Sway z	Ly [m] Lz [m]	ky [-] kz [-]	ly [m] lz [m]	Lam y [-] Lam z [-]	lyz [m]	l LTB [m]
			No	3.056	0.83	2.548	35.70		
S18	ST-11	2	Yes No	8.149 5.093	1.85 0.82	15.044 4.157	65.45 58.24	5.093	5.093
S19	ST-11	1	Yes No	5.750 5.350	3.55 0.87	20.406 4.675	88.78 65.49	5.350	5.350
S19	ST-11	2	Yes No	5.750 4.105	3.55 0.83	20.406 3.396	88.78 47.57	4.105	4.105
S19	ST-11	3	Yes No	2.000 4.105	3.48 0.83	6.955 3.396	30.26 47.57	4.105	4.105
S19	ST-11	4	Yes No	1.705 4.105	2.99 0.83	5.106 3.396	22.22 47.57	4.105	4.105
S19	ST-11	5	Yes No	3.745 3.745	1.78 0.94	6.664 3.505	28.99 49.11	3.745	3.745
S20	ST-11	1	Yes No	8.149 5.093	1.25 0.98	10.151 4.980	44.16 69.77	5.093	5.093
S20	ST-11	2	Yes No	8.149 3.056	1.25 0.80	10.151 2.439	44.16 34.18	3.056	3.056
S21	ST-11	1	Yes No	2.450 4.450	7.14 0.95	17.489 4.215	76.09 59.06	4.450	4.450
S21	ST-11	2	Yes No	2.000 4.450	5.68 0.95	11.352 4.215	49.39 59.06	4.450	4.450
S21	ST-11	3	Yes No	1.680 0.900	5.01 0.95	8.414 0.855	36.61 11.98	0.900	0.900
S21	ST-11	4	Yes No	1.680 0.780	5.01 0.94	8.414 0.733	36.61 10.27	0.780	0.780
S21	ST-11	5	Yes No	3.325 3.325	2.74 0.89	9.109 2.950	39.63 41.34	3.325	3.325
S21	ST-11	6	Yes No	3.745 3.745	3.63 0.81	13.576 3.046	59.07 42.67	3.745	3.745
S22	ST-11	1	Yes No	8.149 3.056	1.99 0.72	16.213 2.194	70.54 30.74	3.056	3.056
S22	ST-11	2	Yes No	8.149 5.093	1.99 0.75	16.213 3.801	70.54 53.25	5.093	5.093
S23	ST-11	1	Yes No	5.750 5.350	3.49 0.87	20.081 4.636	87.36 64.95	5.350	5.350
S23	ST-11	2	Yes No	5.750 4.105	3.49 0.82	20.081 3.347	87.36 46.89	4.105	4.105
S23	ST-11	3	Yes No	2.000 4.105	3.29 0.82	6.588 3.347	28.66 46.89	4.105	4.105
S23	ST-11	4	Yes No	1.705 4.105	2.66 0.82	4.539 3.347	19.75 46.89	4.105	4.105
S23	ST-11	5	Yes No	3.745 3.745	2.35 0.94	8.783 3.516	38.21 49.25	3.745	3.745
S24	ST-11	1	Yes No	8.149 5.093	1.43 0.98	11.615 5.016	50.54 70.27	5.093	5.093
S24	ST-11	2	Yes No	8.149 3.056	1.43 0.76	11.615 2.319	50.54 32.49	3.056	3.056
S25	ST-11	1	Yes No	9.455 5.350	2.73 0.87	25.859 4.641	112.51 65.03	5.350	5.350
S25	ST-11	2	Yes No	9.455 4.105	2.73 0.89	25.859 3.664	112.51 51.33	4.105	4.105
S25	ST-11	3	Yes No	3.745 3.745	3.06 0.81	11.470 3.028	49.90 42.42	3.745	3.745
S26	ST-11	1	Yes No	8.149 3.056	1.71 0.76	13.960 2.323	60.74 32.55	3.056	3.056
S26	ST-11	2	Yes No	8.149 5.093	1.71 0.77	13.960 3.922	60.74 54.95	5.093	5.093
S27	ST-11	1	Yes No	5.750 5.350	2.88 0.85	16.581 4.560	72.14 63.89	5.350	5.350
S27	ST-11	2	Yes No	5.750 4.105	2.88 0.85	16.581 3.490	72.14 48.90	4.105	4.105
S27	ST-11	3	Yes No	2.000 4.105	2.26 0.85	4.512 3.490	19.63 48.90	4.105	4.105
S27	ST-11	4	Yes No	1.705 4.105	1.87 0.85	3.185 3.490	13.86 48.90	4.105	4.105

Member	CS Name	Part	Sway y Sway z	Ly [m] Lz [m]	ky [-] kz [-]	ly [m] lz [m]	Lam y [-] Lam z [-]	lyz [m]	l LTB [m]
S27	ST-11	5	Yes	3.745	1.47	5.504	23.95	3.745	3.745
			No	3.745	0.75	2.807	39.32		
S28	ST-11	1	Yes	8.149	1.42	11.605	50.49	5.093	5.093
			No	5.093	0.83	4.248	59.51		
S28	ST-11	2	Yes	8.149	1.42	11.605	50.49	3.056	3.056
			No	3.056	0.75	2.295	32.16		
S29	ST-11	1	Yes	9.455	2.22	21.019	91.45	5.350	5.350
			No	5.350	0.86	4.584	64.23		
S29	ST-11	2	Yes	9.455	2.22	21.019	91.45	4.105	4.105
			No	4.105	0.89	3.642	51.03		
S29	ST-11	3	Yes	3.745	2.19	8.218	35.76	3.745	3.745
			No	3.745	0.79	2.964	41.52		
S30	ST-11	1	Yes	8.149	2.36	19.207	83.56	3.056	3.056
			No	3.056	0.71	2.163	30.31		
S30	ST-11	2	Yes	8.149	2.36	19.207	83.56	5.093	5.093
			No	5.093	0.75	3.824	53.58		
S31	ST-11	1	Yes	5.350	6.16	32.974	143.46	5.350	5.350
			No	5.350	0.85	4.551	63.76		
S31	ST-11	2	Yes	0.400	10.00	4.000	17.40	4.105	4.105
			No	4.105	0.82	3.356	47.02		
S31	ST-11	3	Yes	2.000	8.77	17.535	76.29	4.105	4.105
			No	4.105	0.82	3.356	47.02		
S31	ST-11	4	Yes	1.705	5.18	8.840	38.46	4.105	4.105
			No	4.105	0.82	3.356	47.02		
S31	ST-11	5	Yes	3.745	1.98	7.410	32.24	3.745	3.745
			No	3.745	0.82	3.087	43.25		
S32	ST-11	1	Yes	5.093	1.14	5.793	25.20	5.093	5.093
			No	5.093	0.85	4.351	60.96		
S32	ST-11	2	Yes	3.056	1.92	5.872	25.55	3.056	3.056
			No	3.056	0.73	2.218	31.08		
S33	ST-11	1	Yes	5.350	6.23	33.311	144.93	5.350	5.350
			No	5.350	0.86	4.588	64.28		
S33	ST-11	2	Yes	4.105	4.10	16.851	73.31	4.105	4.105
			No	4.105	0.83	3.401	47.65		
S33	ST-11	3	Yes	3.745	2.08	7.771	33.81	3.745	3.745
			No	3.745	0.94	3.511	49.19		
S34	ST-11	1	Yes	3.056	2.06	6.296	27.39	3.056	3.056
			No	3.056	0.72	2.189	30.67		
S34	ST-11	2	Yes	5.093	1.21	6.172	26.85	5.093	5.093
			No	5.093	0.77	3.919	54.90		
S35	ST-14	1	Yes	14.169	1.00	14.169	111.34	5.350	5.350
			No	5.350	0.78	4.158	55.64		
S35	ST-14	2	Yes	14.169	1.00	14.169	111.34	4.105	4.105
			No	4.105	0.72	2.954	39.54		
S35	ST-14	3	Yes	14.169	1.00	14.169	111.34	4.714	4.714
			No	4.714	0.58	2.751	36.82		
S36	ST-14	1	Yes	14.169	1.00	14.169	111.34	5.350	5.350
			No	5.350	0.78	4.162	55.70		
S36	ST-14	2	Yes	14.169	1.00	14.169	111.34	4.105	4.105
			No	4.105	0.72	2.935	39.28		
S36	ST-14	3	Yes	14.169	1.00	14.169	111.34	4.714	4.714
			No	4.714	0.74	3.496	46.78		
S37	ST-12	1	Yes	3.000	2.52	7.562	91.31	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S37	ST-12	2	Yes	3.000	2.62	7.845	94.73	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S38	ST-12	1	Yes	3.000	2.62	7.864	94.96	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S38	ST-12	2	Yes	3.000	2.57	7.701	92.99	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S39	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S41	ST-13	1	Yes	45.000	1.09	49.269	226.21	6.000	6.000
			No	6.000	0.62	3.737	56.96		
S41	ST-13	2	Yes	45.000	1.09	49.269	226.21	7.000	7.000

Member	CS Name	Part	Sway y / Sway z	Ly [m] / Lz [m]	ky [-] / kz [-]	ly [m] / lz [m]	Lam y [-] / Lam z [-]	lyz [m]	l LTB [m]
			No	7.000	0.66	4.630	70.57		
S41	ST-13	3	Yes	45.000	1.09	49.269	226.21	6.000	6.000
			No	6.000	0.72	4.341	66.16		
S41	ST-13	4	Yes	45.000	1.09	49.269	226.21	7.000	7.000
			No	7.000	0.75	5.239	79.85		
S41	ST-13	5	Yes	45.000	1.09	49.269	226.21	6.000	6.000
			No	6.000	0.81	4.875	74.30		
S41	ST-13	6	Yes	45.000	1.09	49.269	226.21	7.000	7.000
			No	7.000	0.91	6.391	97.41		
S41	ST-13	7	Yes	45.000	1.09	49.269	226.21	6.000	6.000
			No	6.000	0.75	4.519	68.88		
S42	ST-21	1	Yes	5.000	1.00	5.000	38.48	4.500	4.500
			No	4.500	0.83	3.753	49.52		
S42	ST-21	2	Yes	5.000	1.00	5.000	38.48	0.500	0.500
			No	0.500	0.97	0.487	6.43		
S43	ST-21	1	Yes	5.000	1.00	5.000	38.48	4.500	4.500
			No	4.500	0.74	3.337	44.04		
S43	ST-21	2	Yes	5.000	1.00	5.000	38.48	0.500	0.500
			No	0.500	0.89	0.446	5.89		
S44	ST-13	1	Yes	45.000	1.09	48.911	224.56	6.000	6.000
			No	6.000	0.83	4.966	75.69		
S44	ST-13	2	Yes	45.000	1.09	48.911	224.56	7.000	7.000
			No	7.000	0.70	4.909	74.83		
S44	ST-13	3	Yes	45.000	1.09	48.911	224.56	6.000	6.000
			No	6.000	0.78	4.667	71.14		
S44	ST-13	4	Yes	45.000	1.09	48.911	224.56	7.000	7.000
			No	7.000	0.81	5.686	86.67		
S44	ST-13	5	Yes	45.000	1.09	48.911	224.56	6.000	6.000
			No	6.000	0.64	3.849	58.67		
S44	ST-13	6	Yes	45.000	1.09	48.911	224.56	7.000	7.000
			No	7.000	0.84	5.866	89.42		
S44	ST-13	7	Yes	45.000	1.09	48.911	224.56	6.000	6.000
			No	6.000	0.57	3.418	52.09		
S45	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.93	0.464	6.40		
S46	ST-12	1	Yes	3.000	2.64	7.933	95.79	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S46	ST-12	2	Yes	3.000	2.66	7.984	96.41	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S47	ST-12	1	Yes	3.000	2.66	7.978	96.33	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S47	ST-12	2	Yes	3.000	2.64	7.918	95.61	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S48	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.95	0.475	6.56		
S49	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.96	0.482	6.64		
S50	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.98	0.489	6.75		
S51	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.99	0.497	6.86		
S52	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.98	0.489	6.75		
S53	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.96	0.479	6.61		
S54	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.97	0.485	6.70		
S55	ST-15	1	Yes	0.500	9.38	4.691	22.38	0.500	0.500
			No	0.500	0.94	0.472	6.51		
S56	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.97	0.483	6.66		
S57	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.98	0.489	6.74		
S58	ST-15	1	Yes	0.500	10.00	5.000	23.85	0.500	0.500
			No	0.500	0.97	0.485	6.69		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S59	ST-12	1	Yes	3.000	2.75	8.263	99.77	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S59	ST-12	2	Yes	3.000	2.70	8.109	97.92	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S60	ST-12	1	Yes	3.000	2.69	8.057	97.29	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S60	ST-12	2	Yes	3.000	2.69	8.057	97.28	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S61	ST-24	1	Yes	5.000	1.00	5.000	54.51	5.000	5.000
			No	5.000	1.00	5.000	90.56		
S62	ST-24	1	Yes	5.000	1.00	5.000	54.51	5.000	5.000
			No	5.000	1.00	5.000	90.56		
S63	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S64	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S65	ST-16	1	Yes	5.600	1.00	5.600	51.59	5.600	5.600
			No	5.600	0.73	4.078	149.04		
S66	ST-16	1	Yes	5.600	1.00	5.600	51.59	5.600	5.600
			No	5.600	0.73	4.080	149.13		
S68	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S69	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S69	ST-22	2	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S70	ST-24	1	Yes	5.000	1.00	5.000	54.51	5.000	5.000
			No	5.000	1.00	5.000	90.56		
S71	ST-24	1	Yes	6.000	1.00	6.000	65.41	6.000	6.000
			No	6.000	1.00	6.000	108.67		
S72	ST-21	1	Yes	5.000	1.00	5.000	38.48	0.500	0.500
			No	0.500	0.98	0.488	6.45		
S72	ST-21	2	Yes	5.000	1.00	5.000	38.48	4.500	4.500
			No	4.500	0.83	3.723	49.12		
S73	ST-21	1	Yes	6.000	1.00	6.000	46.18	6.000	6.000
			No	6.000	1.00	6.000	79.17		
S74	ST-22	1	Yes	3.635	0.85	3.090	37.31	7.270	7.270
			No	7.270	0.85	6.179	123.82		
S75	ST-22	1	Yes	3.635	0.85	3.090	37.31	7.270	7.270
			No	7.270	0.85	6.179	123.82		
S75	ST-22	2	Yes	3.635	0.85	3.090	37.31	7.270	7.270
			No	7.270	0.85	6.179	123.82		
S76	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S77	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S77	ST-22	2	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S78	ST-24	1	Yes	6.000	1.00	6.000	65.41	6.000	6.000
			No	6.000	1.00	6.000	108.67		
S79	ST-24	1	Yes	5.000	1.00	5.000	54.51	5.000	5.000
			No	5.000	1.00	5.000	90.56		
S80	ST-21	1	Yes	5.000	1.00	5.000	38.48	0.500	0.500
			No	0.500	0.93	0.464	6.12		
S80	ST-21	2	Yes	5.000	1.00	5.000	38.48	4.500	4.500
			No	4.500	0.76	3.426	45.21		
S81	ST-21	1	Yes	6.000	1.00	6.000	46.18	6.000	6.000
			No	6.000	1.00	6.000	79.17		
S82	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S82	ST-22	2	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S83	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S84	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	7.630	0.85	6.486	129.95		
S84	ST-22	2	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S85	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S86	ST-22	1	Yes	3.235	0.85	2.749	33.20	6.469	6.469
			No	6.469	0.85	5.499	110.18		
S86	ST-22	2	Yes	3.235	0.85	2.749	33.20	6.469	6.469
			No	6.469	0.85	5.499	110.18		
S87	ST-22	1	Yes	3.235	0.85	2.749	33.20	6.469	6.469
			No	6.469	0.85	5.499	110.18		
S88	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S89	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S90	ST-23	1	Yes	1.500	2.87	4.311	36.33	7.000	7.000
			No	7.000	1.00	7.000	100.08		
S90	ST-23	2	Yes	5.000	1.35	6.753	56.91	7.000	7.000
			No	7.000	1.00	7.000	100.08		
S90	ST-23	3	Yes	0.500	5.01	2.506	21.12	7.000	7.000
			No	7.000	1.00	7.000	100.08		
S91	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S92	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S93	ST-12	1	Yes	3.000	2.70	8.110	97.92	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S93	ST-12	2	Yes	3.000	2.71	8.118	98.02	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S94	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S95	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S96	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S97	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S98	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S99	ST-12	1	Yes	3.000	2.71	8.140	98.29	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S99	ST-12	2	Yes	3.000	2.69	8.066	97.40	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S100	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S101	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S102	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S103	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S104	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S105	ST-12	1	Yes	3.000	3.37	10.101	121.97	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S105	ST-12	2	Yes	3.000	2.44	7.310	88.27	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S106	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S107	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S108	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S109	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S110	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S111	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S112	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S113	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S114	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S115	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S116	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S117	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S118	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S119	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S120	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S121	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S122	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S123	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S124	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S125	ST-17	1	Yes	6.134	1.00	6.134	107.10	6.134	6.134
			No	6.134	1.00	6.134	174.27		
S126	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S127	ST-17	1	Yes	5.084	1.00	5.084	88.77	5.084	5.084
			No	5.084	1.00	5.084	144.45		
S128	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S129	ST-17	1	Yes	4.798	1.00	4.798	83.78	4.798	4.798
			No	4.798	1.00	4.798	136.33		
S130	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S131	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S132	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S133	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S134	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S135	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S136	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S137	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S138	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S139	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S140	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S141	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S142	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	7.870	1.00	7.870	402.78		
S143	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S144	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S145	ST-18	1	Yes	8.657	1.00	8.657	226.69	8.657	8.657
			No	8.657	1.00	8.656	443.04		
S146	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S147	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S148	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S149	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S150	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S151	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S152	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S153	ST-18	1	Yes	7.870	1.00	7.870	206.09	7.870	7.870
			No	7.870	1.00	7.870	402.78		
S154	ST-18	1	Yes	8.485	1.00	8.485	222.20	8.485	8.485
			No	8.485	1.00	8.485	434.26		
S155	ST-18	1	Yes	8.485	1.00	8.485	222.20	8.485	8.485
			No	8.485	1.00	8.485	434.26		
S156	ST-18	1	Yes	8.485	1.00	8.485	222.20	8.485	8.485
			No	8.485	1.00	8.485	434.26		
S157	ST-18	1	Yes	8.485	1.00	8.485	222.20	8.485	8.485
			No	8.485	1.00	8.485	434.26		
S158	ST-20	1	Yes	2.000	4.07	8.131	86.25	2.000	2.000
			No	2.000	0.99	1.986	35.53		
S159	ST-20	1	Yes	2.000	2.55	5.106	54.16	2.000	2.000
			No	2.000	0.91	1.827	32.69		
S160	ST-20	1	Yes	1.680	3.62	6.087	64.57	1.680	1.680
			No	1.680	0.93	1.564	27.99		
S161	ST-12	1	Yes	2.828	1.00	2.828	34.15	2.828	2.828
			No	2.828	1.00	2.828	56.67		
S162	ST-20	1	Yes	2.000	2.89	5.775	61.25	2.000	2.000
			No	2.000	1.00	1.998	35.76		
S163	ST-20	1	Yes	1.680	4.11	6.912	73.32	1.680	1.680
			No	1.680	0.99	1.656	29.64		
S164	ST-20	1	Yes	2.000	4.16	8.322	88.28	2.000	2.000
			No	2.000	0.94	1.885	33.72		
S165	ST-12	1	Yes	2.828	1.00	2.828	34.15	2.828	2.828
			No	2.828	1.00	2.828	56.67		
S166	ST-20	1	Yes	2.000	2.89	5.773	61.23	2.000	2.000
			No	2.000	0.99	1.983	35.48		
S167	ST-20	1	Yes	1.680	4.08	6.856	72.73	1.680	1.680
			No	1.680	0.91	1.523	27.25		
S168	ST-20	1	Yes	2.000	4.10	8.193	86.91	2.000	2.000
			No	2.000	0.94	1.875	33.56		
S169	ST-12	1	Yes	2.828	1.00	2.828	34.15	2.828	2.828
			No	2.828	1.00	2.828	56.67		
S170	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S171	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S172	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S173	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S174	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S175	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S176	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S177	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S178	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S179	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S180	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S181	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S182	ST-12	1	Yes	0.700	8.58	6.006	72.52	1.100	1.100
			No	1.100	0.76	0.837	16.78		
S183	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	3	Yes	0.300	9.31	2.792	33.71	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	4	Yes	0.300	8.37	2.512	30.33	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	5	Yes	0.300	9.03	2.710	32.73	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S183	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.98	1.967	39.41		
S184	ST-12	1	Yes	0.700	6.26	4.383	52.92	0.700	0.700
			No	0.700	1.00	0.697	13.96		
S206	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S206	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.76	0.837	33.30		
S207	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S207	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.348	13.84		
S208	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S208	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.92	0.369	14.67		
S209	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S209	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.371	14.78		
S210	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S210	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.373	14.84		
S211	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S211	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.373	14.83		
S212	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S212	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.84	0.338	13.43		
S213	ST-12	1	Yes	0.700	2.29	1.600	19.32	1.100	1.100
			No	1.100	0.77	0.847	16.97		
S214	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S214	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	2.000	0.97	1.938	38.84		
S214	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S214	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S214	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S214	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S214	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.938	38.84		
S215	ST-12	1	Yes	0.700	3.78	2.646	31.95	0.700	0.700
			No	0.700	0.99	0.696	13.94		
S216	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S216	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.77	0.847	33.69		
S217	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S217	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.83	0.331	13.17		
S218	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S218	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.91	0.364	14.46		
S219	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S219	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.92	0.370	14.70		
S220	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S220	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.374	14.86		
S221	ST-19	1	Yes	0.800	9.41	7.530	185.58	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S221	ST-19	2	Yes	0.800	9.41	7.530	185.58	0.400	0.400
			No	0.400	0.86	0.343	13.65		
S222	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S222	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.94	0.375	14.92		
S223	ST-12	1	Yes	0.700	4.26	2.980	35.99	1.100	1.100
			No	1.100	0.76	0.840	16.83		
S224	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S224	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.941	38.90		
S225	ST-12	1	Yes	0.700	5.04	3.530	42.62	0.700	0.700
			No	0.700	1.00	0.697	13.96		
S226	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S226	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.76	0.840	33.41		
S227	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S227	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.69	0.276	10.96		
S228	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S228	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.89	0.356	14.16		
S229	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S229	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.91	0.362	14.41		
S230	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S230	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.92	0.366	14.56		
S231	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S231	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.76	0.305	12.12		
S232	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S232	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.92	0.366	14.57		
S233	ST-12	1	Yes	0.700	4.65	3.253	39.27	1.100	1.100
			No	1.100	0.75	0.824	16.50		
S234	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S234	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.97	1.949	39.04		
S235	ST-12	1	Yes	0.700	5.52	3.863	46.64	0.700	0.700
			No	0.700	1.00	0.697	13.96		
S236	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S236	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.75	0.824	32.76		
S237	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S237	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.80	0.319	12.70		
S238	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S238	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.84	0.337	13.40		
S239	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S239	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.348	13.85		
S240	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S240	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.88	0.353	14.04		
S241	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S241	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.75	0.298	11.86		
S242	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	0.400	1.00	0.400	15.91		
S242	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.349	13.86		
S243	ST-12	1	Yes	0.700	4.60	3.217	38.85	1.100	1.100
			No	1.100	0.76	0.838	16.80		
S244	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S244	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.970	39.48		
S245	ST-12	1	Yes	0.700	5.49	3.840	46.36	0.700	0.700
			No	0.700	1.00	0.697	13.97		
S246	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S246	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.76	0.838	33.35		
S247	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S247	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.85	0.342	13.59		
S248	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S248	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.348	13.84		
S249	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S249	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.348	13.84		
S250	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S250	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.348	13.83		
S251	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S251	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.83	0.334	13.28		
S252	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S252	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.87	0.347	13.79		
S253	ST-12	1	Yes	0.700	4.16	2.913	35.18	1.100	1.100
			No	1.100	0.82	0.899	18.02		
S254	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		
S254	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.989	39.85		

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S255	ST-12	1	Yes	0.700	4.96	3.469	41.89	0.700	0.700
			No	0.700	1.00	0.698	13.98		
S256	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S256	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.82	0.899	35.76		
S257	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S257	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.372	14.78		
S258	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S258	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.93	0.372	14.79		
S259	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S259	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.92	0.368	14.65		
S260	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S260	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.91	0.365	14.53		
S261	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S261	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.88	0.350	13.94		
S262	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S262	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.90	0.362	14.38		
S263	ST-12	1	Yes	0.700	2.87	2.006	24.22	1.100	1.100
			No	1.100	0.93	1.019	20.43		
S264	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	3	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	4	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	5	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S264	ST-12	7	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.99	1.972	39.51		
S265	ST-12	1	Yes	0.700	4.22	2.956	35.69	0.700	0.700
			No	0.700	1.00	0.700	14.02		
S266	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S266	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.93	1.019	40.55		
S267	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S267	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.99	0.395	15.72		
S268	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S268	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.97	0.390	15.50		
S269	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S269	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.96	0.385	15.31		
S270	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400

Member	CS Name	Part	Sway y Sway z	Ly [m] Lz [m]	ky [-] kz [-]	ly [m] lz [m]	Lam y [-] Lam z [-]	lyz [m]	l LTB [m]
			No	0.400	1.00	0.400	15.91		
S270	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.96	0.382	15.20		
S271	ST-19	1	Yes	0.800	9.35	7.484	184.44	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S271	ST-19	2	Yes	0.800	9.35	7.484	184.44	0.400	0.400
			No	0.400	0.94	0.377	14.98		
S272	ST-19	1	Yes	0.800	9.90	7.921	195.22	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S272	ST-19	2	Yes	0.800	9.90	7.921	195.22	0.400	0.400
			No	0.400	0.95	0.380	15.13		
S273	ST-12	1	Yes	0.700	6.58	4.604	55.59	1.100	1.100
			No	1.100	0.99	1.094	21.91		
S274	ST-12	1	Yes	0.200	10.00	2.000	24.15	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	2	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	3	Yes	0.300	8.71	2.614	31.57	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	4	Yes	0.300	7.98	2.393	28.89	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	5	Yes	0.300	8.87	2.662	32.15	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	6	Yes	0.300	10.00	3.000	36.22	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S274	ST-12	7	Yes	0.300	9.07	2.721	32.86	2.000	2.000
			No	2.000	0.98	1.952	39.11		
S275	ST-12	1	Yes	0.700	6.17	4.316	52.12	0.700	0.700
			No	0.700	0.99	0.696	13.95		
S276	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S276	ST-19	2	Yes	0.800	10.00	8.000	197.17	1.100	1.100
			No	1.100	0.99	1.094	43.50		
S277	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S277	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.398	15.84		
S278	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S278	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.98	0.393	15.65		
S279	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S279	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.97	0.387	15.41		
S280	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S280	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.96	0.383	15.25		
S281	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S281	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.94	0.375	14.93		
S282	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	1.00	0.400	15.91		
S282	ST-19	2	Yes	0.800	10.00	8.000	197.17	0.400	0.400
			No	0.400	0.95	0.381	15.15		
S285	ST-19	1	Yes	0.300	8.47	2.542	62.65	0.900	0.900
			No	0.900	0.95	0.855	34.00		
S285	ST-19	2	Yes	0.300	8.69	2.606	64.22	0.900	0.900
			No	0.900	0.95	0.855	34.00		
S285	ST-19	3	Yes	0.300	5.87	1.762	43.42	0.900	0.900
			No	0.900	0.95	0.855	34.00		
S290	ST-12	1	Yes	0.550	6.74	3.710	44.79	1.350	1.350
			No	1.350	0.99	1.340	26.85		

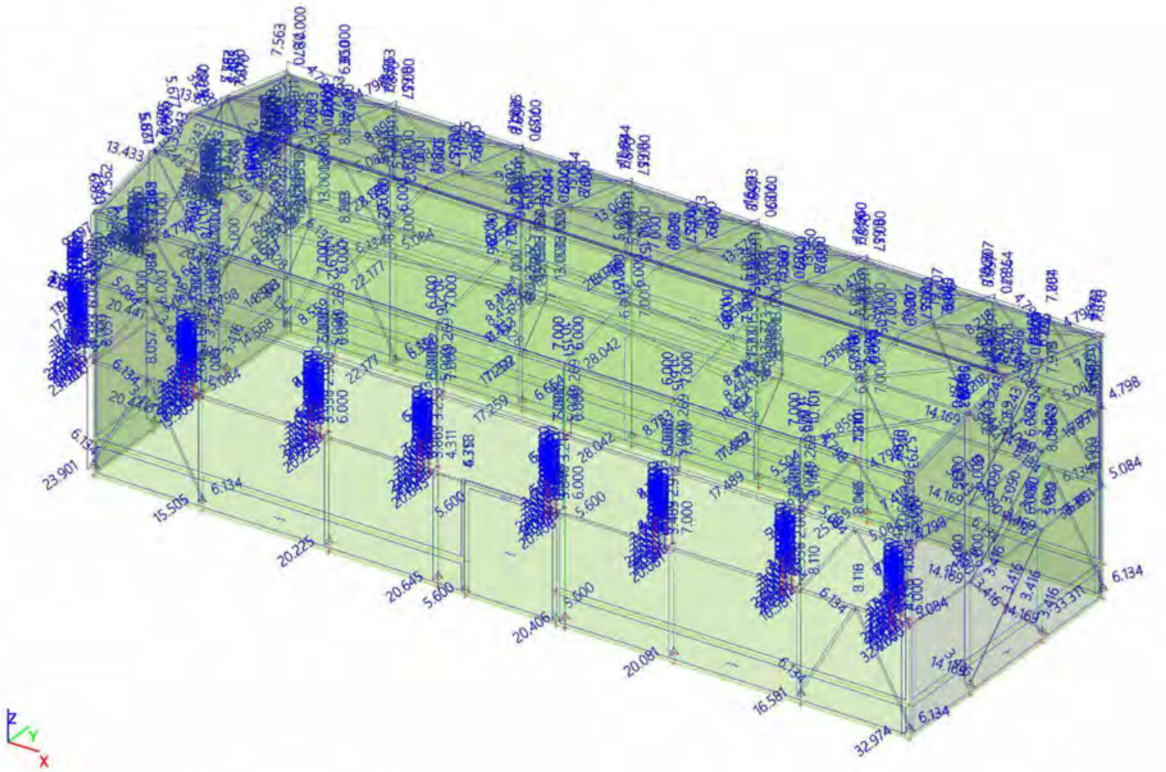
Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S291	ST-12	1	Yes	0.550	6.28	3.451	41.67	1.350	1.350
			No	1.350	0.99	1.341	26.86		
S292	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	0.99	1.340	53.30		
S293	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S294	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S295	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	0.99	1.341	53.33		
S296	ST-19	1	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.91	0.819	32.59		
S296	ST-19	2	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.91	0.819	32.59		
S296	ST-19	3	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.91	0.819	32.59		
S297	ST-12	1	Yes	0.550	6.97	3.834	46.29	1.350	1.350
			No	1.350	1.00	1.349	27.03		
S298	ST-12	1	Yes	0.550	5.94	3.266	39.44	1.350	1.350
			No	1.350	1.00	1.349	27.03		
S299	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	1.00	1.349	53.65		
S300	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S301	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S302	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	1.00	1.349	53.67		
S303	ST-19	1	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.76	0.686	27.30		
S303	ST-19	2	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.76	0.686	27.30		
S303	ST-19	3	Yes	0.300	10.00	3.000	73.94	0.900	0.900
			No	0.900	0.76	0.686	27.30		
S304	ST-12	1	Yes	0.550	6.41	3.526	42.57	1.350	1.350
			No	1.350	1.00	1.349	27.02		
S305	ST-12	1	Yes	0.550	5.43	2.987	36.06	1.350	1.350
			No	1.350	1.00	1.349	27.03		
S306	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	1.00	1.349	53.64		
S307	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S308	ST-19	1	Yes	0.800	10.00	8.000	197.17	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S309	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	1.00	1.349	53.66		
S310	ST-19	1	Yes	0.300	3.94	1.182	29.14	0.900	0.900
			No	0.900	0.90	0.806	32.05		
S310	ST-19	2	Yes	0.300	4.89	1.468	36.17	0.900	0.900
			No	0.900	0.90	0.806	32.05		
S310	ST-19	3	Yes	0.300	3.40	1.019	25.11	0.900	0.900
			No	0.900	0.90	0.806	32.05		
S311	ST-12	1	Yes	0.550	5.96	3.276	39.56	1.350	1.350
			No	1.350	0.99	1.341	26.87		
S312	ST-12	1	Yes	0.550	4.21	2.316	27.96	1.350	1.350
			No	1.350	0.99	1.343	26.91		
S313	ST-19	1	Yes	0.800	10.00	8.000	197.17	1.350	1.350
			No	1.350	0.99	1.341	53.34		
S314	ST-19	1	Yes	0.800	8.80	7.038	173.46	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S315	ST-19	1	Yes	0.800	9.78	7.823	192.81	0.800	0.800
			No	0.800	1.00	0.800	31.82		
S316	ST-19	1	Yes	0.800	9.92	7.939	195.66	1.350	1.350
			No	1.350	0.99	1.343	53.42		
S384	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	7.000	1.00	7.000	140.26		
S385	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S386	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S387	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S388	ST-12	1	Yes	3.000	10.00	30.000	362.24	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S388	ST-12	2	Yes	3.000	2.28	6.850	82.71	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S389	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S429	ST-22	1	Yes	3.235	0.85	2.749	33.20	6.469	6.469
			No	6.469	0.85	5.499	110.18		
S430	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S431	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S432	ST-22	1	Yes	4.019	0.85	3.416	41.25	8.039	8.039
			No	8.039	0.85	6.833	136.91		
S433	ST-22	1	Yes	3.635	0.85	3.090	37.31	7.270	7.270
			No	7.270	0.85	6.179	123.82		
S434	ST-22	1	Yes	3.815	0.85	3.243	39.16	7.630	7.630
			No	7.630	0.85	6.486	129.95		
S435	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S436	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S437	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S438	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S439	ST-12	1	Yes	3.000	2.80	8.388	101.28	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S439	ST-12	2	Yes	3.000	2.74	8.228	99.35	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S440	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S441	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S442	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S443	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S444	ST-12	1	Yes	6.000	1.00	6.000	72.45	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S445	ST-12	1	Yes	7.000	1.00	7.000	84.52	7.000	7.000
			No	7.000	1.00	7.000	140.26		
S446	ST-12	1	Yes	3.000	2.69	8.059	97.31	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S446	ST-12	2	Yes	3.000	2.68	8.038	97.06	6.000	6.000
			No	6.000	1.00	6.000	120.22		
S381	GEN-12	1	Yes	6.000	4.10	24.603	119.61	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	2	Yes	6.000	2.40	14.420	70.10	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	3	Yes	7.000	3.87	27.071	131.61	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	4	Yes	6.000	2.54	15.252	74.15	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	5	Yes	7.000	1.95	13.656	66.39	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	6	Yes	6.000	2.71	16.245	78.97	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		

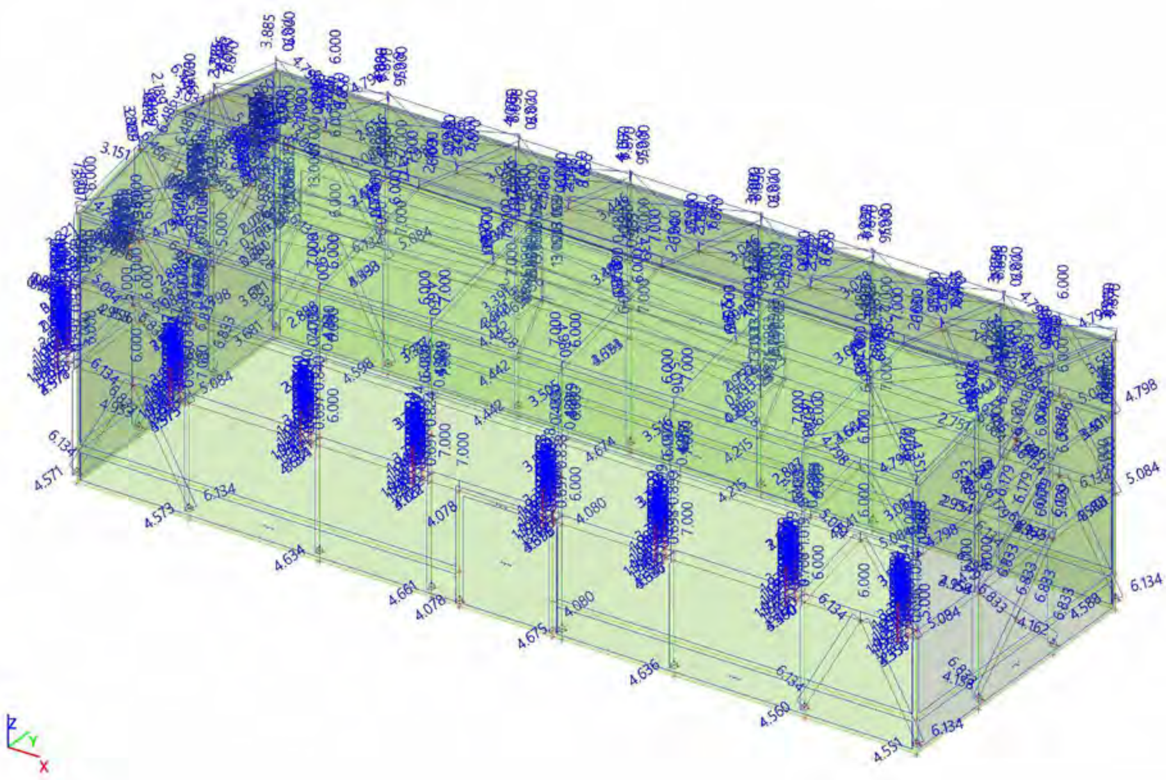
Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
S381	GEN-12	7	Yes	7.000	2.31	16.168	78.60	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	8	Yes	6.000	2.53	15.174	73.77	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S381	GEN-12	9	Yes	5.500	4.04	22.195	107.90	56.500	56.500
			No	56.500	0.53	30.151	**1574.82**		
S447	GEN-12	1	Yes	6.000	4.32	25.900	125.91	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	2	Yes	6.000	2.59	15.559	75.64	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	3	Yes	7.000	4.23	29.623	144.01	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	4	Yes	6.000	2.76	16.589	80.65	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	5	Yes	7.000	1.94	13.579	66.01	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	6	Yes	6.000	2.81	16.867	82.00	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	7	Yes	7.000	2.52	17.658	85.84	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	8	Yes	6.000	2.62	15.745	76.54	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S447	GEN-12	9	Yes	5.500	4.21	23.159	112.59	56.500	56.500
			No	56.500	0.53	30.105	**1572.46**		
S448	GEN-12	1	Yes	6.000	4.62	27.716	134.74	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	2	Yes	6.000	2.74	16.438	79.91	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	3	Yes	7.000	4.44	31.086	151.13	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	4	Yes	6.000	2.88	17.261	83.91	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	5	Yes	7.000	1.94	13.575	66.00	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	6	Yes	6.000	2.96	17.740	86.24	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	7	Yes	7.000	2.74	19.188	93.28	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	8	Yes	6.000	2.73	16.350	79.49	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S448	GEN-12	9	Yes	5.500	4.39	24.170	117.50	56.500	56.500
			No	56.500	0.53	30.075	**1570.89**		
S449	GEN-12	1	Yes	6.000	4.98	29.888	145.30	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	2	Yes	6.000	2.88	17.305	84.13	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	3	Yes	7.000	4.42	30.965	150.54	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	4	Yes	6.000	2.95	17.671	85.91	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	5	Yes	7.000	1.94	13.584	66.04	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	6	Yes	6.000	3.04	18.256	88.75	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	7	Yes	7.000	2.97	20.804	101.14	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	8	Yes	6.000	2.80	16.824	81.79	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S449	GEN-12	9	Yes	5.500	4.59	25.223	122.62	56.500	56.500
			No	56.500	0.53	30.030	**1568.50**		
S450	GEN-12	1	Yes	6.000	5.41	32.476	157.88	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	2	Yes	6.000	3.02	18.126	88.12	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	3	Yes	7.000	4.61	32.278	156.92	56.500	56.500

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	l LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	4	Yes	6.000	2.96	17.774	86.41	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	5	Yes	7.000	1.94	13.605	66.14	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	6	Yes	6.000	3.13	18.773	91.27	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	7	Yes	7.000	3.21	22.491	109.34	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	8	Yes	6.000	2.85	17.099	83.13	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S450	GEN-12	9	Yes	5.500	4.79	26.333	128.02	56.500	56.500
			No	56.500	0.53	29.963	**1565.02**		
S451	GEN-12	1	Yes	6.000	6.03	36.210	176.04	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	2	Yes	6.000	3.09	18.562	90.24	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	3	Yes	7.000	4.74	33.159	161.20	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	4	Yes	6.000	2.88	17.302	84.12	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	5	Yes	7.000	1.95	13.672	66.46	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	6	Yes	6.000	3.04	18.214	88.55	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	7	Yes	7.000	3.44	24.091	117.12	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	8	Yes	6.000	2.88	17.254	83.88	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S451	GEN-12	9	Yes	5.500	5.01	27.536	133.87	56.500	56.500
			No	56.500	0.53	29.880	**1560.70**		
S453	GEN-12	1	Yes	6.000	10.00	60.000	291.69	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	2	Yes	6.000	2.49	14.963	72.74	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	3	Yes	7.000	2.85	19.970	97.08	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	4	Yes	6.000	2.28	13.682	66.52	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	5	Yes	7.000	2.10	14.671	71.33	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	6	Yes	6.000	2.97	17.835	86.70	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	7	Yes	7.000	3.27	22.865	111.16	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	8	Yes	6.000	3.01	18.050	87.75	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S453	GEN-12	9	Yes	5.500	5.19	28.571	138.90	56.500	56.500
			No	56.500	0.53	29.914	**1562.45**		
S454	ST-12	1	Yes	13.000	1.00	13.000	156.97	13.000	13.000
			No	13.000	1.00	13.000	260.48		
S455	ST-12	1	Yes	13.000	1.00	13.000	156.97	13.000	13.000
			No	13.000	1.00	13.000	260.48		
S456	ST-18	1	Yes	13.153	1.00	13.153	344.42	13.153	13.153
			No	13.153	1.00	13.153	673.15		
S457	ST-18	1	Yes	13.153	1.00	13.153	344.42	13.153	13.153
			No	13.153	1.00	13.153	673.15		
S458	ST-12	1	Yes	13.000	1.00	13.000	156.97	13.000	13.000
			No	13.000	1.00	13.000	260.48		
S459	ST-18	1	Yes	13.153	1.00	13.153	344.42	13.153	13.153
			No	13.153	1.00	13.153	673.15		
S460	ST-12	1	Yes	13.000	1.00	13.000	156.97	13.000	13.000
			No	13.000	1.00	13.000	260.48		
S461	ST-18	1	Yes	13.153	1.00	13.153	344.42	13.153	13.153
			No	13.153	1.00	13.153	673.15		

2.2. Iy



2.3. Iz



2.4. EC-EN 1993 Steel check ULS

Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Overall Unity Check

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S1	0.000	UGT-Set B/1	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.28**	0.13	0.28
S2	0.000	UGT-Set B/2	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.39**	0.24	0.39
S3	0.000	UGT-Set B/3	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.10**	0.09	0.10
S4	8.149	UGT-Set B/4	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.07**	0.06	0.07
S5	0.000	UGT-Set B/5	ST-14 - HEA300	S 355 JR (EN 10025-2)	**0.82**	0.10	0.82
S6	0.000	UGT-Set B/6	ST-14 - HEA300	S 355 JR (EN 10025-2)	**0.53**	0.05	0.53
S7	0.000	UGT-Set B/7	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.25**	0.12	0.25
S8	0.000	UGT-Set B/8	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.20**	0.20	0.20
S9	5.350+	UGT-Set B/9	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.37**	0.14	0.37
S10	0.000	UGT-Set B/8	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.17**	0.17	0.00
S11	5.350+	UGT-Set B/10	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.37**	0.16	0.37
S12	8.149	UGT-Set B/11	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.20**	0.20	0.18
S13	0.000	UGT-Set B/12	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.32**	0.12	0.32
S14	0.000	UGT-Set B/13	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.28**	0.28	0.14
S15	0.000	UGT-Set B/14	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.41**	0.12	0.41
S16	8.149	UGT-Set B/11	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S17	0.000	UGT-Set B/15	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.47**	0.11	0.47
S18	0.000	UGT-Set B/11	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S19	5.350+	UGT-Set B/16	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.40**	0.24	0.40
S20	8.149	UGT-Set B/17	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.22**	0.22	0.00
S21	6.130+	UGT-Set B/18	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.49**	0.39	0.49
S22	0.000	UGT-Set B/17	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.22**	0.22	0.00
S23	0.000	UGT-Set B/19	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.34**	0.13	0.34
S24	8.149	UGT-Set B/17	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.20**	0.20	0.00
S25	0.000	UGT-Set B/20	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.53**	0.14	0.53
S26	0.000	UGT-Set B/13	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.28**	0.28	0.16
S27	0.000	UGT-Set B/21	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.32**	0.17	0.32
S28	0.000	UGT-Set B/22	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.19**	0.19	0.19
S29	5.350+	UGT-Set B/23	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.28**	0.12	0.28
S30	0.000	UGT-Set B/24	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.17**	0.17	0.00
S31	0.000	UGT-Set B/25	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.28**	0.08	0.28
S32	0.000	UGT-Set B/26	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.13**	0.13	0.13
S33	0.000	UGT-Set B/27	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.39**	0.12	0.39
S34	3.056+	UGT-Set B/28	ST-11 - HEA550	S 235 JR (EN 10025-2)	**0.13**	0.13	0.00
S35	0.000	UGT-Set B/29	ST-14 - HEA300	S 355 JR (EN 10025-2)	**0.71**	0.15	0.71
S36	0.000	UGT-Set B/30	ST-14 - HEA300	S 355 JR (EN 10025-2)	**0.72**	0.16	0.72
S37	0.000	UGT-Set B/31	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.13**	0.05	0.13

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S38	0.000	UGT-Set B/32	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.31**	0.11	0.31
S39	2.667	UGT-Set B/33	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.03	0.02
S41	20.660-	UGT-Set B/34	ST-13 - I + rail (HEA500, SA75)	S 355 JR (EN 10025-2)	**0.80**	0.29	0.80
S42	4.500-	UGT-Set B/35	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.45**	0.45	0.00
S43	4.500-	UGT-Set B/36	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.44**	0.44	0.00
S44	1.160-	UGT-Set B/37	ST-13 - I + rail (HEA500, SA75)	S 355 JR (EN 10025-2)	**0.76**	0.26	0.76
S45	0.000	UGT-Set B/38	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.29**	0.29	0.00
S46	0.000	UGT-Set B/39	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.09	0.22
S47	3.000+	UGT-Set B/40	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.29**	0.11	0.29
S48	0.000	UGT-Set B/41	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.59**	0.59	0.00
S49	0.000	UGT-Set B/13	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.44**	0.44	0.00
S50	0.000	UGT-Set B/13	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.39**	0.39	0.00
S51	0.000	UGT-Set B/42	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.49**	0.49	0.00
S52	0.000	UGT-Set B/43	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.58**	0.58	0.00
S53	0.500	UGT-Set B/44	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.54**	0.54	0.00
S54	0.500	UGT-Set B/45	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.52**	0.52	0.28
S55	0.500	UGT-Set B/46	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.28**	0.28	0.00
S56	0.500	UGT-Set B/47	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.40**	0.40	0.25
S57	0.500	UGT-Set B/48	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.12**	0.12	0.00
S58	0.500	UGT-Set B/49	ST-15 - HEA500	S 235 JR (EN 10025-2)	**0.44**	0.44	0.00
S59	0.000	UGT-Set B/50	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.09	0.25
S60	0.000	UGT-Set B/51	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.13**	0.04	0.13
S61	0.000	UGT-Set B/52	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.10**	0.05	0.10
S62	0.000	UGT-Set B/53	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.05**	0.04	0.05
S63	0.000	UGT-Set B/54	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S64	0.000	UGT-Set B/55	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.15**	0.05	0.15
S65	0.700	UGT-Set B/56	ST-16 - UNP280	S 235 JR (EN 10025-2)	**0.76**	0.17	0.76
S66	0.700	UGT-Set B/57	ST-16 - UNP280	S 235 JR (EN 10025-2)	**0.79**	0.17	0.79
S68	0.000	UGT-Set B/30	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.70**	0.16	0.70
S69	0.000	UGT-Set B/28	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.73**	0.17	0.73
S70	0.000	UGT-Set B/58	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.04**	0.03	0.04
S71	2.667	UGT-Set B/59	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.03**	0.02	0.03
S72	0.500+	UGT-Set B/60	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.38**	0.38	0.00
S73	2.667	UGT-Set B/61	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.01**	0.01	0.00
S74	0.000	UGT-Set B/62	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.46**	0.13	0.46
S75	0.000	UGT-Set B/63	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.48**	0.13	0.48
S76	0.000	UGT-Set B/62	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.36**	0.09	0.36
S77	0.000	UGT-Set B/64	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.31**	0.08	0.31
S78	1.200+	UGT-Set B/65	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.79**	0.47	0.79
S79	0.000	UGT-Set B/66	ST-24 - HEA220	S 235 JR (EN 10025-2)	**0.23**	0.13	0.23
S80	0.500+	UGT-Set B/67	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.49**	0.49	0.43
S81	0.000	UGT-Set B/68	ST-21 - HEB300	S 355 JR (EN 10025-2)	**0.04**	0.03	0.04

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S82	0.000	UGT-Set B/69	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.78**	0.18	0.78
S83	0.000	UGT-Set B/70	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.65**	0.15	0.65
S84	0.000	UGT-Set B/71	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.30**	0.07	0.30
S85	0.000	UGT-Set B/72	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.47**	0.12	0.47
S86	0.000	UGT-Set B/69	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.44**	0.14	0.44
S87	0.000	UGT-Set B/73	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.44**	0.13	0.44
S88	3.500	UGT-Set B/74	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.03	0.04
S89	2.667	UGT-Set B/74	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.02	0.03
S90	6.500+	UGT-Set B/75	ST-23 - HEA280	S 235 JR (EN 10025-2)	**0.37**	0.16	0.37
S91	2.667	UGT-Set B/76	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.02	0.03
S92	3.500	UGT-Set B/74	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.03	0.04
S93	3.000+	UGT-Set B/77	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S94	0.000	UGT-Set B/78	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.13**	0.04	0.13
S95	0.000	UGT-Set B/79	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S96	0.000	UGT-Set B/80	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.06	0.22
S97	0.000	UGT-Set B/79	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.15**	0.05	0.15
S98	0.000	UGT-Set B/81	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.10**	0.03	0.10
S99	0.000	UGT-Set B/82	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.08	0.21
S100	0.000	UGT-Set B/83	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.07	0.25
S101	0.000	UGT-Set B/83	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.20**	0.07	0.20
S102	0.000	UGT-Set B/83	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.07	0.25
S103	0.000	UGT-Set B/30	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.20**	0.07	0.20
S104	0.000	UGT-Set B/30	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.26**	0.08	0.26
S105	3.000+	UGT-Set B/84	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.11**	0.04	0.11
S106	0.000	UGT-Set B/85	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.60**	0.13	0.60
S107	0.000	UGT-Set B/86	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.54**	0.12	0.54
S108	0.000	UGT-Set B/87	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.25**	0.07	0.25
S109	0.000	UGT-Set B/88	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.35**	0.10	0.35
S110	0.000	UGT-Set B/43	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.21**	0.07	0.21
S111	0.000	UGT-Set B/89	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.21**	0.07	0.21
S112	0.000	UGT-Set B/90	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.66**	0.14	0.66
S113	0.000	UGT-Set B/50	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.99**	0.22	0.99
S114	0.000	UGT-Set B/91	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.41**	0.12	0.41
S115	0.000	UGT-Set B/92	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.27**	0.08	0.27
S116	0.000	UGT-Set B/69	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.32**	0.10	0.32
S117	0.000	UGT-Set B/93	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.40**	0.13	0.40
S118	0.000	UGT-Set B/94	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.57**	0.12	0.57
S119	0.000	UGT-Set B/95	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.56**	0.12	0.56
S120	0.000	UGT-Set B/96	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.26**	0.08	0.26
S121	0.000	UGT-Set B/97	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.34**	0.10	0.34
S122	0.000	UGT-Set B/98	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.26**	0.08	0.26
S123	0.000	UGT-Set B/99	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.14**	0.04	0.14

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S124	0.000	UGT-Set B/100	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.89**	0.20	0.89
S125	0.000	UGT-Set B/101	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.70**	0.15	0.70
S126	0.000	UGT-Set B/102	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.43**	0.13	0.43
S127	0.000	UGT-Set B/103	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.31**	0.09	0.31
S128	0.000	UGT-Set B/104	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.43**	0.14	0.43
S129	0.000	UGT-Set B/105	ST-17 - HEA140	S 235 JR (EN 10025-2)	**0.28**	0.09	0.28
S130	0.000	UGT-Set B/106	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.05	0.16
S131	0.000	UGT-Set B/107	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.10	0.25
S132	0.000	UGT-Set B/13	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.46**	0.14	0.46
S133	0.000	UGT-Set B/32	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.26**	0.10	0.26
S134	0.000	UGT-Set B/108	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.05	0.16
S135	0.000	UGT-Set B/109	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S136	0.000	UGT-Set B/110	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.10**	0.10	0.00
S137	0.000	UGT-Set B/111	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.12**	0.12	0.00
S138	0.000	UGT-Set B/112	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.29**	0.29	0.00
S139	8.657	UGT-Set B/113	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.57**	0.57	0.00
S140	0.000	UGT-Set B/32	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.18**	0.18	0.00
S141	0.000	UGT-Set B/13	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.15**	0.15	0.00
S142	0.000	UGT-Set B/114	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.13**	0.13	0.00
S143	0.000	UGT-Set B/13	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S144	8.657	UGT-Set B/80	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.57**	0.57	0.00
S145	0.000	UGT-Set B/104	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.27**	0.27	0.00
S146	0.000	UGT-Set B/13	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.32**	0.32	0.00
S147	7.870	UGT-Set B/79	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.13**	0.13	0.00
S148	0.000	UGT-Set B/115	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.14**	0.14	0.00
S149	0.000	UGT-Set B/25	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.11**	0.11	0.00
S150	0.000	UGT-Set B/116	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.18**	0.18	0.00
S151	0.000	UGT-Set B/117	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.22**	0.22	0.00
S152	0.000	UGT-Set B/26	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S153	0.000	UGT-Set B/98	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.19**	0.19	0.00
S154	0.000	UGT-Set B/118	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.24**	0.24	0.00
S155	0.000	UGT-Set B/107	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.42**	0.42	0.00
S156	0.000	UGT-Set B/83	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.24**	0.24	0.00
S157	0.000	UGT-Set B/119	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.42**	0.42	0.00
S158	0.000	UGT-Set B/120	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.14**	0.14	0.00
S159	0.000	UGT-Set B/121	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.46**	0.46	0.42
S160	0.000	UGT-Set B/122	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.16**	0.05	0.16
S161	0.000	UGT-Set B/123	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.13	0.16
S162	0.000	UGT-Set B/124	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.76**	0.76	0.00
S163	0.000	UGT-Set B/125	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.20**	0.06	0.20
S164	0.000	UGT-Set B/126	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S165	0.000	UGT-Set B/125	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.16	0.21

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S166	0.000	UGT-Set B/18	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.84**	0.84	0.00
S167	0.000	UGT-Set B/125	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.22**	0.06	0.22
S168	0.000	UGT-Set B/127	ST-20 - HEB220	S 235 JR (EN 10025-2)	**0.23**	0.23	0.00
S169	0.000	UGT-Set B/125	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.16	0.21
S170	0.000	UGT-Set B/24	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.19**	0.05	0.19
S171	0.000	UGT-Set B/24	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S172	0.000	UGT-Set B/24	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.17**	0.05	0.17
S173	0.000	UGT-Set B/22	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S174	0.000	UGT-Set B/22	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.19**	0.05	0.19
S175	0.000	UGT-Set B/128	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S176	3.500	UGT-Set B/33	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.04	0.03
S177	2.667	UGT-Set B/129	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.03	0.03
S178	3.500	UGT-Set B/129	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.04	0.03
S179	2.667	UGT-Set B/130	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.03	0.03
S180	3.500	UGT-Set B/33	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.04	0.03
S181	2.667	UGT-Set B/129	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.03**	0.03	0.02
S182	0.700	UGT-Set B/131	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.25	0.00
S183	0.000	UGT-Set B/132	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.16	0.14
S184	0.700	UGT-Set B/133	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.28**	0.28	0.27
S206	0.800	UGT-Set B/134	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.31	0.32
S207	0.400+	UGT-Set B/135	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S208	0.400+	UGT-Set B/135	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.24
S209	0.400+	UGT-Set B/136	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.24
S210	0.400+	UGT-Set B/137	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.00
S211	0.400+	UGT-Set B/137	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.00
S212	0.400+	UGT-Set B/138	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.33**	0.33	0.00
S213	0.700	UGT-Set B/139	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.33**	0.33	0.00
S214	0.000	UGT-Set B/140	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.13	0.16
S215	0.700	UGT-Set B/141	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.34**	0.34	0.33
S216	0.800	UGT-Set B/142	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.40**	0.34	0.40
S217	0.400+	UGT-Set B/143	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S218	0.400+	UGT-Set B/85	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S219	0.400+	UGT-Set B/85	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S220	0.400+	UGT-Set B/85	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.24
S221	0.400+	UGT-Set B/144	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.25
S222	0.400+	UGT-Set B/85	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.24
S223	0.700	UGT-Set B/145	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.37**	0.37	0.00
S224	0.000	UGT-Set B/134	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.18**	0.18	0.13
S225	0.700	UGT-Set B/146	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.38**	0.38	0.37
S226	0.800	UGT-Set B/147	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.45**	0.37	0.45
S227	0.400+	UGT-Set B/75	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.26
S228	0.400+	UGT-Set B/75	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.25

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S229	0.400+	UGT-Set B/148	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S230	0.400+	UGT-Set B/50	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S231	0.400+	UGT-Set B/137	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.00
S232	0.400+	UGT-Set B/50	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S233	0.700	UGT-Set B/145	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.43**	0.43	0.00
S234	0.000	UGT-Set B/149	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.11	0.16
S235	0.700	UGT-Set B/150	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.43**	0.43	0.41
S236	0.400+	UGT-Set B/151	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.03
S237	0.400+	UGT-Set B/152	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S238	0.400+	UGT-Set B/152	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S239	0.400+	UGT-Set B/152	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S240	0.400+	UGT-Set B/151	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S241	0.400+	UGT-Set B/153	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.32**	0.32	0.00
S242	0.400+	UGT-Set B/151	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S243	0.700	UGT-Set B/154	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.43**	0.43	0.00
S244	0.000	UGT-Set B/155	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.12	0.16
S245	0.700	UGT-Set B/156	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.43**	0.43	0.41
S246	0.800	UGT-Set B/157	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.33**	0.29	0.33
S247	0.400+	UGT-Set B/158	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.30**	0.30	0.24
S248	0.400+	UGT-Set B/158	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S249	0.400+	UGT-Set B/158	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S250	0.400+	UGT-Set B/158	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.24
S251	0.400+	UGT-Set B/97	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.25
S252	0.400+	UGT-Set B/159	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S253	0.700	UGT-Set B/160	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.39**	0.39	0.00
S254	0.000	UGT-Set B/161	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.18**	0.18	0.13
S255	0.700	UGT-Set B/162	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.38**	0.38	0.37
S256	0.800	UGT-Set B/163	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.50**	0.43	0.50
S257	0.800	UGT-Set B/163	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.26	0.31
S258	0.400+	UGT-Set B/164	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.30**	0.30	0.25
S259	0.400+	UGT-Set B/164	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.30**	0.30	0.24
S260	0.400+	UGT-Set B/153	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S261	0.400+	UGT-Set B/165	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S262	0.400+	UGT-Set B/153	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.31**	0.31	0.00
S263	0.700	UGT-Set B/60	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.34**	0.34	0.00
S264	0.000	UGT-Set B/166	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.16	0.16
S265	0.700	UGT-Set B/146	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.35**	0.35	0.33
S266	0.800	UGT-Set B/167	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.39**	0.33	0.39
S267	0.400+	UGT-Set B/168	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.00
S268	0.400+	UGT-Set B/94	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.25
S269	0.400+	UGT-Set B/94	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.25
S270	0.400+	UGT-Set B/94	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.25

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
S271	0.400+	UGT-Set B/138	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.25
S272	0.400+	UGT-Set B/97	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.28**	0.28	0.25
S273	0.700	UGT-Set B/169	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.25	0.00
S274	2.000	UGT-Set B/170	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.15**	0.15	0.00
S275	0.700	UGT-Set B/171	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.25**	0.25	0.25
S276	0.800	UGT-Set B/172	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.29**	0.25	0.29
S277	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S278	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S279	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S280	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S281	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S282	0.800	UGT-Set B/170	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.26**	0.26	0.00
S285	0.000	UGT-Set B/173	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.03**	0.02	0.03
S290	0.000	UGT-Set B/174	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.04	0.00
S291	0.000	UGT-Set B/175	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.04	0.04
S292	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S293	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S294	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S295	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S296	0.000	UGT-Set B/176	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.11**	0.07	0.11
S297	0.000	UGT-Set B/177	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.22	0.00
S298	0.000	UGT-Set B/178	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S299	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S300	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S301	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S302	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S303	0.600+	UGT-Set B/179	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.11**	0.07	0.11
S304	0.000	UGT-Set B/180	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.22	0.19
S305	0.000	UGT-Set B/180	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.21	0.00
S306	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S307	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S308	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S309	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S310	0.000	UGT-Set B/2	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.04**	0.02	0.04
S311	0.000	UGT-Set B/181	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.05**	0.05	0.00
S312	0.000	UGT-Set B/182	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.05**	0.05	0.05
S313	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S314	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S315	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S316	0.000	UGT-Set B/61	ST-19 - HEA100	S 235 JR (EN 10025-2)	**0.00**	0.00	0.00
S384	0.000	UGT-Set B/183	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.11**	0.03	0.11
S385	0.000	UGT-Set B/184	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.59**	0.23	0.59

Name	dx [m]	Case	Cross-section	Material	UC Overall [-]	UC Sec [-]	UC Stab [-]
S386	0.000	UGT-Set B/134	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.92**	0.28	0.92
S387	0.000	UGT-Set B/134	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.55**	0.21	0.55
S388	3.000-	UGT-Set B/185	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.44**	0.04	0.44
S389	0.000	UGT-Set B/186	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.12**	0.03	0.12
S429	0.000	UGT-Set B/73	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.43**	0.13	0.43
S430	0.000	UGT-Set B/70	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.65**	0.15	0.65
S431	0.000	UGT-Set B/72	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.47**	0.11	0.47
S432	0.000	UGT-Set B/30	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.69**	0.16	0.69
S433	0.000	UGT-Set B/62	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.45**	0.12	0.45
S434	0.000	UGT-Set B/62	ST-22 - HEA200	S 355 JR (EN 10025-2)	**0.36**	0.09	0.36
S435	0.000	UGT-Set B/187	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.21**	0.06	0.21
S436	0.000	UGT-Set B/188	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.15**	0.06	0.15
S437	0.000	UGT-Set B/105	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.20**	0.06	0.20
S438	0.000	UGT-Set B/188	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.14**	0.05	0.14
S439	0.000	UGT-Set B/189	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.26**	0.10	0.26
S440	0.000	UGT-Set B/190	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.18**	0.05	0.18
S441	3.500	UGT-Set B/191	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.03	0.04
S442	2.667	UGT-Set B/192	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.02	0.04
S443	3.500	UGT-Set B/191	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.04**	0.03	0.04
S444	0.000	UGT-Set B/193	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.13**	0.05	0.13
S445	0.000	UGT-Set B/193	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.16**	0.05	0.16
S446	0.000	UGT-Set B/138	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.19**	0.06	0.19
S381	35.000-	UGT-Set B/194	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**76.23**	7.50	76.23
S447	48.000+	UGT-Set B/195	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**53.42**	8.26	53.42
S448	28.500+	UGT-Set B/196	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**59.49**	18.53	59.49
S449	28.500+	UGT-Set B/196	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**75.25**	18.51	75.25
S450	28.500+	UGT-Set B/196	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**97.56**	18.48	97.56
S451	28.500+	UGT-Set B/196	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**122.59**	18.44	122.59
S453	41.500+	UGT-Set B/197	GEN-12 - Kanaal (600; 80; 2; 2; 2)	DUMMY STAAL	**62.58**	18.22	62.58
S454	6.158	UGT-Set B/198	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.23**	0.12	0.23
S455	6.158	UGT-Set B/199	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.12	0.22
S456	0.000	UGT-Set B/200	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.11**	0.11	0.00
S457	0.000	UGT-Set B/193	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.09**	0.09	0.00
S458	6.158	UGT-Set B/201	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.12	0.22
S459	0.000	UGT-Set B/202	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.07**	0.07	0.00
S460	6.158	UGT-Set B/203	ST-12 - HEA200	S 235 JR (EN 10025-2)	**0.22**	0.12	0.22
S461	0.000	UGT-Set B/200	ST-18 - L100X10	S 235 JR (EN 10025-2)	**0.08**	0.08	0.00

Name	Combination key
UGT-Set B/1	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG131 + 1.50*3DWind13
UGT-Set B/2	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/3	0.90*BG101 + 0.90*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/4	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind6
UGT-Set B/5	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131

Name	Combination key
	+ 1.50*3DWind25
UGT-Set B/6	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/7	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind23
UGT-Set B/8	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/9	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/10	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind13
UGT-Set B/11	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*BG151
UGT-Set B/12	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind27
UGT-Set B/13	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/14	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*3DWind8
UGT-Set B/15	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG123 + 1.50*BG140 + 1.50*BG151
UGT-Set B/16	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/17	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151
UGT-Set B/18	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/19	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind8
UGT-Set B/20	1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151
UGT-Set B/21	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/22	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/23	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/24	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/25	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG136 + 1.50*3DWind13
UGT-Set B/26	0.90*BG101 + 0.90*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/27	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind5
UGT-Set B/28	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind27
UGT-Set B/29	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind25
UGT-Set B/30	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/31	0.90*BG101 + 0.90*BG102 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/32	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/33	1.35*BG101 + 1.35*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151
UGT-Set B/34	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG134 + 1.50*3DWind10
UGT-Set B/35	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG137 + 1.50*3DWind2
UGT-Set B/36	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/37	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind2
UGT-Set B/38	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG131 + 1.50*3DWind25
UGT-Set B/39	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*3DWind15
UGT-Set B/40	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind15
UGT-Set B/41	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/42	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind10
UGT-Set B/43	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind25
UGT-Set B/44	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142
UGT-Set B/45	1.20*BG101 + 1.20*BG102 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/46	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind13
UGT-Set B/47	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*BG151
UGT-Set B/48	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2
UGT-Set B/49	1.20*BG101 + 1.20*BG102 + 1.50*BG138 + 1.50*BG151 +

Name	Combination key
	1.50*3DWind26
UGT-Set B/50	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/51	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/52	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/53	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind8
UGT-Set B/54	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind2
UGT-Set B/55	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind2
UGT-Set B/56	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*3DWind6
UGT-Set B/57	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind6
UGT-Set B/58	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind14
UGT-Set B/59	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind16
UGT-Set B/60	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind13
UGT-Set B/61	1.35*BG101 + 1.35*BG102
UGT-Set B/62	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/63	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind27
UGT-Set B/64	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind27
UGT-Set B/65	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/66	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/67	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2
UGT-Set B/68	1.20*BG101 + 1.20*BG102 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/69	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/70	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/71	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/72	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/73	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/74	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/75	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/76	1.20*BG101 + 1.20*BG102 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/77	0.90*BG101 + 0.90*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/78	0.90*BG101 + 0.90*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/79	1.20*BG101 + 1.20*BG102 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/80	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/81	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG142 + 1.50*3DWind7
UGT-Set B/82	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind1
UGT-Set B/83	1.20*BG101 + 1.20*BG102 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/84	0.90*BG101 + 0.90*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/85	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind9
UGT-Set B/86	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/87	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*3DWind7
UGT-Set B/88	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind10
UGT-Set B/89	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG133 + 1.50*3DWind19
UGT-Set B/90	1.20*BG101 + 1.20*BG102 + 1.50*BG141 + 1.50*3DWind9
UGT-Set B/91	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG138 + 1.50*3DWind10
UGT-Set B/92	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind15

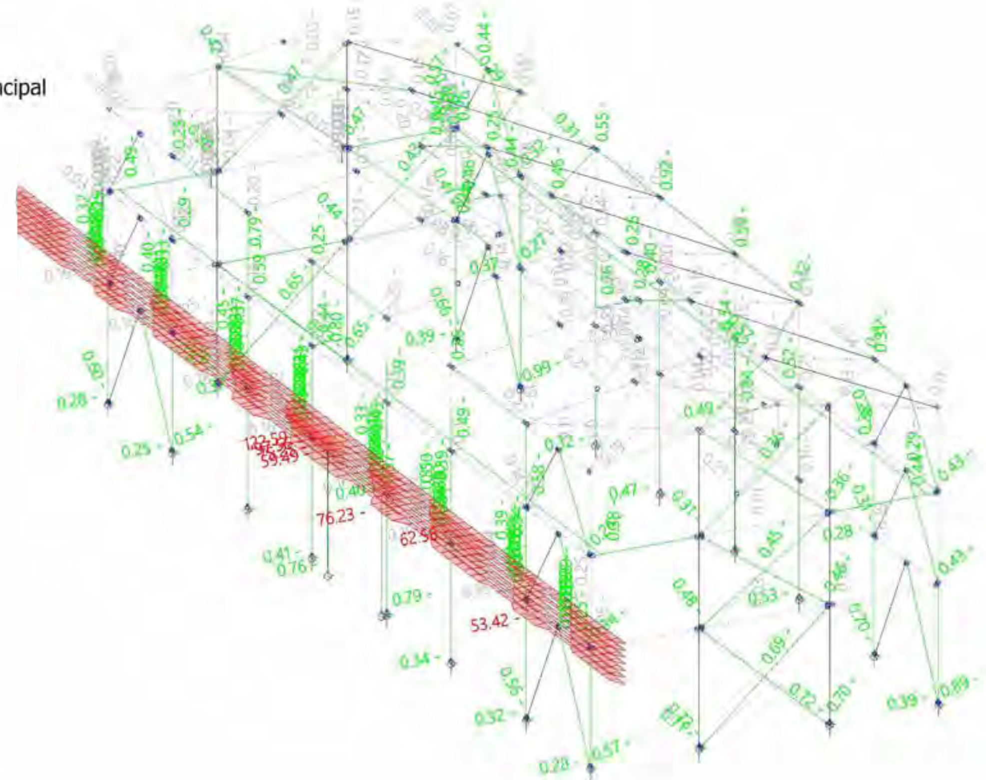
Name	Combination key
UGT-Set B/93	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG133 + 1.50*3DWind17
UGT-Set B/94	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind1
UGT-Set B/95	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/96	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/97	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind2
UGT-Set B/98	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind27
UGT-Set B/99	1.20*BG101 + 1.20*BG102 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/100	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG136 + 1.50*3DWind1
UGT-Set B/101	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/102	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG136 + 1.50*3DWind2
UGT-Set B/103	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind15
UGT-Set B/104	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/105	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind27
UGT-Set B/106	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind2
UGT-Set B/107	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/108	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG135 + 1.50*3DWind10
UGT-Set B/109	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind10
UGT-Set B/110	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind13
UGT-Set B/111	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind15
UGT-Set B/112	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/113	1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/114	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind25
UGT-Set B/115	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind15
UGT-Set B/116	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/117	0.90*BG101 + 0.90*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/118	1.20*BG101 + 1.20*BG102 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/119	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind25
UGT-Set B/120	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG152
UGT-Set B/121	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151
UGT-Set B/122	1.20*BG101 + 1.20*BG102 + 1.50*BG137 + 1.50*BG151 + 1.50*3DWind27
UGT-Set B/123	1.35*BG101 + 1.35*BG102 + 1.50*BG137 + 1.50*BG151
UGT-Set B/124	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind1
UGT-Set B/125	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind16
UGT-Set B/126	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG152 + 1.50*3DWind1
UGT-Set B/127	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG152 + 1.50*3DWind5
UGT-Set B/128	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/129	1.35*BG101 + 1.35*BG102 + 1.50*BG123 + 1.50*BG135 + 1.50*BG151
UGT-Set B/130	1.35*BG101 + 1.35*BG102 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151
UGT-Set B/131	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/132	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG131 + 1.50*3DWind9
UGT-Set B/133	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind27
UGT-Set B/134	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25
UGT-Set B/135	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/136	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind7
UGT-Set B/137	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123

Name	Combination key
	+ 1.50*3DWind1
UGT-Set B/138	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2
UGT-Set B/139	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind13
UGT-Set B/140	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/141	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/142	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/143	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind13
UGT-Set B/144	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind10
UGT-Set B/145	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind13
UGT-Set B/146	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/147	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*3DWind25
UGT-Set B/148	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind19
UGT-Set B/149	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG135 + 1.50*3DWind8
UGT-Set B/150	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/151	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*3DWind9
UGT-Set B/152	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG142 + 1.50*3DWind9
UGT-Set B/153	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind10
UGT-Set B/154	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind13
UGT-Set B/155	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/156	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/157	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/158	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind1
UGT-Set B/159	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind2
UGT-Set B/160	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151 + 1.50*3DWind13
UGT-Set B/161	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG142 + 1.50*3DWind25
UGT-Set B/162	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG133 + 1.50*3DWind8
UGT-Set B/163	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind25
UGT-Set B/164	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/165	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/166	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG136 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/167	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/168	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind13
UGT-Set B/169	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/170	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/171	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG136 + 1.50*3DWind27
UGT-Set B/172	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind16
UGT-Set B/173	1.20*BG101 + 1.20*BG102 + 1.50*BG131 + 1.50*3DWind25
UGT-Set B/174	0.90*BG101 + 0.90*BG102 + 1.50*BG138 + 1.50*3DWind25
UGT-Set B/175	1.20*BG101 + 1.20*BG102 + 1.50*BG138 + 1.50*3DWind25
UGT-Set B/176	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind2
UGT-Set B/177	1.20*BG101 + 1.20*BG102 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/178	0.90*BG101 + 0.90*BG102 + 1.50*BG138 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/179	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG134 + 1.50*3DWind2
UGT-Set B/180	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG138 + 1.50*3DWind15
UGT-Set B/181	0.90*BG101 + 0.90*BG102 + 1.50*BG134 + 1.50*BG151 +

Name	Combination key
	1.50*3DWind17
UGT-Set B/182	1.20*BG101 + 1.20*BG102 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/183	0.90*BG101 + 0.90*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind7
UGT-Set B/184	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG141 + 1.50*3DWind25
UGT-Set B/185	0.90*BG101 + 0.90*BG102 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind8
UGT-Set B/186	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG135 + 1.50*3DWind7
UGT-Set B/187	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG142 + 1.50*3DWind15
UGT-Set B/188	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27
UGT-Set B/189	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*BG151 + 1.50*3DWind15
UGT-Set B/190	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind15
UGT-Set B/191	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind9
UGT-Set B/192	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind9
UGT-Set B/193	0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG142 + 1.50*3DWind16
UGT-Set B/194	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind25
UGT-Set B/195	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*3DWind1
UGT-Set B/196	0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19
UGT-Set B/197	1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG139 + 1.50*BG151 + 1.50*3DWind17
UGT-Set B/198	1.35*BG101 + 1.35*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG135
UGT-Set B/199	1.35*BG101 + 1.35*BG102 + 1.50*BG122 + 1.50*BG140
UGT-Set B/200	1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind5
UGT-Set B/201	1.35*BG101 + 1.35*BG102 + 1.50*BG123 + 1.50*BG138 + 1.50*BG151
UGT-Set B/202	1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG132 + 1.50*BG151 + 1.50*3DWind5
UGT-Set B/203	1.35*BG101 + 1.35*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG140

Resultaten - Overall check

Values: **UC$_{Overall}$**
Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



2.5. EC-EN 1993 Steel check ULS

Linear calculation
Class: Alle UGT
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S5	**0.000 / 14.169 m**	**HEA300**	**S 355 JR (EN 10025-2)**	**Alle UGT**	**0.82 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG131 + 1.50*3DWind25

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	355.0	MPa
Ultimate strength	f_u	470.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-386.85	kN
Shear force	$V_{y,Ed}$	0.85	kN
Shear force	$V_{z,Ed}$	-39.09	kN
Torsion	T_{Ed}	-0.02	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	119	14	3.437e+04	3.437e+04	1.00	0.43	1.00	8.48	7.32	8.14	11.39	3
3	SO	119	14	3.437e+04	3.437e+04	1.00	0.43	1.00	8.48	7.32	8.14	11.39	3
4	I	208	9	3.437e+04	3.437e+04	1.00		1.00	24.47	22.78	27.66	30.92	2
5	SO	119	14	3.437e+04	3.437e+04	1.00	0.43	1.00	8.48	7.32	8.14	11.39	3
7	SO	119	14	3.437e+04	3.437e+04	1.00	0.43	1.00	8.48	7.32	8.14	11.39	3

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Semi-Comp+ properties			
Material coefficient	ε	0.81	
Flange class 2 slenderness limit	$\beta_{2,y,f}$	8.14	
Flange class 3 slenderness limit	$\beta_{3,y,f}$	11.39	
Web class 2 slenderness limit	$\beta_{2,y,w}$	67.53	
Web class 3 slenderness limit	$\beta_{3,y,w}$	100.89	
Flange class 2 slenderness limit	$\beta_{2,z,f}$	8.14	
Flange class 3 slenderness limit	$\beta_{3,z,f}$	13.02	
Web slenderness ratio	c/t_w	24.47	
Flange slenderness ratio	c/t_f	8.48	
Reference slenderness ratio	$c/t_{ref,y}$	0.11	
Reference slenderness ratio	$c/t_{ref,z}$	0.07	
Interpolated section modulus	$W_{3,y}$	1.3702e-03	m^3
Interpolated section modulus	$W_{3,z}$	6.2603e-04	m^3

Note: The resistance for this semi-compact section has been calculated according to Semi-Comp+.

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	1.1300e-02	m^2
Compression resistance	$N_{c,Rd}$	4011.50	kN
Unity check		0.10	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	8.7017e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1783.50	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	3.7750e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	773.72	kN
Unity check		0.05	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.3	MPa
Elastic shear resistance	τ_{Rd}	205.0	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 5.350 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	119	14	1.201e+05	1.116e+05	0.93	0.46	1.00	8.48	7.32	8.14	11.53	3
3	SO	119	14	1.247e+05	1.332e+05	0.94	0.43	1.00	8.48	7.32	8.14	11.27	3
4	I	208	9	1.005e+05	-3.382e+04	-0.34		0.80	24.47	30.21	36.28	57.66	1
5	SO	119	14	-5.352e+04	-4.496e+04								
7	SO	119	14	-5.803e+04	-6.659e+04								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	8.555	5.350	m
Buckling factor	k	2.39	0.93	
Buckling length	l_{cr}	20.441	4.953	m
Critical Euler load	N_{cr}	907.71	5331.60	kN
Slenderness	λ	160.63	66.28	
Relative slenderness	λ_{rel}	2.10	0.87	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		b	c	
Imperfection	α	0.34	0.49	
Reduction factor	χ	0.19	0.62	
Buckling resistance	$N_{b,Rd}$	768.57	2487.04	kN

Flexural Buckling verification			
Cross-section area	A	1.1300e-02	m^2
Buckling resistance	$N_{b,Rd}$	768.57	kN
Unity check		0.50	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	1.1300e-02	m^2
Interpolated section modulus	$W_{3,y}$	1.3702e-03	m^3
Interpolated section modulus	$W_{3,z}$	6.2603e-04	m^3
Design compression force	N_{Ed}	386.85	kN
Design bending moment (maximum)	$M_{y,Ed}$	-118.67	kNm
Design bending moment (maximum)	$M_{z,Ed}$	4.55	kNm
Characteristic compression resistance	N_{Rk}	4011.50	kN
Characteristic moment resistance	$M_{y,Rk}$	486.43	kNm
Characteristic moment resistance	$M_{z,Rk}$	222.24	kNm
Reduction factor	χ_y	0.19	
Reduction factor	χ_z	0.62	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	1.26	
Interaction factor	k_{yz}	0.42	
Interaction factor	k_{zy}	0.76	
Interaction factor	k_{zz}	0.71	

Maximum moment $M_{y,Ed}$ is derived from beam S5 position 6.151 m.
Maximum moment $M_{z,Ed}$ is derived from beam S5 position 5.350 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		linear moment M	
Ratio of end moments	ψ_z	0.00	
Equivalent moment factor	C_{mz}	0.60	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	-117.93	kNm
Field moment	$M_{s,LT}$	-83.14	kNm
Factor	$\alpha_{s,LT}$	0.70	
Ratio of end moments	ψ_{LT}	0.00	
Equivalent moment factor	C_{mLT}	0.76	

Unity check (6.61) = 0.50 + 0.31 + 0.01 = 0.82 -
Unity check (6.62) = 0.16 + 0.18 + 0.01 = 0.35 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	14.169	m
Web		unstiffened	
Web height	h_w	262	mm
Web thickness	t	9	mm
Material coefficient	ε	0.81	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	30.82
Web slenderness limit		48.82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S25	**0.000 / 13.200 m**	**HEA550**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.53 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG111 + 1.50*BG123 + 1.50*BG141 + 1.50*BG151

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	225.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-658.55	kN
Shear force	$V_{y,Ed}$	-0.29	kN
Shear force	$V_{z,Ed}$	27.57	kN
Torsion	T_{Ed}	-0.02	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	24	3.109e+04	3.109e+04	1.00	0.43	1.00	4.86	9.20	10.22	14.31	1
3	SO	117	24	3.109e+04	3.109e+04	1.00	0.43	1.00	4.86	9.20	10.22	14.31	1
4	I	438	13	3.109e+04	3.109e+04	1.00		1.00	35.04	28.62	34.74	38.84	3
5	SO	117	24	3.109e+04	3.109e+04	1.00	0.43	1.00	4.86	9.20	10.22	14.31	1
7	SO	117	24	3.109e+04	3.109e+04	1.00	0.43	1.00	4.86	9.20	10.22	14.31	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Semi-Comp+ properties			
Material coefficient	ε	1.02	
Flange class 2 slenderness limit	$\beta_{2,y,f}$	10.22	
Flange class 3 slenderness limit	$\beta_{3,y,f}$	14.31	
Web class 2 slenderness limit	$\beta_{2,y,w}$	84.82	
Web class 3 slenderness limit	$\beta_{3,y,w}$	126.73	
Flange class 2 slenderness limit	$\beta_{2,z,f}$	10.22	
Flange class 3 slenderness limit	$\beta_{3,z,f}$	16.35	
Web slenderness ratio	c/t_w	35.04	
Flange slenderness ratio	c/t_f	4.86	
Reference slenderness ratio	$c/t_{ref,y}$	0.00	
Reference slenderness ratio	$c/t_{ref,z}$	0.00	
Interpolated section modulus	$W_{3,y}$	4.6250e-03	m³
Interpolated section modulus	$W_{3,z}$	1.1083e-03	m³

Note: The resistance for this semi-compact section has been calculated according to Semi-Comp+.

