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ZUID-WEST-OOST

Rapport mastverzwaringen Tijdelijke OSPs

TenneT TSO B.V.

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Energy Systems
DNV Netherlands B.V.
Utrechtseweg 310-B50
6812 AR Arnhem
The Netherlands

Tel: +31 26 356 9111
Registered Arnhem 09006400

[redacted]

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1	2021-08-06	TenneT comments addressed			
2	2021-09-02	TenneT second round comments			
3	2022-04-07	Check of beams and foundation added			
4	2022-05-25	RFA comments treated, changed insulators			

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1 INTRODUCTION

1.1 Introduction

To increase the future capacity of electricity transmission, it is necessary to upgrade the transmission grid by building new and modifying existing high voltage connections.

It is for this reason the client (OG) intends to build a new 380 kV line between Rilland and Tilburg and to modify the existing 380 kV and 150 kV lines in the vicinity of the new line. This upgrading is part of the program "Zuid-West-Oost" and consists of the following sub-projects:

- Creating temporary riser points to allow for temporary underground high-voltage cables to be installed on the following lines:
  - Geertruidenberg – Oosteind 150 kV (GT-OTD150)
  - Geertruidenberg – Zevenbergschenhoek 150 kV (GT-ZBH150)
  - Roosendaal – Moerdijk 150 kV (RSD-MDK150)
- Installing a temporary line deviation for one circuit (Wit) using Emergency Restoration Solution (ERS) structures to allow for the construction of the new Rilland – Tilburg 150/380kV combination transmission line
- Reconstructing a new line route for the existing Geertruidenberg – Eindhoven 380kV to loop into the new Tilburg transmission substation
- Creating new 150kV connections on adjusted lines to the new Rilland – Tilburg 150/380kV combination line

This report concerns the existing towers which will interface to the temporary riser points. The riser points will be temporary guyed steel structures which have been located at positions which TenneT have deemed the most viable in terms of functionality as well as land accessibility. These riser points can be positioned at variable line angles and distances away from the existing structures. Once the connection to the riser point has been made, the conductor will run through a series of end connections and voltage surge arrestors before being sent underground to another riser point location where the then underground cable will be taken up back onto the transmission line. These riser points are temporary as TenneT has it in their network plan to remove these sections of transmission line in the future but will only be done once a new line solution has been constructed.

1.2 Goal and scope of this report

The goal of this study is to determine whether the tower types described in this report are suitable to interface with the temporary riser points.

After modifications have been applied, the ability of the system to fulfil the applicable requirements will be verified.

1.3 Related documents

1.3.1 Verification & validation plan

The requirements provided by TenneT have been evaluated for relevance. For requirements marked as applicable, a reference is given to the document in which the requirement is fulfilled. The results of this exercise are included in the report "Verificatie en validatie tijdelijke OSP's" [1].

1.3.2 BO-Phase 1

In the report "Rapport TenneT Doorrekenen masten t.b.v. tijdelijke opstijgpunten"" [2] an investigation into the various temporary OSP locations and relevant ERS structures and the associated internal and external clearance checks was completed. Further to this, a check on the electric and magnetic fields (EMF) was completed. The results of these investigations influenced the design of the OSPs. Another document was formulated in October 2020, "Alternatief tijdelijke verbindingen t.b.v. reductie VNB tijden" [3], which detailed the latest temporary OSP positions as well as alternatives to the line deviation on Geetruidenberg – Borsele 380kV. No changes to the conductors and insulators have been described in the E-study for any tower types that require structural modifications.

1.3.3 Starting points document

The assumptions made for the investigation of the strengthening of the structures as part of the temporary OSP situation can be found in documents [2] & [3] which explains the design approach and analysis.

2 CALCULATIONS

2.1 Methodology

2.1.1 Introduction

The previously submitted report regarding the Tijdelijke OSPs [2] performed tower analyses on all structures which focussed primarily on feasibility. This document looks at the strengthening of the structures that had insufficient strength according to the BO-report.

Prior to performing the new analyses, an investigation was performed to the cause of over-utilisations in the strain towers within the scope. It was concluded that the assumed presence of a conductor car [lijnwagens] in all of the wires of one circuit simultaneously in the SPLS 6a load cases caused the over-utilisations. After consultation with TenneT, DNV has received approval to analyse the structures in the SPLS 6a condition assuming that only one phase in a circuit will be loaded with a conductor car at a time and no conductor car will be in present in the span towards the OSP.

Additionally, it was concluded that the strength of the insulator beams in the D+0 and D+3.6 has to be verified into more details, since these beams will experience increased loads due to the vicinity of the riser points and because the insulators hardware exerts eccentric loads to the beams.

Table 1 compares the tower analyses based on the previous assumptions and those now accepted by TenneT. The last column includes the added verification of the beams. The structures which have the "NG" conclusion will be part of the scope of this report. This will cover tower type D+0, D+3.6 and tension tower A.

Table 1 Comparison of tower analyses from previous assumptions

Line	ID	Mast	Mast type	TOSP Distance (m)	Check with SPLS 6a (All Phases)	Check with SPLS 6a (Single Phase)	Check for strength of beams
Roosendaal-Moerdijk 150kV	B4.1:8	94	H-150	118	NG	OK	OK
	B4.1:10	91	D	80	NG	NG	NG
		92	D	65 & 94	NG	NG	NG
	B4.1:11	82	H-130	175	NG	OK	OK
		84	D	145	NG	NG	NG
Geertruidenberg-Zevenbergsehoek 150kV	B4.1:18	24	A	173	NG	NG	OK
		32	D+0	145	OK	OK	NG
	B4.1:22	20	D+0	55	OK	OK	NG
		22	D+3.6	100	NG	NG	NG
Geertruidenberg-Oosteind 150 kV	B4.1:27	199	S+0	160	OK	OK	OK
		202	S+0	160	OK	OK	OK
	B4.1:26	208	S+0	160	OK	OK	OK

Revision 3: At a number of locations, the riser points will be located next to the center line of the overhead line. This causes transversal loads to the tower structures. The beams are checked for these loads and reinforcement proposals have been included in chapter 4. A check is performed whether the increased support reactions can be handled by the existing foundation.

Revision 4: The modification to the beams is changed for tower 22 since insulators of the lower cross arm were changed to "hangende afspanningen" to solve internal clearance issues.

2.1.2 Starting points

The calculations are executed based on the starting points as included in the starting points document [2].

Table 2 Calculation starting points

General	Code	NEN-EN50341-2-15:2019
	Wind zone	III
	Terrain category	II (onbebouwde omgeving)
	Reduction factor cdir	1,00
Initial situation	Consequence class	CC2-0
	Reliability level	Afkeur CC2-0
	Reference period	30 years
Situation after modifcations	Consequence class	CC2
	Reliability level	Verbouw
	Reference period	30 years

2.1.3 Process steps

The process required to determine whether tower reinforcements are required or not consists of the following steps:

- Step 1: Test the existing tower (Init) on “Afkeur”
- Step 2: Define the required reinforcements when the initial tower does not fulfill the “Afkeur” criterion (Def. Aanp.)
- Step 3: Testing (only) the prescribed modifications (AanP) on “Verbouw”
- Step 4: Test the complete tower including reinforcements (Initi + Aanp) on “Afkeur”

The process described above is represented in Figure 2-1.

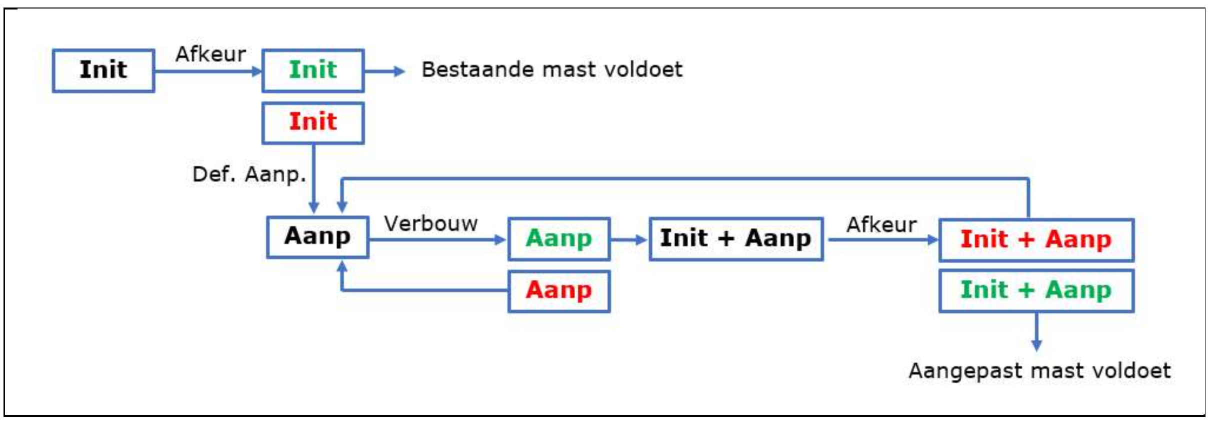


Figure 2-1 Process diagram

2.1.4 Conductor loads

The calculations have been performed with the conductor loads obtained from PLS CADD in addition to the program developed by DNV. The results of the calculations have been included in Appendix A.

2.1.5 Reaction forces on foundation

The reaction forces on the foundation have been calculated to the newly applied temporary OSP situation which has been completed in the “Rapport TenneT Doorrekenen masten t.b.v. tijdelijke opstijgpunten” [2] document. New reaction forces as per PLS-TOWER analysis was completed and have been provided in Appendix A.

2.1.6 Modelling

Based on the received as-built information, the tower was modelled in PLS-Tower. Only the main elements were modelled. Profiles such as redundant members which are not critical for load support were excluded and checked separately. The angle profiles including the bolted connections were modelled and checked in PLS-Tower. Checking of detailed connections such as gusset plates is not included in the scope of work.

The conductor loads from the aforementioned conductor loads program were used as input for the calculations.

Diagonals in the front-, rear and side planes of the tower have been grouped and the check of these members is performed per group. In case one of the elements in the group is overloaded, the resulting upgrades apply for all members in the group.

2.1.7 Beams

The beams of the suspension structures D+0 and D+3.6 were modelled as an isolated structure with the software package AxisVM. The model is discussed into more detail in Appendix D.

2.1.8 Foundation

The foundation reactions of the D+0 and D+3.6 structures will be checked against the capacity of the foundations. The tensile and compressive capacity is calculated with the TS/Paalfunderingen software package. The soil profile is based on the available “sonderingen” of the asset data. This is included in Appendix C.

3 RESULTS PLS-TOWER

In this chapter the results of the analysis with PLS-TOWER are described. PLS-TOWER checks the members of the tower to compression and tension. The beams for the insulators are not included. All of the reinforcement proposals described in this chapter do not include the measures to the beams. The measures for the beams are included in chapter 4.

3.1 GT-ZBH150 A

3.1.1 Tower outline

The tower outline from the received asset data is included in Figure 3-1.

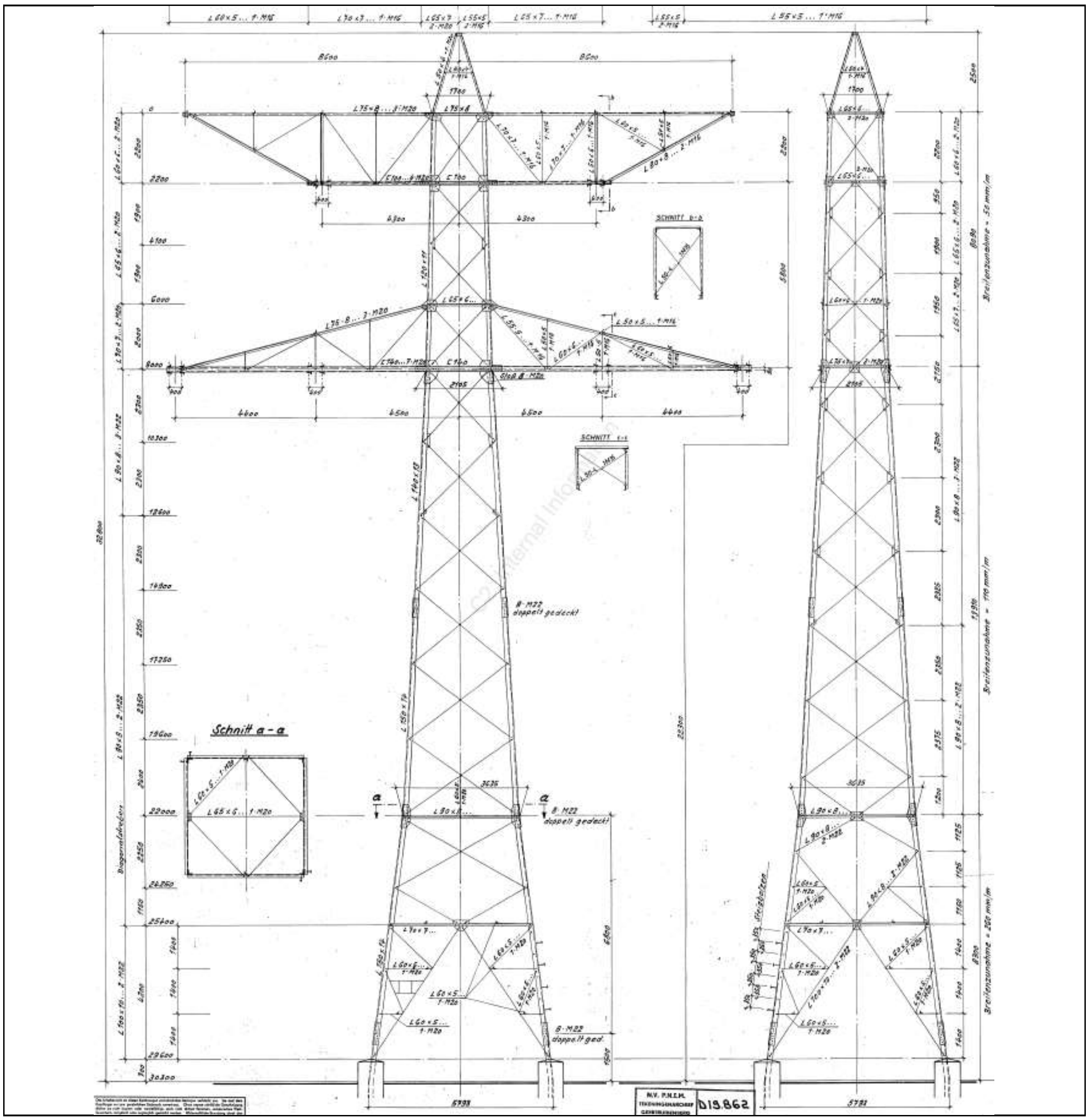


Figure 3-1 GT-ZBH150 Tower outline A

3.1.2 Tower list

This report describes tower type A. There is only one A type tower located along the investigated line at position 24. The tower is located in wind zone III and the wind loading is adjusted based on the increased height of neighboring towers (positive values indicate a height decrease). Table 3 summarises the wind and weight span parameters and indicates the governing tower which was analysed. Figure 3-3 & Figure 3-3 shows the overview of the span between mast 24 (A) and the temporary OSP.

Table 3 Tower A details

Line	Tower number	Tower type	Governing tower number	Line Angle (°)	Back span (m)	Ahead span (m)
GT-ZBH150	**24**	A	24	180	170	323

Figure 3-2 GT-ZBH150 Mast 24 (A) to temporary OSP in QGIS view

Figure 3-3 GT-ZBH150 Mast 24 (A) to temporary OSP in PLS-CADD view

3.1.3 Check of the tower

The results of the analysis for the A with the loads calculated according to “afkeurniveau” is depicted in Figure 3-4 below.

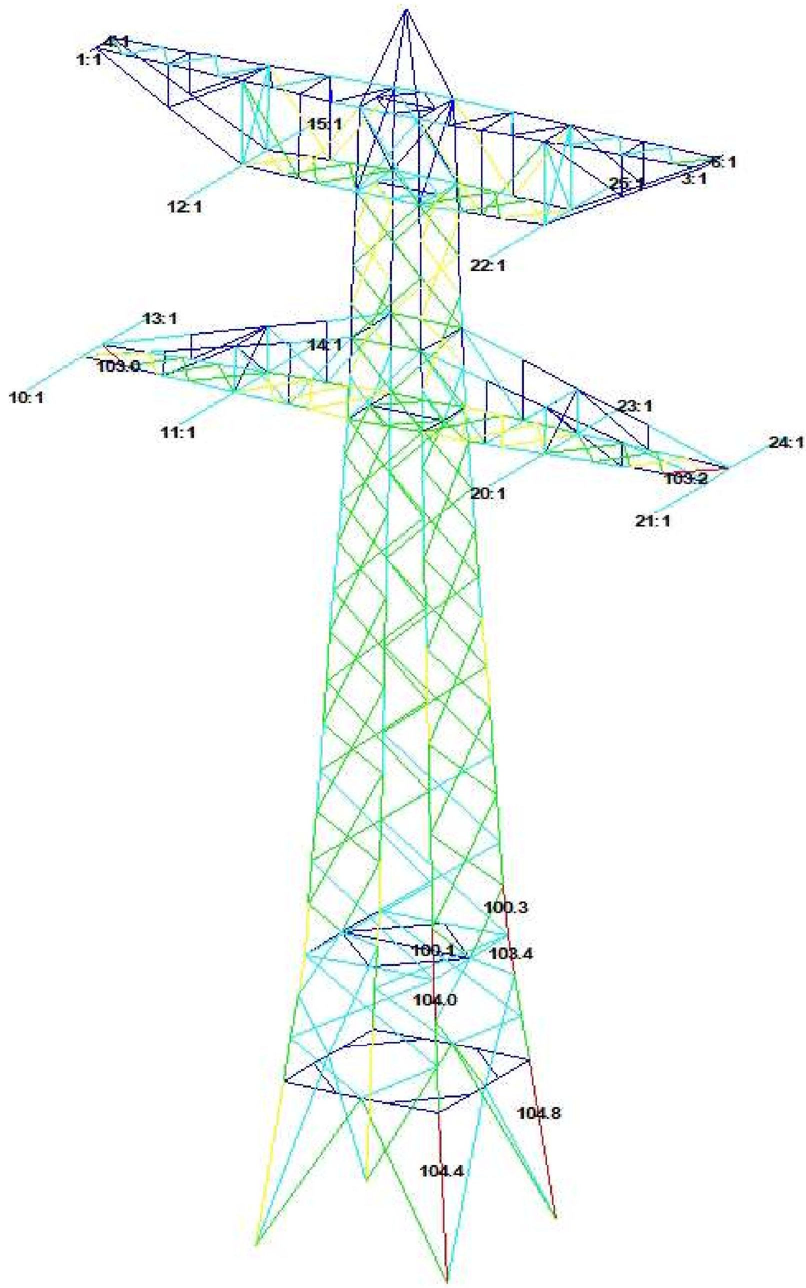


Figure 3-4 PLS-TOWER result for the GT-ZBH150 tower A (24)

The results of the analysis of the angle profiles, redundant members and main leg column anchors have been included in Table 4.

Table 4 Summary of performed checks

Check of	Evaluation		Reference
Profiles		NOK	Figure 3-4

3.1.4 Modifications

This section proposes tower reinforcements to ensure the towers fulfill the “afkeurniveau” loads, new elements to verbouwniveau. The proposal contains the following measures:

- Replacement of bolts on lower section of tower on the main leg members
- Replacement of crossing diagonals in lower crossarms

3.1.5 Strengthening

As per the group summary outputs in Appendix B, the bracing members indicated in Figure 3-5 are to be replaced.

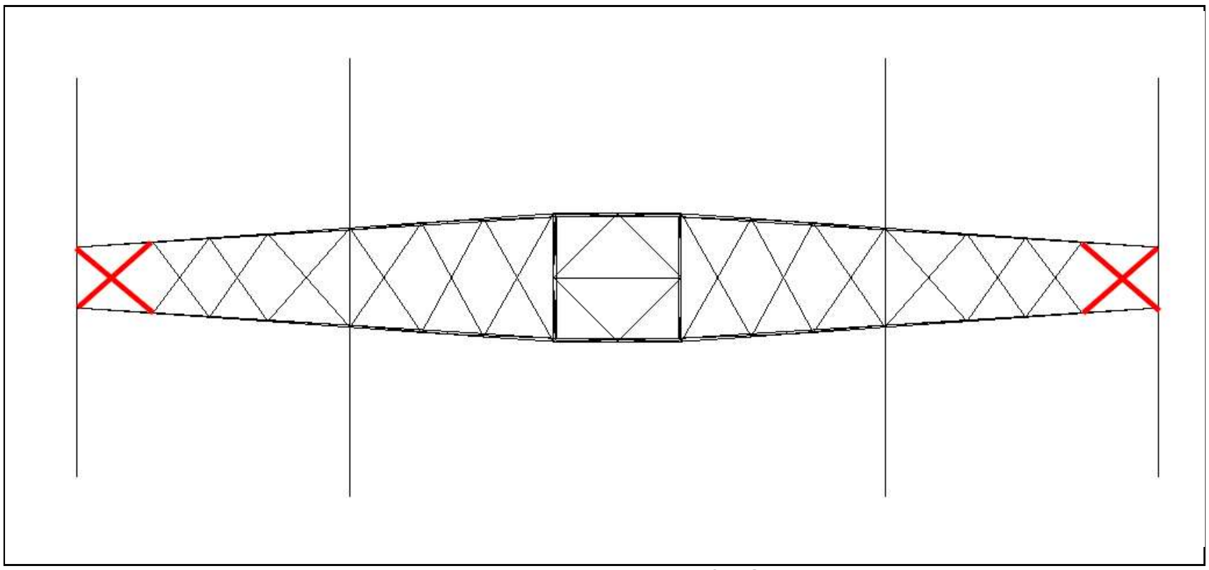


Figure 3-5 Members that need to be replaced in lower cross-arm for GT-ZBH150 tower A (24)

Table 5 provides an overview of the weight of profiles required for the strengthening of tower 24. Weight of plates is not included in the table.

Table 5 Weight of profiles required for modifications on GT-ZBH150 tower 24

Group Label	Profile ini.	Material ini.	Bolts ini.	Profile new	Material new	Bolts new	Mitigation	Number	Length (m)	Weight (kg)
t2od7	60x60x5	S235	1M16-5.6t	70x70x7	S355	1M16-8.8t	Profile exchanged	4	1.66	30.2
mr4	150x150x14	S235	8M22-5.6t			8M22-8.8t*	Bolts exchanged			
mr5	150x150x14	S235	8M22-5.6t			8M22-8.8t*	Bolts exchanged			
									Total	**30.2**

**Note: the exchange of bolts in mr4 and mr5 is about the lap joints of the main legs (refer to Appendix B). Special bolt sizes (M22) will be required which deviates from the TenneT specification but has been chosen to match the existing situation and to be able to re-use the existing bolt hole.*

No members are loaded in bending, no further measure to tower 24 are required.

3.2 GT-ZBH150 D+3.6

3.2.1 Tower outline

The tower outline from the received asset data is included in Figure 3-6.

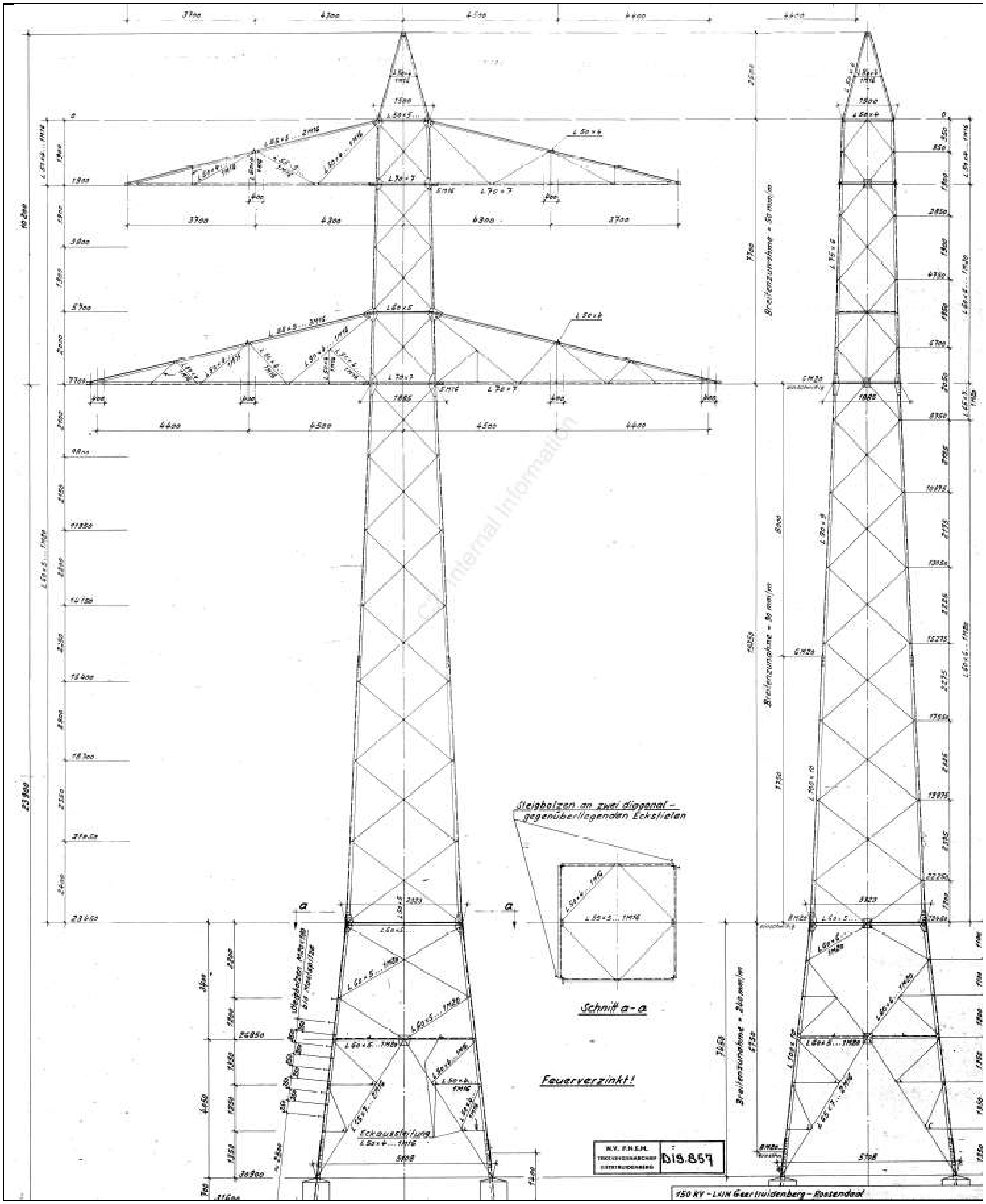


Figure 3-6 GT-ZBH150 Tower outline D+3.6

3.2.2 Tower list

This report describes tower type D+3.6. The tower is located in wind zone III and the wind loading is adjusted based on the increased height of neighboring towers (positive values indicate a height decrease). Table 6 summarises the wind and weight span parameters and indicates the governing tower which was analysed. Figure 3-7 & Figure 3-8 shows the overview of the span between mast 22 (D+3.6) and the temporary OSP.

Table 6 Tower numbers

Line	Tower number	Tower type	Governing tower number	Line Angle (°)	Back span (m)	Ahead span (m)
GT-ZBH150	**22**	D+3.6	22	14.5	310	100

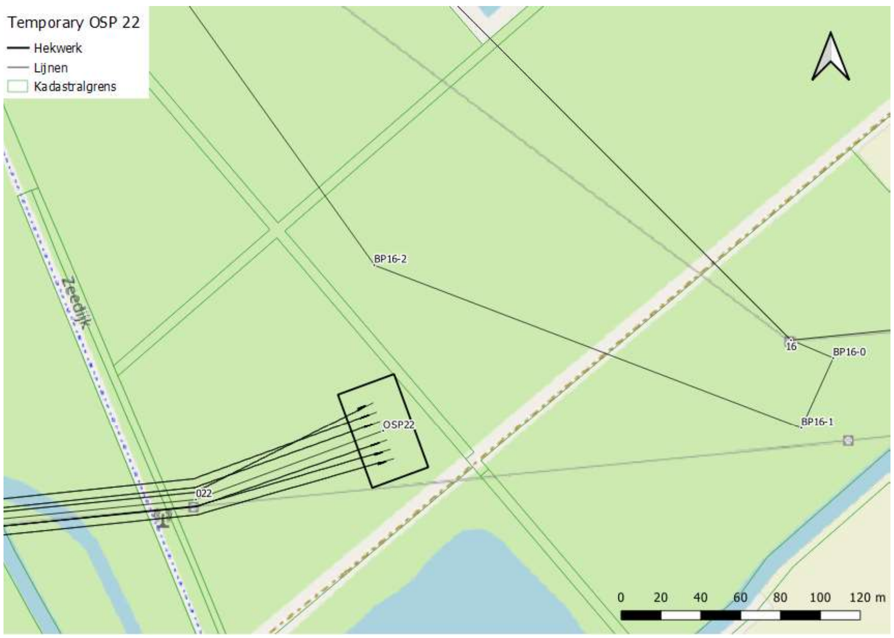


Figure 3-7 GT-ZBH150 Mast 22 (A) to temporary OSP in QGIS view

Figure 3-8 GT-ZBH150 Mast 22 (A) to temporary OSP in PLS-CADD view

3.2.3 Check of the tower

The results of the analysis for the D+3.6 with the loads calculated according to “afkeurniveau” is depicted in Figure 3-9 below.

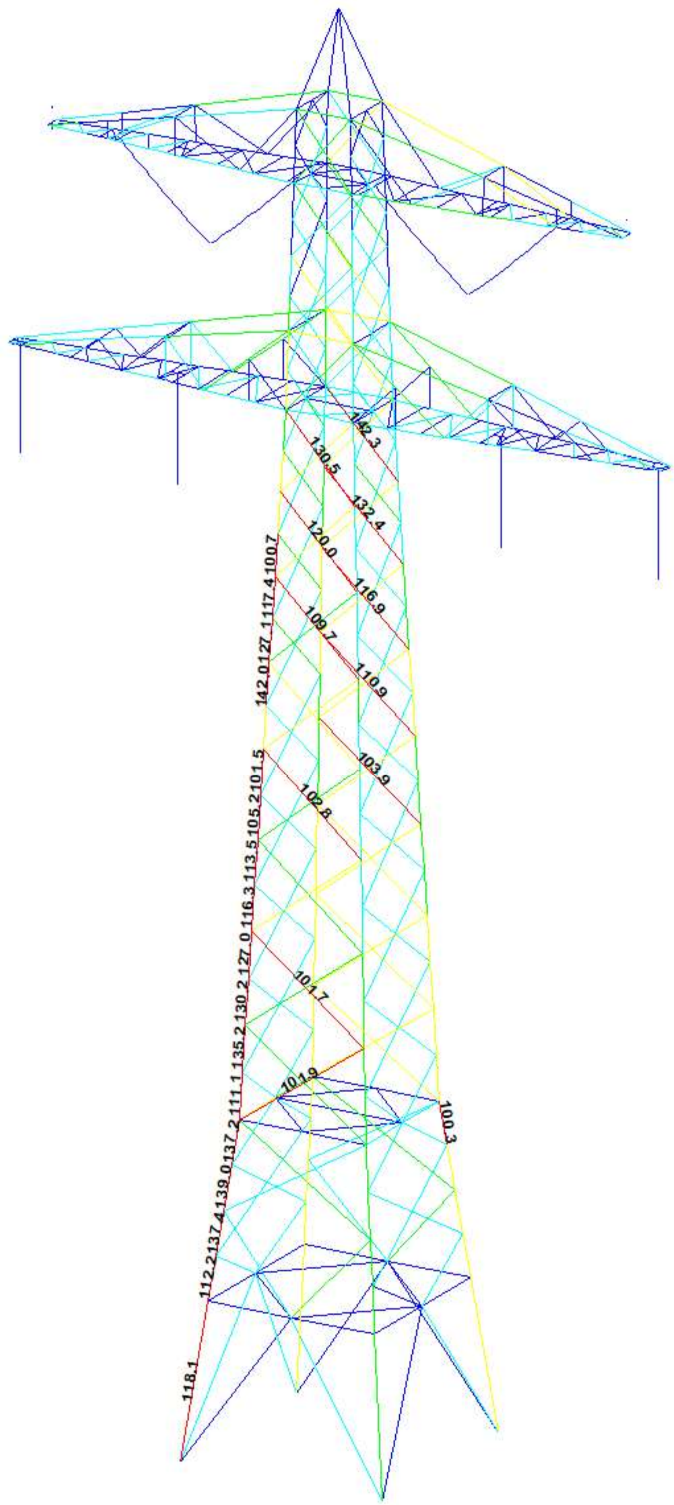


Figure 3-9 PLS-TOWER result for the GT-ZBH150 tower D+3.6 (22)

The results of the analysis of the angle profiles, redundant members and main leg column anchors have been included in Table 7.

Table 7 Summary of performed checks

Check of	Evaluation		Referentie
Profiles		NOK	Figure 3-9

3.2.4 Modifications

This section proposes tower reinforcements to ensure the towers fulfill the “afkeurniveau” loads, new elements to verbouwniveau. The proposal contains the following measures:

- Replacement of crossing diagonal bracing in the tower body
- Changing the number of bolts and their strength class in the cross diagonals from the lower tower body
- Retrofitting the main leg by strengthening it with the same cross section (XEA instead of EA)

3.2.5 Strengthening

As per the group summary outputs in Appendix B, the main legs indicated in Figure 3-10 are to be retrofitted and the crossing diagonals are to be replaced. The detail of the proposed retrofitting can be seen in Figure 3-11.

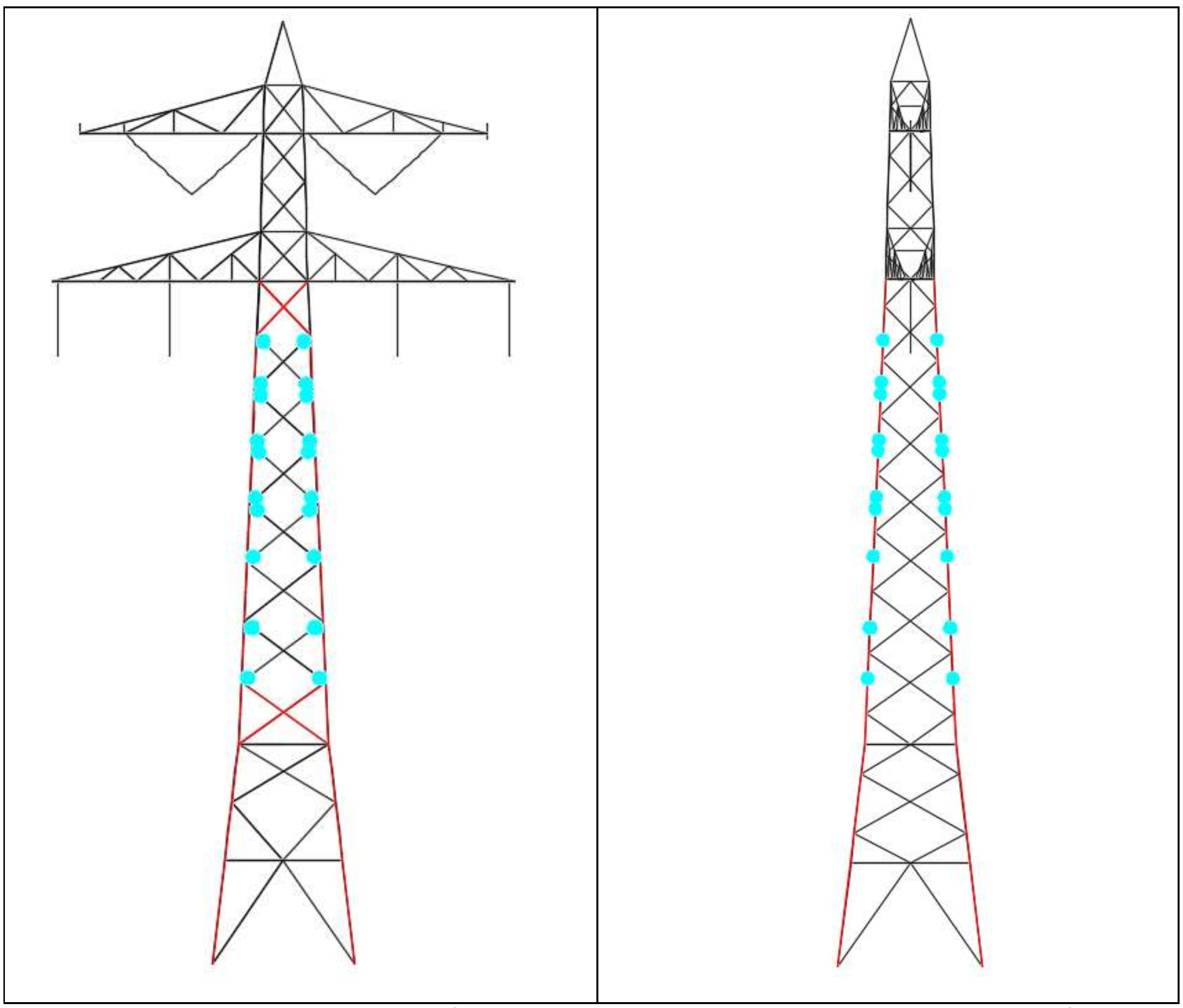


Figure 3-10 Members to be changed/retrofitted and bolts that need to be replaced in Longitudinal (left) and Transverse (right) faces

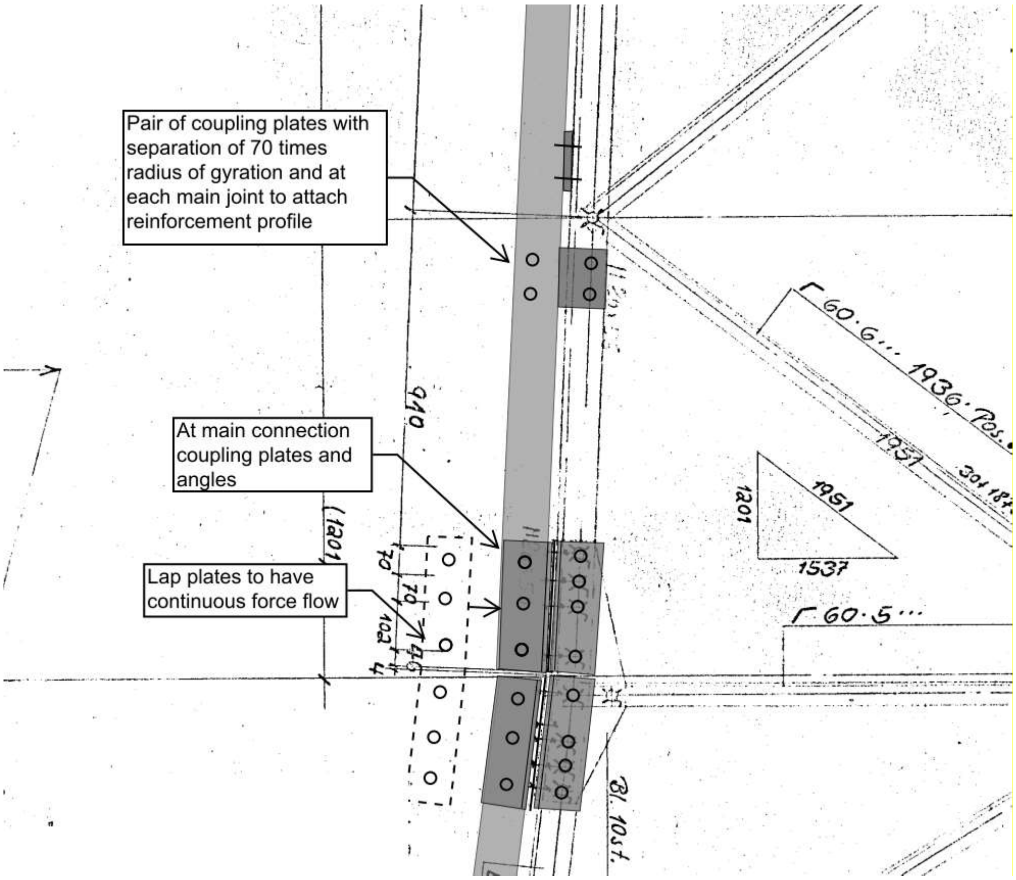


Figure 3-11 Detail of retrofitting solution

provides an overview of the weight of profiles required for the strengthening of tower 22. Weight of plates and the weight of the other modifications described in chapter 4 is not included in the table, see chapter 4 for these weights and total weight. Refer to Appendix B for description of the group labels given in this table.

Table 8 Weight of profiles required for modifications on GT-ZBH150 tower 22

Group Label	Profile ini.	Material ini.	Bolts ini.	Profile new	Material new	Bolts new	Mitigation	Number	Length (m)	Weight(kg)*
mr3B	90x90x9	S235		**L90x9+L90x9**	**S355**		Profile retrofitted	8	1,08	110,5
mr3C	90x90x9	S235		**L90x9+L90x9**	**S355**		Profile retrofitted	8	1,10	112,6
mr3D	90x90x9	S235	6M20-5.6t	**L90x9+L90x9**	**S355**	**12M20-8.8t**	Profile retrofitted	4	1,13	57,8
mr4A	110x110x10	S235	6M20-5.6t	**L110x10+L110x10**	**S355**	**12M20-8.8t**	Profile retrofitted	4	1,13	77,6
mr4B	110x110x10	S235		**L110x10+L110x10**	**S355**		Profile retrofitted	8	1,15	157,8
mr4C	110x110x10	S235		**L110x10+L110x10**	**S355**		Profile retrofitted	8	1,18	162,0
mr4D	110x110x10	S235		**L110x10+L110x10**	**S355**		Profile retrofitted	8	1,20	164,7
mr4E	110x110x10	S235		**L110x10+L110x10**	**S355**	**16M20-8.8t**	Profile retrofitted	8	1,20	164,7
mr5A	110x110x10	S235		**L110x10+L110x10**	**S355**		Profile retrofitted	8	1,17	160,6
mr5B	110x110x10	S235		**L110x10+L110x10**	**S355**		Profile retrofitted	8	1,17	160,6
mr5C	110x110x10	S235	8M20-5.6t	**L110x10+L110x10**	**S355**	**16M20-8.8t**	Profile retrofitted	4	4,11	282,1
mvd11	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd12	60x60x5	S235	1M20-5.6t	**60x60x6**	**S355**	**1M20-8.8t**	Profile exchanged	4	4,19	91,3
mvd5	60x60x5	S235	1M20-5.6t	**60x60x6**	**S355**	**2M20-8.8t**	Profile exchanged	4	2,89	63,0
mvd6	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd7	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd8	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd9	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
									Total	1765,3

3.3 RSD-MDK150 D+0

3.3.1 Tower outline

The tower outline from the received asset data is included in Figure 3-12.

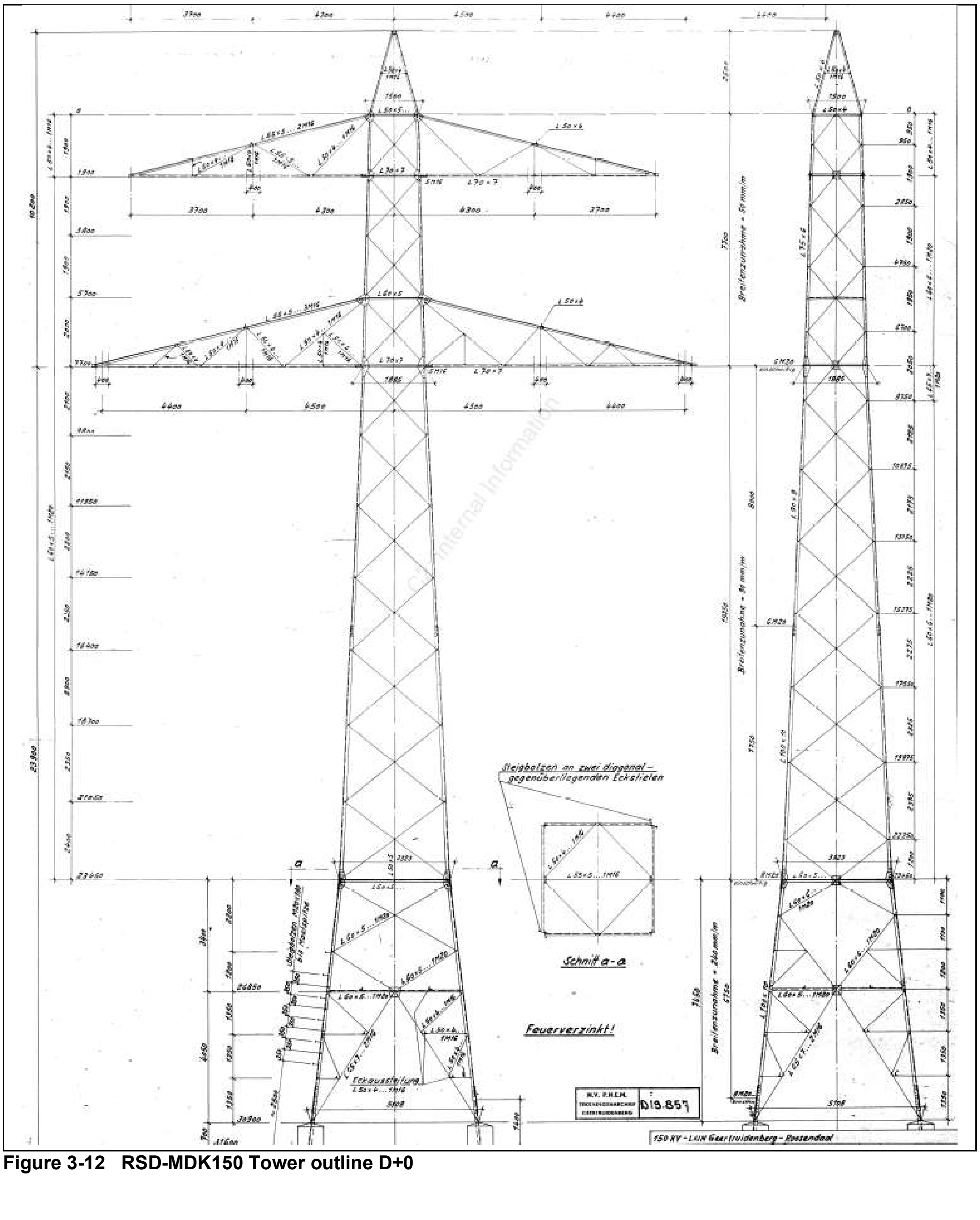


Figure 3-12 RSD-MDK150 Tower outline D+0

3.3.2 Tower list

This report describes tower type D+0. There are three D+0 type towers located along the investigated line at positions 84, 91 and 92. Based on loads, this report distinguishes between positions 84 and 91/92. Tower 91 and 92 have similar loads, with 92 governing. Tower 84 has more favourable loads and will be treated separately. All three towers are located in wind zone III and the wind loading is adjusted based on the increased height of neighboring towers (positive values indicate a height decrease). Table 9 summarises the wind and weight span parameters and indicates the governing tower which was analysed. Figure 3-13 to Figure 3-18 shows the overview of the spans with temporary OSP's.

Table 9 Tower numbers for D+0

Tower number	Tower type	Governing tower number	Circuit	Line Angle (°)	Back span (m)	Ahead span (m)
84	D+0	84	Wit & Zwart	180	325	145
91	D+0	92	Wit & Zwart	180	323	90
92	D+0	92	Wit	176	326	67
			Zwart	169	326	95

Figure 3-13 RSD-MDK150 Mast 84 (D+0) span to temporary OSP in QGIS view

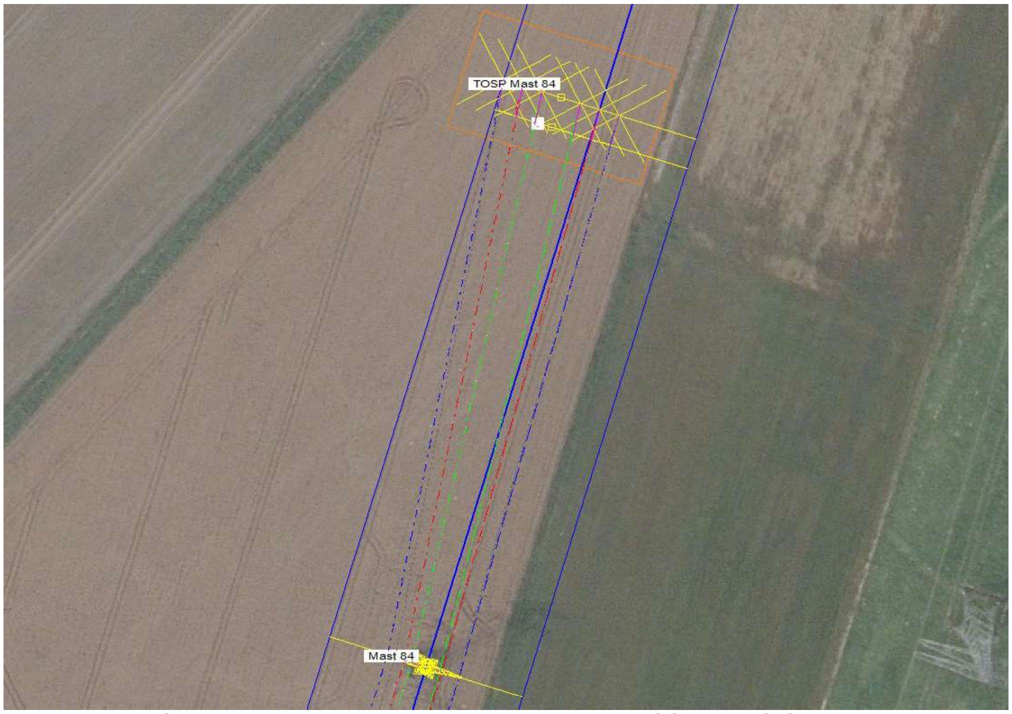


Figure 3-14 RSD-MDK150 Mast 84 (D+0) span to temporary OSP in PLS-CADD view

Figure 3-15 RSD-MDK150 Mast 91 (D+0) span to temporary OSP in QGIS view

Figure 3-16 RSD-MDK150 Mast 91 (D+0) span to temporary OSP in PLS-CADD view

Figure 3-17   RSD-MDK150 Mast 92 (D+0) span to temporary OSP in QGIS view

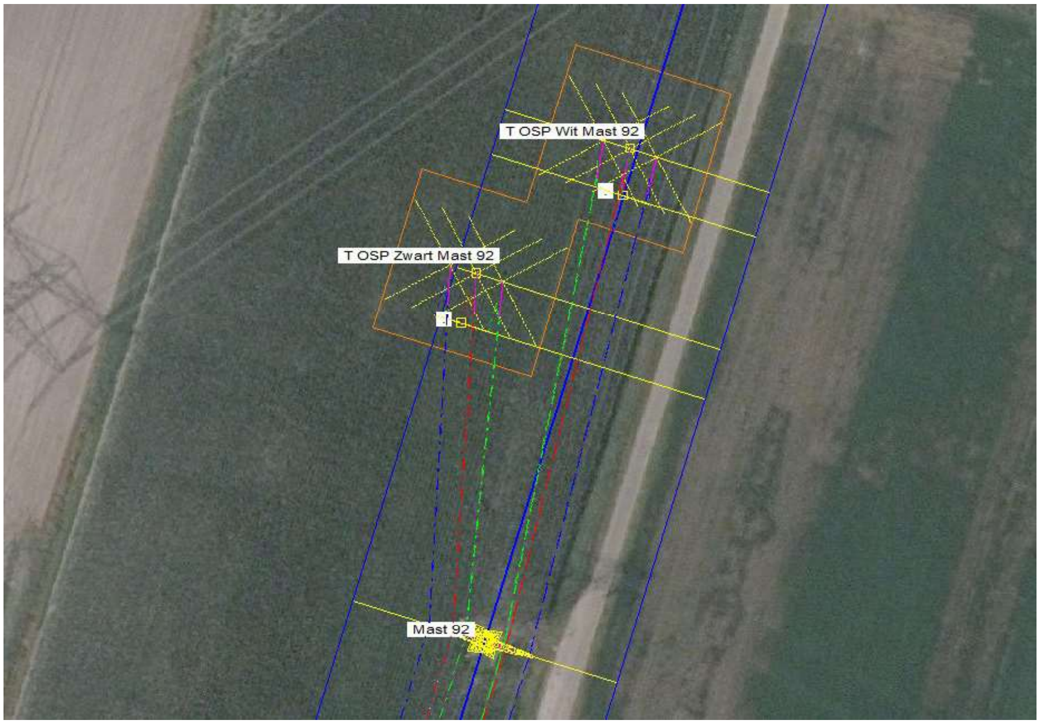


Figure 3-18 RSD-MDK150 Mast 92 (D+0) span to temporary OSP in PLS-CADD view

3.3.3 Check of the tower

The results of the analysis for the D+0, with the loads calculated according to “afkeurniveau” are depicted in Figure 3-19 and Figure 3-20.

3.3.3.1 Tower 92 and 91

The compressive strength of the main legs is not sufficient for the considered loading and three of the crossing diagonals do not check for rupture.

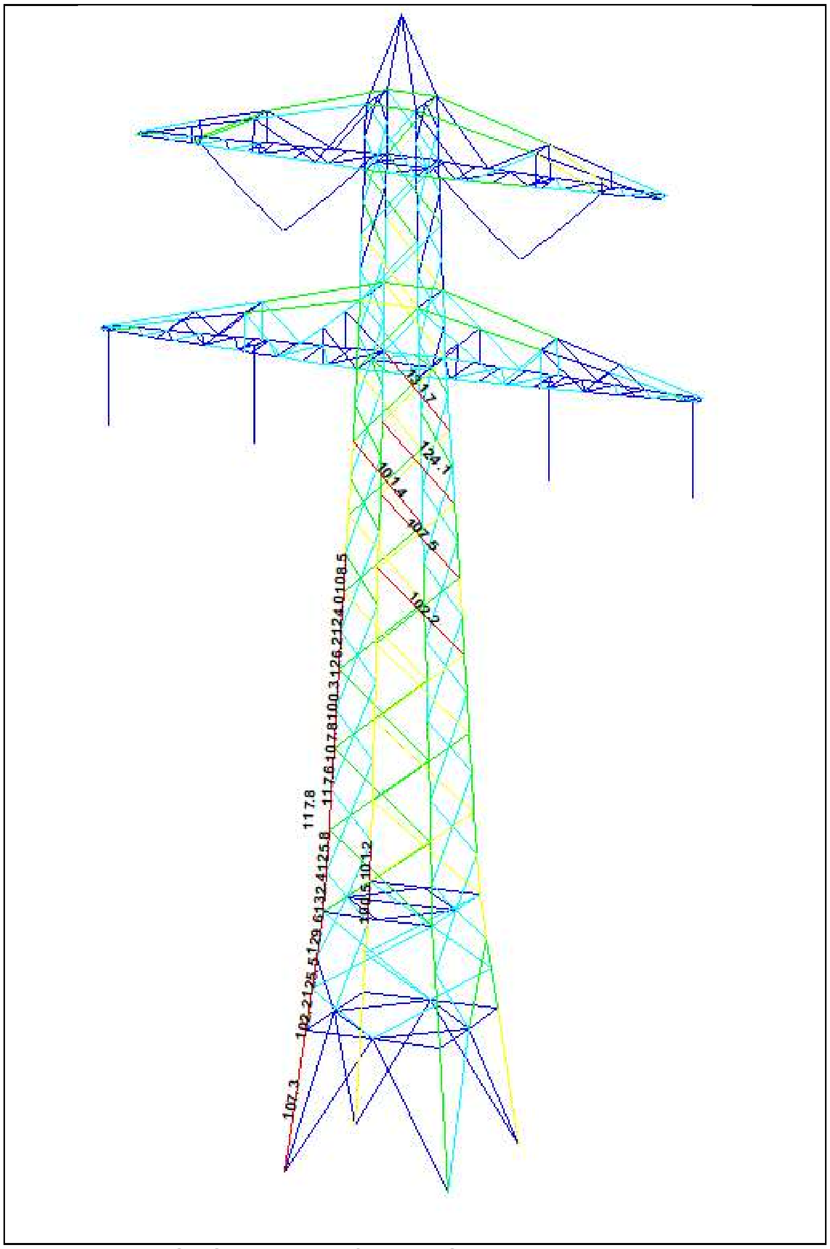


Figure 3-19 PLS-TOWER result for the RSD-MDK150 tower D+0 (92 and 91)

The results of the analysis of the angle profiles, have been included in Table 10.

3.3.3.2 Tower 84

The compressive strength of the main legs is not sufficient for the considered loading and 2 of the crossing diagonals do not check for rupture.

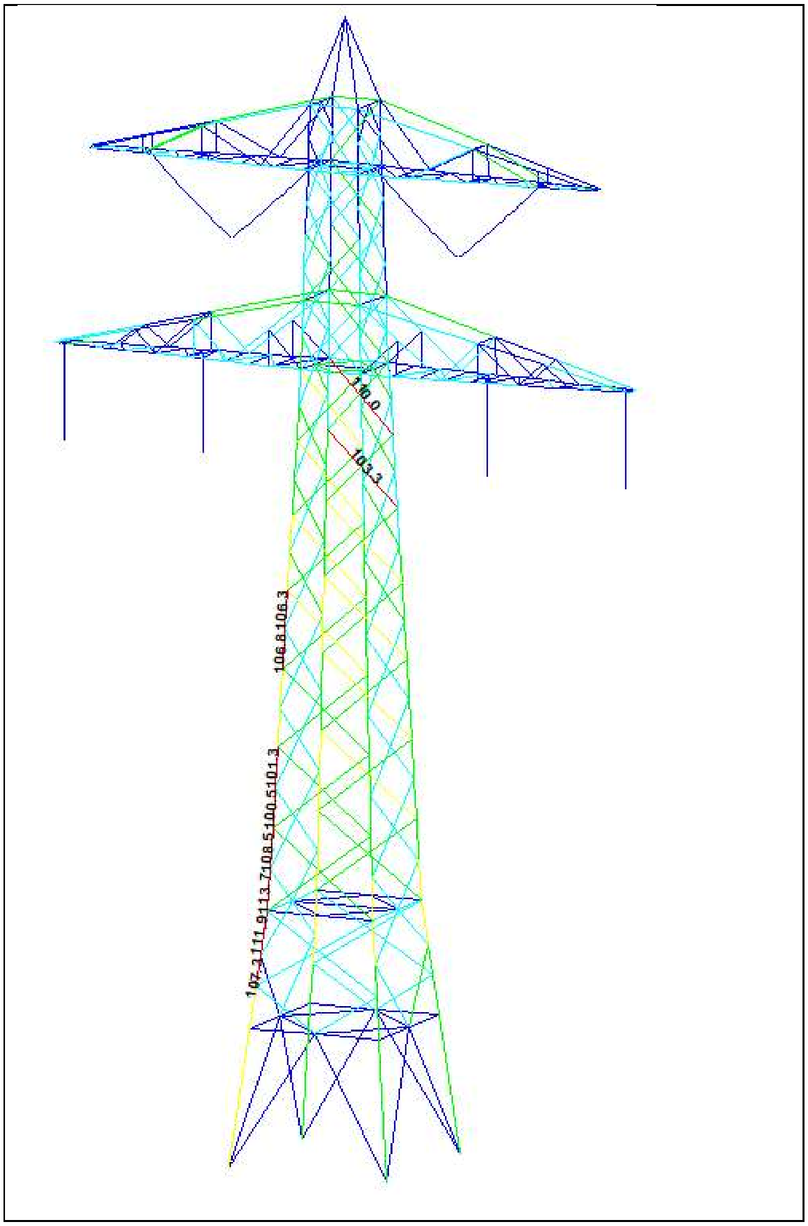


Figure 3-20 PLS-TOWER result for the RSD-MDK150 tower D+0 (84)

Table 10 Summary of performed checks

Check of	Evaluation		Referentie
Profiles Tower 91 and 92		NOK	Figure 3-19
Profiles Tower 84		NOK	Figure 3-20

3.3.4 Modifications

This section proposes tower reinforcements to ensure the towers fulfill the “afkeurniveau” loads, new elements to verbouwniveau. The proposal contains the following measures:

- Retrofitting of main leg along the tower body for tower number 91/92
- Strengthening the failing members by adding redundants for tower number 84

3.3.5 Strengthening

3.3.5.1 Strengthening of tower 92 and 91

As per the group summary outputs in Appendix B, the highlighted members indicated in Figure 3-21 are to be retrofitted. A detail of the proposed solution can be seen in Figure 3-11.

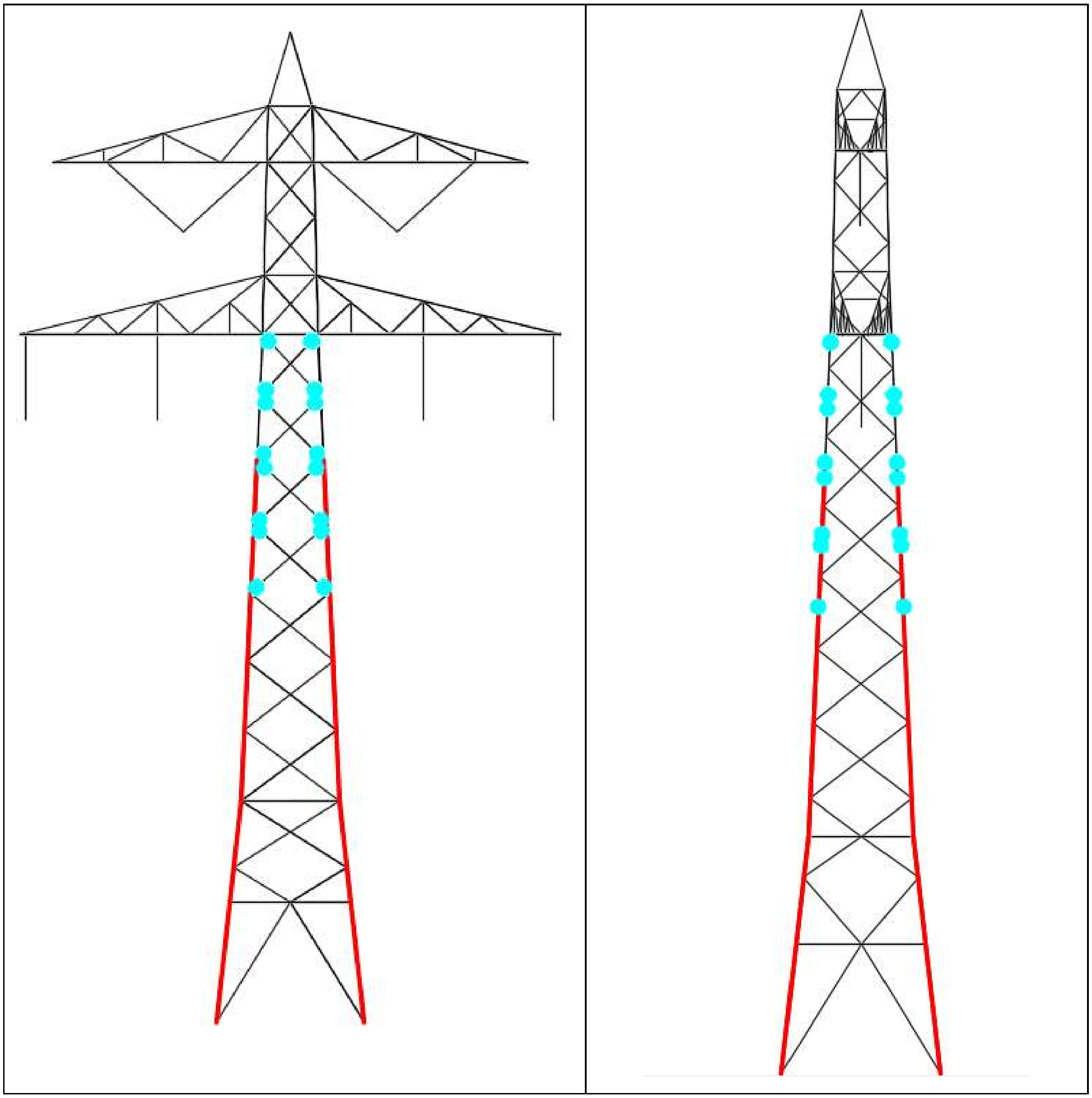


Figure 3-21 Members that need to be retrofitted and bolts to be replaced in Longitudinal (left) and Transverse (right) faces for D+0, RSD-MSK150 towers 91 and 92.

Refer to Appendix B for description of the group labels given in this table.

Table 11 provides an overview of the weight of profiles required for the strengthening of tower 92 and 91. Weight of plates and the weight of the other modifications described in chapter 4 is not included in the table, see chapter 4 for these weights and total weight. Refer to Appendix B for description of the group labels given in this table.

Table 11 Weight of profiles required for modifications on RSD-MDK150 tower 92 and 91

Group Label	Profile ini.	Material ini.	Bolts ini.	Profile new	Material new	Bolts new	Mitigation	Number	Length (m)	Weight (kg)*
mvd5	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd6	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd7	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged	4		
mvd8	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mr5	90x90x9	S235		**L90x9+L90x9**	S235		Profile retrofitted	8	1,10	112,6
mr6	90x90x9	S235	6M20-5.6t	**L90x9+L90x9**	S235	**12M20-8.8t**	Profile retrofitted	8	1,13	115,6
mr7	100x100x10	S235		**L100x10+L100x10**	S235		Profile retrofitted	8	1,15	144,4
mr8	100x100x10	S235		**L100x10+L100x10**	S235		Profile retrofitted	8	1,18	148,1
mr9	100x100x10	S235	8M20-5.6t	**L100x10+L100x10**	S235	**16M20-8.8t**	Profile retrofitted	8	1,20	150,6
mr10	100x100x10	S235	8M20-5.6t	**L100x10+L100x10**	S235	**16M20-8.8t**	Profile retrofitted	4	2,23	140,0
mr11	100x100x10	S235		**L100x10+L100x10**	S235		Profile retrofitted	4	1,21	76,0
mr12	100x100x10	S235	8M20-5.6t	**L100x10+L100x10**	S235	**16M20-8.8t**	Profile retrofitted	4	4,10	257,4
										1144,6

3.3.5.2 Strengthening of tower 84

As per the group summary outputs in Appendix B, the members highlighted in red are failing and in order to overcome that, the redundant members, here represented with green, are being added, as indicated in Figure 3-21.The redundant members are angle profile, of L50x50x5 and 1 bolt of M16-5.6t.

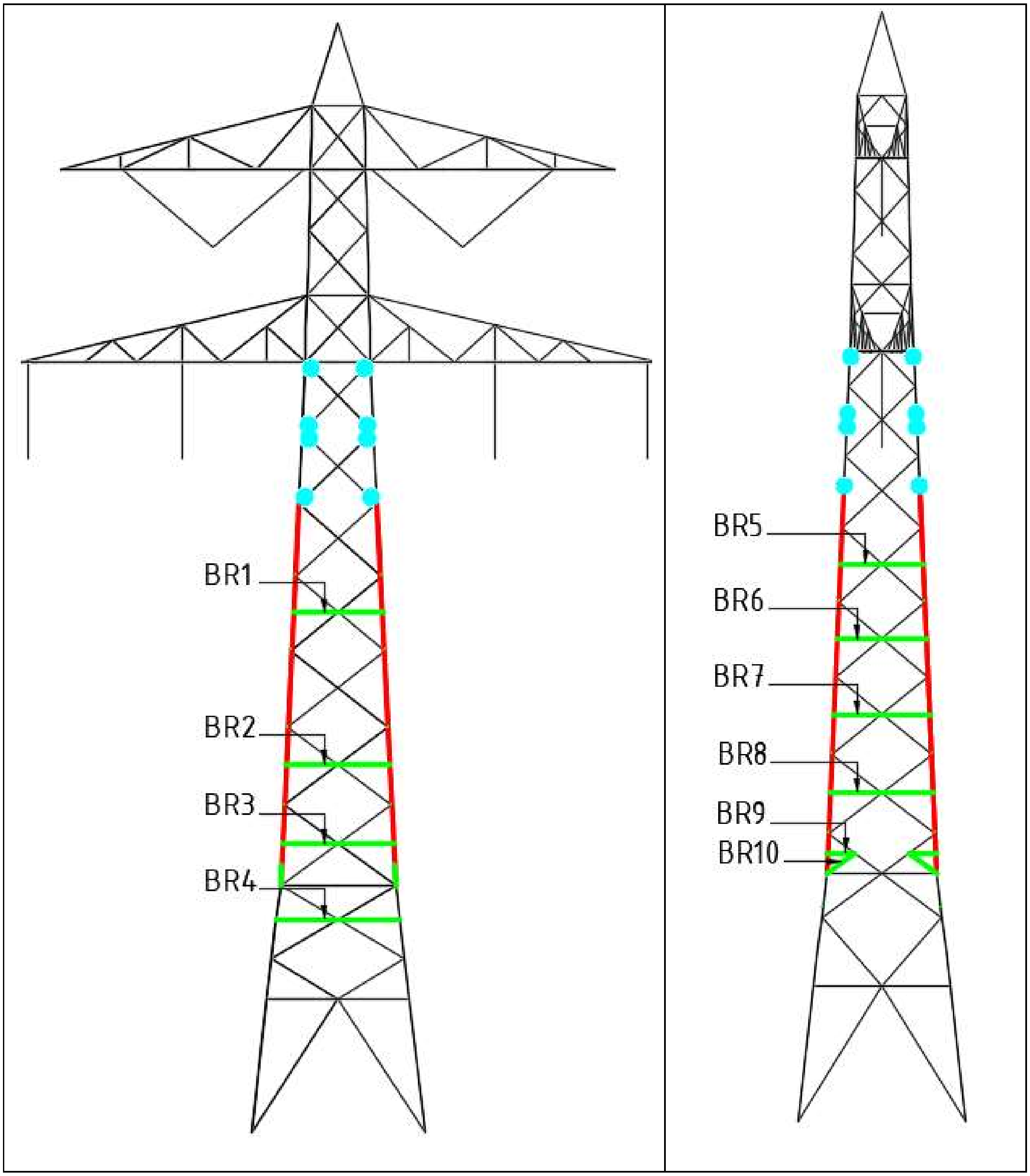


Figure 3-22 Main leg members to be changed, redundant members to be added, and bolts to be changed in Longitudinal (left) and Transverse (right) faces for D+0, RSD-MDK150 tower 84.

Table 12 provides an overview of the weight of profiles required for the strengthening of tower 84. Weight of plates and the weight of the other modifications described in chapter 4 is not included in the table, see chapter 4 for these weights and total weight. Refer to Appendix B for description of the group labels given in this table.

Table 12 Weight of profiles required for modifications on RSD-MDK150 tower 84

Group Label	Profile ini.	Material ini.	Bolts ini.	Profile new	Material new	Bolts new	Mitigation	Number	Length (m)	Weight (kg)
BR1	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.29	19.47
BR2	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.50	22.64
BR3	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.60	24.15
BR4	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.78	26.86
BR5	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.24	18.71
BR6	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.34	20.22
BR7	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.44	21.73
BR8	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.55	23.39
BR9	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	0.83	12.53
BR10	-	-	-	L50x50x5	S355	1M16-8.8t	Profile Added	4	1.05	15.85
mvd5	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mvd6	60x60x5	S235	1M20-5.6t	60x60x5	S235	**2M20-8.8t**	Bolts exchanged			
mr6	90x90x9	S235	6M20-5.6t	90x90x9	S235	6M20-5.6t	Redundants added			
mr8	100x100x10	S235		100x100x10	S235		Redundants added			
mr9	100x100x10	S235	8M20-5.6t	100x100x10	S235	8M20-5.6t	Bolts exchanged			
mr10	100x100x10	S235	8M20-5.6t	100x100x10	S235	8M20-5.6t	Redundants added			
									Total	**205.55**

4 BEAMS

4.1 Introduction

The PLS-TOWER package does not check the structural beams for the insulator attachments in the structure subjected to bending. An additional check with the AxisVM software was performed to the beams. The check has been carried out for the D+0 & D+3.6 structures, since these towers have beams loaded in bending, beams in angle towers with tension insulators are not subjected to bending. Figure 4-1 Shows the location of the beams. The top cross arm stands out, because the insulators were attached below the plane of the cross arm, which results in additional bending load to the lower chord member of the cross arm.

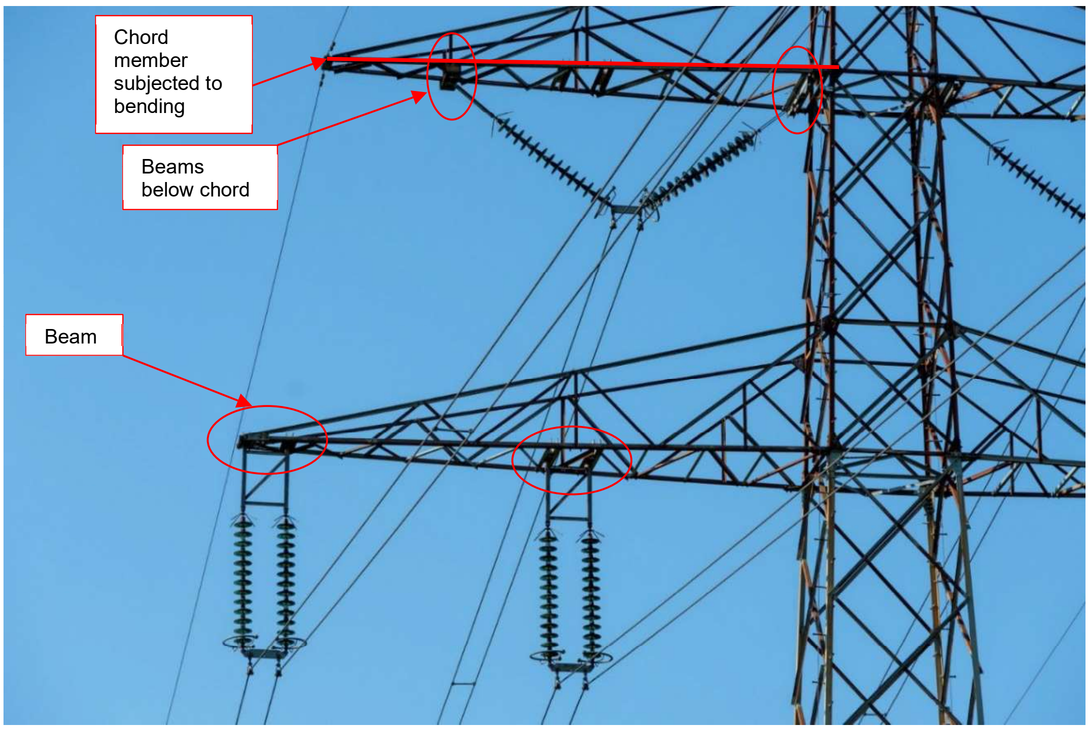


Figure 4-1 Beams in D+0 and D+3.6 structure

4.2 Insulators

There are four locations with OSPs, with six neighbouring suspension towers and two angle towers. Since the proximity of the OSP causes an increase of the line angle and an additional vertical load it is necessary to perform checks to the insulator chains of suspension towers. No detailed drawings exist for the chains and furthermore, the condition of the chains is unknown. It is advised to modify the existing chains with new chains. Secondly, based upon the electrical design, some of the insulators need to be changed for sufficient clearance. The changes tot he insulators are included in report 002.678.00 0928654 21-0968 “Definitief ontwerp OSP’s tijdelijke opstijgpunten”.

For all of the suspension towers, the rigid N-shaped insulator brackets of the lower cross arm are to be replaced by bars that allow for rotation because the strength of these brackets is unknown and because they cause large bending moments in the lower chord member of the cross arm.

As an exception, the insulators in the outer corner of suspension towers 22 with large off-center position are to be replaced by suspension-tension sets (hangende afspanning).

The impact of the change to “hangende afspanning” was investigated with PLS-CADD. With 1 m pivoting length, the conductor tension was determined to be 79% of the EDS-tension. This is within the 80% value that was used in the calculations, so no revision of the conductor loads was required.

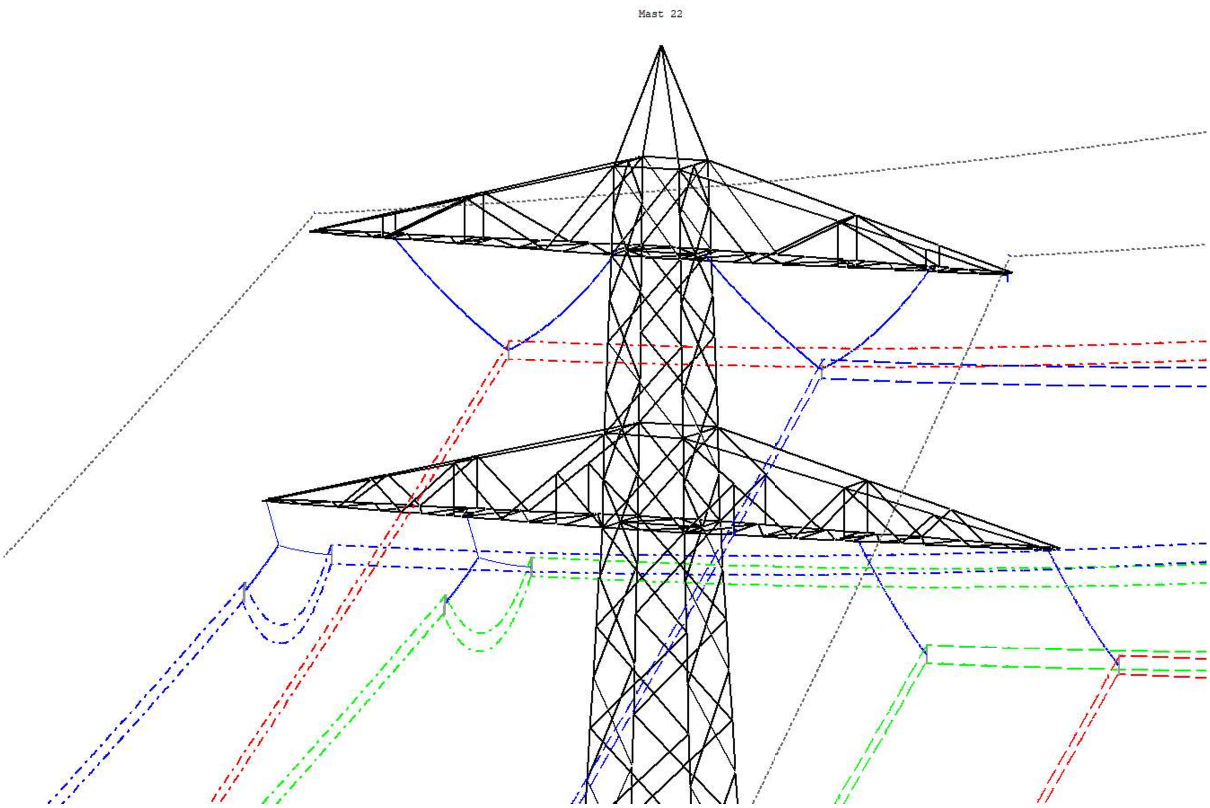


Figure 4-2 Adjustment of suspension insulators to “Hangende afspanning” insulators on outer corner of tower 22 (D+3.6)

Lastly, the V-assemblies of the top cross arm should be modified at the towers with larger line angle. The bridge is to be replaced by a triangle that allows for the required rotation of the conductor attachment.

Table 13 summarises the modifications.

Table 13 modifications to insulators

Suspension	Towers	Existing	New
Top cross arm	22, 91 and 92	V-assembly	V-assembly suitable for large line angle
	other	V-assembly	No changes
Lower cross arm	all	Double parallel chain + bracket	Double parallel chain <u>without</u> bracket
	22	Parallel chain + bracket	Suspension -Tension (“hangende afspanning”) in outer corner, inner corner with double parallel chain without bracket

4.3 Approach to verify beam strength

The beams of the suspension tower types D+0 and D+3.6 (both have similar tower top and cross arms) will be examined for the bending load. Decisive for the load is the proximity to the riser point and the change of direction towards the riser point. The line angle of the conductor towards riser point has the decisive impact to the magnitude of the bending load on the beam. The line angle varies between the tower locations, it was chosen to distinguish between large and smaller line angles. Table 14 shows the division between the two situations, situation one with a small angle, situation two with a large angle, requiring possibly more adaptions.

Table 14 Considered loading situations

Line	Tower No	Tower Type	Span (m)	Direction change (m)	Max. angle conductor (°)	Loading situation
GT-ZBH150	20	D+0	160	6	2	2
GT-ZBH150	22	D+3.6	100	36	20	1
GT-ZBH150	32	D+0	160	6	2	2
RSD-MDK150	84	D+0	145	16	6	2
RSD-MDK150	91	D+0	90	20	13	1
RSD-MDK150	92	D+0	67/95	18	11	1

4.4 Results

The assessment of the existing beams is included in Appendix D. The calculations show that the profiles of the bottom crossarm are satisfactory in all situations, see table 14. In case of the top crossarm, the inner beam does not meet the requirements in situation 1 and 2 (all towers). The outer beam does not pass in case 2 (20, 32 and 84).

Table 15 Result of beams calculations

Beam	U.C. (sit.1)	U.C. (sit.2)	Remark
Beam of the top crossarms inside	1.45	1.07	Situation 1 and 2 don’t pass
Beam of the top crossarms outside	1.05	0.80	Situation 1 does not pass
Beam of the bottom crossarm inside	0.99	0.71	Pass
Beam of the bottom crossarm outside	0.28	0.21	Pass

The bottom chord of the top cross arm was checked as well as part of the beams calculations, since it is subject to bending whereas the lower cross arm does not experience significant bending. The results are shown in the table 15. The calculation shows that the bottom chord is not sufficient, this is for all of the towers.

Table 16 Results of calculation of bottom chord top cross arm

Results for bottom chord	U.C. (sit.1)	U.C. (sit.2)	Remark
Bottom chord top crossarm inside	1.32	1.11	Not OK
Bottom chord top crossarm outer	1.53	1.31	Not OK

4.5 Modification top cross arm

The calculations show that the inner beams of the top cross arm do not comply in situation 1 and 2 (all of the towers), and the outer beams do not comply in situation 1 (tower 22, 91, 92). The bottom chord of the top crossarm does not comply with bending in all cases, both at the inner beams and outer beams. A reinforcement is developed to support the inner beams and bottom chord in one solution. This is shown in Figure 4-3. The existing inner beams will be kept.

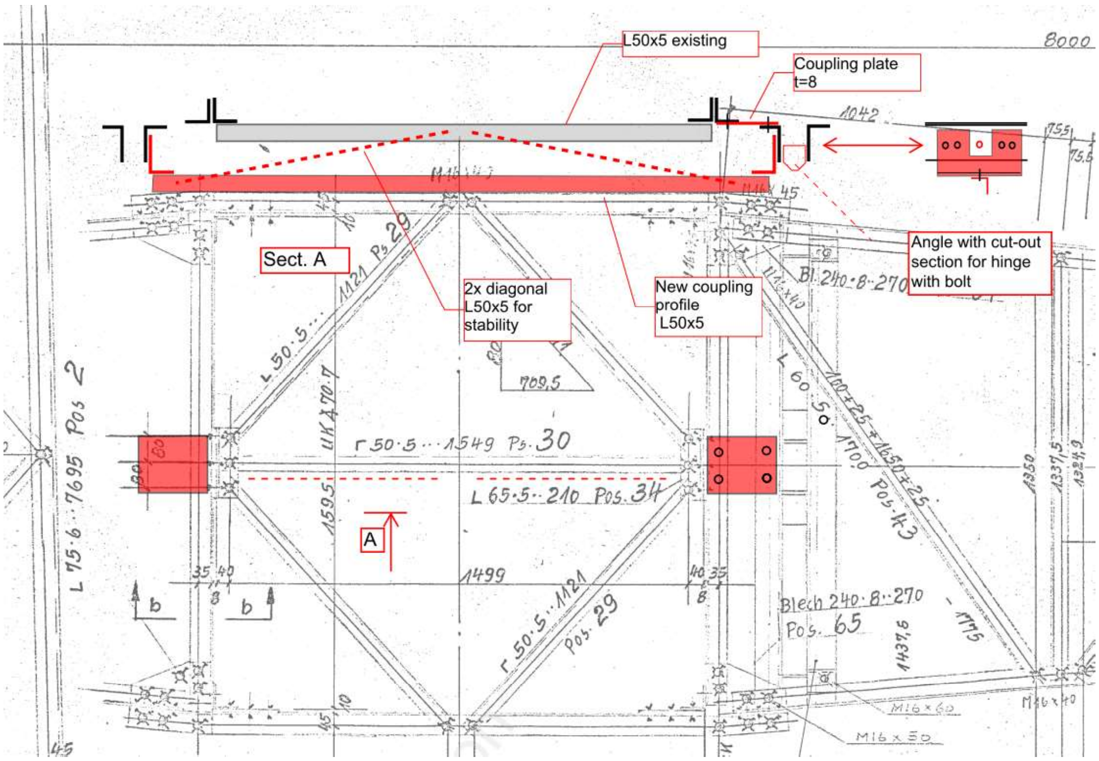


Figure 4-3 Modification of inner beams

The outer beams will need to be replaced by new beams (2 coupled beams L100x10) in loading situation 1. To support the lower chord against bending and to solve large eccentricities in the diagonal connections, in all of the towers the cross arm is to be modified as shown in Figure 4-4.

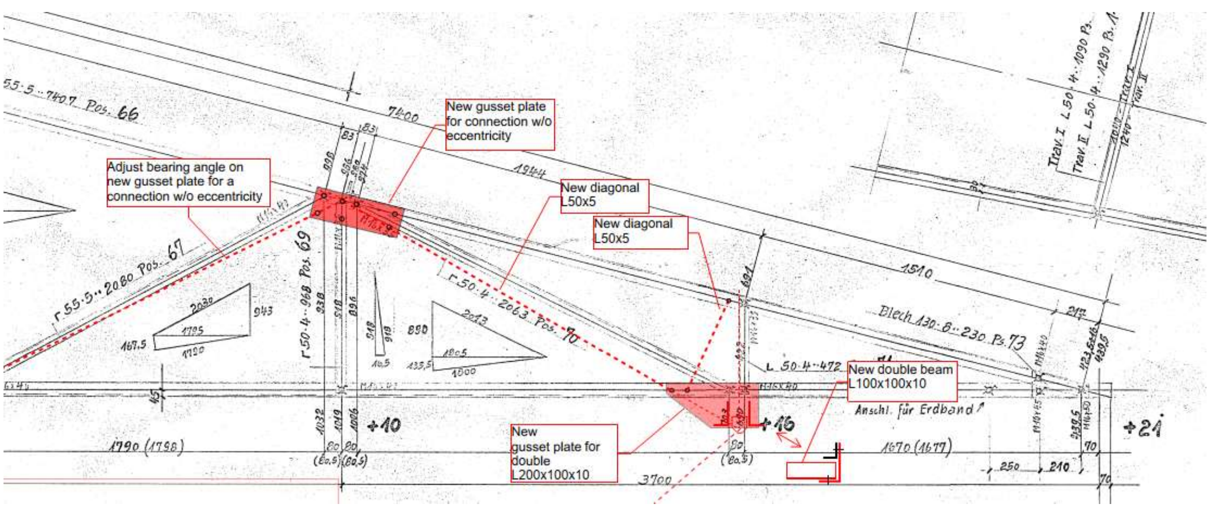


Figure 4-4 Modification of the top cross arm and outer beam (new beam only sit.1, tower 22, 91 and 92)

In Appendix D the modifications are explained in more detail.

The modified structure was checked for verbouwniveau loads. The results are included in table 16.

Table 17 Results of verification of modified structure

Results on bottom chord	U.C. (sit.1)	Remark
Beam top crossarm inside (existing)	0,77	Passes
Beam top crossarm outside (new. L100x10)	0,53	Passes
Diagonal (new. L50x5)	0,26	Passes
Coupling profile (new. L50x5)	0,35	Passes

The new members have utilizations below 1,00, the new structural elements pass the check.

In the implementation phase, the bolted connections, gusset plates and other elements should be checked into further detail.

4.6 Modification lower cross arm (tower 22 only)

In order to attach the suspension-tension sets to the lower cross arm at the outer corner, new beams are required. The beams consist of two L80x8 profiles, these will be attached to the existing four profiles. The new beams clash with the existing diagonal, this profile should be removed. Its function should be taken over by new diagonals (inner position) in combination with two square shaped plates (inner and outer position) to transfer shear forces.

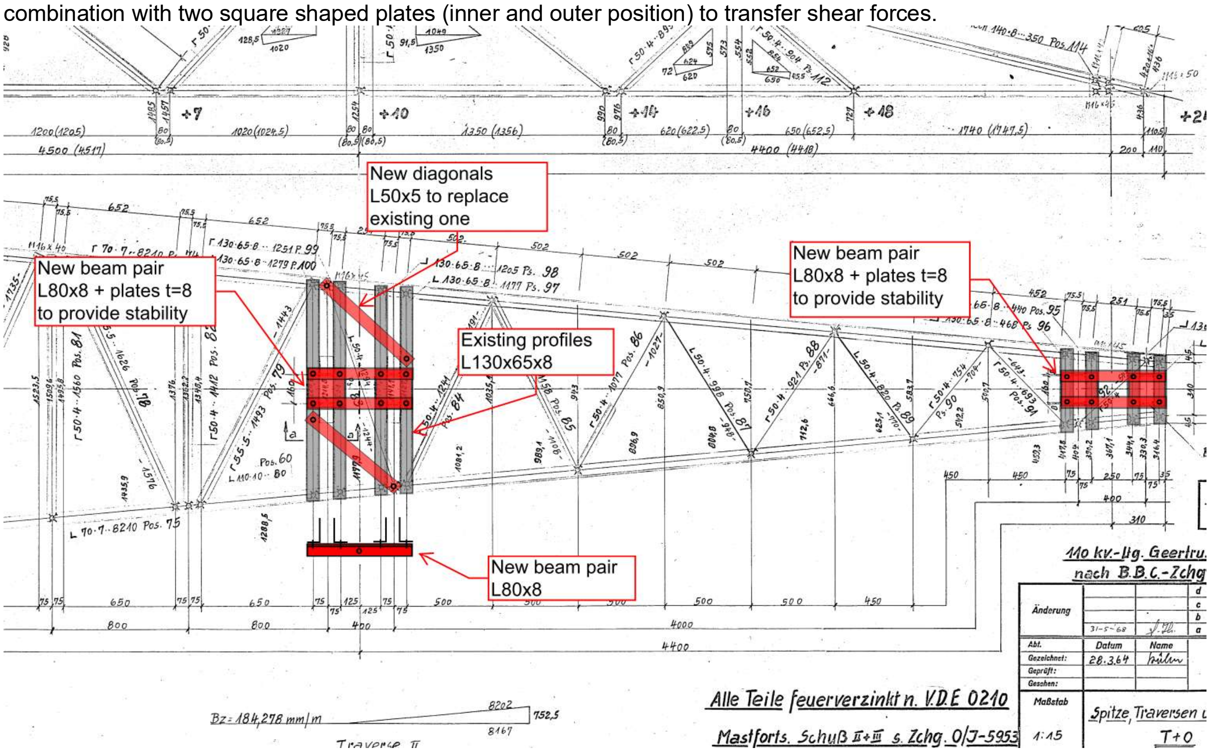


Figure 4-5 New beams for lower cross arm tower 22 (outer corner only)

The verification of the beams is included in Appendix D. Result:

U.C. = 0,23 ≤ 1,00 OK.

The new beams can be fitted directly underneath the existing beams and act favourably to the existing beams, so no further calculations were performed to the existing beams

4.7 Summary

In summary, the following changes have been performed in the towers discussed in this report, see Table 18. The changes apply to the top crossarms only.

Table 18 Summary of changes performed in towers

Line	Mast	Mast type	BO-check	Measure	Beams
Roosendaal-Moerdijk 150kV	94	H-150	OK		
	91	D	NG	Retrofitting of leg members, bolts exchanged in diagonal members.	1
	92	D	NG	Retrofitting of leg members, bolts exchanged in diagonal members.	1
	82	H-130	OK		
	84	D	NG	Redundant members added, bolts exchanged in diagonal members	2
Geertruidenberg-Zevenbergsehoek 150kV	24	A	NG	Diagonal members exchanged of the cross arm	
	32	D+0	NG		2
	20	D+0	NG		2
	22	D+3.6	NG	Retrofitting of leg members, diagonals and bolts exchanged	3
Geertruidenberg-Oosteind 150 kV	199	S+0	OK		
	202	S+0	OK		
	208	S+0	OK		

Modification 1:

For this loading situation, both attachment beams of insulators of the top cross arm are to be exchanged, For the inner beams, add new coupling profile (L50x5), new diagonal members for stability (L50x5), new coupling plate (t=8mm); for the outer beams, adjust the geometry of the diagonals on the vertical side of the crossarm.

Modification 2:

The structural modification is the same as 1, except the outer beams do not have to be replaced by new beams.

Modification 3:

All of the measures 1, additionally two new beams to be attached to the lower cross arm at the outer corner.

4.8 Profile weights including beam adjustments

The weights for the adjustments to beams have been determined. Profile names are based upon pos-numbers of original drawing if existing profiles. The weight of additional plates, gusset plates and other (welded) parts is not included in the table.

The weights of the new profiles for tower 84, 20 and 32 (measure "1") is shown in table 19.

Table 19 Weights of the new profiles for beam adjustments for tower 84, 20 and 32

Group Number	Profile ini	Material	Bolt Ini	Profile New	Material New	Bolt New	Mitigation	Number	Length (m)	Weight (kg)
67	L55x5	S235		L55x5	S235	**1M16-8.8t**	Bolts exchanged	4		
70	L50x4	S235		**L50x5**	**S355**	**1M16-8.8t**	Profile exchanged	4	2,06	31,36
71A	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	4	0,50	7,60
30A[1]	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	1	2,40	9,12
30B[2]	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	2	1,20	9,12
									total	57,20

The weights of the new profiles for tower 91 and 92 (measure "2") is shown in table 20.

Table 20 Weights of the new profiles for beam adjustments for tower 91 and 92

Group Number	Profile ini	Material	Bolt Ini	Profile New	Material New	Bolt New	Mitigation	Number	Length (m)	Weight (kg)
67	L55x5	S235		L55x5	S235	**1M16-8.8t**	Bolts exchanged	4		
70	L50x4	S235		**L50x5**	**S355**	**1M16-8.8t**	Profile exchanged	4	2,06	31,36
71A	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	4	0,50	7,60
30A	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	1	2,40	9,12
30B	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	2	1,20	9,12
Beam top CA	2x L100x65x9	S235		**2x L100x10**	**S355**	**2M16-8.8t**	Profile exchanged	2	0,70	42,28
									total	99,48

The weights of the new profiles for tower 22 (measure "1" and "3") is shown in table 21.

Table 21 Weights of the new profiles for beam adjustments for tower 22

Group Number	Profile ini	Material	Bolt Ini	Profile New	Material New	Bolt New	Mitigation	Number	Length (m)	Weight (kg)
67	L55x5	S235		L55x5	S235	**1M16-8.8t**	Bolts exchanged	4		
70	L50x4	S235		**L50x5**	**S355**	**1M16-8.8t**	Profile exchanged	4	2,06	31,36
71A	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	4	0,50	7,60
30A	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	1	2,40	9,12
30B	-	-	-	**L50x5**	**S355**	**1M16-8.8t**	Profile added	2	1,20	9,12
Beam top CA	2x L100x65x9	S235		**2x L100x10**	**S355**	**2M16-8.8t**	Profile exchanged	2	0,70	42,28
83	-	S235	4M12-5.6t	**L50x5**	**S355**	**1M16-8.8t**	Profile added	2	0,65	4,94
Beam Lower CA[3]	-	S235	4M16-5.6t	**2x L80x8**	**S355**	**2M16-8.8t**	Profile added	2	0,58	22,20
									total	126,61

For tower 20,32, 22, 84, 91 and 92, the total weight of modifications to the tower and the beams is as following:

Table 22 Total weight of profiles for adjustments

Tower	Structure (kg)	Beams (kg)	Total (kg)
20,32	-	57	57
84	206	57	263
91 and 92	1145	99	1244[4]
22	1765	127	1892

1 "new coupling profile shown in figure 4-2

2 "2x diagonal L50x5 for stability" shown in figure 4-2

3 the profile pair is for the "hangende afspanning"

4 the weight is for each tower

5 FOUNDATION

5.1 Introduction

In report 002.678.00 0790751 20-0476 DNV GL rapport TenneT Doorrekenen masten t.b.v. tijdelijke opstijgpunten" the foundations of TOSP towers were analysed. The results were used to determine the preferred location of the TOSP. For a number of locations, the reaction forces on the foundation increased regardless of the TOSP location.

Since the tower legs of the D+0 and D+3.6 structures have to be reinforced as per results of the tower analysis, the introduction of forces into the foundation is to be treated in this report. For these towers, the capacity of the foundation will be calculated and if necessary a reinforcement of the foundation is proposed.

5.2 Analysis

All of the four towers that have TOSP locations placed out of the centerline have increased foundation loads. The reaction forces are included in Appendix A. In table 18 the increase of forces is shown.

Table 23 Increased reaction forces

Lijn	Mast	Type	Current loading (kN)	New loading (kN)	Increase
GT-ZBH150	22	D+3.6	305	410	134%
RSD-MDK150	84	D+0	235	284	121%
RSD-MDK150	91	D+0	235	309	131%
RSD-MDK150	92	D+0	235	332	141%

The actual foundation capacity is determined with the software package TS/Paalfunderingen. The reaction forces of the tower is checked against the capacity of the foundation. The results are included in Appendix C and shown in table 19. Three of the four foundations have over-utlilization and should be reinforced to resist the increased tower loads. For compression, all of the piles have sufficient capacity, only the tension capacity needs to be increased.

Table 24 Utilization of existing foundation piles

Lijn	Mast	Type	Tensile load afkeur 30 yr. (kN)	Capacity (kN)	Utilization (-)	Compressive load (kN)	Capacity (kN)	Utilization (-)
GT-ZBH150	22	D+3.6	410	274	150%	496	949	52%
RSD-MDK150	84	D+0	284	279	102%	339	893	38%
RSD-MDK150	91	D+0	309	289	107%	385	1431	27%
RSD-MDK150	92	D+0	332	361	92%	407	1243	33%

The reinforcement is to be designed with the loads for "Verbouwlevel". In table 20 the required additional capacity of the foundation piles (for the sum of both piles) is shown.

Table 25 Required additional capacity of tension elements

Lijn	Mast	Type	Tensile load afkeur 30 yr. (kN)	Existing capacity (kN)	Shortage (kN)
GT-ZBH150	22	D+3.6	474	274	**200**
RSD-MDK150	84	D+0	336	279	**57**
RSD-MDK150	91	D+0	356	289	**67**

5.3 Reinforcement of foundation

The shortage to the capacity of the existing foundation pile can be mitigated by adding two additional tension piles. Since it is a temporary pile, the application of grout anchor piles is accepted by AM of TenneT. Pre-condition is that the piles will be pre-tensioned to ensure that the piles are effective in carrying the loads from the tower. The proposal is worked out on drawing 10124719-032-210-A2 and included in Figure 5-1 below.

A pair of UNP-beams will be in situ welded to the pile. The tower leg and the additional profile of the tower leg are to be attached to the beam with bolted connections. In the implementation phase, the pile type and pile tip level, the bolted connections, gusset plates and other elements should be checked into further detail.

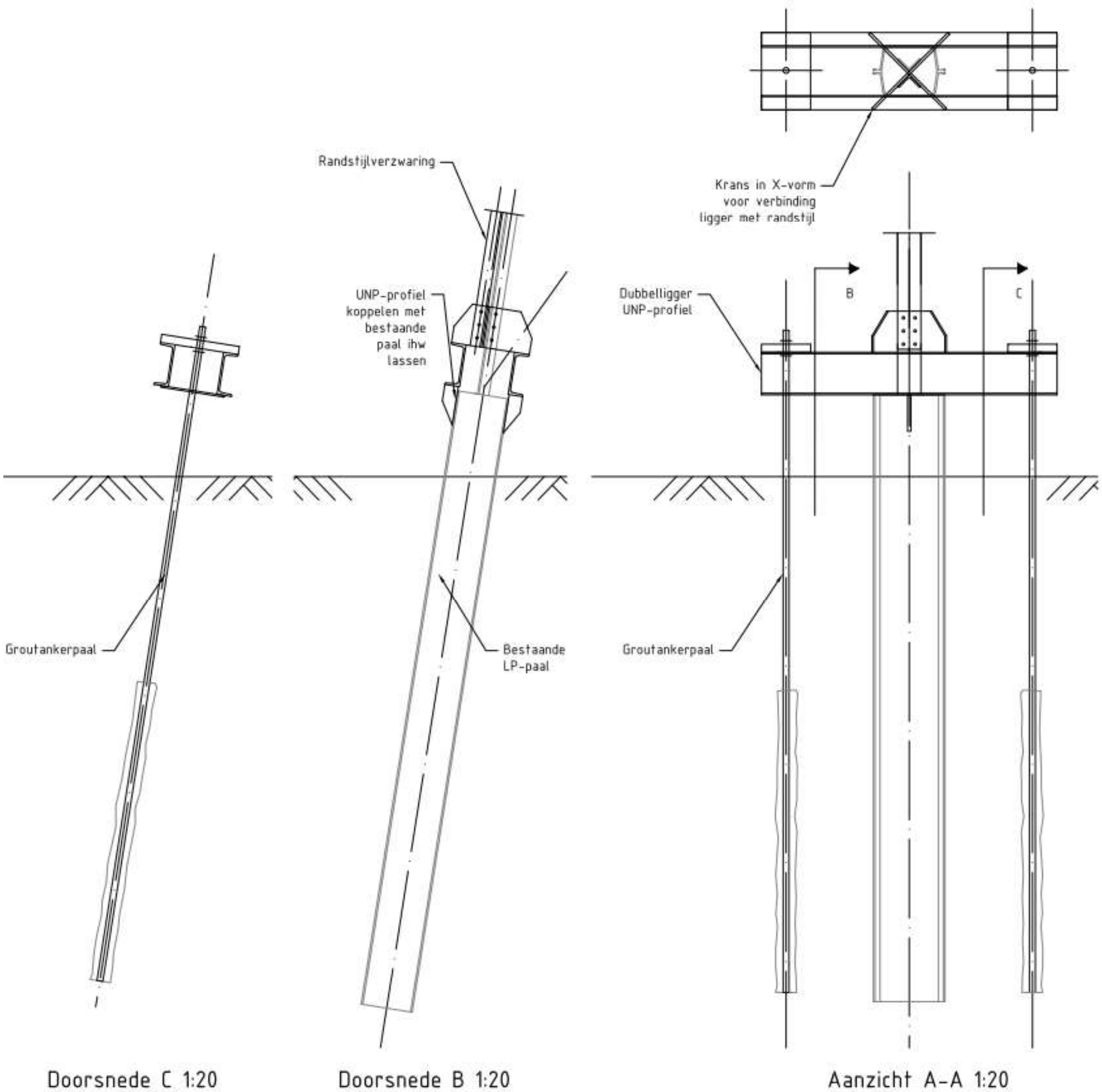


Figure 5-1 Modification proposal for tower foundations with insufficient tension capacity

5.4 Conclusion

The foundation strength of the towers that have increased loads on the foundation are analysed. Out of the four considered locations, three have insufficient strength against tension. These are tower 22 GT-ZBH150 and tower 84, 91 of RSD-MDK150. All foundations have sufficient compression capacity.

For the locations with insufficient strength a modification proposal was developed that comprises the installation of two grout anchorpiles next to the existing pile, which will be coupled with a beam structure that can also provide support to the reinforced tower leg. During the implementation phase, the structure is to be worked out into more detail.

6 VERIFICATION OF REQUIREMENTS

Verification of the applicable requirements is included in “Verificatie en validatie tijdelijke OSP's” [1].

7 REFERENCES

[1] 002.678.00 0935198 - 21-0962 Verificatie en validatie tijdelijke OSP's.
[2] 002.678.00 0790751 - 20-0476 DNV GL rapport TenneT Doorrekenen masten t.b.v. tijdelijke opstijgpunten.
[3] 002.678.00 0864852 - 20-1395 Rev.4 - Alternatief tijdelijke verbindingen t.b.v. reductie VNB tijden.
[4] 002.678.00 0928569 - 21-0960 Uitgangspunten definitief ontwerp tijdelijke OSP's.

APPENDIX A
CONDUCTOR LOADS

The appendix A includes the conductor loads for tower GT-ZBH (24) type A. These loads are calculated with Geleiderbelastingen spreadsheet.

The conductor loads for tower 22, 84 91 and 92 were calculated with PLS-CADD because of differences in span length and direction between conductors and circuits. The loads for tower 22 and the governing tower 92 are included.

At the end of the Appendix, the reaction forces for Afkeurlevel and Verbouwlevel are shown.

Inhoud

Gegevens

Norm	NEN-EN50341-2-15:2019
Initieel	
Gevolgklasse	CC2-0
Betrouwbaarheidsniveau	Afkeur
Referentieperiode	30 jaar
Na aanpassing	
Gevolgklasse	CC2
Betrouwbaarheidsniveau	Verbouw
Referentieperiode	30 jaar
Windgebied	III
Windsnelheid	24,5 m/s
Terreincategorie	II
Reductie factor Cdir	1,00
IJsgebied	B
Masttype	Hoekmast
Masthoogte	32 m
Max. veldlengte	323 m
Lijnhoek	180°
Trekparameter	1200 m
Wind span	247 m
EDS Weight span	384 m
Min. Weight span	302 m
Max. Weight span	494 m

ISSUE	DATE	REVISION	CHK'D	APP'D
0.0	2021-06-16			

Client: TenneT Taking power further

DNV

Title:

Berekening masttype A

JOB No.	-	DATE	-
DRAWN	-	CHKD	-
DESIGN	-	APPD	-

Document name:

GT-ZBH150_A_24_Report.pdf

Project number:

Project client number:

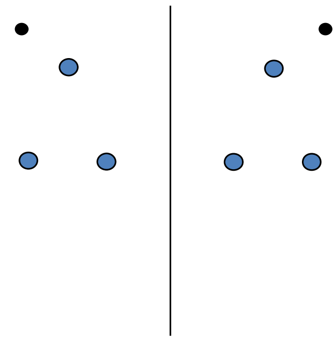
0.0

Geleiderbelastingen

Auteur: TBR
Versie: v11.9

Algemeen

Benaming	A
Masttype	Hoekmast
Aantal circuits	2
Configuratie	2-circuit-donau
Aantal bliksemgeleiders	2



Configuratie geleiders

Uitgangspunten

Norm	NEN-EN50341-2-15:2019
Gevolgklasse initieel	CC2-0
Betrouwbaarheidsniveau initieel	Afkeur CC2-0
Referentieperiode initieel	30 jaar
Gevolgklasse na aanpassing	CC2
Betrouwbaarheidsniveau na aanpassing	Verbouw
Referentieperiode na aanpassing	30 jaar
Windgebied	III
Windsnelheid (m/s)	24,5 m/s
Terreincategorie	II
Reductiefactor c_{dir}	1,00
IJsgebied fasegeleider	B
IJsgebied bliksemgeleider	B

Geleiders Back

Omschrijving	Spanning	Geleider Back	Bundel Ba	IJsgebied	Toeslag gewicht	Toeslag diameter	Intrekwaarden P_{back}
Circuit 1	150 kV	ACSR 20/224	2	B	2 %	2 %	1200
Circuit 2	150 kV	ACSR 20/224	2	B	2 %	2 %	1200
Bliksemdraad 1		ACSR 30/52 PETREL	1	B	2 %	2 %	1500
Bliksemdraad 2		ACSR 30/52 PETREL	1	B	2 %	2 %	1500

Geleiders Ahead

Omschrijving	Spanning	Geleider Ahead	Bundel Ah	IJsgebied	Toeslag gewicht	Toeslag diameter	Intrekwaarden P_{ahead}
Circuit 1	150 kV	ACSR 20/224	2	B	2 %	2 %	1200
Circuit 2	150 kV	ACSR 20/224	2	B	2 %	2 %	1200
Bliksemdraad 1		ACSR 30/52 PETREL	1	B	2 %	2 %	1500
Bliksemdraad 2		ACSR 30/52 PETREL	1	B	2 %	2 %	1500

Isolatoren *(1)*

Omschrijving	Ophanging	Gewicht [kN]	Lengte [m]	Windopp. [m^2]
Circuit 1	Afspanketting	1,50	4,50	1,00
Circuit 2	Afspanketting	1,50	4,50	1,00
Bliksemdraad 1	Afspanketting	0,10	0,20	0,10
Bliksemdraad 2	Afspanketting	0,10	0,20	0,10

1. Eigenschappen gelden voor geheel van de isolatorset

Ophanghoogte en positie in mast

Circuits	Aanduiding	Nummer	Ophanghoogte	Aangrijppunt	Positie in mast Horizontale afstand
Circuit 1	10	150ct1f1	21,4 m	21,4 m	-8,9 m
Circuit 1	11	150ct1f2	21,4 m	21,4 m	-4,4 m
Circuit 1	12	150ct1f3	27,3 m	27,3 m	-4,3 m
Circuit 2	20	150ct2f1	21,4 m	21,4 m	4,4 m
Circuit 2	21	150ct2f2	21,4 m	21,4 m	8,9 m
Circuit 2	22	150ct2f3	27,3 m	27,3 m	4,3 m
Bliksemdraad 1	1	bl1	29,5 m	29,5 m	-8,6 m
Bliksemdraad 2	3	bl2	29,5 m	29,5 m	8,6 m

Project: GT-ZBH150
Tower: A
Number: 24

Hoogteaanpassing naastgelegen masten (aanpassing wind- en weight span)

	Back	Ahead	
Verhoging voor windbelasting	0,0 m	0,0 m	(positief: omhoog)
Verlaging voor verticale belasting	-3,0 m	-3,0 m	(negatief: omlaag, grotere weight span)

Verlaging: Niet in 0,9EG-combinaties

Hoogteafwijking mastbeeld naastgelegen masten en richtingsverandering t.o.v. Lijnrichting

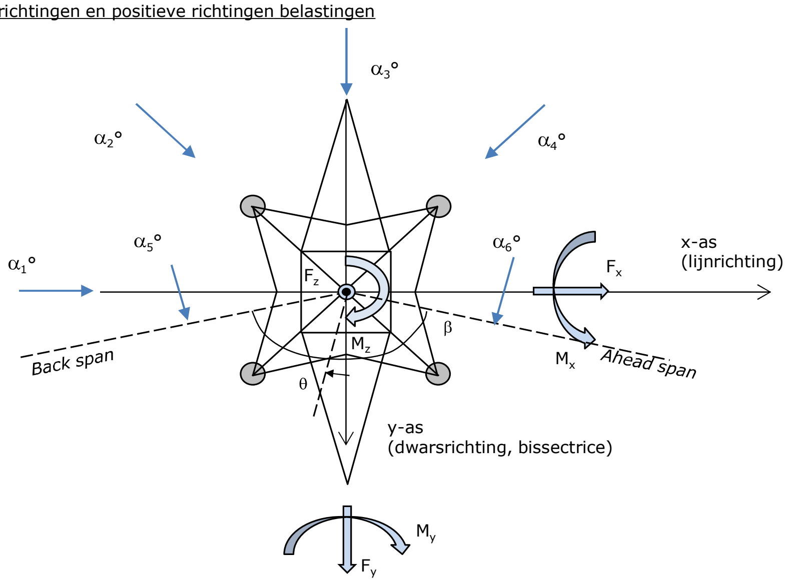
			Hoogteverschil		Richtingsverandering	
Circuits	Aanduiding	Nummer	Δh_back	Δh_ahead	Δy_back	Δy_ahead
Circuit 1	10	150ct1f1	-9,1	0,0 m	-6,6	0,0 m
Circuit 1	11	150ct1f2	-9,1	0,0 m	-5,8	0,0 m
Circuit 1	12	150ct1f3	-15,0	0,0 m	-0,9	0,0 m
Circuit 2	20	150ct2f1	-9,1	0,0 m	5,8	0,0 m
Circuit 2	21	150ct2f2	-9,1	0,0 m	6,6	0,0 m
Circuit 2	22	150ct2f3	-15,0	0,0 m	0,9	0,0 m
Bliksemdraad 1	1	bl1	-10,2	0,0 m	-6,6	0,0 m
Bliksemdraad 2	3	bl2	-10,2	0,0 m	6,6	0,0 m

Lijn- en mastgegevens

		Back	Ahead
		170,0	323,0 m
Ruling span $\sqrt{(\Sigma L^3/\Sigma L)}$		170,0	295,0 m
Lijnhoek	β	180 °	
Rotatie mast t.o.v. bissectrice	θ	0 °	
Vaklengte		170	741 m
Hoogte onderkant mast t.o.v. maaiveld		0,5 m	
Beschouwde windrichtingen	α_1	0 °	
Windrichtingen volgens:	α_2	45 °	
Geleiderbelastingen	α_3	75 °	
	α_4	90 °	
	α_5	105 °	
	α_6	135 °	

Windrichtingen gelden t.o.v. hoofdrichting mastconstructie, niet t.o.v. bissectrice.

Windrichtingen en positieve richtingen belastingen



Beschouwd aantal windrichtingen	
1a	6
3	6
4	1
6	1
Overig	1

Project: GT-ZBH150
Tower: A
Number: 24

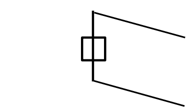
Geleiderafval

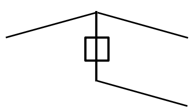
		SPLS - torsie		SPLS - Enkelzijdige trek		5a - geleiderbreuk	
		Aanw.	Afw.	Aanw.	Afw.	Aanw.	Afw.
Circuit 1	150ct1f1	1	0	1	0	1	0
Circuit 1	150ct1f2	1	0	1	0	1	0
Circuit 1	150ct1f3	1	0	1	0	1	0
Circuit 2	150ct2f1	0	1	1	0	1	0
Circuit 2	150ct2f2	0	1	1	0	1	0
Circuit 2	150ct2f3	0	1	1	0	1	0
Bliksemdraad 1	bl1	1	0	1	0	1	0
Bliksemdraad 2	bl2	0	1	1	0	1	0

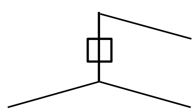
Belastingsituaties SPLS

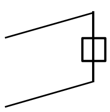
Beschouwde situaties SPLS: 1 t/m 6, alle mogelijke situaties.

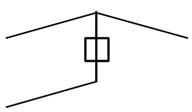
Principe belastingssituaties:

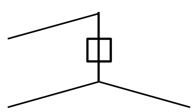

1. Ba All cts


2. Ba ct1


3. Ba ct2


4. Ah All cts

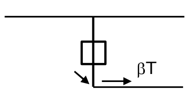

5. Ah ct1


6. Ah ct2

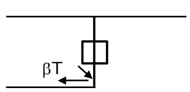
Belastingsituaties 5a. Geleiderbreuk

Beschouwde situaties geleiderbreuk 5a: 1 en 2, alle mogelijke situaties.

Principe belastingssituaties:



1. Ba



2. Ah

Project: GT-ZBH150
Tower: A
Number: 24

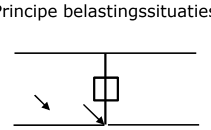
Belastingsituaties 6. Bouw- en onderhoud
Onder 6a wordt de belasting door aanwezigheid lijnwagen of lijnfiets in combinatie met puntlast op traverse in rekening gebracht.
Combinatie 6b bevat geen belastingen in geleider of op traverse. Deze combinatie is toegevoegd om te kunnen combineren met separate controle bordessen etc. De situaties worden in ULS en in iedere SPLS-situatie (in geval van hoekmast) toegepast.

	Fase	Bliksem
Lijnwagen	3,0 kN	1,0 kN
Puntlast op traverse	1,0 kN	1,0 kN

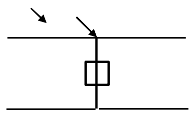
Beschouwde situaties bouw- en onderhoud 6a: 1 t/m 4, alle mogelijke situaties.

Aanwezigheid lijnwagen: Geleider, belasting aanwezig in één van de geleiders, anderen onbelast.

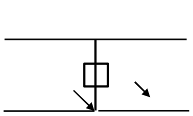
Principe belastingssituaties:



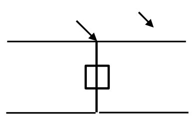
1. Ba Ct1



2. Ba Ct2



3. Ah Ct1



4. Ah Ct2

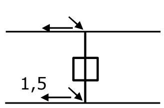
Belastingsituaties 8. Lijndansen als statische belasting

Geleider		
Steunmast fase	0,866 W	1,5 W
Steunmast bliksem	1,5 EDS	1,5 W
Hoekmast fase en bliksem	1,5 EDS	1,5 W

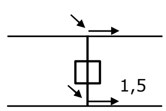
Beschouwde situaties lijndansen 8: Geen (bestaande constructie)

Belasting tegelijk aanwezig in alle geleiders van het circuit.

Principe belastingssituaties:



1. Ba



2. Ah

Belastingcombinatie 8. Lijndansen als dynamische belasting
Alleen van toepassing op hoek- en eindmasten
Belasting bestaat uit EDS-trekbelasting in één van de geleiders aan één zijde van de mast
Door gebruiker via het belastingsspectrum van tabel 4.11/NL.1 om te zetten naar spanningspectrum

Project: GT-ZBH150
Tower: A
Number: 24

Mastconstructie

Eigenschappen

Masttype	Hoekmast		
Mastbenaming	A		
Voetplaat t.o.v. maaiveld	0,5	m	
Masthoogte t.o.v. voetplaat	32,0	m	
Gewicht mast	102,3	kN	

Breedte en helling mast bij fundatie	x-ri.	y-ri.	
Pootsprei	5,40	5,40	m
Helling van de randstijl	0,118	0,118	-
Factor spatkracht	1,3	1,3	-

Berekening windbelasting

Dynamische invloed G_T	1,00 *(Masthoogte < 60 m)*
Windbelasting overhoeks op mastlichaam evenredig met:	(A1C1sin^2(phi)+A2C2cos^2(phi))
Windbelasting overhoeks op traverse evenredig met:	(A1C1sin^2(phi)+A2C2cos^2(phi))
Vergroting wind overhoeks mastlichaam	(1+0,2sin^2(2phi))
Vergroting wind overhoeks traverse	(1+0,2sin^2(2phi))
Factor wind evenwijdig t.o.v. haaks op traverse	0,4

Eigenschappen mastsecties langsrichting (vooraanzicht, yz-vlak)

Omschrijving	h [m]	b_1 [m]	b_2 [m]	Δh [m]	Δ_x [m]	A_0 [m^2]	A_1 [m^2]	$\chi = A_1/A_0$ [-]	C_t
Broekstuk	7,50	5,40	3,63	7,50	0,118	33,86	12,86	0,38	2,28
Eerste tussenstuk	14,60	3,63	2,86	7,10	0,054	23,04	12,05	0,52	1,94
Tweede tussenstuk	21,41	2,86	2,10	6,81	0,056	16,89	10,31	0,61	1,81
Bovenstuk 1	27,30	2,10	1,81	5,89	0,025	11,51	8,02	0,70	1,74
Bovenstuk 2	29,50	1,81	1,70	2,20	0,025	3,86	3,47	0,90	1,82
Topstuk	32,00	1,70		2,50		2,13	0,53	0,25	2,72
Ondertraverse	21,41	17,78		2,09		18,58	11,50	0,62	1,80
Boventraverse	27,30	17,18		2,20		18,90	11,03	0,58	1,84

Eigenschappen mastsecties dwarsrichting (zijaanzicht, xz-vlak)

Omschrijving	h [m]	b_1 [m]	b_2 [m]	Δh [m]	Δ_x [m]	A_0 [m^2]	A_1 [m^2]	$\chi = A_1/A_0$ [-]	C_t
Broekstuk	7,50	5,40	3,63	7,50	0,118	33,86	12,86	0,38	2,28
Eerste tussenstuk	14,60	3,63	2,86	7,10	0,054	23,04	12,05	0,52	1,94
Tweede tussenstuk	21,41	2,86	2,10	6,81	0,056	16,89	10,31	0,61	1,81
Bovenstuk 1	27,30	2,10	1,81	5,89	0,025	11,51	8,02	0,70	1,74
Bovenstuk 2	29,50	1,81	1,70	2,20	0,025	3,86	3,47	0,90	1,82
Topstuk	32,00	1,70		2,50		2,13	0,53	0,25	2,72
Ondertraverse	21,41	17,78		2,09		18,58	11,50	0,62	1,80
Boventraverse	27,30	17,18		2,20		18,90	11,03	0,58	1,84

NB: oppervlakte traverse dwarsrichting wordt in berekening gereduceerd.

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Windoppervlak feeders telecominstallaties				
Onderdeel	A (m²/m)	Factor	Δh	A_1
Broekstuk				
Eerste tussenstuk				
Tweede tussenstuk				
Bovenstuk 1				
Bovenstuk 2				

Invoer antennes			
Omschrijving	A (m²)	h (m)	C_f (m)
Antenne top			
Antenne o.t.			

Belastingen mastsectie langsrichting (x-richting) per windrichting

Omschrijving	p_w	F_{x1}	F_{x2}	F_{x3}	F_{x4}	h_{ef}	M_{y1}	M_{y2}	M_{y3}	M_{y4}
	[kN/m²]	[kN]	[kN]	[kN]	[kN]	[m]	[kNm]	[kNm]	[kNm]	[kNm]
Broekstuk	0,70	20,5	17,4	5,6	0,0	3,8	76,9	65,3	20,9	0,0
Eerste tussenstuk	0,73	16,9	14,4	4,6	0,0	11,1	187,1	158,8	50,8	0,0
Tweede tussenstuk	0,85	15,9	13,5	4,3	0,0	18,0	285,5	242,3	77,6	0,0
Bovenstuk 1	0,94	13,1	11,1	3,6	0,0	24,4	319,0	270,7	86,7	0,0
Bovenstuk 2	0,97	6,2	5,2	1,7	0,0	28,4	174,8	148,3	47,5	0,0
Topstuk	1,00	1,4	1,2	0,4	0,0	30,8	44,2	37,5	12,0	0,0
Ondertraverse	0,90	37,5	22,3	4,5	0,0	22,1	828,2	491,9	99,1	0,0
Boventraverse	0,97	39,4	23,4	4,7	0,0	28,0	1104,5	656,1	132,1	0,0
Totaal		150,9	108,4	29,3	0,0		3020,3	2070,8	526,8	0,0

Belastingen mastsectie dwarsrichting (y-richting) per windrichting

Omschrijving	p_w	F_{y1}	F_{y2}	F_{y3}	F_{x4}	h_{ef}	M_{x1}	M_{x2}	M_{x3}	M_{x4}
	[kN/m²]	[kN]	[kN]	[kN]	[kN]	[m]	[kNm]	[kNm]	[kNm]	[kNm]
Broekstuk	0,70	0,0	17,4	20,8	20,5	3,8	0,0	65,3	78,0	76,9
Eerste tussenstuk	0,73	0,0	14,4	17,2	16,9	11,1	0,0	158,8	189,8	187,1
Tweede tussenstuk	0,85	0,0	13,5	16,1	15,9	18,0	0,0	242,3	289,6	285,5
Bovenstuk 1	0,94	0,0	11,1	13,3	13,1	24,4	0,0	270,7	323,5	319,0
Bovenstuk 2	0,97	0,0	5,2	6,2	6,2	28,4	0,0	148,3	177,3	174,8
Topstuk	1,00	0,0	1,2	1,5	1,4	30,8	0,0	37,5	44,8	44,2
Ondertraverse	0,90	0,0	22,3	16,7	15,0	22,1	0,0	491,9	369,8	331,3
Boventraverse	0,97	0,0	23,4	17,6	15,8	28,0	0,0	656,1	493,1	441,8
Totaal		0,0	108,4	109,4	104,7		0,0	2070,8	1965,9	1860,7

Resulterende belastingen vanuit mastconstructie incl. antenne zonder geleiders niveau fundatie (kar. waarde)

Belasting / windrichting	F_x	F_y	F_z	M_x	M_y	M_z
	[kN]	[kN]	[kN]	[kNm]	[kNm]	[kNm]
Permanente belasting	0	0	102	0	0	0
Windrichting 0°	151	0	0	0	3020	0
Windrichting 45°	108	108	0	2071	2071	0
Windrichting 75°	29	109	0	1966	527	0
Windrichting 90°	0	105	0	1861	0	0

DNV

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Tussenresultaten geleiderbelastingen

Geleiders back

Circuit	Geleider	Diameter [mm]	A [mm^2]	G [N/m]	E [N/mm^2]	αT [-]
Circuit 1	ACSR 20/224	20,3	244,5	7,60	66000	2,04E-05
Circuit 2	ACSR 20/224	20,3	244,5	7,60	66000	2,04E-05
Bliksemdraad 1	ACSR 30/52 PETREL	11,8	82,4	3,71	105500	1,53E-05
Bliksemdraad 2	ACSR 30/52 PETREL	11,8	82,4	3,71	105500	1,53E-05

Geleiders ahead

Circuit	Geleider	Diameter [mm]	A [mm^2]	G [N/m]	E [N/mm^2]	αT [-]
Circuit 1	ACSR 20/224	20,3	244,5	7,60	66000	2,04E-05
Circuit 2	ACSR 20/224	20,3	244,5	7,60	66000	2,04E-05
Bliksemdraad 1	ACSR 30/52 PETREL	11,8	82,4	3,71	105500	1,53E-05
Bliksemdraad 2	ACSR 30/52 PETREL	11,8	82,4	3,71	105500	1,53E-05

Verticale belasting back

Circuit	Bundel [-]	Toeslag [%]	$w_{z,G}$ [N/m]	IJsgebied	Formule	$w_{z,ijs}$ [N/m]	$w_{z,ijs,bundel}$ [N/m]
Circuit 1	2	2	15,5	B	4+0,2d	8,1	16,1
Circuit 2	2	2	15,5	B	4+0,2d	8,1	16,1
Bliksemdraad 1	1	2	3,8	B	4+0,2d	6,4	6,4
Bliksemdraad 2	1	2	3,8	B	4+0,2d	6,4	6,4

Verticale belasting ahead

Circuit	Bundel [-]	Toeslag [%]	$w_{z,G}$ [N/m]	IJsgebied	Formule	$w_{z,ijs}$ [N/m]	$w_{z,ijs,bundel}$ [N/m]
Circuit 1	2	2	15,5	B	4+0,2d	8,1	16,1
Circuit 2	2	2	15,5	B	4+0,2d	8,1	16,1
Bliksemdraad 1	1	2	3,8	B	4+0,2d	6,4	6,4
Bliksemdraad 2	1	2	3,8	B	4+0,2d	6,4	6,4

Isolatoren

Geleider	$G_{isolator}$ [kN]	Aantal -	$F_{v,iso}$ [kN]	Lengte [m]	Windopp. [m^2]	Windhoogte [m]	Stuwdruk [kN/m^2]	Vormfactor [-]	$F_{h,iso}$ [kN]
150ct1f1	1,50	1	1,5	4,5	1,0	21,90	0,90	1,2	1,08
150ct1f2	1,50	1	1,5	4,5	1,0	21,90	0,90	1,2	1,08
150ct1f3	1,50	1	1,5	4,5	1,0	27,80	0,97	1,2	1,16
150ct2f1	1,50	1	1,5	4,5	1,0	21,90	0,90	1,2	1,08
150ct2f2	1,50	1	1,5	4,5	1,0	21,90	0,90	1,2	1,08
150ct2f3	1,50	1	1,5	4,5	1,0	27,80	0,97	1,2	1,16
bl1	0,10	1	0,1	0,2	0,1	30,00	0,99	1,2	0,12
bl2	0,10	1	0,1	0,2	0,1	30,00	0,99	1,2	0,12

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Windbelasting back

Geleider	hoogte wind [m]	Stuwdruk [kN/m^2]	G_{c_dwars} [-]	G_{c_trek} [-]	C_c [-]	$d_{toeslag}$ [mm]	w_y [N/m]	$w_{y,vak}$ [N/m]	$D_{ijs,toeslag}$ [mm]	$w_{y,ijs}$ [N/m]	$w_{y,ijs,vak}$ [N/m]
150ct1f1	15,4	0,81	0,56	0,66	1,20	20,75	22,5	26,7	40,2	43,7	51,7
150ct1f2	15,4	0,81	0,56	0,66	1,20	20,75	22,5	26,7	40,2	43,7	51,7
150ct1f3	18,3	0,85	0,57	0,68	1,20	20,75	24,4	28,9	40,2	47,4	56,0
150ct2f1	15,4	0,81	0,56	0,66	1,20	20,75	22,5	26,7	40,2	43,7	51,7
150ct2f2	15,4	0,81	0,56	0,66	1,20	20,75	22,5	26,7	40,2	43,7	51,7
150ct2f3	18,3	0,85	0,57	0,68	1,20	20,75	24,4	28,9	40,2	47,4	56,0
bl1	23,3	0,92	0,60	0,70	1,20	11,99	7,9	9,3	32,8	21,6	25,4
bl2	23,3	0,92	0,60	0,70	1,20	11,99	7,9	9,3	32,8	21,6	25,4

Windbelasting ahead

Geleider	hoogte wind [m]	Stuwdruk [kN/m^2]	G_{c_dwars} [-]	G_{c_trek} [-]	C_c [-]	$d_{toeslag}$ [mm]	w_y [N/m]	$w_{y,vak}$ [N/m]	$D_{ijs,toeslag}$ [mm]	$w_{y,ijs}$ [N/m]	$w_{y,ijs,vak}$ [N/m]
150ct1f1	14,7	0,80	0,56	0,53	1,20	20,75	22,0	20,8	40,2	42,7	40,4
150ct1f2	14,7	0,80	0,56	0,53	1,20	20,75	22,0	20,8	40,2	42,7	40,4
150ct1f3	20,6	0,89	0,58	0,55	1,20	20,75	25,8	24,4	40,2	49,9	47,2
150ct2f1	14,7	0,80	0,56	0,53	1,20	20,75	22,0	20,8	40,2	42,7	40,4
150ct2f2	14,7	0,80	0,56	0,53	1,20	20,75	22,0	20,8	40,2	42,7	40,4
150ct2f3	20,6	0,89	0,58	0,55	1,20	20,75	25,8	24,4	40,2	49,9	47,2
bl1	24,2	0,93	0,60	0,57	1,20	11,99	8,0	7,6	32,8	21,9	20,7
bl2	24,2	0,93	0,60	0,57	1,20	11,99	8,0	7,6	32,8	21,9	20,7

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Geleiderbelastingen

Auteur: TBR
Versie: v11.9

Uitgangspunten

Betrouwbaarheidsniveau Afkeur CC2-0
Referentieperiode 30 jaar

ULS (bezwijksterkte)		**NEN-EN50341-2-15:2019**						
Belastingsgeval	omschrijving	Temp	γ_G	γ_G		γ_Q		γ_a
		°C	$G_{k,mast}$	$G_{k,geleider}$	Q_{pk}	Q_{wk}	Q_{ik}	A_k
ULS 1a	Wind	10°	1,05	1,05	0,00	1,12	0,00	0,0
ULS 1a_0,9	Wind 0,9Gk alleen mast	10°	0,90	1,05	0,00	1,12	0,00	0,0
ULS 1a_0,9_0,9	Wind 0,9Gk ook geleider	10°	0,90	0,90	0,00	1,12	0,00	0,0
ULS 3	Wind+ijs	-5°	1,05	1,05	0,00	0,34	0,97	0,0
ULS 3_0,9	Wind+ijs 0,9	-5°	0,90	1,05	0,00	0,34	0,97	0,0
ULS 4	Koude+wind	-20°	1,05	1,05	0,00	0,22	0,00	0,0
ULS 4_0,9	Koude+wind 0,9	-20°	0,90	1,05	0,00	0,22	0,00	0,0
ULS 5a	Torsiebelastingen	10°	1,00	1,00	1,00	0,00	0,00	1,0
ULS 5b	Longitudinale belastingen	10°	1,00	1,00	0,00	0,00	0,00	1,0
ULS 6	Bouw en onderhoud	5°	1,05	1,05	1,20	0,22	0,00	0,0
ULS 6_0,9	Bouw en onderhoud	5°	1,05	1,05	0,00	0,22	0,00	0,0
ULS 7	Permanent	10°	1,15	1,15	0,00	0,00	0,00	0,0
ULS 8	Special	10°	1,00	1,00	0,00	0,00	0,00	1,0
SPLS (Bezwijksterkte, enkel voor hoekmasten: afwezigheid geleiders)				γ_G	γ_Q			
				G_k	Q_{pk}	Q_{wk}	Q_{ik}	A_k
SPLS 1a	Wind	10°	1,05	1,05	0,0	0,78	0,00	0,0
SPLS 1a_0,9	Wind 0,9	10°	0,90	1,05	0,0	0,78	0,00	0,0
SPLS 1a_0,9_0,9	Wind 0,9	10°	0,90	0,90	0,0	0,78	0,00	0,0
SPLS 3	Wind+ijs	-5°	1,05	1,05	0,0	0,36	0,34	0,0
SPLS 3_0,9	Wind+ijs 0,9	-5°	0,90	1,05	0,0	0,36	0,34	0,0
SPLS 4	Koude+wind	-20°	1,05	1,05	0,0	0,24	0,00	0,0
SPLS 4_0,9	Koude+wind 0,9	-20°	0,90	1,05	0,0	0,24	0,00	0,0
SPLS 6	Bouw en onderhoud	5°	1,05	1,05	1,2	0,24	0,0	0,0
SPLS 6_0,9	Bouw en onderhoud	5°	1,05	1,05	0,0	0,24	0,0	0,0
SLS (controle van de vervormingen, vermoeiing, EDS)								
				G_k	Q_{pk}	Q_{wk}	Q_{ik}	A_k
SLS 1a	Wind	10°	1,00	1,00	0,0	0,94	0,0	0,0
SLS 3	Wind+ijs	-5°	1,00	1,00	0,0	0,28	0,88	0,0
SLS 4	Wind	-20°	1,00	1,00	0,0	0,19	0,0	0,0
SLS 6	Bouw en onderhoud	5°	1,00	1,00	0,0	0,19	0,0	0,0
SLS 7	PB (EDS, geen wind)	10°	1,00	1,00	0,0	0,00	0,0	0,0

Aantal windrichtingen	6
Aantal belastingcombinaties ULS	66
Aantal belastingcombinaties SPLS	294
Aantal belastingcombinaties SLS	15
Aantal knooplasten	6000

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Samenvattingstabellen geleiderbelastingen

In de onderstaande vier tabellen is weergegeven:
- De maximale geleiderbelasting in het globale assenstelsel, gesplitst in aandeel van back en ahead span
- De gecombineerde geleiderbelasting (Ba+Ah) in het globale assenstelsel met in het lokale assenstelsel de maximaal optredende trekkracht. Componenten Fx en Fy als absolute waarde
- De alledaagse (EDS) waarden van de gecombineerde geleiderbelastingen (Ba+Ah) met bijbehorende trekkrachten
- Controle op uplift, waar een negatieve waarde duidt op uplift

Maximale waarden voor back en ahead span

Geleider	Fx_ba [kN]	Fx_ah [kN]	Fy_ba [kN]	Fy_ah [kN]	Fz_ba [kN]	Fz_ah [kN]
bl1	-15,7	14,9	0,4	1,6	4,1	3,4
150ct2f1	-49,6	43,6	4,5	5,2	11,3	9,8
150ct2f2	-49,6	43,6	4,6	5,2	11,3	9,8
150ct2f3	-49,7	43,7	3,7	5,9	13,0	9,8
150ct1f1	-49,7	43,6	2,1	5,2	11,3	9,8
150ct1f2	-49,7	43,6	2,3	5,2	11,3	9,8
150ct1f3	-49,7	43,7	3,4	5,9	13,0	9,8
bl2	-15,7	14,9	1,3	1,6	4,1	3,4

Min. Weight span (m)

Weight spar	Combinatie1		
Geleider	SLS 1a	SLS 4	SLS 7
bl1	376,6	424,6	376,6
150ct2f1	342,9	379,4	342,9
150ct2f2	342,9	379,4	342,9
150ct2f3	384,5	438,8	384,5
150ct1f1	342,9	379,6	342,9
150ct1f2	342,9	379,6	342,9
150ct1f3	384,5	438,9	384,5
bl2	376,6	424,1	376,6

Max. Weight span (m)

Weight spar	Combinatie1	
Geleider	ULS 1a	ULS 3
bl1	492,7	362,2
150ct2f1	408,2	341,8
150ct2f2	408,2	341,8
150ct2f3	489,9	384,5
150ct1f1	408,2	341,8
150ct1f2	408,2	341,8
150ct1f3	489,9	384,5
bl2	492,7	362,2

Omhullende weight span over alle combinaties (incl. 0,9 combinaties)		
Voor alle geleiders		Wind / Weight span verhouding
Max. weight span	492,7 m	1,999 -
Min. weight span	304,4 m	1,235 -

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Maximale waarden back+ahead span **Maximale waarden trekkracht geleider**

	Fx	Fy	Fz	Ft_ba	Ft_ah
Geleider	[kN]	[kN]	[kN]	[kN]	[kN]
bl1	15,7	2,0	4,1	-15,7	14,9
150ct2f1	49,6	9,6	11,3	-49,6	43,6
150ct2f2	49,6	9,8	11,3	-49,6	43,6
150ct2f3	49,7	9,6	13,0	-49,7	43,7
150ct1f1	49,7	7,3	11,3	-49,7	43,6
150ct1f2	49,7	7,4	11,3	-49,7	43,6
150ct1f3	49,7	9,2	13,0	-49,7	43,7
bl2	15,7	2,9	4,1	-15,7	14,9

EDS-belastingen geleiders

	Fx	Fy	Fz	Ft_ba	Ft_ah
Geleider	[kN]	[kN]	[kN]	[kN]	[kN]
bl1	5,7	0,0	0,9	-5,7	5,7
150ct2f1	18,6	0,6	4,2	-18,6	18,6
150ct2f2	18,6	0,7	4,2	-18,6	18,6
150ct2f3	18,6	0,1	4,8	-18,6	18,6
150ct1f1	18,6	0,0	4,2	-18,6	18,6
150ct1f2	18,6	0,0	4,2	-18,6	18,6
150ct1f3	18,6	0,0	4,8	-18,6	18,6
bl2	5,7	0,2	0,9	-5,7	5,7

Controle uplift SLS-wind

		Fz_ba	Fz_ah
Combinatie:	Geleider	[kN]	[kN]
SLS 4	bl1	0,0	0,0
	150ct2f1	0,0	0,0
	150ct2f2	0,0	0,0
	150ct2f3	0,0	0,0
	150ct1f1	0,0	0,0
	150ct1f2	0,0	0,0
	150ct1f3	0,0	0,0
	bl2	0,0	0,0

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ULS-fundatiebelasting combinatie 1 en 3 wind haaks op de lijn of bissectrice en EDS, vanuit geleiders

Combinatie	Combination	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_75		-4	54	65	1292	-73	15
ULS 1a_0,9_0		1	0	54	0	25	0
ULS 1a_0,9_0,9_75		-7	54	52	1292	-144	16
ULS 3_0		15	0	93	0	368	0
SLS 7		0	0	54	0	1	0

ULS-fundatiebelasting combinatie 1 en 3 wind haaks op de lijn of bissectrice en EDS, totaal geleiders en mast

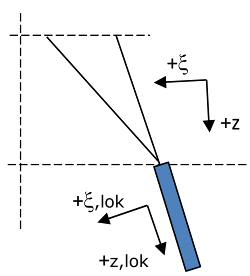
Combinatie	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_75	29	176	172	3487	515	15
ULS 1a_0,9_0,9_75	26	176	145	3487	444	16
SLS 7	0	0	157	0	1	0

Fundatiebelastingen, selectie belastingcombinaties op basis grootste waarde

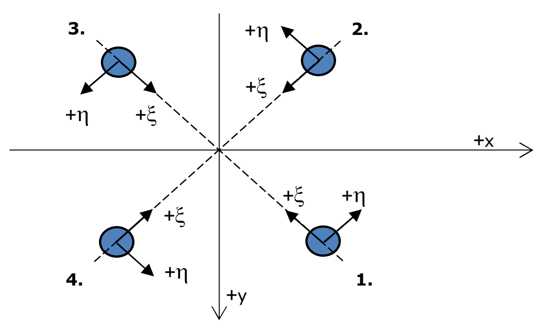
Combinatie	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_105	-37	176	172	**3492**	-661	-8
SPLS 1a_0 Ba All Cts	246	0	145	0	**5429**	0
SPLS 6a_75 Ba Ct2 Ba 10	45	33	180	536	1104	**683**
SPLS 1a_45 Ba All Cts	229	100	145	**1976**	**5079**	0

Noot: grootste waarden kunnen in meerdere combinaties voorkomen, een combinatie is weergegeven.

Oplegreacties op fundering per randstijl



Assenstelsels



Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 1a_45 Ba All Cts	91	103	**689**	-8	-137	-22	699
2	SPLS 1a_0 Ba All Cts	67	-83	**539**	11	-106	-16	546
3	SPLS 3_135 Ah All Cts	-51	-71	**450**	-14	-86	-11	456
4	SPLS 1a_135 Ah All Cts	-90	102	**684**	8	-136	-22	693

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_135 Ah All Cts	-40	-59	**-377**	13	70	7	-383
2	SPLS 1a_0,9_135 Ah All Cts	-79	92	**-614**	-9	121	18	-623
3	SPLS 1a_0,9_45 Ba All Cts	80	92	**-621**	8	122	18	-630
4	SPLS 1a_0,9_0 Ba All Cts	57	-72	**-471**	-11	91	13	-477

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_90 Ah Ct1	24	-49	-105	**52**	17	0	-107
2	SPLS 3_0,9_90 Ba Ct2	-12	-60	185	**51**	-33	-3	188
3	SPLS 3_90 Ba Ct2	1	73	-275	**51**	53	7	-279
4	SPLS 6a_75 Ah Ct1 Ba 10	-9	78	311	**49**	-61	-9	315

Maximale torsiebelasting (negatief)

Stijl Index	Combinatie Combination	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_90 Ba Ct1	18	87	382	**-49**	-74	-10	387
2	SPLS 3_90 Ah Ct2	-4	75	-292	**-50**	56	7	-296
3	SPLS 3_0,9_90 Ah Ct2	10	-61	199	**-50**	-36	-3	201
4	SPLS 3_90 Ba Ct1	-29	-46	-79	**-53**	12	-1	-80

Project: GT-ZBH150
Masttype: A
Mast: 24

Combinatie Ftrek+Fhor

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_105 Ah All Cts	-38	-58	**-374**	**14**	68	6	-380
2	SPLS 1a_0,9_135 Ah All Cts	-79	92	**-614**	**-9**	121	18	-623
3	SPLS 1a_0,9_45 Ba All Cts	80	92	**-621**	**8**	122	18	-630
4	SPLS 1a_0,9_0 Ba All Cts	57	-72	**-471**	**-11**	91	13	-477

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SLS 7	6	6	39	0	-9	-2	40
2	SLS 7	6	-6	39	0	-9	-2	40
3	SLS 7	-6	-6	39	0	-8	-2	40
4	SLS 7	-6	6	39	0	-8	-2	40

Omhullenden ongeacht stijl

Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	SPLS 1a_45 Ba All Cts	91	103	**689**	-8	-137	-22	699
Max. trek	SPLS 1a_0,9_45 Ba All Cts	80	92	**-621**	8	122	18	-630
Max. pos. torsie	SPLS 3_90 Ah Ct1	24	-49	-105	**52**	17	0	-107
Max. neg. torsie	SPLS 3_90 Ba Ct1	-29	-46	-79	**-53**	12	-1	-80
Comb. trek+torsie	SPLS 1a_45 Ba All Cts	80	92	**-621**	**8**	122	18	-630

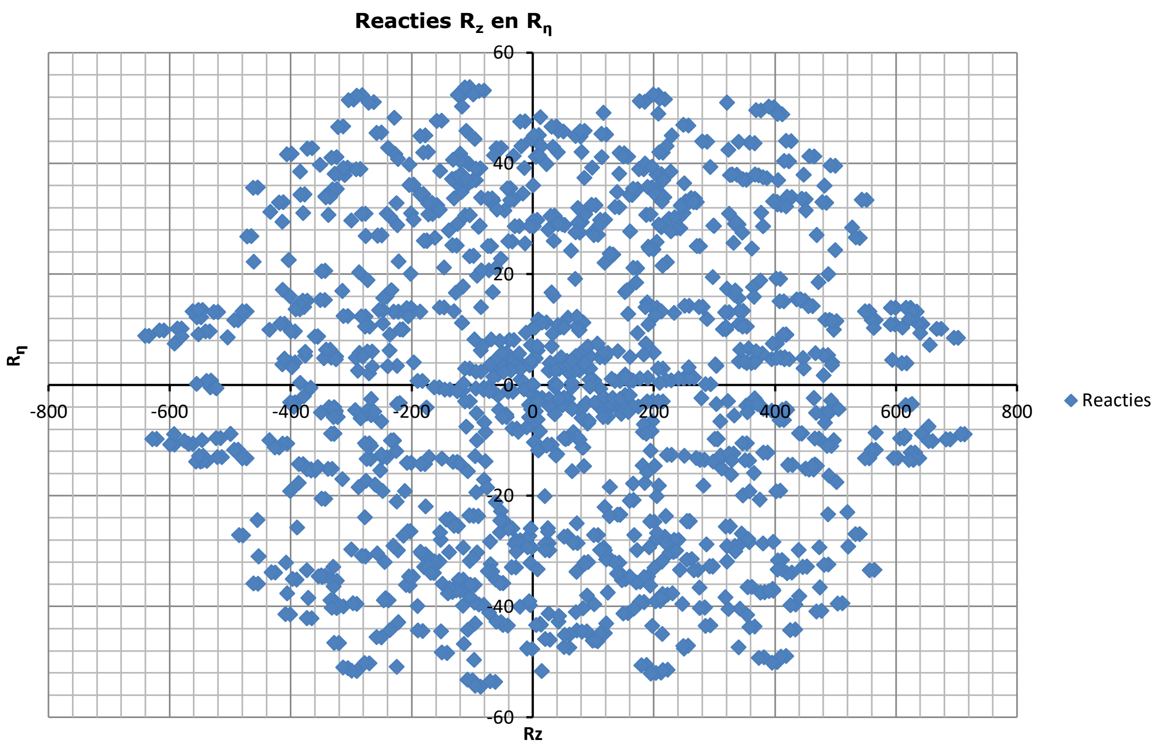
Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 6a_75 Ah All Cts Ba 12	-20	-48	**-274**	20	48	2	-277
2	SLS 1a_135	-56	55	**-385**	0	79	14	-390
3	SLS 1a_45	54	53	**-367**	-1	75	14	-373
4	SLS 1a_0	30	-34	**-225**	-3	45	8	-228

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SLS 1a_45	68	63	**447**	3	-93	-18	453
2	SLS 1a_0	42	-46	**303**	3	-62	-12	307
3	SPLS 6a_75 Ah All Cts Ba 12	-44	-50	**360**	-4	-67	-7	365
4	SPLS 6a_75 Ah All Cts Ba 12	-49	77	**468**	20	-90	-12	474

Project: GT-ZBH150
Masttype: A
Mast: 24



Project: GT-ZBH150
Masttype: A
Mast: 24

Geleiderbelastingen

Auteur: TBR
Versie: v11.9

Uitgangspunten

Betrouwbaarheidsniveau	Verbouw CC2
Referentieperiode	30 jaar

ULS	(bezwijksterkte)	**NEN-EN50341-2-15:2019**						
Belastingsgeval	omschrijving	Temp	γ_G	γ_G		γ_Q		γ_a
		°C	$G_{k,mast}$	$G_{k,geleider}$	Q_{pk}	Q_{wk}	Q_{ik}	A_k
ULS 1a	Wind	10°	1,15	1,15	0,00	1,30	0,00	0,0
ULS 1a_0,9	Wind 0,9Gk alleen mast	10°	0,90	1,15	0,00	1,30	0,00	0,0
ULS 1a_0,9_0,9	Wind 0,9Gk ook geleider	10°	0,90	0,90	0,00	1,30	0,00	0,0
ULS 3	Wind+ijs	-5°	1,15	1,15	0,00	0,39	1,14	0,0
ULS 3_0,9	Wind+ijs 0,9	-5°	0,90	1,15	0,00	0,39	1,14	0,0
ULS 4	Koude+wind	-20°	1,15	1,15	0,00	0,26	0,00	0,0
ULS 4_0,9	Koude+wind 0,9	-20°	0,90	1,15	0,00	0,26	0,00	0,0
ULS 5a	Torsiebelastingen	10°	1,00	1,00	1,00	0,00	0,00	1,0
ULS 5b	Longitudinale belastingen	10°	1,00	1,00	0,00	0,00	0,00	1,0
ULS 6	Bouw en onderhoud	5°	1,15	1,15	1,30	0,26	0,00	0,0
ULS 6_0,9	Bouw en onderhoud	5°	1,15	1,15	0,00	0,26	0,00	0,0
ULS 7	Permanent	10°	1,30	1,30	0,00	0,00	0,00	0,0
ULS 8	Special	10°	1,00	1,00	0,00	0,00	0,00	1,0
SPLS	(Bezwijksterkte, enkel voor hoekmasten: afwezigheid geleiders)			γ_G	γ_Q			
				G_k	Q_{pk}	Q_{wk}	Q_{ik}	A_k
SPLS 1a	Wind	10°	1,15	1,15	0,0	0,78	0,00	0,0
SPLS 1a_0,9	Wind 0,9	10°	0,90	1,15	0,0	0,78	0,00	0,0
SPLS 1a_0,9_0,9	Wind 0,9	10°	0,90	0,90	0,0	0,78	0,00	0,0
SPLS 3	Wind+ijs	-5°	1,15	1,15	0,0	0,36	0,34	0,0
SPLS 3_0,9	Wind+ijs 0,9	-5°	0,90	1,15	0,0	0,36	0,34	0,0
SPLS 4	Koude+wind	-20°	1,15	1,15	0,0	0,24	0,00	0,0
SPLS 4_0,9	Koude+wind 0,9	-20°	0,90	1,15	0,0	0,24	0,00	0,0
SPLS 6	Bouw en onderhoud	5°	1,15	1,15	1,2	0,24	0,0	0,0
SPLS 6_0,9	Bouw en onderhoud	5°	1,15	1,15	0,0	0,24	0,0	0,0
SLS	(controle van de vervormingen, vermoeiing, EDS)							
				G_k	Q_{pk}	Q_{wk}	Q_{ik}	A_k
SLS 1a	Wind	10°	1,00	1,00	0,0	0,94	0,0	0,0
SLS 3	Wind+ijs	-5°	1,00	1,00	0,0	0,28	0,88	0,0
SLS 4	Wind	-20°	1,00	1,00	0,0	0,19	0,0	0,0
SLS 6	Bouw en onderhoud	5°	1,00	1,00	0,0	0,19	0,0	0,0
SLS 7	PB (EDS, geen wind)	10°	1,00	1,00	0,0	0,00	0,0	0,0

Aantal windrichtingen	6
Aantal belastingcombinaties ULS	66
Aantal belastingcombinaties SPLS	294
Aantal belastingcombinaties SLS	15
Aantal knooplasten	6000

Project: GT-ZBH150
Masttype: A
Mast: 24

Samenvattingstabellen geleiderbelastingen

In de onderstaande vier tabellen is weergegeven:
- De maximale geleiderbelasting in het globale assenstelsel, gesplitst in aandeel van back en ahead span
- De gecombineerde geleiderbelasting (Ba+Ah) in het globale assenstelsel met in het lokale assenstelsel de maximaal optredende trekkracht. Componenten Fx en Fy als absolute waarde
- De alledaagse (EDS) waarden van de gecombineerde geleiderbelastingen (Ba+Ah) met bijbehorende trekkrachten
- Controle op uplift, waar een negatieve waarde duidt op uplift

Maximale waarden voor back en ahead span

Geleider	Fx_ba [kN]	Fx_ah [kN]	Fy_ba [kN]	Fy_ah [kN]	Fz_ba [kN]	Fz_ah [kN]
bl1	-16,6	16,6	0,6	1,8	4,4	3,7
150ct2f1	-52,5	46,8	5,1	6,0	12,2	10,6
150ct2f2	-52,5	46,8	5,3	6,0	12,2	10,6
150ct2f3	-52,6	46,9	4,3	6,8	14,0	10,6
150ct1f1	-52,6	46,8	2,5	6,0	12,2	10,6
150ct1f2	-52,6	46,8	2,7	6,0	12,2	10,6
150ct1f3	-52,6	46,9	3,9	6,8	14,0	10,6
bl2	-16,6	16,6	1,5	1,8	4,4	3,7

Min. Weight span (m)

Weight spar	Combinatie1		
Geleider	SLS 1a	SLS 4	SLS 7
bl1	376,6	424,6	376,6
150ct2f1	342,9	379,4	342,9
150ct2f2	342,9	379,4	342,9
150ct2f3	384,5	438,8	384,5
150ct1f1	342,9	379,6	342,9
150ct1f2	342,9	379,6	342,9
150ct1f3	384,5	438,9	384,5
bl2	376,6	424,1	376,6

Max. Weight span (m)

Weight spar	Combinatie1	
Geleider	ULS 1a	ULS 3
bl1	494,0	356,9
150ct2f1	409,9	338,2
150ct2f2	409,9	338,2
150ct2f3	492,7	379,4
150ct1f1	409,9	338,2
150ct1f2	409,9	338,2
150ct1f3	492,7	379,4
bl2	494,0	356,9

Omhullende weight span over alle combinaties (incl. 0,9 combinaties)		
Voor alle geleiders		Wind / Weight span verhouding
Max. weight span	494,0 m	2,004 -
Min. weight span	301,9 m	1,225 -

Project: GT-ZBH150
Masttype: A
Mast: 24

Maximale waarden back+ahead span **Maximale waarden trekkracht geleider**

Geleider	Fx [kN]	Fy [kN]	Fz [kN]	Ft_ba [kN]	Ft_ah [kN]
bl1	15,9	2,4	4,4	-16,6	16,6
150ct2f1	50,5	11,2	12,2	-52,6	46,8
150ct2f2	50,5	11,4	12,2	-52,6	46,8
150ct2f3	50,6	11,2	14,0	-52,6	46,9
150ct1f1	50,5	8,6	12,2	-52,6	46,8
150ct1f2	50,5	8,8	12,2	-52,6	46,8
150ct1f3	50,6	10,8	14,0	-52,6	46,9
bl2	15,9	3,3	4,4	-16,6	16,6

EDS-belastingen geleiders

Geleider	Fx [kN]	Fy [kN]	Fz [kN]	Ft_ba [kN]	Ft_ah [kN]
bl1	5,7	0,0	0,9	-5,7	5,7
150ct2f1	18,6	0,6	4,2	-18,6	18,6
150ct2f2	18,6	0,7	4,2	-18,6	18,6
150ct2f3	18,6	0,1	4,8	-18,6	18,6
150ct1f1	18,6	0,0	4,2	-18,6	18,6
150ct1f2	18,6	0,0	4,2	-18,6	18,6
150ct1f3	18,6	0,0	4,8	-18,6	18,6
bl2	5,7	0,2	0,9	-5,7	5,7

Controle uplift SLS-wind

Combinatie	Geleider	Fz_ba [kN]	Fz_ah [kN]
SLS 4	bl1	0,0	0,0
	150ct2f1	0,0	0,0
	150ct2f2	0,0	0,0
	150ct2f3	0,0	0,0
	150ct1f1	0,0	0,0
	150ct1f2	0,0	0,0
	150ct1f3	0,0	0,0
	bl2	0,0	0,0

Project: GT-ZBH150
Masttype: A
Mast: 24

ULS-fundatiebelasting combinatie 1 en 3 wind haaks op de lijn of bissectrice en EDS, vanuit geleiders

Combinatie	Combination	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_75		-1	63	71	1507	2	17
ULS 1a_0,9_0		3	0	58	0	74	0
ULS 1a_0,9_0,9_75		-5	63	54	1507	-107	18
ULS 3_0		22	0	104	0	540	0
SLS 7		0	0	54	0	1	0

ULS-fundatiebelasting combinatie 1 en 3 wind haaks op de lijn of bissectrice en EDS, totaal geleiders en mast

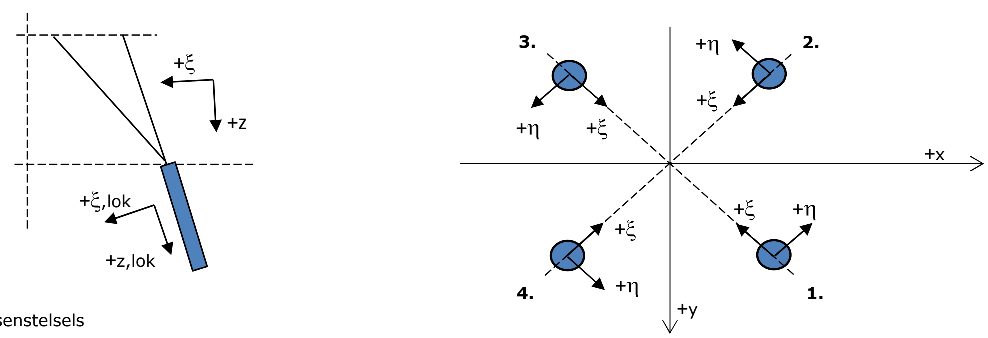
Combinatie	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_75	37	205	189	4068	689	17
ULS 1a_0,9_0,9_75	33	205	146	4069	579	18
SLS 7	0	0	157	0	1	0

Fundatiebelastingen, selectie belastingcombinaties op basis grootste waarde

Combinatie	F_x [kN]	F_y [kN]	F_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
ULS 1a_105	-39	205	189	**4073**	-683	-9
SPLS 1a_0 Ba All Cts	257	0	159	0	**5687**	0
SPLS 6a_75 Ba Ct2 Ba 10	51	33	195	530	1263	**704**
SPLS 1a_45 Ba All Cts	238	100	159	**1976**	**5300**	0

Noot: grootste waarden kunnen in meerdere combinaties voorkomen, een combinatie is weergegeven.

Oplegreacties op fundering per randstijl



Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 1a_45 Ba All Cts	94	106	**713**	-9	-141	-22	723
2	SPLS 1a_0 Ba All Cts	70	-87	**566**	12	-111	-17	574
3	SPLS 3_135 Ah All Cts	-53	-74	**469**	-15	-89	-11	475
4	SPLS 1a_135 Ah All Cts	-93	105	**703**	8	-139	-22	712

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_135 Ah All Cts	-42	-61	**-392**	14	73	7	-398
2	SPLS 1a_0,9_135 Ah All Cts	-80	94	**-629**	-10	123	18	-638
3	SPLS 1a_0,9_45 Ba All Cts	83	95	**-641**	9	126	19	-650
4	SPLS 1a_0,9_0 Ba All Cts	59	-76	**-494**	-12	95	13	-500

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_90 Ah Ct1	26	-50	-105	**54**	17	0	-106
2	SPLS 3_0,9_90 Ba Ct2	-12	-63	199	**52**	-36	-3	201
3	SPLS 3_90 Ba Ct2	1	75	-282	**52**	54	7	-286
4	SPLS 6a_75 Ah Ct1 Ba 10	-9	81	321	**51**	-63	-10	325

Maximale torsiebelasting (negatief)

Stijl Index	Combinatie Combination	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_90 Ba Ct1	19	89	395	**-50**	-76	-10	401
2	SPLS 3_90 Ah Ct2	-3	76	-291	**-52**	56	7	-295
3	SPLS 6a_75 Ah Ct2 Ba 21	11	-63	194	**-52**	-37	-5	197
4	SPLS 3_90 Ba Ct1	-29	-48	-86	**-54**	14	-1	-88

Project: GT-ZBH150
Masttype: A
Mast: 24

Combinatie Ftrek+Fhor

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 3_0,9_135 Ah All Cts	-42	-61	**-392**	**14**	73	7	-398
2	SPLS 1a_0,9_135 Ah All Cts	-80	94	**-629**	**-10**	123	18	-638
3	SPLS 1a_0,9_45 Ba All Cts	83	95	**-641**	**9**	126	19	-650
4	SPLS 1a_0,9_0 Ba All Cts	59	-76	**-494**	**-12**	95	13	-500

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SLS 7	6	6	39	0	-9	-2	40
2	SLS 7	6	-6	39	0	-9	-2	40
3	SLS 7	-6	-6	39	0	-8	-2	40
4	SLS 7	-6	6	39	0	-8	-2	40

Omhullenden ongeacht stijl

Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	SPLS 1a_45 Ba All Cts	94	106	**713**	-9	-141	-22	723
Max. trek	SPLS 1a_0,9_45 Ba All Cts	83	95	**-641**	9	126	19	-650
Max. pos. torsie	SPLS 3_90 Ah Ct1	26	-50	-105	**54**	17	0	-106
Max. neg. torsie	SPLS 3_90 Ba Ct1	-29	-48	-86	**-54**	14	-1	-88
Comb. trek+torsie	SPLS 1a_0,9_45 Ba All Cts	83	95	**-641**	**9**	126	19	-650

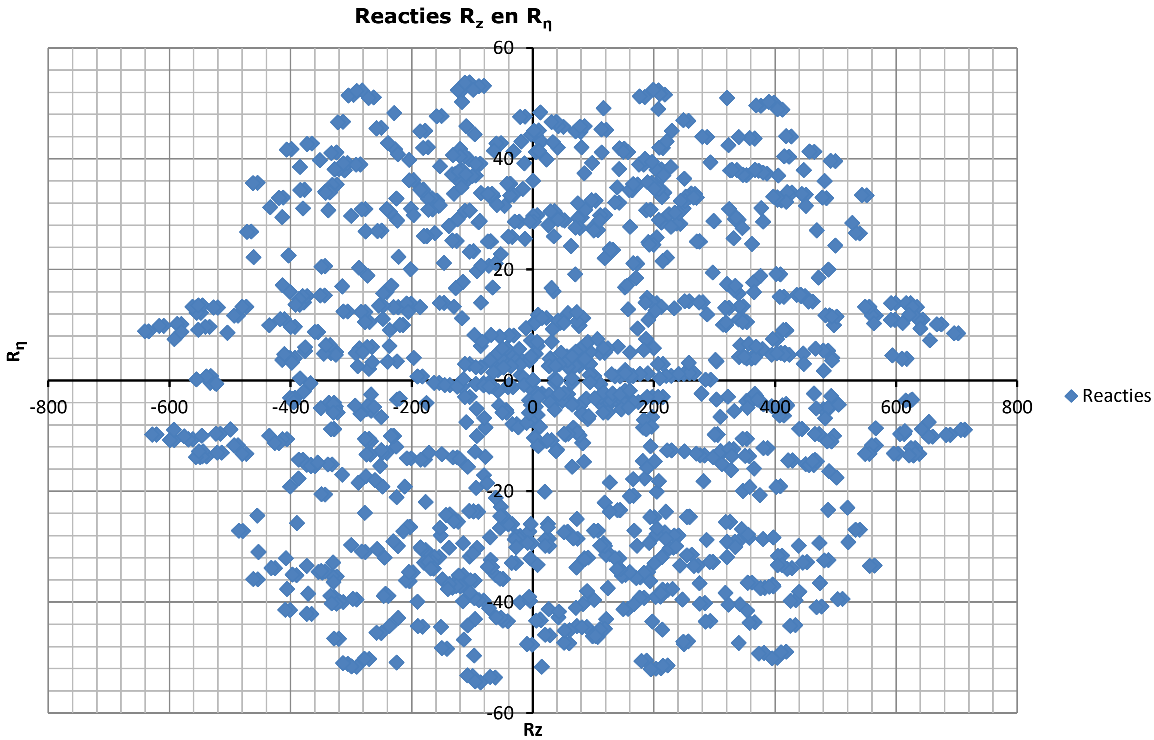
Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SPLS 6a_75 Ah All Cts Ba 12	-21	-50	**-287**	20	50	2	-291
2	SPLS 6a_75 Ah All Cts Ba 12	-49	55	**-395**	-4	73	7	-400
3	SLS 1a_45	54	53	**-367**	-1	75	14	-373
4	SPLS 6a_75 Ba All Cts Ba 10	22	-36	**-230**	-10	41	3	-233

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SLS 1a_45	68	63	**447**	3	-93	-18	453
2	SPLS 6a_75 Ba All Cts Ba 10	36	-50	**319**	10	-60	-7	323
3	SPLS 6a_75 Ah All Cts Ba 12	-47	-53	**380**	-4	-71	-7	386
4	SPLS 6a_75 Ah All Cts Ba 12	-52	80	**488**	20	-94	-12	495

Project: GT-ZBH150
Masttype: A
Mast: 24



01. Leeswijzer en set labels

LEESWIJZER BELASTINGSCOMBINATIES

De belastingen gevallen in de tabellen zijn een afgeleide van de tabellen gegeven in de NORM EN50341-3-15:2017. Tabel 4.13.a, 4.13.b en 4.13.c.
Daar waar relevant zijn deze belastinggevallen opgenomen in de berekening.

- De windrichtingen zijn gerelateerd zijn aan Alignment of bisector en zijn afgestemd op de ahead en back span.
- De belastingen in de tabellen zijn gegeven in het zogenaamde "structucture coordinate system".
- De posities van de geleiders zijn gelabeld met zogenaamde setnummers. De figuren geven de setnummers weer met de toevoeging "..:1". Voor de belastingen is dit weggelaten, gezien deze geen extra informatie geven.

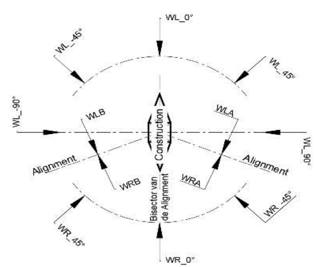
Bijvoorbeeld:
ULS 50yr 1a W ZII Non-Urban WRB, staat voor:

ULS	= Ultimate Limit State,
50yr	= Referentie periode 50 jaar
1a W ZII Non-Urban	= Belastingsgevallen 1 met extreem wind Zone II in niet bebouwd gebied.
WRB	= Wind van Rechts, loodrecht op de alignment van de Back span (zie legenda voor overige aanblaashoeken)

- De toevoeging Br:
Br = Breuk, is bedoeld voor de simulatie van geleiderbreuk met verder een verwijzing naar de afspansets. Bijvoorbeeld SpLS Br. 1a W ZII Non-Urban WRB 1 2 3 7 , afwezigheid van geleiders van de afspanningen ter plaatse van afspansets 1, 2, 3 en 7

- De toevoeging Ydl 0.9:
Ydl 0.9 = Gamma Deadload, is bedoeld voor de gunstige werking van eigengewicht van de constructie op de fundatie en als dusdanig ook (enkel) van belang voor de fundatie.

Legenda wind invalshoek:	
WL_[x] =	Wind van Links onder een hoek [x] ten opzichte van de Bisector
WR_[x] =	Wind van Rechts onder een hoek [x] ten opzichte van de Bisector
WLB =	Wind van Links loodrecht op de alignment van de Back span
WLA =	Wind van Links loodrecht op de alignment van de Ahead span
WRB =	Wind van Rechts loodrecht op de alignment van de Back span
WRA =	Wind van Rechts loodrecht op de alignment van de Ahead span
GW =	Geen Wind



Gehanteerde algemene parameters

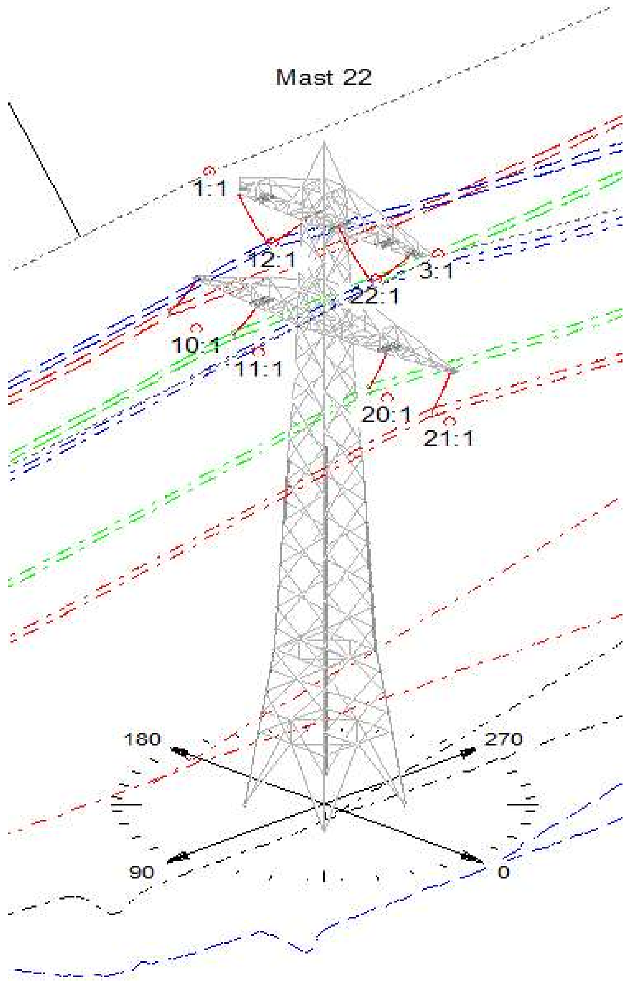
Status :	Afkeur CC2-0	Y_{qw} :	1.13
Windgebied :	Zone 3	Y_{qi} :	0.97
Basiswindsnelheid :	24.5 m/s	Richtingsfactor (Cdir) :	1
Terreincatagorie :	Non-Urban	IJsgebied fasegeleider :	B
Betrouwbaarheidsklasse :	CC2-0	IJsgebied bliksemdraad :	A
Referentieperiode :	30 jaar		

Factoren onder ULS 30yr		Partiele factor			
Omschrijving	Temperatuur	G_k	Q_{pk}	Q_{wk}	Q_{ik}
1a W ZIII	10	1.05		1.13	
3 W + I ZIII	-5	1.05		0.34	0.97
4 Cold ZIII	-20	1.05		0.23	
5a Trsnl ZIII	10	1.00	1.00		
6a C & M ZIII	5	1.05	1.20	0.23	
6b Wght Lnsmn	5	1.05	1.20	0.23	
7 Permanent	10	1.15			
8 Special	10	1.00		0.00	

Factoren onder SpLS		Partiele factor			
Omschrijving	Temperatuur	G_k	Q_{pk}	Q_{wk}	Q_{ik}
SpLS 1a W ZIII	10	1.05		0.78	
SpLS 3 W + I ZIII	-5	1.05		0.36	0.34
SpLS 4 Cold ZIII	-20	1.05		0.24	
SpLS 6a C & M ZIII	5	1.05	1.20	0.24	
SpLS 6b Wght Lnsmn	5	1.05	1.20	0.24	

Factoren onder SeLS		Partiele factor			
Omschrijving	Temperatuur	G_k	Q_{pk}	Q_{wk}	Q_{ik}
SeLS 1a W ZIII	10	1.00		0.94	
SeLS 3 W + I ZIII	-5	1.00		0.28	0.88
SeLS 4 Cold ZIII	-20	1.00		0.19	
SeLS 6a C & M ZIII	5	1.00	1.00	0.19	
SeLS 7 Permanent	10	1.00			

Overzicht set nummers tijdelijke masten



03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
Mast 22	10°C	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 1a W ZIII WLB	1	636	1690	13236	1693	-2771	-9979
		10	3641	5585	34887	6015	-8552	-34298
		11	3639	5580	34916	6017	-8385	-34367
		12	4991	6917	35774	9565	-6120	-34731
	ULS 30yr 1a W ZIII WRB	1	637	-1691	13284	1546	-3490	-8948
		10	3776	-5183	33007	5962	-11008	-30433
		11	3775	-5184	33019	5970	-10852	-30518
		12	5045	-6884	35631	9643	-12579	-34217
	ULS 30yr 1a W ZIII WLA	1	637	1587	12684	1683	-2744	-10035
		10	3647	5274	33630	5817	-8053	-32918
		11	3644	5270	33656	5818	-7895	-32980
		12	4998	6543	34185	9152	-5541	-32735
	ULS 30yr 1a W ZIII WRA	1	638	-1587	12734	1589	-3595	-9128
		10	3781	-4892	31865	5894	-10854	-29611
		11	3780	-4893	31876	5901	-10698	-29691
		12	5052	-6514	34393	9579	-12440	-33555
	ULS 30yr 1a W ZIII WL_0	1	636	1664	13098	1699	-2775	-10083
		10	3641	5508	34595	5953	-8380	-33941
		11	3638	5504	34623	5955	-8216	-34007
		12	4992	6822	35336	9419	-5887	-34077
	ULS 30yr 1a W ZIII WL_-45	1	644	650	7691	1262	-2023	-7314
		10	3745	2352	22614	4488	-5252	-21575
		11	3744	2349	22616	4488	-5148	-21601
		12	5057	3060	22038	6794	-3262	-19885
	ULS 30yr 1a W ZIII WL_-90	1	649	-34	5806	1011	-1758	-5360
		10	3795	-64	18744	4110	-5243	-17161
		11	3794	-65	18744	4111	-5155	-17189
		12	5070	-332	18276	6165	-4500	-15721
	ULS 30yr 1a W ZIII WL_45	1	643	1067	9809	1398	-2352	-7764
		10	3724	3629	26858	5234	-7100	-26692
		11	3722	3626	26873	5234	-6961	-26741
		12	5048	4643	27715	8480	-5522	-28036
	ULS 30yr 1a W ZIII WL_90	1	649	34	5828	1075	-1860	-5578
		10	3796	278	19415	4429	-5782	-19310
		11	3795	277	19416	4429	-5678	-19342
		12	5069	331	19948	7246	-5584	-21220
	ULS 30yr 1a W ZIII WR_0	1	637	-1665	13148	1576	-3571	-9099
		10	3778	-5113	32754	5967	-11041	-30309
		11	3777	-5113	32766	5974	-10883	-30392
		12	5047	-6790	35369	9675	-12637	-34227
	ULS 30yr 1a W ZIII WR_-45	1	647	-650	7707	1349	-2801	-7269
		10	3804	-2106	21931	4813	-7677	-21127
		11	3803	-2106	21934	4815	-7557	-21173
		12	5075	-3055	23158	7867	-8676	-23945
	ULS 30yr 1a W ZIII WR_45	1	641	-1068	9818	1228	-2505	-6918
		10	3794	-3319	25307	4912	-7921	-23035
		11	3793	-3320	25313	4916	-7807	-23092
		12	5066	-4629	26689	7731	-8760	-24471
	ULS 30yr 1a W ZIII 0.9 WLB	1	543	1690	13058	1646	-2745	-9901
		10	3091	5582	33795	5593	-8237	-33265
		11	3088	5577	33827	5595	-8076	-33335
		12	4253	6923	34770	8910	-5864	-33794
	ULS 30yr 1a W ZIII 0.9 WRB	1	543	-1691	13108	1497	-3461	-8860
		10	3229	-5190	31918	5549	-10703	-29427
		11	3228	-5191	31931	5557	-10552	-29511
		12	4311	-6888	34635	9000	-12315	-33278
	ULS 30yr 1a W ZIII 0.9 WLA	1	543	1587	12493	1636	-2718	-9956
		10	3097	5270	32486	5389	-7724	-31833
		11	3094	5266	32514	5390	-7573	-31897
		12	4261	6550	33121	8487	-5269	-31739
	ULS 30yr 1a W ZIII 0.9 WRA	1	545	-1587	12545	1540	-3565	-9036
		10	3233	-4900	30716	5474	-10532	-28548
		11	3232	-4900	30728	5481	-10381	-28627
		12	4318	-6518	33334	8924	-12160	-32554
	ULS 30yr 1a W ZIII 0.9 WL_0	1	542	1664	12917	1652	-2750	-10008
		10	3090	5505	33492	5530	-8062	-32896
		11	3088	5501	33523	5532	-7905	-32964
		12	4254	6829	34318	8762	-5628	-33127
	ULS 30yr 1a W ZIII 0.9 WL_-45	1	551	650	7258	1189	-1939	-7060
		10	3200	2340	20657	3968	-4697	-19724
		11	3199	2338	20660	3968	-4603	-19747

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
		12	4331	3062	20105	5978	-2758	-18038
	ULS 30yr 1a W ZIII 0.9 WL_-90	1	556	-34	5108	904	-1597	-4871
		10	3252	-79	16269	3530	-4536	-14811
		11	3251	-80	16269	3530	-4460	-14834
		12	4345	-332	15795	5252	-3845	-13322
	ULS 30yr 1a W ZIII 0.9 WL_45	1	550	1068	9516	1336	-2293	-7586
		10	3178	3621	25282	4756	-6649	-25198
		11	3176	3618	25298	4757	-6518	-25246
		12	4316	4648	26224	7740	-5135	-26617
	ULS 30yr 1a W ZIII 0.9 WL_90	1	556	34	5131	969	-1700	-5095
		10	3253	264	16945	3849	-5077	-16968
		11	3253	263	16946	3849	-4985	-16996
		12	4344	331	17475	6335	-4933	-18836
	ULS 30yr 1a W ZIII 0.9 WR_0	1	544	-1665	12970	1527	-3542	-9012
		10	3230	-5120	31651	5552	-10732	-29290
		11	3229	-5120	31664	5560	-10579	-29373
		12	4313	-6794	34358	9029	-12370	-33273
	ULS 30yr 1a W ZIII 0.9 WR_-45	1	554	-650	7269	1279	-2723	-7036
		10	3259	-2118	19929	4290	-7111	-19246
		11	3259	-2118	19932	4291	-7000	-19288
		12	4349	-3055	21204	7051	-8160	-22070
	ULS 30yr 1a W ZIII 0.9 WR_45	1	548	-1068	9526	1166	-2446	-6739
		10	3248	-3328	23716	4436	-7469	-21538
		11	3247	-3329	23722	4440	-7363	-21592
		12	4337	-4631	25201	6996	-8364	-23039
	ULS 30yr 5a Trsnl ZIII Br. 1 Ba	1	0	0	0	833	-1239	-3741
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 3 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 10 Ba	1	618	0	5583	1007	-1754	-5302
		10	0	0	0	3571	-734	-2281
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 11 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	0	0	0	3569	-719	-2276
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 12 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	0	0	0	6278	-731	-2637
	ULS 30yr 5a Trsnl ZIII Br. 20 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 21 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 22 Ba	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 1 Ah	1	669	-1	5423	0	0	0
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 3 Ah	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 10 Ah	1	618	0	5583	1007	-1754	-5302
		10	4904	-1	11051	0	0	0
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 11 Ah	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	4904	-1	11037	0	0	0
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 12 Ah	1	618	0	5583	1007	-1754	-5302

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	7387	-1	11663	0	0	0
	ULS 30yr 5a Trsnl ZIII Br. 20 Ah	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 21 Ah	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	ULS 30yr 5a Trsnl ZIII Br. 22 Ah	1	618	0	5583	1007	-1754	-5302
		10	3615	102	18245	4075	-5274	-17444
		11	3614	101	18245	4075	-5182	-17472
		12	4828	-1	18226	6391	-4808	-17614
	SeLS 1a W ZIII WLB	1	608	1406	11636	1562	-2587	-9153
		10	3494	4656	30769	5458	-7625	-30222
		11	3492	4652	30791	5459	-7476	-30280
		12	4774	5747	31459	8665	-5542	-30544
	SeLS 1a W ZIII WRB	1	608	-1407	11675	1435	-3175	-8265
		10	3604	-4303	29119	5399	-9644	-26924
		11	3603	-4303	29129	5405	-9505	-26997
		12	4815	-5723	31325	8717	-10927	-30126
	SeLS 1a W ZIII WLA	1	608	1320	11168	1546	-2546	-9146
		10	3499	4397	29733	5294	-7211	-29081
		11	3497	4394	29753	5295	-7070	-29134
		12	4780	5436	30146	8322	-5062	-28888
	SeLS 1a W ZIII WRA	1	609	-1320	11207	1468	-3254	-8390
		10	3607	-4061	28187	5344	-9520	-26254
		11	3606	-4061	28197	5350	-9381	-26323
		12	4820	-5415	30310	8666	-10815	-29588

04. Summery

		Maximaal optredende belasting (N)			
Mast nummer	**Mast type**	**Verticaal**	**Dwarsbelasting**	**In lijnrichting**	**Maatgevende load case**
Mast 22	D+3.6_ZBH-MDK150 - Verbouw	7530	-3002	360	ULS 30yr 3 W + I ZIII WLB

01. Leeswijzer en set labels

LEESWIJZER BELASTINGSCOMBINATIES
De belastingen gevallen in de tabellen zijn een afgeleide van de tabellen gegeven in de NORM EN50341-3-15:2017. Tabel 4.13.a, 4.13.b en 4.13.c. Daar waar relevant zijn deze belastinggevallen opgenomen in de berekening.

- De windrichtingen zijn gerelateerd zijn aan Alignment of bisector en zijn afgestemd op de ahead en back span.
- De belastingen in de tabellen zijn gegeven in het zogenaamde "structucture coordinate system".
- De posities van de geleiders zijn gelabeld met zogenaamde setnummers. De figuren geven de setnummers weer met de toevoeging "..:1". Voor de belastingen is dit weggelaten, gezien deze geen extra informatie geven.

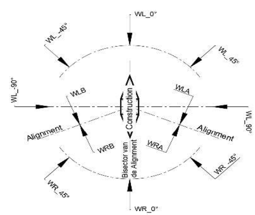
Bijvoorbeeld:
ULS 50yr 1a W ZII Non-Urban WRB, staat voor:

ULS	= Ultimate Limit State,
50yr	= Referentie periode 50 jaar
1a W ZII Non-Urban	= Belastingsgevallen 1 met extreem wind Zone II in niet bebouwd gebied.
WRB	= Wind van Rechts, loodrecht op de alignment van de Back span (zie legenda voor overige aanblaashoeken)

- De toevoeging Br:
Br = Breuk, is bedoeld voor de simulatie van geleiderbreuk met verder een verwijzing naar de afspansets. Bijvoorbeeld SpLS Br. 1a W ZII Non-Urban WRB 1 2 3 7 , afwezigheid van geleiders van de afspanningen ter plaatse van afspansets 1, 2, 3 en 7

- De toevoeging Ydl 0.9:
Ydl 0.9 = Gamma Deadload, is bedoeld voor de gunstige werking van eigengewicht van de constructie op de fundatie en als dusdanig ook (enkel) van belang voor de fundatie.

Legenda wind invalshoek:	
WL_[x] =	Wind van Links onder een hoek [x] ten opzichte van de Bisector
WR_[x] =	Wind van Rechts onder een hoek [x] ten opzichte van de Bisector
WLB =	Wind van Links loodrecht op de alignment van de Back span
WLA =	Wind van Links loodrecht op de alignment van de Ahead span
WRB =	Wind van Rechts loodrecht op de alignment van de Back span
WRA =	Wind van Rechts loodrecht op de alignment van de Ahead span
GW =	Geen Wind



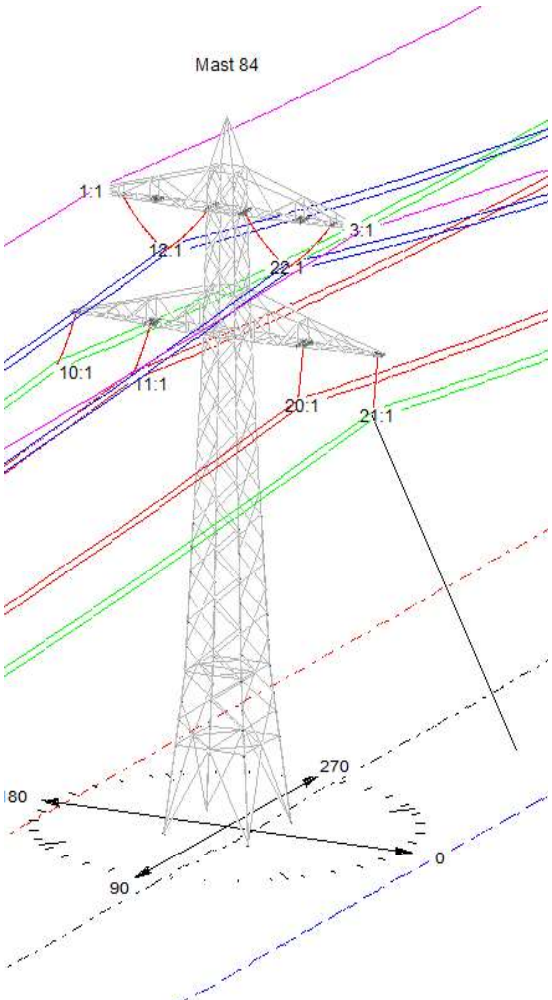
Gehanteerde algemene parameters			
Status :	Afkeur CC2-0	γ_{Qw} :	1.13
Windgebied :	Zone 3	γ_{Qi} :	0.97
Basiswindsnelheid :	24.5 m/s	Richtingsfactor (Cdir) :	1
Terreincatagorie :	Non-Urban	IJsgebied fasegeleider :	B
Betrouwbaarheidsklasse :	CC2-0	IJsgebied bliksemdraad :	A
Referentieperiode :	30 jaar		

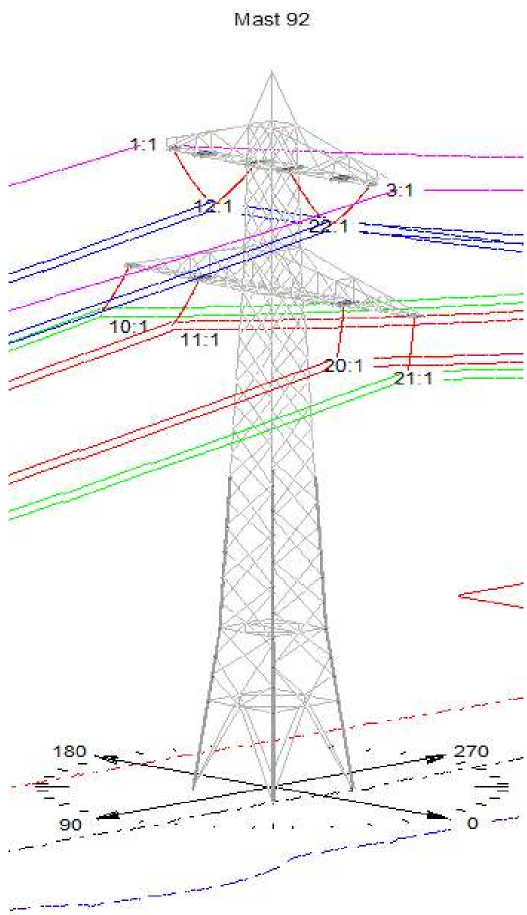
Factoren onder ULS 30yr		Partiele factor			
Omschrijving	**Temperatuur**	G_k	Q_{pk}	Q_{wk}	Q_{ik}
1a W ZIII	10	1.05		1.13	
3 W + I ZIII	-5	1.05		0.34	0.97
4 Cold ZIII	-20	1.05		0.23	
5a Trsnl ZIII	10	1.00	1.00		
6a C & M ZIII	5	1.05	1.20	0.23	
6b Wght Lnsmn	5	1.05	1.20	0.23	
7 Permanent	10	1.15			
8 Special	10	1.00		0.00	

Factoren onder SpLS		Partiele factor			
Omschrijving	**Temperatuur**	G_k	Q_{pk}	Q_{wk}	Q_{ik}
SpLS 1a W ZIII	10	1.05		0.78	
SpLS 3 W + I ZIII	-5	1.05		0.36	0.34
SpLS 4 Cold ZIII	-20	1.05		0.24	
SpLS 6a C & M ZIII	5	1.05	1.20	0.24	
SpLS 6b Wght Lnsmn	5	1.05	1.20	0.24	

Factoren onder SeLS		Partiele factor			
Omschrijving	**Temperatuur**	G_k	Q_{pk}	Q_{wk}	Q_{ik}
SeLS 1a W ZIII	10	1.00		0.94	
SeLS 3 W + I ZIII	-5	1.00		0.28	0.88
SeLS 4 Cold ZIII	-20	1.00		0.19	
SeLS 6a C & M ZIII	5	1.00	1.00	0.19	
SeLS 7 Permanent	10	1.00			

Overzicht set nummers tijdelijke masten





03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
Mast 92	10°C	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 1a W ZIII WLB	1	2149	-2012	-11499	681	1864	14486
		10	6563	-7940	-36386	3774	5968	36701
		11	6491	-7571	-36494	3771	5958	36742
		12	11501	-4455	-37383	5139	7414	38060
	ULS 30yr 1a W ZIII WRB	1	1965	-2560	-10410	682	-1862	14516
		10	6757	-9464	-33081	3902	-5608	34951
		11	6694	-9130	-33219	3901	-5609	34970
		12	11620	-10235	-37421	5159	-7397	38102
	ULS 30yr 1a W ZIII WLA	1	2149	-2012	-11499	681	1864	14486
		10	6563	-7940	-36386	3774	5968	36701
		11	6491	-7571	-36494	3771	5958	36742
		12	11501	-4455	-37383	5139	7414	38060
	ULS 30yr 1a W ZIII WRA	1	1965	-2560	-10410	682	-1862	14516
		10	6757	-9464	-33081	3902	-5608	34951
		11	6694	-9130	-33219	3901	-5609	34970
		12	11620	-10235	-37421	5159	-7397	38102
	ULS 30yr 1a W ZIII WL_0	1	2149	-2012	-11499	681	1864	14486
		10	6563	-7940	-36386	3774	5968	36701
		11	6491	-7571	-36494	3771	5958	36742
		12	11501	-4455	-37383	5139	7414	38060
	ULS 30yr 1a W ZIII WL_-45	1	1617	-1510	-8594	683	946	9507
		10	4950	-5172	-24427	3866	3192	25210
		11	4904	-4923	-24485	3864	3187	25227
		12	8248	-2525	-23363	5205	4096	25138
	ULS 30yr 1a W ZIII WL_-90	1	1181	-1220	-5933	687	1	6187
		10	4159	-4322	-17453	3933	86	18764
		11	4128	-4141	-17498	3932	84	18766
		12	6681	-3109	-16037	5220	1	18297
	ULS 30yr 1a W ZIII WL_45	1	1650	-1614	-8456	685	946	9508
		10	5234	-5805	-25513	3881	3155	25366
		11	5183	-5533	-25574	3878	3150	25374
		12	9321	-3651	-27177	5209	4096	26283
	ULS 30yr 1a W ZIII WL_90	1	1238	-1289	-6092	687	1	6205
		10	4527	-4941	-19519	3937	94	19402
		11	4487	-4730	-19570	3935	92	19401
		12	8035	-4309	-21511	5219	1	19939
	ULS 30yr 1a W ZIII WR_0	1	1965	-2560	-10410	682	-1862	14516
		10	6757	-9464	-33081	3902	-5608	34951
		11	6694	-9130	-33219	3901	-5609	34970
		12	11620	-10235	-37421	5159	-7397	38102
	ULS 30yr 1a W ZIII WR_-45	1	1638	-2018	-8314	685	-945	9529
		10	5354	-6949	-23843	3933	-2957	24519
		11	5308	-6698	-23938	3932	-2958	24534
		12	9390	-7444	-27190	5213	-4092	26273
	ULS 30yr 1a W ZIII WR_45	1	1513	-1801	-7913	684	-944	9496
		10	4976	-6157	-22235	3932	-2909	23912
		11	4934	-5933	-22314	3931	-2911	23918
		12	8298	-6308	-23317	5210	-4092	25131
	ULS 30yr 1a W ZIII 0.9 WLB	1	2116	-2003	-11458	582	1864	14315
		10	6172	-7692	-35397	3204	5965	35672
		11	6101	-7336	-35509	3200	5955	35719
		12	10850	-4277	-36480	4381	7420	37115
	ULS 30yr 1a W ZIII 0.9 WRB	1	1929	-2547	-10348	583	-1862	14346
		10	6379	-9218	-32112	3335	-5613	33917
		11	6318	-8894	-32249	3333	-5614	33938
		12	10993	-10047	-36541	4404	-7400	37174
	ULS 30yr 1a W ZIII 0.9 WLA	1	2116	-2003	-11458	582	1864	14315
		10	6172	-7692	-35397	3204	5965	35672
		11	6101	-7336	-35509	3200	5955	35719
		12	10850	-4277	-36480	4381	7420	37115
	ULS 30yr 1a W ZIII 0.9 WRA	1	1929	-2547	-10348	583	-1862	14346
		10	6379	-9218	-32112	3335	-5613	33917
		11	6318	-8894	-32249	3333	-5614	33938
		12	10993	-10047	-36541	4404	-7400	37174
	ULS 30yr 1a W ZIII 0.9 WL_0	1	2116	-2003	-11458	582	1864	14315
		10	6172	-7692	-35397	3204	5965	35672
		11	6101	-7336	-35509	3200	5955	35719
		12	10850	-4277	-36480	4381	7420	37115
	ULS 30yr 1a W ZIII 0.9 WL_-45	1	1555	-1466	-8384	585	946	9159
		10	4470	-4767	-22788	3300	3184	23511
		11	4427	-4538	-22850	3297	3178	23531

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
		12	7443	-2211	-21771	4455	4099	23498
	ULS 30yr 1a W ZIII 0.9 WL_-90	1	1059	-1103	-5373	588	0	5453
		10	3571	-3724	-15047	3371	74	16271
		11	3544	-3568	-15087	3369	72	16272
		12	5685	-2626	-13590	4474	1	15799
	ULS 30yr 1a W ZIII 0.9 WL_45	1	1587	-1569	-8241	586	946	9157
		10	4749	-5390	-23845	3316	3147	23633
		11	4700	-5137	-23904	3314	3142	23643
		12	8515	-3336	-25577	4459	4100	24636
	ULS 30yr 1a W ZIII 0.9 WL_90	1	1117	-1174	-5540	588	0	5472
		10	3938	-4345	-17120	3375	81	16913
		11	3903	-4160	-17165	3373	80	16913
		12	7044	-3828	-19079	4473	1	17451
	ULS 30yr 1a W ZIII 0.9 WR_0	1	1929	-2547	-10348	583	-1862	14346
		10	6379	-9218	-32112	3335	-5613	33917
		11	6318	-8894	-32249	3333	-5614	33938
		12	10993	-10047	-36541	4404	-7400	37174
	ULS 30yr 1a W ZIII 0.9 WR_-45	1	1578	-1976	-8113	587	-945	9179
		10	4873	-6537	-22189	3368	-2966	22786
		11	4830	-6303	-22276	3367	-2966	22803
		12	8591	-7124	-25594	4464	-4094	24627
	ULS 30yr 1a W ZIII 0.9 WR_45	1	1453	-1759	-7713	586	-944	9146
		10	4492	-5740	-20561	3367	-2917	22165
		11	4453	-5534	-20637	3366	-2919	22172
		12	7499	-5989	-21726	4460	-4094	23495
	ULS 30yr 5a Trsnl ZIII Br. 1 Ba	1	0	0	0	705	0	5781
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 3 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 10 Ba	1	1169	-1216	-5828	654	1	5954
		10	0	0	0	5039	0	11364
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 11 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	0	0	0	5039	0	11335
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 12 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	0	0	0	7524	0	11925
	ULS 30yr 5a Trsnl ZIII Br. 20 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 21 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 22 Ba	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 1 Ah	1	700	-582	-2783	0	0	0
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 3 Ah	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 10 Ah	1	1169	-1216	-5828	654	1	5954
		10	3192	-361	-1303	0	0	0
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 11 Ah	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	3198	-350	-1323	0	0	0
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 12 Ah	1	1169	-1216	-5828	654	1	5954

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	5919	-338	-1684	0	0	0
	ULS 30yr 5a Trsnl ZIII Br. 20 Ah	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 21 Ah	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	ULS 30yr 5a Trsnl ZIII Br. 22 Ah	1	1169	-1216	-5828	654	1	5954
		10	4145	-4431	-17678	3748	86	18246
		11	4111	-4244	-17724	3746	84	18246
		12	7016	-3539	-17914	4971	1	18238
	SeLS 1a W ZIII WLB	1	1982	-1885	-10580	649	1551	12751
		10	5905	-7016	-31923	3622	4974	32223
		11	5841	-6689	-32015	3619	4966	32255
		12	10319	-4033	-32750	4917	6161	33325
	SeLS 1a W ZIII WRB	1	1832	-2344	-9688	650	-1549	12773
		10	6044	-8270	-29096	3725	-4659	30696
		11	5990	-7976	-29217	3724	-4660	30714
		12	10397	-8851	-32765	4930	-6149	33346
	SeLS 1a W ZIII WLA	1	1982	-1885	-10580	649	1551	12751
		10	5905	-7016	-31923	3622	4974	32223
		11	5841	-6689	-32015	3619	4966	32255
		12	10319	-4033	-32750	4917	6161	33325
	SeLS 1a W ZIII WRA	1	1832	-2344	-9688	650	-1549	12773
		10	6044	-8270	-29096	3725	-4659	30696
		11	5990	-7976	-29217	3724	-4660	30714
		12	10397	-8851	-32765	4930	-6149	33346
Mast 84	10°C	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 1a W ZIII WLB	1	1266	-795	-12853	-169	1834	15945
		10	4754	-2513	-41575	1607	5818	41327
		11	4760	-2353	-41535	1613	5811	41282
		12	7759	594	-40963	2974	7344	41235
	ULS 30yr 1a W ZIII WRB	1	1215	-2148	-12130	-173	-1833	16020
		10	4865	-6031	-37589	1915	-5670	38384
		11	4865	-5882	-37648	1912	-5670	38405
		12	7884	-6965	-40809	3042	-7300	41122
	ULS 30yr 1a W ZIII WLA	1	1266	-795	-12853	-169	1834	15945
		10	4754	-2513	-41575	1607	5818	41327
		11	4760	-2353	-41535	1613	5811	41282
		12	7759	594	-40963	2974	7344	41235
	ULS 30yr 1a W ZIII WRA	1	1215	-2148	-12130	-173	-1833	16020
		10	4865	-6031	-37589	1915	-5670	38384
		11	4865	-5882	-37648	1912	-5670	38405
		12	7884	-6965	-40809	3042	-7300	41122
	ULS 30yr 1a W ZIII WL_0	1	1266	-795	-12853	-169	1834	15945
		10	4754	-2513	-41575	1607	5818	41327
		11	4760	-2353	-41535	1613	5811	41282
		12	7759	594	-40963	2974	7344	41235
	ULS 30yr 1a W ZIII WL_-45	1	1047	-748	-10214	58	932	10827
		10	3866	-1549	-27195	2254	3118	27566
		11	3867	-1450	-27169	2257	3113	27537
		12	6079	536	-24701	3669	4072	26096
	ULS 30yr 1a W ZIII WL_-90	1	872	-872	-7498	272	1	7641
		10	3500	-1977	-19166	2829	64	19995
		11	3498	-1904	-19172	2829	62	19993
		12	5390	-1308	-16782	4200	1	18632
	ULS 30yr 1a W ZIII WL_45	1	1078	-873	-9979	138	932	11115
		10	4106	-2171	-30183	2414	3116	29613
		11	4107	-2053	-30180	2415	3111	29603
		12	6976	-346	-32118	3697	4074	30980
	ULS 30yr 1a W ZIII WL_90	1	898	-913	-7674	277	1	7736
		10	3770	-2449	-23540	2707	83	22955
		11	3767	-2357	-23553	2705	81	22957
		12	6385	-2125	-26626	3900	1	24853
	ULS 30yr 1a W ZIII WR_0	1	1215	-2148	-12130	-173	-1833	16020
		10	4865	-6031	-37589	1915	-5670	38384
		11	4865	-5882	-37648	1912	-5670	38405
		12	7884	-6965	-40809	3042	-7300	41122

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
	ULS 30yr 1a W ZIII WR_-45	1	1091	-1640	-10065	133	-931	11218
		10	4234	-4323	-28302	2574	-2979	28208
		11	4232	-4204	-28334	2572	-2980	28218
		12	7032	-5010	-32182	3709	-4061	31010
	ULS 30yr 1a W ZIII WR_45	1	979	-1381	-9172	60	-931	10794
		10	3914	-3634	-24821	2438	-2952	25757
		11	3912	-3543	-24856	2436	-2953	25770
		12	6097	-4108	-24472	3692	-4061	25935
	ULS 30yr 1a W ZIII 0.9 WLB	1	1211	-784	-12755	-258	1834	15769
		10	4373	-2442	-40644	1100	5809	40374
		11	4380	-2284	-40601	1107	5802	40326
		12	7141	657	-40072	2272	7348	40305
	ULS 30yr 1a W ZIII 0.9 WRB	1	1158	-2134	-12016	-262	-1833	15846
		10	4471	-5926	-36580	1410	-5676	37341
		11	4472	-5781	-36639	1408	-5676	37362
		12	7274	-6883	-39894	2346	-7303	40173
	ULS 30yr 1a W ZIII 0.9 WLA	1	1211	-784	-12755	-258	1834	15769
		10	4373	-2442	-40644	1100	5809	40374
		11	4380	-2284	-40601	1107	5802	40326
		12	7141	657	-40072	2272	7348	40305
	ULS 30yr 1a W ZIII 0.9 WRA	1	1158	-2134	-12016	-262	-1833	15846
		10	4471	-5926	-36580	1410	-5676	37341
		11	4472	-5781	-36639	1408	-5676	37362
		12	7274	-6883	-39894	2346	-7303	40173
	ULS 30yr 1a W ZIII 0.9 WL_0	1	1211	-784	-12755	-258	1834	15769
		10	4373	-2442	-40644	1100	5809	40374
		11	4380	-2284	-40601	1107	5802	40326
		12	7141	657	-40072	2272	7348	40305
	ULS 30yr 1a W ZIII 0.9 WL_-45	1	983	-722	-9991	-23	932	10492
		10	3430	-1379	-25462	1789	3109	25809
		11	3431	-1287	-25434	1792	3104	25778
		12	5376	669	-22991	3015	4074	24360
	ULS 30yr 1a W ZIII 0.9 WL_-90	1	781	-801	-6898	214	1	6891
		10	3001	-1700	-16477	2415	54	17279
		11	3000	-1637	-16481	2414	53	17277
		12	4595	-1100	-14143	3598	1	15965
	ULS 30yr 1a W ZIII 0.9 WL_45	1	1013	-845	-9741	60	932	10738
		10	3663	-1999	-28428	1949	3108	27836
		11	3665	-1887	-28425	1950	3103	27825
		12	6275	-215	-30446	3042	4075	29278
	ULS 30yr 1a W ZIII 0.9 WL_90	1	807	-844	-7085	219	1	6991
		10	3274	-2178	-20906	2290	73	20287
		11	3271	-2096	-20917	2289	71	20292
		12	5596	-1920	-24046	3295	1	22239
	ULS 30yr 1a W ZIII 0.9 WR_0	1	1158	-2134	-12016	-262	-1833	15846
		10	4471	-5926	-36580	1410	-5676	37341
		11	4472	-5781	-36639	1408	-5676	37362
		12	7274	-6883	-39894	2346	-7303	40173
	ULS 30yr 1a W ZIII 0.9 WR_-45	1	1026	-1611	-9823	54	-931	10847
		10	3790	-4139	-26516	2111	-2987	26388
		11	3788	-4027	-26547	2109	-2988	26398
		12	6340	-4871	-30510	3057	-4060	29306
	ULS 30yr 1a W ZIII 0.9 WR_45	1	913	-1352	-8922	-19	-931	10450
		10	3467	-3449	-23018	1976	-2959	23926
		11	3466	-3365	-23052	1974	-2960	23940
		12	5397	-3965	-22738	3043	-4061	24180
	ULS 30yr 5a Trsnl ZIII Br. 1 Ba	1	0	0	0	322	0	7138
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 3 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 10 Ba	1	855	-870	-7392	255	1	7443
		10	0	0	0	4392	0	11947
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 11 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	0	0	0	4392	0	11938
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 12 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515

03. Belastingen

Mastnummer	Belastingsgeval	set nummer	loads_from_back_span_vert	loads_from_back_span_trans	loads_from_back_span_long	loads_from_ahead_span_vert	loads_from_ahead_span_trans	loads_from_ahead_span_long
		11	3463	-2038	-20410	2632	68	20515
		12	0	0	0	6848	0	12477
	ULS 30yr 5a Trsnl ZIII Br. 20 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 21 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 22 Ba	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 1 Ah	1	796	-690	-5857	0	0	0
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 3 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 10 Ah	1	855	-870	-7392	255	1	7443
		10	3842	-404	-3614	0	0	0
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 11 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3841	-388	-3611	0	0	0
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 12 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	6562	-343	-4281	0	0	0
	ULS 30yr 5a Trsnl ZIII Br. 20 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 21 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	ULS 30yr 5a Trsnl ZIII Br. 22 Ah	1	855	-870	-7392	255	1	7443
		10	3465	-2116	-20402	2633	70	20515
		11	3463	-2038	-20410	2632	68	20515
		12	5588	-1619	-20471	3869	1	20512
	SeLS 1a W ZIII WLB	1	1188	-815	-11993	-108	1526	14191
		10	4338	-2280	-36621	1696	4856	36421
		11	4343	-2140	-36592	1701	4849	36387
		12	7104	336	-36121	3000	6104	36340
	SeLS 1a W ZIII WRB	1	1136	-1924	-11261	-111	-1525	14267
		10	4446	-5219	-33262	1962	-4708	33909
		11	4445	-5087	-33312	1960	-4709	33927
		12	7195	-5969	-36009	3051	-6071	36248
	SeLS 1a W ZIII WLA	1	1188	-815	-11993	-108	1526	14191
		10	4338	-2280	-36621	1696	4856	36421
		11	4343	-2140	-36592	1701	4849	36387
		12	7104	336	-36121	3000	6104	36340
	SeLS 1a W ZIII WRA	1	1136	-1924	-11261	-111	-1525	14267
		10	4446	-5219	-33262	1962	-4708	33909
		11	4445	-5087	-33312	1960	-4709	33927
		12	7195	-5969	-36009	3051	-6071	36248

04. Summary

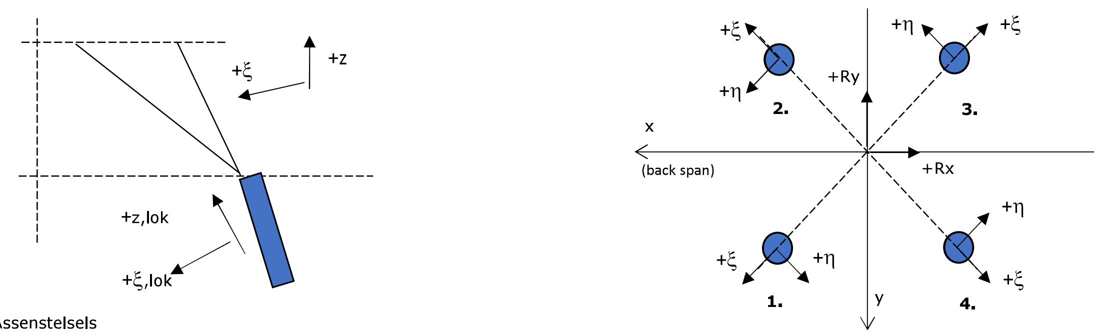
		Maximaal optredende belasting (N)			
Mast nummer	**Mast type**	**Verticaal**	**Dwarsbelasting**	**In lijnrichting**	**Maatgevende load case**
Mast 92	D+0_150	7759	1481	385	ULS 30yr 3 W + I ZIII WLB
Mast 84	D+0_150	5268	3635	32	ULS 30yr 3 W + I ZIII WLB

Project: ZW-Oost TOSP
Masttype: D+3.6
Mast: 22

Oplegreacties per randstijl

Auteur: TBR
Versie: 1.4

Betrouwbaarheidsniveau Afkeur CC2-0
Referentieperiode 30 jaar



Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII WL_45,T BI+	-30	-31	**-236**	1	43	-3	-240
4	ULS 30yr 1a W ZIII WRA,T NR-	-61	55	**-496**	4	82	2	-503
1	ULS 30yr 1a W ZIII WR_45,T BI-	50	43	**-377**	-5	66	-2	-383
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	29	-27	**-210**	2	39	-4	-214

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	40	37	**299**	2	-55	4	304
4	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	20	-23	**141**	2	-30	6	144
1	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	-21	-25	**161**	-3	-33	6	164
2	ULS 30yr 1a W ZIII WRA,T NR-	-49	50	**410**	1	-70	1	416

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	4	-5	**-10**	6	1	1	-10
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-20	9	**-133**	8	21	2	-135
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	4	9	**-61**	3	9	1	-62
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-2	12	**58**	7	-10	0	58

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-4	3	**-4**	-5	0	0	-4
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-13	17	**-140**	-3	21	3	-142
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	14	1	**-72**	-9	11	2	-73
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-11	5	**69**	-5	-11	0	70

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	40	37	**299**	2	-55	4	304
4	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	20	-23	**141**	2	-30	6	144
1	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	-21	-25	**161**	-3	-33	6	164
2	ULS 30yr 1a W ZIII WRA,T NR-	-49	50	**410**	1	-70	1	416

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	13	9	**-102**	-3	15	2	-103
2	10°C,T Global	-5	6	**47**	1	-8	0	47
3	10°C,T Global	4	3	**26**	0	-5	0	27
4	10°C,T Global	-15	11	**-122**	3	19	2	-123

Omhullenden ongeacht stijl

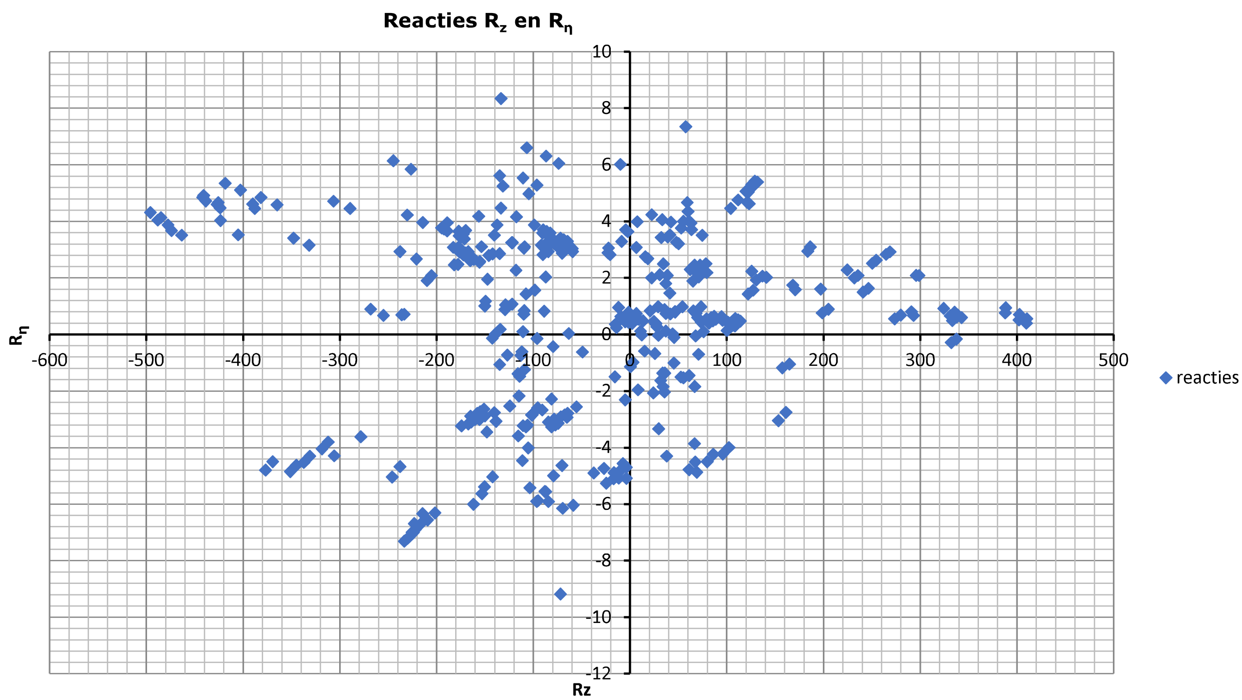
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRA,T NR-	-61	55	**-496**	4	82	2	-503
Max. trek	ULS 30yr 1a W ZIII WRA,T NR-	-49	50	**410**	1	-70	1	416
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-20	9	-133	**8**	21	2	-135
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	14	1	-72	**-9**	11	2	-73
Comb. trek+torsie	ULS 30yr 1a W ZIII WRA,T NR-	-49	50	**410**	**1**	-70	1	416

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	SeLS 1a W ZIII WLB,T NL+	-17	-20	**-147**	2	26	-1	-150
4	SeLS 1a W ZIII WRA,T NR-	-52	47	**-423**	4	70	2	-429
1	SeLS 1a W ZIII WRB,T NL-	39	33	**-306**	-4	51	1	-310
2	SeLS 1a W ZIII WLA,T NR+	17	-16	**-122**	1	24	-3	-124

Maximale trekbelasting SLS

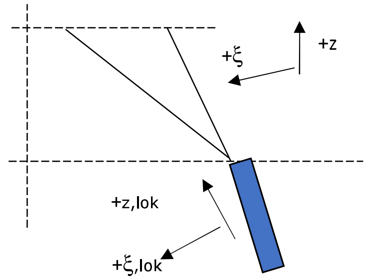
Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	SeLS 1a W ZIII WRB,T NL-	30	26	**225**	2	-40	2	228
4	SeLS 1a W ZIII WLA,T NR+	6	-11	**41**	4	-12	5	43
1	SeLS 1a W ZIII WLB,T NL+	-7	-13	**67**	-4	-14	3	68
2	SeLS 1a W ZIII WRA,T NR-	-41	42	**343**	1	-59	1	348

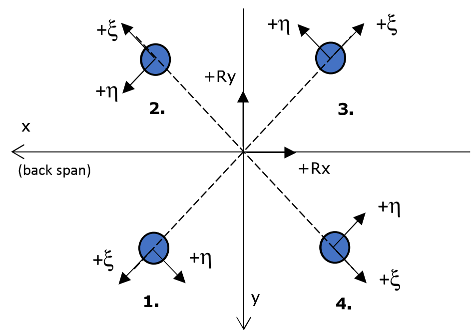


Project: ZW-Oost TOSP
Masttype: D+3.6
Mast: 22

Oplegreacties per randstijl	Auteur:	TBR
	Versie:	1.4

Betrouwbaarheidsniveau Verbouw CC2
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII WL_45,T BI+	-32	-33	**-256**	1	46	-3	-260
4	ULS 30yr 1a W ZIII WRA,T NR-	-69	61	**-560**	5	92	3	-567
1	ULS 30yr 1a W ZIII WR_45,T BI-	54	46	**-406**	-6	70	-1	-412
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	30	-28	**-224**	2	41	-3	-228

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	44	40	**329**	3	-59	4	334
4	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	22	-26	**161**	3	-33	6	165
1	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	-23	-29	**184**	-4	-37	6	188
2	ULS 30yr 1a W ZIII WRA,T NR-	-57	57	**474**	-1	-81	0	481

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 3 W + I ZIII WRB,T NL-	23	13	**146**	8	-26	1	149
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-20	9	**-129**	8	20	2	-131
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	4	8	**-58**	3	9	1	-59
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-2	12	**62**	7	-10	0	63

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-3	3	**0**	-5	0	0	0
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-13	17	**-137**	-3	21	2	-139
1	ULS 30yr 3 W + I ZIII WRB,T NL-	36	22	**-255**	-10	41	2	-258
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	-12	5	**72**	-5	-12	0	73

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	44	40	**329**	3	-59	4	334
4	ULS 30yr 1a W ZIII 0.9 WL_-45,T BI+	22	-26	**161**	3	-33	6	165
1	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	-23	-29	**184**	-4	-37	6	188
2	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	-58	56	**474**	-1	-81	1	480

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	13	9	**-98**	-3	15	1	-99
2	10°C,T Global	-5	6	**50**	1	-8	0	51
3	10°C,T Global	4	3	**30**	1	-5	0	30
4	10°C,T Global	-15	11	**-119**	3	18	2	-120

Omhullenden ongeacht stijl

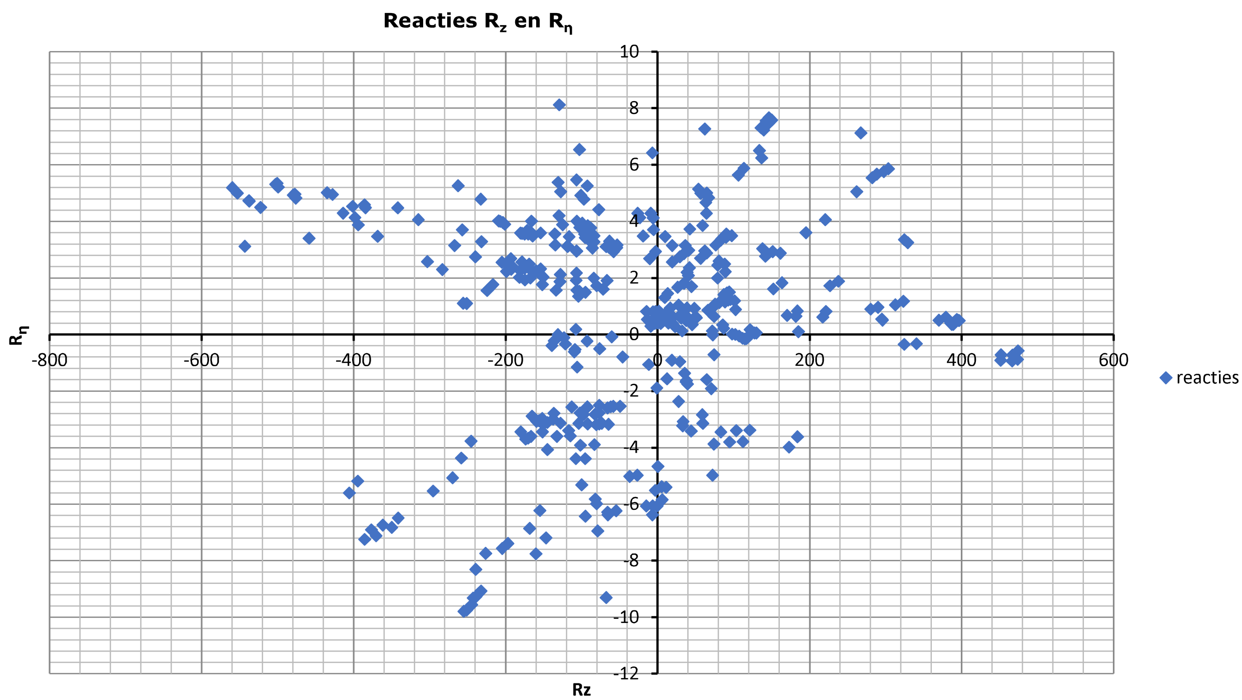
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRA,T NR-	-69	61	**-560**	5	92	3	-567
Max. trek	ULS 30yr 1a W ZIII WRA,T NR-	-57	57	**474**	-1	-81	0	481
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	-20	9	-129	**8**	20	2	-131
Max. neg. torsie	ULS 30yr 3 W + I ZIII WRB,T NL-	36	22	-255	**-10**	41	2	-258
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	-58	56	**474**	**-1**	-81	1	480

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	SeLS 1a W ZIII WLB,T NL+	-15	-18	**-134**	2	23	-1	-136
4	SeLS 1a W ZIII WRA,T NR-	-51	45	**-414**	4	68	2	-419
1	SeLS 1a W ZIII WRB,T NL-	38	31	**-295**	-6	49	1	-299
2	SeLS 1a W ZIII WLA,T NR+	15	-13	**-103**	2	20	-2	-105

Maximale trekbelasting SLS

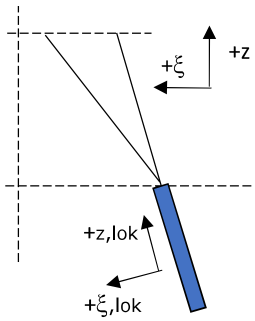
Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
3	SeLS 1a W ZIII WRB,T NL-	30	24	**221**	4	-38	1	224
4	SeLS 1a W ZIII WLA,T NR+	4	-8	**29**	3	-9	4	30
1	SeLS 1a W ZIII WLB,T NL+	-7	-11	**59**	-3	-12	2	61
2	SeLS 1a W ZIII WRA,T NR-	-41	41	**340**	0	-58	0	345

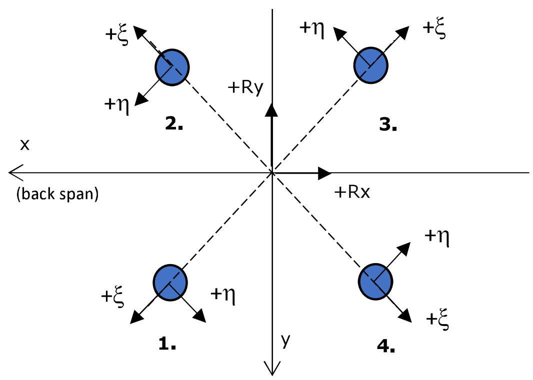


Project: ZW-Oost TOSP
Masttype: D+0
Mast: 84

Oplegreacties per randstijl	Auteur:	TBR
	Versie:	1.4

Betrouwbaarheidsniveau Afkeur CC2-0
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII WL_45,T BI+	-31	-30	**-242**	1	-43	5	-246
2	ULS 30yr 1a W ZIII WRA,T NR-	-42	38	**-339**	-3	-57	3	-344
3	ULS 30yr 1a W ZIII WR_45,T BI-	36	33	**-278**	2	-49	5	-283
4	ULS 30yr 1a W ZIII WL_-45,T BI+	30	-28	**-228**	-1	-41	5	-231

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_45,T	31	26	**227**	-3	40	-5	230
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	24	-22	**179**	1	32	-4	182
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-25	-23	**189**	-1	34	-4	192
4	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-36	32	**284**	3	48	-4	288

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-9	1	**-31**	7	-6	1	-32
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-4	14	**-78**	7	-13	1	-79
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	9	-3	**-21**	8	-4	0	-22
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-8	-3	**25**	8	3	0	25

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	1	-10	**-39**	-8	-7	0	-39
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	-14	3	**-70**	-8	-12	1	-71
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	-3	7	**-14**	-7	-3	1	-14
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	4	7	**18**	-8	3	0	18

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_45,T	31	26	**227**	-3	40	-5	230
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	24	-22	**179**	1	32	-4	182
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-25	-23	**189**	-1	34	-4	192
4	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-36	32	**284**	3	48	-4	288

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	-1	-1	**-5**	0	-1	0	-5
2	10°C,T Global	-7	6	**-50**	-1	-9	1	-51
3	10°C,T Global	6	6	**-49**	1	-8	1	-49
4	10°C,T Global	1	-1	**-4**	0	-1	0	-4

Omhullenden ongeacht stijl

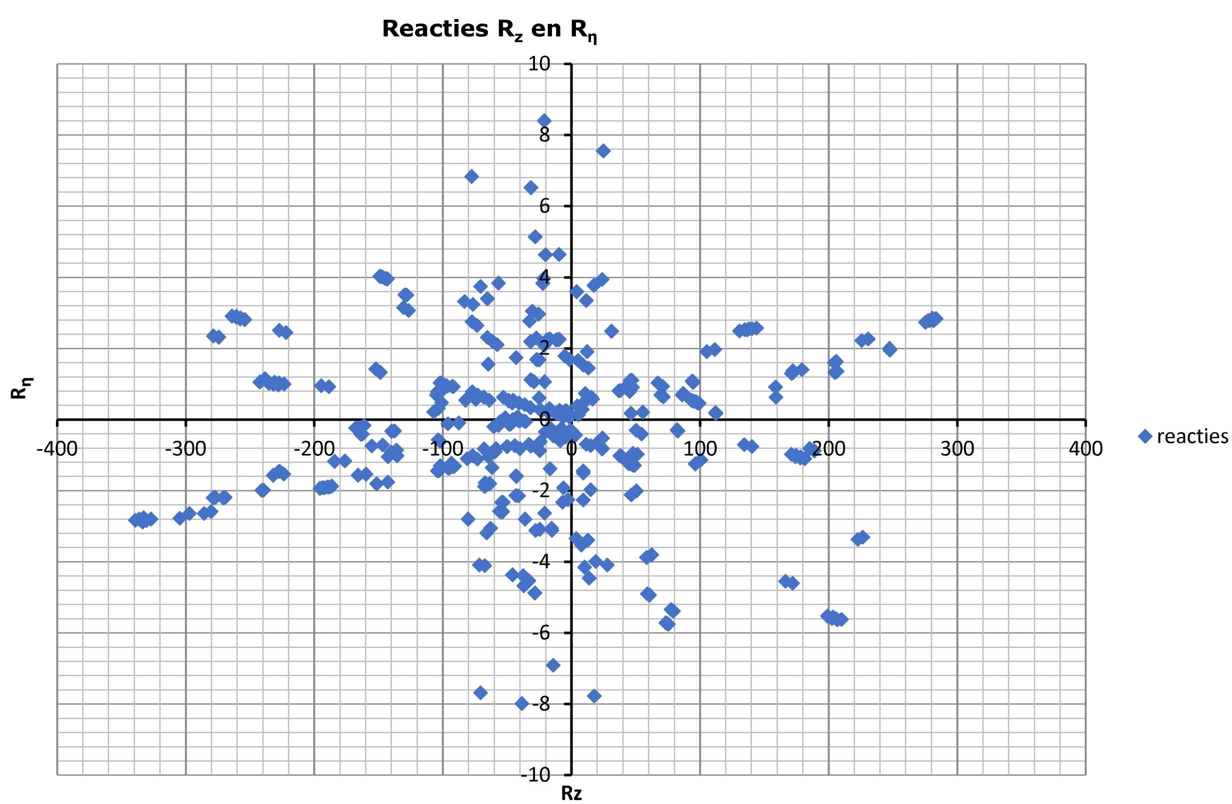
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRA,T NR-	-42	38	**-339**	-3	-57	3	-344
Max. trek	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-36	32	**284**	3	48	-4	288
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	9	-3	-21	**8**	-4	0	-22
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	1	-10	-39	**-8**	-7	0	-39
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-36	32	**284**	**3**	48	-4	288

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLB,T NL+	-24	-23	**-195**	1	-34	3	-197
2	SeLS 1a W ZIII WRA,T NR-	-36	32	**-286**	-3	-48	3	-290
3	SeLS 1a W ZIII WRB,T NL-	29	26	**-227**	3	-39	3	-231
4	SeLS 1a W ZIII WLA,T NR+	22	-20	**-166**	-2	-30	3	-168

Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRB,T NL-	25	18	**172**	-5	30	-3	175
2	SeLS 1a W ZIII WLA,T NR+	16	-13	**111**	2	20	-2	113
3	SeLS 1a W ZIII WLB,T NL+	-18	-17	**140**	-1	24	-2	142
4	SeLS 1a W ZIII WRA,T NR-	-29	26	**231**	2	39	-3	234

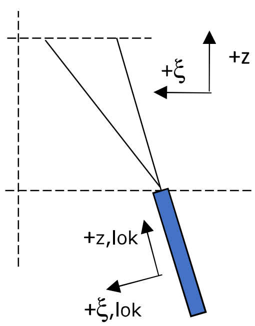


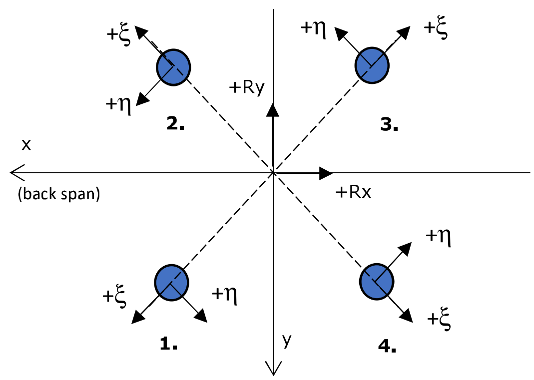
Project: ZW-Oost TOSP
Masttype: D+0
Mast: 84

Oplegreacties per randstijl

Auteur: TBR
Versie: 1.4

Betrouwbaarheidsniveau Verbouw CC2
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x	R_y	R_z	R_η	R_ξ	$R_{\xi,lok}$	$R_{z,lok}$
		[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
1	ULS 30yr 1a W ZIII WL_45,T BI+	-37	-35	**-285**	1	-51	5	-290
2	ULS 30yr 1a W ZIII WRA,T NR-	-49	45	**-395**	-3	-66	3	-400
3	ULS 30yr 1a W ZIII WR_45,T BI-	42	38	**-319**	3	-56	6	-324
4	ULS 30yr 1a W ZIII WL_-45,T BI+	35	-32	**-264**	-2	-47	6	-268

Maximale trekbelasting

Stijl	Combinatie	R_x	R_y	R_z	R_η	R_ξ	$R_{\xi,lok}$	$R_{z,lok}$
		[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
1	ULS 30yr 1a W ZIII 0.9 WR_45,T	36	31	**264**	-4	47	-5	269
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	29	-26	**215**	2	39	-5	219
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-30	-28	**229**	-1	41	-5	232
4	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-43	38	**336**	3	57	-4	340

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x	R_y	R_z	R_η	R_ξ	$R_{\xi,lok}$	$R_{z,lok}$
		[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-9	1	**-31**	7	-6	1	-32
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-4	14	**-78**	7	-13	1	-79
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	9	-3	**-21**	8	-4	0	-22
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	-8	-3	**25**	8	3	0	25

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x	R_y	R_z	R_η	R_ξ	$R_{\xi,lok}$	$R_{z,lok}$
		[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	1	-10	**-39**	-8	-7	0	-39
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	-14	3	**-70**	-8	-12	1	-71
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	-3	7	**-14**	-7	-3	1	-14
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	4	7	**18**	-8	3	0	18

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x	R_y	R_z	R_η	R_ξ	$R_{\xi,lok}$	$R_{z,lok}$
		[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
1	ULS 30yr 1a W ZIII 0.9 WR_45,T	36	31	**264**	-4	47	-5	269
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	29	-26	**215**	2	39	-5	219
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-30	-28	**229**	-1	41	-5	232
4	ULS 30yr 1a W ZIII 0.9 WRA,T NR	-43	38	**336**	3	57	-4	340

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	-1	-1	**-5**	0	-1	0	-5
2	10°C,T Global	-7	6	**-50**	-1	-9	1	-51
3	10°C,T Global	6	6	**-49**	1	-8	1	-49
4	10°C,T Global	1	-1	**-4**	0	-1	0	-4

Omhullenden ongeacht stijl

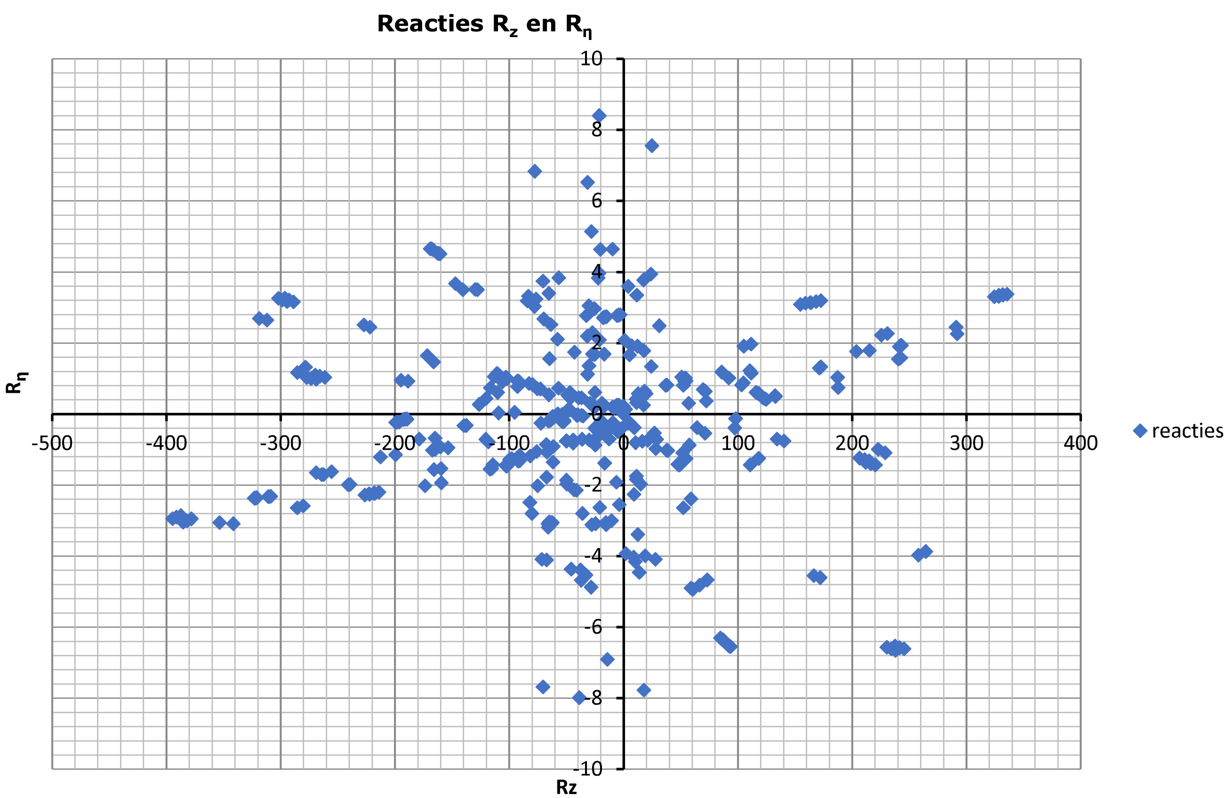
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRA,T NR-	-49	45	**-395**	-3	-66	3	-400
Max. trek	ULS 30yr 1a W ZIII 0.9 WRA,T NF	-43	38	**336**	3	57	-4	340
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	9	-3	-21	**8**	-4	0	-22
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	1	-10	-39	**-8**	-7	0	-39
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WRA,T NF	-43	38	**336**	**3**	57	-4	340

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLB,T NL+	-24	-23	**-195**	1	-34	3	-197
2	SeLS 1a W ZIII WRA,T NR-	-36	32	**-286**	-3	-48	3	-290
3	SeLS 1a W ZIII WRB,T NL-	29	26	**-227**	3	-39	3	-231
4	SeLS 1a W ZIII WLA,T NR+	22	-20	**-166**	-2	-30	3	-168

Maximale trekbelasting SLS

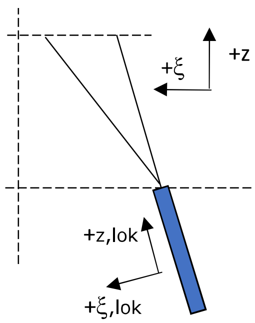
Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRB,T NL-	25	18	**172**	-5	30	-3	175
2	SeLS 1a W ZIII WLA,T NR+	16	-13	**111**	2	20	-2	113
3	SeLS 1a W ZIII WLB,T NL+	-18	-17	**140**	-1	24	-2	142
4	SeLS 1a W ZIII WRA,T NR-	-29	26	**231**	2	39	-3	234

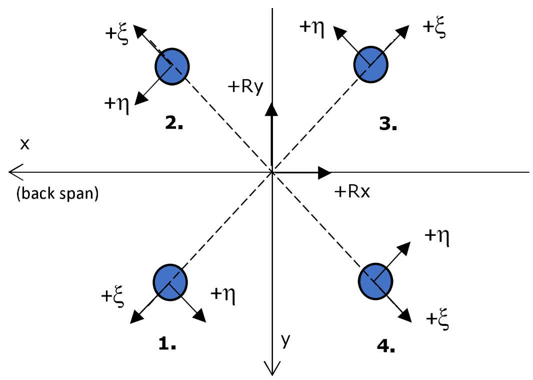


Project: ZW-Oost TOSP
Masttype: D+0
Mast: 91

	Auteur:	TBR
Oplegreacties per randstijl	Versie:	1.4

Betrouwbaarheidsniveau Afkeur CC2-0
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-28	-26	**-209**	1	-38	5	-212
2	ULS 30yr 1a W ZIII WR_-45,T BI-	-41	38	**-319**	-2	-56	6	-324
3	ULS 30yr 1a W ZIII WRB,T NL-	48	43	**-385**	3	-64	4	-390
4	ULS 30yr 1a W ZIII WL_-45,T BI+	28	-28	**-217**	0	-40	5	-221

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WRB,T NL	37	37	**309**	0	52	-3	313
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	20	-20	**151**	0	28	-5	154
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-20	-20	**148**	0	28	-5	151
4	ULS 30yr 1a W ZIII 0.9 WR_-45,T	-34	29	**251**	4	45	-5	255

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-2	9	**33**	8	5	0	34
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	1	10	**-36**	7	-6	1	-37
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	18	5	**-98**	9	-16	1	-100
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-3	-10	**-28**	9	-5	0	-28

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	10	-1	**45**	-8	7	1	45
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	-12	-1	**-47**	-9	-8	0	-48
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	8	17	**-109**	-6	-17	0	-110
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	7	2	**-18**	-6	-3	1	-18

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WRB,T NL	37	37	**309**	0	52	-3	313
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	20	-20	**151**	0	28	-5	154
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-20	-20	**148**	0	28	-5	151
4	ULS 30yr 1a W ZIII 0.9 WR_-45,T	-34	29	**251**	4	45	-5	255

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	2	1	**15**	0	2	0	15
2	10°C,T Global	-9	9	**-78**	-1	-13	0	-79
3	10°C,T Global	10	8	**-81**	1	-13	0	-82
4	10°C,T Global	-2	0	**12**	1	1	0	12

Omhullenden ongeacht stijl

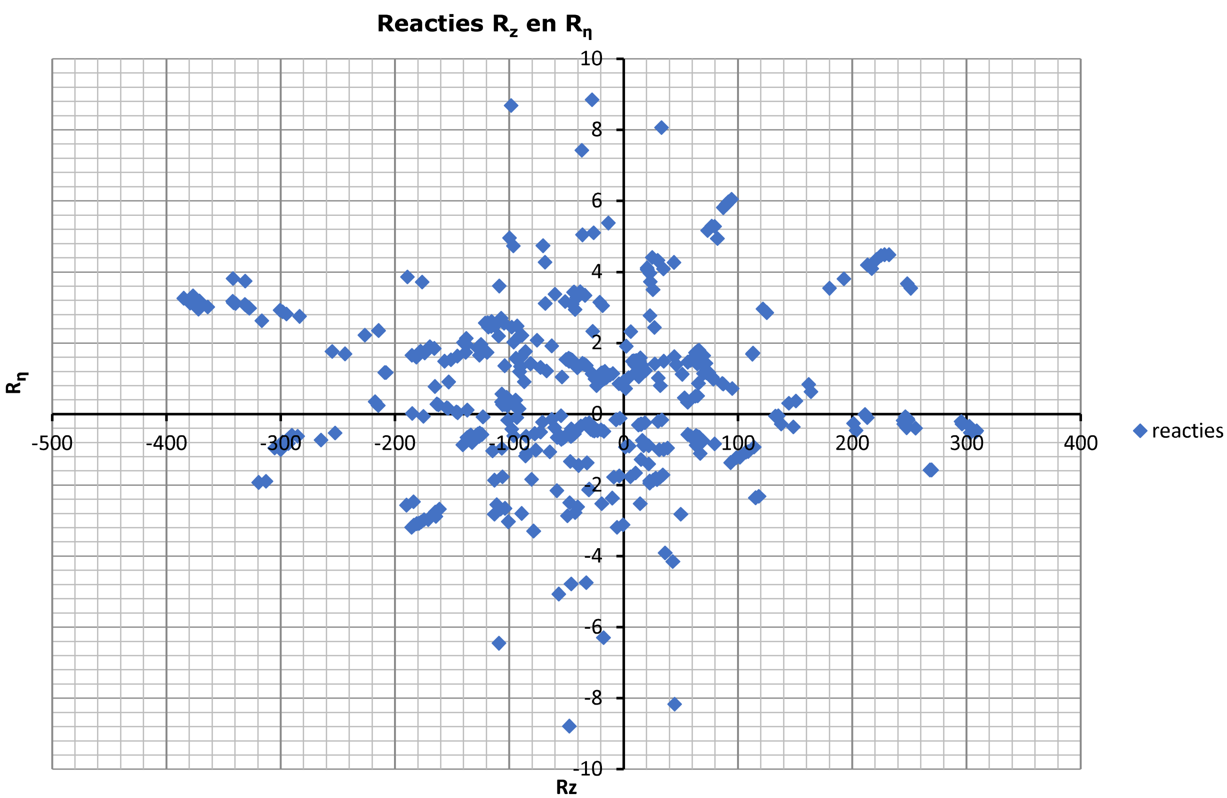
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRB,T NL-	48	43	**-385**	3	-64	4	-390
Max. trek	ULS 30yr 1a W ZIII 0.9 WRB,T NL	37	37	**309**	0	52	-3	313
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-3	-10	-28	**9**	-5	0	-28
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	-12	-1	-47	**-9**	-8	0	-48
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WRB,T NL	37	37	**309**	**0**	52	-3	313

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLB,T NL+	-18	-18	**-137**	0	-25	4	-139
2	SeLS 1a W ZIII WRA,T NR-	-32	31	**-265**	-1	-45	3	-269
3	SeLS 1a W ZIII WRB,T NL-	41	37	**-327**	3	-55	3	-332
4	SeLS 1a W ZIII WLA,T NR+	18	-20	**-151**	2	-27	3	-153

Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRB,T NL-	31	30	**255**	0	43	-3	259
2	SeLS 1a W ZIII WLA,T NR+	10	-11	**80**	-1	15	-2	81
3	SeLS 1a W ZIII WLB,T NL+	-9	-10	**66**	1	13	-3	67
4	SeLS 1a W ZIII WRA,T NR-	-26	21	**193**	4	33	-3	196



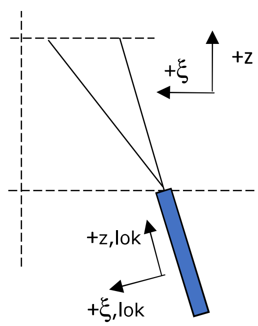
DNV

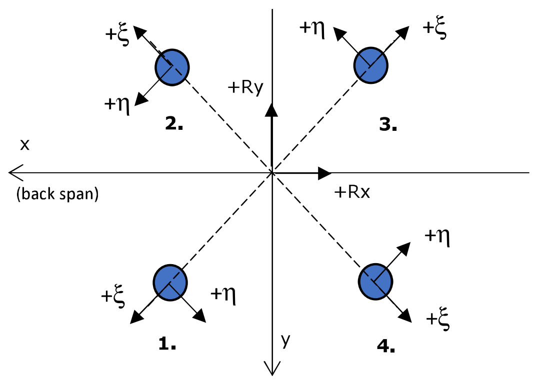
Project: ZW-Oost TOSP
Masttype: D+0
Mast: 91

Oplegreacties per randstijl

Auteur: TBR
Versie: 1.4

Betrouwbaarheidsniveau Verbouw CC2
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-30	-28	**-226**	1	-41	5	-230
2	ULS 30yr 1a W ZIII WR_-45,T BI-	-45	41	**-345**	-3	-60	6	-351
3	ULS 30yr 1a W ZIII WRB,T NL-	54	48	**-431**	4	-72	4	-437
4	ULS 30yr 1a W ZIII WL_-45,T BI+	30	-31	**-239**	0	-43	5	-242

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WRB,T NL	45	41	**356**	-3	61	-5	361
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	23	-22	**175**	1	32	-4	178
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-23	-22	**171**	0	31	-4	174
4	ULS 30yr 1a W ZIII 0.9 WR_-45,T	-39	32	**280**	5	50	-6	284

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-2	10	**37**	8	6	0	37
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	1	9	**-33**	7	-6	1	-34
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	18	5	**-95**	9	-16	1	-96
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-3	-9	**-25**	9	-4	0	-25

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	11	-1	**48**	-8	7	0	48
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	-12	-1	**-44**	-9	-8	1	-45
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	8	17	**-106**	-6	-17	1	-107
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	6	2	**-14**	-6	-3	1	-14

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WRB,T NL	45	41	**356**	-3	61	-5	361
2	ULS 30yr 1a W ZIII 0.9 WL_-45,T	23	-22	**175**	1	32	-4	178
3	ULS 30yr 1a W ZIII 0.9 WL_45,T I	-23	-22	**171**	0	31	-4	174
4	ULS 30yr 1a W ZIII 0.9 WR_-45,T	-39	32	**280**	5	50	-6	284

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	2	2	**19**	0	3	0	19
2	10°C,T Global	-9	8	**-75**	-1	-13	1	-76
3	10°C,T Global	10	8	**-78**	2	-13	1	-79
4	10°C,T Global	-2	0	**15**	1	2	0	15

Omhullenden ongeacht stijl

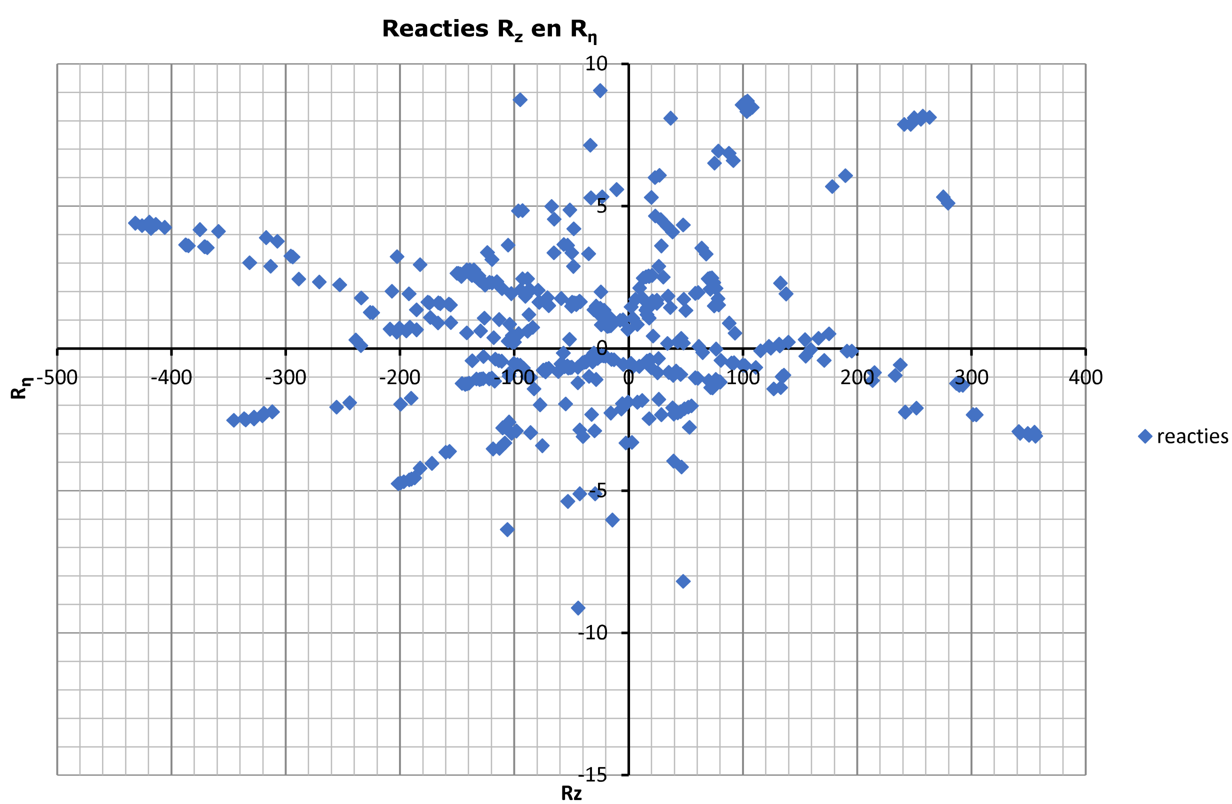
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WRB,T NL-	54	48	**-431**	4	-72	4	-437
Max. trek	ULS 30yr 1a W ZIII 0.9 WRB,T NL	45	41	**356**	-3	61	-5	361
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T	-3	-9	-25	**9**	-4	0	-25
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T	-12	-1	-44	**-9**	-8	1	-45
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WRB,T NL	45	41	**356**	**-3**	61	-5	361

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLB,T NL+	-17	-16	**-126**	1	-23	3	-128
2	SeLS 1a W ZIII WRA,T NR-	-32	29	**-255**	-2	-44	3	-259
3	SeLS 1a W ZIII WRB,T NL-	40	35	**-317**	4	-53	3	-321
4	SeLS 1a W ZIII WLA,T NR+	17	-18	**-142**	1	-25	3	-144

Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRB,T NL-	32	29	**252**	-2	43	-3	255
2	SeLS 1a W ZIII WLA,T NR+	10	-10	**77**	0	14	-2	78
3	SeLS 1a W ZIII WLB,T NL+	-8	-8	**61**	0	12	-2	63
4	SeLS 1a W ZIII WRA,T NR-	-28	19	**190**	6	33	-3	193

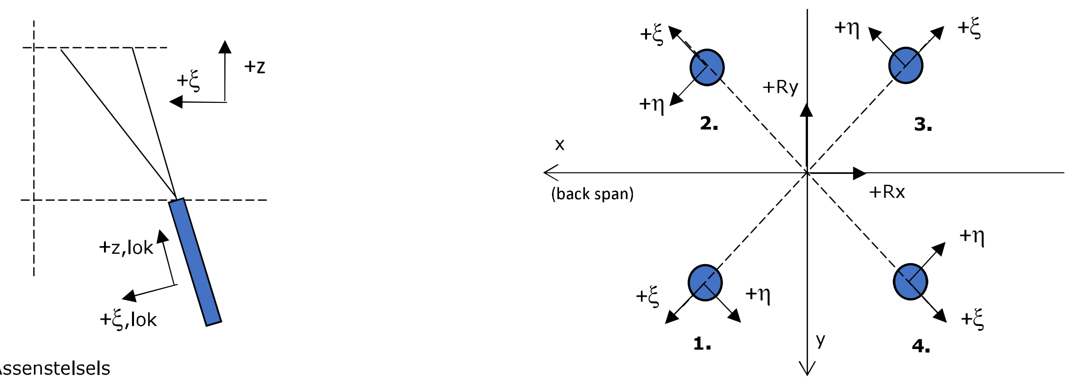


Project: ZW-Oost TOSP
Masttype: D+0
Mast: 92

Auteur:	TBR
Versie:	1.4

Oplegreacties per randstijl

Betrouwbaarheidsniveau Afkeur CC2-0
Referentieperiode 30 jaar



Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII WL_-45,T BI+	-29	-30	**-229**	-1	-42	5	-233
2	ULS 30yr 1a W ZIII WLB,T NL+	-51	46	**-407**	-4	-68	4	-413
3	ULS 30yr 1a W ZIII WR_-45,T BI-	42	39	**-328**	2	-57	5	-333
4	ULS 30yr 1a W ZIII 0.9 WR_45,T	27	-25	**-198**	-1	-37	5	-201

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_-45,T	35	30	**259**	-4	46	-5	263
2	ULS 30yr 1a W ZIII 0.9 WR_45,T	19	-18	**138**	0	26	-5	141
3	ULS 30yr 1a W ZIII 0.9 WL_-45,T	-21	-21	**162**	0	30	-4	165
4	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-40	39	**332**	1	56	-4	337

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-6	1	**-16**	5	-3	1	-16
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-8	16	**-108**	5	-17	0	-109
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	11	0	**-49**	8	-8	0	-49
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-9	-1	**44**	7	6	1	44

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	3	-9	**-28**	-8	-5	0	-28
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	-16	5	**-94**	-8	-15	0	-96
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	0	9	**-36**	-7	-6	0	-36
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	2	8	**30**	-7	4	0	30

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_-45,T	35	30	**259**	-4	46	-5	263
2	ULS 30yr 1a W ZIII 0.9 WR_45,T	19	-18	**138**	0	26	-5	141
3	ULS 30yr 1a W ZIII 0.9 WL_-45,T	-21	-21	**162**	0	30	-4	165
4	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-40	39	**332**	1	56	-4	337

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	2	0	**9**	-1	1	0	9
2	10°C,T Global	-11	8	**-83**	-2	-13	0	-84
3	10°C,T Global	9	8	**-75**	1	-12	0	-76
4	10°C,T Global	-2	1	**17**	0	2	0	17

Omhullenden ongeacht stijl

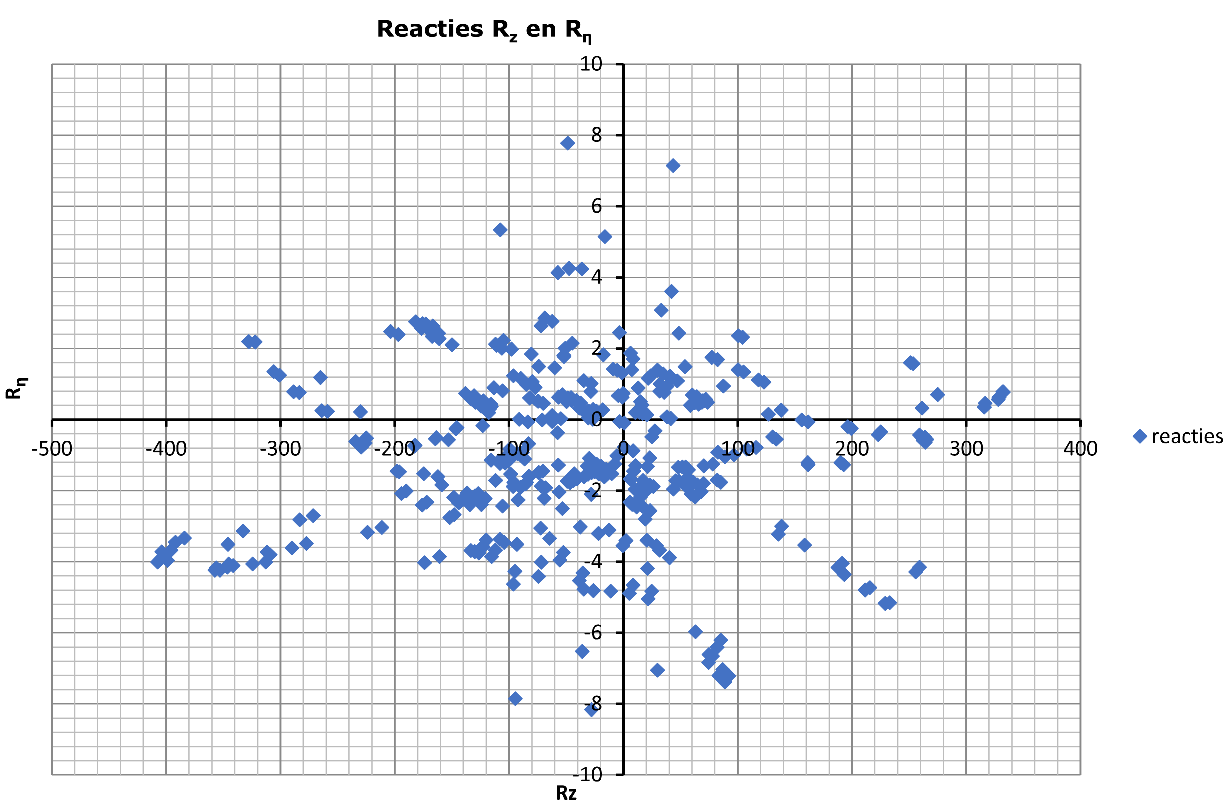
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WLB,T NL+	-51	46	**-407**	-4	-68	4	-413
Max. trek	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-40	39	**332**	1	56	-4	337
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	11	0	-49	**8**	-8	0	-49
Max. neg. torsie	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T	3	-9	-28	**-8**	-5	0	-28
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-40	39	**332**	**1**	56	-4	337

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLA,T NR+	-19	-21	**-159**	-2	-28	3	-161
2	SeLS 1a W ZIII WLB,T NL+	-44	39	**-346**	-4	-58	3	-351
3	SeLS 1a W ZIII WRA,T NR-	33	31	**-265**	1	-45	3	-269
4	SeLS 1a W ZIII WRB,T NL-	21	-20	**-153**	-1	-29	4	-155

Maximale trekbelasting SLS

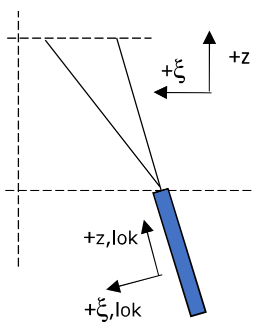
Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRA,T NR-	27	20	**193**	-4	33	-3	196
2	SeLS 1a W ZIII WRB,T NL-	11	-12	**83**	-1	17	-3	84
3	SeLS 1a W ZIII WLA,T NR+	-11	-12	**88**	1	16	-2	89
4	SeLS 1a W ZIII WLB,T NL+	-33	32	**275**	1	47	-3	279

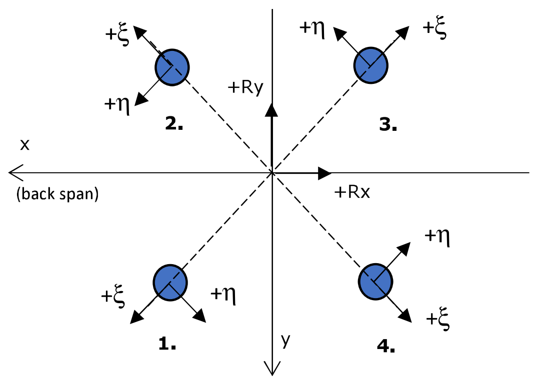


Project: ZW-Oost TOSP
Masttype: D+0
Mast: 92

	Auteur: TBR
Oplegreacties per randstijl	Versie: 1.4

Betrouwbaarheidsniveau Verbouw CC2
Referentieperiode 30 jaar





Assenstelsels

Maximale drukbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII WL_-45,T BI+	-32	-33	**-253**	-1	-45	5	-257
2	ULS 30yr 1a W ZIII WLB,T NL+	-57	50	**-456**	-5	-76	4	-462
3	ULS 30yr 1a W ZIII WR_-45,T BI-	46	42	**-356**	3	-62	5	-361
4	ULS 30yr 1a W ZIII 0.9 WR_45,T	29	-27	**-214**	-1	-39	5	-218

Maximale trekbelasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_-45,T	41	32	**289**	-6	51	-6	294
2	ULS 30yr 1a W ZIII 0.9 WR_45,T	21	-21	**160**	0	30	-4	163
3	ULS 30yr 1a W ZIII 0.9 WL_-45,T	-24	-24	**188**	0	34	-4	191
4	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-48	44	**382**	3	65	-5	387

Maximale torsiebelasting (positief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-5	2	**-13**	5	-3	1	-13
2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-8	16	**-105**	5	-17	1	-106
3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	11	0	**-45**	8	-8	1	-46
4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,1	-10	0	**47**	7	7	1	47

Maximale torsiebelasting (negatief)

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 3 W + I ZIII WRA,T NR-	20	5	**101**	-11	18	-2	102
2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	-16	5	**-91**	-8	-15	1	-92
3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	0	9	**-33**	-6	-6	1	-33
4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,1	2	9	**34**	-7	5	0	34

Combinatie Ftrek+Fh

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	ULS 30yr 1a W ZIII 0.9 WR_-45,T	41	32	**289**	-6	51	-6	294
2	ULS 30yr 1a W ZIII 0.9 WR_45,T	21	-21	**160**	0	30	-4	163
3	ULS 30yr 1a W ZIII 0.9 WL_-45,T	-24	-24	**188**	0	34	-4	191
4	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-48	44	**382**	3	65	-5	387

Permanente belasting

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	10°C,T Global	2	0	**13**	-2	1	0	13
2	10°C,T Global	-11	8	**-79**	-2	-13	1	-81
3	10°C,T Global	9	8	**-72**	1	-12	1	-73
4	10°C,T Global	-2	2	**20**	0	3	1	21

Omhullenden ongeacht stijl

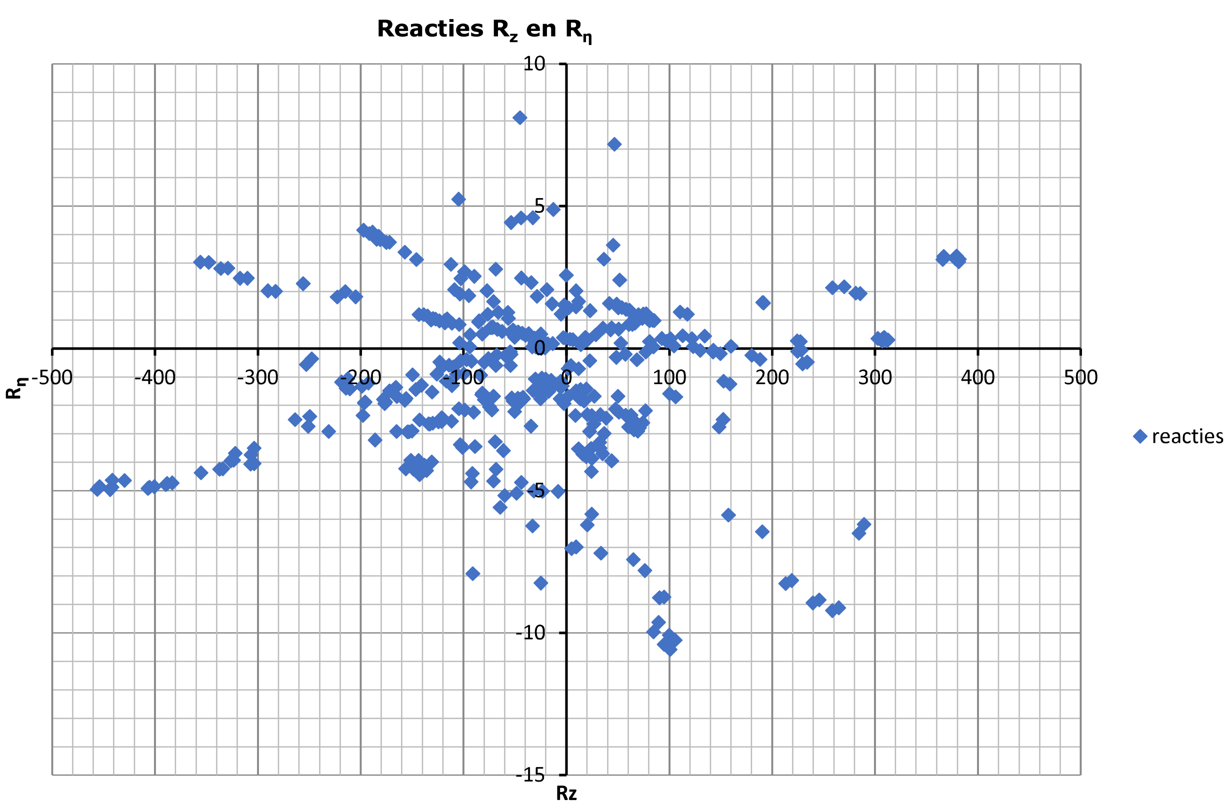
Belasting	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
Max. druk	ULS 30yr 1a W ZIII WLB,T NL+	-57	50	**-456**	-5	-76	4	-462
Max. trek	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-48	44	**382**	3	65	-5	387
Max. pos. torsie	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T	11	0	-45	**8**	-8	1	-46
Max. neg. torsie	ULS 30yr 3 W + I ZIII WRA,T NR-	20	5	101	**-11**	18	-2	102
Comb. trek+torsie	ULS 30yr 1a W ZIII 0.9 WLB,T NL	-48	44	**382**	**3**	65	-5	387

Maximale drukbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WLA,T NR+	-18	-19	**-149**	-1	-27	3	-152
2	SeLS 1a W ZIII WLB,T NL+	-43	37	**-334**	-4	-56	3	-339
3	SeLS 1a W ZIII WRA,T NR-	32	29	**-256**	2	-43	3	-260
4	SeLS 1a W ZIII WRB,T NL-	19	-18	**-141**	-1	-26	4	-143

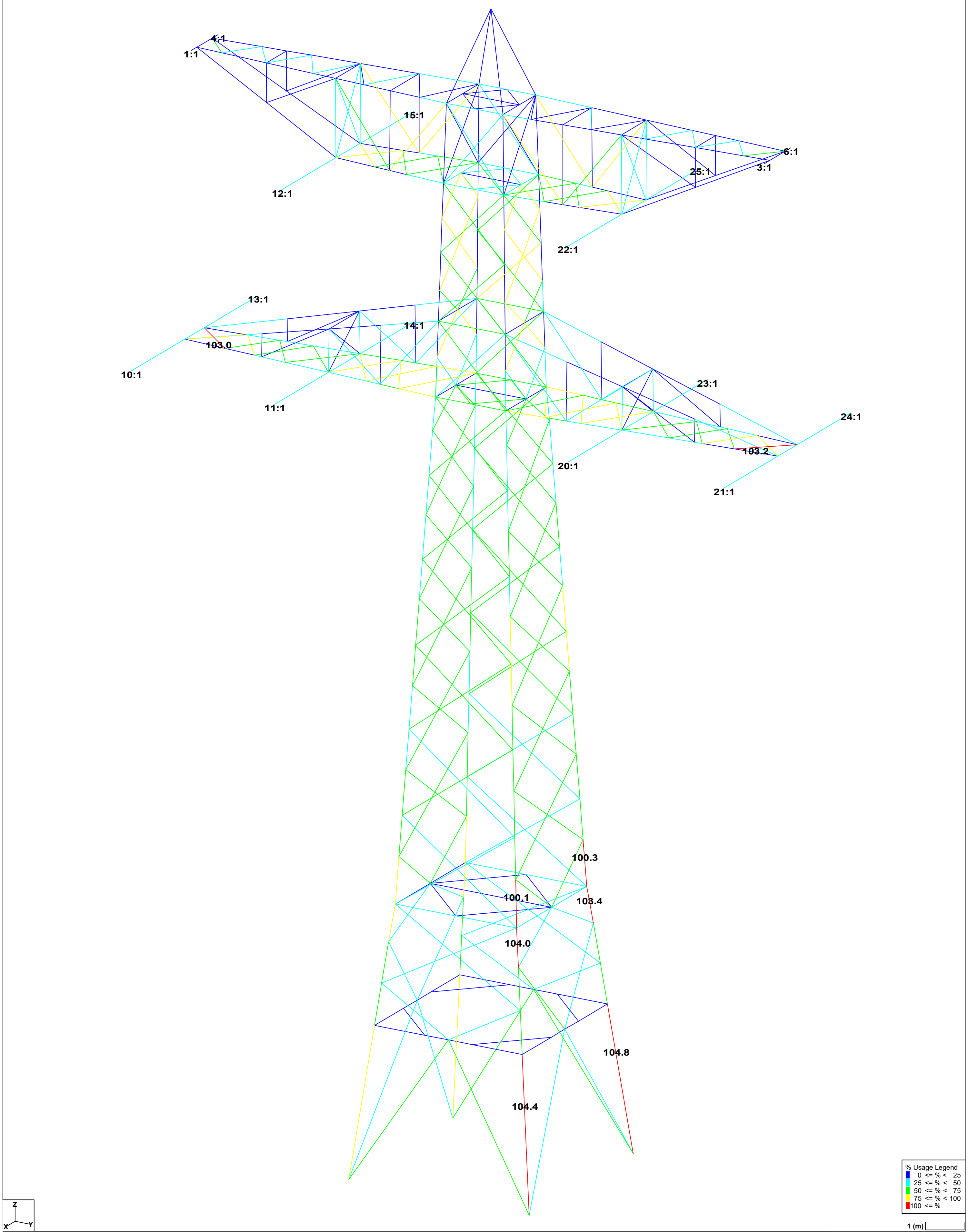
Maximale trekbelasting SLS

Stijl	Combinatie	R_x [kN]	R_y [kN]	R_z [kN]	R_η [kN]	R_ξ [kN]	$R_{\xi,lok}$ [kN]	$R_{z,lok}$ [kN]
1	SeLS 1a W ZIII WRA,T NR-	28	19	**190**	-6	33	-3	193
2	SeLS 1a W ZIII WRB,T NL-	10	-11	**77**	0	15	-3	79
3	SeLS 1a W ZIII WLA,T NR+	-11	-11	**85**	0	15	-2	86
4	SeLS 1a W ZIII WLB,T NL+	-34	31	**270**	2	46	-3	274

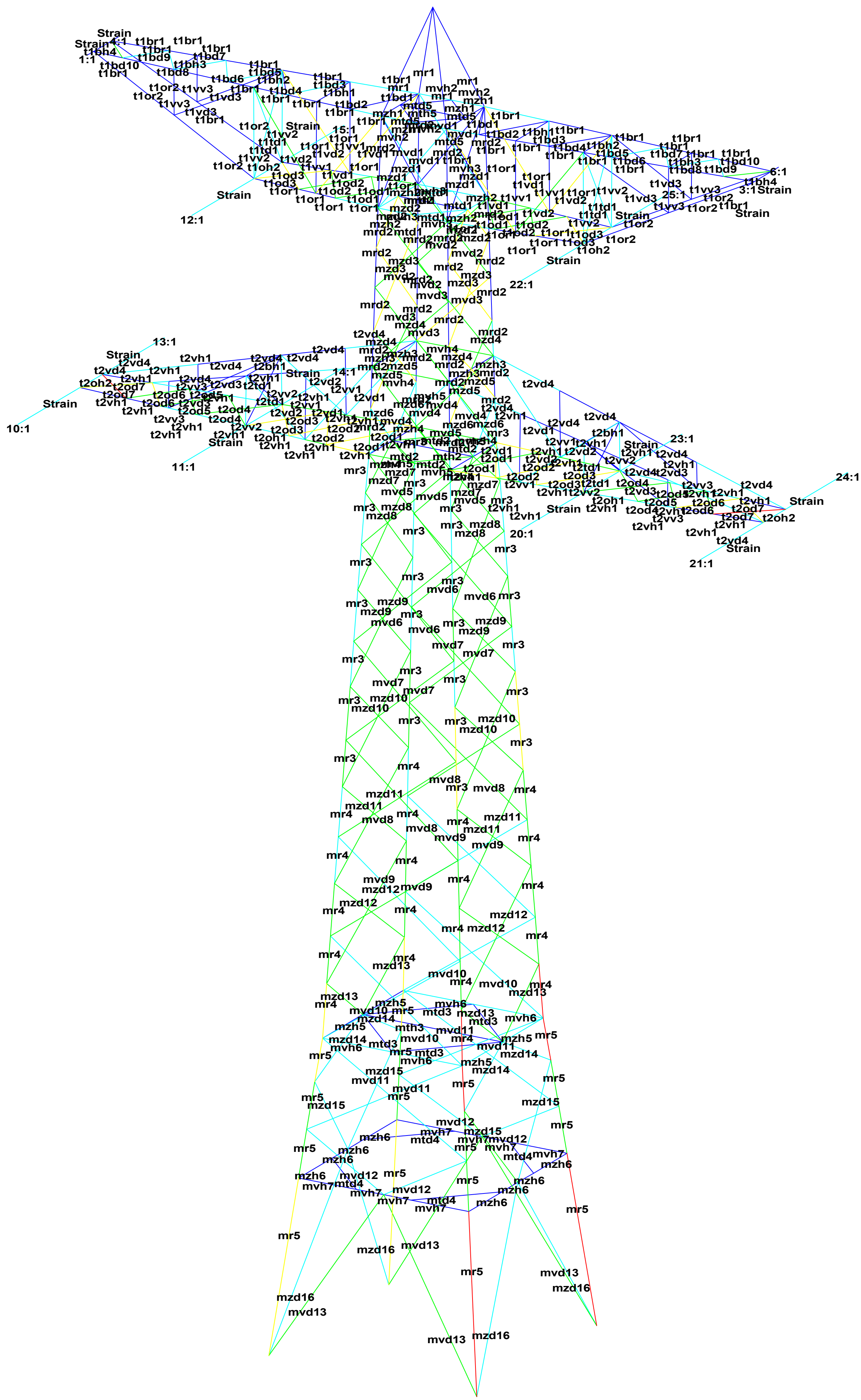


APPENDIX B
PLS-TOWER OUTPUT

The results for tower type A, D+3.6 and D+0 are included. Results for tower 91 and 92 are combined, based on governing tower location 92.