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	2.1200e-02	m²
Compression resistance	$N_{c,Rd}$	4770.00	kN
Unity check		0.14	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.4894e-02	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1934.75	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	8.3960e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	1090.67	kN
Unity check		0.03	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.2	MPa
Elastic shear resistance	τ_{Rd}	129.9	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 5.350 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	24	-3.335e+03	-1.676e+03								
3	SO	117	24	-4.280e+03	-5.939e+03								
4	I	438	13	1.331e+03	5.904e+04	0.02		1.00	35.04	28.62	34.74	58.77	3
5	SO	117	24	6.371e+04	6.205e+04	0.97	0.44	1.00	4.86	9.20	10.22	14.23	1
7	SO	117	24	6.466e+04	6.631e+04	0.97	0.43	1.00	4.86	9.20	10.22	14.10	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	9.455	5.350	m
Buckling factor	k	2.73	0.87	
Buckling length	l_{cr}	25.859	4.641	m
Critical Euler load	N_{cr}	3471.36	10390.51	kN
Slenderness	λ	112.51	65.03	
Relative slenderness	λ_{rel}	1.17	0.68	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		a	b	
Imperfection	α	0.21	0.34	
Reduction factor	χ	0.55	0.80	
Buckling resistance	$N_{b,Rd}$	2612.88	3798.04	kN

Flexural Buckling verification			
Cross-section area	A	2.1200e-02	m^2
Buckling resistance	$N_{b,Rd}$	2612.88	kN
Unity check		0.25	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	2.1200e-02	m^2
Interpolated section modulus	$W_{3,y}$	4.6250e-03	m^3
Interpolated section modulus	$W_{3,z}$	1.1083e-03	m^3
Design compression force	N_{Ed}	658.55	kN
Design bending moment (maximum)	$M_{y,Ed}$	260.69	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-1.54	kNm
Characteristic compression resistance	N_{Rk}	4770.00	kN
Characteristic moment resistance	$M_{y,Rk}$	1040.63	kNm
Characteristic moment resistance	$M_{z,Rk}$	249.37	kNm
Reduction factor	χ_y	0.55	
Reduction factor	χ_z	0.80	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	1.08	
Interaction factor	k_{yz}	0.41	
Interaction factor	k_{zy}	0.65	
Interaction factor	k_{zz}	0.68	

Maximum moment $M_{y,Ed}$ is derived from beam S25 position 9.455 m.
Maximum moment $M_{z,Ed}$ is derived from beam S25 position 5.350 m.

Interaction method 2 parameters		
Method for interaction factors		Table B.1
Sway type y		sway
Equivalent moment factor	C_{my}	0.90
Resulting load type z		linear moment M
Ratio of end moments	ψ_z	0.00
Equivalent moment factor	C_{mz}	0.60
Resulting load type LT		linear moment M
Ratio of end moments	ψ_{LT}	0.00
Equivalent moment factor	C_{mLT}	0.60

Unity check (6.61) = 0.25 + 0.27 + 0.00 = 0.53 -
Unity check (6.62) = 0.17 + 0.16 + 0.00 = 0.34 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	13.200	m
Web		unstiffened	
Web height	h_w	492	mm
Web thickness	t	13	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	39.36
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S41	**20.660 / 45.000 m**	**I + rail (HEA500, SA75)**	**S 355 JR (EN 10025-2)**	**Alle UGT**	**0.80 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG134 + 1.50*3DWind10

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	315.0	MPa
Ultimate strength	f_u	470.0	MPa
Fabrication		Welded	

...::SECTION CHECK::...

The critical check is on position 20.660 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-76.79	kN
Shear force	$V_{y,Ed}$	-34.42	kN
Shear force	$V_{z,Ed}$	342.70	kN
Torsion	T_{Ed}	-0.02	kNm
Bending moment	$M_{y,Ed}$	261.92	kNm
Bending moment	$M_{z,Ed}$	-44.96	kNm

Classification for cross-section design

Classification according to EN 1993-1-1 article 5.5.2

Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m ^{2}]	σ_2 [kN/m ^{2}]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	150	23	-1.232e+05	-6.091e+04								
2	UO	150	23	-2.761e+04	3.463e+04	-0.80	16.56	0.56	6.52	18.73	20.81	73.80	1
3	UO	150	23	9.688e+04	3.463e+04	0.36	0.50	1.00	6.52	7.77	8.64	12.88	1
4	UO	150	23	1.335e+03	-6.091e+04	-45.64	1.83	0.02	6.52	362.55	402.84	24.54	1
5	I	12	12	-6.091e+04	-5.856e+04								
6	I	444	12	-5.856e+04	3.228e+04	-1.81		0.36	37.00	87.50	100.87	202.97	1
7	I	12	12	3.228e+04	3.463e+04	0.93		1.00	0.96	24.18	29.36	33.61	1
8	UO	76	87	3.699e+04	5.259e+04	0.70	0.46	1.00	0.88	7.77	8.64	12.26	1
9	I	12	87	3.699e+04	3.463e+04	0.94		1.00	0.13	24.18	29.36	33.56	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	2.6374e-02	m^2
Compression resistance	$N_{c,Rd}$	8307.92	kN
Unity check		0.01	-

Bending moment check for M_y

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	4.9021e-03	m^3
Plastic bending moment	$M_{pl,y,Rd}$	1544.15	kNm
Unity check		0.17	-

Bending moment check for M_z

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	1.2527e-03	m^3
Plastic bending moment	$M_{pl,z,Rd}$	394.59	kNm
Unity check		0.11	-

Shear check for V_y

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.9655e-02	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	3574.65	kN
Unity check		0.01	-

Note: The shear area is taken from the cross-section properties.

Shear check for V_z

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	6.7449e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	1226.65	kN
Unity check		0.28	-

Note: The shear area is taken from the cross-section properties.

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	14	
Total torsional moment	τ_{Ed}	0.1	MPa
Elastic shear resistance	τ_{Rd}	181.9	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.1 and formula (6.2)

Plastic tension resistance	$N_{pl,Rd}$	8307.92	kN
Plastic bending moment	$M_{pl,y,Rd}$	1544.15	kNm
Plastic bending moment	$M_{pl,z,Rd}$	394.59	kNm

Unity check (6.2) = 0.01 + 0.17 + 0.11 = 0.29 -

Note: No specific interaction formulae according to EN 1993-1-1 article 6.2.9.1 apply.
Therefore the plastic linear summation according to EN 1993-1-1 article 6.2.1(7) is verified.
Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1.160 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	150	23	-1.549e+04	3.810e+02	-40.66	23.80	0.02	6.52	2090.09	2322.32	88.49	1
2	UO	150	23	-1.533e+04	5.357e+02	-28.63	23.80	0.03	6.52	1253.48	1392.75	88.49	1
3	UO	150	23	1.641e+04	5.357e+02	0.03	0.56	1.00	6.52	7.77	8.64	13.61	1
4	UO	150	23	1.625e+04	3.810e+02	0.02	0.57	1.00	6.52	7.77	8.64	13.64	1
5	I	12	12	3.810e+02	3.848e+02	0.99		1.00	0.96	24.18	29.36	32.93	1
6	I	444	12	3.848e+02	5.319e+02	0.72		1.00	37.00	24.18	29.36	36.31	4
7	I	12	12	5.319e+02	5.357e+02	0.99		1.00	0.96	24.18	29.36	32.90	1
8	UO	76	87	5.395e+02	5.648e+02	0.96	0.43	1.00	0.88	7.77	8.64	11.94	1
9	I	12	87	5.395e+02	5.357e+02	0.99		1.00	0.13	24.18	29.36	32.90	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 4
Note: The stability classification is based on the maximum section classification along the member.

Effective section N-
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	150	3.150e+05	3.150e+05	1.00	0.43	0.41	1.00	150		
2	UO	150	3.150e+05	3.150e+05	1.00	0.43	0.41	1.00	150		
3	UO	150	3.150e+05	3.150e+05	1.00	0.43	0.41	1.00	150		
4	UO	150	3.150e+05	3.150e+05	1.00	0.43	0.41	1.00	150		
5	I	12	3.150e+05	3.150e+05	1.00	4.00	0.02	1.00	12	6	6
6	I	444	3.150e+05	3.150e+05	1.00	4.00	0.75	0.94	417	208	208
7	I	12	3.150e+05	3.150e+05	1.00	4.00	0.02	1.00	12	6	6
8	UO	76	3.150e+05	3.150e+05	1.00	0.43	0.05	1.00	76		
9	I	12	3.150e+05	3.150e+05	1.00	4.00	0.00	1.00	12	6	6

Effective section My+
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m ^{2}]	σ_2 [kN/m ^{2}]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	150	-3.150e+05	-3.150e+05							
2	UO	150	1.571e+05	1.571e+05	1.00	0.43	0.41	1.00	150		
3	UO	150	1.571e+05	1.571e+05	1.00	0.43	0.41	1.00	150		
4	UO	150	-3.150e+05	-3.150e+05							
5	I	12	-3.034e+05	-3.150e+05							
6	I	444	1.454e+05	-3.034e+05	-2.09	56.94	0.20	1.00	144	58	86
7	I	12	1.571e+05	1.454e+05	0.93	4.15	0.02	1.00	12	6	6
8	UO	76	2.458e+05	1.687e+05	0.69	0.46	0.05	1.00	76		
9	I	12	1.687e+05	1.571e+05	0.93	4.14	0.00	1.00	12	6	6

Effective section Mz-
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m ^{2}]	σ_2 [kN/m ^{2}]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	150	0.000e+00	-3.150e+05	0.00	1.70	0.20	1.00	150		
2	UO	150	0.000e+00	-3.150e+05	0.00	1.70	0.20	1.00	150		
3	UO	150	3.150e+05	0.000e+00	0.00	0.57	0.35	1.00	150		
4	UO	150	3.150e+05	0.000e+00	0.00	0.57	0.35	1.00	150		
5	I	12	0.000e+00	0.000e+00							
6	I	444	0.000e+00	0.000e+00							
7	I	12	0.000e+00	0.000e+00							
8	UO	76	0.000e+00	0.000e+00							
9	I	12	0.000e+00	0.000e+00							

Effective properties						
Effective area	A_{eff}	2.6687e-02	m^2			
Effective second moment of area	$I_{eff,y}$	1.2802e-03	m^4	$I_{eff,z}$	1.0833e-04	m^4
Effective section modulus	$W_{eff,y}$	3.9620e-03	m^3	$W_{eff,z}$	7.2221e-04	m^3
Shift of the centroid	$e_{N,y}$	1	mm	$e_{N,z}$	0	mm

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	45.000	7.000	m
Buckling factor	k	1.09	0.75	
Buckling length	l_{cr}	49.269	5.239	m
Critical Euler load	N_{cr}	1068.28	8573.18	kN
Slenderness	λ	226.21	79.85	
Relative slenderness	λ_{rel}	2.81	0.99	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		c	c	
Imperfection	α	0.49	0.49	
Reduction factor	χ	0.11	0.55	
Buckling resistance	$N_{b,Rd}$	903.97	4586.77	kN

Flexural Buckling verification			
Cross-section effective area	A_{eff}	2.6687e-02	m^2
Buckling resistance	$N_{b,Rd}$	903.97	kN
Unity check		0.08	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length	l_{cr}	7.000	m
Elastic critical load	$N_{cr,T}$	34506.12	kN
Elastic critical load	$N_{cr,TF}$	1068.28	kN
Relative slenderness	$\lambda_{rel,T}$	2.81	
Limit slenderness	$\lambda_{rel,0}$	0.20	
Buckling curve		c	
Imperfection	α	0.49	
Reduction factor	χ	0.11	
Cross-section effective area	A_{eff}	2.6687e-02	m^2
Buckling resistance	$N_{b,Rd}$	903.97	kN

Unity check		0.08	-

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters			
Method for LTB curve		General case	
Effective section modulus	$W_{eff,y}$	3.9620e-03	m^3
Elastic critical moment	M_{cr}	3630.37	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.59	
Limit slenderness	$\lambda_{rel,LT,0}$	0.20	
LTB curve		d	
Imperfection	α_{LT}	0.76	
Reduction factor	χ_{LT}	0.72	
Design buckling resistance	$M_{b,Rd}$	897.81	kNm
Unity check		0.29	-

Mcr parameters			
LTB length	l_{LT}	7.000	m
Influence of load position		no influence	
Correction factor	k	1.00	
Correction factor	k_w	1.00	
LTB moment factor	C_1	1.20	
LTB moment factor	C_2	0.78	
LTB moment factor	C_3	0.53	
Shear centre distance	d_z	-78	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	51	mm
Mono-symmetry constant	z_j	-26	mm

Warning: Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.
Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section effective area	A_{eff}	2.6687e-02	m^2
Effective section modulus	$W_{eff,y}$	3.9620e-03	m^3
Effective section modulus	$W_{eff,z}$	7.2221e-04	m^3
Design compression force	N_{Ed}	76.79	kN
Design bending moment (maximum)	$M_{y,Ed}$	480.28	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-44.96	kNm
Additional moment	$\Delta M_{y,Ed}$	0.00	kNm
Additional moment	$\Delta M_{z,Ed}$	0.00	kNm
Characteristic compression resistance	N_{Rk}	8406.32	kN
Characteristic moment resistance	$M_{y,Rk}$	1248.02	kNm
Characteristic moment resistance	$M_{z,Rk}$	227.50	kNm
Reduction factor	χ_y	0.11	
Reduction factor	χ_z	0.11	
Reduction factor	χ_{LT}	0.72	
Interaction factor	k_{yy}	0.95	
Interaction factor	k_{yz}	0.92	
Interaction factor	k_{zy}	0.99	
Interaction factor	k_{zz}	0.92	

Maximum moment $M_{y,Ed}$ is derived from beam S41 position 22.060 m.
Maximum moment $M_{z,Ed}$ is derived from beam S41 position 20.660 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.2	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		point load F	
End moment	$M_{h,z}$	12.18	kNm
Field moment	$M_{s,z}$	-44.96	kNm
Factor	$\alpha_{h,z}$	-0.27	
Ratio of end moments	ψ_z	0.95	

Interaction method 2 parameters			
Equivalent moment factor	C_{mz}	0.87	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	-310.45	kNm
Field moment	$M_{s,LT}$	480.28	kNm
Factor	$\alpha_{h,LT}$	-0.65	
Ratio of end moments	ψ_{LT}	0.95	
Equivalent moment factor	C_{mLT}	0.92	

Unity check (6.61) = 0.08 + 0.51 + 0.18 = 0.77 -
Unity check (6.62) = 0.08 + 0.53 + 0.18 = 0.80 -

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S48	**0.000 / 0.500 m**	**HEA500**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.59 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG132 + 1.50*3DWind2

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	225.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	37.30	kN
Shear force	$V_{y,Ed}$	-11.63	kN
Shear force	$V_{z,Ed}$	580.29	kN
Torsion	T_{Ed}	0.36	kNm
Bending moment	$M_{y,Ed}$	-309.83	kNm
Bending moment	$M_{z,Ed}$	-0.36	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m ²]	σ_2 [kN/m ²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	23	8.139e+04	8.180e+04	1.00	0.43	1.00	5.09	9.20	10.22	14.08	1
3	SO	117	23	8.116e+04	8.076e+04	0.99	0.43	1.00	5.09	9.20	10.22	14.12	1
4	I	390	12	6.757e+04	-7.134e+04	-1.06		0.48	32.50	76.29	87.94	133.86	1
5	SO	117	23	-8.517e+04	-8.558e+04								
7	SO	117	23	-8.494e+04	-8.453e+04								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	1.9800e-02	m²
Plastic tension resistance	$N_{pl,Rd}$	4455.00	kN
Ultimate tension resistance	$N_{u,Rd}$	5132.16	kN
Tension resistance	$N_{t,Rd}$	4455.00	kN
Unity check		0.01	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	3.9500e-03	m^3
Plastic bending moment	$M_{pl,y,Rd}$	888.75	kNm
Unity check		0.35	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	1.0583e-03	m^3
Plastic bending moment	$M_{pl,z,Rd}$	238.12	kNm
Unity check		0.00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.4268e-02	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1853.47	kN
Unity check		0.01	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	7.5180e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	976.62	kN
Unity check		0.59	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	2.7	MPa
Elastic shear resistance	τ_{Rd}	129.9	MPa
Unity check		0.02	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 & 6.2.8 and formula (6.41)

Reduction of yield strength z	ρ_z	0.04	
Plastic bending moment reduced due to V_z	$M_{V,y,Rd}$	884.03	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	238.12	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.12 + 0.00 = 0.12 -

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0.000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	23	8.139e+04	8.180e+04	1.00	0.43	1.00	5.09	9.20	10.22	14.08	1
3	SO	117	23	8.116e+04	8.076e+04	0.99	0.43	1.00	5.09	9.20	10.22	14.12	1
4	I	390	12	6.757e+04	-7.134e+04	-1.06		0.48	32.50	76.29	87.94	133.86	1
5	SO	117	23	-8.517e+04	-8.558e+04								
7	SO	117	23	-8.494e+04	-8.453e+04								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	3.9500e-03	m^3
Elastic critical moment	M_{cr}	343196.99	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.05	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	0.500	m
Influence of load position		no influence	
Correction factor	k	1.00	
Correction factor	k_w	1.00	
LTB moment factor	C_1	1.70	
LTB moment factor	C_2	0.00	
LTB moment factor	C_3	1.00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Warning: Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.
Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	0.500	m
Web		unstiffened	
Web height	h_w	444	mm
Web thickness	t	12	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	37.00
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S66	**0.700 / 5.600 m**	**UNP280**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.79 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.700 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-56.33	kN
Shear force	$V_{y,Ed}$	0.06	kN
Shear force	$V_{z,Ed}$	-20.23	kN
Torsion	T_{Ed}	0.04	kNm
Bending moment	$M_{y,Ed}$	-15.39	kNm
Bending moment	$M_{z,Ed}$	0.04	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	70	15	4.191e+04	4.252e+04	0.99	0.43	1.00	4.67	9.00	10.00	13.79	1
3	I	220	10	3.637e+04	-1.608e+04	-0.44		0.69	22.00	44.77	53.28	76.06	1
5	UO	70	15	-2.127e+04	-2.066e+04								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	5.3300e-03	m²
Compression resistance	$N_{c,Rd}$	1252.55	kN
Unity check		0.04	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	5.3200e-04	m³
Plastic bending moment	$M_{pl,y,Rd}$	125.02	kNm
Unity check		0.12	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	1.0900e-04	m³
Plastic bending moment	$M_{pl,z,Rd}$	25.62	kNm
Unity check		0.00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	2.8500e-03	m²
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	386.68	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	2.8550e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	387.36	kN
Unity check		0.05	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	3	
Total torsional moment	τ_{Ed}	1.9	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.01	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.1 and formula (6.2)

Plastic tension resistance	$N_{pl,Rd}$	1252.55	kN
Plastic bending moment	$M_{pl,y,Rd}$	125.02	kNm
Plastic bending moment	$M_{pl,z,Rd}$	25.62	kNm

Unity check (6.2) = 0.04 + 0.12 + 0.00 = 0.17 -

Note: No specific interaction formulae according to EN 1993-1-1 article 6.2.9.1 apply.
Therefore the plastic linear summation according to EN 1993-1-1 article 6.2.1(7) is verified.
Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 2.800 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	70	15	9.233e+04	9.475e+04	0.97	0.43	1.00	4.67	9.00	10.00	13.80	1
3	I	220	10	7.739e+04	-6.194e+04	-0.80		0.56	22.00	61.32	71.57	101.27	1
5	UO	70	15	-7.550e+04	-7.308e+04								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	5.600	5.600	m
Buckling factor	k	1.00	0.73	
Buckling length	l_{cr}	5.600	4.080	m
Critical Euler load	N_{cr}	4150.52	496.75	kN
Slenderness	λ	51.59	149.13	
Relative slenderness	λ_{rel}	0.55	1.59	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		c	c	
Imperfection	α	0.49	0.49	
Reduction factor	χ	0.81	0.29	
Buckling resistance	$N_{b,Rd}$	1020.81	360.32	kN

Flexural Buckling verification			
Cross-section area	A	5.3300e-03	m²
Buckling resistance	$N_{b,Rd}$	360.32	kN
Unity check		0.16	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length	l_{cr}	5.600	m
Elastic critical load	$N_{cr,T}$	1845.40	kN
Elastic critical load	$N_{cr,TF}$	496.75	kN
Relative slenderness	$\lambda_{rel,T}$	1.59	
Limit slenderness	$\lambda_{rel,0}$	0.20	
Buckling curve		c	
Imperfection	α	0.49	
Reduction factor	χ	0.29	
Cross-section area	A	5.3300e-03	m²
Buckling resistance	$N_{b,Rd}$	360.32	kN
Unity check		0.16	-

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters			
Method for LTB curve		General case	
Plastic section modulus	$W_{pl,y}$	5.3200e-04	m³
Elastic critical moment	M_{cr}	99.26	kNm
Relative slenderness	$\lambda_{rel,LT}$	1.12	
Relative slenderness	$\lambda_{rel,T}$	0.10	
Relative slenderness	$\lambda_{rel,EXTRA}$	1.23	

LTB parameters			
Limit slenderness	$\lambda_{rel,LT,0}$	0.20	
LTB curve		a	
Imperfection	α_{LT}	0.21	
Reduction factor	χ_{LT}	0.51	
Design buckling resistance	$M_{b,Rd}$	64.17	kNm
Unity check		0.24	-

Note: $\lambda_{rel,EXTRA}$ is determined according to "Design rule for lateral torsional buckling of channel sections, 2007".

Mcr parameters			
LTB length	l_{LT}	5.600	m
Influence of load position		no influence	
Correction factor	k	1.00	
Correction factor	k_w	1.00	
LTB moment factor	C_1	1.13	
LTB moment factor	C_2	0.48	
LTB moment factor	C_3	0.53	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Warning: Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.
Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	5.3300e-03	m^2
Plastic section modulus	$W_{pl,y}$	5.3200e-04	m^3
Plastic section modulus	$W_{pl,z}$	1.0900e-04	m^3
Design compression force	N_{Ed}	56.33	kN
Design bending moment (maximum)	$M_{y,Ed}$	-40.88	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0.32	kNm
Characteristic compression resistance	N_{Rk}	1252.55	kN
Characteristic moment resistance	$M_{y,Rk}$	125.02	kNm
Characteristic moment resistance	$M_{z,Rk}$	25.62	kNm
Reduction factor	χ_y	0.81	
Reduction factor	χ_z	0.29	
Reduction factor	χ_{LT}	0.51	
Interaction factor	k_{yy}	0.92	
Interaction factor	k_{yz}	0.44	
Interaction factor	k_{zy}	0.98	
Interaction factor	k_{zz}	0.73	

Maximum moment $M_{y,Ed}$ is derived from beam S66 position 2.800 m.
Maximum moment $M_{z,Ed}$ is derived from beam S66 position 5.600 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.2	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		linear moment M	
Ratio of end moments	ψ_z	0.00	
Equivalent moment factor	C_{mz}	0.60	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	4.79	kNm
Field moment	$M_{s,LT}$	-40.88	kNm
Factor	$\alpha_{h,LT}$	-0.12	
Ratio of end moments	ψ_{LT}	0.00	
Equivalent moment factor	C_{mLT}	0.94	

Unity check (6.61) = 0.06 + 0.58 + 0.01 = 0.64 -
Unity check (6.62) = 0.16 + 0.62 + 0.01 = 0.79 -

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S78	**1.200 / 6.000 m**	**HEA220**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.79 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind27

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 1.200 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-139.12	kN
Shear force	$V_{y,Ed}$	-1.20	kN
Shear force	$V_{z,Ed}$	-11.50	kN
Torsion	T_{Ed}	0.00	kNm
Bending moment	$M_{y,Ed}$	62.32	kNm
Bending moment	$M_{z,Ed}$	5.76	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	89	11	-9.932e+04	-1.254e+05								
3	SO	89	11	-8.665e+04	-6.057e+04								
4	I	152	7	-6.592e+04	1.092e+05	-0.60		0.78	21.71	38.41	46.06	85.69	1
5	SO	89	11	1.426e+05	1.686e+05	0.85	0.44	1.00	8.05	9.00	10.00	13.97	1
7	SO	89	11	1.299e+05	1.038e+05	0.80	0.51	1.00	8.05	9.00	10.00	14.96	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	6.4300e-03	m²
Compression resistance	$N_{c,Rd}$	1511.05	kN
Unity check		0.09	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	5.6667e-04	m³
Plastic bending moment	$M_{pl,y,Rd}$	133.17	kNm
Unity check		0.47	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	2.7042e-04	m³
Plastic bending moment	$M_{pl,z,Rd}$	63.55	kNm
Unity check		0.09	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	5.0150e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	680.42	kN
Unity check		0.00	-

Shear check for V_z

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	2.0630e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	279.90	kN
Unity check		0.04	-

Torsion check

According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.1	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	133.17	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	63.55	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.22 + 0.09 = 0.31 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design

Decisive position for stability classification: 1.200 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	89	11	-9.932e+04	-1.254e+05								
3	SO	89	11	-8.665e+04	-6.057e+04								
4	I	152	7	-6.592e+04	1.092e+05	-0.60		0.78	21.71	38.41	46.06	85.69	1
5	SO	89	11	1.426e+05	1.686e+05	0.85	0.44	1.00	8.05	9.00	10.00	13.97	1
7	SO	89	11	1.299e+05	1.038e+05	0.80	0.51	1.00	8.05	9.00	10.00	14.96	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	6.000	6.000	m
Buckling factor	k	1.00	1.00	
Buckling length	l_{cr}	6.000	6.000	m
Critical Euler load	N_{cr}	3114.68	1128.42	kN
Slenderness	λ	65.41	108.67	
Relative slenderness	λ_{rel}	0.70	1.16	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	

Buckling parameters		yy	zz	
Buckling curve		b	c	
Imperfection	α	0.34	0.49	
Reduction factor	χ	0.79	0.45	
Buckling resistance	$N_{b,Rd}$	1187.19	687.09	kN

Flexural Buckling verification			
Cross-section area	A	6.4300e-03	m²
Buckling resistance	$N_{b,Rd}$	687.09	kN
Unity check		0.20	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	5.6667e-04	m³
Elastic critical moment	M_{cr}	266.96	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.71	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	
LTB curve		b	
Imperfection	α_{LT}	0.34	
LTB factor	β	0.75	
Reduction factor	χ_{LT}	0.87	
Correction factor	k_c	0.86	
Correction factor	f	0.93	
Modified reduction factor	$\chi_{LT,mod}$	0.93	
Design buckling resistance	$M_{b,Rd}$	124.07	kNm
Unity check		0.50	-

Mcr parameters			
LTB length	l_{LT}	6.000	m
Fork length	L_g	6.000	m
Influence of load position		no influence	
Factor	α	850.34	
Reduction factor	k_{red}	1.00	
Coefficient	C	5.20	
Factor	S	1328	mm
LTB moment factor	C_1	1.36	
LTB moment factor	C_2	0.00	

Note: M_{cr} has been calculated according to the Dutch NEN-EN NA.
Note: The correction factor k_c is determined from C_1.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	6.4300e-03	m²
Plastic section modulus	$W_{pl,y}$	5.6667e-04	m³
Plastic section modulus	$W_{pl,z}$	2.7042e-04	m³
Design compression force	N_{Ed}	139.12	kN
Design bending moment (maximum)	$M_{y,Ed}$	62.32	kNm
Design bending moment (maximum)	$M_{z,Ed}$	5.76	kNm
Characteristic compression resistance	N_{Rk}	1511.05	kN
Characteristic moment resistance	$M_{y,Rk}$	133.17	kNm
Characteristic moment resistance	$M_{z,Rk}$	63.55	kNm
Reduction factor	χ_y	0.79	
Reduction factor	χ_z	0.45	
Modified reduction factor	$\chi_{LT,mod}$	0.93	
Interaction factor	k_{yy}	0.95	
Interaction factor	k_{yz}	0.69	
Interaction factor	k_{zy}	0.97	

Bending and axial compression check parameters			
Interaction factor	k_{zz}	1.16	

Maximum moment $M_{y,Ed}$ is derived from beam S78 position 1.200 m.
Maximum moment $M_{z,Ed}$ is derived from beam S78 position 1.200 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.2	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		point load F	
End moment	$M_{h,z}$	0.00	kNm
Field moment	$M_{s,z}$	5.76	kNm
Factor	$\alpha_{h,z}$	0.00	
Ratio of end moments	ψ_z	1.00	
Equivalent moment factor	C_{mz}	0.90	
Resulting load type LT		point load F	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	62.32	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.90	

Unity check (6.61) = 0.12 + 0.48 + 0.06 = 0.66 -
Unity check (6.62) = 0.20 + 0.49 + 0.10 = 0.79 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	6.000	m
Web		unstiffened	
Web height	h_w	188	mm
Web thickness	t	7	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	26.86
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S80	**0.500 / 5.000 m**	**HEB300**	**S 355 JR (EN 10025-2)**	**Alle UGT**	**0.49 -**

Combination key
Alle UGT / 0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG131 + 1.50*3DWind2

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	345.0	MPa
Ultimate strength	f_u	470.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.500 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-27.51	kN
Shear force	$V_{y,Ed}$	24.46	kN
Shear force	$V_{z,Ed}$	-47.01	kN
Torsion	T_{Ed}	0.27	kNm
Bending moment	$M_{y,Ed}$	222.43	kNm
Bending moment	$M_{z,Ed}$	-110.05	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	19	-8.055e+04	7.047e+04	-1.14	0.90	0.47	6.18	15.92	17.69	16.46	1
3	SO	117	19	-1.641e+05	-3.151e+05								
4	I	208	11	-9.006e+04	9.375e+04	-0.96		0.52	18.91	56.34	65.23	98.11	1
5	SO	117	19	8.424e+04	-6.678e+04	-0.79	16.41	0.56	6.18	17.83	19.81	70.21	1
7	SO	117	19	1.678e+05	3.188e+05	0.53	0.48	1.00	6.18	7.43	8.25	11.99	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	1.4910e-02	m²
Compression resistance	$N_{c,Rd}$	5143.95	kN
Unity check		0.01	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	1.8690e-03	m³
Plastic bending moment	$M_{pl,y,Rd}$	644.81	kNm
Unity check		0.34	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	8.7010e-04	m³
Plastic bending moment	$M_{pl,z,Rd}$	300.18	kNm
Unity check		0.37	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.1818e-02	m²
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	2353.98	kN
Unity check		0.01	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	4.7450e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	945.14	kN
Unity check		0.05	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	2.8	MPa
Elastic shear resistance	τ_{Rd}	199.2	MPa
Unity check		0.01	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	644.81	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	300.18	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.12 + 0.37 = 0.49 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0.500 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	117	19	-8.055e+04	7.047e+04	-1.14	0.90	0.47	6.18	15.92	17.69	16.46	1
3	SO	117	19	-1.641e+05	-3.151e+05								
4	I	208	11	-9.006e+04	9.375e+04	-0.96		0.52	18.91	56.34	65.23	98.11	1
5	SO	117	19	8.424e+04	-6.678e+04	-0.79	16.41	0.56	6.18	17.83	19.81	70.21	1
7	SO	117	19	1.678e+05	3.188e+05	0.53	0.48	1.00	6.18	7.43	8.25	11.99	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	5.000	4.500	m
Buckling factor	k	1.00	0.76	
Buckling length	l_{cr}	5.000	3.426	m
Critical Euler load	N_{cr}	20867.11	15117.54	kN
Slenderness	λ	38.48	45.21	
Relative slenderness	λ_{rel}	0.50	0.58	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	1.8690e-03	m³
Elastic critical moment	M_{cr}	2986.96	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.46	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	4.500	m
Fork length	L_g	4.500	m
Influence of load position		no influence	
Factor	α	704.94	
Reduction factor	k_{red}	1.00	
Coefficient	C	8.20	
Factor	S	1540	mm
LTB moment factor	C_1	1.78	
LTB moment factor	C_2	0.00	

Note: M_{cr} has been calculated according to the Dutch NEN-EN NA.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	1.4910e-02	m^2
Plastic section modulus	$W_{pl,y}$	1.8690e-03	m^3
Plastic section modulus	$W_{pl,z}$	8.7010e-04	m^3
Design compression force	N_{Ed}	27.51	kN
Design bending moment (maximum)	$M_{y,Ed}$	210.92	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-110.05	kNm
Characteristic compression resistance	N_{Rk}	5143.95	kN
Characteristic moment resistance	$M_{y,Rk}$	644.81	kNm
Characteristic moment resistance	$M_{z,Rk}$	300.18	kNm
Reduction factor	χ_y	1.00	
Reduction factor	χ_z	1.00	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	0.90	
Interaction factor	k_{yz}	0.36	
Interaction factor	k_{zy}	0.54	
Interaction factor	k_{zz}	0.60	

Maximum moment $M_{y,Ed}$ is derived from beam S80 position 0.500 m.
Maximum moment $M_{z,Ed}$ is derived from beam S80 position 0.500 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		linear moment M	
Ratio of end moments	ψ_z	0.00	
Equivalent moment factor	C_{mz}	0.60	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	222.43	kNm
Field moment	$M_{s,LT}$	113.93	kNm
Factor	$\alpha_{s,LT}$	0.51	
Ratio of end moments	ψ_{LT}	0.00	
Equivalent moment factor	C_{mLT}	0.61	

Unity check (6.61) = 0.01 + 0.29 + 0.13 = 0.43 -
Unity check (6.62) = 0.01 + 0.18 + 0.22 = 0.40 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	5.000	m
Web		unstiffened	
Web height	h_w	262	mm
Web thickness	t	11	mm
Material coefficient	ε	0.81	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	23.82
Web slenderness limit		48.82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S82	**0.000 / 8.039 m**	**HEA200**	**S 355 JR (EN 10025-2)**	**Alle UGT**	**0.78 -**

Combination key
Alle UGT / 0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG140 + 1.50*3DWind27

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	355.0	MPa
Ultimate strength	f_u	470.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-343.18	kN
Shear force	$V_{y,Ed}$	0.18	kN
Shear force	$V_{z,Ed}$	0.66	kN
Torsion	T_{Ed}	0.02	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	6.374e+04	6.374e+04	1.00	0.43	1.00	7.88	7.32	8.14	11.39	2
3	SO	79	10	6.374e+04	6.374e+04	1.00	0.43	1.00	7.88	7.32	8.14	11.39	2
4	I	134	7	6.374e+04	6.374e+04	1.00		1.00	20.62	22.78	27.66	30.92	1
5	SO	79	10	6.374e+04	6.374e+04	1.00	0.43	1.00	7.88	7.32	8.14	11.39	2
7	SO	79	10	6.374e+04	6.374e+04	1.00	0.43	1.00	7.88	7.32	8.14	11.39	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	5.3800e-03	m²
Compression resistance	$N_{c,Rd}$	1909.90	kN
Unity check		0.18	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	4.1592e-03	m²
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	852.48	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.8050e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	369.95	kN
Unity check		0.00	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.9	MPa
Elastic shear resistance	τ_{Rd}	205.0	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 4.019 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	6.161e+04	5.738e+04	0.93	0.45	1.00	7.88	7.32	8.14	11.52	2
3	SO	79	10	6.388e+04	6.811e+04	0.94	0.43	1.00	7.88	7.32	8.14	11.26	2
4	I	134	7	6.295e+04	6.414e+04	0.98		1.00	20.62	22.78	27.66	31.12	1
5	SO	79	10	6.548e+04	6.970e+04	0.94	0.43	1.00	7.88	7.32	8.14	11.26	2
7	SO	79	10	6.320e+04	5.898e+04	0.93	0.45	1.00	7.88	7.32	8.14	11.51	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	4.019	8.039	m
Buckling factor	k	0.85	0.85	
Buckling length	l_{cr}	3.416	6.833	m
Critical Euler load	N_{cr}	6552.15	594.84	kN
Slenderness	λ	41.25	136.91	
Relative slenderness	λ_{rel}	0.54	1.79	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		b	c	
Imperfection	α	0.34	0.49	
Reduction factor	χ	0.87	0.24	
Buckling resistance	$N_{b,Rd}$	1654.17	451.29	kN

Flexural Buckling verification			
Cross-section area	A	5.3800e-03	m²
Buckling resistance	$N_{b,Rd}$	451.29	kN
Unity check		0.76	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	5.3800e-03	m²
Plastic section modulus	$W_{pl,y}$	4.2917e-04	m³
Plastic section modulus	$W_{pl,z}$	2.0375e-04	m³
Design compression force	N_{Ed}	343.18	kN
Design bending moment (maximum)	$M_{y,Ed}$	0.75	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0.73	kNm
Characteristic compression resistance	N_{Rk}	1909.90	kN

Bending and axial compression check parameters			
Characteristic moment resistance	$M_{y,Rk}$	152.35	kNm
Characteristic moment resistance	$M_{z,Rk}$	72.33	kNm
Reduction factor	χ_y	0.87	
Reduction factor	χ_z	0.24	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	0.96	
Interaction factor	k_{yz}	1.11	
Interaction factor	k_{zy}	0.58	
Interaction factor	k_{zz}	1.86	

Maximum moment $M_{y,Ed}$ is derived from beam S82 position 2.010 m.
Maximum moment $M_{z,Ed}$ is derived from beam S82 position 4.019 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		point load F	
End moment	$M_{h,z}$	0.00	kNm
Field moment	$M_{s,z}$	0.73	kNm
Factor	$\alpha_{h,z}$	0.00	
Ratio of end moments	ψ_z	1.00	
Equivalent moment factor	C_{mz}	0.90	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	0.75	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.95	

Unity check (6.61) = 0.21 + 0.00 + 0.01 = 0.22 -
Unity check (6.62) = 0.76 + 0.00 + 0.02 = 0.78 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	8.039	m
Web		unstiffened	
Web height	h_w	170	mm
Web thickness	t	7	mm
Material coefficient	ε	0.81	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	26.15
Web slenderness limit		48.82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S90	**6.500 / 7.000 m**	**HEA280**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.37 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG122 + 1.50*BG123 + 1.50*BG134 + 1.50*BG151 + 1.50*3DWind19

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 6.500 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-3.86	kN
Shear force	$V_{y,Ed}$	38.12	kN
Shear force	$V_{z,Ed}$	26.47	kN
Torsion	T_{Ed}	0.29	kNm
Bending moment	$M_{y,Ed}$	-13.12	kNm
Bending moment	$M_{z,Ed}$	-19.06	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m^2]	σ_2 [kN/m^2]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	112	13	2.393e+04	6.874e+04	0.35	0.51	1.00	8.62	9.00	10.00	14.93	1
3	SO	112	13	1.519e+03	-4.330e+04	-28.50	23.80	0.03	8.62	1442.31	1602.56	102.45	1
4	I	196	8	9.797e+03	-9.004e+03	-0.92		0.51	24.50	70.83	81.77	113.74	1
5	SO	112	13	-2.313e+04	-6.795e+04								
7	SO	112	13	-7.256e+02	4.409e+04	-0.02	0.57	0.98	8.62	9.15	10.16	15.90	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	9.7300e-03	m^2
Compression resistance	$N_{c,Rd}$	2286.55	kN
Unity check		0.00	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	1.1125e-03	m^3
Plastic bending moment	$M_{pl,y,Rd}$	261.44	kNm
Unity check		0.05	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	5.1667e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	121.42	kNm
Unity check		0.16	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	7.5360e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1022.46	kN
Unity check		0.04	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	3.1780e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	431.18	kN
Unity check		0.06	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	6.1	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.04	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	261.44	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	121.42	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.00 + 0.16 = 0.16 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1.500 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	112	13	2.965e+04	1.325e+05	0.22	0.53	1.00	8.62	9.00	10.00	15.24	1
3	SO	112	13	-2.178e+04	-1.246e+05								
4	I	196	8	3.096e+03	-2.309e+03	-0.75		0.51	24.50	70.84	81.78	96.37	1
5	SO	112	13	-2.886e+04	-1.317e+05								
7	SO	112	13	2.257e+04	1.254e+05	0.18	0.53	1.00	8.62	9.00	10.00	15.35	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	0.500	7.000	m
Buckling factor	k	5.01	1.00	
Buckling length	l_{cr}	2.506	7.000	m
Critical Euler load	N_{cr}	45199.01	2013.50	kN
Slenderness	λ	21.12	100.08	
Relative slenderness	λ_{rel}	0.22	1.07	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	1.1125e-03	m³
Elastic critical moment	M_{cr}	557.22	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.68	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	7.000	m
Fork length	L_g	7.000	m
Influence of load position		no influence	
Factor	α	575.00	
Reduction factor	k_{red}	1.00	
Coefficient	C	5.51	
Factor	S	1813	mm
LTB moment factor	C_1	1.36	
LTB moment factor	C_2	0.00	

Note: M_{cr} has been calculated according to the Dutch NEN-EN NA.

Bending and axial compression check

According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	9.7300e-03	m^2
Plastic section modulus	$W_{pl,y}$	1.1125e-03	m^3
Plastic section modulus	$W_{pl,z}$	5.1667e-04	m^3
Design compression force	N_{Ed}	3.86	kN
Design bending moment (maximum)	$M_{y,Ed}$	-13.12	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-43.72	kNm
Characteristic compression resistance	N_{Rk}	2286.55	kN
Characteristic moment resistance	$M_{y,Rk}$	261.44	kNm
Characteristic moment resistance	$M_{z,Rk}$	121.42	kNm
Reduction factor	χ_y	1.00	
Reduction factor	χ_z	1.00	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	0.90	
Interaction factor	k_{yz}	0.57	
Interaction factor	k_{zy}	0.54	
Interaction factor	k_{zz}	0.95	

Maximum moment $M_{y,Ed}$ is derived from beam S90 position 6.500 m.
Maximum moment $M_{z,Ed}$ is derived from beam S90 position 1.500 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		line load q	
End moment	$M_{h,z}$	0.00	kNm
Field moment	$M_{s,z}$	-43.72	kNm
Factor	$\alpha_{h,z}$	0.00	
Ratio of end moments	ψ_z	1.00	
Equivalent moment factor	C_{mz}	0.95	
Resulting load type LT		point load F	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	-12.97	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.90	

Unity check (6.61) = 0.00 + 0.05 + 0.21 = 0.25 -
Unity check (6.62) = 0.00 + 0.03 + 0.34 = 0.37 -

Shear Buckling check

According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	7.000	m
Web		unstiffened	
Web height	h_w	244	mm
Web thickness	t	8	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	30.50
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S113	**0.000 / 6.134 m**	**HEA140**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.99 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*3DWind2

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-160.52	kN
Shear force	$V_{y,Ed}$	0.00	kN
Shear force	$V_{z,Ed}$	0.45	kN
Torsion	T_{Ed}	0.00	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	55	9	5.109e+04	5.109e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
3	SO	55	9	5.109e+04	5.109e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
4	I	92	6	5.109e+04	5.109e+04	1.00		1.00	16.73	28.00	34.00	38.00	1
5	SO	55	9	5.109e+04	5.109e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
7	SO	55	9	5.109e+04	5.109e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	3.1400e-03	m²
Compression resistance	$N_{c,Rd}$	737.90	kN
Unity check		0.22	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.0107e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	137.14	kN
Unity check		0.00	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	1	
Total torsional moment	τ_{Ed}	0.1	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 2.726 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	55	9	4.673e+04	4.673e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
3	SO	55	9	4.673e+04	4.673e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
4	I	92	6	4.780e+04	5.391e+04	0.89		1.00	16.73	28.00	34.00	39.55	1
5	SO	55	9	5.499e+04	5.499e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1
7	SO	55	9	5.499e+04	5.499e+04	1.00	0.43	1.00	6.50	9.00	10.00	14.00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	6.134	6.134	m
Buckling factor	k	1.00	1.00	
Buckling length	l_{cr}	6.134	6.134	m
Critical Euler load	N_{cr}	567.43	214.30	kN
Slenderness	λ	107.10	174.27	
Relative slenderness	λ_{rel}	1.14	1.86	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		b	c	
Imperfection	α	0.34	0.49	
Reduction factor	χ	0.51	0.22	
Buckling resistance	$N_{b,Rd}$	377.45	164.45	kN

Flexural Buckling verification			
Cross-section area	A	3.1400e-03	m²
Buckling resistance	$N_{b,Rd}$	164.45	kN
Unity check		0.98	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	3.1400e-03	m²
Plastic section modulus	$W_{pl,y}$	1.7333e-04	m³
Design compression force	N_{Ed}	160.52	kN
Design bending moment (maximum)	$M_{y,Ed}$	0.69	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0.00	kNm
Characteristic compression resistance	N_{Rk}	737.90	kN
Characteristic moment resistance	$M_{y,Rk}$	40.73	kNm
Reduction factor	χ_y	0.51	
Reduction factor	χ_z	0.22	

Bending and axial compression check parameters			
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	1.21	
Interaction factor	k_{zy}	0.72	

Maximum moment $M_{y,Ed}$ is derived from beam S113 position 2.726 m.
Maximum moment $M_{z,Ed}$ is derived from beam S113 position 0.000 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	0.69	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.95	

Unity check (6.61) = 0.43 + 0.02 + 0.00 = 0.45 -
Unity check (6.62) = 0.98 + 0.01 + 0.00 = 0.99 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	6.134	m
Web		unstiffened	
Web height	h_w	116	mm
Web thickness	t	6	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	21.09
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S139	**8.657 / 8.657 m**	**L100X10**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.57 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG133 + 1.50*BG151 + 1.50*3DWind19

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 8.657 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	257.56	kN
Shear force	$V_{y,Ed}$	0.00	kN
Shear force	$V_{z,Ed}$	0.00	kN
Torsion	T_{Ed}	0.00	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	1.9200e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	451.20	kN
Ultimate tension resistance	$N_{u,Rd}$	497.66	kN
Tension resistance	$N_{t,Rd}$	451.20	kN
Unity check		0.57	-

The member satisfies the section check.
Note: Only the section check is executed for this member.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S166	**0.000 / 2.000 m**	**HEB220**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.84 -**

Combination key
Alle UGT / 1.20*BG101 + 1.20*BG102 + 1.50*BG123 + 1.50*BG142 + 1.50*BG151 + 1.50*3DWind5

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	14.66	kN
Shear force	$V_{y,Ed}$	-0.03	kN
Shear force	$V_{z,Ed}$	233.47	kN
Torsion	T_{Ed}	0.00	kNm
Bending moment	$M_{y,Ed}$	-164.02	kNm
Bending moment	$M_{z,Ed}$	0.05	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	87	16	2.051e+05	2.050e+05	1.00	0.43	1.00	5.45	9.00	10.00	13.80	1
3	SO	87	16	2.052e+05	2.053e+05	1.00	0.43	1.00	5.45	9.00	10.00	13.77	1
4	I	152	10	1.524e+05	-1.557e+05	-1.02		0.48	16.00	75.25	86.75	126.63	1
5	SO	87	16	-2.083e+05	-2.082e+05								
7	SO	87	16	-2.084e+05	-2.085e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	9.1040e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	2139.44	kN
Ultimate tension resistance	$N_{u,Rd}$	2359.76	kN
Tension resistance	$N_{t,Rd}$	2139.44	kN
Unity check		0.01	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	8.2700e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	194.34	kNm
Unity check		0.84	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	3.9390e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	92.57	kNm
Unity check		0.00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	7.3013e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	990.61	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	2.7920e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	378.81	kN
Unity check		0.62	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.1	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 & 6.2.8 and formula (6.41)

Reduction of yield strength z	ρ_z	0.05	
Plastic bending moment reduced due to V_z	$M_{V,y,Rd}$	193.28	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	92.57	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.72 + 0.00 = 0.72 -

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0.000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	87	16	2.051e+05	2.050e+05	1.00	0.43	1.00	5.45	9.00	10.00	13.80	1
3	SO	87	16	2.052e+05	2.053e+05	1.00	0.43	1.00	5.45	9.00	10.00	13.77	1
4	I	152	10	1.524e+05	-1.557e+05	-1.02		0.48	16.00	75.25	86.75	126.63	1
5	SO	87	16	-2.083e+05	-2.082e+05								
7	SO	87	16	-2.084e+05	-2.085e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	8.2700e-04	m^3
Elastic critical moment	M_{cr}	4075.63	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.22	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	2.000	m
Fork length	L_g	2.000	m
Influence of load position		no influence	
Factor	α	4665.40	
Reduction factor	k_{red}	1.00	
Coefficient	C	13.41	
Factor	S	1002	mm
LTB moment factor	C_1	2.29	
LTB moment factor	C_2	0.00	

Note: M_{cr} has been calculated according to the Dutch NEN-EN NA.

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	2.000	m
Web		unstiffened	
Web height	h_w	188	mm
Web thickness	t	10	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	19.79
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S256	**0.800 / 0.800 m**	**HEA100**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.50 -**

Combination key
Alle UGT / 0.90*BG101 + 0.90*BG102 + 1.50*BG121 + 1.50*BG122 + 1.50*BG123 + 1.50*BG141 + 1.50*3DWind25

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.800 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-0.72	kN
Shear force	$V_{y,Ed}$	0.26	kN
Shear force	$V_{z,Ed}$	-12.76	kN
Torsion	T_{Ed}	0.25	kNm
Bending moment	$M_{y,Ed}$	-5.06	kNm
Bending moment	$M_{z,Ed}$	-3.50	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m^2]	σ_2 [kN/m^2]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	36	8	1.020e+05	1.949e+05	0.52	0.48	1.00	4.44	9.00	10.00	14.54	1
3	SO	36	8	2.617e+04	-6.670e+04	-2.55	23.80	0.28	4.44	60.18	66.86	102.45	1
4	I	56	5	4.091e+04	-4.023e+04	-0.98		0.51	11.20	70.78	81.71	121.89	1
5	SO	36	8	-1.014e+05	-1.942e+05								
7	SO	36	8	-2.549e+04	6.738e+04	-0.38	0.66	0.73	4.44	12.40	13.78	17.05	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	2.1200e-03	m^2
Compression resistance	$N_{c,Rd}$	498.20	kN
Unity check		0.00	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	8.2917e-05	m^3
Plastic bending moment	$M_{pl,y,Rd}$	19.49	kNm
Unity check		0.26	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	4.1125e-05	m^3
Plastic bending moment	$M_{pl,z,Rd}$	9.66	kNm
Unity check		0.36	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.6850e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	228.62	kN
Unity check		0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	7.5200e-04	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	102.03	kN
Unity check		0.13	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	1	
Total torsional moment	τ_{Ed}	37.8	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.28	-

Combined Shear and Torsion check for V_y and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	201.50	kN
Unity check		0.00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	89.93	kN
Unity check		0.14	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	19.49	kNm
Exponent of bending ratio y	α	2.00	
Plastic bending moment	$M_{pl,z,Rd}$	9.66	kNm
Exponent of bending ratio z	β	1.00	

Unity check (6.41) = 0.07 + 0.36 = 0.43 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0.800 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	36	8	1.020e+05	1.949e+05	0.52	0.48	1.00	4.44	9.00	10.00	14.54	1
3	SO	36	8	2.617e+04	-6.670e+04	-2.55	23.80	0.28	4.44	60.18	66.86	102.45	1
4	I	56	5	4.091e+04	-4.023e+04	-0.98		0.51	11.20	70.78	81.71	121.89	1
5	SO	36	8	-1.014e+05	-1.942e+05								
7	SO	36	8	-2.549e+04	6.738e+04	-0.38	0.66	0.73	4.44	12.40	13.78	17.05	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	0.800	1.100	m
Buckling factor	k	10.00	0.82	
Buckling length	l_{cr}	8.000	0.899	m
Critical Euler load	N_{cr}	113.02	3435.76	kN
Slenderness	λ	197.17	35.76	
Relative slenderness	λ_{rel}	2.10	0.38	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	8.2917e-05	m^3
Elastic critical moment	M_{cr}	403.19	kNm
Relative slenderness	$\lambda_{rel,LT}$	0.22	
Limit slenderness	$\lambda_{rel,LT,0}$	0.40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	1.100	m
Influence of load position		no influence	
Correction factor	k	1.00	
Correction factor	k_w	1.00	
LTB moment factor	C_1	2.86	
LTB moment factor	C_2	0.34	
LTB moment factor	C_3	1.00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Warning: Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.
Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	2.1200e-03	m^2
Plastic section modulus	$W_{pl,y}$	8.2917e-05	m^3
Plastic section modulus	$W_{pl,z}$	4.1125e-05	m^3
Design compression force	N_{Ed}	0.72	kN
Design bending moment	$M_{y,Ed}$	-5.06	kNm
Design bending moment	$M_{z,Ed}$	-3.50	kNm
Characteristic compression resistance	N_{Rk}	498.20	kN
Characteristic moment resistance	$M_{y,Rk}$	19.49	kNm
Characteristic moment resistance	$M_{z,Rk}$	9.66	kNm
Reduction factor	χ_y	1.00	
Reduction factor	χ_z	1.00	
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	0.90	
Interaction factor	k_{yz}	0.60	
Interaction factor	k_{zy}	0.54	
Interaction factor	k_{zz}	1.00	

Note: Since this member is non-prismatic the actual moments in the section are being used instead of the maximal moments.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		point load F	
End moment	$M_{h,z}$	-3.61	kNm
Field moment	$M_{s,z}$	-3.70	kNm
Factor	$\alpha_{h,z}$	0.97	
Ratio of end moments	ψ_z	-0.17	
Equivalent moment factor	C_{mz}	1.00	
Resulting load type LT		point load F	
End moment	$M_{h,LT}$	-37.22	kNm
Field moment	$M_{s,LT}$	3.77	kNm
Factor	$\alpha_{s,LT}$	-0.10	
Ratio of end moments	ψ_{LT}	0.00	
Equivalent moment factor	C_{mLT}	0.40	

Unity check (6.61) = 0.00 + 0.23 + 0.22 = 0.45 -
Unity check (6.62) = 0.00 + 0.14 + 0.36 = 0.50 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	0.800	m
Web		unstiffened	
Web height	h_w	80	mm
Web thickness	t	5	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	16.00
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S386	**0.000 / 7.000 m**	**HEA200**	**S 235 JR (EN 10025-2)**	**Alle UGT**	**0.92 -**

Combination key
Alle UGT / 0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG140 + 1.50*3DWind25

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-359.92	kN
Shear force	$V_{y,Ed}$	0.00	kN
Shear force	$V_{z,Ed}$	1.36	kN
Torsion	T_{Ed}	0.00	kNm
Bending moment	$M_{y,Ed}$	0.00	kNm
Bending moment	$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	6.684e+04	6.684e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
3	SO	79	10	6.684e+04	6.684e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
4	I	134	7	6.684e+04	6.684e+04	1.00		1.00	20.62	28.00	34.00	38.00	1
5	SO	79	10	6.684e+04	6.684e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
7	SO	79	10	6.684e+04	6.684e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	5.3800e-03	m²
Compression resistance	$N_{c,Rd}$	1264.30	kN
Unity check		0.28	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.8050e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	244.90	kN
Unity check		0.01	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0.0	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 3.500 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	6.106e+04	6.106e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
3	SO	79	10	6.106e+04	6.106e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
4	I	134	7	6.254e+04	7.115e+04	0.88		1.00	20.62	28.00	34.00	39.67	1
5	SO	79	10	7.263e+04	7.263e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1
7	SO	79	10	7.263e+04	7.263e+04	1.00	0.43	1.00	7.88	9.00	10.00	14.00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1
Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	7.000	7.000	m
Buckling factor	k	1.00	1.00	
Buckling length	l_{cr}	7.000	7.000	m
Critical Euler load	N_{cr}	1560.81	566.83	kN
Slenderness	λ	84.52	140.26	
Relative slenderness	λ_{rel}	0.90	1.49	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		b	c	
Imperfection	α	0.34	0.49	
Reduction factor	χ	0.66	0.32	
Buckling resistance	$N_{b,Rd}$	835.92	400.35	kN

Flexural Buckling verification			
Cross-section area	A	5.3800e-03	m²
Buckling resistance	$N_{b,Rd}$	400.35	kN
Unity check		0.90	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section area	A	5.3800e-03	m²
Plastic section modulus	$W_{pl,y}$	4.2917e-04	m³
Design compression force	N_{Ed}	359.92	kN
Design bending moment (maximum)	$M_{y,Ed}$	2.37	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0.00	kNm
Characteristic compression resistance	N_{Rk}	1264.30	kN
Characteristic moment resistance	$M_{y,Rk}$	100.85	kNm
Reduction factor	χ_y	0.66	
Reduction factor	χ_z	0.32	

Bending and axial compression check parameters			
Modified reduction factor	$\chi_{LT,mod}$	1.00	
Interaction factor	k_{yy}	1.17	
Interaction factor	k_{zy}	0.70	

Maximum moment $M_{y,Ed}$ is derived from beam S386 position 3.500 m.
Maximum moment $M_{z,Ed}$ is derived from beam S386 position 0.000 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.1	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type LT		line load q	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	2.37	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.95	

Unity check (6.61) = 0.43 + 0.03 + 0.00 = 0.46 -
Unity check (6.62) = 0.90 + 0.02 + 0.00 = 0.92 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	7.000	m
Web		unstiffened	
Web height	h_w	170	mm
Web thickness	t	7	mm
Material coefficient	ε	1.00	
Shear correction factor	η	1.20	

Shear Buckling verification		
Web slenderness	h_w/t	26.15
Web slenderness limit		60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

EN 1993-1-1 Code Check
National annex: Dutch NEN-EN NA

Member S451	**28.500 / 56.500 m**	**Kanaal (600; 80; 2; 2; 2)**	**DUMMY STAAL**	**Alle UGT**	**122.59 -**

Combination key
Alle UGT / 0.90*BG101 + 0.90*BG102 + 1.50*BG122 + 1.50*BG135 + 1.50*BG151 + 1.50*3DWind19

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.00
γ_{M2} for resistance of net sections	1.25

Material			
Yield strength	f_y	235.0	MPa
Ultimate strength	f_u	360.0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 28.500 m

Internal forces		Calculated	Additional moments	Total	Unit
Normal force	N_{Ed}	-6.87		-6.87	kN
Shear force	$V_{y,Ed}$	0.00		0.00	kN
Shear force	$V_{z,Ed}$	0.37		0.37	kN
Torsion	T_{Ed}	0.00		0.00	kNm
Bending moment	$M_{y,Ed}$	4.19	0.00	4.19	kNm
Bending moment	$M_{z,Ed}$	4.78	0.01	4.79	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2

Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	76	2	-6.024e+04	5.947e+05	-0.10	0.59	0.91	38.00	9.91	11.01	16.16	4
3	I	592	2	-8.590e+04	-4.715e+04								
5	UO	76	2	-2.110e+04	6.339e+05	-0.03	0.58	0.97	38.00	9.30	10.33	15.95	4

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 4

Effective section N-
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	76	2.350e+05	2.350e+05	1.00	0.43	2.04	0.44	34		
3	I	592	2.350e+05	2.350e+05	1.00	4.00	5.21	0.18	109	54	54
5	UO	76	2.350e+05	2.350e+05	1.00	0.43	2.04	0.44	34		

Effective section My+
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	76	-1.245e+05	-1.254e+05							
3	I	592	2.332e+05	-1.227e+05	-0.53	13.82	2.80	0.34	132	53	79
5	UO	76	2.350e+05	2.341e+05	1.00	0.43	2.03	0.45	34		

Effective section Mz+
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	UO	76	2.350e+05	1.518e+03	0.01	0.57	1.77	0.50	38		
3	I	592	-7.699e+03	-7.699e+03							
5	UO	76	2.350e+05	1.518e+03	0.01	0.57	1.77	0.50	38		

Effective properties						
Effective area	A_{eff}	3.7859e-04	m²			
Effective second moment of area	$I_{eff,y}$	3.9194e-05	m⁴	$I_{eff,z}$	8.5751e-08	m⁴
Effective section modulus	$W_{eff,y}$	9.9999e-05	m³	$W_{eff,z}$	1.1210e-06	m³
Shift of the centroid	$e_{N,y}$	0	mm	$e_{N,z}$	-1	mm

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section effective area	A_{eff}	3.7859e-04	m²
Compression resistance	$N_{c,Rd}$	88.97	kN
Unity check		0.08	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.15)

Effective section modulus	$W_{eff,y,min}$	9.9999e-05	m³
Bending moment	$M_{c,y,Rd}$	23.50	kNm
Unity check		0.18	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.15)

Effective section modulus	$W_{eff,z,min}$	1.1210e-06	m³
Bending moment	$M_{c,z,Rd}$	0.26	kNm
Unity check		**18.18**	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	3.2000e-04	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	43.42	kN
Unity check		0.00	-

Shear check for V_z

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1.20	
Shear area	A_v	1.2017e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	163.05	kN
Unity check		0.00	-

Torsion check

According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	10	
Total torsional moment	τ_{Ed}	0.0	MPa
Elastic shear resistance	τ_{Rd}	135.7	MPa
Unity check		0.00	-

Note: The unity check for torsion is lower than the limit value of 0.05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.3 and formula (6.43)

Effective properties			
Cross-section effective area	A_{eff}	3.7859e-04	m^2
Shift of the centroid in y direction	$e_{N,y}$	0	mm
Shift of the centroid in z direction	$e_{N,z}$	-1	mm
Effective section modulus	$W_{eff,y}$	9.9999e-05	m^3
Effective section modulus	$W_{eff,z}$	1.1210e-06	m^3

Normal stresses			
Normal stress due to the normal force N	$\sigma_{N,Ed}$	18.2	MPa
Normal stress due to the bending moment M_y	$\sigma_{My,Ed}$	41.9	MPa
Normal stress due to the bending moment M_z	$\sigma_{Mz,Ed}$	4272.3	MPa
Total longitudinal stress	$\sigma_{tot,Ed}$	4332.4	MPa
Unity check		**18.44**	-

The member does NOT satisfy the section check!

...::STABILITY CHECK::...

Classification for member buckling design

Decisive position for stability classification: 2.667 m

Classification according to EN 1993-1-1 article 5.5.2

Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m ²]	σ_2 [kN/m ²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	76	2	-4.764e+04	6.975e+05	-0.07	0.58	0.94	38.00	9.61	10.68	16.06	4
3	I	592	2	-7.708e+04	-8.343e+04								
5	UO	76	2	-5.405e+04	6.911e+05	-0.08	0.59	0.93	38.00	9.70	10.78	16.09	4

Note: The Classification limits have been set according to Semi-Comp+.

The cross-section is classified as Class 4

Note: The stability classification is based on the maximum section classification along the member.

Flexural Buckling check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	7.000	56.500	m
Buckling factor	k	1.95	0.53	
Buckling length	l_{cr}	13.672	29.880	m
Critical Euler load	N_{cr}	710.22	1.29	kN
Slenderness	λ	66.46	1560.70	
Relative slenderness	λ_{rel}	0.35	8.31	

Buckling parameters		yy	zz	
Limit slenderness	$\lambda_{rel,0}$	0.20	0.20	
Buckling curve		c	c	
Imperfection	α	0.49	0.49	
Reduction factor	χ	0.92	0.01	
Buckling resistance	$N_{b,Rd}$	81.98	1.22	kN

Warning: Slenderness 1560.70 is larger than the limit value of 1000.00.

Flexural Buckling verification			
Cross-section effective area	A_{eff}	3.7859e-04	m^2
Buckling resistance	$N_{b,Rd}$	1.22	kN
Unity check		**5.65**	-

Torsional(-Flexural) Buckling check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length	l_{cr}	56.500	m
Elastic critical load	$N_{cr,T}$	4.35	kN
Elastic critical load	$N_{cr,TF}$	1.29	kN
Relative slenderness	$\lambda_{rel,T}$	8.31	
Limit slenderness	$\lambda_{rel,0}$	0.20	
Buckling curve		c	
Imperfection	α	0.49	
Reduction factor	χ	0.01	
Cross-section effective area	A_{eff}	3.7859e-04	m^2
Buckling resistance	$N_{b,Rd}$	1.22	kN
Unity check		**5.65**	-

Lateral Torsional Buckling check

According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters			
Method for LTB curve		General case	
Effective section modulus	$W_{eff,y}$	9.9999e-05	m^3
Elastic critical moment	M_{cr}	0.35	kNm
Relative slenderness	$\lambda_{rel,LT}$	8.18	
Limit slenderness	$\lambda_{rel,LT,0}$	0.20	
LTB curve		d	
Imperfection	α_{LT}	0.76	
Reduction factor	χ_{LT}	0.01	
Design buckling resistance	$M_{b,Rd}$	0.32	kNm
Unity check		**13.04**	-

Note: L/h is outside the limits, the modified design rule for LTB of channel sections cannot be applied.

Mcr parameters			
LTB length	l_{LT}	56.500	m
Influence of load position		no influence	
Correction factor	k	1.00	
Correction factor	k_w	1.00	
LTB moment factor	C_1	1.35	
LTB moment factor	C_2	0.63	
LTB moment factor	C_3	0.41	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Warning: Not all conditions of the Dutch NEN-EN NA (Art. NB.NB.1) are fulfilled, therefore the standard EC-EN approach is used.
Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check

According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 2	
Cross-section effective area	A_{eff}	3.7859e-04	m^2
Effective section modulus	$W_{eff,y}$	9.9999e-05	m^3
Effective section modulus	$W_{eff,z}$	1.1210e-06	m^3
Design compression force	N_{Ed}	6.87	kN
Design bending moment (maximum)	$M_{y,Ed}$	5.49	kNm
Design bending moment	$M_{z,Ed}$	-7.13	kNm

Bending and axial compression check parameters			
(maximum)			
Additional moment	$\Delta M_{y,Ed}$	0.00	kNm
Additional moment	$\Delta M_{z,Ed}$	0.00	kNm
Characteristic compression resistance	N_{Rk}	88.97	kN
Characteristic moment resistance	$M_{y,Rk}$	23.50	kNm
Characteristic moment resistance	$M_{z,Rk}$	0.26	kNm
Reduction factor	χ_y	0.92	
Reduction factor	χ_z	0.01	
Reduction factor	χ_{LT}	0.01	
Interaction factor	k_{yy}	0.92	
Interaction factor	k_{yz}	3.95	
Interaction factor	k_{zy}	0.57	
Interaction factor	k_{zz}	3.95	

Maximum moment $M_{y,Ed}$ is derived from beam S451 position 32.000 m.
Maximum moment $M_{z,Ed}$ is derived from beam S451 position 45.000 m.

Interaction method 2 parameters			
Method for interaction factors		Table B.2	
Sway type y		sway	
Equivalent moment factor	C_{my}	0.90	
Resulting load type z		point load F	
End moment	$M_{h,z}$	-0.01	kNm
Field moment	$M_{s,z}$	-7.13	kNm
Factor	$\alpha_{h,z}$	0.00	
Ratio of end moments	ψ_z	0.09	
Equivalent moment factor	C_{mz}	0.90	
Resulting load type LT		point load F	
End moment	$M_{h,LT}$	0.00	kNm
Field moment	$M_{s,LT}$	6.09	kNm
Factor	$\alpha_{h,LT}$	0.00	
Ratio of end moments	ψ_{LT}	1.00	
Equivalent moment factor	C_{mLT}	0.90	

Unity check (6.61) = 0.08 + 15.65 + 106.85 = **122.59** -
Unity check (6.62) = 5.65 + 9.66 + 106.85 = **122.16** -

The member does NOT satisfy the stability check!

2.6. EC-EN 1993 Steel Check SLS

Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All
Overall Unity Check

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_z [mm] Camber [mm]	Check $_{Overall}$ [-]
S1	0.000	BGT-kar/1	0.0	0.0	35.7	35.7	0.00	0.00	-	**0.07**
			2.4	2.3	35.7	35.7	0.07	0.06	-	
S2	0.000	BGT-kar/2	-0.4	-0.5	29.7	29.7	0.02	0.02	-	**0.12**
			-2.0	-1.8	16.3	16.3	0.12	0.11	-	
S3	2.910	BGT-kar/3	0.6	0.7	17.0	17.0	0.03	0.04	-	**0.04**
			0.1	0.2	17.0	17.0	0.01	0.01	-	
S4	5.238	BGT-kar/4	0.8	0.9	17.0	17.0	0.05	0.05	-	**0.05**
			0.0	0.0	17.0	17.0	0.00	0.00	-	
S5	0.000	BGT-kar/5	0.0	0.0	17.8	17.8	0.00	0.00	-	**0.72**
			41.2	40.9	57.0	57.0	0.72	0.72	-	
S6	0.000	BGT-kar/6	0.0	0.0	17.8	17.8	0.00	0.00	-	**0.75**
			-42.1	-42.7	57.0	57.0	0.74	0.75	-	
S7	0.000	BGT-kar/7	-0.1	-0.1	35.7	35.7	0.00	0.00	-	**0.27**
			8.8	10.3	38.3	38.3	0.23	0.27	-	
S8	8.149	BGT-kar/8	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.24**
			-12.9	-7.1	54.3	54.3	0.24	0.13	-	
S9	0.000	BGT-kar/9	-0.2	-0.2	35.7	35.7	0.01	0.01	-	**0.24**
			15.3	11.9	63.0	63.0	0.24	0.19	-	
S10	0.000	BGT-kar/8	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.24**
			-12.9	-7.1	54.3	54.3	0.24	0.13	-	
S11	0.000	BGT-kar/10	-0.2	-0.2	35.7	35.7	0.00	0.00	-	**0.49**
			17.0	18.9	38.3	38.3	0.44	0.49	-	
S12	8.149	BGT-kar/11	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.29**
			-15.8	-8.6	54.3	54.3	0.29	0.16	-	
S13	0.000	BGT-kar/12	-0.2	-0.1	35.7	35.7	0.01	0.00	-	**0.55**
			9.0	6.7	16.3	16.3	0.55	0.41	-	
S14	0.000	BGT-kar/11	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.29**
			-15.7	-8.7	54.3	54.3	0.29	0.16	-	
S15	0.000	BGT-kar/10	-0.2	-0.2	35.7	35.7	0.01	0.01	-	**0.64**
			23.2	24.6	38.3	38.3	0.60	0.64	-	
S16	8.149	BGT-kar/11	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.31**
			-16.8	-10.3	54.3	54.3	0.31	0.19	-	
S17	0.000	BGT-kar/13	-0.1	-0.1	35.7	35.7	0.00	0.00	-	**0.47**
			29.5	24.1	63.0	63.0	0.47	0.38	-	
S18	0.000	BGT-kar/11	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.30**
			-16.4	-9.9	54.3	54.3	0.30	0.18	-	
S19	0.000	BGT-kar/14	-0.3	-0.3	35.7	35.7	0.01	0.01	-	**0.66**
			23.6	25.2	38.3	38.3	0.62	0.66	-	
S20	8.149	BGT-kar/15	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.33**
			-17.8	-10.5	54.3	54.3	0.33	0.19	-	
S21	0.000	BGT-kar/16	-0.4	-0.3	29.7	29.7	0.01	0.01	-	**0.72**
			11.8	9.0	16.3	16.3	0.72	0.55	-	
S22	0.000	BGT-kar/17	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.32**
			-17.2	-10.1	54.3	54.3	0.32	0.19	-	
S23	0.000	BGT-kar/18	0.3	0.3	35.7	35.7	0.01	0.01	-	**0.50**
			-19.0	-17.1	38.3	38.3	0.50	0.45	-	
S24	8.149	BGT-kar/17	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.30**
			-16.1	-9.6	54.3	54.3	0.30	0.18	-	
S25	0.000	BGT-kar/19	0.1	0.2	35.7	35.7	0.00	0.00	-	**0.39**
			24.4	19.9	63.0	63.0	0.39	0.32	-	
S26	0.000	BGT-kar/17	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.29**
			-15.5	-9.1	54.3	54.3	0.29	0.17	-	
S27	0.000	BGT-kar/10	-0.3	-0.3	35.7	35.7	0.01	0.01	-	**0.27**
			8.9	10.5	38.3	38.3	0.23	0.27	-	
S28	8.149	BGT-kar/20	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.24**
			-13.1	-7.5	54.3	54.3	0.24	0.14	-	
S29	0.000	BGT-kar/21	-0.3	-0.3	35.7	35.7	0.01	0.01	-	**0.26**
			-13.5	-16.5	63.0	63.0	0.21	0.26	-	
S30	0.000	BGT-kar/22	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.24**
			-12.9	-7.2	54.3	54.3	0.24	0.13	-	
S31	0.000	BGT-kar/23	-0.3	-0.4	35.7	35.7	0.01	0.01	-	**0.08**
			2.8	2.7	35.7	35.7	0.08	0.08	-	
S32	8.149	BGT-kar/24	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.05**
			-1.1	-0.9	20.4	20.4	0.05	0.04	-	
S33	0.000	BGT-kar/25	0.4	0.4	35.7	35.7	0.01	0.01	-	**0.08**
			-2.8	-2.8	35.7	35.7	0.08	0.08	-	
S34	0.000	BGT-kar/26	0.0	0.0	10.2	10.2	0.00	0.00	-	**0.07**
			-1.5	-1.4	20.4	20.4	0.07	0.07	-	
S35	6.718	BGT-kar/27	0.0	0.0	13.7	13.7	0.00	0.00	-	**0.95**
			-45.0	-45.0	47.2	47.2	0.95	0.95	-	
S36	6.718	BGT-kar/28	0.0	-0.1	13.7	13.7	0.00	0.00	-	**0.95**

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_c [mm] Camber [mm]	Check (overall) [-]
			-44.4	-44.8	47.2	47.2	0.94	0.95	-	
S37	1.500	BGT-kar/29	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.2	-0.2	10.0	10.0	0.02	0.02	-	
S38	1.500	BGT-kar/30	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.03**
			-0.3	-0.2	10.0	10.0	0.03	0.02	-	
S39	2.667	BGT-kar/31	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S41	22.060-	BGT-kar/32	4.9	4.8	14.0	14.0	0.35	0.35	-	**0.35**
			-5.9	-5.7	23.3	23.3	0.25	0.25	-	
S42	2.250	BGT-kar/33	-5.4	-5.2	15.0	15.0	0.36	0.35	-	**0.36**
			0.0	0.2	16.7	16.7	0.00	0.01	-	
S43	2.250	BGT-kar/19	5.5	5.3	15.0	15.0	0.36	0.35	-	**0.36**
			0.0	0.2	16.7	16.7	0.00	0.01	-	
S44	2.280-	BGT-kar/34	-3.6	-3.5	12.0	12.0	0.30	0.29	-	**0.30**
			-4.8	-4.7	20.0	20.0	0.24	0.24	-	
S45	0.500	BGT-kar/35	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.24**
			-0.8	-0.7	3.3	3.3	0.24	0.21	-	
S46	4.500	BGT-kar/36	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.2	-0.2	10.0	10.0	0.02	0.02	-	
S47	1.500	BGT-kar/37	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.03**
			-0.3	-0.2	10.0	10.0	0.03	0.02	-	
S48	0.500	BGT-kar/38	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.48**
			-1.6	-1.4	3.3	3.3	0.48	0.42	-	
S49	0.500	BGT-kar/39	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.45**
			-1.5	-1.3	3.3	3.3	0.45	0.38	-	
S50	0.500	BGT-kar/39	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.44**
			-1.5	-1.2	3.3	3.3	0.44	0.37	-	
S51	0.500	BGT-kar/40	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.43**
			-1.4	-1.3	3.3	3.3	0.43	0.38	-	
S52	0.500	BGT-kar/41	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.36**
			-1.2	-1.1	3.3	3.3	0.36	0.34	-	
S53	0.000	BGT-kar/42	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.60**
			-2.0	-1.8	3.3	3.3	0.60	0.53	-	
S54	0.000	BGT-kar/43	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.47**
			-1.6	-1.5	3.3	3.3	0.47	0.44	-	
S55	0.000	BGT-kar/44	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.29**
			-1.0	-0.9	3.3	3.3	0.29	0.26	-	
S56	0.000	BGT-kar/45	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.43**
			-1.4	-1.4	3.3	3.3	0.43	0.41	-	
S57	0.000	BGT-kar/46	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.23**
			-0.8	-0.5	3.3	3.3	0.23	0.16	-	
S58	0.000	BGT-kar/47	0.0	0.0	1.7	1.7	0.00	0.00	-	**0.35**
			-1.2	-1.1	3.3	3.3	0.35	0.32	-	
S59	6.000	BGT-kar/48	-8.7	-11.3	40.0	40.0	0.22	0.28	-	**0.28**
			0.0	0.0	10.0	10.0	0.00	0.00	-	
S60	6.000	BGT-kar/49	6.4	8.0	40.0	40.0	0.16	0.20	-	**0.20**
			0.0	0.0	10.0	10.0	0.00	0.00	-	
S61	2.857	BGT-kar/50	0.0	0.0	16.7	16.7	0.00	0.00	-	**0.02**
			-0.4	0.0	16.7	16.7	0.02	0.00	-	
S62	2.857	BGT-kar/51	0.0	0.0	16.7	16.7	0.00	0.00	-	**0.02**
			-0.4	0.0	16.7	16.7	0.02	0.00	-	
S63	6.000	BGT-kar/52	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.26**
			-10.2	-5.7	40.0	40.0	0.26	0.14	-	
S64	6.000	BGT-kar/8	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.26**
			-10.2	-5.6	40.0	40.0	0.26	0.14	-	
S65	2.800+	BGT-kar/53	0.0	0.0	18.7	18.7	0.00	0.00	-	**0.39**
			-7.2	-7.2	18.7	18.7	0.39	0.39	-	
S66	2.800+	BGT-kar/54	-0.1	-0.1	18.7	18.7	0.00	0.00	-	**0.36**
			6.7	6.7	18.7	18.7	0.36	0.36	-	
S68	4.019	BGT-kar/25	1.3	1.3	26.8	26.8	0.05	0.05	-	**0.05**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S69	4.019-	BGT-kar/25	1.3	1.3	26.8	26.8	0.05	0.05	-	**0.05**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S70	2.857	BGT-kar/55	0.0	0.0	16.7	16.7	0.00	0.00	-	**0.02**
			-0.4	0.0	16.7	16.7	0.02	0.00	-	
S71	3.333	BGT-kar/56	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.04**
			-0.8	0.0	20.0	20.0	0.04	0.00	-	
S72	2.750	BGT-kar/57	5.4	5.3	15.0	15.0	0.36	0.35	-	**0.36**
			-0.7	-0.4	16.7	16.7	0.04	0.03	-	
S73	2.667	BGT-kar/58	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.4	0.0	20.0	20.0	0.02	0.00	-	
S74	1.454	BGT-kar/59	0.0	0.0	24.2	24.2	0.00	0.00	-	**0.01**
			-0.1	0.0	12.1	12.1	0.01	0.00	-	
S75	1.454	BGT-kar/60	0.0	0.0	24.2	24.2	0.00	0.00	-	**0.01**
			-0.1	0.0	12.1	12.1	0.01	0.00	-	
S76	3.815	BGT-kar/27	1.6	1.5	25.4	25.4	0.06	0.06	-	**0.06**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S77	3.815-	BGT-kar/27	1.6	1.5	25.4	25.4	0.06	0.06	-	**0.06**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S78	2.571	BGT-kar/61	-2.5	-2.5	20.0	20.0	0.13	0.13	-	**0.63**
			-12.5	-2.3	20.0	20.0	0.63	0.12	-	

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_c [mm] Camber [mm]	Check $_{overall}$ [-]
S79	2.143	BGT-kar/62	0.0	0.0	16.7	16.7	0.00	0.00	-	**0.02**
			-0.4	0.0	16.7	16.7	0.02	0.00	-	
S80	2.750	BGT-kar/63	5.1	5.2	15.0	15.0	0.34	0.35	-	**0.35**
			-5.0	-4.8	16.7	16.7	0.30	0.29	-	
S81	2.667	BGT-kar/64	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.4	0.0	20.0	20.0	0.02	0.00	-	
S82	4.019-	BGT-kar/65	-1.6	-1.6	26.8	26.8	0.06	0.06	-	**0.06**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S83	4.019	BGT-kar/65	-1.6	-1.6	26.8	26.8	0.06	0.06	-	**0.06**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S84	3.815-	BGT-kar/65	1.6	1.7	25.4	25.4	0.06	0.07	-	**0.07**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S85	3.815	BGT-kar/65	1.6	1.7	25.4	25.4	0.06	0.07	-	**0.07**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S86	3.235-	BGT-kar/66	-1.5	-1.4	21.6	21.6	0.07	0.07	-	**0.07**
			0.0	0.0	10.8	10.8	0.00	0.00	-	
S87	3.235	BGT-kar/66	-1.5	-1.4	21.6	21.6	0.07	0.07	-	**0.07**
			0.0	0.0	10.8	10.8	0.00	0.00	-	
S88	3.500	BGT-kar/67	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S89	2.667	BGT-kar/68	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S90	2.929	BGT-kar/69	13.1	13.1	23.3	23.3	0.56	0.56	-	**0.56**
			0.2	0.3	16.7	16.7	0.01	0.02	-	
S91	3.333	BGT-kar/70	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S92	3.500	BGT-kar/71	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S93	0.000	BGT-kar/72	6.4	7.9	40.0	40.0	0.16	0.20	-	**0.20**
			0.0	0.0	10.0	10.0	0.00	0.00	-	
S94	3.500	BGT-kar/73	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S95	2.667	BGT-kar/74	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S96	3.500	BGT-kar/75	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S97	2.667	BGT-kar/76	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S98	3.500	BGT-kar/77	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S99	1.500	BGT-kar/78	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.2	-0.2	10.0	10.0	0.02	0.02	-	
S100	3.500	BGT-kar/79	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S101	2.667	BGT-kar/80	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S102	3.500	BGT-kar/81	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S103	3.333	BGT-kar/82	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S104	3.500	BGT-kar/83	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S105	1.500	BGT-kar/25	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.02**
			-0.2	-0.2	10.0	10.0	0.02	0.02	-	
S106	6.134	BGT-kar/49	5.4	6.0	40.9	40.9	0.13	0.15	-	**0.15**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S107	6.134	BGT-kar/49	-5.4	-6.0	40.9	40.9	0.13	0.15	-	**0.15**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S108	5.084	BGT-kar/84	-4.2	-3.3	33.9	33.9	0.12	0.10	-	**0.12**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S109	5.084	BGT-kar/85	4.8	5.6	33.9	33.9	0.14	0.17	-	**0.17**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S110	4.798	BGT-kar/86	2.8	3.0	32.0	32.0	0.09	0.09	-	**0.09**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S111	4.798	BGT-kar/87	-5.1	-3.2	32.0	32.0	0.16	0.10	-	**0.16**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S112	6.134	BGT-kar/9	8.8	7.2	40.9	40.9	0.21	0.17	-	**0.21**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S113	6.134	BGT-kar/9	-8.7	-7.1	40.9	40.9	0.21	0.17	-	**0.21**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S114	5.084	BGT-kar/88	-5.2	-6.8	33.9	33.9	0.15	0.20	-	**0.20**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S115	5.084	BGT-kar/89	5.4	4.4	33.9	33.9	0.16	0.13	-	**0.16**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S116	4.798	BGT-kar/88	-5.6	-7.9	32.0	32.0	0.17	0.25	-	**0.25**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S117	4.798	BGT-kar/90	4.4	3.7	32.0	32.0	0.14	0.12	-	**0.14**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S118	6.134	BGT-kar/10	-5.5	-6.2	40.9	40.9	0.13	0.15	-	**0.15**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S119	6.134	BGT-kar/10	5.5	6.2	40.9	40.9	0.13	0.15	-	**0.15**

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_z [mm] Camber [mm]	Check $_{overall}$ [-]
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S120	5.084	BGT-kar/91	4.1	3.4	33.9	33.9	0.12	0.10	-	**0.12**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S121	5.084	BGT-kar/92	-5.3	-6.2	33.9	33.9	0.16	0.18	-	**0.18**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S122	4.798	BGT-kar/27	-3.8	-4.1	32.0	32.0	0.12	0.13	-	**0.13**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S123	4.798	BGT-kar/93	5.5	3.8	32.0	32.0	0.17	0.12	-	**0.17**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S124	6.134	BGT-kar/94	7.3	8.7	40.9	40.9	0.18	0.21	-	**0.21**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S125	6.134	BGT-kar/94	-7.3	-8.7	40.9	40.9	0.18	0.21	-	**0.21**
			0.0	0.0	20.4	20.4	0.00	0.00	-	
S126	5.084	BGT-kar/94	6.7	8.2	33.9	33.9	0.20	0.24	-	**0.24**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S127	5.084	BGT-kar/93	-5.4	-4.4	33.9	33.9	0.16	0.13	-	**0.16**
			0.0	0.0	16.9	16.9	0.00	0.00	-	
S128	4.798	BGT-kar/30	-4.7	-4.1	32.0	32.0	0.15	0.13	-	**0.15**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S129	4.798	BGT-kar/95	5.4	7.5	32.0	32.0	0.17	0.23	-	**0.23**
			0.0	0.0	16.0	16.0	0.00	0.00	-	
S130	3.500	BGT-kar/96	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S131	3.333	BGT-kar/97	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S132	3.500	BGT-kar/98	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S133	3.333	BGT-kar/99	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S134	3.500	BGT-kar/100	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S135	0.000	BGT-kar/101	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.27**
			-10.6	-6.1	40.0	40.0	0.27	0.15	-	
S136	3.935-	BGT-kar/102	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S137	3.935-	BGT-kar/103	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S138	4.328+	BGT-kar/104	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S139	4.328+	BGT-kar/105	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S140	4.328+	BGT-kar/106	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S141	4.328-	BGT-kar/107	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S142	3.935+	BGT-kar/69	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S143	3.935-	BGT-kar/108	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S144	4.328+	BGT-kar/109	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S145	4.328-	BGT-kar/110	0.0	0.0	28.9	28.9	0.00	0.00	-	**0.00**
			0.0	0.0	28.9	28.9	0.00	0.00	-	
S146	3.935+	BGT-kar/111	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S147	3.935-	BGT-kar/112	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S148	3.935-	BGT-kar/113	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S149	3.935+	BGT-kar/88	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S150	3.935-	BGT-kar/114	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S151	3.935-	BGT-kar/115	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S152	3.935+	BGT-kar/116	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S153	3.935-	BGT-kar/117	0.0	0.0	26.2	26.2	0.00	0.00	-	**0.00**
			0.0	0.0	26.2	26.2	0.00	0.00	-	
S154	4.243+	BGT-kar/118	0.0	0.0	28.3	28.3	0.00	0.00	-	**0.00**
			0.0	0.0	28.3	28.3	0.00	0.00	-	
S155	4.243-	BGT-kar/119	0.0	0.0	28.3	28.3	0.00	0.00	-	**0.00**
			0.0	0.0	28.3	28.3	0.00	0.00	-	
S156	4.243+	BGT-kar/120	0.0	0.0	28.3	28.3	0.00	0.00	-	**0.00**
			0.0	0.0	28.3	28.3	0.00	0.00	-	
S157	4.243+	BGT-kar/121	0.0	0.0	28.3	28.3	0.00	0.00	-	**0.00**
			0.0	0.0	28.3	28.3	0.00	0.00	-	
S158	1.000-	BGT-kar/122	0.0	0.0	6.7	6.7	0.00	0.00	-	**0.05**
			-0.3	-0.1	6.7	6.7	0.05	0.02	-	
S159	1.000-	BGT-kar/123	0.0	0.0	6.7	6.7	0.00	0.00	-	**0.16**
			-1.1	-0.8	6.7	6.7	0.16	0.12	-	

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_c [mm] Camber [mm]	Check [-]
S160	0.840+	BGT-kar/124	0.0 -0.2	0.0 -0.1	5.6 5.6	5.6 5.6	0.00 0.03	0.00 0.03	- -	**0.03**
S161	0.000	BGT-kar/125	2.0 0.0	2.5 0.0	18.9 9.4	18.9 9.4	0.11 0.00	0.13 0.00	- -	**0.13**
S162	1.000-	BGT-kar/126	0.4 -1.4	0.6 -0.9	13.3 6.7	13.3 6.7	0.03 0.21	0.04 0.14	- -	**0.21**
S163	0.840-	BGT-kar/127	0.0 -0.2	0.0 -0.2	5.6 5.6	5.6 5.6	0.00 0.04	0.00 0.03	- -	**0.04**
S164	0.000	BGT-kar/16	-1.7 0.0	-1.3 0.0	13.3 6.7	13.3 6.7	0.13 0.00	0.10 0.00	- -	**0.13**
S165	0.000	BGT-kar/128	-1.9 0.0	-1.5 0.0	18.9 9.4	18.9 9.4	0.10 0.00	0.08 0.00	- -	**0.10**
S166	1.000-	BGT-kar/129	0.0 -1.5	0.0 -0.9	6.7 6.7	6.7 6.7	0.00 0.22	0.00 0.14	- -	**0.22**
S167	0.840-	BGT-kar/129	0.0 -0.2	0.0 -0.2	5.6 5.6	5.6 5.6	0.00 0.04	0.00 0.03	- -	**0.04**
S168	1.000-	BGT-kar/130	0.0 -0.3	0.0 -0.1	6.7 6.7	6.7 6.7	0.00 0.05	0.00 0.02	- -	**0.05**
S169	0.000	BGT-kar/128	-1.4 0.0	-1.2 0.0	18.9 9.4	18.9 9.4	0.08 0.00	0.06 0.00	- -	**0.08**
S170	3.500	BGT-kar/131	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S171	3.333	BGT-kar/132	0.0 -0.9	0.0 0.0	20.0 20.0	20.0 20.0	0.00 0.05	0.00 0.00	- -	**0.05**
S172	3.500	BGT-kar/133	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S173	3.333	BGT-kar/134	0.0 -0.9	0.0 0.0	20.0 20.0	20.0 20.0	0.00 0.05	0.00 0.00	- -	**0.05**
S174	3.500	BGT-kar/135	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S175	0.000	BGT-kar/20	0.0 -10.4	0.0 -5.9	20.0 40.0	20.0 40.0	0.00 0.26	0.00 0.15	- -	**0.26**
S176	3.500	BGT-kar/136	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S177	3.333	BGT-kar/137	0.0 -0.9	0.0 0.0	20.0 20.0	20.0 20.0	0.00 0.05	0.00 0.00	- -	**0.05**
S178	3.500	BGT-kar/138	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S179	2.667	BGT-kar/139	0.0 -0.9	0.0 0.0	20.0 20.0	20.0 20.0	0.00 0.05	0.00 0.00	- -	**0.05**
S180	3.500	BGT-kar/140	0.0 -1.8	0.0 0.0	23.3 23.3	23.3 23.3	0.00 0.08	0.00 0.00	- -	**0.08**
S181	2.667	BGT-kar/141	0.0 -0.9	0.0 0.0	20.0 20.0	20.0 20.0	0.00 0.05	0.00 0.00	- -	**0.05**
S182	0.700	BGT-kar/142	1.8 0.0	1.8 0.0	7.3 2.3	7.3 2.3	0.25 0.00	0.24 0.00	- -	**0.25**
S183	1.100-	BGT-kar/143	-0.1 0.0	-0.1 0.0	6.7 1.0	6.7 1.0	0.02 0.00	0.02 0.00	- -	**0.02**
S184	0.350+	BGT-kar/144	0.0 0.0	0.0 0.0	2.3 2.3	2.3 2.3	0.00 0.02	0.00 0.02	- -	**0.02**
S206	0.000	BGT-kar/145	0.2 -1.6	0.1 -1.6	2.7 5.3	2.7 5.3	0.07 0.30	0.04 0.31	- -	**0.31**
S207	0.000	BGT-kar/145	0.2 -1.4	0.1 -1.5	2.7 5.3	2.7 5.3	0.07 0.27	0.04 0.28	- -	**0.28**
S208	0.000	BGT-kar/145	0.2 -1.3	0.1 -1.4	2.7 5.3	2.7 5.3	0.07 0.25	0.04 0.26	- -	**0.26**
S209	0.000	BGT-kar/145	0.2 -1.3	0.1 -1.3	2.7 5.3	2.7 5.3	0.07 0.24	0.05 0.24	- -	**0.24**
S210	0.000	BGT-kar/145	0.2 -1.2	0.1 -1.3	2.7 5.3	2.7 5.3	0.07 0.23	0.05 0.24	- -	**0.24**
S211	0.000	BGT-kar/145	0.2 -1.3	0.1 -1.3	2.7 5.3	2.7 5.3	0.07 0.24	0.05 0.24	- -	**0.24**
S212	0.000	BGT-kar/145	0.2 -1.4	0.1 -1.4	2.7 5.3	2.7 5.3	0.07 0.26	0.04 0.26	- -	**0.26**
S213	0.700	BGT-kar/146	-1.7 0.0	-1.7 0.0	7.3 2.3	7.3 2.3	0.23 0.00	0.23 0.00	- -	**0.23**
S214	1.100-	BGT-kar/139	0.2 0.0	0.2 0.0	6.7 1.0	6.7 1.0	0.02 0.00	0.03 0.00	- -	**0.03**
S215	0.350+	BGT-kar/147	0.0 0.1	0.0 0.1	2.3 2.3	2.3 2.3	0.00 0.03	0.00 0.03	- -	**0.03**
S216	0.000	BGT-kar/107	0.5 -1.8	0.4 -1.7	2.7 5.3	2.7 5.3	0.18 0.34	0.15 0.32	- -	**0.34**
S217	0.000	BGT-kar/107	0.5 -1.6	0.4 -1.5	2.7 5.3	2.7 5.3	0.18 0.30	0.14 0.28	- -	**0.30**
S218	0.000	BGT-kar/107	0.5 -1.5	0.4 -1.4	2.7 5.3	2.7 5.3	0.17 0.28	0.14 0.26	- -	**0.28**
S219	0.000	BGT-kar/107	0.4 -1.4	0.4 -1.3	2.7 5.3	2.7 5.3	0.17 0.27	0.13 0.25	- -	**0.27**
S220	0.000	BGT-kar/107	0.4 -1.4	0.3 -1.4	2.7 5.3	2.7 5.3	0.16 0.27	0.13 0.25	- -	**0.27**
S221	0.000	BGT-kar/107	0.4	0.3	2.7	2.7	0.15	0.12	-	**0.30**

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_z [mm] Camber [mm]	Check [illegible] [-]
			-1.6	-1.5	5.3	5.3	0.30	0.28	-	
S222	0.000	BGT-kar/107	0.4	0.3	2.7	2.7	0.16	0.12	-	**0.28**
			-1.5	-1.4	5.3	5.3	0.28	0.27	-	
S223	0.700	BGT-kar/148	1.9	1.9	7.3	7.3	0.25	0.25	-	**0.25**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S224	1.100-	BGT-kar/149	-0.2	-0.2	6.7	6.7	0.03	0.03	-	**0.03**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S225	0.350-	BGT-kar/150	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.03**
			0.1	0.1	2.3	2.3	0.03	0.03	-	
S226	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.23	0.24	-	**0.51**
			-2.7	-2.7	5.3	5.3	0.51	0.50	-	
S227	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.23	0.24	-	**0.47**
			-2.5	-2.5	5.3	5.3	0.47	0.47	-	
S228	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.22	0.24	-	**0.45**
			-2.4	-2.4	5.3	5.3	0.45	0.45	-	
S229	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.22	0.23	-	**0.44**
			-2.4	-2.3	5.3	5.3	0.44	0.44	-	
S230	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.22	0.23	-	**0.44**
			-2.4	-2.3	5.3	5.3	0.44	0.43	-	
S231	0.000	BGT-kar/145	0.5	0.6	2.7	2.7	0.20	0.21	-	**0.47**
			-2.5	-2.5	5.3	5.3	0.47	0.46	-	
S232	0.000	BGT-kar/145	0.6	0.6	2.7	2.7	0.21	0.22	-	**0.45**
			-2.4	-2.4	5.3	5.3	0.45	0.44	-	
S233	0.700	BGT-kar/146	-1.7	-1.7	7.3	7.3	0.23	0.23	-	**0.23**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S234	1.100-	BGT-kar/151	0.1	0.1	6.7	6.7	0.02	0.02	-	**0.02**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S235	0.350-	BGT-kar/152	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.04**
			0.1	0.1	2.3	2.3	0.04	0.04	-	
S236	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.11	0.12	-	**0.61**
			-3.2	-3.2	5.3	5.3	0.60	0.61	-	
S237	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.11	0.12	-	**0.58**
			-3.1	-3.1	5.3	5.3	0.58	0.58	-	
S238	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.11	0.11	-	**0.56**
			-3.0	-3.0	5.3	5.3	0.56	0.56	-	
S239	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.10	0.11	-	**0.55**
			-2.9	-2.9	5.3	5.3	0.55	0.55	-	
S240	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.10	0.10	-	**0.54**
			-2.9	-2.9	5.3	5.3	0.54	0.54	-	
S241	0.000	BGT-kar/145	0.2	0.3	2.7	2.7	0.09	0.10	-	**0.56**
			-3.0	-3.0	5.3	5.3	0.56	0.56	-	
S242	0.000	BGT-kar/145	0.3	0.3	2.7	2.7	0.09	0.10	-	**0.55**
			-2.9	-2.9	5.3	5.3	0.55	0.55	-	
S243	0.700	BGT-kar/153	1.8	1.8	7.3	7.3	0.24	0.24	-	**0.24**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S244	1.100-	BGT-kar/154	-0.1	-0.1	6.7	6.7	0.02	0.02	-	**0.02**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S245	0.350-	BGT-kar/155	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.04**
			0.1	0.1	2.3	2.3	0.04	0.04	-	
S246	0.000	BGT-kar/156	-0.3	-0.3	2.7	2.7	0.10	0.11	-	**0.60**
			-3.2	-3.2	5.3	5.3	0.60	0.60	-	
S247	0.000	BGT-kar/156	-0.3	-0.3	2.7	2.7	0.10	0.11	-	**0.58**
			-3.1	-3.1	5.3	5.3	0.58	0.58	-	
S248	0.000	BGT-kar/156	-0.3	-0.3	2.7	2.7	0.10	0.10	-	**0.56**
			-3.0	-3.0	5.3	5.3	0.56	0.56	-	
S249	0.000	BGT-kar/156	-0.2	-0.3	2.7	2.7	0.09	0.10	-	**0.55**
			-2.9	-2.9	5.3	5.3	0.55	0.54	-	
S250	0.000	BGT-kar/156	-0.2	-0.3	2.7	2.7	0.09	0.10	-	**0.54**
			-2.9	-2.9	5.3	5.3	0.54	0.54	-	
S251	0.000	BGT-kar/156	-0.2	-0.2	2.7	2.7	0.08	0.09	-	**0.57**
			-3.0	-3.0	5.3	5.3	0.57	0.56	-	
S252	0.000	BGT-kar/156	-0.2	-0.3	2.7	2.7	0.09	0.09	-	**0.55**
			-2.9	-2.9	5.3	5.3	0.55	0.54	-	
S253	0.700	BGT-kar/157	-1.9	-1.9	7.3	7.3	0.26	0.26	-	**0.26**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S254	1.100-	BGT-kar/158	0.2	0.2	6.7	6.7	0.03	0.03	-	**0.03**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S255	0.350-	BGT-kar/159	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.03**
			0.1	0.1	2.3	2.3	0.03	0.03	-	
S256	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.19	0.21	-	**0.53**
			-2.8	-2.8	5.3	5.3	0.53	0.52	-	
S257	0.000	BGT-kar/160	-0.5	-0.6	2.7	2.7	0.20	0.21	-	**0.50**
			-2.7	-2.7	5.3	5.3	0.50	0.50	-	
S258	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.20	0.21	-	**0.48**
			-2.6	-2.5	5.3	5.3	0.48	0.48	-	
S259	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.19	0.20	-	**0.47**
			-2.5	-2.5	5.3	5.3	0.47	0.46	-	
S260	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.19	0.20	-	**0.47**
			-2.5	-2.5	5.3	5.3	0.47	0.46	-	
S261	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.18	0.19	-	**0.50**
			-2.6	-2.6	5.3	5.3	0.50	0.48	-	

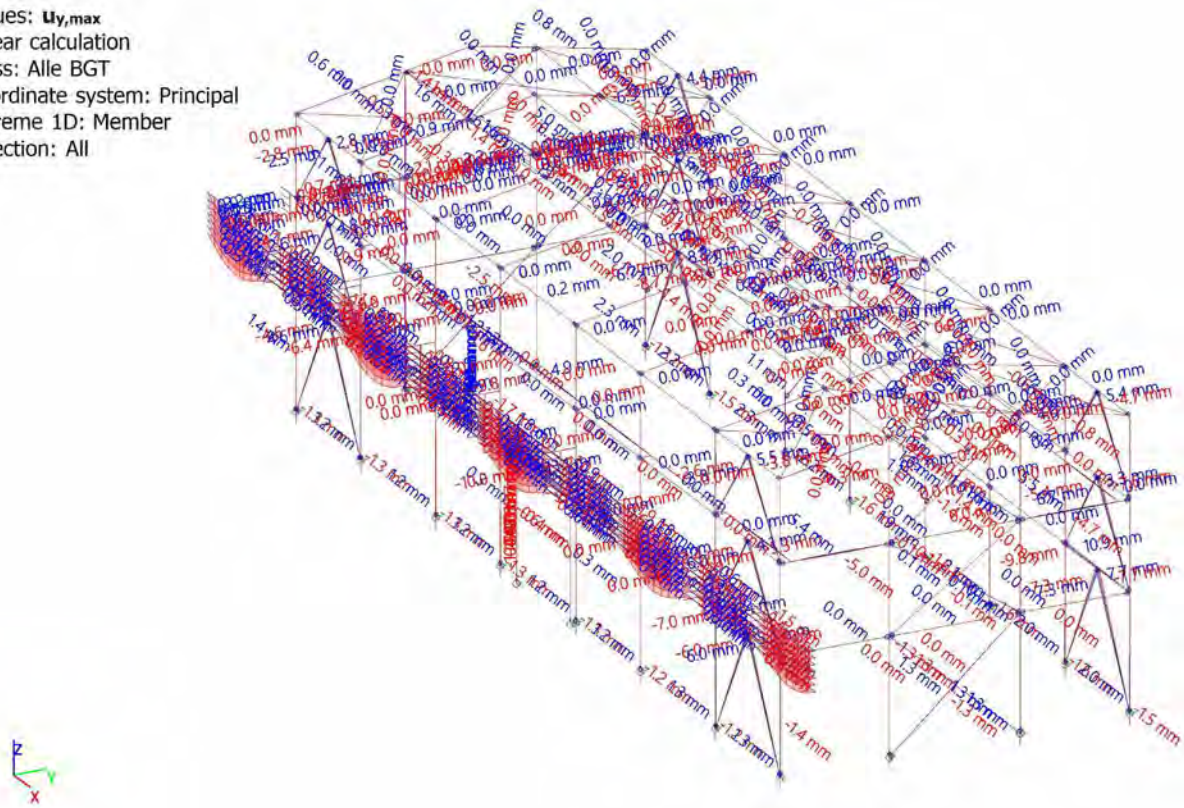
Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_z [mm] Camber [mm]	Check $_{(overall)}$ [-]
S262	0.000	BGT-kar/160	-0.5	-0.5	2.7	2.7	0.18	0.19	-	**0.48**
			-2.5	-2.5	5.3	5.3	0.48	0.47	-	
S263	0.700	BGT-kar/153	1.8	1.9	7.3	7.3	0.25	0.25	-	**0.25**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S264	1.100-	BGT-kar/161	-0.2	-0.2	6.7	6.7	0.02	0.03	-	**0.03**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S265	0.350+	BGT-kar/72	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.03**
			0.1	0.1	2.3	2.3	0.03	0.03	-	
S266	0.000	BGT-kar/162	-0.5	-0.4	2.7	2.7	0.18	0.14	-	**0.38**
			-2.0	-1.9	5.3	5.3	0.38	0.35	-	
S267	0.000	BGT-kar/162	-0.5	-0.4	2.7	2.7	0.17	0.14	-	**0.35**
			-1.8	-1.7	5.3	5.3	0.35	0.32	-	
S268	0.000	BGT-kar/162	-0.4	-0.4	2.7	2.7	0.17	0.13	-	**0.32**
			-1.7	-1.6	5.3	5.3	0.32	0.30	-	
S269	0.000	BGT-kar/162	-0.4	-0.3	2.7	2.7	0.16	0.13	-	**0.31**
			-1.7	-1.5	5.3	5.3	0.31	0.29	-	
S270	0.000	BGT-kar/162	-0.4	-0.3	2.7	2.7	0.15	0.12	-	**0.31**
			-1.6	-1.5	5.3	5.3	0.31	0.29	-	
S271	0.000	BGT-kar/163	-0.5	-0.4	2.7	2.7	0.18	0.14	-	**0.33**
			-1.8	-1.7	5.3	5.3	0.33	0.31	-	
S272	0.000	BGT-kar/162	-0.4	-0.3	2.7	2.7	0.15	0.12	-	**0.31**
			-1.7	-1.6	5.3	5.3	0.31	0.30	-	
S273	0.700	BGT-kar/164	-1.5	-1.4	7.3	7.3	0.20	0.19	-	**0.20**
			0.0	0.0	2.3	2.3	0.00	0.00	-	
S274	1.100-	BGT-kar/164	0.1	0.1	6.7	6.7	0.02	0.02	-	**0.02**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S275	0.350+	BGT-kar/165	0.0	0.0	2.3	2.3	0.00	0.00	-	**0.02**
			0.0	0.0	2.3	2.3	0.02	0.02	-	
S276	0.000	BGT-kar/166	-0.2	-0.2	2.7	2.7	0.09	0.06	-	**0.30**
			-1.6	-1.6	5.3	5.3	0.30	0.30	-	
S277	0.000	BGT-kar/167	-0.3	-0.2	2.7	2.7	0.09	0.06	-	**0.27**
			-1.4	-1.5	5.3	5.3	0.27	0.27	-	
S278	0.000	BGT-kar/167	-0.2	-0.2	2.7	2.7	0.09	0.06	-	**0.25**
			-1.3	-1.3	5.3	5.3	0.25	0.25	-	
S279	0.000	BGT-kar/168	-0.3	-0.3	2.7	2.7	0.13	0.10	-	**0.24**
			-1.3	-1.3	5.3	5.3	0.24	0.24	-	
S280	0.000	BGT-kar/168	-0.3	-0.3	2.7	2.7	0.13	0.10	-	**0.24**
			-1.3	-1.3	5.3	5.3	0.24	0.24	-	
S281	0.000	BGT-kar/169	-0.4	-0.3	2.7	2.7	0.14	0.11	-	**0.28**
			-1.5	-1.4	5.3	5.3	0.28	0.27	-	
S282	0.000	BGT-kar/169	-0.4	-0.3	2.7	2.7	0.14	0.11	-	**0.25**
			-1.4	-1.3	5.3	5.3	0.25	0.25	-	
S285	0.750-	BGT-kar/170	0.0	0.0	3.0	3.0	0.00	0.00	-	**0.00**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S290	0.550	BGT-kar/171	0.9	0.9	9.0	9.0	0.10	0.10	-	**0.10**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S291	0.275-	BGT-kar/172	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.00**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S292	0.800	BGT-kar/171	2.2	2.1	9.0	9.0	0.24	0.23	-	**0.24**
			-0.2	-0.1	5.3	5.3	0.03	0.02	-	
S293	0.800	BGT-kar/173	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.04**
			-0.2	-0.2	5.3	5.3	0.04	0.03	-	
S294	0.800	BGT-kar/173	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.04**
			-0.2	-0.2	5.3	5.3	0.04	0.03	-	
S295	0.800	BGT-kar/173	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.04**
			-0.2	-0.2	5.3	5.3	0.04	0.04	-	
S296	0.150-	BGT-kar/174	0.0	0.0	3.0	3.0	0.00	0.00	-	**0.00**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S297	0.550	BGT-kar/175	0.9	0.9	9.0	9.0	0.10	0.10	-	**0.10**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S298	0.275-	BGT-kar/176	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.02**
			0.0	0.0	1.8	1.8	0.02	0.02	-	
S299	0.800	BGT-kar/175	2.1	2.1	9.0	9.0	0.23	0.23	-	**0.66**
			3.5	3.5	5.3	5.3	0.65	0.66	-	
S300	0.800	BGT-kar/175	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.65**
			3.4	3.5	5.3	5.3	0.64	0.65	-	
S301	0.800	BGT-kar/175	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.64**
			3.4	3.4	5.3	5.3	0.63	0.64	-	
S302	0.800	BGT-kar/175	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.63**
			3.3	3.4	5.3	5.3	0.62	0.63	-	
S303	0.750-	BGT-kar/177	0.0	0.0	3.0	3.0	0.00	0.00	-	**0.00**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S304	0.550	BGT-kar/177	-0.9	-0.9	9.0	9.0	0.10	0.11	-	**0.11**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S305	0.275-	BGT-kar/6	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.02**
			0.0	0.0	1.8	1.8	0.02	0.02	-	
S306	0.800	BGT-kar/177	-2.3	-2.3	9.0	9.0	0.25	0.26	-	**0.67**
			3.5	3.6	5.3	5.3	0.66	0.67	-	
S307	0.800	BGT-kar/177	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.65**
			3.4	3.5	5.3	5.3	0.64	0.65	-	
S308	0.800	BGT-kar/178	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.64**

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_c [mm] Camber [mm]	Check overall [-]
			3.4	3.4	5.3	5.3	0.63	0.64	-	
S309	0.800	BGT-kar/178	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.63**
			3.3	3.4	5.3	5.3	0.62	0.63	-	
S310	0.750+	BGT-kar/179	0.0	0.0	3.0	3.0	0.00	0.00	-	**0.00**
			0.0	0.0	1.0	1.0	0.00	0.00	-	
S311	0.550	BGT-kar/180	-0.6	-0.7	9.0	9.0	0.07	0.08	-	**0.08**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S312	0.275-	BGT-kar/181	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.00**
			0.0	0.0	1.8	1.8	0.00	0.00	-	
S313	0.800	BGT-kar/180	-1.5	-1.8	9.0	9.0	0.17	0.20	-	**0.20**
			0.0	0.1	5.3	5.3	0.00	0.02	-	
S314	0.800	BGT-kar/182	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.09**
			-0.5	-0.4	5.3	5.3	0.09	0.07	-	
S315	0.800	BGT-kar/182	0.0	0.0	2.7	2.7	0.00	0.00	-	**0.09**
			-0.5	-0.4	5.3	5.3	0.09	0.07	-	
S316	0.800	BGT-kar/182	0.0	0.0	4.5	4.5	0.00	0.00	-	**0.10**
			-0.5	-0.4	5.3	5.3	0.10	0.08	-	
S384	3.500	BGT-kar/183	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S385	2.667	BGT-kar/184	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S386	3.500	BGT-kar/185	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S387	2.667	BGT-kar/186	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S388	4.500	BGT-kar/187	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.03**
			-0.3	-0.2	10.0	10.0	0.03	0.02	-	
S389	3.500	BGT-kar/188	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S429	0.000	BGT-kar/66	-1.5	-1.4	21.6	21.6	0.07	0.07	-	**0.07**
			0.0	0.0	10.8	10.8	0.00	0.00	-	
S430	0.000	BGT-kar/65	-1.6	-1.6	26.8	26.8	0.06	0.06	-	**0.06**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S431	0.000	BGT-kar/65	1.6	1.7	25.4	25.4	0.06	0.07	-	**0.07**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S432	0.000	BGT-kar/25	1.3	1.3	26.8	26.8	0.05	0.05	-	**0.05**
			0.0	0.0	13.4	13.4	0.00	0.00	-	
S433	2.181	BGT-kar/27	0.0	0.0	24.2	24.2	0.00	0.00	-	**0.01**
			-0.1	0.0	12.1	12.1	0.01	0.00	-	
S434	0.000	BGT-kar/27	1.6	1.5	25.4	25.4	0.06	0.06	-	**0.06**
			0.0	0.0	12.7	12.7	0.00	0.00	-	
S435	3.500	BGT-kar/189	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S436	3.333	BGT-kar/190	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S437	3.500	BGT-kar/191	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S438	3.333	BGT-kar/192	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S439	1.500	BGT-kar/193	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.03**
			0.3	0.3	10.0	10.0	0.03	0.03	-	
S440	3.500	BGT-kar/194	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S441	3.500	BGT-kar/195	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S442	2.667	BGT-kar/196	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S443	3.500	BGT-kar/197	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S444	2.667	BGT-kar/139	0.0	0.0	20.0	20.0	0.00	0.00	-	**0.05**
			-0.9	0.0	20.0	20.0	0.05	0.00	-	
S445	3.500	BGT-kar/198	0.0	0.0	23.3	23.3	0.00	0.00	-	**0.08**
			-1.8	0.0	23.3	23.3	0.08	0.00	-	
S446	0.000	BGT-kar/21	-9.8	-12.3	40.0	40.0	0.25	0.31	-	**0.31**
			0.0	0.0	10.0	10.0	0.00	0.00	-	
S381	28.500-	BGT-kar/145	-104.5	-104.4	188.3	188.3	0.55	0.55	-	**0.55**
			1.1	1.2	23.3	23.3	0.05	0.05	-	
S447	28.500-	BGT-kar/145	-104.1	-104.0	188.3	188.3	0.55	0.55	-	**0.55**
			1.1	1.2	23.3	23.3	0.05	0.05	-	
S448	28.500-	BGT-kar/145	-104.0	-103.8	188.3	188.3	0.55	0.55	-	**0.55**
			1.2	1.3	23.3	23.3	0.05	0.05	-	
S449	28.500-	BGT-kar/156	-103.8	-103.7	188.3	188.3	0.55	0.55	-	**0.55**
			1.2	1.3	23.3	23.3	0.05	0.06	-	
S450	28.500-	BGT-kar/156	-103.6	-103.5	188.3	188.3	0.55	0.55	-	**0.55**
			1.3	1.4	23.3	23.3	0.05	0.06	-	
S451	28.500-	BGT-kar/156	-103.4	-103.3	188.3	188.3	0.55	0.55	-	**0.55**
			1.3	1.4	23.3	23.3	0.06	0.06	-	
S453	28.500-	BGT-kar/156	-103.7	-103.6	188.3	188.3	0.55	0.55	-	**0.55**
			1.4	1.5	23.3	23.3	0.06	0.06	-	
S454	6.842	BGT-kar/199	0.0	0.0	43.3	43.3	0.00	0.00	-	**0.48**
			-20.7	0.0	43.3	43.3	0.48	0.00	-	

Name	dx [m]	Case	$u_{y,max}$ [mm] $u_{z,max}$ [mm]	$u_{y,var}$ [mm] $u_{z,var}$ [mm]	Lim. $u_{y,max}$ [mm] Lim. $u_{z,max}$ [mm]	Lim. $u_{y,var}$ [mm] Lim. $u_{z,var}$ [mm]	Check $u_{y,max}$ [-] Check $u_{z,max}$ [-]	Check $u_{y,var}$ [-] Check $u_{z,var}$ [-]	Camber dx u_z [mm] Camber [mm]	Check $_{Overall}$ [-]
S455	6.158	BGT-kar/200	0.0 -20.7	0.0 0.0	43.3 43.3	43.3 43.3	0.00 0.48	0.00 0.00	- -	**0.48**
S456	6.576+	BGT-kar/105	0.0 0.0	0.0 0.0	43.8 43.8	43.8 43.8	0.00 0.00	0.00 0.00	- -	**0.00**
S457	9.692	BGT-kar/201	0.0 0.0	0.0 0.0	43.8 43.8	43.8 43.8	0.00 0.00	0.00 0.00	- -	**0.00**
S458	6.842	BGT-kar/202	0.0 -20.7	0.0 0.0	43.3 43.3	43.3 43.3	0.00 0.48	0.00 0.00	- -	**0.48**
S459	12.461	BGT-kar/203	0.0 0.0	0.0 0.0	43.8 43.8	43.8 43.8	0.00 0.00	0.00 0.00	- -	**0.00**
S460	6.158	BGT-kar/204	0.0 -20.7	0.0 0.0	43.3 43.3	43.3 43.3	0.00 0.48	0.00 0.00	- -	**0.48**
S461	6.576-	BGT-kar/33	0.0 0.0	0.0 0.0	43.8 43.8	43.8 43.8	0.00 0.00	0.00 0.00	- -	**0.00**

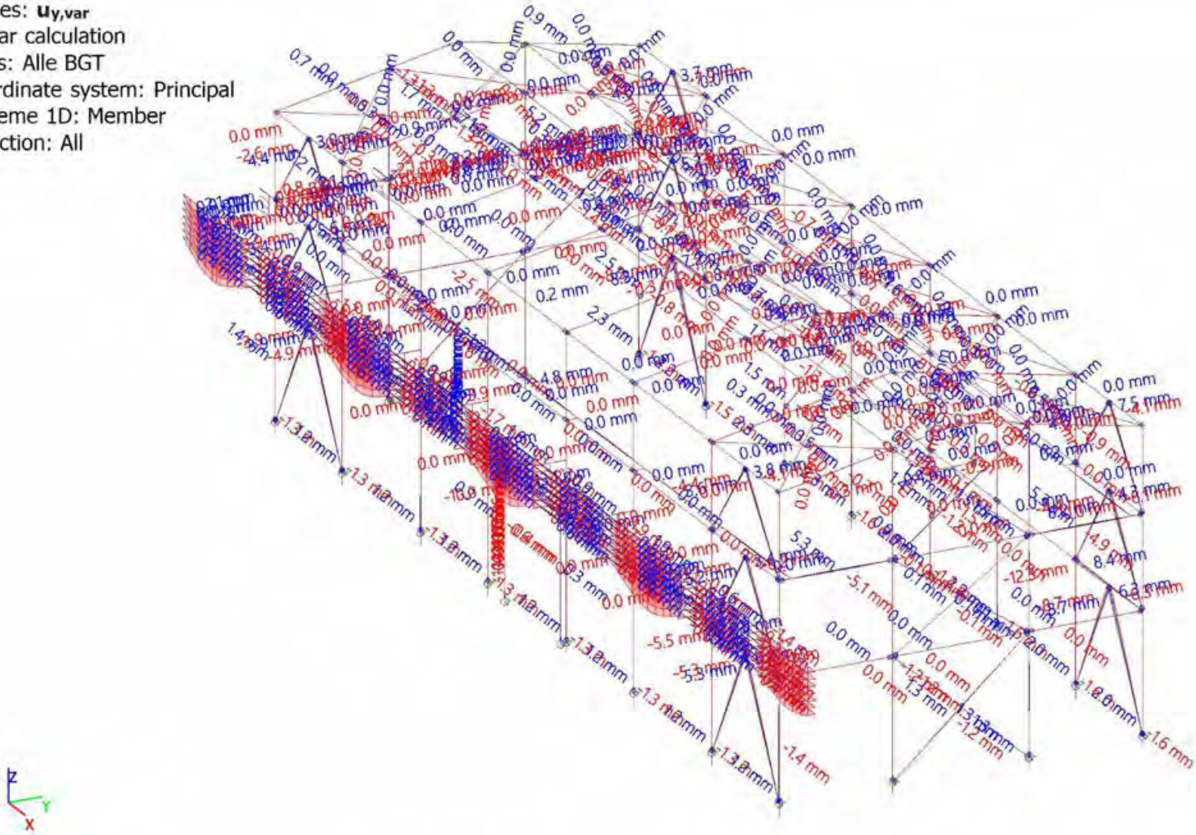
Resultaten - $u^{y,max}$

Values: **$u_{y,max}$**
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



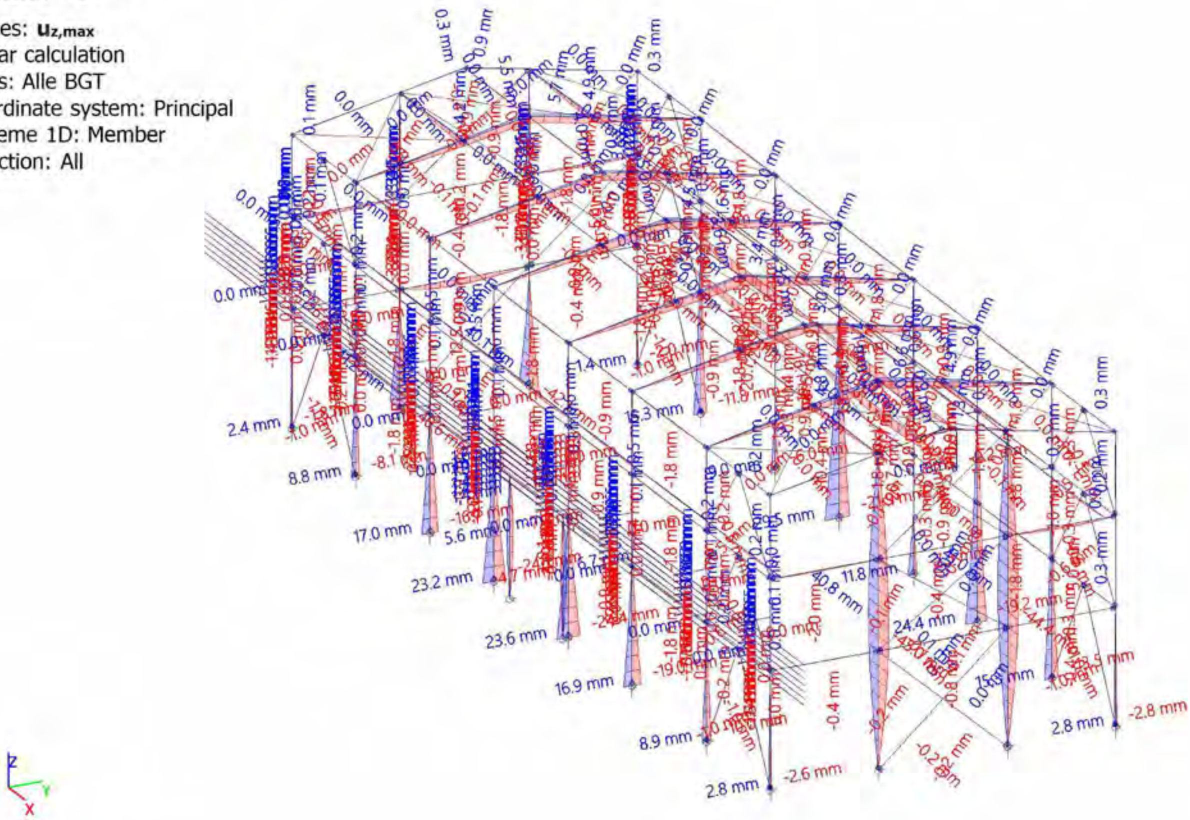
Resultaten - $u^{y,var}$

Values: $\mathbf{u_{y,var}}$
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



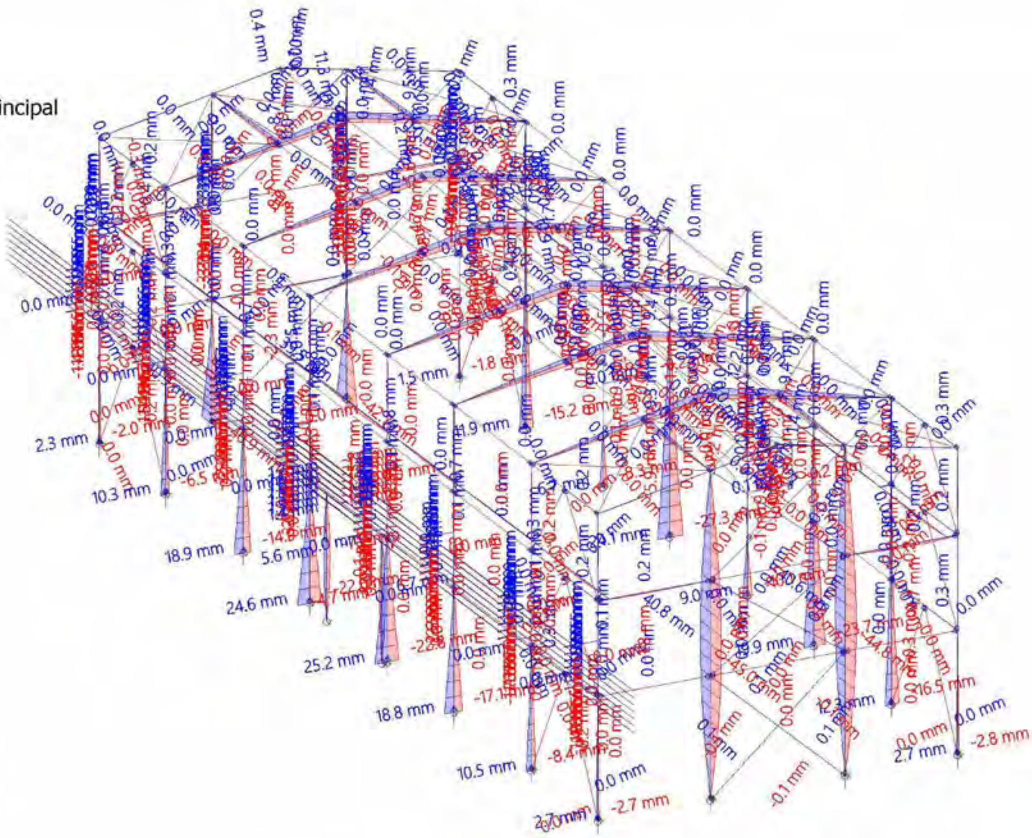
Resultaten - $u^{z,max}$

Values: $\mathbf{u_{z,max}}$
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



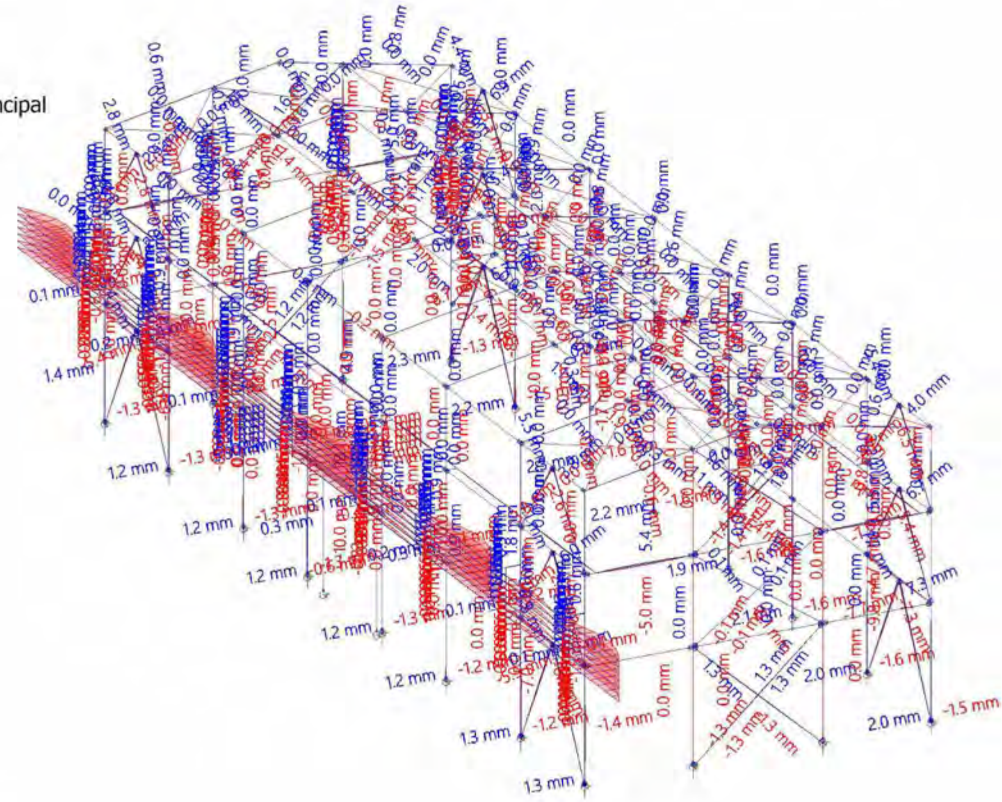
Resultaten - $u^{z,var}$

Values: $\mathbf{u_{z,var}}$
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



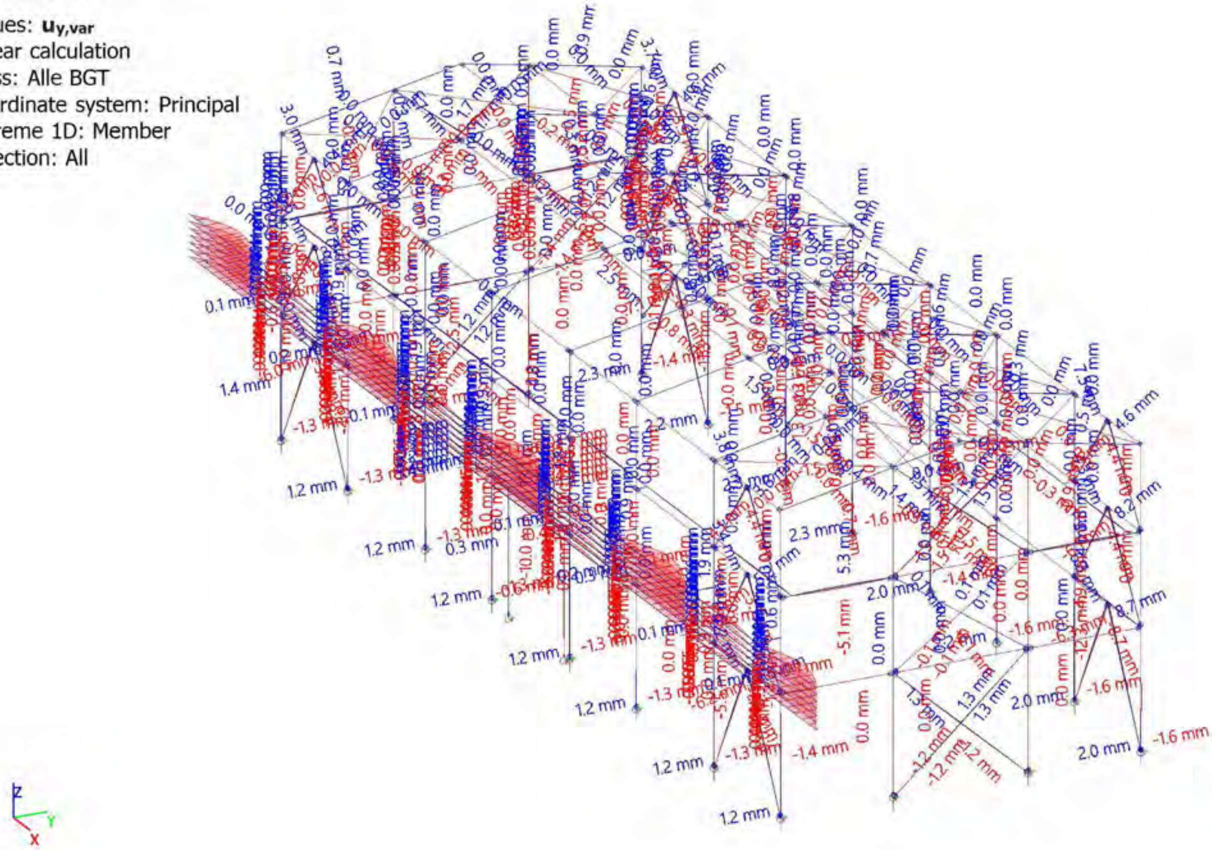
Resultaten - $u^{y,max}$

Values: $\mathbf{u_{y,max}}$
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



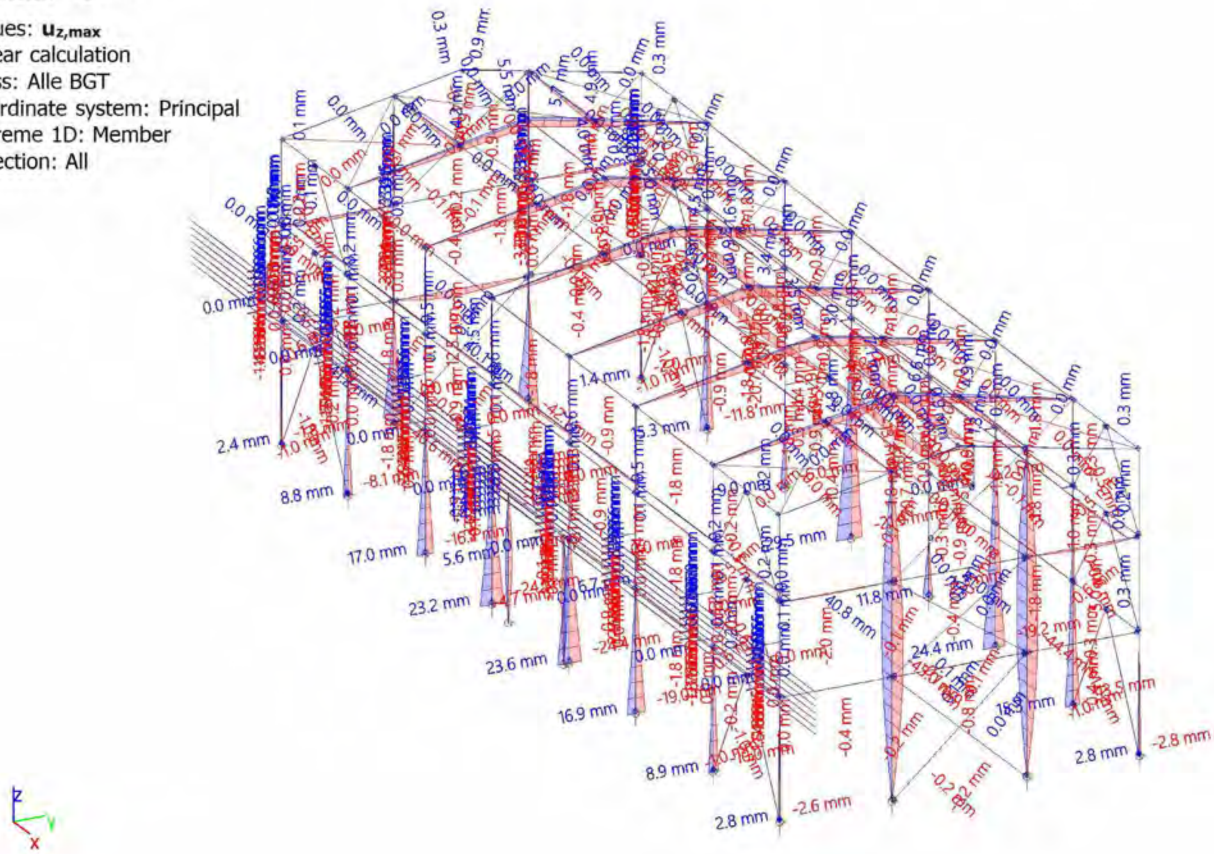
Resultaten - $u^{y,var}$

Values: **$u_{y,var}$**
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



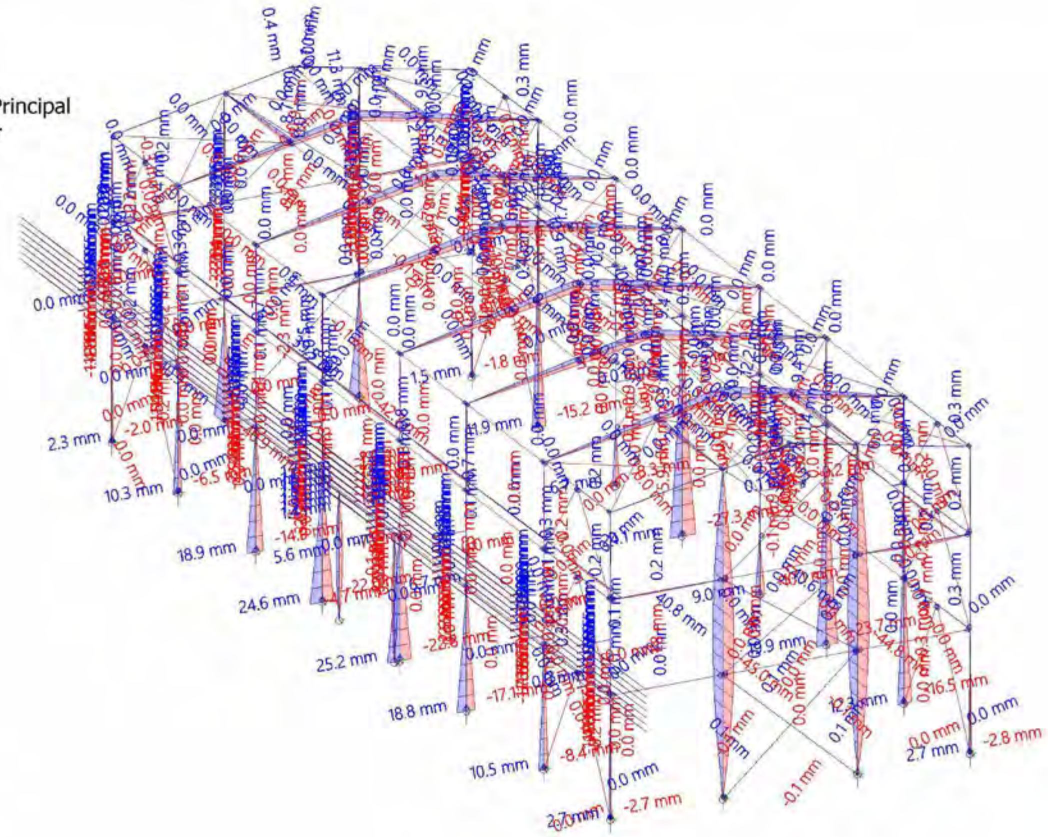
Resultaten - $u^{z,max}$

Values: **$u_{z,max}$**
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



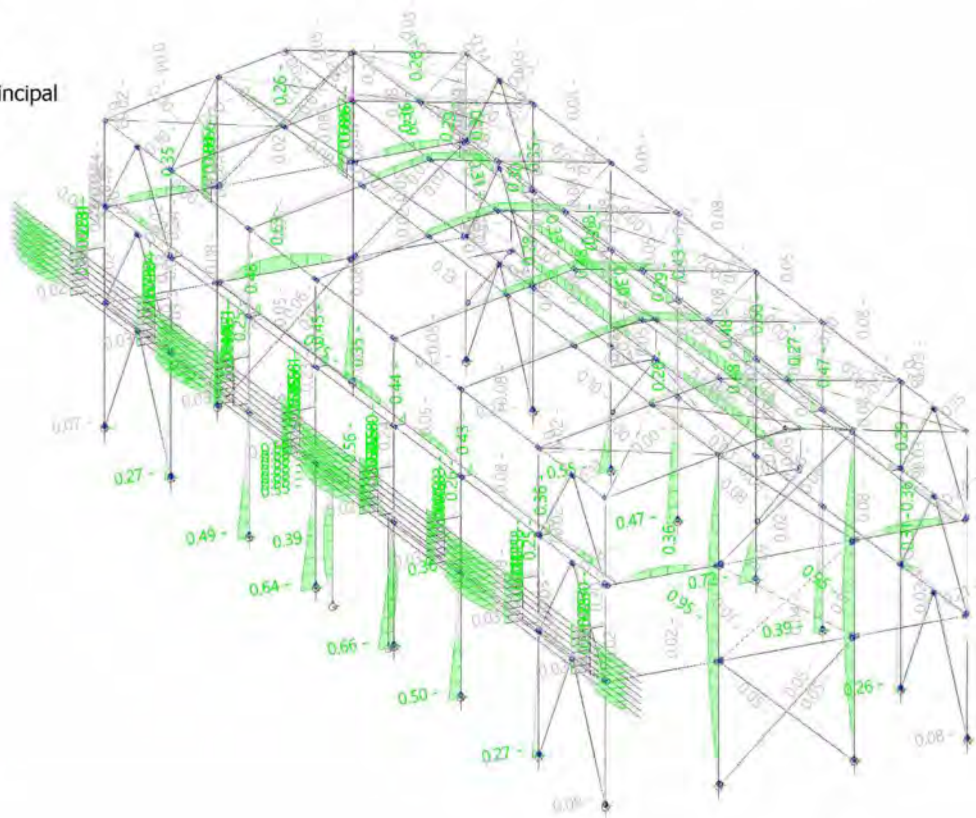
Resultaten - $u^{z,var}$

Values: **$u_{z,var}$**
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All

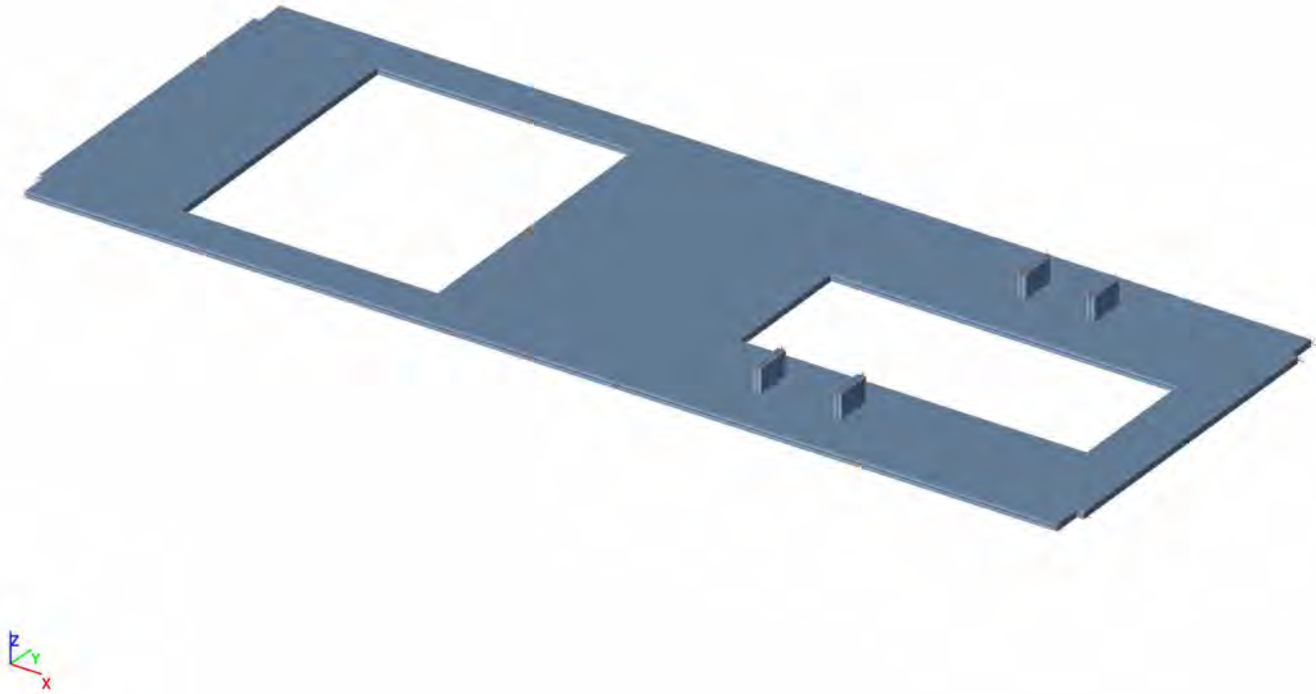


Resultaten - Check ^{Overall}

Values: **Check $_{overall}$**
Linear calculation
Class: Alle BGT
Coordinate system: Principal
Extreme 1D: Member
Selection: All



Annex D.4.
Concrete slab design



1. Table of contents

2. Rekenmodel

2.1. Setup manager

Combination setup

Category H loading not to be combined with snow or wind	✓

Psi factors

Load	Psi0	Psi1	Psi2
CategoryA	0.7	0.5	0.3
CategoryB	0.7	0.5	0.3
CategoryC	0.7	0.7	0.6
CategoryD	0.7	0.7	0.6
CategoryE	1	0.9	0.8
CategoryF	0.7	0.7	0.6
CategoryG	0.7	0.5	0.3
CategoryH	0	0	0
Snow	0.5	0.2	0
Wind	0.6	0.2	0
Temperature	0.6	0.5	0
Construction loads	1	0	0.2

Load combination factors

Permanent action - unfavorable	1.35
Permanent action - favorable	1.00
Leading variable action	1.50
Accompanying variable action	1.50
Reduction factor ksi	0.85
Permanent action - unfavorable	1.00
Permanent action - favorable	1.00
Leading variable action	1.30
Accompanying variable action	1.30

Combination setup

Category H loading not to be combined with snow or wind	✓

Psi factors

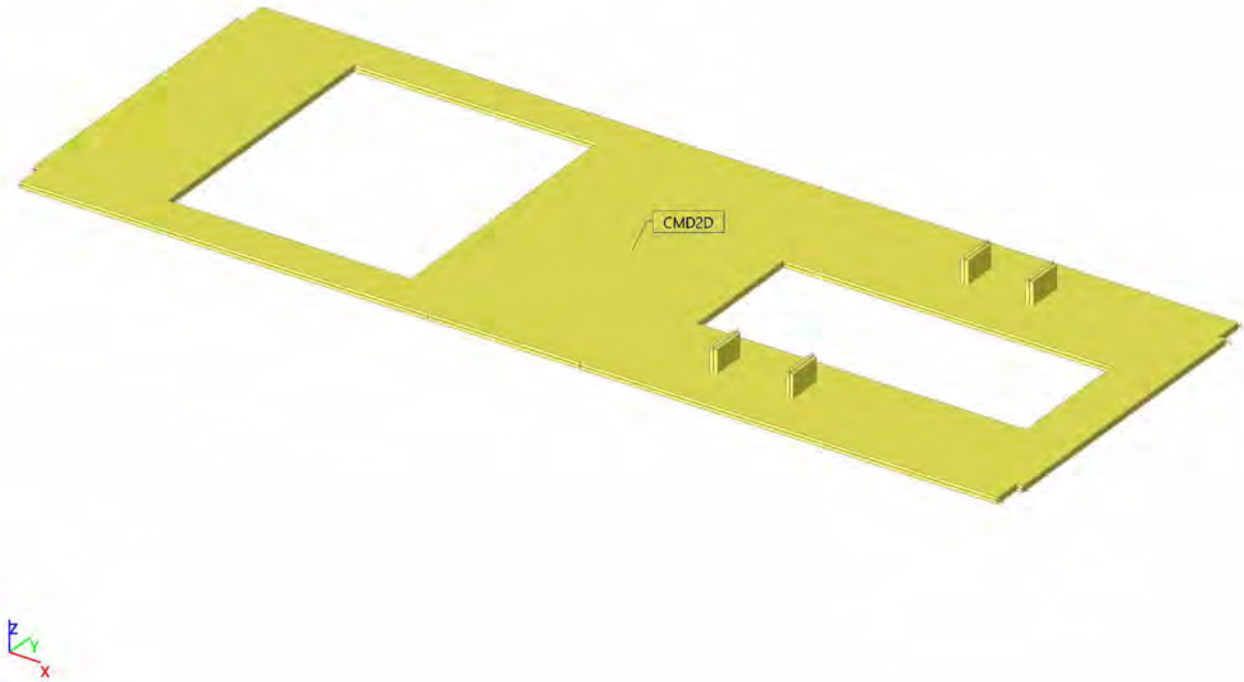
Load	Psi0	Psi1	Psi2
CategoryA	0.7	0.5	0.3
CategoryB	0.7	0.5	0.3
CategoryC	0.7	0.7	0.6
CategoryD	0.7	0.7	0.6
CategoryE	1	0.9	0.8
CategoryF	0.7	0.7	0.6
CategoryG	0.7	0.5	0.3
CategoryH	0	0	0
Snow	0.5	0	0
Wind	0.6	0.2	0
Temperature	0.6	0.5	0
Settlements	1	1	1
Special loads during execution	1	1	0.2
Construction loads	1	0	0.2

Load combination factors

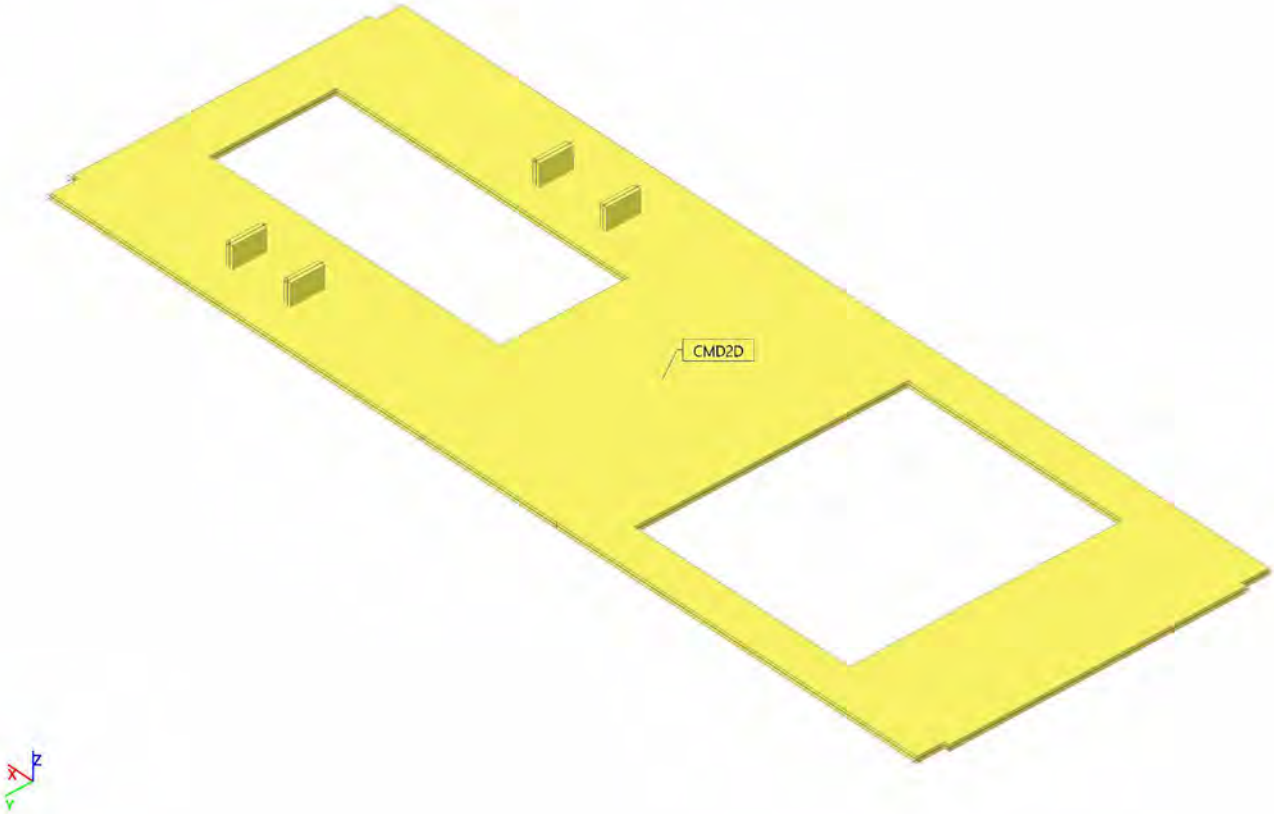
Permanent action - unfavorable	1.35
Permanent action - favorable	1.00
Leading variable action	1.50
Accompanying variable action	1.50
Reduction factor ksi	0.85
Permanent action - unfavorable	1.00
Permanent action - favorable	1.00
Leading variable action [-]	1.10
Accompanying variable action [-]	1.10

2.2. General model description

2.2.1. Isometric view

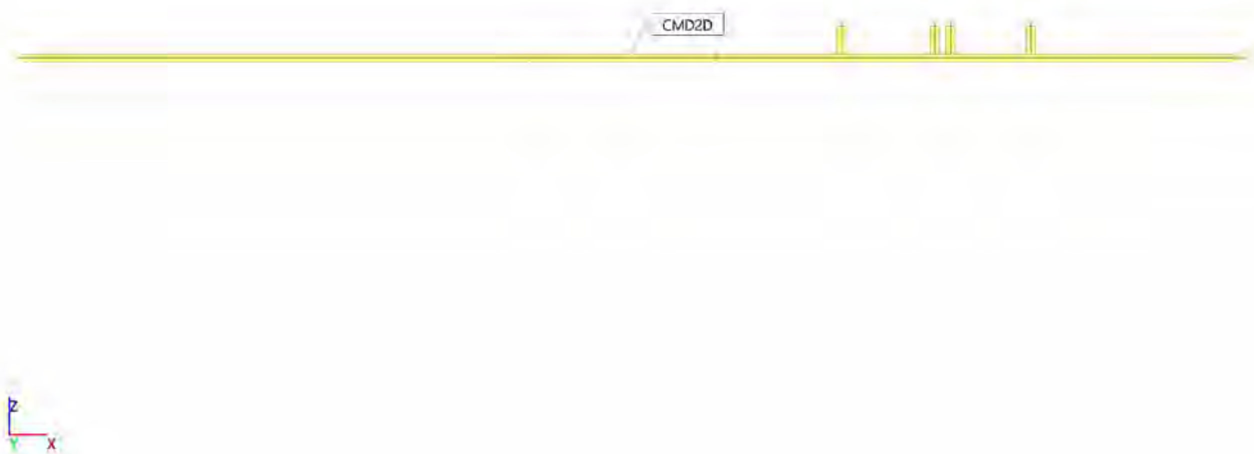


2.2.2. Isometric view

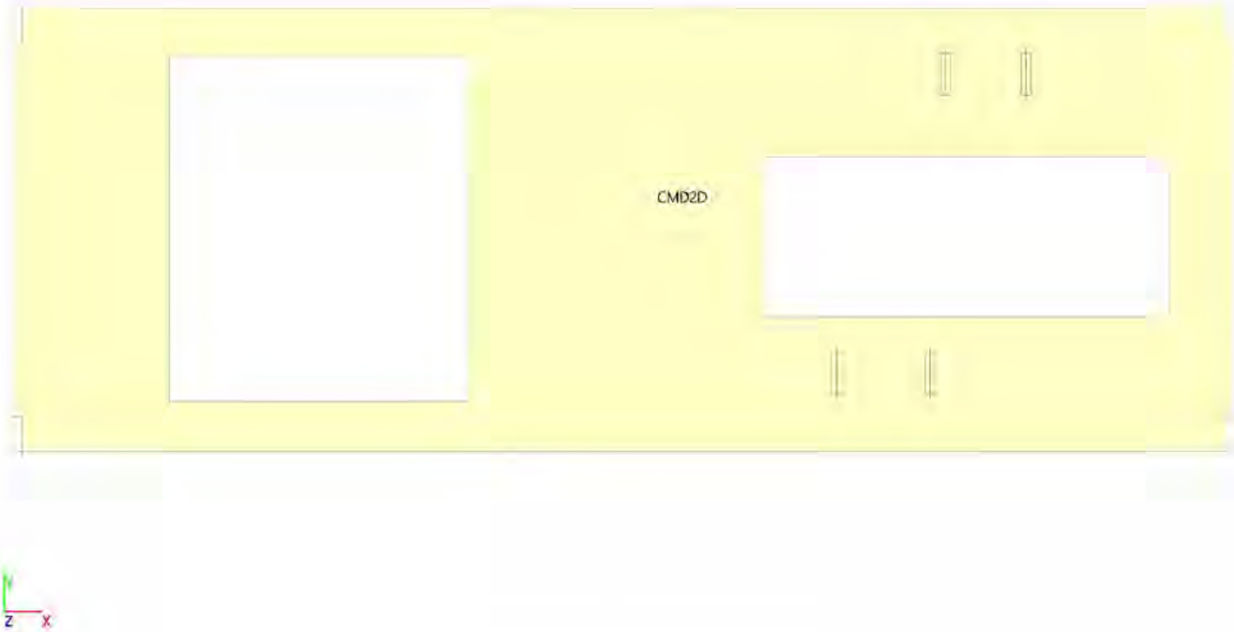


2.2.3. X view

2.2.4. Y view



2.2.5. Z view



2.2.6. Materials

Steel EC3

Name	Unit mass [kg/m³]	E mod [MPa]	Poisson - nu	Lower limit [mm]	Upper limit [mm]	Fy (range) [MPa]	Fu (range) [MPa]
		G mod [MPa]	Thermal exp [m/mK]				
S 235 JR (EN 10025-2)	8000.0	2.1000e+05	0.3	0	3	235.0	360.0
		8.0769e+04	0.00	3	16	235.0	360.0
				16	40	225.0	360.0
				40	63	215.0	360.0
				63	80	215.0	360.0
				80	100	215.0	360.0
				100	150	195.0	350.0
				150	200	185.0	340.0
				200	250	175.0	340.0
S 355 JR (EN 10025-2)	8000.0	2.1000e+05	0.3	0	3	355.0	510.0
		8.0769e+04	0.00	3	16	355.0	470.0
				16	40	345.0	470.0
				40	63	335.0	470.0
				63	80	325.0	470.0
				80	100	315.0	470.0
				100	150	295.0	450.0
				150	200	285.0	450.0
				200	250	275.0	450.0

Concrete EC2

Name	Type	Unit mass [kg/m³]	E mod [MPa]	Poisson - nu	Thermal exp [m/mK]	Characteristic compressive cylinder strength fck(28) [MPa]
C35/45	Concrete	2500.0	3.4100e+04	0.2	0.00	35.00

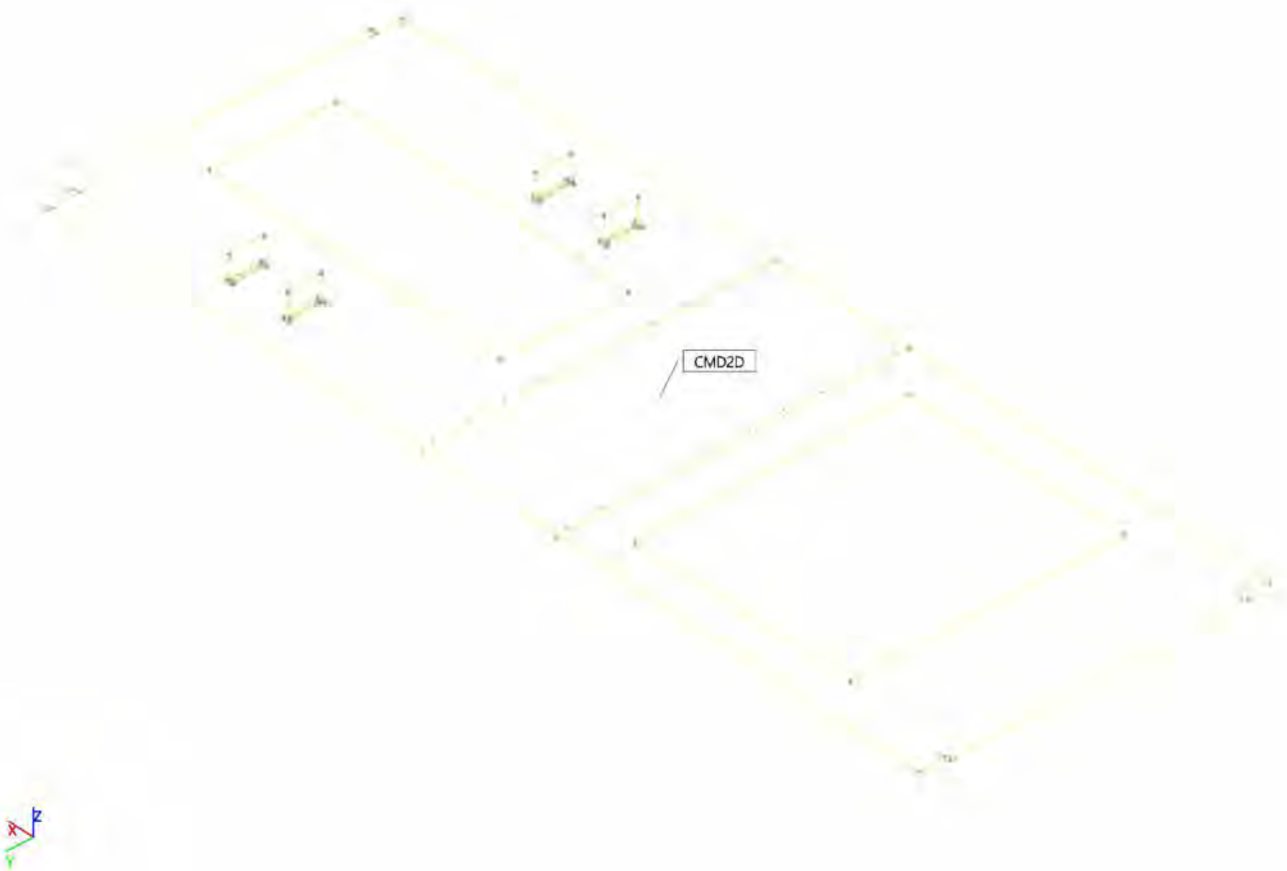
Reinforcement EC2

Name	Type	Unit mass [kg/m³]	E mod [MPa]	G mod [MPa]	Thermal exp [m/mK]	Characteristic yield strength fyk [MPa]
B 500A	Reinforcement steel	7850.0	2.0000e+05	8.3333e+04	0.00	500.0
B 500B	Reinforcement steel	7850.0	2.0000e+05	8.3333e+04	0.00	500.0

Name Type	E mod [MPa] G mod [MPa]	Poisson - nu	Unit mass [kg/m³]	Log. decrement (non-uniform damping only)	Specific heat [J/gK]
Rigid General material	1.0000e+12 3.8462e+11	0.3	0.0	0.15	6.0000e-01

Explanations of symbols	
Log. decrement (non-uniform damping only)	This material damping property is used only in case non uniform damping is enabled for dynamic analysis (see project functionality). Please note, that non uniform damping require a specific license, which is not part of the standard dynamic pack.