4:1
1:1
15:1
12:1
6:1
3:1
25:1
22:1
13:1
14:1
103.0
10:1
11:1
23:1
24:1
103.2
20:1
21:1
100.3
100.1
103.4
104.0
104.8
104.4
% Usage Legend
0 <= % < 25
25 <= % < 50
50 <= % < 75
75 <= % < 100
100 <= %
Z
X
Y
1 (m)

DNV GL Nederlands BV, Project: "A_GT-ZBH150 - Afkeur"
Tower Version 16.85, 18:49:01 donderdag 3 juni 2021
Undeformed geometry displayed



% Usage Legend
0 <= % < 25
25 <= % < 50
50 <= % < 75
75 <= % < 100
100 <= %

1 (m)

DNV

<u>**Toetsing initiële constructie afkeurniveau**</u>

Datum: 30-7-2021
Auteur: SSHD
Versie: 1.0

GT-ZBH150
A
Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Overschrijding druk	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)	Overschrijding trek	U.C
mr1	mr1	50x50x4	S235	4M16-5,6t	0,50	0,50	0,50	142	**-0.8**	SPLS 6a_75 Ah Ct1 Ba 12	34,8	150,7	138,2	0,02		**0.6**	SPLS 6a_75 Ah Ct2 Ba 22	82,4	150,7	89,7	0,01		0,02
t1br1	t1br1	75x75x8	S235	5M20-5,6t	1,00	1,00	1,00	119	**-40.5**	SPLS 3_0,9_90 Ah All Cts	131,5	294,0	432,0	0,31		**66.8**	SPLS 6a_75 Ah All Cts Ba 3	204,3	294,0	349,1	0,33		0,33
t1bd1	t1bd1	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	174	**-6.9**	SPLS 6a_75 Ah All Cts Ba 12	29,4	37,7	86,4	0,24		**6.3**	SPLS 6a_75 Ba All Cts Ah 22	92,2	37,7	65,4	0,17		0,24
t1vd1	t1vd1	70x70x7	S235	1M16-5,6t	1,00	1,00	1,00	207	**-2.0**	SPLS 6a_75 Ba Ct2 Ah 3	40,9	37,7	60,5	0,05		**29.8**	SPLS 6a_75 Ba Ct2 Ba 1	104,8	37,7	44,8	0,79		0,79
t1bd7	t1bd7	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	124	**-13.7**	SPLS 6a_75 Ah All Cts Ba 1	44,1	37,7	86,4	0,36		**13.0**	SPLS 6a_75 Ba All Cts Ah 3	92,2	37,7	65,4	0,34		0,36
t1bd6	t1bd6	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	130	**-11.8**	SPLS 6a_75 Ba All Cts Ah 3	41,7	37,7	86,4	0,31		**12.5**	SPLS 6a_75 Ah All Cts Ba 3	92,2	37,7	65,4	0,33		0,33
t1vd3	t1vd3	60x60x5	S235	1M16-5,6t	1,00	1,00	1,00	206	**0.0**		25,3	37,7	43,2	0,00		**1.3**	SPLS 1a_90 Ba All Cts	60,5	37,7	32,0	0,04		0,04
t1bh2	t1bh2	50x50x4	S235	1M16-5,6t	1,00	1,00	1,00	133	**-4.7**	SPLS 6a_75 Ah Ct1 Ba 22	30,0	37,7	34,6	0,16		**1.1**	SPLS 6a_75 Ah Ct2 Ba 3	36,9	37,7	22,4	0,05		0,16
t1bd5	t1bd5	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	136	**-11.2**	SPLS 6a_75 Ah All Cts Ba 1	39,8	37,7	86,4	0,30		**10.7**	SPLS 6a_75 Ba All Cts Ah 3	92,2	37,7	65,4	0,28		0,30
t1bd4	t1bd4	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	152	**-8.3**	SPLS 6a_75 Ba All Cts Ah 22	34,7	37,7	86,4	0,24		**9.3**	SPLS 6a_75 Ah All Cts Ba 22	92,2	37,7	65,4	0,25		0,25
t1bd3	t1bd3	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	157	**-8.4**	SPLS 6a_75 Ah All Cts Ba 12	33,5	37,7	86,4	0,25		**7.6**	SPLS 6a_75 Ba All Cts Ah 22	92,2	37,7	65,4	0,20		0,25
t1bd2	t1bd2	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	170	**-7.2**	SPLS 6a_75 Ba All Cts Ah 22	30,2	37,7	86,4	0,24		**8.0**	SPLS 6a_75 Ah All Cts Ba 22	92,2	37,7	65,4	0,21		0,24
t1bh1	t1bh1	50x50x4	S235	1M16-5,6t	1,00	1,00	1,00	153	**-0.3**	ULS 1a_135	25,4	37,7	34,6	0,01		**0.3**	ULS 1a_0,9_0,9_0	36,9	37,7	22,4	0,01		0,01
t1bd9	t1bd9	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	108	**-16.7**	SPLS 6a_75 Ah All Cts Ba 1	50,3	37,7	86,4	0,44		**15.6**	SPLS 6a_75 Ba All Cts Ah 3	92,2	37,7	65,4	0,41		0,44
t1bd8	t1bd8	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	117	**-14.3**	SPLS 6a_75 Ba All Cts Ah 3	46,8	37,7	86,4	0,38		**15.3**	SPLS 6a_75 Ah All Cts Ba 1	92,2	37,7	65,4	0,41		0,41
t1vv2	t1vv2	60x60x6	S235	1M16-5,6t	1,00	1,00	1,00	188	**-2.1**	SPLS 6a_75 Ba Ct2 Ba 3	34,3	37,7	51,8	0,06		**13.9**	SPLS 6a_75 Ah Ct1 Ba 1	72,6	37,7	38,4	0,37		0,37
t1vd2	t1vd2	70x70x7	S235	1M16-5,6t	1,00	1,00	1,00	204	**-28.7**	SPLS 6a_75 Ba Ct2 Ba 1	41,6	37,7	60,5	0,76		**4.1**	SPLS 6a_75 Ah Ct2 Ba 3	104,8	37,7	52,3	0,11		0,76
t1vv1	t1vv1	60x60x5	S235	1M16-5,6t	1,00	1,00	1,00	188	**-0.7**	SPLS 6a_75 Ah All Cts Ba 3	28,8	37,7	43,2	0,02		**0.0**		60,5	37,7	37,3	0,00		0,02
t1or2	t1or2	80x80x8	S235	2M16-5,6t	2,00	1,00	1,00	199	**-11.0**	SPLS 6a_75 Ba Ct2 Ba 1	67,6	75,4	138,2	0,16		**0.0**		218,9	75,4	102,4	0,00		0,16
t1bd10	t1bd10	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	108	**-18.7**	SPLS 6a_75 Ba All Cts Ah 3	50,3	37,7	86,4	0,50		**20.2**	SPLS 6a_75 Ah All Cts Ba 1	92,2	37,7	65,4	0,54		0,54
t1bh4	t1bh4	120x80x10	S235	2M16-5,6t	2,00	2,00	2,00	94	**-0.1**	SPLS 1a_0,9_0,9_135 Ah Ct1	253,9	75,4	172,8	0,00		**15.0**	ULS 3_90	166,4	75,4	155,7	0,20		0,20
t1vv3	t1vv3	50x50x5	S235	1M16-5,6t	1,00	1,00	1,00	114	**-0.8**	ULS 7	43,3	37,7	43,2	0,02		**0.0**		46,1	37,7	28,0	0,00		0,02
t1bh3	t1bh3	50x50x4	S235	1M16-5,6t	1,00	1,00	1,00	107	**-0.2**	ULS 1a_0	37,2	37,7	34,6	0,01		**0.2**	ULS 1a_0,9_0,9_135	36,9	37,7	22,4	0,01		0,01
t1td1	t1td1	50x50x4	S235	1M16-5,6t	0,51	0,51	0,51	132	**-3.1**	SPLS 6a_75 Ba Ct2 Ah 3	30,0	37,7	34,6	0,10		**9.4**	SPLS 6a_75 Ba Ct2 Ba 1	36,9	37,7	22,4	0,42		0,42
mvh2	mvh2	75x75x8	S235	3M20-5,6t	2,00	1,00	1,00	75	**-30.6**	SPLS 3_0,9_90 Ba All Cts	167,1	176,4	259,2	0,18		**57.6**	SPLS 6a_75 Ah All Cts Ba 1	154,0	176,4	209,5	0,37		0,37
mzh1	mzh1	65x65x6	S235	2M16-5,6t	2,00	1,00	1,00	86	**-7.5**	SPLS 3_90 Ba Ct1	100,8	75,4	103,7	0,10		**6.7**	SPLS 6a_75 Ah Ct2 Ba 22	117,6	75,4	103,7	0,09		0,10
mrd2	mrd2	120x120x11	S235	8M20-5,6t	2,00	1,00	1,00	60	**-166.1**	SPLS 6a_75 Ah All Cts Ba 22	510,5	470,4	950,4	0,35		**116.5**	SPLS 1a_0,9_75 Ba All Cts	536,0	470,4	672,0	0,25		0,35
mtd5	mtd5	55x55x5	S235	2M16-5,6t	1,00	1,00	1,00	113	**-8.0**	SPLS 6a_75 Ah Ct2 Ba 3	60,1	75,4	172,8	0,13		**8.2**	SPLS 6a_75 Ah Ct1 Ba 1	50,7	75,4	112,1	0,16		0,16
mvd1	mvd1	60x60x6	S235	2M20-5,6t	0,50	0,50	0,50	120	**-22.3**	SPLS 3_90 Ba Ct1	73,5	117,6	129,6	0,30		**15.6**	SPLS 6a_75 Ah All Cts Ba 3	68,7	117,6	77,6	0,23		0,30
mzd1	mzd1	60x60x6	S235	2M20-5,6t	0,50	0,50	0,50	120	**-17.3**	SPLS 6a_75 Ah Ct2 Ba 22	73,5	117,6	129,6	0,24		**14.5**	SPLS 3_0,9_90 Ah Ct1	68,7	117,6	77,6	0,21		0,24
mth5	mth5	55x55x5	S235	2M16-5,6t	1,00	1,00	1,00	160	**0.0**	SPLS 3_0,9_105 Ah All Cts	40,8	75,4	172,8	0,00		**0.2**	SPLS 6a_75 Ba All Cts Ah 12	50,7	75,4	112,1	0,00		0,00
mvh3	mvh3	UNP100	S235	3M20-5,6t	2,00	1,00	1,00	62	**-75.4**	SPLS 6a_75 Ah All Cts Ba 12	225,4	176,4	194,4	0,43		**47.6**	SPLS 3_0,9_90 Ba All Cts	194,5	176,4	194,4	0,27		0,43
mtd1	mtd1	55x55x5	S235	2M16-5,6t	1,00	1,00	1,00	121	**-23.4**	SPLS 6a_75 Ba Ct1 Ba 22	56,5	75,4	172,8	0,41		**23.4**	SPLS 6a_75 Ba Ct1 Ba 22	50,7	75,4	149,3	0,46		0,46
t1od1	t1od1	65x65x7	S235	1M16-5,6t	0,53	0,53	0,53	87	**-20.6**	SPLS 6a_75 Ah Ct1 Ba 12	97,7	37,7	60,5	0,55		**19.9**	SPLS 6a_75 Ah Ct2 Ba 22	92,7	37,7	44,8	0,53		0,55
t1or1	t1or1	UNP100	S235	7M20-5,6t	1,50	1,00	1,00	79	**-101.6**	SPLS 6a_75 Ah Ct1 Ba 12	188,2	399,3	453,6	0,54		**58.8**	SPLS 3_0,9_90 Ba Ct2	173,4	399,3	366,5	0,34		0,54
mzh2	mzh2	UNP100	S235	2M20-5,6t	2,00	1,00	1,00	62	**-28.9**	SPLS 6a_75 Ah Ct2 Ba 22	226,7	117,6	129,6	0,25		**35.3**	SPLS 6a_75 Ah Ct1 Ba 12	185,1	117,6	88,7	0,40		0,40
t1od3	t1od3	65x65x7	S235	1M16-5,6t	0,53	0,53	0,53	77	**-29.0**	SPLS 6a_75 Ah Ct1 Ba 12	103,1	37,7	60,5	0,77		**29.7**	SPLS 6a_75 Ah Ct2 Ba 22	84,7	37,7	44,8	0,79		0,79
t1od2	t1od2	65x65x7	S235	1M16-5,6t	0,53	0,53	0,53	77	**-23.5**	SPLS 6a_75 Ah Ct2 Ba 22	102,9	37,7	60,5	0,62		**22.8**	SPLS 6a_75 Ah Ct1 Ba 12	84,7	37,7	44,8	0,61		0,62
mth1	mth1	55x55x5	S235	2M16-5,6t	1,00	1,00	1,00	171	**0.0**	SPLS 6a_75 Ba Ct2 Ba 1	37,6	75,4	172,8	0,00		**0.1**	ULS 3_0,9_90	47,3	75,4	148,0	0,00		0,00
mvd2	mvd2	65x65x6	S235	2M20-5,6t	0,50	0,50	0,50	108	**-61.1**	SPLS 6a_75 Ah Ct1 Ba 12	89,0	117,6	129,6	0,69		**51.5**	SPLS 6a_75 Ah Ct2 Ba 22	76,4	117,6	77,6	0,67		0,69
t1oh2	t1oh2	120x80x10	S235	2M16-8,8t	1,00	1,00	1,00	74	**0.0**		296,5	120,6	172,8	0,00		**36.3**	ULS 3_0,9_90	383,9	120,6	0,0	0,30		0,30
mzd2	mzd2	65x65x6	S235	2M24-5,6t	1,00	1,00	1,00	108	**-69.1**	SPLS 6a_75 Ah Ct1 Ba 12	89,0	169,4	155,5	0,78		**68.6**	SPLS 6a_75 Ah Ct1 Ba 12	96,5	169,4	77,0	0,89		0,89
mzd3	mzd3	65x65x6	S235	2M24-5,6t	0,50	0,50	0,50	112	**-67.6**	SPLS 6a_75 Ah Ct1 Ba 12	85,9	169,4	155,5	0,79		**68.1**	SPLS 6a_75 Ah Ct2 Ba 22	80,7	169,4	95,7	0,84		0,84
mvd3	mvd3	65x65x6	S235	2M20-5,6t	0,50	0,50	0,50	111	**-48.3**	SPLS 6a_75 Ah Ct2 Ba 22	87,0	117,6	129,6	0,56		**57.4**	SPLS 6a_75 Ah Ct1 Ba 12	76,4	117,6	77,6	0,75		0,75
mzd4	mzd4	65x65x7	S235	2M20-5,6t	2,00	1,00	1,00	132	**-59.8**	SPLS 6a_75 Ah Ct2 Ba 22	79,4	117,6	151,2	0,75		**58.1**	SPLS 6a_75 Ah Ct1 Ba 12	133,1	117,6	90,6	0,64		0,75
mvh4	mvh4	65x65x6	S235	3M20-5,6t	1,00	1,00	1,00	163	**-3.2**	SPLS 3_0,9_105 Ah All Cts	56,7	176,4	194,4	0,06		**53.0**	SPLS 6a_75 Ah All Cts Ba 21	99,2	176,4	116,5	0,53		0,53
mzh3	mzh3	60x60x6	S235	1M20-5,6t	2,00	1,00	1,00	110	**-4.2**	SPLS 6a_75 Ba Ct2 Ba 10	68,3	58,8	64,8	0,07		**0.3**	SPLS 1a_0,9_0,9_75 Ba Ct1	65,7	58,8	33,3	0,01		0,07
t2vd4	t2vd4	75x75x8	S235	3M20-5,6t	2,00	1,00	1,00	219	**0.0**		54,5	176,4	259,2	0,00		**54.6**	SPLS 6a_75 Ba Ct1 Ba 21	143,9	176,4	209,5	0,38		0,38
mzd5	mzd5	65x65x7	S235	2M20-5,6t	2,00	1,00	1,00	146	**-62.0**	SPLS 6a_75 Ah Ct2 Ba 22	70,8	117,6	151,2	0,88		**59.8**	SPLS 6a_75 Ah Ct1 Ba 12	133,1	117,6	90,6	0,66		0,88
t2vd1	t2vd1	55x55x5	S235	1M16-5,6t	1,00	1,00	1,00	260	**0.0**		16,5	37,7	86,4	0,00		**13.3**	SPLS 6a_75 Ba Ct2 Ba 11	92,2	37,7	56,0	0,35		0,35
mvd4	mvd4	70x70x7	S235	3M20-5,6t	0,50	0,50	0,50	108	**-62.2**	SPLS 6a_75 Ah Ct1 Ba 12	111,4	176,4	226,8	0,56		**51.6**	SPLS 6a_75 Ah Ct2 Ba 22	117,3	176,4	160,4	0,44		0,56
t2vv1	t2vv1	50x50x5	S235	1M16-5,6t	1,00	1,00	1,00	167	**-0.4**	SPLS 6a_75 Ah Ct1 Ba 10	28,0	37,7	43,2	0,02		**0.0**		46,1	37,7	28,0	0,00		0,02
t2bh1	t2bh1	50x50x5	S235	1M16-5,6t	1,00	1,00	1,00	162	**-2.6**	SPLS 6a_75 Ba Ct2 Ba 11	29,1	37,7	43,2	0,09		**0.0**		46,1	37,7	28,0	0,00		0,09
t2vv2	t2vv2	50x50x5	S235	1M16-5,6t	1,00	1,00	1,00	123	**-0.2**	SPLS 3_0,9_105 Ah Ct1	40,1	37,7	43,2	0,00		**10.1**	SPLS 6a_75 Ah Ct2 Ba 20	46,1	37,7	28,0	0,36		0,36
t2vd3	t2vd3	60x60x5	S235	1M16-5,6t	1,00	1,00	1,00	206	**0.0**		25,4	37,7	43,2	0,00		**5.3**	SPLS 6a_75 Ah All Cts Ba 10	141,1	37,7	32,0	0,17		0,17
t2vd2	t2vd2	60x60x6	S235	1M16-5,6t	1,00	1,00	1,00	172	**-16.1**	SPLS 6a_75 Ah Ct2 Ba 20	38,8	37,7	51,8	0,43		**0.0**		72,6	37,7	38,4	0,00		0,43
t2td1	t2td1	50x50x4	S235	1M16-5,6t	0,50	0,50	0,50	102	**0.0**		38,9	37,7	34,6	0,00		**3.4**	SPLS 6a_75 Ah Ct1 Ba 20	36,9	37,7	22,4	0,15		0,15
mzd6	mzd6	90x90x8	S235	3M22-5,6t	1,00	1,00	1,00	85	**-61.5**	SPLS 6a_75 Ah Ct1 Ba 12	198,4	218,2	285,1	0,31		**62.4**	SPLS 6a_75 Ah Ct2 Ba 22	178,3	218,2	211,2	0,35		0,35
t2vv3	t2vv3	50x50x5	S235	1M16-5,6t	1,00	1,00	1,00	66	**-0.5**	SPLS 6a_75 Ba Ct2 Ba 10	60,0	37,7	43,2	0,01		**0.0**		46,1	37,7	28,0	0,00		0,01
t2oh1	t2oh1	120x80x10	S235	2M16-8,8t	1,00	1,00	1,00	96	**0.0**		249,7	120,6	172,8	0,00		**33.9**	ULS 3_90	383,9	120,6	0,0	0,28		0,28
mtd2	mtd2	65x65x7	S235	2M20-5,6t	1,00	1,00	1,00	118	**-61.1**	SPLS 6a_75 Ba Ct1 Ba 21	94,4	117,6	151,2	0,65		**61.3**	SPLS 6a_75 Ah Ct1 Ba 10	99,4	117,6	106,9	0,62		0,65
mvd5	mvd5	90x90x8	S235	3M22-5,6t	0,53	0,53	0,53	93	**-119.1**	SPLS 3_90 Ba Ct1	185,8	218,2	285,1	0,64		**113.4**	SPLS 3_0,9_90 Ba Ct2	184,0	218,2	211,2	0,62		0,64
t2vh1	t2vh1	UNP140	S235	7M20-5,6t	1,59	1,00	1,00	66	**-257.6**	SPLS 6a_75 Ah Ct1 Ba 10	294,7	399,3	529,2	0,87		**180.0**	SPLS 6a_75 Ah Ct2 Ba 21	276,6	399,3	374,2	0,65		0,87
mth2	mth2	65x65x7	S235	2M20-5,6t	1,00	1,00	1,00	167	**-0.1**	SPLS 6a_75 Ba Ct2 Ba 12	63,2	117,6	151,2	0,00		**0.0**	ULS 1a_0,9_0,9_90	88,1	117,6	106,9	0,00		0,00
mvh5	mvh5	UNP140	S235	5M20-5,6t	2,00	1,00	1,00	60	**-204.9**	SPLS 6a_75 Ah All Cts Ba 10	324,9	294,0	378,0	0,70		**140.3**	SPLS 6a_75 Ah All Cts Ba 10	276,6	294,0	305,5	0,51		0,70
t2od4	t2od4	60x60x5	S235	1M16-5,6t	0,50	0,50	0,50	87	**-22.3**	SPLS 6a_75 Ah All Cts Ba 10	65,0	37,7	43,2	0,59		**20.6**	SPLS 6a_75 Ah All Cts Ba 21	60,5	37,7	32,0	0,64		0,64
t2od3	t2od3	70x70x7	S235	1M16-5,6t	0,50	0,50	0,50	77	**-34.4**	SPLS 6a_75 Ah Ct1 Ba 11	111,5	37,7	60,5	0,91		**36.0**	SPLS 6a_75 Ah Ct2 Ba 20	104,8	37,7	44,8	0,96		0,96
mzh4	mzh4	75x75x7#	S235	4M22-5,6t	2,00	1,00	1,00	92	**-29.5**	SPLS 6a_75 Ah Ct2 Ba 20	130,4	290,9	332,6	0,23		**34.4**	SPLS 6a_75 Ah Ct1 Ba 10	220,8	290,9	205,5	0,17		0,23
t2od2	t2od2	70x70x7	S235	1M16-5,6t	0,50	0,50	0,50	79	**-31.6**	SPLS 6a_75 Ah Ct2 Ba 20	110,5	37,7	60,5	0,84		**31.4**	SPLS 6a_75 Ah Ct1 Ba 11	104,8	37,7	44,8	0,83		0,84
t2od1	t2od1	70x70x7	S235	1M16-5,6t	0,50	0,50	0,50	86	**-28.6**	SPLS 6a_75 Ah All Cts Ba 11	106,7	37,7	60,5	0,76		**27.8**	SPLS 6a_75 Ah All Cts Ba 20	104,8	37,7	44,8	0,74		0,76
t2od6	t2od6	60x60x5	S235	1M16-5,6t	0,50	0,50	0,50	66	**-24.8**	SPLS 6a_75 Ah All Cts Ba 21	72,3	37,7	43,2	0,66		**25.8**	SPLS 6a_75 Ah All Cts Ba 10	60,5	37,7	32,0	0,81		0,81
t2oh2	t2oh2	120x80x10	S235	2M16-8,8t	1,00	1,00	1,00	59	**0.0**		328,9	120,6	172,8	0,00		**38.5**	ULS 3_90	383,9	120,6	0,0	0,32		0,32
t2od7	t2od7	60x60x5	S235	1M16-5,6t	0,50	0,50	0,50	71	**-35.9**	SPLS 6a_75 Ah All Cts Ba 10	70,7	37,7	43,2	0,95		**33.0**	SPLS 6a_75 Ah Ct2 Ba 21	60,5	37,7	32,0	1,03	stuik	1,03
t2od5	t2od5	60x60x5	S235	1M16-5,6t	0,50	0,50	0,50	72	**-21.9**	SPLS 6a_75 Ah All Cts Ba 21	70,5	37,7	43,2	0,58		**22.3**	SPLS 6a_75 Ah All Cts Ba 10	60,5	37,7	32,0	0,70		0,70
mr3	mr3	140x140x13#	S235	8M22-5,6t	2,00	1,00	1,00	52	**-430.2**	SPLS 1a_75 Ba All Cts	733,1	546,7	1235,5	0,79		**374.2**	SPLS 1a_0,9_75 Ba All Cts	750,9	546,7	1029,6	0,68		0,79
mzd7	mzd7	90x90x8	S235	3M22-5,6t	1,00	1,00	1,00	82	**-127.9**	SPLS 3_0,9_90 Ah Ct1	203,2	218,2	285,1	0,63		**127.5**	SPLS 3_0,9_90 Ah Ct2	207,0	218,2	211,2	0,62		0,63
mzd8	mzd8	90x90x8	S235	3M22-5,6t	0,53	0,53	0,53	98	**-128.8**	SPLS 3_90 Ah Ct2	178,4	218,2	285,1	0,72		**128.2**	SPLS 3_0,9_90 Ah Ct1	207,0	218,2	211,2	0,62		0,72
mvd6	mvd6	90x90x8	S235	3M22-5,6t	0,53	0,53	0,53	102	**-101.4**	SPLS 3_90 Ba Ct2	172,8	218,2	285,1	0,59		**104.8**	SPLS 3_90 Ba Ct1	184,0	218,2	211,2	0,57		0,59
mzd9	mzd9	90x90x8	S235	3M22-5,6t	0,53	0,53	0,53	104	**-110.4**	SPLS 3_0,9_90 Ba Ct1	170,4	218,2	285,1	0,65		**110.9**	SPLS 3_90 Ah Ct1	207,0	218,2	211,2	0,54		0,65
mvd7	mvd7	90x90x8	S235	2M22-5,6t	0,53	0,53	0,53	109	**-90.4**	SPLS 3_90 Ba Ct1	163,3	145,4	190,1	0,62		**87.5**	SPLS 3_90 Ba Ct2	189,8	145,4	140,8	0,62		0,62
mzd10	mzd10	90x90x8	S235	3M22-5,6t	0,53	0,53	0,53	111	**-99.6**	SPLS 3_90 Ah Ct2	160,3	218,2	285,1	0,62		**97.9**	SPLS 3_0,9_90 Ba Ct1	184,0	218,2	244,2	0,53		0,62
mvd8	mvd8	90x90x8	S235	2M22-5,6t	0,52	0,52	0,52	112	**-76.8**	SPLS 3_0,9_90 Ba Ct1	159,3	145,4	190,1	0,53		**78.7**	SPLS 6a_75 Ba Ct2 Ba 10	189,8	145,4	140,8	0,56		0,56
mr4	mr4	150x150x14	S235	8M22-5,6t	2,00	1,00	1,00	57	**-583.6**	SPLS 3_105 Ah All Cts	813,8	581,8	1330,6	1,00	afschuiving	**518.3**	SPLS 1a_0,9_75 Ba All Cts	866,2	581,8	1330,6	0,89		1,00
mzd11	mzd11	90x90x8	S235	2M22-5,6t	0,53	0,53	0,53	116	**-86.4**	SPLS 3_0,9_90 Ba Ct1	154,1	145,4	190,1	0,59		**87.9**	SPLS 3_90 Ah Ct2	155,3	145,4	140,8	0,62		0,62
mvd9	mvd9	90x90x8	S235	2M22-5,6t	0,52	0,52	0,52	119	**-72.4**	SPLS 3_90 Ba Ct2	150,2	145,4	190,1	0,50		**71.2**	SPLS 3_0,9_90 Ba Ct1	189,8	145,4	140,8	0,51		0,51
mzd12	mzd12	90x90x8	S235	2M22-5,6t	0,53	0,53	0,53	123	**-82.2**	SPLS 3_90 Ah Ct2	144,5	145,4	190,1	0,57		**79.1**	SPLS 3_0,9_90 Ba Ct1	155,3	145,4	140,8	0,56		0,57
mvd10	mvd10	90x90x8	S235	2M22-5,6t	0,52	0,52	0,52	126	**-67.8**	SPLS 3_90 Ba Ct1	140,9	145,4	190,1	0,48		**67.0**	SPLS 3_90 Ba Ct2	189,8	145,4	140,8	0,48		0,48
mzd13	mzd13	90x90x8	S235	2M22-5,6t	1,00	1,00	1,00	124	**-74.3**	SPLS 3_0,9_90 Ba Ct1	143,4	145,4	190,1	0,52		**77.6**	SPLS 3_90 Ah Ct2	155,3	145,4	140,8	0,55		0,55
mth3	mth3	65x65x6	S235	1M20-5,6t	1,00	1,00	1,00	296	**-0.1**	SPLS 1a_0 Ba All Cts	19,0	58,8	64,8	0,01		**0.0**	SPLS 3_0,9_90 Ah All Cts	65,7	58,8	33,3	0,00		0,01
mzd14	mzd14	90x90x8	S235	2M22-5,6t	1,00	1,00	1,00	125	**-55.3**	SPLS 3_0,9_90 Ba Ct2	142,0	145,4	190,1	0,39		**61.4**	SPLS 3_90 Ba Ct1	224,3	145,4	140,8	0,44		0,44
mr5	mr5	150x150x14	S235	8M22-5,6t	0,33	0,33	0,33	48	**-577.9**	SPLS 3_105 Ah All Cts	849,4	551,4	1330,6	1,05	afschuiving	**540.3**	SPLS 1a_0,9_75 Ba All Cts	866,2	581,8	1232,0	0,93		1,05
mzh5	mzh5	90x90x8	S235	2M22-5,6t	2,00	1,00	1,00	133	**-35.4**	SPLS 3_90 Ah All Cts	126,2	145,4	190,1	0,28		**29.7**	SPLS 3_0,9_90 Ba All Cts	241,5	145,4	140,8	0,21		0,28

Toetsing initiële constructie afkeurniveau

Datum: 30-7-2021
Auteur: SSHD
Versie: 1.0

GT-ZBH150
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Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Overschrijding druk	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)	Overschrijding trek	U.C
mvh6	mvh6	90x90x8	S235	2M22-5,6t	2,00	1,00	1,00	133	**-31.4**	SPLS 3_0,9_105 Ah All Cts	126,2	145,4	190,1	0,25		**42.7**	SPLS 3_105 Ah All Cts	241,5	145,4	140,8	0,30		0,30
mtd3	mtd3	60x60x5	S235	1M20-5,6t	1,00	1,00	1,00	220	**-1.4**	ULS 1a_0,9_0,9_75	23,1	58,8	54,0	0,06		**1.5**	ULS 1a_0,9_0,9_105	54,7	58,8	27,7	0,05		0,06
mvd11	mvd11	90x90x8	S235	2M22-5,6t	0,53	0,53	0,53	134	**-63.0**	SPLS 3_90 Ba Ct2	131,7	145,4	190,1	0,48		**50.0**	SPLS 3_0,9_90 Ba Ct1	155,3	145,4	140,8	0,36		0,48
mzd15	mzd15	90x90x8	S235	2M22-5,6t	0,50	1,00	0,50	110	**-74.1**	SPLS 3_90 Ba Ct1	153,0	145,4	190,1	0,51		**63.7**	SPLS 3_0,9_90 Ba Ct2	224,3	145,4	140,8	0,45		0,51
mvd12	mvd12	90x90x8	S235	2M22-5,6t	1,00	1,00	1,00	135	**-56.4**	SPLS 3_90 Ba Ct1	130,7	145,4	190,1	0,43		**47.3**	SPLS 3_0,9_90 Ba Ct2	155,3	145,4	140,8	0,34		0,43
mzh6	mzh6	70x70x7	S235	1M22-5,6t	2,30	1,76	1,20	163	**-3.9**	SPLS 1a_0,9_75 Ba All Cts	60,2	72,7	83,2	0,06		**3.4**	ULS 1a_0,9_0,9_135	92,7	72,7	73,4	0,05		0,06
mvh7	mvh7	70x70x7	S235	1M22-5,6t	2,30	1,76	1,20	163	**0.0**		60,2	72,7	83,2	0,00		**11.1**	SPLS 3_90 Ah All Cts	92,7	72,7	73,4	0,15		0,15
mtd4	mtd4	60x60x5	S235	1M20-5,6t	1,00	1,00	1,00	182	**-1.1**	ULS 1a_0	30,1	58,8	54,0	0,04		**0.9**	ULS 1a_0,9_0	54,7	58,8	27,7	0,03		0,04
mzd16	mzd16	100x100x10	S235	2M24-5,6t	0,33	0,33	0,33	86	**-84.6**	SPLS 3_90 Ba Ct1	272,4	169,4	259,2	0,50		**72.3**	SPLS 3_0,9_90 Ba Ct2	202,3	169,4	177,2	0,43		0,50
mvd13	mvd13	100x100x10	S235	2M22-5,6t	0,33	0,33	0,33	86	**-79.6**	SPLS 6a_75 Ah Ct1 Ba 10	272,4	145,4	237,6	0,55		**73.6**	SPLS 3_0,9_90 Ba Ct2	217,7	145,4	176,0	0,51		0,55

![DNV]

Toetsing versterkte constructie afkeurniveau

Datum: 30-7-2021
Auteur: SSHD
Versie: 1.0

GT-ZBH150
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Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Opm.	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)
mr1	mr1	50x50x4	S235	4M16-5.6t	0.50	0.50	0.50	142	**-0.8**	SPLS 6a_75 Ah Ct1 Ba	34.8	150.7	138.2	0.02		**0.6**	SPLS 6a_75 Ah Ct2 Ba	82.4	150.7	89.7	0.01
t1br1	t1br1	75x75x8	S235	5M20-5.6t	1.00	1.00	1.00	119	**-40.5**	SPLS 3_0,9_90 Ah All (	131.5	294.0	432.0	0.31		**66.8**	SPLS 6a_75 Ah All Cts	204.3	294.0	349.1	0.33
t1bd1	t1bd1	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	174	**-6.9**	SPLS 6a_75 Ah All Cts	29.4	37.7	86.4	0.24		**6.3**	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.17
t1vd1	t1vd1	70x70x7	S235	1M16-5.6t	1.00	1.00	1.00	207	**-2.0**	SPLS 6a_75 Ba Ct2 Ah	40.9	37.7	60.5	0.05		**29.8**	SPLS 6a_75 Ba Ct2 Ba	104.8	37.7	44.8	0.79
t1bd7	t1bd7	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	124	**-13.7**	SPLS 6a_75 Ah All Cts	44.1	37.7	86.4	0.36		**13.0**	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.34
t1bd6	t1bd6	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	130	**-11.8**	SPLS 6a_75 Ba All Cts	41.7	37.7	86.4	0.31		**12.5**	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.33
t1vd3	t1vd3	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	206	**0.0**		25.3	37.7	43.2	0.00		**1.3**	SPLS 1a_90 Ba All Cts	60.5	37.7	32.0	0.04
t1bh2	t1bh2	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	133	**-4.7**	SPLS 6a_75 Ah Ct1 Ba	30.0	37.7	34.6	0.16		**1.1**	SPLS 6a_75 Ah Ct2 Ba	36.9	37.7	22.4	0.05
t1bd5	t1bd5	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	136	**-11.2**	SPLS 6a_75 Ah All Cts	39.8	37.7	86.4	0.30		**10.7**	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.28
t1bd4	t1bd4	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	152	**-8.3**	SPLS 6a_75 Ba All Cts	34.7	37.7	86.4	0.24		**9.3**	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.25
t1bd3	t1bd3	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	157	**-8.4**	SPLS 6a_75 Ah All Cts	33.5	37.7	86.4	0.25		**7.6**	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.20
t1bd2	t1bd2	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	170	**-7.2**	SPLS 6a_75 Ba All Cts	30.2	37.7	86.4	0.24		**8.0**	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.21
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	153	**-0.3**	ULS 1a_135	25.4	37.7	34.6	0.01		**0.3**	ULS 1a_0,9_0,9_0	36.9	37.7	22.4	0.01
t1bd9	t1bd9	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	108	**-16.7**	SPLS 6a_75 Ah All Cts	50.3	37.7	86.4	0.44		**15.6**	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.41
t1bd8	t1bd8	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	117	**-14.3**	SPLS 6a_75 Ba All Cts	46.8	37.7	86.4	0.38		**15.3**	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.41
t1vv2	t1vv2	60x60x6	S235	1M16-5.6t	1.00	1.00	1.00	188	**-2.1**	SPLS 6a_75 Ah Ct2 Ba	34.3	37.7	51.8	0.06		**13.9**	SPLS 6a_75 Ah Ct1 Ba	72.6	37.7	38.4	0.37
t1vd2	t1vd2	70x70x7	S235	1M16-5.6t	1.00	1.00	1.00	204	**-28.7**	SPLS 6a_75 Ba Ct2 Ba	41.6	37.7	60.5	0.76		**4.1**	SPLS 6a_75 Ah Ct2 Ba	104.8	37.7	52.3	0.11
t1vv1	t1vv1	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	188	**-0.7**	SPLS 6a_75 Ah All Cts	28.8	37.7	43.2	0.02		**0.0**		60.5	37.7	37.3	0.00
t1or2	t1or2	80x80x8	S235	2M16-5.6t	2.00	1.00	1.00	199	**-11.0**	SPLS 6a_75 Ba Ct2 Ba	67.6	75.4	138.2	0.16		**0.0**		218.9	75.4	102.4	0.00
t1bd10	t1bd10	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	108	**-18.7**	SPLS 6a_75 Ba All Cts	50.3	37.7	86.4	0.50		**20.2**	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.54
t1bh4	t1bh4	120x80x10	S235	2M16-5.6t	2.00	2.00	2.00	94	**-0.1**	SPLS 1a_0,9_0,9_135	253.9	75.4	172.8	0.00		**15.0**	ULS 3_90	166.4	75.4	155.7	0.20
t1vv3	t1vv3	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	114	**-0.8**	ULS 7	43.3	37.7	43.2	0.02		**0.0**		46.1	37.7	28.0	0.00
t1bh3	t1bh3	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	107	**-0.2**	ULS 1a_0	37.2	37.7	34.6	0.01		**0.2**	ULS 1a_0,9_0,9_135	36.9	37.7	22.4	0.01
t1td1	t1td1	50x50x4	S235	1M16-5.6t	0.51	0.51	0.51	132	**-3.1**	SPLS 6a_75 Ba Ct2 Ah	30.0	37.7	34.6	0.10		**9.4**	SPLS 6a_75 Ba Ct2 Ba	36.9	37.7	22.4	0.42
mvh2	mvh2	75x75x8	S235	3M20-5.6t	2.00	1.00	1.00	75	**-30.6**	SPLS 3_0,9_90 Ba All (	167.1	176.4	259.2	0.18		**57.6**	SPLS 6a_75 Ah All Cts	154.0	176.4	209.5	0.37
mzh1	mzh1	65x65x6	S235	2M16-5.6t	2.00	1.00	1.00	86	**-7.5**	SPLS 3_90 Ba Ct1	100.8	75.4	103.7	0.10		**6.7**	SPLS 6a_75 Ah Ct2 Ba	117.6	75.4	103.7	0.09
mrd2	mrd2	120x120x11	S235	8M20-5.6t	2.00	1.00	1.00	60	**-166.1**	SPLS 6a_75 Ah All Cts	510.5	470.4	950.4	0.35		**116.5**	SPLS 1a_0,9_75 Ba All	536.0	470.4	672.0	0.25
mtd5	mtd5	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	113	**-8.0**	SPLS 6a_75 Ah Ct2 Ba	60.1	75.4	172.8	0.13		**8.2**	SPLS 6a_75 Ah Ct1 Ba	50.7	75.4	112.1	0.16
mvd1	mvd1	60x60x6	S235	2M20-5.6t	0.50	0.50	0.50	120	**-22.3**	SPLS 3_90 Ba Ct1	73.5	117.6	129.6	0.30		**15.6**	SPLS 6a_75 Ah All Cts	68.7	117.6	77.6	0.23
mzd1	mzd1	60x60x6	S235	2M20-5.6t	0.50	0.50	0.50	120	**-17.3**	SPLS 6a_75 Ah Ct2 Ba	73.5	117.6	129.6	0.24		**14.5**	SPLS 3_0,9_90 Ah Ct1	68.7	117.6	77.6	0.21
mth5	mth5	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	160	**0.0**	SPLS 3_0,9_105 Ah All	40.8	75.4	172.8	0.00		**0.2**	SPLS 6a_75 Ba All Cts	50.7	75.4	112.1	0.00
mvh3	mvh3	UNP100	S235	3M20-5.6t	2.00	1.00	1.00	62	**-75.4**	SPLS 6a_75 Ah All Cts	225.4	176.4	194.4	0.43		**47.7**	SPLS 3_0,9_90 Ba All (	194.5	176.4	194.4	0.27
mtd1	mtd1	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	121	**-23.4**	SPLS 6a_75 Ba Ct1 Ba	56.5	75.4	172.8	0.41		**23.4**	SPLS 6a_75 Ba Ct1 Ba	50.7	75.4	149.3	0.46
t1od1	t1od1	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	87	**-20.6**	SPLS 6a_75 Ah Ct1 Ba	97.7	37.7	60.5	0.55		**19.9**	SPLS 6a_75 Ah Ct2 Ba	92.7	37.7	44.8	0.53
t1or1	t1or1	UNP100	S235	7M20-5.6t	1.50	1.00	1.00	79	**-101.6**	SPLS 6a_75 Ah Ct1 Ba	188.2	399.3	453.6	0.54		**58.8**	SPLS 3_0,9_90 Ba Ct2	173.4	399.3	366.5	0.34
mzh2	mzh2	UNP100	S235	2M20-5.6t	2.00	1.00	1.00	62	**-28.9**	SPLS 6a_75 Ah Ct2 Ba	226.7	117.6	129.6	0.25		**35.3**	SPLS 6a_75 Ah Ct1 Ba	185.1	117.6	88.7	0.40
t1od3	t1od3	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	77	**-29.0**	SPLS 6a_75 Ah Ct1 Ba	103.1	37.7	60.5	0.77		**29.7**	SPLS 6a_75 Ah Ct2 Ba	84.7	37.7	44.8	0.79
t1od2	t1od2	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	77	**-23.5**	SPLS 6a_75 Ah Ct2 Ba	102.9	37.7	60.5	0.62		**22.8**	SPLS 6a_75 Ah Ct1 Ba	84.7	37.7	44.8	0.61
mth1	mth1	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	171	**0.0**	SPLS 6a_75 Ba Ct2 Ba	37.6	75.4	172.8	0.00		**0.1**	ULS 3_0,9_90	47.3	75.4	148.0	0.00
mvd2	mvd2	65x65x6	S235	2M20-5.6t	0.50	0.50	0.50	108	**-61.1**	SPLS 6a_75 Ah Ct1 Ba	89.0	117.6	129.6	0.69		**51.5**	SPLS 6a_75 Ah Ct2 Ba	76.4	117.6	77.6	0.67
t1oh2	t1oh2	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	74	**0.0**		296.5	120.6	172.8	0.00		**36.3**	ULS 3_0,9_90	383.9	120.6	0.0	0.30
mzd2	mzd2	65x65x6	S235	2M24-5.6t	1.00	1.00	1.00	108	**-69.1**	SPLS 6a_75 Ah Ct1 Ba	89.0	169.4	155.5	0.78		**68.6**	SPLS 6a_75 Ah Ct1 Ba	96.5	169.4	77.0	0.89
mzd3	mzd3	65x65x6	S235	2M24-5.6t	0.50	0.50	0.50	112	**-67.6**	SPLS 6a_75 Ah Ct1 Ba	85.9	169.4	155.5	0.79		**68.1**	SPLS 6a_75 Ah Ct2 Ba	80.7	169.4	95.7	0.84
mvd3	mvd3	65x65x6	S235	2M20-5.6t	0.50	0.50	0.50	111	**-48.3**	SPLS 6a_75 Ah Ct2 Ba	87.0	117.6	129.6	0.55		**57.4**	SPLS 6a_75 Ah Ct1 Ba	76.4	117.6	77.6	0.75
mzd4	mzd4	65x65x7	S235	2M20-5.6t	2.00	1.00	1.00	132	**-59.8**	SPLS 6a_75 Ah Ct2 Ba	79.4	117.6	151.2	0.75		**58.1**	SPLS 6a_75 Ah Ct1 Ba	133.1	117.6	90.6	0.64
mvh4	mvh4	65x65x6	S235	3M20-5.6t	1.00	1.00	1.00	163	**-3.1**	SPLS 3_0,9_105 Ah All	56.7	176.4	194.4	0.05		**53.1**	SPLS 6a_75 Ah All Cts	99.2	176.4	116.5	0.54
mzh3	mzh3	60x60x6	S235	1M20-5.6t	2.00	1.00	1.00	110	**-4.2**	SPLS 6a_75 Ba Ct2 Ba	68.3	58.8	64.8	0.07		**0.3**	SPLS 1a_0,9_0,9_75 B	65.7	58.8	33.3	0.01
t2vd4	t2vd4	75x75x8	S235	3M20-5.6t	2.00	1.00	1.00	219	**0.0**		54.5	176.4	259.2	0.00		**54.6**	SPLS 6a_75 Ba Ct1 Ba	143.9	176.4	209.5	0.38
mzd5	mzd5	65x65x7	S235	2M20-5.6t	2.00	1.00	1.00	146	**-62.0**	SPLS 6a_75 Ah Ct2 Ba	70.8	117.6	151.2	0.88		**59.8**	SPLS 6a_75 Ah Ct1 Ba	133.1	117.6	90.6	0.66
t2vd1	t2vd1	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	260	**0.0**		16.5	37.7	86.4	0.00		**13.3**	SPLS 6a_75 Ba Ct2 Ba	92.2	37.7	56.0	0.35
mvd4	mvd4	70x70x7	S235	3M20-5.6t	0.50	0.50	0.50	108	**-62.2**	SPLS 6a_75 Ah Ct1 Ba	111.4	176.4	226.8	0.56		**51.6**	SPLS 6a_75 Ah Ct2 Ba	117.3	176.4	160.4	0.44
t2vv1	t2vv1	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	167	**-0.5**	SPLS 6a_75 Ah Ct1 Ba	28.0	37.7	43.2	0.02		**0.0**		46.1	37.7	28.0	0.00
t2bh1	t2bh1	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	162	**-2.6**	SPLS 6a_75 Ba Ct2 Ba	29.1	37.7	43.2	0.09		**0.0**		46.1	37.7	28.0	0.00
t2vv2	t2vv2	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	123	**-0.1**	SPLS 3_0,9_105 Ah Ct	40.1	37.7	43.2	0.00		**10.1**	SPLS 6a_75 Ah Ct2 Ba	46.1	37.7	28.0	0.36
t2vd3	t2vd3	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	206	**0.0**		25.4	37.7	43.2	0.00		**5.4**	SPLS 6a_75 Ah Ct2 Ba	141.1	37.7	32.0	0.17
t2vd2	t2vd2	60x60x6	S235	1M16-5.6t	1.00	1.00	1.00	172	**-16.1**	SPLS 6a_75 Ah Ct2 Ba	38.8	37.7	51.8	0.43		**0.0**		72.6	37.7	38.4	0.00
t2td1	t2td1	50x50x4	S235	1M16-5.6t	0.50	0.50	0.50	102	**0.0**		38.9	37.7	34.6	0.00		**3.4**	SPLS 6a_75 Ah Ct1 Ba	36.9	37.7	22.4	0.15
mzd6	mzd6	90x90x8	S235	3M22-5.6t	1.00	1.00	1.00	85	**-61.5**	SPLS 6a_75 Ah Ct1 Ba	198.4	218.2	285.1	0.31		**62.4**	SPLS 6a_75 Ah Ct2 Ba	178.3	218.2	211.2	0.35
t2vv3	t2vv3	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	66	**-0.5**	SPLS 6a_75 Ba Ct2 Ba	60.0	37.7	43.2	0.01		**0.0**		46.1	37.7	28.0	0.00
t2oh1	t2oh1	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	96	**0.0**		249.7	120.6	172.8	0.00		**33.9**	ULS 3_90	383.9	120.6	0.0	0.28
mtd2	mtd2	65x65x7	S235	2M20-5.6t	1.00	1.00	1.00	118	**-61.1**	SPLS 6a_75 Ba Ct1 Ba	94.4	117.6	151.2	0.65		**61.3**	SPLS 6a_75 Ah Ct1 Ba	99.4	117.6	106.9	0.62
mvd5	mvd5	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	93	**-119.1**	SPLS 3_90 Ba Ct1	185.8	218.2	285.1	0.64		**113.4**	SPLS 3_0,9_90 Ba Ct2	184.0	218.2	211.2	0.62
t2vh1	t2vh1	UNP140	S235	7M20-5.6t	1.59	1.00	1.00	66	**-257.7**	SPLS 6a_75 Ah Ct1 Ba	294.7	399.3	529.2	0.87		**179.9**	SPLS 6a_75 Ah Ct2 Ba	276.6	399.3	374.2	0.65
mth2	mth2	65x65x7	S235	2M20-5.6t	1.00	1.00	1.00	167	**-0.1**	SPLS 6a_75 Ba Ct2 Ba	63.2	117.6	151.2	0.00		**0.0**	ULS 1a_0,9_0,9_90	88.1	117.6	106.9	0.00
mvh5	mvh5	UNP140	S235	5M20-5.6t	2.00	1.00	1.00	60	**-205.0**	SPLS 6a_75 Ah All Cts	324.9	294.0	378.0	0.70		**140.2**	SPLS 6a_75 Ah All Cts	276.6	294.0	305.5	0.51
t2od4	t2od4	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	87	**-22.2**	SPLS 6a_75 Ah All Cts	65.0	37.7	43.2	0.59		**20.6**	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.64
t2od3	t2od3	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	77	**-34.4**	SPLS 6a_75 Ah Ct1 Ba	111.5	37.7	60.5	0.91		**36.0**	SPLS 6a_75 Ah Ct2 Ba	104.8	37.7	44.8	0.96
mzh4	mzh4	75x75x7#	S235	4M22-5.6t	2.00	1.00	1.00	92	**-29.5**	SPLS 6a_75 Ah Ct2 Ba	130.4	290.9	332.6	0.23		**34.4**	SPLS 6a_75 Ah Ct1 Ba	220.8	290.9	205.5	0.17
t2od2	t2od2	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	79	**-31.6**	SPLS 6a_75 Ah Ct2 Ba	110.5	37.7	60.5	0.84		**31.4**	SPLS 6a_75 Ah Ct1 Ba	104.8	37.7	44.8	0.83

Toetsing versterkte constructie afkeurniveau

Datum: 30-7-2021
Auteur: SSHD
Versie: 1.0

GT-ZBH150
A
Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Opm.	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)
t2od1	t2od1	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	86	**-28.6**	SPLS 6a_75 Ah All Cts	106.7	37.7	60.5	0.76		**27.8**	SPLS 6a_75 Ah All Cts	104.8	37.7	44.8	0.74
t2od6	t2od6	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	66	**-24.0**	SPLS 6a_75 Ah All Cts	72.3	37.7	43.2	0.64		**25.5**	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.80
t2oh2	t2oh2	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	59	**0.0**		328.9	120.6	172.8	0.00		**38.6**	ULS 3_90	383.9	120.6	0.0	0.32
t2od7	t2od7	**70x70x7**	**S355**	**1M16-8.8t**	0.50	0.50	0.50	61	**-36.7**	SPLS 6a_75 Ah All Cts	170.0	60.3	82.3	0.61		**33.0**	SPLS 6a_75 Ah Ct2 Ba	115.2	60.3	61.0	0.55
t2od5	t2od5	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	72	**-22.1**	SPLS 6a_75 Ah All Cts	70.5	37.7	43.2	0.59		**22.3**	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.70
mr3	mr3	140x140x13#	S235	8M22-5.6t	2.00	1.00	1.00	52	**-430.2**	SPLS 1a_75 Ba All Cts	733.1	546.7	1235.5	0.79		**374.1**	SPLS 1a_0,9_75 Ba All	750.9	546.7	1029.6	0.68
mzd7	mzd7	90x90x8	S235	3M22-5.6t	1.00	1.00	1.00	82	**-127.9**	SPLS 3_0,9_90 Ah Ct1	203.2	218.2	285.1	0.63		**127.5**	SPLS 3_0,9_90 Ah Ct2	207.0	218.2	211.2	0.62
mzd8	mzd8	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	98	**-128.8**	SPLS 3_90 Ah Ct2	178.4	218.2	285.1	0.72		**128.2**	SPLS 3_0,9_90 Ah Ct1	207.0	218.2	211.2	0.62
mvd6	mvd6	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	102	**-101.3**	SPLS 3_90 Ba Ct2	172.8	218.2	285.1	0.59		**104.8**	SPLS 3_90 Ba Ct1	184.0	218.2	211.2	0.57
mzd9	mzd9	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	104	**-110.4**	SPLS 3_0,9_90 Ba Ct1	170.4	218.2	285.1	0.65		**110.9**	SPLS 3_90 Ah Ct2	207.0	218.2	211.2	0.54
mvd7	mvd7	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	109	**-90.4**	SPLS 3_90 Ba Ct1	163.3	145.4	190.1	0.62		**87.5**	SPLS 3_90 Ba Ct2	189.8	145.4	140.8	0.62
mzd10	mzd10	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	111	**-99.6**	SPLS 3_90 Ah Ct2	160.3	218.2	285.1	0.62		**97.9**	SPLS 3_0,9_90 Ba Ct1	184.0	218.2	244.2	0.53
mvd8	mvd8	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	112	**-76.8**	SPLS 3_0,9_90 Ba Ct1	159.3	145.4	190.1	0.53		**78.7**	SPLS 6a_75 Ba Ct2 Ba	189.8	145.4	140.8	0.56
mr4	mr4	150x150x14	S235	**8M22-8.8t**	2.00	1.00	1.00	57	**-583.6**	SPLS 3_105 Ah All Cts	813.8	930.8	1330.6	0.72		**518.2**	SPLS 1a_0,9_75 Ba All	866.2	930.8	1330.6	0.60
mzd11	mzd11	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	116	**-86.4**	SPLS 3_0,9_90 Ba Ct1	154.1	145.4	190.1	0.59		**87.9**	SPLS 3_90 Ah Ct2	155.3	145.4	140.8	0.62
mvd9	mvd9	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	119	**-72.4**	SPLS 3_90 Ba Ct2	150.2	145.4	190.1	0.50		**71.2**	SPLS 3_0,9_90 Ba Ct1	189.8	145.4	140.8	0.51
mzd12	mzd12	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	123	**-82.2**	SPLS 3_90 Ah Ct2	144.5	145.4	190.1	0.57		**79.1**	SPLS 3_0,9_90 Ba Ct1	155.3	145.4	140.8	0.56
mvd10	mvd10	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	126	**-67.8**	SPLS 3_90 Ba Ct1	140.9	145.4	190.1	0.48		**67.0**	SPLS 3_90 Ba Ct2	189.8	145.4	140.8	0.48
mzd13	mzd13	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	124	**-74.3**	SPLS 3_0,9_90 Ba Ct1	143.4	145.4	190.1	0.52		**77.6**	SPLS 3_90 Ah Ct2	155.3	145.4	140.8	0.55
mth3	mth3	65x65x6	S235	1M20-5.6t	1.00	1.00	1.00	296	**-0.1**	SPLS 1a_0 Ba All Cts	19.0	58.8	64.8	0.01		**0.0**	SPLS 3_0,9_90 Ah All (	65.7	58.8	33.3	0.00
mzd14	mzd14	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	125	**-55.3**	SPLS 3_0,9_90 Ba Ct2	142.0	145.4	190.1	0.39		**61.4**	SPLS 3_90 Ba Ct1	224.3	145.4	140.8	0.44
mr5	mr5	150x150x14	S235	**8M22-8.8t**	**2.00**	**1.00**	**1.00**	45	**-605.1**	SPLS 1a_75 Ba All Cts	859.9	930.8	1330.6	0.70		**540.3**	SPLS 1a_0,9_75 Ba All	866.2	930.8	1232.0	0.62
mzh5	mzh5	90x90x8	S235	2M22-5.6t	2.00	1.00	1.00	133	**-35.4**	SPLS 3_90 Ah All Cts	126.2	145.4	190.1	0.28		**29.7**	SPLS 3_0,9_90 Ba All (	241.5	145.4	140.8	0.21
mvh6	mvh6	90x90x8	S235	2M22-5.6t	2.00	1.00	1.00	133	**-31.4**	SPLS 3_0,9_105 Ah All	126.2	145.4	190.1	0.25		**42.7**	SPLS 3_105 Ah All Cts	241.5	145.4	140.8	0.30
mtd3	mtd3	60x60x5	S235	1M20-5.6t	1.00	1.00	1.00	220	**-1.4**	ULS 1a_0,9_0,9_75	23.1	58.8	54.0	0.06		**1.5**	ULS 1a_0,9_0,9_105	54.7	58.8	27.7	0.05
mvd11	mvd11	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	134	**-63.0**	SPLS 3_90 Ba Ct2	131.7	145.4	190.1	0.48		**50.0**	SPLS 3_0,9_90 Ba Ct1	155.3	145.4	140.8	0.36
mzd15	mzd15	90x90x8	S235	2M22-5.6t	0.50	1.00	0.50	110	**-74.1**	SPLS 3_90 Ba Ct1	153.0	145.4	190.1	0.51		**63.7**	SPLS 3_0,9_90 Ba Ct2	224.3	145.4	140.8	0.45
mvd12	mvd12	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	135	**-56.4**	SPLS 3_90 Ba Ct1	130.7	145.4	190.1	0.43		**47.3**	SPLS 3_0,9_90 Ba Ct2	155.3	145.4	140.8	0.34
mzh6	mzh6	70x70x7	S235	1M22-5.6t	2.30	1.76	1.20	163	**-3.9**	SPLS 1a_0,9_75 Ba All	60.2	72.7	83.2	0.06		**3.4**	ULS 1a_0,9_0,9_135	92.7	72.7	73.4	0.05
mvh7	mvh7	70x70x7	S235	1M22-5.6t	2.30	1.76	1.20	163	**0.0**		60.2	72.7	83.2	0.00		**11.1**	SPLS 3_90 Ah All Cts	92.7	72.7	73.4	0.15
mtd4	mtd4	60x60x5	S235	1M20-5.6t	1.00	1.00	1.00	182	**-1.1**	ULS 1a_0	30.1	58.8	54.0	0.04		**0.9**	ULS 1a_0,9_0	54.7	58.8	27.7	0.03
mzd16	mzd16	100x100x10	S235	2M24-5.6t	0.33	0.33	0.33	86	**-84.6**	SPLS 3_90 Ba Ct1	272.4	169.4	259.2	0.50		**72.3**	SPLS 3_0,9_90 Ba Ct2	202.3	169.4	177.2	0.43
mvd13	mvd13	100x100x10	S235	2M22-5.6t	0.33	0.33	0.33	86	**-79.6**	SPLS 6a_75 Ah Ct1 Ba	272.4	145.4	237.6	0.55		**73.6**	SPLS 3_0,9_90 Ba Ct2	217.7	145.4	176.0	0.51

Toetsing versterkte constructieonderdelen verbouwniveau

Datum: 30-7-2021
Auteur: SSHD
Versie: 1.0

GT-ZBH150
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Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Opm.	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)
mr1	mr1	50x50x4	S235	4M16-5.6t	0.50	0.50	0.50	142	-0.8	SPLS 6a_75 Ah Ct1 Ba	34.8	150.7	138.2	0.02		0.6	SPLS 6a_75 Ah Ct2 Ba	82.4	150.7	89.7	0.01
t1br1	t1br1	75x75x8	S235	5M20-5.6t	1.00	1.00	1.00	119	-41.0	SPLS 3_0,9_90 Ah All (	131.5	294.0	432.0	0.31		68.6	SPLS 6a_75 Ah All Cts	204.3	294.0	349.1	0.34
t1bd1	t1bd1	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	174	-7.1	SPLS 6a_75 Ah All Cts	29.4	37.7	86.4	0.24		6.6	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.18
t1vd1	t1vd1	70x70x7	S235	1M16-5.6t	1.00	1.00	1.00	207	-1.3	SPLS 6a_75 Ba Ct2 Ah	40.9	37.7	60.5	0.04		30.8	SPLS 6a_75 Ba Ct2 Ba	104.8	37.7	44.8	0.82
t1bd7	t1bd7	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	124	-13.9	SPLS 6a_75 Ah All Cts	44.1	37.7	86.4	0.37		13.3	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.35
t1bd6	t1bd6	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	130	-12.1	SPLS 6a_75 Ba All Cts	41.7	37.7	86.4	0.32		12.7	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.34
t1vd3	t1vd3	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	206	0.0		25.3	37.7	43.2	0.00		1.5	ULS 7	60.5	37.7	32.0	0.05
t1bh2	t1bh2	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	133	-4.9	SPLS 6a_75 Ah Ct1 Ba	30.0	37.7	34.6	0.16		1.0	SPLS 6a_75 Ah Ct2 Ba	36.9	37.7	22.4	0.04
t1bd5	t1bd5	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	136	-11.4	SPLS 6a_75 Ah All Cts	39.8	37.7	86.4	0.30		10.9	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.29
t1bd4	t1bd4	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	152	-8.7	SPLS 6a_75 Ba All Cts	34.7	37.7	86.4	0.25		9.6	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.25
t1bd3	t1bd3	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	157	-8.7	SPLS 6a_75 Ah All Cts	33.5	37.7	86.4	0.26		7.9	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.21
t1bd2	t1bd2	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	170	-7.5	SPLS 6a_75 Ba All Cts	30.2	37.7	86.4	0.25		8.2	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.22
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	153	-0.4	ULS 1a_135	25.4	37.7	34.6	0.01		0.3	ULS 1a_0,9_0,9_0	36.9	37.7	22.4	0.01
t1bd9	t1bd9	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	108	-16.9	SPLS 6a_75 Ah All Cts	50.3	37.7	86.4	0.45		15.9	SPLS 6a_75 Ba All Cts	92.2	37.7	65.4	0.42
t1bd8	t1bd8	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	117	-14.6	SPLS 6a_75 Ba All Cts	46.8	37.7	86.4	0.39		15.5	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.41
t1vv2	t1vv2	60x60x6	S235	1M16-5.6t	1.00	1.00	1.00	188	-1.9	SPLS 6a_75 Ah Ct2 Ba	34.3	37.7	51.8	0.06		14.3	SPLS 6a_75 Ah Ct1 Ba	72.6	37.7	38.4	0.38
t1vd2	t1vd2	70x70x7	S235	1M16-5.6t	1.00	1.00	1.00	204	-29.6	SPLS 6a_75 Ba Ct2 Ba	41.6	37.7	60.5	0.79		3.6	SPLS 6a_75 Ah Ct2 Ba	104.8	37.7	52.3	0.10
t1vv1	t1vv1	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	188	-0.7	SPLS 6a_75 Ah All Cts	28.8	37.7	43.2	0.03		0.0		60.5	37.7	37.3	0.00
t1or2	t1or2	80x80x8	S235	2M16-5.6t	2.00	1.00	1.00	199	-11.7	ULS 6a_75 Ba 1	67.6	75.4	138.2	0.17		0.0		218.9	75.4	102.4	0.00
t1bd10	t1bd10	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	108	-19.2	SPLS 6a_75 Ba All Cts	50.3	37.7	86.4	0.51		20.4	SPLS 6a_75 Ah All Cts	92.2	37.7	65.4	0.54
t1bh4	t1bh4	120x80x10	S235	2M16-5.6t	2.00	2.00	2.00	94	-0.1	SPLS 1a_0,9_0,9_135	253.9	75.4	172.8	0.00		16.7	ULS 3_90	166.4	75.4	155.7	0.22
t1vv3	t1vv3	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	114	-0.9	ULS 7	43.3	37.7	43.2	0.02		0.0		46.1	37.7	28.0	0.00
t1bh3	t1bh3	50x50x4	S235	1M16-5.6t	1.00	1.00	1.00	107	-0.2	ULS 1a_0,9_0	37.2	37.7	34.6	0.01		0.2	ULS 1a_0,9_0,9_135	36.9	37.7	22.4	0.01
t1td1	t1td1	50x50x4	S235	1M16-5.6t	0.51	0.51	0.51	132	-2.9	SPLS 6a_75 Ba Ct2 Ah	30.0	37.7	34.6	0.10		9.7	SPLS 6a_75 Ba Ct2 Ba	36.9	37.7	22.4	0.43
mvh2	mvh2	75x75x8	S235	3M20-5.6t	2.00	1.00	1.00	75	-31.2	SPLS 3_0,9_90 Ba All (	167.1	176.4	259.2	0.19		59.9	SPLS 6a_75 Ah All Cts	154.0	176.4	209.5	0.39
mzh1	mzh1	65x65x6	S235	2M16-5.6t	2.00	1.00	1.00	86	-7.7	SPLS 3_90 Ba Ct1	100.8	75.4	103.7	0.10		6.9	SPLS 6a_75 Ah Ct2 Ba	117.6	75.4	103.7	0.09
mrd2	mrd2	120x120x11	S235	8M20-5.6t	2.00	1.00	1.00	60	-171.6	SPLS 6a_75 Ah All Cts	510.5	470.4	950.4	0.36		119.1	SPLS 1a_0,9_75 Ba All	536.0	470.4	672.0	0.25
mtd5	mtd5	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	113	-8.3	SPLS 6a_75 Ah Ct2 Ba	60.1	75.4	172.8	0.14		8.5	SPLS 6a_75 Ah Ct1 Ba	50.7	75.4	112.1	0.17
mvd1	mvd1	60x60x6	S235	2M20-5.6t	0.50	0.50	0.50	120	-23.0	SPLS 3_90 Ba Ct1	73.5	117.6	129.6	0.31		15.8	SPLS 6a_75 Ah All Cts	68.7	117.6	77.6	0.23
mzd1	mzd1	60x60x6	S235	2M20-5.6t	0.50	0.50	0.50	120	-17.8	SPLS 6a_75 Ah Ct2 Ba	73.5	117.6	129.6	0.24		14.8	SPLS 3_0,9_90 Ah Ct1	68.7	117.6	77.6	0.22
mth5	mth5	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	160	0.0	SPLS 3_0,9_105 Ah All	40.8	75.4	172.8	0.00		0.2	SPLS 6a_75 Ba All Cts	50.7	75.4	112.1	0.00
mvh3	mvh3	UNP100	S235	3M20-5.6t	2.00	1.00	1.00	62	-77.9	SPLS 6a_75 Ah All Cts	225.4	176.4	194.4	0.44		49.0	SPLS 3_0,9_90 Ba All (	194.5	176.4	194.4	0.28
mtd1	mtd1	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	121	-24.0	SPLS 6a_75 Ba Ct1 Ba	56.5	75.4	172.8	0.42		24.0	SPLS 6a_75 Ah Ct1 Ba	50.7	75.4	149.3	0.47
t1od1	t1od1	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	87	-21.0	SPLS 6a_75 Ah Ct1 Ba	97.7	37.7	60.5	0.56		20.3	SPLS 6a_75 Ah Ct2 Ba	92.7	37.7	44.8	0.54
t1or1	t1or1	UNP100	S235	7M20-5.6t	1.50	1.00	1.00	79	-104.6	SPLS 6a_75 Ah Ct1 Ba	188.2	399.3	453.6	0.56		60.2	SPLS 3_0,9_90 Ba Ct2	173.4	399.3	366.5	0.35
mzh2	mzh2	UNP100	S235	2M20-5.6t	2.00	1.00	1.00	62	-29.5	SPLS 6a_75 Ah Ct2 Ba	226.7	117.6	129.6	0.25		36.2	SPLS 6a_75 Ah Ct1 Ba	185.1	117.6	88.7	0.41
t1od3	t1od3	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	77	-29.6	SPLS 6a_75 Ah Ct1 Ba	103.1	37.7	60.5	0.79		30.3	SPLS 6a_75 Ah Ct2 Ba	84.7	37.7	44.8	0.80
t1od2	t1od2	65x65x7	S235	1M16-5.6t	0.53	0.53	0.53	77	-23.9	SPLS 6a_75 Ah Ct2 Ba	102.9	37.7	60.5	0.63		23.3	SPLS 6a_75 Ah Ct1 Ba	84.7	37.7	44.8	0.62
mth1	mth1	55x55x5	S235	2M16-5.6t	1.00	1.00	1.00	171	0.0	SPLS 6a_75 Ba Ct2 Ba	37.6	75.4	172.8	0.00		0.1	ULS 3_0,9_90	47.3	75.4	148.0	0.00
mvd2	mvd2	65x65x6	S235	2M20-5.6t	0.50	0.50	0.50	108	-63.1	SPLS 6a_75 Ah Ct1 Ba	89.0	117.6	129.6	0.71		53.0	SPLS 6a_75 Ah Ct2 Ba	76.4	117.6	77.6	0.69
t1oh2	t1oh2	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	74	0.0		296.5	120.6	172.8	0.00		40.1	ULS 3_0,9_90	383.9	120.6	0.0	0.33
mzd2	mzd2	65x65x6	S235	2M24-5.6t	1.00	1.00	1.00	108	-71.0	SPLS 6a_75 Ah Ct1 Ba	89.0	169.4	155.5	0.80		70.5	SPLS 6a_75 Ah Ct1 Ba	96.5	169.4	77.0	0.91
mzd3	mzd3	65x65x6	S235	2M24-5.6t	0.50	0.50	0.50	112	-69.4	SPLS 6a_75 Ah Ct1 Ba	85.9	169.4	155.5	0.81		70.0	SPLS 6a_75 Ah Ct2 Ba	80.7	169.4	95.7	0.87
mvd3	mvd3	65x65x6	S235	2M20-5.6t	0.50	0.50	0.50	111	-49.6	SPLS 6a_75 Ah Ct2 Ba	87.0	117.6	129.6	0.57		59.4	SPLS 6a_75 Ah Ct1 Ba	76.4	117.6	77.6	0.78
mzd4	mzd4	65x65x7	S235	2M20-5.6t	2.00	1.00	1.00	132	-61.4	SPLS 6a_75 Ah Ct2 Ba	79.4	117.6	151.2	0.77		59.6	SPLS 6a_75 Ah Ct1 Ba	133.1	117.6	90.6	0.66
mvh4	mvh4	65x65x6	S235	3M20-5.6t	1.00	1.00	1.00	163	-2.7	SPLS 3_0,9_105 Ah All	56.7	176.4	194.4	0.05		55.9	SPLS 6a_75 Ah All Cts	99.2	176.4	116.5	0.56
mzh3	mzh3	60x60x6	S235	1M20-5.6t	2.00	1.00	1.00	110	-4.3	SPLS 6a_75 Ba Ct2 Ba	68.3	58.8	64.8	0.07		0.3	SPLS 1a_0,9_0,9_75 B	65.7	58.8	33.3	0.01
t2vd4	t2vd4	75x75x8	S235	3M20-5.6t	2.00	1.00	1.00	219	0.0		54.5	176.4	259.2	0.00		57.7	ULS 6a_75 Ba 21	143.9	176.4	209.5	0.40
mzd5	mzd5	65x65x7	S235	2M20-5.6t	2.00	1.00	1.00	146	-63.7	SPLS 6a_75 Ah Ct2 Ba	70.8	117.6	151.2	0.90		61.3	SPLS 6a_75 Ah Ct1 Ba	133.1	117.6	90.6	0.68
t2vd1	t2vd1	55x55x5	S235	1M16-5.6t	1.00	1.00	1.00	260	0.0		16.5	37.7	86.4	0.00		13.9	SPLS 6a_75 Ba Ct2 Ba	92.2	37.7	56.0	0.37
mvd4	mvd4	70x70x7	S235	3M20-5.6t	0.50	0.50	0.50	108	-64.0	SPLS 6a_75 Ah Ct1 Ba	111.4	176.4	226.8	0.57		52.5	SPLS 6a_75 Ah Ct2 Ba	117.3	176.4	160.4	0.45
t2vv1	t2vv1	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	167	-0.5	SPLS 6a_75 Ah Ct1 Ba	28.0	37.7	43.2	0.02		0.0		46.1	37.7	28.0	0.00
t2bh1	t2bh1	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	162	-2.8	ULS 6a_75 Ba 11	29.1	37.7	43.2	0.10		0.0		46.1	37.7	28.0	0.00
t2vv2	t2vv2	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	123	-0.1	SPLS 3_0,9_105 Ah Ct	40.1	37.7	43.2	0.00		10.5	SPLS 6a_75 Ah Ct2 Ba	46.1	37.7	28.0	0.37
t2vd3	t2vd3	60x60x5	S235	1M16-5.6t	1.00	1.00	1.00	206	0.0		25.4	37.7	43.2	0.00		5.7	SPLS 6a_75 Ah Ct2 Ba	141.1	37.7	32.0	0.18
t2vd2	t2vd2	60x60x6	S235	1M16-5.6t	1.00	1.00	1.00	172	-16.8	SPLS 6a_75 Ah Ct2 Ba	38.8	37.7	51.8	0.44		0.0		72.6	37.7	38.4	0.00
t2td1	t2td1	50x50x4	S235	1M16-5.6t	0.50	0.50	0.50	102	0.0		38.9	37.7	34.6	0.00		3.6	SPLS 6a_75 Ah Ct1 Ba	36.9	37.7	22.4	0.16
mzd6	mzd6	90x90x8	S235	3M22-5.6t	1.00	1.00	1.00	85	-63.2	SPLS 6a_75 Ah Ct1 Ba	198.4	218.2	285.1	0.32		64.2	SPLS 6a_75 Ah Ct2 Ba	178.3	218.2	211.2	0.36
t2vv3	t2vv3	50x50x5	S235	1M16-5.6t	1.00	1.00	1.00	66	-0.5	ULS 6a_75 Ba 10	60.0	37.7	43.2	0.01		0.0		46.1	37.7	28.0	0.00
t2oh1	t2oh1	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	96	0.0		249.7	120.6	172.8	0.00		37.5	ULS 3_90	383.9	120.6	0.0	0.31
mtd2	mtd2	65x65x7	S235	2M20-5.6t	1.00	1.00	1.00	118	-63.0	SPLS 6a_75 Ah Ct1 Ba	94.4	117.6	151.2	0.67		63.3	SPLS 6a_75 Ah Ct1 Ba	99.4	117.6	106.9	0.64
mvd5	mvd5	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	93	-123.1	SPLS 6a_75 Ah Ct1 Ba	185.8	218.2	285.1	0.66		116.4	SPLS 6a_75 Ah Ct2 Ba	184.0	218.2	211.2	0.63
t2vh1	t2vh1	UNP140	S235	7M20-5.6t	1.59	1.00	1.00	66	-265.0	SPLS 6a_75 Ah Ct1 Ba	294.7	399.3	529.2	0.90		183.2	SPLS 6a_75 Ah Ct2 Ba	276.6	399.3	374.2	0.66
mth2	mth2	65x65x7	S235	2M20-5.6t	1.00	1.00	1.00	167	-0.2	SPLS 6a_75 Ba Ct2 Ba	63.2	117.6	151.2	0.00		0.0	ULS 1a_0,9_0,9_90	88.1	117.6	106.9	0.00
mvh5	mvh5	UNP140	S235	5M20-5.6t	2.00	1.00	1.00	60	-212.1	SPLS 6a_75 Ah All Cts	324.9	294.0	378.0	0.72		143.5	SPLS 6a_75 Ah All Cts	276.6	294.0	305.5	0.52
t2od4	t2od4	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	87	-22.7	SPLS 6a_75 Ah All Cts	65.0	37.7	43.2	0.60		20.9	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.65
t2od3	t2od3	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	77	-35.4	SPLS 6a_75 Ah Ct1 Ba	111.5	37.7	60.5	0.94		36.9	SPLS 6a_75 Ah Ct2 Ba	104.8	37.7	44.8	0.98
mzh4	mzh4	75x75x7#	S235	4M22-5.6t	2.00	1.00	1.00	92	-30.3	SPLS 6a_75 Ah Ct2 Ba	130.4	290.9	332.6	0.23		35.5	SPLS 6a_75 Ah Ct1 Ba	220.8	290.9	205.5	0.17

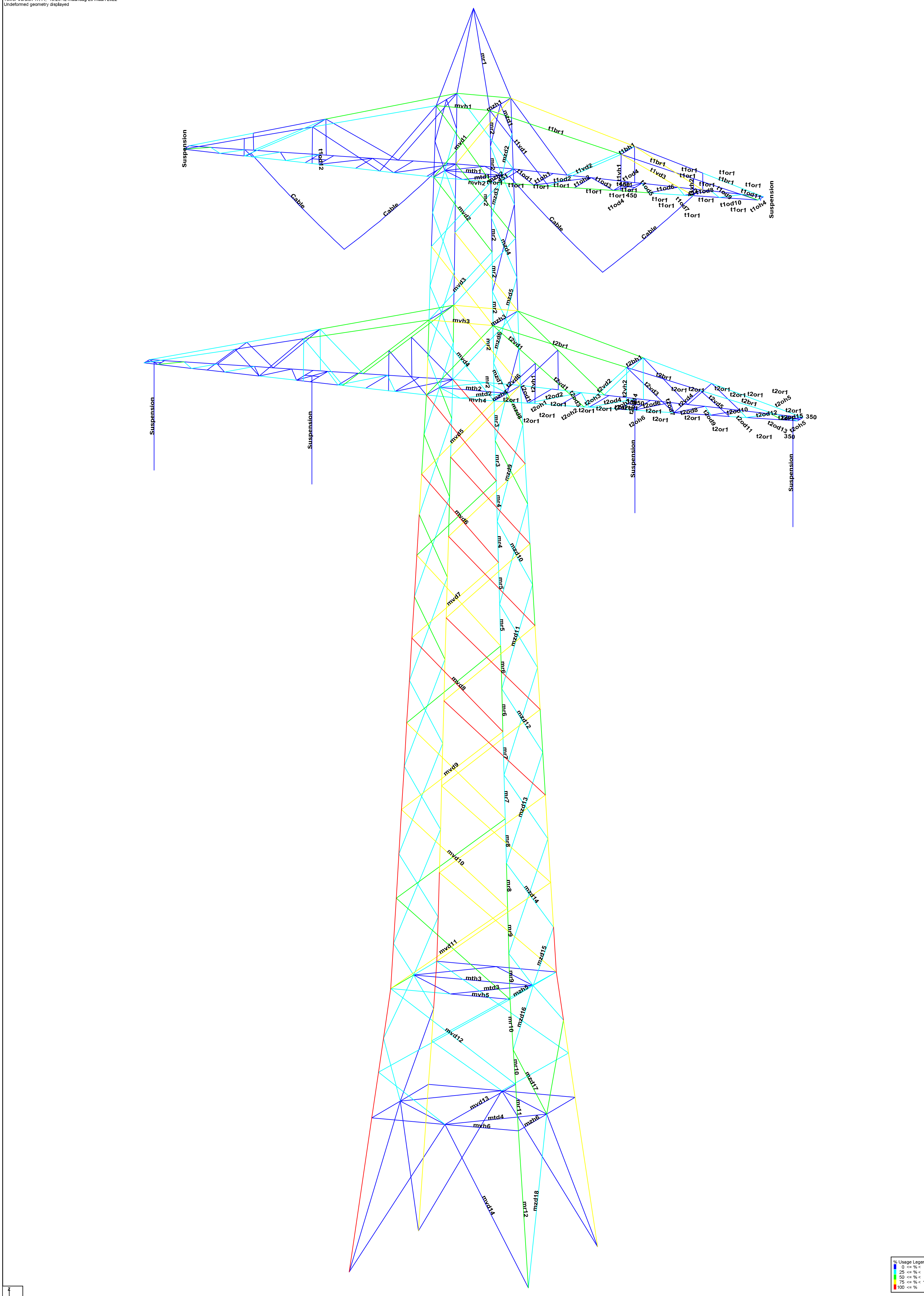
Toetsing versterkte constructieonderdelen verbouwniveau

Datum: 30-7-2021
Auteur: SSHD
Versie: 1,0

GT-ZBH150
A
Mast 24

Staafgroep	Omschrijving	Profiel	Staalsoort	Bouten	RLX	RLY	RLZ	Slankheid	Druk	Combinatie druk	Knik	Afschuiving	Stuik (druk)	U.C. (druk)	Opm.	Trek	Combinatie trek	Nettodsn.	Afschuif	Stuik (trek)	U.C. (trek)
t2od2	t2od2	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	79	**-32.4**	SPLS 6a_75 Ah Ct2 Ba	110.5	37.7	60.5	0.86		**32.2**	SPLS 6a_75 Ah Ct1 Ba	104.8	37.7	44.8	0.86
t2od1	t2od1	70x70x7	S235	1M16-5.6t	0.50	0.50	0.50	86	**-29.4**	SPLS 6a_75 Ah All Cts	106.7	37.7	60.5	0.78		**28.6**	SPLS 6a_75 Ah All Cts	104.8	37.7	44.8	0.76
t2od6	t2od6	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	66	**-24.4**	SPLS 6a_75 Ah All Cts	72.3	37.7	43.2	0.65		**26.0**	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.81
t2oh2	t2oh2	120x80x10	S235	2M16-8.8t	1.00	1.00	1.00	59	**0.0**		328.9	120.6	172.8	0.00		**42.6**	ULS 3_90	383.9	120.6	0.0	0.35
t2od7	t2od7	**70x70x7**	**S355**	**1M16-8.8t**	0.50	0.50	0.50	61	**-37.5**	SPLS 6a_75 Ah All Cts	170.0	60.3	82.3	0.62		**33.6**	SPLS 6a_75 Ah Ct2 Ba	115.2	60.3	61.0	0.56
t2od5	t2od5	60x60x5	S235	1M16-5.6t	0.50	0.50	0.50	72	**-22.5**	SPLS 6a_75 Ah All Cts	70.5	37.7	43.2	0.60		**22.7**	SPLS 6a_75 Ah All Cts	60.5	37.7	32.0	0.71
mr3	mr3	140x140x13#	S235	8M22-5.6t	2.00	1.00	1.00	52	**-445.9**	SPLS 3_90 Ba All Cts	733.1	546.7	1235.5	0.82		**384.9**	SPLS 1a_0,9_75 Ba All	750.9	546.7	1029.6	0.70
mzd7	mzd7	90x90x8	S235	3M22-5.6t	1.00	1.00	1.00	82	**-131.9**	SPLS 3_0,9_90 Ah Ct1	203.2	218.2	285.1	0.65		**131.5**	SPLS 3_0,9_90 Ah Ct2	207.0	218.2	211.2	0.64
mzd8	mzd8	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	98	**-132.8**	SPLS 3_90 Ah Ct2	178.4	218.2	285.1	0.74		**132.2**	SPLS 3_0,9_90 Ah Ct1	207.0	218.2	211.2	0.64
mvd6	mvd6	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	102	**-104.0**	SPLS 6a_75 Ah Ct2 Ba	172.8	218.2	285.1	0.60		**107.9**	SPLS 6a_75 Ah Ct1 Ba	184.0	218.2	211.2	0.59
mzd9	mzd9	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	104	**-113.7**	SPLS 3_0,9_90 Ah Ct1	170.4	218.2	285.1	0.67		**114.4**	SPLS 3_90 Ah Ct2	207.0	218.2	211.2	0.55
mvd7	mvd7	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	109	**-92.8**	SPLS 6a_75 Ah Ct1 Ba	163.3	145.4	190.1	0.64		**89.7**	SPLS 6a_75 Ah Ct2 Ba	189.8	145.4	140.8	0.64
mzd10	mzd10	90x90x8	S235	3M22-5.6t	0.53	0.53	0.53	111	**-102.7**	SPLS 3_90 Ah Ct2	160.3	218.2	285.1	0.64		**100.8**	SPLS 3_0,9_90 Ba Ct1	184.0	218.2	244.2	0.55
mvd8	mvd8	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	112	**-78.5**	SPLS 3_0,9_90 Ba Ct1	159.3	145.4	190.1	0.54		**81.0**	SPLS 6a_75 Ba Ct2 Ba	189.8	145.4	140.8	0.58
mr4	mr4	150x150x14	S235	**8M22-8.8t**	2.00	1.00	1.00	57	**-603.5**	SPLS 3_75 Ba All Cts	813.8	930.8	1330.6	0.74		**533.5**	SPLS 1a_0,9_75 Ba All	866.2	930.8	1330.6	0.62
mzd11	mzd11	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	116	**-88.9**	SPLS 3_0,9_90 Ba Ct1	154.1	145.4	190.1	0.61		**90.7**	SPLS 3_90 Ah Ct2	155.3	145.4	140.8	0.64
mvd9	mvd9	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	119	**-74.1**	SPLS 3_90 Ba Ct2	150.2	145.4	190.1	0.51		**72.8**	SPLS 3_0,9_90 Ba Ct1	189.8	145.4	140.8	0.52
mzd12	mzd12	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	123	**-84.8**	SPLS 3_90 Ah Ct2	144.5	145.4	190.1	0.59		**81.5**	SPLS 3_0,9_90 Ba Ct1	155.3	145.4	140.8	0.58
mvd10	mvd10	90x90x8	S235	2M22-5.6t	0.52	0.52	0.52	126	**-69.4**	SPLS 3_90 Ba Ct1	140.9	145.4	190.1	0.49		**68.6**	SPLS 3_0,9_90 Ba Ct2	189.8	145.4	140.8	0.49
mzd13	mzd13	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	124	**-76.5**	SPLS 3_0,9_90 Ba Ct1	143.4	145.4	190.1	0.53		**80.1**	SPLS 3_90 Ah Ct2	155.3	145.4	140.8	0.57
mth3	mth3	65x65x6	S235	1M20-5.6t	1.00	1.00	1.00	296	**-0.1**	SPLS 1a_0,9_0 Ba All (	19.0	58.8	64.8	0.01		**0.0**	ULS 3_0,9_90	65.7	58.8	33.3	0.00
mzd14	mzd14	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	125	**-56.5**	SPLS 3_0,9_90 Ba Ct2	142.0	145.4	190.1	0.40		**62.9**	SPLS 3_90 Ba Ct1	224.3	145.4	140.8	0.45
mr5	mr5	150x150x14	S235	**8M22-8.8t**	**2.00**	**1.00**	**1.00**	45	**-625.2**	SPLS 1a_75 Ba All Cts	859.9	930.8	1330.6	0.73		**556.1**	SPLS 1a_0,9_75 Ba All	866.2	930.8	1232.0	0.64
mzh5	mzh5	90x90x8	S235	2M22-5.6t	2.00	1.00	1.00	133	**-36.7**	SPLS 3_90 Ba All Cts	126.2	145.4	190.1	0.29		**30.6**	SPLS 3_0,9_90 Ba All (	241.5	145.4	140.8	0.22
mvh6	mvh6	90x90x8	S235	2M22-5.6t	2.00	1.00	1.00	133	**-32.3**	SPLS 3_0,9_105 Ah All	126.2	145.4	190.1	0.26		**43.8**	SPLS 3_105 Ah All Cts	241.5	145.4	140.8	0.31
mtd3	mtd3	60x60x5	S235	1M20-5.6t	1.00	1.00	1.00	220	**-1.6**	ULS 1a_0,9_0,9_75	23.1	58.8	54.0	0.07		**1.7**	ULS 1a_0,9_0,9_105	54.7	58.8	27.7	0.06
mvd11	mvd11	90x90x8	S235	2M22-5.6t	0.53	0.53	0.53	134	**-64.8**	SPLS 3_90 Ba Ct2	131.7	145.4	190.1	0.49		**51.5**	SPLS 6a_75 Ah Ct1 Ba	155.3	145.4	140.8	0.37
mzd15	mzd15	90x90x8	S235	2M22-5.6t	0.50	1.00	0.50	110	**-76.0**	SPLS 3_90 Ba Ct1	153.0	145.4	190.1	0.52		**65.1**	SPLS 3_0,9_90 Ba Ct2	224.3	145.4	140.8	0.46
mvd12	mvd12	90x90x8	S235	2M22-5.6t	1.00	1.00	1.00	135	**-58.4**	SPLS 6a_75 Ah Ct1 Ba	130.7	145.4	190.1	0.45		**48.9**	SPLS 3_0,9_105 Ah Ct:	155.3	145.4	140.8	0.35
mzh6	mzh6	70x70x7	S235	1M22-5.6t	2.30	1.76	1.20	163	**-4.0**	SPLS 1a_0,9_75 Ba All	60.2	72.7	83.2	0.07		**3.9**	ULS 1a_0,9_0,9_135	92.7	72.7	73.4	0.05
mvh7	mvh7	70x70x7	S235	1M22-5.6t	2.30	1.76	1.20	163	**0.0**		60.2	72.7	83.2	0.00		**11.7**	SPLS 3_90 Ah All Cts	92.7	72.7	73.4	0.16
mtd4	mtd4	60x60x5	S235	1M20-5.6t	1.00	1.00	1.00	182	**-1.2**	ULS 1a_0	30.1	58.8	54.0	0.04		**1.1**	ULS 1a_0,9_0	54.7	58.8	27.7	0.04
mzd16	mzd16	100x100x10	S235	2M24-5.6t	0.33	0.33	0.33	86	**-86.9**	SPLS 3_90 Ba Ct1	272.4	169.4	259.2	0.51		**73.9**	SPLS 3_0,9_90 Ba Ct2	202.3	169.4	177.2	0.44
mvd13	mvd13	100x100x10	S235	2M22-5.6t	0.33	0.33	0.33	86	**-82.9**	SPLS 6a_75 Ah Ct1 Ba	272.4	145.4	237.6	0.57		**75.6**	SPLS 3_0,9_90 Ba Ct2	217.7	145.4	176.0	0.52

DNV GL Nederlands BV, Project: "D+0_150 – Afkeur"
Tower Version 17.11, 13:23:12 maandag 28 maart 2022
Undeformed geometry displayed



% Usage Legend
0 <= % < 25
25 <= % < 50
50 <= % < 75
75 <= % < 100
100 <= %

1 (m)

Assessment of groups for initial structure (afkeur level)

GT-ZBH150
D+0
22

Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
350	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-11.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	425.6	0.0	0.0	0.03		**6.8**	ULS 30yr 1a W ZIII WRB,T NL-	564.0	0.0	0.0	0.01		0.03
450	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-0.1**	ULS 30yr 1a W ZIII WRA,T NR-	425.6	0.0	0.0	0.00		**0.1**	ULS 30yr 1a W ZIII WRA,T NR-	564.0	0.0	0.0	0.00		0.00
451	130x90x10 Double*	130x130x10#(12,0,1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	39	**-0.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933.8	37.7	86.4	0.02		**6.9**	ULS 30yr 1a W ZIII 0.9 WRB,T NL-	645.1	37.7	64.0	0.18		0.18
452	130x90x10 Double*	130x130x10#(12,0,1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	18	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1031.0	37.7	86.4	0.10		**2.1**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	645.1	37.7	64.0	0.06		0.10
BLfict	BLfict	50x50x5	S235						1.00	1.00	1.00	41	**-3.1**	SeLS 1a W ZIII WLA,T NR+	91.1	0.0	0.0	0.00		**15.6**	ULS 30yr 3 W + I ZIII WRB,T NL-	112.8	0.0	0.0	0.00		0.00
mr1	mr1	50x50x4	S235	4M12-5.6t	1	25	20	60	0.67	0.67	0.67	186	**-1.6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24.6	80.6	103.7	0.07		**1.6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72.1	80.6	75.7	0.02		0.07
mr2A	mr2	75x75x6	S235	4M16-5.6t	1	25	30	60	2.40	1.00	1.00	100	**-29.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	127.1	150.7	207.4	0.23		**10.2**	ULS 30yr 1a W ZIII WRB,T NL-	169.5	150.7	128.0	0.08		0.23
mr2B	mr2	75x75x6	S235						2.40	1.00	1.00	105	**-99.4**	ULS 30yr 3 W + I ZIII WR_0,T BI-	119.8	0.0	0.0	0.83		**44.7**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	204.5	0.0	0.0	0.22		0.83
mr2C	mr2	75x75x6	S235	6M20-5.6t	1	40	30	60	2.40	1.00	1.00	105	**-108.2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	119.8	352.8	388.8	0.90		**58.9**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	157.1	352.8	266.2	0.37		0.90
mr3A	mr3	90x90x9	S235	8M20-5.6t	1	55	40	60	2.40	2.43	1.00	94	**-182.0**	ULS 30yr 3 W + I ZIII WR_0,T BI-	239.7	0.0	0.0	0.76		**104.8**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	470.4	683.3	0.35		0.76
mr3B	mr3	90x90x9	S235						2.40	2.43	1.00	96	**-235.9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	234.2	0.0	0.0	1.01	buckling	**170.7**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	361.7	0.0	0.0	0.47		1.01
mr3C	mr3	90x90x9	S235						2.40	2.43	1.00	98	**-290.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	228.7	0.0	0.0	1.27	buckling	**220.9**	ULS 30yr 1a W ZIII WRA,T NR-	361.7	0.0	0.0	0.61		1.27
mr3D	mr3	90x90x9	S235	6M20-5.6t	1	35	40	70	2.40	2.40	1.00	99	**-321.1**	ULS 30yr 1a W ZIII WR_0,T BI-	226.2	352.8	583.2	1.42	buckling	**262.0**	ULS 30yr 1a W ZIII WR_0,T BI-	296.3	352.8	412.4	0.88		1.42
mr4A	mr4	110x110x10	S235	6M20-5.6t	1	35	40	70	2.40	2.43	1.00	81	**-331.3**	ULS 30yr 1a W ZIII WRA,T NR-	365.9	352.8	648.0	0.94		**269.9**	ULS 30yr 1a W ZIII WRA,T NR-	433.4	352.8	458.2	0.77		0.94
mr4B	mr4	110x110x10	S235						2.40	2.43	1.00	83	**-379.5**	ULS 30yr 1a W ZIII WRA,T NR-	360.7	0.0	0.0	1.05	buckling	**313.0**	ULS 30yr 1a W ZIII WRA,T NR-	496.3	0.0	0.0	0.63		1.05
mr4C	mr4	110x110x10	S235						2.40	2.43	1.00	85	**-413.4**	ULS 30yr 1a W ZIII WRA,T NR-	355.4	0.0	0.0	1.16	buckling	**352.0**	ULS 30yr 1a W ZIII WRA,T NR-	496.3	0.0	0.0	0.71		1.16
mr4D	mr4	110x110x10	S235						2.40	2.40	1.00	86	**-459.8**	ULS 30yr 1a W ZIII WRA,T NR-	353.2	0.0	0.0	1.30	buckling	**390.8**	ULS 30yr 1a W ZIII WRA,T NR-	496.3	0.0	0.0	0.79		1.30
mr4E	mr4	110x110x10	S235	8M20-5.6t					2.40	2.40	1.00	86	**-477.5**	ULS 30yr 1a W ZIII WRA,T NR-	353.2	0.0	0.0	1.35	buckling	**418.7**	ULS 30yr 1a W ZIII WRA,T NR-	433.4	470.4	698.2	0.97		1.35
mr5A	mr5	110x110x10	S235	8M20-5.6t	1	45	50	60	2.40	2.40	1.00	83	**-501.6**	ULS 30yr 1a W ZIII WRA,T NR-	360.8	0.0	0.0	1.39	buckling	**434.9**	ULS 30yr 1a W ZIII WRA,T NR-	433.4	470.4	759.3	1.00	net sect.	1.39
mr5B	mr5	110x110x10	S235						2.40	2.40	1.00	83	**-495.8**	ULS 30yr 1a W ZIII WRA,T NR-	360.8	0.0	0.0	1.37	buckling	**418.1**	ULS 30yr 1a W ZIII WRA,T NR-	496.3	0.0	0.0	0.84		1.37
mr5C	mr5	110x110x10	S235	8M20-5.6t	1	40	50	60	0.33	0.33	0.33	63	**-488.6**	ULS 30yr 1a W ZIII WRA,T NR-	413.6	470.4	864.0	1.18	buckling, shear	**406.6**	ULS 30yr 1a W ZIII WRA,T NR-	433.4	470.4	698.2	0.94		1.18
mtd1	mtd1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	116	**-6.5**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42.3	37.7	43.2	0.17		**6.7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46.1	37.7	28.0	0.24		0.24
mtd2	mtd2	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	137	**-13.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35.4	37.7	43.2	0.38		**13.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.1	37.7	28.0	0.48		0.48
mtd6	mtd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	255	**-1.1**	ULS 30yr 3 W + I ZIII WR_0,T BI-	12.4	37.7	34.6	0.09		**1.1**	ULS 30yr 1a W ZIII WRA,T NR-	36.9	37.7	22.4	0.05		0.09
mtd7	mtd7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	335	**-0.6**	ULS 30yr 1a W ZIII WL_-45,T BI+	8.0	37.7	34.6	0.07		**0.6**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.03		0.07
mth1	mth1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-0.4**	ULS 30yr 1a W ZIII WRA,T NR-	28.5	37.7	43.2	0.01		**0.0**	0.0	46.1	37.7	28.0	0.00		0.01
mth2	mth2	50x50x5	S235	1M16-5.6t	1	40	25		1.00	1.00	1.00	194	**-0.3**	ULS 30yr 3 W + I ZIII WLB,T NL+	22.8	37.7	43.2	0.01		**0.0**	0.0	46.1	37.7	37.4	0.00		0.01
mth3	mth3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	334	**-0.2**	ULS 30yr 3 W + I ZIII WLB,T NL+	11.0	37.7	86.4	0.02		**0.0**	0.0	92.2	37.7	56.0	0.00		0.02
mvd1	mvd1	50x50x4	S235	1M16-5.6t	1	30	25		0.52	0.52	0.52	130	**-20.2**	ULS 30yr 3 W + I ZIII WRB,T NL-	30.6	37.7	34.6	0.66		**18.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.82		0.82
mvd10	mvd10	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	169	**-29.1**	ULS 30yr 1a W ZIII WR_0,T BI-	33.3	58.8	54.0	0.87		**26.6**	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	0.96		0.96
mvd11	mvd11	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	177	**-25.5**	ULS 30yr 1a W ZIII WRA,T NR-	31.2	58.8	54.0	0.82		**28.2**	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	1.02	bearing	1.02
mvd12	mvd12	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	185	**-30.1**	ULS 30yr 1a W ZIII WRA,T NR-	29.5	58.8	54.0	1.02	buckling	**23.3**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.84		1.02
mvd13	mvd13	60x60x5	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	206	**-17.7**	ULS 30yr 3 W + I ZIII WR_0,T BI-	25.3	58.8	54.0	0.70		**6.7**	ULS 30yr 1a W ZIII WR_-45,T BI-	54.7	58.8	27.7	0.24		0.70
mvd14	mvd14	60x60x5	S235	1M20-5.6t	1	30	30		1.00	0.50	0.50	170	**-8.4**	ULS 30yr 1a W ZIII WR_-45,T BI-	26.3	58.8	54.0	0.32		**16.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	54.7	58.8	27.7	0.60		0.60
mvd15	mvd15	65x65x7	S235	2M16-5.6t	1	30	30	60	1.00	0.33	0.33	253	**-9.1**	ULS 30yr 3 W + I ZIII WRB,T NL-	33.7	75.4	121.0	0.27		**15.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107.1	75.4	89.6	0.21		0.27
mvd2	mvd2	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	110	**-26.4**	ULS 30yr 1a W ZIII WRB,T NL-	53.9	58.8	54.0	0.49		**18.7**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	54.7	58.8	27.7	0.67		0.67
mvd3	mvd3	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	117	**-18.1**	ULS 30yr 1a W ZIII 0.9 WRB,T NL-	51.0	58.8	54.0	0.35		**24.6**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	0.89		0.89
mvd4	mvd4	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	121	**-33.3**	ULS 30yr 3 W + I ZIII WR_0,T BI-	49.1	58.8	54.0	0.68		**24.2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	54.7	58.8	27.7	0.87		0.87
mvd5	mvd5	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	129	**-41.1**	ULS 30yr 1a W ZIII WR_0,T BI-	45.8	58.8	54.0	0.90		**39.4**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	1.42	bearing	1.42
mvd6	mvd6	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	137	**-35.9**	ULS 30yr 1a W ZIII WRB,T NL-	43.1	58.8	54.0	0.83		**36.7**	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	1.32	bearing	1.32
mvd7	mvd7	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	144	**-33.4**	ULS 30yr 1a W ZIII WR_0,T BI-	40.6	58.8	54.0	0.82		**32.4**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	1.17	bearing	1.17
mvd8	mvd8	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	152	**-30.9**	ULS 30yr 1a W ZIII WRB,T NL-	38.0	58.8	54.0	0.81		**30.8**	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	1.11	bearing	1.11
mvd9	mvd9	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	160	**-29.1**	ULS 30yr 1a W ZIII WR_0,T BI-	35.6	58.8	54.0	0.82		**28.8**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	1.04	bearing	1.04
mvh1	mvh1	50x50x5	S235	2M16-5.6t	1	30	25	50	1.00	1.00	1.00	155	**0.0**	0	38.5	75.4	86.4	0.00		**35.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	48.7	75.4	56.0	0.73		0.73
mvh2	mvh2	70x70x7	S235	6M16-5.6t	1	30	35	50	2.00	1.00	1.00	75	**-69.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	170.5	226.1	362.9	0.41		**17.6**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	178.3	226.1	268.8	0.10		0.41
mvh3	mvh3	60x60x5	S235	2M20-5.6t	1	30	30	55	1.00	1.00	1.00	155	**0.0**	0	46.5	117.6	108.0	0.00		**53.8**	ULS 30yr 3 W + I ZIII WLB,T NL+	54.1	117.6	55.5	0.99		0.99
mvh4	mvh4	70x70x7	S235	5M16-5.6t	1	50	30	50	2.00	1.00	1.00	89	**-52.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	152.8	188.4	302.4	0.35		**6.2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	178.3	188.4	272.5	0.03		0.35
mvh5	mvh5	60x60x5	S235	2M20-5.6t	1	30	30	60	2.00	1.00	1.00	195	**-5.5**	ULS 30yr 1a W ZIII WR_-45,T BI-	32.8	117.6	108.0	0.17		**13.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	57.8	117.6	55.5	0.24		0.24
mvh6	mvh6	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	198	**-2.4**	ULS 30yr 1a W ZIII WRA,T NR-	30.1	58.8	54.0	0.08		**1.5**	ULS 30yr 1a W ZIII WL_45,T BI+	54.7	58.8	27.7	0.05		0.08
mzd1	mzd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-12.0**	SeLS 3 W + I ZIII WRA,T NR-	31.9	37.7	34.6	0.37		**1.0**	ULS 30yr 1a W ZIII WL_90,T BI+	36.9	37.7	22.4	0.05		0.37
mzd10	mzd10	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	140	**-20.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49.7	58.8	64.8	0.41		**17.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.52		0.52
mzd11	mzd11	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	148	**-15.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.7	58.8	64.8	0.33		**18.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.55		0.55
mzd12	mzd12	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	156	**-16.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43.8	58.8	64.8	0.37		**14.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.42		0.42
mzd13	mzd13	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	164	**-12.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.0	58.8	64.8	0.31		**14.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.45		0.45
mzd14	mzd14	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	173	**-13.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	38.4	58.8	64.8	0.36		**11.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.34		0.36
mzd15	mzd15	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	181	**-11.0**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.1	58.8	64.8	0.30		**13.1**	ULS 30yr 1a W ZIII WR_-45,T BI-	65.7	58.8	33.3	0.39		0.39
mzd16	mzd16	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	179	**-14.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.7	58.8	64.8	0.39		**11.7**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	65.7	58.8	33.3	0.35		0.39
mzd17	mzd17	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	191	**-11.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	33.6	58.8	64.8	0.35		**10.6**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.7	58.8	33.3	0.32		0.35
mzd18	mzd18	60x60x6	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	217	**-10.4**	ULS 30yr 3 W + I ZIII WRB,T NL-	28.0	58.8	64.8	0.37		**10.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.7	58.8	33.3	0.33		0.37
mzd19	mzd19	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	211	**-11.4**	ULS 30yr 3 W + I ZIII WRB,T NL-	29.1	58.8	64.8	0.39		**12.4**	ULS 30yr 1a W ZIII WRB,T NL-	65.7	58.8	33.3	0.37		0.39
mzd2	mzd2	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	108	**-20.4**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.5	58.8	64.8	0.35		**10.3**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.31		0.35
mzd20	mzd20	65x65x7	S235	2M16-5.6t	1	30	30	60	1.00	0.33	0.33	253	**-12.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	33.7	75.4	121.0	0.35		**10.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	107.1	75.4	89.6	0.14		0.35
mzd3	mzd3	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	115	**-13.9**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	61.5	58.8	64.8	0.24		**16.4**	SeLS 3 W + I ZIII WRB,T NL-	65.7	58.8	33.3	0.49		0.49
mzd4	mzd4	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-14.4**	SeLS 3 W + I ZIII WLB,T NL+	60.8	58.8	64.8	0.25		**15.0**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.45		0.45
mzd5	mzd5	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-16.1**	ULS 30yr 3 W + I ZIII WL_45,T BI+	51.1	58.8	54.0	0.31		**13.1**	SeLS 3 W + I ZIII WRA,T NR-	54.7	58.8	27.7	0.47		0.47
mzd8	mzd8	65x65x7	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	115	**-26.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77.8	58.8	75.6	0.46		**20.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76.6	58.8	38.8	0.54		0.54
mzd9	mzd9	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	133	**-19.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52.9	58.8	64.8	0.36		**23.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.71		0.71
mzh1	mzh1	50x50x4	S235	1M16-5.6t	1	30	25		2.00	1.00	1.00	98	**-1.6**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	42.7	37.7	34.6	0.05		**0.8**	ULS 30yr 3 W + I ZIII WL_45,T BI+	36.9	37.7	22.4	0.04		0.05
mzh2	mzh2	65x65x5	S235	2M16-5.6t	1	30	30	50	2.00	1.00	1.00	81	**-7.9**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	88.9	75.4	172.8	0.10		**13.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	56.7	75.4	128.0	0.23		0.23
mzh3	mzh3	60x60x5	S235	1M20-5.6t	1	30	30		2.00	1.00	1.00	99	**-7.7**	ULS 30yr 3 W + I ZIII WR_0,T BI-	62.7	58.8	54.0	0.14		**0.0**	0.0	54.7	58.8	27.7	0.00		0.14
mzh4	mzh4	65x65x5	S235	2M16-5.6t	1	30	30	50	1.00	1.00	1.00	74	**-6.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98.2	75.4	172.8	0.09		**7.0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	56.7	75.4	128.0	0.12		0.12
mzh5	mzh5	60x60x6	S235	2M20-5.6t	1	30	30	60	2.00	1.00	1.00	195	**-34.7**	ULS 30yr 1a W ZIII WRA,T NR-	39.0	117.6	129.6	0.89		**28.1**	ULS 30yr 1a W ZIII WRA,T NR-	68.7	117.6	66.5	0.42		0.89
mzh6	mzh6	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	198	**-3.1**	ULS 30yr 1a W ZIII WRA,T NR-	30.1	58.8	54.0	0.10		**1.8**	ULS 30yr 1a W ZIII 0.9 WRB,T NL-	54.7	58.8	27.7	0.07		0.10
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-0.4**	ULS 30yr 3 W + I ZIII WR_0,T BI-	40.1	37.7	34.6	0.01		**0.0**	0.0	36.9	37.7	22.4	0.00		0.01
t1br1	t1br1	55x55x5	S235	3M16-5.6t	1	30	25	60	2.13	1.00	1.00	231	**-1.0**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	23.6	75.4	172.8	0.04		**47.0**	ULS 30yr 3 W + I ZIII WRB,T NL-	57.4	113.0	168.1	0.82		0.82
t1od1	t1od1	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	162	**-2.6**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	35.2	37.7	43.2	0.07		**3.8**	ULS 30yr 3 W + I ZIII WL_45,T BI+	60.5	37.7	32.0	0.12		0.12
t1od10	t1od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-5.4**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.6	37.7	34.6	0.15		**14.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.65		0.65
t1od11	t1od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	86	**-8.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	44.3	37.7	34.6	0.25		**1.9**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.08		0.25
t1od2	t1od2	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	146	**-5.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	39.8	37.7	43.2	0.15		**2.4**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	60.5	37.7	32.0	0.07		0.15
t1od3	t1od3	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	132	**-2.9**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44.8	37.7	43.2	0.08		**5.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	60.5	37.7	32.0	0.18		0.18
t1od4	t1od4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	**-5.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	35.9	37.7	34.6	0.16		**1.8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.08		0.16
t1od5	t1od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	**-3.0**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.0	37.7	34.6	0.09		**6.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.29		0.29
t1od6	t1od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	100	**-7.4**	ULS 30yr 3 W + I ZIII WRB,T NL-	39.6	37.7	34.6	0.21		**3.2**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.14		0.21
t1od7	t1od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	93	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	52.4	37.7	34.6	0.11		**8.0**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.36		0.36
t1od8	t1od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	78	**-3.3**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.0	37.7	34.6	0.10		**9.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.42		0.42
t1od9	t1od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	72	**-10.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	61.4	37.7	34.6	0.32		**3.9**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.17		0.32
t1oh1	t1oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	143	**0.0**	0	27.4	37.7	34.6	0.00		**0.6**	ULS 30yr 3 W + I ZIII WR_45,T BI-	36.9	37.7	22.4	0.02		0.02
t1oh2	t1oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-0.2**	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	32.1	37.7	34.6	0.01		**0.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.02		0.02
t1oh5	t1oh5	65x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	33	**-10.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	175.2	37.7	69.1	0.27		**3.6**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	96.8	37.7	51.2	0.10		0.27
t1or1	t1or1	70x70x7	S235	6M16-5.6t					1.68	1.00	1.00	76	**-101.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	170.1	0.0	0.0	0.60		**37.6**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	178.3	226.1	268.8	0.21		0.60
t1vd1	t1vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	256	**0.0**	0	12.3	37.7	34.6	0.00		**5.1**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.23		0.23
t1vd2	t1vd2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	203	**-8.6**	ULS 30yr 3 W + I ZIII WRB,T NL-	23.8	37.7	86.4	0.36		**0.0**	0.0	92.2	37.7	56.0	0.00		0.36
t1vd3	t1vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	224	**0.0**	0	15.1	37.7	34.6	0.00		**20.8**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.93		0.93
t1vv1	t1vv1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	99	**-0.1**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	39.8	37.7	34.6	0.00		**1.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.06		0.06
t1vv2	t1vv2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	47	**-0.2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	53.0	37.7	34.6	0.01		**0.0**	0.0	36.9	37.7	22.4	0.00		0.01
t2bh1	t2bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	122	**-0.1**	ULS 30yr 3 W + I ZIII WLB,T NL+	32.9	37.7	34.6	0.00		**0.0**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	36.9	37.7	22.4	0.00		0.00
t2br1	t2br1	55x55x5	S235	3M16-5.6t	1	30	25	60	1.76	1.00	1.00	286	**0.0**	0	17.1	75.4	172.8	0.00		**42.4**	ULS 30yr 3 W + I ZIII WR_0,T BI-	57.4	113.0	168.1	0.74		0.74
t2od1	t2od1	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	190	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26.0	37.7	86.4	0.15		**8.3**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.22		0.22
t2od10	t2od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	94	**-7.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.3	37.7	34.6	0.21		**3.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.15		0.21
t2od11	t2od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	84	**-3.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	44.6	37.7	34.6	0.11		**8.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.38		0.38
t2od12	t2od12	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	77	**-9.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.2	37.7	34.6	0.28		**4.5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.20		0.28
t2od13	t2od13	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-5.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46.6	37.7	34.6	0.17		**12.2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	36.9	37.7	22.4	0.55		0.55
t2od14	t2od14	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	60	**-5.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50.0	37.7	34.6	0.16		**1.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.06		0.16
t2od2	t2od2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**-9.7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29.2	37.7	86.4	0.33		**4.1**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.11		0.33
t2od3	t2od3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-4.9**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32.8	37.7	86.4	0.15		**10.4**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.27		0.27
t2od4	t2od4	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	148	**-11.9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.1	37.7	86.4	0.33		**5.0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.13		0.33
t2od5	t2od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	133	**-2.0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30.0	37.7	34.6	0.07		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.9	37.7	22.4	0.16		0.16
t2od6	t2od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	131	**-4.7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30.4	37.7	34.6	0.16		**2.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.10		0.16
t2od7	t2od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	119	**-2.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33.7	37.7	34.6	0.07		**5.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.23		0.23
t2od8	t2od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-5.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.1	37.7	34.6	0.16		**2.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.12		0.16
t2od9	t2od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	102	**-3.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	38.7	37.7	34.6	0.09		**6.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.28		0.28

DNV

Assessment of groups for initial structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

GT-ZBH150
D+0
22

Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
t2oh1	t2oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	175	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	21.3	37.7	34.6	0.01		**0.4**	ULS 30yr 1a W ZIII WL_-90,T BI+	36.9	37.7	22.4	0.02		0.02
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	24.0	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.02		0.02
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	**-0.4**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	27.1	37.7	34.6	0.02		**0.8**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.03		0.03
t2oh4	t2oh4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-3.6**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.09		**6.9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.18		0.18
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	**-6.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.18		**4.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.12		0.18
t2or1	t2or1	70x70x7	S235		1	100	35	85	1.21	1.00	1.00	67	**-71.2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	180.1	188.4	302.4	0.40		**26.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	220.9	0.0	0.0	0.12		0.40
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207	**0.0**	0	18.1	37.7	34.6	0.00		**11.7**	ULS 30yr 3 W + I ZIII WLB,T NL+	36.9	37.7	22.4	0.52		0.52
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-9.8**	ULS 30yr 3 W + I ZIII WLB,T NL+	23.3	37.7	34.6	0.42		**0.0**	0.0	36.9	37.7	22.4	0.00		0.42
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**0.0**	0	21.6	37.7	34.6	0.00		**1.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.07		0.07
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-1.9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	40.3	37.7	34.6	0.05		**0.0**	0.0	36.9	37.7	22.4	0.00		0.05
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	104	**0.0**	0	38.1	37.7	34.6	0.00		**2.9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.13		0.13
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-0.1**	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	36.3	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.02		0.02
t2vd7	t2vd7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	**-0.4**	ULS 30yr 1a W ZIII WR_0,T BI-	24.5	37.7	34.6	0.02		**0.0**	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	36.9	37.7	22.4	0.00		0.02
t2vv1	t2vv1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	115	**0.0**	0	34.9	37.7	34.6	0.00		**7.8**	ULS 30yr 3 W + I ZIII WLB,T NL+	36.9	37.7	22.4	0.35		0.35
Tv1oh1	Tv2oh1	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	**-1.0**	ULS 30yr 3 W + I ZIII WR_0,T BI-	262.0	37.7	86.4	0.03		**0.8**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	121.0	37.7	64.0	0.02		0.03
Tv1oh2	Tv2oh2	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	36	**-1.1**	ULS 30yr 3 W + I ZIII WRB,T NL-	264.9	37.7	86.4	0.03		**0.6**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	121.0	37.7	64.0	0.01		0.03
Tv2oh3	Tv2oh3	130x65x8	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	53	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	188.4	37.7	86.4	0.05		**2.0**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	121.0	37.7	64.0	0.05		0.05
Tv2oh4	Tv2oh4	130x65x8	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	47	**-1.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	194.7	37.7	86.4	0.04		**0.7**	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	121.0	37.7	64.0	0.02		0.04

Assessment of groups for modified structure (afkeur level)