2.2.7. Analysis model



2.2.8. Layers

Name	Structural model only
Foundation	×
Crainebeam	×
Dummy	×
Kolommen	×
Ligger	×
Bracing	×
Support	×
Tabletop	×

2.2.9. UCS

Current UCS			
Type	vector		
X [m], Y [m], Z [m]	0.000	0.000	0.000
X-X, X-Y, X-Z	1	0	0
Y-X, Y-Y, Y-Z	0	1	0
Z-X, Z-Y, Z-Z	0	0	1

2.3. Model data

2.3.1. Mesh setup

Name	NetInstelling1
Minimal distance between definition point and line [m]	0.001
Average number of 1D mesh elements on straight 1D members	1
Average size of 2D mesh element [m]	0.300
Definition of mesh element size for panels	Manual
Average size of panel element [m]	1.000
Elastic mesh	✓
Use automatic mesh refinement	×
Minimal length of beam element [m]	0.100
Maximal length of beam element [m]	1000.000
Average size of tendons, elements on subsoil, nonlinear soil spring [m]	1.000
Generation of nodes in connections of beam elements	×
Generation of variable eccentricities on members instead of constant ones	×
Division on haunches and arbitrary members	5
Division for integration strip and 2D-1D upgrade	50
Mesh refinement following the beam type	None
Maximal out of plane angle of a quadrilateral [mrad]	30.0
Predefined mesh ratio	1.5

2.3.2. Solver setup

Name	SolverSetup1
Neglect shear force deformation (Ay, Az >> A)	×
Initial stress	×
Use IRS (Improved Reduced System) method	×
Apply property modifiers	✓
Number of thicknesses of rib plate	20
Maximum soil interaction iterations	10
Maximum iterations	20
Number of increments	1
Number of buckling modes	2
Number of sections on average member	10
Number of eigenmodes	10
Step for soil/water pressure [m]	0.500
C1x [MN/m ^{3}]	1.0000e-01
C1y [MN/m ^{3}]	1.0000e-01
C1z [MN/m ^{3}]	1.0000e+01
C2x [MN/m]	5.0000e+00
C2y [MN/m]	5.0000e+00
Coefficient for reinforcement	1
Warning when maximal translation is greater than [mm]	1000.0
Warning when maximal rotation is greater than [mrad]	100.0
Parallelism tolerance [deg]	10.00
Span length ratio Le/beff,i,max (1 side) [-]	8.00
Simply supported beam [-]	1.00
Inner span [-]	0.70
End span [-]	0.85
Cantilever [-]	2.00
Solver precision ratio	1
Soil combination	None
Plastic hinge code	No code
Bending theory of plate/shell analysis	Mindlin
Type of solver	Direct
Type of eigen value solver	Lanczos
Type of eigen value solver	Lanczos
Method of calculation	Picard

2.3.3. 1D

2.3.3.1. Nodes

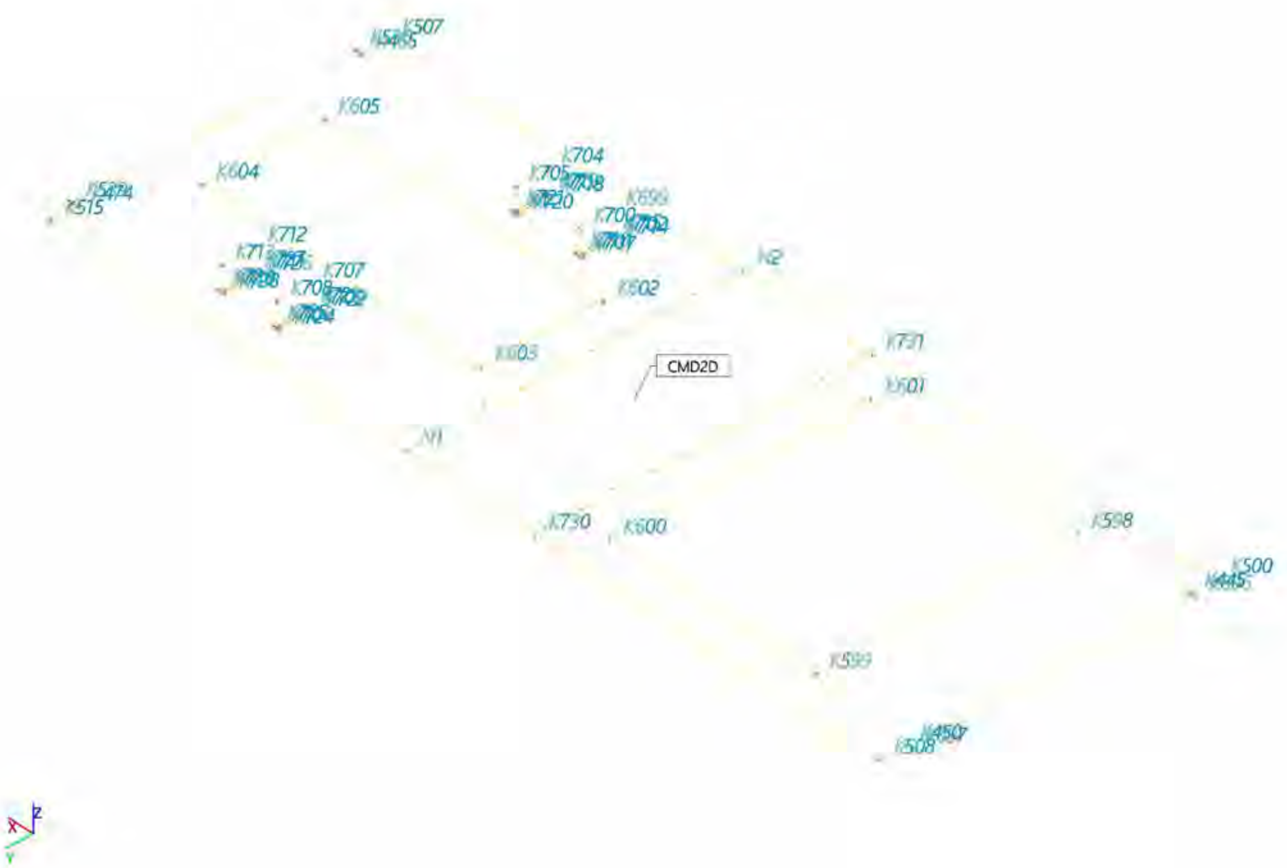
Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K445	12.500	5.750	0.000
K450	12.500	19.750	0.000
K465	57.500	5.750	0.000
K474	57.500	19.750	0.000
K500	12.500	4.450	0.000
K507	57.500	4.450	0.000
K508	12.500	21.050	0.000
K515	57.500	21.050	0.000
K536	57.800	5.750	0.000

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K539	57.800	19.750	0.000
K598	18.003	6.327	0.000
K599	18.003	19.227	0.000
K600	29.203	19.227	0.000
K601	29.203	6.327	0.000
K602	40.280	9.490	0.000
K603	40.280	15.490	0.000
K604	55.430	15.490	0.000
K605	55.430	9.490	0.000
K696	12.250	5.750	0.000
K697	12.250	19.750	0.000
K699	42.966	6.600	1.200
K700	42.966	8.200	1.200
K701	42.966	8.200	0.000
K702	42.966	6.600	0.000
K1	46.466	8.200	0.000

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K703	46.466	6.600	0.000
K704	46.466	6.600	1.200
K705	46.466	8.200	1.200
K706	47.065	19.400	0.000
K707	47.065	17.800	1.200
K708	47.065	19.400	1.200
K709	47.065	17.800	0.000
K710	50.065	19.400	0.000
K711	50.065	17.800	0.000
K712	50.065	17.800	1.200
K713	50.065	19.400	1.200
K714	42.791	6.600	0.000
K715	43.141	6.600	0.000
K716	43.141	8.200	0.000
K717	42.791	8.200	0.000
K718	46.291	6.600	0.000

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
K719	46.641	6.600	0.000
K720	46.291	8.200	0.000
K721	46.641	8.200	0.000
K722	46.890	17.800	0.000
K723	47.240	17.800	0.000
K724	46.890	19.400	0.000
K725	47.240	19.400	0.000
K726	49.890	17.800	0.000
K727	50.240	17.800	0.000
K728	49.890	19.400	0.000
K729	50.240	19.400	0.000
K730	31.241	21.050	0.000
K731	31.241	4.450	0.000
N1	38.242	21.050	0.000
N2	38.242	4.450	0.000

2.3.3.2. Knopen

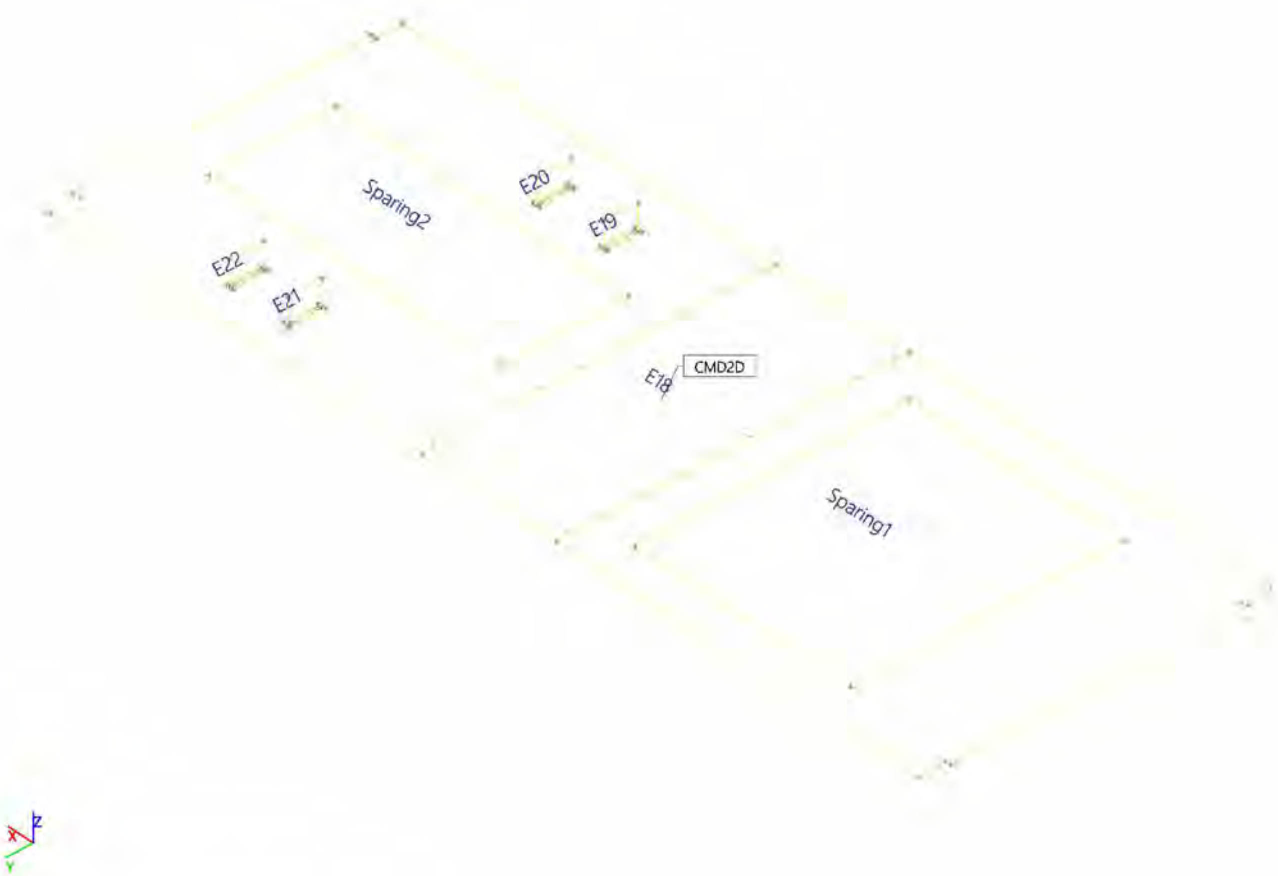


2.3.4. 2D

2.3.4.1. 2D members

Name	Layer	Type	Element type	Material	Thickness type	Th. [mm]
E18	Foundation	plate (90)	Standard	C35/45	constant	300
E19	Foundation	wall (80)	Standard	C35/45	constant	350
E20	Foundation	wall (80)	Standard	C35/45	constant	350
E21	Foundation	wall (80)	Standard	C35/45	constant	350
E22	Foundation	wall (80)	Standard	C35/45	constant	350

2.3.4.2. Platen



2.3.4.3. 2D member openings

Name	2D member
Sparing1	E18
Sparing2	E18

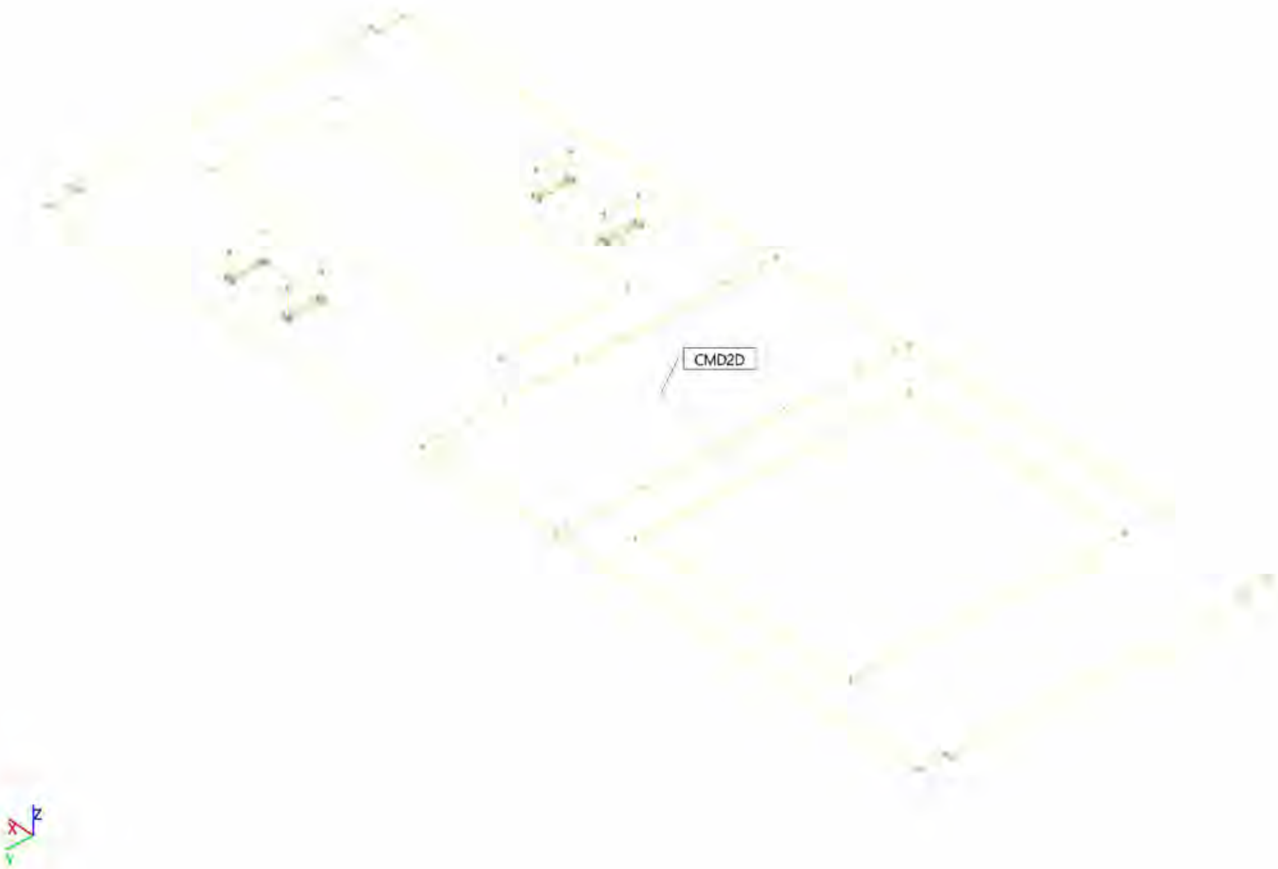
2.3.4.4. 2D member internal edges

Name	Member 1	Length [m]	Shape	Node	Edge
Rand1	E18	0.350	Line	K714 K715	Line
Rand2	E18	1.600	Line	K715 K716	Line
Rand3	E18	0.350	Line	K716 K717	Line
Rand4	E18	1.600	Line	K717 K714	Line

Name	Member 1	Length [m]	Shape	Node	Edge
Rand5	E18	0.350	Line	K718 K719	Line
Rand6	E18	1.600	Line	K720 K718	Line
Rand7	E18	1.600	Line	K719 K721	Line
Rand8	E18	0.350	Line	K721 K720	Line
Rand9	E18	0.350	Line	K722 K723	Line
Rand10	E18	1.600	Line	K724 K722	Line
Rand11	E18	1.600	Line	K723 K725	Line
Rand12	E18	0.350	Line	K725 K724	Line
Rand13	E18	0.350	Line	K726 K727	Line
Rand14	E18	1.600	Line	K728 K726	Line
Rand15	E18	1.600	Line	K727 K729	Line
Rand16	E18	0.350	Line	K729 K728	Line
Rand17	E18	16.600	Line	K730 K731	Line
Rand18	E18	16.600	Line	N1 N2	Line

2.3.5. Supports

2.3.5.1. Steunpunten



2.3.5.2. Supports on 2D member edge

Name	2D member Edge	Orig Coor	Pos x_1 Pos x_2	X	Y	Z	Rx	Ry	Rz
Sle1	E18 12	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle2	 1	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle3	 2	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle4	 3	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle5	 4	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle6	 1	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle7	 2	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle8	 3	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle9	 4	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle10	E18 1	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle11	E18 2	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle12	E18 3	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free

Name	2D member Edge	Orig Coor	Pos x_1 Pos x_2	X	Y	Z	Rx	Ry	Rz
Sle13	E18 4	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle14	E18 5	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle15	E18 6	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle16	E18 7	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle17	E18 8	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle18	E18 9	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle19	E18 10	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle20	E18 11	From start Rela	0.000 1.000	Rigid	Rigid	Rigid	Free	Free	Free
Sle21	 1	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free
Sle22	 1	From start Rela	0.000 1.000	Free	Free	Rigid	Free	Free	Free

3. Loads

3.1. Load cases

Name	Description	Action type	Load group	Load type	Spec	Direction	Duration	Master load case
BG101	Self weight	Permanent	LG1	Self weight		-Z		
BG102	Permanent	Permanent	LG1	Standard				
BG111	Area loads	Variable	LG2	Static	Standard		Short	None
BG112	Area 1	Variable	LG2	Static	Standard		Short	None
BG113	Area 2	Variable	LG2	Static	Standard		Short	None
BG114	Area 3	Variable	LG2	Static	Standard		Short	None
BG121	Traffic load weelloads 1	Variable	LG3	Static	Standard		Short	None
BG122	Traffic load weelloads 2	Variable	LG3	Static	Standard		Short	None
BG123	Traffic load weelloads 3	Variable	LG3	Static	Standard		Short	None
BG124	Traffic load weelloads 4	Variable	LG3	Static	Standard		Short	None
BG125	Traffic load weelloads 5	Variable	LG3	Static	Standard		Short	None
BG126	Traffic load weelloads 6	Variable	LG3	Static	Standard		Short	None
BG127	Traffic load weelloads 7	Variable	LG3	Static	Standard		Short	None
BG131	Traffic load Type 3 1	Variable	LG3	Static	Standard		Short	None
BG132	Traffic load Type 3 2	Variable	LG3	Static	Standard		Short	None
BG133	Traffic load Type 3 3	Variable	LG3	Static	Standard		Short	None
BG134	Traffic load Type 3 4	Variable	LG3	Static	Standard		Short	None
BG141	Equipment	Variable	LG4	Static	Standard		Short	None

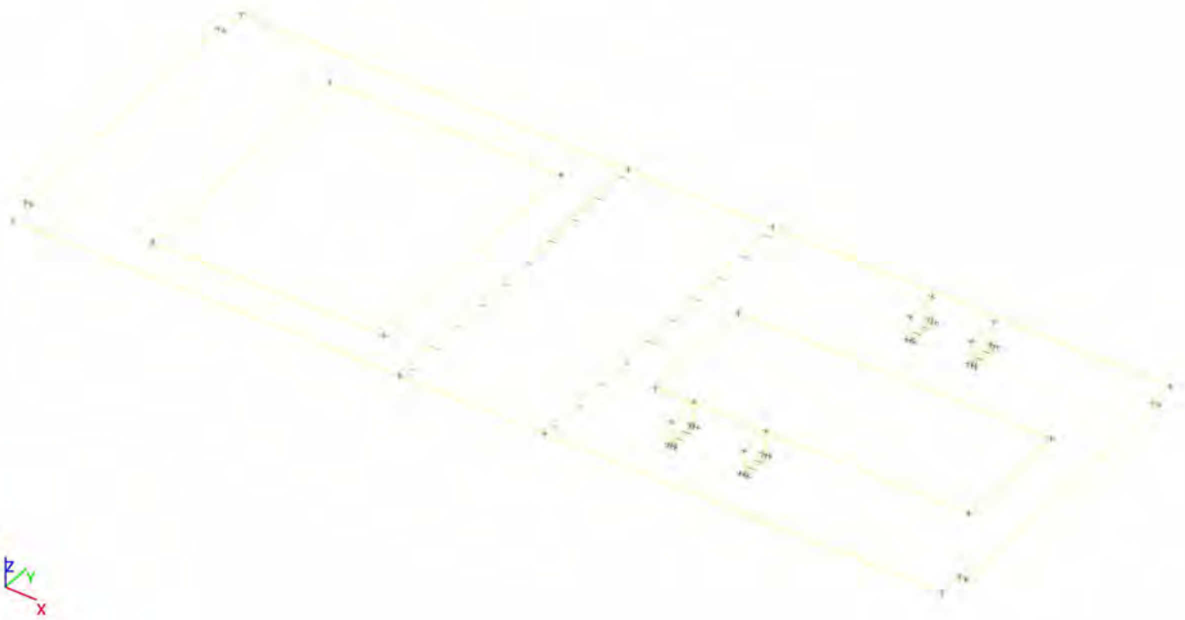
3.2. Load cases

3.2.1. Load cases - BG101

Name	Description	Action type	Load group	Load type	Direction
BG101	Self weight	Permanent	LG1	Self weight	-Z

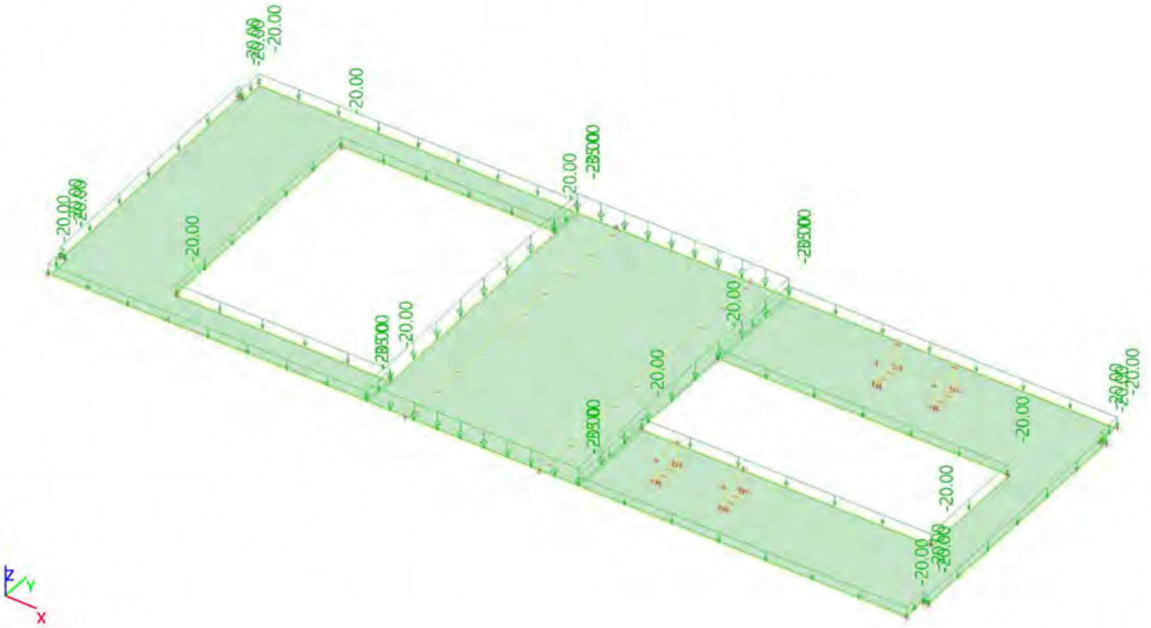
3.2.2. Load cases - BG102

Name	Description	Action type	Load group	Load type
BG102	Permanent	Permanent	LG1	Standard



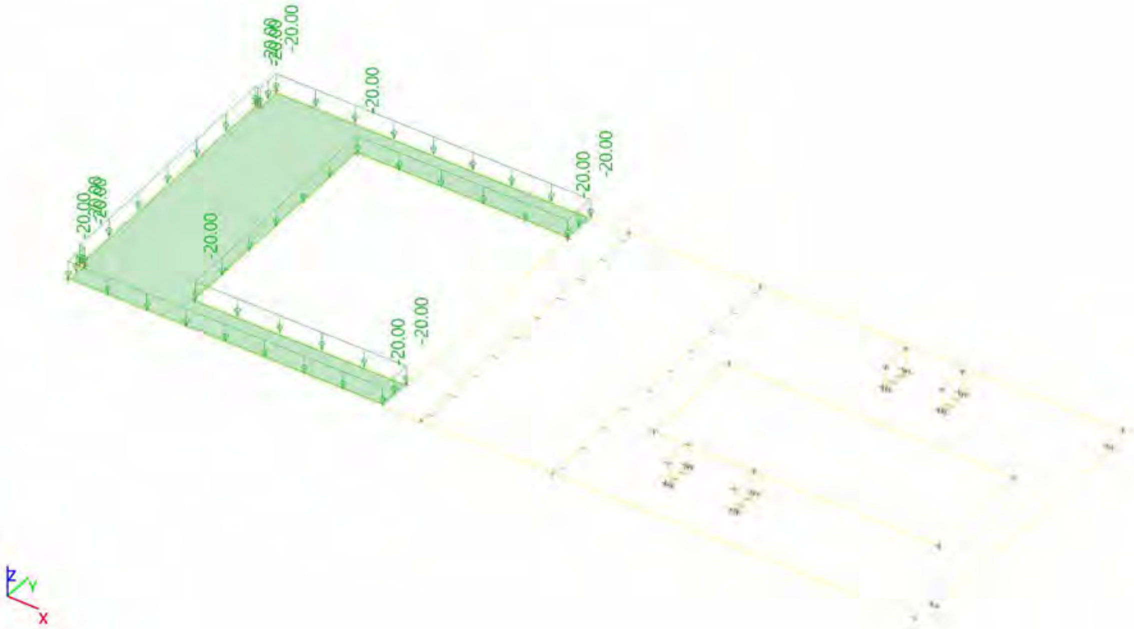
3.2.3. Load cases - BG111

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG111	Area loads	Variable	LG2	Static	Standard	Short	None



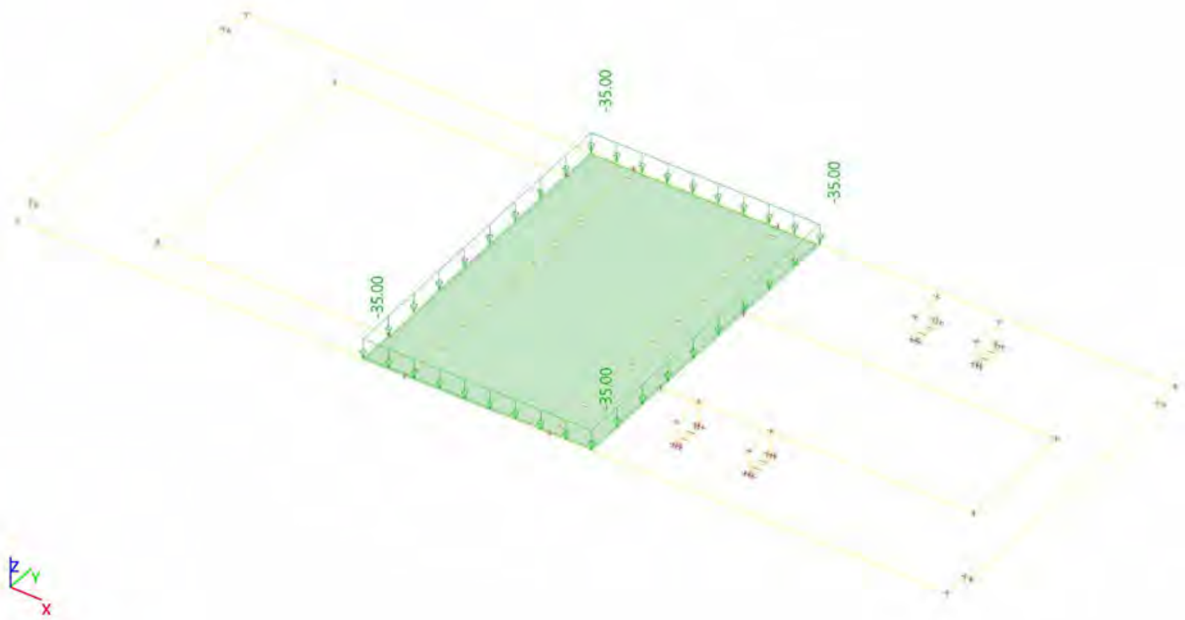
3.2.4. Load cases - BG112

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG112	Area 1	Variable	LG2	Static	Standard	Short	None



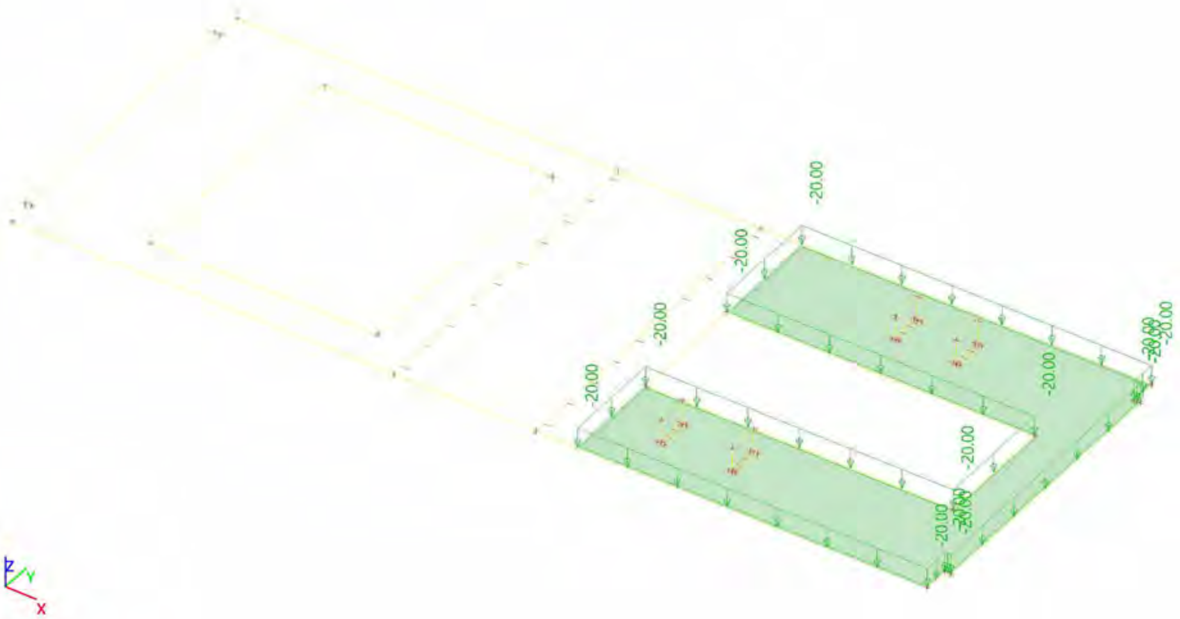
3.2.5. Load cases - BG113

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG113	Area 2	Variable	LG2	Static	Standard	Short	None



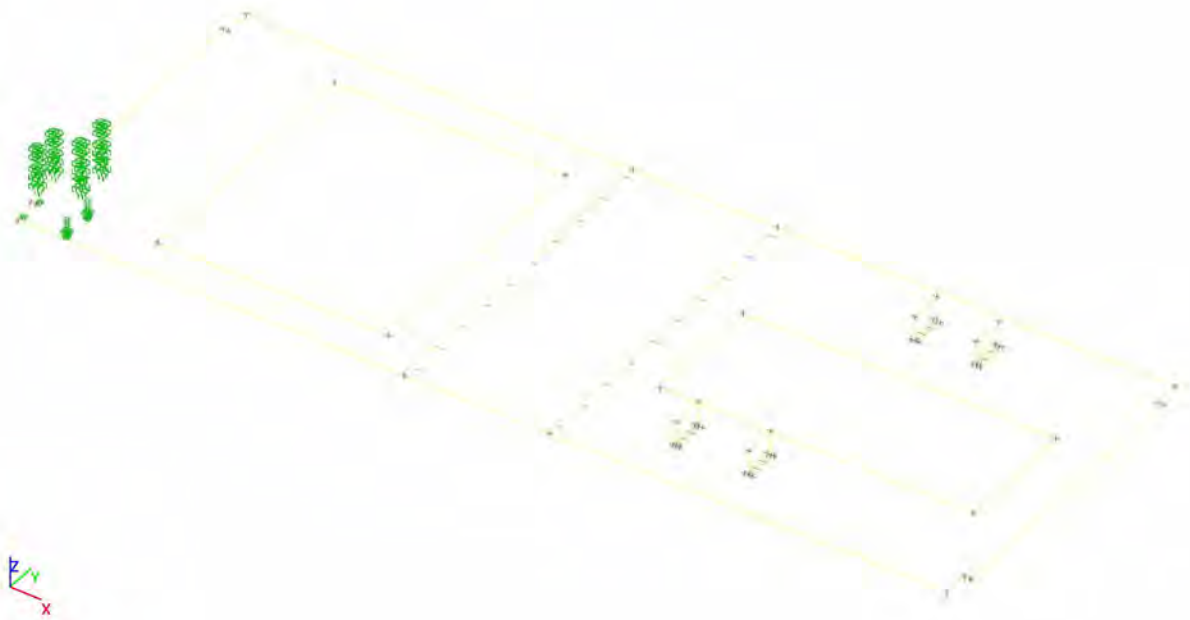
3.2.6. Load cases - BG114

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG114	Area 3	Variable	LG2	Static	Standard	Short	None



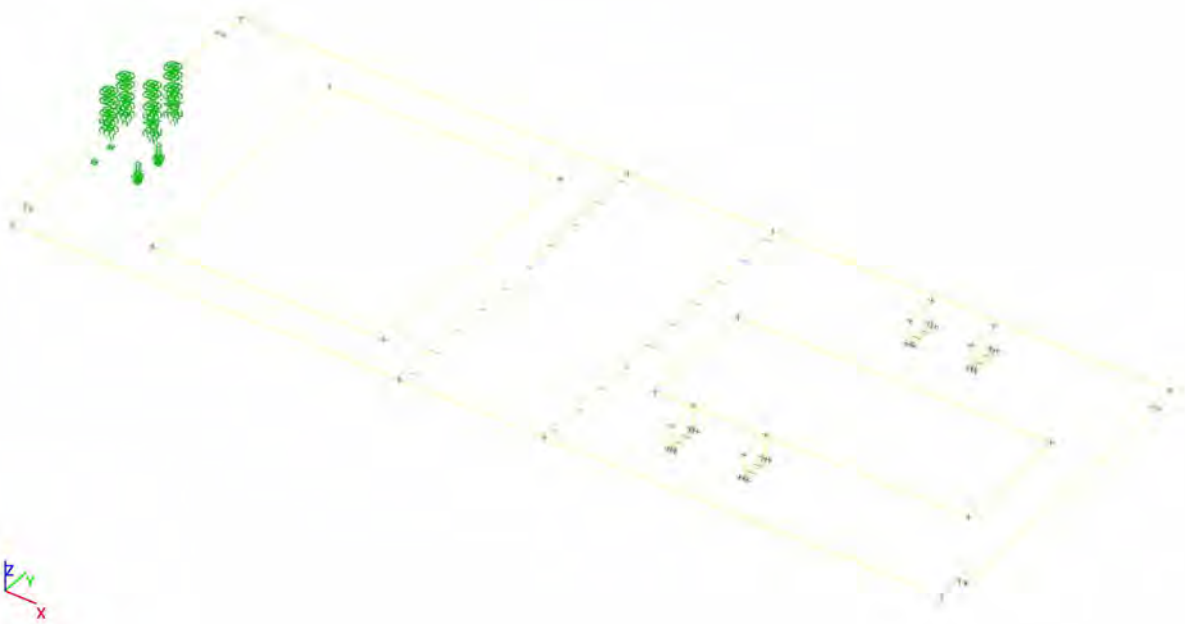
3.2.7. Load cases - BG121

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG121	Traffic load weelloads 1	Variable	LG3	Static	Standard	Short	None



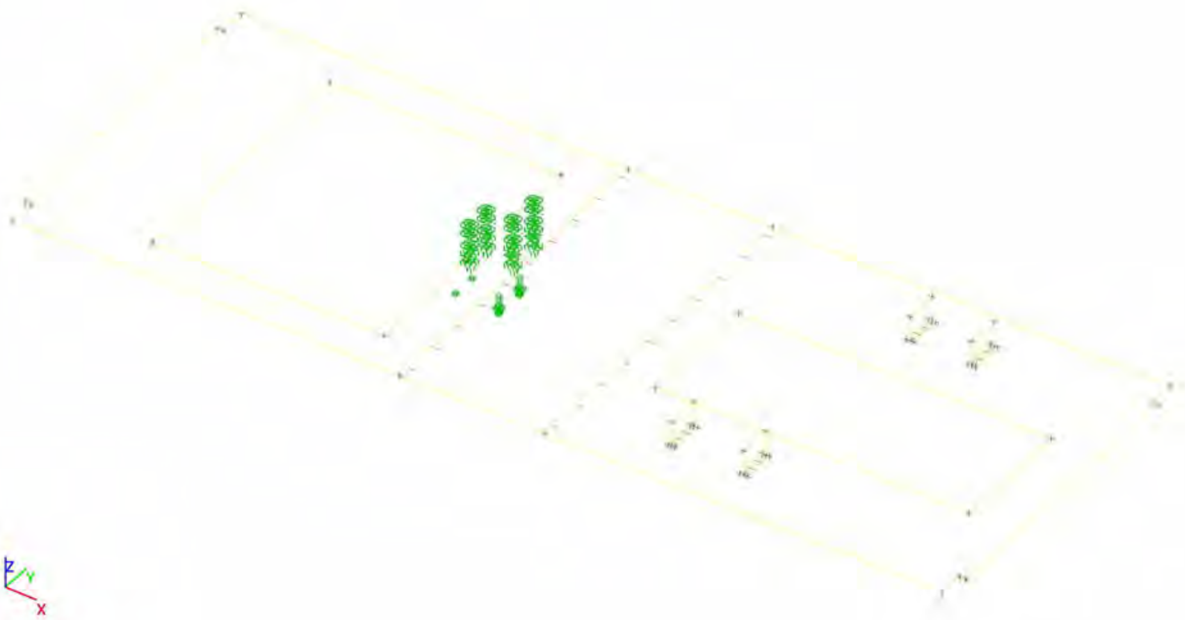
3.2.8. Load cases - BG122

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG122	Traffic load weelloads 2	Variable	LG3	Static	Standard	Short	None



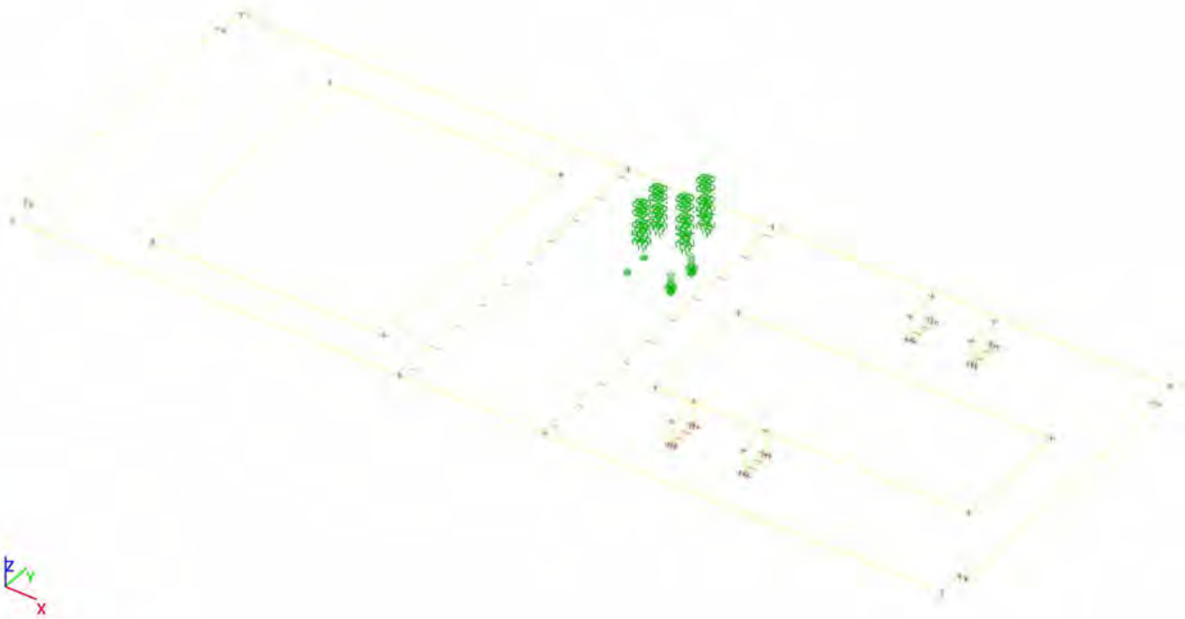
3.2.9. Load cases - BG123

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG123	Traffic load weelloads 3	Variable	LG3	Static	Standard	Short	None



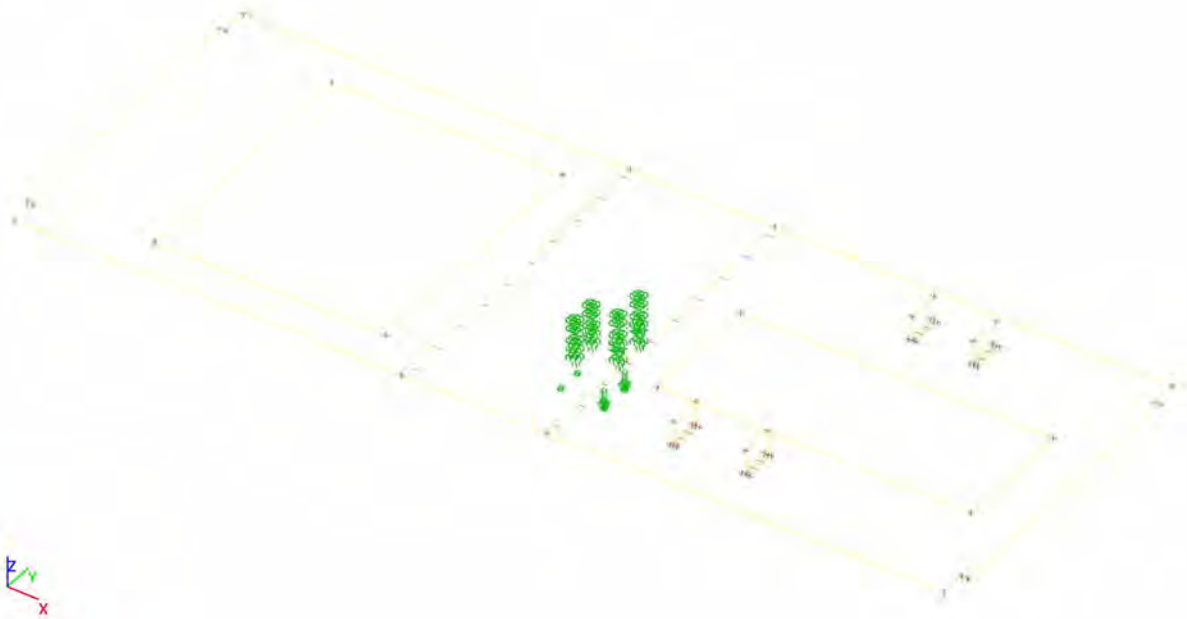
3.2.10. Load cases - BG124

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG124	Traffic load weelloads 4	Variable	LG3	Static	Standard	Short	None



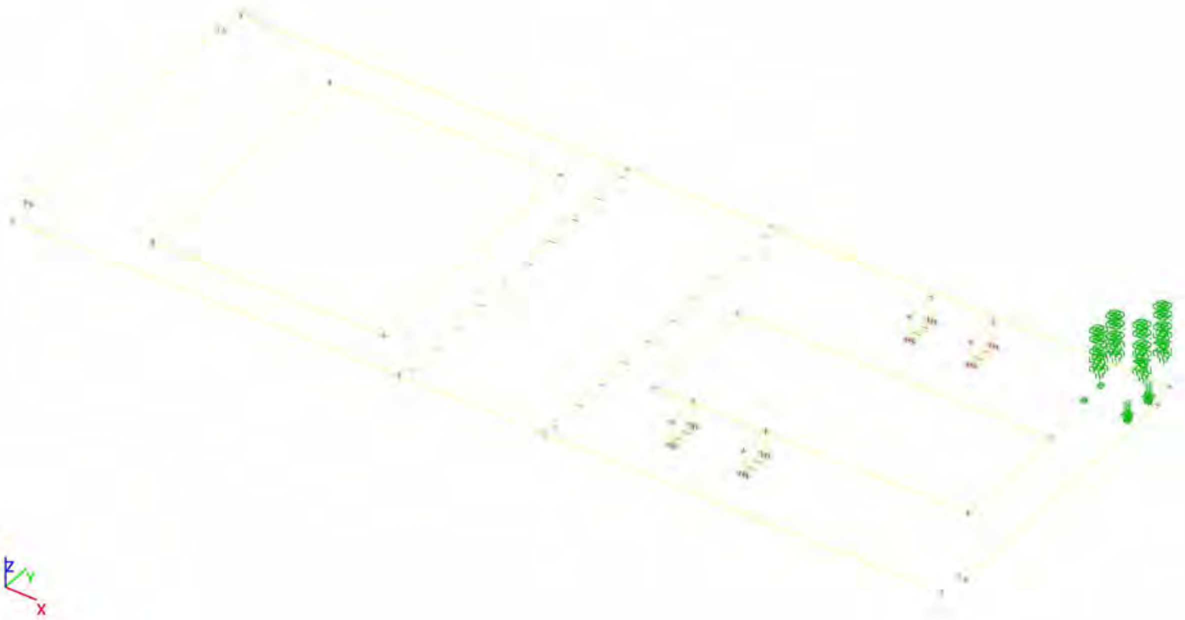
3.2.11. Load cases - BG125

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG125	Traffic load weelloads 5	Variable	LG3	Static	Standard	Short	None



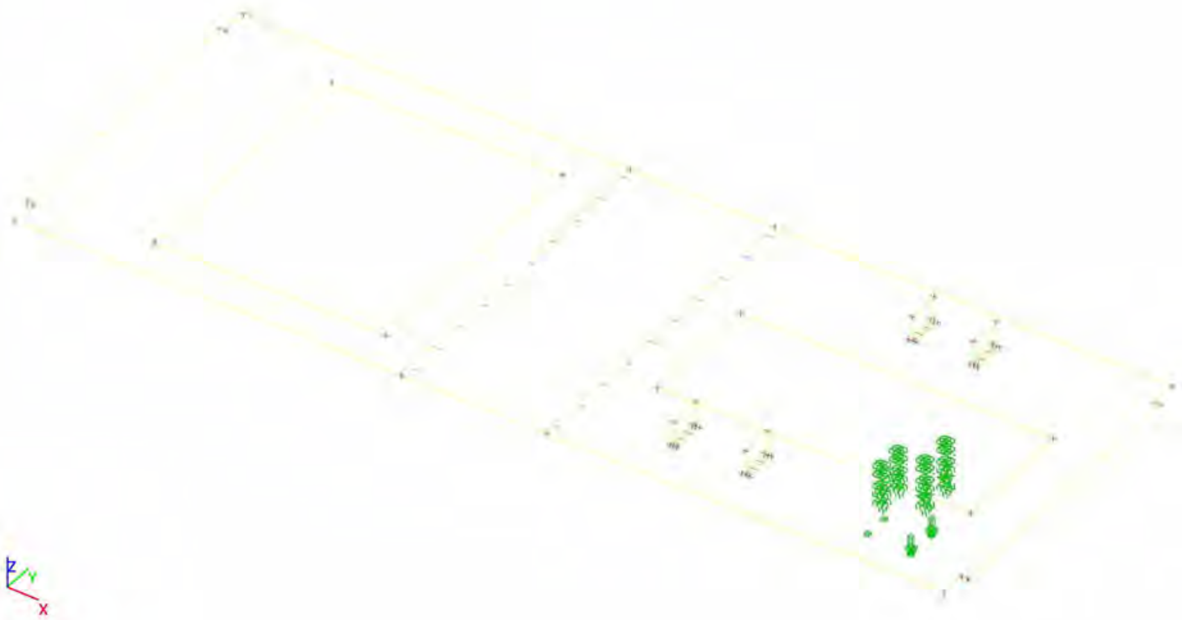
3.2.12. Load cases - BG126

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG126	Traffic load weelloads 6	Variable	LG3	Static	Standard	Short	None



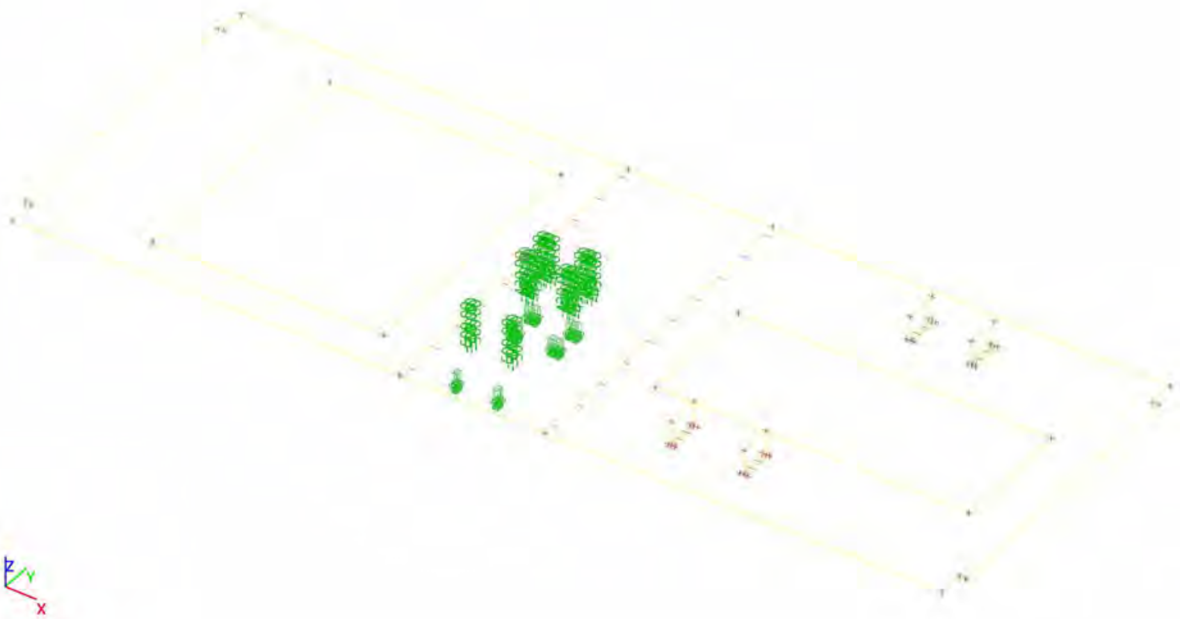
3.2.13. Load cases - BG127

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG127	Traffic load weelloads 7	Variable	LG3	Static	Standard	Short	None



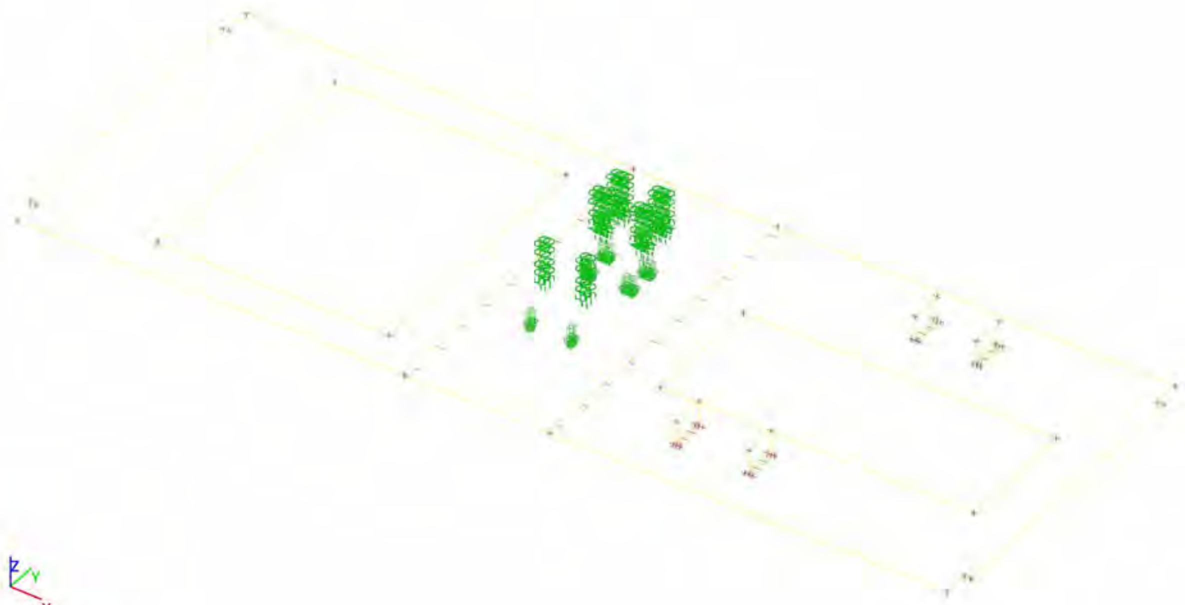
3.2.14. Load cases - BG131

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG131	Traffic load Type 3 1	Variable	LG3	Static	Standard	Short	None



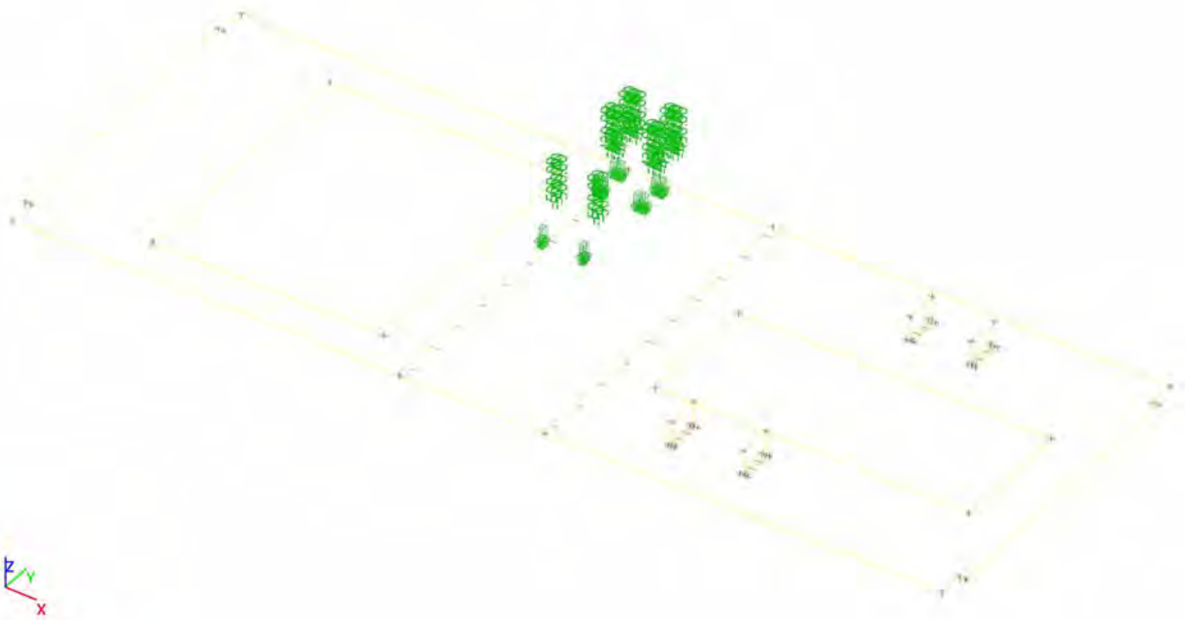
3.2.15. Load cases - BG132

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG132	Traffic load Type 3 2	Variable	LG3	Static	Standard	Short	None



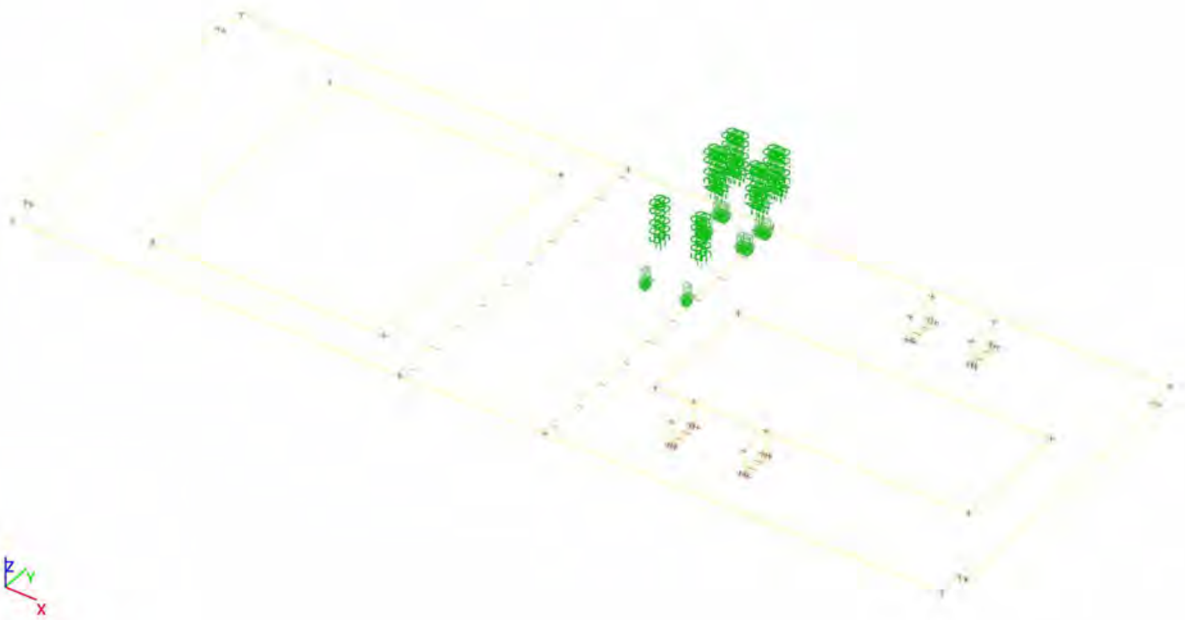
3.2.16. Load cases - BG133

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG133	Traffic load Type 3 3	Variable	LG3	Static	Standard	Short	None



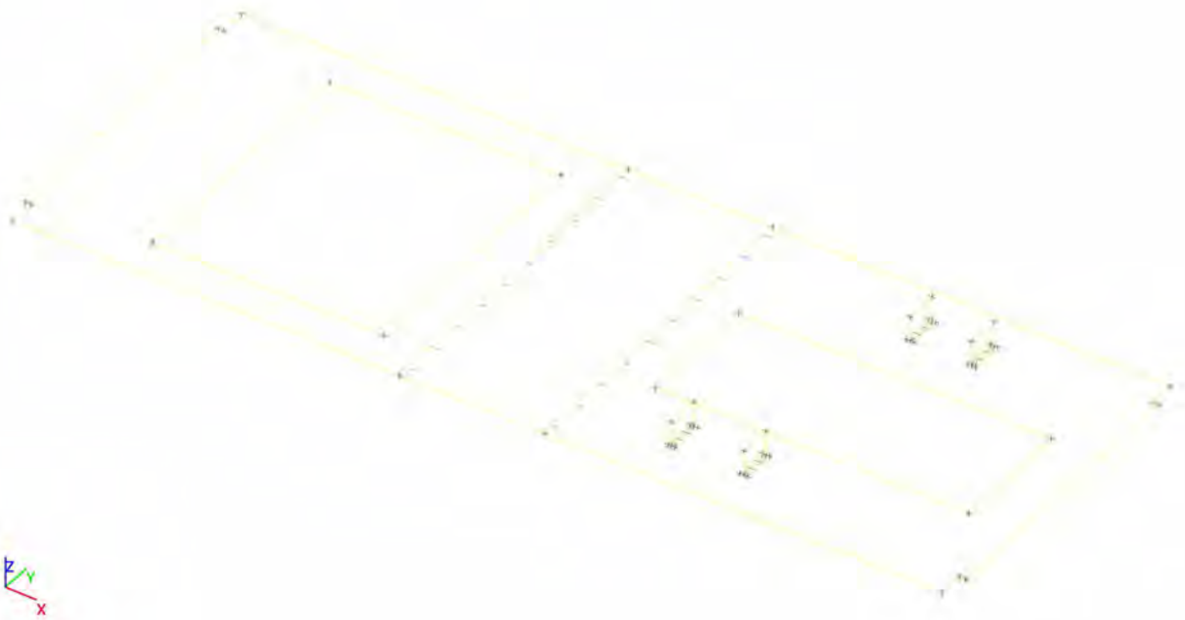
3.2.17. Load cases - BG134

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG134	Traffic load Type 3 4	Variable	LG3	Static	Standard	Short	None



3.2.18. Load cases - BG141

Name	Description	Action type	Load group	Load type	Spec	Duration	Master load case
BG141	Equipment	Variable	LG4	Static	Standard	Short	None



3.3. Load groups

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

3.4. Combinations

Name	Type	Load cases	Coeff. [-]
UGT-Set B	EN-ULS (STR/GEO) Set B	BG101 - Self weight	1.00
		BG102 - Permanent	1.00
		BG111 - Area loads	1.00
		BG112 - Area 1	1.00
		BG113 - Area 2	1.00
		BG114 - Area 3	1.00
		BG121 - Traffic load weelloads 1	1.00
		BG122 - Traffic load weelloads 2	1.00
		BG123 - Traffic load weelloads 3	1.00
		BG124 - Traffic load weelloads 4	1.00
		BG125 - Traffic load weelloads 5	1.00
		BG126 - Traffic load weelloads 6	1.00
		BG127 - Traffic load weelloads 7	1.00
		BG131 - Traffic load Type 3 1	1.00
		BG132 - Traffic load Type 3 2	1.00
		BG133 - Traffic load Type 3 3	1.00
		BG134 - Traffic load Type 3 4	1.00
		BG141 - Equipment	1.00
BGT-kar	EN-SLS Characteristic	BG101 - Self weight	1.00
		BG102 - Permanent	1.00
		BG111 - Area loads	1.00
		BG112 - Area 1	1.00
		BG113 - Area 2	1.00
		BG114 - Area 3	1.00
		BG121 - Traffic load weelloads 1	1.00
		BG122 - Traffic load weelloads 2	1.00
		BG123 - Traffic load weelloads 3	1.00
		BG124 - Traffic load weelloads 4	1.00
		BG125 - Traffic load weelloads 5	1.00
		BG126 - Traffic load weelloads 6	1.00
		BG127 - Traffic load weelloads 7	1.00
		BG131 - Traffic load Type 3 1	1.00
		BG132 - Traffic load Type 3 2	1.00
		BG133 - Traffic load Type 3 3	1.00
		BG134 - Traffic load Type 3 4	1.00
		BG141 - Equipment	1.00
BGT-quasi	EN-SLS Quasi-permanent	BG101 - Self weight	1.00
		BG102 - Permanent	1.00
		BG111 - Area loads	1.00
		BG112 - Area 1	1.00
		BG113 - Area 2	1.00
		BG114 - Area 3	1.00
		BG121 - Traffic load weelloads 1	1.00
		BG122 - Traffic load weelloads 2	1.00
		BG123 - Traffic load weelloads 3	1.00
		BG124 - Traffic load weelloads 4	1.00
		BG125 - Traffic load weelloads 5	1.00
		BG126 - Traffic load weelloads 6	1.00
		BG127 - Traffic load weelloads 7	1.00
		BG131 - Traffic load Type 3 1	1.00
		BG132 - Traffic load Type 3 2	1.00
		BG133 - Traffic load Type 3 3	1.00
		BG134 - Traffic load Type 3 4	1.00
		BG141 - Equipment	1.00

3.5. Result classes

Name	List
GEO	UGT-Set B - EN-ULS (STR/GEO) Set B
Alle UGT	UGT-Set B - EN-ULS (STR/GEO) Set B
Alle BGT	BGT-kar - EN-SLS Characteristic BGT-quasi - EN-SLS Quasi-permanent
Alle UGT+BGT	UGT-Set B - EN-ULS (STR/GEO) Set B BGT-kar - EN-SLS Characteristic BGT-quasi - EN-SLS Quasi-permanent

4. Calculation protocol

Linear calculation

Number of 2D elements	5810
Number of 1D elements	0
Number of mesh nodes	6177
Number of equations	37062
Bending theory	Mindlin
Load cases	BG101, BG111, BG112, BG113, BG114, BG121, BG122, BG123, BG124, BG125, BG126, BG127, BG131, BG132, BG133, BG134
Start of calculation	20.11.2022 14:13
End of calculation	20.11.2022 14:13

Sum of loads and reactions

Load case	Value	X [kN]	Y [kN]	Z [kN]
BG101	loads	0.00	0.00	-3962.10
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	3962.10
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG102	loads	0.00	0.00	0.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG111	loads	0.00	0.00	-13144.57
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	13144.57
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG112	loads	0.00	0.00	-2725.80
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	2725.80
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG113	loads	0.00	0.00	-6435.74
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	6435.74
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG114	loads	0.00	0.00	-3983.04
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	3983.04
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG121	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG122	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG123	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG124	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG125	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00

Load case	Value	X [kN]	Y [kN]	Z [kN]
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG126	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG127	loads	0.00	0.00	-224.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	224.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG131	loads	0.00	0.00	-312.58
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	312.58
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG132	loads	0.00	0.00	-312.58
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	312.58
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG133	loads	0.00	0.00	-312.58
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	312.58
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG134	loads	0.00	0.00	-312.58
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	312.58
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00
BG141	loads	0.00	0.00	0.00
	reaction in nodes	0.00	0.00	0.00
	reaction on lines	0.00	0.00	0.00
	contact 1D	0.00	0.00	0.00
	contact 2D	0.00	0.00	0.00

5. Resultaten

5.1. Vervormingen

5.1.1. 3D verplaatsingen

5.1.1.1. 3D displacement

Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element
Results on 2D member:
Extreme 2D: Global

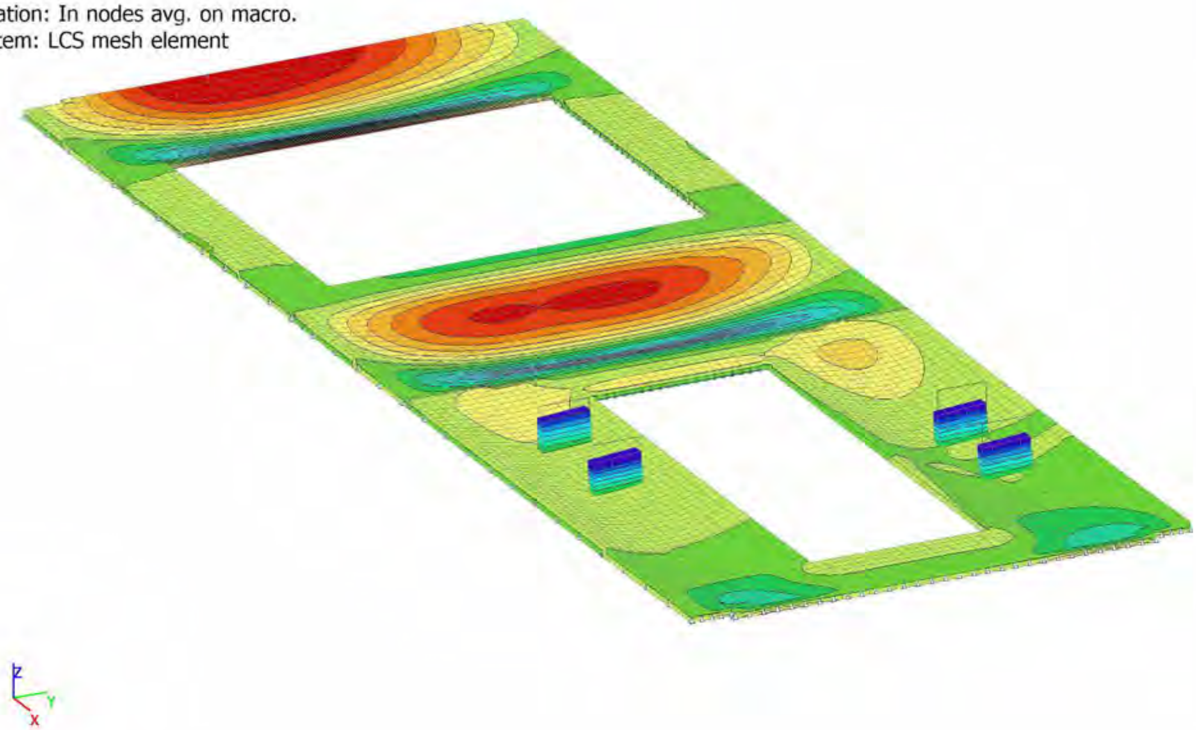
Name	Mesh	Position [m]	Case	ux+ [mm] ux- [mm]	uy+ [mm] uy- [mm]	uz+ [mm] uz- [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U total+ [mm] U total- [mm]
E20	Element: 5766 Node: 48	46.466 8.200 1.200	BGT-kar/1	**-0.5** **-0.5**	-1.9 -2.1	0.1 0.1	0.1	0.0	0.5	2.0 2.1
E21	Element: 5785 Node: 6147	47.065 17.800 0.900	BGT-kar/2	-0.4 -0.4	-3.7 **-3.9**	0.0 0.0	0.0	0.0	0.4	3.8 3.9
E18	Element: 2385 Node: 2606	34.589 14.108 0.000	BGT-kar/3	0.0 0.0	0.0 0.0	**-6.3** **-6.3**	0.0	0.2	0.0	**6.3** **6.3**
E18	Element: 1439 Node: 1158	30.337 13.806 0.000	BGT-kar/3	0.0 0.0	0.0 0.0	**0.4** **0.4**	0.0	-0.1	0.0	0.4 0.4

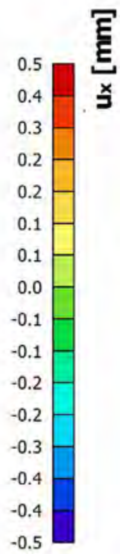
Name	Mesh	Position [m]	Case	ux+ [mm] ux- [mm]	uy+ [mm] uy- [mm]	uz+ [mm] uz- [mm]	φx [mrad]	φy [mrad]	φz [mrad]	U total+ [mm] U total- [mm]
E18	Element: 3681 Node: 3708	47.706 15.490 0.000	BGT-kar/2	0.0 0.0	**0.3** -0.3	0.0 0.0	**-2.3**	0.0	0.0	0.3 0.3
E18	Element: 5585 Node: 3456	47.269 21.050 0.000	BGT-kar/2	0.0 0.0	-0.3 **0.3**	0.0 0.0	**2.2**	0.0	0.0	0.3 0.3
E18	Element: 597 Node: 328	18.003 11.427 0.000	BGT-kar/4	-0.5 **0.5**	0.0 0.0	0.0 0.0	0.0	**-3.1**	0.0	0.5 0.5
E18	Element: 293 Node: 3385	12.250 11.112 0.000	BGT-kar/4	**0.5** -0.5	0.0 0.0	0.0 0.0	0.0	**3.1**	0.0	0.5 0.5
E21	Element: 5775 Node: 50	47.065 17.800 0.000	BGT-kar/2	0.0 0.0	**-3.8** -3.7	0.0 0.0	0.0	0.0	**-0.3**	3.8 3.7
E21	Element: 5771 Node: 49	47.065 19.400 0.000	BGT-kar/2	0.0 0.0	-2.9 -3.3	0.0 0.0	0.0	0.0	**1.0**	2.9 3.3
E18	Element: 385 Node: 117	30.052 21.050 0.000	BGT-kar/5	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
BGT-kar/1	BG101 + BG102 + BG111 + BG127
BGT-kar/2	BG101 + BG102 + BG114 + BG126
BGT-kar/3	BG101 + BG102 + BG113 + BG132
BGT-kar/4	BG101 + BG102 + BG111 + BG122
BGT-kar/5	BG101 + BG102 + BG114

5.1.1.2. Resultaten - u_x

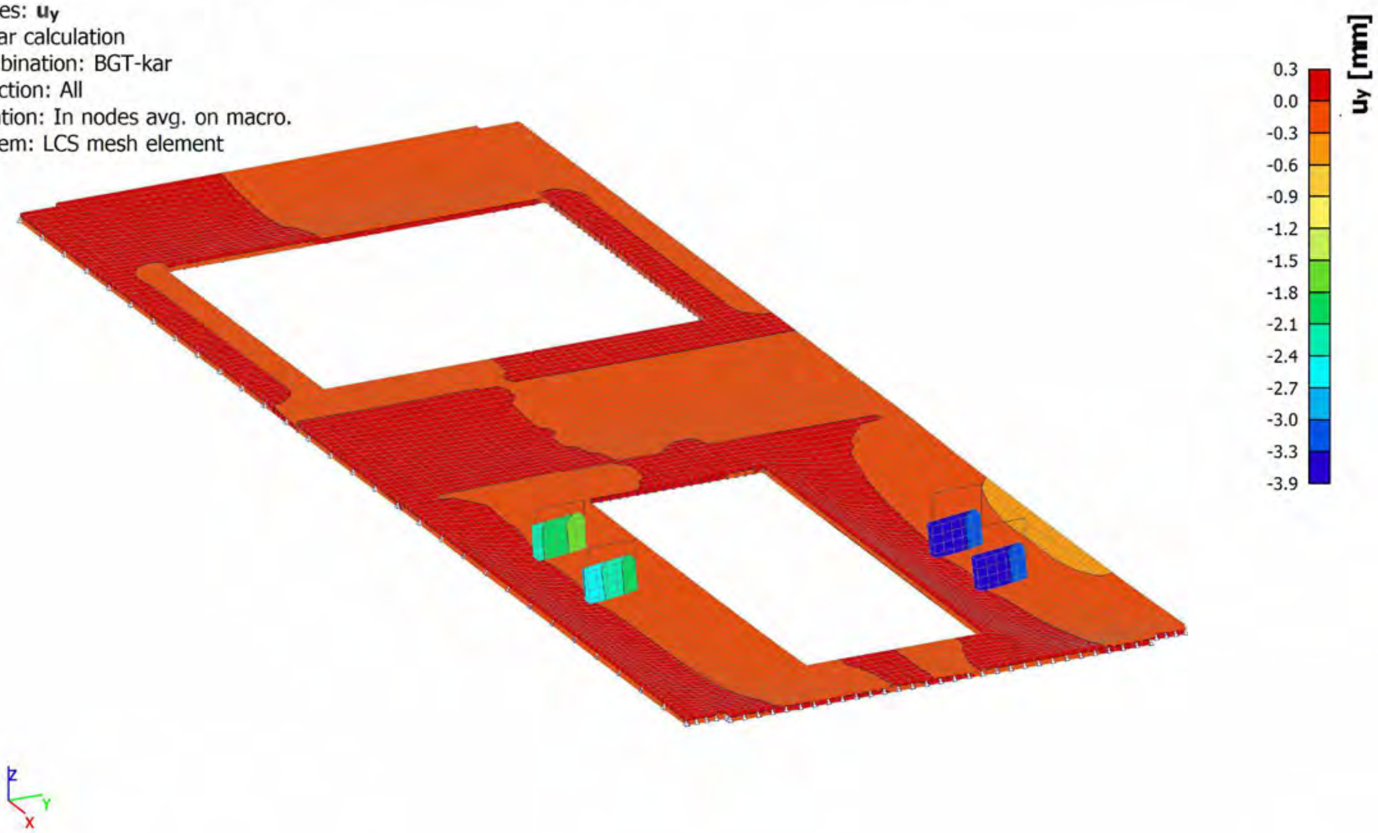
Values: u_x
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element





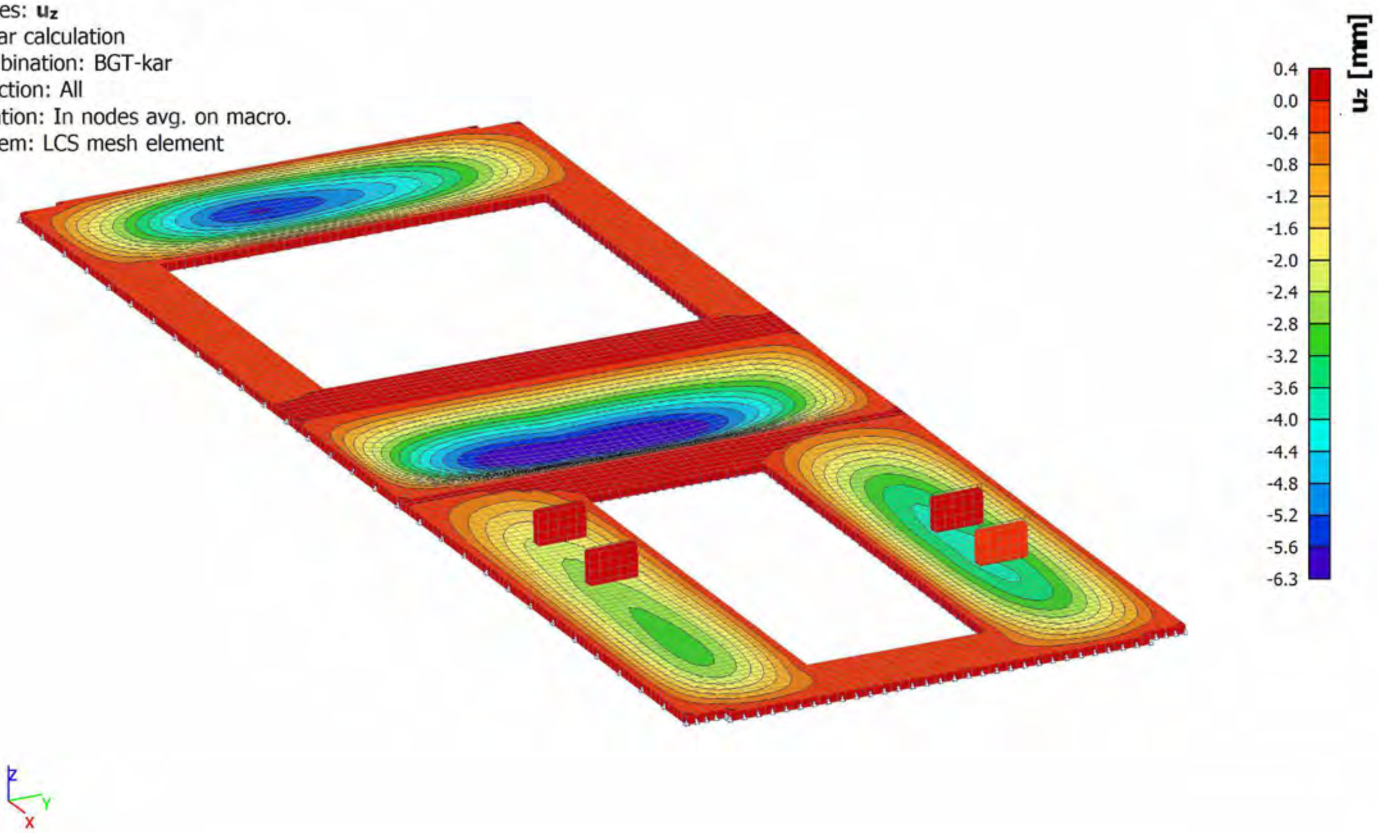
5.1.1.3. Resultaten - u_y

Values: u_y
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



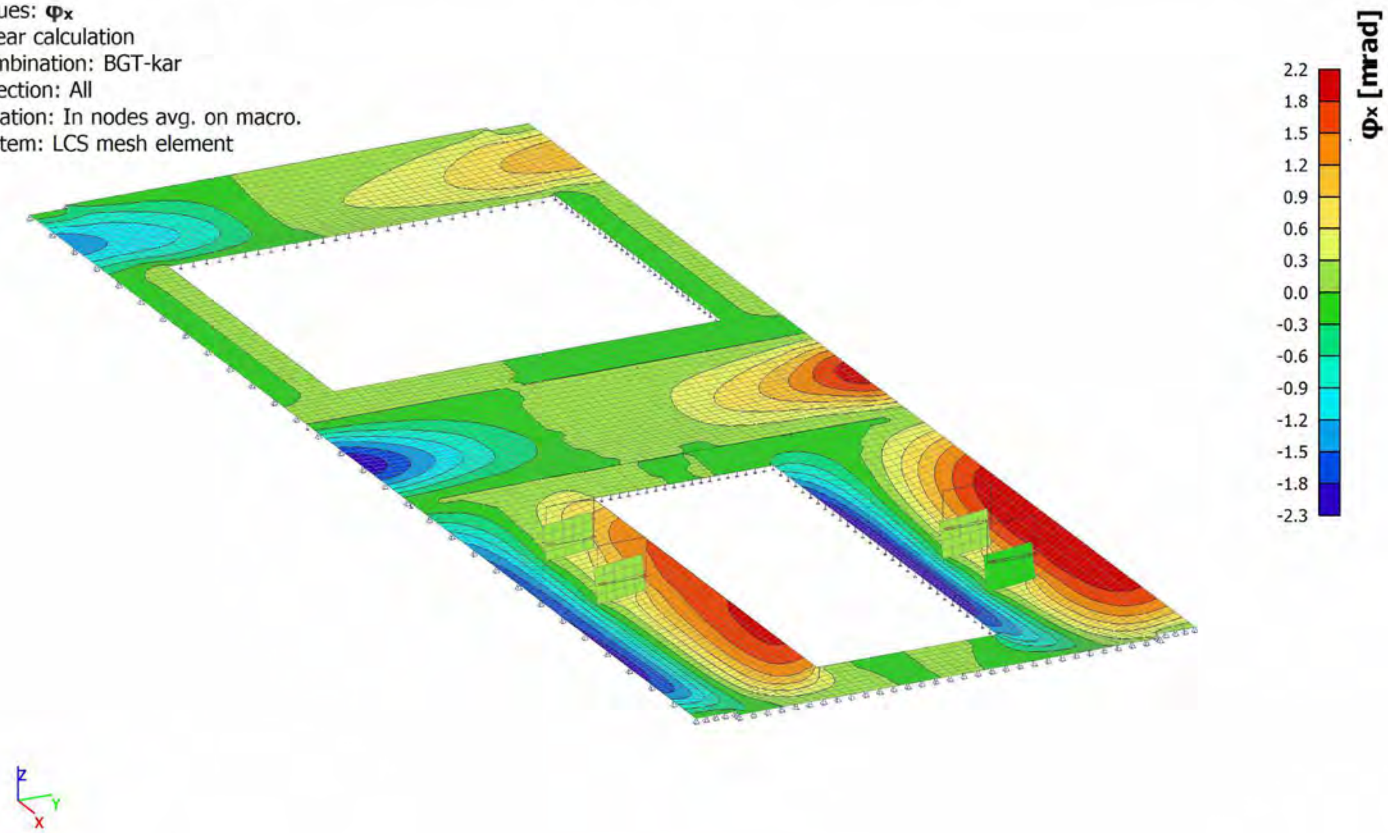
5.1.1.4. Resultaten - u_z

Values: u_z
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



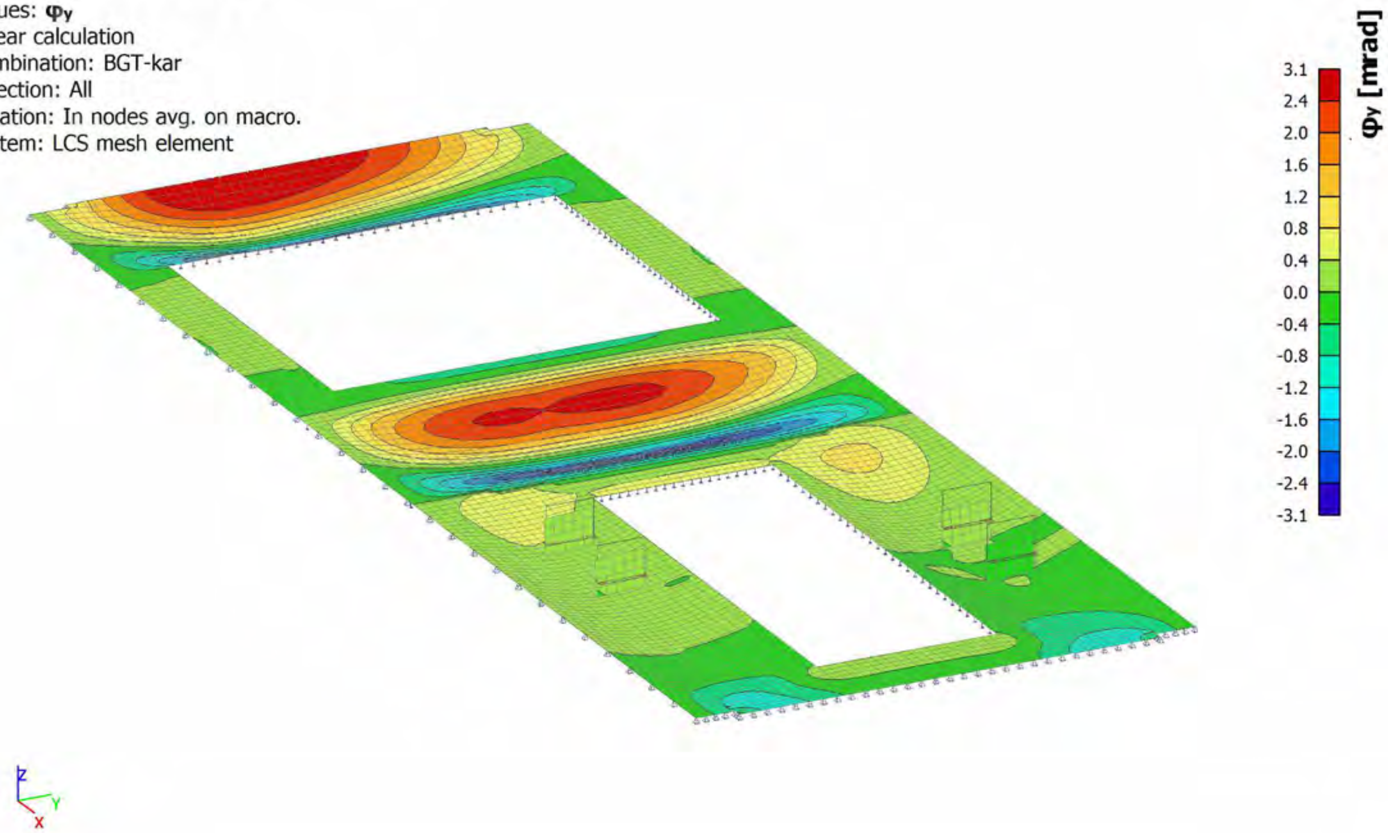
5.1.1.5. Resultaten - φ_x

Values: φ_x
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



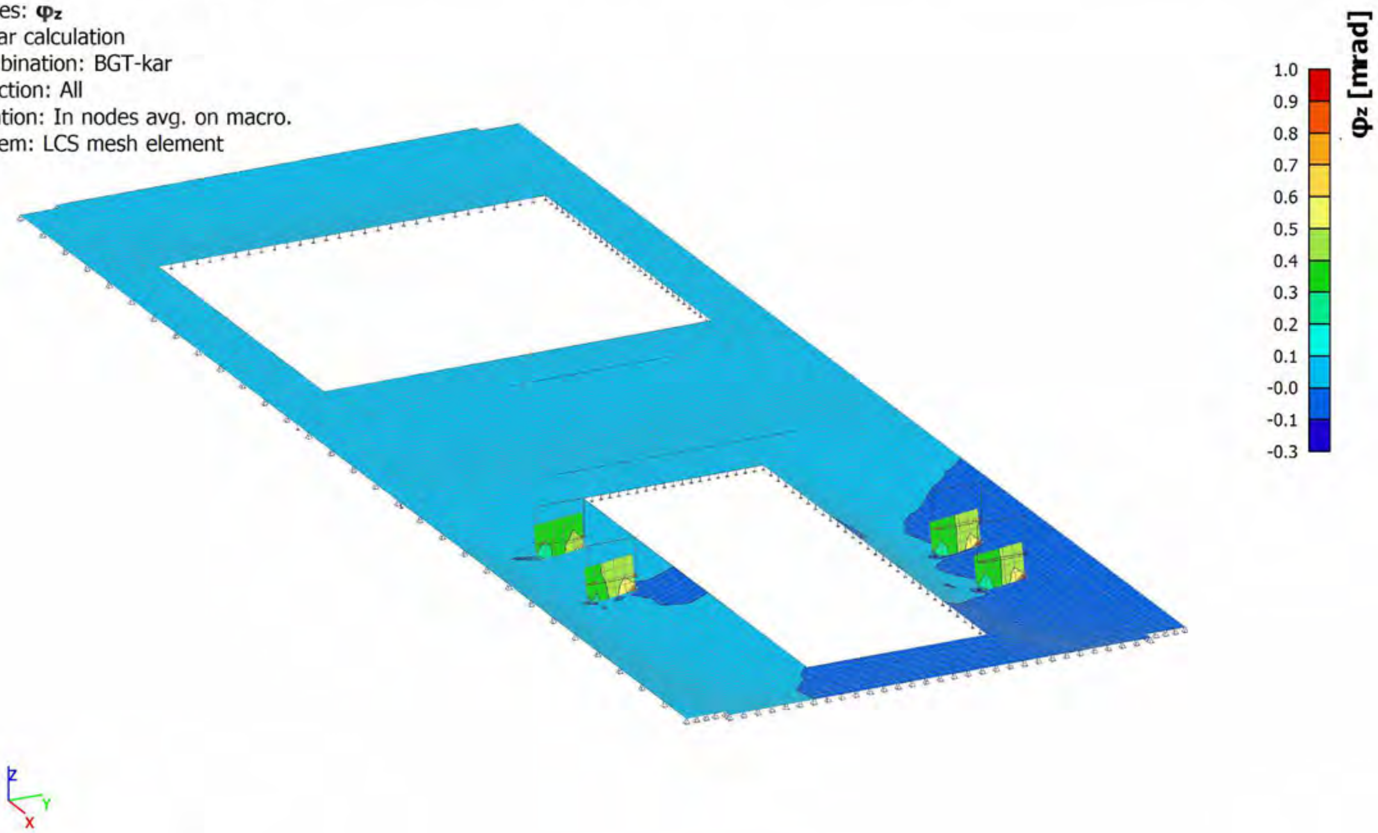
5.1.1.6. Resultaten - φ_y

Values: φ_y
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



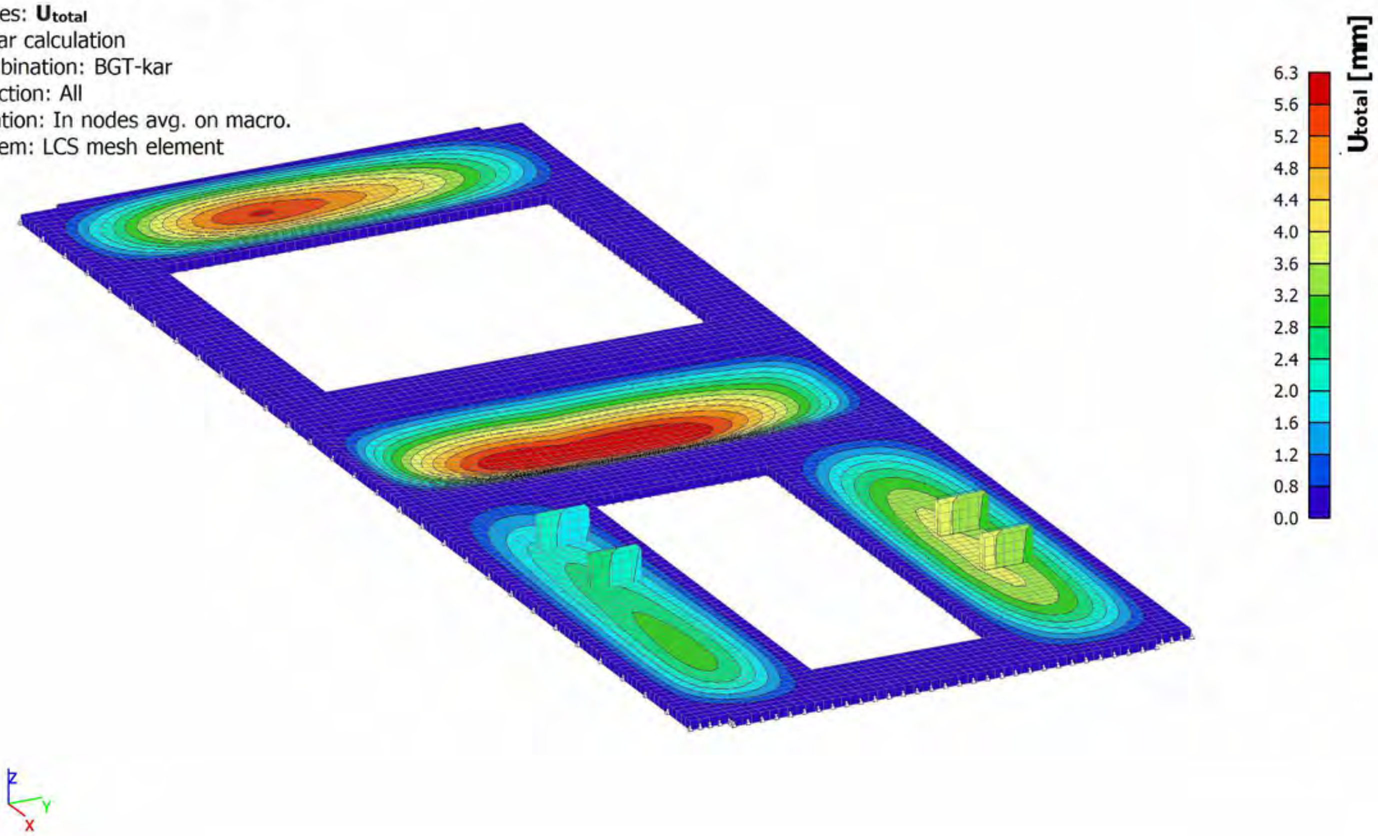
5.1.1.7. Resultaten - φ_z

Values: φ_z
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



5.1.1.8. Resultaten - U_total

Values: U_{total}
Linear calculation
Combination: BGT-kar
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



5.2. Forces

5.2.1. Reactiekrachten

5.2.1.1. Reactions

Linear calculation
Load case: BG101
System: Global
Extreme: Global
Selection: All
Linear Intensity

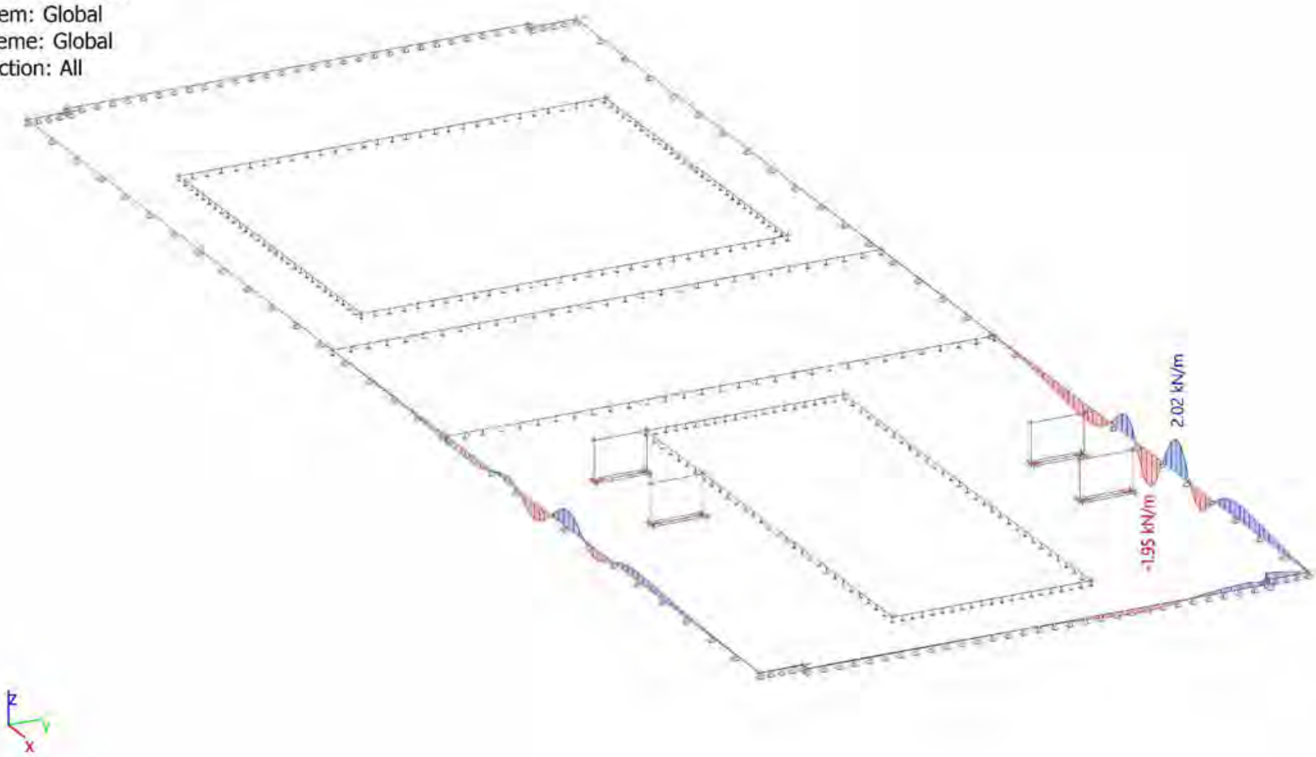
Name	dx [m]	Case	R_x [kN/m]	R_y [kN/m]	R_z [kN/m]	M_x [kNm/m]	M_y [kNm/m]	M_z [kNm/m]
Sle15/E18	35.070	BG101	**-1.95**	-2.97	25.21	0.00	0.00	0.00
Sle15/E18	36.875	BG101	**2.02**	-1.94	24.43	**0.00**	**0.00**	**0.00**
Sle15/E18	34.468	BG101	-0.22	**-4.58**	26.26	0.00	0.00	0.00
Sle1/E18	10.833	BG101	0.00	**2.28**	22.04	0.00	0.00	0.00
Sle12/E18	14.000	BG101	0.00	0.00	**-183.71**	0.00	0.00	0.00
Sle13/E18	0.250	BG101	0.00	0.00	**420.44**	0.00	0.00	0.00

Reactions on line supports

Name	dx [m]	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e [mm]
Sle15/E18	35.070	BG101	**-0.59**	-0.89	7.59	0.00	0.00	0.00	0.0
Sle15/E18	36.875	BG101	**0.61**	-0.58	7.35	**0.00**	**0.00**	**0.00**	0.0
Sle15/E18	34.468	BG101	-0.06	**-1.38**	7.90	0.00	0.00	0.00	0.0
Sle1/E18	10.833	BG101	0.00	**0.69**	6.63	0.00	0.00	0.00	0.0
Sle12/E18	14.000	BG101	0.00	0.00	**-50.33**	0.00	0.00	0.00	0.0
Sle13/E18	0.250	BG101	0.00	0.00	**120.88**	0.00	0.00	0.00	0.0

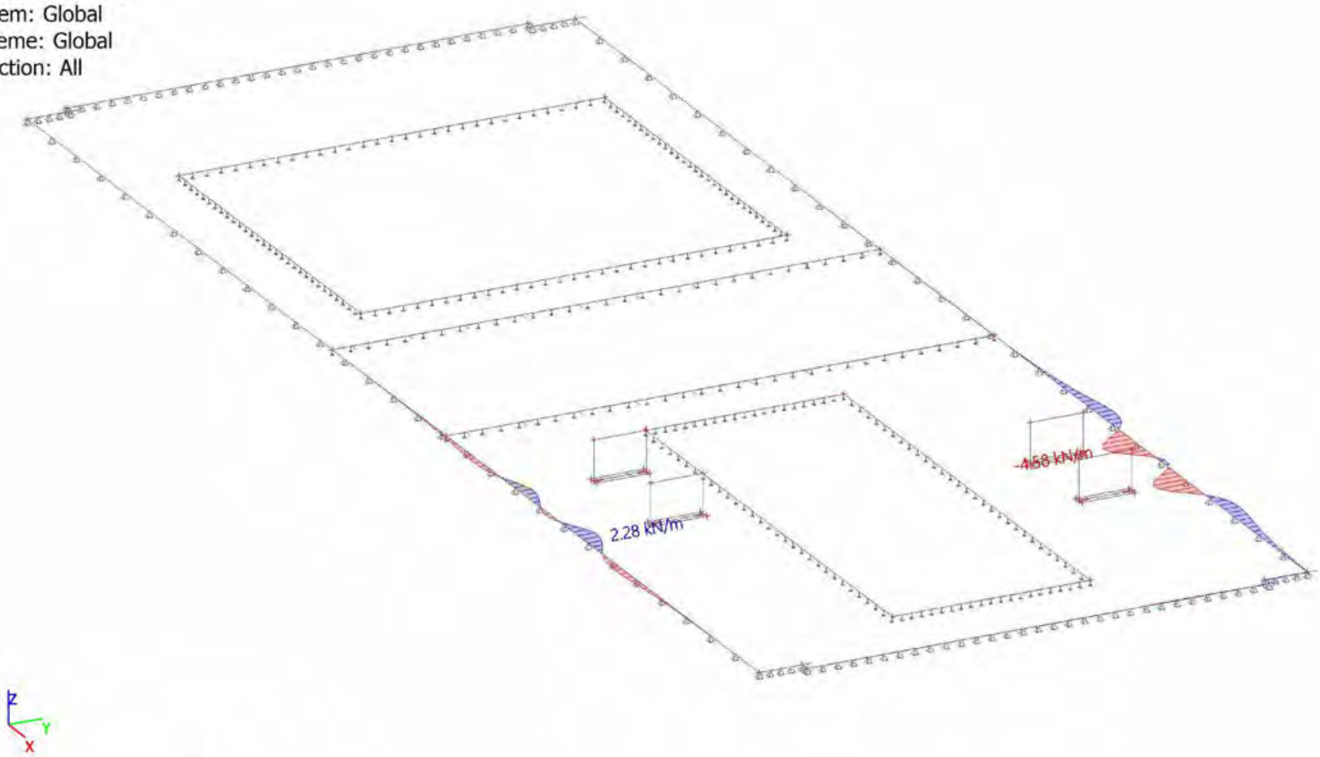
5.2.1.2. Resultaten - R_x

Values: $\mathbf{R_x}$
Linear calculation
Load case: BG101
System: Global
Extreme: Global
Selection: All



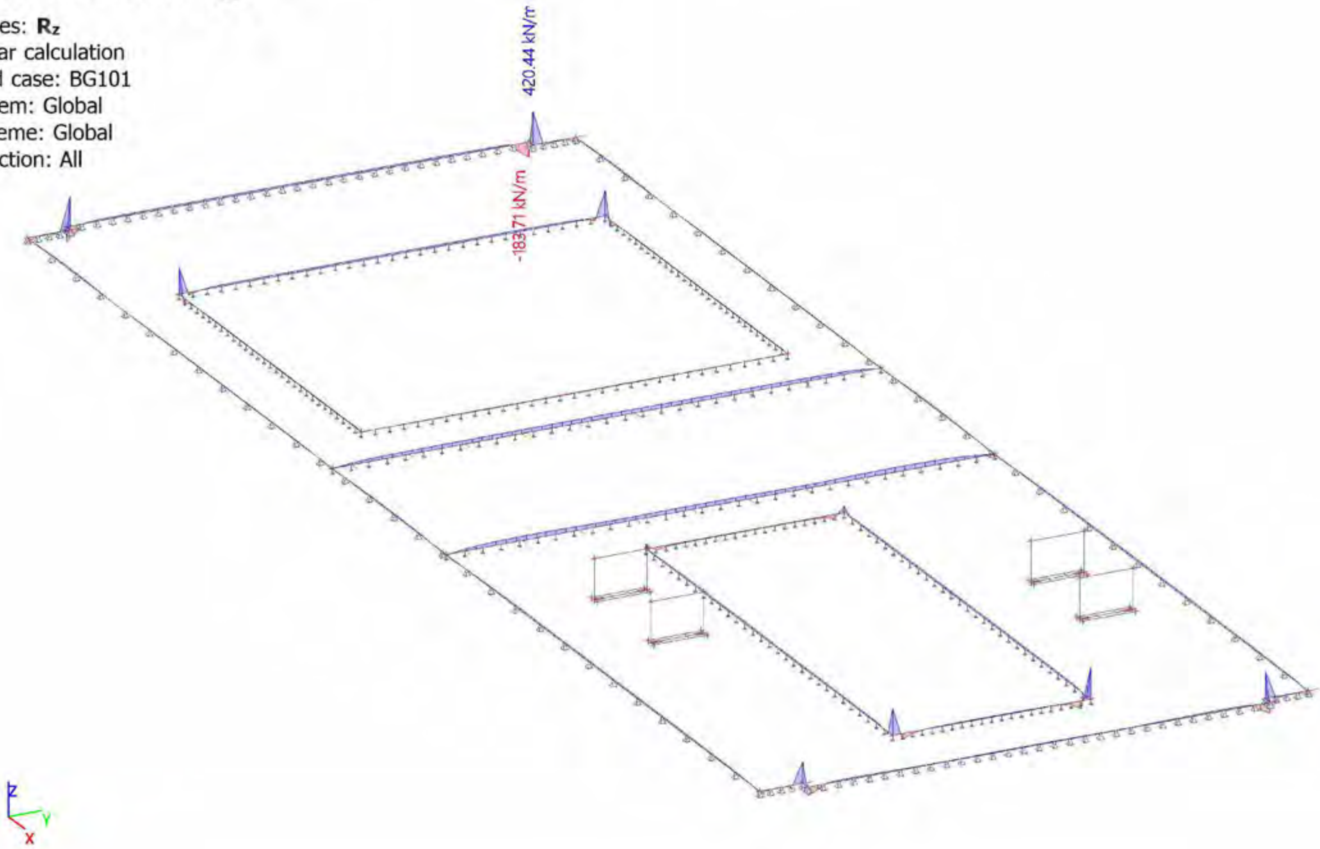
5.2.1.3. Resultaten - R_y

Values: $\mathbf{R_y}$
Linear calculation
Load case: BG101
System: Global
Extreme: Global
Selection: All



5.2.1.4. Resultaten - R_z

Values: $\mathbf{R_z}$
Linear calculation
Load case: BG101
System: Global
Extreme: Global
Selection: All



5.2.2. 3D stress

5.2.2.1. 3D stress

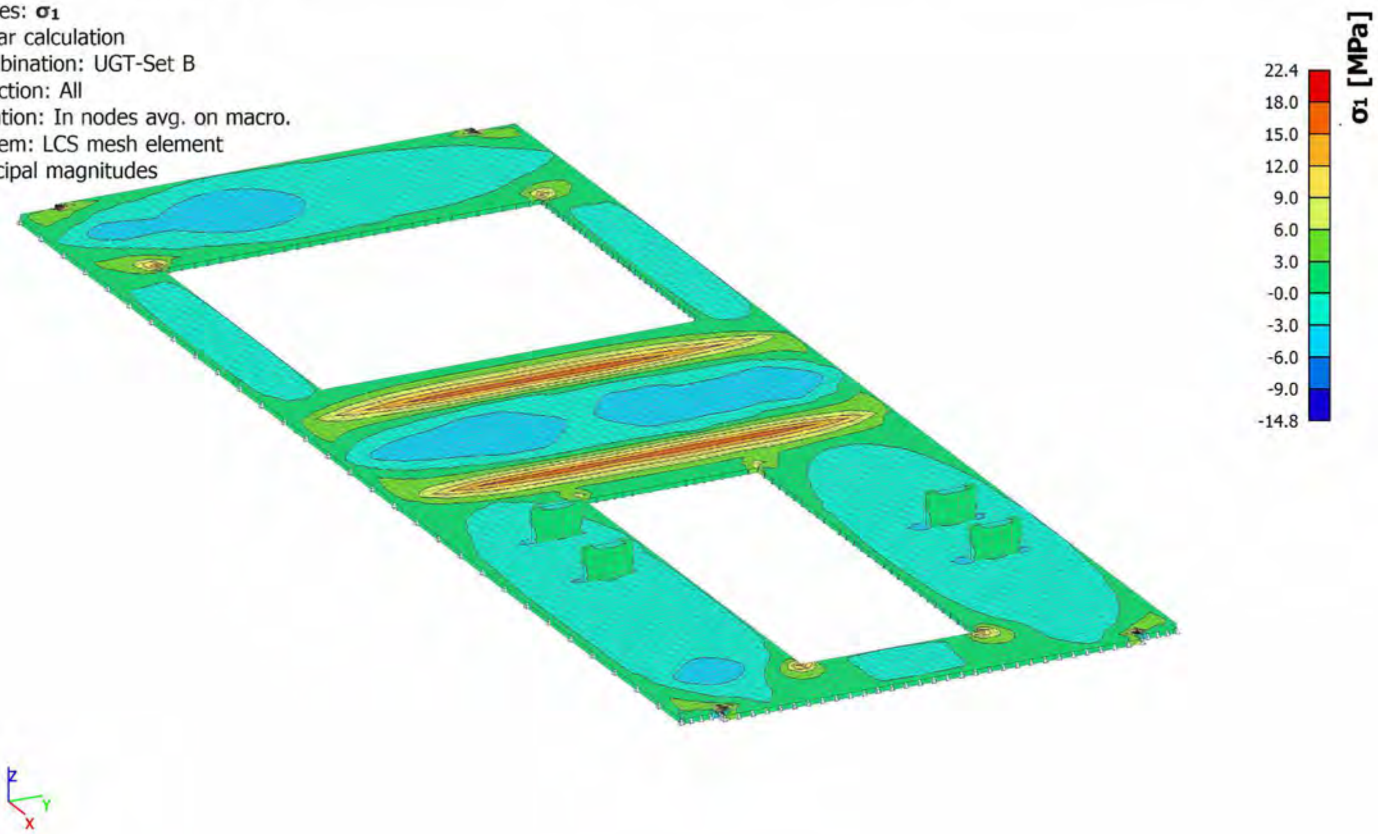
Linear calculation
Combination: UGT-Set B
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element
Principal magnitudes
Results on 2D member
Extreme 2D: Global

Name	Mesh	Position [m]	Case	σ_{E+} [MPa] σ_{E-} [MPa]	σ_{1+} [MPa] σ_{1-} [MPa]	σ_{2+} [MPa] σ_{2-} [MPa]	$\alpha+$ [deg] $\alpha-$ [deg]	$\tau_{max,b}$ [MPa]
E18	Element: 407 Node: 140	25.887 4.450 0.000	UGT-Set B/1	**0.0** 0.0	0.0 0.0	0.0 0.0	-37.67 52.64	0.0
E18	Element: 372 Node: 104	26.184 21.050 0.000	UGT-Set B/2	0.0 **0.0**	0.0 0.0	0.0 0.0	41.61 -34.34	0.0
E18	Element: 3163 Node: 49	47.065 19.400 0.000	UGT-Set B/3	12.0 15.2	**-7.2** 17.5	-13.8 7.8	-6.87 -83.25	5.4
E18	Element: 276 Node: 2	12.500 5.750 0.000	UGT-Set B/4	**19.8** 19.8	**22.4** -7.0	7.0 -22.4	8.60 -81.40	10.8
E18	Element: 275 Node: 2	12.500 5.750 0.000	UGT-Set B/5	18.9 18.9	21.2 **-14.8**	14.8 -21.2	-19.18 70.82	17.4
E18	Element: 3159 Node: 50	47.065 17.800 0.000	UGT-Set B/6	13.3 16.8	-7.0 **19.3**	-15.3 7.7	7.07 85.22	5.6
E18	Element: 3763 Node: 50	47.065 17.800 0.000	UGT-Set B/6	16.7 13.1	-5.7 14.8	**-18.8** 4.9	-0.87 89.29	3.4
E18	Element: 275 Node: 2	12.500 5.750 0.000	UGT-Set B/7	18.9 18.9	21.2 -14.8	**14.8** -21.2	-19.18 70.82	**17.4**
E18	Element: 276 Node: 2	12.500 5.750 0.000	UGT-Set B/8	19.8 **19.8**	22.4 -7.0	7.0 **-22.4**	8.60 -81.40	10.8
E18	Element: 3169 Node: 54	50.065 17.800 0.000	UGT-Set B/3	13.2 16.7	-7.2 19.2	-15.2 **7.9**	7.79 85.39	5.6
E21	Element: 5786 Node: 52	47.065 19.400 1.200	UGT-Set B/9	0.1 0.1	0.1 0.1	0.0 0.0	-56.38 -56.21	**0.0**

Name	Combination key
UGT-Set B/1	0.90*BG101 + 0.90*BG102 + 1.50*BG114 + 1.50*BG125
UGT-Set B/2	0.90*BG101 + 0.90*BG102 + 1.50*BG114 + 1.50*BG126
UGT-Set B/3	1.35*BG101 + 1.35*BG102 + 1.50*BG111 + 1.50*BG126
UGT-Set B/4	1.35*BG101 + 1.35*BG102 + 1.50*BG111 + 1.50*BG122
UGT-Set B/5	1.35*BG101 + 1.35*BG102 + 1.50*BG112 + 1.50*BG121
UGT-Set B/6	1.35*BG101 + 1.35*BG102 + 1.50*BG114 + 1.50*BG126
UGT-Set B/7	1.35*BG101 + 1.35*BG102 + 1.50*BG111 + 1.50*BG121
UGT-Set B/8	1.35*BG101 + 1.35*BG102 + 1.50*BG112 + 1.50*BG122
UGT-Set B/9	0.90*BG101 + 0.90*BG102 + 1.50*BG113 + 1.50*BG126

5.2.2.2. Resultaten - σ_1

Values: σ_1
Linear calculation
Combination: UGT-Set B
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element
Principal magnitudes



6. Concrete

6.1. Design forces

6.1.1. Internal forces 2D

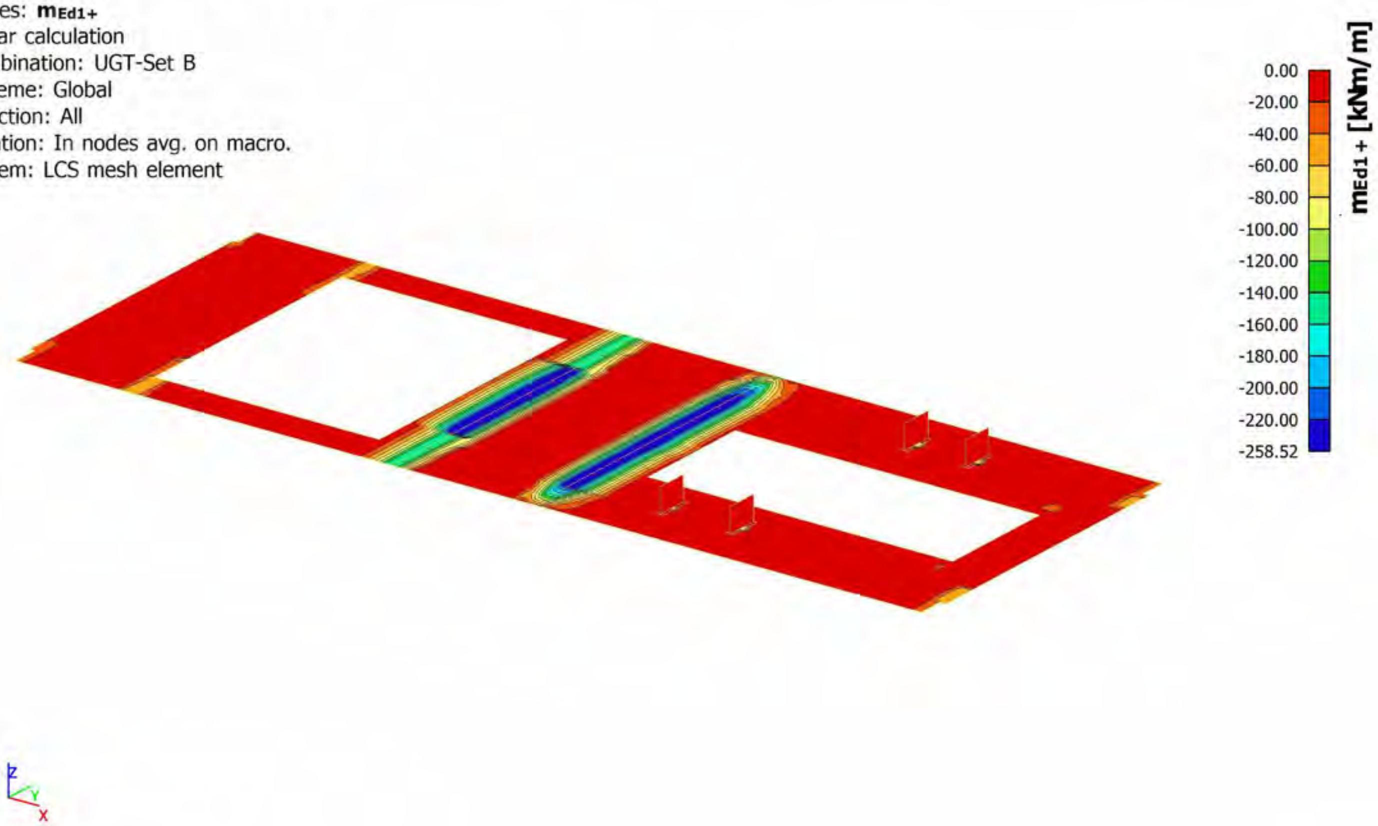
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element
Design internal forces in centroidal plane

Name	Mesh	Position [m]	Case	m_{Ed1+} [kNm/m] n_{Ed1+} [kN/m]	m_{Ed2+} [kNm/m] n_{Ed2+} [kN/m]	m_{Edc+} [kNm/m] n_{Edc+} [kN/m]	m_{Ed1-} [kNm/m] n_{Ed1-} [kN/m]	m_{Ed2-} [kNm/m] n_{Ed2-} [kN/m]	m_{Edc-} [kNm/m] n_{Edc-} [kN/m]	v_{Ed} [kN/m]
E18	Element: 1832 Node: 367	31.241 14.108 0.000	UGT-Set B/1	**-258.52** 17.63	-51.24 17.66	-0.58 -35.29	0.00 17.63	**0.00** 17.66	0.00 -35.29	195.78
E18	Element: 4292 Node: 5144	56.003 9.255 0.000	UGT-Set B/2	0.00 230.69	**-77.97** 230.64	-11.82 -461.17	28.64 230.69	0.00 230.64	0.00 -461.17	130.12
E22	Element: 5791 Node: 53	50.065 19.400 0.000	UGT-Set B/3	-1.92 -326.06	-36.01 -2358.74	**-50.67** -2950.10	0.00 -326.06	0.00 -2358.74	0.00 -2950.10	19.91
E18	Element: 1591 Node: 1386	15.265 10.788 0.000	UGT-Set B/4	**0.00** 29.17	**0.00** 29.17	**0.00** -58.34	**214.88** 29.17	83.42 29.17	1.11 -58.34	58.08
E18	Element: 1870 Node: 2069	31.850 20.748 0.000	UGT-Set B/5	-75.01 **660.55**	0.00 660.53	-31.28 -1321.12	**0.00** **660.55**	31.38 660.53	**0.00** -1321.12	90.81
E21	Element: 5774 Node: 3393	47.065 18.120 0.000	UGT-Set B/6	0.00 127.85	0.00 **1474.12**	-2.16 -97.70	1.41 127.85	22.04 **1474.12**	0.00 -97.70	1.68
E18	Element: 3154 Node: 50	47.065 17.800 0.000	UGT-Set B/6	0.00 390.13	0.00 900.41	0.00 -623.81	78.96 390.13	215.47 900.41	**65.51** -623.81	1110.48
E21	Element: 5775 Node: 50	47.065 17.800 0.000	UGT-Set B/6	-5.22 **-334.88**	-36.53 **-2463.97**	-50.15 **-3185.76**	0.00 **-334.88**	0.00 **-2463.97**	0.00 **-3185.76**	4.62
E18	Element: 1034 Node: 1923	24.663 5.380 0.000	UGT-Set B/7	0.00 0.01	0.00 0.00	0.00 **0.00**	0.60 0.01	2.97 0.00	0.00 **0.00**	0.06
E21	Element: 5786 Node: 52	47.065 19.400 1.200	UGT-Set B/8	-0.39 26.46	-0.56 37.98	0.00 -27.69	0.00 26.46	0.00 37.98	0.41 -27.69	**0.01**
E18	Element: 3159 Node: 50	47.065 17.800 0.000	UGT-Set B/6	0.00 390.38	0.00 897.84	-45.68 -590.68	134.29 390.38	**270.89** 897.84	0.00 -590.68	**1119.44**

Name	Combination key
UGT-Set B/1	1.35*BG101 + 1.35*BG102 + 1.50*BG113 + 1.50*BG132
UGT-Set B/2	1.35*BG101 + 1.35*BG102 + 1.50*BG111 + 1.50*BG127
UGT-Set B/3	1.35*BG101 + 1.35*BG102 + 1.50*BG114 + 1.50*BG127
UGT-Set B/4	1.35*BG101 + 1.35*BG102 + 1.50*BG111 + 1.50*BG122
UGT-Set B/5	1.35*BG101 + 1.35*BG102 + 1.50*BG113 + 1.50*BG133
UGT-Set B/6	1.35*BG101 + 1.35*BG102 + 1.50*BG114 + 1.50*BG126
UGT-Set B/7	0.90*BG101 + 0.90*BG102 + 1.50*BG114 + 1.50*BG125
UGT-Set B/8	0.90*BG101 + 0.90*BG102 + 1.50*BG113 + 1.50*BG126

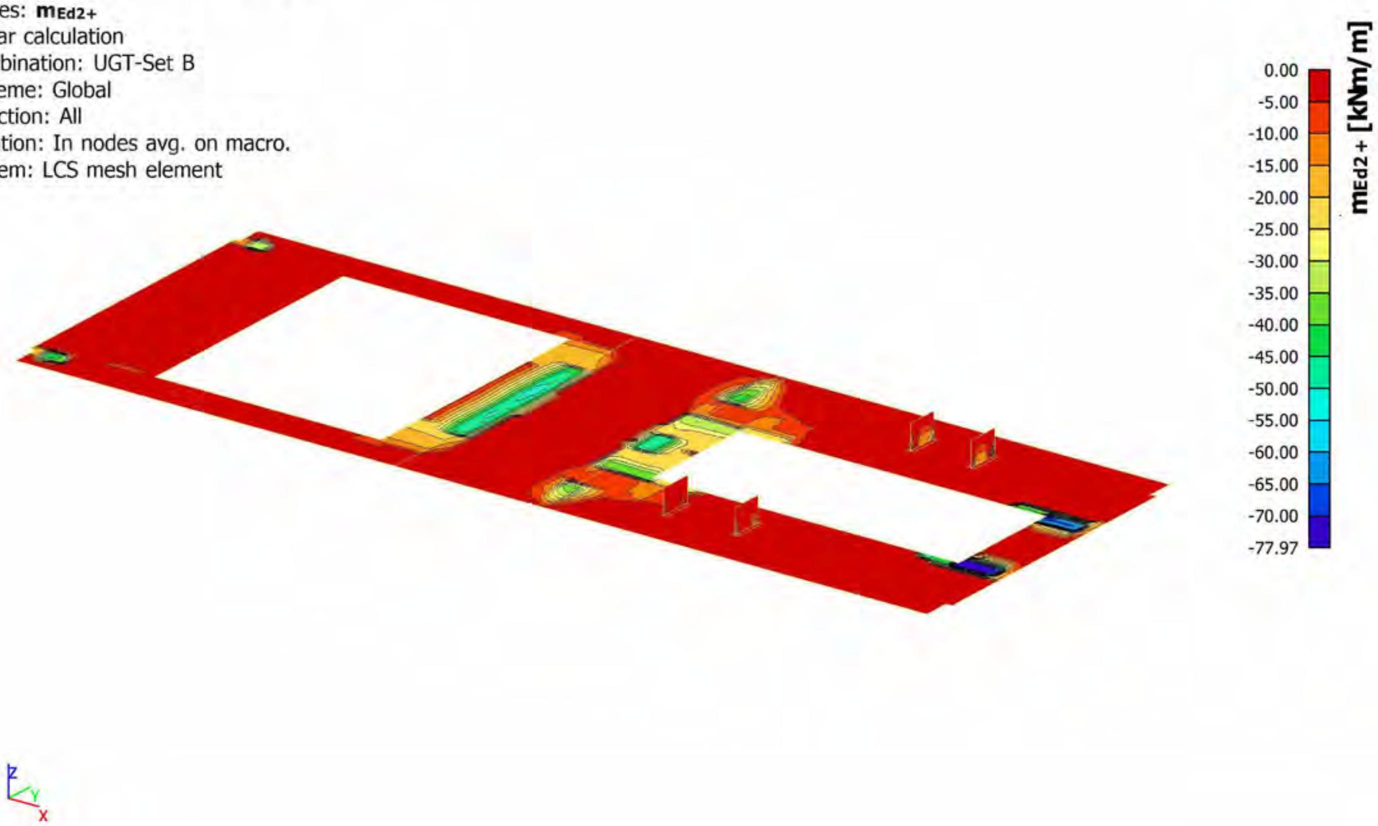
6.1.2. Rekenmodel - mEd,1+

Values: m_{Ed1+}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



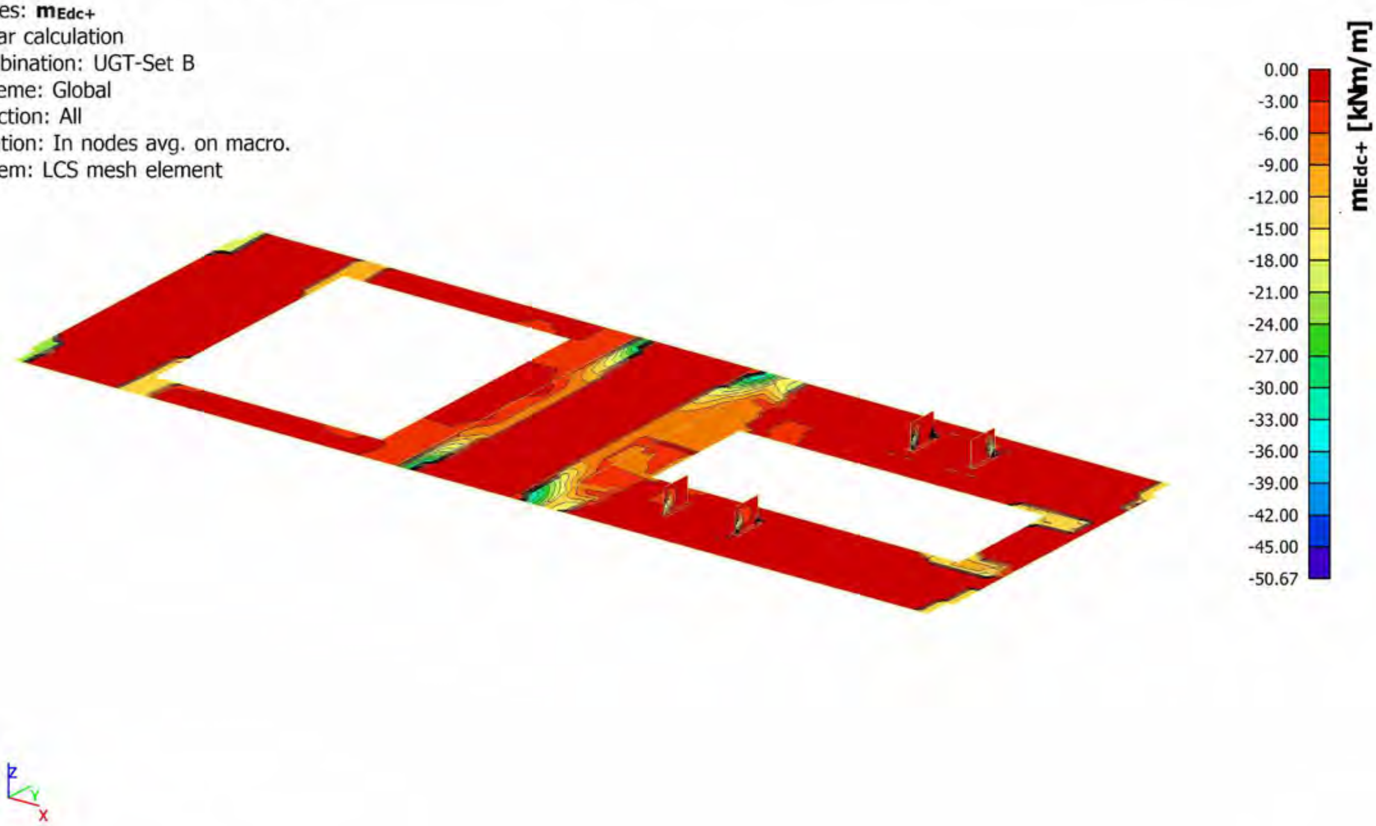
6.1.3. Rekenmodel - mEd,2+

Values: m_{Ed2+}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



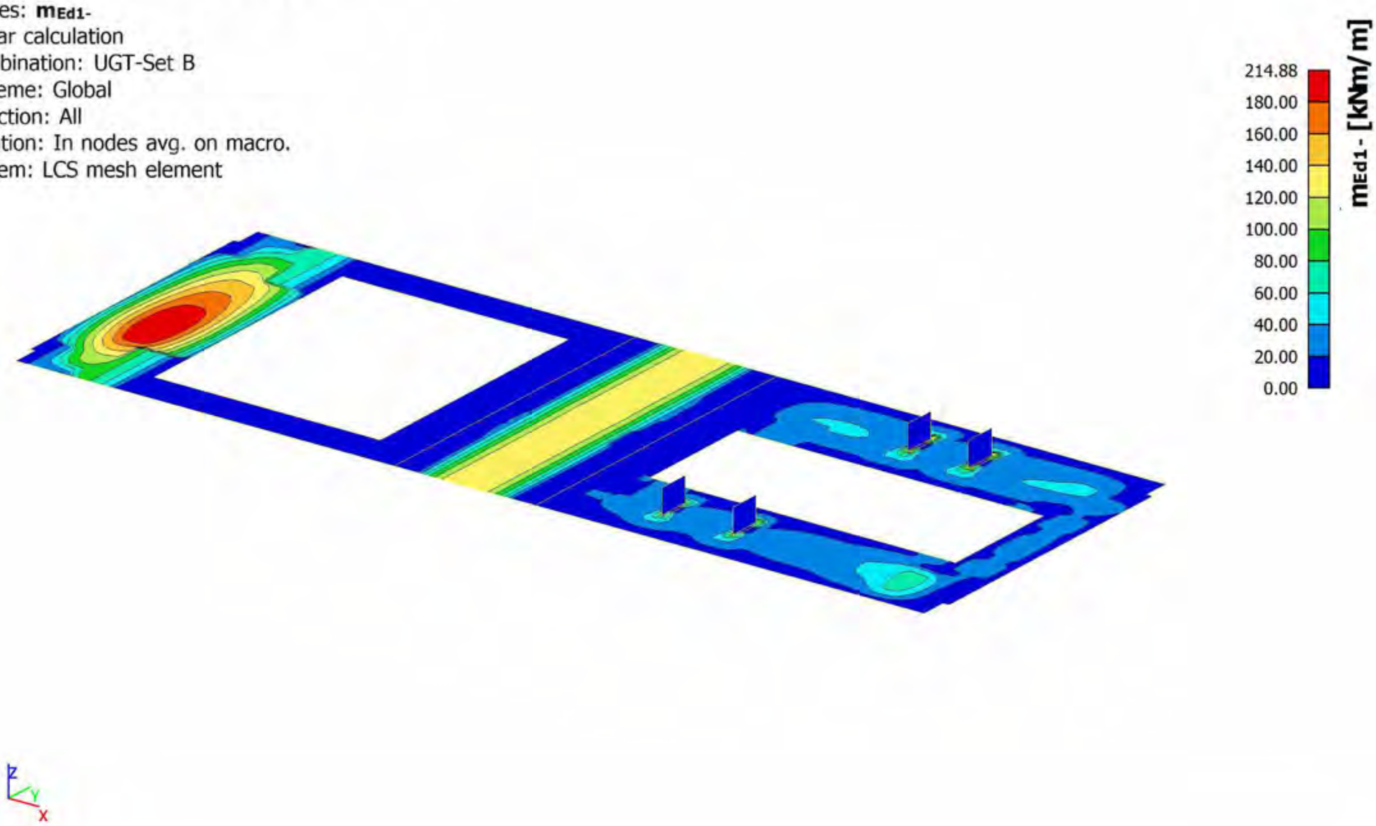
6.1.4. Rekenmodel - mEd,c+

Values: **mEdc+**
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



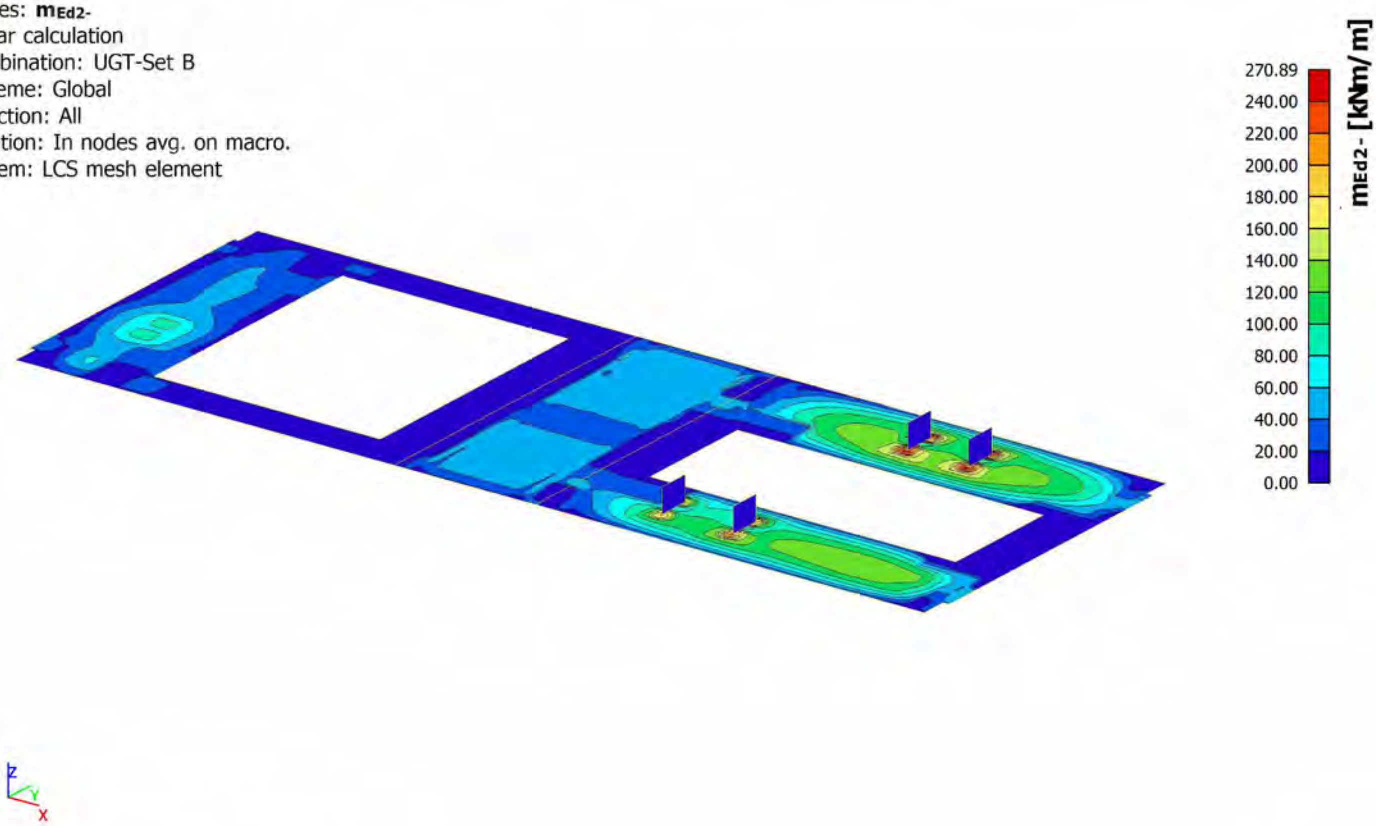
6.1.5. Rekenmodel - mEd,1-

Values: **mEd1-**
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



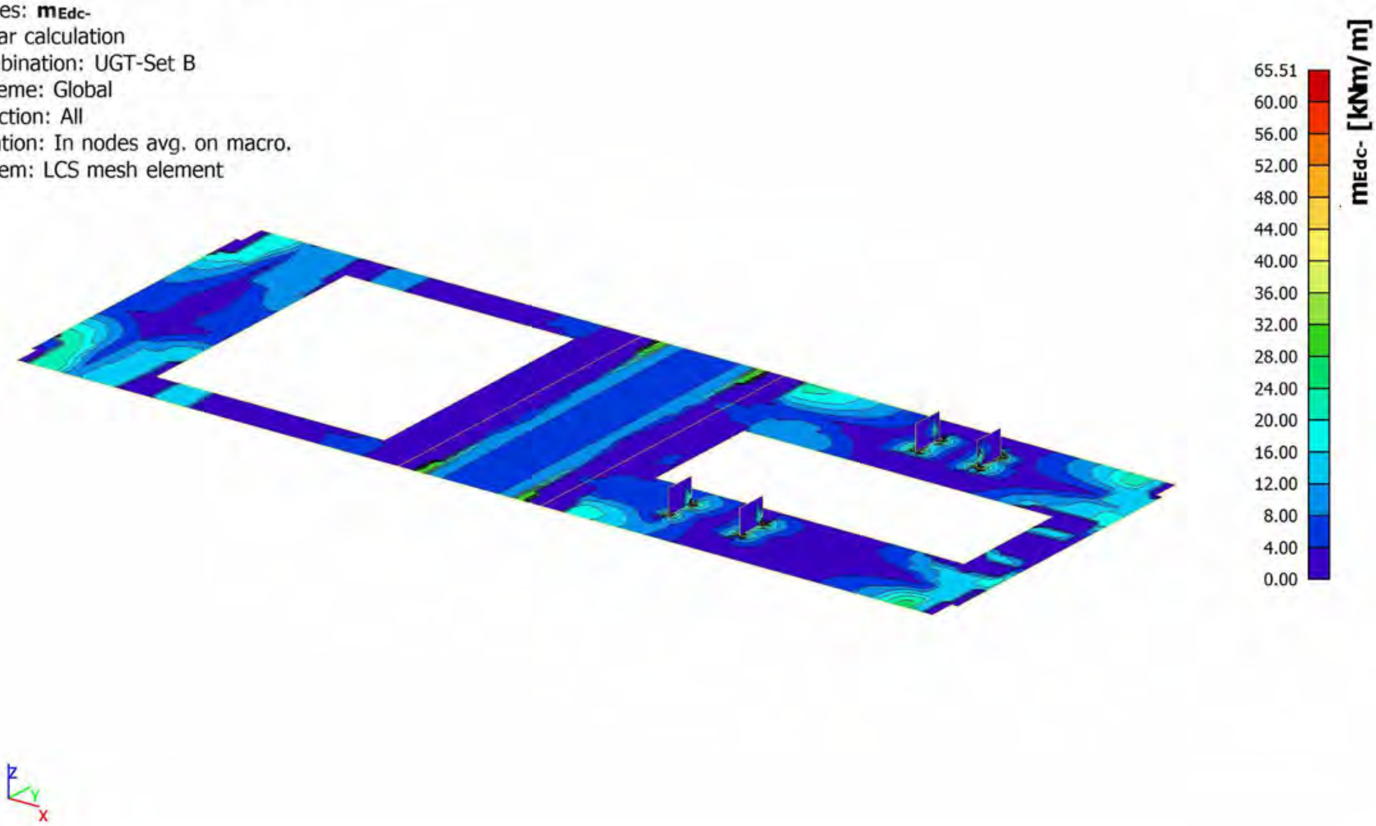
6.1.6. Rekenmodel - mEd,2-

Values: m_{Ed2-}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



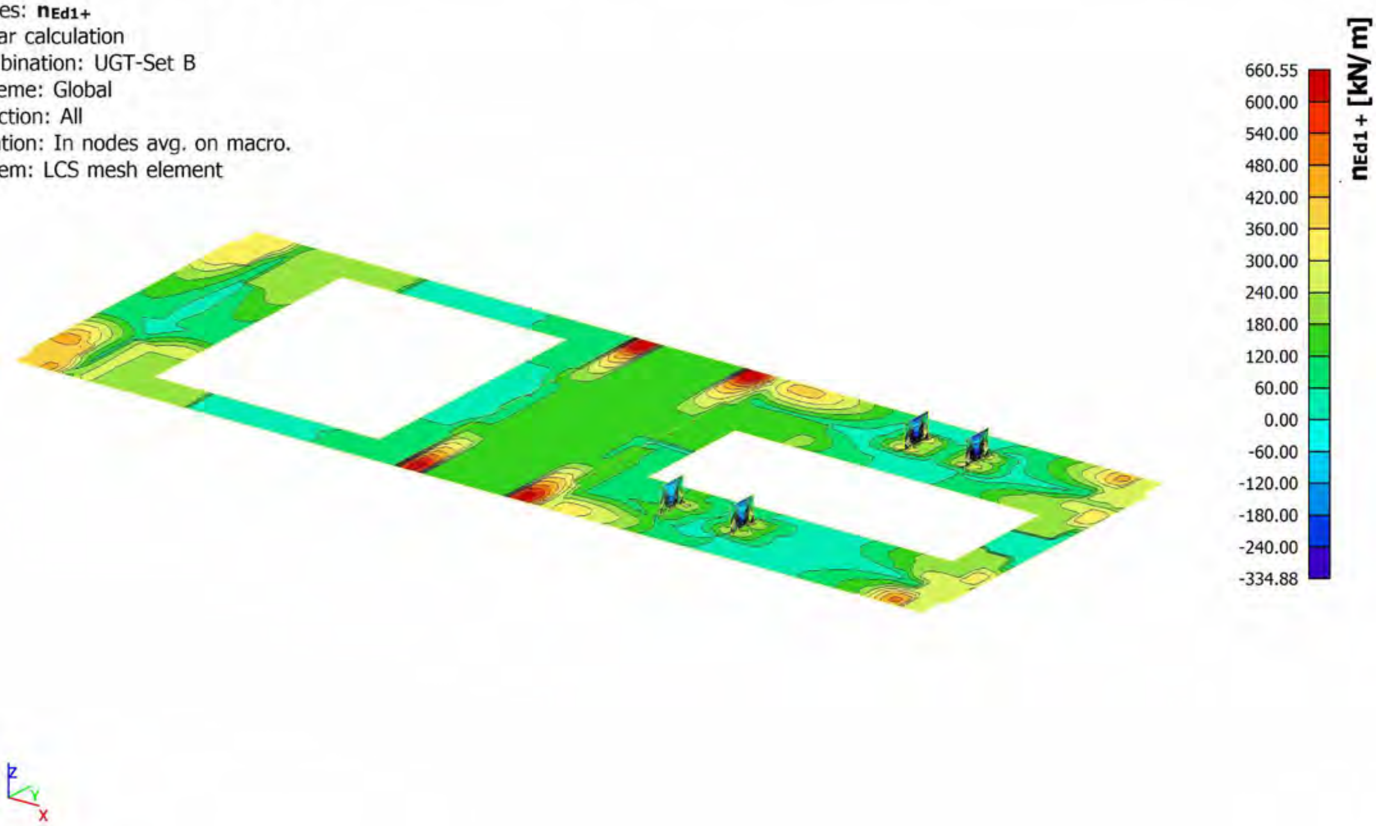
6.1.7. Rekenmodel - mEd,c-

Values: m_{Edc-}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



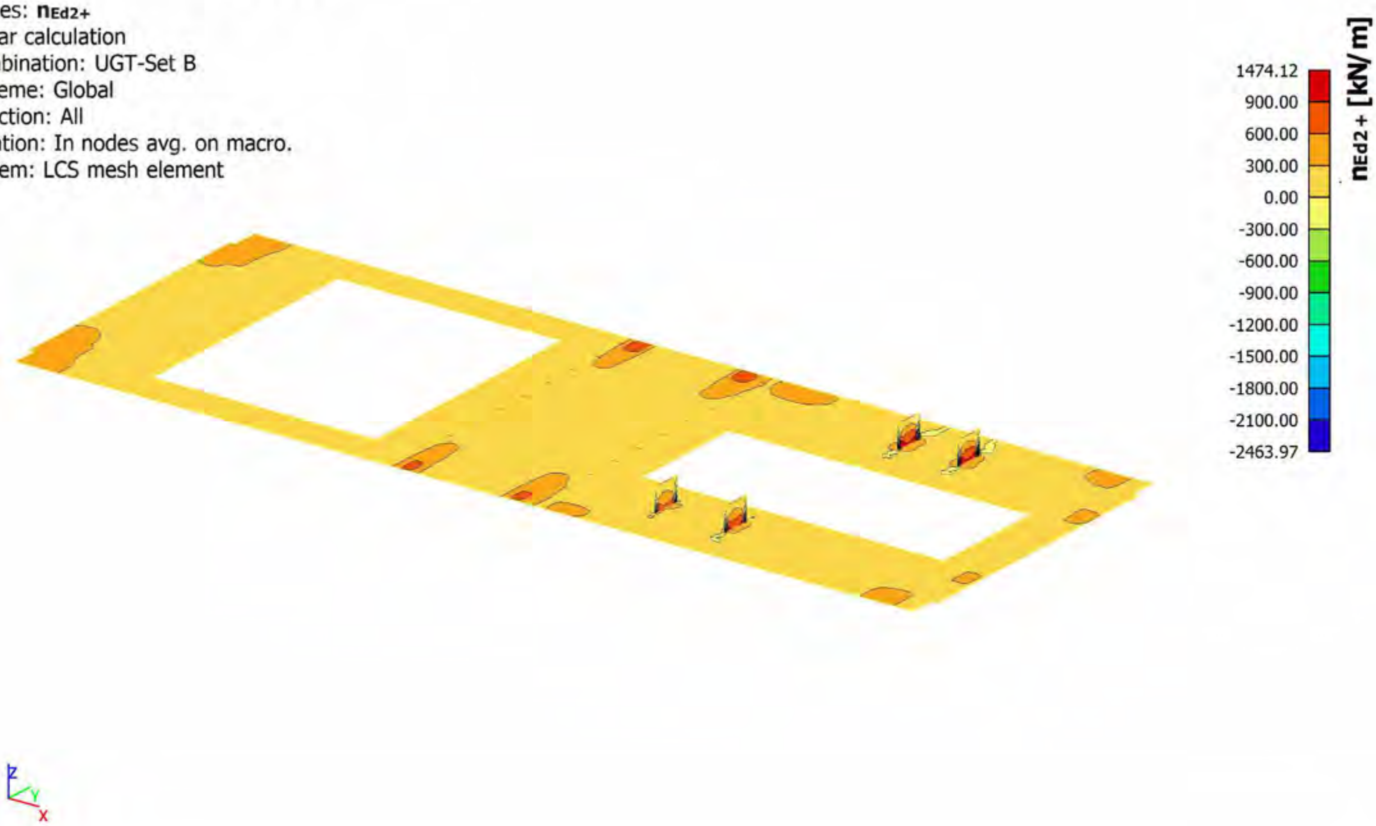
6.1.8. Rekenmodel - nEd,1+

Values: n_{Ed1+}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



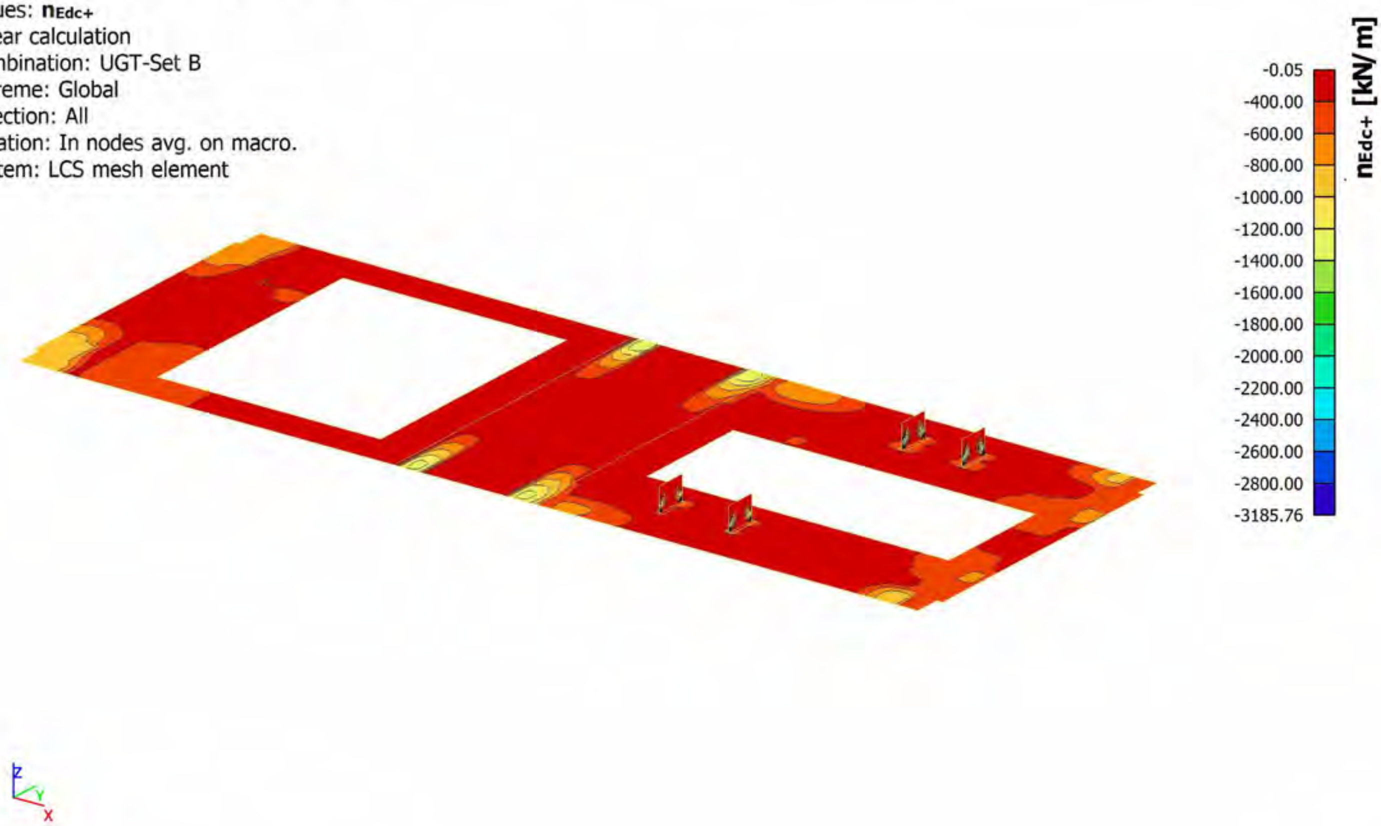
6.1.9. Rekenmodel - nEd,2+

Values: n_{Ed2+}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



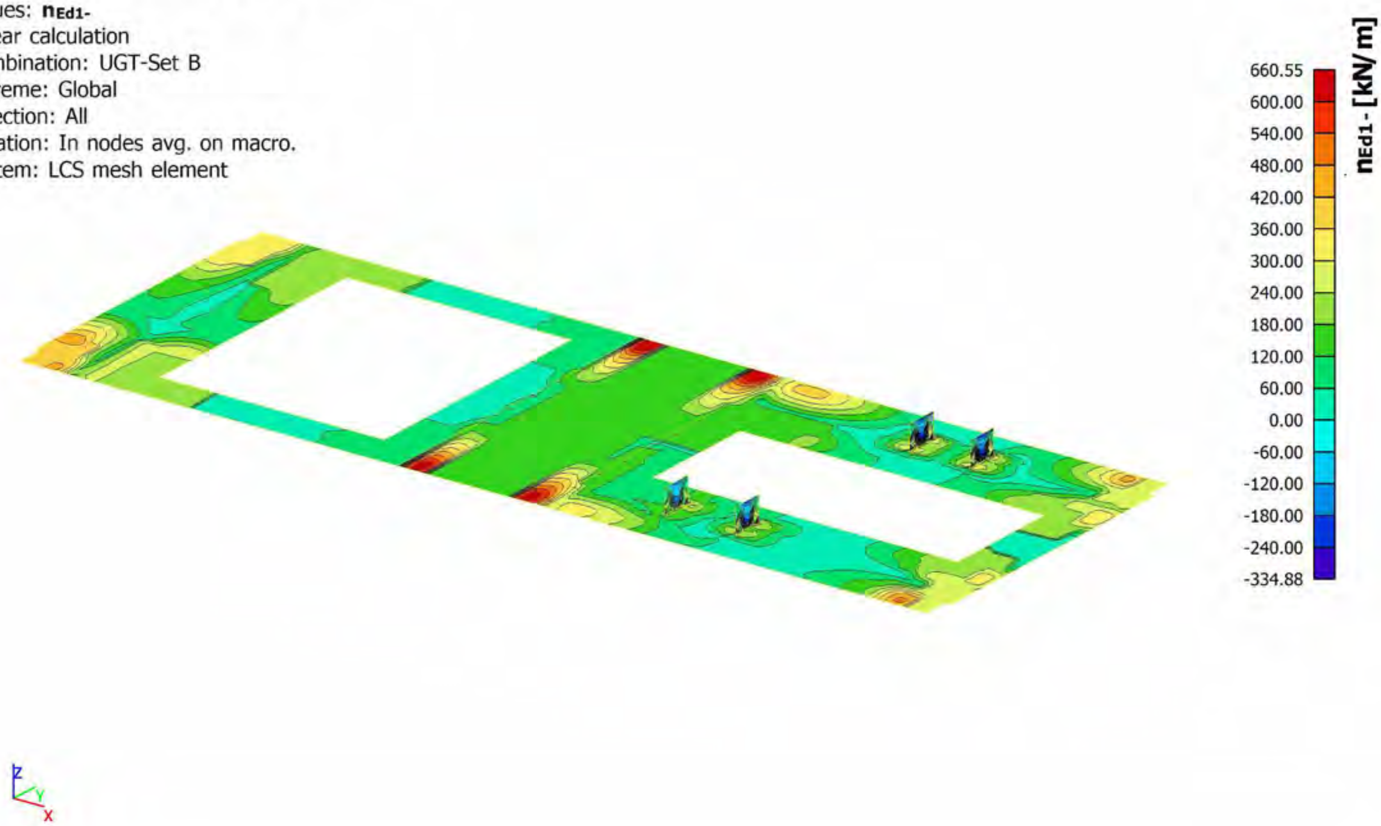
6.1.10. Rekenmodel - nEd,c+

Values: n_{Edc+}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



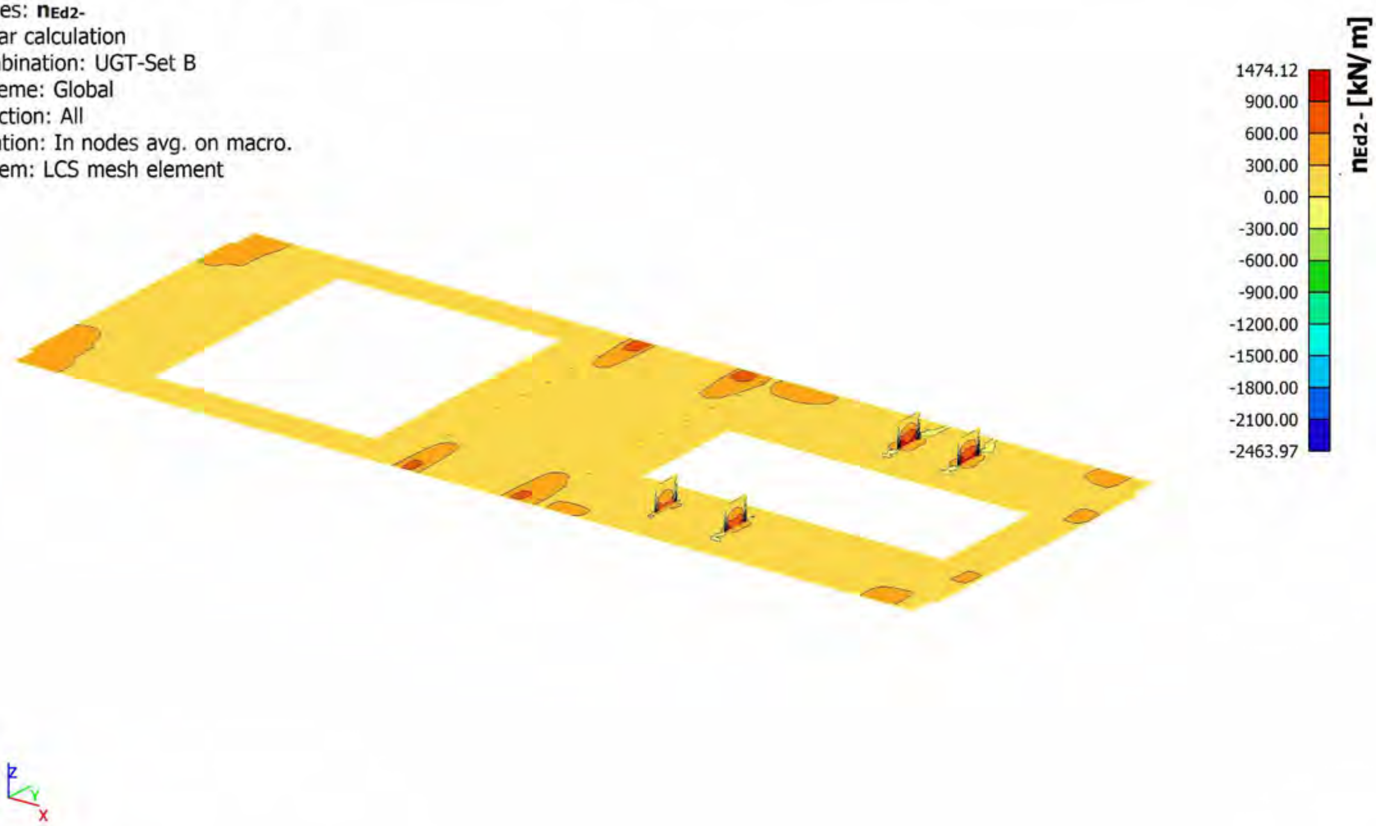
6.1.11. Rekenmodel - nEd,1-

Values: n_{Ed1-}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



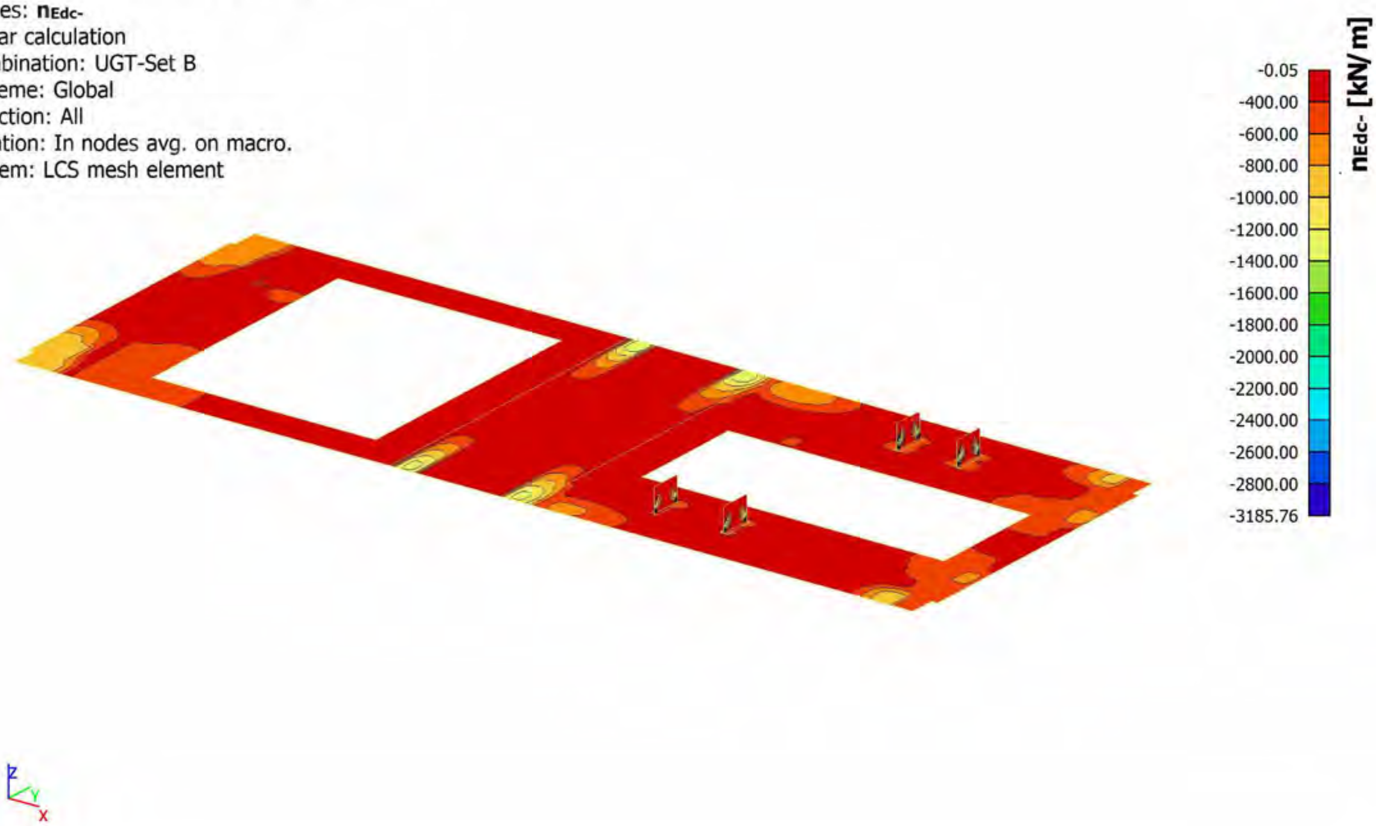
6.1.12. Rekenmodel - nEd,2-

Values: n_{Ed2-}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



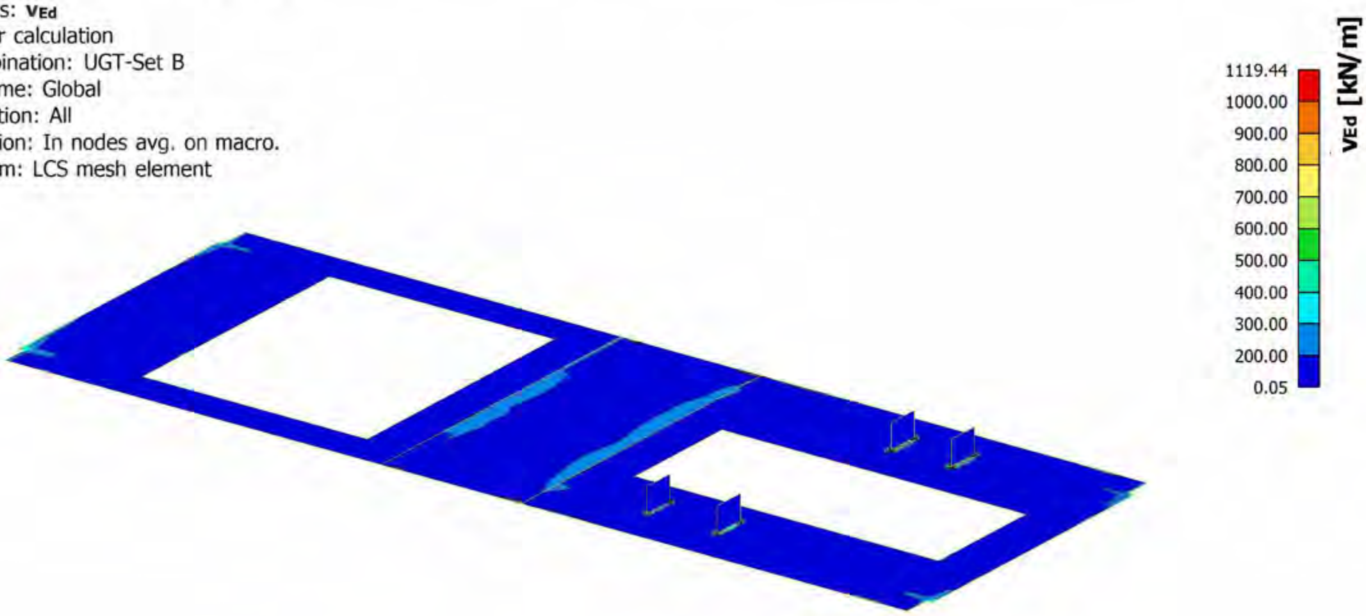
6.1.13. Rekenmodel - nEd,c-

Values: n_{Edc-}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



6.1.14. Rekenmodel - vEd

Values: v_{Ed}
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



6.2. Result picture generator

6.2.1. Reinforcement design (ULS+SLS)

Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element

Plate E18	**h=300 mm**
NEN EN 1992-1-1+C2/NB+A1:2020	Node 2342/8482 [X= 38.242, Y=17.730, Z=0.000 m]