GT-ZBH150
D+0
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Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
350	Fictief member	UNP160	S235						2,00	2,00	2,00	21	**-11,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	425,6	0,0	0,0	0,03		**6,7**	ULS 30yr 1a W ZIII WRB,T NL-	564,0	0,0	0,0	0,01		0,03
450	Fictief member	UNP160	S235						2,00	2,00	2,00	21	**-0,1**	ULS 30yr 1a W ZIII WRA,T NR-	425,6	0,0	0,0	0,00		**0,1**	ULS 30yr 1a W ZIII WRA,T NR-	564,0	0,0	0,0	0,00		0,00
451	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5,6t	1	30	45		2,00	2,00	2,00	39	**-0,6**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933,8	37,7	86,4	0,02		**7,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	645,1	37,7	64,0	0,18		0,18
452	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5,6t	1	30	45		2,00	2,00	2,00	18	**-3,8**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1031,0	37,7	86,4	0,10		**2,1**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	645,1	37,7	64,0	0,06		0,10
BLfict	BLfict	50x50x5	S235						1,00	1,00	1,00	41	**-3,1**	SeLS 1a W ZIII WLA,T NR+	91,1	0,0	0,0	0,00		**15,6**	ULS 30yr 3 W + I ZIII WRB,T NL-	112,8	0,0	0,0	0,00		0,00
mr1	mr1	50x50x4	S235	4M12-5,6t	1	25	20	60	0,67	0,67	0,67	186	**-1,6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24,6	80,6	103,7	0,07		**1,6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72,1	80,6	75,7	0,02		0,07
mr2A	mr2	75x75x6	S235	4M16-5,6t	1	25	30	60	2,40	1,00	1,00	100	**-29,6**	ULS 30yr 3 W + I ZIII WRB,T NL-	127,1	150,7	207,4	0,23		**10,2**	ULS 30yr 1a W ZIII WRB,T NL-	169,5	150,7	128,0	0,08		0,23
mr2B	mr2	75x75x6	S235						2,40	1,00	1,00	105	**-99,7**	ULS 30yr 3 W + I ZIII WR_0,T BI-	119,8	0,0	0,0	0,83		**49,8**	ULS 30yr 1a W ZIII 0,9 WR_0,T BI-	204,5	0,0	0,0	0,24		0,83
mr2C	mr2	75x75x6	S235	6M20-5,6t	1	40	30	60	2,40	1,00	1,00	105	**-108,5**	ULS 30yr 3 W + I ZIII WR_0,T BI-	119,8	352,8	388,8	0,91		**55,8**	ULS 30yr 1a W ZIII 0,9 WRA,T NR-	157,1	352,8	266,2	0,36		0,91
mr3A	mr3	90x90x9	S235		1	55	40	60	2,40	2,43	1,00	94	**-178,5**	ULS 30yr 3 W + I ZIII WR_0,T BI-	239,7	0,0	0,0	0,74		**101,7**	ULS 30yr 1a W ZIII 0,9 WRA,T NR-	296,3	470,4	683,3	0,34		0,74
mr3B	mr3	**L90x9+L90x9**	S235						2,40	2,43	1,00	96	**-238,2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	427,0	0,0	0,0	0,56		**169,4**	ULS 30yr 1a W ZIII 0,9 WRA,T NR-	728,5	0,0	0,0	0,23		0,56
mr3C	mr3	**L90x9+L90x9**	S235						2,40	2,43	1,00	98	**-287,2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	416,2	0,0	0,0	0,69		**221,4**	ULS 30yr 1a W ZIII 0,9 WR_0,T BI-	728,5	0,0	0,0	0,30		0,69
mr3D	mr3	**L90x9+L90x9**	S235	**12M20-8,8t**	1	35	40	70	2,40	2,40	1,00	99	**-324,0**	ULS 30yr 1a W ZIII WRA,T NR-	411,4	1105,0	1166,4	0,79		**263,4**	ULS 30yr 1a W ZIII 0,9 WR_0,T BI-	700,9	1105,0	824,7	0,38		0,79
mr4A	mr4	**L110x10+L110x1**	S235	**12M20-8,8t**	1	35	40	70	2,40	2,43	1,00	82	**-333,7**	ULS 30yr 1a W ZIII WRA,T NR-	677,5	1105,0	1296,0	0,49		**270,2**	ULS 30yr 1a W ZIII WRA,T NR-	982,4	1105,0	916,4	0,29		0,49
mr4B	mr4	**L110x10+L110x1**	S235						2,40	2,43	1,00	83	**-382,6**	ULS 30yr 1a W ZIII WRA,T NR-	665,3	0,0	0,0	0,58		**313,9**	ULS 30yr 1a W ZIII WRA,T NR-	994,1	0,0	0,0	0,32		0,58
mr4C	mr4	**L110x10+L110x1**	S235						2,40	2,43	1,00	85	**-420,1**	ULS 30yr 1a W ZIII WRA,T NR-	652,9	0,0	0,0	0,64		**355,2**	ULS 30yr 1a W ZIII WRA,T NR-	994,1	0,0	0,0	0,36		0,64
mr4D	mr4	**L110x10+L110x1**	S235						2,40	2,40	1,00	86	**-467,5**	ULS 30yr 1a W ZIII WRA,T NR-	647,9	0,0	0,0	0,72		**392,9**	ULS 30yr 1a W ZIII WRA,T NR-	994,1	0,0	0,0	0,40		0,72
mr4E	mr4	**L110x10+L110x1**	S235	**16M20-8,8t**					2,40	2,40	1,00	86	**-489,7**	ULS 30yr 1a W ZIII WRA,T NR-	647,9	1420,6	1728,0	0,76		**425,1**	ULS 30yr 1a W ZIII WRA,T NR-	982,4	1420,6	1396,4	0,43		0,76
mr5A	mr5	**L110x10+L110x1**	S235		1	45	50	60	2,40	2,40	1,00	83	**-513,8**	ULS 30yr 1a W ZIII WRA,T NR-	665,5	0,0	0,0	0,77		**441,1**	ULS 30yr 1a W ZIII WRA,T NR-	982,4	1448,8	1518,5	0,45		0,77
mr5B	mr5	**L110x10+L110x1**	S235						2,40	2,40	1,00	83	**-511,9**	ULS 30yr 1a W ZIII WRA,T NR-	665,5	0,0	0,0	0,77		**425,0**	ULS 30yr 1a W ZIII WRA,T NR-	994,1	0,0	0,0	0,43		0,77
mr5C	mr5	**L110x10+L110x1**	S235	**16M20-8,8t**	1	40	50	60	0,33	0,33	0,33	63	**-506,0**	ULS 30yr 1a W ZIII WRA,T NR-	792,9	1448,8	1728,0	0,64		**416,1**	ULS 30yr 1a W ZIII WRA,T NR-	982,4	1448,8	1396,4	0,42		0,64
mtd1	mtd1	50x50x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	116	**-6,5**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42,3	37,7	43,2	0,17		**6,7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46,1	37,7	28,0	0,24		0,24
mtd2	mtd2	50x50x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	137	**-13,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35,4	37,7	43,2	0,38		**13,5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46,1	37,7	28,0	0,48		0,48
mtd6	mtd6	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	255	**-0,8**	ULS 30yr 1a W ZIII WL_45,T BI+	12,4	37,7	34,6	0,06		**1,0**	ULS 30yr 1a W ZIII WR_-45,T BI-	36,9	37,7	22,4	0,04		0,06
mtd7	mtd7	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	335	**-0,7**	ULS 30yr 1a W ZIII WL_-45,T BI+	8,0	37,7	34,6	0,09		**0,7**	ULS 30yr 1a W ZIII 0,9 WR_-45,T BI-	36,9	37,7	22,4	0,03		0,09
mth1	mth1	50x50x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	164	**-0,4**	ULS 30yr 3 W + I ZIII WL_0,T BI+	28,5	37,7	43,2	0,01		**0,0**		46,1	37,7	28,0	0,00		0,01
mth2	mth2	50x50x5	S235	1M16-5,6t	1	40	25		1,00	1,00	1,00	194	**-0,3**	ULS 30yr 3 W + I ZIII WLA,T NR+	22,8	37,7	43,2	0,01		**0,1**	ULS 30yr 3 W + I ZIII WL_0,T BI+	46,1	37,7	37,4	0,00		0,01
mth3	mth3	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	334	**-0,2**	ULS 30yr 3 W + I ZIII WLA,T NR+	11,0	37,7	86,4	0,02		**0,0**		92,2	37,7	56,0	0,00		0,02
mvd1	mvd1	50x50x4	S235	1M16-5,6t	1	30	25		0,52	0,52	0,52	130	**-20,1**	ULS 30yr 3 W + I ZIII WRB,T NL-	30,6	37,7	34,6	0,66		**18,1**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,81		0,81
mvd10	mvd10	60x60x5	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	169	**-29,3**	ULS 30yr 3 W + I ZIII WRB,T NL-	33,3	58,8	54,0	0,88		**27,0**	ULS 30yr 1a W ZIII WR_0,T BI-	54,7	58,8	27,7	0,97		0,97
mvd11	mvd11	60x60x5	S235	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	177	**-25,2**	ULS 30yr 1a W ZIII 0,9 WR_0,T BI-	31,2	188,2	108,0	0,81		**29,7**	ULS 30yr 1a W ZIII WR_0,T BI-	65,2	188,2	55,5	0,54		0,81
mvd12	mvd12	**60x60x6**	**S355**	**1M20-8,8t**	1	30	30		0,52	0,52	0,52	185	**-31,9**	ULS 30yr 1a W ZIII WRA,T NR-	39,5	94,1	88,2	0,81		**23,0**	ULS 30yr 1a W ZIII 0,9 WRA,T NR-	89,4	94,1	45,3	0,51		0,81
mvd13	mvd13	60x60x5	S235	1M20-5,6t	1	30	30		0,54	0,54	0,54	206	**-18,8**	ULS 30yr 3 W + I ZIII WR_0,T BI-	25,3	58,8	54,0	0,74		**3,8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54,7	58,8	27,7	0,14		0,74
mvd14	mvd14	60x60x5	S235	1M20-5,6t	1	30	30		1,00	0,50	0,50	170	**-6,3**	ULS 30yr 3 W + I ZIII 0,9 WR_0,T BI-	26,3	58,8	54,0	0,24		**15,4**	ULS 30yr 3 W + I ZIII WRB,T NL-	54,7	58,8	27,7	0,55		0,55
mvd15	mvd15	65x65x7	S235	2M16-5,6t	1	30	30	60	1,00	0,33	0,33	253	**-8,2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	33,7	75,4	121,0	0,24		**15,8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107,1	75,4	89,6	0,21		0,24
mvd2	mvd2	60x60x5	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	110	**-26,4**	ULS 30yr 1a W ZIII WRB,T NL-	53,9	58,8	54,0	0,49		**18,4**	ULS 30yr 3 W + I ZIII 0,9 WR_0,T BI-	54,7	58,8	27,7	0,66		0,66
mvd3	mvd3	60x60x5	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	117	**-18,0**	ULS 30yr 1a W ZIII 0,9 WRB,T NL-	51,0	58,8	54,0	0,35		**24,7**	ULS 30yr 1a W ZIII WRB,T NL-	54,7	58,8	27,7	0,89		0,89
mvd4	mvd4	60x60x5	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	121	**-32,9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	49,1	58,8	54,0	0,67		**23,9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	54,7	58,8	27,7	0,86		0,86
mvd5	mvd5	**60x60x6**	**S355**	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	129	**-41,4**	ULS 30yr 1a W ZIII WR_0,T BI-	64,6	188,2	176,4	0,64		**39,6**	ULS 30yr 1a W ZIII WR_0,T BI-	105,4	188,2	90,6	0,44		0,64
mvd6	mvd6	60x60x5	S235	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	137	**-36,1**	ULS 30yr 1a W ZIII WR_0,T BI-	43,1	188,2	108,0	0,84		**37,1**	ULS 30yr 1a W ZIII WRB,T NL-	65,2	188,2	55,5	0,67		0,84
mvd7	mvd7	60x60x5	S235	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	144	**-33,7**	ULS 30yr 1a W ZIII WRB,T NL-	40,6	188,2	108,0	0,83		**33,0**	ULS 30yr 1a W ZIII WR_0,T BI-	65,2	188,2	55,5	0,60		0,83
mvd8	mvd8	60x60x5	S235	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	152	**-31,7**	ULS 30yr 1a W ZIII WR_0,T BI-	38,0	188,2	108,0	0,83		**31,3**	ULS 30yr 1a W ZIII WR_0,T BI-	65,2	188,2	55,5	0,56		0,83
mvd9	mvd9	60x60x5	S235	**2M20-8,8t**	1	30	30		0,52	0,52	0,52	160	**-29,5**	ULS 30yr 1a W ZIII WR_0,T BI-	35,6	188,2	108,0	0,83		**30,2**	ULS 30yr 1a W ZIII WRB,T NL-	65,2	188,2	55,5	0,54		0,83
mvh1	mvh1	50x50x5	S235	2M16-5,6t	1	30	25	50	1,00	1,00	1,00	155	**0,0**		38,5	75,4	86,4	0,00		**35,9**	ULS 30yr 3 W + I ZIII WRB,T NL-	48,7	75,4	56,0	0,74		0,74
mvh2	mvh2	70x70x7	S235	6M16-5,6t	1	30	35	50	2,00	1,00	1,00	75	**-69,4**	ULS 30yr 3 W + I ZIII WRB,T NL-	170,5	226,1	362,9	0,41		**17,6**	ULS 30yr 3 W + I ZIII 0,9 WRB,T NL-	178,3	226,1	268,8	0,10		0,41
mvh3	mvh3	60x60x5	S235	2M20-5,6t	1	30	30	55	1,00	1,00	1,00	155	**0,0**		46,5	117,6	108,0	0,00		**53,6**	ULS 30yr 3 W + I ZIII WLB,T NL+	54,1	117,6	55,5	0,99		0,99
mvh4	mvh4	70x70x7	S235	5M16-5,6t	1	50	30	50	2,00	1,00	1,00	89	**-51,3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	152,8	188,4	302,4	0,34		**6,5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	178,3	188,4	272,5	0,04		0,34
mvh5	mvh5	60x60x5	S235	2M20-5,6t	1	30	30	60	2,00	1,00	1,00	195	**0,0**		32,8	117,6	108,0	0,00		**13,7**	ULS 30yr 1a W ZIII WL_90,T BI+	57,8	117,6	55,5	0,25		0,25
mvh6	mvh6	60x60x5	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	198	**-2,0**	ULS 30yr 1a W ZIII 0,9 WRA,T NR-	30,1	58,8	54,0	0,07		**2,0**	ULS 30yr 1a W ZIII WL_45,T BI+	54,7	58,8	27,7	0,07		0,07
mzd1	mzd1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	125	**-11,3**	ULS 30yr 3 W + I ZIII WRA,T NR-	31,9	37,7	34,6	0,35		**2,1**	ULS 30yr 1a W ZIII WR_45,T BI-	48,4	37,7	25,6	0,08		0,35
mzd10	mzd10	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	140	**-20,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49,7	58,8	64,8	0,41		**17,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,52		0,52
mzd11	mzd11	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	148	**-15,9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46,7	58,8	64,8	0,34		**17,8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,54		0,54
mzd12	mzd12	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	156	**-15,9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43,8	58,8	64,8	0,36		**14,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,43		0,43
mzd13	mzd13	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	164	**-13,3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41,0	58,8	64,8	0,32		**14,3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,43		0,43
mzd14	mzd14	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	173	**-13,1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	38,4	58,8	64,8	0,34		**12,1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,36		0,36
mzd15	mzd15	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	181	**-11,1**	ULS 30yr 1a W ZIII WR_-45,T BI-	36,1	58,8	64,8	0,31		**13,3**	ULS 30yr 1a W ZIII WR_-45,T BI-	65,7	58,8	33,3	0,40		0,40
mzd16	mzd16	60x60x6	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	179	**-14,4**	ULS 30yr 1a W ZIII WR_-45,T BI-	36,7	58,8	64,8	0,39		**11,7**	ULS 30yr 1a W ZIII WR_-45,T BI-	65,7	58,8	33,3	0,35		0,39
mzd17	mzd17	60x60x6	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	191	**-11,3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	33,6	58,8	64,8	0,34		**8,5**	ULS 30yr 3 W + I ZIII WRB,T NL-	65,7	58,8	33,3	0,26		0,34
mzd18	mzd18	60x60x6	S235	1M20-5,6t	1	30	30		0,54	0,54	0,54	217	**-8,5**	ULS 30yr 3 W + I ZIII WRB,T NL-	28,0	58,8	64,8	0,30		**9,6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65,7	58,8	33,3	0,29		0,30
mzd19	mzd19	60x60x6	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	211	**-10,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	29,1	58,8	64,8	0,34		**9,3**	ULS 30yr 3 W + I ZIII WRB,T NL-	65,7	58,8	33,3	0,28		0,34
mzd2	mzd2	60x60x6	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	108	**-20,2**	ULS 30yr 3 W + I ZIII WRB,T NL-	65,5	58,8	64,8	0,34		**10,3**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65,7	58,8	33,3	0,31		0,34
mzd20	mzd20	65x65x7	S235	2M16-5,6t	1	30	30	60	1,00	0,33	0,33	253	**-11,7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	33,7	75,4	121,0	0,35		**10,1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	107,1	75,4	89,6	0,13		0,35
mzd3	mzd3	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	115	**-13,9**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	61,5	58,8	64,8	0,24		**17,2**	ULS 30yr 3 W + I ZIII 0,9 WLB,T NL+	65,7	58,8	33,3	0,52		0,52
mzd4	mzd4	60x60x6	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	116	**-15,4**	ULS 30yr 3 W + I ZIII 0,9 WLB,T NL+	60,8	58,8	64,8	0,26		**15,0**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65,7	58,8	33,3	0,45		0,45
mzd5	mzd5	60x60x5	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	116	**-16,1**	ULS 30yr 3 W + I ZIII WL_45,T BI+	51,1	58,8	54,0	0,31		**13,6**	ULS 30yr 3 W + I ZIII 0,9 WLB,T NL+	54,7	58,8	27,7	0,49		0,49
mzd8	mzd8	65x65x7	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	115	**-26,9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77,8	58,8	75,6	0,46		**20,7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76,6	58,8	38,8	0,53		0,53
mzd9	mzd9	60x60x6	S235	1M20-5,6t	1	30	30		0,52	0,52	0,52	133	**-19,3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52,9	58,8	64,8	0,36		**23,5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65,7	58,8	33,3	0,71		0,71
mzh1	mzh1	50x50x4	S235	1M16-5,6t	1	30	25		2,00	1,00	1,00	98	**-1,8**	ULS 30yr 1a W ZIII WR_45,T BI-	42,7	37,7	34,6	0,05		**0,9**	ULS 30yr 1a W ZIII WL_45,T BI+	36,9	37,7	22,4	0,04		0,05
mzh2	mzh2	65x65x5	S235	2M16-5,6t	1	30	30	50	2,00	1,00	1,00	81	**-8,2**	ULS 30yr 1a W ZIII WRB,T NL-	88,9	75,4	172,8	0,11		**13,5**	ULS 30yr 3 W + I ZIII WRB,T NL-	56,7	75,4	128,0	0,24		0,24
mzh3	mzh3	60x60x5	S235	1M20-5,6t	1	30	30		2,00	1,00	1,00	99	**-7,7**	ULS 30yr 3 W + I ZIII WR_0,T BI-	62,7	58,8	54,0	0,14		**0,0**		54,7	58,8	27,7	0,00		0,14
mzh4	mzh4	65x65x5	S235	2M16-5,6t	1	30	30	50	1,00	1,00	1,00	74	**-6,8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98,2	75,4	172,8	0,09		**6,7**	ULS 30yr 3 W + I ZIII 0,9 WRB,T NL-	56,7	75,4	128,0	0,12		0,12
mzh5	mzh5	60x60x6	S235	2M20-5,6t	1	30	30	60	2,00	1,00	1,00	195	**-34,0**	ULS 30yr 1a W ZIII WRA,T NR-	39,0	117,6	129,6	0,87		**27,9**	ULS 30yr 1a W ZIII WRA,T NR-	68,7	117,6	66,5	0,42		0,87
mzh6	mzh6	60x60x5	S235	1M20-5,6t	1	30	30		1,00	1,00	1,00	198	**-2,6**	ULS 30yr 1a W ZIII WRA,T NR-	30,1	58,8	54,0	0,09		**1,8**	ULS 30yr 1a W ZIII WRA,T NR-	54,7	58,8	27,7	0,07		0,09
t1bh1	t1bh1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	98	**-0,4**	ULS 30yr 3 W + I ZIII WR_0,T BI-	40,1	37,7	34,6	0,01		**0,0**		36,9	37,7	22,4	0,00		0,01
t1br1	t1br1	55x55x5	S235	2M16-5,6t	1	30	25	60	2,13	1,00	1,00	231	**-1,0**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	23,6	75,4	172,8	0,04		**47,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	57,4	113,0	168,1	0,82		0,82
t1od1	t1od1	60x60x5	S235	1M16-5,6t	1	30	30		1,00	1,00	1,00	162	**-2,6**	ULS 30yr 1a W ZIII 0,9 WL_-90,T BI+	35,2	37,7	43,2	0,07		**3,8**	ULS 30yr 3 W + I ZIII WL_45,T BI+	60,5	37,7	32,0	0,12		0,12
t1od10	t1od10	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	75	**-5,3**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46,6	37,7	34,6	0,15		**14,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,62		0,62
t1od11	t1od11	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	86	**-7,7**	ULS 30yr 3 W + I ZIII WRB,T NL-	44,3	37,7	34,6	0,22		**1,8**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36,9	37,7	22,4	0,08		0,22
t1od2	t1od2	60x60x5	S235	1M16-5,6t	1	30	30		1,00	1,00	1,00	146	**-5,7**	ULS 30yr 3 W + I ZIII WRB,T NL-	39,8	37,7	43,2	0,15		**2,4**	ULS 30yr 1a W ZIII 0,9 WL_-90,T BI+	60,5	37,7	32,0	0,07		0,15
t1od3	t1od3	60x60x5	S235	1M16-5,6t	1	30	30		1,00	1,00	1,00	132	**-2,9**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44,8	37,7	43,2	0,08		**5,8**	ULS 30yr 3 W + I ZIII WRB,T NL-	60,5	37,7	32,0	0,18		0,18
t1od4	t1od4	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	111	**-5,4**	ULS 30yr 3 W + I ZIII WRB,T NL-	35,9	37,7	34,6	0,16		**1,8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36,9	37,7	22,4	0,08		0,16
t1od5	t1od5	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	111	**-3,0**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36,0	37,7	34,6	0,09		**6,4**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,29		0,29
t1od6	t1od6	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	100	**-7,3**	ULS 30yr 3 W + I ZIII WRB,T NL-	39,6	37,7	34,6	0,21		**3,2**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36,9	37,7	22,4	0,14		0,21
t1od7	t1od7	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	93	**-3,8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	52,4	37,7	34,6	0,11		**7,9**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,35		0,35
t1od8	t1od8	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	78	**-3,3**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46,0	37,7	34,6	0,10		**9,3**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,42		0,42
t1od9	t1od9	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	72	**-11,0**	ULS 30yr 3 W + I ZIII WRB,T NL-	61,4	37,7	34,6	0,32		**3,9**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36,9	37,7	22,4	0,17		0,32
t1oh1	t1oh1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	143	**0,0**		27,4	37,7	34,6	0,00		**0,5**	ULS 30yr 3 W + I ZIII WR_45,T BI-	36,9	37,7	22,4	0,02		0,02
t1oh2	t1oh2	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	125	**-0,2**	ULS 30yr 1a W ZIII 0,9 WR_45,T BI-	32,1	37,7	34,6	0,01		**0,4**	ULS 30yr 1a W ZIII WR_-45,T BI-	36,9	37,7	22,4	0,02		0,02
t1oh5	t1oh5	65x65x8	S235	1M16-5,6t	1	30	30		2,00	2,00	2,00	33	**-10,1**	ULS 30yr 3 W + I ZIII WRB,T NL-	175,2	37,7	69,1	0,27		**3,6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ba,T Global	96,8	37,7	51,2	0,10		0,27
t1or1	t1or1	70x70x7	S235						1,68	1,00	1,00	76	**-101,6**	ULS 30yr 3 W + I ZIII WRB,T NL-	170,1	0,0	0,0	0,60		**37,3**	ULS 30yr 3 W + I ZIII 0,9 WRB,T NL-	178,3	226,1	268,8	0,21		0,60
t1vd1	t1vd1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	256	**0,0**		12,3	37,7	34,6	0,00		**5,1**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,23		0,23
t1vd2	t1vd2	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	203	**-8,6**	ULS 30yr 3 W + I ZIII WRB,T NL-	23,8	37,7	86,4	0,36		**0,0**		92,2	37,7	56,0	0,00		0,36
t1vd3	t1vd3	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	224	**0,0**		15,1	37,7	34,6	0,00		**20,8**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,93		0,93
t1vv1	t1vv1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	99	**-0,1**	ULS 30yr 3 W + I ZIII 0,9 WRB,T NL-	39,8	37,7	34,6	0,00		**1,3**	ULS 30yr 3 W + I ZIII WRB,T NL-	36,9	37,7	22,4	0,06		0,06
t1vv2	t1vv2	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	47	**-0,2**	ULS 30yr 3 W + I ZIII WRB,T NL-	53,0	37,7	34,6	0,01		**0,0**		36,9	37,7	22,4	0,00		0,01
t2bh1	t2bh1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	122	**-0,1**	ULS 30yr 3 W + I ZIII WLB,T NL+	32,9	37,7	34,6	0,00		**0,0**	ULS 30yr 1a W ZIII 0,9 WL_-45,T BI+	36,9	37,7	22,4	0,00		0,00
t2br1	t2br1	55x55x5	S235	2M16-5,6t	1	30	25	60	1,76	1,00	1,00	286	**0,0**		17,1	75,4	172,8	0,00		**42,5**	ULS 30yr 3 W + I ZIII WR_0,T BI-	57,4	113,0	168,1	0,74		0,74
t2od1	t2od1	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	190	**-3,8**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26,0	37,7	86,4	0,15		**8,3**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92,2	37,7	56,0	0,22		0,22
t2od10	t2od10	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	94	**-7,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41,3	37,7	34,6	0,21		**3,4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36,9	37,7	22,4	0,15		0,21
t2od11	t2od11	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	84	**-3,9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	44,6	37,7	34,6	0,11		**8,4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36,9	37,7	22,4	0,38		0,38
t2od12	t2od12	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	77	**-9,7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46,2	37,7	34,6	0,28		**4,5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36,9	37,7	22,4	0,20		0,28
t2od13	t2od13	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	75	**-5,8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46,6	37,7	34,6	0,17		**12,1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	36,9	37,7	22,4	0,54		0,54
t2od14	t2od14	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	60	**-5,0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50,0	37,7	34,6	0,14		**1,2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36,9	37,7	22,4	0,06		0,14
t2od2	t2od2	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	174	**-9,7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29,2	37,7	86,4	0,33		**4,1**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92,2	37,7	56,0	0,11		0,33
t2od3	t2od3	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	160	**-4,9**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32,8	37,7	86,4	0,15		**10,4**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92,2	37,7	56,0	0,27		0,27
t2od4	t2od4	55x55x5	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	148	**-11,9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36,1	37,7	86,4	0,33		**5,0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92,2	37,7	56,0	0,13		0,33
t2od5	t2od5	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	133	**-2,0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30,0	37,7	34,6	0,07		**3,5**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36,9	37,7	22,4	0,16		0,16
t2od6	t2od6	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	131	**-4,7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30,4	37,7	34,6	0,16		**2,2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36,9	37,7	22,4	0,10		0,16
t2od7	t2od7	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	119	**-2,4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33,7	37,7	34,6	0,07		**5,1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36,9	37,7	22,4	0,23		0,23
t2od8	t2od8	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	110	**-5,6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36,1	37,7	34,6	0,16		**2,6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36,9	37,7	22,4	0,12		0,16
t2od9	t2od9	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	102	**-3,0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	38,7	37,7	34,6	0,09		**6,3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36,9	37,7	22,4	0,28		0,28
t2oh1	t2oh1	50x50x4	S235	1M16-5,6t	1	30	25		1,00	1,00	1,00	175	**-0,1**	ULS 30yr 1a W ZIII 0,9 WL_90,T BI+	21,3	37,7	34,6	0,01		**0,4**	ULS 30yr 1a W ZIII WL_-90,T BI+	36,9	37,7	22,4	0,02		0,02

Date 28-3-2022
Author TBR
Version v4,4

Assessment of groups for modified structure (afkeur level)

GT-ZBH150
D+0
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Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	24.0	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.02		0.02
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	**-0.4**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	27.1	37.7	34.6	0.02		**0.7**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.03		0.03
t2oh4	t2oh4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-3.6**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.10		**6.9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.18		0.18
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	**-6.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.18		**4.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.11		0.18
t2or1	t2or1	70x70x7	S235	5M16-5.6t	1	100	35	85	1.21	1.00	1.00	67	**-71.1**	ULS 30yr 3 W + I ZIII WR_0,T BI-	180.1	188.4	302.4	0.39		**26.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	220.9	0.0	0.0	0.12		0.39
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207	**0.0**		18.1	37.7	34.6	0.00		**11.7**	ULS 30yr 3 W + I ZIII WL_0,T BI+	36.9	37.7	22.4	0.52		0.52
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-9.8**	ULS 30yr 3 W + I ZIII WLB,T NL+	23.3	37.7	34.6	0.42		**0.0**		36.9	37.7	22.4	0.00		0.42
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**0.0**		21.6	37.7	34.6	0.00		**1.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.07		0.07
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-1.9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	40.3	37.7	34.6	0.05		**0.0**		36.9	37.7	22.4	0.00		0.05
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	104	**0.0**		38.1	37.7	34.6	0.00		**2.9**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.13		0.13
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-0.2**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	36.3	37.7	34.6	0.01		**0.4**	ULS 30yr 1a W ZIII WRA,T NR-	36.9	37.7	22.4	0.02		0.02
t2vd7	t2vd7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	**-0.4**	ULS 30yr 1a W ZIII WRA,T NR-	24.5	37.7	34.6	0.02		**0.1**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	36.9	37.7	22.4	0.00		0.02
t2vv1	t2vv1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	115	**0.0**		34.9	37.7	34.6	0.00		**7.8**	ULS 30yr 3 W + I ZIII WLB,T NL+	36.9	37.7	22.4	0.35		0.35
Tv1oh1	Tv2oh1	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	**-0.8**	ULS 30yr 3 W + I ZIII WR_0,T BI-	262.0	37.7	86.4	0.02		**0.7**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	121.0	37.7	64.0	0.02		0.02
Tv1oh2	Tv2oh2	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	36	**-0.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	264.9	37.7	86.4	0.02		**0.6**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	121.0	37.7	64.0	0.02		0.02
Tv2oh3	Tv2oh3	130x65x8	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	53	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	188.4	37.7	86.4	0.05		**2.0**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	121.0	37.7	64.0	0.05		0.05
Tv2oh4	Tv2oh4	130x65x8	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	47	**-0.9**	ULS 30yr 3 W + I ZIII WRB,T NL-	194.7	37.7	86.4	0.03		**0.7**	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	121.0	37.7	64.0	0.02		0.03

Assessment of groups for modified elements (verbouw level)

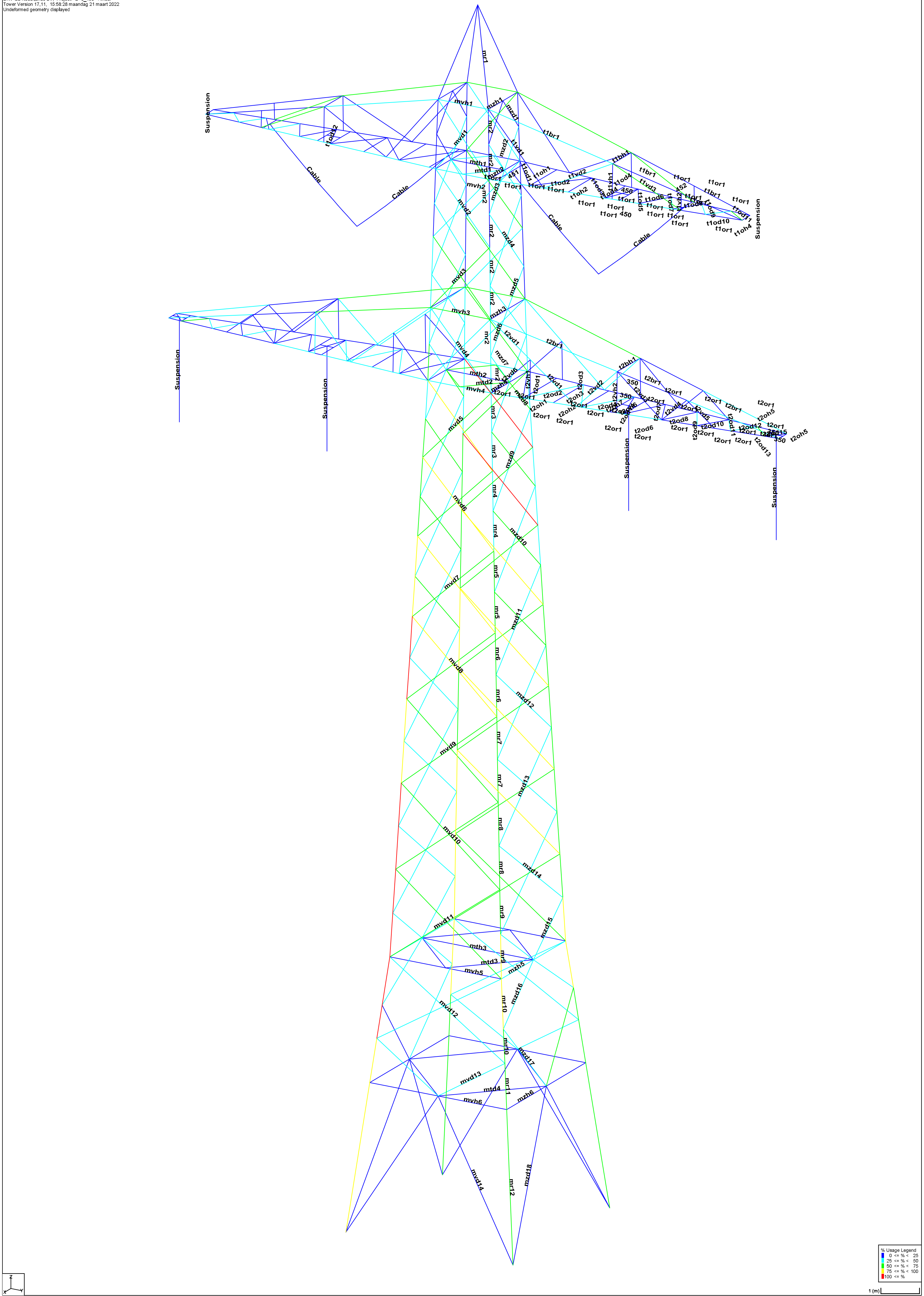
Date 28-3-2022
Author TBR
Version v4.4

GT-ZBH150
D+0
22

Group Label	Description	Profile	Steel Quality	Bolts	plane s	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)
mr3B	mr3	L90x9+L90x9	S235						2.40	2.43	1.00	96	**-274.7**	ULS 30yr 3 W + I ZIII WR_0,T BI-	427.0	0.0	0.0	0.64	
mr3C	mr3	L90x9+L90x9	S235						2.40	2.43	1.00	98	**-331.5**	ULS 30yr 1a W ZIII WRA,T NR-	416.2	0.0	0.0	0.80	
mr3D	mr3	L90x9+L90x9	S235	**12M20-8.8t**	1	35	40	70	2.40	2.40	1.00	99	**-378.9**	ULS 30yr 1a W ZIII WRA,T NR-	411.4	1105.0	1166.4	0.92	
mr4A	mr4	L110x10+L110x10	S235	**12M20-8.8t**	1	35	40	70	2.40	2.43	1.00	82	**-390.5**	ULS 30yr 1a W ZIII WRA,T NR-	677.5	1105.0	1296.0	0.58	
mr4B	mr4	L110x10+L110x10	S235						2.40	2.43	1.00	83	**-447.6**	ULS 30yr 1a W ZIII WRA,T NR-	665.3	0.0	0.0	0.67	
mr4C	mr4	L110x10+L110x10	S235						2.40	2.43	1.00	85	**-491.5**	ULS 30yr 1a W ZIII WRA,T NR-	652.9	0.0	0.0	0.75	
mr4D	mr4	L110x10+L110x10	S235						2.40	2.40	1.00	86	**-546.6**	ULS 30yr 1a W ZIII WRA,T NR-	647.9	0.0	0.0	0.84	
mr4E	mr4	L110x10+L110x10	S235	**16M20-8.8t**					2.40	2.40	1.00	86	**-572.9**	ULS 30yr 1a W ZIII WRA,T NR-	647.9	1420.6	1728.0	0.88	
mr5A	mr5	L110x10+L110x10	S235		1	45	50	60	2.40	2.40	1.00	83	**-600.6**	ULS 30yr 1a W ZIII WRA,T NR-	665.5	0.0	0.0	0.90	
mr5B	mr5	L110x10+L110x10	S235						2.40	2.40	1.00	83	**-597.9**	ULS 30yr 1a W ZIII WRA,T NR-	665.5	0.0	0.0	0.90	
mr5C	mr5	L110x10+L110x10	S235	**16M20-8.8t**	1	40	50	60	0.33	0.33	0.33	63	**-590.9**	ULS 30yr 1a W ZIII WRA,T NR-	792.9	1448.8	1728.0	0.75	
mvd11	mvd11	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	177	**-29.7**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	31.2	188.2	108.0	0.95	
mvd12	mvd12	60x60x6	**S355**	**1M20-8.8t**	1	30	30		0.52	0.52	0.52	185	**-37.1**	ULS 30yr 1a W ZIII WRA,T NR-	39.5	94.1	88.2	0.94	
mvd5	mvd5	60x60x6	**S355**	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	129	**-47.7**	ULS 30yr 1a W ZIII WRB,T NL-	64.6	188.2	176.4	0.74	
mvd6	mvd6	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	137	**-41.9**	ULS 30yr 1a W ZIII WR_0,T BI-	43.1	188.2	108.0	0.97	
mvd7	mvd7	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	144	**-38.9**	ULS 30yr 1a W ZIII WR_0,T BI-	40.6	188.2	108.0	0.96	
mvd8	mvd8	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	152	**-36.7**	ULS 30yr 1a W ZIII WR_0,T BI-	38.0	188.2	108.0	0.97	
mvd9	mvd9	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	160	**-34.3**	ULS 30yr 1a W ZIII WR_0,T BI-	35.6	188.2	108.0	0.96	

Group Label	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)
mr3B	**202.8**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	728.5	0.0	0.0	0.28	
mr3C	**263.6**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	728.5	0.0	0.0	0.36	
mr3D	**312.2**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	700.9	1105.0	824.7	0.45	
mr4A	**320.1**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	982.4	1105.0	916.4	0.35	
mr4B	**371.2**	ULS 30yr 1a W ZIII WRA,T NR-	994.1	0.0	0.0	0.37	
mr4C	**419.5**	ULS 30yr 1a W ZIII WRA,T NR-	994.1	0.0	0.0	0.42	
mr4D	**464.2**	ULS 30yr 1a W ZIII WRA,T NR-	994.1	0.0	0.0	0.47	
mr4E	**501.5**	ULS 30yr 1a W ZIII WRA,T NR-	982.4	1420.6	1396.4	0.51	
mr5A	**520.3**	ULS 30yr 1a W ZIII WRA,T NR-	982.4	1448.8	1518.5	0.53	
mr5B	**502.1**	ULS 30yr 1a W ZIII WRA,T NR-	994.1	0.0	0.0	0.51	
mr5C	**491.6**	ULS 30yr 1a W ZIII WRA,T NR-	982.4	1448.8	1396.4	0.50	
mvd11	**34.4**	ULS 30yr 1a W ZIII WR_0,T BI-	65.2	188.2	55.5	0.62	
mvd12	**27.3**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	89.4	94.1	45.3	0.60	
mvd5	**45.9**	ULS 30yr 1a W ZIII WR_0,T BI-	105.4	188.2	90.6	0.51	
mvd6	**42.7**	ULS 30yr 1a W ZIII WRB,T NL-	65.2	188.2	55.5	0.77	
mvd7	**38.2**	ULS 30yr 1a W ZIII WR_0,T BI-	65.2	188.2	55.5	0.69	
mvd8	**36.2**	ULS 30yr 1a W ZIII WR_0,T BI-	65.2	188.2	55.5	0.65	
mvd9	**34.8**	ULS 30yr 1a W ZIII WRB,T NL-	65.2	188.2	55.5	0.63	

DNV GL Nederlands BV, Project: "D+0_150 - Afkeur"
Tower Version 17.11, 15:58:28 maandag 21 maart 2022
Undeformed geometry displayed



Assessment of groups for initial structure (afkeur level)

RSD-MDK150
D+0
84

Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
mr1	mr1	50x50x4	S235	4M12-5.6t	1	25	20	60	0.67	0.67	0.67	186	**-2.2**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24.6	80.6	103.7	0.09		**2.1**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72.1	80.6	75.7	0.03		0.09
mzd1	mzd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-1.4**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	31.9	37.7	34.6	0.04		**1.2**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	36.9	37.7	22.4	0.05		0.05
mzh1	mzh1	50x50x4	S235	1M16-5.6t	1	30	25		2.00	1.00	1.00	98	**-3.1**	ULS 30yr 3 W + I ZIII WLB,T NL+	42.7	37.7	34.6	0.09		**1.2**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.05		0.09
mvh1	mvh1	50x50x5	S235	2M16-5.6t	1	30	25	50	1.00	1.00	1.00	155	**0.0**	0	38.5	75.4	86.4	0.00		**28.3**	ULS 30yr 3 W + I ZIII WLB,T NL+	48.7	75.4	56.0	0.58		0.58
t1vd1	t1vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	254	**0.0**	0	12.5	37.7	34.6	0.00		**4.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.18		0.18
t1br1	t1br1	55x55x5	S235	3M16-5.6t	1	30	25	60	1.89	1.00	1.00	231	**-2.9**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	23.6	0.0	0.0	0.12		**34.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.60		0.60
mvd1	mvd1	50x50x4	S235	1M16-5.6t	1	30	25		0.52	0.52	0.52	130	**-12.2**	ULS 30yr 1a W ZIII WRA,T NR-	30.6	37.7	34.6	0.40		**11.8**	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.52		0.52
mr2	mr2	75x75x6	S235	8M20-5.6t	1	30	30	60	2.00	1.00	1.00	87	**-76.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	143.3	470.4	518.4	0.53		**42.7**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	157.1	470.4	366.5	0.27		0.53
t1vd2	t1vd2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	206	**-6.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	26.1	37.7	86.4	0.25		**0.0**	0.0	92.2	37.7	56.0	0.00		0.25
t1vd3	t1vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	224	**0.0**	0	15.1	37.7	34.6	0.00		**14.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.65		0.65
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-0.2**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	40.1	37.7	34.6	0.01		**0.0**	0.0	36.9	37.7	22.4	0.00		0.01
t1vh1	t1vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	99	**0.0**	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	39.8	37.7	34.6	0.00		**1.2**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.05		0.05
mzd2	mzd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-10.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	31.9	37.7	34.6	0.32		**1.7**	ULS 30yr 1a W ZIII WR_45,T BI-	36.9	37.7	22.4	0.08		0.32
t1vh2	t1vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	47	**-0.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	53.0	37.7	34.6	0.00		**0.0**	0.0	36.9	37.7	22.4	0.00		0.00
t1or1	t1or1	70x70x7	S235	6M16-5.6t					1.68	1.00	1.00	76	**-75.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	170.1	0.0	0.0	0.45		**24.5**	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	178.3	226.1	268.8	0.14		0.45
t1od8	t1od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	86	**-6.3**	ULS 30yr 3 W + I ZIII WR_0,T BI-	44.3	37.7	34.6	0.18		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.16		0.18
t1od7	t1od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	93	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	41.9	37.7	34.6	0.11		**6.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	36.9	37.7	22.4	0.30		0.30
t1od6	t1od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	100	**-6.2**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	39.6	37.7	34.6	0.18		**3.6**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.16		0.18
t1od5	t1od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	**-3.1**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.0	37.7	34.6	0.09		**5.3**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	36.9	37.7	22.4	0.23		0.23
t1od4	t1od4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	**-1.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	261.9	37.7	86.4	0.03		**0.9**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	121.0	37.7	64.0	0.02		0.03
t1od1	t1od1	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	162	**-2.6**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	35.2	37.7	43.2	0.07		**3.6**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	60.5	37.7	32.0	0.11		0.11
t1od2	t1od2	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	146	**-4.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	39.8	37.7	43.2	0.12		**2.4**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	60.5	37.7	32.0	0.07		0.12
t1oh1	t1oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	143	**0.0**	0	27.4	37.7	34.6	0.00		**0.4**	ULS 30yr 3 W + I ZIII WL_-90,T BI+	36.9	37.7	22.4	0.02		0.02
t1od10	t1od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	72	**-8.5**	ULS 30yr 3 W + I ZIII WRB,T NL-	47.4	37.7	34.6	0.25		**5.8**	ULS 30yr 5a Trsnl ZIII Br. 1 Ba,T Global	36.9	37.7	22.4	0.26		0.26
t1od12	t1od12	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	111	**-3.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	35.9	37.7	34.6	0.11		**1.5**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.07		0.11
t1od9	t1od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	78	**-5.0**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.0	37.7	34.6	0.14		**7.2**	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.32		0.32
t1od3	t1od3	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	132	**-3.1**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44.8	37.7	43.2	0.08		**5.1**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	60.5	37.7	32.0	0.16		0.16
t1oh2	t1oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-0.2**	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	32.0	37.7	34.6	0.01		**0.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.01		0.01
mzh2	mzh2	70x70x7	S235	2M16-5.6t	1	40	35	50	2.00	1.00	1.00	75	**-6.7**	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	137.4	75.4	121.0	0.09		**9.0**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	101.6	75.4	109.0	0.12		0.12
mvh2	mvh2	70x70x7	S235	6M16-5.6t	1	30	35	50	2.00	1.00	1.00	75	**-54.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	137.4	226.1	362.9	0.40		**13.2**	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	178.3	226.1	268.8	0.07		0.40
mzd3	mzd3	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-17.4**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	65.6	58.8	64.8	0.30		**14.1**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.42		0.42
t1oh4	t1oh4	UNP160	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	21	**-8.0**	ULS 30yr 3 W + I ZIII WR_0,T BI-	428.6	37.7	64.8	0.21		**5.5**	ULS 30yr 5a Trsnl ZIII Br. 1 Ba,T Global	90.7	37.7	48.0	0.15		0.21
mth1	mth1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	165	**-0.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	28.5	37.7	43.2	0.02		**0.0**	0.0	46.1	37.7	28.0	0.00		0.02
mtd1	mtd1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	116	**-8.8**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42.3	37.7	43.2	0.23		**8.9**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46.1	37.7	28.0	0.32		0.32
t1od11	t1od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-8.0**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.6	37.7	34.6	0.23		**11.4**	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.51		0.51
mvd2	mvd2	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	110	**-19.4**	ULS 30yr 1a W ZIII WR_0,T BI-	54.0	58.8	54.0	0.36		**14.3**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	54.7	58.8	27.7	0.51		0.51
mzd4	mzd4	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	115	**-15.6**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	61.6	58.8	64.8	0.27		**14.3**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	65.7	58.8	33.3	0.43		0.43
mvd3	mvd3	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	116	**-14.2**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	51.2	58.8	54.0	0.28		**18.8**	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	0.68		0.68
mzd5	mzd5	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-11.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	74.0	58.8	64.8	0.19		**15.4**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.46		0.46
mzh3	mzh3	60x60x5	S235	1M20-5.6t	1	30	30		2.00	1.00	1.00	98	**-4.6**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	63.4	58.8	54.0	0.08		**0.0**	0.0	54.7	58.8	27.7	0.00		0.08
mvh3	mvh3	60x60x5	S235	2M20-5.6t	1	30	30	55	1.00	1.00	1.00	153	**0.0**	0	47.3	117.6	108.0	0.00		**39.3**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	54.1	117.6	55.5	0.73		0.73
t2br1	t2br1	55x55x5	S235	3M16-5.6t	1	30	25	60	1.76	1.00	1.00	286	**0.0**	0	17.0	75.4	172.8	0.00		**30.4**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	57.4	113.0	168.1	0.53		0.53
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207	**0.0**	0	18.2	37.7	34.6	0.00		**8.7**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.39		0.39
mzd6	mzd6	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-11.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	68.6	58.8	64.8	0.20		**15.5**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.47		0.47
mvd4	mvd4	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	121	**-22.3**	ULS 30yr 1a W ZIII WRA,T NR-	49.3	58.8	54.0	0.45		**16.8**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	54.7	58.8	27.7	0.61		0.61
t2bh1	t2bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	120	**0.0**	ULS 30yr 3 W + I ZIII WR_45,T BI-	33.3	37.7	34.6	0.00		**0.0**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.00		0.00
t2vh2	t2vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	114	**0.0**	0	34.9	37.7	34.6	0.00		**5.6**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.25		0.25
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	173	**0.0**	0	21.6	37.7	34.6	0.00		**1.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.06		0.06
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-7.2**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	23.3	37.7	34.6	0.31		**0.0**	0.0	36.9	37.7	22.4	0.00		0.31
t2vh1	t2vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	109	**0.0**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	36.5	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.02		0.02
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	**-0.4**	ULS 30yr 1a W ZIII WR_0,T BI-	24.6	37.7	34.6	0.02		**0.0**	0.0	36.9	37.7	22.4	0.00		0.02
mzd7	mzd7	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-15.1**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	61.0	58.8	64.8	0.26		**10.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	65.7	58.8	33.3	0.33		0.33
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	105	**0.0**	0	38.0	37.7	34.6	0.00		**2.2**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.10		0.10
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	97	**-1.4**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	40.4	37.7	34.6	0.04		**0.0**	0.0	36.9	37.7	22.4	0.00		0.04
t2or1	t2or1	70x70x7	S235	5M16-5.6t					1.21	1.00	1.00	67	**-63.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	180.1	188.4	302.4	0.35		**25.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	261.3	0.14		0.35
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	**-7.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.19		**4.2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.11		0.19
t2od10	t2od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	94	**-8.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.3	37.7	34.6	0.23		**3.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.17		0.23
t2od9	t2od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	102	**-3.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	38.7	37.7	34.6	0.10		**6.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.31		0.31
t2od8	t2od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-6.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.1	37.7	34.6	0.18		**3.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.13		0.18
t2od7	t2od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	119	**-2.7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33.7	37.7	34.6	0.08		**5.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.25		0.25
t2od6	t2od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	131	**-5.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30.4	37.7	34.6	0.17		**2.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.11		0.17
t2od15	t2od15	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	60	**-5.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50.0	37.7	34.6	0.15		**1.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.06		0.15
t2od14	t2od14	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	133	**-2.2**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30.0	37.7	34.6	0.07		**3.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.9	37.7	22.4	0.17		0.17
t2od4	t2od4	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	148	**-12.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.1	37.7	86.4	0.35		**5.9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	91.6	37.7	56.0	0.16		0.35
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	**-0.4**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	27.1	37.7	34.6	0.01		**0.5**	ULS 30yr 1a W ZIII WR_45,T BI-	36.9	37.7	22.4	0.02		0.02
t2od3	t2od3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-5.6**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32.8	37.7	86.4	0.17		**11.2**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.30		0.30
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	24.0	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.01		0.01
t2od2	t2od2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**-10.4**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29.2	37.7	86.4	0.35		**4.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	92.2	37.7	56.0	0.13		0.35
t2oh1	t2oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	175	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	21.3	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WL_-90,T BI+	36.9	37.7	22.4	0.02		0.02
t2od1	t2od1	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	190	**-4.4**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26.0	37.7	86.4	0.17		**8.9**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.24		0.24
mr3	mr3	90x90x9	S235	8M20-5.6t	1	55	40	60	2.40	2.43	1.00	94	**-122.0**	ULS 30yr 1a W ZIII WRA,T NR-	239.7	0.0	0.0	0.51		**77.5**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	470.4	683.3	0.26		0.51
mzh4	mzh4	65x65x5	S235	2M16-5.6t	1	30	30	50	1.00	1.00	1.00	74	**-7.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98.2	75.4	172.8	0.10		**6.6**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	56.7	75.4	128.0	0.12		0.12
mvh4	mvh4	70x70x7	S235	5M16-5.6t	1	50	30	50	2.00	1.00	1.00	89	**-48.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	123.2	188.4	302.4	0.39		**12.7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	178.3	188.4	272.5	0.07		0.39
mvd5	mvd5	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	129	**-32.1**	ULS 30yr 1a W ZIII WRB,T NL-	45.8	58.8	54.0	0.70		**30.5**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	1.10	bearing	1.10
t2od13	t2od13	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-6.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46.6	37.7	34.6	0.19		**13.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.59		0.59
t2od12	t2od12	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	77	**-10.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.2	37.7	34.6	0.31		**5.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.23		0.31
t2od11	t2od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	84	**-4.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	56.0	37.7	34.6	0.13		**9.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.41		0.41
mth2	mth2	50x50x5	S235	1M16-5.6t	1	40	25		1.00	1.00	1.00	194	**-0.3**	ULS 30yr 3 W + I ZIII WL_45,T BI+	22.8	37.7	43.2	0.01		**0.0**	0.0	46.1	37.7	37.4	0.00		0.01
mtd2	mtd2	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	137	**-15.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35.4	37.7	43.2	0.42		**15.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.1	37.7	28.0	0.54		0.54
mzd8	mzd8	65x65x7	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	115	**-27.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77.8	58.8	75.6	0.46		**22.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76.6	58.8	38.8	0.58		0.58
mzd9	mzd9	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	133	**-20.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52.9	58.8	64.8	0.39		**24.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.73		0.73
mvd6	mvd6	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	137	**-27.7**	ULS 30yr 1a W ZIII WRA,T NR-	43.1	58.8	54.0	0.64		**28.6**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	1.03	bearing	1.03
mzd10	mzd10	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	140	**-21.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49.9	58.8	64.8	0.43		**18.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.55		0.55
mvd7	mvd7	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	144	**-26.0**	ULS 30yr 1a W ZIII WRB,T NL-	40.6	58.8	54.0	0.64		**25.1**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.90		0.90
mzd11	mzd11	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	148	**-16.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	46.7	58.8	64.8	0.35		**19.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.57		0.57
mvd8	mvd8	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	152	**-23.6**	ULS 30yr 1a W ZIII WRA,T NR-	38.0	58.8	54.0	0.62		**23.8**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	0.86		0.86
mzd12	mzd12	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	156	**-17.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43.7	58.8	64.8	0.40		**14.7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mvd9	mvd9	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	161	**-22.8**	ULS 30yr 1a W ZIII WRB,T NL-	35.5	58.8	54.0	0.64		**22.2**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.80		0.80
mr4	mr4	90x90x9	S235						2.40	2.43	1.00	96	**-163.5**	ULS 30yr 1a W ZIII WRA,T NR-	234.2	0.0	0.0	0.70		**122.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	361.7	0.0	0.0	0.34		0.70
mzd13	mzd13	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	164	**-13.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	41.0	58.8	64.8	0.33		**16.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.48		0.48
mvd10	mvd10	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	169	**-21.3**	ULS 30yr 1a W ZIII WRA,T NR-	33.3	58.8	54.0	0.64		**21.2**	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	0.76		0.76
mzd14	mzd14	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	173	**-15.1**	ULS 30yr 1a W ZIII WR_-45,T BI-	38.3	58.8	64.8	0.40		**12.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.37		0.40
mvd11	mvd11	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	177	**-20.2**	ULS 30yr 1a W ZIII WRB,T NL-	31.2	58.8	54.0	0.65		**19.7**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.71		0.71
mzd15	mzd15	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	172	**-11.5**	ULS 30yr 1a W ZIII WR_-45,T BI-	38.8	58.8	64.8	0.30		**14.5**	ULS 30yr 1a W ZIII WR_-45,T BI-	65.7	58.8	33.3	0.44		0.44
mth3	mth3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	314	**0.0**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	13.7	37.7	86.4	0.00		**0.1**	ULS 30yr 3 W + I ZIII WL_45,T BI+	101.4	37.7	56.0	0.00		0.00
mtd3	mtd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	240	**-1.2**	ULS 30yr 1a W ZIII WRA,T NR-	13.6	37.7	34.6	0.09		**1.3**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.06		0.09
mzd16	mzd16	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	191	**-11.8**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	33.5	58.8	64.8	0.35		**11.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.34		0.35
mzh5	mzh5	60x60x5	S235	2M20-5.6t	1	30	30		1.00	1.00	1.00	142	**-21.6**	ULS 30yr 1a W ZIII WRA,T NR-	51.5	117.6	108.0	0.42		**16.7**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	65.2	117.6	55.5	0.30		0.42
mvh5	mvh5	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	142	**-10.7**	ULS 30yr 1a W ZIII WR_-45,T BI-	51.5	117.6	108.0	0.21		**6.1**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	57.8	117.6	55.5	0.11		0.21
mvd12	mvd12	60x60x5	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	192	**-9.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	28.0	58.8	54.0	0.34		**10.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	54.7	58.8	27.7	0.38		0.38
mr5	mr5	90x90x9	S235						2.40	2.43	1.00	98	**-208.9**	ULS 30yr 1a W ZIII WRA,T NR-	228.7	0.0	0.0	0.91		**164.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	361.7	0.0	0.0	0.46		0.91
mr6	mr6	90x90x9	S235	6M20-5.6t	1	35	40	70	2.40	2.43	1.00	100	**-238.3**	ULS 30yr 1a W ZIII WRA,T NR-	223.1	352.8	583.2	1.07	buckling	**196.9**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	352.8	412.4	0.66		1.07
mr7	mr7	100x100x10	S235						2.40	2.43	1.00	92	**-278.6**	ULS 30yr 1a W ZIII WRA,T NR-	303.3	0.0	0.0	0.92		**231.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2	0.0	0.0	0.51		0.92
mr8	mr8	100x100x10	S235						2.40	2.40	1.00	93	**-305.0**	ULS 30yr 1a W ZIII WRA,T NR-	301.0	0.0	0.0	1.01	buckling	**258.5**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2	0.0	0.0	0.57		1.01
mr9	mr9	100x100x10	S235	8M20-5.6t					2.40	2.40	1.20	95	**-335.5**	ULS 30yr 1a W ZIII WRA,T NR-	295.1	470.4	864.0	1.14	buckling	**287.7**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	698.2	0.75		1.14
mr10	mr10	100x100x10	S235	8M20-5.6t	1	35	50	70	2.03	1.20	1.00	88	**-351.5**	ULS 30yr 1a W ZIII WRA,T NR-	314.0	470.4	864.0	1.12	buckling	**300.9**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	610.9	0.78		1.12
mr11	mr11	100x100x10	S235						1.00	1.00	1.00	62	**-332.7**	ULS 30yr 1a W ZIII WRA,T NR-	378.3	0.0	0.0	0.88		**278.4**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2	0.0	0.0	0.62		0.88
mr12	mr12	100x100x10	S235	8M20-5.6t	1	50	50	60	0.33	0.33	0.33	70	**-333.1**	ULS 30yr 1a W ZIII WRA,T NR-	360.7	470.4	864.0	0.92		**277.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	759.3	0.72		0.92
mzd17	mzd17	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	123	**-12.5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	57.3	58.8	64.8	0.22		**17.8**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	65.7	58.8	33.3	0.54		0.54
mvd13	mvd13	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	193	**-9.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	27.8	58.8	54.0	0.35		**8.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54.7	58.8	27.7	0.30		0.35
mvh6	mvh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-1.5**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	39.8	117.6	108.0	0.04		**0.8**	ULS 30yr 1a W ZIII WL_45,T BI+	57.8	117.6	55.5	0.01		0.04

Assessment of groups for initial structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
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Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
mzh6	mzh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-2.0**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	39.8	117.6	108.0	0.05		**1.2**	ULS 30yr 1a W ZIII WR_45,T BI-	57.8	117.6	55.5	0.02		0.05
mtd4	mtd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	295	**-0.4**	ULS 30yr 1a W ZIII WL_-45,T BI+	11.1	37.7	34.6	0.04		**0.5**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.02		0.04
mzd18	mzd18	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	88.0	75.4	121.0	0.20		**16.1**	ULS 30yr 1a W ZIII 0.9 WRB,T NL-	107.1	75.4	74.7	0.22		0.22
mvd14	mvd14	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	88.0	75.4	121.0	0.19		**12.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107.1	75.4	74.7	0.17		0.19
t2oh6	t2oh6	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-4.1**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.11		**2.9**	ULS 30yr 1a W ZIII WRB,T NL-	121.0	37.7	64.0	0.08		0.11
t2oh7	t2oh7	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	92	**-3.5**	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	183.0	37.7	86.4	0.09		**7.4**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.20		0.20
350	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-6.2**	ULS 30yr 1a W ZIII WR_0,T BI-	425.6	0.0	0.0	0.01		**5.4**	ULS 30yr 1a W ZIII WR_0,T BI-	564.0	0.0	0.0	0.01		0.01
450	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-0.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	425.6	0.0	0.0	0.00		**0.0**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	564.0	0.0	0.0	0.00		0.00
451	130x90x10 Double*	130x130x10#(12,0.1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	39	**-0.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933.6	37.7	86.4	0.02		**5.6**	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	645.1	37.7	64.0	0.15		0.15
452	130x90x10 Double*	130x130x10#(12,0.1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	18	**-5.1**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1030.9	37.7	86.4	0.13		**2.5**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	645.1	37.7	64.0	0.07		0.13

Assessment of groups for modified structure (afkeur level)

Date	28-3-2022
Author	TBR
Version	v4,4

RSD-MDK150
D+0
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Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
mr1	mr1	50x50x4	S235	4M12-5.6t	1	25	20	60	0.67	0.67	0.67	186	-2.2	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24.6	80.6	103.7	0.09		2.1	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72.1	80.6	75.7	0.03		0.09
mzd1	mzd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	-1.4	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	31.9	37.7	34.6	0.04		1.2	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	36.9	37.7	22.4	0.05		0.05
mzh1	mzh1	50x50x4	S235	1M16-5.6t	1	30	25		2.00	1.00	1.00	98	-3.1	ULS 30yr 3 W + I ZIII WLB,T NL+	42.7	37.7	34.6	0.09		1.2	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.05		0.09
mvh1	mvh1	50x50x5	S235	2M16-5.6t	1	30	25	50	1.00	1.00	1.00	155			38.5	75.4	86.4			28.3	ULS 30yr 3 W + I ZIII WLB,T NL+	48.7	75.4	56.0	0.58		0.58
t1vd1	t1vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	254			12.5	37.7	34.6			4.0	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.18		0.18
t1br1	t1br1	55x55x5	S235		1	30	25	60	1.89	1.00	1.00	231	-2.9	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	23.6			0.12		34.7	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.60		0.60
mvd1	mvd1	50x50x4	S235	1M16-5.6t	1	30	25		0.52	0.52	0.52	130	-12.2	ULS 30yr 1a W ZIII WRA,T NR-	30.6	37.7	34.6	0.40		11.8	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.52		0.52
mr2	mr2	75x75x6	S235	8M20-5.6t	1	30	30	60	2.00	1.00	1.00	87	-76.2	ULS 30yr 3 W + I ZIII WRA,T NR-	143.3	470.4	518.4	0.53		42.7	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	157.1	470.4	366.5	0.27		0.53
t1vd2	t1vd2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	206	-6.5	ULS 30yr 3 W + I ZIII WRA,T NR-	26.1	37.7	86.4	0.25				92.2	37.7	56.0			0.25
t1vd3	t1vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	224			15.1	37.7	34.6			14.5	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.65		0.65
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	-0.2	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	40.1	37.7	34.6	0.01				36.9	37.7	22.4			0.01
t1vh1	t1vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	99	0.0	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	39.8	37.7	34.6	0.00		1.2	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.05		0.05
mzd2	mzd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	-10.2	ULS 30yr 3 W + I ZIII WRA,T NR-	31.9	37.7	34.6	0.32		1.7	ULS 30yr 1a W ZIII WR_45,T BI-	36.9	37.7	22.4	0.08		0.32
t1vh2	t1vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	47	-0.2	ULS 30yr 3 W + I ZIII WRA,T NR-	53.0	37.7	34.6	0.00				36.9	37.7	22.4			0.00
t1or1	t1or1	70x70x7	S235						1.68	1.00	1.00	76	-75.9	ULS 30yr 3 W + I ZIII WRA,T NR-	170.1			0.45		24.5	ULS 30yr 3 W + I ZIII 0.9 WRB,T NL-	178.3	226.1	268.8	0.14		0.45
t1od8	t1od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	86	-6.3	ULS 30yr 3 W + I ZIII WR_0,T BI-	44.3	37.7	34.6	0.18		3.5	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.16		0.18
t1od7	t1od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	93	-3.8	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	41.9	37.7	34.6	0.11		6.7	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	36.9	37.7	22.4	0.30		0.30
t1od6	t1od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	100	-6.2	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	39.6	37.7	34.6	0.18		3.6	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.16		0.18
t1od5	t1od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	-3.1	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.0	37.7	34.6	0.09		5.3	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	36.9	37.7	22.4	0.23		0.23
t1od4	t1od4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	-1.0	ULS 30yr 3 W + I ZIII WRA,T NR-	261.9	37.7	86.4	0.03		0.9	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	121.0	37.7	64.0	0.02		0.03
t1od1	t1od1	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	162	-2.6	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	35.2	37.7	43.2	0.07		3.6	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	60.5	37.7	32.0	0.11		0.11
t1od2	t1od2	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	146	-4.5	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	39.8	37.7	43.2	0.12		2.4	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	60.5	37.7	32.0	0.07		0.12
t1oh1	t1oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	143			27.4	37.7	34.6			0.4	ULS 30yr 3 W + I ZIII WL_-90,T BI+	36.9	37.7	22.4	0.02		0.02
t1od10	t1od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	72	-8.5	ULS 30yr 3 W + I ZIII WRB,T NL-	47.4	37.7	34.6	0.25		5.8	ULS 30yr 5a Trsnl ZIII Br. 1 Ba,T Global	36.9	37.7	22.4	0.26		0.26
t1od12	t1od12	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	111	-3.8	ULS 30yr 3 W + I ZIII WRA,T NR-	35.9	37.7	34.6	0.11		1.5	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.07		0.11
t1od9	t1od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	78	-5.0	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.0	37.7	34.6	0.14		7.2	ULS 30yr 3 W + I ZIII WRB,T NL-	36.9	37.7	22.4	0.32		0.32
t1od3	t1od3	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	132	-3.1	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44.8	37.7	43.2	0.08		5.1	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	60.5	37.7	32.0	0.16		0.16
t1oh2	t1oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	-0.2	ULS 30yr 1a W ZIII 0.9 WR_45,T BI-	32.0	37.7	34.6	0.01		0.3	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.01		0.01
mzh2	mzh2	70x70x7	S235	2M16-5.6t	1	40	35	50	2.00	1.00	1.00	75	-6.7	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	137.4	75.4	121.0	0.09		9.0	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	101.6	75.4	109.0	0.12		0.12
mvh2	mvh2	70x70x7	S235	6M16-5.6t	1	30	35	50	2.00	1.00	1.00	75	-54.3	ULS 30yr 3 W + I ZIII WRA,T NR-	137.4	226.1	362.9	0.40		13.2	ULS 30yr 3 W + I ZIII 0.9 WR_0,T BI-	178.3	226.1	268.8	0.07		0.40
mzd3	mzd3	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	-17.4	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	65.6	58.8	64.8	0.30		14.1	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.42		0.42
t1oh4	t1oh4	UNP160	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	21	-8.0	ULS 30yr 3 W + I ZIII WR_0,T BI-	428.6	37.7	64.8	0.21		5.5	ULS 30yr 5a Trsnl ZIII Br. 1 Ba,T Global	90.7	37.7	48.0	0.15		0.21
mth1	mth1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	165	-0.4	ULS 30yr 3 W + I ZIII WRA,T NR-	28.5	37.7	43.2	0.02				46.1	37.7	28.0			0.02
mtd1	mtd1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	116	-8.8	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42.3	37.7	43.2	0.23		8.9	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46.1	37.7	28.0	0.32		0.32
t1od11	t1od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	-8.0	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.6	37.7	34.6	0.23		11.4	ULS 30yr 3 W + I ZIII WR_0,T BI-	36.9	37.7	22.4	0.51		0.51
mvd2	mvd2	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	110	-19.4	ULS 30yr 1a W ZIII WR_0,T BI-	54.0	58.8	54.0	0.36		14.3	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	54.7	58.8	27.7	0.51		0.51
mzd4	mzd4	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	115	-15.6	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	61.6	58.8	64.8	0.27		14.3	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	65.7	58.8	33.3	0.43		0.43
mvd3	mvd3	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	116	-14.2	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	51.2	58.8	54.0	0.28		18.8	ULS 30yr 1a W ZIII WR_0,T BI-	54.7	58.8	27.7	0.68		0.68
mzd5	mzd5	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	-11.3	ULS 30yr 3 W + I ZIII WRA,T NR-	74.0	58.8	64.8	0.19		15.4	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.46		0.46
mzh3	mzh3	60x60x5	S235	1M20-5.6t	1	30	30		2.00	1.00	1.00	98	-4.6	ULS 30yr 3 W + I ZIII WR_-45,T BI-	63.4	58.8	54.0	0.08				54.7	58.8	27.7			0.08
mvh3	mvh3	60x60x5	S235	2M20-5.6t	1	30	30	55	1.00	1.00	1.00	153			47.3	117.6	108.0			39.3	ULS 30yr 3 W + I ZIII WR_-45,T BI-	54.1	117.6	55.5	0.73		0.73
t2br1	t2br1	55x55x5	S235	2M16-5.6t	1	30	25	60	1.76	1.00	1.00	286			17.0	75.4	172.8			30.4	ULS 30yr 3 W + I ZIII WR_-45,T BI-	57.4	113.0	168.1	0.53		0.53
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207			18.2	37.7	34.6			8.7	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.39		0.39
mzd6	mzd6	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	-11.7	ULS 30yr 3 W + I ZIII WRA,T NR-	68.6	58.8	64.8	0.20		15.5	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	65.7	58.8	33.3	0.47		0.47
mvd4	mvd4	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	121	-22.3	ULS 30yr 1a W ZIII WRA,T NR-	49.3	58.8	54.0	0.45		16.8	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	54.7	58.8	27.7	0.61		0.61
t2bh1	t2bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	120	0.0	ULS 30yr 3 W + I ZIII WR_45,T BI-	33.3	37.7	34.6	0.00		0.0	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.00		0.00
t2vh2	t2vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	114			34.9	37.7	34.6			5.6	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.25		0.25
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	173			21.6	37.7	34.6			1.3	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.06		0.06
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	-7.2	ULS 30yr 3 W + I ZIII WR_-45,T BI-	23.3	37.7	34.6	0.31				36.9	37.7	22.4			0.31
t2vh1	t2vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	109	0.0	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	36.5	37.7	34.6	0.00		0.3	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.02		0.02
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	-0.4	ULS 30yr 1a W ZIII WR_0,T BI-	24.6	37.7	34.6	0.02				36.9	37.7	22.4			0.02
mzd7	mzd7	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	-15.1	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	61.0	58.8	64.8	0.26		10.9	ULS 30yr 3 W + I ZIII WRA,T NR-	65.7	58.8	33.3	0.33		0.33
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	105			38.0	37.7	34.6			2.2	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.10		0.10
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	97	-1.4	ULS 30yr 3 W + I ZIII WR_-45,T BI-	40.4	37.7	34.6	0.04				36.9	37.7	22.4			0.04
t2or1	t2or1	70x70x7	S235	5M16-5.6t					1.21	1.00	1.00	67	-63.6	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	180.1	188.4	302.4	0.35		25.8	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	261.3	0.14		0.35
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	-7.2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.19		4.2	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.11		0.19
t2od10	t2od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	94	-8.1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.3	37.7	34.6	0.23		3.9	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.17		0.23
t2od9	t2od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	102	-3.4	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	38.7	37.7	34.6	0.10		6.9	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.31		0.31
t2od8	t2od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	-6.2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.1	37.7	34.6	0.18		3.0	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.13		0.18
t2od7	t2od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	119	-2.7	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33.7	37.7	34.6	0.08		5.6	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.25		0.25
t2od6	t2od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	131	-5.1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30.4	37.7	34.6	0.17		2.5	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.11		0.17
t2od15	t2od15	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	60	-5.1	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50.0	37.7	34.6	0.15		1.4	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.06		0.15
t2od14	t2od14	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	133	-2.2	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30.0	37.7	34.6	0.07		3.8	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	91.6	37.7	22.4	0.17		0.17
t2od4	t2od4	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	148	-12.8	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.1	37.7	86.4	0.35		5.9	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	92.2	37.7	56.0	0.16		0.35
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	-0.4	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	27.1	37.7	34.6	0.01		0.5	ULS 30yr 1a W ZIII WR_45,T BI-	36.9	37.7	22.4	0.02		0.02
t2od3	t2od3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	-5.6	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32.8	37.7	86.4	0.17		11.2	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.30		0.30
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	-0.1	ULS 30yr 1a W ZIII 0.9 WL_-90,T BI+	24.0	37.7	34.6	0.00		0.3	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.01		0.01
t2od2	t2od2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	-10.4	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29.2	37.7	86.4	0.35		4.8	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	92.2	37.7	56.0	0.13		0.35
t2oh1	t2oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	175	-0.1	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	21.3	37.7	34.6	0.00		0.4	ULS 30yr 1a W ZIII WL_-90,T BI+	36.9	37.7	22.4	0.02		0.02
t2od1	t2od1	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	190	-4.4	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26.0	37.7	86.4	0.17		8.9	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.24		0.24
mr3	mr3	90x90x9	S235		1	55	40	60	2.40	2.43	1.00	94	-122.0	ULS 30yr 1a W ZIII WRA,T NR-	239.7			0.51		77.5	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	470.4	683.3	0.26		0.51
mzh4	mzh4	65x65x5	S235	2M16-5.6t	1	30	30	50	1.00	1.00	1.00	74	-7.8	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98.2	75.4	172.8	0.10		6.6	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	56.7	75.4	128.0	0.12		0.12
mvh4	mvh4	70x70x7	S235	5M16-5.6t	1	50	30	50	2.00	1.00	1.00	89	-48.3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	123.2	188.4	302.4	0.39		12.7	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	178.3	188.4	272.5	0.07		0.39
mvd5	mvd5	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	129	-32.1	ULS 30yr 1a W ZIII WRB,T NL-	45.8	188.2	108.0	0.70		30.5	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.55		0.70
t2od13	t2od13	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	-6.6	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46.6	37.7	34.6	0.19		13.3	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.59		0.59
t2od12	t2od12	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	77	-10.6	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.2	37.7	34.6	0.31		5.1	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.23		0.31
t2od11	t2od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	84	-4.4	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	56.0	37.7	34.6	0.13		9.2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.41		0.41
mth2	mth2	50x50x5	S235	1M16-5.6t	1	40	25		1.00	1.00	1.00	194	-0.3	ULS 30yr 3 W + I ZIII WL_45,T BI+	22.8	37.7	43.2	0.01				46.1	37.7	37.4			0.01
mtd2	mtd2	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	137	-15.0	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35.4	37.7	43.2	0.42		15.0	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.1	37.7	28.0	0.54		0.54
mzd8	mzd8	65x65x7	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	115	-27.1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77.8	58.8	75.6	0.46		22.7	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76.6	58.8	38.8	0.58		0.58
mzd9	mzd9	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	133	-20.6	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52.9	58.8	64.8	0.39		24.2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.73		0.73
mvd6	mvd6	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	137	-27.7	ULS 30yr 1a W ZIII WRA,T NR-	43.1	188.2	108.0	0.64		28.6	ULS 30yr 1a W ZIII WRB,T NL-	65.2	188.2	55.5	0.52		0.64
mzd10	mzd10	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	140	-21.4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49.9	58.8	64.8	0.43		18.2	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.55		0.55
mvd7	mvd7	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	144	-26.0	ULS 30yr 1a W ZIII WRB,T NL-	40.6	58.8	54.0	0.64		25.1	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.90		0.90
mzd11	mzd11	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	148	-16.3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	46.7	58.8	64.8	0.35		19.1	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.57		0.57
mvd8	mvd8	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	152	-23.6	ULS 30yr 1a W ZIII WRA,T NR-	38.0	58.8	54.0	0.62		23.8	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	0.86		0.86
mzd12	mzd12	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	156	-17.4	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43.7	58.8	64.8	0.40		14.7	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mvd9	mvd9	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	161	-22.8	ULS 30yr 1a W ZIII WRB,T NL-	35.5	58.8	54.0	0.64		22.2	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.80		0.80
mr4	mr4	90x90x9	S235						2.40	2.43	1.00	96	-163.5	ULS 30yr 1a W ZIII WRA,T NR-	234.2			0.70		122.6	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	361.7			0.34		0.70
mzd13	mzd13	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	164	-13.4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	41.0	58.8	64.8	0.33		16.0	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.48		0.48
mvd10	mvd10	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	169	-21.3	ULS 30yr 1a W ZIII WRA,T NR-	33.3	58.8	54.0	0.64		21.2	ULS 30yr 1a W ZIII WRB,T NL-	54.7	58.8	27.7	0.76		0.76
mzd14	mzd14	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	173	-15.1	ULS 30yr 1a W ZIII WR_-45,T BI-	38.3	58.8	64.8	0.40		12.3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.37		0.40
mvd11	mvd11	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	177	-20.2	ULS 30yr 1a W ZIII WRB,T NL-	31.2	58.8	54.0	0.65		19.7	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.71		0.71
mzd15	mzd15	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	172	-11.5	ULS 30yr 1a W ZIII WR_-45,T BI-	38.8	58.8	64.8	0.30		14.5	ULS 30yr 1a W ZIII WR_-45,T BI-	65.7	58.8	33.3	0.44		0.44
mth3	mth3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	314	0.0	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	13.7	37.7	86.4	0.00		0.1	ULS 30yr 3 W + I ZIII WL_45,T BI+	101.4	37.7	56.0	0.00		0.00
mtd3	mtd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	240	-1.2	ULS 30yr 1a W ZIII WRA,T NR-	13.6	37.7	34.6	0.09		1.3	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.06		0.09
mzd16	mzd16	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	191	-11.8	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	33.5	58.8	64.8	0.35		11.3	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.34		0.35
mzh5	mzh5	60x60x5	S235	2M20-5.6t	1	30	30		1.00	1.00	1.00	142	-21.6	ULS 30yr 1a W ZIII WRA,T NR-	51.5	117.6	108.0	0.42		16.7	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	65.2	117.6	55.5	0.30		0.42
mvh5	mvh5	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	142	-10.7	ULS 30yr 1a W ZIII WR_-45,T BI-	51.5	117.6	108.0	0.21		6.1	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	57.8	117.6	55.5	0.11		0.21
mvd12	mvd12	60x60x5	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	192	-9.4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	28.0	58.8	54.0	0.34		10.7	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	54.7	58.8	27.7	0.38		0.38
mr5	mr5	90x90x9	S235						2.40	2.43	1.00	98	-208.9	ULS 30yr 1a W ZIII WRA,T NR-	228.7			0.91		164.6	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	361.7			0.46		0.91
mr6	mr6	90x90x9	S235	6M20-5.6t	1	35	40	70	**1.00**	**1.00**	1.00	64	-240.4	ULS 30yr 1a W ZIII WRA,T NR-	300.2	352.8	583.2	0.80		196.9	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	352.8	412.4	0.66		0.80
mr7	mr7	100x100x10	S235						2.40	2.43	1.00	92	-278.6	ULS 30yr 1a W ZIII WRA,T NR-	303.3			0.92		231.6	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2			0.51		0.92
mr8	mr8	100x100x10	S235						**1.00**	**1.00**	1.00	60	-305.0	ULS 30yr 1a W ZIII WRA,T NR-	382.4			0.80		258.5	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2			0.57		0.80
mr9	mr9	100x100x10	S235						**1.00**	**1.00**	**1.00**	62	-320.2	ULS 30yr 1a W ZIII WRA,T NR-	379.7			0.84		287.7	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	698.2	0.75		0.84
mr10	mr10	100x100x10	S235	8M20-5.6t	1	35	50	70	**1.00**	**1.00**	**0.27**	43	-351.5	ULS 30yr 1a W ZIII WRA,T NR-	414.9	470.4	864.0	0.85		300.9	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	610.9	0.78		0.85
mr11	mr11	100x100x10	S235						1.00	1.00	1.00	62	-332.7	ULS 30yr 1a W ZIII WRA,T NR-	378.3			0.88		278.4	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2			0.62		0.88
mr12	mr12	100x100x10	S235	8M20-5.6t	1	50	50	60	0.33	0.33	0.33	70	-333.1	ULS 30yr 1a W ZIII WRA,T NR-	360.7	470.4	864.0	0.92		277.6	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	759.3	0.72		0.92
mzd17	mzd17	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	123	-12.5	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	57.3	58.8	64.8	0.22		17.8	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	65.7	58.8	33.3	0.54		0.54
mvd13	mvd13	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	193	-9.8	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	27.8	58.8	54.0	0.35		8.4	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54.7	58.8	27.7	0.30		0.35
mvh6	mvh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	-1.5	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	39.8	117.6	108.0	0.04		0.8	ULS 30yr 1a W ZIII WL_45,T BI+	57.8	117.6	55.5	0.01		0.04
mzh6	mzh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	-2.0	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	39.8	117.6	108.0	0.05		1.2	ULS 30yr 1a W ZIII WR_45,T BI-	57.8	117.6	55.5	0.02		0.05

Assessment of groups for modified structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
84

Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
mtd4	mtd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	295	**-0.4**	ULS 30yr 1a W ZIII WL_-45,T BI+	11.1	37.7	34.6	0.04		**0.5**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	36.9	37.7	22.4	0.02		0.04
mzd18	mzd18	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	88.0	75.4	121.0	0.20		**16.1**	ULS 30yr 1a W ZIII 0.9 WRB,T NL-	107.1	75.4	74.7	0.22		0.22
mvd14	mvd14	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	88.0	75.4	121.0	0.19		**12.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107.1	75.4	74.7	0.17		0.19
t2oh6	t2oh6	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-4.1**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.11		**2.9**	ULS 30yr 1a W ZIII WRB,T NL-	121.0	37.7	64.0	0.08		0.11
t2oh7	t2oh7	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	92	**-3.5**	ULS 30yr 5a Trsnl ZIII Br. 11 Ba,T Global	183.0	37.7	86.4	0.09		**7.4**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.20		0.20
350	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-6.2**	ULS 30yr 1a W ZIII WR_0,T BI-	425.6			0.01		**5.4**	ULS 30yr 1a W ZIII WR_0,T BI-	564.0			0.01		0.01
450	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-0.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	425.6			0.00		**0.0**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	564.0					0.00
451	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	39	**-0.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933.6	37.7	86.4	0.02		**5.6**	ULS 30yr 5a Trsnl ZIII Br. 22 Ah,T Global	645.1	37.7	64.0	0.15		0.15
452	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	18	**-5.1**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1030.9	37.7	86.4	0.13		**2.5**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	645.1	37.7	64.0	0.07		0.13

DNV

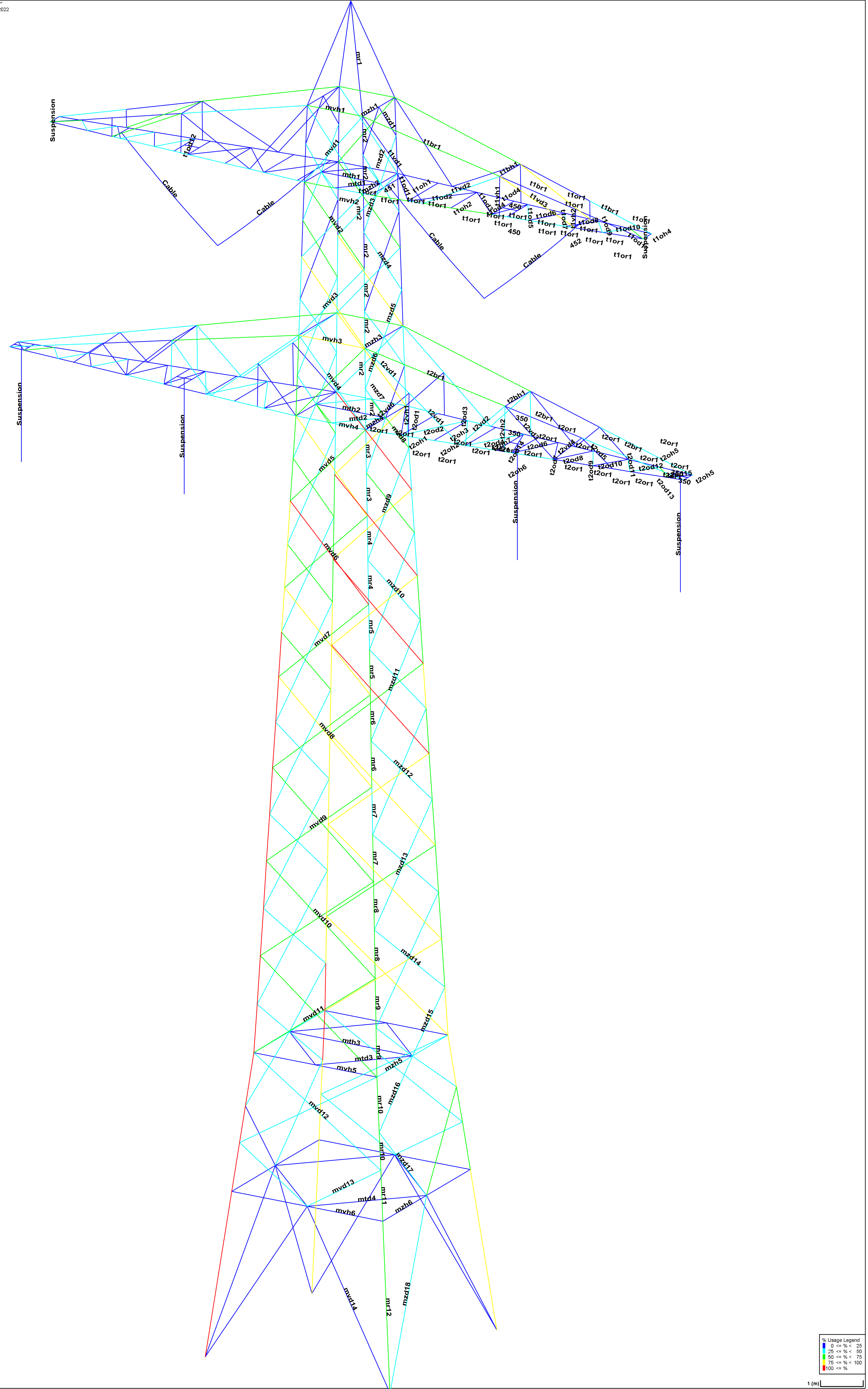
Assessment of groups for modified elements (verbouw level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
84

Group Label	Description	Profile	Steel Quality	Bolts	#shear planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)
mvd5	mvd5	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	129	**-36.9**	ULS 30yr 1a W ZIII WRB,T NL-	45.8	188.2	108.0	0.81		**35.4**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	65.2	188.2	55.5	0.64	
mvd6	mvd6	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	137	**-32.1**	ULS 30yr 1a W ZIII WRA,T NR-	43.1	188.2	108.0	0.75		**32.9**	ULS 30yr 1a W ZIII WRB,T NL-	65.2	188.2	55.5	0.59	
mr6	mr6	90x90x9	S235	6M20-5.6t	1	35	40	70	**1.00**	**1.00**	1.00	64	**-280.1**	ULS 30yr 1a W ZIII WRA,T NR-	300.2	352.8	583.2	0.93		**233.2**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	296.3	352.8	412.4	0.79	
mr8	mr8	100x100x10	S235						**1.00**	**1.00**	1.00	60	**-355.3**	ULS 30yr 1a W ZIII WRA,T NR-	382.4	0.0	0.0	0.93		**305.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	451.2	0.0	0.0	0.68	
mr9	mr9	100x100x10	S235						**1.00**	**1.00**	**1.00**	62	**-373.4**	ULS 30yr 1a W ZIII WRA,T NR-	379.7	0.0	0.0	0.98		**340.0**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	698.2	0.89	
mr10	mr10	100x100x10	S235	8M20-5.6t	1	35	50	70	**1.00**	**1.00**	**0.27**	43	**-409.3**	ULS 30yr 1a W ZIII WRA,T NR-	414.9	470.4	864.0	0.99		**355.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	383.6	470.4	610.9	0.93	

DNV GL Nederlands BV, Project: "D+0_150 – Afkeur"
Tower Version 17.11, 16:00:43 maandag 21 maart 2022
Undeformed geometry displayed



Assessment of groups for initial structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
92

Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
mr1	mr1	50x50x4	S235	4M12-5.6t	1	25	20	60	0.67	0.67	0.67	186	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24.6	80.6	103.7	0.07		**1.7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72.1	80.6	75.7	0.02		0.07
mzd1	mzd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-1.3**	ULS 30yr 1a W ZIII WL_45,T BI+	31.9	37.7	34.6	0.04		**1.1**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	36.9	37.7	22.4	0.05		0.05
mzh1	mzh1	50x50x4	S235	1M16-5.6t	1	30	25		2.00	1.00	1.00	98	**-1.4**	ULS 30yr 1a W ZIII WL_90,T BI+	42.7	37.7	34.6	0.04		**1.0**	ULS 30yr 1a W ZIII WL_-45,T BI+	36.9	37.7	22.4	0.05		0.05
mvh1	mvh1	50x50x5	S235	2M16-5.6t	1	30	25	50	1.00	1.00	1.00	155	**0.0**	0	38.5	75.4	86.4	0.00		**34.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	48.7	75.4	56.0	0.71		0.71
t1vd1	t1vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	254	**0.0**	0	12.5	37.7	34.6	0.00		**4.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.20		0.20
t1br1	t1br1	55x55x5	S235	3M16-5.6t	1	30	25	60	2.13	1.00	1.00	231	**-1.4**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	23.6	75.4	172.8	0.06		**41.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.73		0.73
mvd1	mvd1	50x50x4	S235	1M16-5.6t	1	30	25		0.52	0.52	0.52	130	**-13.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	30.6	37.7	34.6	0.45		**12.9**	ULS 30yr 1a W ZIII WRA,T NR-	36.9	37.7	22.4	0.57		0.57
mr2	mr2	75x75x6	S235	8M20-5.6t	1	30	30	60	2.00	1.00	1.00	87	**-100.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	143.3	470.4	518.4	0.70		**49.4**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	157.1	470.4	366.5	0.31		0.70
t1vd2	t1vd2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	206	**-7.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	26.1	37.7	86.4	0.29		**0.0**	0.0	92.2	37.7	56.0	0.00		0.29
t1vd3	t1vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	224	**0.0**	0	15.1	37.7	34.6	0.00		**17.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.77		0.77
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-0.3**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	40.1	37.7	34.6	0.01		**0.0**	0.0	36.9	37.7	22.4	0.00		0.01
t1vh1	t1vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	99	**-0.2**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	39.8	37.7	34.6	0.01		**1.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.06		0.06
mzd2	mzd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-11.3**	ULS 30yr 3 W + I ZIII WL_45,T BI+	31.9	37.7	34.6	0.35		**1.0**	ULS 30yr 1a W ZIII WL_90,T BI+	36.9	37.7	22.4	0.05		0.35
t1vh2	t1vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	47	**-0.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	53.0	37.7	34.6	0.00		**0.0**	0.0	36.9	37.7	22.4	0.00		0.00
t1or1	t1or1	70x70x7	S235	6M16-5.6t					1.68	1.00	1.00	76	**-92.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	170.1	0.0	0.0	0.54		**34.3**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	178.3	226.1	268.8	0.19		0.54
t1od8	t1od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	86	**-8.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	44.3	37.7	34.6	0.23		**2.2**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.10		0.23
t1od7	t1od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	93	**-2.8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	41.9	37.7	34.6	0.08		**7.5**	ULS 30yr 3 W + I ZIII WLA,T NR+	36.9	37.7	22.4	0.33		0.33
t1od6	t1od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	100	**-6.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	39.6	37.7	34.6	0.20		**2.7**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.12		0.20
t1od5	t1od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	**-2.3**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.0	37.7	34.6	0.07		**6.0**	ULS 30yr 3 W + I ZIII WLA,T NR+	36.9	37.7	22.4	0.27		0.27
t1od4	t1od4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	**-1.5**	ULS 30yr 3 W + I ZIII WL_90,T BI+	261.9	37.7	86.4	0.04		**0.9**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	121.0	37.7	64.0	0.02		0.04
t1od1	t1od1	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	162	**-2.5**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	35.2	37.7	43.2	0.07		**3.9**	ULS 30yr 3 W + I ZIII WL_90,T BI+	60.5	37.7	32.0	0.12		0.12
t1od2	t1od2	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	146	**-5.2**	ULS 30yr 3 W + I ZIII WL_90,T BI+	39.8	37.7	43.2	0.14		**2.2**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	60.5	37.7	32.0	0.07		0.14
t1oh1	t1oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	143	**0.0**	0	27.4	37.7	34.6	0.00		**0.6**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.03		0.03
t1od10	t1od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	72	**-11.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	47.4	37.7	34.6	0.34		**3.7**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.17		0.34
t1od12	t1od12	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	111	**-4.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	35.9	37.7	34.6	0.14		**1.1**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.05		0.14
t1od9	t1od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	78	**-3.2**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.0	37.7	34.6	0.09		**9.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.44		0.44
t1od3	t1od3	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	132	**-2.4**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44.8	37.7	43.2	0.06		**5.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	60.5	37.7	32.0	0.18		0.18
t1oh2	t1oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-0.1**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	32.0	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WL_45,T BI+	36.9	37.7	22.4	0.01		0.01
mzh2	mzh2	70x70x7	S235	2M16-5.6t	1	40	35	50	2.00	1.00	1.00	75	**-7.1**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	137.4	75.4	121.0	0.09		**10.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	101.6	75.4	109.0	0.14		0.14
mvh2	mvh2	70x70x7	S235	6M16-5.6t	1	30	35	50	2.00	1.00	1.00	75	**-70.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	137.4	226.1	362.9	0.51		**19.9**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	178.3	226.1	268.8	0.11		0.51
mzd3	mzd3	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-18.7**	ULS 30yr 3 W + I ZIII WL_-45,T BI+	65.6	58.8	64.8	0.32		**12.6**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.38		0.38
t1oh4	t1oh4	UNP160	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	21	**-10.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	428.6	37.7	64.8	0.27		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	90.7	37.7	48.0	0.09		0.27
mth1	mth1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	165	**-0.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	28.5	37.7	43.2	0.02		**0.0**	0.0	46.1	37.7	28.0	0.00		0.02
mtd1	mtd1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	116	**-7.2**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42.3	37.7	43.2	0.19		**7.3**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46.1	37.7	28.0	0.26		0.26
t1od11	t1od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-5.2**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.6	37.7	34.6	0.15		**15.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.67		0.67
mvd2	mvd2	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	110	**-22.4**	ULS 30yr 1a W ZIII WRA,T NR-	54.0	58.8	54.0	0.41		**15.5**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	54.7	58.8	27.7	0.56		0.56
mzd4	mzd4	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	115	**-14.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	61.6	58.8	64.8	0.25		**16.7**	ULS 30yr 3 W + I ZIII WL_-45,T BI+	65.7	58.8	33.3	0.50		0.50
mvd3	mvd3	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	116	**-15.4**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	51.2	58.8	54.0	0.30		**21.6**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.78		0.78
mzd5	mzd5	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-14.3**	ULS 30yr 3 W + I ZIII WL_-45,T BI+	74.0	58.8	64.8	0.24		**14.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mzh3	mzh3	60x60x5	S235	1M20-5.6t	1	30	30		2.00	1.00	1.00	98	**-5.5**	ULS 30yr 3 W + I ZIII WL_90,T BI+	63.4	58.8	54.0	0.10		**0.0**	0.0	54.7	58.8	27.7	0.00		0.10
mvh3	mvh3	60x60x5	S235	2M20-5.6t	1	30	30	55	1.00	1.00	1.00	153	**0.0**	0	47.3	117.6	108.0	0.00		**48.8**	ULS 30yr 3 W + I ZIII WL_90,T BI+	54.1	117.6	55.5	0.90		0.90
t2br1	t2br1	55x55x5	S235	3M16-5.6t	1	30	25	60	1.76	1.00	1.00	286	**0.0**	0	17.0	75.4	172.8	0.00		**40.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.70		0.70
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207	**0.0**	0	18.2	37.7	34.6	0.00		**11.1**	ULS 30yr 3 W + I ZIII WLA,T NR+	36.9	37.7	22.4	0.50		0.50
mzd6	mzd6	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-15.0**	ULS 30yr 3 W + I ZIII WL_-45,T BI+	68.6	58.8	64.8	0.26		**14.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mvd4	mvd4	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	121	**-27.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	49.3	58.8	54.0	0.56		**22.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	54.7	58.8	27.7	0.80		0.80
t2bh1	t2bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	120	**0.0**	ULS 30yr 3 W + I ZIII WLA,T NR+	33.3	37.7	34.6	0.00		**0.0**	0.0	36.9	37.7	22.4	0.00		0.00
t2vh2	t2vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	114	**0.0**	0	34.9	37.7	34.6	0.00		**7.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.33		0.33
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	173	**0.0**	0	21.6	37.7	34.6	0.00		**1.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.07		0.07
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-9.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	23.3	37.7	34.6	0.40		**0.0**	0.0	36.9	37.7	22.4	0.00		0.40
t2vh1	t2vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	109	**-0.1**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	36.5	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WL_90,T BI+	36.9	37.7	22.4	0.02		0.02
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	**-0.4**	ULS 30yr 1a W ZIII WL_90,T BI+	24.6	37.7	34.6	0.02		**0.0**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	36.9	37.7	22.4	0.00		0.02
mzd7	mzd7	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-14.8**	ULS 30yr 3 W + I ZIII WL_90,T BI+	61.0	58.8	64.8	0.25		**13.1**	ULS 30yr 3 W + I ZIII WL_-45,T BI+	65.7	58.8	33.3	0.39		0.39
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	105	**0.0**	0	38.0	37.7	34.6	0.00		**2.7**	ULS 30yr 3 W + I ZIII WL_90,T BI+	36.9	37.7	22.4	0.12		0.12
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	97	**-1.7**	ULS 30yr 3 W + I ZIII WL_90,T BI+	40.4	37.7	34.6	0.05		**0.0**	0.0	36.9	37.7	22.4	0.00		0.05
t2or1	t2or1	70x70x7	S235	5M16-5.6t					1.21	1.00	1.00	67	**-63.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	180.1	188.4	302.4	0.35		**22.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	261.3	0.13		0.35
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	**-6.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.18		**4.2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.11		0.18
t2od10	t2od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	94	**-7.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.3	37.7	34.6	0.22		**2.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.12		0.22
t2od9	t2od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	102	**-2.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	38.7	37.7	34.6	0.07		**6.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.29		0.29
t2od8	t2od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-5.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.1	37.7	34.6	0.17		**2.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.09		0.17
t2od7	t2od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	119	**-1.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33.7	37.7	34.6	0.06		**5.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.24		0.24
t2od6	t2od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	131	**-4.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30.4	37.7	34.6	0.16		**1.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.07		0.16
t2od15	t2od15	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	60	**-5.2**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50.0	37.7	34.6	0.15		**0.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.04		0.15
t2od14	t2od14	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	133	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30.0	37.7	34.6	0.06		**3.7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	91.6	37.7	22.4	0.16		0.16
t2od4	t2od4	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	148	**-12.3**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.1	37.7	86.4	0.34		**4.0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.11		0.34
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	**-0.6**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	27.1	37.7	34.6	0.02		**0.6**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.03		0.03
t2od3	t2od3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-3.9**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32.8	37.7	86.4	0.12		**10.7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.28		0.28
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-0.1**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	24.0	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WL_45,T BI+	36.9	37.7	22.4	0.02		0.02
t2od2	t2od2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**-10.0**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29.2	37.7	86.4	0.34		**3.2**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.09		0.34
t2oh1	t2oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	175	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_0,T BI+	21.3	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.02		0.02
t2od1	t2od1	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	190	**-3.1**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26.0	37.7	86.4	0.12		**8.6**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.23		0.23
mr3	mr3	90x90x9	S235	8M20-5.6t	1	55	40	60	2.40	2.43	1.00	94	**-162.1**	ULS 30yr 3 W + I ZIII WRA,T NR-	239.7	0.0	0.0	0.68		**90.9**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	296.3	470.4	683.3	0.31		0.68
mzh4	mzh4	65x65x5	S235	2M16-5.6t	1	30	30	50	1.00	1.00	1.00	74	**-20.5**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98.2	75.4	172.8	0.10		**6.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54.7	75.4	128.0	0.11		0.11
mvh4	mvh4	70x70x7	S235	5M16-5.6t	1	50	30	50	2.00	1.00	1.00	89	**-49.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	123.2	188.4	302.4	0.40		**8.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	272.5	0.05		0.40
mvd5	mvd5	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	129	**-38.8**	ULS 30yr 1a W ZIII WRA,T NR-	45.8	58.8	54.0	0.85		**36.5**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	1.32	bearing	1.32
t2od13	t2od13	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-4.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46.6	37.7	34.6	0.13		**12.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.56		0.56
t2od12	t2od12	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	77	**-10.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.2	37.7	34.6	0.29		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.16		0.29
t2od11	t2od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	84	**-3.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	56.0	37.7	34.6	0.09		**8.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.39		0.39
mth2	mth2	50x50x5	S235	1M16-5.6t	1	40	25		1.00	1.00	1.00	194	**-0.3**	ULS 30yr 3 W + I ZIII WLA,T NR+	22.8	37.7	43.2	0.02		**0.0**	0.0	46.1	37.7	37.4	0.00		0.02
mtd2	mtd2	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	137	**-14.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35.4	37.7	43.2	0.41		**14.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.1	37.7	28.0	0.52		0.52
mzd8	mzd8	65x65x7	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	115	**-27.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77.8	58.8	75.6	0.46		**21.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76.6	58.8	38.8	0.56		0.56
mzd9	mzd9	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	133	**-19.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52.9	58.8	64.8	0.38		**24.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.73		0.73
mvd6	mvd6	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	137	**-33.1**	ULS 30yr 1a W ZIII WRA,T NR-	43.1	58.8	54.0	0.77		**34.4**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	1.24	bearing	1.24
mzd10	mzd10	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	140	**-21.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49.9	58.8	64.8	0.43		**17.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.53		0.53
mvd7	mvd7	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	144	**-31.2**	ULS 30yr 1a W ZIII WRA,T NR-	40.6	58.8	54.0	0.77		**29.8**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	1.08	bearing	1.08
mzd11	mzd11	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	148	**-15.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.7	58.8	64.8	0.33		**19.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.58		0.58
mvd8	mvd8	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	152	**-27.9**	ULS 30yr 1a W ZIII WRA,T NR-	38.0	58.8	54.0	0.74		**28.3**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	1.02	bearing	1.02
mzd12	mzd12	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	156	**-17.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43.7	58.8	64.8	0.40		**13.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.41		0.41
mvd9	mvd9	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	161	**-27.0**	ULS 30yr 1a W ZIII WRA,T NR-	35.5	58.8	54.0	0.76		**26.1**	ULS 30yr 1a W ZIII WL_90,T BI+	54.7	58.8	27.7	0.94		0.94
mr4	mr4	90x90x9	S235						2.40	2.43	1.00	96	**-205.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	234.2	0.0	0.0	0.88		**140.6**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	361.7	0.0	0.0	0.39		0.88
mzd13	mzd13	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	164	**-12.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	41.0	58.8	64.8	0.30		**16.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.49		0.49
mvd10	mvd10	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	169	**-25.0**	ULS 30yr 1a W ZIII WL_90,T BI+	33.3	58.8	54.0	0.75		**24.8**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.90		0.90
mzd14	mzd14	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	173	**-17.2**	ULS 30yr 1a W ZIII WLB,T NL+	38.3	58.8	64.8	0.45		**11.7**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	65.7	58.8	33.3	0.35		0.45
mvd11	mvd11	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	177	**-23.6**	ULS 30yr 1a W ZIII WRA,T NR-	31.2	58.8	54.0	0.76		**23.0**	ULS 30yr 1a W ZIII WL_90,T BI+	54.7	58.8	27.7	0.83		0.83
mzd15	mzd15	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	172	**-12.4**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	38.8	58.8	64.8	0.32		**16.3**	ULS 30yr 1a W ZIII WLB,T NL+	65.7	58.8	33.3	0.49		0.49
mth3	mth3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	314	**-0.1**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	13.7	37.7	86.4	0.00		**0.1**	ULS 30yr 3 W + I ZIII WLA,T NR+	101.4	37.7	56.0	0.00		0.00
mtd3	mtd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	240	**-1.4**	ULS 30yr 1a W ZIII WL_90,T BI+	13.6	37.7	34.6	0.10		**1.5**	ULS 30yr 1a W ZIII WLB,T NL+	36.9	37.7	22.4	0.07		0.10
mzd16	mzd16	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	191	**-14.3**	ULS 30yr 1a W ZIII WRA,T NR-	33.5	58.8	64.8	0.43		**11.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.34		0.43
mzh5	mzh5	60x60x5	S235	2M20-5.6t	1	30	30		1.00	1.00	1.00	142	**-25.3**	ULS 30yr 1a W ZIII WL_90,T BI+	51.5	117.6	108.0	0.49		**19.0**	ULS 30yr 1a W ZIII WL_90,T BI+	65.2	117.6	55.5	0.34		0.49
mvh5	mvh5	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	142	**-11.7**	ULS 30yr 3 W + I ZIII WLB,T NL+	51.5	117.6	108.0	0.23		**6.3**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	57.8	117.6	55.5	0.11		0.23
mvd12	mvd12	60x60x5	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	192	**-9.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	28.0	58.8	54.0	0.32		**11.3**	ULS 30yr 3 W + I ZIII WL_90,T BI+	54.7	58.8	27.7	0.41		0.41
mr5	mr5	90x90x9	S235						2.40	2.43	1.00	98	**-248.0**	ULS 30yr 1a W ZIII WL_90,T BI+	228.7	0.0	0.0	1.08	buckling	**187.6**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	361.7	0.0	0.0	0.52		1.08
mr6	mr6	90x90x9	S235	6M20-5.6t	1	35	40	70	2.40	2.43	1.00	100	**-281.6**	ULS 30yr 1a W ZIII WL_90,T BI+	223.1	352.8	583.2	1.26	buckling	**225.7**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	296.3	352.8	412.4	0.76		1.26
mr7	mr7	100x100x10	S235						2.40	2.43	1.00	92	**-326.9**	ULS 30yr 1a W ZIII WL_90,T BI+	303.3	0.0	0.0	1.08	buckling	**264.2**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	451.2	0.0	0.0	0.59		1.08
mr8	mr8	100x100x10	S235						2.40	2.43	1.00	94	**-350.6**	ULS 30yr 1a W ZIII WLB,T NL+	297.7	0.0	0.0	1.18	buckling	**295.9**	ULS 30yr 1a W ZIII WL_90,T BI+	451.2	0.0	0.0	0.66		1.18
mr9	mr9	100x100x10	S235	8M20-5.6t					2.40	2.40	1.20	95	**-390.9**	ULS 30yr 1a W ZIII WLB,T NL+	295.1	470.4	864.0	1.32	buckling	**329.2**	ULS 30yr 1a W ZIII WLB,T NL+	383.6	470.4	698.2	0.86		1.32
mr10	mr10	100x100x10	S235	8M20-5.6t	1	35	50	70	2.03	1.20	1.00	88	**-407.1**	ULS 30yr 1a W ZIII WLB,T NL+	314.0	470.4	864.0	1.30	buckling	**345.0**	ULS 30yr 1a W ZIII WLB,T NL+	383.6	470.4	610.9	0.90		1.30
mr11	mr11	100x100x10	S235						1.00	1.00	1.00	62	**-386.7**	ULS 30yr 1a W ZIII WLB,T NL+	378.3	0.0	0.0	1.02	buckling	**319.9**	ULS 30yr 1a W ZIII WLB,T NL+	451.2	0.0	0.0	0.71		1.02
mr12	mr12	100x100x10	S235	8M20-5.6t	1	50	50	60	0.33	0.33	0.33	70	**-387.1**	ULS 30yr 1a W ZIII WLB,T NL+	360.7	470.4	864.0	1.07	buckling	**318.9**	ULS 30yr 1a W ZIII WLB,T NL+	383.6	470.4	759.3	0.83		1.07
mzd17	mzd17	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	123	**-14.7**	ULS 30yr 1a W ZIII WLB,T NL+	57.3	58.8	64.8	0.26		**21.3**	ULS 30yr 1a W ZIII WRA,T NR-	65.7	58.8	33.3	0.64		0.64
mvd13	mvd13	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	193	**-11.0**	ULS 30yr 3 W + I ZIII WL_90,T BI+	27.8	58.8	54.0	0.40		**8.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54.7	58.8	27.7	0.29		0.40
mvh6	mvh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-1.9**	ULS 30yr 1a W ZIII WLB,T NL+	39.8	117.6	108.0	0.05		**0.8**	ULS 30yr 1a W ZIII WL_-45,T BI+	57.8	117.6	55.5	0.01		0.05

DNV

Assessment of groups for initial structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
92

Group Label	Description	Profile	Steel Quality	Bolts	#sh.planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with
mzh6	mzh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-2.5**	ULS 30yr 1a W ZIII WLB,T NL+	39.8	117.6	108.0	0.06		**1.3**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	57.8	117.6	55.5	0.02		0.06
mtd4	mtd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	295	**-0.4**	ULS 30yr 1a W ZIII WR_45,T BI-	11.1	37.7	34.6	0.04		**0.5**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	36.9	37.7	22.4	0.02		0.04
mzd18	mzd18	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	88.0	75.4	121.0	0.20		**19.6**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	107.1	75.4	74.7	0.26		0.26
mvd14	mvd14	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	88.0	75.4	121.0	0.19		**12.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107.1	75.4	74.7	0.17		0.19
t2oh6	t2oh6	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.10		**3.7**	ULS 30yr 1a W ZIII WRA,T NR-	121.0	37.7	64.0	0.10		0.10
t2oh7	t2oh7	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	92	**-3.1**	ULS 30yr 1a W ZIII WRA,T NR-	183.0	37.7	86.4	0.08		**7.1**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.19		0.19
350	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-7.9**	ULS 30yr 1a W ZIII WRA,T NR-	425.6	0.0	0.0	0.02		**6.9**	ULS 30yr 1a W ZIII WRA,T NR-	564.0	0.0	0.0	0.01		0.02
450	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-0.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	425.6	0.0	0.0	0.00		**0.0**	0.0	564.0	0.0	0.0	0.00		0.00
451	130x90x10 Double*	130x130x10#(12,0.1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	39	**-0.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933.6	37.7	86.4	0.01		**5.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	645.1	37.7	64.0	0.15		0.15
452	130x90x10 Double*	130x130x10#(12,0.1	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	18	**-4.8**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1030.9	37.7	86.4	0.13		**1.9**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	645.1	37.7	64.0	0.05		0.13

Assessment of groups for modified structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4,4

RSD-MDK150
D+0
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Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
mr1	mr1	50x50x4	S235	4M12-5.6t	1	25	20	60	0.67	0.67	0.67	186	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	24.6	80.6	103.7	0.07		**1.7**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	72.1	80.6	75.7	0.02		0.07
mzd1	mzd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-1.3**	ULS 30yr 1a W ZIII WL_0,T BI+	31.9	37.7	34.6	0.04		**1.1**	ULS 30yr 1a W ZIII WL_0,T BI+	36.9	37.7	22.4	0.05		0.05
mzh1	mzh1	50x50x4	S235	1M16-5.6t	1	30	25		2.00	1.00	1.00	98	**-2.8**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	42.7	37.7	34.6	0.08		**1.1**	ULS 30yr 1a W ZIII WL_45,T BI+	36.9	37.7	22.4	0.05		0.08
mvh1	mvh1	50x50x5	S235	2M16-5.6t	1	30	25	50	1.00	1.00	1.00	155			38.5	75.4	86.4			**34.4**	ULS 30yr 3 W + I ZIII WL_90,T BI+	48.7	75.4	56.0	0.71		0.71
t1vd1	t1vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	254			12.5	37.7	34.6			**4.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.20		0.20
t1br1	t1br1	55x55x5	S235	2M16-5.6t	1	30	25	60	2.13	1.00	1.00	231	**-1.4**	ULS 30yr 5a Trsnl ZIII Br. 3 Ah,T Global	23.6	75.4	172.8	0.06		**41.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.73		0.73
mvd1	mvd1	50x50x4	S235	1M16-5.6t	1	30	25		0.52	0.52	0.52	130	**-13.5**	ULS 30yr 3 W + I ZIII WL_90,T BI+	30.6	37.7	34.6	0.44		**12.7**	ULS 30yr 1a W ZIII WL_90,T BI+	36.9	37.7	22.4	0.56		0.56
mr2	mr2	75x75x6	S235	8M20-5.6t	1	30	30	60	2.00	1.00	1.00	87	**-100.5**	ULS 30yr 3 W + I ZIII WL_90,T BI+	143.3	470.4	518.4	0.70		**49.2**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	157.1	470.4	366.5	0.31		0.70
t1vd2	t1vd2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	206	**-7.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	26.1	37.7	86.4	0.29				92.2	37.7	56.0			0.29
t1vd3	t1vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	224			15.1	37.7	34.6			**17.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.77		0.77
t1bh1	t1bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	98	**-0.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	40.1	37.7	34.6	0.01				36.9	37.7	22.4			0.01
t1vh1	t1vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	99	**-0.2**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	39.8	37.7	34.6	0.01		**1.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.06		0.06
mzd2	mzd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-11.3**	ULS 30yr 3 W + I ZIII WL_45,T BI+	31.9	37.7	34.6	0.35		**1.4**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	36.9	37.7	22.4	0.06		0.35
t1vh2	t1vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	47	**-0.2**	ULS 30yr 3 W + I ZIII WL_90,T BI+	53.0	37.7	34.6	0.00				36.9	37.7	22.4			0.00
t1or1	t1or1	70x70x7	S235						1.68	1.00	1.00	76	**-92.2**	ULS 30yr 3 W + I ZIII WRA,T NR-	170.1			0.54		**34.1**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	178.3	226.1	268.8	0.19		0.54
t1od8	t1od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	86	**-7.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	44.3	37.7	34.6	0.22		**2.1**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.10		0.22
t1od7	t1od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	93	**-2.8**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	41.9	37.7	34.6	0.08		**7.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.33		0.33
t1od6	t1od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	100	**-6.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	39.6	37.7	34.6	0.20		**2.7**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.12		0.20
t1od5	t1od5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	111	**-2.3**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.0	37.7	34.6	0.07		**6.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.27		0.27
t1od4	t1od4	130x65x8	S235	1M16-5.6t	1	30	30		2.00	1.00	1.00	38	**-1.2**	ULS 30yr 3 W + I ZIII WL_90,T BI+	261.9	37.7	86.4	0.03		**0.9**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	121.0	37.7	64.0	0.02		0.03
t1od1	t1od1	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	162	**-2.5**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	35.2	37.7	43.2	0.07		**3.9**	ULS 30yr 3 W + I ZIII WL_90,T BI+	60.5	37.7	32.0	0.12		0.12
t1od2	t1od2	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	146	**-5.2**	ULS 30yr 3 W + I ZIII WL_90,T BI+	39.8	37.7	43.2	0.14		**2.2**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	60.5	37.7	32.0	0.07		0.14
t1oh1	t1oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	143			27.4	37.7	34.6			**0.6**	ULS 30yr 3 W + I ZIII WR_-45,T BI-	36.9	37.7	22.4	0.02		0.02
t1od10	t1od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	72	**-11.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	47.4	37.7	34.6	0.34		**3.7**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	36.9	37.7	22.4	0.17		0.34
t1od12	t1od12	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	111	**-4.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	35.9	37.7	34.6	0.13		**1.0**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	36.9	37.7	22.4	0.05		0.13
t1od9	t1od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	78	**-3.2**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.0	37.7	34.6	0.09		**9.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.44		0.44
t1od3	t1od3	60x60x5	S235	1M16-5.6t	1	30	30		1.00	1.00	1.00	132	**-2.4**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	44.8	37.7	43.2	0.06		**5.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	60.5	37.7	32.0	0.18		0.18
t1oh2	t1oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	125	**-0.1**	ULS 30yr 1a W ZIII 0.9 WR_-45,T BI-	32.0	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WL_45,T BI+	36.9	37.7	22.4	0.01		0.01
mzh2	mzh2	70x70x7	S235	2M16-5.6t	1	40	35	50	2.00	1.00	1.00	75	**-7.0**	ULS 30yr 3 W + I ZIII WL_90,T BI+	137.4	75.4	121.0	0.09		**10.9**	ULS 30yr 3 W + I ZIII WRA,T NR-	101.6	75.4	109.0	0.14		0.14
mvh2	mvh2	70x70x7	S235	6M16-5.6t	1	30	35	50	2.00	1.00	1.00	75	**-70.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	137.4	226.1	362.9	0.51		**20.0**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	178.3	226.1	268.8	0.11		0.51
mzd3	mzd3	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-18.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.6	58.8	64.8	0.31		**12.6**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.38		0.38
t1oh4	t1oh4	UNP160	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	21	**-10.5**	ULS 30yr 3 W + I ZIII WRA,T NR-	428.6	37.7	64.8	0.28		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	90.7	37.7	48.0	0.09		0.28
mth1	mth1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	165	**-0.6**	ULS 30yr 3 W + I ZIII WR_0,T BI-	28.5	37.7	43.2	0.02				46.1	37.7	28.0			0.02
mtd1	mtd1	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	116	**-7.1**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	42.3	37.7	43.2	0.19		**7.3**	ULS 30yr 5a Trsnl ZIII Br. 1 Ah,T Global	46.1	37.7	28.0	0.26		0.26
t1od11	t1od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-5.1**	ULS 30yr 5a Trsnl ZIII Br. 3 Ba,T Global	46.6	37.7	34.6	0.15		**15.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.68		0.68
mvd2	mvd2	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	110	**-22.3**	ULS 30yr 1a W ZIII WRA,T NR-	54.0	58.8	54.0	0.41		**15.4**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	54.7	58.8	27.7	0.56		0.56
mzd4	mzd4	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	115	**-14.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	61.6	58.8	64.8	0.25		**16.3**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.7	58.8	33.3	0.49		0.49
mvd3	mvd3	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	116	**-15.3**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	51.2	58.8	54.0	0.30		**21.5**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.77		0.77
mzd5	mzd5	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	107	**-13.8**	ULS 30yr 3 W + I ZIII WRB,T NL-	74.0	58.8	64.8	0.23		**14.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mzh3	mzh3	60x60x5	S235	1M20-5.6t	1	30	30		2.00	1.00	1.00	98	**-5.5**	ULS 30yr 3 W + I ZIII WLB,T NL+	63.4	58.8	54.0	0.10				54.7	58.8	27.7			0.10
mvh3	mvh3	60x60x5	S235	2M20-5.6t	1	30	30	55	1.00	1.00	1.00	153			47.3	117.6	108.0			**49.0**	ULS 30yr 3 W + I ZIII WL_90,T BI+	54.1	117.6	55.5	0.90		0.90
t2br1	t2br1	55x55x5	S235	2M16-5.6t	1	30	25	60	1.76	1.00	1.00	286			17.0	75.4	172.8			**40.1**	ULS 30yr 3 W + I ZIII WRA,T NR-	57.4	113.0	168.1	0.70		0.70
t2vd1	t2vd1	50x50x4	S235	1M16-5.6t	1	30	25		1.86	1.00	1.00	207			18.2	37.7	34.6			**11.1**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.50		0.50
mzd6	mzd6	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-14.2**	ULS 30yr 3 W + I ZIII WRB,T NL-	68.6	58.8	64.8	0.24		**14.7**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	65.7	58.8	33.3	0.44		0.44
mvd4	mvd4	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	121	**-28.0**	ULS 30yr 3 W + I ZIII WRA,T NR-	49.3	58.8	54.0	0.57		**22.1**	ULS 30yr 3 W + I ZIII WL_90,T BI+	54.7	58.8	27.7	0.80		0.80
t2bh1	t2bh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	120	**0.0**	ULS 30yr 3 W + I ZIII WLA,T NR+	33.3	37.7	34.6	0.00				36.9	37.7	22.4			0.00
t2vh2	t2vh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	114			34.9	37.7	34.6			**7.4**	ULS 30yr 3 W + I ZIII WL_90,T BI+	36.9	37.7	22.4	0.33		0.33
t2vd3	t2vd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	173			21.6	37.7	34.6			**1.6**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.07		0.07
t2vd2	t2vd2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	164	**-9.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	23.3	37.7	34.6	0.40				36.9	37.7	22.4			0.40
t2vh1	t2vh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	109	**-0.1**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	36.5	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WLB,T NL+	36.9	37.7	22.4	0.02		0.02
t2vd6	t2vd6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	157	**-0.4**	ULS 30yr 1a W ZIII WLB,T NL+	24.6	37.7	34.6	0.02		**0.0**	ULS 30yr 3 W + I ZIII 0.9 WRA,T NR-	36.9	37.7	22.4	0.00		0.02
mzd7	mzd7	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	116	**-15.1**	ULS 30yr 3 W + I ZIII WLB,T NL+	61.0	58.8	64.8	0.26		**12.4**	ULS 30yr 3 W + I ZIII WRB,T NL-	65.7	58.8	33.3	0.37		0.37
t2vd5	t2vd5	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	105			38.0	37.7	34.6			**2.7**	ULS 30yr 3 W + I ZIII WRA,T NR-	36.9	37.7	22.4	0.12		0.12
t2vd4	t2vd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	97	**-1.7**	ULS 30yr 3 W + I ZIII WL_90,T BI+	40.4	37.7	34.6	0.05				36.9	37.7	22.4			0.05
t2or1	t2or1	70x70x7	S235	5M16-5.6t					1.21	1.00	1.00	67	**-63.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	180.1	188.4	302.4	0.35		**22.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	261.3	0.13		0.35
t2oh5	t2oh5	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	34	**-6.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	266.5	37.7	86.4	0.18		**4.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	121.0	37.7	64.0	0.11		0.18
t2od10	t2od10	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	94	**-7.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.3	37.7	34.6	0.22		**2.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.12		0.22
t2od9	t2od9	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	102	**-2.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	38.7	37.7	34.6	0.07		**6.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.29		0.29
t2od8	t2od8	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	110	**-5.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.1	37.7	34.6	0.17		**2.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.09		0.17
t2od7	t2od7	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	119	**-1.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	33.7	37.7	34.6	0.05		**5.3**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.24		0.24
t2od6	t2od6	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	131	**-4.7**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	30.4	37.7	34.6	0.16		**1.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ba,T Global	36.9	37.7	22.4	0.07		0.16
t2od15	t2od15	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	60	**-5.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	50.0	37.7	34.6	0.14		**0.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.04		0.14
t2od14	t2od14	50x50x4	S235	1M16-5.6t		30	25		1.00	1.00	1.00	133	**-1.7**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	30.0	37.7	34.6	0.06		**3.7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	91.6	37.7	22.4	0.16		0.16
t2od4	t2od4	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	148	**-12.3**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	36.1	37.7	86.4	0.34		**4.0**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.11		0.34
t2oh3	t2oh3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	145	**-0.4**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	27.1	37.7	34.6	0.02		**0.6**	ULS 30yr 1a W ZIII WR_-45,T BI-	36.9	37.7	22.4	0.03		0.03
t2od3	t2od3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-3.9**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	32.8	37.7	86.4	0.12		**10.7**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.28		0.28
t2oh2	t2oh2	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	160	**-0.1**	ULS 30yr 1a W ZIII 0.9 WR_0,T BI-	24.0	37.7	34.6	0.00		**0.3**	ULS 30yr 1a W ZIII WL_45,T BI+	36.9	37.7	22.4	0.02		0.02
t2od2	t2od2	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	174	**-10.0**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	29.2	37.7	86.4	0.34		**3.2**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	92.2	37.7	56.0	0.09		0.34
t2oh1	t2oh1	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	175	**-0.1**	ULS 30yr 1a W ZIII 0.9 WL_0,T BI+	21.3	37.7	34.6	0.00		**0.4**	ULS 30yr 1a W ZIII WR_0,T BI-	36.9	37.7	22.4	0.02		0.02
t2od1	t2od1	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	190	**-3.1**	ULS 30yr 5a Trsnl ZIII Br. 20 Ba,T Global	26.0	37.7	86.4	0.12		**8.6**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	92.2	37.7	56.0	0.23		0.23
mr3	mr3	90x90x9	S235		1	55	40	60	2.40	2.43	1.00	94	**-162.3**	ULS 30yr 3 W + I ZIII WRA,T NR-	239.7			0.68		**91.6**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	296.3	470.4	683.3	0.31		0.68
mzh4	mzh4	65x65x5	S235	2M16-5.6t	1	30	30	50	1.00	1.00	1.00	74	**-7.3**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	98.2	75.4	172.8	0.10		**5.9**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	56.7	75.4	128.0	0.10		0.10
mvh4	mvh4	70x70x7	S235	5M16-5.6t	1	50	30	50	2.00	1.00	1.00	89	**-49.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	123.2	188.4	302.4	0.40		**9.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	178.3	188.4	272.5	0.05		0.40
mvd5	mvd5	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	129	**-38.9**	ULS 30yr 1a W ZIII WRA,T NR-	45.8	188.2	108.0	0.85		**36.4**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.66		0.85
t2od13	t2od13	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	75	**-4.6**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	46.6	37.7	34.6	0.13		**12.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.56		0.56
t2od12	t2od12	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	77	**-10.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.2	37.7	34.6	0.29		**3.5**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	36.9	37.7	22.4	0.16		0.29
t2od11	t2od11	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	84	**-3.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ba,T Global	56.0	37.7	34.6	0.09		**8.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	36.9	37.7	22.4	0.39		0.39
mth2	mth2	50x50x5	S235	1M16-5.6t	1	40	25		1.00	1.00	1.00	194	**-0.3**	ULS 30yr 3 W + I ZIII WLA,T NR+	22.8	37.7	43.2	0.02				46.1	37.7	37.4			0.02
mtd2	mtd2	50x50x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	137	**-14.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	35.4	37.7	43.2	0.41		**14.5**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.1	37.7	28.0	0.52		0.52
mzd8	mzd8	65x65x7	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	115	**-26.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	77.8	58.8	75.6	0.46		**22.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	76.6	58.8	38.8	0.57		0.57
mzd9	mzd9	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	133	**-20.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	52.9	58.8	64.8	0.38		**23.8**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.72		0.72
mvd6	mvd6	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	137	**-33.1**	ULS 30yr 1a W ZIII WRA,T NR-	43.1	188.2	108.0	0.77		**34.7**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.63		0.77
mzd10	mzd10	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	140	**-21.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	49.9	58.8	64.8	0.42		**17.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.54		0.54
mvd7	mvd7	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	144	**-31.4**	ULS 30yr 1a W ZIII WRA,T NR-	40.6	188.2	108.0	0.77		**29.9**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.54		0.77
mzd11	mzd11	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	148	**-16.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	46.7	58.8	64.8	0.34		**18.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.56		0.56
mvd8	mvd8	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	152	**-28.1**	ULS 30yr 1a W ZIII WRA,T NR-	38.0	188.2	108.0	0.74		**28.8**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.52		0.74
mzd12	mzd12	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	156	**-17.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	43.7	58.8	64.8	0.39		**14.2**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.43		0.43
mvd9	mvd9	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	161	**-27.5**	ULS 30yr 1a W ZIII WRA,T NR-	35.5	58.8	54.0	0.77		**26.7**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.96		0.96
mr4	mr4	90x90x9	S235						2.40	2.43	1.00	96	**-205.8**	ULS 30yr 3 W + I ZIII WL_90,T BI+	234.2			0.88		**141.1**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	361.7			0.39		0.88
mzd13	mzd13	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	164	**-12.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	41.0	58.8	64.8	0.31		**15.7**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.47		0.47
mvd10	mvd10	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	169	**-25.5**	ULS 30yr 1a W ZIII WL_90,T BI+	33.3	58.8	54.0	0.77		**25.7**	ULS 30yr 1a W ZIII WRA,T NR-	54.7	58.8	27.7	0.93		0.93
mzd14	mzd14	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	173	**-15.4**	ULS 30yr 1a W ZIII WL_45,T BI+	38.3	58.8	64.8	0.40		**11.3**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	65.7	58.8	33.3	0.34		0.40
mvd11	mvd11	60x60x5	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	177	**-24.4**	ULS 30yr 1a W ZIII WRA,T NR-	31.2	58.8	54.0	0.78		**23.8**	ULS 30yr 1a W ZIII WL_90,T BI+	54.7	58.8	27.7	0.86		0.86
mzd15	mzd15	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	172	**-10.4**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	38.8	58.8	64.8	0.27		**14.5**	ULS 30yr 1a W ZIII WL_45,T BI+	65.7	58.8	33.3	0.44		0.44
mth3	mth3	55x55x5	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	314	**0.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	13.7	37.7	86.4	0.00		**0.0**	ULS 30yr 3 W + I ZIII 0.9 WL_-90,T BI+	101.4	37.7	56.0	0.00		0.00
mtd3	mtd3	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	240	**-1.2**	ULS 30yr 1a W ZIII WRA,T NR-	13.6	37.7	34.6	0.09		**1.3**	ULS 30yr 1a W ZIII WLB,T NL+	36.9	37.7	22.4	0.06		0.09
mzd16	mzd16	60x60x6	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	191	**-10.9**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	33.5	58.8	64.8	0.33		**10.4**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	65.7	58.8	33.3	0.31		0.33
mzh5	mzh5	60x60x5	S235	2M20-5.6t	1	30	30		1.00	1.00	1.00	142	**-23.9**	ULS 30yr 1a W ZIII WL_90,T BI+	51.5	117.6	108.0	0.46		**18.5**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	65.2	117.6	55.5	0.33		0.46
mvh5	mvh5	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	142	**-9.2**	ULS 30yr 1a W ZIII WL_45,T BI+	51.5	117.6	108.0	0.18		**5.2**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	57.8	117.6	55.5	0.09		0.18
mvd12	mvd12	60x60x5	S235	1M20-5.6t	1	30	30		0.54	0.54	0.54	192	**-8.8**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	28.0	58.8	54.0	0.32		**9.6**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	54.7	58.8	27.7	0.35		0.35
mr5	mr5	**L90x9+L90x9**	S235						2.40	2.43	1.00	98	**-246.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	416.2			0.59		**185.7**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	728.5			0.25		0.59
mr6	mr6	**L90x9+L90x9**	S235	**12M20-8.8t**	1	35	40	70	2.40	2.43	1.00	100	**-284.3**	ULS 30yr 1a W ZIII WL_90,T BI+	405.5	1105.0	1166.4	0.70		**223.8**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	700.9	1105.0	824.7	0.32		0.70
mr7	mr7	**L100x10+L100x1**	S235						2.40	2.43	1.00	92	**-327.2**	ULS 30yr 1a W ZIII WLB,T NL+	549.7			0.60		**262.7**	ULS 30yr 1a W ZIII WLB,T NL+	902.4			0.29		0.60
mr8	mr8	**L100x10+L100x1**	S235						2.40	2.43	1.00	94	**-355.8**	ULS 30yr 1a W ZIII WLB,T NL+	537.5			0.66		**294.6**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	902.4			0.33		0.66
mr9	mr9	**L100x10+L100x1**	S235	**16M20-8.8t**					2.40	2.40	1.20	95	**-395.3**	ULS 30yr 1a W ZIII WLB,T NL+	532.5	1420.6	1728.0	0.74		**328.8**	ULS 30yr 1a W ZIII WLB,T NL+	881.3	1420.6	1396.4	0.37		0.74
mr10	mr10	**L100x10+L100x1**	S235	**16M20-8.8t**	1	35	50	70	2.03	1.20	1.00	88	**-411.4**	ULS 30yr 1a W ZIII WLB,T NL+	573.7	1420.6	1728.0	0.72		**344.8**	ULS 30yr 1a W ZIII WLB,T NL+	881.3	1420.6	1221.8	0.39		0.72
mr11	mr11	**L100x10+L100x1**	S235						1.00	1.00	1.00	62	**-399.4**	ULS 30yr 1a W ZIII WLB,T NL+	725.5			0.55		**328.3**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	902.4			0.36		0.55
mr12	mr12	**L100x10+L100x1**	S235	**16M20-8.8t**	1	50	50	60	0.33	0.33	0.33	70	**-399.9**	ULS 30yr 1a W ZIII WLB,T NL+	683.1	1448.8	1728.0	0.59		**327.3**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	881.3	1448.8	1518.5	0.37		0.59
mzd17	mzd17	60x60x6	S235	1M20-5.6t	1	30	30		0.52	0.52	0.52	123	**-13.3**	ULS 30yr 1a W ZIII WLB,T NL+	57.3	58.8	64.8	0.23		**15.8**	ULS 30yr 1a W ZIII 0.9 WRA,T NR-	65.7	58.8	33.3	0.47		0.47
mvd13	mvd13	60x60x5	S235	1M20-5.6t	1	30	30		1.00	1.00	1.00	193	**-9.1**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	27.8	58.8	54.0	0.33		**8.0**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	54.7	58.8	27.7	0.29		0.33
mvh6	mvh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-1.7**	ULS 30yr 1a W ZIII WLB,T NL+	39.8	117.6	108.0	0.04		**1.1**	ULS 30yr 1a W ZIII WLB,T NL+	57.8	117.6	55.5	0.02		0.04
mzh6	mzh6	60x60x5	S235	2M20-5.6t	1	30	30	60	1.00	1.00	1.00	175	**-2.2**	ULS 30yr 1a W ZIII WLB,T NL+	39.8	117.6	108.0	0.06		**1.7**	ULS 30yr 1a W ZIII WR_-45,T BI-	57.8	117.6	55.5	0.03		0.06

Assessment of groups for modified structure (afkeur level)

Date 28-3-2022
Author TBR
Version v4.4

RSD-MDK150
D+0
92

Group Label	Description	Profile	Steel Quality	Bolts	#sh. plane	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)	Total U.C. (with climb)
mtd4	mtd4	50x50x4	S235	1M16-5.6t	1	30	25		1.00	1.00	1.00	295	**-0.6**	ULS 30yr 1a W ZIII WR_45,T BI-	11.1	37.7	34.6	0.05		**0.6**	ULS 30yr 1a W ZIII 0.9 WL_45,T BI+	36.9	37.7	22.4	0.02		0.05
mzd18	mzd18	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.7**	ULS 30yr 1a W ZIII WL_45,T BI+	88.0	75.4	121.0	0.19		**14.7**	ULS 30yr 1a W ZIII WR_-45,T BI-	107.1	75.4	74.7	0.20		0.20
mvd14	mvd14	65x65x7	S235	2M16-5.6t	1	25	30	60	0.33	0.33	0.33	126	**-14.0**	ULS 30yr 5a Trsnl ZIII Br. 10 Ah,T Global	88.0	75.4	121.0	0.19		**12.1**	ULS 30yr 5a Trsnl ZIII Br. 21 Ah,T Global	107.1	75.4	74.7	0.16		0.19
t2oh6	t2oh6	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	87	**-3.8**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	190.9	37.7	86.4	0.10		**3.7**	ULS 30yr 1a W ZIII WRA,T NR-	121.0	37.7	64.0	0.10		0.10
t2oh7	t2oh7	130x65x8	S235	1M16-5.6t	1	30	30		2.00	2.00	2.00	92	**-3.2**	ULS 30yr 1a W ZIII WRA,T NR-	183.0	37.7	86.4	0.08		**7.1**	ULS 30yr 5a Trsnl ZIII Br. 11 Ah,T Global	121.0	37.7	64.0	0.19		0.19
350	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-7.9**	ULS 30yr 1a W ZIII WRA,T NR-	425.6			0.02		**6.8**	ULS 30yr 1a W ZIII WRA,T NR-	564.0			0.01		0.02
450	Fictief member	UNP160	S235						2.00	2.00	2.00	21	**-0.4**	ULS 30yr 3 W + I ZIII WRA,T NR-	425.6			0.00				564.0					0.00
451	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	39	**-0.5**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	933.6	37.7	86.4	0.01		**5.8**	ULS 30yr 3 W + I ZIII WRA,T NR-	645.1	37.7	64.0	0.15		0.15
452	130x90x10 Double*	130x130x10#(12,0	S235	1M16-5.6t	1	30	45		2.00	2.00	2.00	18	**-4.8**	ULS 30yr 5a Trsnl ZIII Br. 12 Ah,T Global	1030.9	37.7	86.4	0.13		**1.9**	ULS 30yr 5a Trsnl ZIII Br. 22 Ba,T Global	645.1	37.7	64.0	0.05		0.13

Assessment of groups for modified elements (verbouw level)

RSD-MDK150
D+0
92

Group Label	Description	Profile	Steel Quality	Bolts	#sh. planes	e1	e2	p1	RLX	RLY	RLZ	Slenderness	Compression (kN)	Load Case (Compression)	Buckling	Shear (Comp)	Bearing (Comp)	U.C. (Comp)	Comment (Comp)	Tension (kN)	Load Case (Tension)	Net Section	Shear (Tens)	Bearing (Tens)	U.C. (Tens)	Comment (Tens)
mvd5	mvd5	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	129	**-44.8**	ULS 30yr 1a W ZIII WRA,T NR-	45.8	188.2	108.0	0.98		**42.1**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.76	
mvd6	mvd6	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	137	**-38.2**	ULS 30yr 1a W ZIII WRA,T NR-	43.1	188.2	108.0	0.89		**39.9**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.72	
mvd7	mvd7	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	144	**-36.1**	ULS 30yr 1a W ZIII WRA,T NR-	40.6	188.2	108.0	0.89		**34.6**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.62	
mvd8	mvd8	60x60x5	S235	**2M20-8.8t**	1	30	30		0.52	0.52	0.52	152	**-32.5**	ULS 30yr 1a W ZIII WRA,T NR-	38.0	188.2	108.0	0.86		**33.1**	ULS 30yr 1a W ZIII WRA,T NR-	65.2	188.2	55.5	0.60	
mr5	mr5	L90x9+L90x9	S235						2.40	2.43	1.00	98	**-285.3**	ULS 30yr 1a W ZIII WLB,T NL+	416.2	0.0	0.0	0.69		**219.8**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	728.5	0.0	0.0	0.30	
mr6	mr6	L90x9+L90x9	S235	**12M20-8.8t**	1	35	40	70	2.40	2.43	1.00	100	**-329.5**	ULS 30yr 1a W ZIII WL_90,T BI+	405.5	1105.0	1166.4	0.81		**263.9**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	700.9	1105.0	824.7	0.38	
mr7	mr7	L100x10+L100x10	S235						2.40	2.43	1.00	92	**-379.1**	ULS 30yr 1a W ZIII WLB,T NL+	549.7	0.0	0.0	0.69		**308.8**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	902.4	0.0	0.0	0.34	
mr8	mr8	L100x10+L100x10	S235						2.40	2.43	1.00	94	**-412.5**	ULS 30yr 1a W ZIII WLB,T NL+	537.5	0.0	0.0	0.77		**345.9**	ULS 30yr 1a W ZIII 0.9 WL_90,T BI+	902.4	0.0	0.0	0.38	
mr9	mr9	L100x10+L100x10	S235	**16M20-8.8t**					2.40	2.40	1.20	95	**-458.0**	ULS 30yr 1a W ZIII WLB,T NL+	532.5	1420.6	1728.0	0.86		**385.0**	ULS 30yr 1a W ZIII WLB,T NL+	881.3	1420.6	1396.4	0.44	
mr10	mr10	L100x10+L100x10	S235	**16M20-8.8t**	1	35	50	70	2.03	1.20	1.00	88	**-476.7**	ULS 30yr 1a W ZIII WLB,T NL+	573.7	1420.6	1728.0	0.83		**403.8**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	881.3	1420.6	1221.8	0.46	
mr11	mr11	L100x10+L100x10	S235						1.00	1.00	1.00	62	**-463.0**	ULS 30yr 1a W ZIII WLB,T NL+	725.5	0.0	0.0	0.64		**385.1**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	902.4	0.0	0.0	0.43	
mr12	mr12	L100x10+L100x10	S235	**16M20-8.8t**	1	50	50	60	0.33	0.33	0.33	70	**-463.5**	ULS 30yr 1a W ZIII WLB,T NL+	683.1	1448.8	1728.0	0.68		**384.0**	ULS 30yr 1a W ZIII 0.9 WLB,T NL+	881.3	1448.8	1518.5	0.44	

APPENDIX C
FOUNDATION SHEAR BLOCK CHECKS

The appendix contains the calculation of the capacity of the foundation piles with the TS/Paalfunderingen software and the verification of the shear block connection of the inserted leg into the pile. The output of TS/Paalfunderingen is included for tension and compression.