Design assumptions

Reinforcement

Longitudinal: **B 500A**

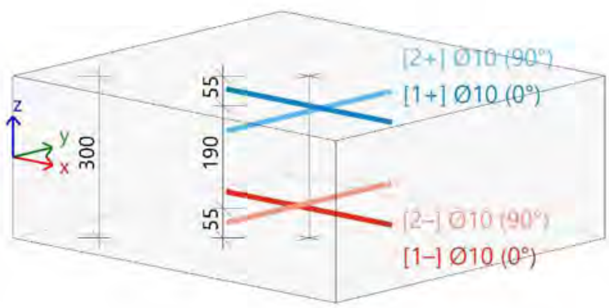
Upper surface

[1+] First layer (0°)	Ø10 mm / Principal
[2+] Second layer (90°)	Ø10 mm / Principal
Cover:	c_{user} = 50 mm

Lower surface

[1−] First layer (0°)	Ø10 mm / Principal
[2−] Second layer (90°)	Ø10 mm / Principal
Cover:	c_{user} = 50 mm

Shear: **B 500B** Ø8 mm



Concrete:

Material: **C35/45**

Structural class:	S3 (design working life of 50 years, no special quality control)	(Table 4.3N)
Environmental conditions:	XC3, XF3, XD1, XA3 (in situ)	(Table 4.1N)

Minimum cover (§4.4.1.2)

$$c_{min} = \max\left(c_{min,b}; c_{min,dur} + \Delta c_{dur,\gamma} - \Delta c_{dur,st} - \Delta c_{dur,add}; 10\right) \quad (4.2)$$

$$= \max\left(10; 30 + 0 - 0 - 0; 10\right) = 30 \text{ mm}$$

Nominal cover (§4.4.1.1)

$$c_{nom} = c_{min} + \Delta c_{dev} = 30 + 5 = 35 \text{ mm} \quad (4.1)$$

Internal forces from structural analysis

Ultimate limit state

Involving the shifting of moment curve : YES (§9.2.1.3(2))

$a_l = h \cdot Coeff_d = 0.3 \cdot 0.9 = 270$ mm (§6.2.2(5))

Case	m_x [kNm/m]	m_y [kNm/m]	m_{xy} [kNm/m]	n_x [kN/m]	n_y [kN/m]	n_{xy} [kN/m]	v_x [kN/m]	v_y [kN/m]
UGT-Set B/1	-26.04	6.48	-2.66	-0.05	-0.07	0.09	-23.66	1.93
UGT-Set B/2	-248.01	-37.30	-26.07	-0.24	-0.34	0.48	-248.36	16.03
UGT-Set B/3	-70.95	43.74	-15.36	-0.24	-0.34	0.49	-43.71	-5.96
UGT-Set B/4	-227.23	-33.33	-24.32	-0.05	-0.06	0.09	-262.61	10.93
UGT-Set B/5	-40.09	-6.87	-1.79	-0.05	-0.06	0.09	-36.42	0.63
UGT-Set B/6	-244.17	-37.63	-27.58	-0.24	-0.34	0.48	-274.05	16.96
UGT-Set B/7	-28.56	6.39	-3.30	-0.05	-0.06	0.09	-21.74	2.13
UGT-Set B/8	-239.04	-35.30	-25.55	-0.07	-0.10	0.14	-274.43	11.90
UGT-Set B/9	-71.91	38.08	-13.13	-0.22	-0.30	0.44	-44.67	-8.23
UGT-Set B/10	-203.22	-30.63	-18.09	-0.05	-0.06	0.09	-206.32	7.78
UGT-Set B/11	-70.94	43.74	-15.34	-0.24	-0.34	0.49	-43.73	-5.96
UGT-Set B/12	-57.91	40.50	-14.00	-0.22	-0.31	0.44	-31.91	-6.93
UGT-Set B/13	-242.88	-34.98	-24.03	-0.07	-0.10	0.14	-248.75	10.97
UGT-Set B/14	-71.75	43.65	-15.98	-0.24	-0.34	0.48	-41.81	-5.77
UGT-Set B/15	-209.45	-33.49	-15.43	-0.05	-0.06	0.09	-221.00	6.28

Case	Combination key
UGT-Set B/1	0.90*BG101+0.90*BG102+1.50*BG112+1.50*BG125
UGT-Set B/2	1.35*BG101+1.35*BG102+1.50*BG111+1.50*BG132
UGT-Set B/3	1.35*BG101+1.35*BG102+1.50*BG114+1.50*BG126
UGT-Set B/4	0.90*BG101+0.90*BG102+1.50*BG113+1.50*BG124
UGT-Set B/5	0.90*BG101+0.90*BG102+1.50*BG134
UGT-Set B/6	1.35*BG101+1.35*BG102+1.50*BG111+1.50*BG124
UGT-Set B/7	0.90*BG101+0.90*BG102+1.50*BG112+1.50*BG131
UGT-Set B/8	1.35*BG101+1.35*BG102+1.50*BG113+1.50*BG124
UGT-Set B/9	0.90*BG101+0.90*BG102+1.50*BG114+1.50*BG134
UGT-Set B/10	0.90*BG101+0.90*BG102+1.50*BG113+1.50*BG131
UGT-Set B/11	1.35*BG101+1.35*BG102+1.50*BG114+1.50*BG125
UGT-Set B/12	0.90*BG101+0.90*BG102+1.50*BG114+1.50*BG125
UGT-Set B/13	1.35*BG101+1.35*BG102+1.50*BG113+1.50*BG132
UGT-Set B/14	1.35*BG101+1.35*BG102+1.50*BG114+1.50*BG131
UGT-Set B/15	0.90*BG101+0.90*BG102+1.50*BG113+1.50*BG134

Longitudinal reinforcement

Ultimate limit state design

Direction of reinforcement layer [α=90°]

[2-]: lower surface

m_{Ed} = 47.2 kNm/m | n_{Ed} = 137 kN/m [UGT-Set B/14]

f_{cd} = 23.3 MPa (γ_C = 1.5, α_{cc} = 1)

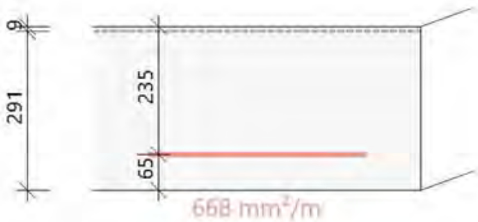
f_{yd} = 435 MPa (γ_S = 1.15)

Ø10 mm : d_1=65 mm -> d=235 mm

x=9 mm -> z=232 mm

$A_{s,ult}$=668 mm^2/m (tensile)

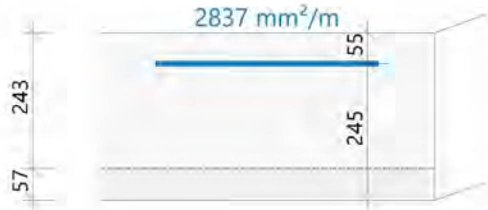
ρ_l=0.284%



Direction of reinforcement layer [α=0°]

[1+]: upper surface

m_{Ed} = -244 kNm/m | n_{Ed} = 243 kN/m [UGT-Set B/2]
f_{cd} = 23.3 MPa (γ_C = 1.5, α_{cc} = 1)
f_{yd} = 435 MPa (γ_S = 1.15)
Ø10 mm : d_1=55 mm -> d=245 mm
x=57 mm -> z=223 mm
$A_{s,ult}$=2837 mm^2/m (tensile)
ρ_l=1.158%



Direction of reinforcement layer [α=90°]

[2+]: upper surface

m_{Ed} = -33.3 kNm/m | n_{Ed} = 257 kN/m [UGT-Set B/6]
f_{cd} = 23.3 MPa (γ_C = 1.5, α_{cc} = 1)
f_{yd} = 435 MPa (γ_S = 1.15)
Ø10 mm : d_1=65 mm -> d=235 mm
x=3 mm -> z=234 mm
$A_{s,ult}$=704 mm^2/m (tensile)
ρ_l=0.300%

Design summary

	Case	α_s [°]	$d_{s,ref}$ [mm]	m_{Ed} [kNm]	n_{Ed} [kN]	d [mm]	x [mm]	z [mm]	F_{cd} [kN]	F_{sd} [kN]	$A_{s,ult}$ [mm^2]
[1+]	UGT-Set B/2	0.0	ϕ10	**-243.93**	**243.48**	245.0	56.6	223.0	-990.2	1233.6	**2837**
[2+]	UGT-Set B/6	90.0	ϕ10	**-33.27**	**257.03**	235.0	2.8	233.9	-48.8	305.9	**704**
[2-]	UGT-Set B/14	90.0	ϕ10	**47.22**	**136.85**	235.0	8.8	231.6	-153.6	290.5	**668**

α_s - direction of the reinforcement layer; m_{Ed}, n_{Ed} - recalculated design load, F_{cd} - resisting force in the concrete; F_{sd} - resisting force in the reinforcement; $A_{s,ult}$ - required reinforcement area from ULS design

UGT-Set B/14	1.35*BG101+1.35*BG102+1.50*BG114+1.50*BG131
UGT-Set B/2	1.35*BG101+1.35*BG102+1.50*BG111+1.50*BG132
UGT-Set B/6	1.35*BG101+1.35*BG102+1.50*BG111+1.50*BG124

Check of concrete diagonal strut

Check direction (extreme) [α=135°]

Design normal force in direction of concrete strut

$n_{Ed,sc}$ = -258 kN [UGT-Set B/6]

with full cross-section height:

$$h=300\text{ mm} \rightarrow A_{cc} = h \cdot b = 0.3 \cdot 1000 = 300000\text{ mm}^2$$

$$f_{cd} = \frac{\alpha_{cc} \cdot f_{ck}}{\gamma_C} = \frac{1 \cdot 35}{1.5} = 23\text{ MPa}$$

Design resistance of concrete strut (in compression)

$$n_{Rd,sc} = A_{cc} \cdot Red_{fcd} \cdot f_{cd} = 300000 \cdot 0.85 \cdot 23 = 5950\text{ kN}$$

Unity check

$$UC_{sc} = \frac{abs\left(n_{Ed,sc}\right)}{n_{Rd,sc}} = \frac{abs\left(-258\right)}{5950} = 0.043$$

Minimum and maximum reinforcement areas

Minimum area of principal tension reinforcement (§9.2.1.1(1))

[2-] Reinforcement layer

First order eccentricity

e_y = 0 mm
e_z = 345 mm

$$e = \sqrt{e_y^2 + e_z^2} = \sqrt{0^2 + 345^2} = 345\text{ mm}$$

Elastic section modulus

$\alpha_e = 0\,°$

$W_{ely} = 15{\cdot}10^6\ mm^3$

$W_{elz} = 50{\cdot}10^6\ mm^3$

$W_{el} = 15{\cdot}10^6\ mm^3$

$$\eta_y = \frac{e_z \cdot A_c}{W_{ely}} = \frac{345 \cdot 300000}{15{\cdot}10^6} = 6.9$$

$$\eta_z = \frac{e_y \cdot A_c}{W_{elz}} = \frac{0 \cdot 300000}{50{\cdot}10^6} = 0$$

$$\eta = \frac{e \cdot A_c}{W_{el}} = \frac{345 \cdot 300000}{15{\cdot}10^6} = 6.9$$

Combination for compression

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y - 1} = \frac{3.2 \cdot 15{\cdot}10^6 \cdot 6.9}{6.9 - 1} = 56.1\ kNm$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z - 1} = \frac{3.2 \cdot 50{\cdot}10^6 \cdot 0}{0 - 1} = 0\ kNm$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta - 1} = \frac{3.2 \cdot 300000 \cdot 1}{6.9 - 1} = 163\ kN$$

$A_{s,req,comp} = 323\ mm^2$

Combination for tension

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y + 1} = \frac{3.2 \cdot 15{\cdot}10^6 \cdot 6.9}{6.9 + 1} = 41.9\ kNm$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z + 1} = \frac{3.2 \cdot 50{\cdot}10^6 \cdot 0}{0 + 1} = 0\ kNm$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta + 1} = \frac{3.2 \cdot 300000 \cdot 1}{6.9 + 1} = 122\ kN$$

$A_{s,req,tens} = 570\ mm^2$

Combination for bending

$M_{E,min,y} = f_{ctm} \cdot W_{ely} = 3.2 \cdot 15{\cdot}10^6 = 48\ kNm$

$M_{E,min,z} = f_{ctm} \cdot W_{elz} = 3.2 \cdot 50{\cdot}10^6 = 160\ kNm$

$A_{s,req,bend} = 463\ mm^2$

$A_{s,min,1} = \max\left(A_{s,req,comp};A_{s,req,tens};A_{s,req,bend}\right) = \max\left(323;570;463\right) = 570\ mm^2/m$

Required area from ULS

$A_s = 668\ mm^2$

$Coeff_{Asmin} = 1.25$

$A_{s,min,2} = Coeff_{Asmin} \cdot A_s = 1.25 \cdot 668 = 835\ mm^2/m$

Final minimal allowed area of longitudinal reinforcement

$A_{s,min} = \min\left(A_{s,min,1};A_{s,min,2}\right) = \min\left(570;835\right) = 570\ mm^2/m$

[1+] Reinforcement layer

First order eccentricity

$e_y = 0$ mm

$e_z = 1002$ mm

$$e = \sqrt{e_y^2 + e_z^2} = \sqrt{0^2 + 1002^2} = 1002 \text{ mm}$$

Elastic section modulus

$\alpha_e = 0$ °

$W_{ely} = 15 \cdot 10^6$ mm^3

$W_{elz} = 50 \cdot 10^6$ mm^3

$W_{el} = 15 \cdot 10^6$ mm^3

$$\eta_y = \frac{e_z \cdot A_c}{W_{ely}} = \frac{1002 \cdot 300000}{15 \cdot 10^6} = 20$$

$$\eta_z = \frac{e_y \cdot A_c}{W_{elz}} = \frac{0 \cdot 300000}{50 \cdot 10^6} = 0$$

$$\eta = \frac{e \cdot A_c}{W_{el}} = \frac{1002 \cdot 300000}{15 \cdot 10^6} = 20$$

Combination for compression

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y - 1} = \frac{3.2 \cdot 15 \cdot 10^6 \cdot 20}{20 - 1} = 50.5 \text{ kNm}$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z - 1} = \frac{3.2 \cdot 50 \cdot 10^6 \cdot 0}{0 - 1} = 0 \text{ kNm}$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta - 1} = \frac{3.2 \cdot 300000 \cdot 1}{20 - 1} = 50.4 \text{ kN}$$

$A_{s,req,comp} = 401$ mm^2

Combination for tension

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y + 1} = \frac{3.2 \cdot 15 \cdot 10^6 \cdot 20}{20 + 1} = 45.7 \text{ kNm}$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z + 1} = \frac{3.2 \cdot 50 \cdot 10^6 \cdot 0}{0 + 1} = 0 \text{ kNm}$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta + 1} = \frac{3.2 \cdot 300000 \cdot 1}{20 + 1} = 45.6 \text{ kN}$$

$A_{s,req,tens} = 482$ mm^2

Combination for bending

$M_{E,min,y} = f_{ctm} \cdot W_{ely} = 3.2 \cdot 15 \cdot 10^6 = 48$ kNm

$M_{E,min,z} = f_{ctm} \cdot W_{elz} = 3.2 \cdot 50 \cdot 10^6 = 160$ kNm

$A_{s,req,bend} = 443$ mm^2

$A_{s,min,1} = \max\left(A_{s,req,comp}; A_{s,req,tens}; A_{s,req,bend}\right) = \max\left(401; 482; 443\right) = 482$ mm^2/m

Required area from ULS

$A_s = 2837\ mm^2$

$Coeff_{Asmin} = 1.25$

$A_{s,min,2} = Coeff_{Asmin} \cdot A_s = 1.25 \cdot 2837 = 3546\ mm^2/m$

Final minimal allowed area of longitudinal reinforcement

$A_{s,min} = \min\left(A_{s,min,1};A_{s,min,2}\right) = \min\left(482;3546\right) = 482\ mm^2/m$

[2+] Reinforcement layer

First order eccentricity

$e_y = 0\ mm$

$e_z = 129\ mm$

$e = \sqrt{e_y^2 + e_z^2} = \sqrt{0^2 + 129^2} = 129\ mm$

Elastic section modulus

$\alpha_e = 0\ °$

$W_{ely} = 15 \cdot 10^6\ mm^3$

$W_{elz} = 50 \cdot 10^6\ mm^3$

$W_{el} = 15 \cdot 10^6\ mm^3$

$$\eta_y = \frac{e_z \cdot A_c}{W_{ely}} = \frac{129 \cdot 300000}{15 \cdot 10^6} = 2.59$$

$$\eta_z = \frac{e_y \cdot A_c}{W_{elz}} = \frac{0 \cdot 300000}{50 \cdot 10^6} = 0$$

$$\eta = \frac{e \cdot A_c}{W_{el}} = \frac{129 \cdot 300000}{15 \cdot 10^6} = 2.59$$

Combination for compression

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y - 1} = \frac{3.2 \cdot 15 \cdot 10^6 \cdot 2.59}{2.59 - 1} = 78.2\ kNm$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z - 1} = \frac{3.2 \cdot 50 \cdot 10^6 \cdot 0}{0 - 1} = 0\ kNm$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta - 1} = \frac{3.2 \cdot 300000 \cdot 1}{2.59 - 1} = 604\ kN$$

$A_{s,req,comp} = 0\ mm^2$

Combination for tension

$$M_{E,min,y} = \frac{f_{ctm} \cdot W_{ely} \cdot \eta_y}{\eta_y + 1} = \frac{3.2 \cdot 15 \cdot 10^6 \cdot 2.59}{2.59 + 1} = 34.6\ kNm$$

$$M_{E,min,z} = \frac{f_{ctm} \cdot W_{elz} \cdot \eta_z}{\eta_z + 1} = \frac{3.2 \cdot 50 \cdot 10^6 \cdot 0}{0 + 1} = 0\ kNm$$

$$N_{E,min} = \frac{f_{ctm} \cdot A_c \cdot 1}{\eta + 1} = \frac{3.2 \cdot 300000 \cdot 1}{2.59 + 1} = 267\ kN$$

$A_{s,req,tens} = 702\ mm^2$

Combination for bending

$$M_{E,min,y} = f_{ctm} \cdot W_{ely} = 3.2 \cdot 15 \cdot 10^6 = 48 \text{ kNm}$$

$$M_{E,min,z} = f_{ctm} \cdot W_{elz} = 3.2 \cdot 50 \cdot 10^6 = 160 \text{ kNm}$$

$$A_{s,req,bend} = 463 \text{ mm}^2$$

$$A_{s,min,1} = \max\left(A_{s,req,comp}; A_{s,req,tens}; A_{s,req,bend}\right) = \max\left(0;702;463\right) = 702 \text{ mm}^2/\text{m}$$

Required area from ULS

$$A_s = 704 \text{ mm}^2$$

$$Coeff_{Asmin} = 1.25$$

$$A_{s,min,2} = Coeff_{Asmin} \cdot A_s = 1.25 \cdot 704 = 880 \text{ mm}^2/\text{m}$$

Final minimal allowed area of longitudinal reinforcement

$$A_{s,min} = \min\left(A_{s,min,1}; A_{s,min,2}\right) = \min\left(702;880\right) = 702 \text{ mm}^2/\text{m}$$

Maximum cross-sectional area of tension or compression reinforcement (§9.2.1.1(3))

[2-][1+][2+] Reinforcement layer

$$A_{s,max} = Coeff_{Asmax} \cdot A_c = 0.04 \cdot 0.3 = 12000 \text{ mm}^2/\text{m}$$

Minimum and maximum spacing of reinforcement bars

Maximum spacing of principal reinforcement bars (§9.3.1.1(3))

[2-][1+][2+] Reinforcement layer

$$s_{max} = \min\left(Coeff_{smax,slab,A} \cdot h; Coeff_{smax,slab,B}\right) = \min\left(3 \cdot 300;400\right) = 400 \text{ mm}$$

Minimum clear distance between reinforcement bars (§8.2(2))

[1-][2-][1+][2+] Reinforcement layer

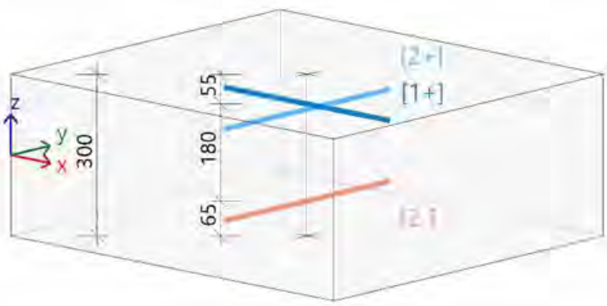
$$s_{min} = \max\left(k_1 \cdot \phi; d_g + k_2; s_{l,min}\right) = \max\left(1 \cdot 10;32 + 5;20\right) = 37 \text{ mm}$$

Longitudinal reinforcement - Summary

Designed reinforcement layers (in direction from the member local x axis):

	Basic	Additional		α	$A_{s,min}$	$A_{s,ult}$	$\Delta A_{s,serv}$	$A_{s,req}$	$A_{s,prov}$	$A_{s,max}$	$s_{min(cl)}$	s_{max}	Status
		User	Auto	[°]	[mm^2]	[mm^2]	[mm^2]	[mm^2]	[mm^2]	[mm^2]	[mm]	[mm]	
[1+]	ϕ10/150	---	ϕ10/100	0.0	482	2837	---	**2837**	**1310**	12000	55	60	**Not OK**
								0.95%	0.44%		≥37	≤400	
[2+]	ϕ10/150	---	ϕ10/200	90.0	702	704	---	**704**	**917**	12000	81	86	**OK**
								0.23%	0.31%		≥37	≤400	
[2-]	ϕ10/150	---	ϕ10/200	90.0	570	668	---	**668**	**917**	12000	81	86	**OK**
								0.22%	0.31%		≥37	≤400	

$A_{s,req}$ - required reinforcement area as max($A_{s,ult}$; $A_{s,min}$)+$\Delta A_{s,serv}$; $A_{s,prov}$ - provided reinforcement area; $A_{s,min/max}$ - min/max reinforcement area; $s_{max(min)}$ - maximum spacing of bars (minimum clear distance between bars



[1+] ϕ10/150 + ϕ10/100 (insufficient)
[2+] ϕ10/150 + ϕ10/200
[2-] ϕ10/150 + ϕ10/200

Design of shear reinforcement

Design shear force

$$v_{Ed} = \sqrt{v_x^2 + v_y^2} = \sqrt{-274.1^2 + 17.0^2} = 274.6 \text{ kN/m [UGT-Set B/6]}$$

Principal forces and plane of deformation

$m_z = -248$ kNm | $n_z = -0.12$ kN

$d = 240$ mm | $z = 214$ mm

Longitudinal reinforcement ratio (considering upper surface is in tension) (§6.4.4(1))

$$\rho_{lx} = \frac{A_{sl,x}}{b \cdot d} = \frac{1310}{1000 \cdot 240} = 0.546\ \% \quad \rho_{ly} = \frac{A_{sl,y}}{b \cdot d} = \frac{917}{1000 \cdot 240} = 0.382\ \%$$

$$\rho_l = \min\left(\sqrt{\rho_{lx} \cdot \rho_{ly}};0.02\right) = \min\left(\sqrt{5.46 \cdot 10^{-3} \cdot 3.82 \cdot 10^{-3}};0.02\right) = 0.457\ \%$$

Shear resistance without shear reinforcement

Normal concrete stresses (positive if compression)

Normal forces (from FEM): $n_x = -0.2$ kN/m $n_y = -0.3$ kN/m [UGT-Set B/6]

$$\sigma_{cp,1} = \min\left(\frac{-n_x}{A_c};0.2 \cdot f_{cd}\right) = \min\left(\frac{--0.2}{0.3};0.2 \cdot 23.3 \cdot 10^6\right) = 0.00 \text{ MPa} \quad (§6.2.2(1))$$

$$\sigma_{cp,2} = \min\left(\frac{-n_y}{A_c};0.2 \cdot f_{cd}\right) = \min\left(\frac{--0.3}{0.3};0.2 \cdot 23.3 \cdot 10^6\right) = 0.00 \text{ MPa} \quad (§6.2.2(1))$$

$$\sigma_{cp} = \frac{\sigma_{cp,1} + \sigma_{cp,2}}{2} = \frac{0.00 + 0.00}{2} = 0.00 \text{ MPa}$$

Design shear resistance without shear reinforcement (§6.4.4(1))

$$k = \min\left(1 + \left(\frac{200}{d}\right)^{\frac{1}{2}};2\right) = \min\left(1 + \left(\frac{200}{240}\right)^{\frac{1}{2}};2\right) = 1.91$$

$C_{Rdc} = 0.12$ $v_{min} = 0.548$ MPa $k_1 = 0.15$

$$v_{Rdc} = \max\left(10^6 \cdot \left(C_{Rdc} \cdot k \cdot \left(100 \cdot \rho_l \cdot f_{ck}\right)^{\frac{1}{3}} + k_1 \cdot \sigma_{cp}\right) \cdot d;0\right) \quad (6.47)$$

$$= \max\left(10^6 \cdot \left(0.12 \cdot 1.91 \cdot \left(100 \cdot 4.57 \cdot 10^{-3} \cdot 35\right)^{\frac{1}{3}} + 0.15 \cdot 962 \cdot 10^{-6}\right) \cdot 0.24;0\right) = 139 \text{ kN/m}$$

$$v_{Rdcmin} = \max\left(10^6 \cdot \left(v_{min} + k_1 \cdot \sigma_{cp}\right) \cdot d;0\right) = \max\left(10^6 \cdot \left(0.548 + 0.15 \cdot 962 \cdot 10^{-6}\right) \cdot 0.24;0\right) = 132 \text{ kN/m}$$

$$v_{Rdc} = \max\left(v_{Rdc};v_{Rdcmin}\right) = \max\left(139 \text{ kN/m};132 \text{ kN/m}\right) = 139 \text{ kN/m}$$

Maximal concrete shear resistance

Strength reduction factor for concrete cracked in shear

$$\nu = 0.6 \cdot \left(1 - \frac{f_{ck}}{250}\right) = 0.6 \cdot \left(1 - \frac{35}{250}\right) = 0.516 \quad (6.6N)$$

Angle of compression concrete strut

$\theta = \theta_{inp} = 40°$, $\cot(\theta) = 1.192$

Design value of the max shear force which can be sustained by the member

$$v_{Rd,max} = \frac{\alpha_{cw} \cdot b_w \cdot z \cdot \nu_1 \cdot f_{cd}}{\left(\text{cotg}(\theta) + \text{tg}(\theta)\right)} = \frac{1 \cdot 1 \cdot 0.214 \cdot 0.516 \cdot 23.3}{\left(\text{cotg}(40) + \text{tg}(40)\right)} = 1271 \text{ kN/m} \quad (6.9)$$

Check shear capacity (without shear reinforcement)

Check $v_{Rd,max}$

$v_{Ed} = 275$ kN/m $\leq v_{Rd,max} = 1271$ kN/m **(OK)**

Check v_{Rdc}

$v_{Ed} = 275$ kN/m $> v_{Rdc} = 139$ kN/m **(NOT OK, shear reinforcement is required)**

Statically required shear reinforcement

$$f_{ywd,req} = \frac{f_{ywk,req}}{\gamma_S} = \frac{500}{1.15} = 435 \text{ MPa}$$

$$A_{sw,req} = \frac{v_{Ed}}{z \cdot f_{ywd,req} \cdot \text{cotg}(\theta)} = \frac{274.6}{0.214 \cdot 435 \cdot \text{cotg}(40)} = 2473 \text{ mm}^2/\text{m} \qquad (6.8)$$

Required shear reinforcement

50ϕ8/m^2 => $A_{sw,req}$ = 2473mm^2/m^2

Detailing of shear reinforcement

Minimal depth of slab with shear reinforcement 9.3.2(1)

Depth of slab

$h = 300$ mm

Minimal depth of slab with shear reinforcement

$h_{min} = 200$ mm (§9.3.2(1))

$h \geq h_{min}$

300 mm ≥ 200 mm

Minimal area of shear reinforcement from minimal ratio 9.3.2(2)

Characteristic cylinder concrete strength

$f_{ck} = 35$ MPa

Characteristic yield strength of reinforcement

$f_{ywk} = 500$ MPa

Minimal allowed reinforcement percentage of stirrups

$$\rho_{w,min} = \frac{\text{Coeff}_{\rho w,min} \cdot \sqrt{f_{ck}}}{f_{ywk}} = \frac{0.08 \cdot \sqrt{35}}{500} = 947 \cdot 10^{-6} \qquad (9.5N)$$

Minimum width of the cross-section in tensile area

$b_w = 1000$ mm

Angle between shear reinforcement and the longitudinal axis

$\alpha = 90$ °

Minimal area of shear reinforcement

$$A_{sws,\rho,min} = \rho_{w,min} \cdot b_w \cdot \sin(\alpha) = 947 \cdot 10^{-6} \cdot 1000 \cdot \sin(90) = 947 \text{ mm}^2/\text{m}$$

Minimal area of shear reinforcement from max. spacing of shear links 9.3.2(4)

Effective height of beam

$d = 240$ mm

Angle between shear reinforcement and the longitudinal axis

$\alpha = 90\,°$

Maximal spacing of shear links

$$s_{max,long} = Coeff_{smax} \cdot d \cdot \left(1 + cotg\left(\alpha\right)\right) = 0.75 \cdot 0.24 \cdot \left(1 + cotg\left(90\right)\right) = 0.18 \text{ m} \tag{9.9}$$

Minimal area of shear reinforcement

$$A_{sws,sp,min} = \frac{1}{s_{max,long}} \cdot \pi \cdot \frac{\phi^2}{4} = \frac{1}{0.18} \cdot 3.14 \cdot \frac{8^2}{4} = 279 \text{ mm}^2/\text{m}$$

Shear reinforcement - Summary

	Case	θ [°]	v_{Ed} [kN/m]	$A_{sl,x}$ [mm^2]	$A_{sl,y}$ [mm^2]	ρ_l [%]	$v_{Rd,c}$ [kN/m]	$v_{Rd,max}$ [kN/m]	$A_{sw,req}$ [mm^2/m^2]	Status
[+]	UGT-Set B/6	40.0	**274.6**	1310	917	0.457	138.8	1270.5	**2473**	**OK**

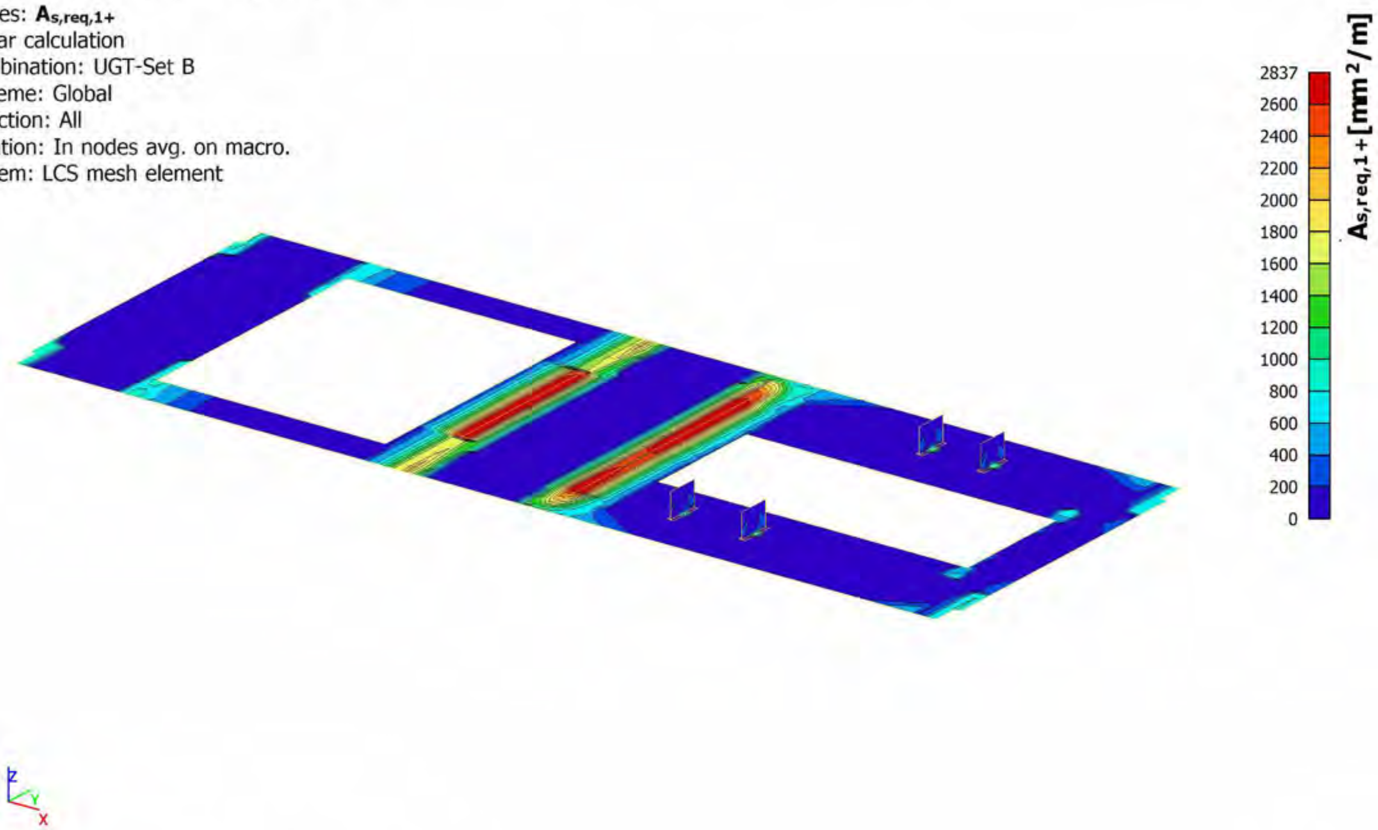
v_{Ed} - design shear force, $A_{sl,x/y}$ - tensile longitudinal reinforcement, ρ_l - corresponding reinforcement ratio, v_{Rdc} - shear resistance without shear reinforcement, $v_{Rd,max}$ - maximal concrete shear resistance, $A_{sw,req}$ - required shear reinforcement

Errors/Warnings/Notes

Code	Description	Solution
⚠W/01	The applied provided reinforcement is not sufficient (As,prov < As,req).	Increase the amount of the basic or additional reinforcement.

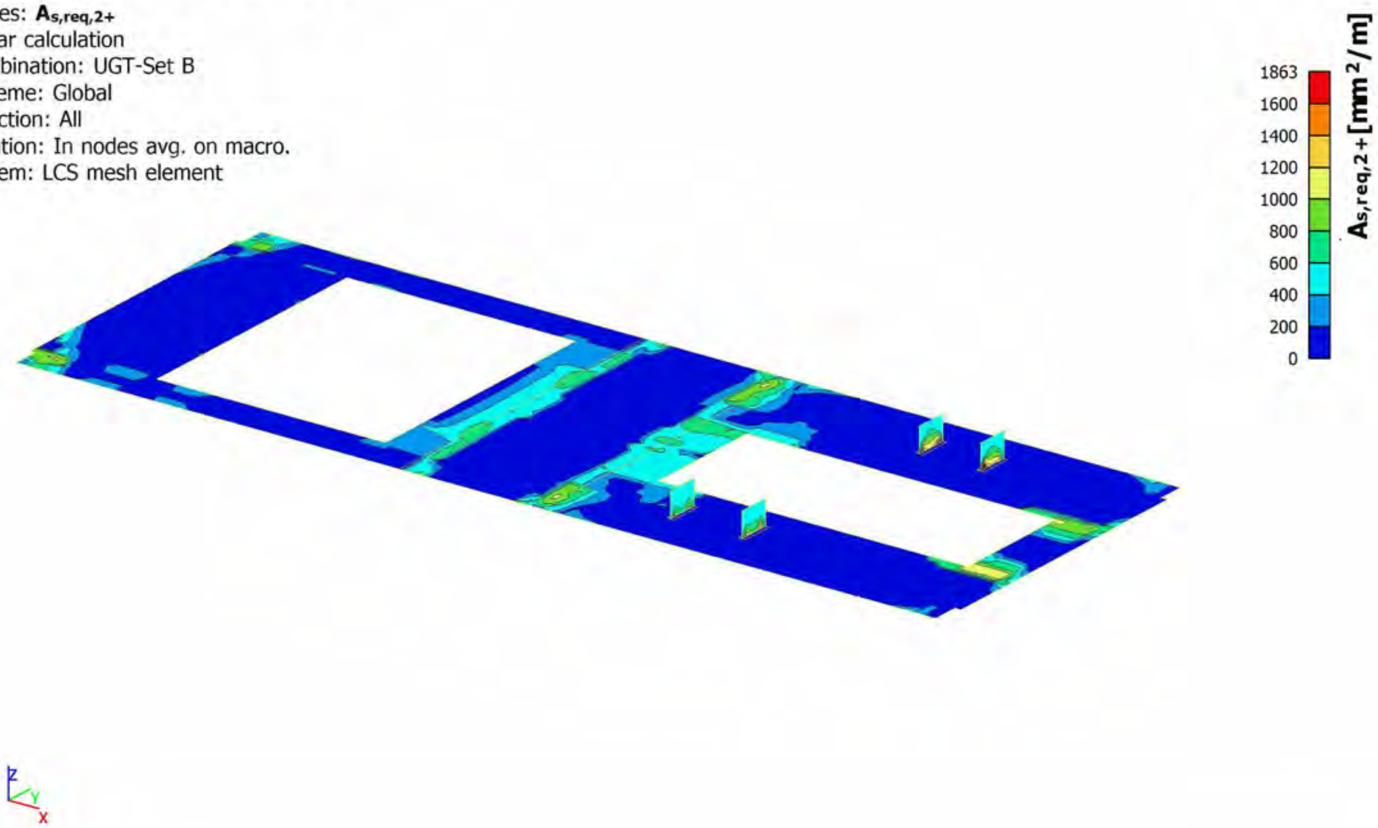
6.2.2. Rekenmodel - As,req,1+

Values: $\mathbf{A_{s,req,1+}}$
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



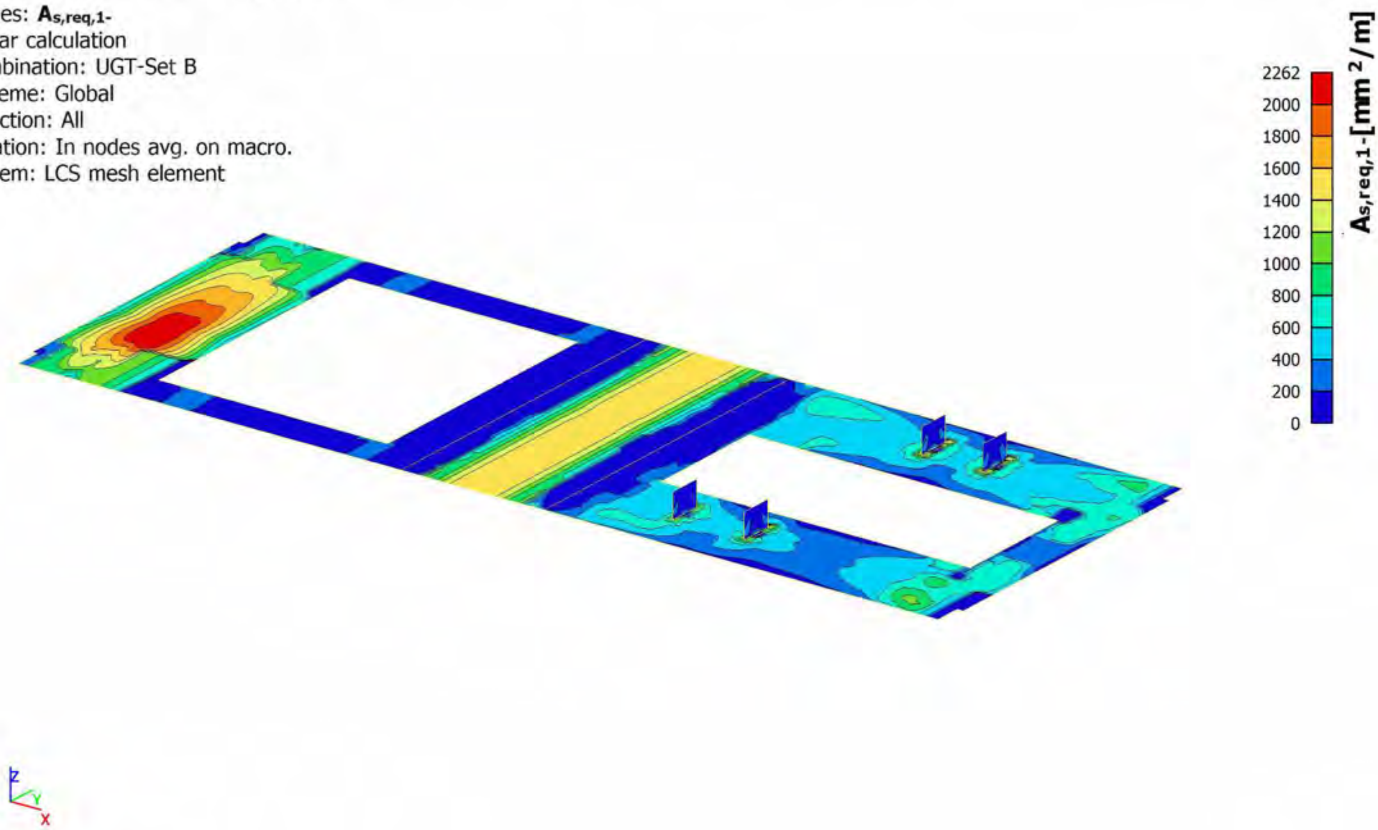
6.2.3. Rekenmodel - As,req,2+

Values: $\mathbf{A_{s,req,2+}}$
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



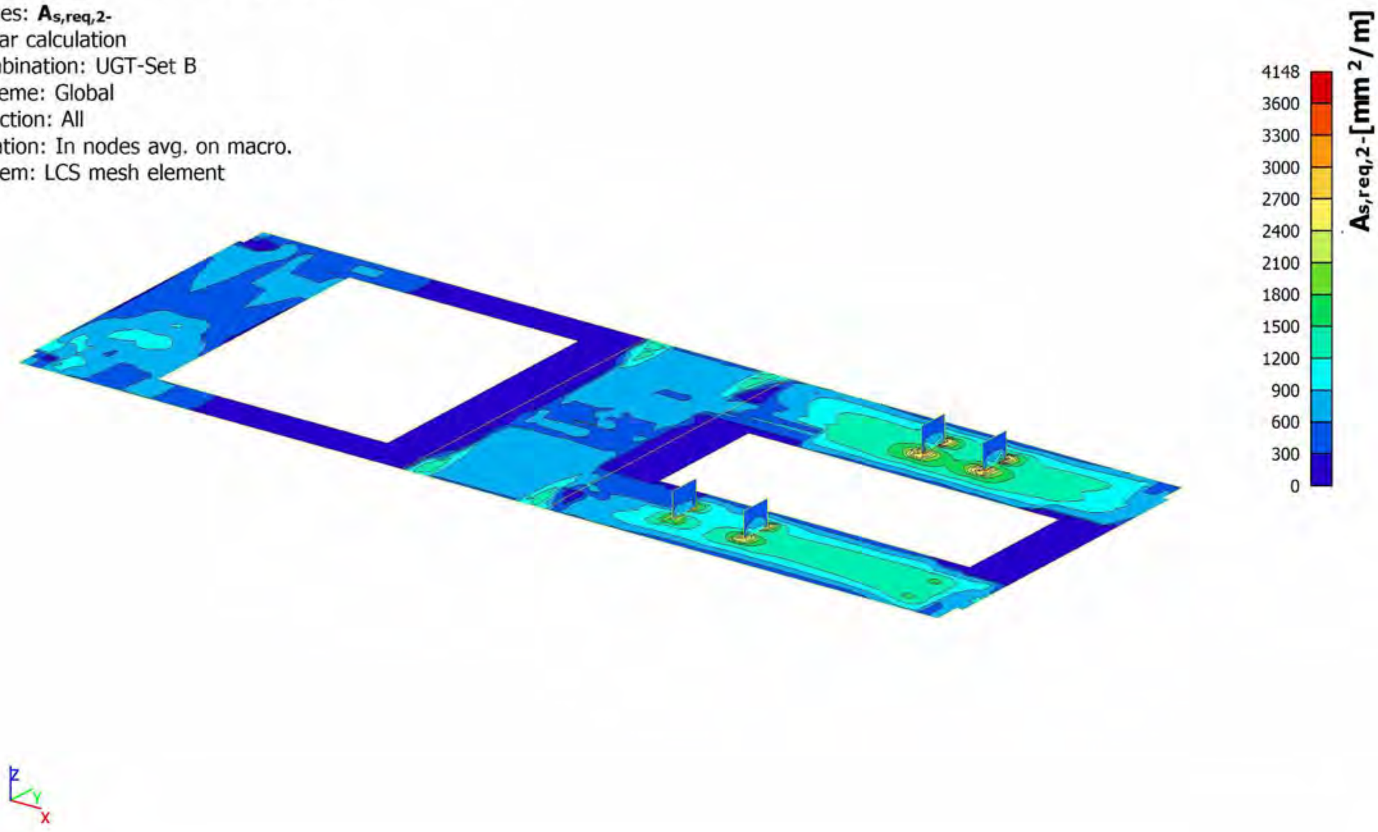
6.2.4. Rekenmodel - As,req,1-

Values: **$A_{s,req,1-}$**
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



6.2.5. Rekenmodel - As,req,2-

Values: **$A_{s,req,2-}$**
Linear calculation
Combination: UGT-Set B
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Annex D.5.
Export Concrete slab

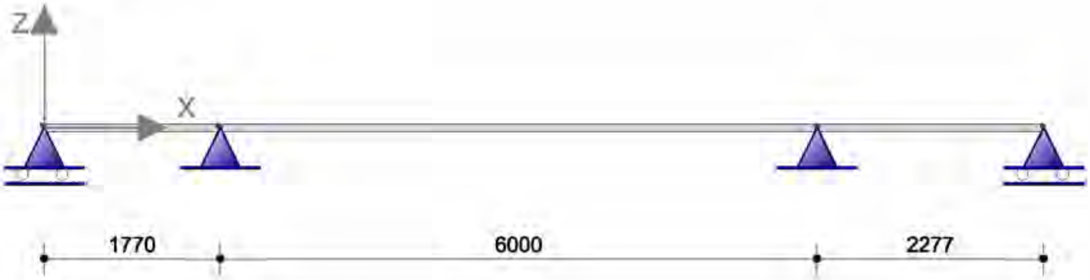
File :....Konstruktis\CCS Project LINDE\vloerplaat.xbe2

Table of contents

Applied standards: : NEN-EN 1992-1-1+C1:2011/NB:2016+A1:2020 nl
Consequence class : CC2

Gravity acceleration g : 9.81 m/s ^{2}

1 Input Data



1.1 NODES

Node Number	Coordinates		Restraints		
	X [mm]	Z [mm]	Tx	Tz	Ry
1	0	0		A	
2	1770	0	A	A	
3	7770	0	A	A	
4	10047	0		A	

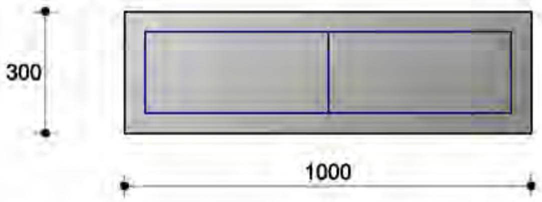
1.2 BEAMS

Beam Number	Node		Beam type	Profile	Length [mm]
	from	to			
1	1	2	├──┤	Profiel 1	1770
2	2	3	├──┤	Profiel 1	6000
3	3	4	├──┤	Profiel 1	2277

1.3 PROFILES

Profile Number	Name	Weight [kg/m]	E [N/mm²]	A [mm²]	Iy [mm4]	Wy;el_1 [mm³]	Wy;el_2 [mm³]
1	Profiel 1	750.0	7675	3E5	2.25E9	1.5E7	1.5E7

Profiel 1



Element type	Beam	Structural Class S4
Prefab	no	
Concrete grade	C35/45	Creep coefficient 2.70
Steel grade	B500B	
Granule diameter	31.5 mm	
	Top side	Bottom side
Env. class	XC1,XS1,XA3 →XS1	XC4,XS1,XA3 →XS1
Concrete surface	Can be checked	Can be checked
ΔC_{dev}	5 mm	
Cover	50 mm	50 mm
Nominal cover c_{nom}	40 mm	40 mm EN 1992-1-1 (4.1)
Number of stirrup sections	3	Angle compression strut 40

1.4 LOAD CASES

no.	Description	Type	ψ0	ψ1	ψ2
1	Permanent	Dead load incl. self-weight	1.00	1.00	1.00
2	Veranderlijk	E:storage	1.00	0.90	0.80
3	Veranderlijk	E:storage	1.00	0.90	0.80

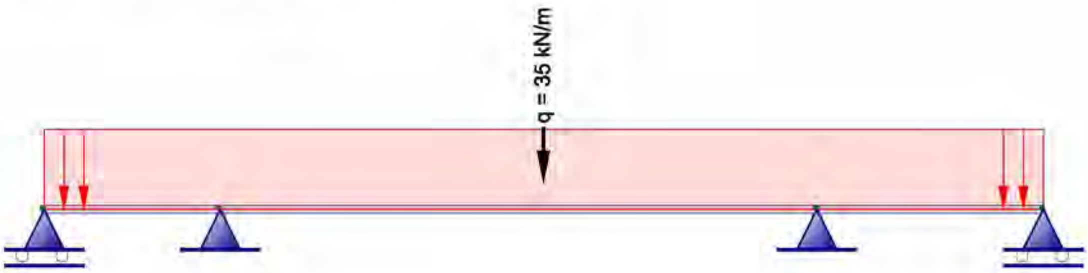
1.5 LOAD CASE 1 Permanent Including self-weight

***) Loads due to self-weight are not drawn!**
Total self-weight: : 7392 kg.

1.5.1 Beam loads

Loads				Distance from		
Type	q1	q2	Angle	Node	a [mm]	L [mm]
q	-7.358 kN/m	-7.358 kN/m	0.0	1	0	1770
q	-7.358 kN/m	-7.358 kN/m	0.0	2	0	6000
q	-7.358 kN/m	-7.358 kN/m	0.0	3	0	2277

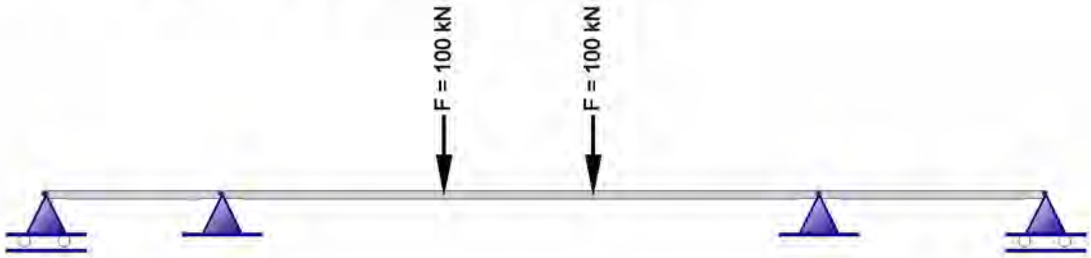
1.6 LOAD CASE 2 Veranderlijk



1.6.1 Beam loads

Loads				Distance from		
Type	q1	q2	Angle	Node	a [mm]	L [mm]
q	-35.000 kN/m	-35.000 kN/m	0.0	1	0	10047

1.7 LOAD CASE 3 Veranderlijk



1.7.1 Beam loads

Loads				Distance from		
Type	q1	q2	Angle	Node	a [mm]	L [mm]
F	-100.000 kN		0.0	1	5500	
F	-100.000 kN		0.0	1	4000	

2 Calculation Results

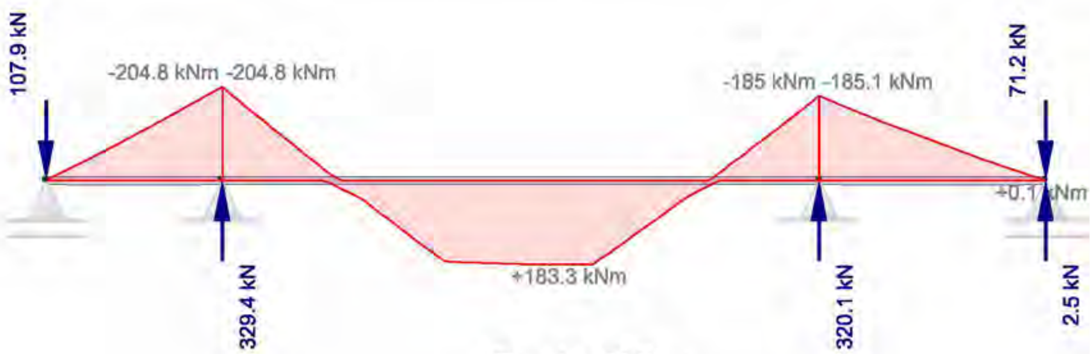
2.1 ULTIMATE LIMIT STATES (ULS)

2.1.1 Load combinations

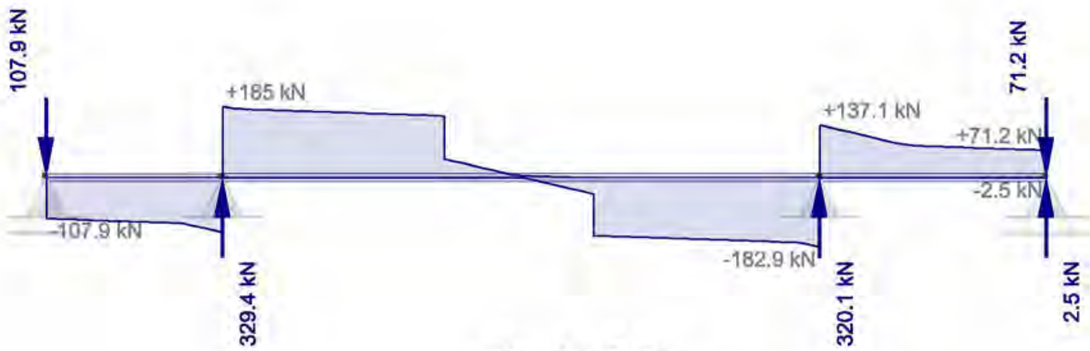
Geometric linear analysis

Combination Number	Description	Type
1	Permanent	ULS
2	Veranderlijk	ULS
3	Veranderlijk	ULS

Combination Number	Load case (ψ x γ)				
	1	2	3		
1	1.00x1.35				
2	1.00x1.20	1.00x1.50			
3	1.00x1.20		1.00x1.50		



Envelop M-line



Envelop D-line

2.1.2 Envelope reaction forces

Node Number	Combination Number	Fx [kN]	Fz [kN]	My [kNm]
1	1		**-5.798**	
	3		**-107.896**	
2	1		**53.344**	
	2		**329.374**	
3	1		**51.835**	
	2		**320.058**	
4	2		**2.538**	
	3		**-71.219**	
Minimum / maximum values				
1	3		**-107.896**	
2	2		**329.374**	

2.1.3 Envelope beam forces

Beam Number	Combination Number	Node Number	x-local [mm]	Nx-local [kN]	Vz-local [kN]	My-local [kNm]
1	1	1		0.000	**-5.798**	0.000
	3	1		0.000	**-107.896**	0.000
	1	2		0.000	**23.378**	**-25.821**
	2	2		0.000	**144.350**	-159.430
	3	2		0.000	123.524	**-204.807**
2	1	2		0.000	**29.966**	**25.821**
	2	2		0.000	**185.024**	159.430
	3	2		0.000	180.779	**204.807**
	3		3486	0.000	0.000	**183.344**
	1	3		0.000	**29.630**	**-24.813**
	2	3		0.000	**182.950**	-153.207
	3	3		0.000	172.195	**-185.053**
3	1	3		0.000	**22.205**	**24.813**
	2	3		0.000	**137.108**	153.207
	3	3		0.000	91.322	**185.053**
	2		2236	0.000	0.000	**0.053**
	2	4		0.000	**2.538**	0.000
	3	4		0.000	**-71.219**	0.000

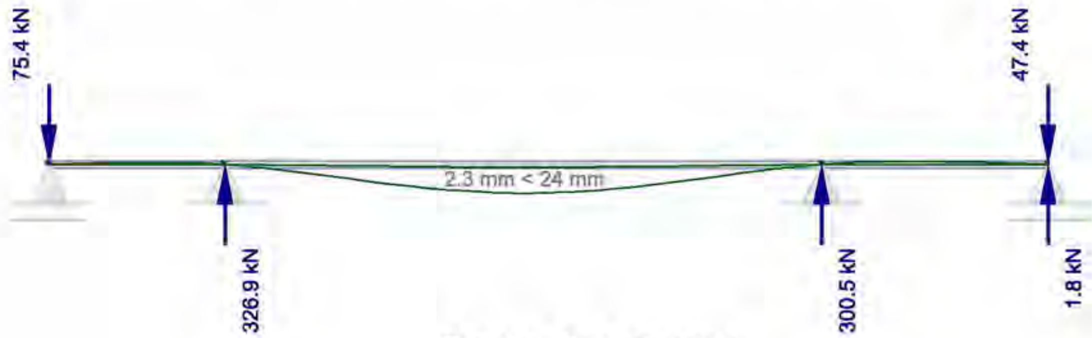
2.2 SERVICE LIMIT STATES (SLS)

2.2.1 Load combinations

Geometric linear analysis

Combination Number	Description	Type
4	Permanent	SLS
5	Veranderlijk	SLS
6	Veranderlijk	SLS
7	BGT Blijvend	SLS Permanent
8	BGT Quasi blijvend	SLS Quasi permanent

Combination Number	Load case (ψ x γ)				
	1	2	3		
4	1.00x1.00				
5	1.00x1.00	1.00x1.00			
6	1.00x1.00		1.00x1.00		
7	1.00x1.00				
8	1.00x1.00	0.80x1.00	0.80x1.00		



Envelop displacements

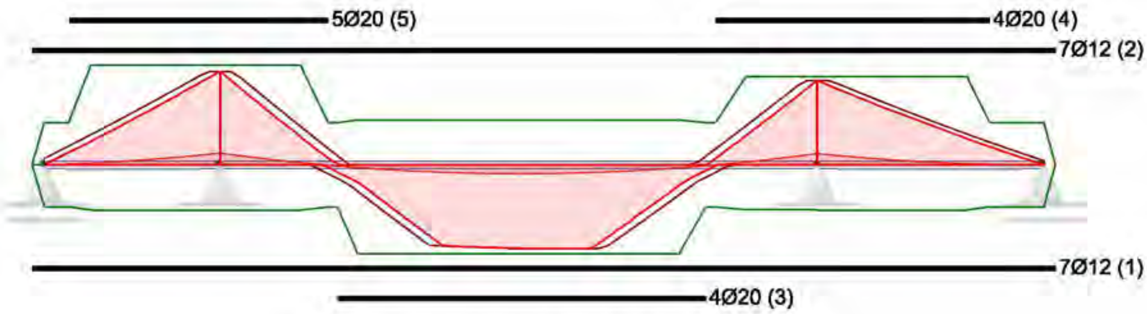
2.2.2 Envelope node displacements

Node Number	Combination Number	dx [mm]	dz [mm]	dr [mrad]
1	4	**0.0**	**0.0**	**0.2**
	8	0.0	**0.0**	**2.8**
2	4	**0.0**	**0.0**	**-0.6**
	8	0.0	**0.0**	**-6.0**
3	4	**0.0**	**0.0**	**0.6**
	8	0.0	**0.0**	**6.7**
4	4	**0.0**	0.0	**-0.2**
	5	0.0	**0.0**	-1.1
	6	0.0	**0.0**	-2.6
	8	0.0	0.0	**-2.8**
Minimum / maximum values				
1	4	**0.0**		
1	4	**0.0**		
2	8		**0.0**	
1	8		**0.0**	
2	8			**-6.0**
3	8			**6.7**

2.3 REINFORCEMENT

2.3.1 Longitudinal reinforcement

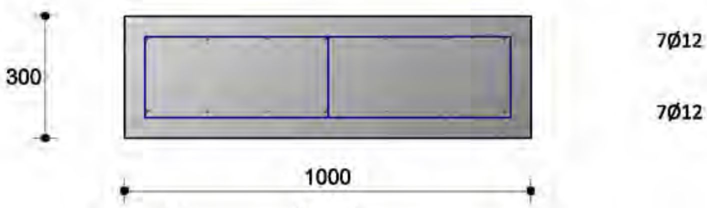
no.	from x [mm]	to x [mm]	Length [mm]	Side	Reinforcement	z [mm]	Ld begin [mm]	Ld end [mm]	Weight [kg]
1	-120	10167	10287	Bottom	7Ø12	-244	120	120	63.9
2	-120	10167	10287	Top	7Ø12	-56	120	120	63.9
3	2950	6650	3700	Bottom	4Ø20	-244	200	265	36.5
4	6750	9505	2755	Top	4Ø20	-56	305	231	27.2
5	250	2855	2605	Top	5Ø20	-56	224	282	32.1
								Total	223.7



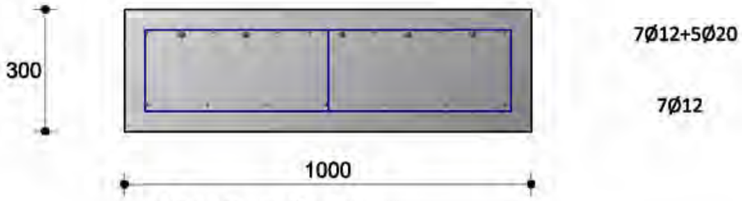
Envelope shifted M-line (ULS)

2.3.2 Longitudinal reinforcement - Ultimate limit state (ULS)

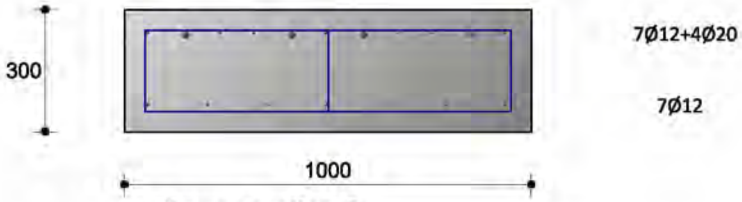
x [mm]	Sect.	MEd [kNm]	MRd [kNm]	xu [mm]	xu,max [mm]	Side	Reinforcement	Remarks
0	1	-13.9	-92.4	38.7	81.0	Top	7Ø12	
1770	2	-204.8	-218.6	59.8	124.1	Top	7Ø12+5Ø20	
7770	3	-185.1	-193.6	55.0	119.1	Top	7Ø12+4Ø20	
10006	1	-12.2	-92.4	38.7	81.0	Top	7Ø12	
5256	4	183.3	193.6	55.0	119.1	Bottom	7Ø12+4Ø20	



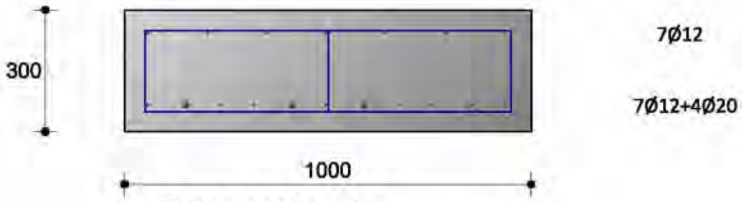
Cross section 1



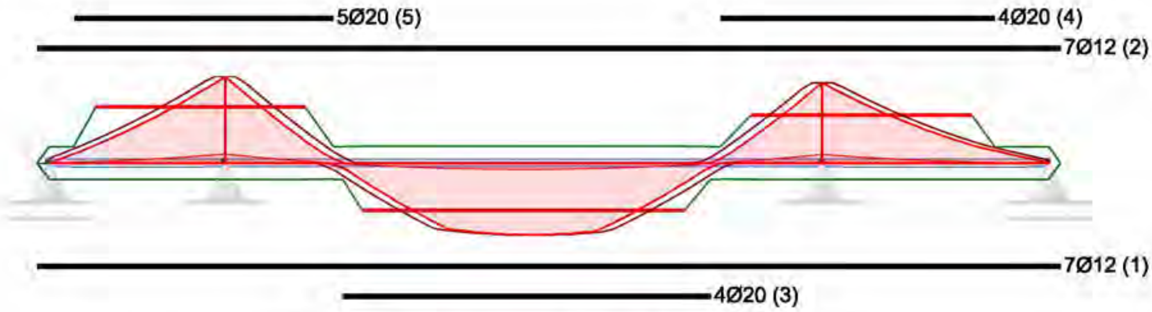
Cross section 2



Cross section 3



Cross section 4



Envelope shifted M-line (SLS)

2.3.3 Longitudinal reinforcement - Service limit state (SLS)

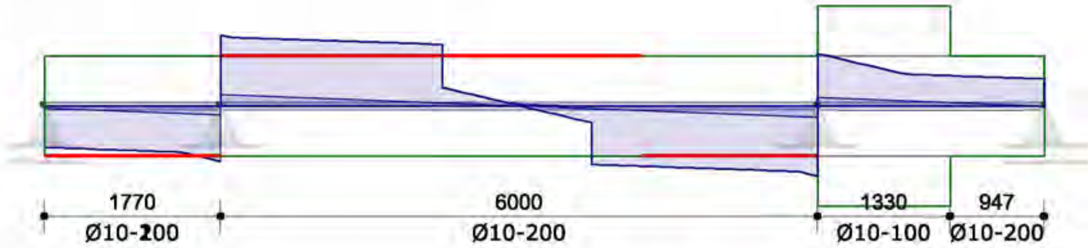
Control of cracking without direct calculationt ...EN 1992-1-1 art.7.3.3

x [mm]	Sect.	Mk [kNm]	MRk [kNm]	s [mm]	s,max [mm]	Ø [mm]	Ø,max [mm]	Remarks
0	1	-10.0	-35.6	146.0	146.0	12.0	8.4	
1770	2	***-188.9***	***-122.5***	80.0	80.0	16.3	5.6	4)
1770	2	***-188.9***	***-122.5***	80.0	80.0	16.3	5.6	4)
7770	3	***-175.3***	***-104.5***	88.4	88.4	15.9	5.9	4)
7770	3	***-175.3***	***-104.5***	88.4	88.4	15.9	5.9	4)
10006	1	-8.2	-35.6	146.0	146.0	12.0	8.4	
4849	4	***157.1***	***104.5***	88.4	88.4	15.9	5.9	4)

4) Control cracking does not comply.

2.3.4 Stirrups

from x [mm]	to x [mm]	Length [mm]	Stirrups
0	1770	1770	Ø10-200 (3s.)
0	1770	1770	Ø10-100 (3s.)
1770	7770	6000	Ø10-200 (3s.)
7770	9100	1330	Ø10-100 (3s.)
9100	10047	947	Ø10-200 (3s.)



Envelope D-line (ULS)

2.3.5 Shear reinforcement - Ultimate limit state (ULS)

...EN 1992-1-1 art.6.2.1

x [mm]	VEd [kN]	VRd,c [kN]	VRd,s [kN]	VRd,max [kN]	Side	Stirrups	Remarks
0	-107.9	-130.8	-130.8	-1476.6	Top	Ø10-100 (3s.)	
1770	***-144.3***	***-130.8***	***-130.8***	***-1476.6***	Top	Ø10-100 (3s.)	3)
6000	***-156.6***	***-130.8***	***-130.8***	***-1476.6***	Top	Ø10-200 (3s.)	3)
7770	***-182.9***	***-130.8***	***-130.8***	***-1476.6***	Top	Ø10-200 (3s.)	3)
10047	-2.5	-130.8	-130.8	-1476.6	Top	Ø10-200 (3s.)	
1770	***185.0***	***130.8***	***130.8***	***1476.6***	Bottom	Ø10-200 (3s.)	3)
2277	***176.3***	***130.8***	***130.8***	***1476.6***	Bottom	Ø10-200 (3s.)	3)
7770	137.1	130.8	261.5	1476.6	Bottom	Ø10-100 (3s.)	
9100	79.6	130.8	261.5	1476.6	Bottom	Ø10-100 (3s.)	
10047	71.2	130.8	130.8	1476.6	Bottom	Ø10-200 (3s.)	

3) Shear does not comply.

Annex D.6.
Beam design (dutch)

D.6. Tweepaals poer, volgens staafwerkmodellen

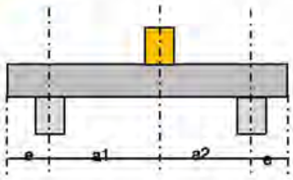
D.6.1. Algemeen

D.6.1.1. Materiaal

Betonkwaliteit	=	C35/45
Milieuklasse	=	XC4 / / XS1 / XF3 / XA3
Toelaatbare scheurwijdte	=	0.2 mm
Betondekking	=	80 mm
Wapeningkwaliteit	=	B 500B

D.6.1.2. Geometrie

Poerbreedte b = 1000 mm — Afstand van paal 1 tot hart kolom a1 = 1000 mm
Poerhoogte h = 800 mm — Afstand van paal 2 tot hart kolom a2 = 1000 mm
Afstand van eind poer tot ondersteuning e = 500 mm
Paalvorm = rond — Kolom vorm = rechthoekig
Paalafmetingen D_{paal} = 460 mm — Kolom afmetingen D_{kolom} = 850 mm
B_{paal} = mm — B_{kolom} = 500 mm



Ingeschatte wapeningsafmeting

		aant.	D	A per staaf			A totaal	
bovenstaven	=	7 x	Ø 20	314	mm²		2199.1	mm²/m
bijlegstaaf	=	0 x	Ø 0	0	mm²			
onderstaven	=	8 x	Ø 25	491	mm²		3927.0	mm²/m
bijlegstaaf	=	0 x	Ø 0	0	mm²			
flankstaaf	=	2 x	Ø 12	226	mm²	+(1*Ø20+1*Ø25)/2 =	855	mm²/m
beugels	=		Ø 12	-	300 mm		1508	mm²/m
					aantal sneden per beugel	=	4	snedig

D.6.1.3. Belasting

De aanwezige belastingen vanuit de kolom zijn:

	Rx [kN]	Ry [kN]	Rz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
min. Belasting incl. veiligheid	**-66.33**	**-256.72**	**-1205.3**	**0**	**0**	**0**
max. Belasting incl. veiligheid	**-89.43**	**283.69**	**707.31**	**0**	**0**	**0**
min. Belasting excl. veiligheid	**-43.93**	**-168.88**	**-844.51**	**0**	**0**	**0**
max. Belasting excl. veiligheid	**-59.31**	**190.26**	**451.72**	**0**	**0**	**0**

[Negative Rz = druk, Positief = trek]
Krachten zijn afkomstig uit het hoofdrekenmodel

D.6.2. Overzichten

D.6.2.1. Reactiekrachten

Druk

R_a = a/l * R_z = 1000 / 2000 * -1205.3 = -602.65 kN
R_b = b/l * R_z = 1000 / 2000 * -1205.3 = -602.65 kN

Trek

R_a = a/l * R_z = 1000 / 2000 * 707.31 = 353.66 kN — Controle verder niet van toepassing
R_b = b/l * R_z = 1000 / 2000 * 707.31 = 353.66 kN

D.6.2.2. Overzicht u.c.'s

Drukbelasting onder kolom	u.c.	=	14.13%	Trekwapening tussen paal 1 & 2	u.c.	=	69.23%
Schuinvlak met diagonaal naar paal 1	u.c.	=	40.08%	Toetsing geschatte hoogte	u.c.	=	81.52%
Schuinvlak met diagonaal naar paal 2	u.c.	=	40.08%	Toetsing positie trekband	u.c.	=	81.33%
Drukbelasting op paal 1	u.c.	=	21.26%	Controle hoogte poer	u.c.	=	81.28%
Druk schuinvlak diagonaal vanaf paal 1	u.c.	=	73.73%	Scheurwijdte	u.c.	=	85.47%
Drukbelasting op paal 2	u.c.	=	21.26%				
Druk schuinvlak diagonaal vanaf paal 2	u.c.	=	73.73%				

Benodige verankeringslengte 378.46 mm
Aanwezige lengte 407.50 mm
Er is voldoende lengte aanwezig na oplegging voor verankering, omzetten wapening rekentechnisch niet nodig.
Buigdoorndiameter -119.76 mm

D.6.3. Berekening poer volgens de theorie van staafwerkmodellen art. 6.5, van EN 1992-1-1 +NB

D.6.3.1. Controle gedrongen ligger

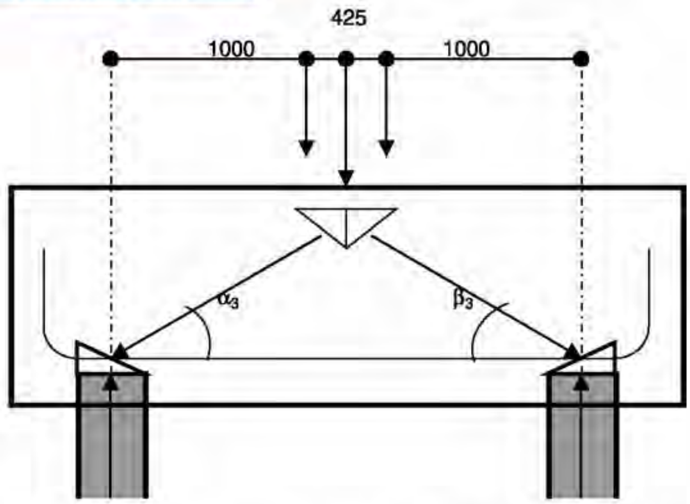
Conform EN 1992-1-1 +NB art. 5.3.1 (3) is er spraken van een gedrongen ligger indien de overspanning ≤ 3 * balkhoogte

Overspanning = 2000 mm

Balkhoogte = 800 mm * 3 = 2400 mm ≥ 2000 mm

Berekening volgt volgens theorie staafwerkmodellen, balk is een gedrongen ligger.

D.6.3.2. Berekening van de hoeken & staafkrachten



d_{rek} = 0.7 * (h - c - øb - 0.5 * øk)

d_{rek} = 487 mm

HOEKEN

α_1	=	werklijn paal 1 naar F_{links}	=	boogtan (d_{rek} / m)		boogtan (486.85 / 787.5)	=	31.7 °
α_2	=	werklijn paal 1 naar F_{rechts}	=	boogtan (d_{rek} / n)		boogtan (486.85 / 1212.5)	=	21.9 °
β_1	=	werklijn paal 2 naar F_{links}	=	boogtan (d_{rek} / o)		boogtan (486.85 / 1212.5)	=	21.9 °
β_2	=	werklijn paal 2 naar F_{rechts}	=	boogtan (d_{rek} / p)		boogtan (486.85 / 787.5)	=	31.7 °
m	=	a_1 - 0.25 * L_{kolom}	=	1000 - 850 / 4	=	788 mm		
n	=	a_1 + 0.25 * L_{kolom}	=	1000 + 850 / 4	=	1213 mm		
o	=	a_2 - 0.25 * L_{kolom}	=	1000 - 850 / 4	=	788 mm		
p	=	a_2 + 0.25 * L_{kolom}	=	1000 + 850 / 4	=	1213 mm		
hoek a	=	krachtenveelhoek F_{links}	=	90 - α_2	=	90 - 21.9	=	68.1 °
hoek c	=	krachtenveelhoek F_{links}	=	90 - α_1	=	90 - 31.7	=	58.3 °
hoek b	=	krachtenveelhoek F_{links}	=	180 - hoek a - hoek c	=	180 - 68.1 - 58.3	=	53.6 °
hoek d	=	krachtenveelhoek F_{rechts}	=	90 - β_2	=	90 - 31.7	=	58.3 °
hoek f	=	krachtenveelhoek F_{rechts}	=	90 - β_1	=	90 - 21.9	=	68.1 °
hoek e	=	krachtenveelhoek F_{rechts}	=	180 - hoek d - hoek f	=	180 - 58.3 - 68.1	=	53.6 °

STAAFKRACHTEN

Staafkracht t.g.v. linker halve puntlast

D1	=	R_a * sin(c) / sin(b)	=	602.65 * sin(58.3) / sin(53.6)	=	636.84 kN
H_1	=	D_1 *cos(β_1)	=	636.84 * cos(21.9)	=	590.98 kN

Staafkracht t.g.v reactiekracht rechts

D_2	=	R_b * sin f / sin e	=	602.65 * sin(68.1) / sin(53.6)	=	694.80 kN
H_2	=	D_2 *cos(β_2)	=	694.8 * cos(31.7)	=	590.98 kN

Totale trekkracht in onderregel	T_{Ed}	=	H_1 + H_2	=	1181.96 kN
Drukdiagonaal paal 1	$D_{Ed,1}$	=	√ (602.65² + 1181.96²)	=	1326.73 kN
Drukdiagonaal paal 2	$D_{Ed,2}$	=	√ (602.65² + 1181.96²)	=	1326.73 kN
α_3 = hellingshoek drukstaaf paal 1		=	boogtan (602.7 / 1181.96)	=	27.0 °
β_3 = hellingshoek drukstaaf paal 2		=	boogtan (602.7 / 1181.96)	=	27.0 °

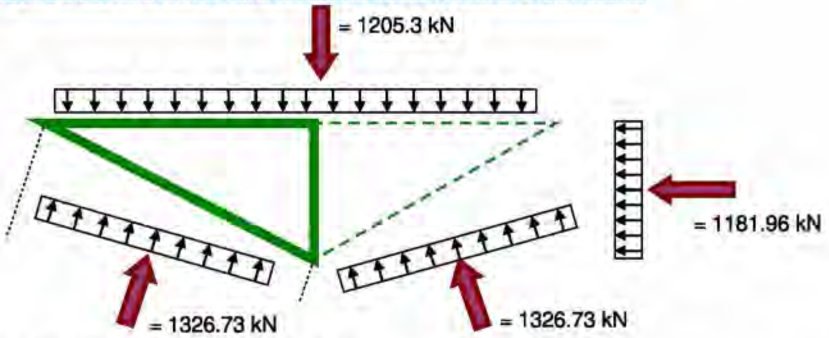
Hoek contactvlakken horizontaal 90 - α_3 links = 63.0 °

Hoek contactvlakken horizontaal 90 - β_3 links = 63.0 °

D.6.3.3. Bepaling druksterkte

Karakteristieke cilinderdruksterkte	f_{ck}	=		= 35.00 N/mm²	
Rekenwaarde betondruksterkte	f_{cd}	=	f_{ck} / γ_{MC}	= 23.33 N/mm²	(3.15)
	γ_{MC}	=		= 1.50	
Sterktereductiefactor	v'	=	1 - f_{ck} / 250	= 0.86	(6.57N)

D.6.3.4. Controle knoop onder kolom, type CCC (compressie, compressie, compressie), controle drukkrachten



Toelaatbare drukspanning in de knoop $\sigma_{Rd,max}$ = $k_1 * v' * f_{cd}$ = 20.1 N/mm² (6.60)

k_1 = 1 conform NB Nederland

Normaalkracht uit de kolom	F_{Ed}	=	1205 kN
Oppervlak van de kolom	A	=	425000 mm²
Gereduceerd oppervlak kolom i.v.m. veiligheid uitvoering	A_{rek} = A * 1	=	425000 mm²
Spanning onder kolom	σ	=	2.84 N/mm²
Uitnuttingsgraad		=	14.13%

Vertikaal vlak

Normaalkracht = Trekkracht in trekband	= T_{Ed}	=	1181.96 kN
Breedte van knoop onder kolom	=	=	500 mm
Rekenbreedte i.v.m betondekking en veiligheid		=	652 mm
Minimale knoophoogte	= 1181.96 * 1000 / 500 / 20.07	=	117.80 mm

Schuinvlak met diagonaal naar paal 1

Schuine lengte	= √ (117.8² + 325.96²)	=	346.59 mm
Hoek knoop met horizontaal	= boogtan (117.8 / 325.96)	=	19.9 °
Hoek contactvlak en loodrechte van drukdiagonaal	= 19.87 - 62.98	=	-43.1 °
Werkelijke lengte van drukvlak	= 346.6 * cos(-43.11)	=	253.01 mm

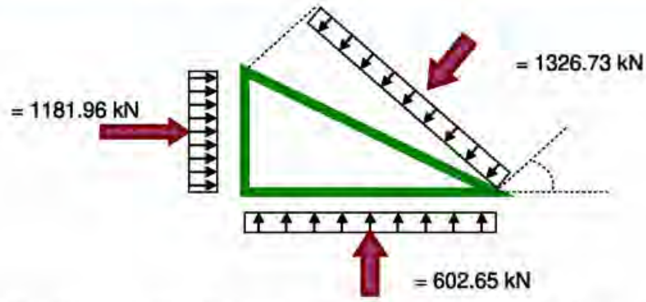
Drukspanning in diagonaal = 1326.7 * 10³ / (253 * 500)	=	8.04 N/mm²
Uitnuttingsgraad	=	40.08%

Schuinvlak met diagonaal naar paal 2

Schuine lengte	= √ (117.8² + 325.96²)	=	346.59 mm
Hoek knoop met horizontaal	= boogtan (117.8 / 325.96)	=	19.9 °
Hoek contactvlak en loodrechte van drukdiagonaal	= 19.87 - 62.98	=	-43.1 °
Werkelijke lengte van drukvlak	= 346.6 * cos(-43.11)	=	253.01 mm

Drukspanning in diagonaal = 1326.7 * 10³ / (253 * 651.92)	=	8.04 N/mm²
Uitnuttingsgraad	=	40.08%

D.6.3.5. Controle knoop bij paal 1, type CCT (compressie, compressie, trek), controle drukkrachten



Toelaatbare drukspanning in de knoop	$\sigma_{Rd,max}$	=	$k_2 * v' * f_{cd}$	=	17.1 N/mm²	(6.61)
			k_2	=	0.85	conform NB Nederland

Reactiekracht op paal 1	R_a	=	603 kN
Oppervlak van de kolom	A	=	166190 mm²
Gereduceerd oppervlak kolom i.v.m. veiligheid uitvoering	A_{rek} = A * 1	=	166190 mm²
Spanning onder kolom	σ	=	3.63 N/mm²
Uitnuttingsgraad		=	21.26%

Vertikaal vlak

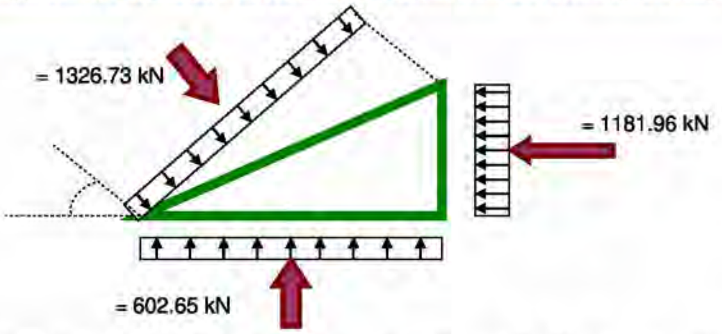
Normaalkracht = Trekkracht in trekband	= T_{Ed}	=	1181.96 kN
Breedte van knoop equivalente breedte		=	407.7 mm
Rekenbreedte i.v.m betondekking en veiligheid		=	407.7 mm
Minimale knoophoogte	= 1181.96 * 1000 / 407.66 / 17.06	=	169.98 mm

Schuinvlak

Schuine lengte	= √ (169.98² + 203.83²)	=	265.41 mm
Hoek knoop met horizontaal	= boogtan (169.98 / 203.83)	=	39.8 °
Hoek contactvlak en loodrechte van drukdiagonaal	= 39.83 - 27.02	=	12.8 °
Werkelijke lengte van drukvlak	= 265.4 * cos(12.81)	=	258.80 mm

Drukspanning in diagonaal = 1326.7 * 10³ / (258.8 * 407.7)	=	12.58 N/mm²
Uitnuttingsgraad	=	73.73%

D.6.3.6. Controle knoop bij paal 2, type CCT (compressie, compressie, trek), controle drukkrachten



Toelaatbare drukspanning in de knoop	$\sigma_{Rd,max}$	= $k_2 * v' * f_{cd}$	= 17.1 N/mm²		(6.61)
		k_2	= 0.85	conform NB Nederland	

Reactiekracht op paal	R_b	=	603 kN
Oppervlak van de kolom	A	=	166190 mm²
Gereduceerd oppervlak kolom i.v.m. veiligheid uitvoering	A_{rek} = A * 1	=	166190 mm²
Spanning onder kolom	σ	=	3.63 N/mm²
Uitnuttingsgraad		=	21.26%

Vertikaal vlak			
Normaalkracht = Trekkracht in trekband	= T_{Ed}	=	1181.96 kN
Breedte van knoop equivalente breedte		=	407.7 mm
Rekenbreedte i.v.m betondekking en veiligheid		=	407.7 mm
Minimale knoophoogte	= 1181.96 * 1000 / 407.66 / 17.06	=	169.98 mm
Schuinvlak			
Schuine lengte	= √ (169.98² + 203.83²)	=	265.41 mm
Hoek knoop met horizontaal	= boogtan (169.98 / 203.83)	=	39.8 °
Hoek contactvlak en loodrechte van drukdiagonaal	= 39.83 - 27.02	=	12.8 °
Werkelijke lengte van drukvlak	= 265.4 * cos(12.81)	=	258.80 mm
Drukspanning in diagonaal = 1326.7 * 10³ / (258.8 * 407.7)		=	12.58 N/mm²
Uitnuttingsgraad		=	73.73%

D.6.3.7. Controle trekband tussen paal 1 & 2

Trekkracht	T_{Ed}	=	1181.96 kN
Benodige wapening	T_{Ed} *10³ / fy	=	2718.5 mm²
Aanwezige wapening		=	3927.0 mm²
Uitnuttingsgraad		=	69.23%

D.6.3.8. Controle hoogte inwendige hefboomsarm & ligging trekband

Ingeschatte hoogte hefboomsarm		=	486.85 mm
Maximale hoogte hefboomsarm	= 800 - 117.8 - 170 / 2	=	597.2 mm
Toetsing geschatte hoogte		=	81.52%
Hart trekband - onderzijde poer		=	104.5 mm
Hartmaat vertikale vlak CCT knoop - onderzijde poer		=	85 mm
Toetsing positie trekband		=	81.33%
Minimale poerhoogte	= 486.85 + 104.5 + 58.9	=	650 mm
Controle hoogte poer		=	81.28%

D.6.3.9. Controle scheurwijdte

σ_s = 210.89 N/mm²

max. toegepaste d = 25 mm

max. toegepaste h.o.h. = 117 mm

w_k = 0.20 mm

max. toelaatbare d = 14.91 mm

max. toelaatbare h.o.h. = 136.39 mm

scheurwijdte voldoet

D.6.3.10. Bepaling benodigde verankeringslengte na oplegpunt

$l_{b,rqd}$ = $0.25 * ø * s_{sd} / f_{bd}$ = 557.38 mm

σ_{sd} = = 300.98 N/mm²

ø = = 25.00 mm

f_{bd} = $2.25 * \eta_1 * \eta_2 * f_{ctd}$ = 3.38 N/mm²

f_{ctd} = = 1.50 N/mm²

η_1 = = 1.00 bij goede aanhechting

η_2 = = 1.00 voor ø ≤ 32 mm

Verankeringslengte

$\alpha_1 * \alpha_2 * \alpha_3 * \alpha_4 * \alpha_5 * l_{b,rqd} > l_{b,min}$

c_d 80 mm

α_1 = 0.7 = voor gebogen staven

α_2 = 0.97 = voor gebogen staven: MAX(MIN((1-(0.15*(80-3*25)/25));1);0.7)

α_3 = 1 = veilig gerekend

α_4 = 1 = veilig gerekend

α_5 = 1 = veilig gerekend

$l_{b,min}$ = max(0.3 $l_{b,rqd}$;10Ø;100 mm) = 250.00 mm

l_{bd} = = 378.46 mm

aanwezige lengte = e - c_d -øb_{lg} -0.5 øh_w = 407.50 mm

Er is voldoende lengte aanwezig na oplegging voor verankering, omzetten wapening rekentechnisch niet nodig.

D.6.3.11. Minimale buigdiameter

l_{bd}	=	378.46 mm
Lengte tot aan dekking x	=	407.50 mm
Benodigde lengte na bocht	=	-29.04 mm
betondekking op te buigen staaf	=	80 mm
$F_{bt} = (l_{bd} - x) / l_{bd} * T_{Ed}$	=	-90.70 kN
$ø_{m,min} \geq F_{bt} * [(1/a_b) + 1/(2*ø)]/f_{cd}$	=	-119.8 mm
a_b	=	93 mm

Annex E
Detail calculations

Content

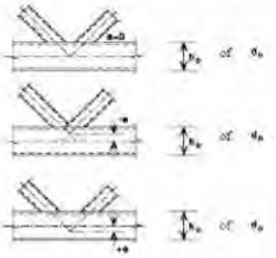
Annex E.1.
General information connections / performance requirements

Content

E.1. General information connections / performance requirements

E.1.1. General connection information/requirements

- Steel grades: All plate material is S235JR unless otherwise noted.
  If the main part is S355... then the plate material is S355JR unless otherwise noted
- Gusset plates should be made as compact as possible within the minimum geometry requirements:
  end distances, intermediate distances, weld dimension and spreading dimensions
- If connections have to be made with a deviation the scheme for the purpose of implementation, this can be done without additional checks, provided the following are met:



Figuur 5.3 — Excentriciteit van verbindingen

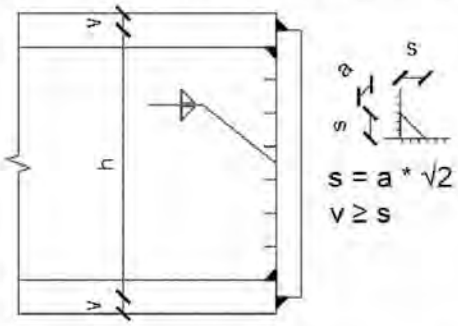
$$-0{,}55\, d_0 \leq e \leq 0{,}25\, d_0 \qquad \text{... (5.1a)}$$

$$-0{,}55\, h_0 \leq e \leq 0{,}25\, h_0 \qquad \text{... (5.1b)}$$

where:

e is the eccentricity defined in Figure 5.3;
d_0 is the diameter of the chord;
h_0 is the depth of the chord, in the plane of the lattice girder.

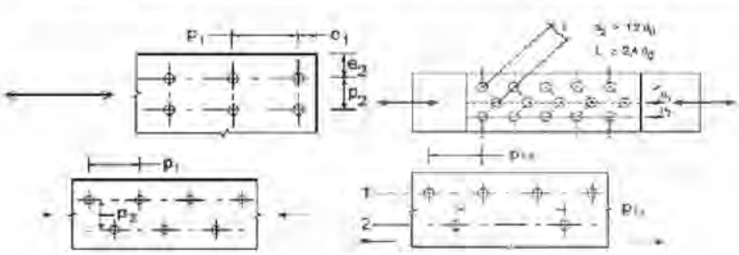
- Produce sheet material in a thickness of 15 mm, unless stated otherwise
- Take the provisions prescribed by the galvanizing plant for hot-dip galvanized construction parts.
  Openings in profiles and plates must be coordinated with the constructor.
- Connections that are not specified must be made with nuts and bolts in at least M16 8.8 according to ISO 4014, without pre-tension, unless M16 in connection with. profile is too large, then at least M12 8.8.
- Anchor bolt position tolerances according to table B.23 of EN 1090-2 +NA
- When detailing, keep in mind that for a bolt, there must be enough space around the bolt to allow the bolt to be fitted and to be able to tighten the bolt with a wrench. When positioning the connection, take into account the mounting order of the different parts.
  If there is insufficient space to place the bolts, discuss with the engineer how things can be adjusted with a wrench.
- According to EN 1090-2 +NA, the bolts should be run out with a 1 pass through (advice is 2 passes)
- With pre-tensioned bolts, there must be at least 4 turns excluding spout between the nut and the beginning of the stem.
- Connections are categorized by default in Category A and/or Category D of EN 1993-1-8 3.4 + NA.
- If it concerns a special connection with bias, these are determined according to Category C and Category E of EN 1993-1-8 3.4 + NA.
- When using standard practical connections in normal holes and short slotted holes, washers are not required.
- For the use of oversized holes and long slotted holes, the use of washers is required.
- For slotted holes that are subject to tension, plate rings of sufficient thickness must be used.
- For moment connections, prestressed and overlap connections with 1 bolt / bolt row, a washer is required at both the nut and at the bolt head.
  Application of hardened slope plates on slopes greater than according to the following:
  a.) 1/20 (~3gr) ≤ M20 b.) 1/30 (~2gr) > M20
- Carry out corner welds in a thickness of 4 mm unless stated otherwise. The weld size is the root diameter:

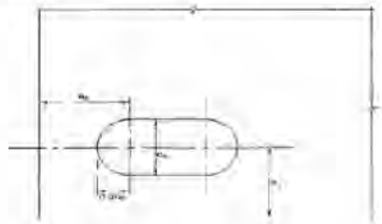


ISO 4017 bolts used for calculation

ISO 4014 bolts to be used in structure

According to fig. 3.3 of EN1993-1-8 - Minimum and maximum edge distances for bolts				
Distance and spacing acc. to figure	**Minimum distance**	**Maximum distance**		
		Steel according to EN 10025 with the exception of steel grades according to EN 10025-5		Steelstructures made acc. EN 10025-5
	All steeltypes	Steel exposed to the outside environment or other corrosive influences	Steel NOT exposed to the outside environment or other corrosive influences	untreated steel
Edgedistance e_1	$1.2 * d_0$	$4t + 40$ mm		largest value of 8t or 125 mm
Edgedistance e_2	$1.2 * d_0$	$4t + 40$ mm		largest value of 8t or 125 mm
Edgedistance e_3 for slotted holes	$1.5 * d_0$			
Edgedistance e_4 for slotted holes	$1.5 * d_0$			
Spacing p_1	$2.2 * d_0$	smallest value of 14t or 200 mm	smallest value of 14t or 200 mm	smallest value of $14t_{min}$ or 175 mm
Steek $p_{1,0}$		smallest value of 14t or 200 mm		
Steek $p_{1,i}$		smallest value of 28t or 200 mm		
Steek p_2	$2.4 * d_0$	smallest value of 14t or 200 mm	smallest value of 14t or 200 mm	smallest value of $14t_{min}$ or 175 mm





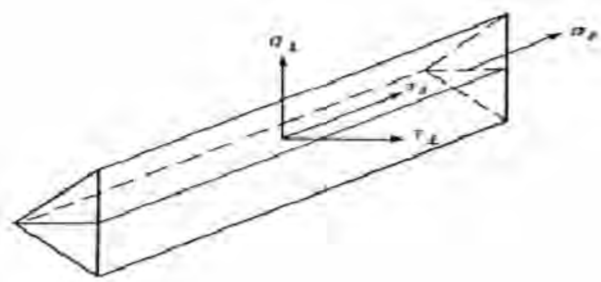
E.1.2. General weld data

Simplified method:

$\sqrt{(N^2 + Vy^2 + Vz^2)} < l_{las} * f_{vw,d} * a$

Combined stress method:

Formula



N =	$\sigma_\perp$ =	$\tau_\perp$ =	$N*\sqrt{2} / (4*a*l)$	$\tau_\parallel$ =		0 N/mm²
Vy =	$\sigma_\perp$ =	$\tau_\perp$ =	$Vy*\sqrt{2} / (4*a*l)$	$\tau_\parallel$ =		0 N/mm²
Vz =	$\tau_\parallel$ =		$Vz / (2*a*l)$	$\sigma_\perp$ =	$\tau_\perp$ =	0 N/mm²
Mx =	$\tau_\parallel$ =		$(M/t) / (2*a*l)$	$\sigma_\perp$ =	τ_1 =	0 N/mm²
Mx =	$\sigma_\perp$ =	$\tau_\perp$ =	$2.12*M / (a*l^2)$	$\tau_\parallel$ =		0 N/mm²
My =	$\sigma_\perp$ =	$\tau_\perp$ =	$2.12*M / (a*l^2)$	$\tau_\parallel$ =		0 N/mm²
Mz =	$\sigma_\perp$ =	$\tau_\perp$ =	$0.706*M / (a*l*t)$	$\tau_\parallel$ =		0 N/mm²

Combined stress (acc. EN 1993-1-8+NA)

$\sigma_{w;s;d} = \sqrt{\sigma_\perp^2 + 3*(\tau_\perp^2 + \tau_\parallel^2)} < f_{w,d}$

Additional rule $\sigma_\perp < 0.9\, f_u / \gamma_{M2}$

General weld sizes

According to EN-1993-1-8 § 7.3.1. welds for SHS-sections shall be:

For S235 and S275: $a = 1.0 * t$

For S355: $a = 1.1 * t$

The minimum and maximum welding dimensions:

$2 \leq a \leq 0.7 *$ min. t

$a \geq \sqrt{(\text{max. } t - 0.5)}$ **

** This formula takes into account the risk of brittle & cold fracture, which can be caused by the rapid cooling. These dimensions do not apply if a correct welding procedure is followed in accordance with EN 1090-2 +NA. Combined with, among other things, the correct Z-class and version in accordance with EN 1993-1-10

E.1.3. Base plate connections

Base plate connections must conform to the following rules:

- Anchor bolts with hooks may not be used if the yield point is higher than f_{yb} = 300 N/mm² (only 4.6 is allowed)
- Anchor bolts with a yield point higher than f_{yb} = 300 N/mm² shall have an anchorplate or similar to ensure adequate transfer of force to the concrete.
- Unless noted otherwise in the calculation, anchor bolts shall have 2 nuts + washers min. t = 4 mm
- Installation of adhesive anchors needs to be done according to specifications of the manufacturer.

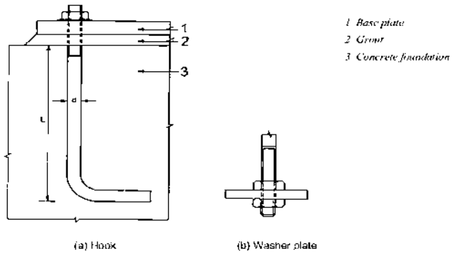


Figure 6.14 of EN 1993-1-8+NA, connections of anchorbolts

Base plates are designed with large holes acc. table 11 of EN 1090-2+NA. When larger holes are used the washers shall be welded to the baseplate on site or the holes shall be filled with a suitable resin acc. AISC Steel design Guide 1 [9].

If holes in base plates need to be enlarged during erection due to variations in anchor bolt positions and, as a consequence, washers need to be welded this must be communicated to the calculator so the welds can be calculated.

During erection the collums can be alligned using the following methods:
- through the use of a minimum of 4 adjusting nuts, not allowable for anchors that can't be used in compression e.g mechanical fasteners.
- through the use of wedges.

In case of a baseplate connection with shear concrete reïnforcement bars need to be sufficïent to allow for the shear force.

Anchor bolts shall be manufactured acc. EN ISO 898-1 or shall be hot-rolled steel acc. EN 10025-2+NA or EN 10025-4+NA.

Grouting shall be cement based grout, special grout or fine concrete and shall have a compression strenghth equal or greater than the concrete.

Cement based grout for use between steel bases or bearing plates and concrete foundations shall be as follows:
- for nominal thickness not exceeding 25 mm: Neat Portland cement;
- for nominal thickness between 25 and 50 mm: Fluid Portland cement mortar that is not leaner than 1:1 cement to fine aggregate;
- for nominal thickness of 50 mm and above: Dry as possible Portland cement mortar that is not leaner than 1:2 cement to fine aggregate.

Wedges are to be removed after grouting and the holes filled.

All rings are plate rings with a minimum thickness of 5 mm.

If holes larger than according to EN 1090-2 +NA are used, this will be passed on to the constructor, for the purpose of determining the thickness of the ring and any weld. E.e.a. should always be tested for possible tensile forces.

Base anchorage length if not specified:

Length based on full tension in anchor

	Hook anchor, length for hook:				Threaded rod, with double nut and plate washer		
	4.6 / C20/25	4.6 / C30/37	4.6 / C35/45		8.8 / C20/25	8.8 / C30/37	8.8 / C35/45
M12	301	230	200		803	612	533
M16	401	306	266		1070	817	710
M20	502	383	333		1338	1021	888
M24	602	459	399		1605	1225	1065
M30	752	574	499		2006	1531	1331
M36	941	718	624		2508	1914	1664

E.1.4. Steel-steelconnections

For the calculation of connections between steel to steel, the components method as described in EN 1993-1-8 + NA is used.

On the basis of the 20 basic components, the respective checks for a connection are performed.

For the calculations use is made of, when possible, calculation programs that have a calculation method that is in accordance with the component method, programs that use the component method, or separate excel spreadsheets that are based on the check according to the individual components.

For certain basic types of connections, Excel spreadsheets are used for the calculation.

Various sources are used for the preparation and maintenance of these spreadsheets.

These calculation sheets are primarily prepared on the basis of SCI document P358 "Joints in steel constructions: Simple joints to Eurocode 3".

Where UK safety factors are used in this document, they have been superseded by the applicable NB unless the UK value makes a safer assumption.

For special moment connections that cannot be calculated with the available calculation programs, SCI document P398 "Joints in steel constructions: Moment-Resisting Joints to Eurocode 3" is used as the basis for hand/spreadsheet calculations

Manual calculations are used for non-standard connections, which may be supplemented with calculation sheets that are written on the basis of the standard components according to EN 1993-1-8 + NB

Baseplates are calculated by means of an Excel spreadsheet which is prepared on the basis of CUR/BmS report 10, this report is based on the rules from EN 1993-1-8 + NA and EN 1992-1-1 + NA + CEN/TS 1992 -4-x, which are internally supplemented with the newer EN 1992-4 +NA.

These spreadsheets have been checked both internally on the basis of various practical documentation and through external checks through comments from controlling authorities.

E.1.5. Rekenprogramma's

In addition to the internally developed calculation sheets, several special calculation programs are used for calculating connections. Or in some cases (usually with anchor connections) supplier-specific programs are used.

The available programs are:

Scia Engineer	For basic moment connections, hinged floor connections
Hilti PROFIS Demu Fischer C-FIX DesignFiX	4 calculation programs for the design of adhesive anchor connections based on ETAG documentation, i.c.w. the product-specific data.
IDEA StatiCa Connect	FEM analysis package for connections. Features a wider range of controls allowing multiple exotic knots to be calculated. E.e.a. is checked according to the rules of the FEM analysis. Where the permissible bolt forces and welding stresses are tested against the EN 1993-1-8 + NA The calculation program takes into account all modeled eccentricities that apply within the node. **The component method is not followed herein. In contrast, a more accurate FEM distribution and control is performed based on the tensions that arise in the node. E.e.a. according to EN 1993-1-5 + NA, Annex C. See also §E.1.7. for explanation of the calculation method of the program.**

E.1.6. FEM Analysis / shown stresses

In some calculations of e.g. Scia and IDEA StatiCa Connect display voltages that are greater than the basic f_y values used for calculation. These exceedances are usually permissible in accordance with the applicable standard.

For connection calculations with IDEA StatiCa Connect, the maximum permissible exceedance of the yield point is set at 5% as standard. This means that a maximum tension for S235 material of 235 * 1.05 = 247 N/mm² is permissible.

This value (the strain hardening of steel) of 5% has been chosen in accordance with EN1993-1-5 +NB appendix C par. C8 note 1. According to the introductory presentation of IDEA given by Prof. dr. ir. F.S.K. Bijlaard, however, there is sufficient theoretical background to be allowed to set this value at 10% (see example 2 below for an explanation of 10%). For example, it appears that in the main/detail calculation in several cases the stresses may be much greater than the yield point.

In addition, in accordance with Technical File #5 of Bouwen met Staal for earthquakes, 10% is already calculated for the strain hardening, this is in accordance with EN 1998-1 +NB. Which provides an extra foundation for the application of a higher strain hardening.

Below are some examples of formulas where the voltage > f_y, but the u.c. < 1. Starting point for the material is S235

Example 1

formulas 6.33 t/m 6.41 of EN 1993-1-1 + NB

$$\left.\begin{array}{ll} 6.33 & N_{Ed} \leq 0{,}25\, N_{pl,Rd} \text{ en} \\ 6.34 & N_{Ed} \leq \dfrac{0.5 h_w t_w f_y}{\gamma_{M0}} \end{array}\right\} \quad N\Rightarrow 235*25\% \quad = \quad 58.8 \text{ N/mm}^2 \quad \text{u.c.} \quad = \quad 0.25 < 1 \text{ sufficient}$$

The following voltages are calculated for the moments:

According to formula 6.36: $M_{N,y,Rd} = M_{pl,y,Rd}\,(1-n)/(1-0{,}5a)$ but $M_{N,y,Rd} \leq M_{pl,y,Rd}$

My=> $\sigma M_{N,y,Rd}$ = 235 N/mm² $\sigma M_{y,Ed}$ = 177 N/mm² u.c. = 0.75 < 1 sufficient

for $n \leq a$: $M_{N,z,Rd} = M_{pl,z,Rd}$

Mz=> $\sigma M_{N,z,Rd}$ = 235 N/mm² $\sigma M_{z,Ed}$ = 120 N/mm² u.c. = 0.51 < 1 sufficient

$n = N_{Ed} / N_{pl,Rd} = 0.25$

$a = (A - 2{*}b{*}tf) / A$ but $\leq 0.5 = 0.5$

For biaxial bending, this stress may be according to formula 6.41:

$$\left[\frac{M_{y,Ed}}{M_{N,y,Rd}}\right]^{\alpha} + \left[\frac{M_{z,Ed}}{M_{N,z,Rd}}\right]^{\beta} \leq 1 \quad = \left(\frac{177}{235}\right)^{2} + \left(\frac{120}{235}\right)^{1.25} = 0.999 < 1 \text{ sufficient}$$

For I and H profiles the exponents are:

$\alpha = 2$

$\beta = 5n$ but $\geq 1 = 1.25$

The u.c. complies with this, however the maximum stress that occurs is higher than the basic yield stress:

σ = 58.75 + 177 + 120 = 356 N/mm² => 51.38% overrun

Example 2

Permissible draft in profile at the location of a hole:

According to EN 1993-1-1 +NA formula 6.7 the tensile force in a profile may be max: $N_{u,Rd} = 0.9 * A_{net} * f_u / \gamma_{M2}$

γ_{M2} = 1.25

f_u = 360 N/mm²

Allowable stress that follows from this σ = 360 * 0.9 / 1.25 = 259 N/mm²

This is an exceedance of = 10.30% compared to f_y (10% value as indicated by Prof. Ir. F.S.K. Bijlaard)

Example 3

Permissible butt t.p.v. bolt holes

$$F_{b,Rd} = \frac{k_1 * \alpha_b * f_u * d * t}{\gamma_{M2}}$$

α_b = 1

k_1 = 2.5

Allowable voltage that follows from this σ = 360 * 1 * 2.5 / 1.25 = 720 N/mm²

This is an exceedance of = 206.38% compared to f_y

The conclusion that can be drawn from this is that at local points in both main and detailed calculations the yield point of the parent material may be exceeded without problems in the profile.

E.1.7. Theoretical Background IDEA Statica (text conform IDEA)

E.1.7.1. CBFEM versus Component method

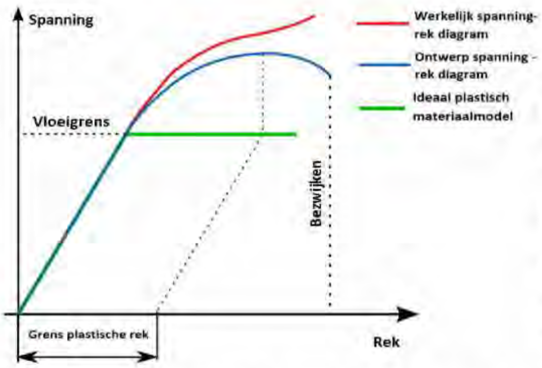
The weak point of standard Component method is in analyzing of internal forces and stress in a joint. CBFEM replaces specific analysis of internal forces in joint with general FEA.

COMPONENTENMODEL BOUTVERBINDING CBFEM MODEL

Check methods of specific components like bolts or welds are done according to standard Component method (Eurocode).
For the fasteners – bolts and welds – special FEM components had to be developed to model the welds and bolts behaviour in joint. All parts of 1D members and all additional plates are modelled as plate/walls. These elements are made of steel (metal in general) and the behaviour of this material is significantly nonlinear.

The real stress-strain diagram of steel is replaced by the ideal plastic material for design purposes in building practice. The advantage of ideal plastic material is, that only yield strength and modulus of elasticity must be known to describe the material curve. The granted ductility of construction steel is 15 %. The real usable value of limit plastic strain is 5% for ordinary design (1993-1-5 appendix C paragraph C.8 note 1).

The stress in steel cannot exceed the yield strength when using the ideal elastic-plastic stress-strain diagram.



Real tension curve and the ideal elastic-plastic diagram of material

CBFEM method aims to model the real state precisely. Meshes of plates / walls are not merged, no intersections are generated between them, unlike it is used to when modelling structures and buildings. Mesh of finite elements is generated on each individual plate independently on mesh of other plates.

Between the meshes, special massless force interpolation constraints are added. They ensure the connection between the edge of one plate and the surface or edge of the other plate. Welds are modelled using a special elastoplastic element, which is added to the interpolation links between the plates. The element respects the weld throat thickness, position and orientation. The plasticity state is controlled by stresses in the weld throat section. The plastic redistribution of stress in welds allows for stress peaks to be redistributed along the longer part of the weld.

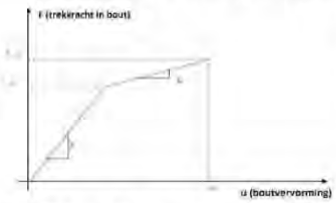
This unique calculation model provides very good results – both for the point of view of precision and of the analysis speed.
The method is protected by patent. The steel base plate is placed loosely on the concrete foundation.

It is a contact element in the analysis model – the connection resists compression fully, but does not resist tension.

Stress-strain diagram of contact between the concrete block and the base plate

Bolted connection consists of two or more clasped plates and one or more bolts. Plates are placed loosely on each other.

A contact element is inserted between plates in the analysis model, which acts only in compression. No forces are carried in tension.



Verklaring symbolen:

- K – linear stiffness of bolt,
- K_p – stiffness of bolt at plastic branch,
- F_{lt} – limit force for linear behaviour of bolt,
- $F_{t,Rd}$ – limit bolt resistance,
- u_l – limit deformation of bolt.

Shear force is taken by bearing. Special model for its transferring in the force direction only is implemented. IDEA StatiCa Connection can check bolts for interaction of shear and tension. The bolt behavior is implemented according to the following picture

The concrete block in CBFEM is modelled using Winkler-Pasternak subsoil model. The stiffness of subsoil is determined using modulus of elasticity of concrete and effective height of subsoil. The concrete block is not designed by CBFEM method.

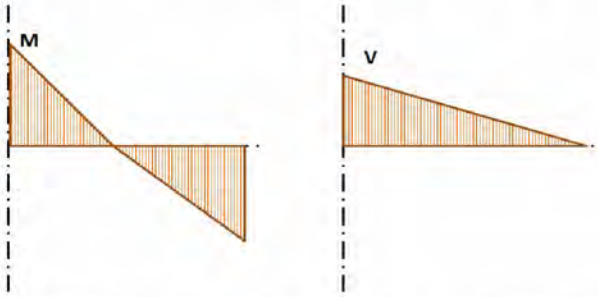
E.1.7.2. Loads

End forces of member of the frame analysis model are transferred to the ends of member segments. Eccentricities of members caused by the joint design are respected during load transfer.

The analysis model created by CBFEM method corresponds to the real joint very precisely, whereas the analysis of internal forces is performed on very idealised 3D FEM 1D model, where individual beams are modelled using centrelines and the joints are modelled using immaterial nodes.

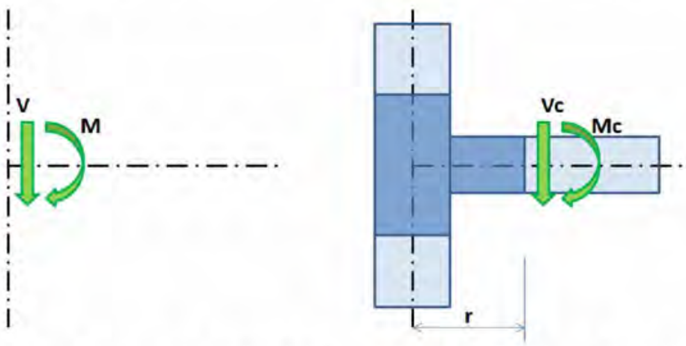
Joint of a vertical column and a horizontal beam

Internal forces are analysed using 1D members in 3D model. There is an example of courses of internal forces in the following picture.



Internal forces in horizontal beam. M and V are the end forces at joint.

The effects caused by member on the joint are important to design the joint (connection). The effects are illustrated in the following picture.



Effects of the member on the joint. CBFEM model is drawn in dark blue color.

Moment M and shear force V act in a theoretical joint. The point of theoretical joint does not exist in CBFEM model, thus the load cannot be applied here. The model must be loaded by actions M and V, which have to be transferred to the end of segment in the distance r.

Mc = M – V . r

Vc = V

In CBFEM model, the end section of segment is loaded by moment Mc and force Vc.

E.1.7.3. Welds

E.1.7.3.1. Design resistance

he stress in the throat section of fillet weld is determined according to EN 1993-1-8 – Cl. 4.5.3:

$\sigma_{w,Ed} = [\sigma_{\perp}^2 + 3\,(\tau_{\perp}^2 + \tau_{\parallel}^2)]^{0.5}$

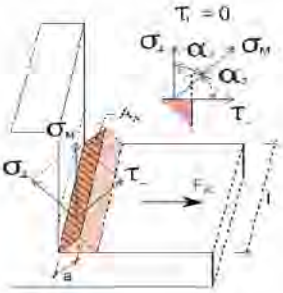
$\sigma_{w,Rd} = f_u \,/\, (\beta_w\, \gamma_{M2})$

$0.9 \cdot \sigma_{w,Rd} = f_u \,/\, \gamma_{M2}$

E.1.7.3.2. *Uitnutting van de las*

$U_t = \min(\sigma_{w,Ed}/\sigma_{w,Rd}; \sigma_{\perp}/0.9\text{-}\sigma_{w,Rd})$

β_w - correlation factor - tab 4.1



E.1.7.4. Bolts

Design tension resistance of bolt: $F_{t,Rd} = 0.9\ f_{ub}\ A_s/\ \gamma_{M2}$.

Design shear resistance at punching of bolt head or nut EN 1993-1-8: $B_{p,Rd} = 0.6\ \pi\ d_m\ t_p\ f_u\ /\ \gamma_{M2}$.

Design shear resistance per one shear plane: $F_{v,Rd} = \alpha_v\ f_{ub}\ A\ /\ \gamma_{M2}$.

Design bearing resistance of plate EN 1993-1-8: $F_{b,Rd} = k_1\ a_b\ f_u\ d\ t\ /\ \gamma_{M2}$.

Utilisation in tension [%]: $Utt = F_{t,Ed}\ /\ \min(F_{t,Rd}, B_{p,Rd})$.

Utilisation in shear [%]: $Uts = V\ /\ \min(F_{v,Rd}, F_{b,Rd})$.

Interaction of shear and tension [%]: $Utts = (V\ /\ F_{v,Rd}) + (F_{t,Ed}\ /\ 1.4\ F_{t,Rd})$.

where

- A – gross cross-section of the bolt or tensile stress area of the bolt if threads are intercepted by shear area,
- A_s – tensile stress area of the bolt,
- f_{ub} – ultimate tensile strength,
- d_m – bolt head diameter,
- d – bolt diameter,
- t_p – plate thickness under the bolt head/nut,
- f_u – ultimate steel strength,
- $\alpha_v = 0.6$ for classes (4.6, 5.6, 8.8)
- $\alpha_v = 0.5$ for classes (4.8, 5.8, 6.8, 10.9),
- $k_1 \leq 2.5$ – factor from Table 3.4,
- $a_b \leq 1.0$ – factor from Table 3.4,
- $F_{t,Ed}$ – design tensile force in bolt,
- V – resultant of shear forces in bolt.

E.1.7.5. Preloaded bolts

The design slip resistance of a preloaded class 8.8 or 10.9 bolt is subjected to an applied tensile force, $F_{t,Ed}$

Preloading force to be used EN 1993-1-8 – 3.9 (3.7)

$F_{p,C} = 0.7\ f_{ub}\ As$

Design slip resistance per bolt EN 1993-1-8 3.9 – (3.8)

$F_{s,Rd} = k_s\ n\ \mu\ (F_{p,C} - 0.8\ F_{t,Ed})\ /\ \gamma_{M3}$

Utilisation in shear [%]:

$U_{ts} = V\ /\ F_{s,Rd}$ where

- A_s – tensile stress area of the bolt,
- f_{ub} – ultimate tensile strength,
- ks – coefficient given in Table 3.6; ks = 1,
- μ – slip factor obtained,
- n – number of the friction surfaces. Check is calculated for each friction surface separately,
- γ_{M3} – safety factor,
- V – shear force,
- $F_{t,Ed}$ – design tensile force in bolt.

E.1.7.6. Anchors

Anchors are checked according to EN 1992-4. The following checks are performed:

- Tensile steel resistance (Cl. 7.2.1.3) is checked for each individual anchor.
- Concrete cone failure resistance (Cl. 7.2.1.4) is checked for an anchor or a group of anchors loaded in tension with a common concrete cone.
- Pull-out resistance (Cl. 7.2.1.5) is checked for each individual anchor with washer plate
- Concrete blowout resistance (Cl. 7.2.1.8) is checked for a group of anchors with washer plates near a concrete edge.
- Anchor shear steel resistance (Cl. 7.2.2.3) is checked for each individual anchor. Anchoring with stand-off: direct is considered as shear without lever arm (Cl. 7.2.2.3.1), and anchoring with stand-off: mortar joint is considered as shear with lever arm (Cl. 7.2.2.3.2).
- Concrete pryout failure (Cl. 7.2.2.4) is checked for a group of anchors
- Concrete edge failure (Cl. 7.2.2.5) is checked for a group of anchors near a concrete edge. It is assumed that the full shear load acting on a base plate is transferred via this group of anchors.

Note that pull-out and combined pull-out and concrete failures of bonded anchors are not checked due to missing values of shear strength of glue. Concrete splitting failure is not checked due to missing splitting forces of post-installed anchor. These checks, if relevant, must be verified by anchor manufacturer.

Anchors with stand-off

Anchor with stand-off is designed as a bar element loaded by shear force, bending moment, and compressive or tensile force. The bar element is designed according to EN 1993-1-1. The linear interaction of tension (compression) and bending moment is assumed.

E.1.7.7. Concrete block

Concrete resistance at concentrated compression:

$F_{jd} = \beta_j \, k_j \, f_{ck} / \gamma_C$.

Average stress under the base plate:

$\sigma = N / A_{eff}$.

Utilisation in compression [%]:

$U_t = \sigma / F_{jd}$,

where

- f_{ck} – characteristic compressive concrete strength,
- $\beta_j = 0.67$ – foundation joint material coefficient,
- k_j – concentration factor,
- γ_c – safety factor,
- A_{eff} – effective area, on which the column force N is distributed.

E.1.7.8. Shear in concrete block

1. Shear is transferred only by friction:
   $V_{Rd,y} = N \cdot C_f$,
   $V_{Rd,z} = N \cdot C_f$.
2. Shear is transferred by shear iron:
   $V_{Rd,y} = N \cdot C_f + A_{vy} \cdot f_y / (\sqrt{3} \, \gamma_{M0})$,
   $V_{Rd,z} = N \cdot C_f + A_{vz} \cdot f_y / (\sqrt{3} \, \gamma_{M0})$.
3. Shear is transferred by anchors:
   Anchors loaded in shear are checked according to EN 1992-4.

Utilisation in shear [%]:

$U_t = \min (V_y/V_{Rd,y}, V_z/V_{Rd,z})$,

where

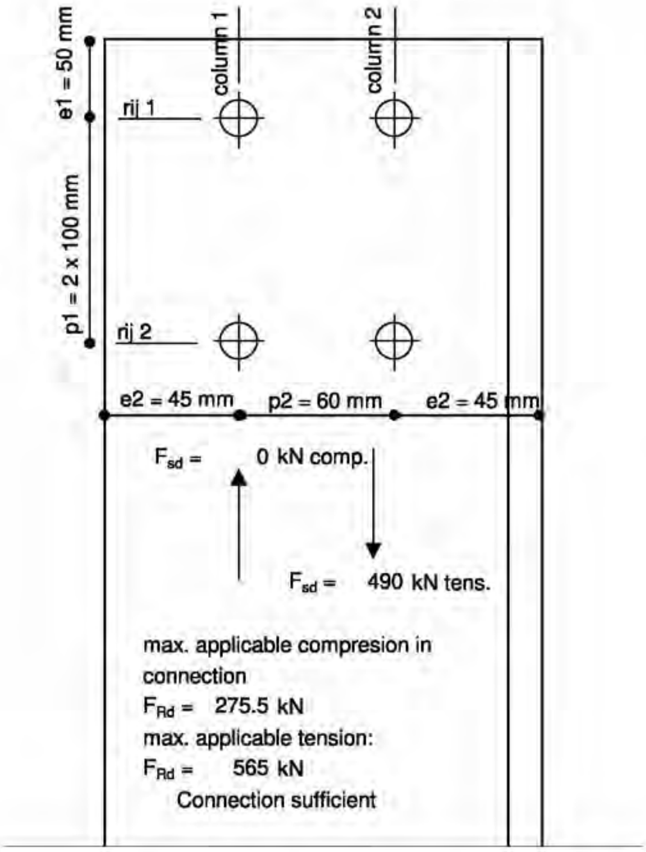
- A_{vy} – shear area of shear iron cross-section,
- A_{vz} – shear area of shear iron cross-section,
- f_y – yield strength,
- γ_{M0} – safety factor,
- V_y – shear force component in the base plate plane in y-direction,
- V_z – shear force component in the base plate plane in z-direction,
- N – compressive force perpendicular to the base plate,
- C_f – coefficient of friction between steel and concrete.

Annex E.2.
Windbrace Angle, equal legs

E.2. Windbrace Angle, equal legs

E.2.1. Design

Profile type	=	Angle, equal legs
Profile	=	150 x 15 mm
Steelkwal. Profile	=	S235
Gussetplate t	=	15 mm
Steelkwal. Gussetpl.	=	S235
Steellkwal. Connecting member	=	S235
Bolt	=	M24 A4-80 d_0 = 26 mm
$F_{v,Rd}$ =	=	94.1 kN
nr. of bolts	=	6 stk
nr. of columns	=	2 stk
nr. of rows	=	3 stk
e_1	=	50 mm
p_1	=	100 mm
e_2	=	45 mm
p_2	=	60 mm



Profile data:

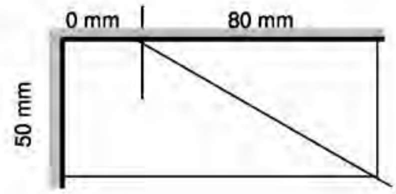
A =50 * 15 + 135 * 15 = 4275 mm²

A_{net} = A - Agat = 3495 mm²

Applied length of weld on gussetplate:

a = 4 mm

Welds not sufficient



E.2.2. Check edgedistance acc. EN 1993-1-8 § 3.5 + NA

e_1 =	$1.2 \cdot d_0/e_1$	=	0.62	< 1 distance sufficient
	$e_1 / (4 \cdot \min(t ; t_{w1}) + 40)$	=	0.5	< 1 distance sufficient
e_2 =	$1.2 \cdot d_0/e_2$	=	0.69	< 1 distance sufficient
	$e_2 / (4 \cdot \min(t ; t_{w1}) + 40)$	=	0.45	< 1 distance sufficient
p_1 =	$2.2 \cdot d_0/p_1$	=	0.57	< 1 distance sufficient
	$p_1 / \min(14 \cdot \min(t ; t_{w1}) ; 200)$	=	0.5	< 1 distance sufficient
p_2 =	$2.4 \cdot d_0/p_2$	=	1.04	> 1 distance to small
	$p_2 / \min(14 \cdot \min(t ; t_{w1}) ; 200)$	=	0.3	Not applicable

E.2.3. Determening factors

γ_{M0}	=	1.0	α_v	=	0.5	$k_{1\ randbout}$	=	2.5
γ_{M1}	=	1.0	$\alpha_{b\ randbout}$	=	0.6	$k_{1\ tussenbout}$	=	1.53
γ_{M2}	=	1.25	$\alpha_{b\ tussenbout}$	=	1.0	β	=	0.8

E.2.4. Check profile EN 1993-1-1 § 6.2.3 + NB & EN 1993-1-8 § 3.10 + NA

$N_{t,Rd}$ = $\beta \cdot A_{net} \cdot f_u/\gamma_{M2}$ = 612 kN

β = 0.61 for L-beams with 3 or more bolts

u.c. = 0.8 < 1 profile sufficient

E.2.5. Check bolts EN 1993-1-8 § 3.6 + NA

Bearing edgebolt in brace

$F_{b,Rd} = \frac{k_1 * \alpha_b * f_u * d * t}{\gamma_{M2}} =$ 166 kN

Bearing edgebolt in gussetplate

$F_{b,Rd} = \frac{k_1 * \alpha_b * f_u * d * t}{\gamma_{M2}} =$ 166 kN

Bearing inbetweenbolt in brace

$F_{b,Rd} = \frac{k_1 * \alpha_b * f_u * d * t}{\gamma_{M2}} =$ 159 kN

Bearing inbetweenbolt in gussetplate

$F_{b,Rd} = \frac{k_1 * \alpha_b * f_u * d * t}{\gamma_{M2}} =$ 159 kN

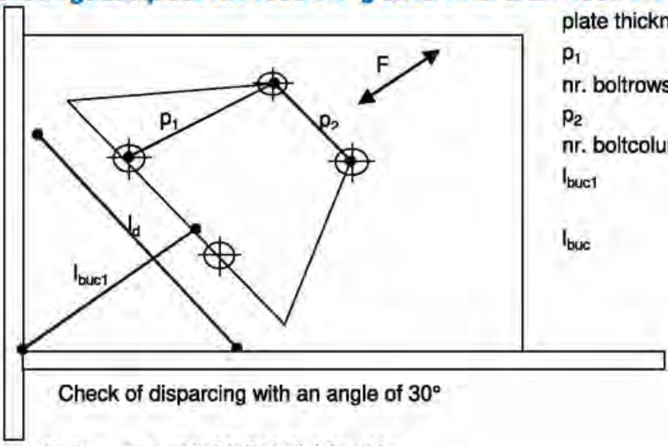
Shear	$F_{v,Rd} =$	94.1 * 6 =	565 kN	u.c. =	0.87 < 1 sufficient
nr. of edgebolts = 4		nr. of inbetweenbolts = 2			
Bearing of bracing	$F_{b,Rd} =$	166.2 * 4 + 158.7 * 2 =	982 kN	u.c. =	0.5 < 1 sufficient
Bearing of gussetplate	$F_{b,Rd} =$	166.2 * 4 + 158.7 * 2 =	982 kN	u.c. =	0.5 < 1 sufficient

E.2.6. Check blocktearing acc. EN 1993-1-8 § 3.10 + NA

Boltgroep is designed as Symmetrially:

$V_{eff,1,Rd} =$	$f_u * A_{nt} / \gamma_{M2} + f_y * A_{nv} / \sqrt{3} / \gamma_{M0}$	= 763 kN
f_u =		= 235 N/mm²
f_y =		= 360 N/mm²
A_{nt} =	((45 + 60 * (2 - 1)) * 15) - ((26 * 15) * (2 - 0.5))	= 990 mm²
A_{nv} =	((50 + 100 * (3 - 1)) * 15) - ((26 * 15) * (3 - 0.5))	= 2775 mm²
u.c. =		= 0.64 < 1 sufficient

E.2.7. Check gussetplate EN 1993-1-1 § 6.2.3 + NB & EN 1993-1-1 § 6.3.1 + NA



Check of disparcing with an angle of 30°

plate thickness	=	15 mm
p_1	=	100 mm
nr. boltrows	=	3 stk
p_2	=	60 mm
nr. boltcolumns	=	2 stk
l_{buc1}	=	100 mm
max. length is applied		
l_{buc}	=	300 mm (= l_{buc1} + p1 * (n-1))

Length of section = 2*100/(3^0.5) * 2 + 60 = l_d = 291 mm

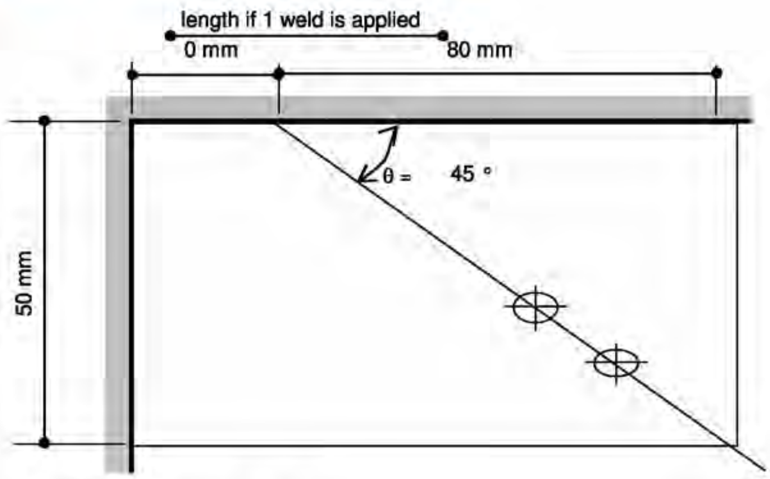
Tension strength

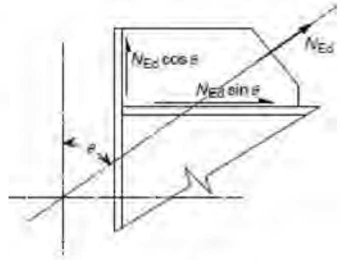
$N_{pl,Rd}$ = 290.9 * 15 * 0.235 = $N_{pl,Rd}$ = 1026 kN

$N_{u,Rd}$ = 0.9 * ((290.9 - 2 * 26) * 15) * 0.36 / 1.25 = $N_{u,Rd}$ = 929 kN

Compression strength		In y-axis	In z-axis
$N_{b,Rd}$ =		528.8	275.5
calc. width = p2 * boltcolumns - 1 + 2 * e2	= safe assumption	150.0	150.0
A =		2250	2250
$\chi_y = \frac{1}{\Phi + \sqrt{(\Phi^2 - \lambda^2)}} \leq 1 =$		1	0.52
$\Phi = 0.5 * (1 + \alpha (\lambda - 0.2) + \lambda^2) =$		0.48	1.24
$\lambda = \frac{L_{cr} * 1}{i * \lambda_1} =$		0.1	1.03
λ_1 = 93,9 * ε =		93.9	93.9
I = mm⁴		4218750	42188
i =		43.3	4.33
L_{cr} = factor of 1.4 is applied on l_{buc}		0.42	0.42
ε = $\sqrt{(235 / f_y)}$=		1	1
imperfectionfactor α =		0.49	0.49
bucklingcurve acc. table 6.2 EN 1993-1-1 +NA =		c	c

E.2.8. Check of welds EN 1993-1-8 § 4.5 + NA





force distribution in welds acc.
SCI publication P358

N_{ed}	=	490 kN
θ	=	45 °
$N_{Ed}\cos\theta$	=	346 kN
$N_{Ed}\sin\theta$	=	346 kN
a	=	4 mm
$f_{vw,d}$ =	=	208 N/mm²

If 2 weldlenghts are present:

Per weld applicable =	50 * 4 * 2 * (207.8/1000) =	83.1 kN	u.c. =	4.17 > 1 not sufficient
	(0 + 80) * 4 * 2 * (207.8/1000) =	133 kN	u.c. =	2.6 > 1 not sufficient
normative =		83.1 kN	u.c. =	4.17 > 1 not sufficient

If only 1 weld is present:

For a equal u.c. a weldlegth of 490 / (4.17 * 0.2078 * 2 * 4) = 70.7 mm needs to be applied

To be symmetrically distributed pertainng to the workline of the bracing

Bijlage E.3.
Baseplate design (Dutch)

Inhoud

Algemene uitgangspunten berekening:

Berekeningen volgens Eurocode.

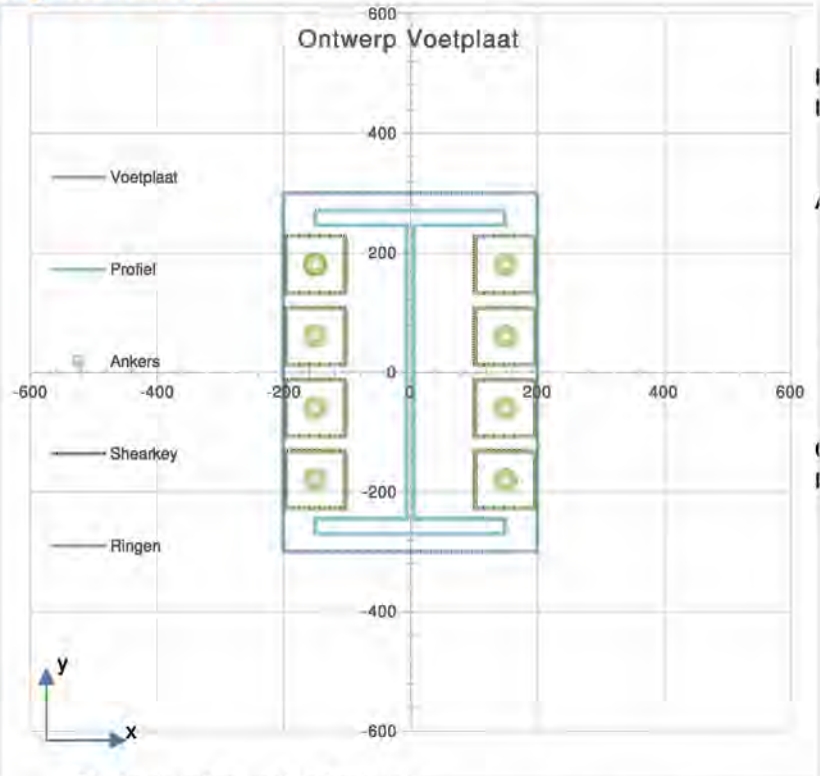
Beton volgens EN 1992-1-1, Staal volgens EN 1993-1-1, Verbindingen volgens EN 1993-1-8, Ankers volgens EN 1992-4 alles incl. NB.

Daarnaast is gebruik gemaakt van verschillende handboeken, o.a. CUR/BmS rapport 10, ECCS uitgave Design of Joints in Steel and Composite Structures en ECCS publicatie Desing and Analysis of Connections in Steel Structures

Voetplaat zit altijd centrisch onder het profiel

E.3. Baseplate design (Dutch)

E.3.1. Algmeen ontwerp



Profiel = HEA550 S235JR

Lassen a_f = 6 mm Dubbele hoeklas

a_w = 6 mm Dubbele hoeklas

Anker

Draadstang met ankerplaat

M30 / 8.8

Draadeind lg 1000

volgplaat 95x95x25

Ring DIN436-M30

= ø 95 x 6

Ondersabeling d = 50 mm

Krimparme gietmortel K70

Berekening uitgevoerd op basis van:

Groutlaag is van voldoende kwaliteit (sterker dan het beton) waardoor voor dwarskracht geen afstandsmontage gerekend moet worden

Resultaten

Momentweerstand	M_y =	515.9	kNm
	M_z =	46.1	kNm
Trekweerstand	T =	1999.8	kN
Drukweerstand	C =	4285.8	kN
Min. dwarskracht capaciteit	V =	31.7982	kN

Verbinding voldoet

Wapening:

Splijtwapening	=	Geen splijtwapening t.b.v druk nodig			
Afschuifwapening	=	X-as = 219.7 mm²			
		Y-as = 732.4 mm²			
Trekwapening	=	haarspelden/bgls	4 x	ø16 =	1608 mm²/ankerrij
		staven	4 x	ø16 =	804 mm²

E.3.2. Algemene uitgangspunten

E.3.2.1. Staalprofielen

Kolom = HEA550 S235JR   Hoogte kolom = 13200 mm

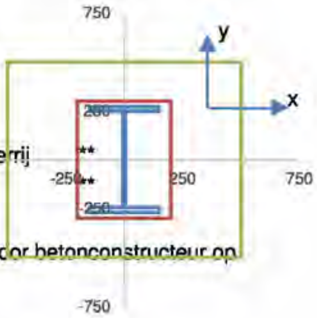
Las flens = Dubbele hoeklas a = 6 mm

Las web = Dubbele hoeklas a = 6 mm

Voetplaat = 600 x 400 x 30 mm³ (b x h x t) S235JR

Shearkey = geen

Ontwerp vp t.o.v. beton



E.3.2.2. Betononderdelen

Betonkwaliteit	=	C30/37	Wapeningsstaal			=	B 500B	
Breedte	=	1000 mm	afstand hart kolom tot rand		b_x	=	500	mm
Lengte	=	1000 mm	afstand hart kolom tot rand		l_x	=	500	mm
Hoogte beton	=	1000 mm	Wapening t.b.v. verbinding:					
			haarspelden/bgls	4 x	ø16	=	1608	mm²/ankerrij
			staven	4 x	ø16	=	804	mm²
			betondekking cd	50	mm, aangenomen waarde			

** Minimaal benodigde wapening boven in constructie, controle door betonconstructeur op aanwezigheid benodigd.

Ondersabeling = Krimparme gietmortel K70

Dikte ondersabeling = 50 mm   minimale maat = 40 mm = 8.4 mm stelruimte

Hoek ondersabeling = 45 °

E.3.1.3. Ankers en ontwerp

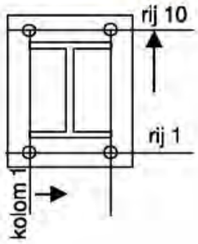
Type anker = Draadstang met ankerplaat   Diameter / kwaliteit = M30 / 8.8

Anker = Draadeind lg 1000   Plaatring afmeting = DIN436-M30

= ∅ 95 x 6

Ankerplaat = 95 x 95 x 25 mm³ (b x h x t) S235JR

Z-as profiel			Y-as profiel		
e1-1	=	120 mm	$e_{2\text{-}1}$	=	50 mm
p1-1	=	120 mm	p_2	=	300 mm
p1-2	=	120 mm	$e_{2\text{-}2}$	=	50 mm
p1-3	=	120 mm			
p1-4	=	mm			
p1-5	=	mm			
p1-6	=	mm			
p1-7	=	mm			
p1-8	=	mm			
p1-9	=	mm			
e1-2	=	120 mm			



E.3.2.4. Krachten

Aangegeven krachten zijn volgens de profiel assen

Normaalkracht Trek	T =	708 kN	Moment	M_x =	0	kNm
Normaalkracht Druk	C =	1210 kN		M_y =	0	kNm
Afschuiving	V_y =	90 kN		M_z =	0	kNm
	V_z =	300 kN				

E.3.3. *Overzicht u.c.'s / Samenvatting*

Controle Druk zie §E.3.7.3.

Max. drukcapaciteit	N	=	4285.8	kN	u.c.	=	28.23%	< 100% voldoet
Max. drukcapaciteit	My	=	1396.9	kN	u.c.	=	0.00%	< 100% voldoet
Max. drukcapaciteit	Mz	=	614.6	kN	u.c.	=	0.00%	< 100% voldoet
					u.c. comb.	=	28.23%	< 100% voldoet

Controle Splijtwapening druk zie §E.3.7.4.

geen splijtwapening nodig

Controle Trek zie §E.3.8.4.

Max. Trek	=	1999.8	kN	u.c.	=	35.40%	< 100% voldoet
Max. Trek M_y	=	515.9	kNm	u.c.	=	0.00%	< 100% voldoet
Max. Trek M_z	=	46.1	kNm	u.c.	=	0.00%	< 100% voldoet
				u.c. comb.	=	35.40%	< 100% voldoet

Controle Afschuiving zie §E.3.9.7.

Wrijving $F_{f,Rd}$ = 242.0 kN u.c. = 129.43% > 100% voldoet niet

Ankers

Stuik van plaat = 10.37% < 100% voldoet

Anker zonder hefboomarm

F_{vRd} = 89.0 kN u.c. = 87.94% < 100% voldoet

u.c. = V_{Ed} / (F_{vRd}/2)

conform CUR/BmS rapport 10, i.v.m. gebruik ruime gaten

V_{Ed} volgens §E.3.5.

Beton u.c. wrik = 492.50% > 100%, wapening nodig

u.c. randbreuk = 19.28% < 100% voldoet

Wapening X-as = 219.71 mm²

Y-as = 732.36 mm²

Shearkey

Geen shearkey aanwezig, controle niet van toepassing

Controle Lassen zie §E.3.10.

Las flens kolom-voetplaat	u.c. max	=	41.33%	< 100% voldoet
Las web kolom-voetplaat	u.c. max	=	49.16%	< 100% voldoet

E.3.4. Profiel/Materiaal gegevens & Factoren

Profielgegevens

Kolom						Shearkey					
b	=	300 mm	A	=	21180 mm²	b_s	=	mm	A	=	mm²
h	=	540 mm	$A_{vz;pl}$	=	8372 mm²	h_s	=	mm	$A_{vz;pl}$	=	mm²
t_w	=	12.5 mm	$A_{vy;pl}$	=	12808 mm²	t_{ws}	=	mm	$A_{vy;pl}$	=	mm²
t_f	=	24 mm	$W_{y;pl}$	=	4622000 mm³	t_{fs}	=	mm	$W_{y;pl}$	=	mm³
r	=	27 mm	$W_{z;pl}$	=	1107000 mm³	r_s	=	mm	$W_{z;pl}$	=	mm³
			I_y	=	1119000000 mm⁴				I_y	=	mm⁴
			I_z	=	108200000 mm⁴				I_z	=	mm⁴

Staal kwaliteit

Kolom			Voetplaat			Shearkey			Beton / Wapening kwaliteit		
$f_{y;c}$	=	225 N/mm²	$f_{y;bp}$	=	225 N/mm²	$f_{y;sk}$	=	N/mm²	f_{ck}	=	30 N/mm²
$f_{u;c}$	=	360 N/mm²	$f_{u;bp}$	=	360 N/mm²	$f_{u;sk}$	=	N/mm²	f_{cd}	=	20 N/mm²
									f_{ctd}	=	1.35 N/mm²
Grout kwaliteit	=	K70							$f_{y;wk}$	=	500 N/mm²
sterkte na 28dg	=	85 N/mm²							$f_{y;wd}$	=	435 N/mm²

Anker kwaliteit	=	8.8	$f_{y;b}$	=	640 N/mm²	$f_{u;b}$	=	800 N/mm²
$A_{b;s}$	=	561 mm²	$Ø_{eff}$	=	26.7 mm	d_m	=	45 mm
α_v	=	0.6				d_0	=	38.0 mm **
α_{bc}	=	0.25				g	=	0.8 = factor voor ruime gaten
α_{bc}	=	$0.44-0.0003 \cdot f_{y;b}$	waarbij $235\ N/mm^2 \leq f_{yb} \leq 640\ N/mm^2$					

** Gatafmeting is groter dan toegestaan volgens EN 1992-4 tabel 6.1, maar conform EN 1090-2 tabel 11 overmaatse gaten.

I.v.m. de uitvoering van ingestorte ankers is de waarde van EN 1992-4 tabel 6.1 praktisch nooit haalbaar en daarom is gekozen de in de norm opgegeven afstand als richtlijn te negeren en terug te vallen op CUR/BmS rapport 10, i.c.m. de EN 1090-2.

Factoren

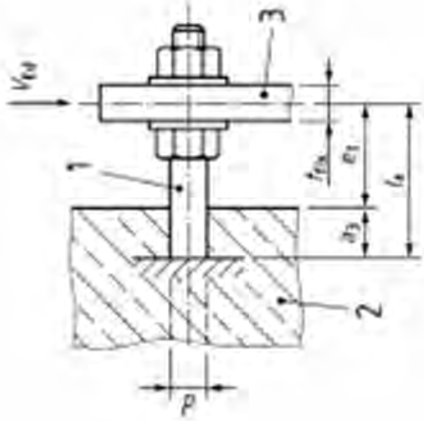
γ_{m0}	=	1.0	γ_{Mc}	=	1.5	$\alpha_{b\ randbout}$	=	1
γ_{m1}	=	1.0	β_j	=	0.667	$\alpha_{b\ tussenbout}$	=	0.8
γ_{m2}	=	1.25	α_c	=	1.0	$k_{1\ randbout}$	=	1.98
$\gamma_{Ms;T}$	=	1.5	$\gamma_{Ms;re}$	=	1.15	$k_{1\ tussenbout}$	=	2.5
$\gamma_{Ms;V}$	=	1.3				k_2	=	0.9

E.3.5. *Bepaling verdeling van Afschuifkrachten / Torsiemoment*

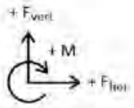
Voor de afschuifweerstand wordt uitgegaan van de EN 1992-4 gegeven methode voor afstandsmontage.
Er wordt daarbij gerekend dat alle bouten evenredig veel kracht krijgen te verwerken, en allen meedoen in de opname van dwarskracht.
Allereerst wordt daarom de afschuifkracht per bout berekend

$V_z = F_{vert}$ = 300 kN
$V_y = F_{hor}$ = 90 kN
Mx = M = 0 kNm

Bout	X-as [mm]	Y-as [mm]	F_{Fvert} [kN]	F_{Mvert} [kN]	F_v [kN]	F_{fhor} [kN]	F_{mhor} [kN]	F_h [kN]	V [kN]	M_{vEd} [kNmm]
1	50	120	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
2	350	120	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
3	50	240	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
4	350	240	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
5	50	360	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
6	350	360	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
7	50	480	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
8	350	480	37.5	0	37.5	11.3	0	11.3	39.2	1566.0
					300			90	313	



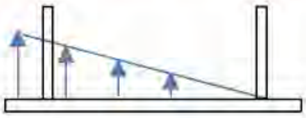
zwaartepunt van de boutgroep:
x = 200 mm
y = 300 mm



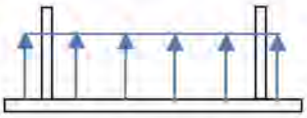
Moment t.g.v. dwarskracht bedraagt:
$M_{Ed} = V_{Ed} * l_a / \alpha_m$ = 1566.0 kNmm (formule 6.1 van EN 1992-4 +NB)
V_{Ed} = 39.2 kN
l_a = $a_3 + e_1$ = 80 mm
a_3 = 0.5 d_{nom} = 15 mm
e_1 = dikte groutlaag + t_{plaat} / 2 = 65 mm
α_m = 2 De verankering is verhinderd in rotatie doordat er ten alle tijden een groutlaag dient te worden voorzien t.b.v. het overbrengen van de drukkrachten. Omdat deze groutlaag echter > ½d_{nom} dient er met afstandsmontage te worden gerekend.

E.3.6. Bepaling verdeling van Trek-/Drukkrachten

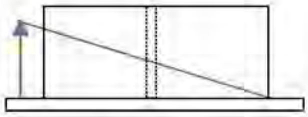
Voor het bepalen van de trekkrachten wordt uitgegaan van een lineaire verdeling van de krachten:



Verdeling t.g.v. My
Drukpunt t.p.v. hart flens



Verdeling t.g.v. N



Verdeling t.g.v. Mz

Afbeeldingen zijn indicatief

N	=	708 kN trek
My	=	0 kNm
Mz	=	0 kNm

Bout	Boutrij	$F_{t.g.v.\ N}$ [kN]	Arm My [s_i in mm]	$F_{T;My}$ [kN]	Arm Mz [s_i in mm]	$F_{T;Mz}$ [kN]	$F_{T;tot}$ [kN]	
1	rij 01	88.50	78	0	300	0.00	88.50	Eerste boutrij onder getrokken flens
2	rij 01	88.50	78	0	0	0	88.50	
3	rij 02	88.50	198	0.00	300	0.00	88.50	Tussen boutrij
4	rij 02	88.50	198	0.00	0	0	88.50	
5	rij 03	88.50	318	0.00	300	0.00	88.50	Tussen boutrij
6	rij 03	88.50	318	0.00	0	0	88.50	
7	rij 04	88.50	438	0.00	300	0.00	88.50	Tussen boutrij
8	rij 04	88.50	438	0.00	0	0	88.50	

$F_1 = M_y * s_1 / (\Sigma s_i^2 + s_A * \Sigma s_i)$
$F_2 = F_1 * s_2 / s_1$
$F_3 = F_1 * s_3 / s_1$
enz.
$s_A = 0$, drukpunt is t.p.v. de flens
$F_{T;My} = F_i / 2$

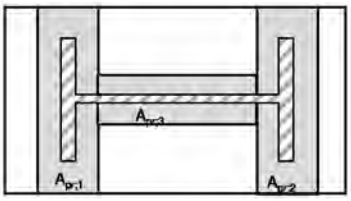
F1 = trekkracht in boutrij verst van het drukpunt
F2 = eerste rij naast F1
enz.

$F_{C;My}$ = 0.0 kN
$F_{C;Mz}$ = 0.0 kN

E.3.7. Bepaling Druksterkte

E.3.7.1. Bepaling of randeffecten van toepassing zijn en factor

$h_r > h_p$	h_r =	200 mm	h_p	=	600 mm	randeffect
$b_r > b_p$	b_r =	300 mm	b_p	=	400 mm	randeffect
$d_b > 2{*}h_p$	d_b =	1000 mm	$2{*}h_p$	=	1200 mm	randeffect
$d_b > 2{*}b_p$			$2{*}b_p$	=	800 mm	



afbeelding schematisch, ter indicatie onderdelen

aangenomen c = t

max. drukprent:	600 *	360 mm	$A_{c0,max}$	=	216000 mm²
drukprent onder 1 flens bepaald	84 *	360 mm	A_{c0}	=	30240 mm²
A_{c1}	252 *	960 mm		=	241920 mm²

kd = $\sqrt{(A_{c1} / A_{c0})} \leq 3$ = 2.82843

E.3.7.2. Bepaling drukoppervlak

$c = t{*}\sqrt{(f_{yd}/3f_{jd})}$	=	42.3 mm			
$f_{jd} = \beta_j{*}k_d{*}f_{cd}$	=	37.7 N/mm²			
f_{cd}	=	20.0 N/mm²			
$l_{eff;1/2}$	=	96.3 mm	$l_{eff;3}$	=	407.4 mm
$h_{eff;1/2}$	=	385 mm	$h_{eff;3}$	=	97.1 mm
$A_{pr;1} / A_{pr;2}$	=	37041 mm²	$A_{pr;3}$	=	39563 mm²

$A_{pr;tot.}$ = 113645 mm²

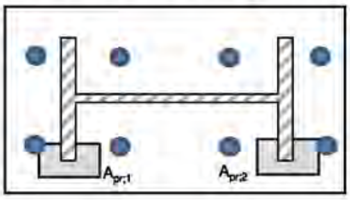
E.3.7.3. Bepaling capaciteit

Maximale drukkracht onder voetplaat	N_C	=	4285.8 kN
Maximale drukkracht t.b.v. M_y	$N_{C;My}$	=	1396.9 kN

Voor Mz wordt met de volgende breedte gerekend: = 42.3 mm

Apr = 16297.7 mm²

$N_{C;Mz}$ = 614.6 kN



afb. indicatief

E.3.7.4. Splijtwapening t.b.v. druk

$C/A_{prent} < f_{cd}$ of $C/A_{pr;1} < 5$ N/mm²

C/A_{prent}	=	10.6 N/mm²	< 20 N/mm² akkoord
$C/A_{pr;1}$	=	9.22 N/mm²	> 5 N/mm² niet akkoord

geen splijtwapening nodig

E.3.8. Bepaling Treksterkte

E.3.8.1. Algemeen

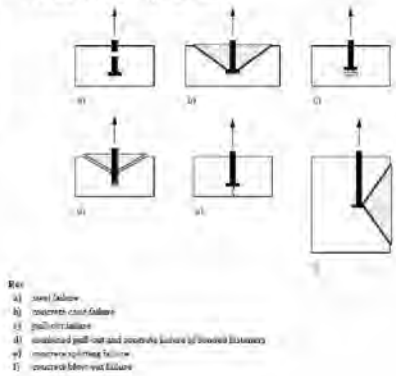
Voor de bepaling van de Trekweerstand worden er meerdere onderdelen bekeken:

- Weerstand t.g.v. de ankers:
  - T.o.v. het staal;

1 - Bezwijken van ankers op trek — EN 1993-1-8 +NB / EN 1992-4 +NB
1 - Bezwijken voetplaat op moment/schuifsterkte — EN 1993-1-8 +NB / CUR-BmS rapport 10
1 - Bezwijken van voetplaat op trek — EN 1993-1-8 +NB

  - T.o.v. het beton;

2 - Betonkegelbreuk — EN 1992-4 +NB
3 - Uittrekken van anker — EN 1992-4 +NB
4 - ~~Combinatie betonkegelbreuk/uittrekken anker~~ — ~~EN 1992-4 +NB~~ Alleen voor lijmankers
5 - Beton splijten — EN 1992-4 +NB
6 - Beton uitbreken — EN 1992-4 +NB
7 - Bezwijken wapening — EN 1992-4 +NB
8 - Bezwijken ankerlengte wapening — EN 1992-4 +NB



E.3.8.2. Weerstand t.o.v. Staal

E.3.8.2.1. Weerstand anker op trek

Treksterkte van het anker:

Treksterkte

$F_{t,Rd} = k_2 * f_{ub} * A_s / \gamma_{m2}$ = **323.1** kN

Ponsweerstand

$B_{p,Rd} = 0.6 * \pi * d_m * t * f_u / \gamma_{m2}$ = **733** kN

E.3.8.2.2. Weerstand voetplaat op moment/schuifsterkte

F_{vRd} plaat = $b_p * t_p * f_{yd} / \sqrt{4}$ = **1558.8** kN niet van toepassing

E.3.8.2.3. Weerstand voetplaat op trek

Bepaling equivalent T-stuk:

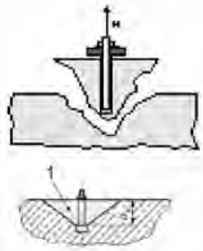
Bout rij	Type rij	$l_{eff,cp}$ indi.	$l_{eff,nc}$ indi.	$l_{eff,cp}$ groep	$l_{eff,nc}$ groep	$l_{eff,1}$ afz.	$l_{eff,1}$ groep	Mpl kNmm	Mpl kNmm	$F_{T,1\text{-}2,Rd,i}$ kN	$F_{T,1\text{-}2,Rd,g}$ kN	$F_{T,3,Rd}$ kN	$F_{T,Rd}$ kN
1	2	861	548	550	303	547.85	422.67	44376	34237	648.00	499.94	646.27	499.94
2	3	861	610	240	120	610	422.67	49438	34237	721.93	499.94	646.27	499.94
3	3	861	610	0	0	610	422.67	49438	34237	721.93	499.94	646.27	499.94
4	3	861	610	0	0	610	422.67	49438	34237	721.93	499.94	646.27	499.94

Type 1 Boutrij in het uitstekende deel, ter plaatse van de op trek belaste kolomflens
Type 2 Eerste boutrij onder de getrokken kolomflens
Type 3 Andere tussen gelegen boutrij

Uitgangspunt voor de berekening is dat er geen wrikkrachten mogen optreden.

E.3.8.3. Weerstand t.o.v. Beton

E.3.8.3.1. Betonkegelbreuk enkele anker



$N_{Rk,c}$ = $N^0_{Rk,c} * (A_{c,N} / A^0_{c,N}) * \psi_{s,N} * \psi_{re,N} * \psi_{ec,N} * \psi_{M,N}$ = 10.6 kN volgens EN 1992-4 (7.1)

$N^0_{Rk,c}$ = $k_1 * \sqrt{f_{ck}} * h_{ef}^{1.5}$ = 1142344.09 N volgens EN 1992-4 (7.2)

k_1 = 8.9 Waarde voor gescheurd beton aangehouden, op het moment dat er trek ontstaat zal het beton hier scheuren. Daarom wordt hiermee gerekend.

h_{ef} = 819 mm = lengte in beton - $t_{volgplaat}$ - t_{moer} - 3 * spoed

$A^0_{c,N}$ = $s_{cr,N} * s_{cr,N}$ = 6035374.89 mm² volgens EN 1992-4 (7.3)

$s_{cr,N}$ = $3 * h_{ef}$ = 2457 mm volgens opmerking bij form. 7.3

$c_{cr,N}$ = $1.5 * h_{ef}$ = 1228 mm volgens opmerking bij form. 7.4

$A_{c,N}$ = $s_{cr,N} * s_{cr,N}$ = 72000 mm² volgens EN 1992-4 (7.3) Bij 1 anker

$\psi_{s,N}$ = $0.7 + 0.3 * (c / c_{cr,N}) \le 1$ = 0.78

$\psi_{re,N}$ = $0.5 + h_{ef} / 200 \le 1$ = 1

$\psi_{ec,N}$ = 1

$\psi_{ec,Ny}$ = $1 / (1 + 2 * (e_{Ny} / s_{cr,N})) \le 1$ 1

$\psi_{ec,Nz}$ = $1 / (1 + 2 * (e_{Nz} / s_{cr,N})) \le 1$ 1

e_{Ny} = M_y / N_{max} = 0 mm

e_{Nz} = M_z / N_{max} = 0 mm

$\psi_{M,N}$ = 1

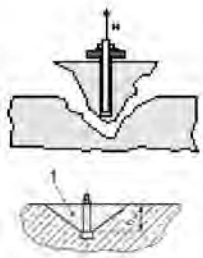
1 als $c < 1.5*h_{ef}$

1 als $z / h_{ef} \ge 1.5$

anders: $2 - (z / (1.5*h_{ef}) \ge 1$

$N_{Rd,c}$ = $N_{Rk,c} / \gamma_{Mc}$ = **7.1** kN

E.3.8.3.2. Betonkegelbreuk ankergroep [Ankers in groep: anker 1 t/m 8]



$N_{Rk,c}$ = $N^0_{Rk,c} * (A_{c,N} / A^0_{c,N}) * \psi_{s,N} * \psi_{re,N} * \psi_{ec,N} * \psi_{M,N}$ = 147 kN volgens EN 1992-4 (7.1)

$N^0_{Rk,c}$ = $k_1 * \sqrt{f_{ck}} * h_{ef}^{1.5}$ = 1142344.09 N volgens EN 1992-4 (7.2)

k_1 = 8.9 Waarde voor gescheurd beton aangehouden, op het moment dat er trek ontstaat zal het beton hier scheuren. Daarom wordt hiermee gerekend.

h_{ef} = 819 mm = lengte in beton - $t_{volgplaat}$ - t_{moer} - 3 * spoed

$A^0_{c,N}$ = $s_{cr,N} * s_{cr,N}$ = 6035374.89 mm² volgens EN 1992-4 (7.3)

$s_{cr,N}$ = $3 * h_{ef}$ = 2457 mm volgens opmerking bij form. 7.3

$c_{cr,N}$ = $1.5 * h_{ef}$ = 1228 mm volgens opmerking bij form. 7.4

$A_{c,N}$ = $(c_1 + s_1 + 0.5*s_{cr,N})*(c_2 + s_2 + 0.5*s_{cr,N})$ = 1000000 mm²

$\psi_{s,N}$ = $0.7 + 0.3 * (c / c_{cr,N}) \le 1$ = 0.78

$\psi_{re,N}$ = $0.5 + h_{ef} / 200 \le 1$ = 1

$\psi_{ec,N}$ = 1

$\psi_{ec,Ny}$ = $1 / (1 + 2 * (e_{Ny} / s_{cr,N})) \le 1$ 1

$\psi_{ec,Nz}$ = $1 / (1 + 2 * (e_{Nz} / s_{cr,N})) \le 1$ 1

e_{Ny} = M_y / N_{max} = 0 mm

e_{Nz} = M_z / N_{max} = 0 mm

$\psi_{M,N}$ = 1

1 als $c < 1.5*h_{ef}$

1 als z / hef ≥ 1.5

anders: $2 - (z / (1.5*h_{ef}) \ge 1$

$N_{Rd,c}$ = $N_{Rk,c} / \gamma_{Mc}$ = **98.2** kN

E.3.8.3.3. Uittrekken anker

$N_{Rk,p}$ = $k_2 * A_h * f_{ck}$ = 1555 kN volgens EN 1992-4 (7.11)

k_2 = uitgangspunt is gescheurd beton = 7.5

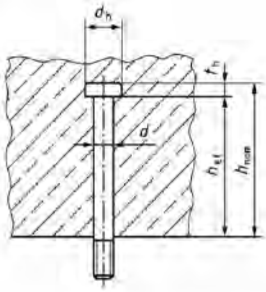
A_h = $\pi/4 * (d_h^2 - d_a^2)$ = 6910.18 mm² volgens EN 1992-4 (7.12)

d_h = $s + 2t_h < b_{ap} < 6*t_h + d$ = 98.5 mm > 95 mm ankerplaat afm. voldoet nie

overhoekse maat do= $d_m/\cos 30°$ = 52 mm

$s = (d_m+do)/2$ = 48.5 mm

d_a = 30 mm



$N_{Rd,p}$ = $N_{Rk,p} / \gamma_{Mc}$ = **1036.5** kN

E.3.8.3.4. Combinatie uittrekken anker + betonkegelbreuk

Toetsing niet van toepassing voor ingestorte ankers

E.3.8.3.5. Controle betonsplijten

In absentie van verdere opties voor het aftoetsen of er wel/geen wapening nodig is, wordt op basis van EN 1992-4 formule 7.22 de volgende min. benodige wapening bepaald

$\Sigma A_{s,re}$ = $k_4 * \Sigma N_{Ed} / f_{y;wd}$ = **708** N/mm² te verdelen over de ankers / mee te nemen in de overige wapening.

k_4 = 0.5

ΣN_{Ed} = 708.00 kN

Verder is het uitgangspunt dat aan art. 7.2.1.7 b) 1) is voldaan. $w_k \leq 0.3$ mm, i.c.m. dat de betonkegelbreuk en uittrekweerstand voldoende gewaarborgt zijn.