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

ALGEMENE GEGEVENS

Project : ZW-Oost
Onderdeel : TOSP fundatie trek
Datum : 05-06-2020
Bestand : P:\EANL_Projects\10124719 - TenneT Engineering ZW380 kV Oost\2 Content\001 Tekeningen\050 PLS cadd\Fundatie berekeningen RFC013\RFC013 trek.pvw
Berekeningstype : Verticaal belaste paal
Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Toegepaste normen volgens Eurocode met Nederlandse NB

Geotechniek	EN 1997-1:2004	AC:2009	
	NEN-EN 1997-1:2005	C1+A1:2013	NB:2016
	NEN 9997-1:2016	C2:2017	

BODEMPROFIELGEGEVENS: B 92 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.01 Grondwaterstand [m] : -0.99

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.01	-1.97	Leem - Zwak zandig - Vast	1.0	50.0		
2	-1.97	-3.59	Zand - Schoon - Matig	1.0	100.0		
3	-3.59	-5.24	Leem - Zwak zandig - Vast	1.0	50.0		
4	-5.24	-14.90	Zand - Schoon - Matig	1.0	100.0		

BODEMPROFIELGEGEVENS: B 91 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.04 Grondwaterstand [m] : -0.96

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.04	-4.57	Zand - Zwak siltig - Kleiig	1.0	100.0		
2	-4.57	-5.49	Klei - Zwak zandig - Vast	1.0	50.0		
3	-5.49	-11.99	Zand - Schoon - Matig	1.0	100.0		
4	-11.99	-13.18	Klei - Zwak zandig - Slap	1.0	50.0		
5	-13.18	-14.82	Klei - Schoon - Matig	1.0	50.0		

BODEMPROFIELGEGEVENS: B 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.00 Grondwaterstand [m] : -1.00

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.00	-2.00	Veen - Matig voorbelast - Matig	1.0	50.0		
2	-2.00	-11.01	Zand - Zwak siltig - Kleiig	1.0	100.0		
3	-11.01	-11.89	Grind - Sterk siltig - Los	1.0	50.0		
4	-11.89	-12.55	Zand - Schoon - Matig	1.0	100.0		
5	-12.55	-13.29	Leem - Zwak zandig - Vast	1.0	50.0		
6	-13.29	-18.66	Zand - Sterk siltig - Kleiig	1.0	100.0		

BODEMPROFIELGEGEVENS: B 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.00 Grondwaterstand [m] : -1.00

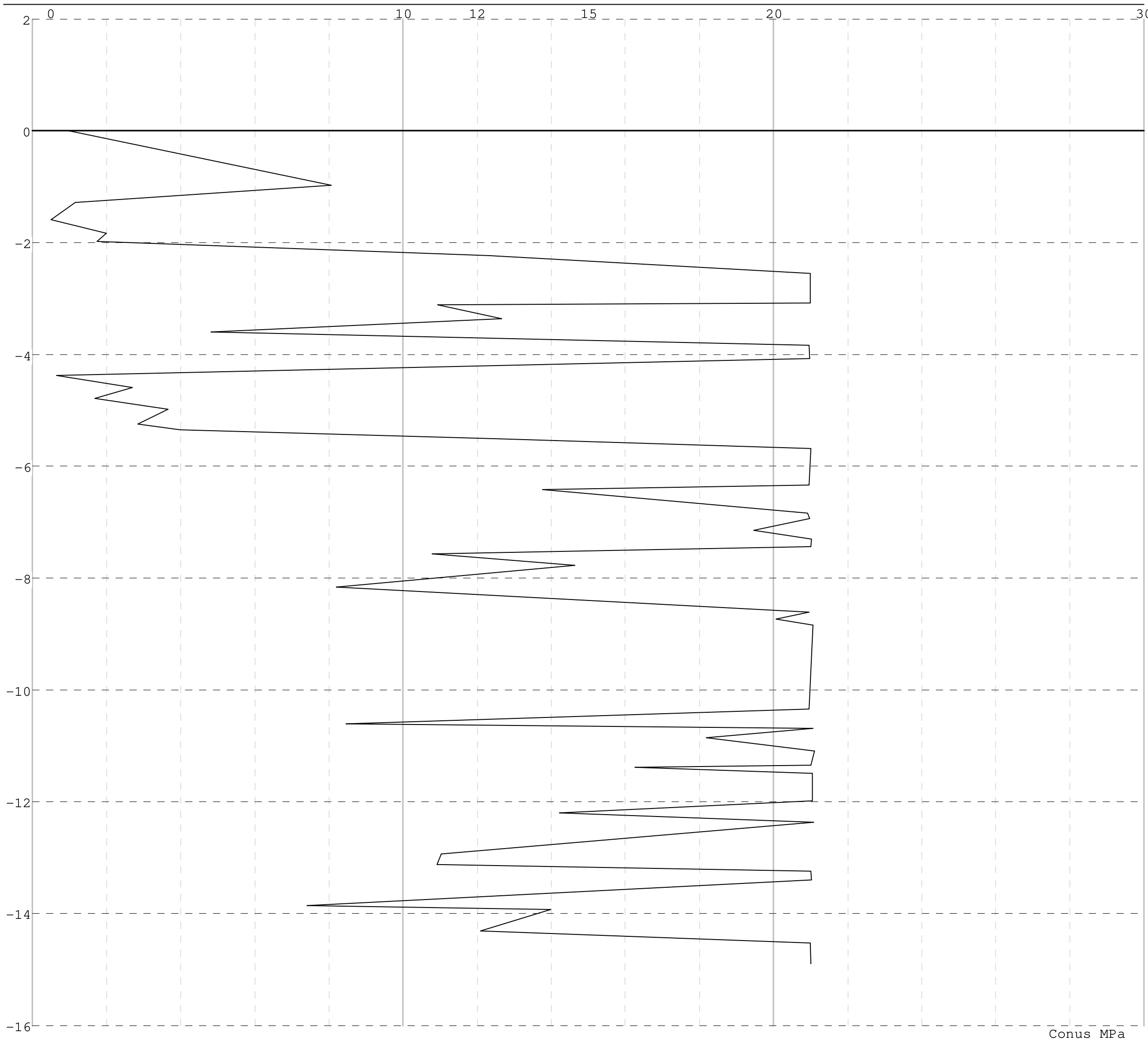
Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.00	-1.11	Klei - Zwak zandig - Matig	1.0	50.0		
2	-1.11	-1.37	Zand - Schoon - Los	1.0	100.0		
3	-1.37	-3.70	Klei - Zwak zandig - Slap	1.0	50.0		
4	-3.70	-5.81	Veen - Matig voorbelast - Matig	1.0	50.0		
5	-5.81	-8.97	Zand - Schoon - Matig	1.0	100.0		
6	-8.97	-9.38	Leem - Zwak zandig - Vast	1.0	50.0		
7	-9.38	-13.74	Zand - Sterk siltig - Kleiig	1.0	100.0		
8	-13.74	-13.77	Leem - Zwak zandig - Vast	1.0	50.0		
9	-13.77	-14.22	Zand - Sterk siltig - Kleiig	1.0	100.0		
10	-14.22	-14.40	Leem - Zwak zandig - Vast	1.0	50.0		
11	-14.40	-15.62	Zand - Zwak siltig - Kleiig	1.0	100.0		
12	-15.62	-16.81	Leem - Zwak zandig - Vast	1.0	50.0		
13	-16.81	-16.99	Zand - Schoon - Los	1.0	100.0		

SONDERINGSGEGEVENS ALGEMEEN: S 92 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.01 Bodemprofiel: B 92 RSD - MDK
Traject negatieve kleef : 0.00 tot -1.60 [m]
Traject positieve kleef : -1.80 tot -14.90 [m]

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SONDERINGSGEGEVENS GRAFIEK: S 92 RSD - MDK

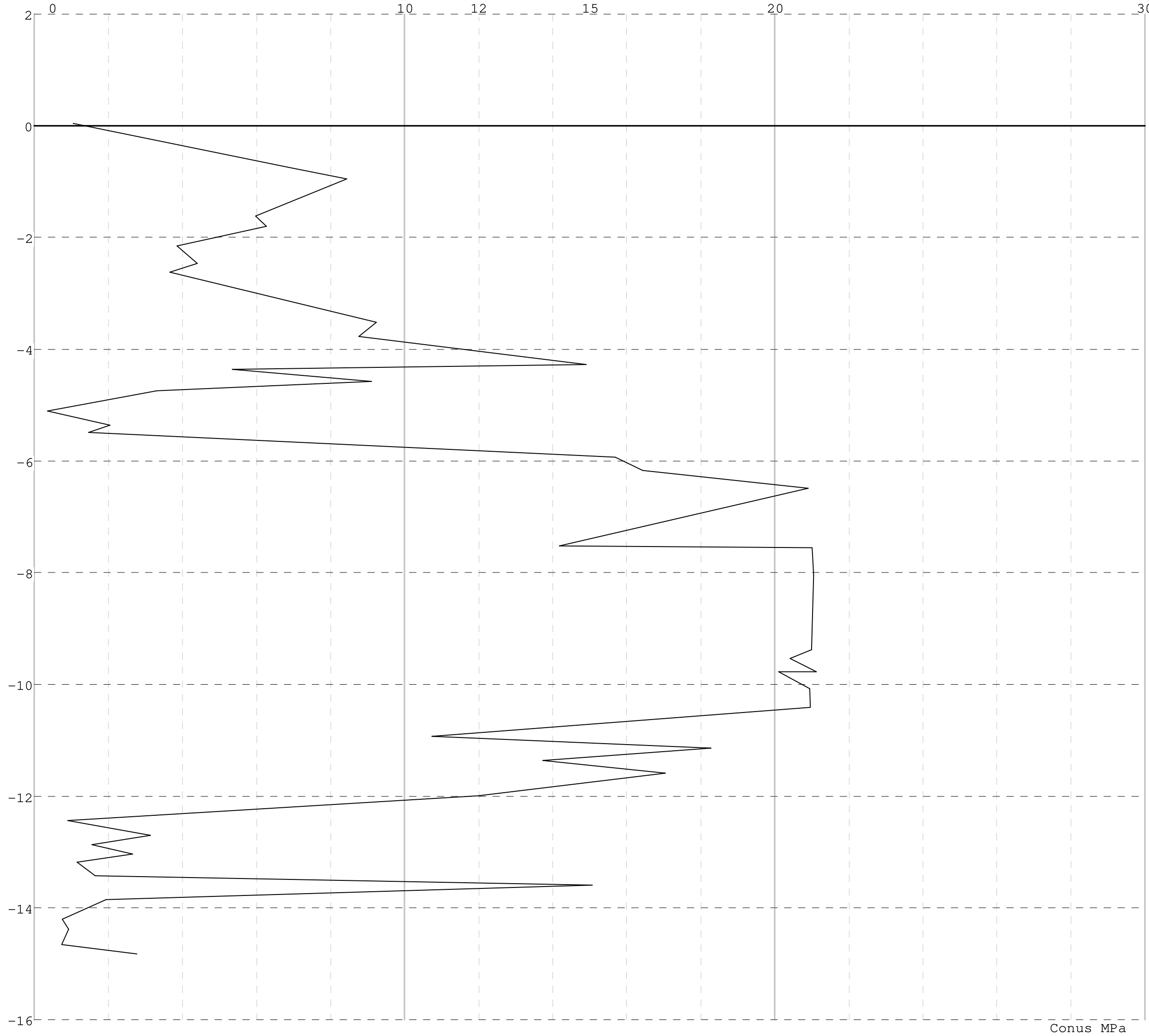


Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SONDERINGSGEGEVENS ALGEMEEN: S 91 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.04 Bodemprofiel: B 91 RSD - MDK
Traject negatieve kleef : 0.04 tot -2.60 [m]
Traject positieve kleef : -2.70 tot -14.82 [m]

SONDERINGSGEGEVENS GRAFIEK: S 91 RSD - MDK

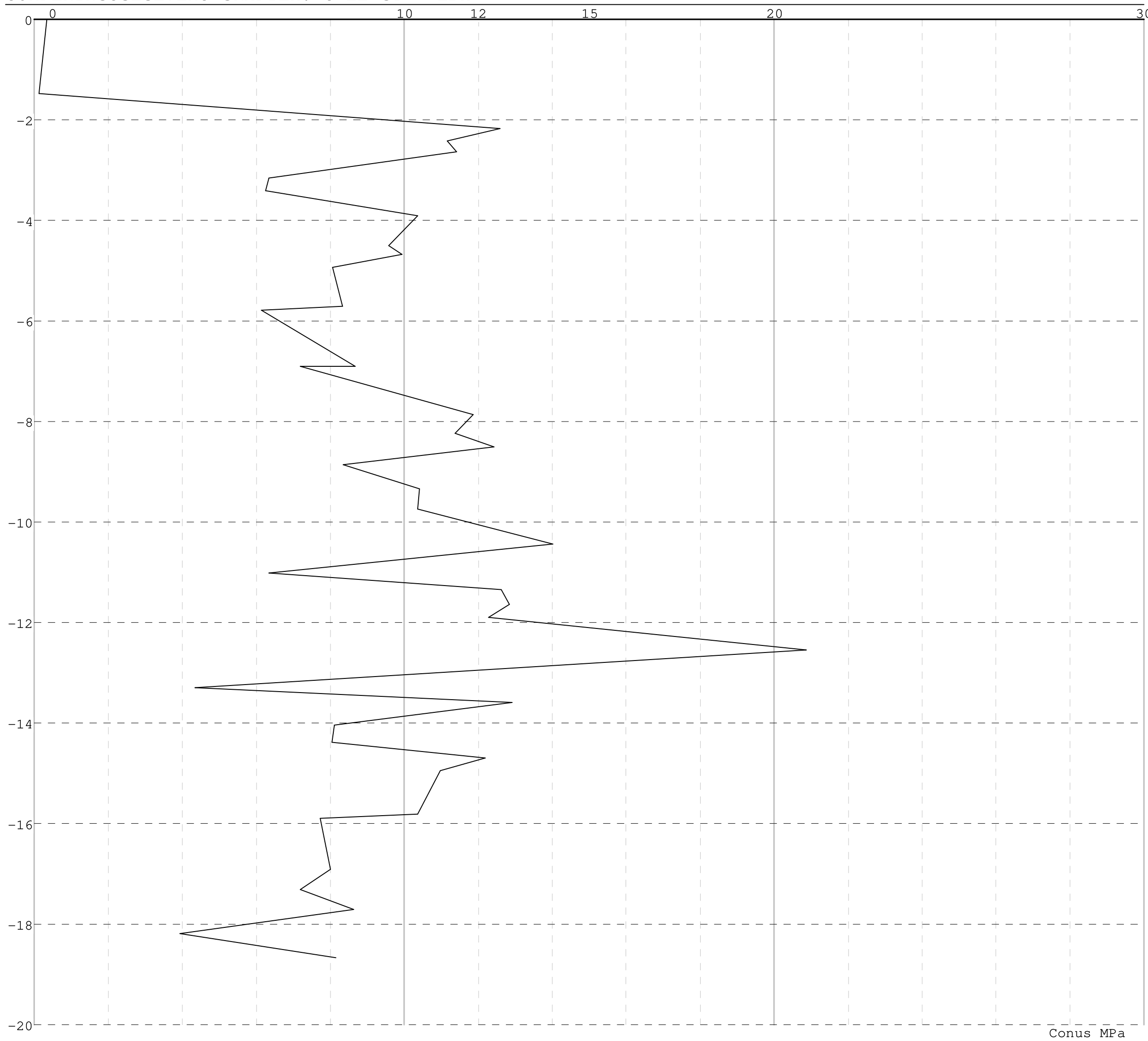


Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SONDERINGSGEGEVENS ALGEMEEN: S 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.00 Bodemprofiel: B 22 GT - ZBH
Traject negatieve kleef : -0.10 tot -1.40 [m]
Traject positieve kleef : -1.70 tot -18.66 [m]

SONDERINGSGEGEVENS GRAFIEK: S 22 GT - ZBH

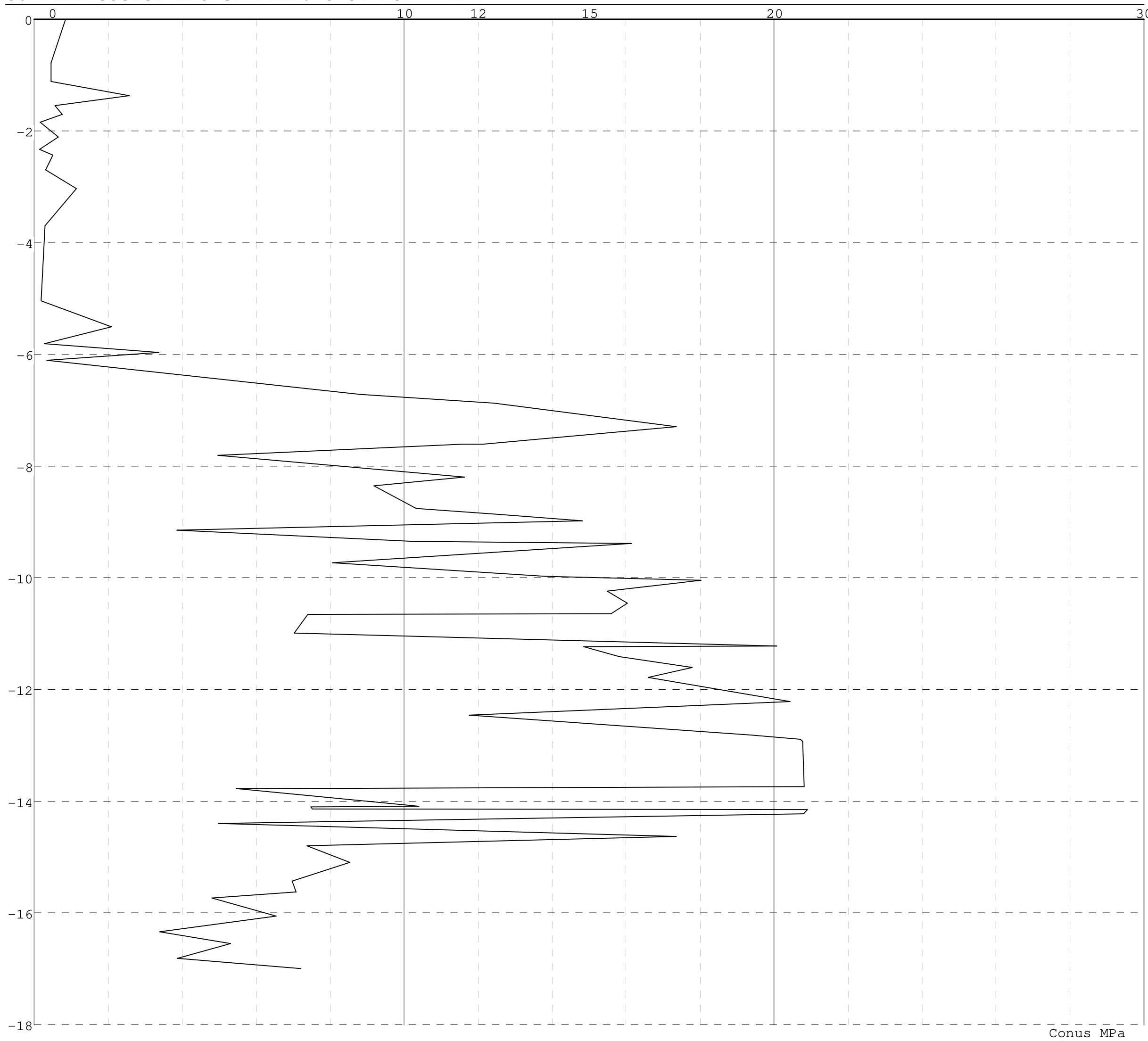


Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SONDERINGSGEGEVENS ALGEMEEN: S 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.00 Bodemprofiel: B 84 RSD - MDK
Traject negatieve kleef : -0.10 tot -6.40 [m]
Traject positieve kleef : -6.50 tot -16.99 [m]

SONDERINGSGEGEVENS GRAFIEK: S 84 RSD - MDK



REKENGEGEVENS 22 GT - ZBH

Berekening : Controlerend
Rekenmethode : Trekpalen volgens NEN-EN 1997-1, art. 7.6.3
Sondering(en) : S 22 GT - ZBH
Let op: trekcapaciteit t.p.v. negatief kleeftraject is meegerekend.

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.35
$\gamma_{m;var;qc}$: 1.50
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -9.90
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
Bovenbel. [kN/m²] : 0.00

RESULTATEN 22 GT - ZBH (n=1)

Sondering : S 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	Effectief inheiniveau [m]	E.G. paal [kN]	$R_{t;cal;k}$ [kN]	$R_{t;d}$ [kN]	$F_{t;tot;1}$ [kN]	U.C.
-9.90	-9.90	16.3	274.3	274.3	0.0	0.00

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SAMENVATTINGSTABEL 22 GT - ZBH (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{t;cal}$ [kN]	Rekenwaarden $R_{t;d}$ [kN]	$R_{t;netto;d}$ [kN]
S 22 GT - ZBH	0.00	-9.90	274.3	274.3	274.3

REKENGEGEVENS 91 RSD - MDK

Berekening : Controlerend
Rekenmethode : Trekpalen volgens NEN-EN 1997-1, art. 7.6.3
Sondering(en) : S 91 RSD - MDK
Let op: trekcapaciteit t.p.v. negatief kleeftraject is meegerekend.

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.35
$\gamma_{m;var;qc}$: 1.50
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -8.80
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
Bovenbel. [kN/m²] : 0.00

RESULTATEN 91 RSD - MDK (n=1)

Sondering : S 91 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	Effectief inheiniveau [m]	E.G. paal [kN]	$R_{t;cal;k}$ [kN]	$R_{t;d}$ [kN]	$F_{t;tot;1}$ [kN]	U.C.
-8.80	-8.80	14.6	289.7	289.7	0.0	0.00

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SAMENVATTINGSTABEL 91 RSD – MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{t;cal}$ [kN]	Rekenwaarden $R_{t;d}$ [kN]	$R_{t;netto;d}$ [kN]
S 91 RSD - MDK	0.04	-8.80	289.7	289.7	289.7

REKENGEGEVENS 92 RSD – MDK

Berekening : Controlerend
Rekenmethode : Trekpalen volgens NEN-EN 1997-1, art. 7.6.3
Sondering(en) : S 92 RSD - MDK
Let op: trekcapaciteit t.p.v. negatief kleeftraject is meegerekend.

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.35
$\gamma_{m;var;qc}$: 1.50
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -9.30
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
Bovenbel. [kN/m²] : 0.00

RESULTATEN 92 RSD – MDK (n=1)

Sondering : S 92 RSD – MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	Effectief inheiniveau [m]	E.G. paal [kN]	$R_{t;cal;k}$ [kN]	$R_{t;d}$ [kN]	$F_{t;tot;1}$ [kN]	U.C.
-9.30	-9.30	15.4	361.7	361.7	0.0	0.00

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SAMENVATTINGSTABEL 92 RSD - MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{t;cal}$ [kN]	Rekenwaarden $R_{t;d}$ [kN]	$R_{t;netto;d}$ [kN]
S 92 RSD - MDK	0.01	-9.30	361.7	361.7	361.7

REKENGEGEVENS 84 RSD - MDK

Berekening : Controlerend
Rekenmethode : Trekpalen volgens NEN-EN 1997-1, art. 7.6.3
Sondering(en) : S 84 RSD - MDK
Let op: trekcapaciteit t.p.v. negatief kleeftraject is meegerekend.

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.35
$\gamma_{m;var;qc}$: 1.50
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -12.30
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
Bovenbel. [kN/m²] : 0.00

RESULTATEN 84 RSD - MDK (n=1)

Sondering : S 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	Effectief inheiniveau [m]	E.G. paal [kN]	$R_{t;cal;k}$ [kN]	$R_{t;d}$ [kN]	$F_{t;tot;1}$ [kN]	U.C.
-12.30	-12.30	20.0	279.8	279.8	0.0	0.00

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

SAMENVATTINGSTABEL 84 RSD - MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{t;cal}$ [kN]	Rekenwaarden $R_{t;d}$ [kN]	$R_{t;netto;d}$ [kN]
S 84 RSD - MDK	0.00	-12.30	279.8	279.8	279.8

PAALGEGEVENS Larssen LP2

Type : Eigen paal
Basispaaltype : Stalen buispaal (gesloten)
Wijze van installeren : Heien
Wijze van terugwinnen : n.v.t.
Afmeting a [m] : 0.314
Afmeting b [m] : 0.410
Elasticiteitsmodulus [N/mm²] : 40000
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Paalklassefactor α_p : 0.70
Paalvoetvormfactor β : 1.00
Type lastzakkingsdiagram : Grondverdringende paal
Verm.factor * $\varphi'_{j;k}$: 0.75
Groutomhulling : NEE

Project : ZW-Oost
Onderdeel : TOSP fundatie trek

OVERZICHT NETTO DRAAGVERMOGEN TREKPALEN (n=1)

Netto paaldraagvermogen(s) zijn naar beneden toe afgerond op: 1.0 kN nauwkeurig
Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	$R_{t;netto;d}$ [kN] 22 GT - Z	91 RSD -	92 RSD -	84 RSD -
S 92 RSD - MDK	0.01	-9.30			361	
S 91 RSD - MDK	0.04	-8.80		289		
S 22 GT - ZBH	0.00	-9.90	274			
S 84 RSD - MDK	0.00	-12.30				279

Project : ZW-Oost
Onderdeel : D3 TOSP druk

ALGEMENE GEGEVENS

Project : ZW-Oost
Onderdeel : D3 TOSP druk
Datum : 05-06-2020
Bestand : P:\EANL_Projects\10124719 - TenneT Engineering ZW380 kV Oost\2 Content\001 Tekeningen\050 PLS cadd\Fundatie berekeningen RFC013\RFC013 druk.pvw
Berekeningstype : Verticaal belaste paal
Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Toegepaste normen volgens Eurocode met Nederlandse NB

Geotechniek	EN 1997-1:2004	AC:2009	
	NEN-EN 1997-1:2005	C1+A1:2013	NB:2016
	NEN 9997-1:2016	C2:2017	

BODEMPROFIELGEGEVENS: B 92 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.01 Grondwaterstand [m] : -0.99

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.01	-1.97	Leem - Zwak zandig - Vast	1.0	50.0		
2	-1.97	-3.59	Zand - Schoon - Matig	1.0	100.0		
3	-3.59	-5.24	Leem - Zwak zandig - Vast	1.0	50.0		
4	-5.24	-14.90	Zand - Schoon - Matig	1.0	100.0		

BODEMPROFIELGEGEVENS: B 91 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.04 Grondwaterstand [m] : -0.96

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.04	-4.57	Zand - Zwak siltig - Kleiig	1.0	100.0		
2	-4.57	-5.49	Klei - Zwak zandig - Vast	1.0	50.0		
3	-5.49	-11.99	Zand - Schoon - Matig	1.0	100.0		
4	-11.99	-13.18	Klei - Zwak zandig - Slap	1.0	50.0		
5	-13.18	-14.82	Klei - Schoon - Matig	1.0	50.0		

BODEMPROFIELGEGEVENS: B 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.00 Grondwaterstand [m] : -1.00

Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.00	-2.00	Veen - Matig voorbelast - Matig	1.0	50.0		
2	-2.00	-11.01	Zand - Zwak siltig - Kleiig	1.0	100.0		
3	-11.01	-11.89	Grind - Sterk siltig - Los	1.0	50.0		
4	-11.89	-12.55	Zand - Schoon - Matig	1.0	100.0		
5	-12.55	-13.29	Leem - Zwak zandig - Vast	1.0	50.0		
6	-13.29	-18.66	Zand - Sterk siltig - Kleiig	1.0	100.0		

BODEMPROFIELGEGEVENS: B 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
d50-reductie is meegenomen overeenkomstig NEN-EN 9997 art. 7.6.2.3 (i)
Hoogte maaiveld [m] : 0.00 Grondwaterstand [m] : -1.00

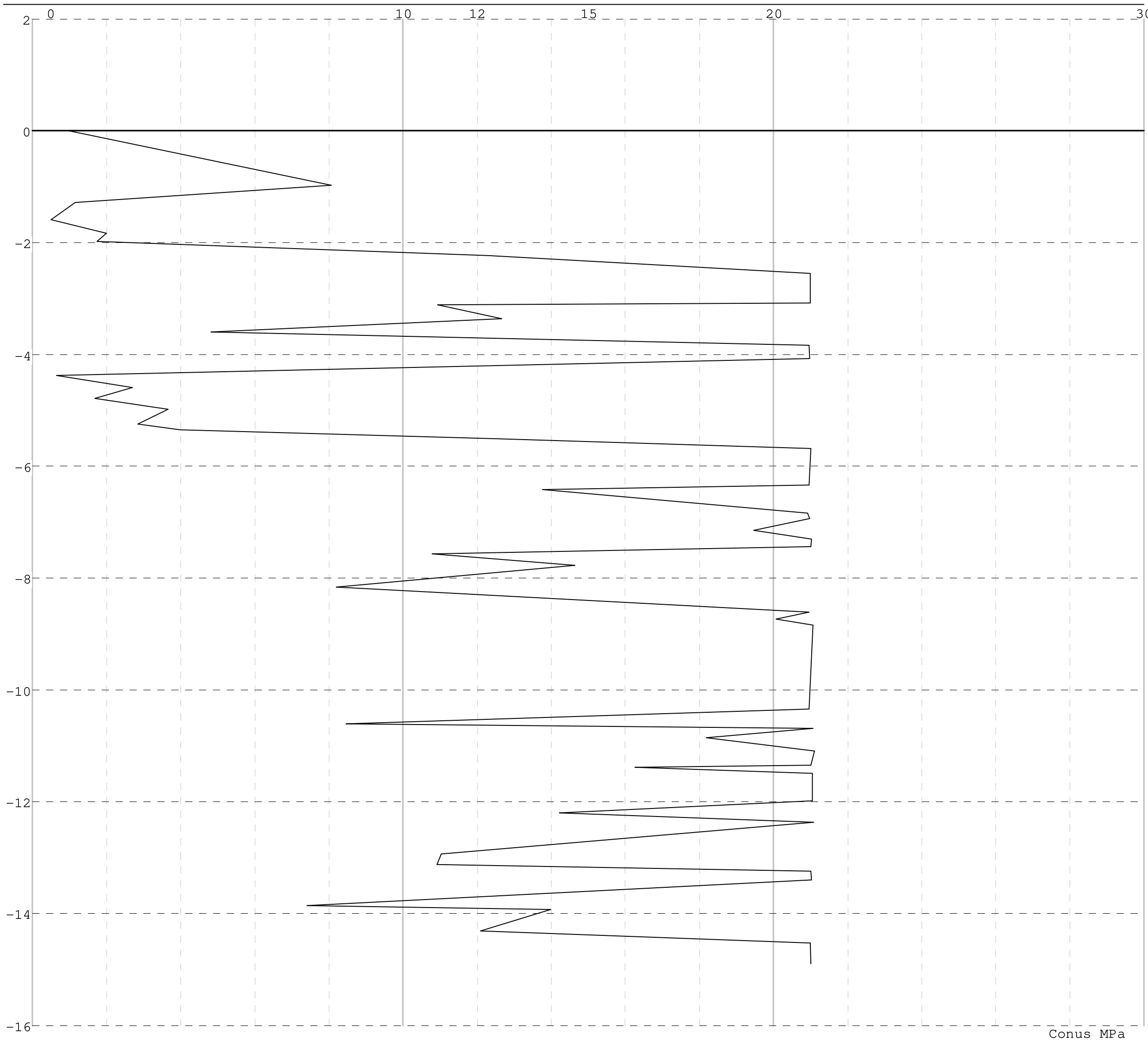
Laag	Van [m]	Tot [m]	Omschrijving	OCR	Aandeel pos. kleef [%]	α_s	d_{50} [mm]
1	0.00	-1.11	Klei - Zwak zandig - Matig	1.0	50.0		
2	-1.11	-1.37	Zand - Schoon - Los	1.0	100.0		
3	-1.37	-3.70	Klei - Zwak zandig - Slap	1.0	50.0		
4	-3.70	-5.81	Veen - Matig voorbelast - Matig	1.0	50.0		
5	-5.81	-8.97	Zand - Schoon - Matig	1.0	100.0		
6	-8.97	-9.38	Leem - Zwak zandig - Vast	1.0	50.0		
7	-9.38	-13.74	Zand - Sterk siltig - Kleiig	1.0	100.0		
8	-13.74	-13.77	Leem - Zwak zandig - Vast	1.0	50.0		
9	-13.77	-14.22	Zand - Sterk siltig - Kleiig	1.0	100.0		
10	-14.22	-14.40	Leem - Zwak zandig - Vast	1.0	50.0		
11	-14.40	-15.62	Zand - Zwak siltig - Kleiig	1.0	100.0		
12	-15.62	-16.81	Leem - Zwak zandig - Vast	1.0	50.0		
13	-16.81	-16.99	Zand - Schoon - Los	1.0	100.0		

SONDERINGSGEGEVENS ALGEMEEN: S 92 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.01 Bodemprofiel: B 92 RSD - MDK
Traject negatieve kleef : 0.00 tot -1.60 [m]
Traject positieve kleef : -1.80 tot -14.90 [m]

Project : ZW-Oost
Onderdeel : D3 TOSP druk

SONDERINGSGEGEVENS GRAFIEK: S 92 RSD - MDK



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Project              : ZW-Oost
Onderdeel            : D3 TOSP druk
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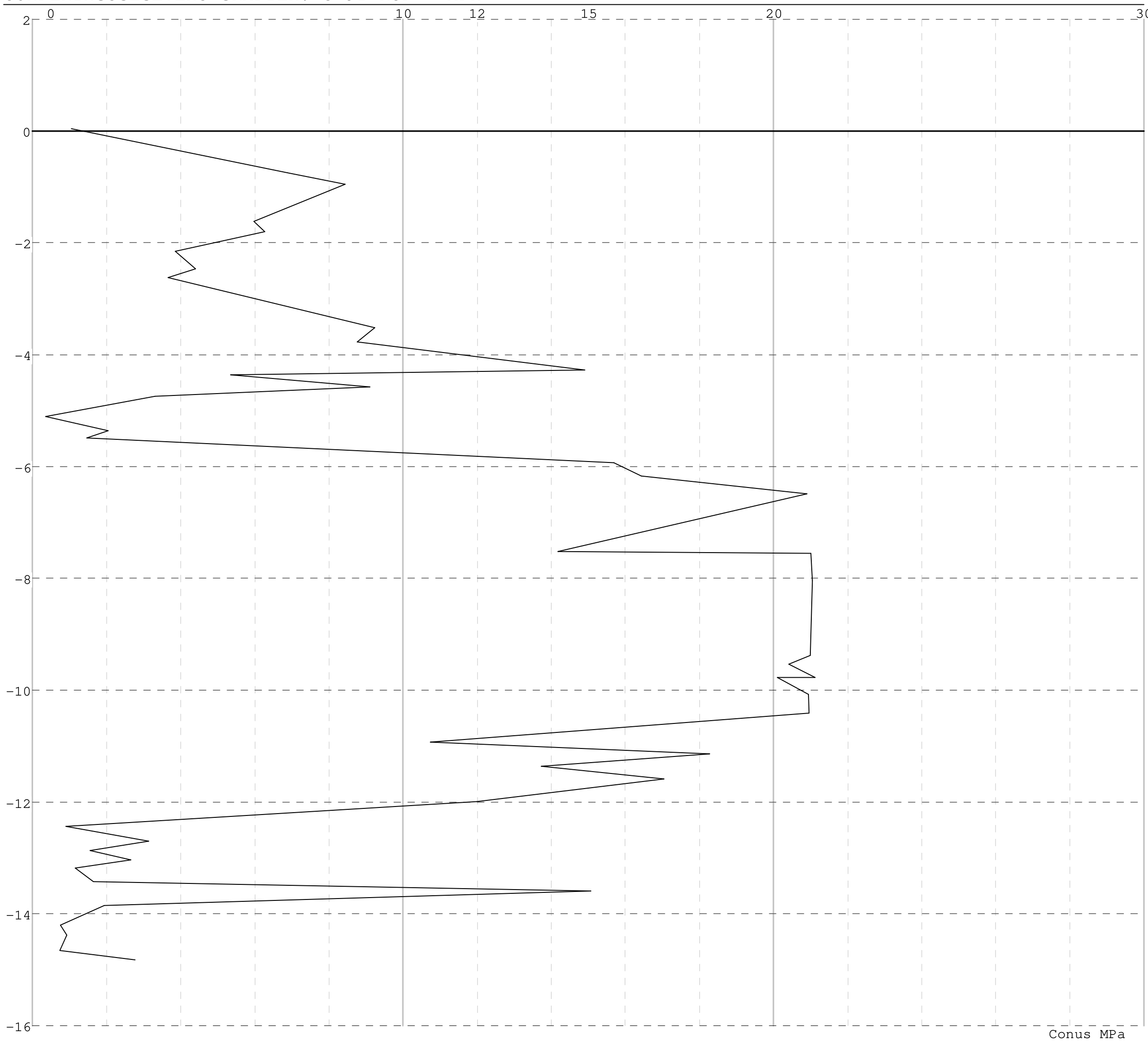
SONDERINGSGEGEVENS ALGEMEEN: S 91 RSD - MDK

```
Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m]     :   0.04     Bodemprofiel: B 91 RSD - MDK
Traject negatieve kleef :   0.04     tot    -2.60 [m]
Traject positieve kleef :  -2.70     tot   -14.82 [m]
```

SONDERINGSGEGEVENS GRAFIEK: S 91 RSD - MDK

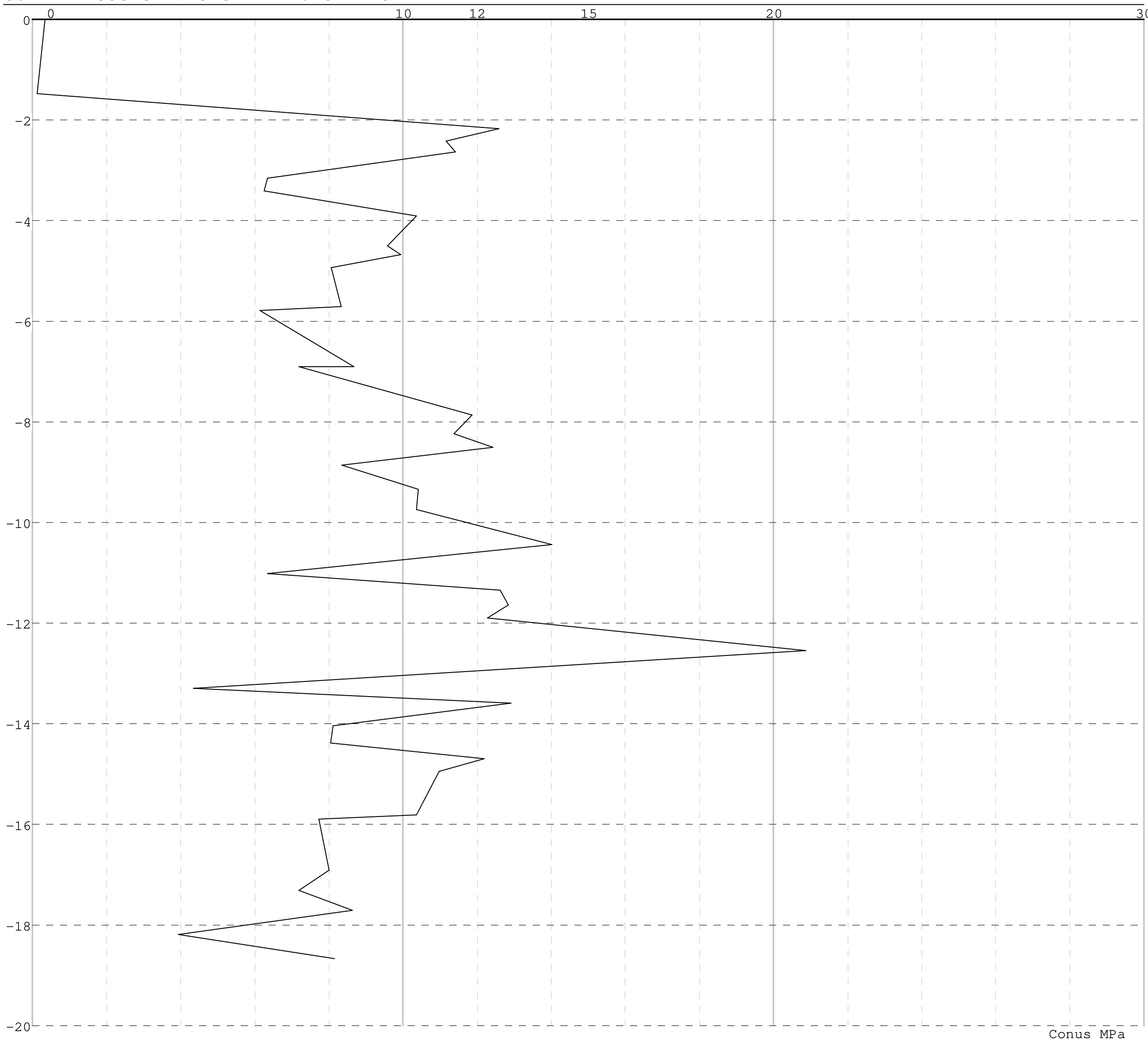


Project : ZW-Oost
Onderdeel : D3 TOSP druk

SONDERINGSGEGEVENS ALGEMEEN: S 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.00 Bodemprofiel: B 22 GT - ZBH
Traject negatieve kleef : -0.10 tot -1.40 [m]
Traject positieve kleef : -1.70 tot -18.66 [m]

SONDERINGSGEGEVENS GRAFIEK: S 22 GT - ZBH

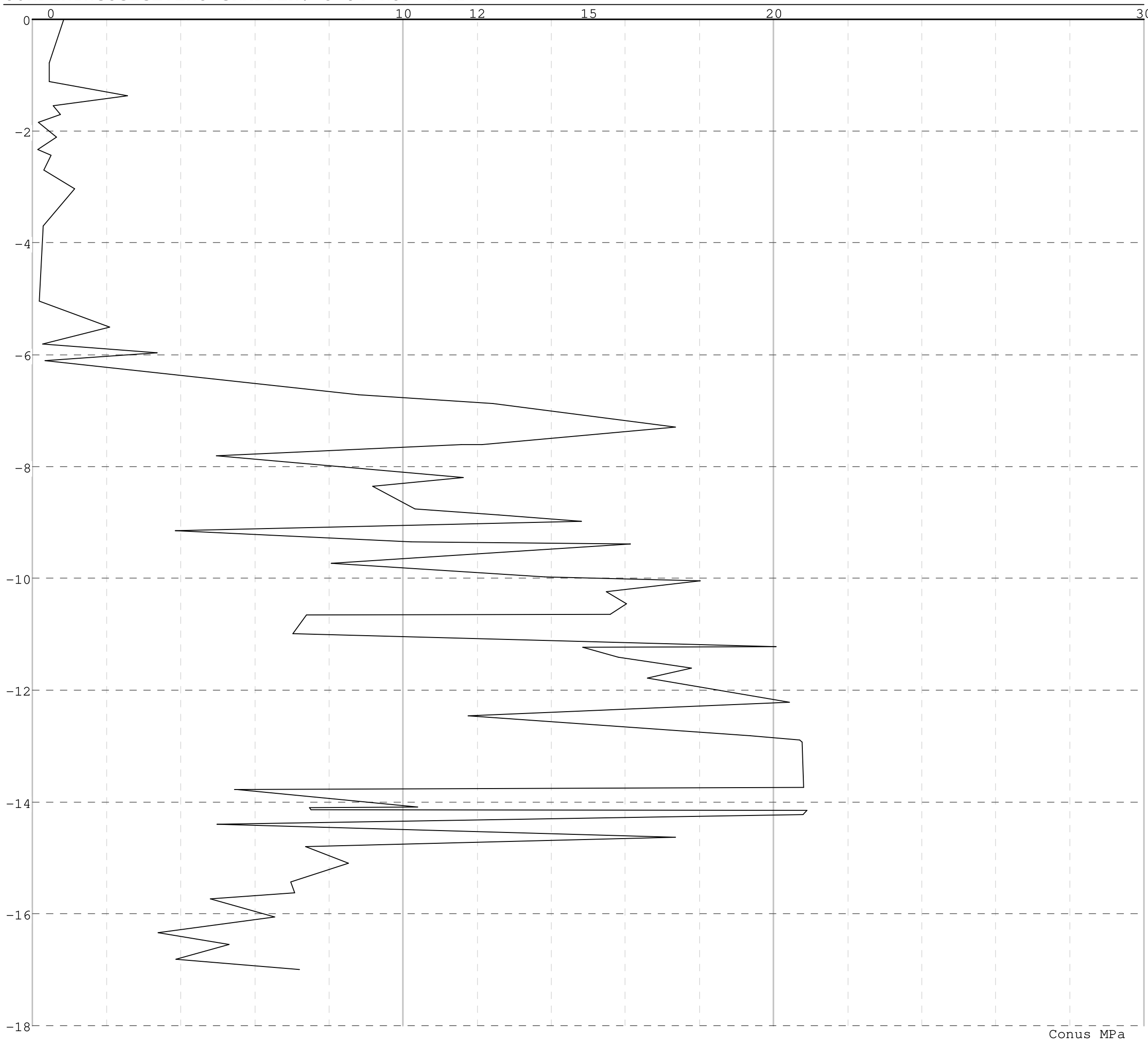


Project : ZW-Oost
Onderdeel : D3 TOSP druk

SONDERINGSGEGEVENS ALGEMEEN: S 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.
Hoogte maaiveld [m] : 0.00 Bodemprofiel: B 84 RSD - MDK
Traject negatieve kleef : -0.10 tot -6.40 [m]
Traject positieve kleef : -6.50 tot -16.99 [m]

SONDERINGSGEGEVENS GRAFIEK: S 84 RSD - MDK



REKENGEGEVENS 22 GT - ZBH

Berekening : Controlerend
Rekenmethode : Drukpalen volgens NEN-EN 1997-1, art. 7.6.2
Sondering(en) : S 22 GT - ZBH

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.20
$\gamma_{f;nk}$: 1.0
$R_{s;cal;max;i}$ begrenzen op 0.75 * $R_{b;cal;max;i}$: NEE
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -9.90
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
$s_{req;1}$ [m] : 0.15 $s_{req;2}$ [m] : 0.05
Bovenbel. [kN/m²] : 0.00

RESULTATEN 22 GT - ZBH (n=1)

Sondering : S 22 GT - ZBH

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Niveau [m]	R_b [kN]	R_s [kN]	$R_{c;cal}$ [kN]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	R_{cnd} [kN]	$F_{c;tot;1}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-9.90	633.5	957.9	1591	1145	954.1	-4.3	949.8	-4.3	0.00	-0.0	-0.0

Project : ZW-Oost
Onderdeel : D3 TOSP druk

SAMENVATTINGSTABEL 22 GT - ZBH (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{b;cal}$ [kN]	$R_{s;cal}$ [kN]	$R_{c;cal}$ [kN]	Rekenwaarden $R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]
S 22 GT - ZBH	0.00	-9.90	633.5	957.9	1591.4	954.1	-4.3	949.8

Totaal resultaten 22 GT - ZBH (van 1 sonderingen)

Uitgangspunten
Correlatiefactor ξ_{3gem} (n= 1) : 1.39
Correlatiefactor ξ_{4min} (n= 1) : 1.39

gebaseerd op sonderingen:
S 22 GT - ZBH

$R_{c;k}$ = min.{ $R_{c;cal;gem}/\xi_3$; $R_{c;cal;min}/\xi_4$ } (7.8)

Inheiniveau [m]	
-9.90	$R_{c;k}$ = min.{(1591.4/ 1.39);(1591.4/ 1.39)}= 1144.9

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{c;tot;1}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-9.90	1144.9	954.1	-4.3	-4.3	949.8	0.00	-0.0	-0.0

REKENGEGEVENS 91 RSD - MDK

Berekening : Controlerend
Rekenmethode : Drukpalen volgens NEN-EN 1997-1, art. 7.6.2
Sondering(en) : S 91 RSD - MDK

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.20
$\gamma_{f;nk}$: 1.0
$R_{s;cal;max;i}$ begrenzen op 0.75 * $R_{b;cal;max;i}$: NEE
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -8.80
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
$s_{req;1}$ [m] : 0.15 $s_{req;2}$ [m] : 0.05
Bovenbel. [kN/m²] : 0.00

RESULTATEN 91 RSD - MDK (n=1)

Sondering : S 91 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Niveau [m]	R_b [kN]	R_s [kN]	$R_{c;cal}$ [kN]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	R_{cnd} [kN]	$F_{c;tot;1}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-8.80	1510	910.7	2421	1741	1451	-20.1	1431	-20.1	0.01	-0.1	-0.0

Project : ZW-Oost
Onderdeel : D3 TOSP druk

SAMENVATTINGSTABEL 91 RSD - MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{b;cal}$ [kN]	$R_{s;cal}$ [kN]	$R_{c;cal}$ [kN]	Rekenwaarden $R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]
S 91 RSD - MDK	0.04	-8.80	1510.0	910.7	2420.7	1451.2	-20.1	1431.2

Totaal resultaten 91 RSD - MDK (van 1 sonderingen)

Uitgangspunten
Correlatiefactor ξ_{3gem} (n= 1) : 1.39
Correlatiefactor ξ_{4min} (n= 1) : 1.39

gebaseerd op sonderingen:
S 91 RSD - MDK

$R_{c;k}$ = min.{ $R_{c;cal;gem}/\xi_3$; $R_{c;cal;min}/\xi_4$ } (7.8)

Inheiniveau [m]	
-8.80	$R_{c;k}$ = min.{(2420.7/ 1.39);(2420.7/ 1.39)}= 1741.5

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{c;tot;1}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-8.80	1741.5	1451.2	-20.1	-20.1	1431.2	0.01	-0.1	-0.0

REKENGEGEVENS 92 RSD - MDK

Berekening : Controlerend
Rekenmethode : Drukpalen volgens NEN-EN 1997-1, art. 7.6.2
Sondering(en) : S 92 RSD - MDK

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.20
$\gamma_{f;nk}$: 1.0
$R_{s;cal;max;i}$ begrenzen op 0.75 * $R_{b;cal;max;i}$: NEE
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -9.30
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
$s_{req;1}$ [m] : 0.15 $s_{req;2}$ [m] : 0.05
Bovenbel. [kN/m²] : 0.00

RESULTATEN 92 RSD - MDK (n=1)

Sondering : S 92 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Niveau [m]	R_b [kN]	R_s [kN]	$R_{c;cal}$ [kN]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	R_{cnd} [kN]	$F_{c;tot;1}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-9.30	925.9	1165	2091	1504	1254	-10.2	1243	-10.2	0.01	-0.0	-0.0

Project : ZW-Oost
Onderdeel : D3 TOSP druk

SAMENVATTINGSTABEL 92 RSD - MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{b;cal}$ [kN]	$R_{s;cal}$ [kN]	$R_{c;cal}$ [kN]	Rekenwaarden $R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]
S 92 RSD - MDK	0.01	-9.30	925.9	1165.2	2091.1	1253.7	-10.2	1243.4

Totaal resultaten 92 RSD - MDK (van 1 sonderingen)

Uitgangspunten
Correlatiefactor ξ_{3gem} (n= 1) : 1.39
Correlatiefactor ξ_{4min} (n= 1) : 1.39

gebaseerd op sonderingen:
S 92 RSD - MDK

$R_{c;k}$ = min.{ $R_{c;cal;gem}/\xi_3$; $R_{c;cal;min}/\xi_4$ } (7.8)

Inheiniveau [m]	
-9.30	$R_{c;k}$ = min.{(2091.1/ 1.39);(2091.1/ 1.39)}= 1504.4

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{c;tot;1}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-9.30	1504.4	1253.7	-10.2	-10.2	1243.4	0.01	-0.0	-0.0

REKENGEGEVENS 84 RSD - MDK

Berekening : Controlerend
Rekenmethode : Drukpalen volgens NEN-EN 1997-1, art. 7.6.2
Sondering(en) : S 84 RSD - MDK

Stijf bouwwerk : NEE
Paalgroep : NEE
Aantal sonderingen : 1
Factor $\xi_{3\ (n=1)}$: 1.39
Factor $\xi_{3\ (gem)}$: 1.39
Factor $\xi_{4\ (min)}$: 1.39
Weerstandsfactor γ_R : 1.20
$\gamma_{f;nk}$: 1.0
$R_{s;cal;max;i}$ begrenzen op 0.75 * $R_{b;cal;max;i}$: NEE
UGT draagvermogen zonder negatieve kleef : NEE

Paal : Larssen LP2
Niveau paalkop [m] : N.A.P. 0.00
Paalpuntniveau : N.A.P. -12.30
$E_{d;1}$ [kN] : 0.00 $E_{d;2}$ [kN] : 0.00
$s_{req;1}$ [m] : 0.15 $s_{req;2}$ [m] : 0.05
Bovenbel. [kN/m²] : 0.00

RESULTATEN 84 RSD - MDK (n=1)

Sondering : S 84 RSD - MDK

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Niveau [m]	R_b [kN]	R_s [kN]	$R_{c;cal}$ [kN]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	R_{cnd} [kN]	$F_{c;tot;1}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-12.30	731.7	892.0	1624	1168	973.4	-80.2	893.2	-80.2	0.08	-0.3	-0.3

Project : ZW-Oost
Onderdeel : D3 TOSP druk

SAMENVATTINGSTABEL 84 RSD - MDK (n=1)

Uitgangspunten
- paal : Larssen LP2
- paaltype : Eigen paal
- schachtafmeting : 314 x 410

Paalklassefactor α_p : 0.70
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Correlatiefactor $\xi_{3(n=1)}$: 1.39

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	Bezwijkdraagvermogen $R_{b;cal}$ [kN]	$R_{s;cal}$ [kN]	$R_{c;cal}$ [kN]	Rekenwaarden $R_{c;d}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]
S 84 RSD - MDK	0.00	-12.30	731.7	892.0	1623.7	973.4	-80.2	893.2

Totaal resultaten 84 RSD - MDK (van 1 sonderingen)

Uitgangspunten
Correlatiefactor ξ_{3gem} (n= 1) : 1.39
Correlatiefactor ξ_{4min} (n= 1) : 1.39

gebaseerd op sonderingen:
S 84 RSD - MDK

$R_{c;k}$ = min.{ $R_{c;cal;gem}/\xi_3$; $R_{c;cal;min}/\xi_4$ } (7.8)

Inheiniveau [m]	
-12.30	$R_{c;k}$ = min.{(1623.7/ 1.39);(1623.7/ 1.39)}= 1168.1

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

Inheiniveau [m]	$R_{c;k}$ [kN]	$R_{c;d}$ [kN]	$F_{c;tot;1}$ [kN]	$F_{nk;d}$ [kN]	$R_{c;netto;d}$ [kN]	U.C.	$s_{1;1}$ [mm]	$s_{1;2}$ [mm]
-12.30	1168.1	973.4	-80.2	-80.2	893.2	0.08	-0.3	-0.3

PAALGEGEVENS Larssen LP2

Type : Eigen paal
Basispaaltype : Stalen buispaal (gesloten)
Wijze van installeren : Heien
Wijze van terugwinnen : n.v.t.
Afmeting a [m] : 0.314
Afmeting b [m] : 0.410
Elasticiteitsmodulus [N/mm²] : 40000
Factor α_s (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)
Factor α_t (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)
Paalklassefactor α_p : 0.70
Paalvoetvormfactor β : 1.00
Type lastzakkingsdiagram : Grondverdringende paal
Verm.factor * $\varphi'_{j;k}$: 0.75
Groutomhulling : NEE

Project : ZW-Oost
Onderdeel : D3 TOSP druk

OVERZICHT NETTO DRAAGVERMOGEN DRUKPALEN

Netto paaldraagvermogen(s) zijn naar beneden toe afgerond op: 1.0 kN nauwkeurig
Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

sondering	maaiveld niveau	paalpunt niveau	$R_{c;netto;d}$ [kN] 22 GT - Z	91 RSD -	92 RSD -	84 RSD -
S 92 RSD - MDK	0.01	-9.30			1243	
S 91 RSD - MDK	0.04	-8.80		1431		
S 22 GT - ZBH	0.00	-9.90	949			
S 84 RSD - MDK	0.00	-12.30				893

Project: GT-ZBH150
Mast: 22 - D+3.6

Shear blocks

NEN-EN 1993-1-1 en NEN-EN 1994-1-1

Datum: 2022-04-06
Auteur: TBR
Versie: 1.4

Load			
Compression	$F_{Ed,c}$	**496**	kN
Tension	$F_{Ed,t}$	**410**	kN

Results			
Compression	U.C.	0.90	< 1,00 OK
Tension	U.C.	0.81	< 1,00 OK

Main leg

Profile		**L120.11**	
Steel material		S235	
Cross section		2540	mm^2
Axial capacity	N_{pl}	597	kN
Width	b	120	mm
Thickness	t	11	mm
Length in concrete		1125	mm

Shear blocks main leg

Width	b	50	mm
Thickness	h	30	mm
Length	L	110	mm
Welds	a	4	mm
c.t.c. separation	s	150	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Foot plate

Thickness	t	25	mm
Ext. length	m	10	mm
Welds	a	5	mm

Pile

Name		Buispaal	
Diameter		470	mm
Thickness		10	mm
Cross section		14451	mm^2
Steel material		S235	
Capacity		3396	kN
Concrete strength		C25/30	

Shear blocks pile

Width	b	100	mm
Thickness	h	30	mm
Length	L	150	mm
Welds	a	4	mm
c.t.c. separation	s	200	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Design value concrete strength

Material factor	γ_c	1.5	
Add. mat. factor	γ_m	1.25	-
f_{cd} =		13.3	N/mm^2

Steel tower stub

Yield strength	f_{yd} =	235	N/mm^2
Tensile strength	f_{ud} =	360	N/mm^2

Capacity shear blocks main leg

A_{f1} =	3300	mm^2
A_{f2} =	7500	mm^2
Slope	1:	5
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1.51	
$f_{jd} = C_A \times f_{cd}$ =	20.1	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	398	kN
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	398	kN

Capacity foot plate

k_d =	1.73	-
$f_{jd} = C_A \times f_{cd}$ =	23.1	N/mm^2
$c = t\sqrt{(f_{yd} / 3f_{jd})}$ =	49	mm
$m^* = \min(c,m)$ =	10	mm
Type foot plate	Diagonally cut	
Effective for	Compr. and tension	
$A_{p,c}$ =	7162	mm^2
$F_{Rd,c} = A_{p,druk} \times f_{jd}$ =	165	kN
$A_{p,t}$ =	4622	mm^2
$F_{Rd,t} = A_{p,t} \times f_{jd}$ =	107	kN

Capacities

$F_{rd,c,plate}$ =	165	kN	
$F_{rd,blocks,c}$ =	398	kN	
$F_{rd,c} = F_{rd,blck} + F_{rd,footplate}$ =	**563**	kN	
U.C. compression	0.88	< 1,00 OK	
Welds foot plate (see next page)	476	kN	
$F_{rd,t}$ = min. (welds / foot plate) =	107	kN	
$F_{rd,blocks,t}$ =	398	kN	
$F_{rd,t} = F_{rd,blck} + F_{rd,footplate}$ =	**505**	kN	
U.C. tension	0.81	< 1,00 OK	
U.C. welds	0.55	< 1,00 OK	

Capacity shear blocks pile

A_{f1} =	4500	mm^2
A_{f2} =	10500	mm^2
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1.53	-
$f_{jd} = k_d \times f_{cd}$ =	20.4	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	**550**	kN
U.C. compression	0.90	< 1,00 OK
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	**550**	kN
U.C. tension	0.75	< 1,00 OK
U.C. welds	0.41	< 1,00 OK

"Splitting" of pile

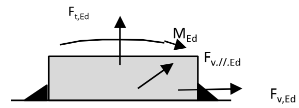
Spread of forces		45	°
Length force flow		900	mm
Splitting force		228	kN/m
Yield strength wall	f_{yd} =	235	N/mm^2
Capacity tubular pile		4700	kN/m
U.C.		0.05	< 1,00 OK

Project: GT-ZBH150
Mast: 22 - D+3.6

Welds of shear blocks of main leg

Out-of-plane loading

Plate			**Welds**		
t =	50	mm	a =	4	mm
Grade	S235		l =	110	mm
f_{yd} =	235	N/mm²	β_w =	0.8	-
f_u =	360	N/mm²	γ_{M2} =	1.25	-



Member forces			**Stress components**		
Factor	1.2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 4al$ =	0	N/mm²
$F_{t,Ed}$ =	**0**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 4al$ =	64	N/mm²
$F_{v,Ed} = F_{rd,c} / n$ =	**80**	kN		64	N/mm²
$F_{v//,Ed}$ =	**0**	kN	$b^* = b + 2/3a\sqrt{2}$	53.8	mm
$M_{Ed} = 1/2\ b / h \times F_{v,Ed}$ =	**1.19**	kNm	$\sigma_1 = \tau_1 = 0{,}706M_{Ed} / al\ b^*$ =	36	N/mm²
			$\tau_{//} = F_{v//,Ed} / 2al$ =	0	N/mm²
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =	199	N/mm²

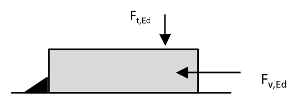
Check

$\sigma_{vw,Ed}$ =	199	N/mm²	≤	$f_u / \beta_w \gamma_{M2}$ =	360	N/mm²	U.C. =	**0.55** OK
σ_1 =	100	N/mm²	≤	$0{,}9 f_u / \gamma_{M2}$ =	259	N/mm²	U.C. =	**0.38** OK

Welds of shear blocks of pile

Out-of-plane loading

Plate			**Welds**		
t =	100	mm	a =	4	mm
Grade	S235		l =	150	mm
f_{yd} =	235	N/mm²	β_w =	0.8	-
f_u =	360	N/mm²	γ_{M2} =	1.25	-



Member forces			**Stress components**		
Factor	1.2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 2al$ =	10	N/mm²
$F_{t,Ed} = 1/2\ b / h \times F_{v,Ed}$ =	**16**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 2al$ =	65	N/mm²
$F_{v,Ed}$ =	**110**	kN		75	N/mm²
$F_{v//,Ed}$ =	**0**	kN			
M_{Ed} =	**0.00**	kNm			
			$\tau_{//} = F_{v//,Ed} / 2al$ =	0	N/mm²
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =	149	N/mm²

Check

$\sigma_{vw,Ed}$ =	149	N/mm²	≤	$f_u / \beta_w \gamma_{M2}$ =	360	N/mm²	U.C. =	**0.41** OK
σ_1 =	75	N/mm²	≤	$0{,}9 f_u / \gamma_{M2}$ =	259	N/mm²	U.C. =	**0.29** OK

Welds of foot plate

$f_u / \beta_w \gamma_{M2}$ =		360	N/mm²
Weld size	a =	5	mm
Length	l = 2b+ 2b - t =	458	mm
Capacity	$F_{Rd} = a \times l \times f_{w,d} / \sqrt{3}$ =	**476**	kN

DNV

Project: GT-ZBH150
Mast: 24 - A

Shear blocks

NEN-EN 1993-1-1 en NEN-EN 1994-1-1

Datum: 2022-04-07
Auteur: TBR
Versie: 1.4

Load				**Results**			
Compression	$F_{Ed,c}$	**603**	kN	Compression	U.C.	0,76	< 1,00 OK
Tension	$F_{Ed,t}$	**523**	kN	Tension	U.C.	0,78	< 1,00 OK

Main leg

Profile		**L160.17**	
Steel material		S235	
Cross section		5182	mm^2
Axial capacity	N_{pl}	1218	kN
Width	b	160	mm
Thickness	t	17	mm
Length in concrete		1125	mm

Shear blocks main leg

Width	b	50	mm
Thickness	h	30	mm
Length	L	150	mm
Welds	a	4	mm
c.t.c. separation	s	150	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Foot plate

Thickness	t	25	mm
Ext. length	m	10	mm
Welds	a	5	mm

Pile

Name		Buispaal	
Diameter		470	mm
Thickness		10	mm
Cross section		14451	mm^2
Steel material		S235	
Capacity		3396	kN
Concrete strength		C25/30	

Shear blocks pile

Width	b	100	mm
Thickness	h	50	mm
Length	L	250	mm
Welds	a	6	mm
c.t.c. separation	s	290	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Design value concrete strength

Material factor	γ_c	1,5	
Add. mat. factor	γ_m	1,25	-
f_{cd} =		13,3	N/mm^2

Steel tower stub

Yield strength	f_{yd} =	235	N/mm^2
Tensile strength	f_{ud} =	360	N/mm^2

Capacity shear blocks main leg

A_{f1} =	4500	mm^2
A_{f2} =	9500	mm^2
Slope	1: 5	
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1,45	
$f_{jd} = C_A \times f_{cd}$ =	19,4	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	523	kN
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	523	kN

Capacity foot plate

k_d =	1,73	-
$f_{jd} = C_A \times f_{cd}$ =	23,1	N/mm^2
$c = t\sqrt{(f_{yd} / 3f_{jd})}$ =	50	mm
$m^* = \min(c,m)$ =	10	mm
Type foot plate	Diagonally cut	
Effective for	Compr. and tension	
$A_{p,c}$ =	11620	mm^2
$F_{Rd,c} = A_{p,druk} \times f_{jd}$ =	268	kN
$A_{p,t}$ =	6438	mm^2
$F_{Rd,t} = A_{p,t} \times f_{jd}$ =	149	kN

Capacities

$F_{rd,c,plate}$ =	268	kN
$F_{rd,blocks,c}$ =	523	kN
$F_{rd,c} = F_{rd,blck} + F_{rd,footplate}$ =	**791**	kN
U.C. compression	0,76	< 1,00 OK
Welds foot plate (see next page)	630	kN
$F_{rd,t}$ = min. (welds / foot plate) =	149	kN
$F_{rd,blocks,t}$ =	523	kN
$F_{rd,t} = F_{rd,blck} + F_{rd,footplate}$ =	**672**	kN
U.C. tension	0,78	< 1,00 OK
U.C. welds	0,53	< 1,00 OK

Capacity shear blocks pile

A_{f1} =	12500	mm^2
A_{f2} =	27000	mm^2
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1,47	-
$f_{jd} = k_d \times f_{cd}$ =	19,6	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	**1470**	kN
U.C. compression	0,41	< 1,00 OK
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	**1470**	kN
U.C. tension	0,36	< 1,00 OK
U.C. welds	0,48	< 1,00 OK

"Splitting" of pile

Spread of forces		45	°
Length force flow		900	mm
Splitting force		291	kN/m
Yield strength wall	f_{yd} =	235	N/mm^2
Capacity tubular pile		4700	kN/m
U.C.		0,06	< 1,00 OK

Project: GT-ZBH150
Mast: 24 - A

Welds of shear blocks of main leg

Out-of-plane loading

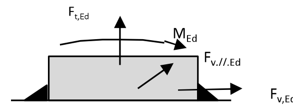


Plate			***Welds***		
t =	50	mm	a =	4	mm
Grade	S235		l =	150	mm
f_{yd} =	235	N/mm^2	β_w =	0,8	-
f_u =	360	N/mm^2	γ_{M2} =	1,25	-

Member forces			***Stress components***		
Factor	1,2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 4al$ =	0	N/mm^2
$F_{t,Ed}$ =	**0**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 4al$ =	62	N/mm^2
$F_{v,Ed} = F_{rd,c} / n$ =	**105**	kN		62	N/mm^2
$F_{v//,Ed}$ =	**0**	kN	$b^* = b + 2/3a\sqrt{2}$	53,8	mm
M_{Ed} = 1/2 b / h x $F_{v,Ed}$ =	**1,57**	kNm	$\sigma_1 = \tau_1 = 0{,}706M_{Ed} / al\,b^*$ =	34	N/mm^2
			$\tau_{//} = F_{v//,Ed} / 2al$ =	0	N/mm^2
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =	192	N/mm^2

Check

$\sigma_{vw,Ed}$ =	192	N/mm^2	≤	$f_u / \beta_w\gamma_{M2}$ =	360	N/mm^2	U.C. =	**0,53** OK
σ_1 =	96	N/mm^2	≤	$0{,}9f_u / \gamma_{M2}$ =	259	N/mm^2	U.C. =	**0,37** OK

Welds of shear blocks of pile

Out-of-plane loading

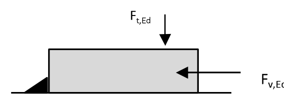


Plate			***Welds***		
t =	100	mm	a =	6	mm
Grade	S235		l =	250	mm
f_{yd} =	235	N/mm^2	β_w =	0,8	-
f_u =	360	N/mm^2	γ_{M2} =	1,25	-

Member forces			***Stress components***		
Factor	1,2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 2al$ =	17	N/mm^2
$F_{t,Ed}$ = 1/2 b / h x $F_{v,Ed}$ =	**73**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 2al$ =	69	N/mm^2
$F_{v,Ed}$ =	**294**	kN		87	N/mm^2
$F_{v//,Ed}$ =	**0**	kN			
M_{Ed} =	**0,00**	kNm			
			$\tau_{//} = F_{v//,Ed} / 2al$ =	0	N/mm^2
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =	173	N/mm^2

Check

$\sigma_{vw,Ed}$ =	173	N/mm^2	≤	$f_u / \beta_w\gamma_{M2}$ =	360	N/mm^2	U.C. =	**0,48** OK
σ_1 =	87	N/mm^2	≤	$0{,}9f_u / \gamma_{M2}$ =	259	N/mm^2	U.C. =	**0,33** OK

Welds of foot plate

$f_u / \beta_w\gamma_{M2}$ =		360	N/mm^2
Weld size	a =	5	mm
Length	l = 2b+ 2b - t =	606	mm
Capacity	$F_{Rd} = a \times l \times f_{w,d} / \sqrt{3}$ =	**630**	kN

DNV

Project: RSD-MDK150
Mast: 92 - D+0

Shear blocks

NEN-EN 1993-1-1 en NEN-EN 1994-1-1

Datum: 2022-04-06
Auteur: TBR
Versie: 1.4

Load				**Results**			
Compression	$F_{Ed,c}$	**407**	kN	Compression	U.C.	0.74	< 1,00 OK
Tension	$F_{Ed,t}$	**332**	kN	Tension	U.C.	0.66	< 1,00 OK

Main leg

Profile		**L120.11**	
Steel material		S235	
Cross section		2540	mm^2
Axial capacity	N_{pl}	597	kN
Width	b	120	mm
Thickness	t	11	mm
Length in concrete		1125	mm

Shear blocks main leg

Width	b	50	mm
Thickness	h	30	mm
Length	L	110	mm
Welds	a	4	mm
c.t.c. separation	s	150	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Foot plate

Thickness	t	25	mm
Ext. length	m	10	mm
Welds	a	5	mm

Pile

Name		Buispaal	
Diameter		470	mm
Thickness		10	mm
Cross section		14451	mm^2
Steel material		S235	
Capacity		3396	kN
Concrete strength		C25/30	

Shear blocks pile

Width	b	100	mm
Thickness	h	30	mm
Length	L	150	mm
Welds	a	4	mm
c.t.c. separation	s	200	mm
Number for compr.	n_c	6	-
Number for tension	n_t	6	-

Design value concrete strength

Material factor	γ_c	1.5	
Add. mat. factor	γ_m	1.25	-
f_{cd} =		13.3	N/mm^2

Steel tower stub

Yield strength	f_{yd} =	235	N/mm^2
Tensile strength	f_{ud} =	360	N/mm^2

Capacity shear blocks main leg

A_{f1} =	3300	mm^2
A_{f2} =	7500	mm^2
Slope	1:	5
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1.51	
$f_{jd} = C_A \times f_{cd}$ =	20.1	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	398	kN
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	398	kN

Capacity foot plate

k_d =	1.73	-
$f_{jd} = C_A \times f_{cd}$ =	23.1	N/mm^2
$c = t\sqrt{(f_{yd} / 3f_{jd})}$ =	49	mm
$m^* = \min(c,m)$ =	10	mm
Type foot plate	Diagonally cut	
Effective for	Compr. and tension	
$A_{p,c}$ =	7162	mm^2
$F_{Rd,c} = A_{p,druk} \times f_{jd}$ =	165	kN
$A_{p,t}$ =	4622	mm^2
$F_{Rd,t} = A_{p,t} \times f_{jd}$ =	107	kN

Capacities

$F_{rd,c,plate}$ =	165	kN	
$F_{rd,blocks,c}$ =	398	kN	
$F_{rd,c} = F_{rd,blck} + F_{rd,footplate}$ =	**563**	kN	
U.C. compression	0.72	< 1,00 OK	
Welds foot plate (see next page)	476	kN	
$F_{rd,t}$ = min. (welds / foot plate) =	107	kN	
$F_{rd,blocks,t}$ =	398	kN	
$F_{rd,t} = F_{rd,blck} + F_{rd,footplate}$ =	**505**	kN	
U.C. tension	0.66	< 1,00 OK	
U.C. welds	0.55	< 1,00 OK	

Capacity shear blocks pile

A_{f1} =	4500	mm^2
A_{f2} =	10500	mm^2
$C_A = \sqrt{(A_{f2}/A_{f1})}$ =	1.53	-
$f_{jd} = k_d \times f_{cd}$ =	20.4	N/mm^2
$F_{Rd,c} = n_c \times A_{f1} \times f_{jd}$ =	**550**	kN
U.C. compression	0.74	< 1,00 OK
$F_{Rd,t} = n_t \times A_{f1} \times f_{jd}$ =	**550**	kN
U.C. tension	0.60	< 1,00 OK
U.C. welds	0.41	< 1,00 OK

"Splitting" of pile

Spread of forces		45	°
Length force flow		900	mm
Splitting force		184	kN/m
Yield strength wall	f_{yd} =	235	N/mm^2
Capacity tubular pile		4700	kN/m
U.C.		0.04	< 1,00 OK

Project: RSD-MDK150
Mast: 92 - D+0

Welds of shear blocks of main leg

Out-of-plane loading

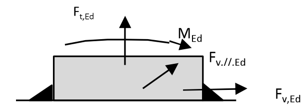


Plate			***Welds***			
t =	50	mm	a =	4	mm	
Grade	S235		l =	110	mm	
f_{yd} =	235	N/mm²	β_w =	0.8	-	
f_u =	360	N/mm²	γ_{M2} =	1.25	-	
Member forces			***Stress components***			
Factor	1.2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 4al$ =		0	N/mm²
$F_{t,Ed}$ =	**0**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 4al$ =		64	N/mm²
$F_{v,Ed} = F_{rd,c} / n$ =	**80**	kN			64	N/mm²
$F_{v//,Ed}$ =	**0**	kN	$b^* = b + 2/3a\sqrt{2}$		53.8	mm
$M_{Ed} = 1/2\ b / h \times F_{v,Ed}$ =	**1.19**	kNm	$\sigma_1 = \tau_1 = 0{,}706 M_{Ed} / al\ b^*$ =		36	N/mm²
			$\tau_{//} = F_{v//,Ed} / 2al$ =		0	N/mm²
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =		199	N/mm²

Check

$\sigma_{vw,Ed}$ =	199	N/mm²	≤	$f_u / \beta_w \gamma_{M2}$ =	360	N/mm²	U.C. =	**0.55** OK
σ_1 =	100	N/mm²	≤	$0{,}9 f_u / \gamma_{M2}$ =	259	N/mm²	U.C. =	**0.38** OK

Welds of shear blocks of pile

Out-of-plane loading

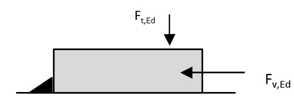


Plate			***Welds***			
t =	100	mm	a =	4	mm	
Grade	S235		l =	150	mm	
f_{yd} =	235	N/mm²	β_w =	0.8	-	
f_u =	360	N/mm²	γ_{M2} =	1.25	-	
Member forces			***Stress components***			
Factor	1.2		$\sigma_1 = \tau_1 = F_{t,Ed}\sqrt{2} / 2al$ =		10	N/mm²
$F_{t,Ed} = 1/2\ b / h \times F_{v,Ed}$ =	**16**	kN	$\sigma_1 = \tau_1 = F_{v,Ed}\sqrt{2} / 2al$ =		65	N/mm²
$F_{v,Ed}$ =	**110**	kN			75	N/mm²
$F_{v//,Ed}$ =	**0**	kN				
M_{Ed} =	**0.00**	kNm				
			$\tau_{//} = F_{v//,Ed} / 2al$ =		0	N/mm²
			$\sigma_{vw,Ed} = \sqrt{(\sigma_1^2 + 3\tau_1^2 + 3\tau_{//}^2)}$ =		149	N/mm²

Check

$\sigma_{vw,Ed}$ =	149	N/mm²	≤	$f_u / \beta_w \gamma_{M2}$ =	360	N/mm²	U.C. =	**0.41** OK
σ_1 =	75	N/mm²	≤	$0{,}9 f_u / \gamma_{M2}$ =	259	N/mm²	U.C. =	**0.29** OK

Welds of foot plate

$f_u / \beta_w \gamma_{M2}$ =		360	N/mm²
Weld size	a =	5	mm
Length	l = 2b+ 2b - t =	458	mm
Capacity	$F_{Rd} = a \times l \times f_{w,d} / \sqrt{3}$ =	**476**	kN

APPENDIX D
BEAMS

INTRODUCTION

In the BO phase, calculations were performed on the towers. The members were checked in PLS-TOWER. The elaboration of the report has shown that the beams need additional calculations and checks, since these cannot be tested in PLS-TOWER. This memo describes the result of the checking. A reinforcement proposal has been worked out for the components that do not comply.

STRUCTURE LOADS

There are four locations with OSPs, with an existing tower on either side. The beams of the suspension tower types D+0 and D+3.6 are examined for the bending load. Decisive for the load is the proximity to the riser point and the change of direction towards the riser point. Table 1 shows that the loads can be divided into two situations, one with a large angle, one with a small angle.

Table 1 Overview locations with structural loads

Line	Tower No	Tower Type	Span (m)	Direction change (m)	Max. angle conductor (°)	Loading situation
GT-ZBH150	20	D+0	160	6	2	1
GT-ZBH150	22	D+3.6	100	36	20	2
GT-ZBH150	24	A	170			
GT-ZBH150	32	D+0	160	6	2	1
RSD-MDK150	82	H130	175			
RSD-MDK150	84	D+0	145	16	6	1
RSD-MDK150	91	D+0	90	20	13	2
RSD-MDK150	92	D+0	67/95	18	11	2

The following tables show the loads from PLS-TOWER for towers of situation 1 and situation 2.

Tower loading situation 2

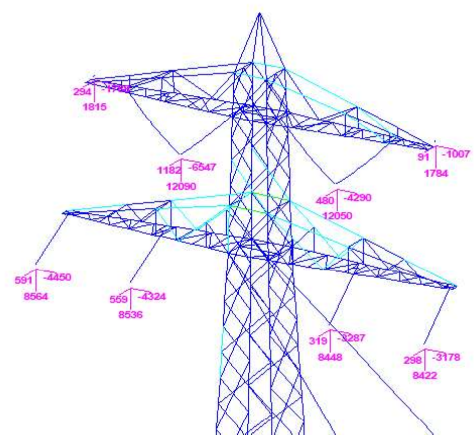
Towers 22 (table 2) and 92 (table 3) were examined. Tower 91 has not been found to be decisive because the vertical load is smaller than tower 92. Loads are shown for “afkeur” and “verbouw” level due to possible need for reinforcements.

A comparison between the two locations shows that the loads are highest at tower 22. These are used in the calculations.

Revision 4: at tower 22 the insulator string at the outer corner of the lower cross arm will be changed to a “hangende afspanning”. The changes to structural loads were found to be negligible, the loads that were determined with the vertical insulator chain were kept in the calculation.

The impact of the change to “hangende afspanning” was investigated with PLS-CADD. With 1 m pivoting length, the conductor tension was determined to be 79% of the EDS-tension. This is within the 80% value that was used in the calculations, so no revision of the conductor loads was required.

Table 2 Structural loads for D+3.6 (GT-ZBH tower 22)[1]

<table>
<tr><td>SLS 7</td><td>
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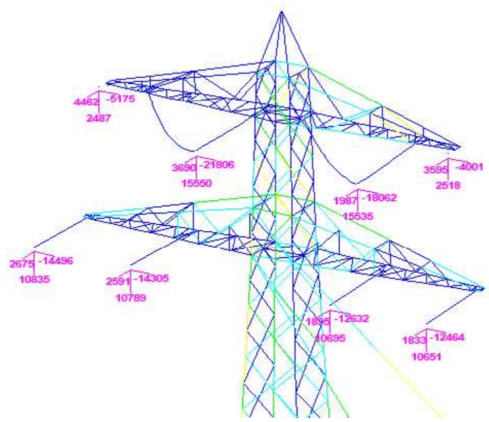
<tr><td>ULS 1a_90</td><td>
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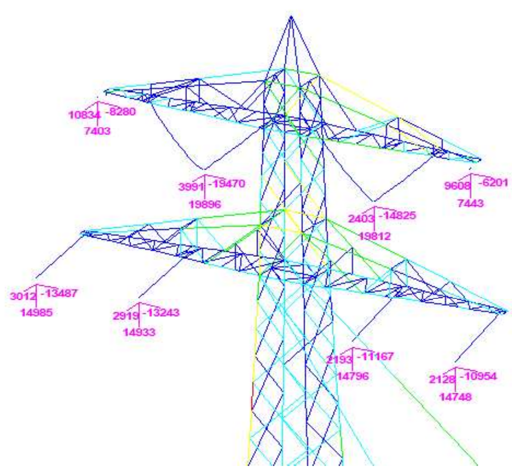
<tr><td>ULS 3_90</td><td>
</td></tr>
</table>

[1] The pictures shows a supporting guy-wire which was eventually not applied. The presence of the guy wire has no influence to the loads.

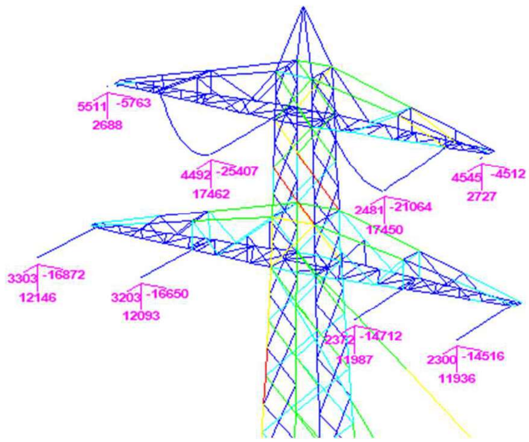
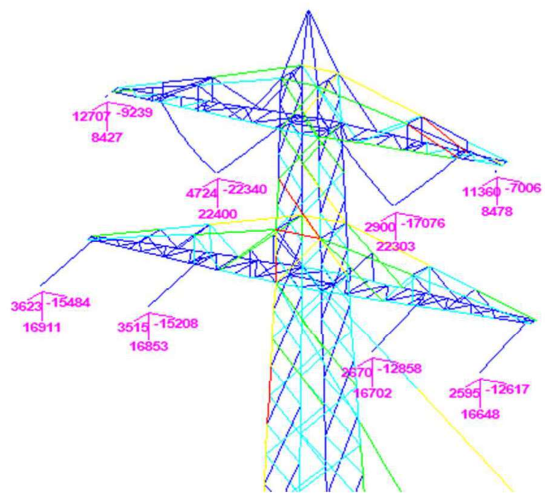
ULS 1a_90 (verbouw)	
ULS 3_90 (verbouw)	

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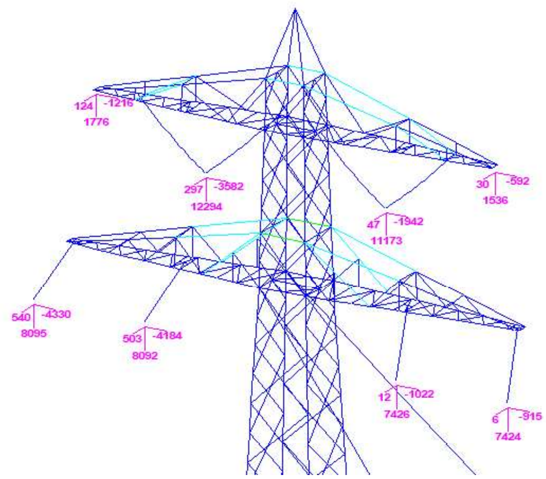
Table 3 Structural loads for D+0 (RSD-MDK tower 92)

<table>
<tr><td>SLS 7</td><td>
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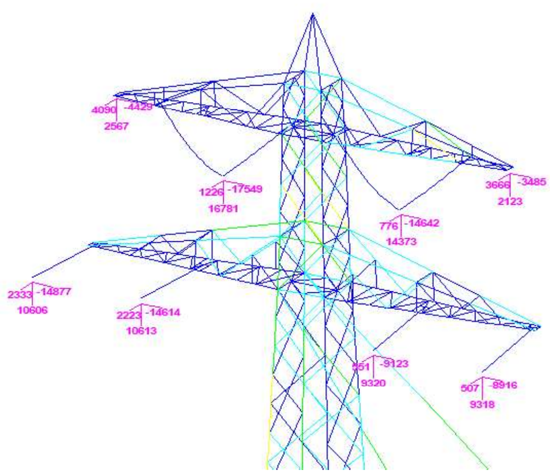
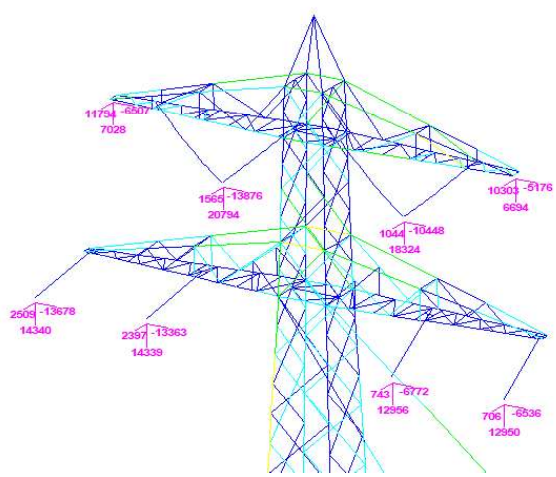
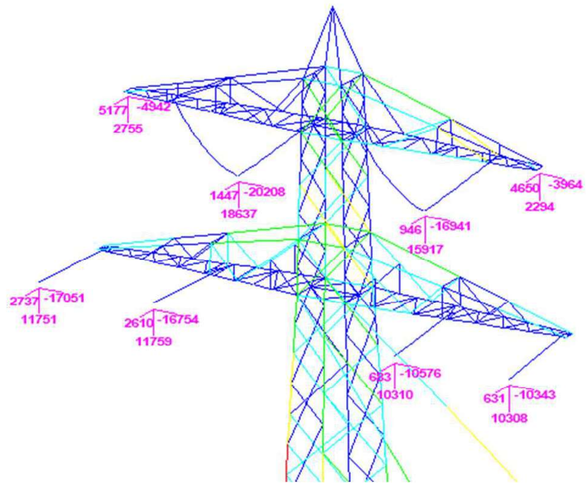
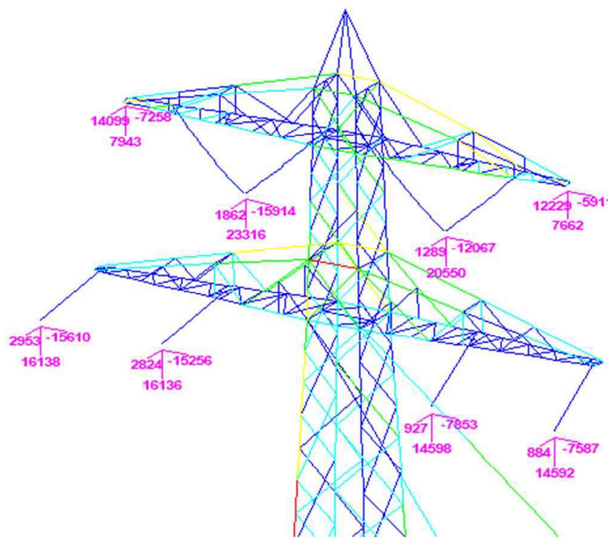
<tr><td>ULS 1a_90</td><td>
</td></tr>
<tr><td>ULS 3_90</td><td>
</td></tr>
</table>

ULS 1a_90 (verbouw)	
ULS 3_90 (verbouw)	

Structural Loading Situation 1

In Table 4 and Table 5 the loads for towers 20 and 32 are given. The loads are based on a 55 m distance to the OSP.

Table 4 Structural loads for D+0 (GT-ZBH tower 20 and 32 – TOSP 55 m)

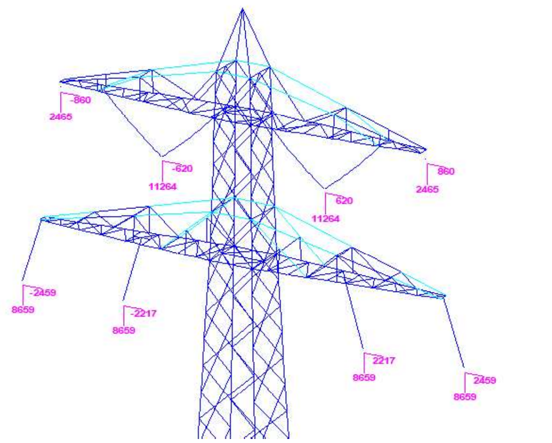
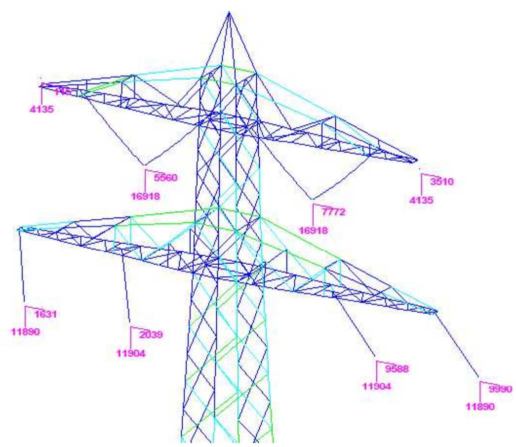
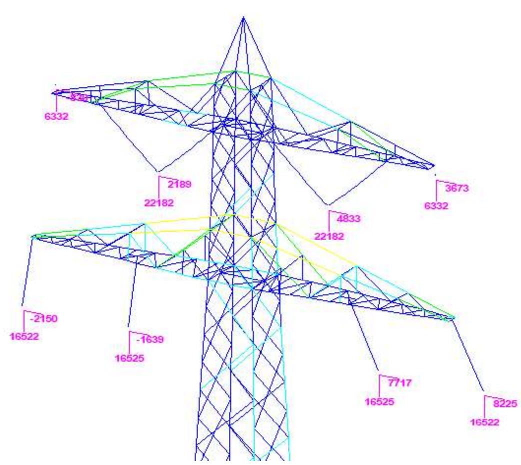
	
	
	

Table 5 Structural loads for D+0 (GT-ZBH tower 20 – TOSP 160 m)

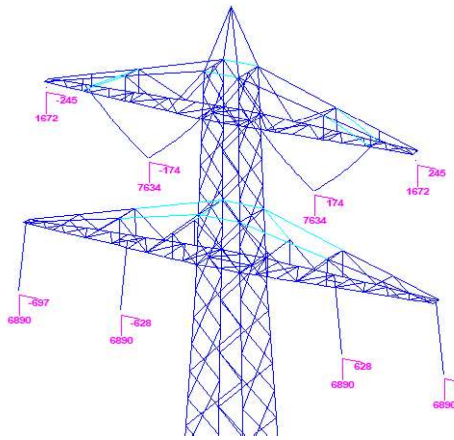
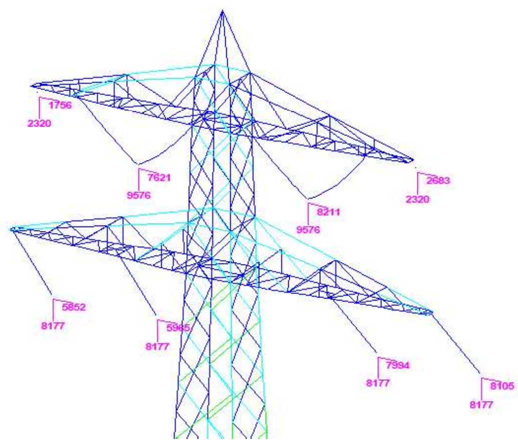
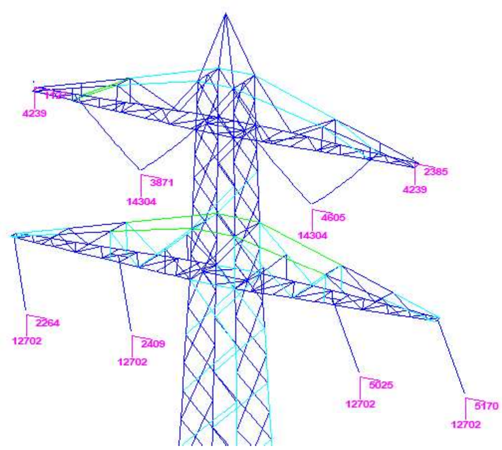
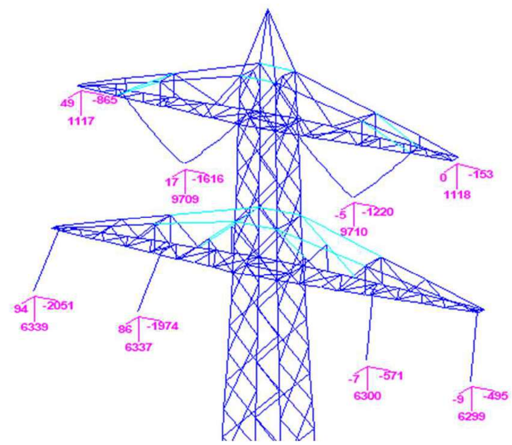
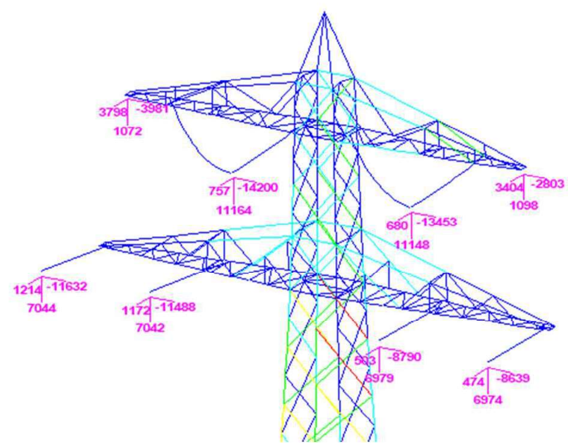
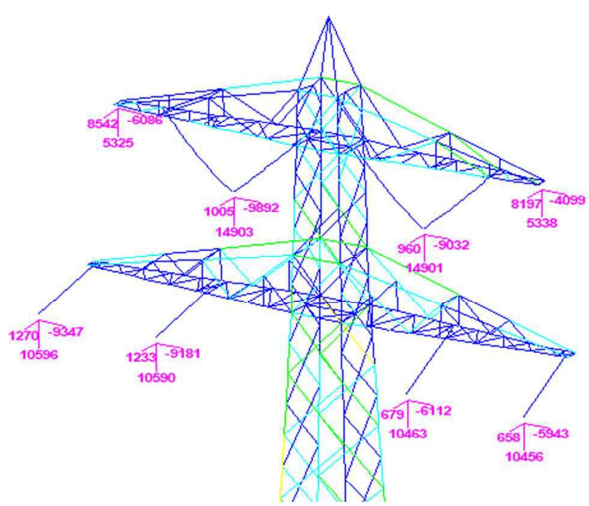
Tower 32 – 160 m	
SLS 7	
ULS 1a_90	
ULS 3_90	

Table 6 shows the loads for tower 84. Regarding the loads, this is in between the two groups and will be examined additionally.

Table 6 Tower type D+0 (RSD-MDK tower 84)

SLS 7	
ULS 1a_90	
ULS 3_90	

CONSTRUCTION DETAILS

The suspension of the conductors of the 150 kV lines between Woensdrecht and Geertruidenberg was modified in the 1970s due to problems with galloping. In this case, the top conductor is suspended via a V-chain, with beams of double angle profile fitted under the crossarm. The two lower conductors have an extended chain via a steel bracket

Figure 1 Current suspension phase conductors 150 kV lines between Woensdrecht and Geertruidenberg

Detailed workshop drawings of the beams and of the brackets in the insulator chains are not available. The schematic drawing of the insulator chains is used.

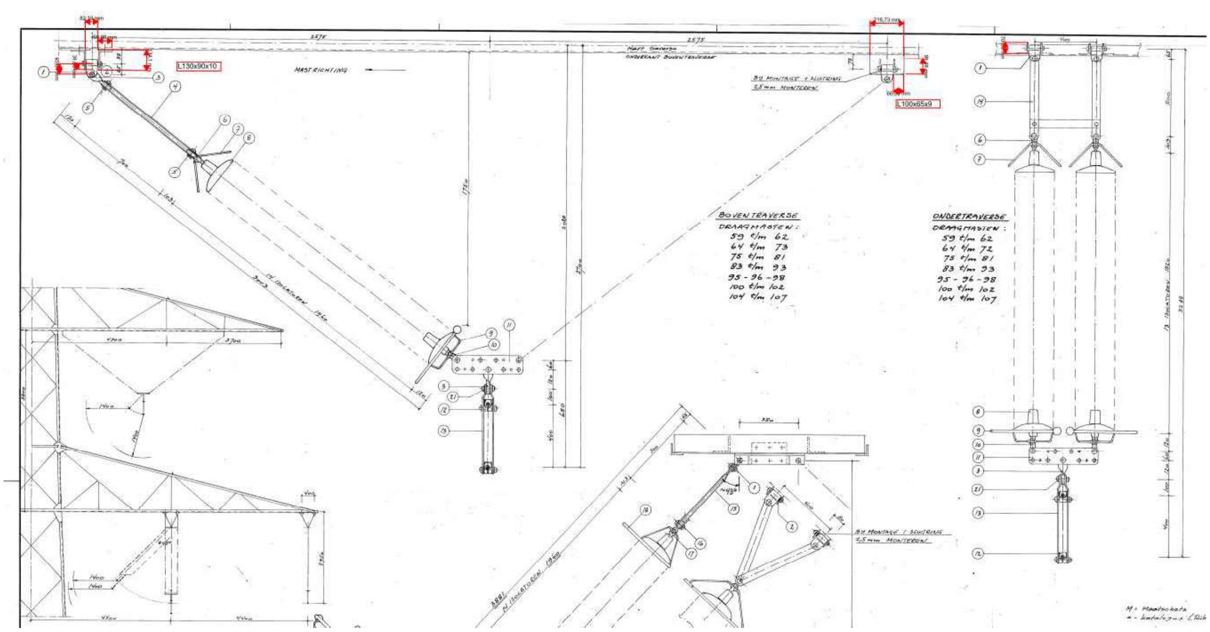


Figure 2 Schematic drawing of the insulator chain according to P-106330

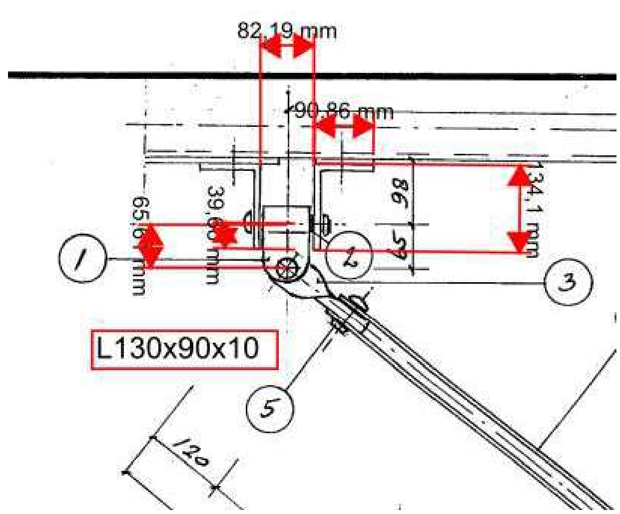
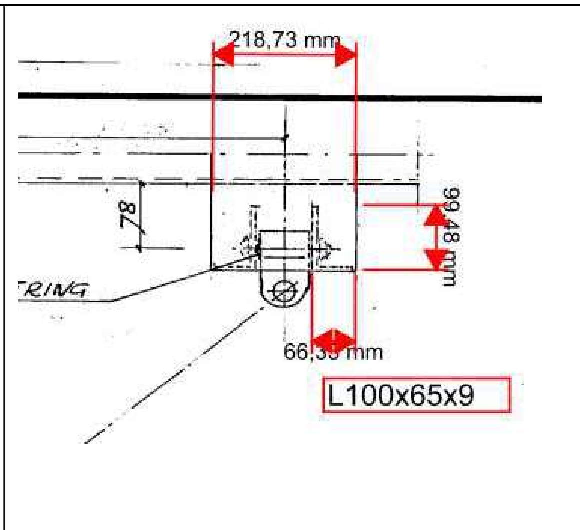
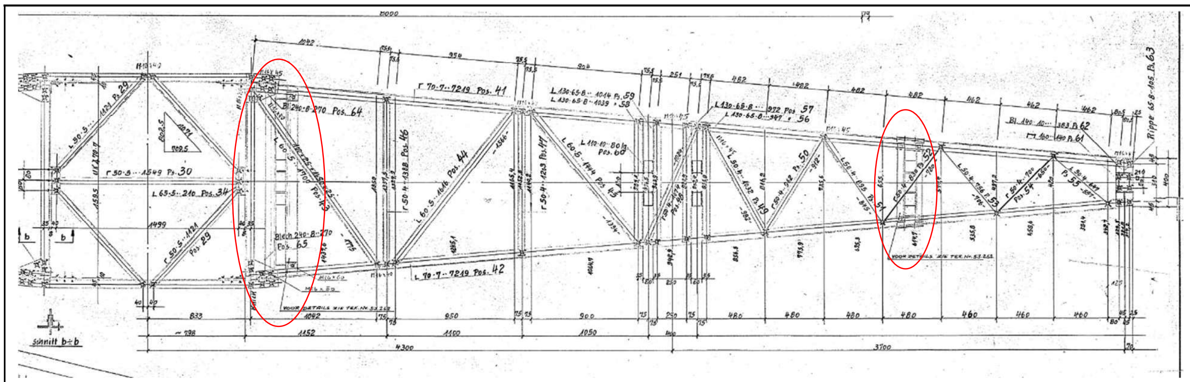
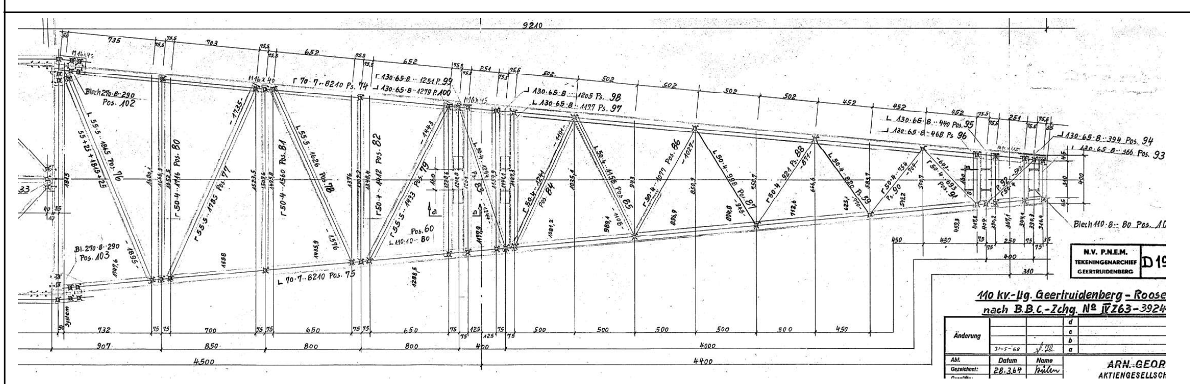
	
Detail of suspension V-chain at tower body	*Detail suspension V-chain outside. The double girder is attached to the bottom edge by means of an angle steel profile.*

Figure 3 Details of insulator chain with measured beam size

The position of the beams is indicated on the workshop drawing of the crossarms.



Upper crossarm with indication of the auxiliary beams for the V-chains, the middle beams have not been used after the adjustment



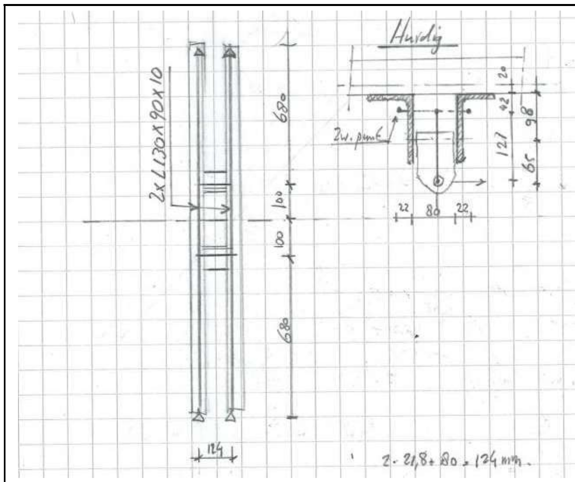
Bottom Crossarm with double beam at the location of suspension

Figure 4 Details of crossarm drawing D-19829

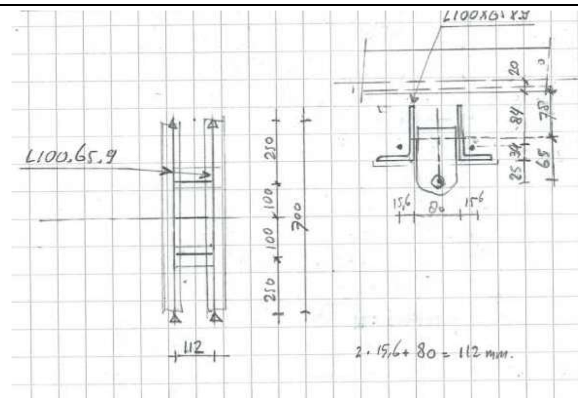
CHECK OF THE EXISTING BEAMS

Beams of the insulators

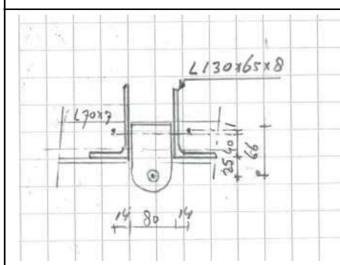
The existing beams are calculated for the two situations. It is assumed that the N-shaped insulator frames in the lower cross arm are removed because the strength of these assemblies is unknown and because large bending moments arise at the lower edge of the beam that cannot be carried. In the drawing below, the schematic of the beams of the upper crossarms is given



Inner beam of the top crossarm (tower side)



Outer beam of the top crossarm



Inner and outer beams of the bottom crossarm

Figure 5 Beams schematics

The loads are applied according to:

- situation 1: tower 22
- situation 2: tower 20

Due to the double chain, the load of the lower beam is divided by 2. With the V chain, the load on the suspension points is calculated from the conductor load with component T (transverse) and V (vertical) based on the geometry of the V - chain. If the resultant of the load falls within the dimension of the V-chain (both legs under tension), the following formulas are used.

$F_z = V/2 + T \times h / 2b$

$F_y = F_z \times b/h$

With b: half the width of the V-chain (2.575 m) and h: the height of the V-chain (2.02 m). Table 7 shows the loads on the beams of the top crossarm.

Table 7 Loading of the top crossarm

Loading	Top Crossarm		T (kN)	V (kN)	Fy (kN)	Fz (kN)
Tower 22	Inner	SLS 7	6,5	12,1	**11,0**	**8,6**
(sit.1)		ULS 1a_90	21,8	15,6	**21,8**	**15,6**
		ULS 3_90	19,5	19,9	**22,4**	**17,6**
	Outer	SLS 7	4,3	12,1	**9,9**	**7,7**
		ULS 1a_90	18	15,5	**18,9**	**14,8**
		ULS 3_90	14,8	19,8	**20,0**	**15,7**
Tower 20	Inner	SLS 7	0,6	11,3	**7,5**	**5,9**
(sit.2)		ULS 1a_90	7,8	16,9	**14,7**	**11,5**
		ULS 3_90	4,8	22,2	**16,5**	**13,0**
	Outer	SLS 7	-0,6	11,3	**6,9**	**5,4**
		ULS 1a_90	5,6	16,9	**13,6**	**10,6**
		ULS 3_90	2,2	22,2	**15,2**	**12,0**

In Table 8 the loadings for the bottom crossarms are given

Table 8 Loading of the bottom crossarm

Loading	Bottom Crossarm		T (kN)	V (kN)	Fy (kN)	Fz (kN)
Tower 22	Inner	SLS 7	4,3	8,5	**2,2**	**4,3**
(sit.1)		ULS 1a_90	14,3	10,8	**7,2**	**5,4**
		ULS 3_90	13,2	14,9	**6,6**	**7,5**
	Outer	SLS 7	4,5	8,6	**2,3**	**4,3**
		ULS 1a_90	14,5	10,8	**7,3**	**5,4**
		ULS 3_90	13,5	15	**6,8**	**7,5**
Tower 20	Inner	SLS 7	2,5	8,7	**1,3**	**4,4**
(sit.2)		ULS 1a_90	9,6	11,9	**4,8**	**6,0**
		ULS 3_90	7,7	16,5	**3,9**	**8,3**
	Outer	SLS 7	2,2	8,7	**1,1**	**4,4**
		ULS 1a_90	10	11,9	**5,0**	**6,0**
		ULS 3_90	8,2	16,5	**4,1**	**8,3**

The beams have been verified in AxisVM with an elastic model

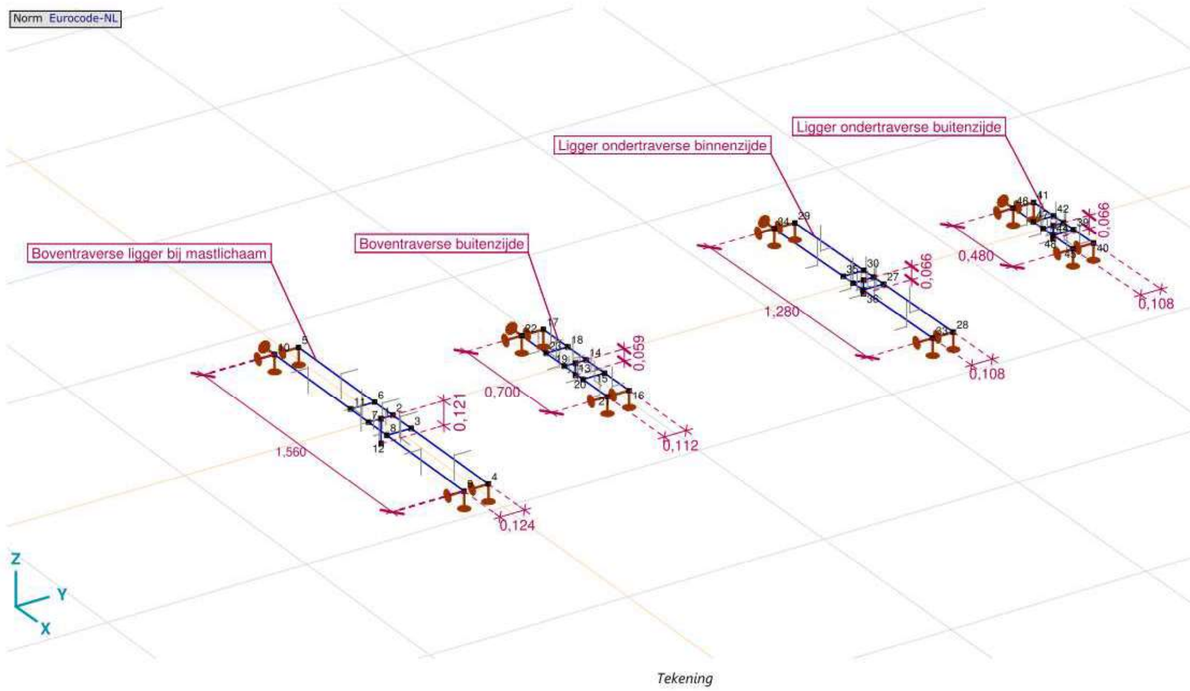


Figure 6 AxisVM Model of the beams

The calculations show that the profiles of the bottom crossarm are satisfactory in all situations. In case of the top crossarm, the inner beam does not meet the requirements in situation 1 and 2. The outer beam does not meet the requirements in case 1 only.

Table 9 Results for beams

Beam	U.C. (sit.1)	U.C. (sit.2)	Remark
Beam of the top crossarms inside	1.45	1.07	Not passing for situation 1 and 2
Beam of the top crossarms outside	1.05	0.80	Not passing for situation 1
Beam of the bottom crossarm inside	0.99	0.71	Pass
Beam of the bottom crossarm outside	0.28	0.21	Pass

Bottom chord members top cross arm

The eccentrically applied load of the insulator chain leads to bending moments on the bottom chord of the crossarm. For the lower beam, bending moments are small because the force is distributed over two chains and the beams are connected directly to the bottom chord. The check for bending is therefore limited to the bottom chord of the top crossarm.

Two parts are modeled: one part at the inner beams, the second part at the outer beams. The load is applied per beam via short fictitious auxiliary bars. The scheme is shown in the figure below

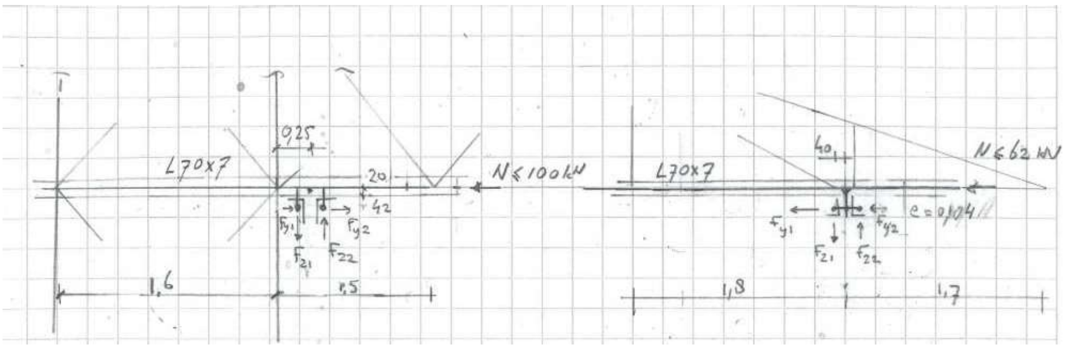


Figure 7 Schematics of bottom chord

The loads are shown in the table. The envelope value of the compressive force in the bottom chord from the calculation of PLS-TOWER has been used, because the associated compressive force in the bottom chord is not known for each load combination. Moreover, the difference in load between extreme wind and wind and ice is small.

Table 10 Loadings on bottom chord

Loading	Top crossarm		Fy1 (kN)	Fy2 (kN)	Fz1 (kN)	Fz2 (kN)	N (kN)
Tower 22	Inside	Envelope	7.5	3.9	-15.5	6.6	100
	Outside	Envelope	-5.9	-4.3	1.3	-9.3	62
Tower 20	Inside	Envelope	5.5	2.8	-11.5	4.6	100
	Outside	Envelope	-4.4	-3.2	0.9	-6.3	62

Results

The calculation was performed with AxisVM and is included at the end of this Appendix. The check is carried out on the basis of stresses and buckling stability.

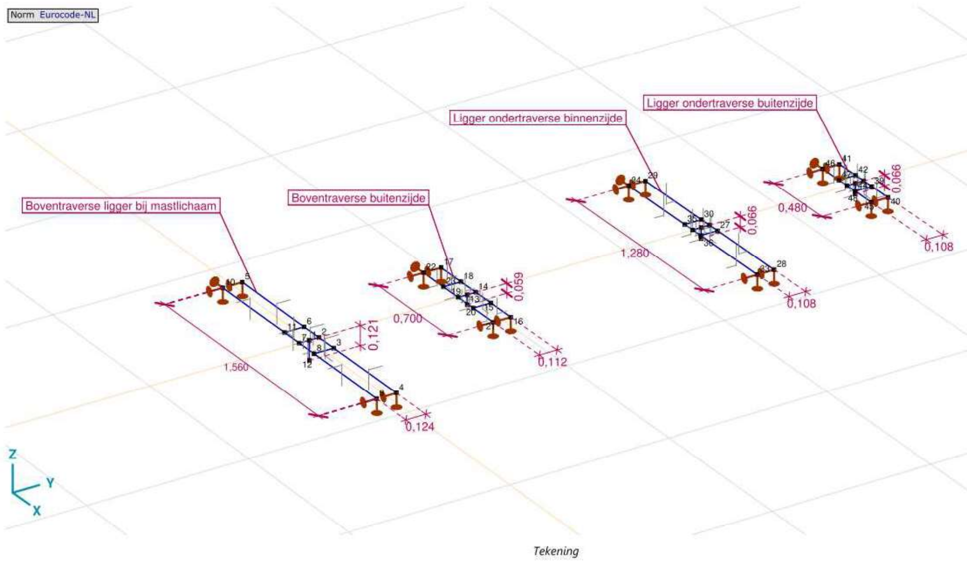


Figure 8 AxisVM beam model

The results are included in Table 11.

Table 11 Results of the bottom chord calculations

Results for bottom chord	**U.C. (sit.1)**	**U.C. (sit.2)**	
Bottom chord top crossarm inside	1.32	1.11	Not OK
Onderrand boventraverse buiten	1.53	1.31	Not OK

The calculation shows that the bottom chord is not sufficient in all of the cases

REINFORCEMENT PROPOSAL

The calculations show that the inner beam does not comply in situation 1 and 2, and the outer beam does not comply in situation 1. The bottom chord of the top crossarm does not comply with bending in all cases, both on the inside and the outside.

For the inner beams it was decided to interconnect them between both sides of the tower. This distributes the load evenly over the beams and also reduces the reaction at the bottom chord. This is presented in Figure 9.

The coupling takes place via a coupling plate that connects the top side of the double profile to the horizontal connection. The underside of the beam is supported by a new horizontal. Via diagonals the horizontal force is transferred to the existing horizontal.

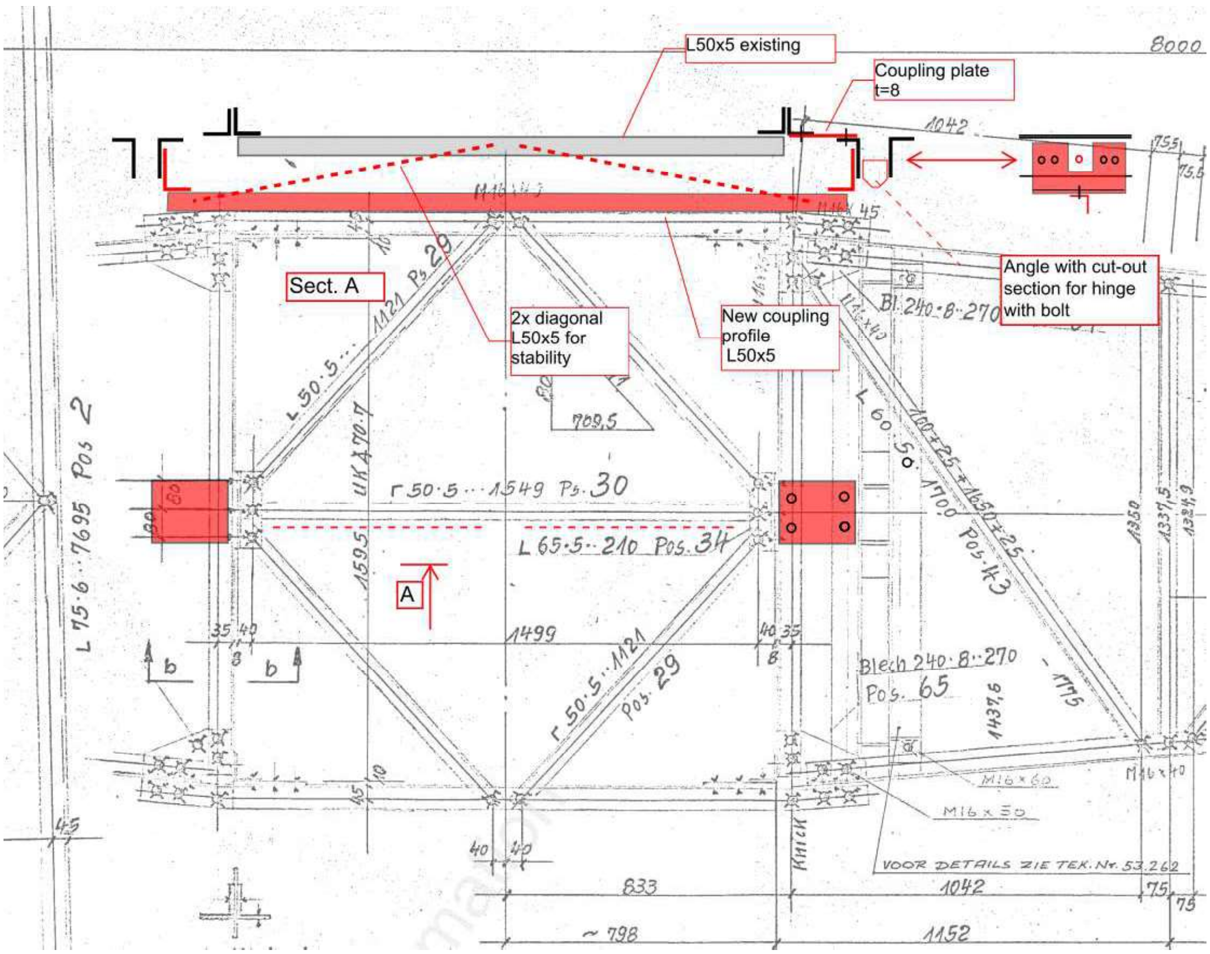


Figure 9 Principle of adjustment of inner beams over crossarms

The outer beam reinforcement proposal focuses on reinforcing the beam while reducing the bending on the bottom chord. The beam is located under the bottom chord of the traverse and is not easy to support, so this profile has to be exchanged for a heavier one.

To reduce the bending moment on the bottom chord, adjust the geometry of the diagonals on the vertical side of the crossarms. This also aims to reduce the eccentricity of the connection on the top chord (Figure 10). A new gusset plate provides a connection without eccentricity.

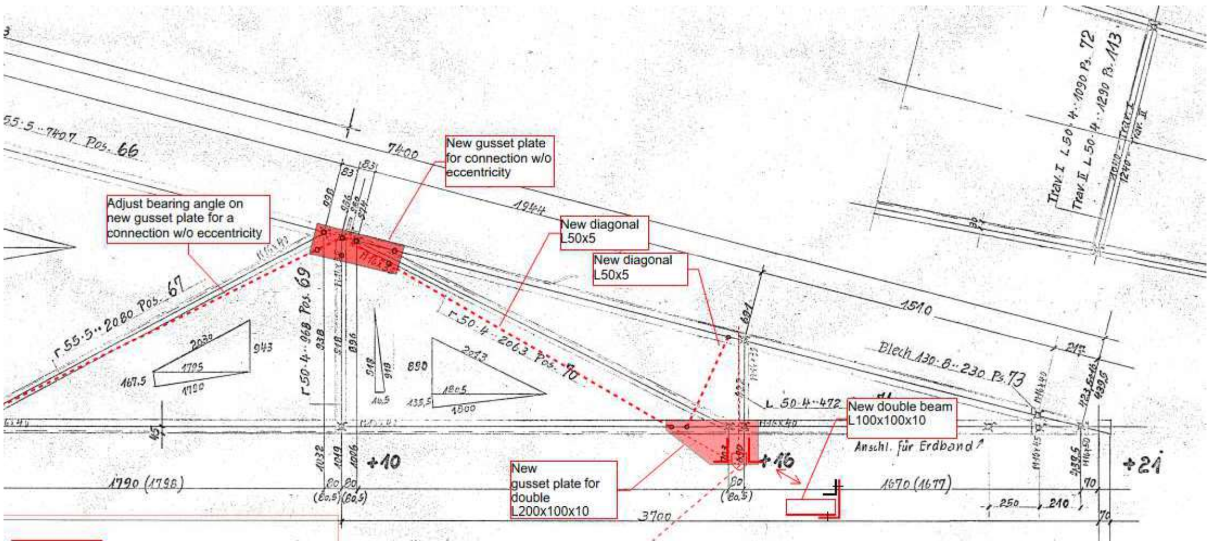


Figure 10 Adjustment of the top crossarm’s outer beam

Verifications

The following calculations are performed to the adjusted structure:

- reinforcement of the bottom chord of the top crossarm and the innermost beam of the top crossarm;
- new outer beam for the top crossarm;

The parts are tested in one model.

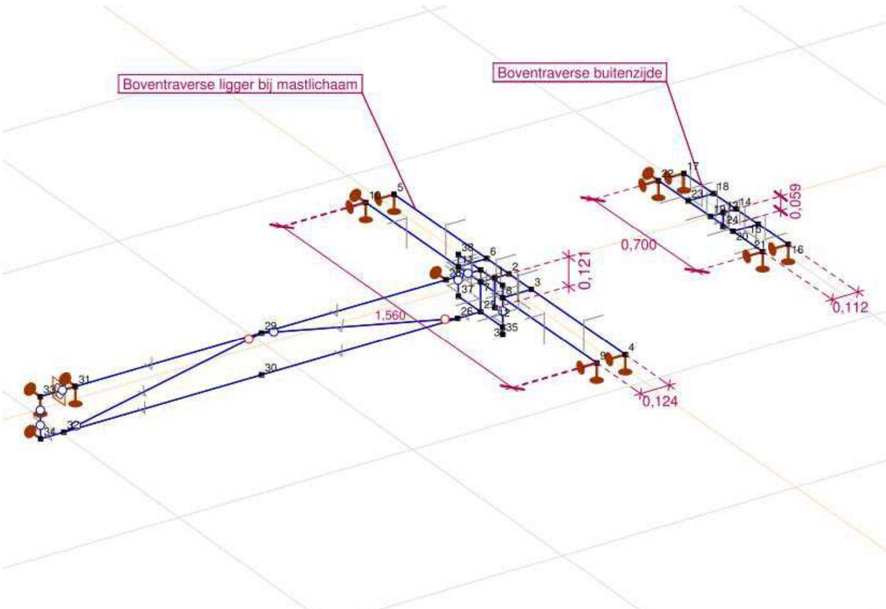


Figure 11 Model of the reinforced structure

Structural loading

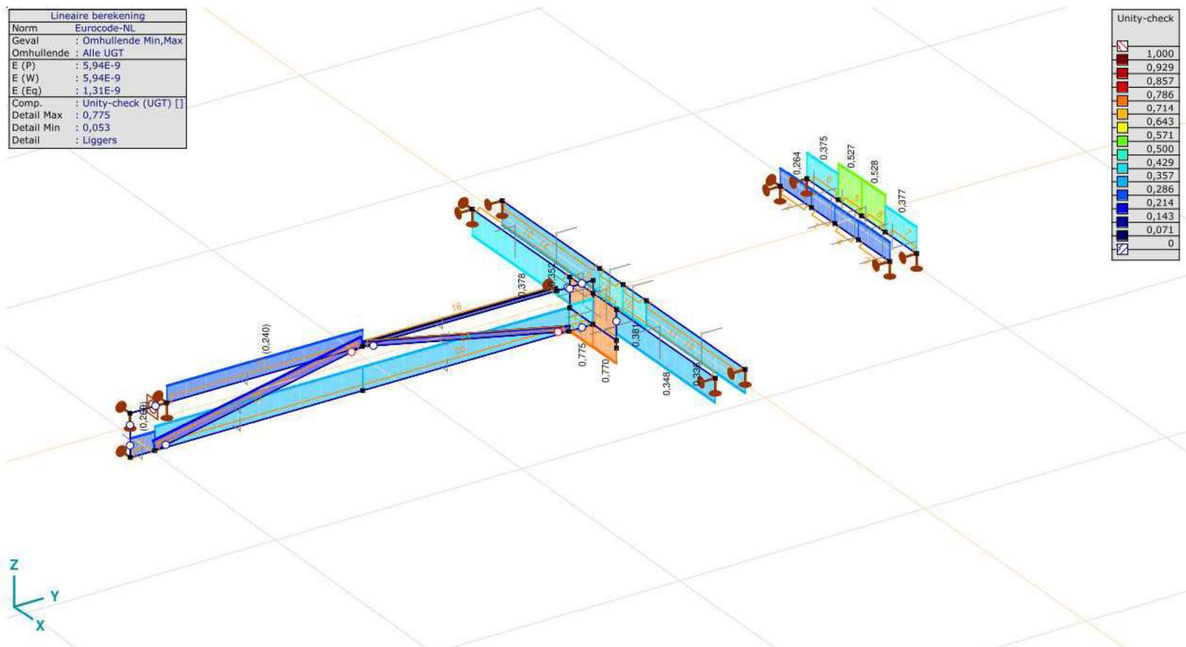
The starting point is the loading for the reinforced structure

Table 12 Loadings on the reinforced structure

Loading	Top Crossarm		T (kN)	V (kN)	Fy (kN)	Fz (kN)
Tower 22	Inside	SLS 7	6,5	12,1	**11,0**	**8,6**
		ULS 1a_90	25,4	17,5	**25,4**	**17,5**
		ULS 3_90	22,3	22,4	**25,4**	**19,9**
	Outside	SLS 7	4,3	12,1	**9,9**	**7,7**
		ULS 1a_90	21	17,5	**21,7**	**17,0**
		ULS 3_90	17,1	22,3	**22,8**	**17,9**

Results

The calculation with AxisVM shows that the existing beams on both the inside and outside meet the requirements, the same holds for the new parts.



[Stl], > Liggers, Lineair, Omhullende (Alle UGT), Unity-check, Lijnen (gevuld)

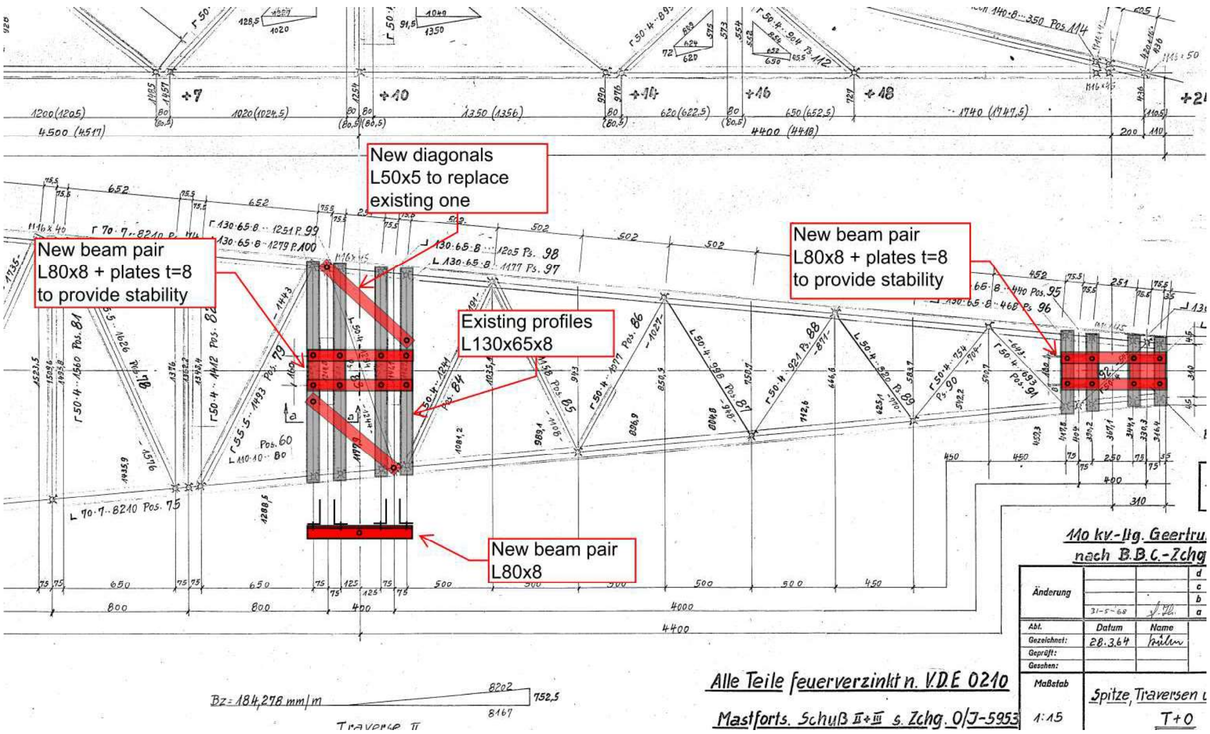
The unity checks are summarized in Table 13.

Table 13 Results for the reinforced construction

Results on bottom chord	U.C. (sit.1)	
Beam top crossarm inside (existing)	0,77	Passes
Beam top crossarm outside (new. L100x10)	0,53	Passes
Diagonal (new. L50x5)	0,26	Passes
Coupling profile (new. L50x5)	0,35	Passes

New beams lower cross arm tower 22

In order to attach the suspension-tension sets to the lower cross arm at the outer corner, new beams are required. The beams consist of two L80x8 profiles, these will be attached to the existing four profiles. The new beams clash with the existing diagonal, this profile should be removed. Its function should be taken over by new diagonals (inner position) in combination with two square shaped plates (inner and outer position) to transfer shear forces.



The new beams 2x L80x8 are checked in AxisVM software for the loads. The beams span the length of 0,4 m between the existing beams L130x90.

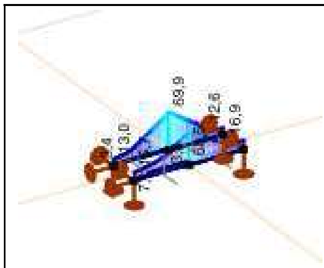
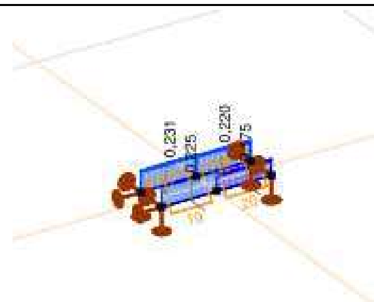
Loads

The loads for “verbouwniveau” were used, based upon the output of PLS-TOWER shown in table 2 in this Appendix. The force is directly applied to the beams, since the insulator is connected with one bolt.

Loading	Bottom Crossarm		Fx (kN)	Fy (kN)	Fz (kN)
Tower 22		SLS 7	0,3	3,2	8,6
		ULS 1a_90	2,4	14,7	12,0
		ULS 3_90	2,7	12,9	16,7

DNV

Results

	
Stress level 2x L80x8 profiles	Usage

The calculation with AxisVM shows that the new beams L80x8 meet the requirements.

The new beams can be fitted directly underneath the existing beams and act favourably to the existing beams, so no further calculations were performed to the existing beams.

Points of attention UO-fase

The reinforcements regarding the profiles are detailed in this report.

In the implementation phase, the checks of bolted connections, gusset plates and sheet parts subject to bending must be performed.

Output AxisVM:

- check of beams situation 1
- check of beams situation 2
- check of reinforced beams
- check of lower chord
- check of new beam “hangende afspanning”

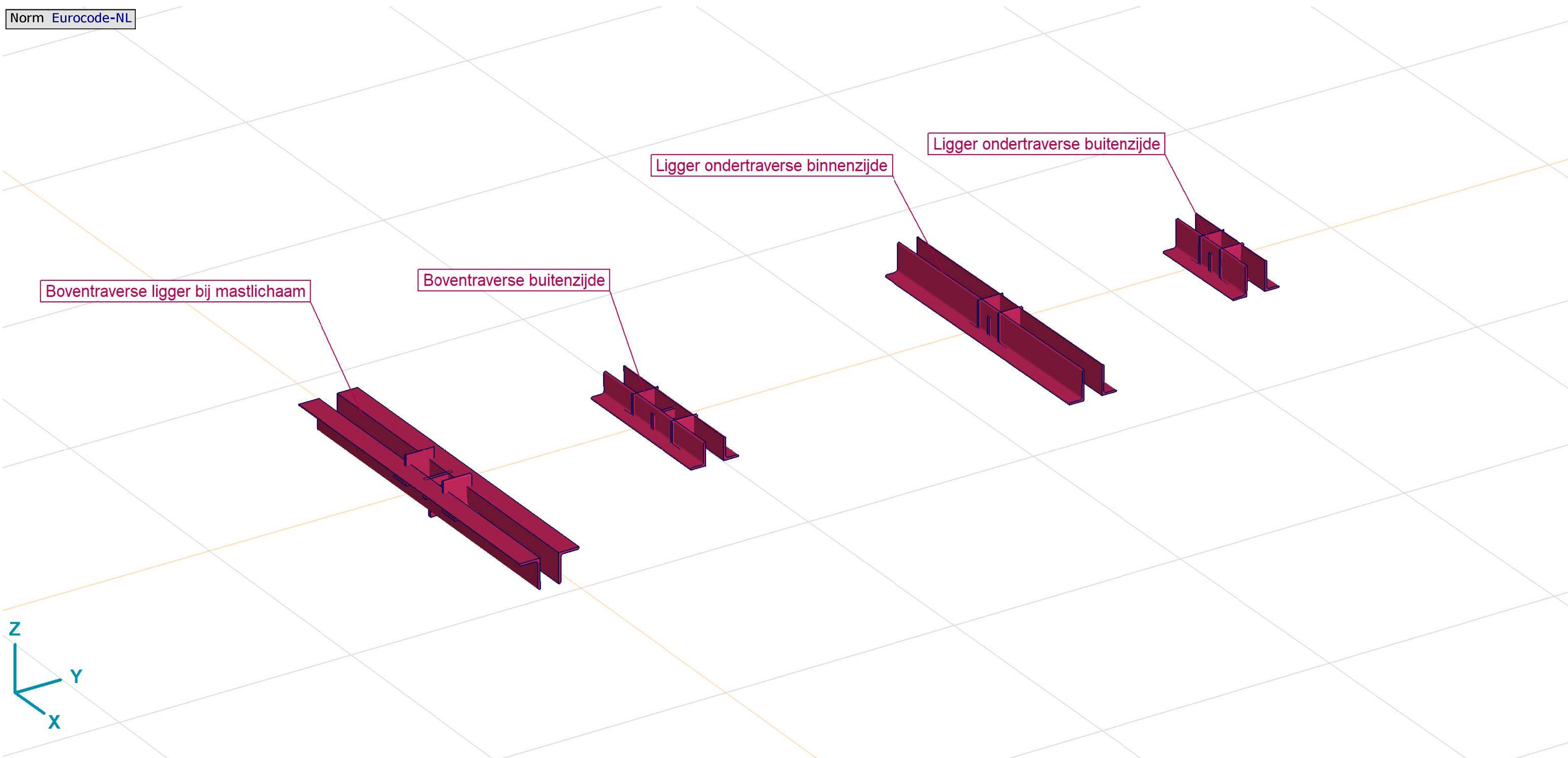
Project:

Constructeur: DNV GL - Energy

Liggers D+0 huidig sit 1.axs

Rapport

Rapport, Inhoudsopgave



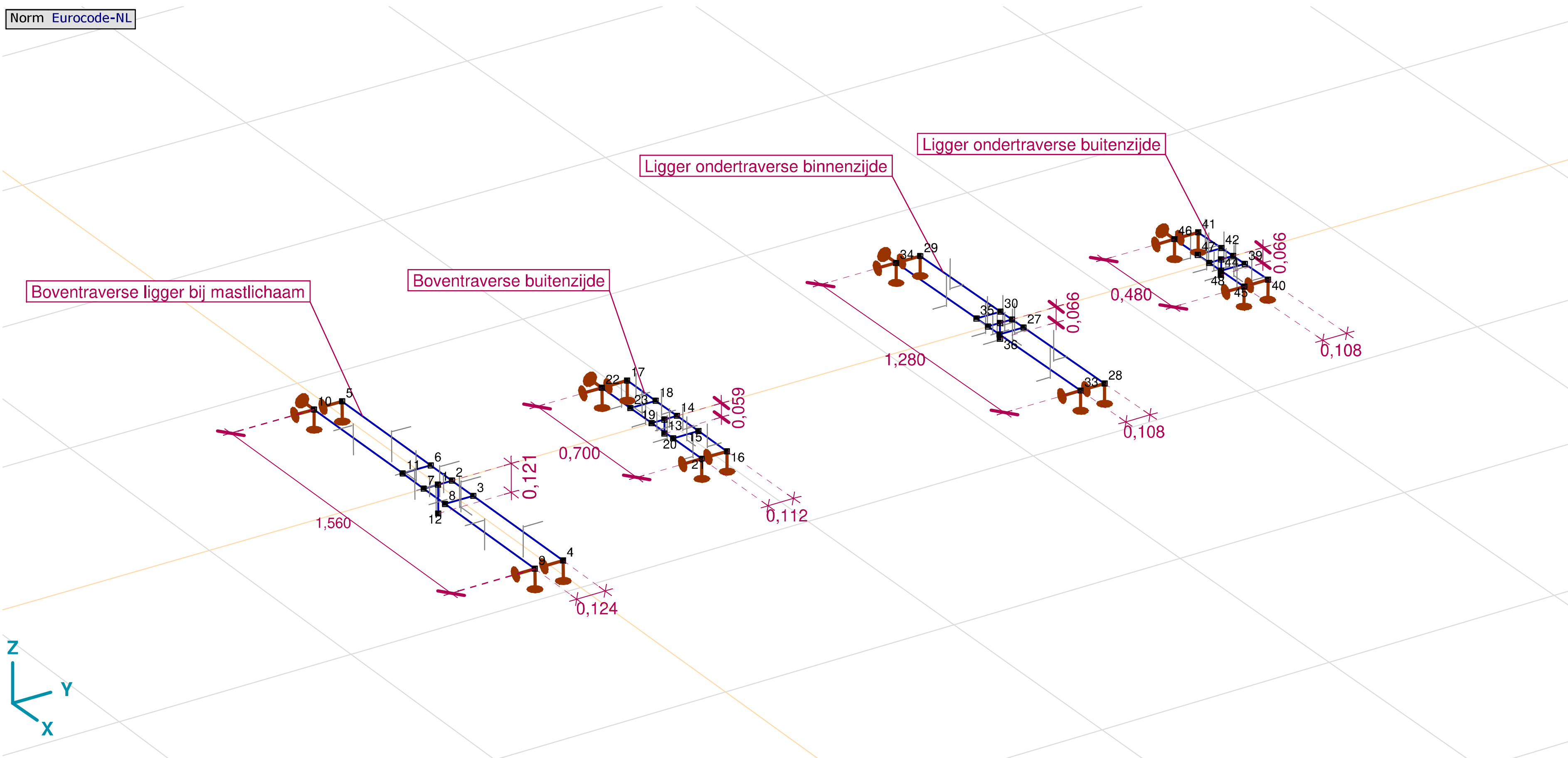
rendered view

Materialen

	Naam	*Type*	*Nationale norm*	*Materiaalnorm*	*Model*	*E_x [N/mm²]*	*E_y [N/mm²]*	*ν*	*α_T [1/°C]*	*ρ [kg/m³]*	*Materiaal kleur*	*Contour kleur*	*Structuur*	*P_1*
1	S 235	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm²] = 235,00

	Naam	*P_2*	*P_3*	*P_4*	*P_5*	*P_6*	*P_7*	*P_8*	*P_9*	*P_{10}*	*P_{11}*	*P_{12}*	*P_{13}*	*P_{14}*
1	S 235	f_u[N/mm²] = 360,00	f^*_y[N/mm²] = 215,00	f^*_u[N/mm²] = 360,00										

Naam: Materiaalnaam; **Type:** Type materiaal; **Model:** Materiaal model; **E_x:** Elasticiteitsmodulus in lokale x richting; **E_y:** Elasticiteitsmodulus in lokale y richting; **ν:** Poisson's verhouding; **α_T:** Warmteuitzettingscoëfficiënt; **ρ:** Dichtheid; **Materiaal kleur:** Materiaalkleur; **Contour kleur:** Contourkleur; **P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}:** Ontwerpparameter;


Norm Eurocode-NL
Boventraverse ligger bij mastlichaam
Boventraverse buitenzijde
Ligger ondertraverse binnenzijde
Ligger ondertraverse buitenzijde
1,560
0,121
0,124
0,700
0,059
0,112
1,280
0,066
0,108
0,480
0,066
0,108
Z
Y
X

Tekening

Knopen

	X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]
1	0	0	0	11	−0,150	−0,062	0	21	0,350	0,944	0	31	0	2,446	0	41	−0,240	3,554	0
2	0	0,062	0	12	0	0	−0,121	22	−0,350	0,944	0	32	0,080	2,446	0	42	−0,080	3,554	0
3	0,150	0,062	0	13	0	1,000	0	23	−0,150	0,944	0	33	0,640	2,446	0	43	0	3,446	0
4	0,780	0,062	0	14	0	1,056	0	24	0	1,000	−0,059	34	−0,640	2,446	0	44	0,080	3,446	0
5	−0,780	0,062	0	15	0,150	1,056	0	25	0	2,500	0	35	−0,080	2,446	0	45	0,240	3,446	0
6	−0,150	0,062	0	16	0,350	1,056	0	26	0	2,554	0	36	0	2,500	−0,066	46	−0,240	3,446	0
7	0	−0,062	0	17	−0,350	1,056	0	27	0,080	2,554	0	37	0	3,500	0	47	−0,080	3,446	0
8	0,150	−0,062	0	18	−0,150	1,056	0	28	0,640	2,554	0	38	0	3,554	0	48	0	3,500	−0,066
9	0,780	−0,062	0	19	0	0,944	0	29	−0,640	2,554	0	39	0,080	3,554	0				
10	−0,780	−0,062	0	20	0,150	0,944	0	30	−0,080	2,554	0	40	0,240	3,554	0				

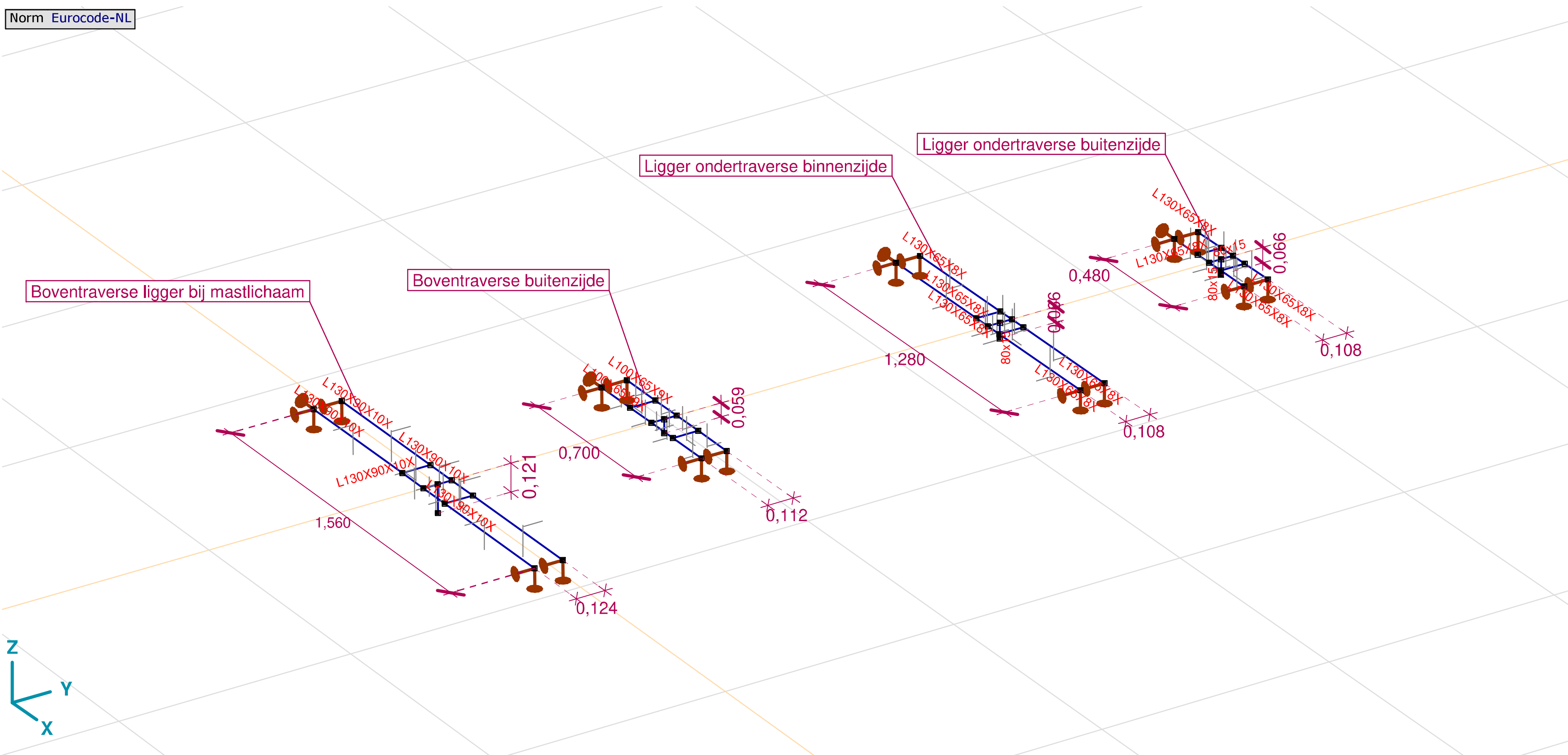
Staven

	Start-punt	Eind-punt	Lengte	Lokaal X	Materiaal	Doorsnede	Ref$_z$	<– Aansluitingen	Aansluitingen –>
1	3	2	0,150	j - i	S 235	1	R2	.	.
2	4	3	0,630	j - i	S 235	1	R2	.	.
3	6	5	0,630	j - i	S 235	1	R2	.	.
4	2	6	0,150	i - j	S 235	1	R2	.	.
5	7	8	0,150	i - j	S 235	1	R2	.	.
6	8	9	0,630	i - j	S 235	1	R2	.	.
7	10	11	0,630	i - j	S 235	1	R2	.	.
8	11	7	0,150	j - i	S 235	1	R2	.	.
9	11	6	0,124	j - i	S 235	1	Auto	.	.
10	3	8	0,124	i - j	S 235	1	Auto	.	.
11	12	1	0,121	j - i	S 235	2	Auto	.	.
12	1	2	0,062	i - j	S 235	2	R1	.	Schar-YZ
13	7	1	0,062	j - i	S 235	2	R1	100111	.
14	13	14	0,056	i - j	S 235	2	R1	.	100111
15	14	15	0,150	i - j	S 235	3	Auto	.	.
16	15	16	0,200	i - j	S 235	3	Auto	.	.
17	17	18	0,200	i - j	S 235	3	Auto	.	.
18	18	14	0,150	j - i	S 235	3	Auto	.	.
19	20	19	0,150	j - i	S 235	3	Auto	.	.
20	21	20	0,200	j - i	S 235	3	Auto	.	.
21	23	22	0,200	j - i	S 235	3	Auto	.	.

Staven

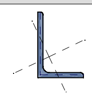
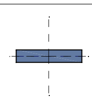
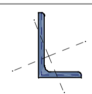
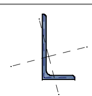
	Start-punt	*Eind-punt*	*Lengte*	*Lokaal X*	*Materiaal*	*Doorsnede*	*Ref_z*	*<– Aansluitingen*	*Aansluitingen –>*
22	19	23	0,150	i - j	S 235	3	Auto	.	.
23	19	13	0,056	j - i	S 235	2	R1	Schar-YZ	.
24	23	18	0,112	j - i	S 235	3	Auto	.	.
25	15	20	0,112	i - j	S 235	3	Auto	.	.
26	24	13	0,059	j - i	S 235	2	Auto	.	.
27	25	26	0,054	i - j	S 235	2	R1	.	100111
28	26	27	0,080	i - j	S 235	4	Auto	.	.
29	27	28	0,560	i - j	S 235	4	Auto	.	.
30	29	30	0,560	i - j	S 235	4	Auto	.	.
31	30	26	0,080	j - i	S 235	4	Auto	.	.
32	32	31	0,080	j - i	S 235	4	Auto	.	.
33	33	32	0,560	j - i	S 235	4	Auto	.	.
34	35	34	0,560	j - i	S 235	4	Auto	.	.
35	31	35	0,080	i - j	S 235	4	Auto	.	.
36	31	25	0,054	j - i	S 235	2	R1	Schar-YZ	.
37	35	30	0,108	j - i	S 235	4	Auto	.	.
38	27	32	0,108	i - j	S 235	4	Auto	.	.
39	36	25	0,066	j - i	S 235	2	Auto	.	.
40	37	38	0,054	i - j	S 235	2	R1	.	100111
41	38	39	0,080	i - j	S 235	4	Auto	.	.
42	39	40	0,160	i - j	S 235	4	Auto	.	.
43	41	42	0,160	i - j	S 235	4	Auto	.	.
44	42	38	0,080	j - i	S 235	4	Auto	.	.
45	44	43	0,080	j - i	S 235	4	Auto	.	.
46	45	44	0,160	j - i	S 235	4	Auto	.	.
47	47	46	0,160	j - i	S 235	4	Auto	.	.
48	43	47	0,080	i - j	S 235	4	Auto	.	.
49	43	37	0,054	j - i	S 235	2	R1	Schar-YZ	.
50	47	42	0,108	j - i	S 235	4	Auto	.	.
51	39	44	0,108	i - j	S 235	4	Auto	.	.
52	48	37	0,066	j - i	S 235	2	Auto	.	.

Lengte: Elementlengte; **Lokaal X:** Lokale X-richting; **Ref_z:** Referentie voor lokale Z-richting; **<– Aansluitingen:** Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt;



Tekening profielen

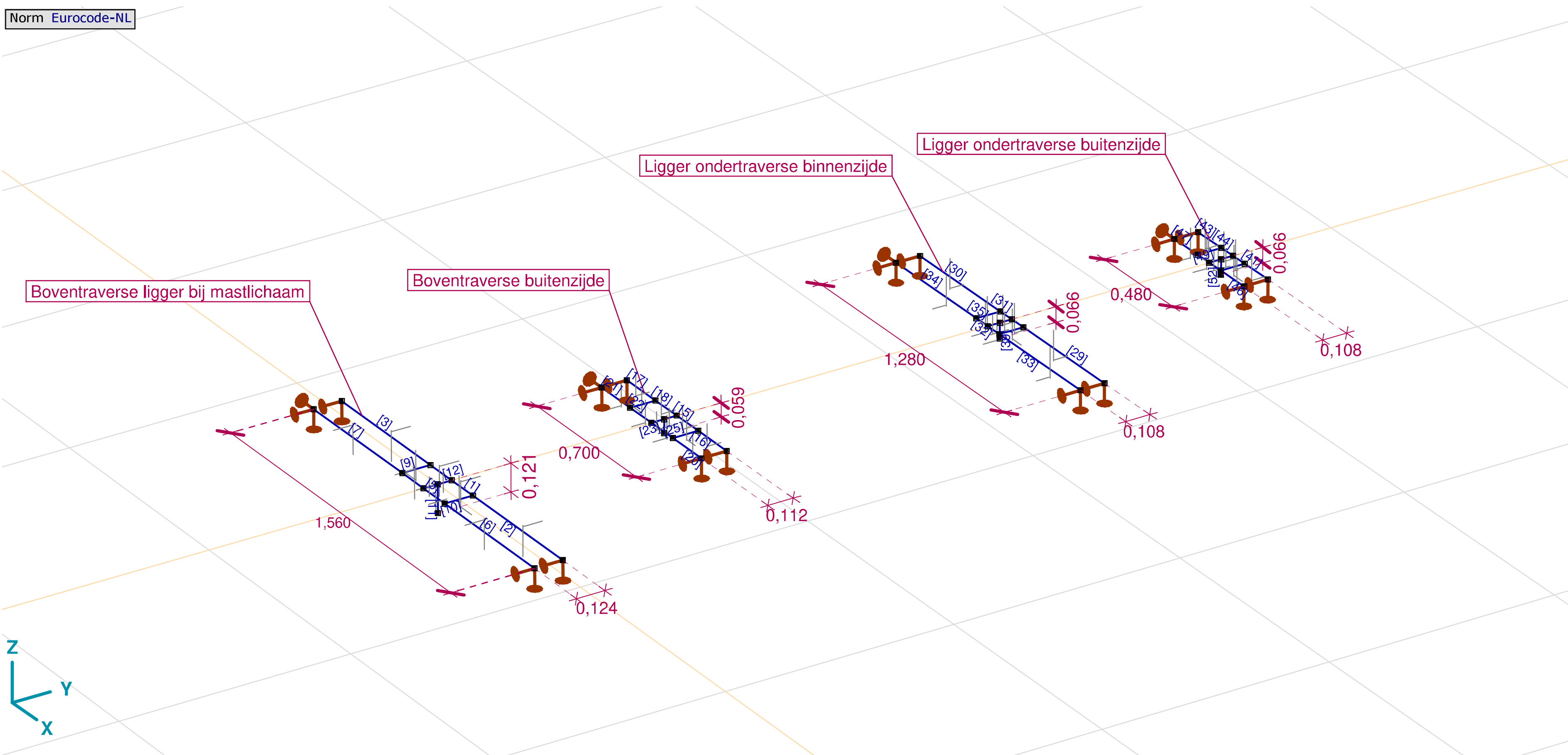
Profielen

	Naam	Tekening	Productie	Vorm	*h* *[mm]*	*b* *[mm]*	*tw* *[mm]*	*tf* *[mm]*	r_1 *[mm]*	r_2 *[mm]*	r_3 *[mm]*	*Ax* $[mm^2]$	*Ay* $[mm^2]$	*Az* $[mm^2]$	*Ix* $[mm^4]$	*Iy* $[mm^4]$	*Iz* $[mm^4]$
1	L 130X 90X10X		Gewalst	L	130,0	90,0	10,0	10,0	12,0	6,0	0	2115,52	730,05	1115,03	75067,63	3579805,00	1407288,00
2	80x15		Gewalst	Recht.	15,0	80,0	0	0	0	0	0	1200,00	1000,00	1000,00	79361,69	22500,00	640000,00
3	L 100X 65X 9X		Gewalst	L	100,0	65,0	9,0	9,0	10,0	5,0	0	1414,78	477,96	772,93	40681,80	1406314,00	466914,90
4	L 130X 65X 8X		Gewalst	L	130,0	65,0	8,0	8,0	11,0	5,5	0	1509,04	400,01	894,73	34749,90	2625007,00	447616,10

	Naam	*Iyz* $[mm^4]$	I_1 $[mm^4]$	I_2 $[mm^4]$	*α* *[°]*	*Iω* $[mm^6]$	$W_{1,el,t}$ $[mm^3]$	$W_{1,el,b}$ $[mm^3]$	$W_{2,el,t}$ $[mm^3]$	$W_{2,el,b}$ $[mm^3]$	$W_{1,pl}$ $[mm^3]$	$W_{2,pl}$ $[mm^3]$	i_y *[mm]*	i_z *[mm]*	*Hy* *[mm]*	*Hz* *[mm]*
1	L 130X 90X10X	−1302677,00	4189697,00	797396,10	25,09	6,7E+07	46873,24	62990,74	17179,39	21346,26	81837,91	34394,52	41,1	25,8	90,0	130,0
2	80x15	0	640000,00	22500,00	90,00	1E+07	16000,00	16000,00	3000,00	3000,00	24000,00	4500,00	4,3	23,1	80,0	15,0
3	L 100X 65X 9X	−466019,90	1598273,00	274955,80	22,39	2E+07	23552,43	32380,51	7940,67	10044,04	41416,09	16324,54	31,5	18,2	65,0	100,0
4	L 130X 65X 8X	−608865,80	2783699,00	288924,20	14,61	2,9E+07	32704,41	48773,37	7411,05	11687,17	56896,01	16576,57	41,7	17,2	65,0	130,0

	Naam	y_G *[mm]*	z_G *[mm]*	y_s *[mm]*	z_s *[mm]*	β_y *[mm]*	β_z *[mm]*	β_w *[]*	*S.p.*
1	L 130X 90X10X	21,8	41,5	−16,4	−35,0	112,7	95,4	−292,0	4
2	80x15	40,0	7,5	0	0	0	0	0	5
3	L 100X 65X 9X	15,9	33,2	−11,1	−26,9	84,2	70,1	−343,9	4
4	L 130X 65X 8X	13,7	45,6	−9,5	−39,4	111,6	90,0	−547,9	4

Naam: Doorsnede naam; **Productie:** Productieproces; **Vorm:** Profiel; **h:** Doorsnede hoogte; **b:** Doorsnede breedte; **tw:** Lijfdikte; **tf:** Flensdikte; **r_1, r_2, r_3:** Afrondingswaarde; **Ax:** Doorsnede-oppervlak; **Ay, Az:** Afschuivingsoppervlak; **Ix:** Torsietraagheidsmoment;
Iy, Iz: Buigtraagheidsmoment; **Iyz:** Centrifugaal traagheidsmoment; **I_1, I_2:** Hoofdbuigtraagheidsmoment; **α:** Hoofdrichtingen; **Iω:** Krommingsconstante; **$W_{1,el,t}$, $W_{1,el,b}$, $W_{2,el,t}$, $W_{2,el,b}$:** Elastisch weerstandsmoment; **$W_{1,pl}$, $W_{2,pl}$:** Plastisch weerstandsmoment; **i_y, i_z:** Traagheidsstraal;
Hy: Afmeting in lokale Y-richting; **Hz:** Afmeting in lokale Z-richting; **y_G:** Y-coördinaat van het zwaartepunt; **z_G:** Z-coördinaat van het zwaartepunt; **y_s:** Y-coördinaat van het afschuivingsmiddelpunt (torsie); **z_s:** Z-coördinaat van het afschuivingsmiddelpunt (torsie);
β_y, β_z, β_w: Wagner's coëfficiënt; **S.p.:** Spanningspunten;



Tekening staven

Staafaansluitingen

	<– Aansluitingen	*Aansluitingen –>*	$<\!-\, e_x$	$<\!-\, \theta_x$	$<\!-\, \theta_y$	$<\!-\, \theta_z$
12	.	Schar-YZ	.	.	.	.
13	100111	.	Vrij	Vrij	Vrij	Vrij
14	.	100111	.	.	.	.
23	Schar-YZ	.	.	.	Vrij	Vrij
27	.	100111	.	.	.	.
36	Schar-YZ	.	.	.	Vrij	Vrij
40	.	100111	.	.	.	.
49	Schar-YZ	.	.	.	Vrij	Vrij

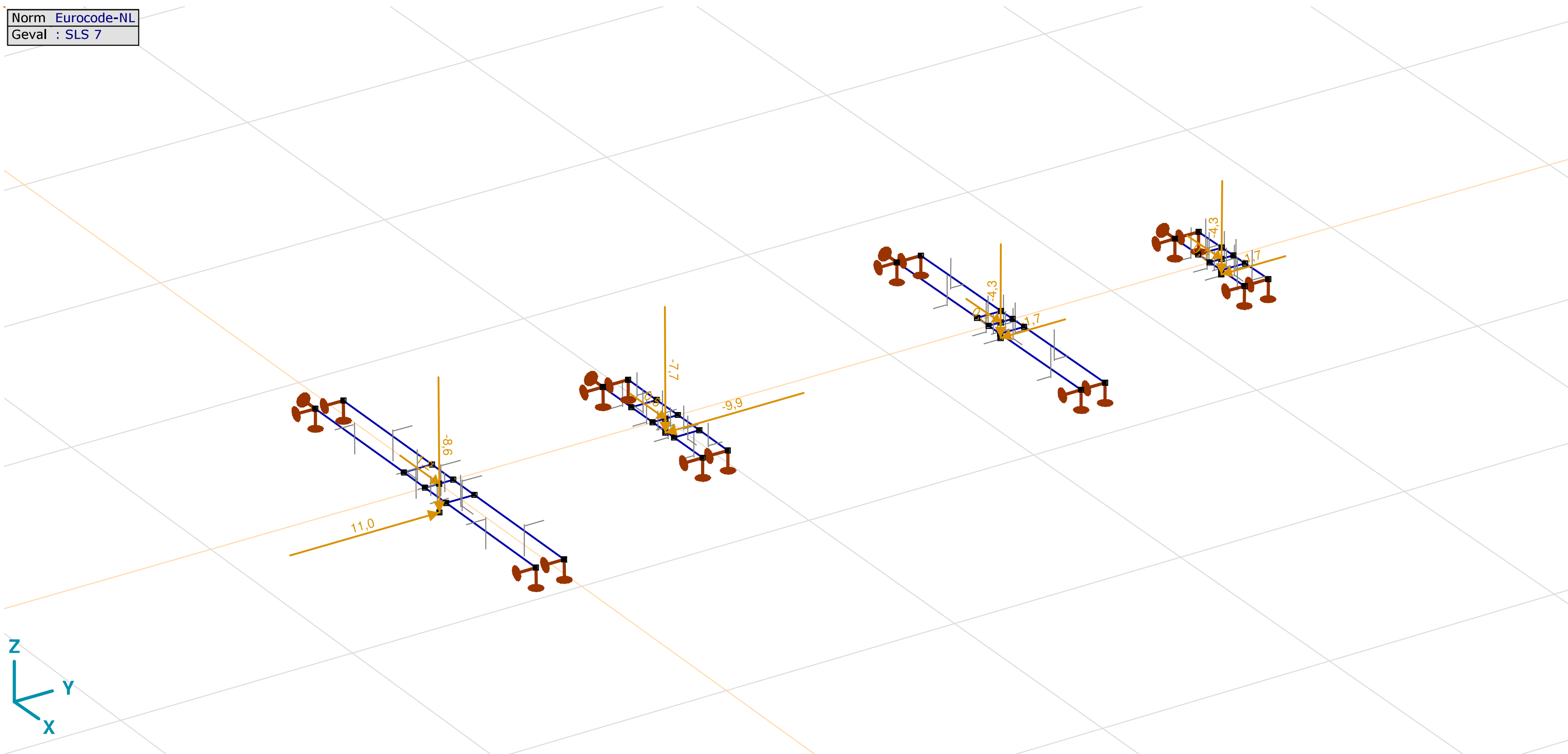
<– Aansluitingen: Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt; **$<\!-\, e_x$, $<\!-\, \theta_x$, $<\!-\, \theta_y$, $<\!-\, \theta_z$:** Type;

EG: Staaf eigen gewicht

	Σ [kg]
1–52	127,980
Totaal	**127,980**

Σ: Totale massa;

Norm	Eurocode-NL
Geval	: SLS 7



SLS 7

SLS 7: Knoopbelastingen

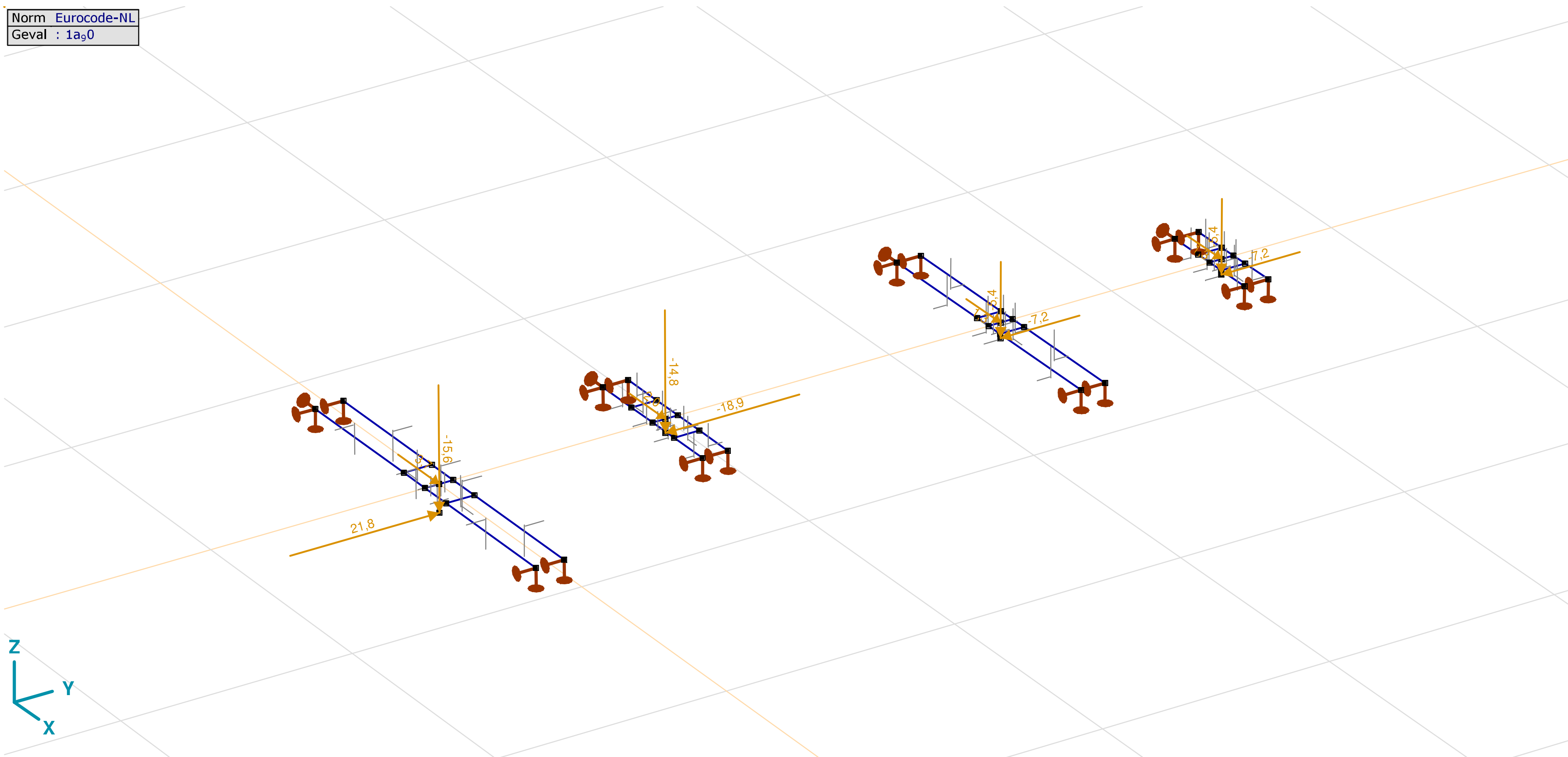
	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	1,2	0	0	0	0	0
12	Globaal	0	11,0	−8,6	0	0	0
13	Globaal	0,5	0	0	0	0	0
24	Globaal	0	−9,9	−7,7	0	0	0
25	Globaal	0,3	0	0	0	0	0
36	Globaal	0	−1,7	−4,3	0	0	0
37	Globaal	0,3	0	0	0	0	0
48	Globaal	0	−1,7	−4,3	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

1a_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	3,7	0	0	0	0	0
12	Globaal	0	21,8	−15,6	0	0	0
13	Globaal	2,0	0	0	0	0	0
24	Globaal	0	−18,9	−14,8	0	0	0
25	Globaal	1,3	0	0	0	0	0
36	Globaal	0	−7,2	−5,4	0	0	0
37	Globaal	1,3	0	0	0	0	0
48	Globaal	0	−7,2	−5,4	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

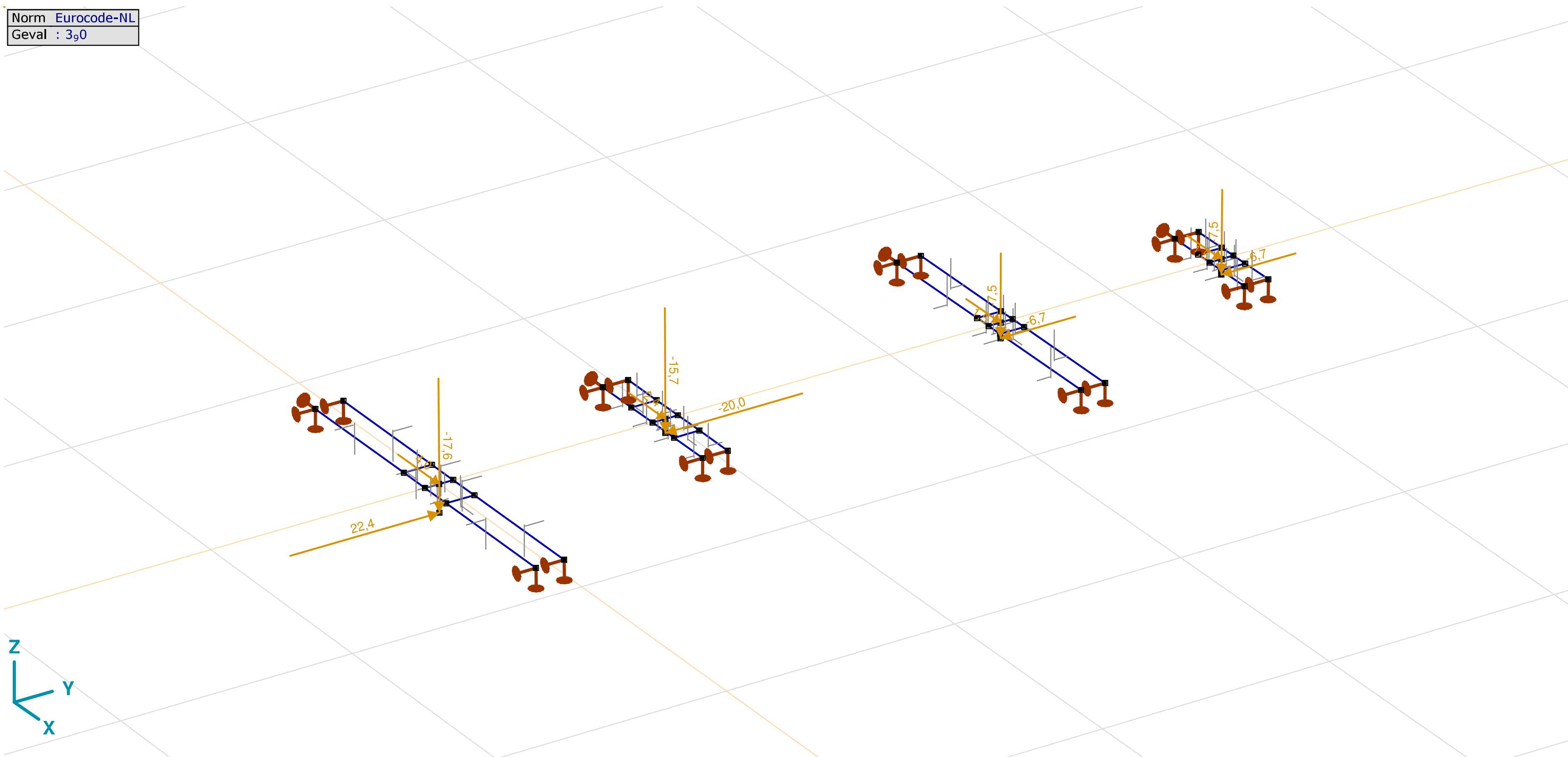


1a_90

3_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	4,0	0	0	0	0	0
12	Globaal	0	22,4	−17,6	0	0	0
13	Globaal	2,4	0	0	0	0	0
24	Globaal	0	−20,0	−15,7	0	0	0
25	Globaal	1,5	0	0	0	0	0
36	Globaal	0	−6,7	−7,5	0	0	0
37	Globaal	1,5	0	0	0	0	0
48	Globaal	0	−6,7	−7,5	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

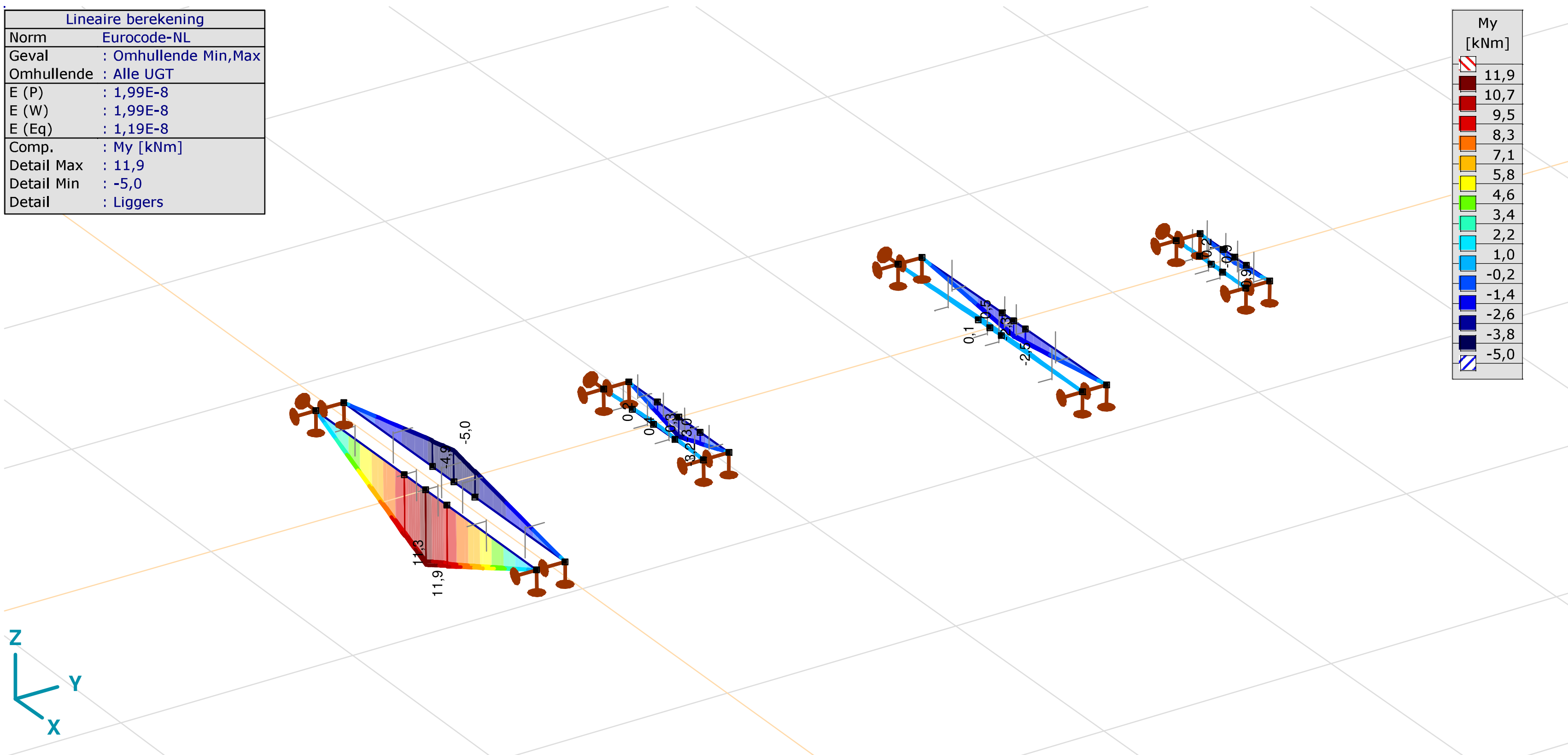


3_90

Gebruiker gedefinieerde belastingcombinaties uit belastinggevallen

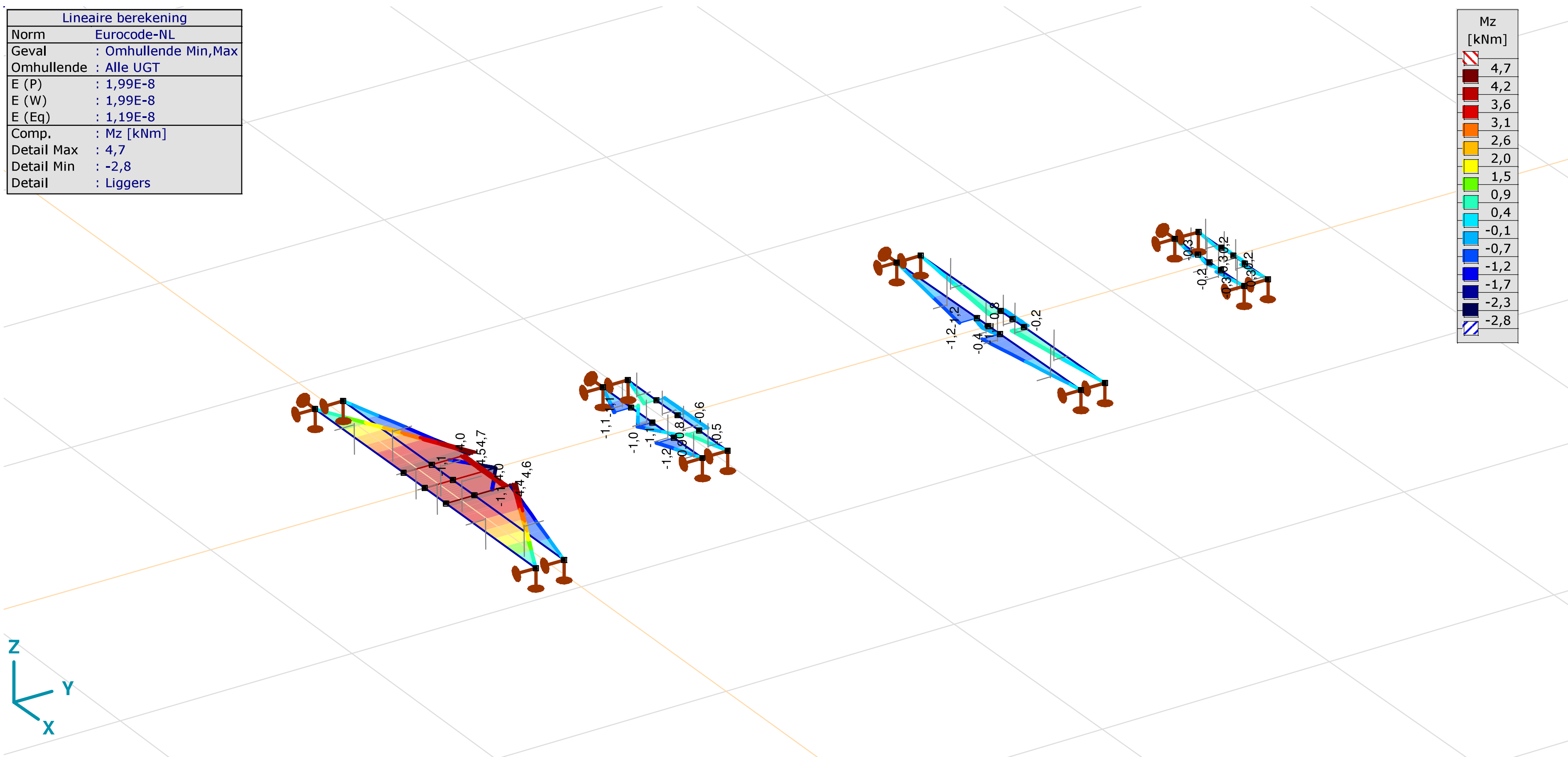
	Naam	Type	ST1	EG (PERM1)	SLS 7 (VER1)	1a_90 (VER1)	3_90 (VER1)	Commentaar
1	Co #1	UGT	0	1,20	0	1,00	0	
2	Co #2	UGT	0	1,20	0	0	1,00	
3	Co #3	BGT Quasi-blijvend	0	1,00	1,00	0	0	

Naam: Naam belastingcombinatie; **Type:** Type belastingcombinatie; **ST1, EG (PERM1), SLS 7 (VER1), 1a$_9$0 (VER1), 3$_9$0 (VER1):** Factor;



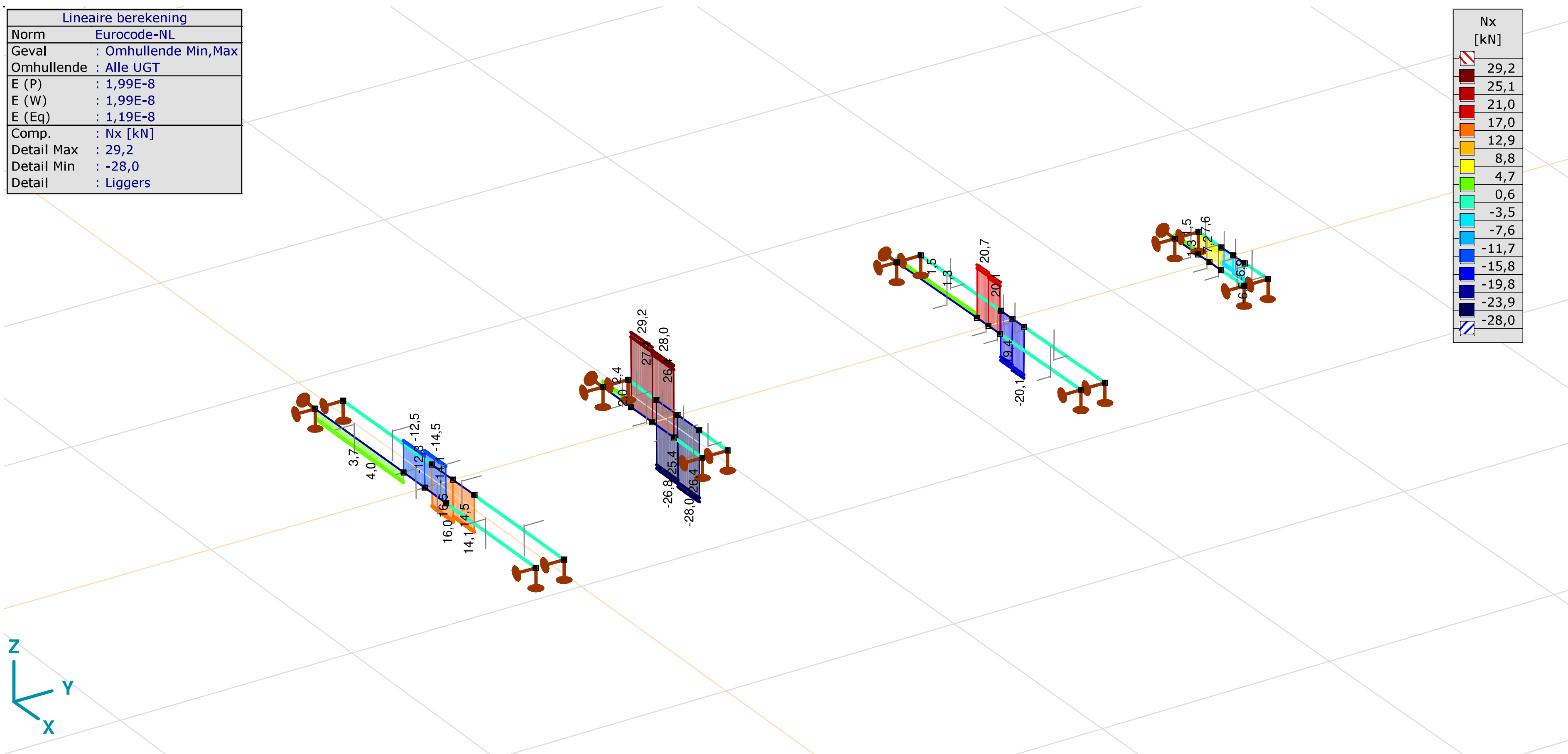
[I], > Liggers, Lineair, Omhullende (Alle UGT), My, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Mz [kNm]
Detail Max	: 4,7
Detail Min	: -2,8
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Mz, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Nx [kN]
Detail Max	: 29,2
Detail Min	: -28,0
Detail	: Liggers

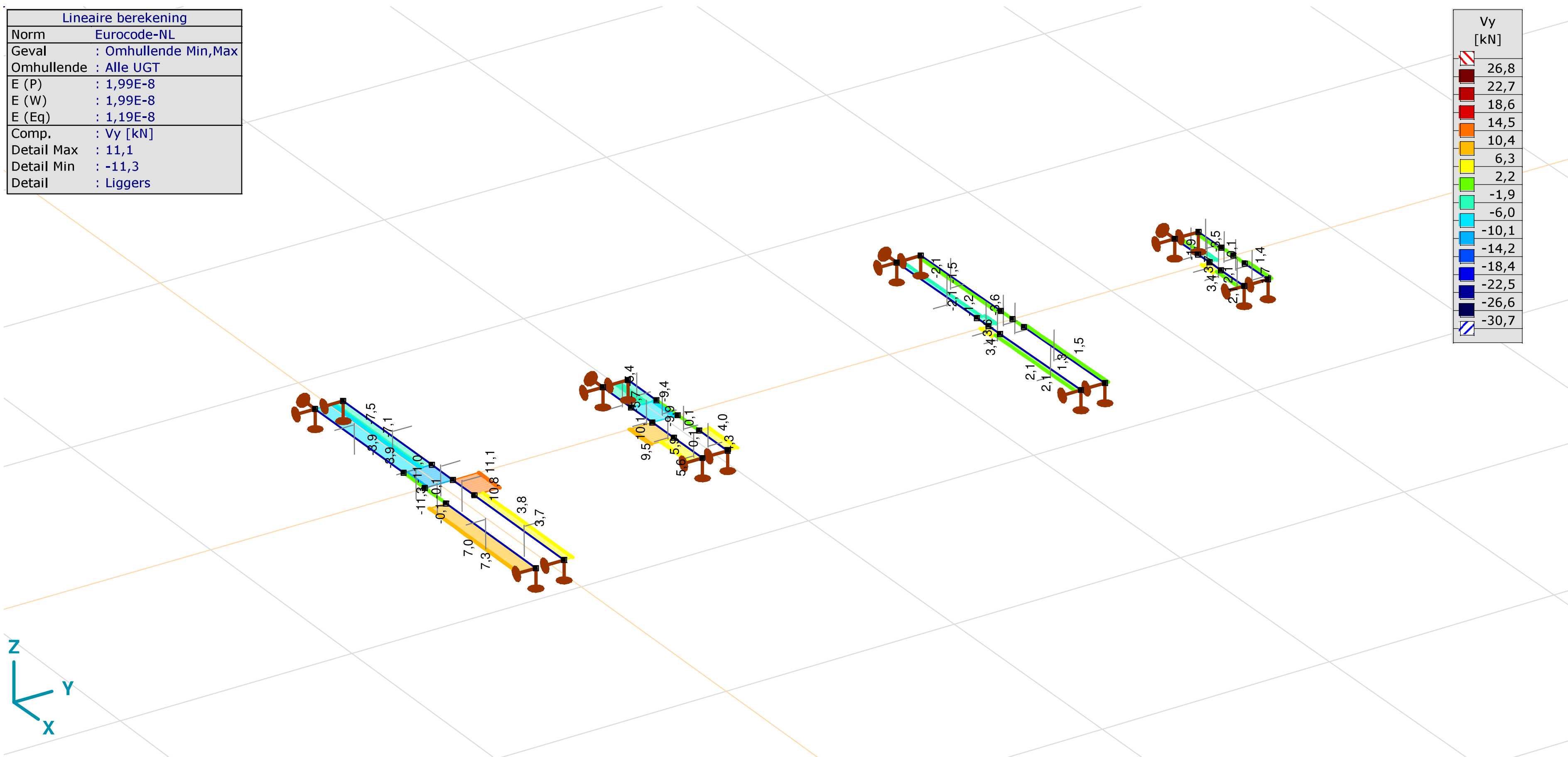


[I], > Liggers, Lineair, Omhullende (Alle UGT), Nx, Lijnen (gevuld)

Project:

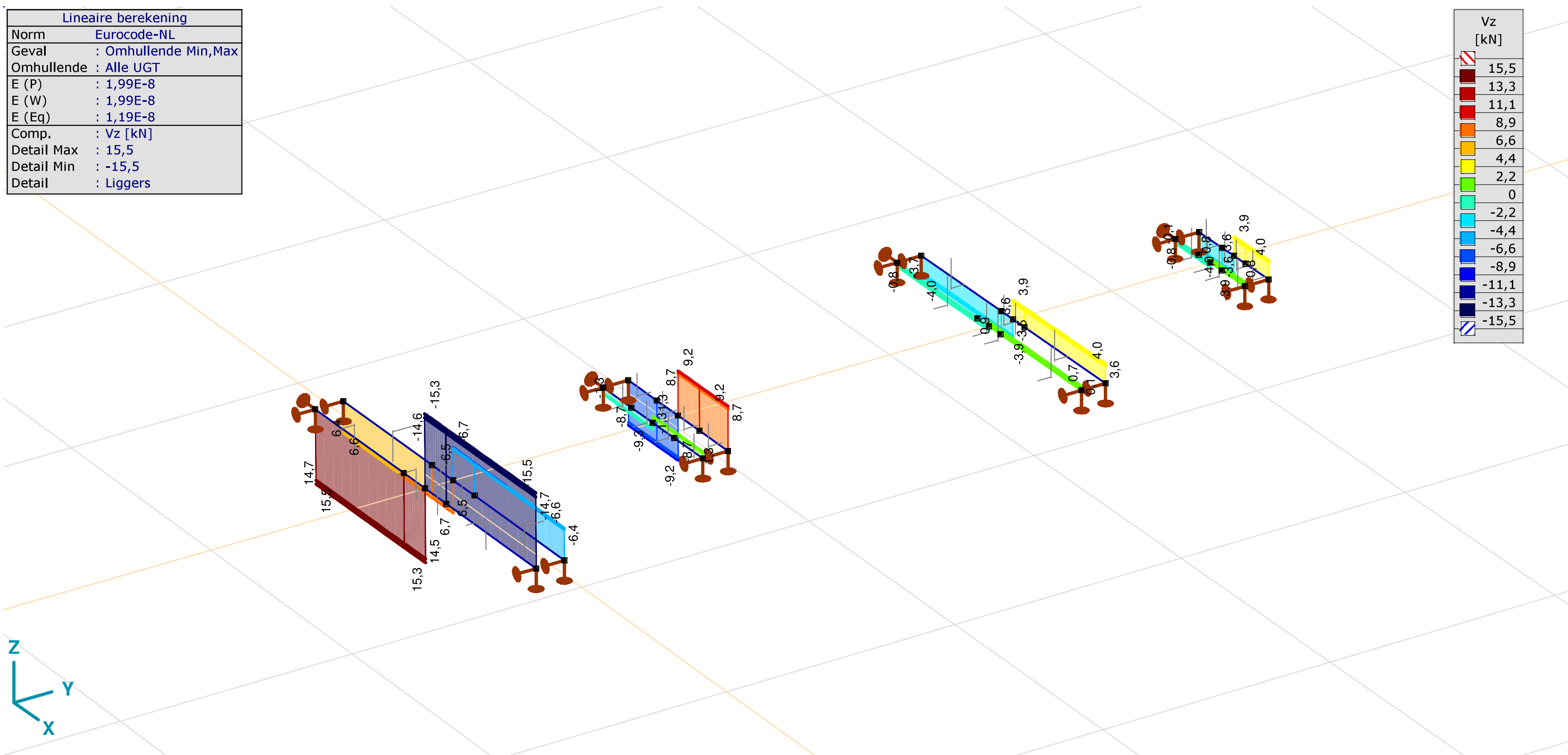
Constructeur: DNV GL - Energy

Model: **Liggers D+0 huidig sit 1.axs**



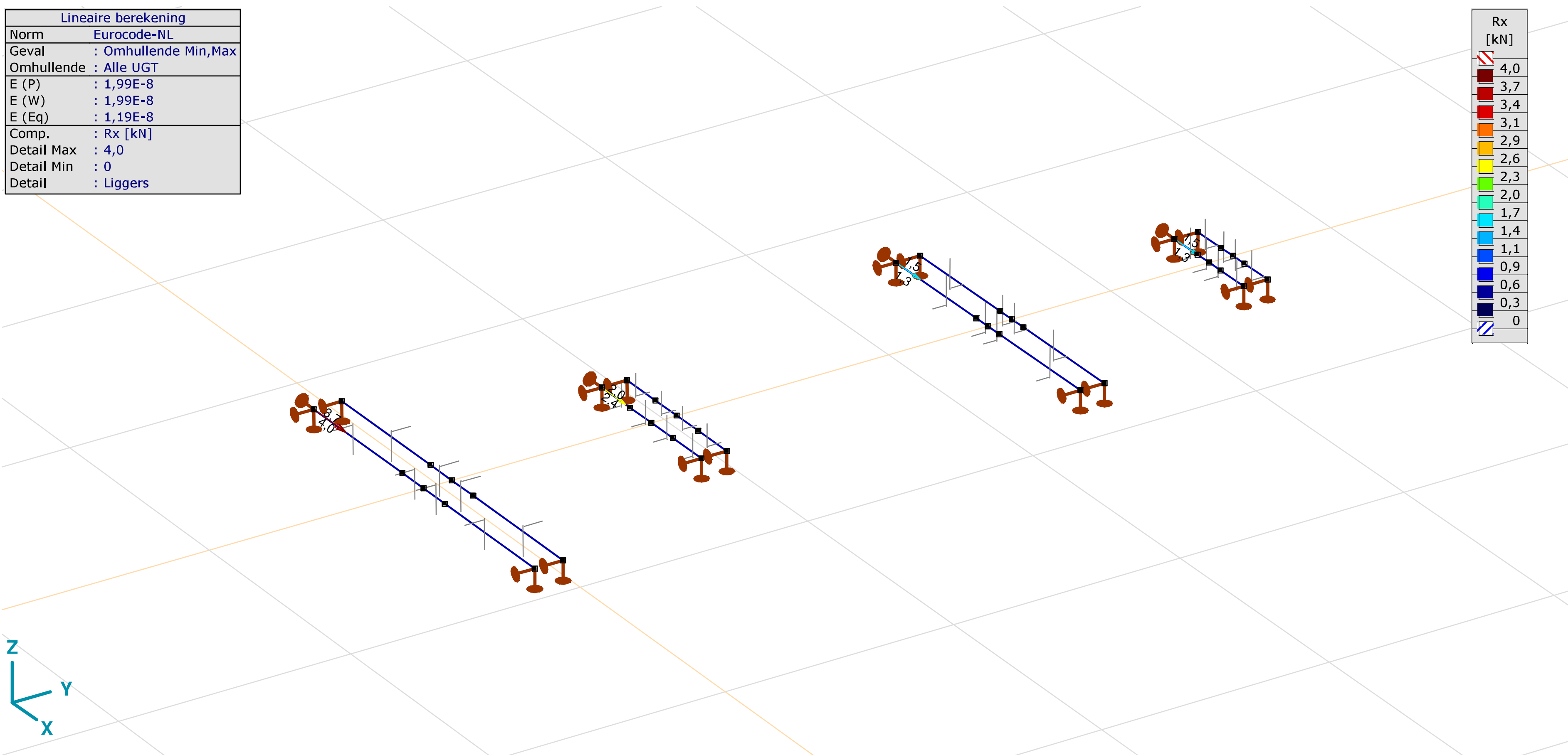
[I], > Liggers, Lineair, Omhullende (Alle UGT), Vy, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Vz [kN]
Detail Max	: 15,5
Detail Min	: -15,5
Detail	: Liggers



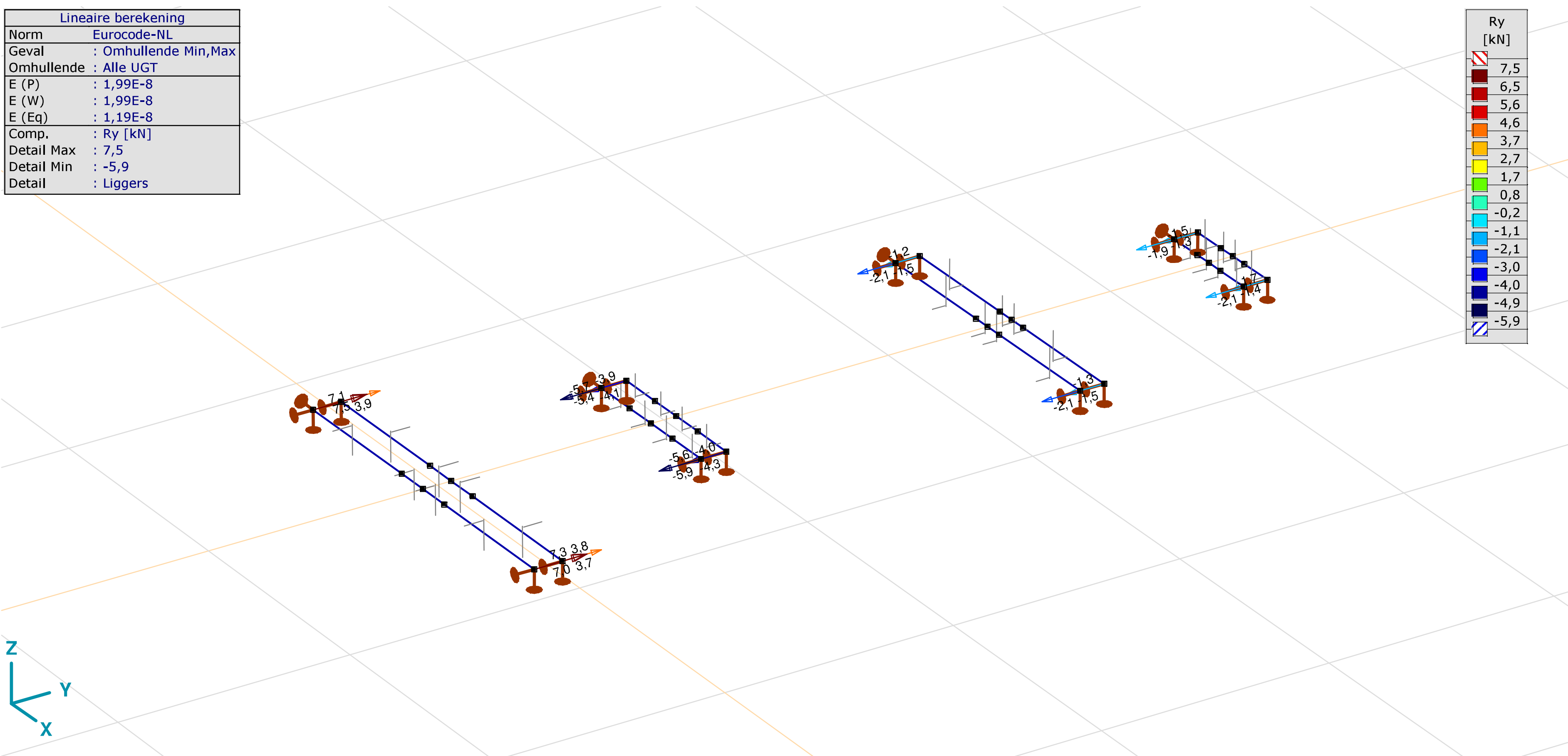
[I], > Liggers, Lineair, Omhullende (Alle UGT), Vz, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Rx [kN]
Detail Max	: 4,0
Detail Min	: 0
Detail	: Liggers



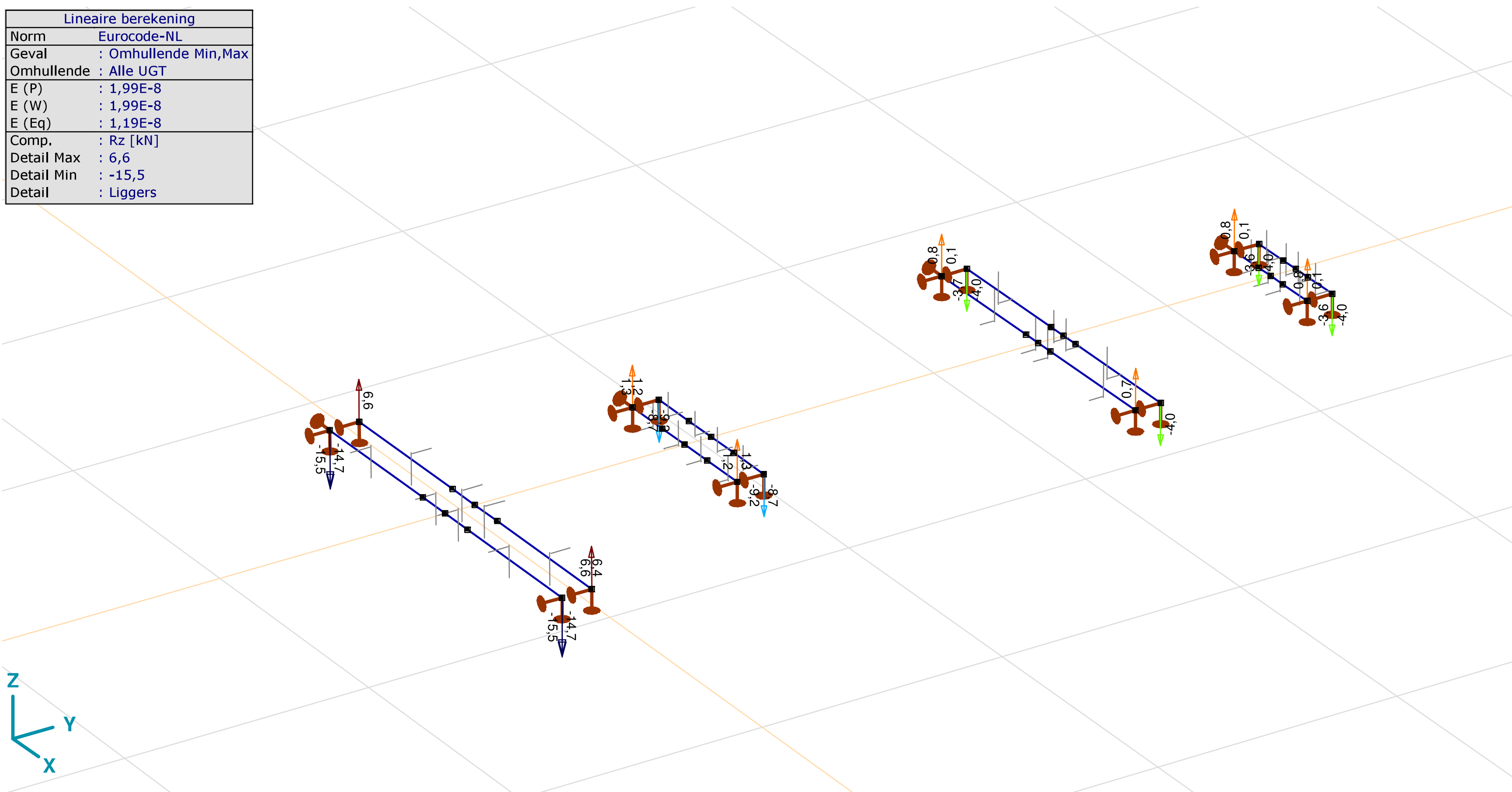
[I], > Liggers, Lineair, Omhullende (Alle UGT), Rx (knoopopl.), Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Ry [kN]
Detail Max	: 7,5
Detail Min	: -5,9
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Ry (knoopopl.), Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Rz [kN]
Detail Max	: 6,6
Detail Min	: -15,5
Detail	: Liggers



Rz [kN]
6,6
5,0
3,4
1,8
0,3
-1,3
-2,9
-4,5
-6,0
-7,6
-9,2
-10,8
-12,4
-13,9
-15,5

[I], > Liggers, Lineair, Omhullende (Alle UGT), Rz (knoopopl.), Lijnen

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
1	4	0,780	0,062	0	Glob.	Ry	min	Co #2		**3,7**	6,4	7,4	0,587
							max	Co #1		**3,8**	6,6	7,6	0,575
						Rz	min	Co #2		3,7	**6,4**	7,4	0,587
							max	Co #1		3,8	**6,6**	7,6	0,575
						αR	min	Co #1		3,8	6,6	7,6	0,575
							max	Co #2		3,7	6,4	7,4	0,587
2	5	−0,780	0,062	0	Glob.	Ry	min	Co #2		**3,9**	6,4	7,5	0,611
							max	Co #1		**3,9**	6,6	7,7	0,597
						Rz	min	Co #2		3,9	**6,4**	7,5	0,611
							max	Co #1		3,9	**6,6**	7,7	0,597
						αR	min	Co #1		3,9	6,6	7,7	0,597
							max	Co #2		3,9	6,4	7,5	0,611
3	9	0,780	−0,062	0	Glob.	Ry	min	Co #1		**7,0**	−14,7	16,3	−0,475
							max	Co #2		**7,3**	−15,5	17,1	−0,472
						Rz	min	Co #2		7,3	**−15,5**	17,1	−0,472
							max	Co #1		7,0	**−14,7**	16,3	−0,475
						αR	min	Co #1		7,0	−14,7	16,3	−0,475
							max	Co #2		7,3	−15,5	17,1	−0,472
4	10	−0,780	−0,062	0	Glob.	Rx	min	Co #1	**3,7**	7,1	−14,7	16,8	−0,546
							max	Co #2	**4,0**	7,5	−15,5	17,7	−0,547
						Ry	min	Co #1	3,7	**7,1**	−14,7	16,8	−0,546
							max	Co #2	4,0	**7,5**	−15,5	17,7	−0,547
						Rz	min	Co #2	4,0	7,5	**−15,5**	17,7	−0,547
							max	Co #1	3,7	7,1	**−14,7**	16,8	−0,546
						αR	min	Co #2	4,0	7,5	−15,5	17,7	−0,547
							max	Co #1	3,7	7,1	−14,7	16,8	−0,546
5	16	0,350	1,056	0	Glob.	Ry	min	Co #2		**−4,3**	−9,2	10,2	−0,464
							max	Co #1		**−4,0**	−8,7	9,6	−0,464
						Rz	min	Co #2		−4,3	**−9,2**	10,2	−0,464
							max	Co #1		−4,0	**−8,7**	9,6	−0,464
						αR	min	Co #2		−4,3	−9,2	10,2	−0,464
							max	Co #1		−4,0	−8,7	9,6	−0,464

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
6	17	−0,350	1,056	0	Glob.	Ry	min	Co #2		**−4,1**	−9,3	10,1	−0,443
							max	Co #1		**−3,9**	−8,7	9,6	−0,445
						Rz	min	Co #2		−4,1	**−9,3**	10,1	−0,443
							max	Co #1		−3,9	**−8,7**	9,6	−0,445
						αR	min	Co #1		−3,9	−8,7	9,6	−0,445
							max	Co #2		−4,1	−9,3	10,1	−0,443
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−5,9**	1,3	6,0	4,598
							max	Co #1		**−5,6**	1,2	5,7	4,563
						Rz	min	Co #1		−5,6	**1,2**	5,7	4,563
							max	Co #2		−5,9	**1,3**	6,0	4,598
						αR	min	Co #1		−5,6	1,2	5,7	4,563
							max	Co #2		−5,9	1,3	6,0	4,598
8	22	−0,350	0,944	0	Glob.	Rx	min	Co #1	**2,0**	−5,4	1,2	5,9	4,713
							max	Co #2	**2,4**	−5,7	1,3	6,3	4,810
						Ry	min	Co #2	2,4	**−5,7**	1,3	6,3	4,810
							max	Co #1	2,0	**−5,4**	1,2	5,9	4,713
						Rz	min	Co #1	2,0	−5,4	**1,2**	5,9	4,713
							max	Co #2	2,4	−5,7	**1,3**	6,3	4,810
						αR	min	Co #1	2,0	−5,4	1,2	5,9	4,713
							max	Co #2	2,4	−5,7	1,3	6,3	4,810
9	28	0,640	2,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,6	4,0	−0,415
							max	Co #2		**−1,3**	−4,0	4,2	−0,315
						Rz	min	Co #2		−1,3	**−4,0**	4,2	−0,315
							max	Co #1		−1,5	**−3,6**	4,0	−0,415
						αR	min	Co #1		−1,5	−3,6	4,0	−0,415
							max	Co #2		−1,3	−4,0	4,2	−0,315
10	29	−0,640	2,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,7	3,9	−0,399
							max	Co #2		**−1,2**	−4,0	4,2	−0,299
						Rz	min	Co #2		−1,2	**−4,0**	4,2	−0,299
							max	Co #1		−1,5	**−3,7**	3,9	−0,399
						αR	min	Co #1		−1,5	−3,7	3,9	−0,399
							max	Co #2		−1,2	−4,0	4,2	−0,299

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
11	33	0,640	2,446	0	Glob.	Ry	min	Co #2		**−2,1**	0,1	2,1	31,297
							max	Co #1		**−2,1**	0,7	2,3	2,868
						Rz	min	Co #2		−2,1	**0,1**	2,1	31,297
							max	Co #1		−2,1	**0,7**	2,3	2,868
						αR	min	Co #1		−2,1	0,7	2,3	2,868
							max	Co #2		−2,1	0,1	2,1	31,297
12	34	−0,640	2,446	0	Glob.	Rx	min	Co #1	**1,3**	−2,1	0,8	2,6	3,277
							max	Co #2	**1,5**	−2,1	0,1	2,6	35,297
						Ry	min	Co #1	1,3	**−2,1**	0,8	2,6	3,277
							max	Co #2	1,5	**−2,1**	0,1	2,6	35,297
						Rz	min	Co #2	1,5	−2,1	**0,1**	2,6	35,297
							max	Co #1	1,3	−2,1	**0,8**	2,6	3,277
						αR	min	Co #1	1,3	−2,1	0,8	2,6	3,277
							max	Co #2	1,5	−2,1	0,1	2,6	35,297
13	40	0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,7**	−3,6	4,0	−0,468
							max	Co #2		**−1,4**	−4,0	4,2	−0,359
						Rz	min	Co #2		−1,4	**−4,0**	4,2	−0,359
							max	Co #1		−1,7	**−3,6**	4,0	−0,468
						αR	min	Co #1		−1,7	−3,6	4,0	−0,468
							max	Co #2		−1,4	−4,0	4,2	−0,359
14	41	−0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,6	3,9	−0,427
							max	Co #2		**−1,3**	−4,0	4,2	−0,317
						Rz	min	Co #2		−1,3	**−4,0**	4,2	−0,317
							max	Co #1		−1,5	**−3,6**	3,9	−0,427
						αR	min	Co #1		−1,5	−3,6	3,9	−0,427
							max	Co #2		−1,3	−4,0	4,2	−0,317
15	45	0,240	3,446	0	Glob.	Ry	min	Co #2		**−2,1**	0,1	2,1	16,704
							max	Co #1		**−2,1**	0,8	2,2	2,568
						Rz	min	Co #2		−2,1	**0,1**	2,1	16,704
							max	Co #1		−2,1	**0,8**	2,2	2,568
						αR	min	Co #1		−2,1	0,8	2,2	2,568
							max	Co #2		−2,1	0,1	2,1	16,704

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
16	46	−0,240	3,446	0	Glob.	Rx	min	Co #1	**1,3**	−1,9	0,8	2,5	2,876
							max	Co #2	**1,5**	−1,9	0,1	2,4	19,133
						Ry	min	Co #2	1,5	**−1,9**	0,1	2,4	19,133
							max	Co #1	1,3	**−1,9**	0,8	2,5	2,876
						Rz	min	Co #2	1,5	−1,9	**0,1**	2,4	19,133
							max	Co #1	1,3	−1,9	**0,8**	2,5	2,876
						αR	min	Co #1	1,3	−1,9	0,8	2,5	2,876
							max	Co #2	1,5	−1,9	0,1	2,4	19,133
Ext.													
12	34	−0,640	2,446	0	Glob.	Rx	min	Co #1	**1,3**	−2,1	0,8	2,6	3,277
16	46	−0,240	3,446	0	Glob.		min	Co #1	**1,3**	−1,9	0,8	2,5	2,876
4	10	−0,780	−0,062	0	Glob.		max	Co #2	**4,0**	7,5	−15,5	17,7	−0,547
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−5,9**	1,3	6,0	4,598
4	10	−0,780	−0,062	0	Glob.		max	Co #2	4,0	**7,5**	−15,5	17,7	−0,547
3	9	0,780	−0,062	0	Glob.	Rz	min	Co #2		7,3	**−15,5**	17,1	−0,472
4	10	−0,780	−0,062	0	Glob.		min	Co #2	4,0	7,5	**−15,5**	17,7	−0,547
2	5	−0,780	0,062	0	Glob.		max	Co #1		3,9	**6,6**	7,7	0,597
4	10	−0,780	−0,062	0	Glob.	αR	min	Co #2	4,0	7,5	−15,5	17,7	−0,547
12	34	−0,640	2,446	0	Glob.		max	Co #2	1,5	−2,1	0,1	2,6	35,297

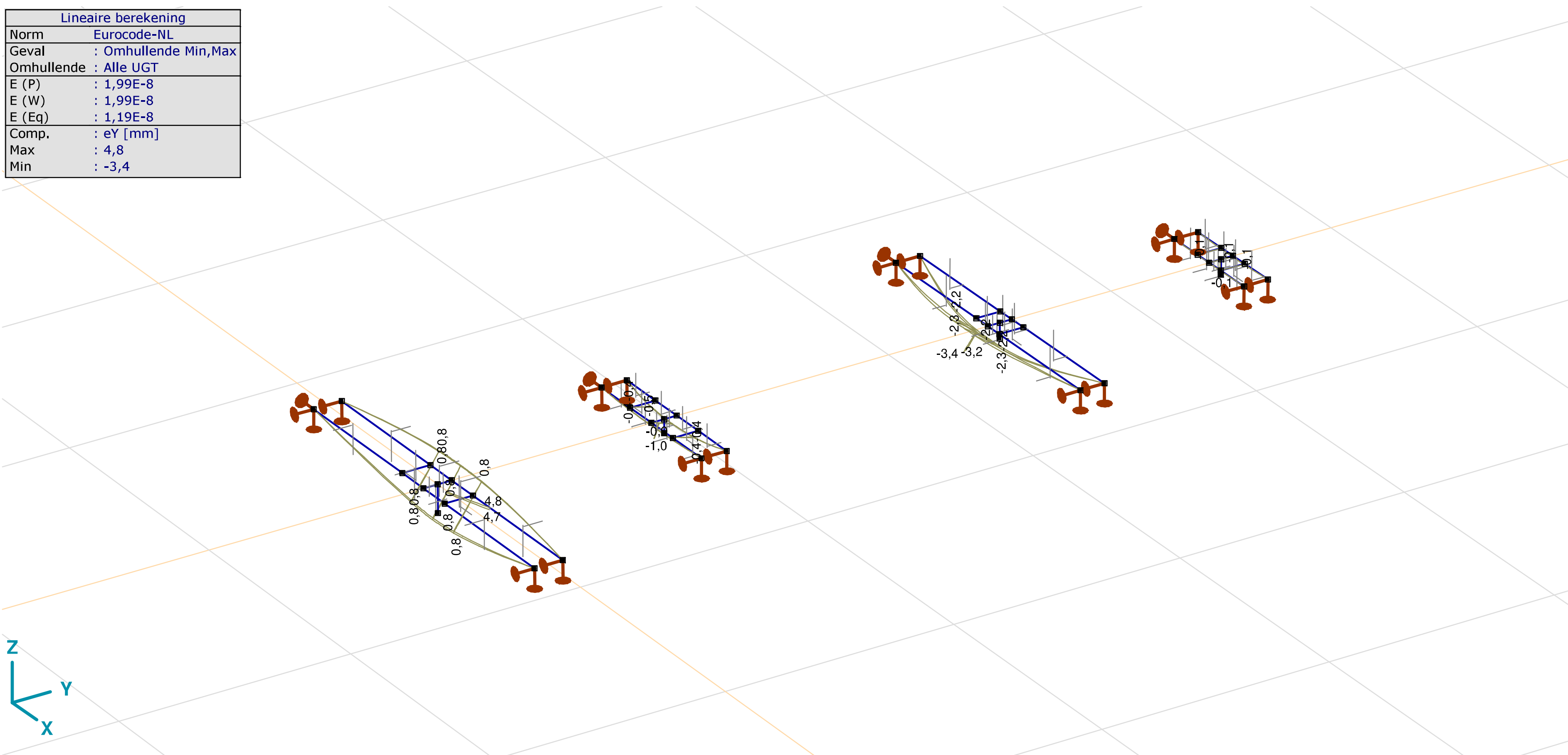
Knoop: Ondersteunde knoop; **Type:** Opleggingstype; **C:** Extreme component; **min. max.:** Extreme type; **Geval:** Belastinggeval van de extreme; **Rx:** X-component opleggingsreactiekracht; **Ry:** Y-component opleggingsreactiekracht; **Rz:** Z-component opleggingsreactiekracht;
Rr: Resulterende opleggingsreactiekracht; **αR:** Verhouding verticale oplegkracht / horizontale oplegkracht;

Project:

Constructeur: DNV GL - Energy

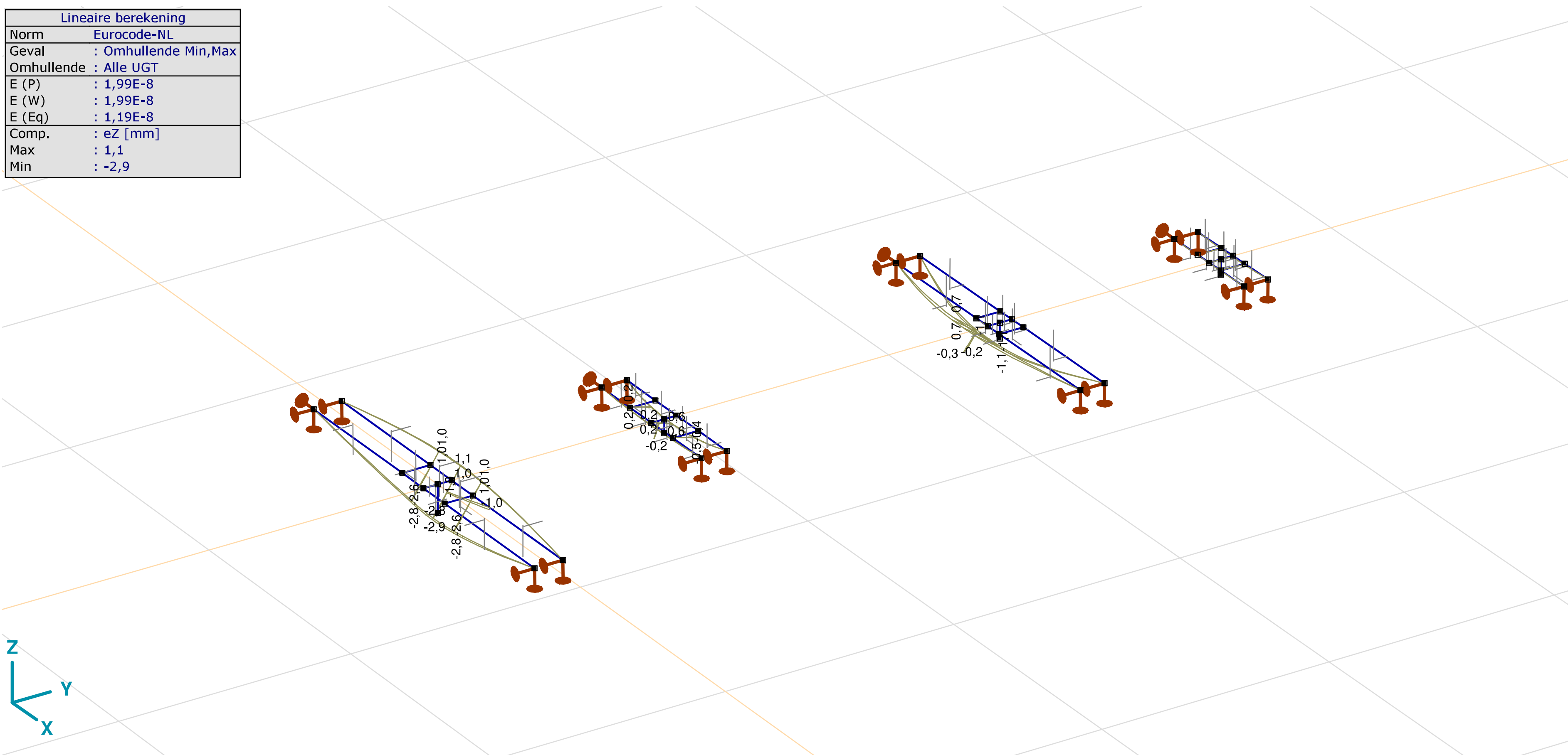
Model: **Liggers D+0 huidig sit 1.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: eY [mm]
Max	: 4,8
Min	: -3,4



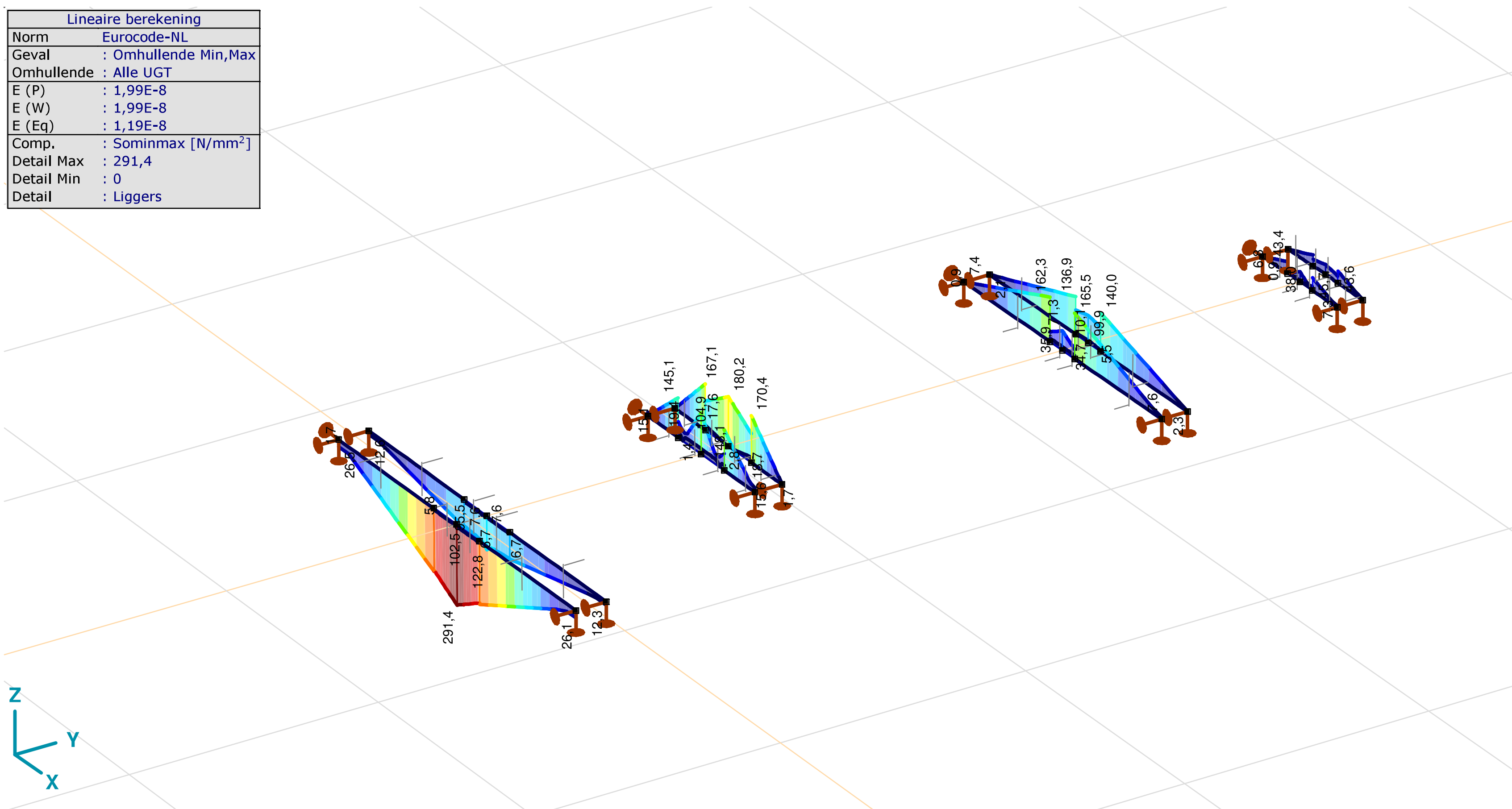
[I], Lineair, Omhullende (Alle UGT), eY, Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: eZ [mm]
Max	: 1,1
Min	: -2,9



[I], Lineair, Omhullende (Alle UGT), eZ, Lijnen

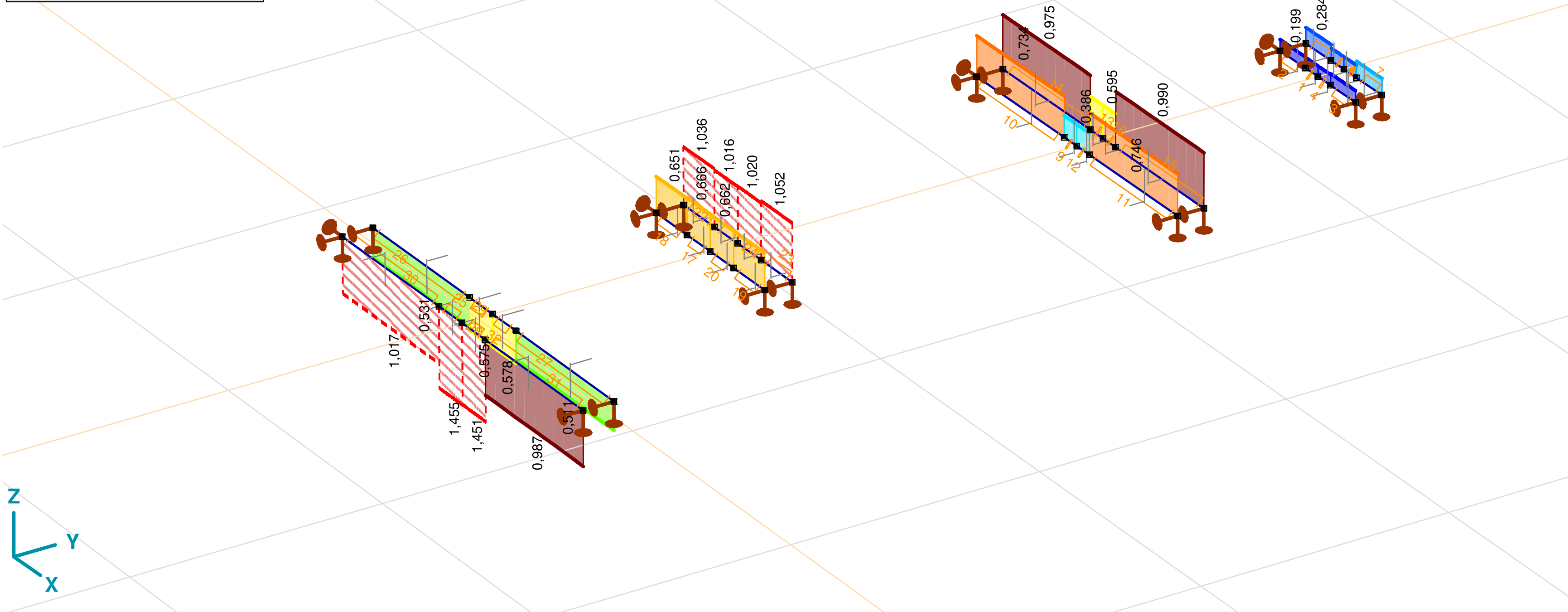
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Sominmax [N/mm²]
Detail Max	: 291,4
Detail Min	: 0
Detail	: Liggers



Sominmax [N/mm²]
291,4
270,6
249,8
229,0
208,2
187,3
166,5
145,7
124,9
104,1
83,3
62,4
41,6
20,8
0

[I], > Liggers, Lineair, Omhullende (Alle UGT), Sominmax, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,99E-8
E (W)	: 1,99E-8
E (Eq)	: 1,19E-8
Comp.	: Unity-check (UGT) []
Detail Max	: 1,455
Detail Min	: 0,191
Detail	: Liggers

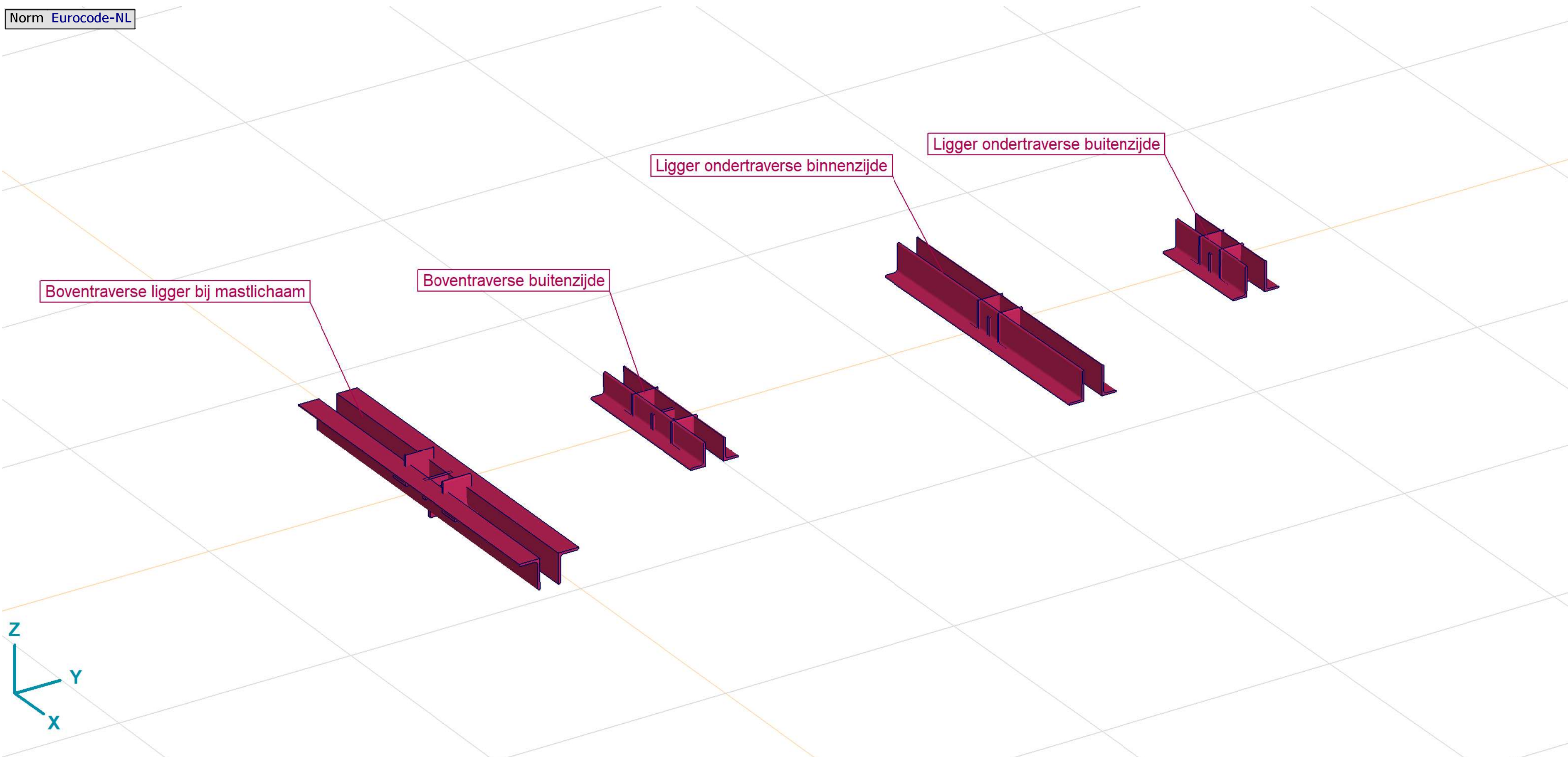


Unity-check
1,000
0,929
0,857
0,786
0,714
0,643
0,571
0,500
0,429
0,357
0,286
0,214
0,143
0,071
0

[Stl], > Liggers, Lineair, Omhullende (Alle UGT), Unity-check, Lijnen (gevuld)

Rapport

Rapport, Inhoudsopgave



rendered view

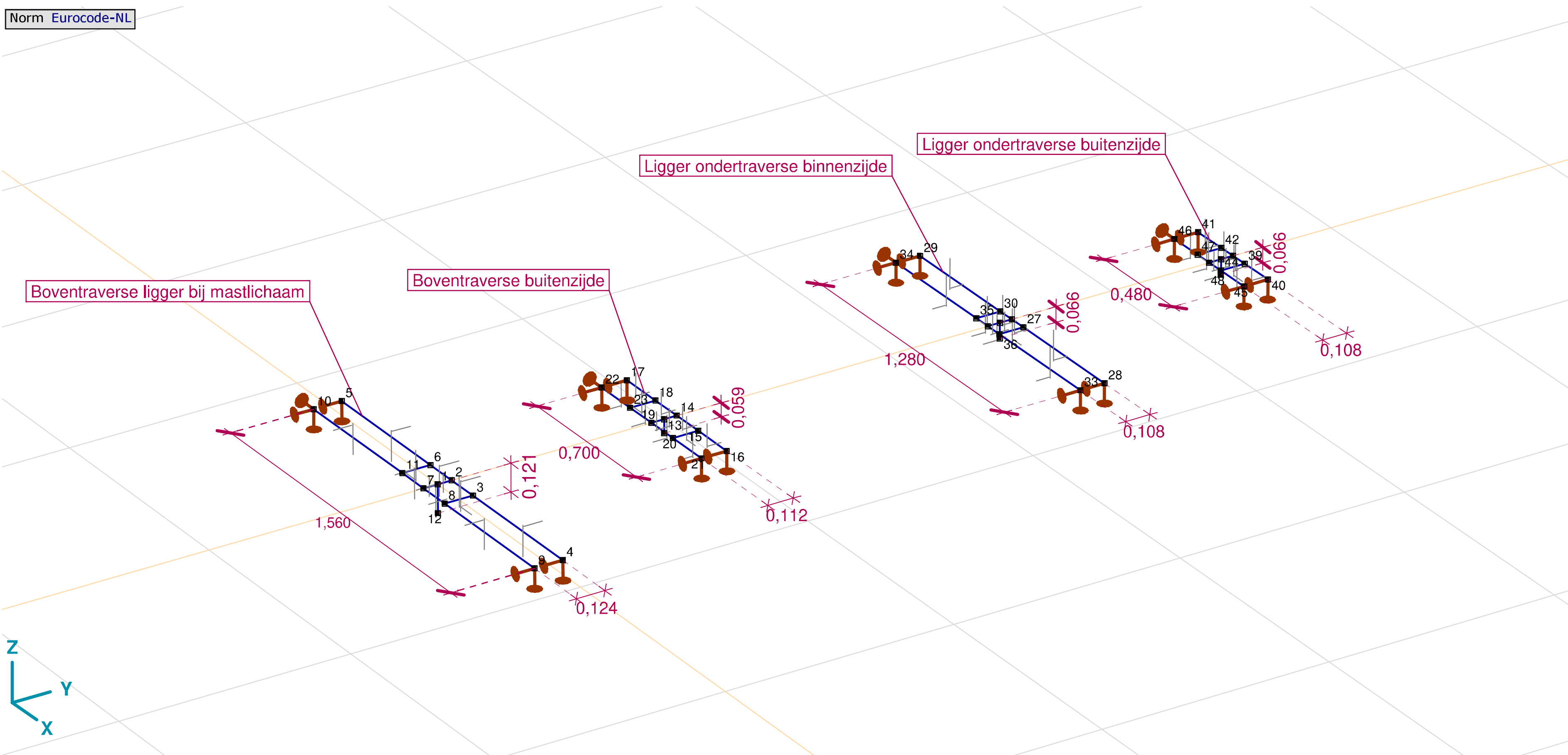
Materialen

	Naam	Type	Nationale norm	Materiaalnorm	Model	E_x [N/mm²]	E_y [N/mm²]	ν	α_T [1/°C]	ρ [kg/m³]	Materiaal kleur	Contour kleur	Structuur	P_1
1	S 235	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm²] = 235,00

	Naam	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}
1	S 235	f_u[N/mm²] = 360,00	f^*_y[N/mm²] = 215,00	f^*_u[N/mm²] = 360,00										

Naam: Materiaalnaam; **Type:** Type materiaal; **Model:** Materiaal model; **E_x:** Elasticiteitsmodulus in lokale x richting; **E_y:** Elasticiteitsmodulus in lokale y richting; **ν:** Poisson's verhouding; **α_T:** Warmteuitzettingscoëfficiënt; **ρ:** Dichtheid; **Materiaal kleur:** Materiaalkleur; **Contour kleur:** Contourkleur; **P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}:** Ontwerpparameter;

Norm Eurocode-NL



Tekening

Knopen

	X [m]	Y [m]	Z [m]
1	0	0	0
2	0	0,062	0
3	0,150	0,062	0
4	0,780	0,062	0
5	−0,780	0,062	0
6	−0,150	0,062	0
7	0	−0,062	0
8	0,150	−0,062	0
9	0,780	−0,062	0
10	−0,780	−0,062	0
11	−0,150	−0,062	0
12	0	0	−0,121
13	0	1,000	0
14	0	1,056	0
15	0,150	1,056	0
16	0,350	1,056	0
17	−0,350	1,056	0
18	−0,150	1,056	0
19	0	0,944	0
20	0,150	0,944	0
21	0,350	0,944	0
22	−0,350	0,944	0
23	−0,150	0,944	0
24	0	1,000	−0,059
25	0	2,500	0
26	0	2,554	0
27	0,080	2,554	0
28	0,640	2,554	0
29	−0,640	2,554	0
30	−0,080	2,554	0
31	0	2,446	0
32	0,080	2,446	0
33	0,640	2,446	0
34	−0,640	2,446	0
35	−0,080	2,446	0
36	0	2,500	−0,066
37	0	3,500	0
38	0	3,554	0
39	0,080	3,554	0
40	0,240	3,554	0
41	−0,240	3,554	0
42	−0,080	3,554	0
43	0	3,446	0
44	0,080	3,446	0
45	0,240	3,446	0
46	−0,240	3,446	0
47	−0,080	3,446	0
48	0	3,500	−0,066

Staven

	Start-punt	Eind-punt	Lengte	Lokaal X	Materiaal	Doorsnede	Ref_z	<– Aansluitingen	Aansluitingen –>
1	3	2	0,150	j - i	S 235	1	R2	.	.
2	4	3	0,630	j - i	S 235	1	R2	.	.
3	6	5	0,630	j - i	S 235	1	R2	.	.
4	2	6	0,150	i - j	S 235	1	R2	.	.
5	7	8	0,150	i - j	S 235	1	R2	.	.
6	8	9	0,630	i - j	S 235	1	R2	.	.
7	10	11	0,630	i - j	S 235	1	R2	.	.
8	11	7	0,150	j - i	S 235	1	R2	.	.
9	11	6	0,124	j - i	S 235	1	Auto	.	.
10	3	8	0,124	i - j	S 235	1	Auto	.	.
11	12	1	0,121	j - i	S 235	2	Auto	.	.
12	1	2	0,062	i - j	S 235	2	R1	.	Schar-YZ
13	7	1	0,062	j - i	S 235	2	R1	100111	.
14	13	14	0,056	i - j	S 235	2	R1	.	100111
15	14	15	0,150	i - j	S 235	3	Auto	.	.
16	15	16	0,200	i - j	S 235	3	Auto	.	.
17	17	18	0,200	i - j	S 235	3	Auto	.	.
18	18	14	0,150	j - i	S 235	3	Auto	.	.
19	20	19	0,150	j - i	S 235	3	Auto	.	.
20	21	20	0,200	j - i	S 235	3	Auto	.	.
21	23	22	0,200	j - i	S 235	3	Auto	.	.

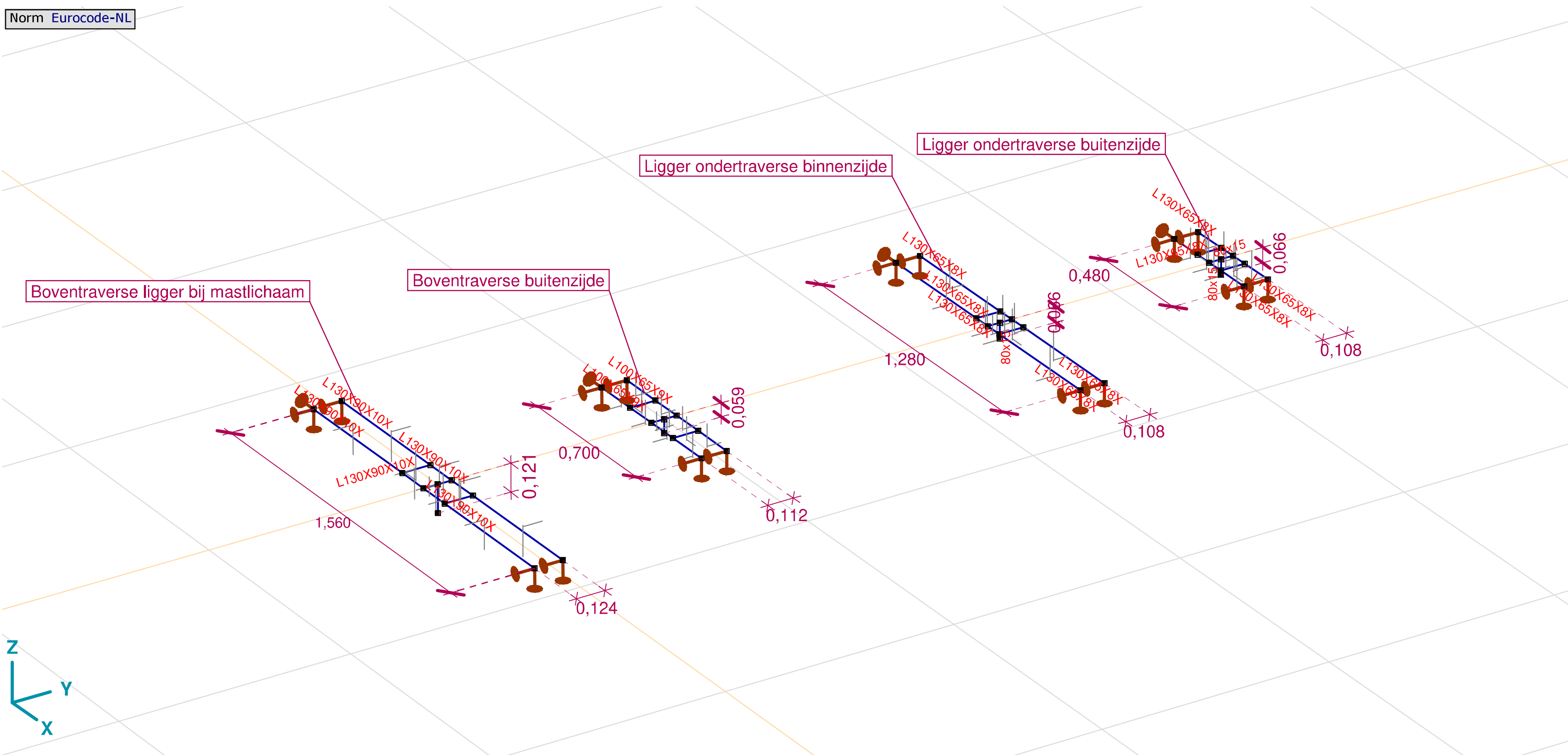
Staven

	Start-punt	*Eind-punt*	*Lengte*	*Lokaal X*	*Materiaal*	*Doorsnede*	*Ref_z*	*<– Aansluitingen*	*Aansluitingen –>*
22	19	23	0,150	i - j	S 235	3	Auto	.	.
23	19	13	0,056	j - i	S 235	2	R1	Schar-YZ	.
24	23	18	0,112	j - i	S 235	3	Auto	.	.
25	15	20	0,112	i - j	S 235	3	Auto	.	.
26	24	13	0,059	j - i	S 235	2	Auto	.	.
27	25	26	0,054	i - j	S 235	2	R1	.	100111
28	26	27	0,080	i - j	S 235	4	Auto	.	.
29	27	28	0,560	i - j	S 235	4	Auto	.	.
30	29	30	0,560	i - j	S 235	4	Auto	.	.
31	30	26	0,080	j - i	S 235	4	Auto	.	.
32	32	31	0,080	j - i	S 235	4	Auto	.	.
33	33	32	0,560	j - i	S 235	4	Auto	.	.
34	35	34	0,560	j - i	S 235	4	Auto	.	.
35	31	35	0,080	i - j	S 235	4	Auto	.	.
36	31	25	0,054	j - i	S 235	2	R1	Schar-YZ	.
37	35	30	0,108	j - i	S 235	4	Auto	.	.
38	27	32	0,108	i - j	S 235	4	Auto	.	.
39	36	25	0,066	j - i	S 235	2	Auto	.	.
40	37	38	0,054	i - j	S 235	2	R1	.	100111
41	38	39	0,080	i - j	S 235	4	Auto	.	.
42	39	40	0,160	i - j	S 235	4	Auto	.	.
43	41	42	0,160	i - j	S 235	4	Auto	.	.
44	42	38	0,080	j - i	S 235	4	Auto	.	.
45	44	43	0,080	j - i	S 235	4	Auto	.	.
46	45	44	0,160	j - i	S 235	4	Auto	.	.
47	47	46	0,160	j - i	S 235	4	Auto	.	.
48	43	47	0,080	i - j	S 235	4	Auto	.	.
49	43	37	0,054	j - i	S 235	2	R1	Schar-YZ	.
50	47	42	0,108	j - i	S 235	4	Auto	.	.
51	39	44	0,108	i - j	S 235	4	Auto	.	.
52	48	37	0,066	j - i	S 235	2	Auto	.	.

Lengte: Elementlengte; **Lokaal X:** Lokale X-richting; **Ref_z:** Referentie voor lokale Z-richting; **<– Aansluitingen:** Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt;

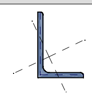
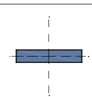
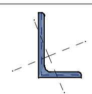
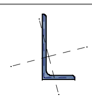
Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+0 huidig sit 2.axs**

Norm Eurocode-NL



Tekening profielen

Profielen

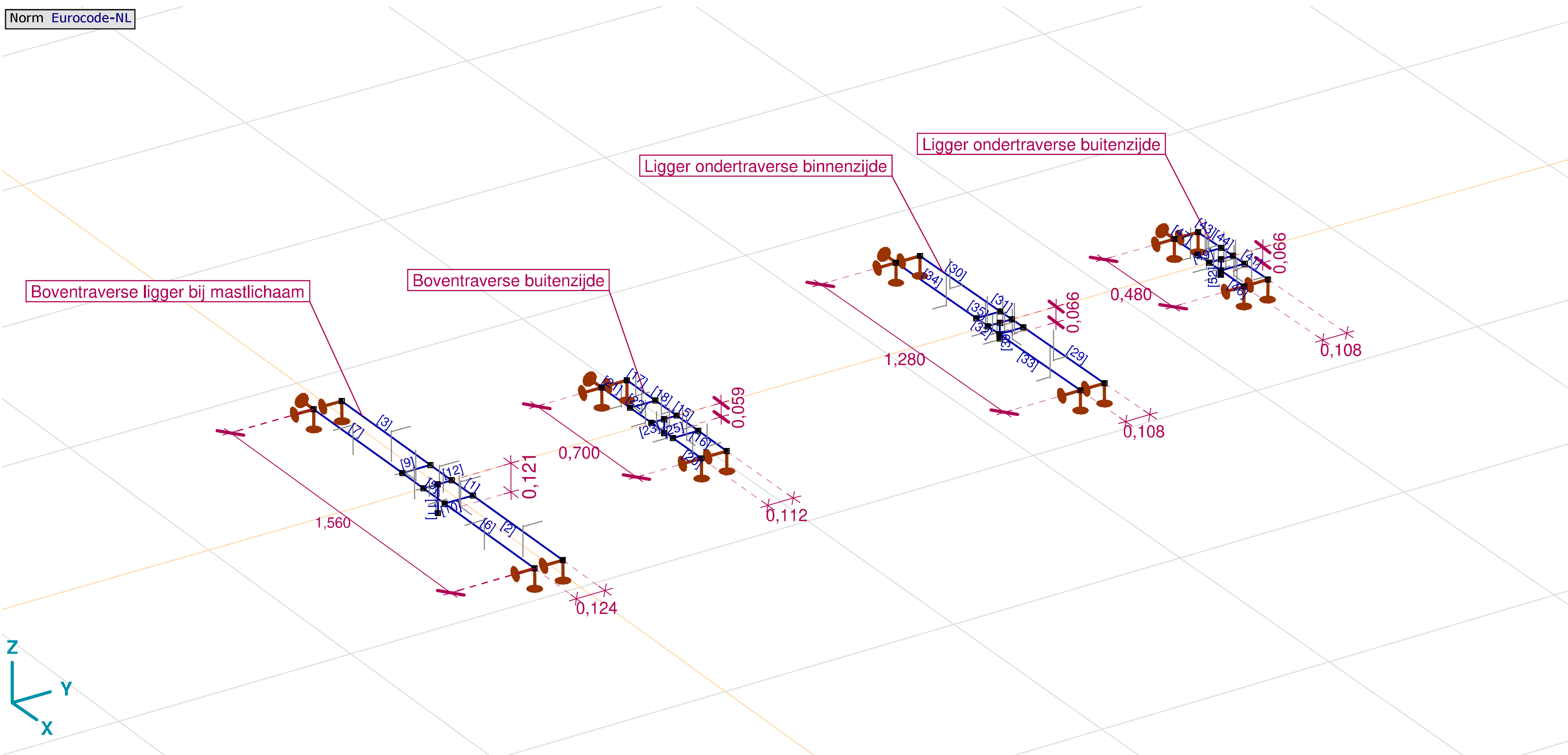
	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm^2]	Ay [mm^2]	Az [mm^2]	Ix [mm^4]	Iy [mm^4]	Iz [mm^4]
1	L 130X 90X10X		Gewalst	L	130,0	90,0	10,0	10,0	12,0	6,0	0	2115,52	730,05	1115,03	75067,63	3579805,00	1407288,00
2	80x15		Gewalst	Recht.	15,0	80,0	0	0	0	0	0	1200,00	1000,00	1000,00	79361,69	22500,00	640000,00
3	L 100X 65X 9X		Gewalst	L	100,0	65,0	9,0	9,0	10,0	5,0	0	1414,78	477,96	772,93	40681,80	1406314,00	466914,90
4	L 130X 65X 8X		Gewalst	L	130,0	65,0	8,0	8,0	11,0	5,5	0	1509,04	400,01	894,73	34749,90	2625007,00	447616,10

	Naam	Iyz [mm^4]	I_1 [mm^4]	I_2 [mm^4]	α [°]	Iω [mm^6]	$W_{1,el,t}$ [mm^3]	$W_{1,el,b}$ [mm^3]	$W_{2,el,t}$ [mm^3]	$W_{2,el,b}$ [mm^3]	$W_{1,pl}$ [mm^3]	$W_{2,pl}$ [mm^3]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]
1	L 130X 90X10X	−1302677,00	4189697,00	797396,10	25,09	6,7E+07	46873,24	62990,74	17179,39	21346,26	81837,91	34394,52	41,1	25,8	90,0	130,0
2	80x15	0	640000,00	22500,00	90,00	1E+07	16000,00	16000,00	3000,00	3000,00	24000,00	4500,00	4,3	23,1	80,0	15,0
3	L 100X 65X 9X	−466019,90	1598273,00	274955,80	22,39	2E+07	23552,43	32380,51	7940,67	10044,04	41416,09	16324,54	31,5	18,2	65,0	100,0
4	L 130X 65X 8X	−608865,80	2783699,00	288924,20	14,61	2,9E+07	32704,41	48773,37	7411,05	11687,17	56896,01	16576,57	41,7	17,2	65,0	130,0

	Naam	y_G [mm]	z_G [mm]	y_s [mm]	z_s [mm]	β_y [mm]	β_z [mm]	β_w []	S.p.
1	L 130X 90X10X	21,8	41,5	−16,4	−35,0	112,7	95,4	−292,0	4
2	80x15	40,0	7,5	0	0	0	0	0	5
3	L 100X 65X 9X	15,9	33,2	−11,1	−26,9	84,2	70,1	−343,9	4
4	L 130X 65X 8X	13,7	45,6	−9,5	−39,4	111,6	90,0	−547,9	4

Naam: Doorsnede naam; **Productie:** Productieproces; **Vorm:** Profiel; **h:** Doorsnede hoogte; **b:** Doorsnede breedte; **tw:** Lijfdikte; **tf:** Flensdikte; **r_1, r_2, r_3:** Afrondingswaarde; **Ax:** Doorsnede-oppervlak; **Ay, Az:** Afschuivingsoppervlak; **Ix:** Torsietraagheidsmoment; **Iy, Iz:** Buigtraagheidsmoment; **Iyz:** Centrifugaal traagheidsmoment; **I_1, I_2:** Hoofdbuigtraagheidsmoment; **α:** Hoofdrichtingen; **Iω:** Krommingsconstante; **$W_{1,el,t}$, $W_{1,el,b}$, $W_{2,el,t}$, $W_{2,el,b}$:** Elastisch weerstandsmoment; **$W_{1,pl}$, $W_{2,pl}$:** Plastisch weerstandsmoment; **i_y, i_z:** Traagheidsstraal; **Hy:** Afmeting in lokale Y-richting; **Hz:** Afmeting in lokale Z-richting; **y_G:** Y-coördinaat van het zwaartepunt; **z_G:** Z-coördinaat van het zwaartepunt; **y_s:** Y-coördinaat van het afschuivingsmiddelpunt (torsie); **z_s:** Z-coördinaat van het afschuivingsmiddelpunt (torsie); **β_y, β_z, β_w:** Wagner's coëfficiënt; **S.p.:** Spanningspunten;

Norm Eurocode-NL



Tekening staven

Staafaansluitingen

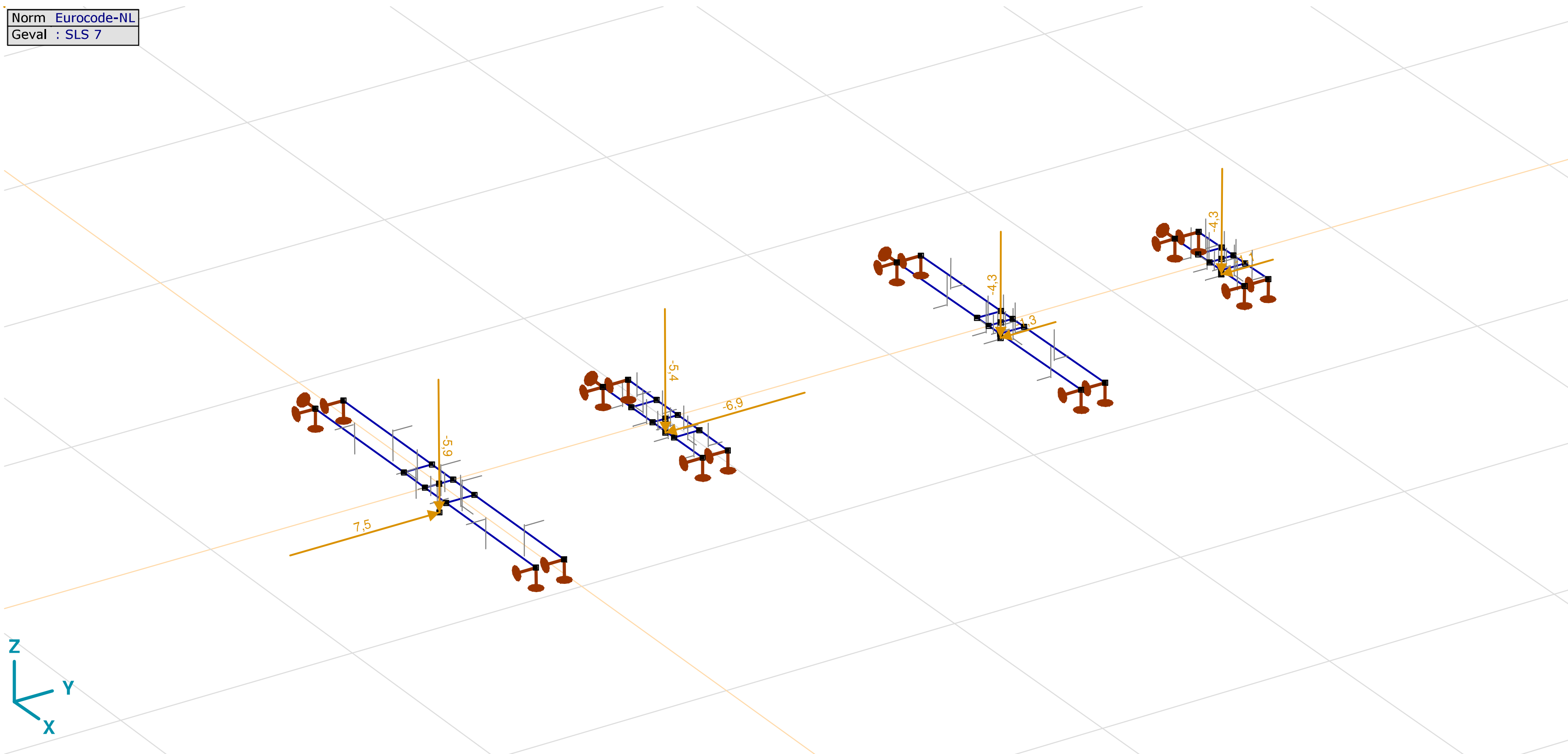
	<– Aansluitingen	*Aansluitingen –>*	*<– e_x*	*<– θ_x*	*<– θ_y*	*<– θ_z*
12	.	Schar-YZ	.	.	.	.
13	100111	.	Vrij	Vrij	Vrij	Vrij
14	.	100111	.	.	.	.
23	Schar-YZ	.	.	.	Vrij	Vrij
27	.	100111	.	.	.	.
36	Schar-YZ	.	.	.	Vrij	Vrij
40	.	100111	.	.	.	.
49	Schar-YZ	.	.	.	Vrij	Vrij

<– Aansluitingen: Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt; **<– e_x, <– θ_x, <– θ_y, <– θ_z:** Type;

EG: Staaf eigen gewicht

	Σ [kg]
1–52	127,980
Totaal	**127,980**

Σ: Totale massa;



SLS 7

SLS 7: Knoopbelastingen

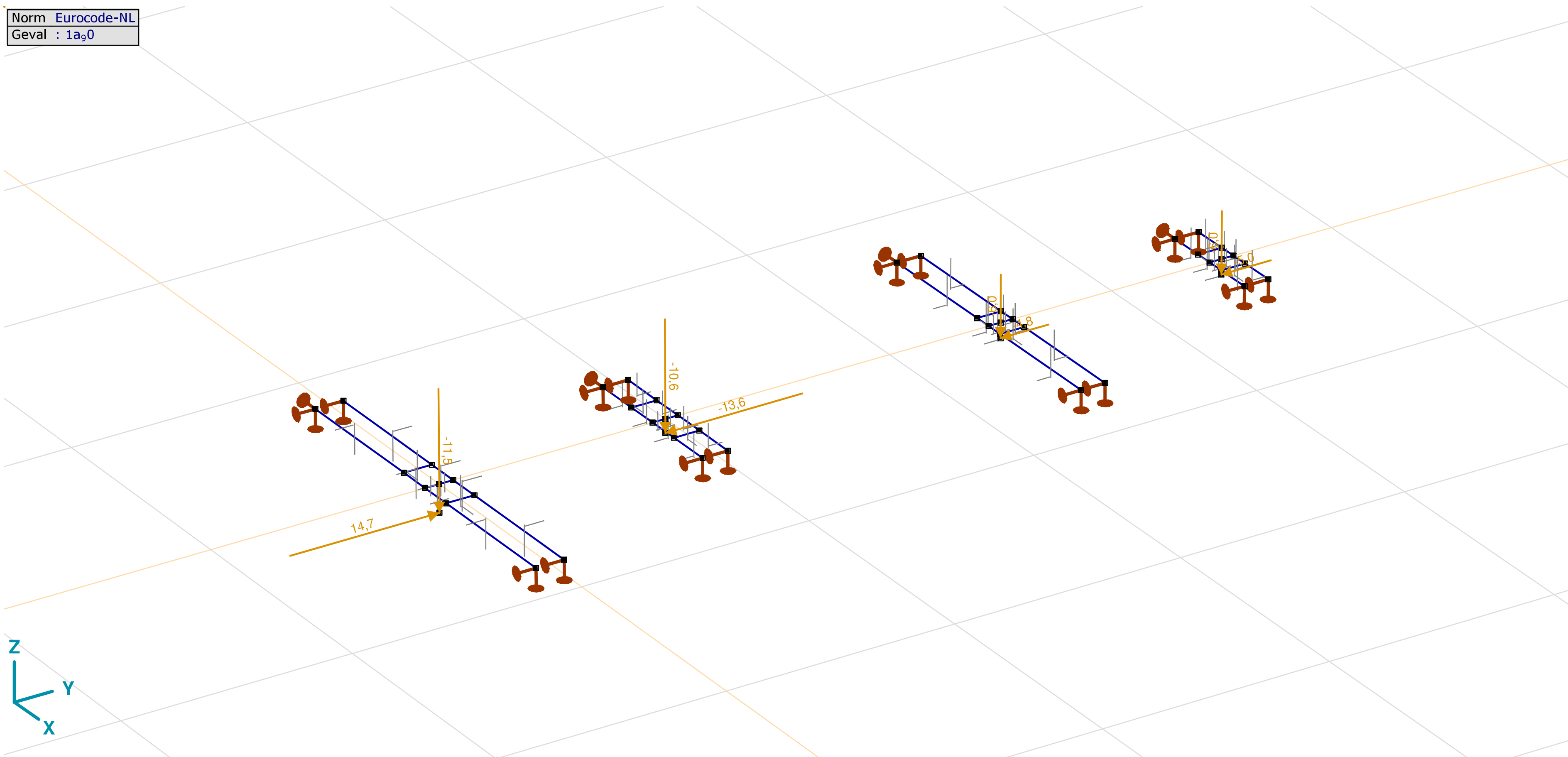
	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
12	Globaal	0	7,5	−5,9	0	0	0
24	Globaal	0	−6,9	−5,4	0	0	0
36	Globaal	0	−1,3	−4,3	0	0	0
48	Globaal	0	−1,1	−4,3	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

1a_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
12	Globaal	0	14,7	−11,5	0	0	0
24	Globaal	0	−13,6	−10,6	0	0	0
36	Globaal	0	−4,8	−6,0	0	0	0
48	Globaal	0	−5,0	−6,0	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

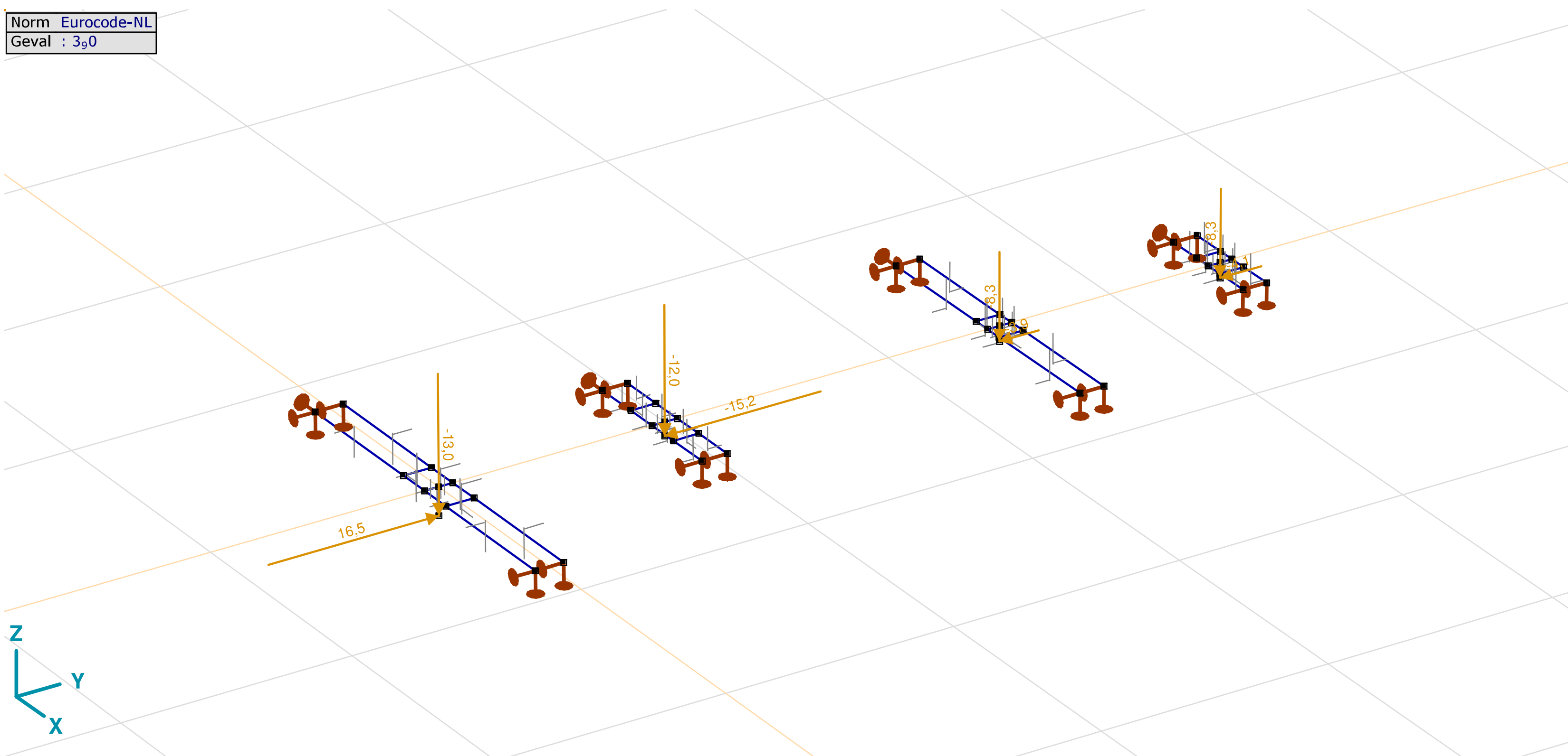


1a_90

3_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
12	Globaal	0	16,5	−13,0	0	0	0
24	Globaal	0	−15,2	−12,0	0	0	0
36	Globaal	0	−3,9	−8,3	0	0	0
48	Globaal	0	−4,1	−8,3	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