E.3.8.3.6. Controle Beton uitbreken

$N_{Rk,cb}$ = $N^0_{Rk,cb} * (A_{c,Nb} / A^0_{c,Nb}) * \psi_{s,Nb} * \psi_{g,Nb} * \psi_{ec,Nb}$ = 3796 kN volgens EN 1992-4 (7.25)

$N^0_{Rk,c}$ = $k_5 * c_1 * \sqrt{A_h} * \sqrt{f_{ck}}$ = 1267577.26 N volgens EN 1992-4 (7.26)

k_5 = 8.7 Waarde voor gescheurd beton aangehouden, op het moment dat er trek ontstaat zal het beton hier scheuren. Daarom wordt hiermee gerekend.

c_1 = 320 mm

c_2 = 320 mm

$A_{c,Nb}$ = $(4*c_1) * (4*c_1)$ = 1638400 mm²

$A^0_{c,Nb}$ = A * B = 821100 mm²

A = = 1000 mm

B = = 821.1 mm

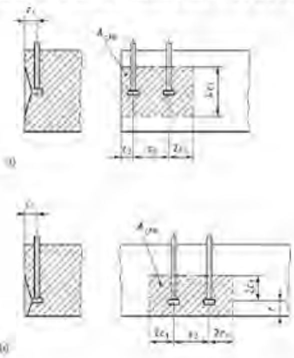
$\psi_{s,Nb}$ = 0.85

$\psi_{g,Nb}$ = 1.77

$\psi_{ec,Nb}$ = 1.00

$\psi_{ec,Nb}$ = 1.00

$\psi_{ec,Nb}$ = 1.00



$N_{Rd,cb}$ = $N_{Rk,cb} / \gamma_{Mc}$ = **2530.6** kN

E.3.8.3.7. Controle Trek wapening (t.b.v. splijt / betonkegelbreuk)

$$N_{Rk,re} = \sum_{i=1}^{n_{re}} A_{s,re,1} * fyk_{,re} = 3217 \text{ kN} = 2797 \text{ kN/ankerrij}$$

$A_{s,re,1}$ = 1608 mm²/anker
$f_{yk,re}$ = 500 N/mm²
i = 4 stks rijen
n_{re} = 4 stks

$N^0_{Rd,a}$ = $l_1 * \pi * d * f_{bd} / (\alpha_1 * \alpha_2) \leq A_{s,re} * f_{yk,re} / \gamma_{Ms,re}$ = 88.9 kN/snede
$A_{s,re} * f_{yk,re} / \gamma_{Ms,re}$ = 699.3 kN
$l_1 * \pi * d * f_{bd} / (\alpha_1 * \alpha_2)$ = 88.9 kN
l_1 = 900 mm, aangenomen = h_{balk} - 2*cd
d = ø16
f_{bd} = 1.35 N/mm² (= f_{ctd})
α_1 = 0.7 voor rechte staven, of gebogen staven, dichter dan 5*d van betonrand
α_2 = 1.0 voor gebogen staven: max(min((1-0.15*(cd-3d)/d);1);0.7)

$$N_{Rd,a} = \sum_{i=1}^{n_{re}} N^0_{Rd,a,i} = 2845 \text{ kN}$$

Max. capaciteit wapening trek = **2797.4** kN

E.3.8.4. Weerstand t.a.v. Trek

Bepaling weerstanden per rij t.a.v. My

Boutrij	Arm [mm]	$F_{T,1\text{-}2,Rd,i}$ kN	$F_{T,1\text{-}2,Rd,g}$ kN	$F_{T,3,Rd}$ kN	$F_{T;con;Rd}$ min	F_{tRd} min	F_{cRd} min	F_{Rd}/rij [kN]	My [kNm]
1	78	648.0	499.9	646.3	2797.4	499.9	1396.9	499.9	39.0
2	198	721.9	499.9	646.3	2797.4	499.9	1396.9	499.9	99.0
3	318	721.9	499.9	646.3	2797.4	499.9	1396.9	499.9	159.0
4	438	721.9	499.9	646.3	2797.4	499.9	1396.9	499.9	219.0
	Σ	2813.8	1999.8	2585.1	11189.5	1999.8			**515.9**

Bepaling weerstanden per rij t.a.v. Mz

Boutrij	Arm [mm]	$F_{T,1\text{-}2,Rd,i}$ kN	$F_{T,1\text{-}2,Rd,g}$ kN	$F_{T,3,Rd}$ kN	$F_{T;con;Rd}$ min	F_{tRd} min	F_{cRd} min	F_{Rd}/rij [kN]	Mz [kNm]
1	300	324.0	250.0	323.1	2797.4	250.0	153.7	153.7	46.1
2	300	361.0	250.0	323.1	2797.4	250.0	0.0	0.0	0.0
3	300	361.0	250.0	323.1	2797.4	250.0	0.0	0.0	0.0
4	300	361.0	250.0	323.1	2797.4	250.0	0.0	0.0	0.0
	Σ	1406.9	999.9	1292.5	11189.5	999.9			**46.1**

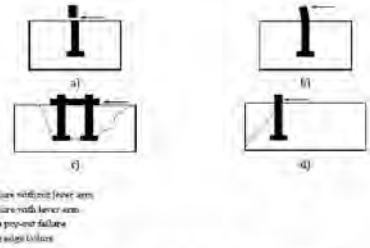
Max. trekcapaciteit
$F_{tRd,ankers}$ = 1999.8 kN
$F_{tRd,beton}$ = 2530.6 kN
$F_{tRd,wapening}$ = 2797.4 kN
F_{TRd} = **1999.8** kN

E.3.9. Bepaling Afschuifweerstand

E.3.9.1. Algemeen

Voor de bepaling van de afschuifweerstand worden er meerdere onderdelen bekeken:

- Weerstand t.g.v. wrijving. Deze wordt niet verder gebruikt omdat niet zeker is in welke combinatie dit van toepassing is.
- Weerstand t.g.v. de ankers:
  - T.o.v. het staal;
    - Afschuifcapaciteit van anker — EN 1993-1-8 +NB
    - Stuikweerstand voetplaat — EN 1993-1-8 +NB
    - Staalbezwijken zonder momentarm — EN 1992-4 +NB
    - Staalbezwijken met momentarm — EN 1992-4 +NB
  - T.o.v. het beton;
    - Beton achteruitbreken — EN 1992-4 +NB
    - Beton vooruitbreken — EN 1992-4 +NB
  - Benodigde wapening t.b.v. inleiding; — En 1992-1-1 +NB / EN 1992-4 +NB / CUR/BmS rapport 10
- Weerstand t.g.v. shearkey. — SCI publication P398



E.3.9.2. Weerstand t.g.v. wrijving

Maximale opgegeven drukkracht R_z = 1210 kN

Wrijvingsweerstand $F_{f,Rd} = c_{,d} * Rz$

Voor zand-cement mortel: $c_{f,d}$ = 0.2

$F_{f,Rd}$ = **242.0** kN

E.3.9.3. Weerstand t.o.v. staal

Afschuiving

$F_{v,Rd} = \alpha_v * f_{u;b} * A_s / \gamma_{m2}$ = **215.4** kN — volgens EN 1993-1-8 +NB

Afschuifweerstand in beton

$F_{2,vb,Rd} = \alpha_{bc} * f_{u;b} * A_s / \gamma_{m2}$ = **89.0** kN — volgens EN 1993-1-8 +NB

	Vz	Vy				
$F_{b,Rd1} = k_1 * \alpha_b * f_u * d * t * g / \gamma_{m2}$	= **411.4** kN	**227.4** kN	k_1 = 1.98	α_b = 1 /	k_1 = 2.5	α_b = 0.44
$F_{b,Rd2} = k_1 * \alpha_b * f_u * d * t * g / \gamma_{m3}$	= **416.1** kN	**227.4** kN	k_1 = 2.5	α_b = 0.8 /	k_1 = 2.5	α_b = 0.44
$F_{b,Rd3} = k_1 * \alpha_b * f_u * d * t * g / \gamma_{m4}$	= **416.1** kN	**227.4** kN	k_1 = 2.5	α_b = 0.8 /	k_1 = 2.5	α_b = 0.44
$F_{b,Rd4} = k_1 * \alpha_b * f_u * d * t * g / \gamma_{m5}$	= **411.4** kN	**227.4** kN	k_1 = 1.98	α_b = 1 /	k_1 = 2.5	α_b = 0.44

Volgens EN 1992-4 +NB

Ankers zonder momentarm

$V^0_{Rk,s} = k_6 * A_s * f_{u;b}$ = **224.4** kN voor een los anker

k_6 = 0.6 voor $f_{u;b} < 500$ N/mm²

= 0.5 voor 500 N/mm² $< f_{u;b} <$ 1000 N/mm²

$V_{Rk,s} = k_7 * V^0_{Rk,s}$ = **179.5** kN voor ankers in groep

veilige waarde van k_7 = 0.8 voor staal met een breukrek van < 8% aangehouden

Ankers met momentarm

$V_{Rk,s,M} = \alpha_M * M_{Rk,s} / l_a$ = **21.8** kN

α_m = 2

l_a = 80 mm

$M_{Rk,s} = M^0_{Rk,s} * (1 - N_{Ed} / N_{Rd,s})$ = **871.0** kNmm

$M^0_{Rk,s} = \pi * Ø_{eff}^3 / 32 * f_{y;b}$ = 1199.5 kNmm

N_{Ed} = 88.5 kN

$N_{Rd,s}$ = 323.1 kN

E.3.9.4. Weerstand t.o.v. beton

E.3.9.4.1. Beton loswrikken/achteruitbreken

$V_{Rk,cp}$ = $0.75 * k_8 * N_{Rk,c}$ = 11.9 kN /anker (7.39b)

$k_8 = 1$ voor $h_{ef} < 60$ mm; $k_8 = 2$ voor $h_{ef} \geq 60$ mm (ETAG 001, Annex C – Cl. 5.2.3.3)

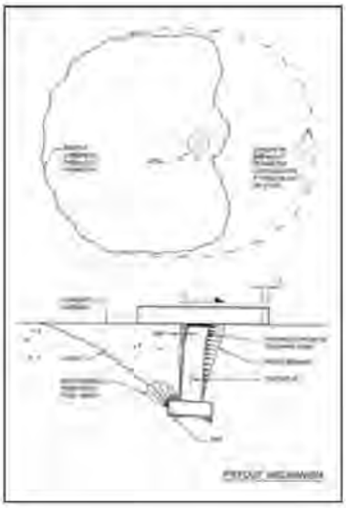
k_8 = 2

$N_{Rk,c}$ = $N^0_{Rk,c} * (A_{c,N} / A^0_{c,N}) * \psi_{s,N} * \psi_{re,N} * \psi_{ec,N} * \psi_{M,N}$ = 7.95 kN volgens EN 1992-4 (7.1)

$N^0_{Rk,c}$ = $k_1 * \sqrt{f_{ck}} * h_{ef}^{1.5}$ = 1142344.09 N volgens EN 1992-4 (7.2)

k_1 = 8.9 Waarde voor gescheurd beton aangehouden, op het moment dat er trek ontstaat zal het beton hier scheuren. Daarom wordt hiermee gerekend.

h_{ef} = 819 mm = lengte in beton - $t_{volgplaat}$ - t_{moer} - 3 * spoed



$A^0_{c,N}$ = $s_{cr,N} * s_{cr,N}$ = 6035374.89 mm² volgens EN 1992-4 (7.3)

$s_{cr,N}$ = $3 * h_{ef}$ = 2457 mm

$c_{cr,N}$ = $1.5 * h_{ef}$ = 1228 mm

$A_{c,N}$ = t.b.v. 1 anker gerekend met 2x 0.5s = 60000 mm²

$\psi_{s,N}$ = $0.7 + 0.3 * (c / c_{cr,N}) \leq 1$ = 0.7

$\psi_{re,N}$ = $0.5 + h_{ef} / 200 \leq 1$ = 1

$\psi_{ec,N}$ = 1

$\psi_{ec,Ny}$ = $1 / (1 + 2 * (e_{Ny} / s_{cr,N})) \leq 1$ = 1

$\psi_{ec,Nz}$ = $1 / (1 + 2 * (e_{Nz} / s_{cr,N})) \leq 1$ = 1

e_{Ny} = M_y / N_{max} = 0 mm

e_{Nz} = M_z / N_{max} = 0 mm

$\psi_{M,N}$ = 1

1 als $c < 1.5 * h_{ef}$

1 als $z / h_{ef} \geq 1.5$

anders: $2 - (z / (1.5 * h_{ef})) \geq 1$

Max. capaciteit wrikkracht $V_{Rd,cp}$ = **7.9** kN /anker

E.3.9.4.2. Betonrand breuk

$V_{Rk,c}$ = $V^0_{Rk,c} * (A_{c,v} / A^0_{c,v}) * \psi_{s,v} * \psi_{h,v} * \psi_{ec,v} * \psi_{\alpha,v} * \psi_{re,V}$ = 291.793 kN / 296.979 kN volgens EN 1992-4 (7.40)

$V^0_{Rk,c}$ = $k_9 * d_{nom}^{\alpha} * l_f^{\beta} * \sqrt{f_{ck}} * c_1^{1.5}$ = 123941 N / 110826 N volgens EN 1992-4 (7.41)

k_9 = 1.7 uitgangspunt is dat het beton in de verbindingszone gescheurd is

d_{nom} = 26.7

α = $0.1 * (l_f / c_1)^{0.5}$ = 0.11 / 0.11 volgens EN 1992-4 (7.42)

β = $0.1 * (d_{nom} / c_1)^{0.2}$ = 0.06 / 0.06 volgens EN 1992-4 (7.43)

l_f = = 400 mm

c_1 = 350 mm / 320 mm

$A^0_{c,v}$ = $4.5 * c_1^2$ = 551250 / 460800 mm² volgens EN 1992-4 (7.44)

$A_{c,v}$ = = 525000 / 480000 mm²

$\psi_{s,v}$ = $0.7 + 0.3 * c_2 / (1.5 * c_1) \leq 1$ = 0.88286 / 0.92 volgens EN 1992-4 (7.45)

$\psi_{h,v}$ = $(1.5 * c_1 / h)^{0.5} \geq 1$ = 1.00 / 1.00 volgens EN 1992-4 (7.46)

$\psi_{ec,v}$ = $1 / (1 + 2 e_v / (3c_1)) \leq 1$ = 1.00 / 1.00 volgens EN 1992-4 (7.47)

e_v = 0.0 / 0.00 mm

$\psi_{\alpha,v}$ = = 2 / 2 volgens EN 1992-4 (7.48)

α_v = 90.0 / 90.00 °

$\psi_{re,V}$ = = 1.4 / 1.40

Max. capaciteit wrikkracht $V_{Rd,cY}$ = **194.5** kN /anker

$V_{Rd,cX}$ = **198.0** kN /anker

E.3.9.5. Wapening t.b.v. afschuiving

Bepaald volgens CUR/BmS rapport 10

Rekenkracht in wapening in X-as				Rekenkracht in wapening in Y-as			
Rx	=	90	kN	Ry	=	300	kN
Hoogte balk	=	1000	mm	Hoogte balk	=	1000	mm
dekking op wapening c	=	50	mm	dekking op wapening c	=	50	mm
d	=	950	mm	d	=	950	mm
z	$0.85 * d \approx$	808	mm	z	$0.85 * d \approx$	808	mm
e_s	$0.5 * t_{pl} + d_{grout} + c =$	50	mm	e_s	$0.5 * t_{pl} + d_{grout} + c =$	50	mm
$N_{Ed,re}$ =	$(e_s / z + 1) * Rx =$	95.6	kN	$N_{Ed,re}$ =	$(e_s / z + 1) * Ry =$	319	kN

Benodigde wapening is: 95.6 * 1000 / 435 = 219.7 mm²   Benodige wapening is: 318.6 * 1000 / 435 = 732.4 mm²

E.3.9.6. Bepaling Shearkey

Er is geen shearkey aanwezig, berekening niet van toepassing

E.3.9.7. Weerstand en Controle t.a.v. Dwarskracht

Wrijving	$F_{f,Rd}$	=	242.0	kN
Afschuiving	$F_{v,Rd}$	=	215.4	kN /anker
	$F_{2,vb,Rd}$	=	89.0	kN /anker
	$V_{Rk,s}$	=	179.5	kN /anker
	$V_{Rk,s,M}$	=	21.8	kN /anker
Wrikkracht	$V_{Rd,cp}$	=	7.9	kN /anker
Betonrandbreuk	$V_{Rd,cY}$	=	194.5	kN /anker
	$V_{Rd,cX}$	=	198.0	kN /anker

Wapening	X-as	=	219.7	mm²
	Y-as	=	732.4	mm²

Controle stuik van plaat + beton

Bout	X-as [mm]	Y-as [mm]	F_v [kN]	F_h [kN]	$F_{b,Rdz}$	$F_{b,Rdy}$	u.c. stuik z	y	tt	u.c. beton Wrik	randbreuk	
1	50	120	37.5	11.3	411.4	227.4	9.11%	4.95%	10.37%	492.50%	19.28%	5.68%
2	350	120	37.5	11.3	411.4	227.4	9.11%	4.95%	10.37%	492.50%	19.28%	5.68%
3	50	240	37.5	11.3	416.1	227.4	9.01%	4.95%	10.28%	492.50%	19.28%	5.68%
4	350	240	37.5	11.3	416.1	227.4	9.01%	4.95%	10.28%	492.50%	19.28%	5.68%
5	50	360	37.5	11.3	416.1	227.4	9.01%	4.95%	10.28%	492.50%	19.28%	5.68%
6	350	360	37.5	11.3	416.1	227.4	9.01%	4.95%	10.28%	492.50%	19.28%	5.68%
7	50	480	37.5	11.3	411.4	227.4	9.11%	4.95%	10.37%	492.50%	19.28%	5.68%
8	350	480	37.5	11.3	411.4	227.4	9.11%	4.95%	10.37%	492.50%	19.28%	5.68%
							9.11%	4.95%	10.37%	492.50%	19.28%	5.68%

Wapening nodig

E.3.10. Bepaling Lassen

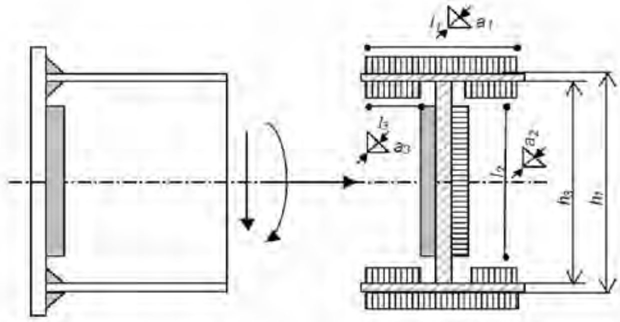
E.3.10.1. Algemeen

Berekening is op basis van de omhullende spanningsmethode.
Sterkte waardes ten behoeve van de las zijn:

$f_{u;c}$	=	360 N/mm²	β_w =	0.8
$f_{u;bp}$	=	360 N/mm²	β_w =	0.8
maatgevend	=	360 N/mm²	β_w =	0.8
$f_{w;u;d}$	=	$f_u/(\beta_w{*}\gamma_{M2})$	=	360.0 N/mm²

E.3.10.2. Controle lassen Kolom-Voetplaat

Laslengtes				
	l_1	=	300 mm	(las flens extern)
	$2{*}l_3$	=	234 mm	(las flens intern)
	l_2	=	438 mm	(las web)
	l_{tf}	=	1067 mm	
	l_{tw}	=	876 mm	



Verdeling van krachten is op onderstaande basis gedaan:
$M_y/M_z/M_x/V_y$ via de flenzen
V_z via het web
N via alle lassen

$\sigma_{N\perp} = \tau_{N\perp}$	= $N * \sqrt{2} / (2 * (a_f * l_{tf} + a_w * l_{tw}))$	=	73.4 N/mm²
$\tau_{vz\parallel}$	= $V_z / (2 * a_w * l_2)$	=	57.1 N/mm²
$\tau_{vy\parallel}$	= $V_y / (a_f * l_{tf})$	=	14.1 N/mm²
$\sigma_{Mz\perp} = \tau_{Mz\perp}$	= $Mz * 2.12 / (2 * (a_f * l_{t3}^2))$	=	0 N/mm²
$\sigma_{My\perp} = \tau_{My\perp}$	= $My/(h-t_f) * \sqrt{2} / (2 * a_f * (l_{tf}/2))$	=	0 N/mm²
$\tau_{Mx\parallel}$	= $Mx/(h-t_f) / (a_f * (l_{tf}/2))$	=	0 N/mm²

$\tau_{N\parallel}$	=	0 N/mm²
$\sigma_{vz\perp} = \tau_{vz\perp}$	=	0 N/mm²
$\sigma_{vy\perp} = \tau_{vy\perp}$	=	0 N/mm²
$\tau_{Mz\parallel}$	=	0 N/mm²
$\tau_{My\parallel}$	=	0 N/mm²
$\sigma_{Mx\perp} = \tau_{Mx\perp}$	=	0 N/mm²

		Flens	Web
$\sigma_\perp = \tau_\perp$	=	73.4 N/mm²	73.4 N/mm²
$\tau_\parallel$	=	14.1 N/mm²	57.1 N/mm²

Omhullende spanning volgens EN 1993-1-8 +NB

				u.c. 1	u.c. 2
$\sigma_{w;s;d;flens}$	= $\sqrt{(\sigma_\perp^2+3*(\tau_\perp^2+\tau_\parallel^2))}$	=	148.8 N/mm²	41.33%	28.31%
$\sigma_{w;s;d;web}$	= $\sqrt{(\sigma_\perp^2+3*(\tau_\perp^2+\tau_\parallel^2))}$	=	177.0 N/mm²	49.16%	28.31%

u.c. 1 = $\sigma_{w;s;d} / f_{w;u;d}$
u.c. 2 = $\sigma_1 < 0.9\, f_u / \gamma_{M2}$

E.3.10.3. Controle lassen Shearkey-Voetplaat

Er is geen Sherkey aanwezig, lascontrole niet van toepassing

E.3.11. Berekening stijfheid

E.3.11.1. Bepaling stijfheidscoëfficiënten voor basiscomponenten

E.3.11.1.1. Beton op druk (met inbegrip van grout)

k_{13} = (E_c * √(h_{eff} * l_{eff}))/ (1.275 * E) = 11.8

h_{eff} = = 385 mm
l_{eff} = = 96 mm
E = = 210000 N/mm²
E_c = 22000 * $(f_{cm} / 10)^{0.3}$ / 2 = 16418 N/mm²
f_{cm} = f_{ck} + 8 = 38 N/mm²
f_{ck} = = 30 N/mm²

E.3.11.1.2. Plaat op buiging onder druk

k_{14} = ∞
Deze coëfficiënt is al verdisconteerd bij de berekening van stijfheidscoëfficiët k_{13}

E.3.11.1.3. Voetplaat op buiging onder trek (voor een boutrij op trek)

Bepaling toelaatbaarheid optreden wrikkrachten
wrikkrachten mogen optreden indien: Lb ≤ ((8.8 * m³ * As) / (lef * t³)

L_b = 8 * d_{nom} + d_{grout} + t + t_{ring} + 0.5 * t_{moer} = 339 mm
d_{nom} = = 30 mm
d_{grout} = = 50 mm
t = = 30 mm
t_{ring} = = 6 mm
t_{moer} = = 25.6 mm
m = = 137 mm
A_s = = 561 mm
l_{ef} = = 423 mm
(8.8 * m³ * A_s) / (lef * t³) = 1111 mm wrikkrachten mogen optreden
In dien wrikkrachten mogen optreden geldt:
k_{15} = 0.85 * l_{ef} * t³ / m³ = 3.78
Indien geen wrikkrachten mogen optreden geldt:
k_{15} = 0.425 * l_{ef} * t³ / m³ = 1.89
factor voor voetplaat op buiging onder trek is:
k_{15} = = 3.78

E.3.11.1.4. Ankerbouten op trek

In dien wrikkrachten mogen optreden geldt:
k_{16} = 1.6 * A_s / l_b = 2.65
Indien geen wrikkrachten mogen optreden geldt:
k_{16} = 2 * A_s / l_b = 3.31
factor voor ankerbouten op trek is:
k_{16} = = 2.65
Bepaling coëfficiënten:
k_T = 1 / ((1 / k_{15}) + (1 / k_{16})) = 1.56
k_c = k_{13} = 11.8

E.3.11.1.5. Bepaling rotatie stijfheid Sj

Max. kolommoment	=	My =	1040.0 kNm		
		Mz =	249.1 kNm		
Max. optredend moment	=	My =	0.0 kNm		$= M_{j,Ed}$
		Mz =	0.0 kNm		
Maatgevend moment	=	My =	515.9 kNm	niet volledig sterk	$= M_{j,Rd}$
		Mz =	46.1 kNm	niet volledig sterk	

Rotatiestijfheid alleen bepaald t.g.v. My

indien $M_{j,Ed} \leq ⅔\, M_{jRd}$: $\mu = 1$

indien $⅔\, M_{j,Rd} \leq M_{j,Ed} \leq M_{j,Rd}$ $\mu = (1.5 * M_{j,Rd} / M_{j,Rd})^{2.7}$

$\mu = 1$

E = 210000 N/mm²

z = 438 mm

$\Sigma 1/k$ = 0.72704

e = 1.00

e_k = 176.9

$$S_j = \frac{1}{\mu} * \frac{E * z^2}{\Sigma 1/k} = 55412538273 \text{ Nmm/rad} = 55413 \text{ kNm/rad} = 55.413 \text{ MNm/rad}$$

E.3.12. Toepassingsgebied / Referenties

E.3.12. (1) De berekeningsmethode in dit rekenblad zijn gebasseerd op "CUR/BmS rapport 10 Kolomvoetplaatverbindingen", in combinatie met de gestelde eisen uit EN 1993-1-1 + NB, EN 1993-1-8 + NB en EN 1992-1-1 + NB.

Ook zijn de eisen/adviesen uit prEN 1992-4 meegenomen.

En gaat uit van de plasticiteitstheorie. Voor ankerverbindingen betekent dit dat taaibezwijken van het staal maatgevend dient te zijn t.o.v. betonbezijken.

Taai bezwijken van op trek belaste ankers wordt bereikt als aan een van de volgende voorwaarden is voldaan:

- Taai vervormingsgedrag van de ankers is maatgevend boven betonbezwijken van de ankers. Dit wordt bereikt als het staal van de ankers voldoet aan E.3.12. (2), waarbij voor "ankers op aanhechting" als extra geld dat moet zijn voldaan aan E.3.12. (3). En bij "ankers met mechanische verankering en korte lijmankers" aan E.3.12. (4).
- Plastische vervorming van de voetplaat is maatgevend boven betonbezijken van de ankers. Dit wordt bereikt als de voetplaat voldoet aan (5).

Voor een afschuifbelasting moet voor verbindingen met zowel "ankers op aanhechting" als "ankers met mechanische verankering en korte lijmankers" worden voldaan aan E.3.12. (6) om taai bezwijken te bereiken.

Als de belasting op de ankers veel kleiner is dan de sterkte behorend bij betonbezwijken, hoeft niet te worden voldaan aan de plasticiteitseis. Dit geldt als de rekenwaarde voor de sterkte van betonbezwijken groter of gelijk is aan 1.7 maal de rekenwaarde van de optredende belasting.

Dit geld voor zowel voor verbindingen belast op trek als op afschuiving.

E.3.12. (2) Om taai bezwijken van het staal te bereiken, geldt voor "ankers op aanhechting" art. 3.2.4 van EN 1992-1-1 + NB. En voor draadeinden geldt ISO 898-1. Voor "ankers met mechanische verankering en korte lijmankers" geld dat:

- De nominale treksterkte van het anker niet groter mag zijn dan $f_{u,b}$ = 800 N/mm².
- De verhouding vloeisterkte/treksterkte niet groter mag zijn dan $f_{y,b}/f_{y,b}$ = 0.8
- De breukrek, e_u, gemeten over een afstand van 5d minimaal 12% moet zijn.
- Voor ankers met plaatselik een geringere doorsnede dient voldaan te zijn aan art. B.1.1.2 (4) van CEN/TS 1992-4-1.

E.3.12. (3) Om bij "ankers op aanhechting" taai bezwijken op trek te bereiken, dient voor de berekening van de verankerslengte de maximale staalspanning van f_{yb} te zijn gehanteerd.

E.3.12. (4) Bij "ankers met mechanische verankering en korte lijmankers" mag worden aangenomen dat bij trekbelasting taaibezijken maatgevend is als aan onderstaande voorwaarden is voldaan:

- de rekenwaarde van de sterkte van betonbezijken (betonkegelbreuk en uittrekken) is minimaal gelijk aan 1.25 maal de rekenwaarde van de treksterkte voor staalbezwijken van het anker.
- splijten van het beton is niet maatgevend, omdat een van de volgende omstandigheden van toepassing is:
- er sprake is van voldoende grote dikte van de betonconstructie, en voldoende afstand tot de randen is voorzien in alle richtingen.
- de aanwezige wapening is voldoende om de scheurwijdte te beperken tot een maximale waarde van 0.3 mm.

E.3.12. (5) Plastische vervorming van de voetplaat is maatgevend boven betonbezwijken van de ankers als de rekenwaarde van de sterkte voor betonbezwijken (betonkegelbreuk en uittrekken anker) van de ankers minimaal gelijks is aan 1.25 maal de trekkracht waarbij de doorsnede direct naast de kolom het plastisch moment, $M_{pl,Rd}$, berijkt.

E.3.12. (6) Voor een verbinding op afschuiving moet ophangwapening op een effectieve wijze aangebracht zijn. Dit betekend dat de wapening zodanig aanwezig moet zijn dat de afschuifkracht kan worden opgenomen.

Project data

Project name	Predesign YARA CCS Machine Hall
Project number	370 A3T8
Author	5.1.2.e
Description	Moment connection design
Date	20-11-2022
Design code	EN

Material

Steel	S 235 (EN 10025-2)

Project item CON1

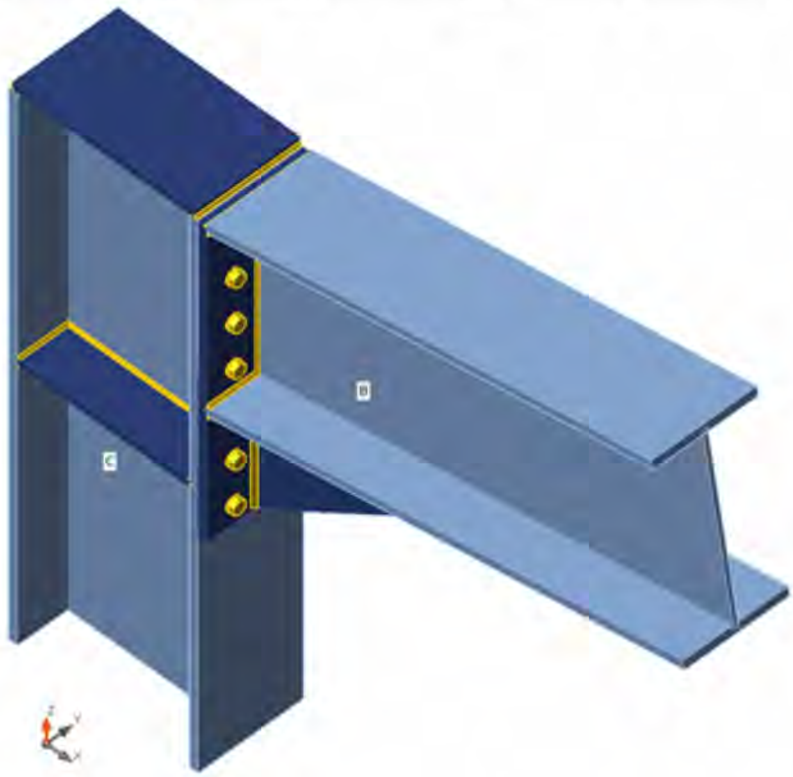
Design

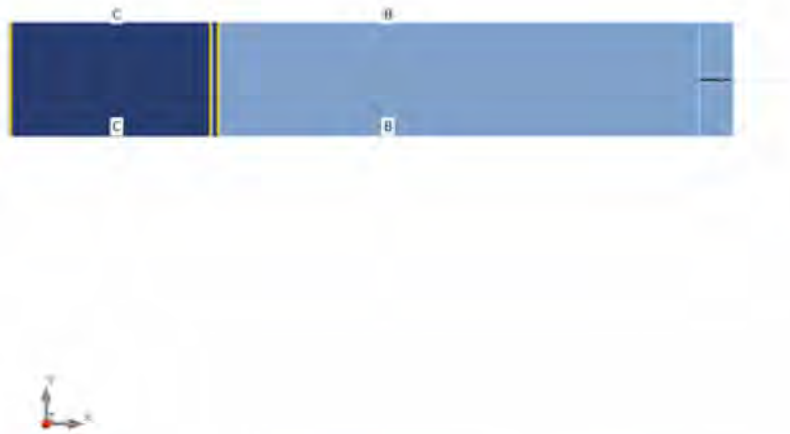
Name	CON1
Description	
Analysis	Stress, strain/ simplified loading

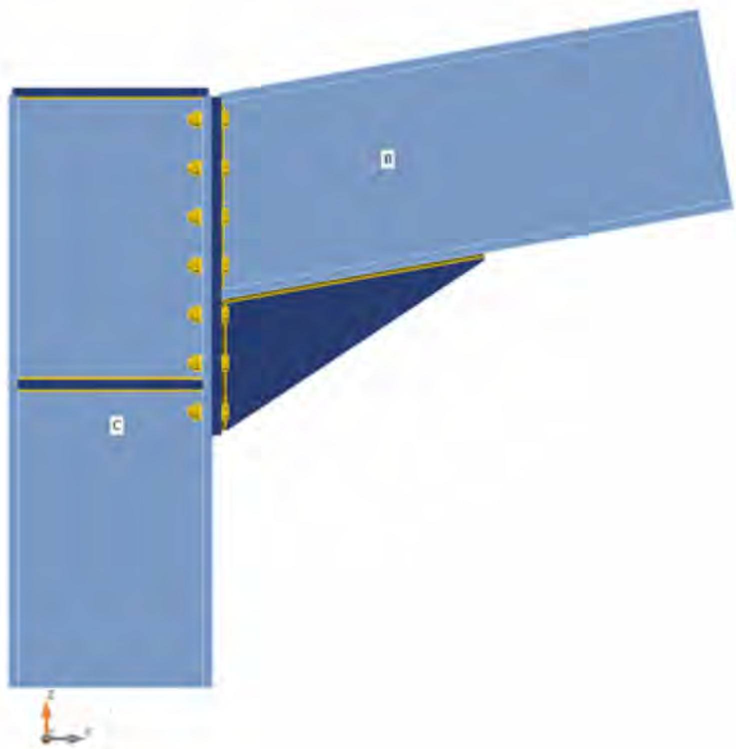
Members

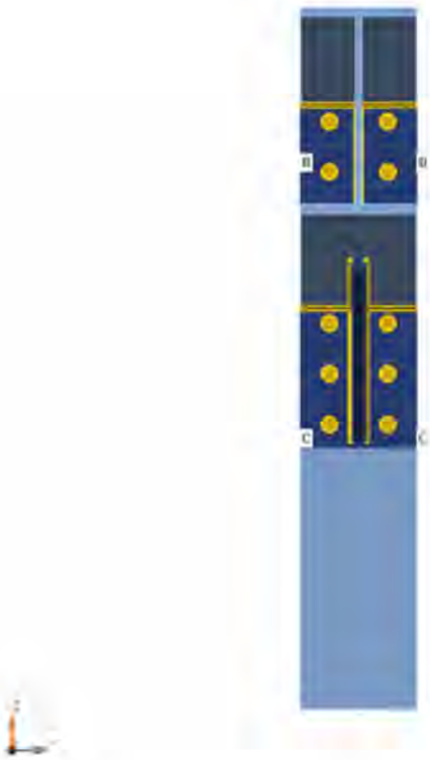
Geometry

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
C	1 - HEA550	0.0	90.0	0.0	0	0	0	Node
B	1 - HEA550	0.0	-10.0	0.0	0	0	0	Node




C
B
C
B


B
C



Cross-sections

Name	Material
1 - HEA550	S 235 (EN 10025-2)

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm^2]
M24 A4-80	M24 A4-80	24	800.0	452

Load effects (Equilibrium not required)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	-165.0	7.0	-81.0	6.0	220.0	16.0
LE2	B	151.0	7.0	-81.0	6.0	220.0	16.0

Check

Summary

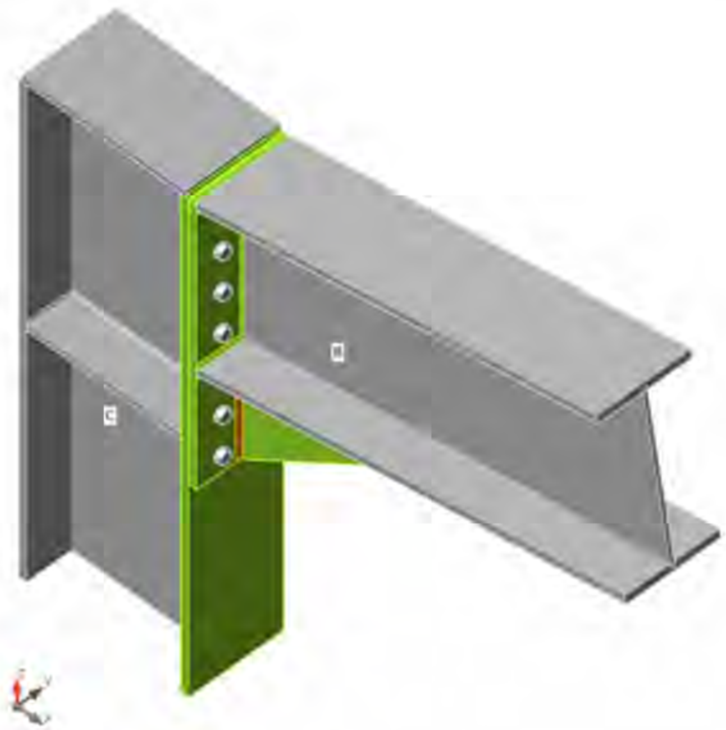
Name	Value	Status
Analysis	100.0%	OK
Plates	0.1 < 5.0%	OK
Bolts	78.3 < 100%	OK
Welds	98.0 < 100%	OK
Buckling	25.53	

Plates

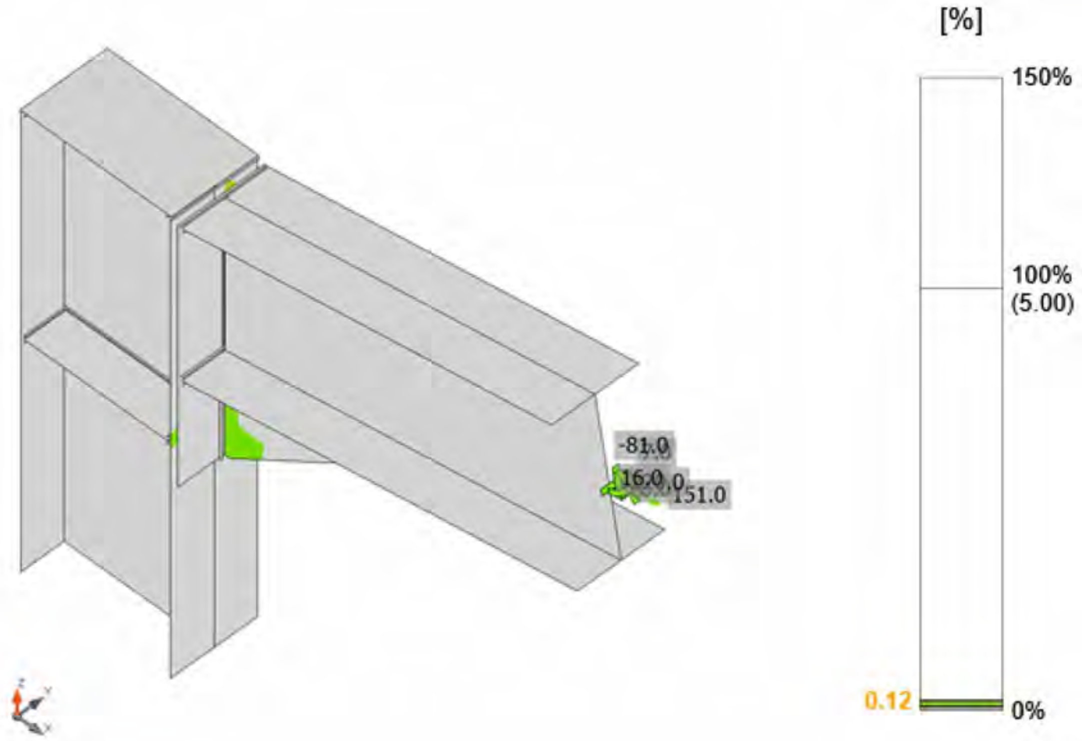
Name	Material	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [%]	$\sigma_{c,Ed}$ [MPa]	Status
C-bfl 1	S 235 (EN 10025-2)	24.0	LE2	137.0	0.0	0.0	OK
C-tfl 1	S 235 (EN 10025-2)	24.0	LE2	225.2	0.1	23.1	OK
C-w 1	S 235 (EN 10025-2) - 1	12.5	LE2	186.0	0.0	0.0	OK
B-bfl 1	S 235 (EN 10025-2)	24.0	LE1	151.4	0.0	0.0	OK
B-tfl 1	S 235 (EN 10025-2)	24.0	LE2	157.2	0.0	0.0	OK
B-w 1	S 235 (EN 10025-2) - 1	12.5	LE2	109.9	0.0	0.0	OK
EP1	S 235 (EN 10025-2)	25.0	LE2	225.1	0.0	33.2	OK
STIFF2a	S 235 (EN 10025-2)	20.0	LE1	190.2	0.0	0.0	OK
STIFF2b	S 235 (EN 10025-2)	20.0	LE2	185.4	0.0	0.0	OK
Rib1	S 235 (EN 10025-2)	30.0	LE2	225.0	0.0	0.0	OK
STIFF3	S 235 (EN 10025-2)	20.0	LE2	202.0	0.0	0.0	OK

Design data

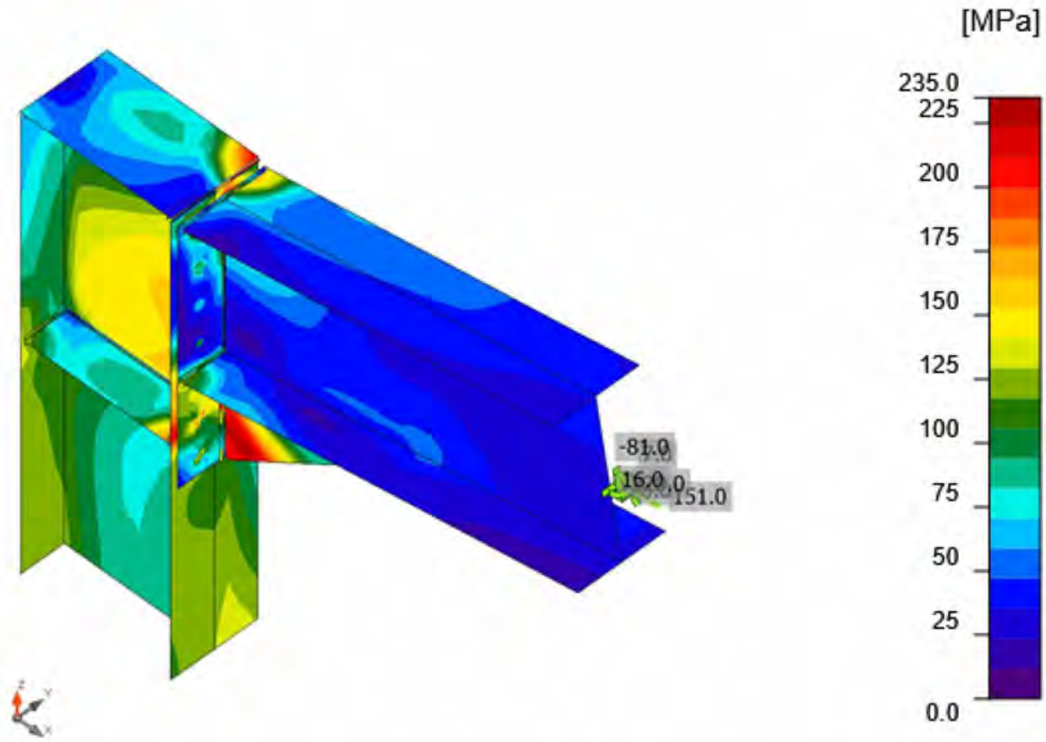
Material	f_y [MPa]	ε_{lim} [%]
S 235 (EN 10025-2)	225.0	5.0
S 235 (EN 10025-2) - 1	235.0	5.0



Overall check, LE2

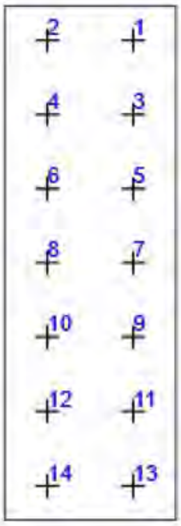


Strain check, LE2



Equivalent stress, LE2

Bolts



Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	$F_{b,Rd}$ [kN]	Ut_t [%]	Ut_s [%]	Ut_{ts} [%]	Status
B1	LE2	159.2	4.6	398.8	78.3	4.1	60.0	OK
B2	LE2	112.5	7.8	339.6	55.3	6.9	46.4	OK
B3	LE2	59.4	2.1	409.7	29.2	1.9	22.7	OK
B4	LE2	61.1	6.5	414.7	30.0	5.7	27.2	OK
B5	LE2	38.9	3.2	414.7	19.1	2.8	16.5	OK
B6	LE2	39.1	5.3	414.7	19.2	4.7	18.4	OK
B7	LE2	21.3	9.2	414.7	10.5	8.1	15.6	OK
B8	LE2	27.5	7.1	398.8	13.5	6.3	16.0	OK
B9	LE1	0.0	21.5	414.7	0.0	19.1	19.1	OK
B10	LE2	36.5	6.7	399.4	17.9	5.9	18.8	OK
B11	LE1	0.0	25.1	414.7	0.0	22.2	22.2	OK
B12	LE2	39.2	4.9	414.7	19.3	4.3	18.1	OK
B13	LE2	2.4	24.1	414.7	1.2	21.4	22.2	OK
B14	LE2	22.1	18.4	414.7	10.9	16.3	24.0	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M24 A4-80 - 1	203.3	495.0	113.0

Detailed result for B1

Tension resistance check (EN 1993-1-8 tab 3.4)

$$F_{t,Rd} = \frac{k_2\, f_{ub}\, A_s}{\gamma_{M2}} = 203.3 \text{ kN} \geq F_t = 159.2 \text{ kN}$$

where:

$k_2 = 0.90$	– Factor
$f_{ub} = 800.0$ MPa	– Ultimate tensile strength of the bolt
$A_s = 353$ mm^2	– Tensile stress area of the bolt
$\gamma_{M2} = 1.25$	– Safety factor

Punching resistance check (EN 1993-1-8 tab 3.4)

$$B_{p,Rd} = \frac{0.6\, \pi\, d_m\, t_p\, f_u}{\gamma_{M2}} = 495.0 \text{ kN} \geq F_t = 159.2 \text{ kN}$$

where:

$d_m = 38$ mm	– The mean of the across points and across flats dimensions of the bolt head or the nut, whichever is smaller
$t_p = 24$ mm	– Thickness
$f_u = 360.0$ MPa	– Ultimate strength
$\gamma_{M2} = 1.25$	– Safety factor

Shear resistance check (EN 1993-1-8 tab 3.4)

$$F_{v,Rd} = \frac{\beta_p\, \alpha_v\, f_{ub} A}{\gamma_{M2}} = 113.0 \text{ kN} \geq V = 4.6 \text{ kN}$$

where:

$\beta_p = 1.00$	– Reducing factor
$\alpha_v = 0.50$	– Reducing factor
$f_{ub} = 800.0$ MPa	– Ultimate tensile strength of the bolt
$A = 353$ mm^2	– Tensile stress area of the bolt
$\gamma_{M2} = 1.25$	– Safety factor

Bearing resistance check (EN 1993-1-8 tab 3.4)

$F_{b,Rd} = \frac{k_1\, \alpha_b\, f_u\, dt}{\gamma_{M2}} =$ 398.8 kN ≥ $V =$ 4.6 kN

where:

$k_1 = \min(2.8\frac{e_2}{d_0} - 1.7, 1.4\frac{p_2}{d_0} - 1.7, 2.5) = 2.50$	– Factor for edge distance and bolt spacing perpendicular to the direction of load transfer
$\alpha_b = \min(\frac{e_1}{3d_0}, \frac{p_1}{3d_0} - \frac{1}{4}, \frac{f_{ub}}{f_u}, 1) = 0.96$	– Factor for end distance and bolt spacing in direction of load transfer
$e_2 = 64$ mm	– Distance to the plate edge perpendicular to the shear force
$p_2 = \infty$ mm	– Distance between bolts perpendicular to the shear force
$d_0 = 26$ mm	– Bolt hole diameter
$e_1 = 75$ mm	– Distance to the plate edge in the direction of the shear force
$p_1 = \infty$ mm	– Distance between bolts in the direction of the shear force
$f_{ub} = 800.0$ MPa	– Ultimate tensile strength of the bolt
$f_u = 360.0$ MPa	– Ultimate strength
$d = 24$ mm	– Nominal diameter of the fastener
$t = 24$ mm	– Thickness of the plate
$\gamma_{M2} = 1.25$	– Safety factor

Interaction of tension and shear (EN 1993-1-8 tab 3.4)

$U_{tts} = \frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4\, F_{t,Rd}} =$ 60.0 %

Utilization in tension

$U_{tt} = \frac{F_{t,Ed}}{\min(F_{t,Rd}; B_{p,Rd})} =$ 78.3 %

Utilization in shear

$U_{ts} = \frac{V_{Ed}}{\min(F_{v,Rd}; F_{b,Rd})} =$ 4.1 %

Welds

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_\perp$ [MPa]	$\tau_\parallel$ [MPa]	$\tau_\perp$ [MPa]	Ut [%]	Ut_c [%]	Status
EP1	B-bfl 1	◢7.0◣	300	LE1	153.9	0.0	24.0	85.5	-19.8	42.7	30.9	OK
		◢7.0◣	300	LE1	248.3	0.0	-149.7	62.3	95.9	69.0	36.9	OK
EP1	B-tfl 1	◢7.0◣	300	LE2	128.8	0.0	-62.2	-49.7	42.1	35.8	21.1	OK
		◢7.0◣	300	LE2	258.7	0.0	193.6	-33.5	-93.2	74.7	36.4	OK
EP1	B-w 1	◢4.0◣	524	LE2	237.1	0.0	110.2	64.7	102.4	65.9	31.8	OK
		◢4.0◣	524	LE2	167.5	0.0	76.6	-16.0	-84.5	46.5	26.4	OK
C-bfl 1	STIFF2a	◢5.0◣	144	LE1	100.7	0.0	-76.5	11.8	-35.9	29.5	21.3	OK
		◢5.0◣	144	LE1	110.4	0.0	77.6	26.0	-37.1	30.7	24.5	OK
C-w 1	STIFF2a	◢5.0◣	492	LE1	137.7	0.0	-1.5	79.5	0.1	38.2	30.7	OK
		◢5.0◣	492	LE1	69.5	0.0	28.5	-5.0	-36.2	19.3	9.9	OK
C-tfl 1	STIFF2a	◢5.0◣	144	LE2	246.0	0.0	-19.1	129.4	-57.5	68.3	41.3	OK
		◢5.0◣	144	LE1	352.9	0.1	-211.7	78.9	142.7	98.0	80.8	OK
C-bfl 1	STIFF2b	◢5.0◣	144	LE2	135.3	0.0	-84.8	43.0	-43.1	37.6	32.4	OK
		◢5.0◣	144	LE2	129.5	0.0	93.6	0.4	-51.7	36.1	25.8	OK
C-w 1	STIFF2b	◢5.0◣	492	LE1	71.7	0.0	-1.6	41.4	0.2	19.9	14.2	OK
		◢5.0◣	492	LE2	127.7	0.0	44.1	57.5	-38.5	35.5	27.1	OK
C-tfl 1	STIFF2b	◢5.0◣	144	LE2	324.7	0.0	199.0	84.5	121.7	90.2	66.5	OK
		◢5.0◣	144	LE1	167.9	0.0	-40.5	94.0	2.1	46.6	32.5	OK
EP1	Rib1	◢8.0◣	350	LE2	211.5	0.0	36.5	-117.5	25.7	58.7	41.9	OK
		◢8.0◣	350	LE1	352.8	0.0	-134.6	-159.8	99.6	98.0	85.4	OK
B-bfl 1	Rib1	◢8.0◣	709	LE1	150.2	0.0	-38.7	81.2	20.9	41.7	24.1	OK
		◢8.0◣	709	LE1	121.7	0.0	65.1	-46.3	37.1	33.8	18.2	OK
STIFF3	C-bfl 1	◢5.0◣	300	LE2	125.9	0.0	87.4	6.9	51.8	35.0	20.3	OK
		◢5.0◣	300	LE2	89.1	0.0	-52.8	2.7	-41.4	24.8	15.8	OK
STIFF3	C-tfl 1	◢5.0◣	300	LE2	251.2	0.0	-72.0	77.9	115.0	69.8	34.3	OK
		◢5.0◣	300	LE2	304.0	0.0	229.1	77.9	-85.1	88.4	38.4	OK
STIFF3	C-w 1	◢5.0◣	516	LE2	95.7	0.0	24.3	-24.8	-47.3	26.6	14.9	OK
		◢5.0◣	516	LE2	129.4	0.0	-1.8	74.7	1.2	35.9	26.7	OK

Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235 (EN 10025-2)	0.80	360.0	259.2

Detailed result for C-tfl 1 STIFF2a

Weld resistance check (EN 1993-1-8 4.5.3.2)

$\sigma_{w,Rd} = f_u/(\beta_w \gamma_{M2}) =$ 360.0 MPa ≥ $\sigma_{w,Ed} = [\sigma_\perp^2 + 3(\tau_\perp^2 + \tau_\parallel^2)]^{0.5} =$ 352.9 MPa

$\sigma_{\perp,Rd} = 0.9\ f_u\ /\ \gamma_{M2} =$ 259.2 MPa ≥ $|\sigma_\perp| =$ 211.7 MPa

where:

$f_u = 360.0$ MPa – Ultimate strength

$\beta_w = 0.80$ – appropriate correlation factor taken from Table 4.1

$\gamma_{M2} = 1.25$ – Safety factor

Stress utilization

$U_t = \max(\frac{\sigma_{w,Ed}}{\sigma_{w,Rd}}\ ;\ \frac{|\sigma_\perp|}{\sigma_{\perp,Rd}}) =$ 98.0 %

Buckling

Loads	Shape	Factor [-]
LE1	1	30.58
	2	37.19
	3	38.56
	4	43.69
	5	44.96
	6	45.15
LE2	1	25.53
	2	26.46
	3	26.67
	4	28.48
	5	32.40
	6	36.40

Cost estimation

Steel

Steel grade	Total weight [kg]	Unit cost [€/kg]	Cost [€]
S 235 (EN 10025-2)	130.97	2.00	261.94

Bolts

Bolt assembly	Total weight [kg]	Unit cost [€/kg]	Cost [€]
M24 A4-80	8.86	5.00	44.31

Welds

Weld type	Throat thickness [mm]	Leg size [mm]	Total weight [kg]	Unit cost [€/kg]	Cost [€]
Double fillet	7.0	9.9	0.46	40.00	18.46
Double fillet	4.0	5.7	0.13	40.00	5.26
Double fillet	5.0	7.1	1.05	40.00	42.00
Double fillet	8.0	11.3	1.06	40.00	42.55

Hole drilling

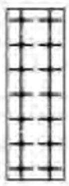
Bolt assembly cost [€]	Percentage of bolt assembly cost [%]	Cost [€]
44.31	30.0	13.29

Cost summary

Cost estimation summary	Cost [€]
Total estimated cost	427.82

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
Snede1							
EP1	P25.0x300.0-900.3 (S 235 (EN 10025-2))		1	Double fillet: a = 7.0 Double fillet: a = 4.0	600.0 524.0	M24 A4-80	14
STIFF2	P20.0x143.7-492.0 (S 235 (EN 10025-2))		2	Double fillet: a = 5.0	1559.0		
Rib1	P30.0x473.4-700.0 (S 235 (EN 10025-2))		1	Double fillet: a = 8.0	1058.7		
STIFF3	P20.0x300.0-520.0 (S 235 (EN 10025-2))		1	Double fillet: a = 5.0	1116.0		

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Double fillet	S 235 (EN 10025-2)	7.0	9.9	600.0
Double fillet	S 235 (EN 10025-2)	4.0	5.7	524.0
Double fillet	S 235 (EN 10025-2)	5.0	7.1	2675.0
Double fillet	S 235 (EN 10025-2)	8.0	11.3	1058.7

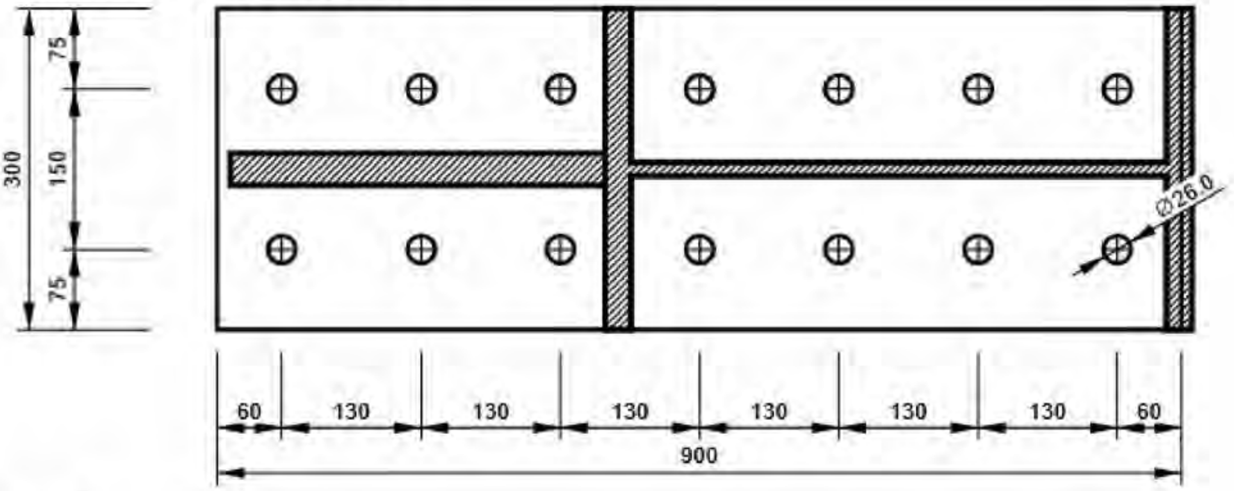
Bolts

Name	Grip length [mm]	Count
M24 A4-80	49	14

Drawing

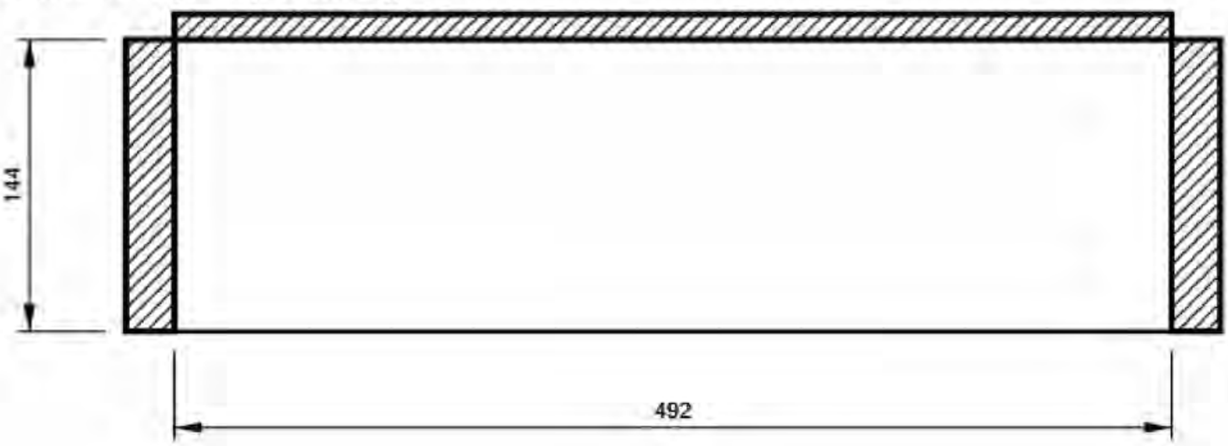
EP1

P25.0x900-300 (S 235 (EN 10025-2))



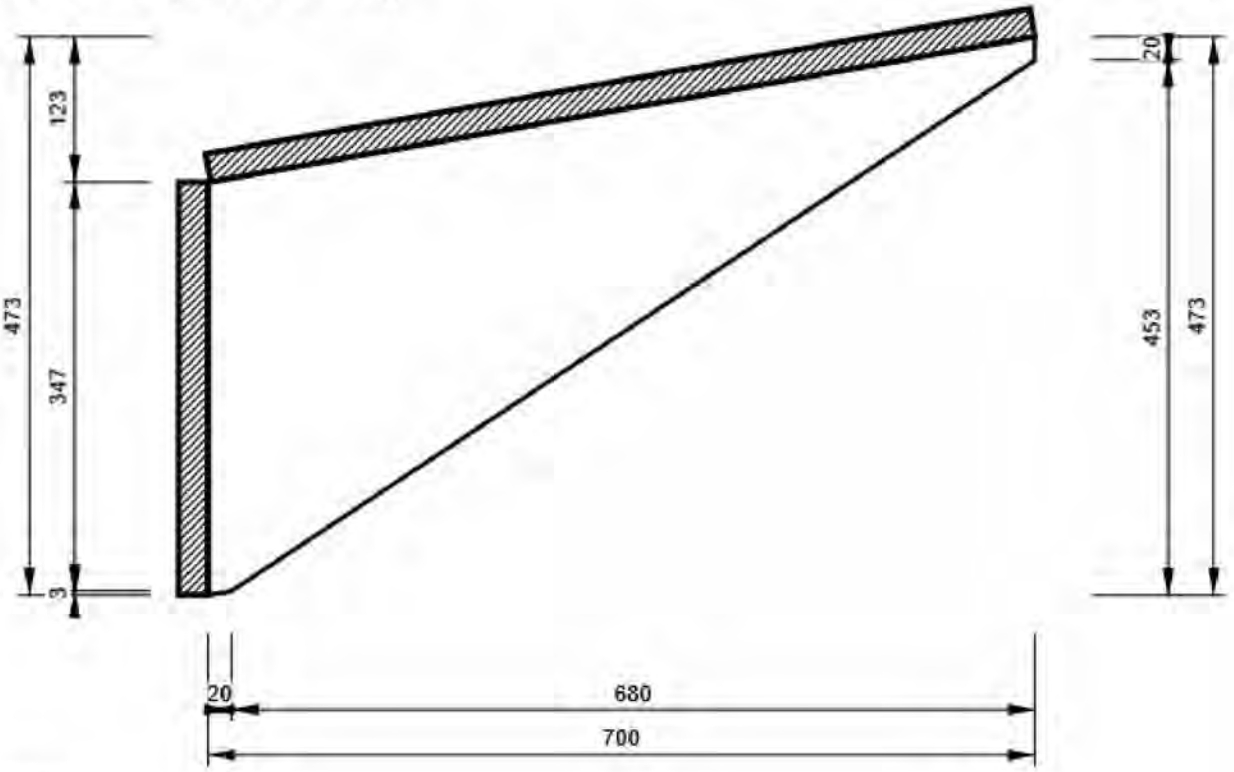
STIFF2

P20.0x492-144 (S 235 (EN 10025-2))



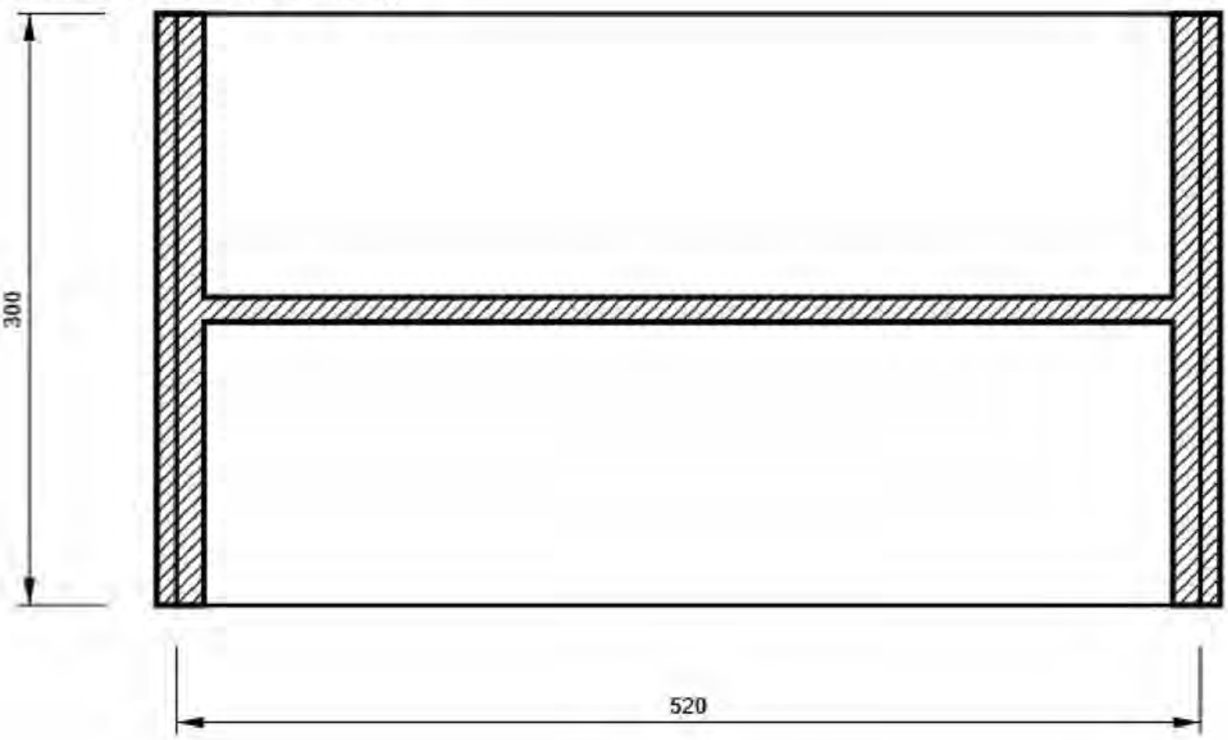
Rib1

P30.0x700-473 (S 235 (EN 10025-2))

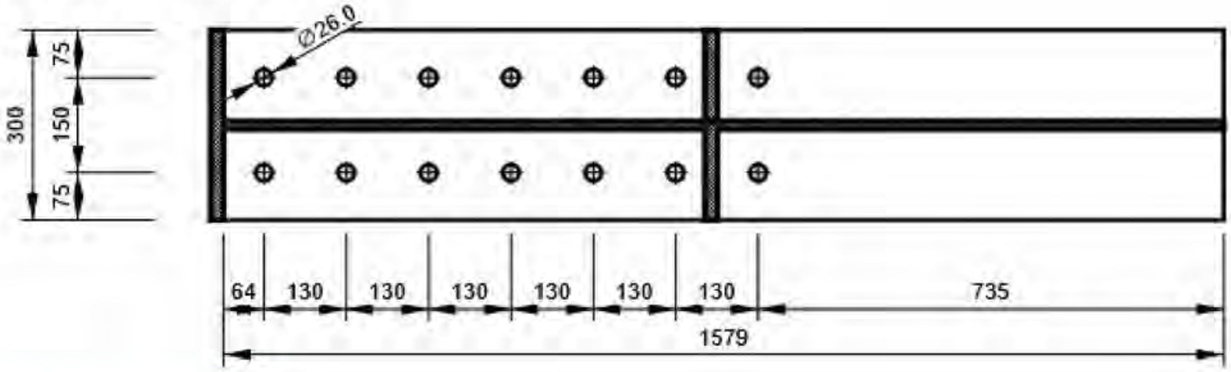


STIFF3

P20.0x520-300 (S 235 (EN 10025-2))



C, HEA550 - Top flange 1:



Symbol explanation

Symbol	Symbol explanation
ε_{Pl}	Strain
σ_{Ed}	Eq. stress
f_y	Yield strength
ε_{lim}	Limit of plastic strain
$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$B_{p,Rd}$	Punching shear resistance
$F_{t,Ed}$	Tension force
V	Resultant of bolt shear forces Vy and Vz in shear planes
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
$\sigma_{w,Ed}$	Equivalent stress
$\sigma_{w,Rd}$	Equivalent stress resistance
$\sigma_{\perp}$	Perpendicular stress
$\tau_{\parallel}$	Shear stress parallel to weld axis
$\tau_{\perp}$	Shear stress perpendicular to weld axis
$0.9\ \sigma_{w,Rd}$	Perpendicular stress resistance: 0.9*fu/γM2
β_w	Corelation factor EN 1993-1-8 tab. 4.1
Ut	Utilization
Ut_c	Weld capacity utilization
◢	Fillet weld

Code settings

Item	Value	Unit	Reference
γ_{M0}	1.00	-	EN 1993-1-1: 6.1
γ_{M1}	1.00	-	EN 1993-1-1: 6.1
γ_{M2}	1.25	-	EN 1993-1-1: 6.1
γ_{M3}	1.25	-	EN 1993-1-8: 2.2
γ_{C}	1.50	-	EN 1992-1-1: 2.4.2.4
γ_{Inst}	1.20	-	EN 1992-4: Table 4.1
Joint coefficient βj	0.67	-	EN 1993-1-8: 6.2.5
Effective area - influence of mesh size	0.10	-	
Friction coefficient - concrete	0.25	-	EN 1993-1-8
Friction coefficient in slip-resistance	0.30	-	EN 1993-1-8 tab 3.7
Limit plastic strain	0.05	-	EN 1993-1-5
Detailing	No		
Distance between bolts [d]	2.20	-	EN 1993-1-8: tab 3.3
Distance between bolts and edge [d]	1.20	-	EN 1993-1-8: tab 3.3
Concrete breakout resistance check	Both		EN 1992-4: 7.2.1.4 and 7.2.2.5
Use calculated αb in bearing check.	Yes		EN 1993-1-8: tab 3.4
Cracked concrete	Yes		EN 1992-4
Local deformation check	No		CIDECT DG 1, 3 - 1.1
Local deformation limit	0.03	-	CIDECT DG 1, 3 - 1.1
Geometrical nonlinearity (GMNA)	Yes		Analysis with large deformations for hollow section joints
Braced system	No		EN 1993-1-8: 5.2.2.5

Software info

Application	IDEA StatiCa Connection
Version	22.1.0.3519
Developed by	IDEA StatiCa

Annex F
Overview of codes and Literature

Content

F. Overview of codes and Literature

F.1. Used codes

F.1.1. Basic codes for calculation

Eurocode 0: Basis of structural design
EN 1990+NA
Eurocode: Basis of structural design
Eurocode 1: Actions on structures
EN 1991-1-1+NA
Eurocode 1: Actions on structures - Part 1-1: General actions -Densities, self-weight, imposed loads for buildings
EN 1991-1-2+NA
Eurocode 1: Actions on structures - Part 1-2: General actions - Actions on structures exposed to fire
EN 1991-1-3+NA
Eurocode 1: Actions on structures - Part 1-3: General actions - Snow loads
EN 1991-1-4+NA
Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions
EN 1991-1-5+NA
Eurocode 1: Actions on structures - Part 1-5: General actions - Thermal actions
EN 1991-1-6+NA
Eurocode 1: Actions on structures - Part 1-6: General actions - Actions during execution
EN 1991-1-7+NA
Eurocode 1: Actions on structures - Part 1-7: General actions - Accidental Actions
EN 1991-2+NA
Eurocode 1: Actions on structures - Part 2: Traffic loads on bridges
Eurocode 2: Design of concrete structures
EN 1992-1-1+NA
Eurocode 2: Design of concrete structures - Part 1-1: General rules, and rules for buildings
Eurocode 3: Design of steel structures
EN 1993-1-1+NA
Eurocode 3: Design of steel structures - Part 1-1: General rules, and rules for buildings
EN 1993-1-5+NA
Eurocode 3: Design of steel structures - Part 1-5: General rules - Plated structural elements
EN 1993-1-8+NA
Eurocode 3: Design of steel structures - Part 1-8: Design of joints
EN 1993-1-10+NA
Eurocode 3: Design of steel structures - Part 1-10: Material toughness and through-thickness properties
EN 1993-1-11+NA
Eurocode 3: Design of steel structures - Part 1-11: Design of structures with tension components
Eurocode 7: Geotechnisch ontwerp
EN 1997-1+NA
EN 1997 - Eurocode 7: Geotechnical design - Part 1: General rules
EN 1997-2+NA
EN 1997 - Eurocode 7: Geotechnical design - Part 2: Ground investigation and testing
NEN 9997-1
Geotechnical design of structures - Part 1: General rules

F.2. Standards for execution

EN 1090-1+NA
Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment for structural components
EN 1090-2+NA
Execution of steel structures and aluminium structures - Part 2: Technical requirements for the execution of steel structures
EN 13670+NA
Execution of concrete structures

F.3. Material codes

F.3.1. Codes for Steel

EN 10025
Hot rolled products of structural steels
EN 10029
Hot rolled steel plates 3 mm thick or above - Tolerances on dimension, shape and mass
EN 10034
Structural steel I and H sections. Tolerances on shape and dimensions

EN 10051
Hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels - Tolerances on dimensions and shape
EN 10055
Hot rolled steel equal flange tees with radiused root and toes - Dimensions and tolerances on shape and dimensions
EN 10056
Structural steel equal and unequal leg angles
En 10164
Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions
En 10210
Hot finished structural hollow sections of non-alloy and fine grain steels - Part 2: Tolerances, dimensions and sectional properties
EN 10219
Cold formed welded structural hollow sections of non-allow and fine grain steels - Part 2: Tolerances, dimensions and sectional properties
EN ISO 12944
Corrosion protection of steel structures by protective paint systems
EN 1461
Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods

F.3.2. Codes for concrete
EN 206-1+NA
Concrete - Part 1: Specification, performance, production and conformity
NEN 8005
Dutch supplement to EN 206-1: Concrete - Part 1: Specification, performance, production and conformity
EN 197-1+NA
Concrete - Part 1: Composition, specifications and conformity criteria for common cements
EN 14216 +NA
Cement - Composition, specifications and conformity criteria for very low heat special cements
NEN 3550
Cements conforming to EN 197-1, EN 197-4 or EN 14216, with additional special properties - Definitions and requirements
NEN 6008
Steel for the reinforcement of concrete
EN 10080 +NA
Steel for the reinforcement of concrete
EN 12390 +NA (all parts)
Testing hardened concrete
EN ISO 17660 +NA (all parts)
Welding - Welding of reïnforcing steel
EN 10138 +NA
Prestressing steels - Part 1: General requirements
NEN 3868
Prestressing steel
EN ISO 15630 +NA
Steel for the reïnforcement and prestressing of concrete - Test methods - Part 1: Reinforcing bars, wire rod and wire

F.3.3. Codes for Wood N.A.

F.3.4. Normen voor Metselwerk N.A.

F.4. Codes for connections / connectionmaterials

F.4.1. Codes for Baseplatedesign
EN 1992-4 +NA
Eurocode 2 - Design of concrete structures - Part 4: Design of fastenings for use in concrete
CUR/BmS rapport 10 kolomvoetplaten

F.4.2. Bolts, nuts and washers
EN 14399
High-strength structural bolting assemblies for preloading
EN ISO 898
Mechanical properties of fasteners made of carbon steel and alloy steel
EN ISO 2320
Prevailing torque type steel hexagon nuts - Mechanical and preformance requirements

EN ISO 4014
Hexagon head bolts - Product grades A and B
EN ISO 4017
Hexagon head screws - Product grades A and B
EN ISO 4032
Hexagon nuts, style 1 - Product grades A and B
EN ISO 4033
Hexagon nuts, style 2 - Product grades A and B
EN ISO 7040
Prevailing torque hexagon nuts (with non-metallic insert), style 1 - Property classes 5, 8 and 10
EN ISO 7042
Prevailing torque type all-metal hexagon nuts, style 2 - Property classes 5, 8, 10 and 12
EN ISO 7719
Prevailing torque type all-metal hexagon nuts, style 1 - Property classes 5, 8 and 10
ISO 286-2
ISO system of limits and fits - Part 2: Tables of standard tolerance grades and limit deviations for hole and shafts
ISO 1891
Bolts, screws, nuts and accessories - Terminology and nomenclature - Trilingual edition
EN ISO 7089
Plain washers - Nominal series - Product grade A
EN ISO 7090
Plain washers, chamfered - Normal series - Product grade A
EN ISO 10511
Prevailing torque type hexagon thin nuts (with non-metallic insert)
EN ISO 10512
Prevailing torque type hexagon thin nuts, style 1, with metric fine pitch tread - Property classes 6, 8 and 10
EN ISO 10513
Prevailing torque type al-metal hexagon thin nuts, style 2, with metric fine pitch tread - Property classes 8, 10 and 12

F.4.3. Welds

EN 12345
Welding - Multilingual terms for welded joints with illustrations
EN ISO 14555
Welding - Arc stud welding of metallic materials
EN ISO 13918
Welding - Studs for arc stud welding
EN ISO 15614-1
Specifation and approval of welding procedures for metallic materials - Part 3 : Welding procedure tests for arc welding of steels
EN ISO 5817
Welding - Fusion welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006,IDT)
EN 1011
Welding - Recommendations for welding of metallic materials

F.5. Other codes

No other standards applied, otherwise the standards stated

F.6. Used Literature

Documents	Discription
Publicaties SCI	Several publications of the "Steel Construction Institute " on calculating steel structures
Publicaties BmS	Several books and documents from "Bouwen met Staal"
GTS 2013	Grafieken en Tabelen Staalbouw 2013 from "Bouwen met Staal"
Stahlbau-Praxis	Band 1 to 3 van BBB Beuth
Kranbahnen	Bemessung und konstruktive Gestaltung nach Eurocode, van BBB Beuth
Design of Steel Structures	ECCS publicatie, ECCS Eurocode Design Manuals For general design rules of steelstructures
Design of Joints in Steel and Composite Structures	ECCS publicatie, ECCS Eurocode Design Manuals For detailcalculations acc. to EN 1993-1-8
Design of Plated Structures	ECCS publicatie, ECCS Eurocode Design Manuals General design rules for steelstructures, steel plates acc. to EN 1993-1-5
GTB 2013	Grafieken en Tabelen Beton 2013 from "Betonvereniging"
Betonbauteile nach Eurocode	Hintergründe, Auslegungen, Praxisbeispiele Beiträge aus Praxis und Wissenschaft
Holzbau kompakt nach Eurocode 5	Bauwerk-Basis-Bibliothek
Geotechnik nach Eurocode Band 1: Bodenmechanik	Grundlagen, Nachweise, Berechnungsbeispiele
Geotechnik nach Eurocode Band 2: Grundbau	Grundlagen, Nachweise, Berechnungsbeispiele Bauwerk-Basis-Bibliothek
NB-overige landen / Andere normen	Where special design data (such as ψ-values for example installation) are missing the National Annex / Standards of other countries are applied.