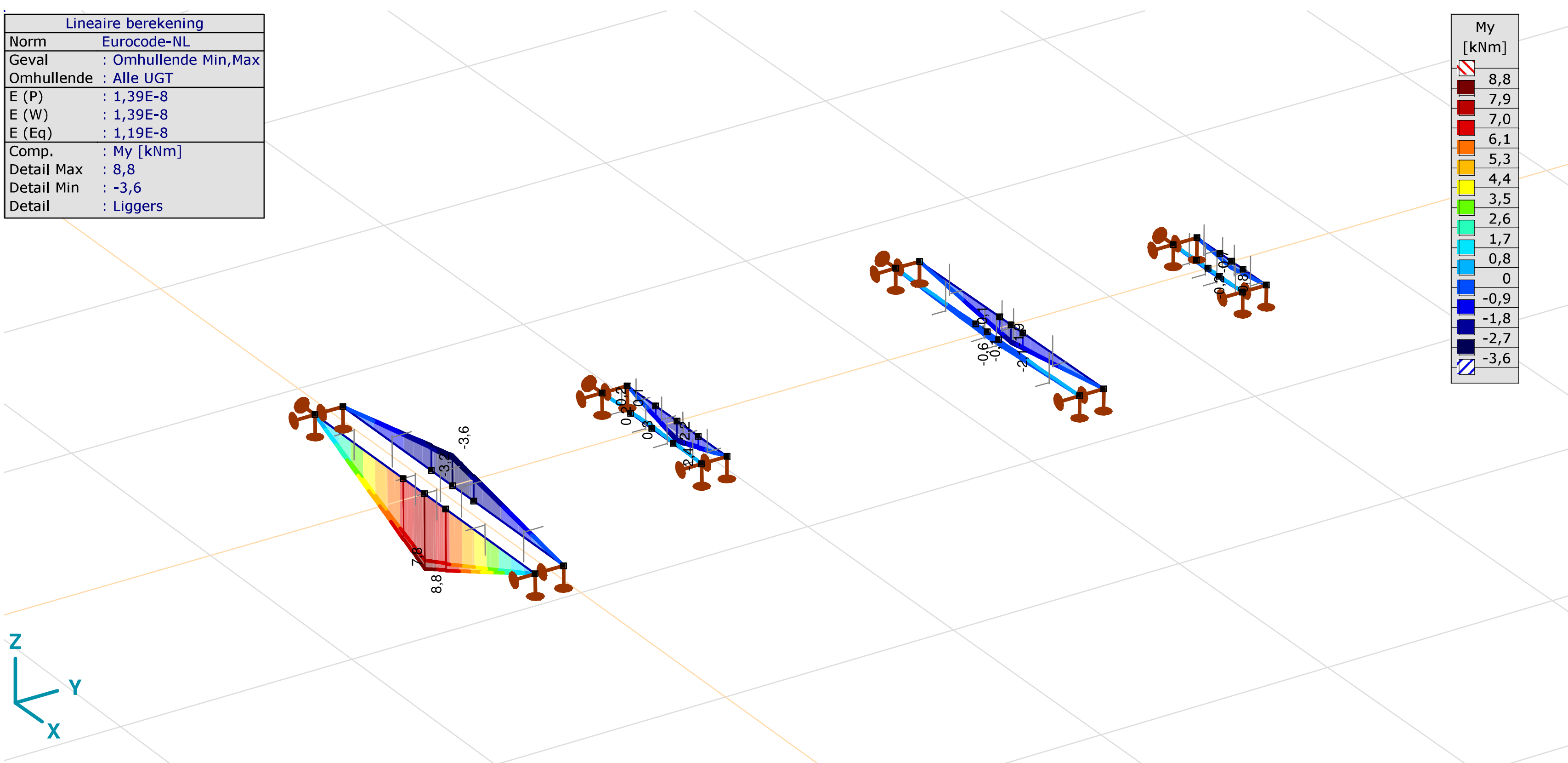


3_90

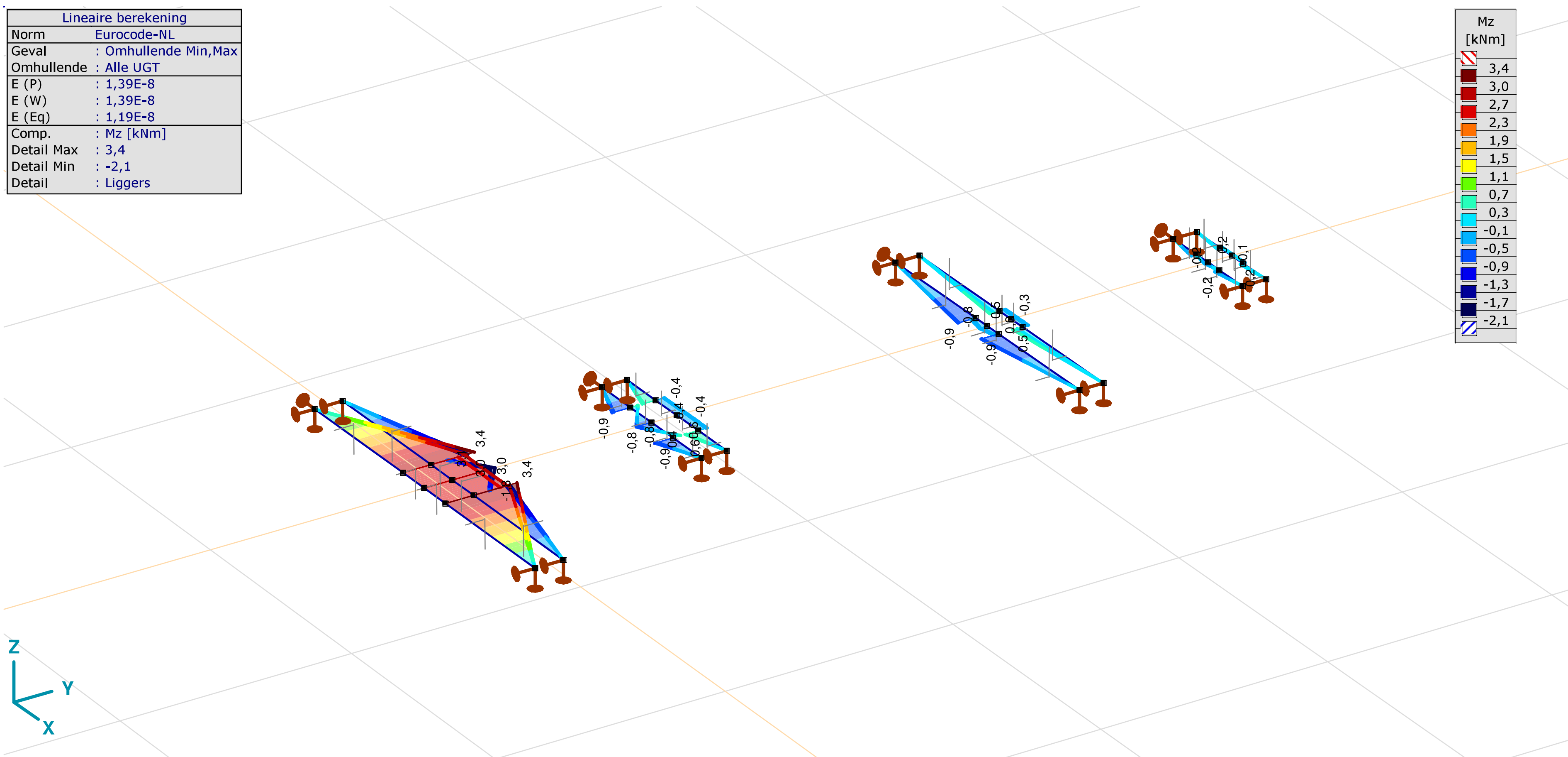
Gebruiker gedefinieerde belastingcombinaties uit belastinggevallen

	Naam	Type	ST1	EG (PERM1)	SLS 7 (VER1)	1a_90 (VER1)	3_90 (VER1)	Commentaar
1	Co #1	UGT	0	1,20	0	1,00	0	
2	Co #2	UGT	0	1,20	0	0	1,00	
3	Co #3	BGT Quasi-blijvend	0	1,00	1,00	0	0	

Naam: Naam belastingcombinatie; **Type:** Type belastingcombinatie; **ST1, EG (PERM1), SLS 7 (VER1), $1a_90$ (VER1), 3_90 (VER1):** Factor;



[I], > Liggers, Lineair, Omhullende (Alle UGT), My, Lijnen (gevuld)



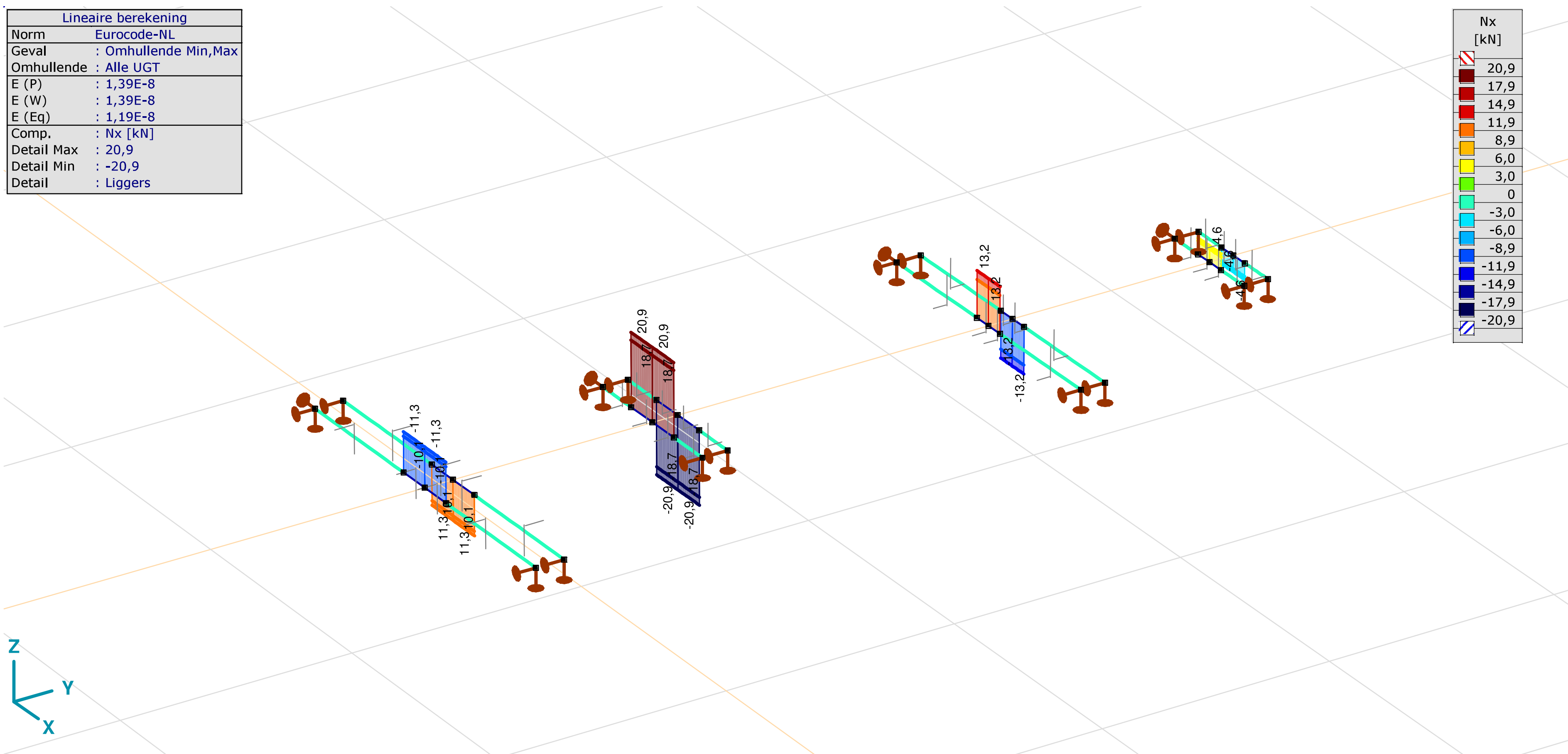
[I], > Liggers, Lineair, Omhullende (Alle UGT), Mz, Lijnen (gevuld)

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 huidig sit 2.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Nx [kN]
Detail Max	: 20,9
Detail Min	: -20,9
Detail	: Liggers



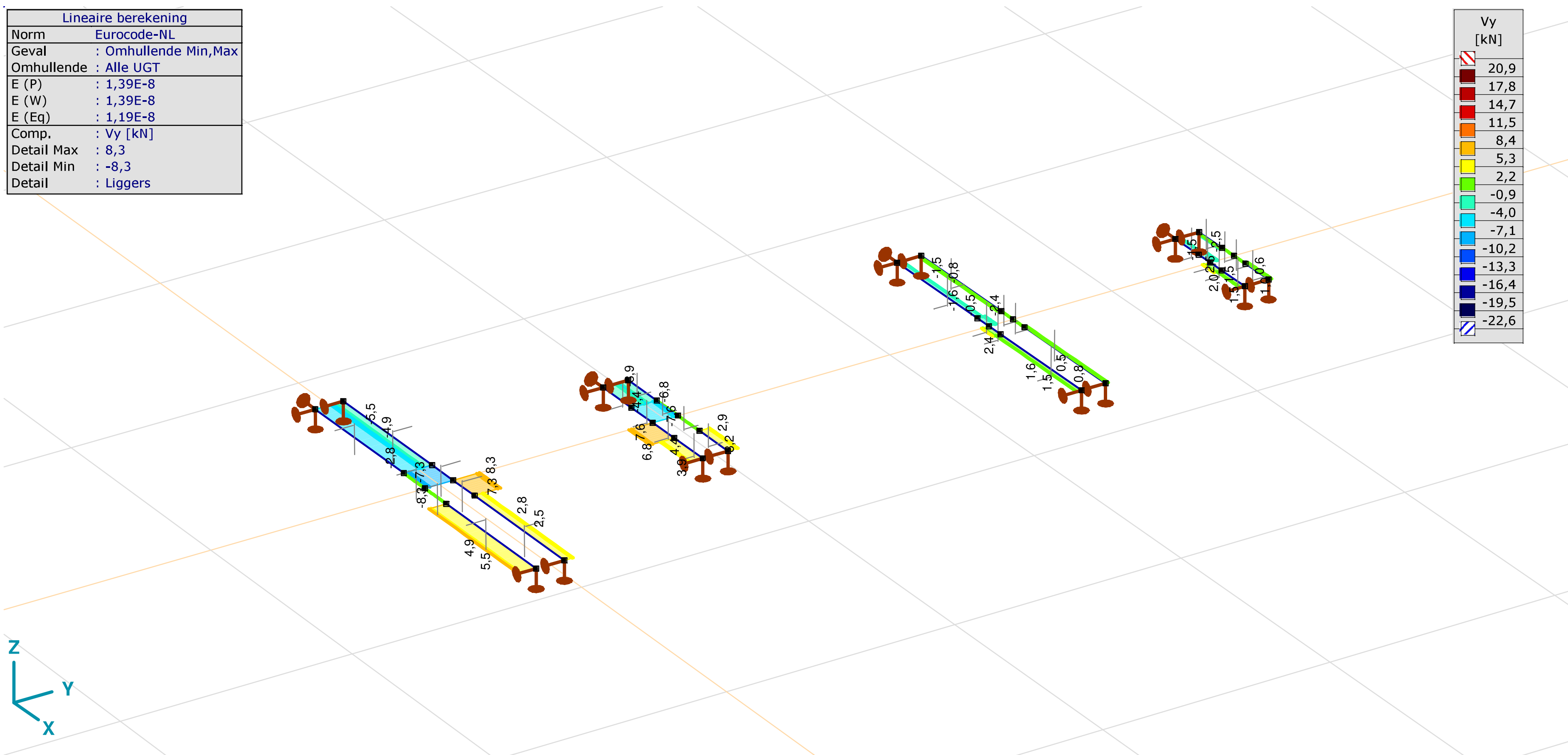
Nx [kN]
20,9
17,9
14,9
11,9
8,9
6,0
3,0
0
-3,0
-6,0
-8,9
-11,9
-14,9
-17,9
-20,9

[I], > Liggers, Lineair, Omhullende (Alle UGT), Nx, Lijnen (gevuld)

Project:

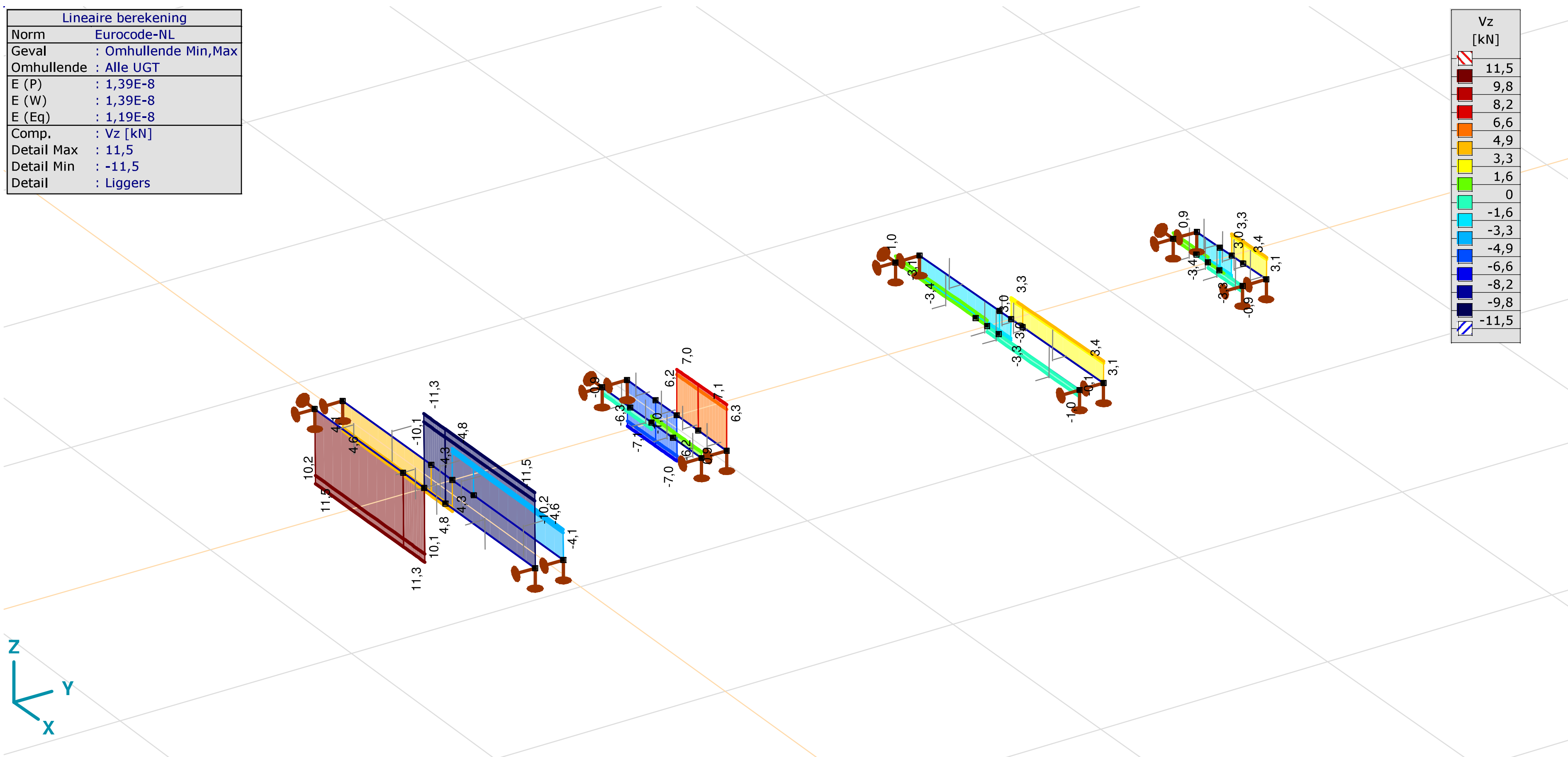
Constructeur: DNV GL - Energy

Model: **Liggers D+0 huidig sit 2.axs**



[I], > Liggers, Lineair, Omhullende (Alle UGT), Vy, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Vz [kN]
Detail Max	: 11,5
Detail Min	: -11,5
Detail	: Liggers

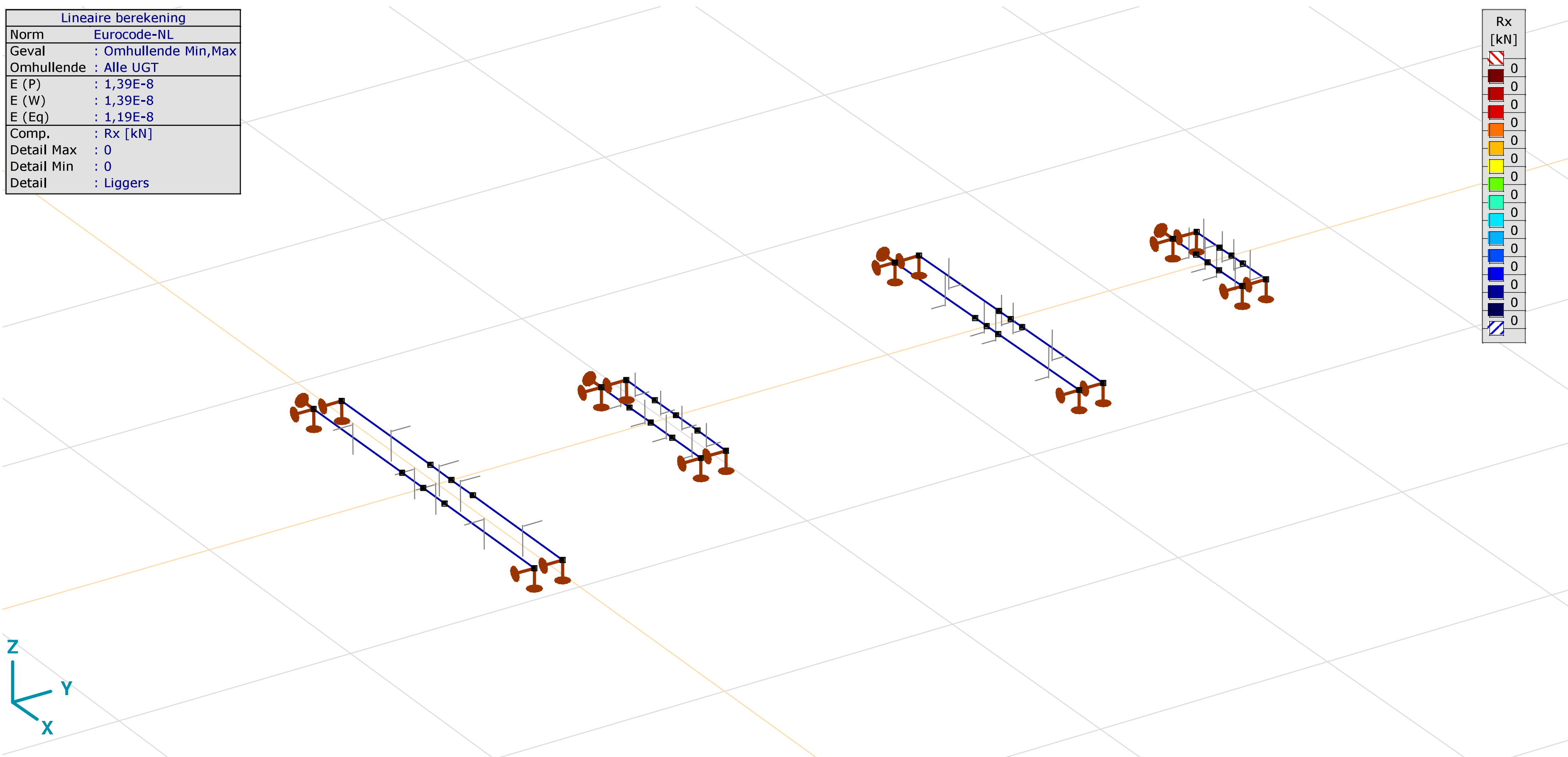


[I], > Liggers, Lineair, Omhullende (Alle UGT), Vz, Lijnen (gevuld)

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 huidig sit 2.axs**



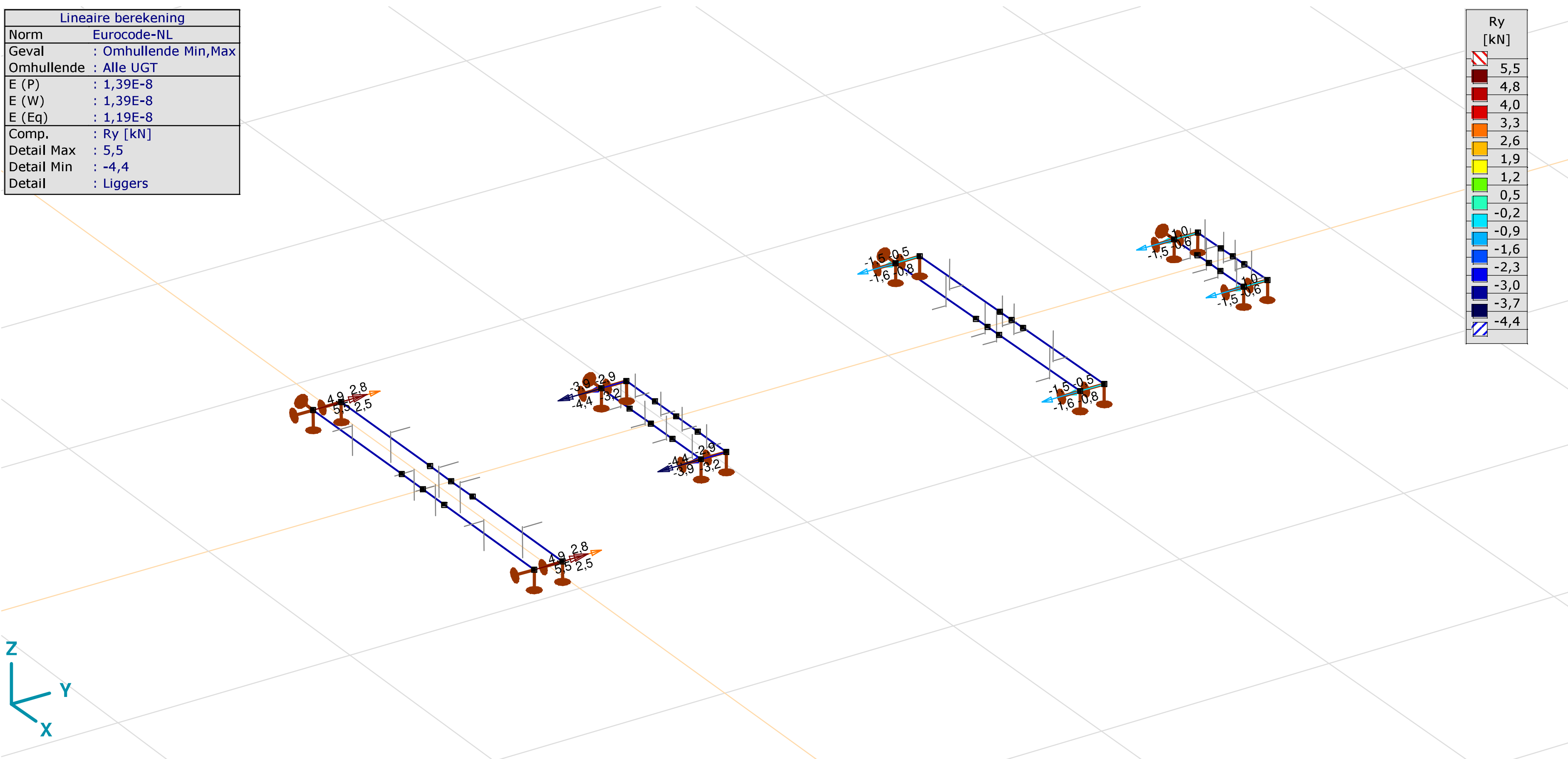
[I], > Liggers, Lineair, Omhullende (Alle UGT), Rx (knoopopl.), Lijnen

Project:

Constructeur: DNV GL - Energy

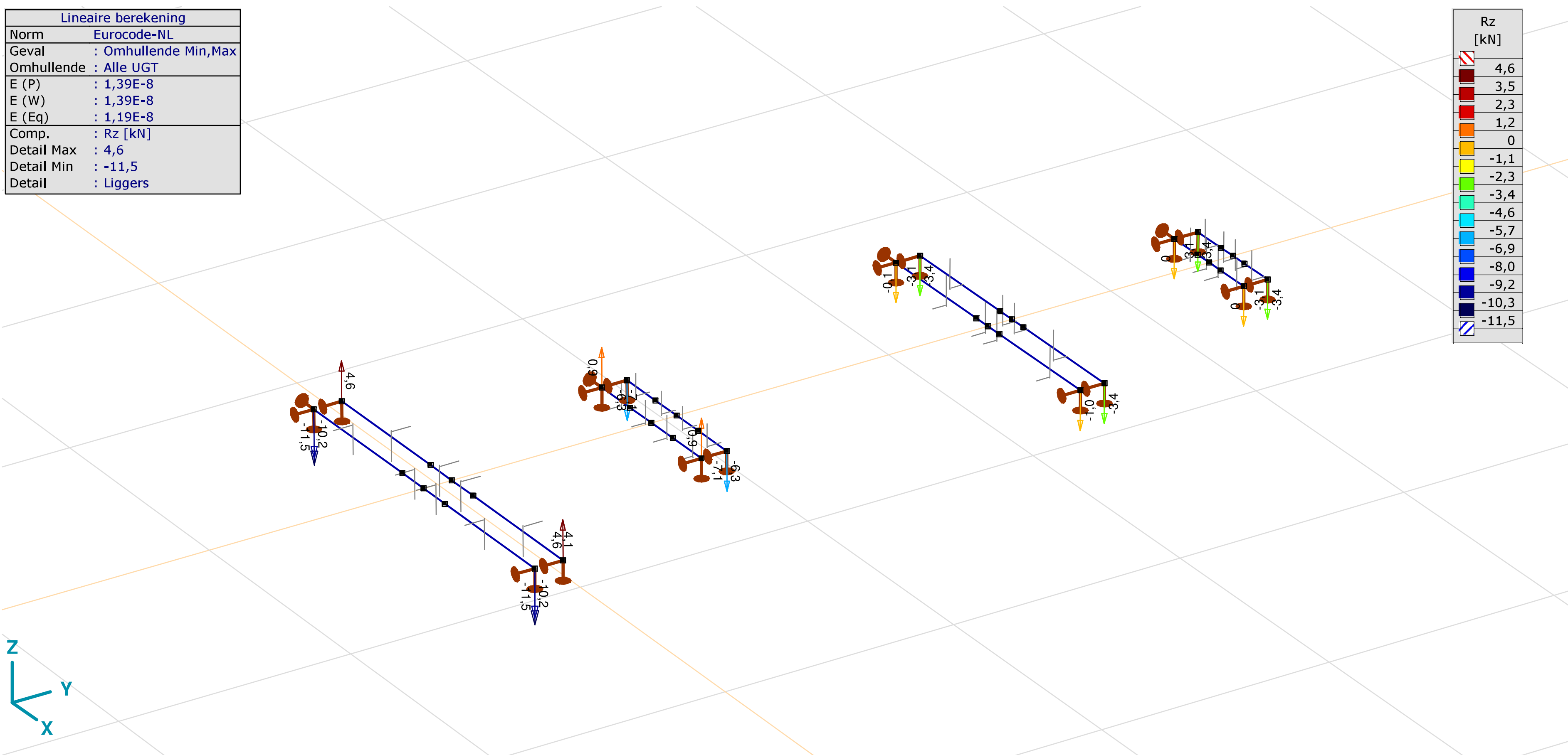
Model: **Liggers D+0 huidig sit 2.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Ry [kN]
Detail Max	: 5,5
Detail Min	: -4,4
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Ry (knoopopl.), Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Rz [kN]
Detail Max	: 4,6
Detail Min	: -11,5
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Rz (knoopopl.), Lijnen

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
1	4	0,780	0,062	0	Glob.	Ry	min	Co #1		**2,5**	4,1	4,8	0,603
							max	Co #2		**2,8**	4,6	5,4	0,603
						Rz	min	Co #1		2,5	**4,1**	4,8	0,603
							max	Co #2		2,8	**4,6**	5,4	0,603
						αR	min	Co #2		2,8	4,6	5,4	0,603
							max	Co #1		2,5	4,1	4,8	0,603
2	5	−0,780	0,062	0	Glob.	Ry	min	Co #1		**2,5**	4,1	4,8	0,603
							max	Co #2		**2,8**	4,6	5,4	0,603
						Rz	min	Co #1		2,5	**4,1**	4,8	0,603
							max	Co #2		2,8	**4,6**	5,4	0,603
						αR	min	Co #2		2,8	4,6	5,4	0,603
							max	Co #1		2,5	4,1	4,8	0,603
3	9	0,780	−0,062	0	Glob.	Ry	min	Co #1		**4,9**	−10,2	11,3	−0,476
							max	Co #2		**5,5**	−11,5	12,7	−0,476
						Rz	min	Co #2		5,5	**−11,5**	12,7	−0,476
							max	Co #1		4,9	**−10,2**	11,3	−0,476
						αR	min	Co #2		5,5	−11,5	12,7	−0,476
							max	Co #1		4,9	−10,2	11,3	−0,476
4	10	−0,780	−0,062	0	Glob.	Rx	min	Co #1	**0**	4,9	−10,2	11,3	−0,476
							max	Co #1	**0**	4,9	−10,2	11,3	−0,476
						Ry	min	Co #1	0	**4,9**	−10,2	11,3	−0,476
							max	Co #2	0	**5,5**	−11,5	12,7	−0,476
						Rz	min	Co #2	0	5,5	**−11,5**	12,7	−0,476
							max	Co #1	0	4,9	**−10,2**	11,3	−0,476
						αR	min	Co #2	0	5,5	−11,5	12,7	−0,476
							max	Co #1	0	4,9	−10,2	11,3	−0,476
5	16	0,350	1,056	0	Glob.	Ry	min	Co #2		**−3,2**	−7,1	7,7	−0,450
							max	Co #1		**−2,9**	−6,3	6,9	−0,454
						Rz	min	Co #2		−3,2	**−7,1**	7,7	−0,450
							max	Co #1		−2,9	**−6,3**	6,9	−0,454
						αR	min	Co #1		−2,9	−6,3	6,9	−0,454
							max	Co #2		−3,2	−7,1	7,7	−0,450

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
6	17	−0,350	1,056	0	Glob.	Ry	min	Co #2		**−3,2**	−7,1	7,7	−0,450
							max	Co #1		**−2,9**	−6,3	6,9	−0,454
						Rz	min	Co #2		−3,2	**−7,1**	7,7	−0,450
							max	Co #1		−2,9	**−6,3**	6,9	−0,454
						αR	min	Co #1		−2,9	−6,3	6,9	−0,454
							max	Co #2		−3,2	−7,1	7,7	−0,450
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−4,4**	0,9	4,5	4,674
							max	Co #1		**−3,9**	0,9	4,0	4,511
						Rz	min	Co #1		−3,9	**0,9**	4,0	4,511
							max	Co #2		−4,4	**0,9**	4,5	4,674
						αR	min	Co #1		−3,9	0,9	4,0	4,511
							max	Co #2		−4,4	0,9	4,5	4,674
8	22	−0,350	0,944	0	Glob.	Rx	min	Co #1	**0**	−3,9	0,9	4,0	4,511
							max	Co #1	**0**	−3,9	0,9	4,0	4,511
						Ry	min	Co #2	0	**−4,4**	0,9	4,5	4,674
							max	Co #1	0	**−3,9**	0,9	4,0	4,511
						Rz	min	Co #1	0	−3,9	**0,9**	4,0	4,511
							max	Co #2	0	−4,4	**0,9**	4,5	4,674
						αR	min	Co #1	0	−3,9	0,9	4,0	4,511
							max	Co #2	0	−4,4	0,9	4,5	4,674
9	28	0,640	2,554	0	Glob.	Ry	min	Co #1		**−0,8**	−3,1	3,2	−0,275
							max	Co #2		**−0,5**	−3,4	3,4	−0,143
						Rz	min	Co #2		−0,5	**−3,4**	3,4	−0,143
							max	Co #1		−0,8	**−3,1**	3,2	−0,275
						αR	min	Co #1		−0,8	−3,1	3,2	−0,275
							max	Co #2		−0,5	−3,4	3,4	−0,143
10	29	−0,640	2,554	0	Glob.	Ry	min	Co #1		**−0,8**	−3,1	3,2	−0,275
							max	Co #2		**−0,5**	−3,4	3,4	−0,143
						Rz	min	Co #2		−0,5	**−3,4**	3,4	−0,143
							max	Co #1		−0,8	**−3,1**	3,2	−0,275
						αR	min	Co #1		−0,8	−3,1	3,2	−0,275
							max	Co #2		−0,5	−3,4	3,4	−0,143

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
11	33	0,640	2,446	0	Glob.	Ry	min	Co #1		**−1,6**	−0,1	1,6	−11,528
							max	Co #2		**−1,5**	−1,0	1,8	−1,490
						Rz	min	Co #2		−1,5	**−1,0**	1,8	−1,490
							max	Co #1		−1,6	**−0,1**	1,6	−11,528
						αR	min	Co #1		−1,6	−0,1	1,6	−11,528
							max	Co #2		−1,5	−1,0	1,8	−1,490
12	34	−0,640	2,446	0	Glob.	Rx	min	Co #1	**0**	−1,6	−0,1	1,6	−11,528
							max	Co #1	**0**	−1,6	−0,1	1,6	−11,528
						Ry	min	Co #1	0	**−1,6**	−0,1	1,6	−11,528
							max	Co #2	0	**−1,5**	−1,0	1,8	−1,490
						Rz	min	Co #2	0	−1,5	**−1,0**	1,8	−1,490
							max	Co #1	0	−1,6	**−0,1**	1,6	−11,528
						αR	min	Co #1	0	−1,6	−0,1	1,6	−11,528
							max	Co #2	0	−1,5	−1,0	1,8	−1,490
13	40	0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,0**	−3,1	3,2	−0,317
							max	Co #2		**−0,6**	−3,4	3,4	−0,173
						Rz	min	Co #2		−0,6	**−3,4**	3,4	−0,173
							max	Co #1		−1,0	**−3,1**	3,2	−0,317
						αR	min	Co #1		−1,0	−3,1	3,2	−0,317
							max	Co #2		−0,6	−3,4	3,4	−0,173
14	41	−0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,0**	−3,1	3,2	−0,317
							max	Co #2		**−0,6**	−3,4	3,4	−0,173
						Rz	min	Co #2		−0,6	**−3,4**	3,4	−0,173
							max	Co #1		−1,0	**−3,1**	3,2	−0,317
						αR	min	Co #1		−1,0	−3,1	3,2	−0,317
							max	Co #2		−0,6	−3,4	3,4	−0,173
15	45	0,240	3,446	0	Glob.	Ry	min	Co #1		**−1,5**	0	1,5	−84,594
							max	Co #2		**−1,5**	−0,9	1,7	−1,690
						Rz	min	Co #2		−1,5	**−0,9**	1,7	−1,690
							max	Co #1		−1,5	**0**	1,5	−84,594
						αR	min	Co #1		−1,5	0	1,5	−84,594
							max	Co #2		−1,5	−0,9	1,7	−1,690

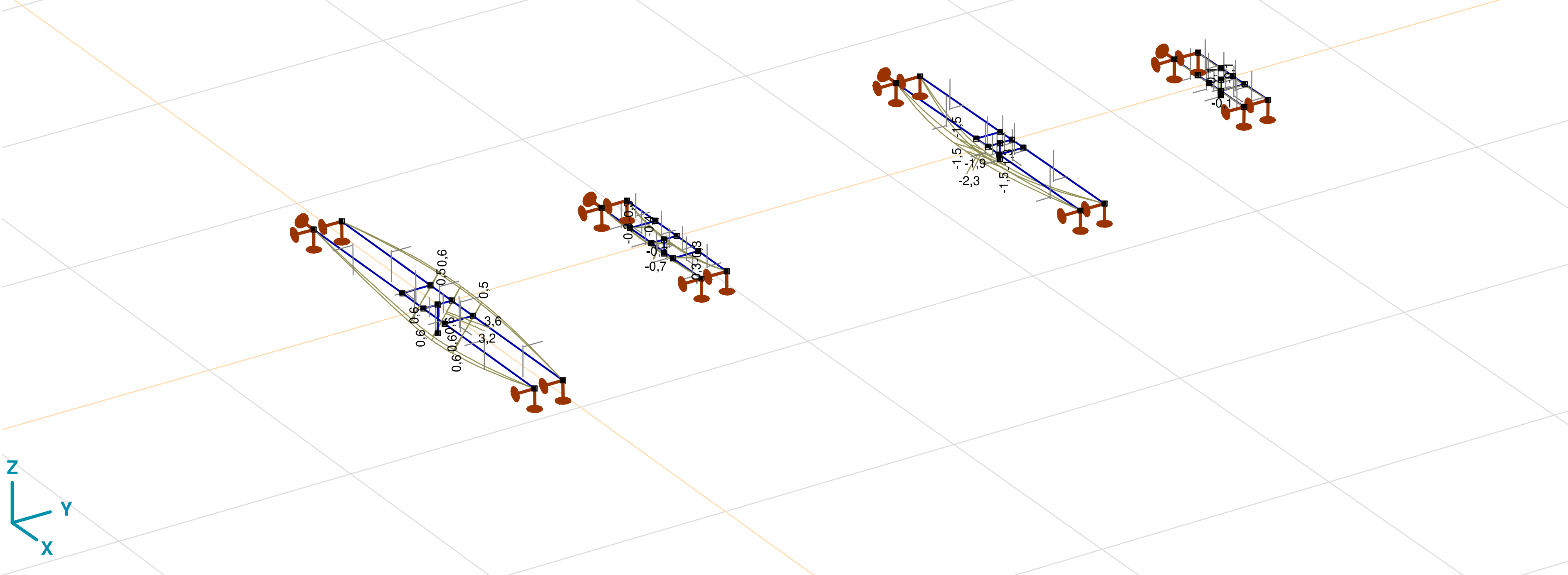
Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	X [m]	Y [m]	Z [m]	Type	C	min. max.	Geval	Rx [kN]	Ry [kN]	Rz [kN]	Rr [kN]	αR
16	46	−0,240	3,446	0	Glob.	Rx	min	Co #1	**0**	−1,5	0	1,5	−84,594
							max	Co #1	**0**	−1,5	0	1,5	−84,594
						Ry	min	Co #1	0	**−1,5**	0	1,5	−84,594
							max	Co #2	0	**−1,5**	−0,9	1,7	−1,690
						Rz	min	Co #2	0	−1,5	**−0,9**	1,7	−1,690
							max	Co #1	0	−1,5	**0**	1,5	−84,594
						αR	min	Co #1	0	−1,5	0	1,5	−84,594
							max	Co #2	0	−1,5	−0,9	1,7	−1,690
Ext.													
4	10	−0,780	−0,062	0	Glob.	Rx	min	Co #1	**0**	4,9	−10,2	11,3	−0,476
4	10	−0,780	−0,062	0	Glob.		max	Co #1	**0**	4,9	−10,2	11,3	−0,476
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−4,4**	0,9	4,5	4,674
8	22	−0,350	0,944	0	Glob.		min	Co #2	0	**−4,4**	0,9	4,5	4,674
3	9	0,780	−0,062	0	Glob.		max	Co #2		**5,5**	−11,5	12,7	−0,476
4	10	−0,780	−0,062	0	Glob.		max	Co #2	0	**5,5**	−11,5	12,7	−0,476
3	9	0,780	−0,062	0	Glob.	Rz	min	Co #2		5,5	**−11,5**	12,7	−0,476
4	10	−0,780	−0,062	0	Glob.		min	Co #2	0	5,5	**−11,5**	12,7	−0,476
1	4	0,780	0,062	0	Glob.		max	Co #2		2,8	**4,6**	5,4	0,603
2	5	−0,780	0,062	0	Glob.		max	Co #2		2,8	**4,6**	5,4	0,603
15	45	0,240	3,446	0	Glob.	αR	min	Co #1		−1,5	0	1,5	−84,594
16	46	−0,240	3,446	0	Glob.		min	Co #1	0	−1,5	0	1,5	−84,594
7	21	0,350	0,944	0	Glob.		max	Co #2		−4,4	0,9	4,5	4,674
8	22	−0,350	0,944	0	Glob.		max	Co #2	0	−4,4	0,9	4,5	4,674

Knoop: Ondersteunde knoop; **Type:** Opleggingstype; **C:** Extreme component; **min. max.:** Extreme type; **Geval:** Belastinggeval van de extreme; **Rx:** X-component opleggingsreactiekracht; **Ry:** Y-component opleggingsreactiekracht; **Rz:** Z-component opleggingsreactiekracht;
Rr: Resulterende opleggingsreactiekracht; **αR:** Verhouding verticale oplegkracht / horizontale oplegkracht;

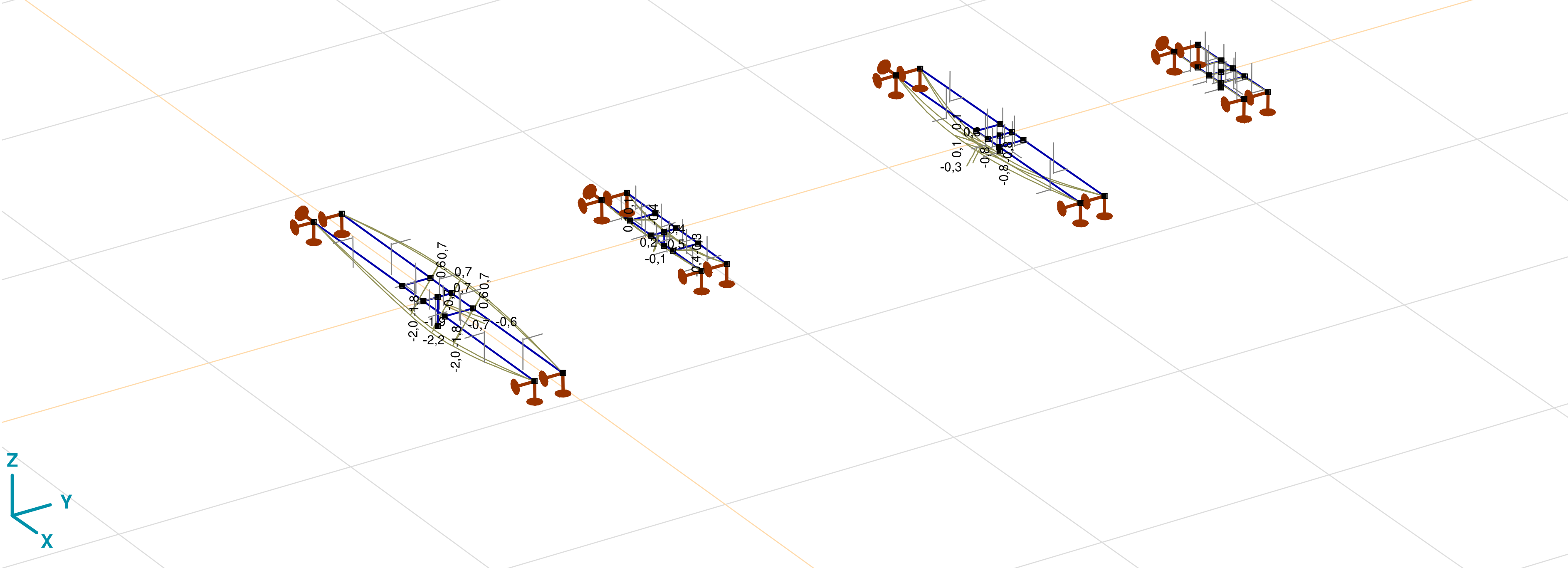
Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+0 huidig sit 2.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: eY [mm]
Max	: 3,6
Min	: -2,3



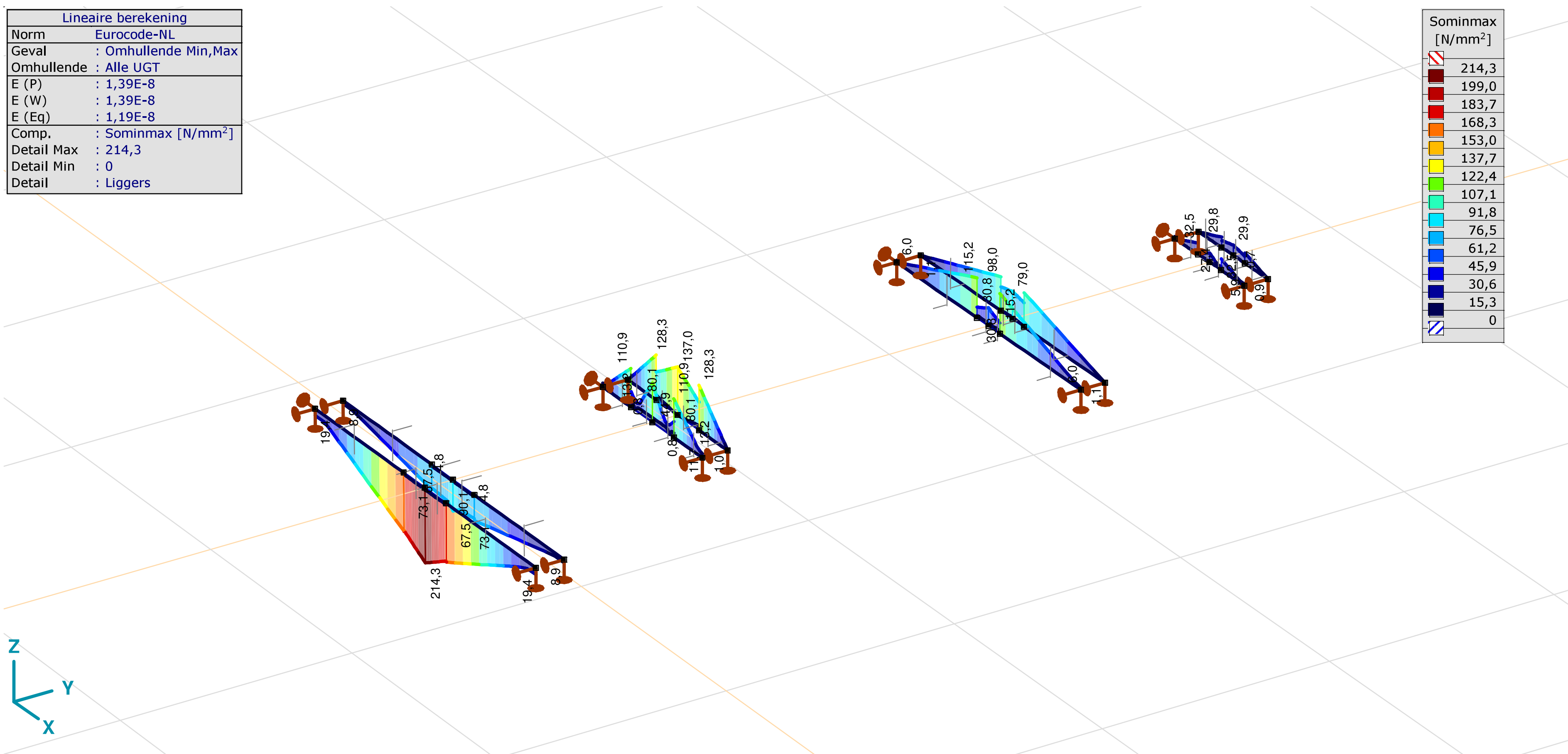
[I], Lineair, Omhullende (Alle UGT), eY, Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: eZ [mm]
Max	: 0,7
Min	: -2,2



[I], Lineair, Omhullende (Alle UGT), eZ, Lijnen

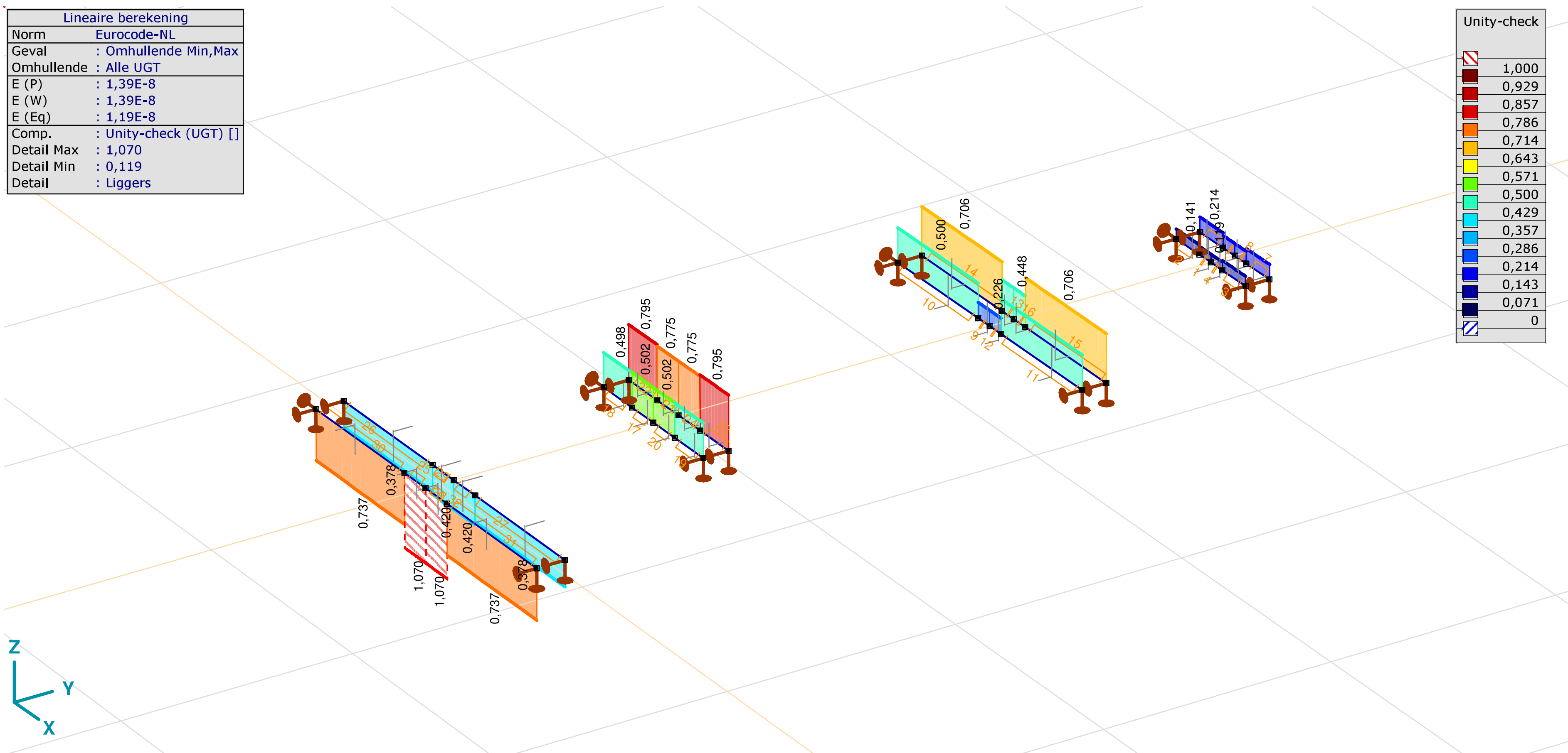
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Sominmax [N/mm^2]
Detail Max	: 214,3
Detail Min	: 0
Detail	: Liggers



Sominmax [N/mm^2]
214,3
199,0
183,7
168,3
153,0
137,7
122,4
107,1
91,8
76,5
61,2
45,9
30,6
15,3
0

[I], > Liggers, Lineair, Omhullende (Alle UGT), Sominmax, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,39E-8
E (W)	: 1,39E-8
E (Eq)	: 1,19E-8
Comp.	: Unity-check (UGT) []
Detail Max	: 1,070
Detail Min	: 0,119
Detail	: Liggers

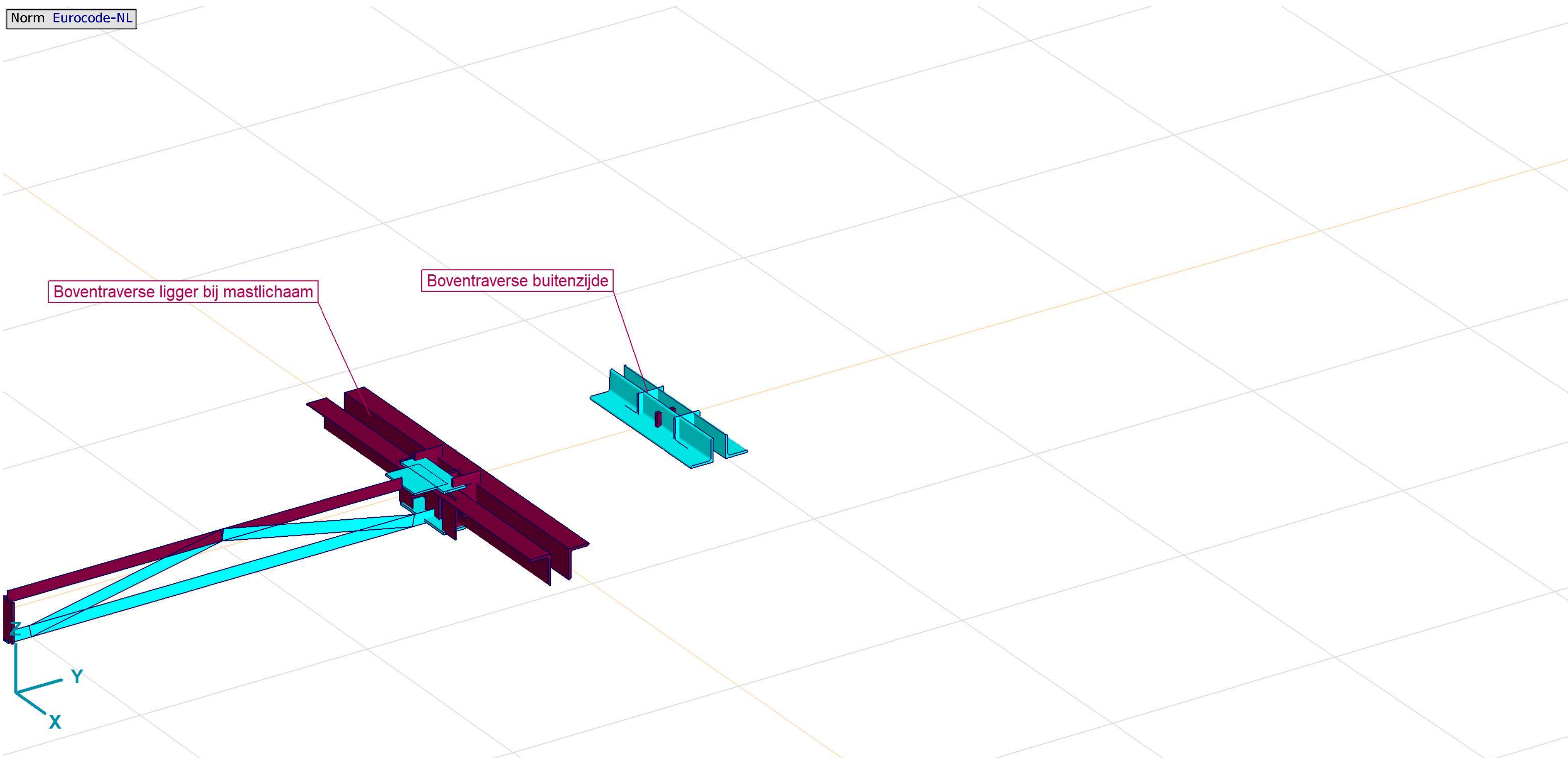


Unity-check
1,000
0,929
0,857
0,786
0,714
0,643
0,571
0,500
0,429
0,357
0,286
0,214
0,143
0,071
0

[Stl], > Liggers, Lineair, Omhullende (Alle UGT), Unity-check, Lijnen (gevuld)

Rapport

Rapport, Inhoudsopgave



rendered view

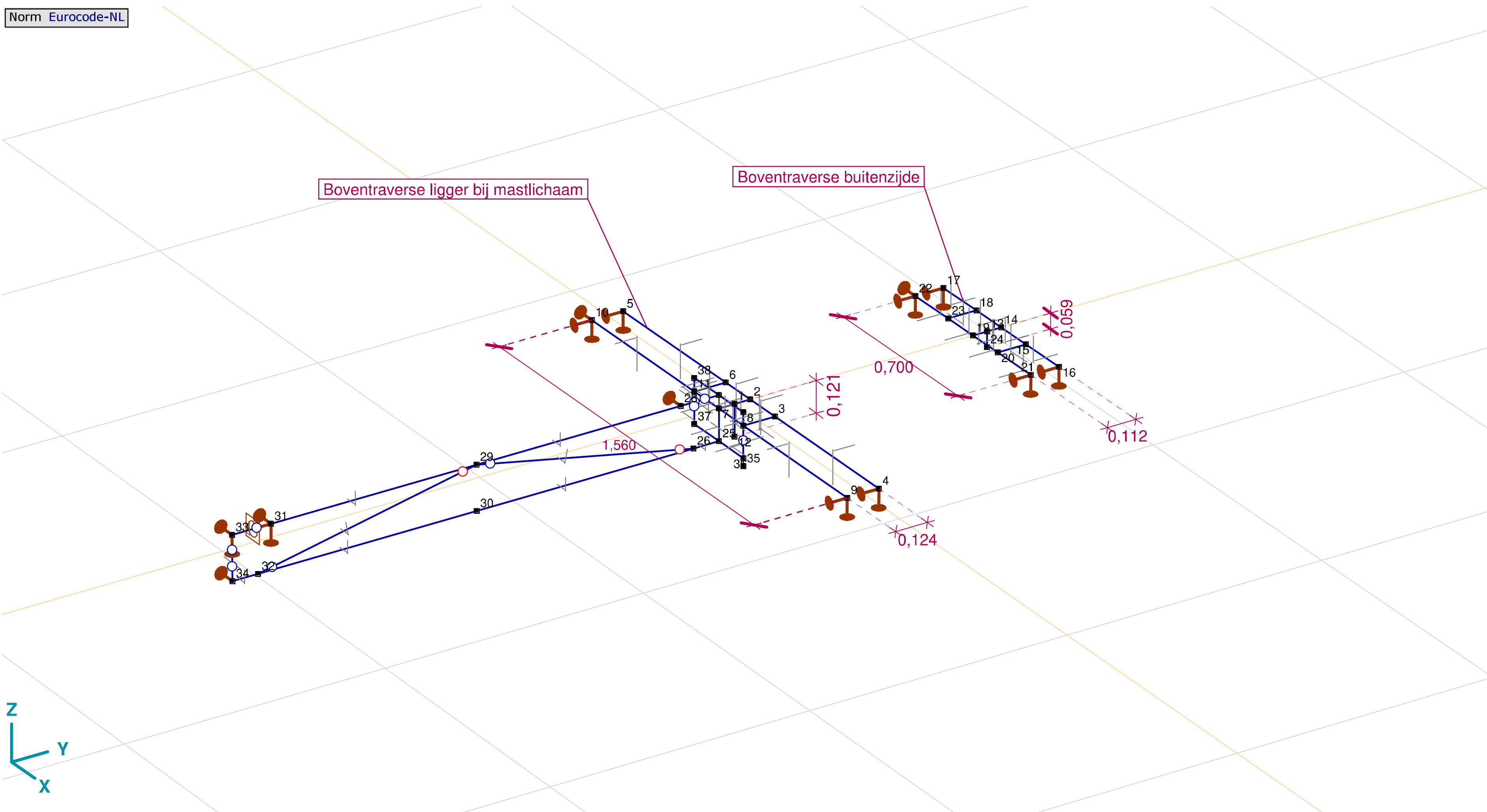
Materialen

	Naam	*Type*	*Nationale norm*	*Materiaalnorm*	*Model*	*E_x [N/mm^2]*	*E_y [N/mm^2]*	*ν*	*α_T [1/°C]*	*ρ [kg/m^3]*	*Materiaal kleur*	*Contour kleur*	*Structuur*	*P_1*
1	S 235	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm^2] = 235,00
2	S 355	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm^2] = 355,00

	Naam	*P_2*	*P_3*	*P_4*	*P_5*	*P_6*	*P_7*	*P_8*	*P_9*	*P_{10}*	*P_{11}*	*P_{12}*	*P_{13}*	*P_{14}*
1	S 235	f_u[N/mm^2] = 360,00	f^*_y[N/mm^2] = 215,00	f^*_u[N/mm^2] = 360,00										
2	S 355	f_u[N/mm^2] = 510,00	f^*_y[N/mm^2] = 335,00	f^*_u[N/mm^2] = 470,00										

Naam: Materiaalnaam; **Type:** Type materiaal; **Model:** Materiaal model; **E_x:** Elasticiteitsmodulus in lokale x richting; **E_y:** Elasticiteitsmodulus in lokale y richting; **ν:** Poisson's verhouding; **α_T:** Warmteuitzettingscoëfficiënt; **ρ:** Dichtheid; **Materiaal kleur:** Materiaalkleur;
Contour kleur: Contourkleur; **P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}:** Ontwerpparameter;

Norm Eurocode-NL



Tekening

Knopen

	X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]		X [m]	Y [m]	Z [m]
1	0	0	0	9	0,780	−0,062	0	17	−0,350	1,056	0	25	0	−0,062	−0,121	33	0	−1,962	0,050
2	0	0,062	0	10	−0,780	−0,062	0	18	−0,150	1,056	0	26	0	−0,162	−0,121	34	0	−1,962	−0,121
3	0,150	0,062	0	11	−0,150	−0,062	0	19	0	0,944	0	27	0	−0,062	0,050	35	0,150	−0,062	−0,150
4	0,780	0,062	0	12	0	0	−0,121	20	0,150	0,944	0	28	0	−0,212	0,050	36	0,150	−0,062	−0,121
5	−0,780	0,062	0	13	0	1,000	0	21	0,350	0,944	0	29	0	−1,012	0,050	37	−0,150	−0,062	−0,121
6	−0,150	0,062	0	14	0	1,056	0	22	−0,350	0,944	0	30	0	−1,012	−0,121	38	−0,150	−0,062	0,050
7	0	−0,062	0	15	0,150	1,056	0	23	−0,150	0,944	0	31	0	−1,812	0,050	39	0,150	−0,062	0,050
8	0,150	−0,062	0	16	0,350	1,056	0	24	0	1,000	−0,059	32	0	−1,862	−0,121				

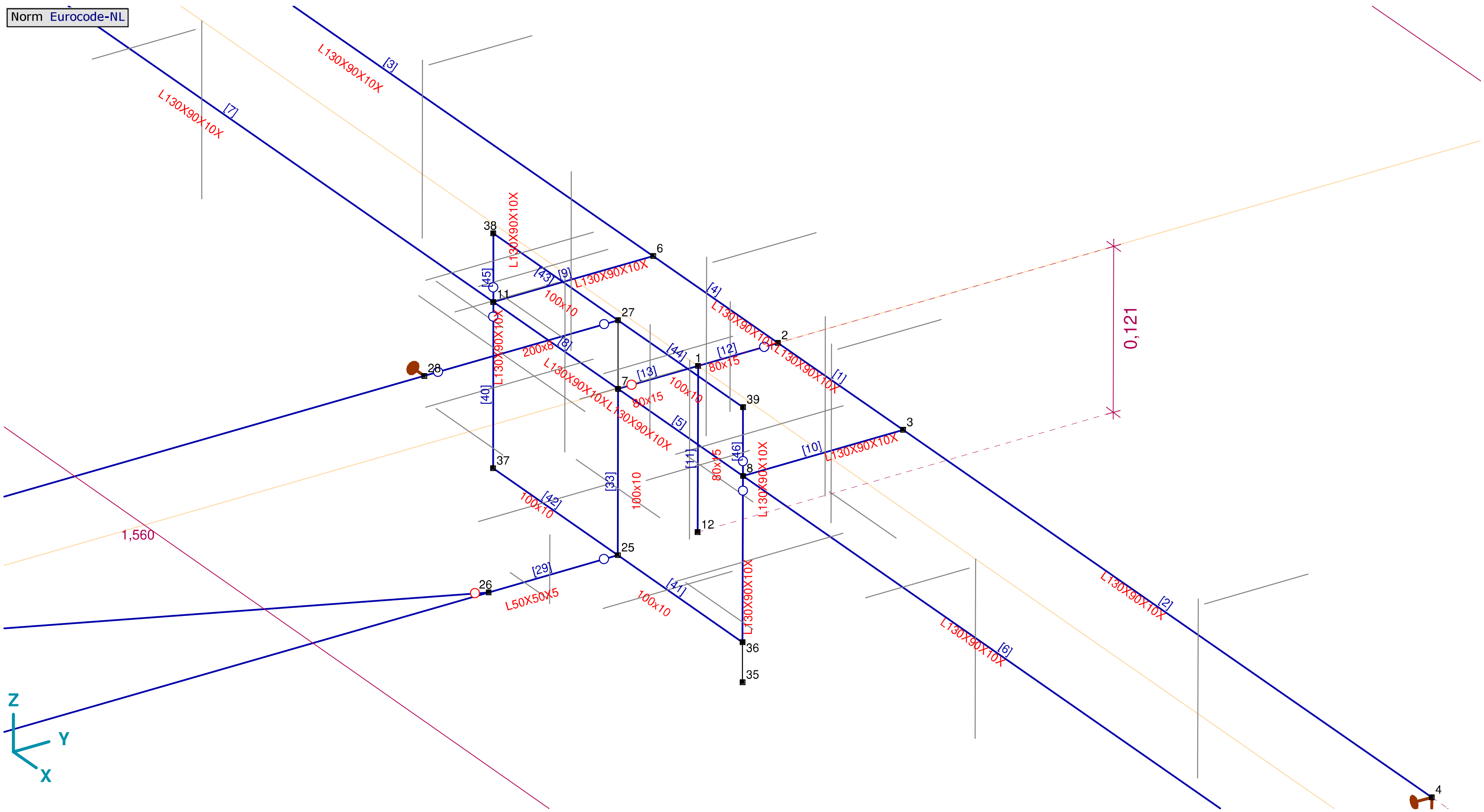
Staven

	Start-punt	Eind-punt	Lengte	Lokaal X	Materiaal	Doorsnede	Ref_z	<– Aansluitingen	Aansluitingen –>
1	3	2	0,150	j - i	S 235	1	R2	.	.
2	4	3	0,630	j - i	S 235	1	R2	.	.
3	6	5	0,630	j - i	S 235	1	R2	.	.
4	2	6	0,150	i - j	S 235	1	R2	.	.
5	7	8	0,150	i - j	S 235	1	R2	.	.
6	8	9	0,630	i - j	S 235	1	R2	.	.
7	10	11	0,630	i - j	S 235	1	R2	.	.
8	11	7	0,150	j - i	S 235	1	R2	.	.
9	11	6	0,124	j - i	S 235	1	Auto	.	.
10	3	8	0,124	i - j	S 235	1	Auto	.	.
11	12	1	0,121	j - i	S 235	2	Auto	.	.
12	1	2	0,062	i - j	S 235	2	R1	.	Schar-YZ
13	7	1	0,062	j - i	S 235	2	R1	100111	.
14	13	14	0,056	i - j	S 235	2	R1	.	100111
15	14	15	0,150	i - j	S 355	6	Auto	.	.
16	15	16	0,200	i - j	S 355	6	Auto	.	.
17	17	18	0,200	i - j	S 355	6	Auto	.	.
18	18	14	0,150	j - i	S 355	6	Auto	.	.
19	20	19	0,150	j - i	S 355	6	Auto	.	.
20	21	20	0,200	j - i	S 355	6	Auto	.	.
21	23	22	0,200	j - i	S 355	6	Auto	.	.
22	19	23	0,150	i - j	S 355	6	Auto	.	.
23	19	13	0,056	j - i	S 235	2	R1	Schar-YZ	.

Staven

	Start-punt	*Eind-punt*	*Lengte*	*Lokaal X*	*Materiaal*	*Doorsnede*	*Ref_z*	*<– Aansluitingen*	*Aansluitingen –>*
24	23	18	0,112	j - i	S 355	6	Auto	.	.
25	15	20	0,112	i - j	S 355	6	Auto	.	.
26	24	13	0,059	j - i	S 235	2	Auto	.	.
27	29	26	0,867	j - i	S 355	5	Auto	Schar-YZ	Bol
28	32	29	0,867	j - i	S 355	5	Auto	Schar-YZ	Bol
29	26	25	0,100	j - i	S 355	5	Auto	.	Schar-YZ
30	30	26	0,850	j - i	S 355	5	Auto	.	.
31	32	30	0,850	j - i	S 355	5	Auto	.	.
32	34	32	0,100	j - i	S 355	5	Auto	.	.
33	25	7	0,121	j - i	S 235	9	Auto	.	.
34	28	27	0,150	j - i	S 355	7	Auto	Schar-YZ	Schar-YZ
35	29	28	0,800	j - i	S 235	5	Auto	.	.
36	31	29	0,800	j - i	S 235	5	Auto	.	.
37	33	31	0,150	j - i	S 235	5	Auto	.	Schar-YZ
38	34	33	0,171	j - i	S 235	9	Auto	Schar-YZ	Schar-YZ
39	36	8	0,121	j - i	S 235	1	R1	.	Schar-Z
40	37	11	0,121	j - i	S 235	1	R1	.	Schar-Z
41	25	36	0,150	i - j	S 355	9	R1	.	.
42	37	25	0,150	j - i	S 355	9	R1	.	.
43	38	27	0,150	j - i	S 355	9	R1	.	.
44	27	39	0,150	i - j	S 355	9	R1	.	.
45	11	38	0,050	i - j	S 235	1	R1	Schar-Z	.
46	8	39	0,050	i - j	S 235	1	R1	Schar-Z	.

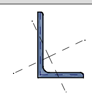
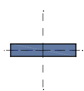
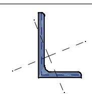
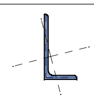
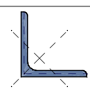
Lengte: Elementlengte; **Lokaal X:** Lokale X-richting; **Ref_z:** Referentie voor lokale Z-richting; **<– Aansluitingen:** Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt;



Tekening profielen

Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+0 versterkt.axs**

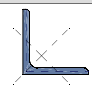
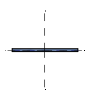
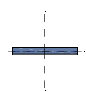
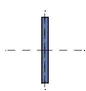
Profielen

	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm^2]	Ay [mm^2]	Az [mm^2]	Ix [mm^4]	Iy [mm^4]	Iz [mm^4]
1	L 130X 90X10X		Gewalst	L	130,0	90,0	10,0	10,0	12,0	6,0	0	2115,52	730,05	1115,03	75067,63	3579805,00	1407288,00
2	80x15		Gewalst	Recht.	15,0	80,0	0	0	0	0	0	1200,00	1000,00	1000,00	79361,69	22500,00	640000,00
3	L 100X 65X 9X		Gewalst	L	100,0	65,0	9,0	9,0	10,0	5,0	0	1414,78	477,96	772,93	40681,80	1406314,00	466914,90
4	L 130X 65X 8X		Gewalst	L	130,0	65,0	8,0	8,0	11,0	5,5	0	1509,04	400,01	894,73	34749,90	2625007,00	447616,10
5	L 50X 50X 5		Gewalst	L	50,0	50,0	5,0	5,0	7,0	3,5	0	480,28	210,38	213,29	4408,87	109629,10	109629,10

	Naam	Iyz [mm^4]	I_1 [mm^4]	I_2 [mm^4]	α [°]	Iω [mm^6]	$W_{1,el,t}$ [mm^3]	$W_{1,el,b}$ [mm^3]	$W_{2,el,t}$ [mm^3]	$W_{2,el,b}$ [mm^3]	$W_{1,pl}$ [mm^3]	$W_{2,pl}$ [mm^3]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]
1	L 130X 90X10X	−1302677,00	4189697,00	797396,10	25,09	6,7E+07	46873,24	62990,74	17179,39	21346,26	81837,91	34394,52	41,1	25,8	90,0	130,0
2	80x15	0	640000,00	22500,00	90,00	1E+07	16000,00	16000,00	3000,00	3000,00	24000,00	4500,00	4,3	23,1	80,0	15,0
3	L 100X 65X 9X	−466019,90	1598273,00	274955,80	22,39	2E+07	23552,43	32380,51	7940,67	10044,04	41416,09	16324,54	31,5	18,2	65,0	100,0
4	L 130X 65X 8X	−608865,80	2783699,00	288924,20	14,61	2,9E+07	32704,41	48773,37	7411,05	11687,17	56896,01	16576,57	41,7	17,2	65,0	130,0
5	L 50X 50X 5	−64162,80	173791,90	45466,32	45,00	678722	4915,58	4915,58	2584,40	2290,67	7830,31	4045,39	15,1	15,1	50,0	50,0

	Naam	y_G [mm]	z_G [mm]	y_s [mm]	z_s [mm]	$β_y$ [mm]	$β_z$ [mm]	$β_w$ []	S.p.
1	L 130X 90X10X	21,8	41,5	−16,4	−35,0	112,7	95,4	−292,0	4
2	80x15	40,0	7,5	0	0	0	0	0	5
3	L 100X 65X 9X	15,9	33,2	−11,1	−26,9	84,2	70,1	−343,9	4
4	L 130X 65X 8X	13,7	45,6	−9,5	−39,4	111,6	90,0	−547,9	4
5	L 50X 50X 5	14,0	14,0	−11,0	−11,0	45,0	45,0	0	4

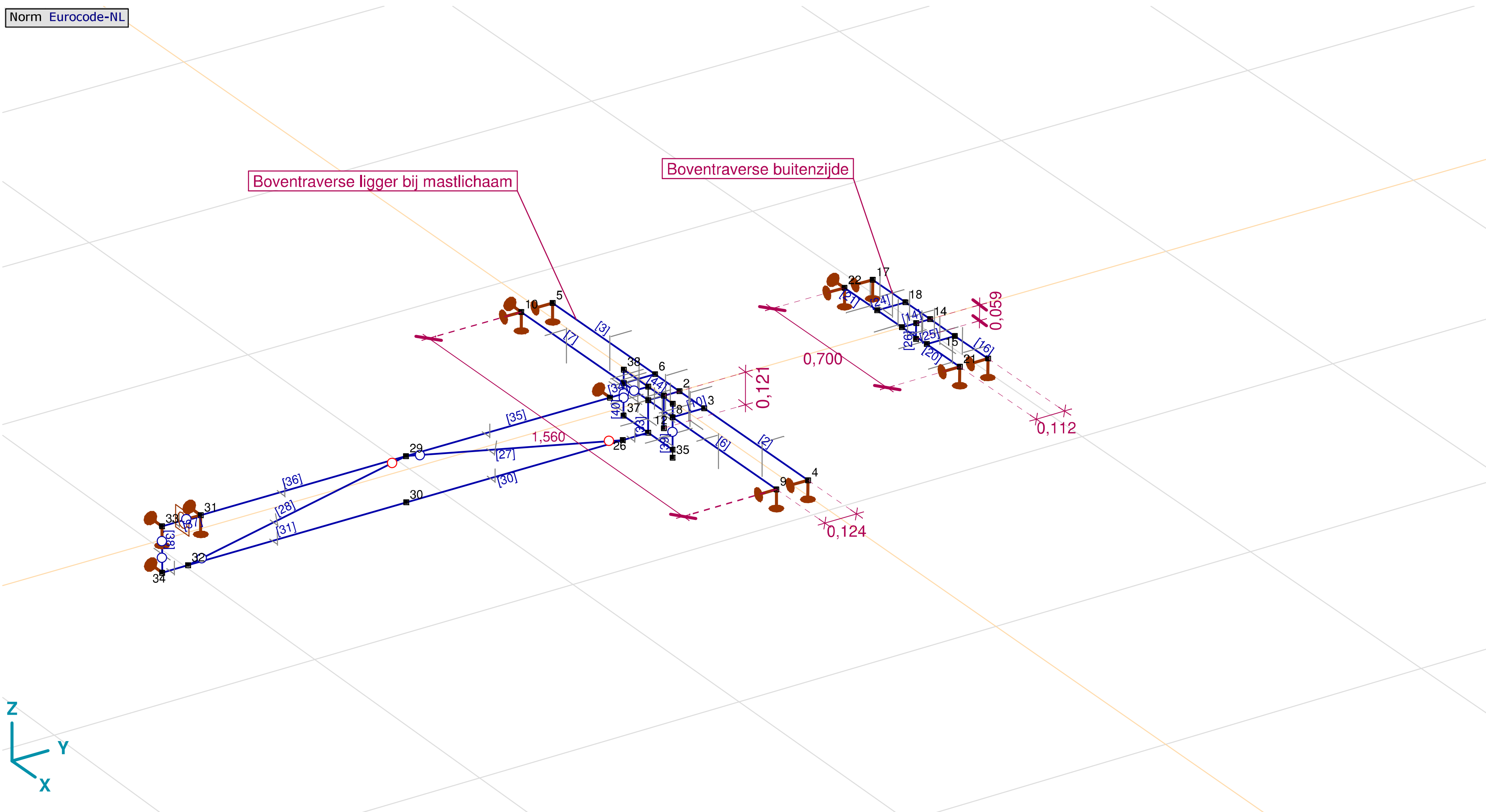
Profielen

	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm^2]	Ay [mm^2]	Az [mm^2]	Ix [mm^4]	Iy [mm^4]	Iz [mm^4]
6	L 100X100X10		Gewalst	L	100,0	100,0	10,0	10,0	12,0	6,0	0	1915,52	840,25	849,06	68399,99	1766604,00	1766604,00
7	200x8		Gewalst	Recht.	8,0	200,0	0	0	0	0	0	1600,00	1333,33	1333,33	33261,65	8533,33	5333333,00
8	100x10		Gewalst	Recht.	10,0	100,0	0	0	0	0	0	1000,00	833,33	833,33	31229,21	8333,33	833333,30
9	100x10		Gewalst	Recht.	10,0	100,0	0	0	0	0	0	1000,00	833,33	833,33	31229,21	833333,30	8333,33

	Naam	Iyz [mm^4]	I_1 [mm^4]	I_2 [mm^4]	α [°]	Iω [mm^6]	$W_{1,el,t}$ [mm^3]	$W_{1,el,b}$ [mm^3]	$W_{2,el,t}$ [mm^3]	$W_{2,el,b}$ [mm^3]	$W_{1,pl}$ [mm^3]	$W_{2,pl}$ [mm^3]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]
6	L 100X100X10	−1036581,00	2803186,00	730023,00	45,00	4,4E+07	39643,03	39643,03	20631,62	18290,47	62957,84	32342,18	30,4	30,4	100,0	100,0
7	200x8	0	5333333,00	8533,33	90,00	2,8E+07	53333,33	53333,33	2133,33	2133,33	80000,00	3200,00	2,3	57,7	200,0	8,0
8	100x10	0	833333,30	8333,33	90,00	6626062	16666,67	16666,67	1666,67	1666,67	25000,00	2500,00	2,9	28,9	100,0	10,0
9	100x10	0	833333,30	8333,33	0	6626062	16666,67	16666,67	1666,67	1666,67	25000,00	2500,00	28,9	2,9	10,0	100,0

	Naam	y_G [mm]	z_G [mm]	y_s [mm]	z_s [mm]	$β_y$ [mm]	$β_z$ [mm]	$β_w$ []	S.p.
6	L 100X100X10	28,2	28,2	−22,3	−22,3	90,4	90,4	0	4
7	200x8	100,0	4,0	0	0	0	0	0	5
8	100x10	50,0	5,0	0	0	0	0	0	5
9	100x10	5,0	50,0	0	0	0	0	0	5

Naam: Doorsnede naam; **Productie:** Productieproces; **Vorm:** Profiel; **h:** Doorsnede hoogte; **b:** Doorsnede breedte; **tw:** Lijfdikte; **tf:** Flensdikte; **r_1, r_2, r_3:** Afrondingswaarde; **Ax:** Doorsnede-oppervlak; **Ay, Az:** Afschuivingsoppervlak; **Ix:** Torsietraagheidsmoment;
Iy, Iz: Buigtraagheidsmoment; **Iyz:** Centrifugaal traagheidsmoment; **I_1, I_2:** Hoofdbuigtraagheidsmoment; **α:** Hoofdrichtingen; **Iω:** Krommingsconstante; **$W_{1,el,t}$, $W_{1,el,b}$, $W_{2,el,t}$, $W_{2,el,b}$:** Elastisch weerstandsmoment; **$W_{1,pl}$, $W_{2,pl}$:** Plastisch weerstandsmoment; **i_y, i_z:** Traagheidsstraal;
Hy: Afmeting in lokale Y-richting; **Hz:** Afmeting in lokale Z-richting; **y_G:** Y-coördinaat van het zwaartepunt; **z_G:** Z-coördinaat van het zwaartepunt; **y_s:** Y-coördinaat van het afschuivingsmiddelpunt (torsie); **z_s:** Z-coördinaat van het afschuivingsmiddelpunt (torsie);
$β_y$, $β_z$, $β_w$: Wagner's coëfficiënt; **S.p.:** Spanningspunten;



Tekening staven

Staafaansluitingen

	<– Aansluitingen	Aansluitingen –>	<– e_x	<– θ_x	<– θ_y	<– θ_z
12	.	Schar-YZ	.	.	.	.
13	100111	.	Vrij	Vrij	Vrij	Vrij
14	.	100111	.	.	.	.
23	Schar-YZ	.	.	.	Vrij	Vrij
27	Schar-YZ	Bol	.	.	Vrij	Vrij
28	Schar-YZ	Bol	.	.	Vrij	Vrij
29	.	Schar-YZ	.	.	.	.
34	Schar-YZ	Schar-YZ	.	.	Vrij	Vrij
37	.	Schar-YZ	.	.	.	.
38	Schar-YZ	Schar-YZ	.	.	Vrij	Vrij
39	.	Schar-Z	.	.	.	.
40	.	Schar-Z	.	.	.	.
45	Schar-Z	.	.	.	.	Vrij
46	Schar-Z	.	.	.	.	Vrij

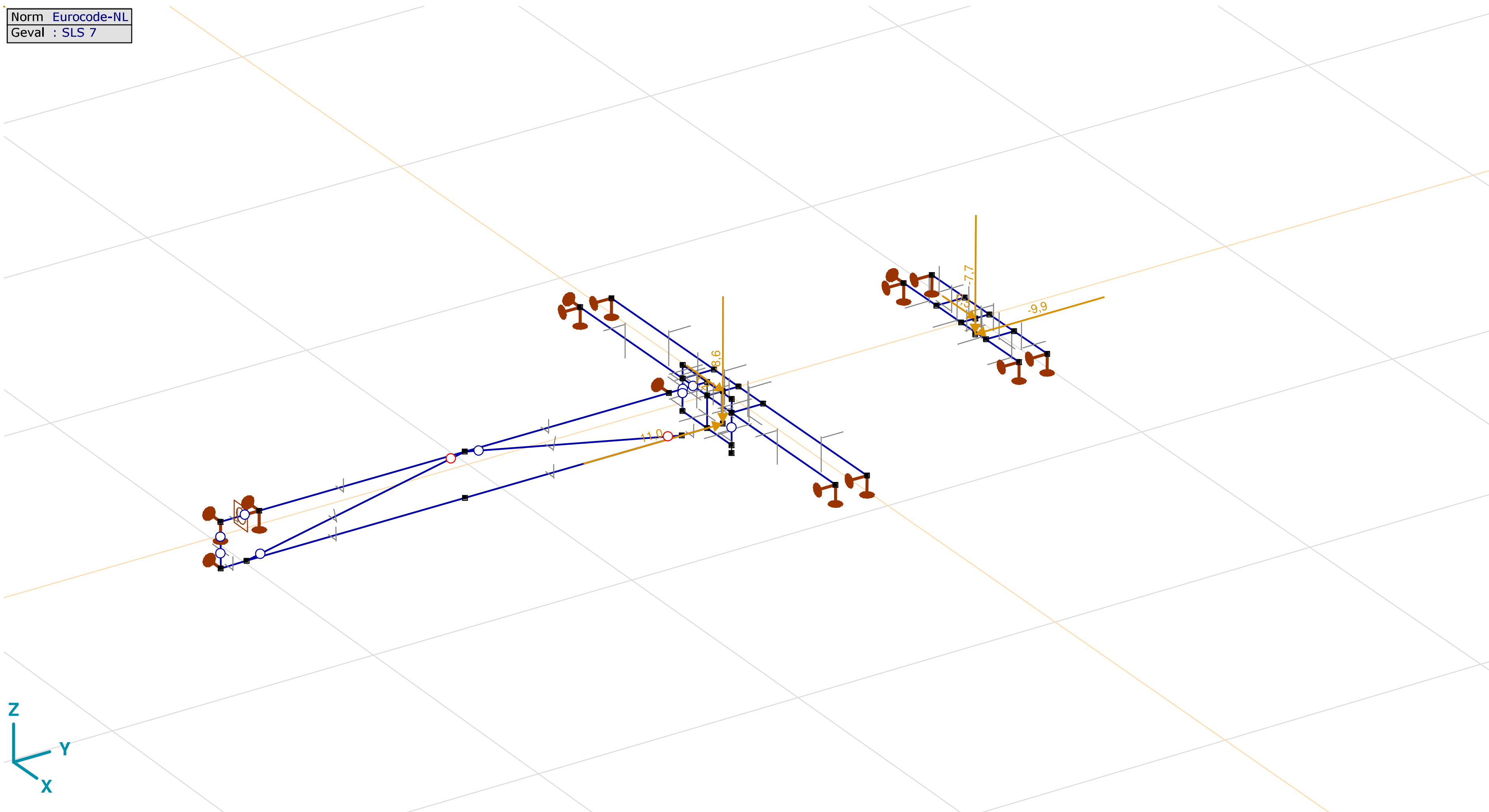
<– Aansluitingen: Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt; **<– e_x, <– θ_x, <– θ_y, <– θ_z:** Type;

EG: Staaf eigen gewicht

	Σ [kg]
1–46	119,135
Totaal	**119,135**

Σ: Totale massa;

Norm	Eurocode-NL
Geval	: SLS 7



SLS 7

SLS 7: Knoopbelastingen

	Richting	*Fx* *[kN]*	*Fy* *[kN]*	*Fz* *[kN]*	*Mx* *[kNm]*	*My* *[kNm]*	*Mz* *[kNm]*
1	Globaal	1,2	0	0	0	0	0
12	Globaal	0	11,0	−8,6	0	0	0
13	Globaal	0,5	0	0	0	0	0
24	Globaal	0	−9,9	−7,7	0	0	0

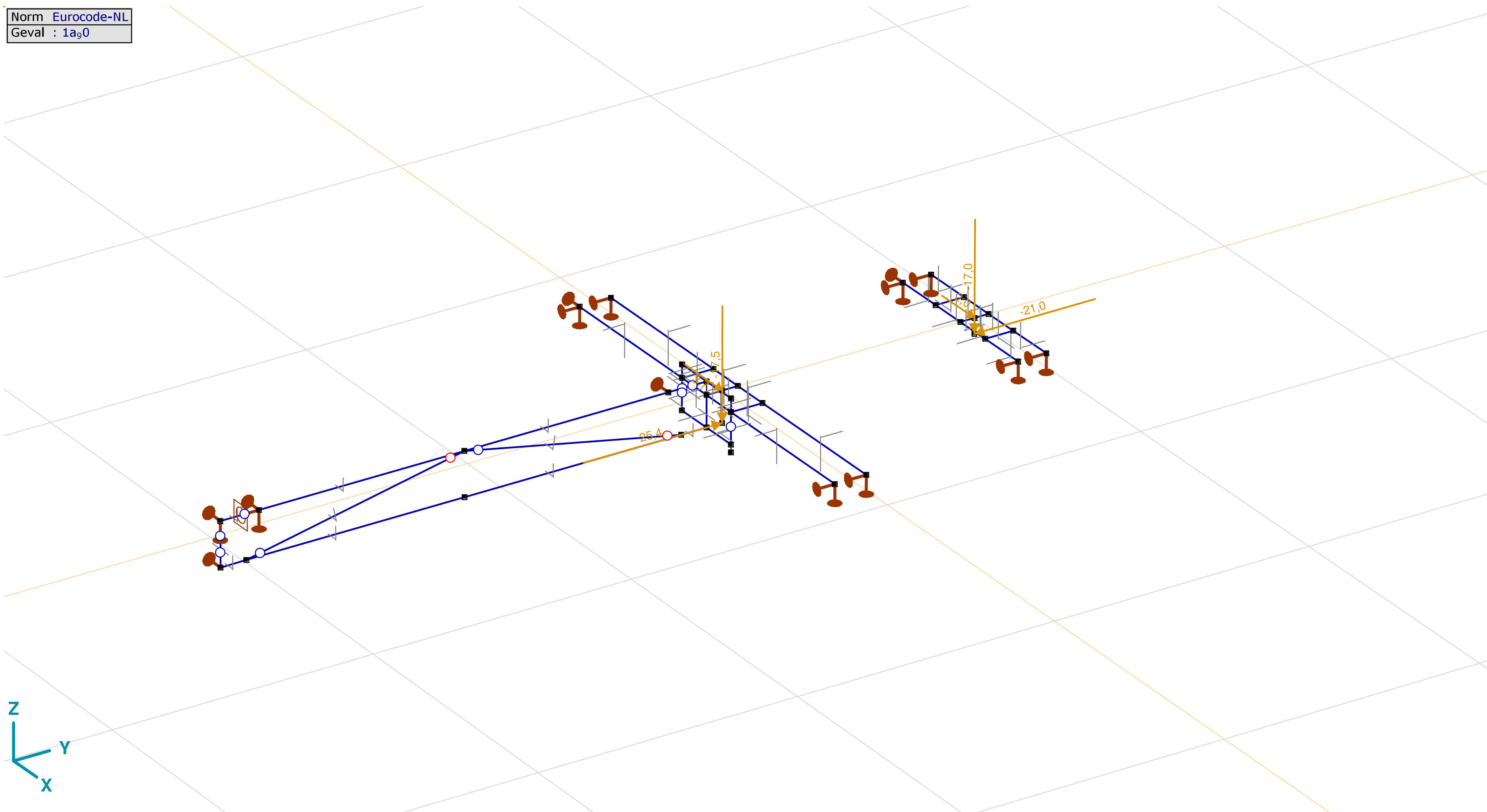
Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

1a_90: Knoopbelastingen

	Richting	*Fx* *[kN]*	*Fy* *[kN]*	*Fz* *[kN]*	*Mx* *[kNm]*	*My* *[kNm]*	*Mz* *[kNm]*
1	Globaal	3,7	0	0	0	0	0
12	Globaal	0	25,4	−17,5	0	0	0
13	Globaal	2,0	0	0	0	0	0
24	Globaal	0	−21,0	−17,0	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

Norm	Eurocode-NL
Geval	: $1a_90$



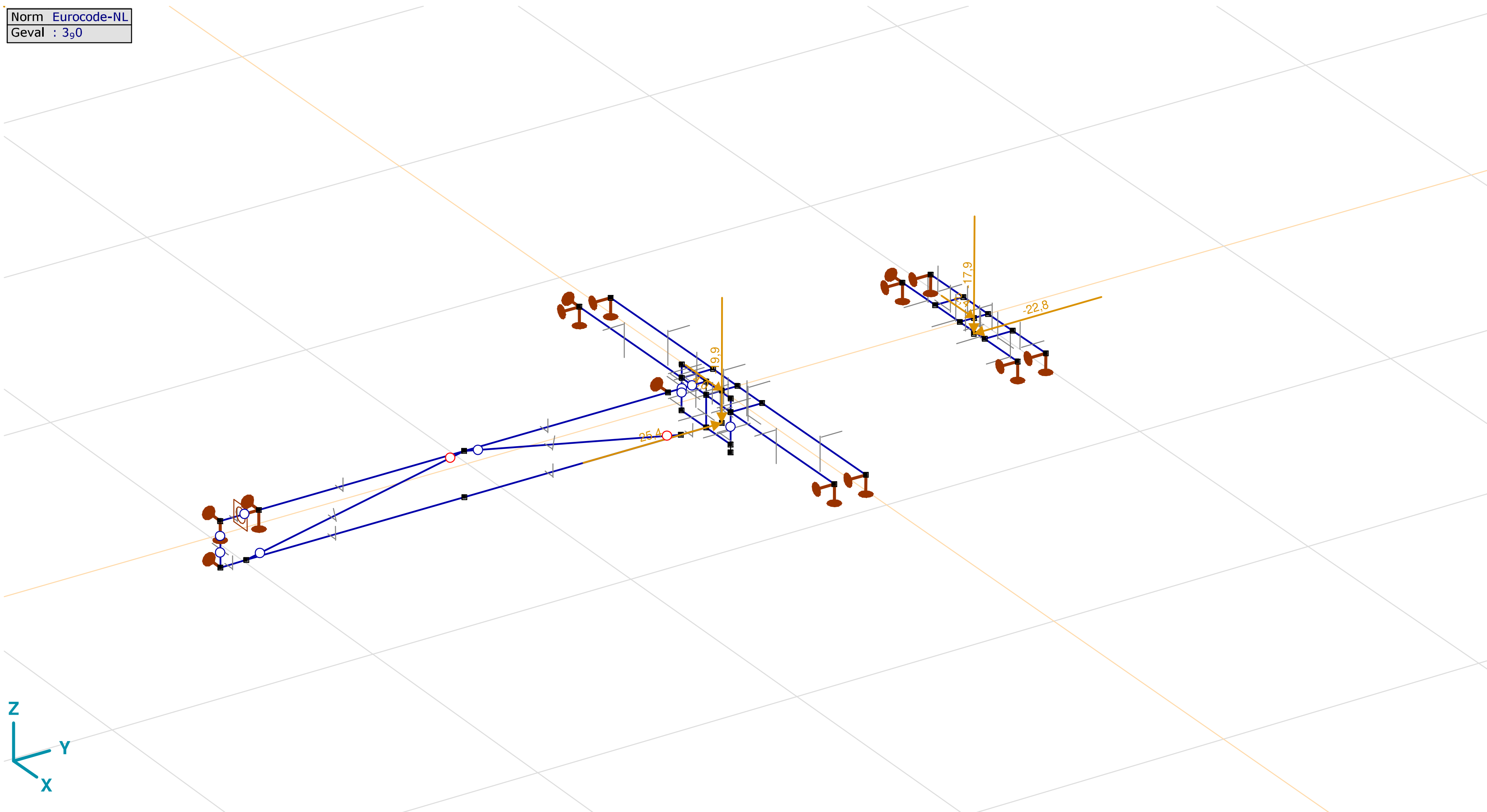
1a_90

3_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	4,0	0	0	0	0	0
12	Globaal	0	25,4	−19,9	0	0	0
13	Globaal	2,4	0	0	0	0	0
24	Globaal	0	−22,8	−17,9	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+0 versterkt.axs**

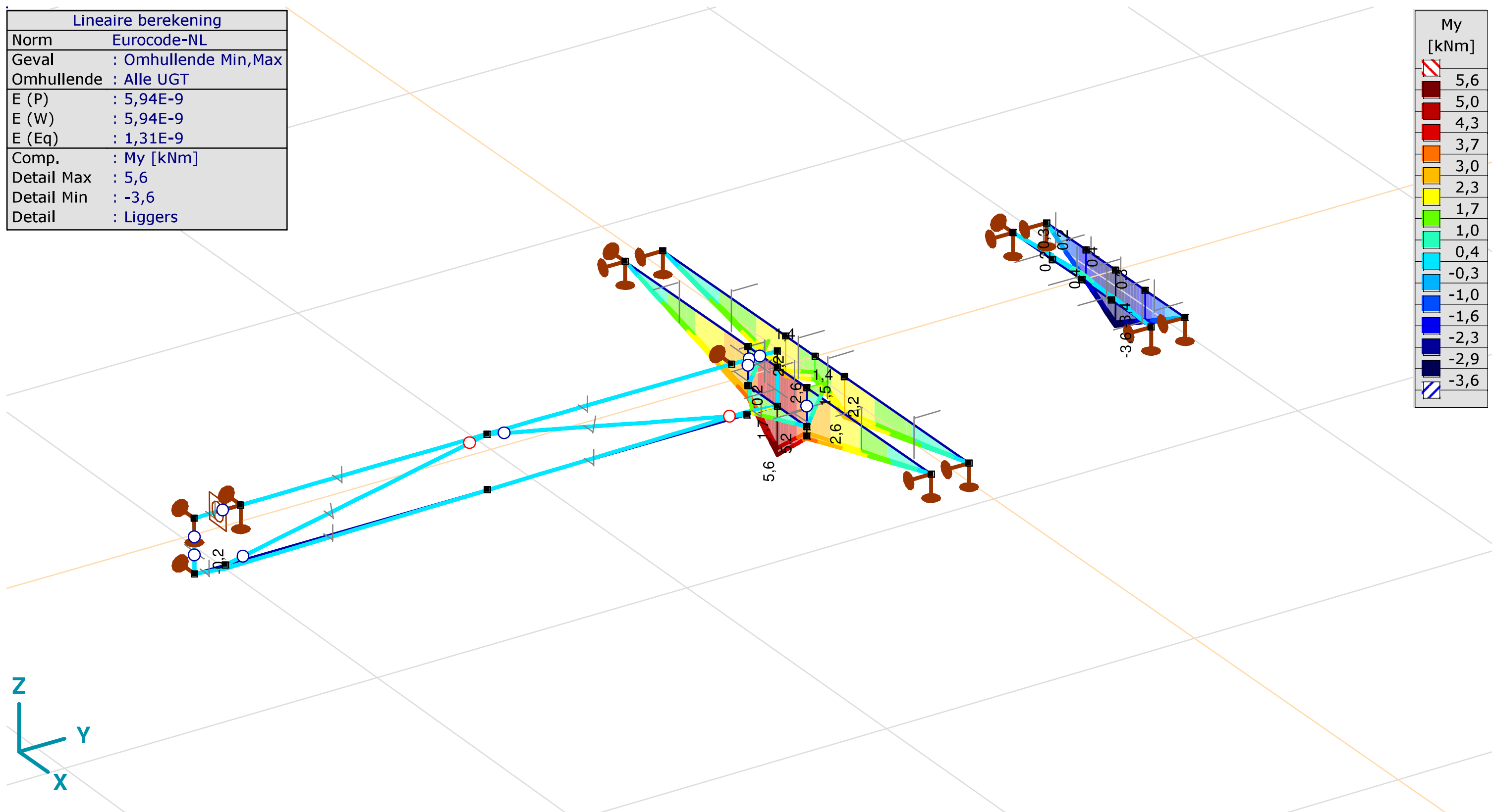


3_90

Gebruiker gedefinieerde belastingcombinaties uit belastinggevallen

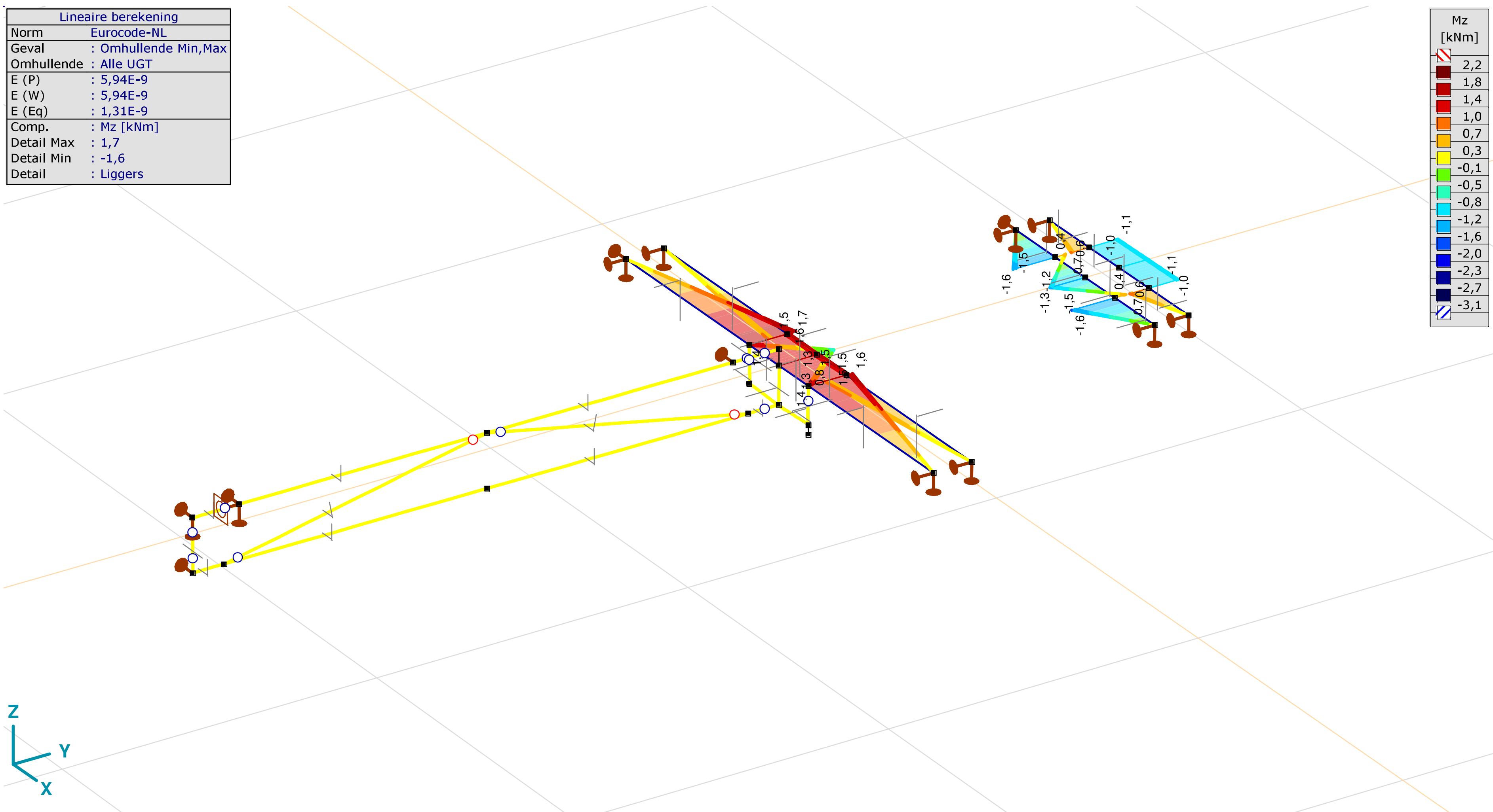
	Naam	Type	ST1	EG (PERM1)	SLS 7 (VER1)	1a_90 (VER1)	3_90 (VER1)	Commentaar
1	Co #1	UGT	0	1,20	0	1,00	0	
2	Co #2	UGT	0	1,20	0	0	1,00	
3	Co #3	BGT Quasi-blijvend	0	1,00	1,00	0	0	

Naam: Naam belastingcombinatie; **Type:** Type belastingcombinatie; **ST1, EG (PERM1), SLS 7 (VER1), 1a90 (VER1), 390 (VER1):** Factor;



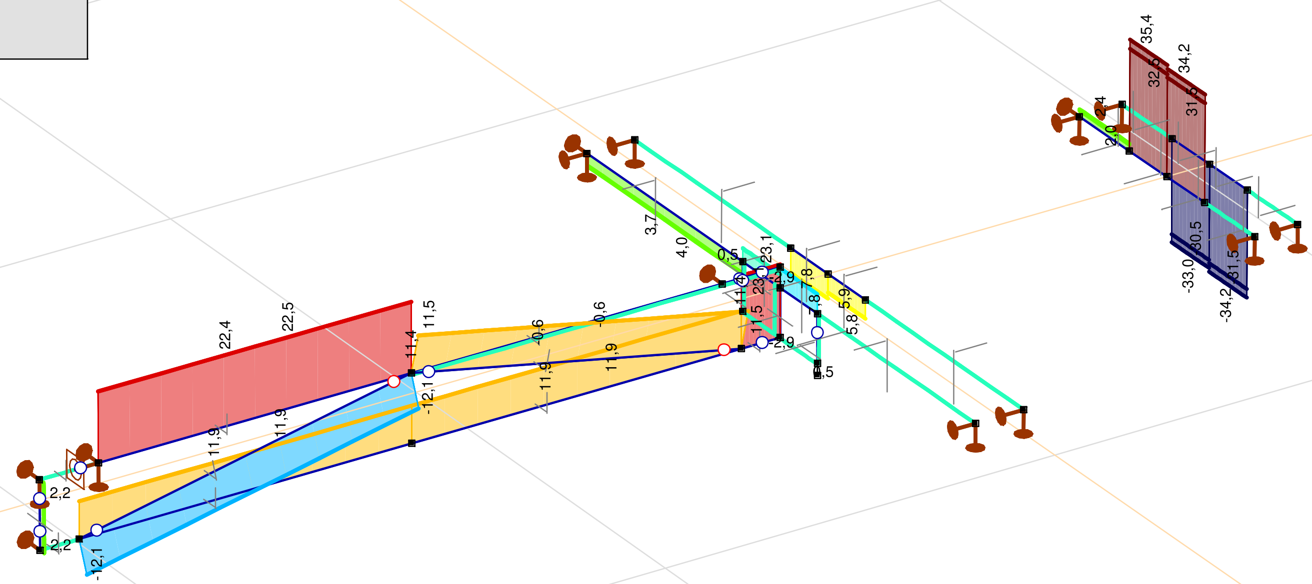
[I], > Liggers, Lineair, Omhullende (Alle UGT), My, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Mz [kNm]
Detail Max	: 1,7
Detail Min	: -1,6
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Mz, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Nx [kN]
Detail Max	: 35,4
Detail Min	: -34,2
Detail	: Liggers



Nx [kN]
35,4
30,5
25,5
20,5
15,5
10,6
5,6
0,6
-4,4
-9,4
-14,3
-19,3
-24,3
-29,3
-34,2

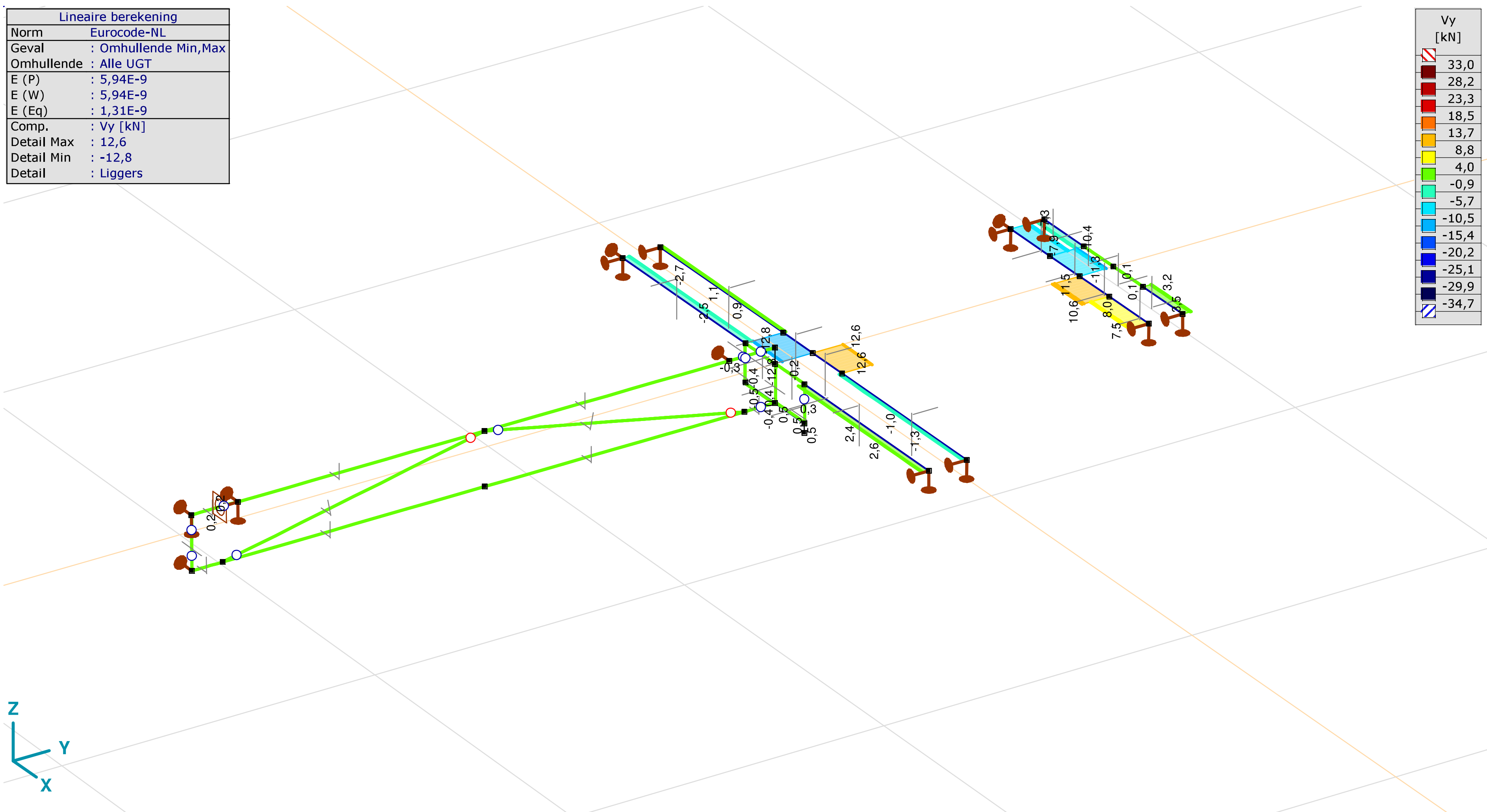
[I], > Liggers, Lineair, Omhullende (Alle UGT), Nx, Lijnen (gevuld)

Project:

Constructeur: DNV GL - Energy

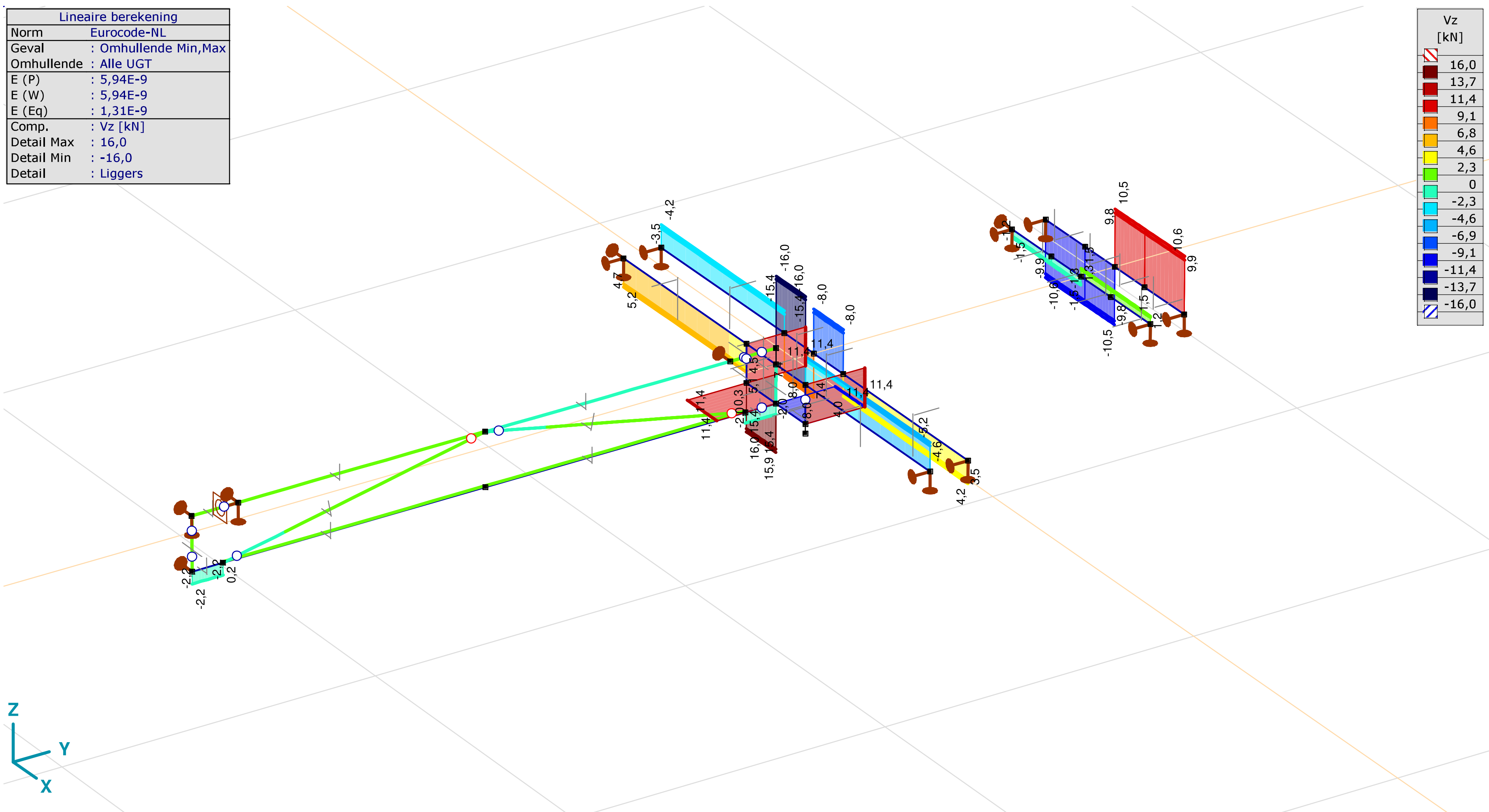
Model: **Liggers D+0 versterkt.axs** 28-2-2022 Pag. 21

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Vy [kN]
Detail Max	: 12,6
Detail Min	: -12,8
Detail	: Liggers



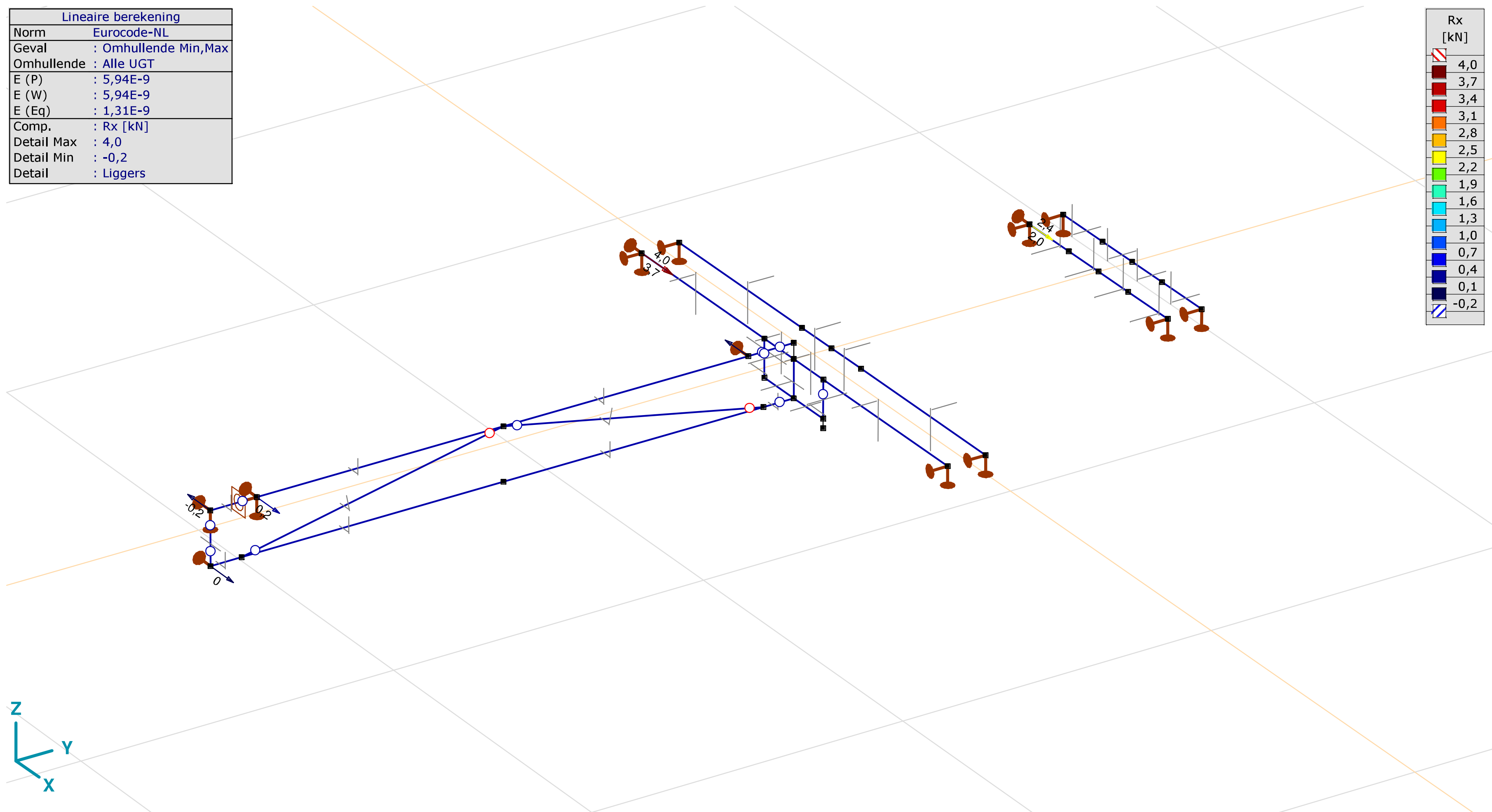
[I], > Liggers, Lineair, Omhullende (Alle UGT), Vy, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Vz [kN]
Detail Max	: 16,0
Detail Min	: -16,0
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Vz, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Rx [kN]
Detail Max	: 4,0
Detail Min	: -0,2
Detail	: Liggers



Rx [kN]
4,0
3,7
3,4
3,1
2,8
2,5
2,2
1,9
1,6
1,3
1,0
0,7
0,4
0,1
-0,2

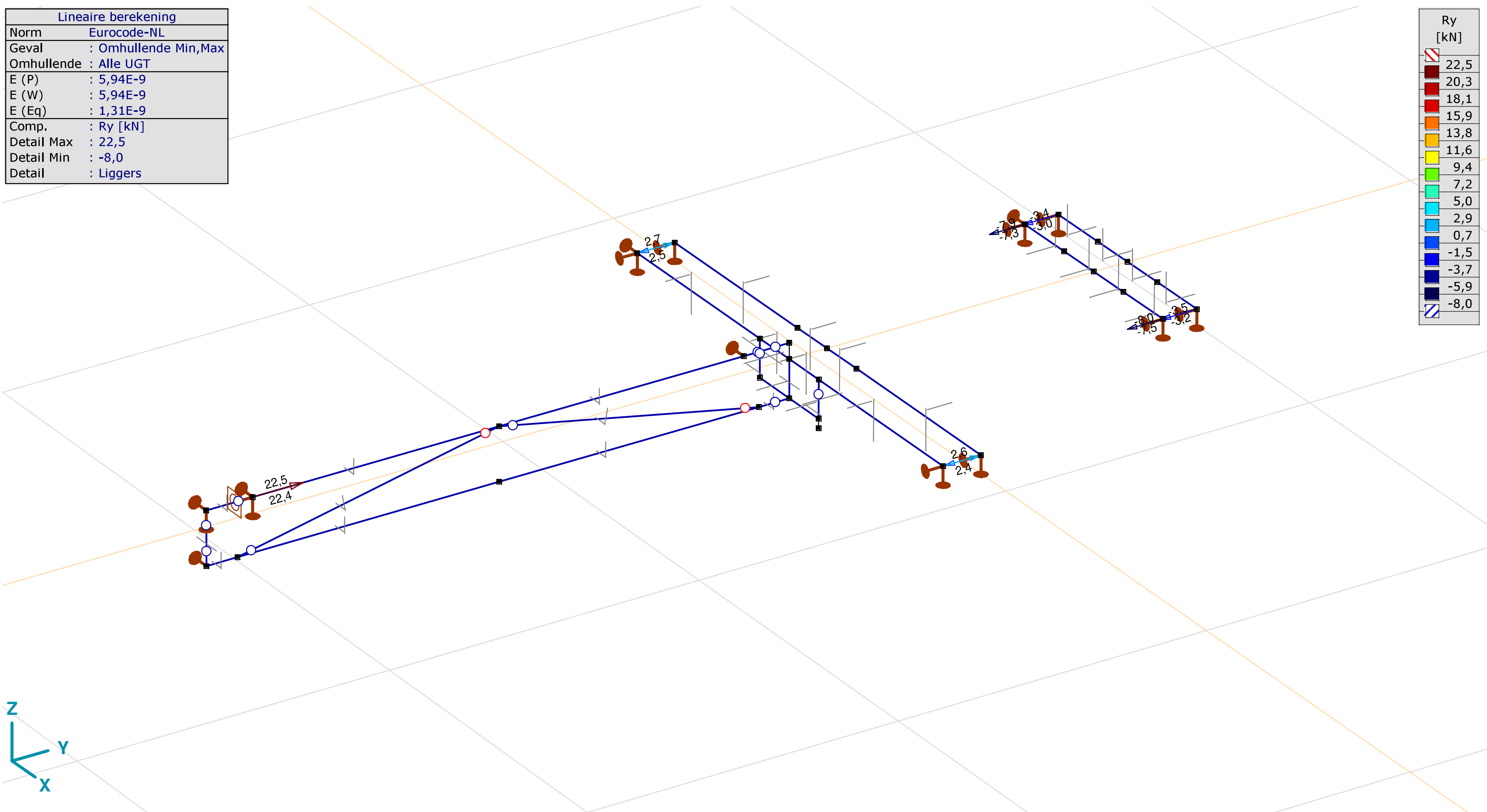
[I], > Liggers, Lineair, Omhullende (Alle UGT), Rx (knoopopl.), Lijnen

Project:

Constructeur: DNV GL - Energy

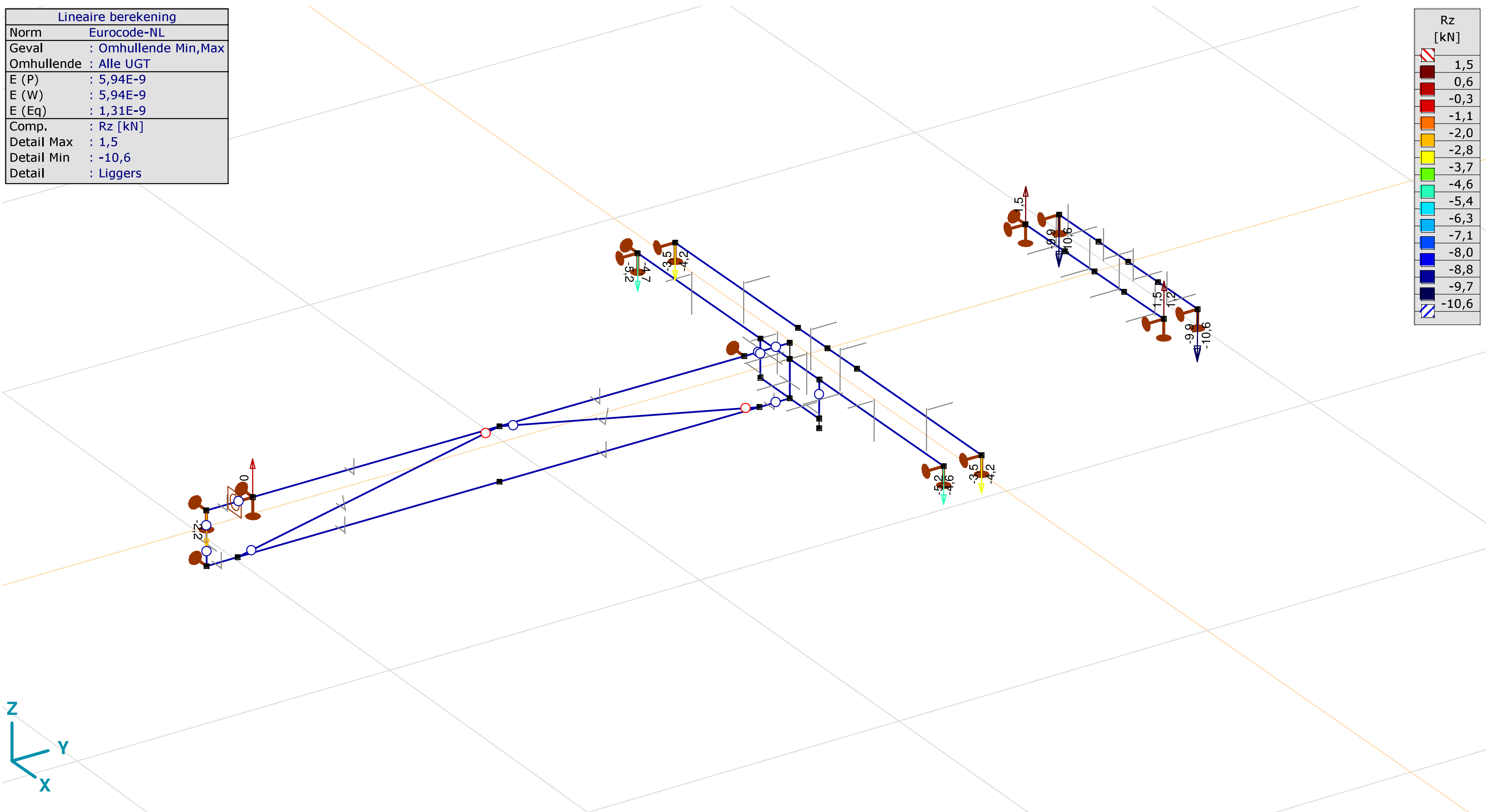
Model: **Liggers D+0 versterkt.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Ry [kN]
Detail Max	: 22,5
Detail Min	: -8,0
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Ry (knoopopl.), Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Rz [kN]
Detail Max	: 1,5
Detail Min	: -10,6
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Rz (knoopopl.), Lijnen

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
1	4	0,780	0,062	0	Glob.	Ry	min	Co #2		**−1,3**	−4,2	4,4	−0,305
							max	Co #1		**−1,0**	−3,5	3,7	−0,291
						Rz	min	Co #2		−1,3	**−4,2**	4,4	−0,305
							max	Co #1		−1,0	**−3,5**	3,7	−0,291
						αR	min	Co #2		−1,3	−4,2	4,4	−0,305
							max	Co #1		−1,0	−3,5	3,7	−0,291
2	5	−0,780	0,062	0	Glob.	Ry	min	Co #2		**−1,1**	−4,2	4,3	−0,268
							max	Co #1		**−0,9**	−3,5	3,6	−0,250
						Rz	min	Co #2		−1,1	**−4,2**	4,3	−0,268
							max	Co #1		−0,9	**−3,5**	3,6	−0,250
						αR	min	Co #2		−1,1	−4,2	4,3	−0,268
							max	Co #1		−0,9	−3,5	3,6	−0,250
3	9	0,780	−0,062	0	Glob.	Ry	min	Co #1		**2,4**	−4,6	5,2	−0,511
							max	Co #2		**2,6**	−5,2	5,8	−0,493
						Rz	min	Co #2		2,6	**−5,2**	5,8	−0,493
							max	Co #1		2,4	**−4,6**	5,2	−0,511
						αR	min	Co #1		2,4	−4,6	5,2	−0,511
							max	Co #2		2,6	−5,2	5,8	−0,493
4	10	−0,780	−0,062	0	Glob.	Rx	min	Co #1	**3,7**	2,5	−4,7	6,5	−0,958
							max	Co #2	**4,0**	2,7	−5,2	7,1	−0,923
						Ry	min	Co #1	3,7	**2,5**	−4,7	6,5	−0,958
							max	Co #2	4,0	**2,7**	−5,2	7,1	−0,923
						Rz	min	Co #2	4,0	2,7	**−5,2**	7,1	−0,923
							max	Co #1	3,7	2,5	**−4,7**	6,5	−0,958
						αR	min	Co #1	3,7	2,5	−4,7	6,5	−0,958
							max	Co #2	4,0	2,7	−5,2	7,1	−0,923
5	16	0,350	1,056	0	Glob.	Ry	min	Co #2		**−3,5**	−10,6	11,1	−0,336
							max	Co #1		**−3,2**	−9,9	10,4	−0,321
						Rz	min	Co #2		−3,5	**−10,6**	11,1	−0,336
							max	Co #1		−3,2	**−9,9**	10,4	−0,321
						αR	min	Co #2		−3,5	−10,6	11,1	−0,336
							max	Co #1		−3,2	−9,9	10,4	−0,321

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
6	17	−0,350	1,056	0	Glob.	Ry	min	Co #2		**−3,4**	−10,6	11,1	−0,317
							max	Co #1		**−3,0**	−9,9	10,3	−0,305
						Rz	min	Co #2		−3,4	**−10,6**	11,1	−0,317
							max	Co #1		−3,0	**−9,9**	10,3	−0,305
						αR	min	Co #2		−3,4	−10,6	11,1	−0,317
							max	Co #1		−3,0	−9,9	10,3	−0,305
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−8,0**	1,5	8,2	5,543
							max	Co #1		**−7,5**	1,2	7,6	6,228
						Rz	min	Co #1		−7,5	**1,2**	7,6	6,228
							max	Co #2		−8,0	**1,5**	8,2	5,543
						αR	min	Co #2		−8,0	1,5	8,2	5,543
							max	Co #1		−7,5	1,2	7,6	6,228
8	22	−0,350	0,944	0	Glob.	Rx	min	Co #1	**2,0**	−7,3	1,2	7,7	6,303
							max	Co #2	**2,4**	−7,9	1,5	8,3	5,645
						Ry	min	Co #2	2,4	**−7,9**	1,5	8,3	5,645
							max	Co #1	2,0	**−7,3**	1,2	7,7	6,303
						Rz	min	Co #1	2,0	−7,3	**1,2**	7,7	6,303
							max	Co #2	2,4	−7,9	**1,5**	8,3	5,645
						αR	min	Co #2	2,4	−7,9	1,5	8,3	5,645
							max	Co #1	2,0	−7,3	1,2	7,7	6,303
9	28	0	−0,212	0,050	Glob.	Rx	min	Co #1	**0**			0	
							max	Co #2	**0**			0	
10	31	0	−1,812	0,050	Glob.	Rx	min	Co #1	**0,2**	22,4	0	22,4	2889,848
							max	Co #2	**0,2**	22,5	0	22,5	2896,644
						Ry	min	Co #1	0,2	**22,4**	0	22,4	2889,848
							max	Co #2	0,2	**22,5**	0	22,5	2896,644
						Rz	min	Co #1	0,2	22,4	**0**	22,4	2889,848
							max	Co #1	0,2	22,4	**0**	22,4	2889,848
						αR	min	Co #1	0,2	22,4	0	22,4	2889,848
							max	Co #2	0,2	22,5	0	22,5	2896,644
11	33	0	−1,962	0,050	Glob.	Rx	min	Co #2	**−0,2**		−2,2	2,2	−0,085
							max	Co #1	**−0,2**		−2,2	2,2	−0,085

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
						Rz	min	Co #2	−0,2		**−2,2**	2,2	−0,085
							max	Co #1	−0,2		**−2,2**	2,2	−0,085
						αR	min	Co #1	−0,2		−2,2	2,2	−0,085
							max	Co #2	−0,2		−2,2	2,2	−0,085
12	34	0	−1,962	−0,121	Glob.	Rx	min	Co #1	**0**			0	
							max	Co #2	**0**			0	
Ext.													
11	33	0	−1,962	0,050	Glob.	Rx	min	Co #2	**−0,2**		−2,2	2,2	−0,085
4	10	−0,780	−0,062	0	Glob.		max	Co #2	**4,0**	2,7	−5,2	7,1	−0,923
7	21	0,350	0,944	0	Glob.	Ry	min	Co #2		**−8,0**	1,5	8,2	5,543
10	31	0	−1,812	0,050	Glob.		max	Co #2	0,2	**22,5**	0	22,5	2896,644
5	16	0,350	1,056	0	Glob.	Rz	min	Co #2		−3,5	**−10,6**	11,1	−0,336
6	17	−0,350	1,056	0	Glob.		min	Co #2		−3,4	**−10,6**	11,1	−0,317
8	22	−0,350	0,944	0	Glob.		max	Co #2	2,4	−7,9	**1,5**	8,3	5,645
4	10	−0,780	−0,062	0	Glob.	αR	min	Co #1	3,7	2,5	−4,7	6,5	−0,958
10	31	0	−1,812	0,050	Glob.		max	Co #2	0,2	22,5	0	22,5	2896,644

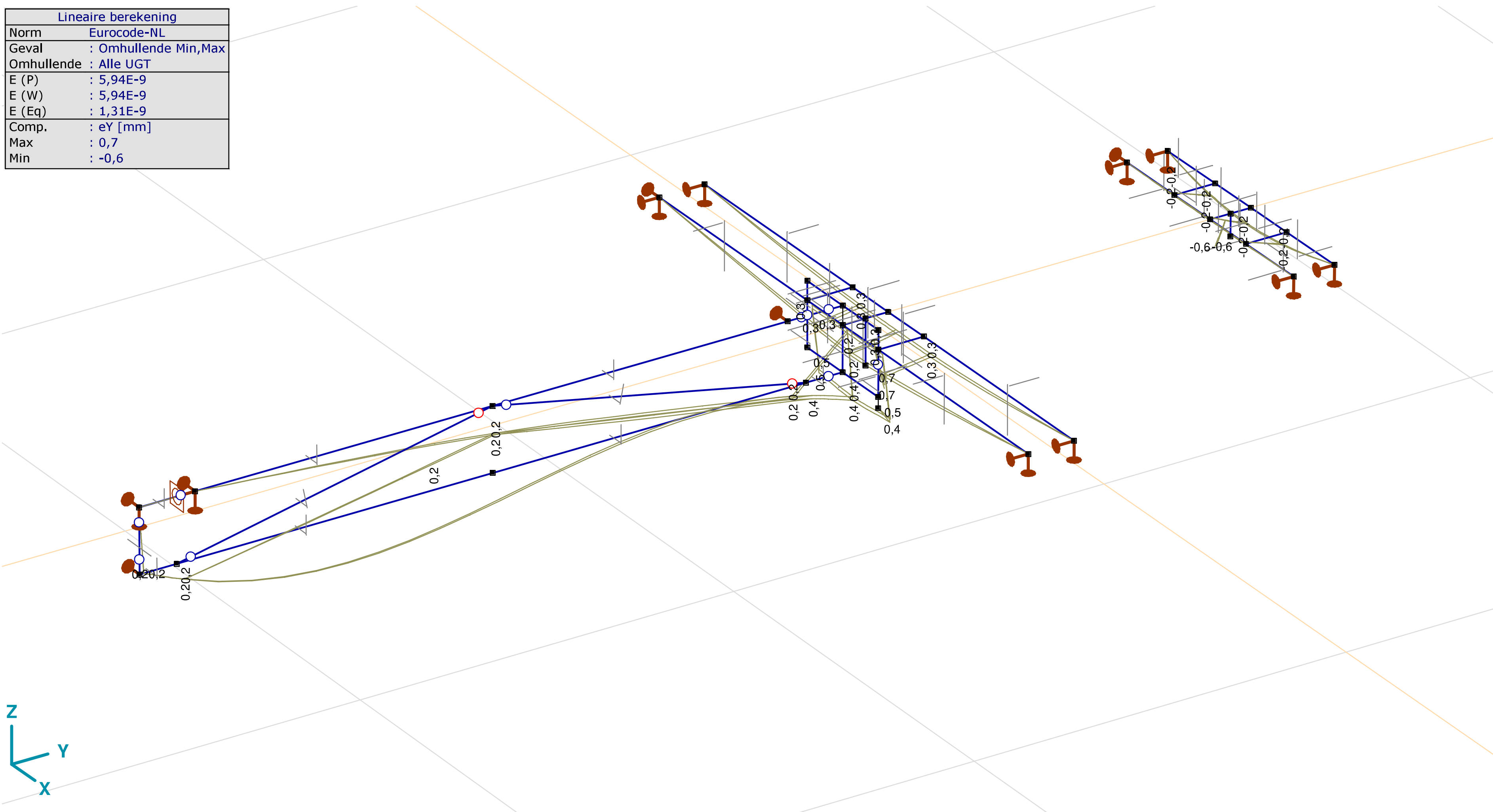
Knoop: Ondersteunde knoop; **Type:** Opleggingstype; **C:** Extreme component; **min. max.:** Extreme type; **Geval:** Belastinggeval van de extreme; **Rx:** X-component opleggingsreactiekracht; **Ry:** Y-component opleggingsreactiekracht; **Rz:** Z-component opleggingsreactiekracht;
Rr: Resulterende opleggingsreactiekracht; **αR:** Verhouding verticale oplegkracht / horizontale oplegkracht;

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 versterkt.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: eY [mm]
Max	: 0,7
Min	: -0,6



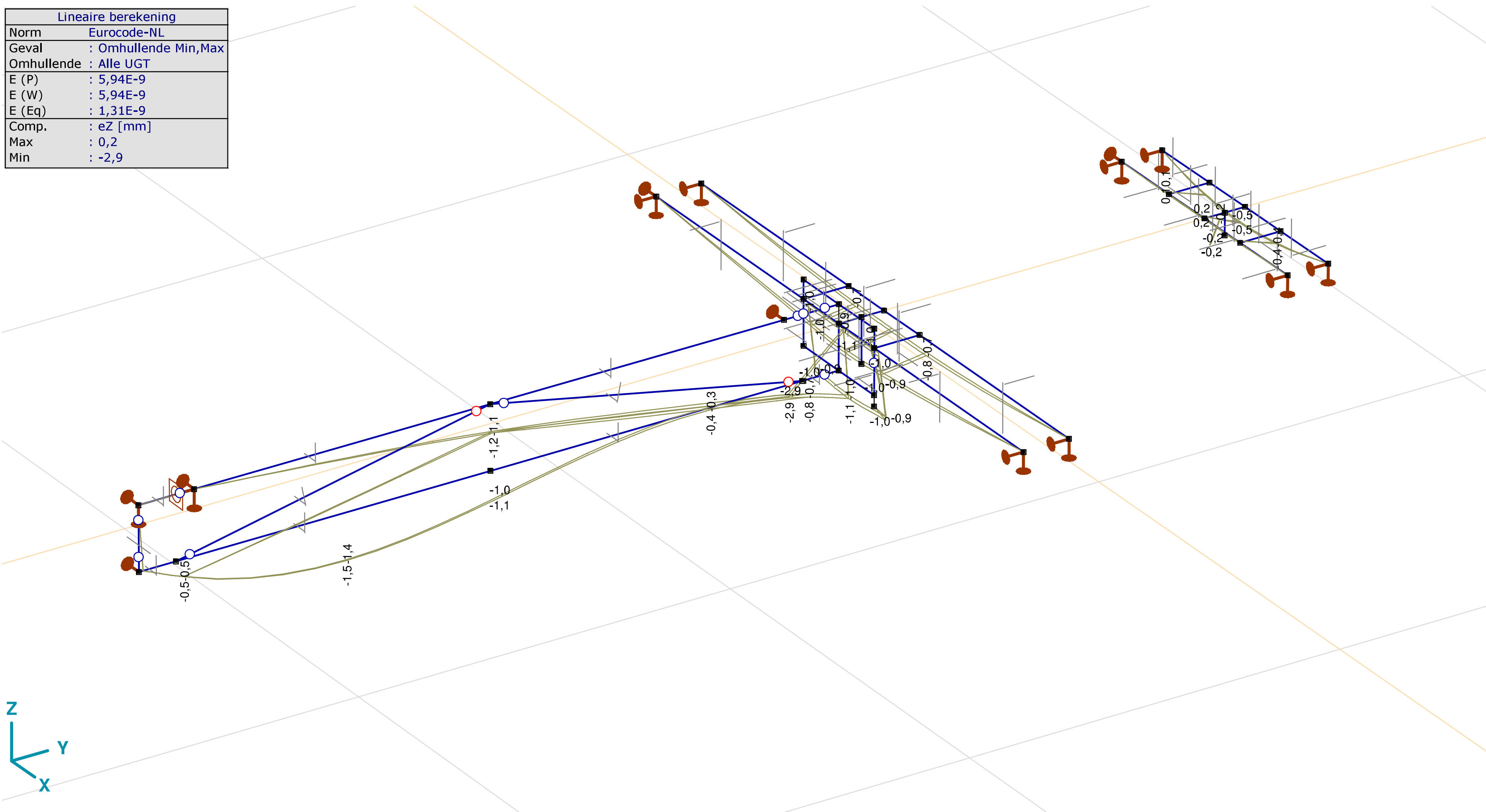
[I], Lineair, Omhullende (Alle UGT), eY, Lijnen

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 versterkt.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: eZ [mm]
Max	: 0,2
Min	: -2,9



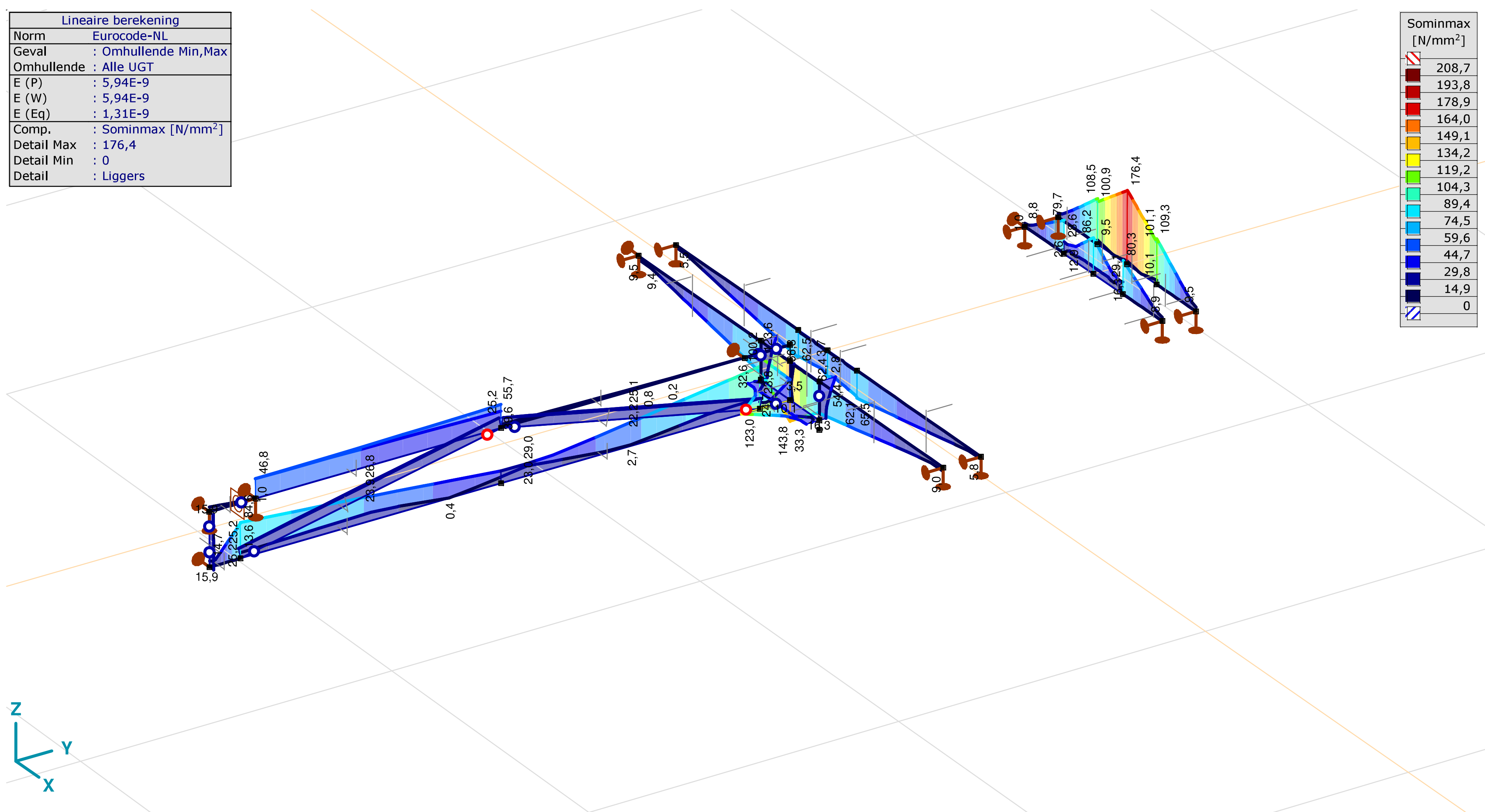
[I], Lineair, Omhullende (Alle UGT), eZ, Lijnen

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 versterkt.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Sominmax [N/mm²]
Detail Max	: 176,4
Detail Min	: 0
Detail	: Liggers



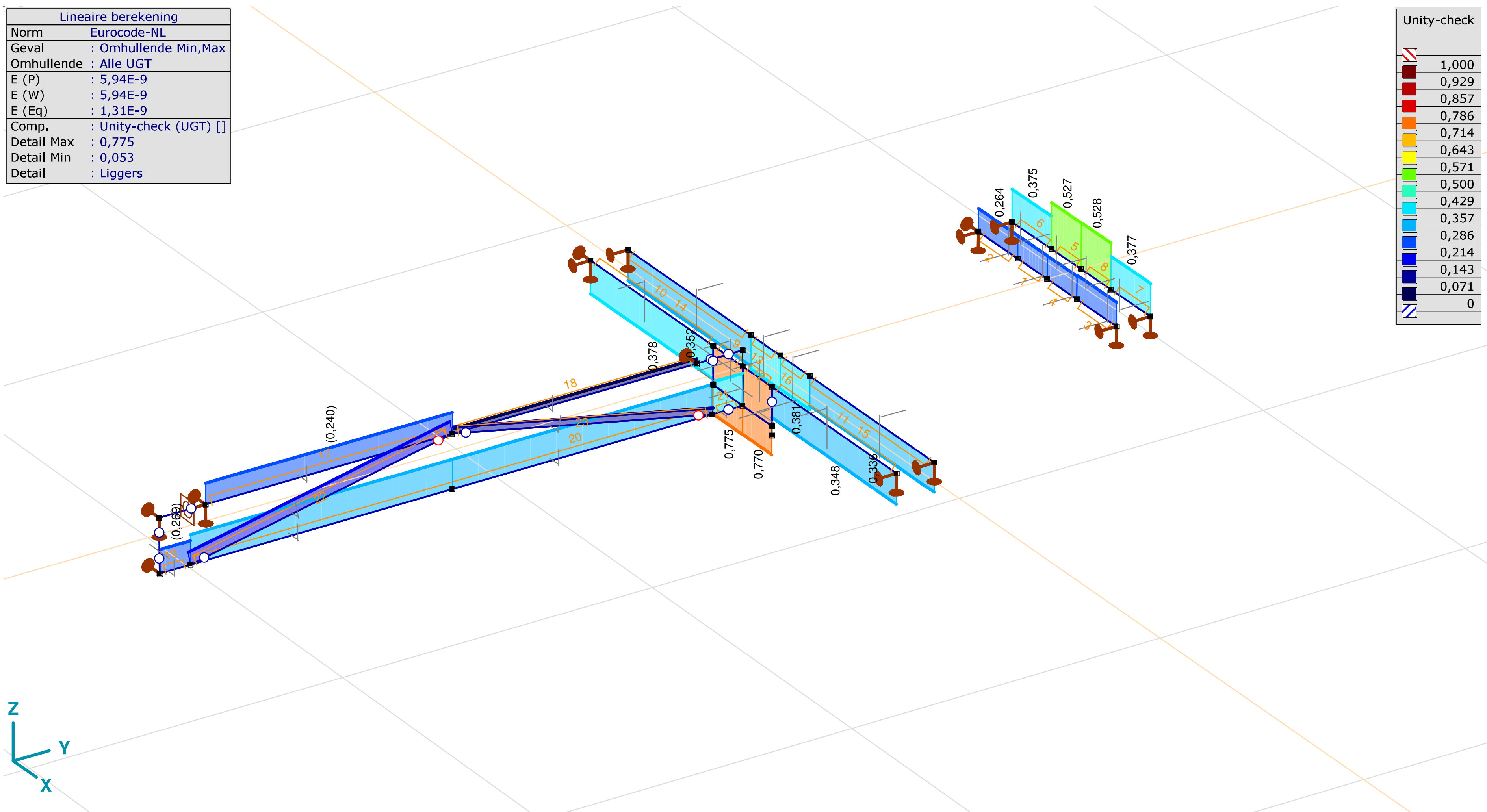
[I], > Liggers, Lineair, Omhullende (Alle UGT), Sominmax, Lijnen (gevuld)

Project:

Constructeur: DNV GL - Energy

Model: **Liggers D+0 versterkt.axs**

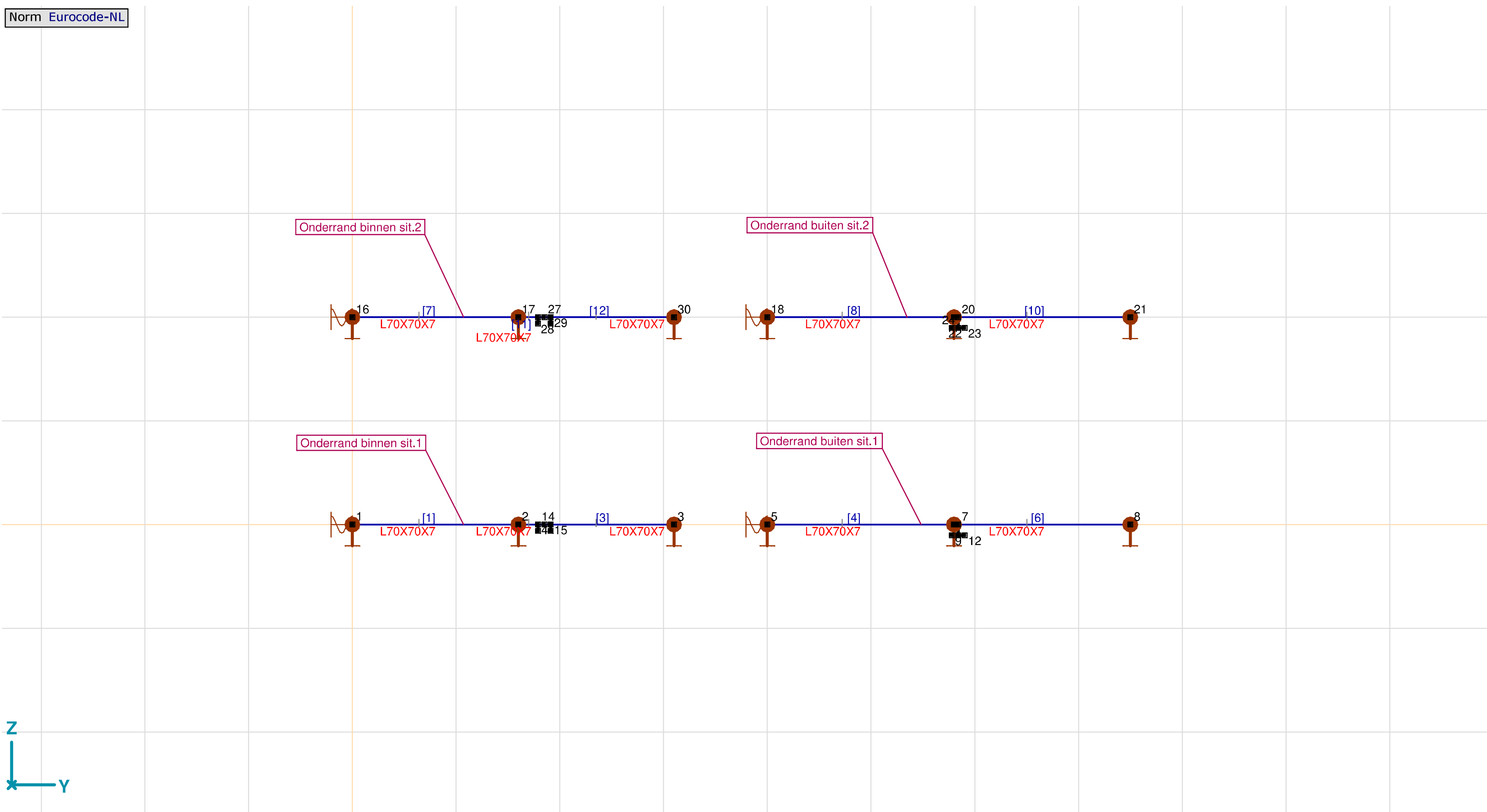
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 5,94E-9
E (W)	: 5,94E-9
E (Eq)	: 1,31E-9
Comp.	: Unity-check (UGT) []
Detail Max	: 0,775
Detail Min	: 0,053
Detail	: Liggers



[Stl], > Liggers, Lineair, Omhullende (Alle UGT), Unity-check, Lijnen (gevuld)

Rapport

Rapport, Inhoudsopgave



Zijaanzicht

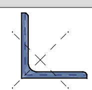
Materialen

	Naam	Type	Nationale norm	Materiaalnorm	Model	E_x [N/mm²]	E_y [N/mm²]	ν	α_T [1/°C]	ρ [kg/m³]	Materiaal kleur	Contour kleur	Structuur	P_1
1	S 235	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm²] = 235,00

	Naam	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}
1	S 235	f_u[N/mm²] = 360,00	f_y^*[N/mm²] = 215,00	f_u^*[N/mm²] = 360,00										

Naam: Materiaalnaam; **Type:** Type materiaal; **Model:** Materiaal model; **E_x:** Elasticiteitsmodulus in lokale x richting; **E_y:** Elasticiteitsmodulus in lokale y richting; **ν:** Poisson's verhouding; **α_T:** Warmteuitzettingscoëfficiënt; **ρ:** Dichtheid; **Materiaal kleur:** Materiaalkleur; **Contour kleur:** Contourkleur; **P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}:** Ontwerpparameter;

Profielen

	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm²]	Ay [mm²]	Az [mm²]	Ix [mm⁴]	Iy [mm⁴]	Iz [mm⁴]	Iyz [mm⁴]
1	L 70X 70X 7		Gewalst	L	70,0	70,0	7,0	7,0	9,0	4,5	0	939,73	412,00	416,89	16632,03	422933,40	422933,40	−247895,00

	Naam	I_1 [mm⁴]	I_2 [mm⁴]	α [°]	Iω [mm⁶]	$W_{1,el,t}$ [mm³]	$W_{1,el,b}$ [mm³]	$W_{2,el,t}$ [mm³]	$W_{2,el,b}$ [mm³]	$W_{1,pl}$ [mm³]	$W_{2,pl}$ [mm³]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]	y_G [mm]	z_G [mm]
1	L 70X 70X 7	670828,40	175038,40	45,00	5155803	13552,78	13552,78	7084,59	6279,10	21549,95	11096,74	21,2	21,2	70,0	70,0	19,7	19,7

	Naam	y_s [mm]	z_s [mm]	β_y [mm]	β_z [mm]	β_w []	S.p.
1	L 70X 70X 7	−15,5	−15,5	63,2	63,2	0	4

Naam: Doorsnede naam; **Productie:** Productieproces; **Vorm:** Profiel; **h:** Doorsnede hoogte; **b:** Doorsnede breedte; **tw:** Lijfdikte; **tf:** Flensdikte; **r_1, r_2, r_3:** Afrondingswaarde; **Ax:** Doorsnede-oppervlak; **Ay, Az:** Afschuivingsoppervlak; **Ix:** Torsietraagheidsmoment; **Iy, Iz:** Buigtraagheidsmoment; **Iyz:** Centrifugaal traagheidsmoment; **I_1, I_2:** Hoofdbuigtraagheidsmoment; **α:** Hoofdrichtingen; **Iω:** Krommingsconstante; **$W_{1,el,t}$, $W_{1,el,b}$, $W_{2,el,t}$, $W_{2,el,b}$:** Elastisch weerstandsmoment; **$W_{1,pl}$, $W_{2,pl}$:** Plastisch weerstandsmoment; **i_y, i_z:** Traagheidsstraal; **Hy:** Afmeting in lokale Y-richting; **Hz:** Afmeting in lokale Z-richting; **y_G:** Y-coördinaat van het zwaartepunt; **z_G:** Z-coördinaat van het zwaartepunt; **y_s:** Y-coördinaat van het afschuivingsmiddelpunt (torsie); **z_s:** Z-coördinaat van het afschuivingsmiddelpunt (torsie); **β_y, β_z, β_w:** Wagner's coëfficiënt; **S.p.:** Spanningspunten;

Knopen

	X [m]	Y [m]	Z [m]
1	0	0	0
2	0	1,600	0
3	0	3,100	0
4	0	1,850	0
5	0	4,000	0
6	0	5,800	0
7	0	5,840	0
8	0	7,500	0
9	0	5,840	−0,104
10	0	1,789	−0,062
11	0	1,911	−0,062
12	0	5,901	−0,104
13	0	5,779	−0,104
14	0	1,789	0
15	0	1,911	0
16	0	0	2,000
17	0	1,600	2,000
18	0	4,000	2,000
19	0	5,800	2,000
20	0	5,840	2,000
21	0	7,500	2,000
22	0	5,840	1,896
23	0	5,901	1,896
24	0	5,779	1,896
25	0	1,789	1,938
26	0	1,789	2,000
27	0	1,850	2,000
28	0	1,911	1,938
29	0	1,911	2,000
30	0	3,100	2,000

Staven

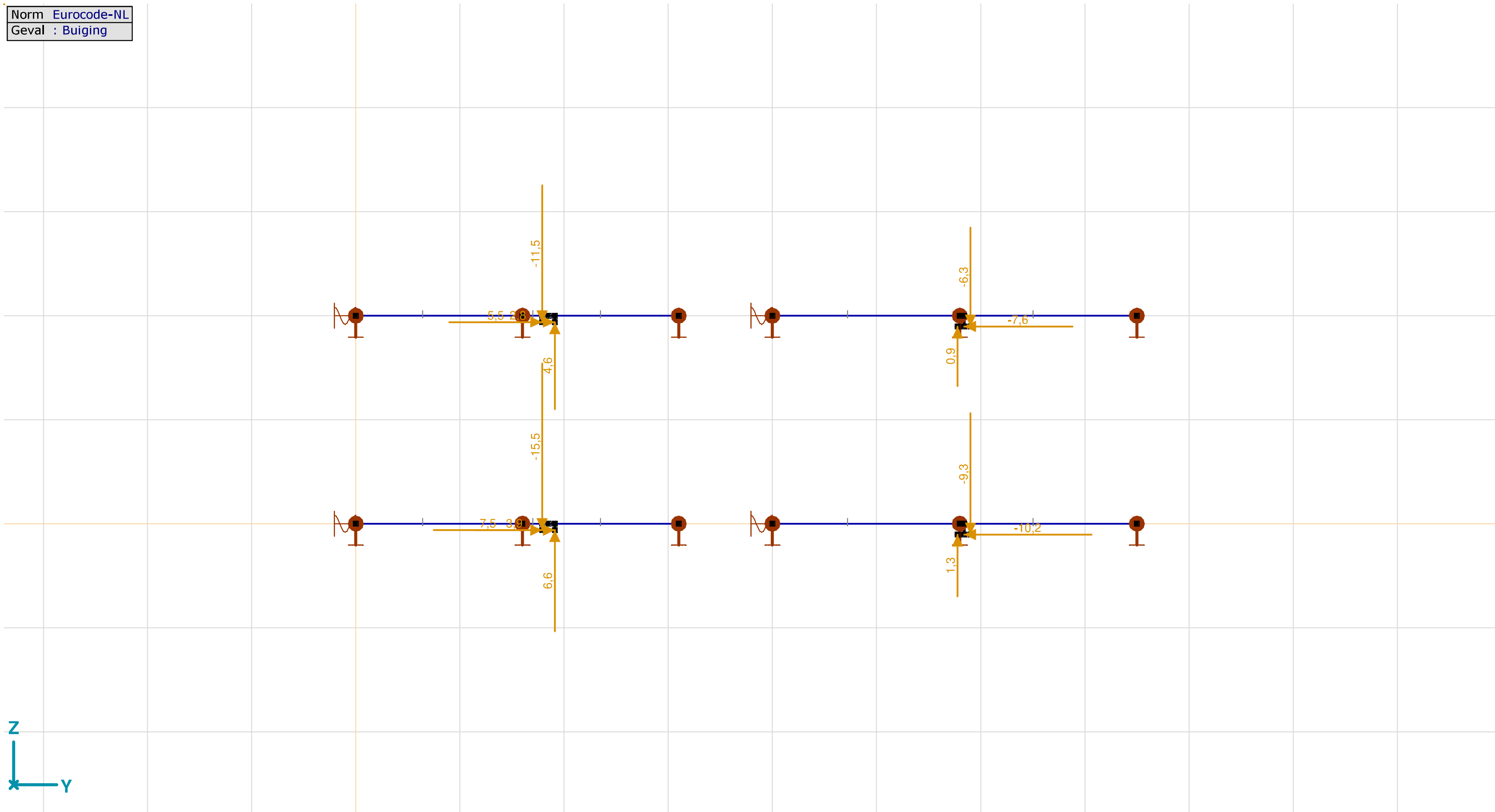
	Start-punt	Eind-punt	Lengte	Lokaal X	Materiaal	Doorsnede
1	1	2	1,600	i - j	S 235	1
2	2	4	0,250	i - j	S 235	1
3	4	3	1,250	j - i	S 235	1
4	5	6	1,800	i - j	S 235	1
5	6	7	0,040	i - j	S 235	1
6	7	8	1,660	i - j	S 235	1
7	16	17	1,600	i - j	S 235	1
8	18	19	1,800	i - j	S 235	1
9	19	20	0,040	i - j	S 235	1
10	20	21	1,660	i - j	S 235	1
11	17	27	0,250	i - j	S 235	1
12	27	30	1,250	i - j	S 235	1

Lengte: Elementlengte; **Lokaal X:** Lokale X-richting;

Buiging: Knoopbelastingen

	Richting	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
9	Globaal	0	−10,2	0	0	0	0
10	Globaal	0	7,5	−15,5	0	0	0
11	Globaal	0	3,9	6,6	0	0	0
12	Globaal	0	0	−9,3	0	0	0
13	Globaal	0	0	1,3	0	0	0
22	Globaal	0	−7,6	0	0	0	0
23	Globaal	0	0	−6,3	0	0	0
24	Globaal	0	0	0,9	0	0	0
25	Globaal	0	5,5	−11,5	0	0	0
28	Globaal	0	2,8	4,6	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

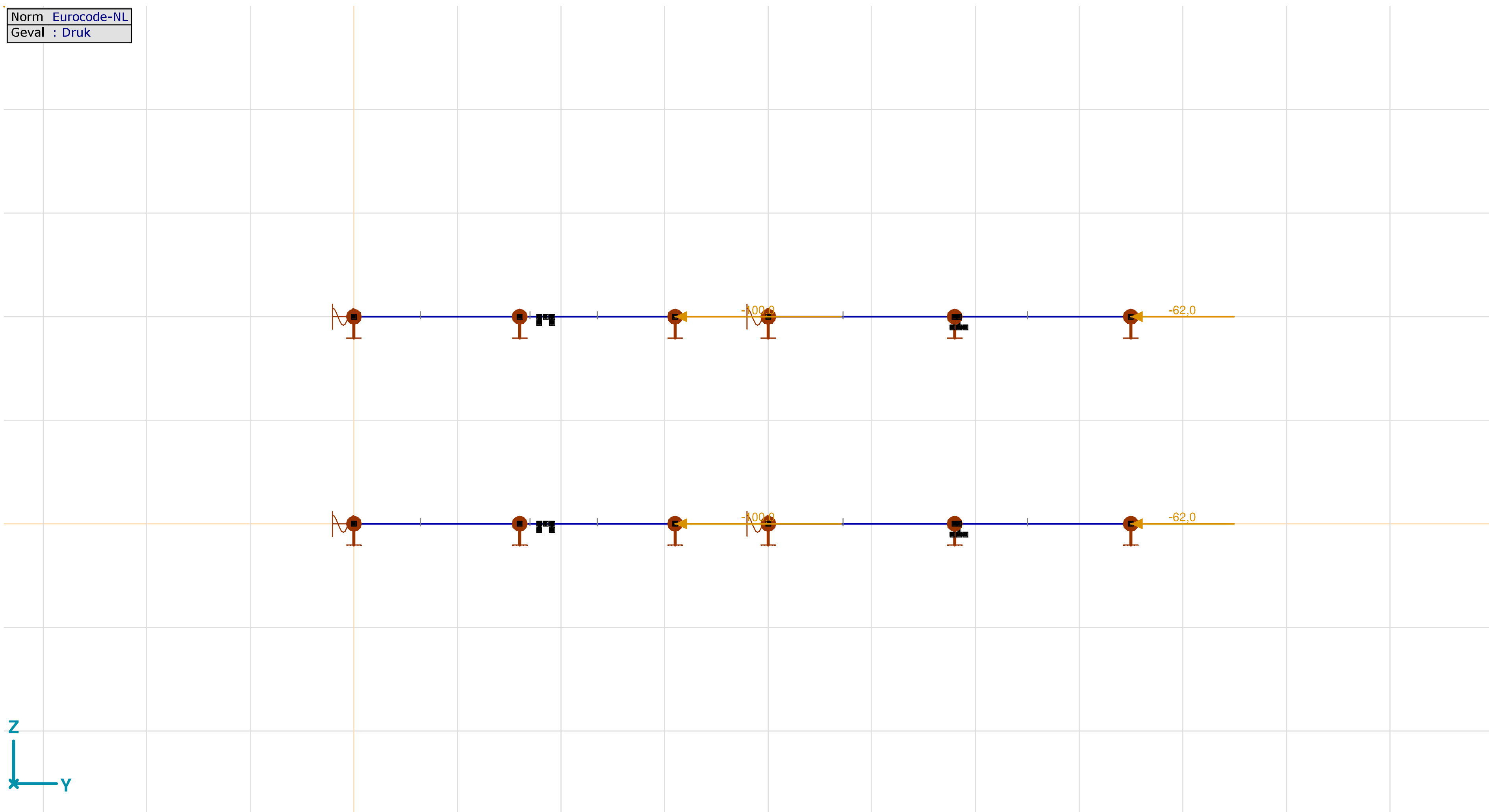


Buiging, Zijaanzicht

Druk: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
3	Globaal	0	−100,0	0	0	0	0
8	Globaal	0	−62,0	0	0	0	0
21	Globaal	0	−62,0	0	0	0	0
30	Globaal	0	−100,0	0	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

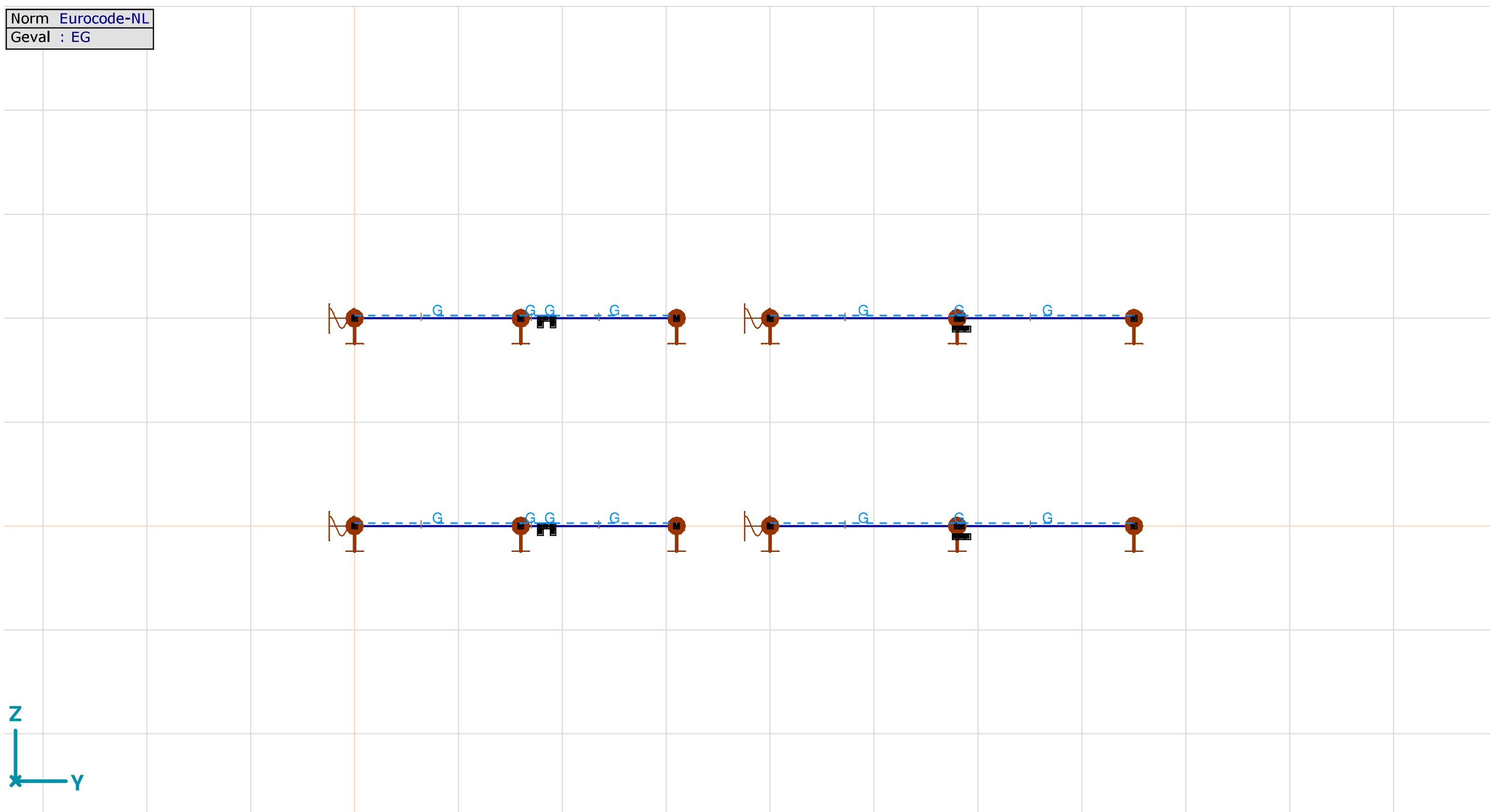


Druk, Zijaanzicht

EG: Staaf eigen gewicht

	Σ [kg]
1–16	97,375
Totaal	**97,375**

Σ: Totale massa;

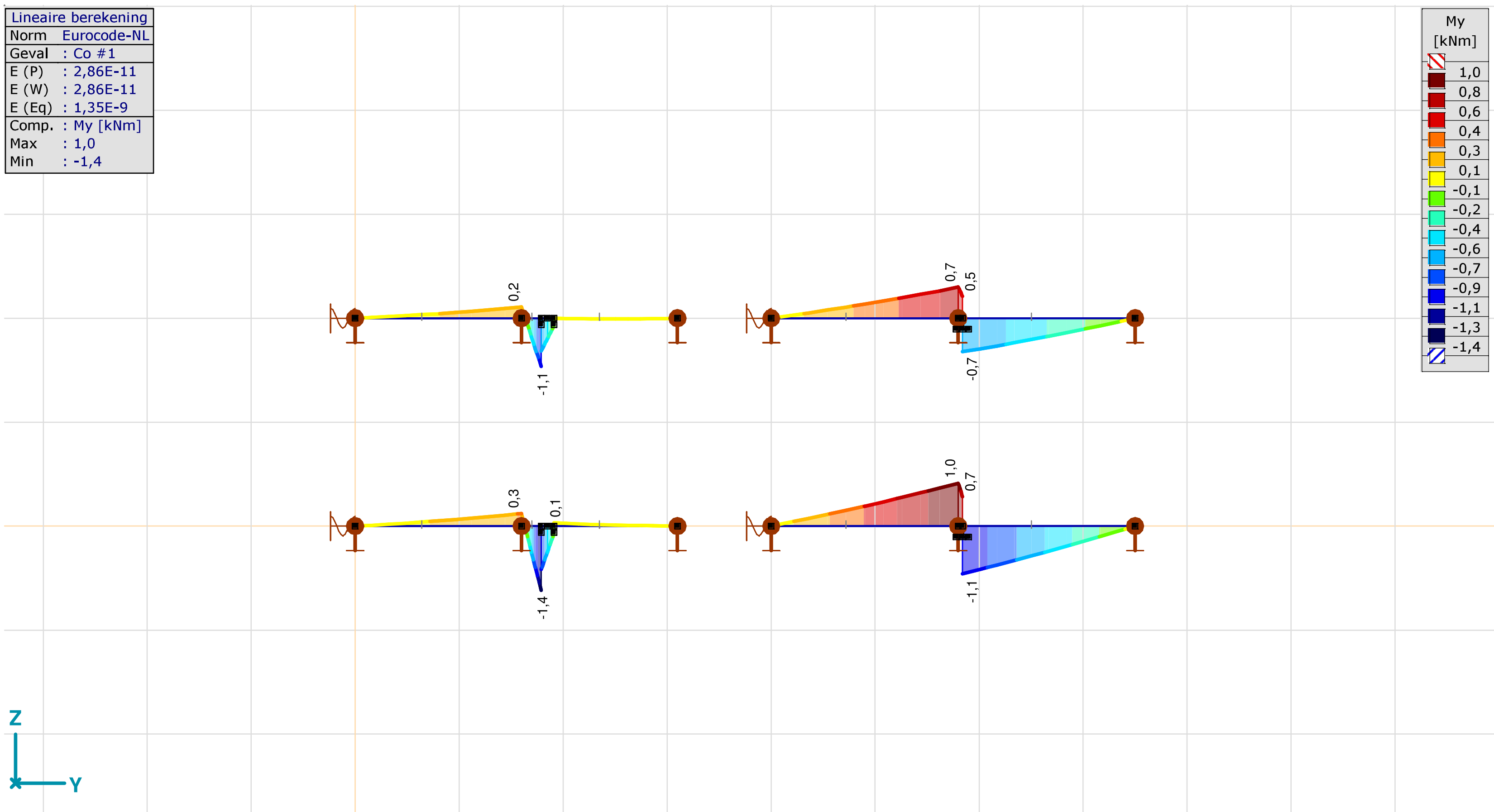


EG, Zijaanzicht

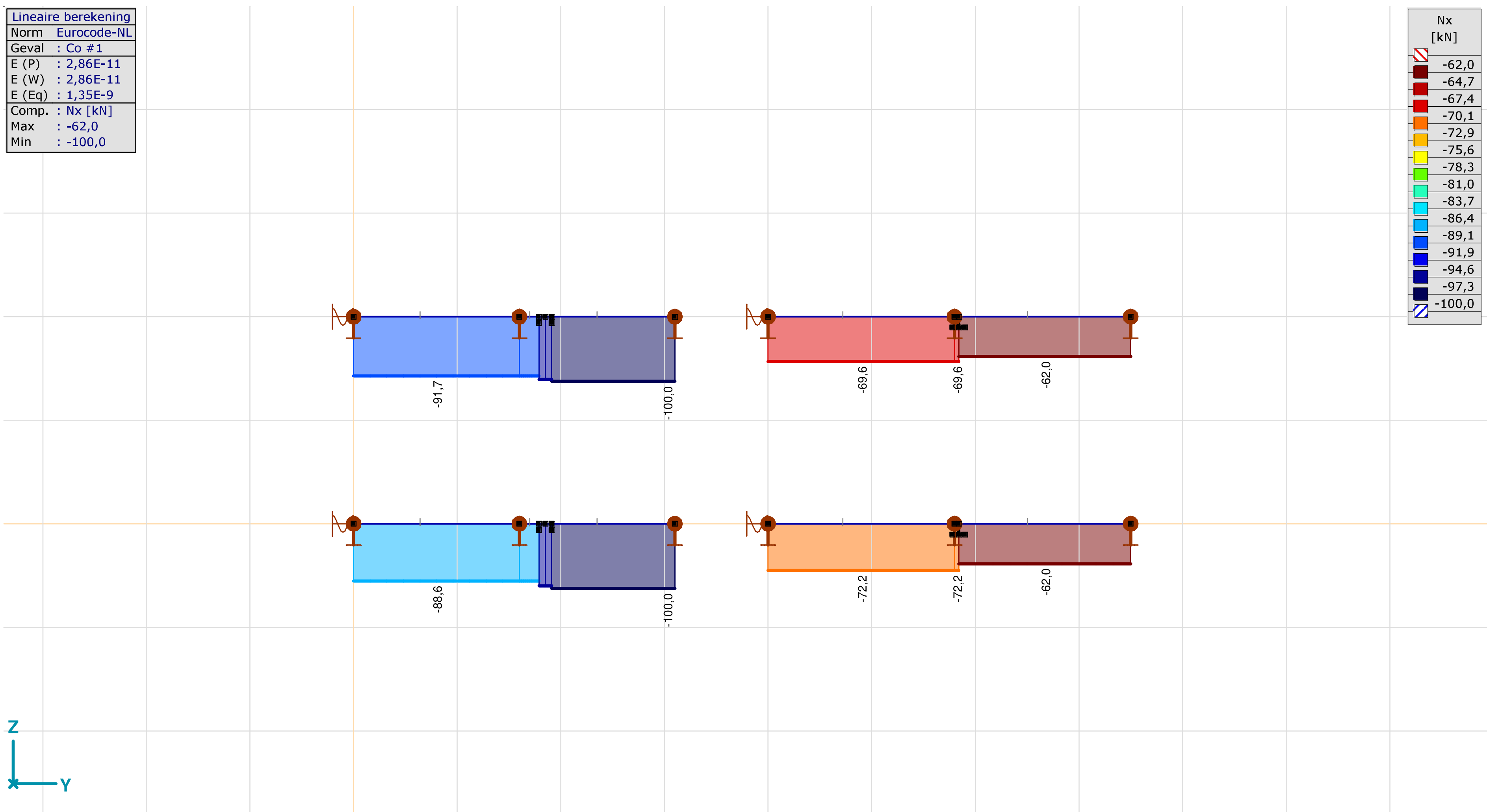
Gebruiker gedefinieerde belastingcombinaties uit belastinggevallen

	Naam	Type	Buiging	Druk	EG	Commentaar
1	Co #1	UGT	1,00	1,00	1,05	

Naam: Naam belastingcombinatie; **Type:** Type belastingcombinatie; **Buiging, Druk, EG:** Factor;

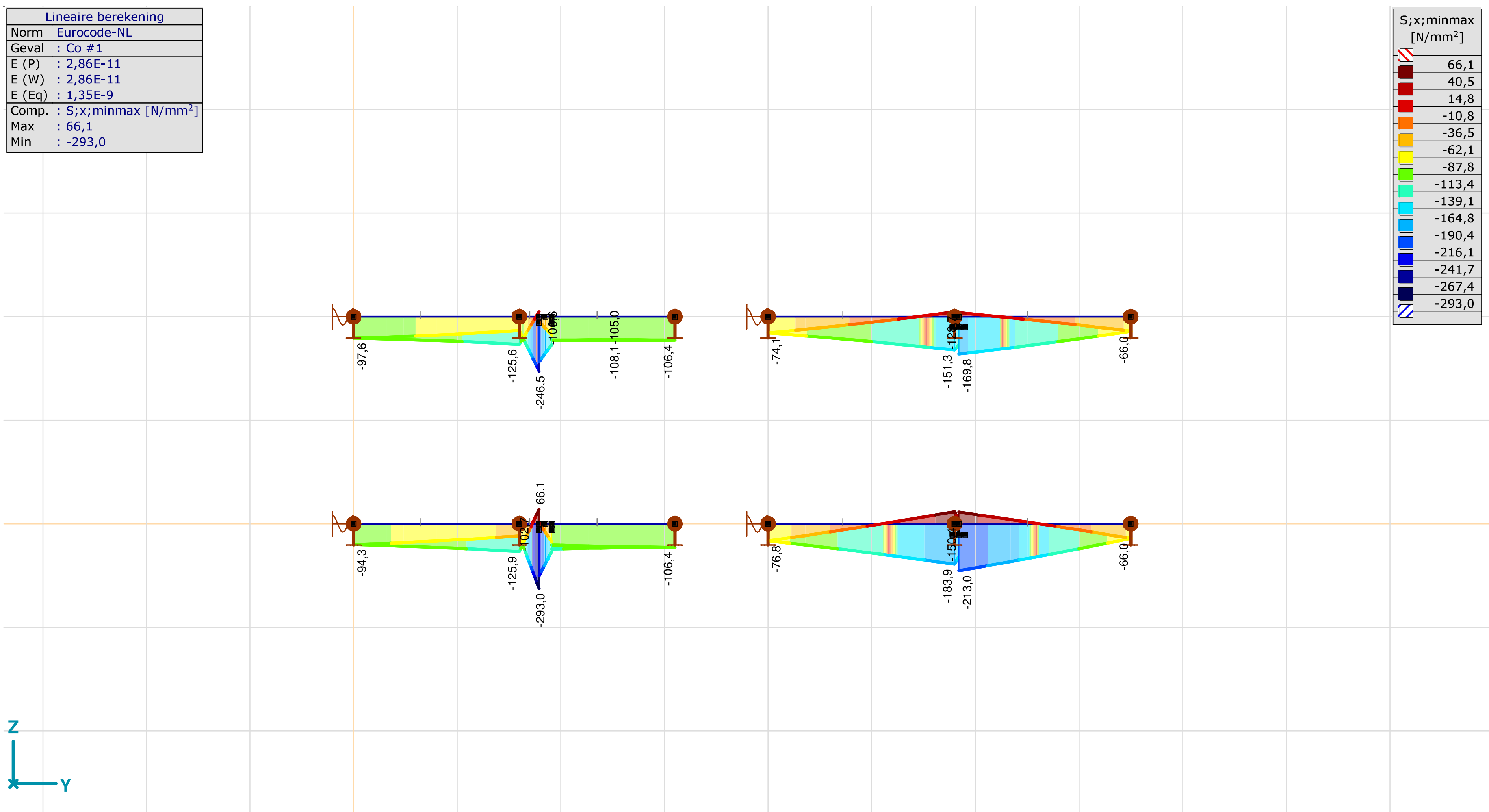


[I], Lineair, Co #1 (UGT), My, Lijnen (gevuld), Zijaanzicht

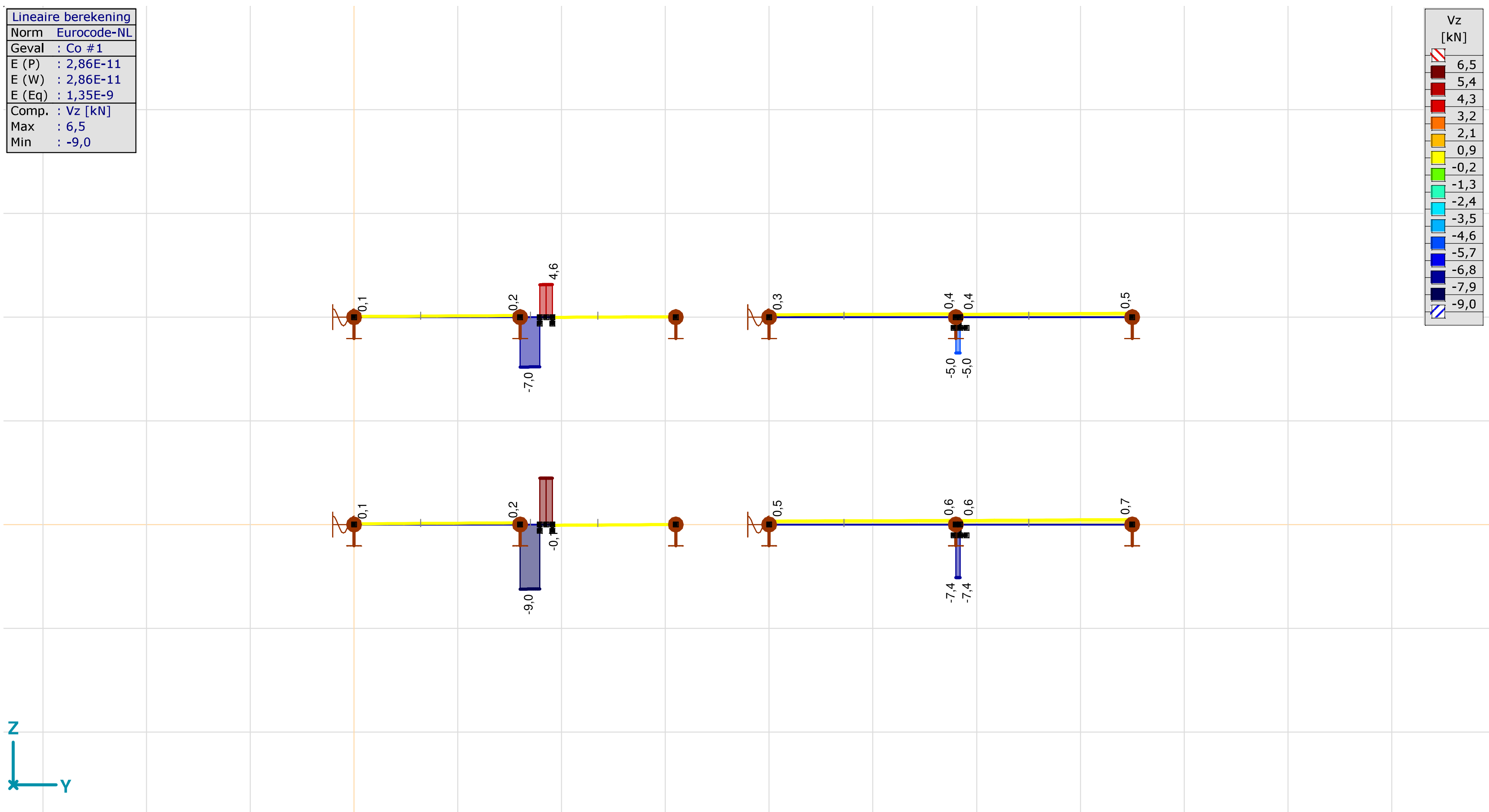


[I], Lineair, Co #1 (UGT), Nx, Lijnen (gevuld), Zijaanzicht

Project:
Constructeur: DNV GL - Energy
Model: **Onderrand boventraverse.axs**

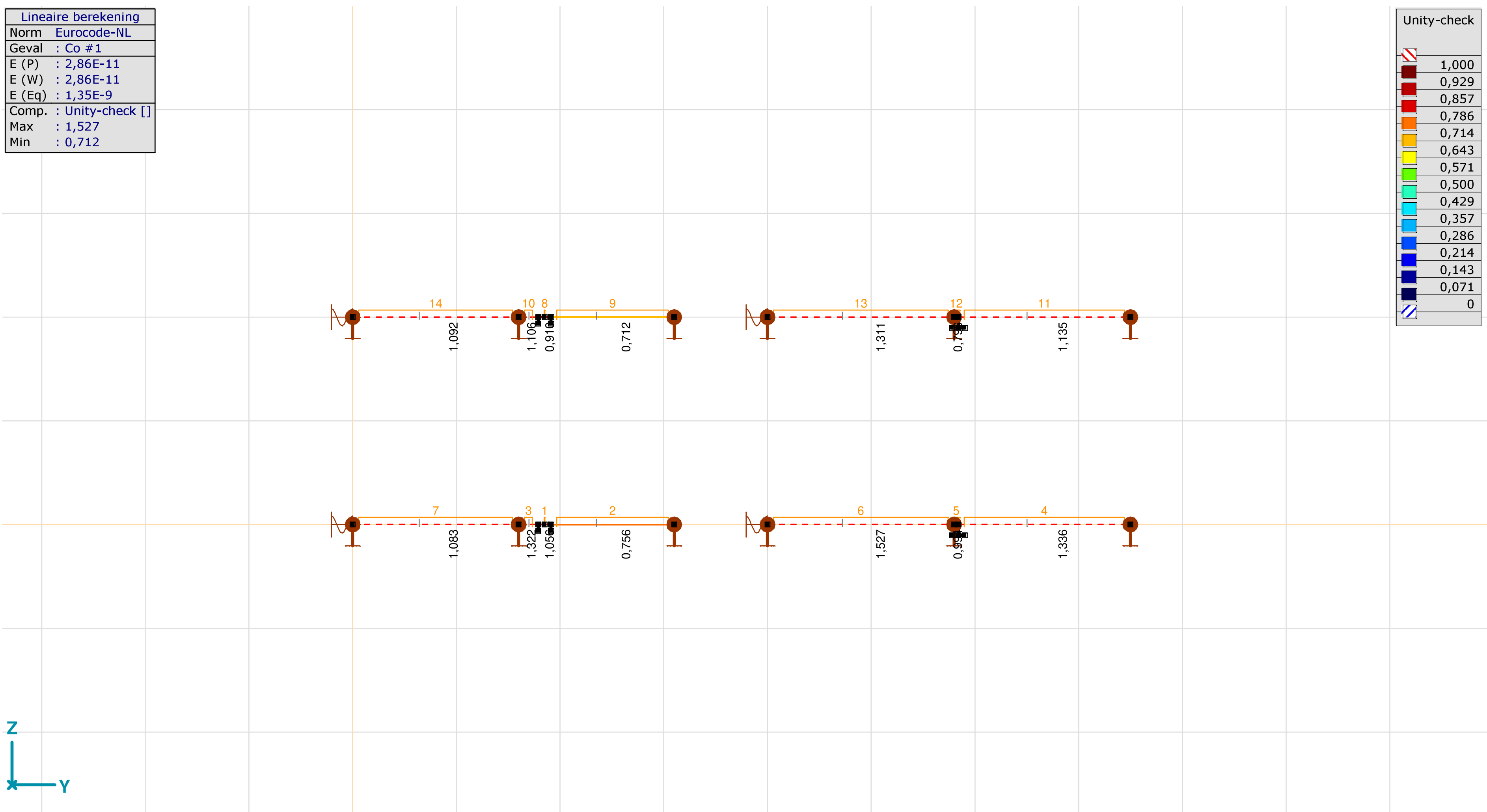


[I], Lineair, Co #1 (UGT), S;x;minmax, Lijnen (gevuld), Zijaanzicht



[I], Lineair, Co #1 (UGT), Vz, Lijnen (gevuld), Zijaanzicht

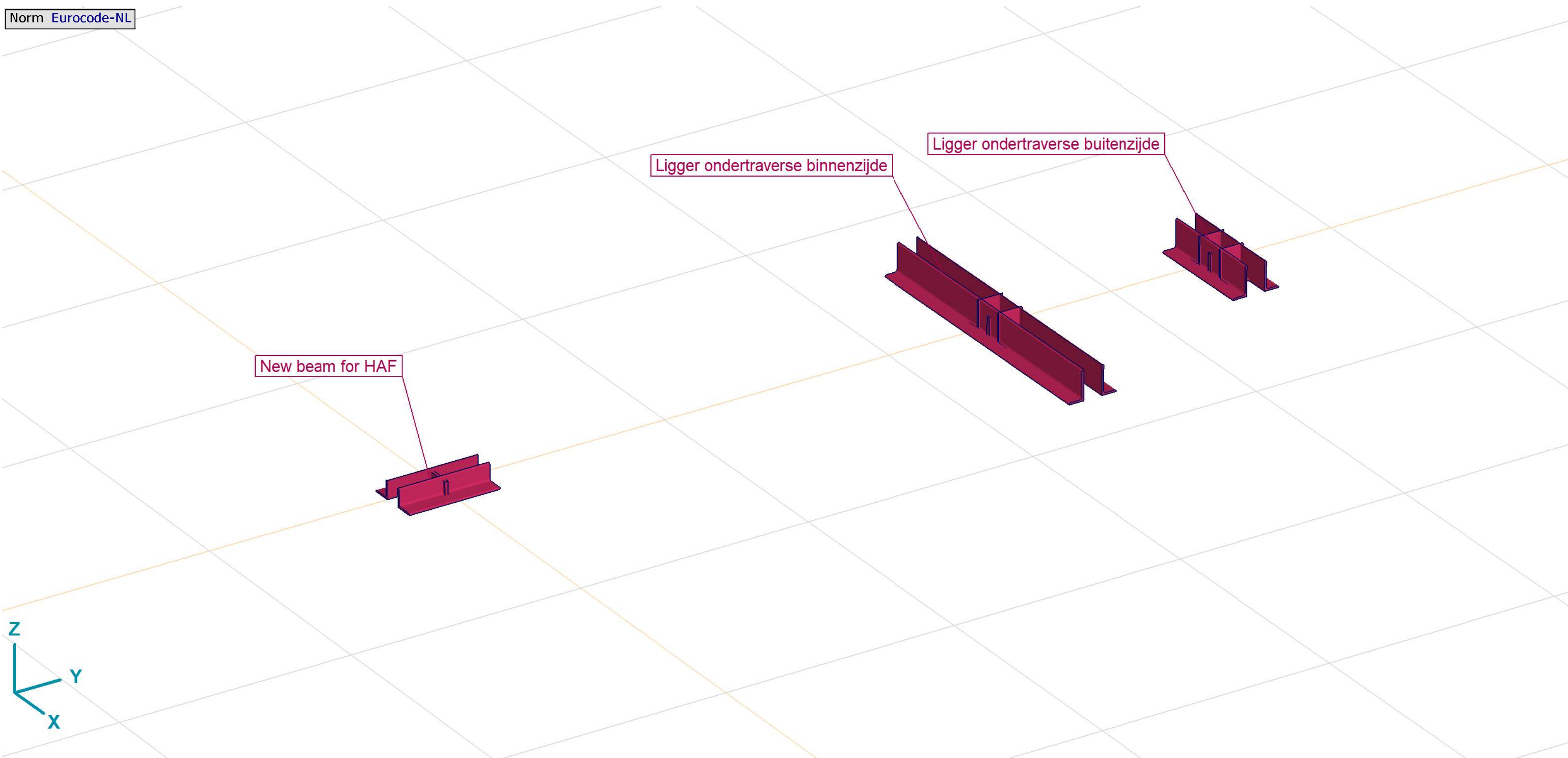
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Co #1
E (P)	: 2,86E-11
E (W)	: 2,86E-11
E (Eq)	: 1,35E-9
Comp.	: Unity-check []
Max	: 1,527
Min	: 0,712



[Stl], Lineair, Co #1 (UGT), Unity-check, Kleuren 2D, Zijaanzicht

Rapport

Rapport, Inhoudsopgave



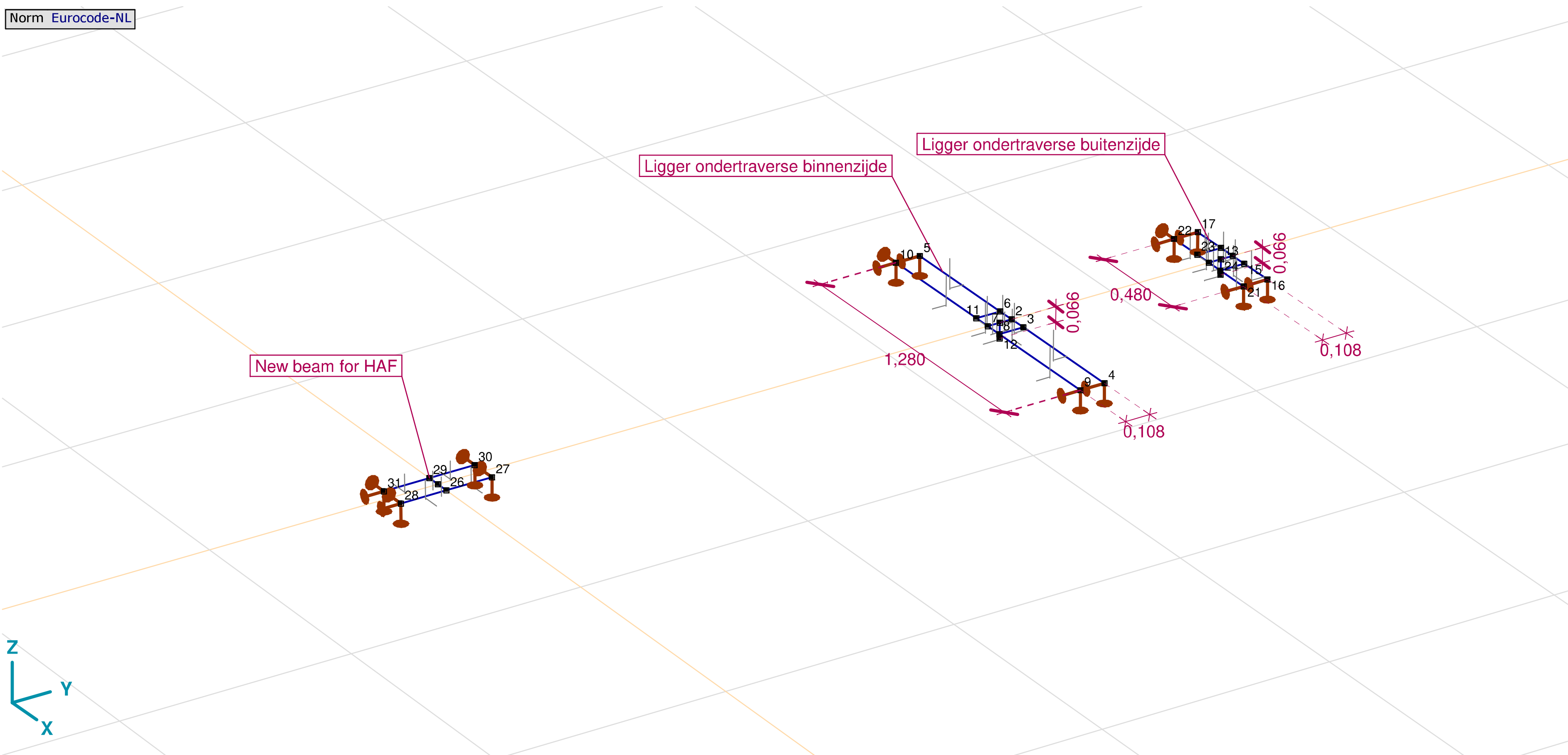
rendered view

Materialen

	Naam	Type	Nationale norm	Materiaalnorm	Model	E_x [N/mm²]	E_y [N/mm²]	ν	α_T [1/°C]	ρ [kg/m³]	Materiaal kleur	Contour kleur	Structuur	P_1
1	S 235	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm²] = 235,00
2	S 355	Staal	Eurocode-NL	10025-2	Lineair	210000	210000	0,30	1,2E-5	7850			Steel	f_y[N/mm²] = 355,00

	Naam	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}
1	S 235	f_u[N/mm²] = 360,00	f^*_y[N/mm²] = 215,00	f^*_u[N/mm²] = 360,00										
2	S 355	f_u[N/mm²] = 510,00	f^*_y[N/mm²] = 335,00	f^*_u[N/mm²] = 470,00										

Naam: Materiaalnaam; **Type:** Type materiaal; **Model:** Materiaal model; **E_x:** Elasticiteitsmodulus in lokale x richting; **E_y:** Elasticiteitsmodulus in lokale y richting; **ν:** Poisson's verhouding; **α_T:** Warmteuitzettingscoëfficiënt; **ρ:** Dichtheid; **Materiaal kleur:** Materiaalkleur;
Contour kleur: Contourkleur; **P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}:** Ontwerpparameter;


Norm Eurocode-NL
Ligger ondertraverse buitenzijde
Ligger ondertraverse binnenzijde
New beam for HAF
0,066
0,066
0,480
1,280
0,108
0,108
Z
Y
X

Tekening

Knopen

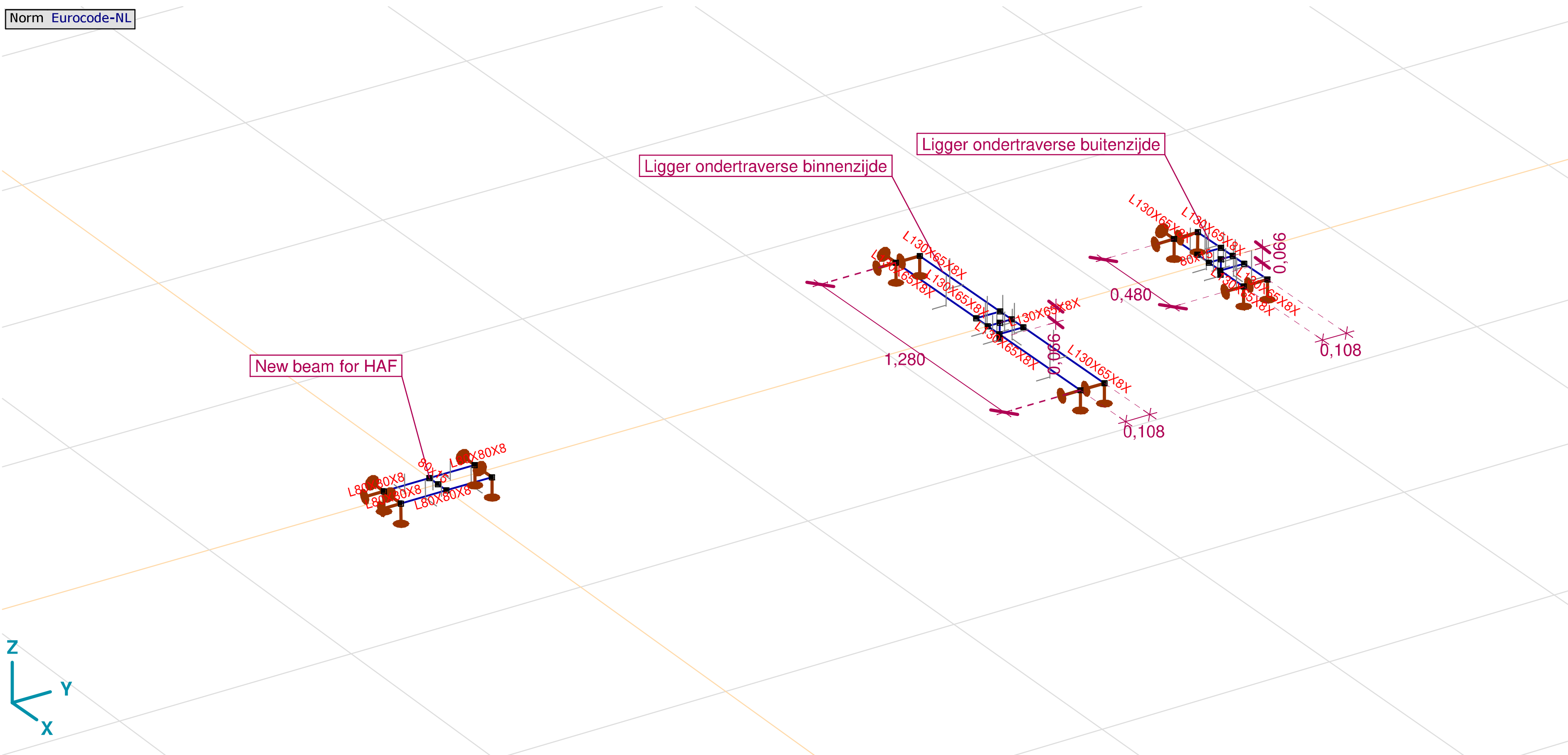
	X [m]	Y [m]	Z [m]
1	0	2,500	0
2	0	2,554	0
3	0,080	2,554	0
4	0,640	2,554	0
5	−0,640	2,554	0
6	−0,080	2,554	0
7	0	2,446	0
8	0,080	2,446	0
9	0,640	2,446	0
10	−0,640	2,446	0
11	−0,080	2,446	0
12	0	2,500	−0,066
13	0	3,500	0
14	0	3,554	0
15	0,080	3,554	0
16	0,240	3,554	0
17	−0,240	3,554	0
18	−0,080	3,554	0
19	0	3,446	0
20	0,080	3,446	0
21	0,240	3,446	0
22	−0,240	3,446	0
23	−0,080	3,446	0
24	0	3,500	−0,066
25	0	0	0
26	0,060	0	0
27	0,060	0,200	0
28	0,060	−0,200	0
29	−0,060	0	0
30	−0,060	0,200	0
31	−0,060	−0,200	0

Staven

	Start-punt	*Eind-punt*	*Lengte*	*Lokaal X*	*Materiaal*	*Doorsnede*	*Ref_z*	*<– Aansluitingen*	*Aansluitingen –>*
1	1	2	0,054	i - j	S 235	2	R1	.	100111
2	2	3	0,080	i - j	S 235	4	Auto	.	.
3	3	4	0,560	i - j	S 235	4	Auto	.	.
4	5	6	0,560	i - j	S 235	4	Auto	.	.
5	6	2	0,080	j - i	S 235	4	Auto	.	.
6	8	7	0,080	j - i	S 235	4	Auto	.	.
7	9	8	0,560	j - i	S 235	4	Auto	.	.
8	11	10	0,560	j - i	S 235	4	Auto	.	.
9	7	11	0,080	i - j	S 235	4	Auto	.	.
10	7	1	0,054	j - i	S 235	2	R1	Schar-YZ	.
11	11	6	0,108	j - i	S 235	4	Auto	.	.
12	3	8	0,108	i - j	S 235	4	Auto	.	.
13	12	1	0,066	j - i	S 235	2	Auto	.	.
14	13	14	0,054	i - j	S 235	2	R1	.	100111
15	14	15	0,080	i - j	S 235	4	Auto	.	.
16	15	16	0,160	i - j	S 235	4	Auto	.	.
17	17	18	0,160	i - j	S 235	4	Auto	.	.
18	18	14	0,080	j - i	S 235	4	Auto	.	.
19	20	19	0,080	j - i	S 235	4	Auto	.	.
20	21	20	0,160	j - i	S 235	4	Auto	.	.
21	23	22	0,160	j - i	S 235	4	Auto	.	.
22	19	23	0,080	i - j	S 235	4	Auto	.	.
23	19	13	0,054	j - i	S 235	2	R1	Schar-YZ	.
24	23	18	0,108	j - i	S 235	4	Auto	.	.
25	15	20	0,108	i - j	S 235	4	Auto	.	.
26	24	13	0,066	j - i	S 235	2	Auto	.	.
27	27	26	0,200	j - i	S 355	5	Auto	.	.
28	26	28	0,200	i - j	S 355	5	Auto	.	.
29	29	30	0,200	i - j	S 355	5	Auto	.	.
30	31	29	0,200	j - i	S 355	5	Auto	.	.
31	25	26	0,060	i - j	S 235	2	R1	.	.
32	29	25	0,060	j - i	S 235	2	R1	Schar-Y	.

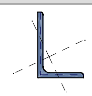
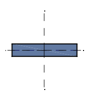
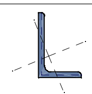
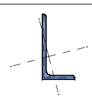
Lengte: Elementlengte; **Lokaal X:** Lokale X-richting; **Ref_z:** Referentie voor lokale Z-richting; **<– Aansluitingen:** Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt;

Norm Eurocode-NL



Tekening profielen

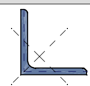
Profielen

	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm^2]	Ay [mm^2]	Az [mm^2]	Ix [mm^4]	Iy [mm^4]	Iz [mm^4]
1	L 130X 90X10X		Gewalst	L	130,0	90,0	10,0	10,0	12,0	6,0	0	2115,52	730,05	1115,03	75067,63	3579805,00	1407288,00
2	80x15		Gewalst	Recht.	15,0	80,0	0	0	0	0	0	1200,00	1000,00	1000,00	79361,69	22500,00	640000,00
3	L 100X 65X 9X		Gewalst	L	100,0	65,0	9,0	9,0	10,0	5,0	0	1414,78	477,96	772,93	40681,80	1406314,00	466914,90
4	L 130X 65X 8X		Gewalst	L	130,0	65,0	8,0	8,0	11,0	5,5	0	1509,04	400,01	894,73	34749,90	2625007,00	447616,10

	Naam	Iyz [mm^4]	I_1 [mm^4]	I_2 [mm^4]	α [°]	$I\omega$ [mm^6]	$W_{1,el,t}$ [mm^3]	$W_{1,el,b}$ [mm^3]	$W_{2,el,t}$ [mm^3]	$W_{2,el,b}$ [mm^3]	$W_{1,pl}$ [mm^3]	$W_{2,pl}$ [mm^3]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]
1	L 130X 90X10X	−1302677,00	4189697,00	797396,10	25,09	6,7E+07	46873,24	62990,74	17179,39	21346,26	81837,91	34394,52	41,1	25,8	90,0	130,0
2	80x15	0	640000,00	22500,00	90,00	1E+07	16000,00	16000,00	3000,00	3000,00	24000,00	4500,00	4,3	23,1	80,0	15,0
3	L 100X 65X 9X	−466019,90	1598273,00	274955,80	22,39	2E+07	23552,43	32380,51	7940,67	10044,04	41416,09	16324,54	31,5	18,2	65,0	100,0
4	L 130X 65X 8X	−608865,80	2783699,00	288924,20	14,61	2,9E+07	32704,41	48773,37	7411,05	11687,17	56896,01	16576,57	41,7	17,2	65,0	130,0

	Naam	y_G [mm]	z_G [mm]	y_s [mm]	z_s [mm]	β_y [mm]	β_z [mm]	β_w []	S.p.
1	L 130X 90X10X	21,8	41,5	−16,4	−35,0	112,7	95,4	−292,0	4
2	80x15	40,0	7,5	0	0	0	0	0	5
3	L 100X 65X 9X	15,9	33,2	−11,1	−26,9	84,2	70,1	−343,9	4
4	L 130X 65X 8X	13,7	45,6	−9,5	−39,4	111,6	90,0	−547,9	4

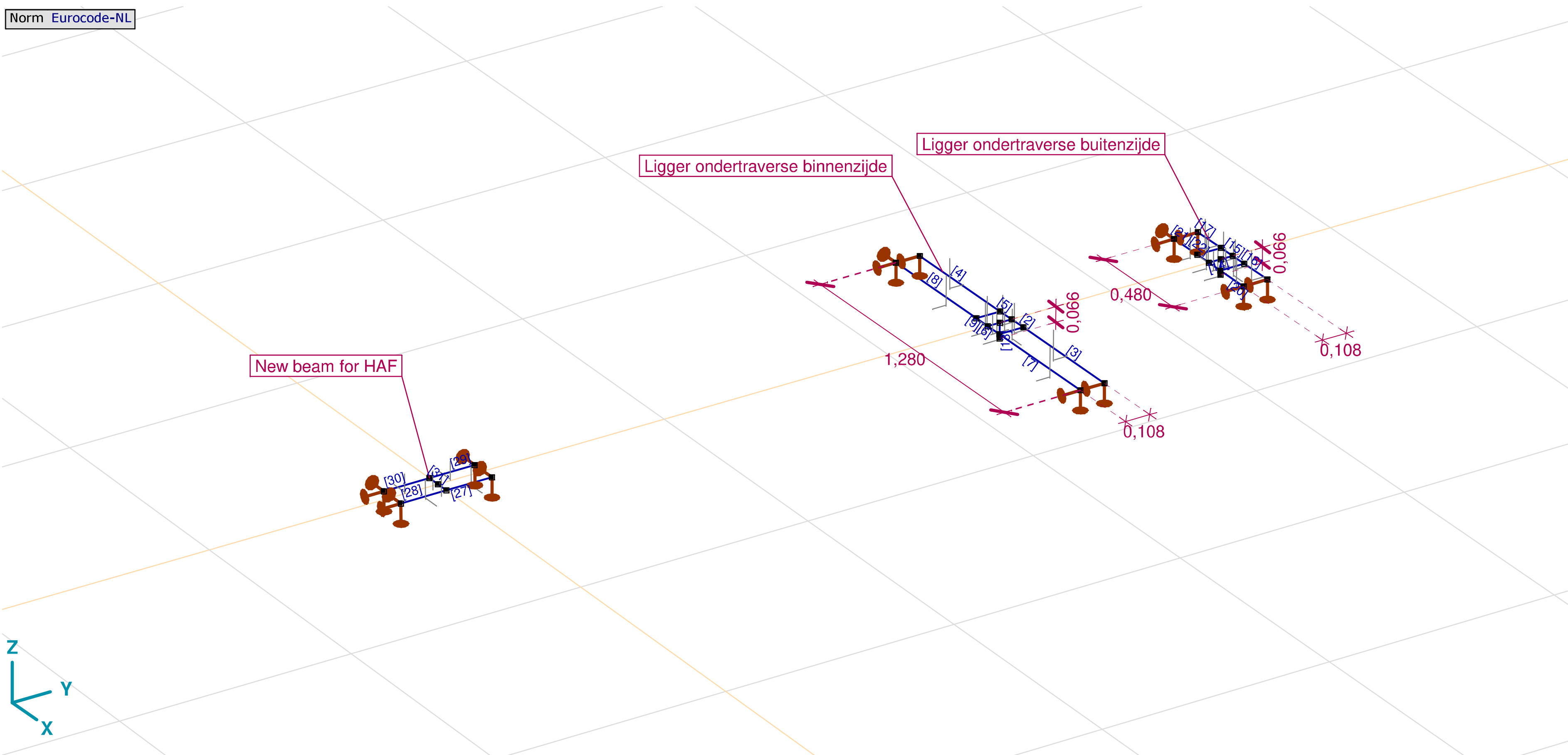
Profielen

	Naam	Tekening	Productie	Vorm	h [mm]	b [mm]	tw [mm]	tf [mm]	r_1 [mm]	r_2 [mm]	r_3 [mm]	Ax [mm^2]	Ay [mm^2]	Az [mm^2]	Ix [mm^4]	Iy [mm^4]	Iz [mm^4]
5	L 80X 80X 8		Gewalst	L	80,0	80,0	8,0	8,0	10,0	5,0	0	1226,78	537,99	544,05	28221,86	722397,80	722397,80

	Naam	Iyz [mm^4]	I_1 [mm^4]	I_2 [mm^4]	α [°]	Iω [mm^6]	$W_{1,el,t}$ [mm^3]	$W_{1,el,b}$ [mm^3]	$W_{2,el,t}$ [mm^3]	$W_{2,el,b}$ [mm^3]	$W_{1,pl}$ [mm^3]	$W_{2,pl}$ [mm^3]	i_y [mm]	i_z [mm]	Hy [mm]	Hz [mm]
5	L 80X 80X 8	−423612,40	1146010,00	298785,40	45,00	1,2E+07	20258,79	20258,79	10570,72	9369,56	32196,08	16562,34	24,3	24,3	80,0	80,0

	Naam	y_G [mm]	z_G [mm]	y_s [mm]	z_s [mm]	β_y [mm]	β_z [mm]	β_w []	S.p.
5	L 80X 80X 8	22,5	22,5	−17,8	−17,8	72,3	72,3	0	4

Naam: Doorsnede naam; **Productie:** Productieproces; **Vorm:** Profiel; **h:** Doorsnede hoogte; **b:** Doorsnede breedte; **tw:** Lijfdikte; **tf:** Flensdikte; **r_1, r_2, r_3:** Afrondingswaarde; **Ax:** Doorsnede-oppervlak; **Ay, Az:** Afschuivingsoppervlak; **Ix:** Torsietraagheidsmoment;
Iy, Iz: Buigtraagheidsmoment; **Iyz:** Centrifugaal traagheidsmoment; **I_1, I_2:** Hoofdbuigtraagheidsmoment; **α:** Hoofdrichtingen; **Iω:** Krommingsconstante; **$W_{1,el,t}$, $W_{1,el,b}$, $W_{2,el,t}$, $W_{2,el,b}$:** Elastisch weerstandsmoment; **$W_{1,pl}$, $W_{2,pl}$:** Plastisch weerstandsmoment; **i_y, i_z:** Traagheidsstraal;
Hy: Afmeting in lokale Y-richting; **Hz:** Afmeting in lokale Z-richting; **y_G:** Y-coördinaat van het zwaartepunt; **z_G:** Z-coördinaat van het zwaartepunt; **y_s:** Y-coördinaat van het afschuivingsmiddelpunt (torsie); **z_s:** Z-coördinaat van het afschuivingsmiddelpunt (torsie);
β_y, β_z, β_w: Wagner's coëfficiënt; **S.p.:** Spanningspunten;



Tekening staven

Staafaansluitingen

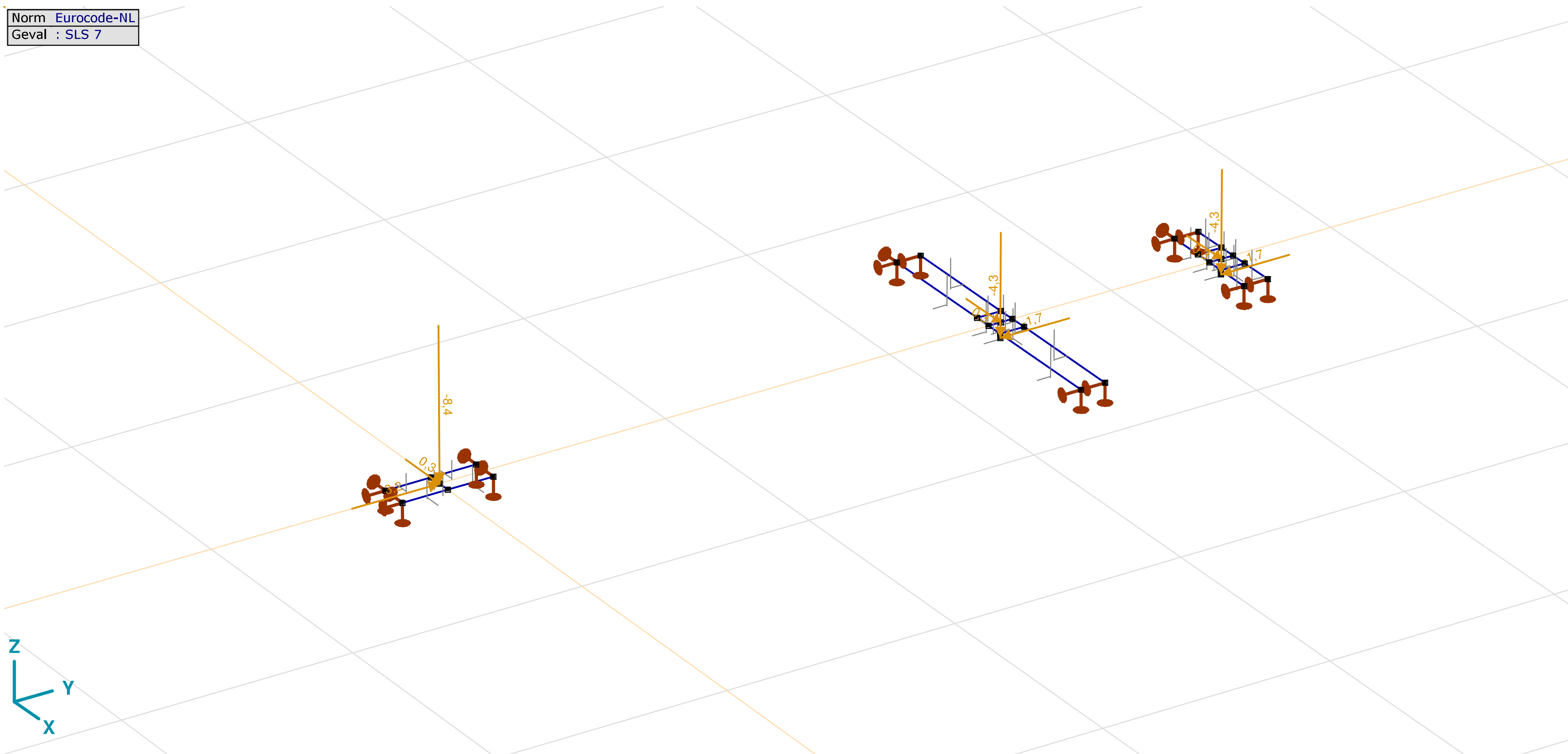
	<– Aansluitingen	*Aansluitingen –>*	$<- e_x$	$<- \theta_x$	$<- \theta_y$	$<- \theta_z$
1	.	100111	.	.	.	.
10	Schar-YZ	.	.	.	Vrij	Vrij
14	.	100111	.	.	.	.
23	Schar-YZ	.	.	.	Vrij	Vrij
32	Schar-Y	.	.	.	Vrij	.

<– Aansluitingen: Staafeindaansluitingen op startpunt; **Aansluitingen –>:** Staafeindaansluitingen op eindpunt; **$<- e_x$, $<- \theta_x$, $<- \theta_y$, $<- \theta_z$:** Type;

EG: Staaf eigen gewicht

	Σ [kg]
1–32	58,928
Totaal	**58,928**

Σ: Totale massa;



SLS 7

SLS 7: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	0,3	0	0	0	0	0
12	Globaal	0	−1,7	−4,3	0	0	0
13	Globaal	0,3	0	0	0	0	0
24	Globaal	0	−1,7	−4,3	0	0	0
25	Globaal	0,3	3,2	−8,4	0	0	0

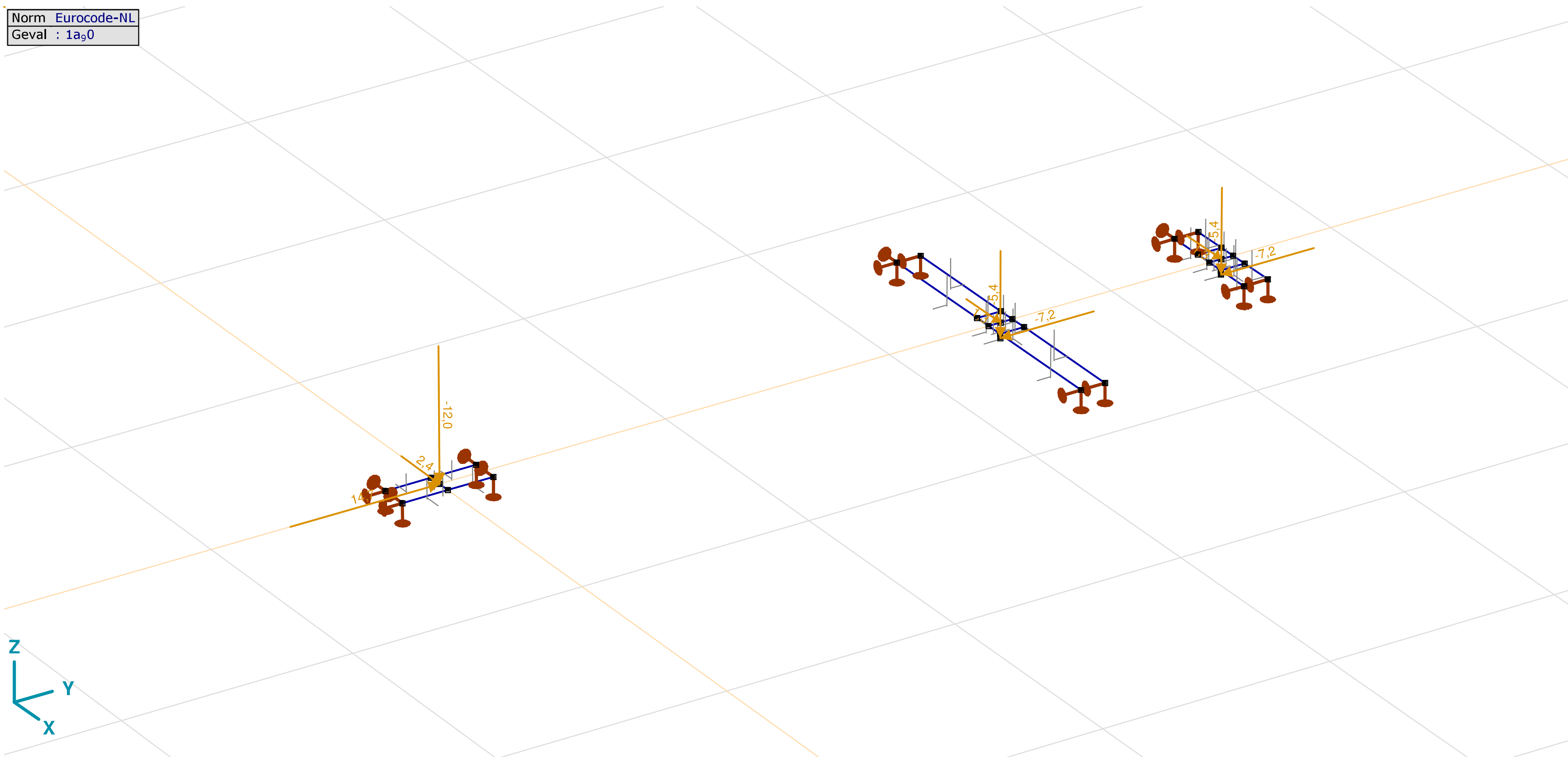
Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

1a_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	1,3	0	0	0	0	0
12	Globaal	0	−7,2	−5,4	0	0	0
13	Globaal	1,3	0	0	0	0	0
24	Globaal	0	−7,2	−5,4	0	0	0
25	Globaal	2,4	14,7	−12,0	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

Norm	Eurocode-NL
Geval	: $1a_90$

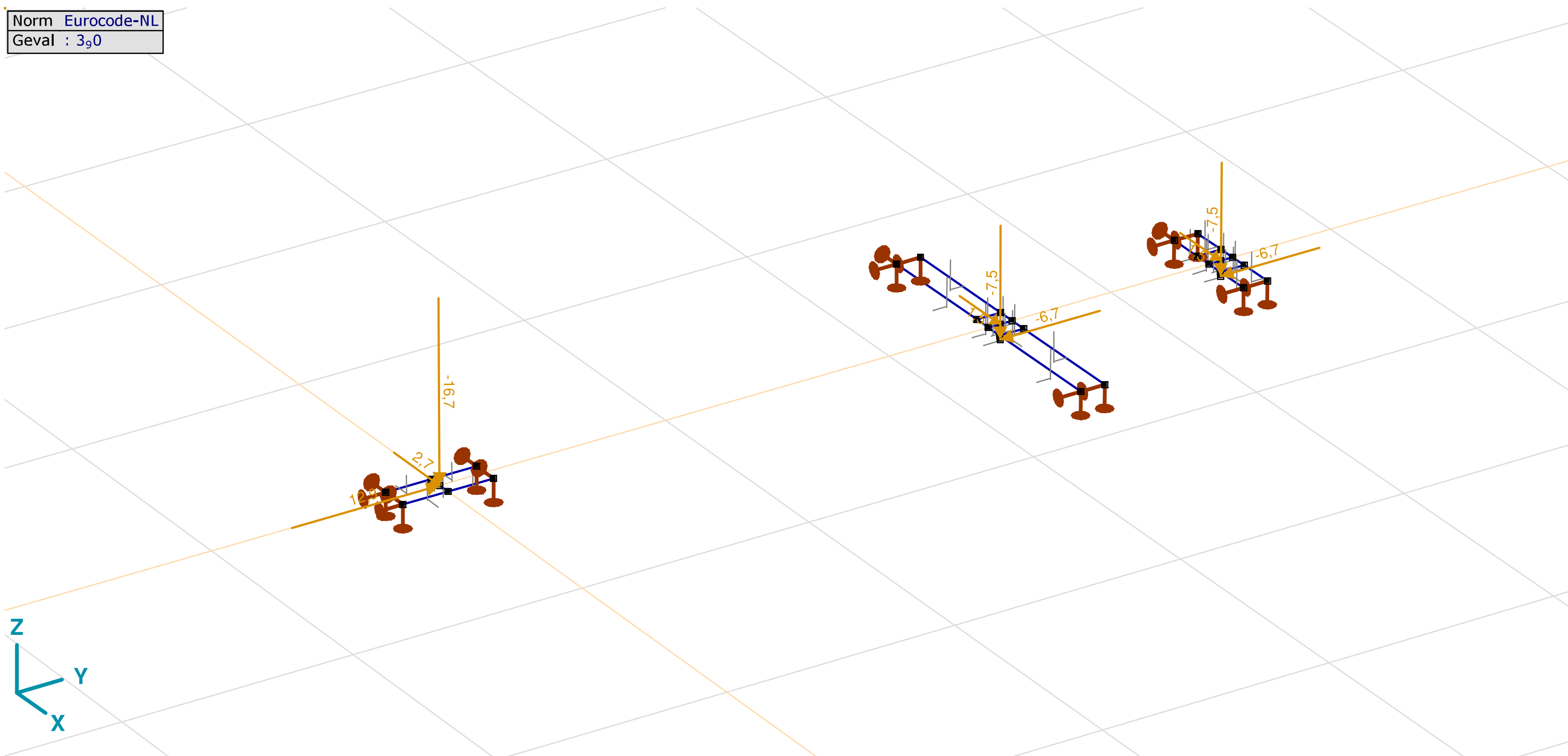


1a_90

3_90: Knoopbelastingen

	Richting	*Fx [kN]*	*Fy [kN]*	*Fz [kN]*	*Mx [kNm]*	*My [kNm]*	*Mz [kNm]*
1	Globaal	1,5	0	0	0	0	0
12	Globaal	0	−6,7	−7,5	0	0	0
13	Globaal	1,5	0	0	0	0	0
24	Globaal	0	−6,7	−7,5	0	0	0
25	Globaal	2,7	12,9	−16,7	0	0	0

Fx, Fy, Fz: Belastingkracht component; **Mx, My, Mz:** Belastingsmoment component;

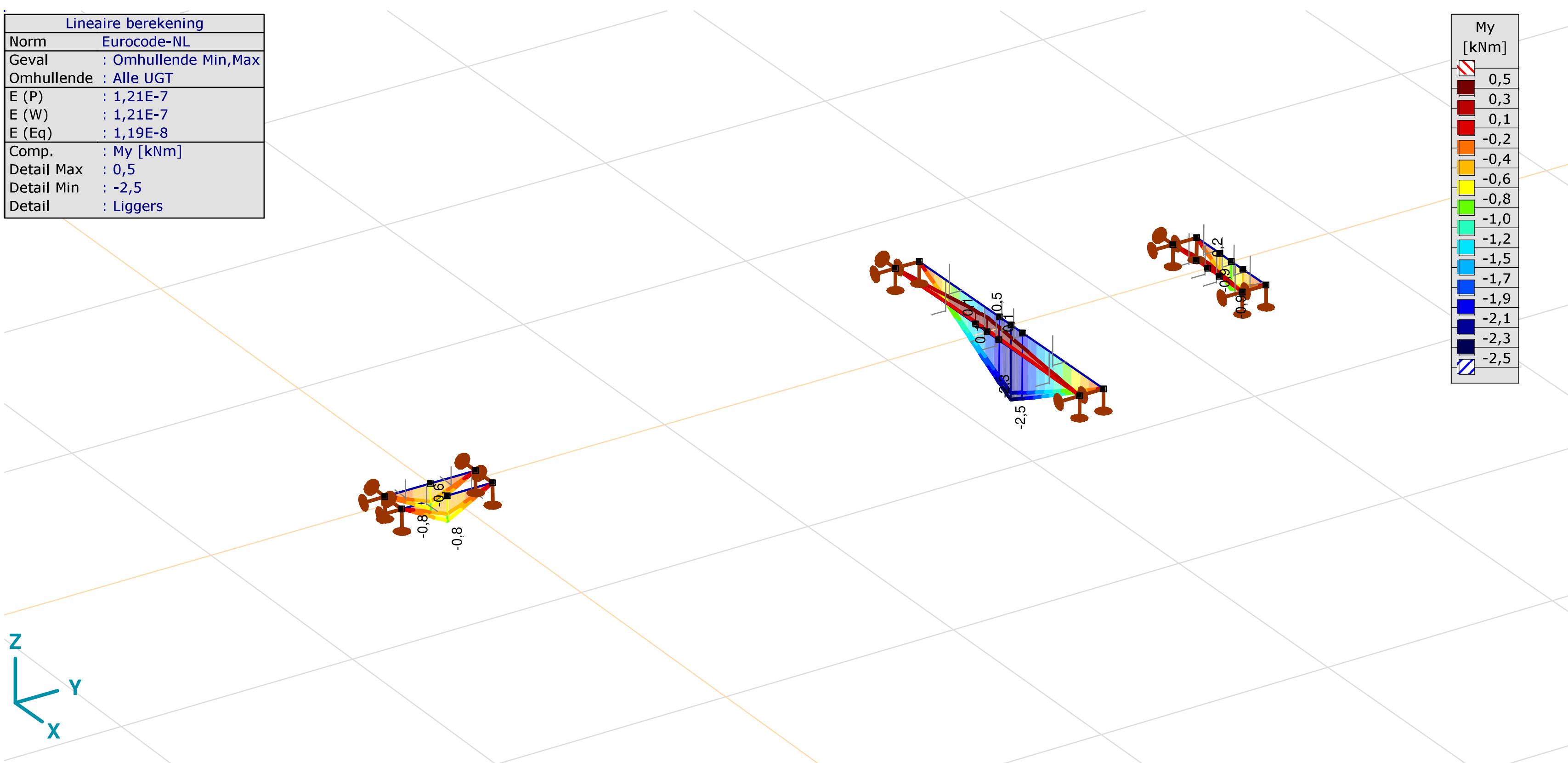


3_90

Gebruiker gedefinieerde belastingcombinaties uit belastinggevallen

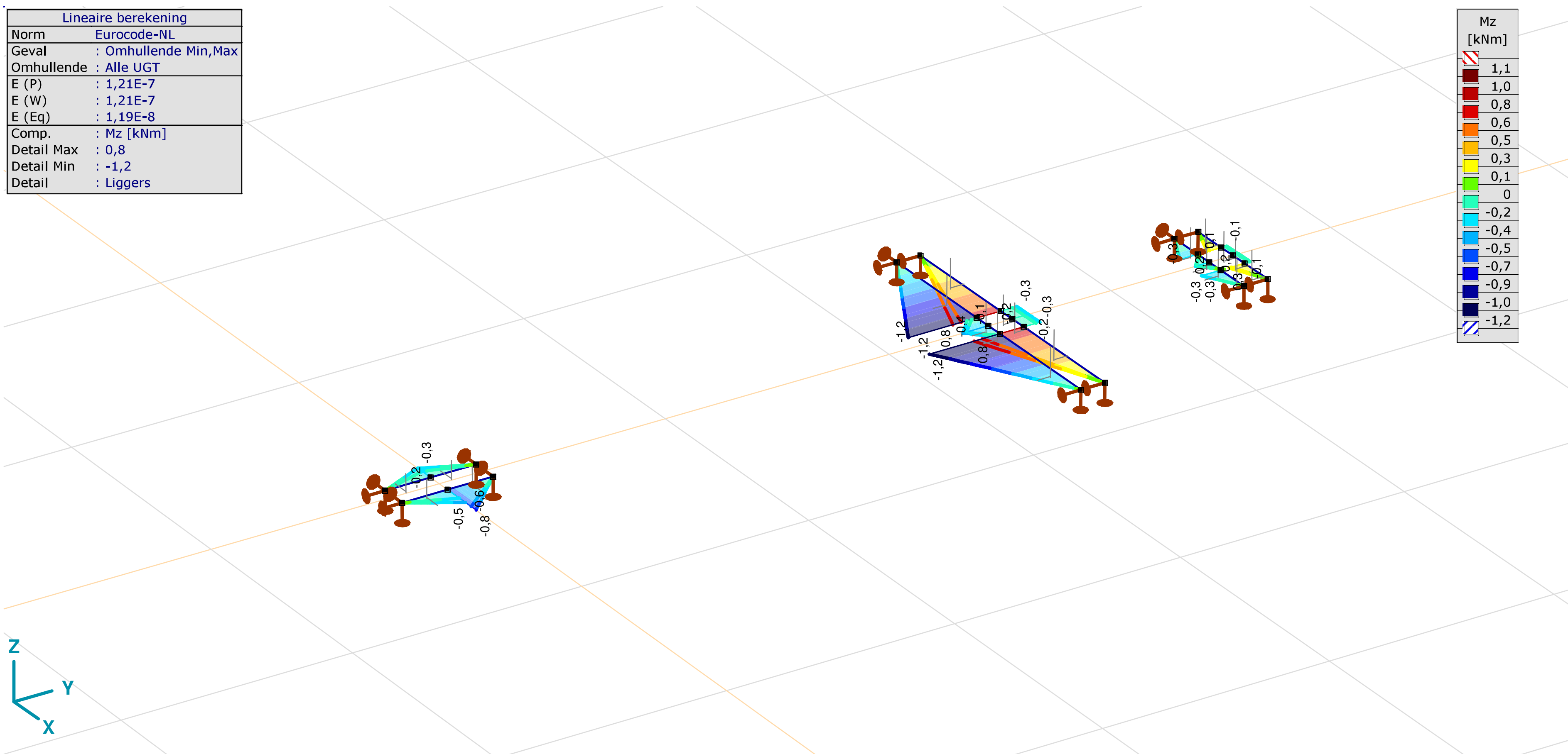
	Naam	*Type*	*ST1*	*EG (PERM1)*	*SLS 7 (VER1)*	*1a_90 (VER1)*	*3_90 (VER1)*	*Commentaar*
1	Co #1	UGT	0	1,20	0	1,00	0	
2	Co #2	UGT	0	1,20	0	0	1,00	
3	Co #3	BGT Quasi-blijvend	0	1,00	1,00	0	0	

Naam: Naam belastingcombinatie; **Type:** Type belastingcombinatie; **ST1, EG (PERM1), SLS 7 (VER1), 1a$_9$0 (VER1), 3$_9$0 (VER1):** Factor;



[I], > Liggers, Lineair, Omhullende (Alle UGT), My, Lijnen (gevuld)

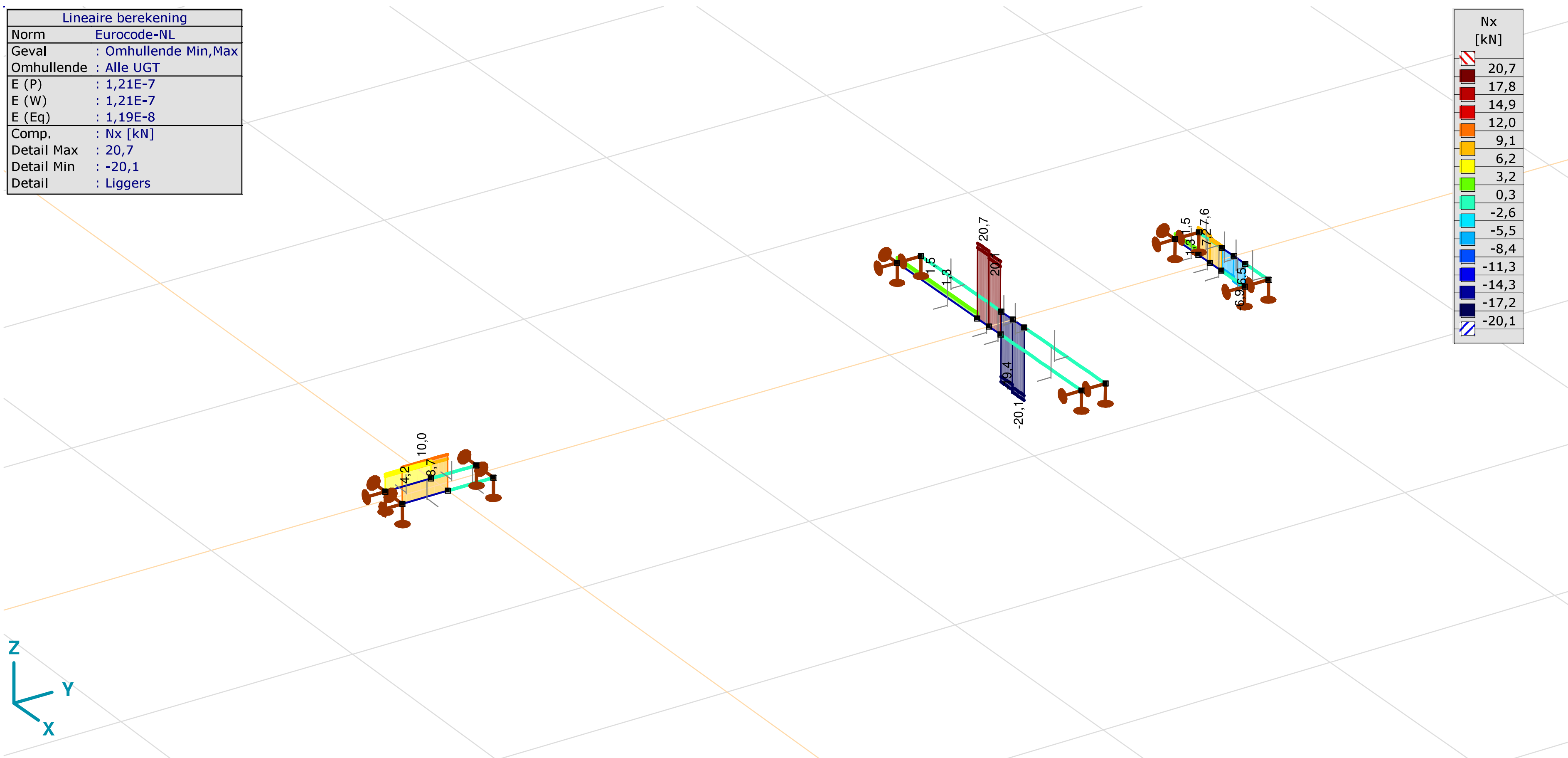
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Mz [kNm]
Detail Max	: 0,8
Detail Min	: -1,2
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Mz, Lijnen (gevuld)

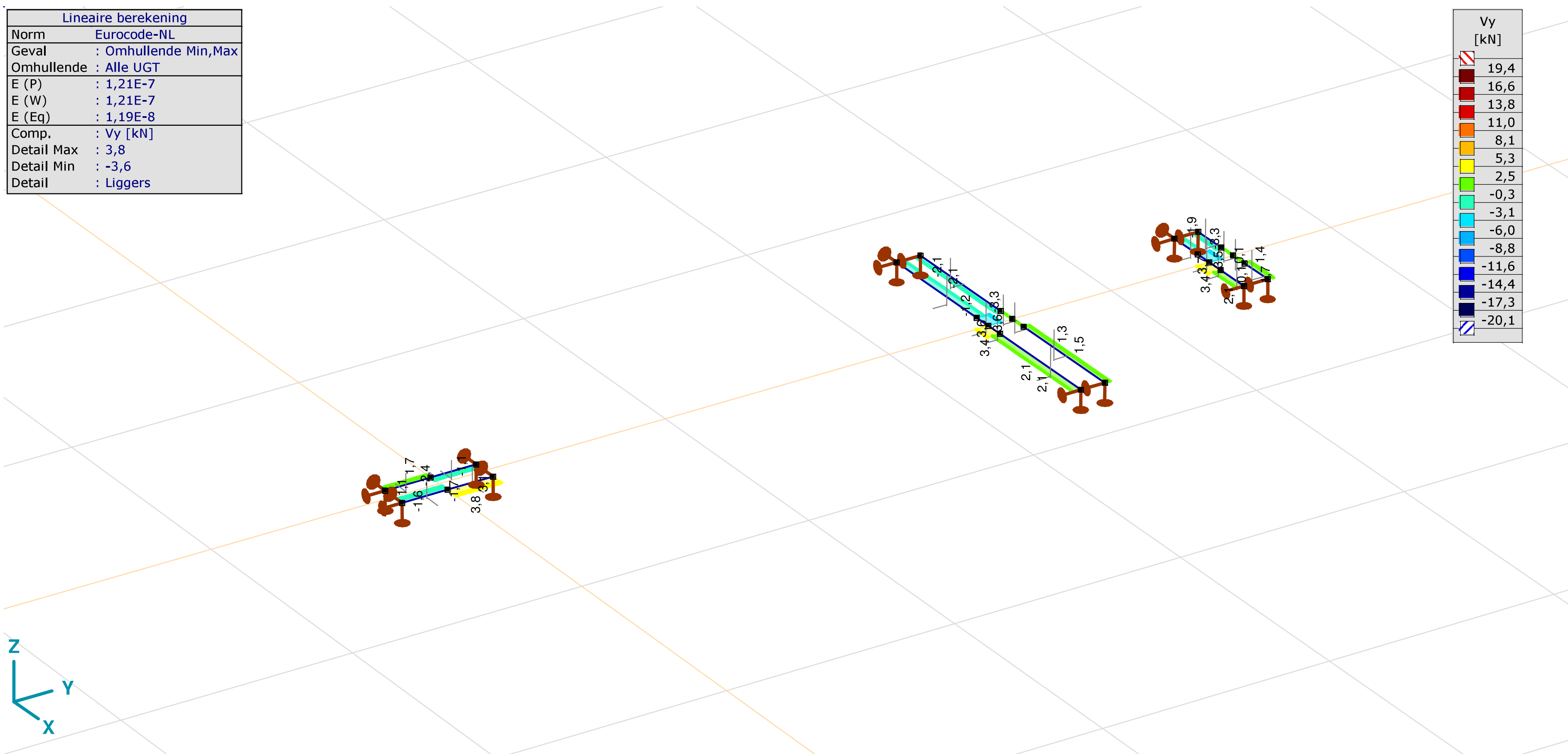
Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+3.6 HAF.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Nx [kN]
Detail Max	: 20,7
Detail Min	: -20,1
Detail	: Liggers



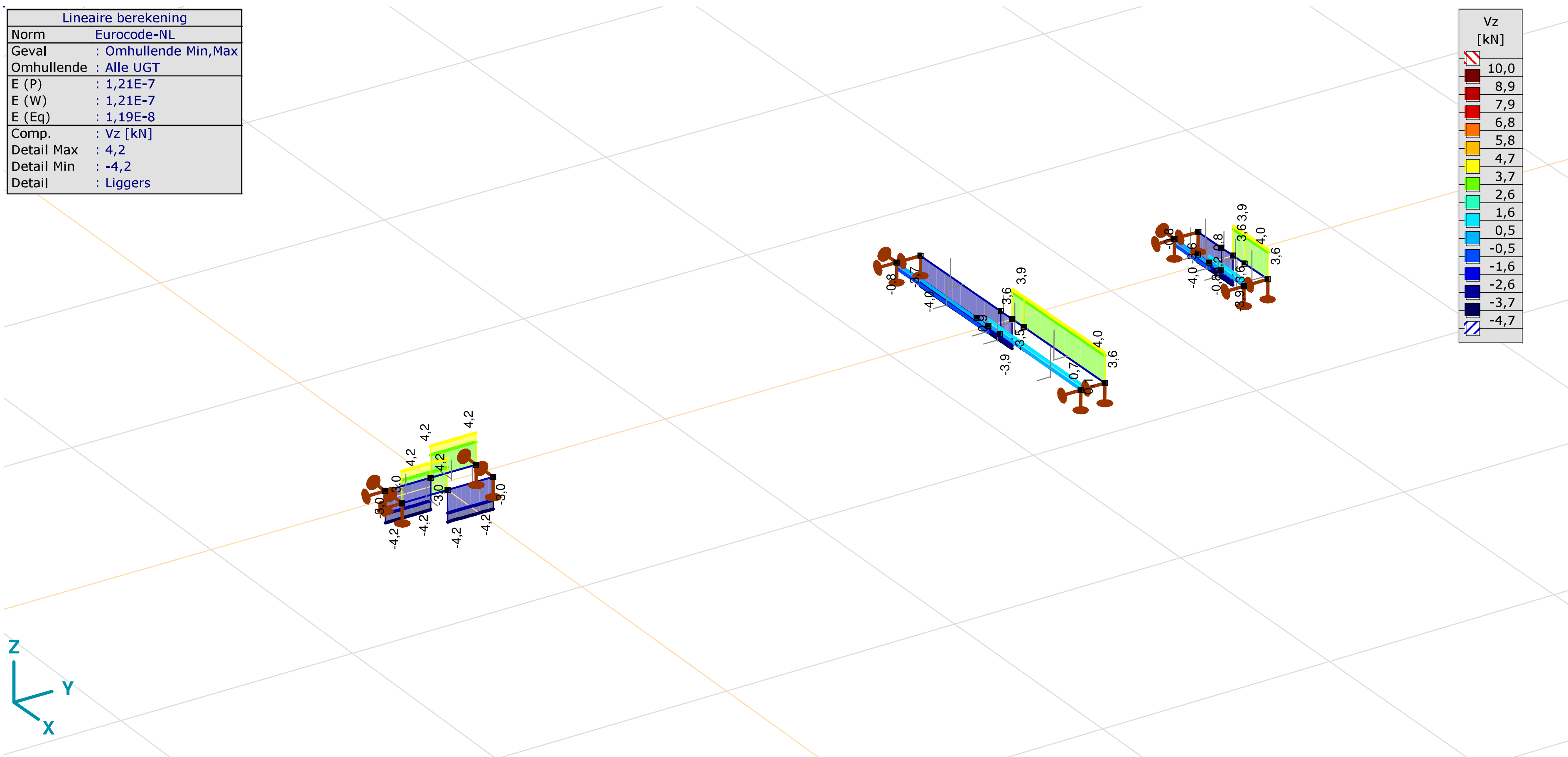
[I], > Liggers, Lineair, Omhullende (Alle UGT), Nx, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Vy [kN]
Detail Max	: 3,8
Detail Min	: -3,6
Detail	: Liggers



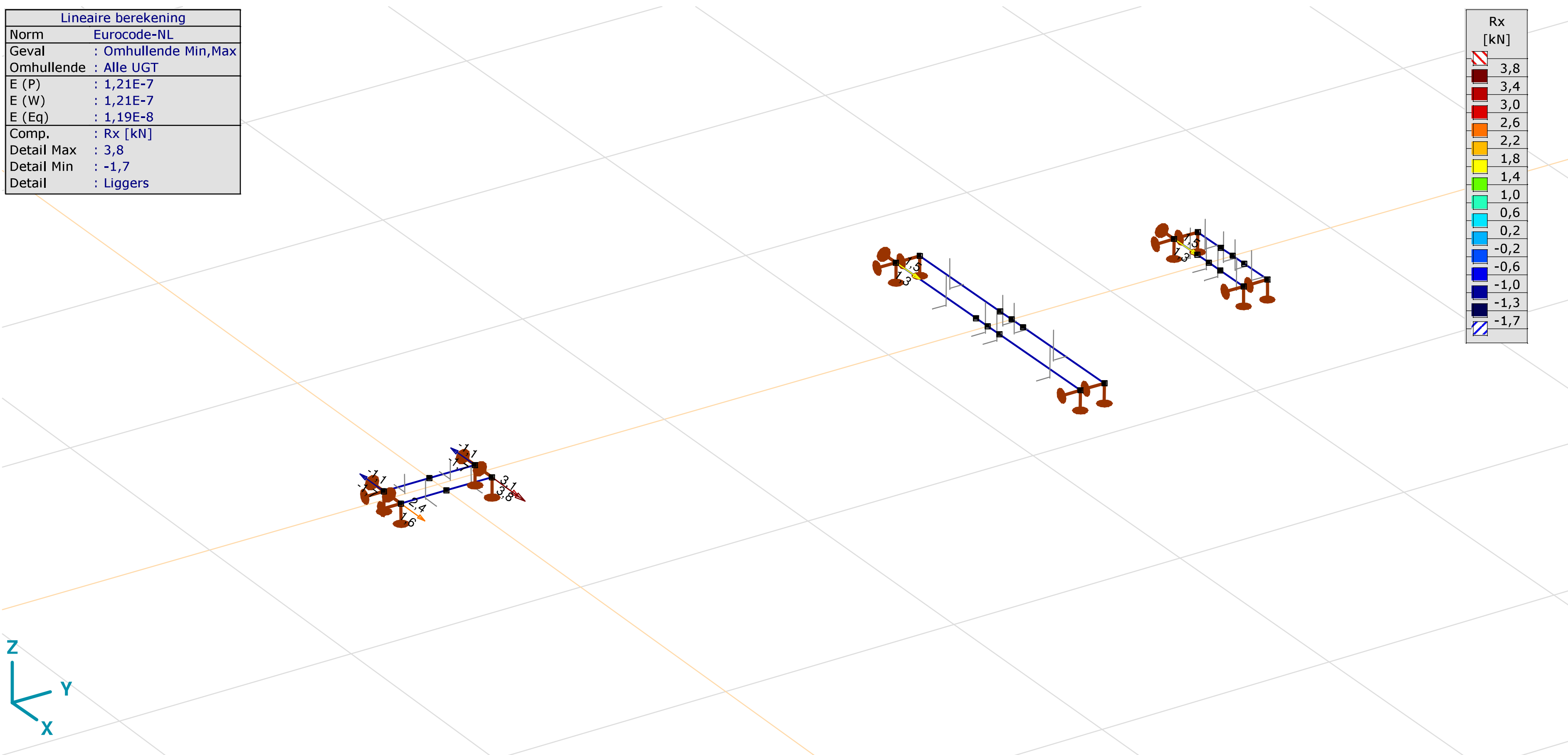
[I], > Liggers, Lineair, Omhullende (Alle UGT), Vy, Lijnen (gevuld)

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Vz [kN]
Detail Max	: 4,2
Detail Min	: -4,2
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Vz, Lijnen (gevuld)

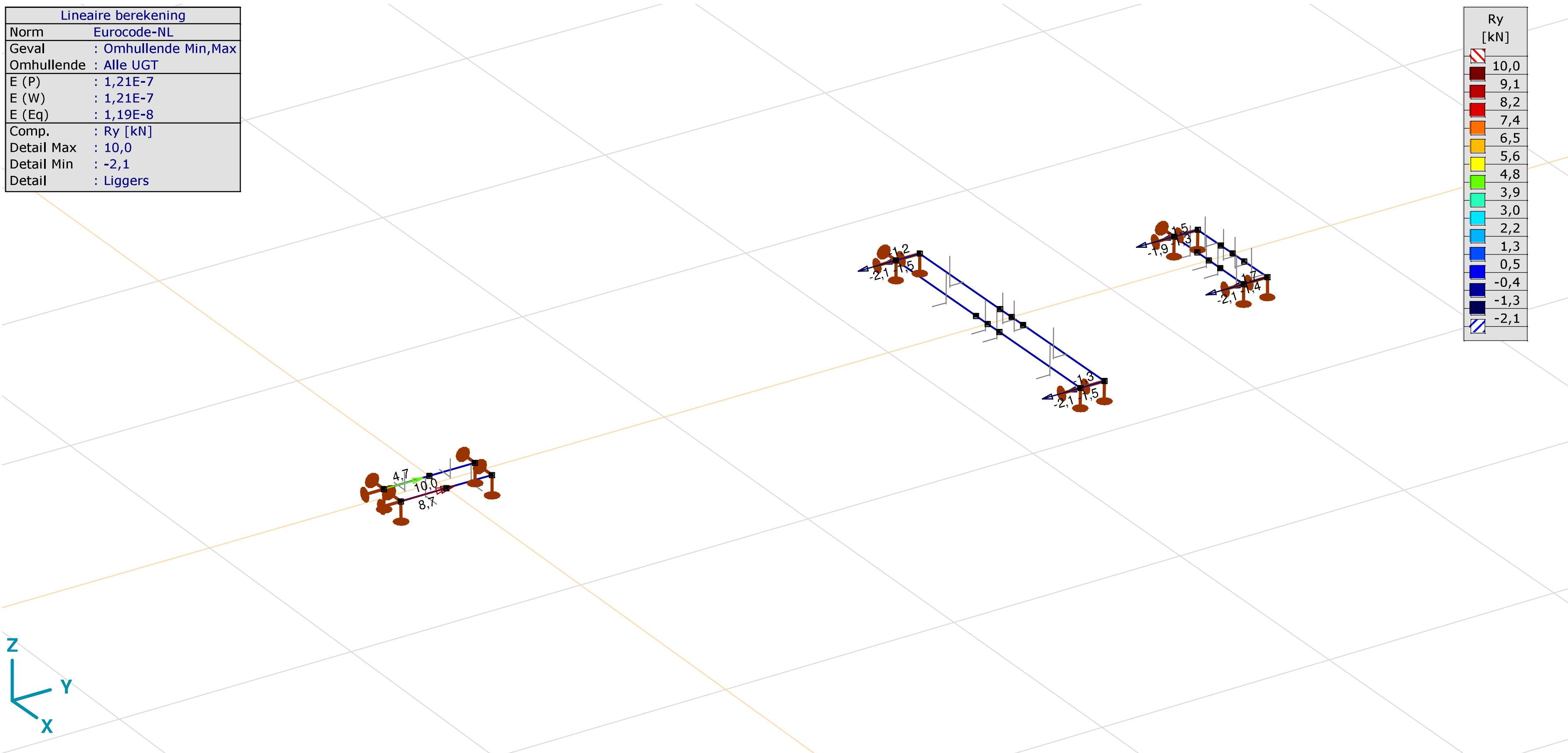
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Rx [kN]
Detail Max	: 3,8
Detail Min	: -1,7
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Rx (knoopopl.), Lijnen

Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+3.6 HAF.axs**

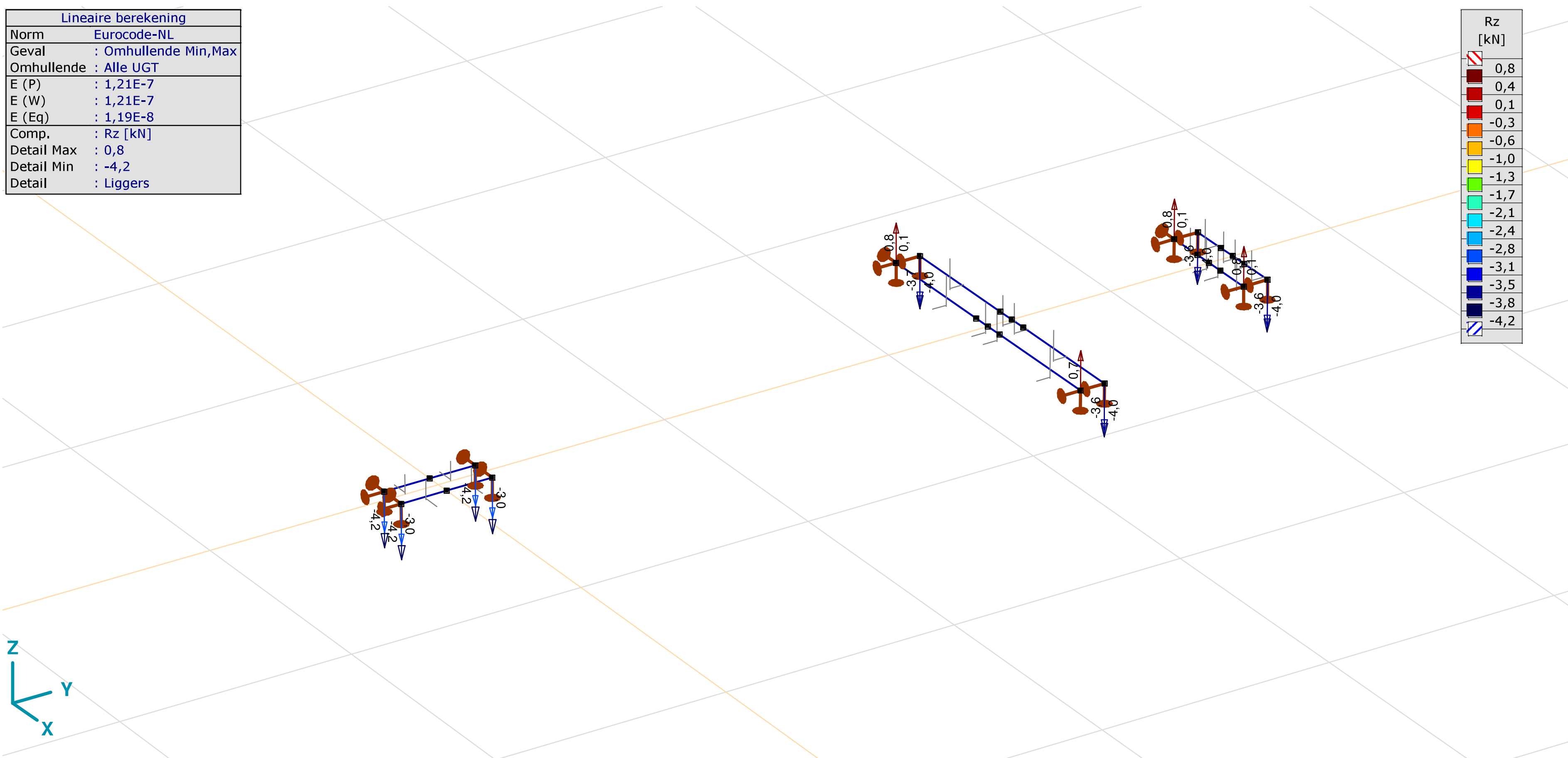
Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Ry [kN]
Detail Max	: 10,0
Detail Min	: -2,1
Detail	: Liggers



Ry [kN]
10,0
9,1
8,2
7,4
6,5
5,6
4,8
3,9
3,0
2,2
1,3
0,5
-0,4
-1,3
-2,1

[I], > Liggers, Lineair, Omhullende (Alle UGT), Ry (knoopopl.), Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Rz [kN]
Detail Max	: 0,8
Detail Min	: -4,2
Detail	: Liggers



[I], > Liggers, Lineair, Omhullende (Alle UGT), Rz (knoopopl.), Lijnen

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
1	4	0,640	2,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,6	4,0	−0,415
							max	Co #2		**−1,3**	−4,0	4,2	−0,315
						Rz	min	Co #2		−1,3	**−4,0**	4,2	−0,315
							max	Co #1		−1,5	**−3,6**	4,0	−0,415
						αR	min	Co #1		−1,5	−3,6	4,0	−0,415
							max	Co #2		−1,3	−4,0	4,2	−0,315
2	5	−0,640	2,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,7	3,9	−0,399
							max	Co #2		**−1,2**	−4,0	4,2	−0,299
						Rz	min	Co #2		−1,2	**−4,0**	4,2	−0,299
							max	Co #1		−1,5	**−3,7**	3,9	−0,399
						αR	min	Co #1		−1,5	−3,7	3,9	−0,399
							max	Co #2		−1,2	−4,0	4,2	−0,299
3	9	0,640	2,446	0	Glob.	Ry	min	Co #2		**−2,1**	0,1	2,1	31,297
							max	Co #1		**−2,1**	0,7	2,3	2,868
						Rz	min	Co #2		−2,1	**0,1**	2,1	31,297
							max	Co #1		−2,1	**0,7**	2,3	2,868
						αR	min	Co #1		−2,1	0,7	2,3	2,868
							max	Co #2		−2,1	0,1	2,1	31,297
4	10	−0,640	2,446	0	Glob.	Rx	min	Co #1	**1,3**	−2,1	0,8	2,6	3,277
							max	Co #2	**1,5**	−2,1	0,1	2,6	35,297
						Ry	min	Co #1	1,3	**−2,1**	0,8	2,6	3,277
							max	Co #2	1,5	**−2,1**	0,1	2,6	35,297
						Rz	min	Co #2	1,5	−2,1	**0,1**	2,6	35,297
							max	Co #1	1,3	−2,1	**0,8**	2,6	3,277
						αR	min	Co #1	1,3	−2,1	0,8	2,6	3,277
							max	Co #2	1,5	−2,1	0,1	2,6	35,297
5	16	0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,7**	−3,6	4,0	−0,468
							max	Co #2		**−1,4**	−4,0	4,2	−0,359
						Rz	min	Co #2		−1,4	**−4,0**	4,2	−0,359
							max	Co #1		−1,7	**−3,6**	4,0	−0,468
						αR	min	Co #1		−1,7	−3,6	4,0	−0,468
							max	Co #2		−1,4	−4,0	4,2	−0,359

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
6	17	−0,240	3,554	0	Glob.	Ry	min	Co #1		**−1,5**	−3,6	3,9	−0,427
							max	Co #2		**−1,3**	−4,0	4,2	−0,317
						Rz	min	Co #2		−1,3	**−4,0**	4,2	−0,317
							max	Co #1		−1,5	**−3,6**	3,9	−0,427
						αR	min	Co #1		−1,5	−3,6	3,9	−0,427
							max	Co #2		−1,3	−4,0	4,2	−0,317
7	21	0,240	3,446	0	Glob.	Ry	min	Co #2		**−2,1**	0,1	2,1	16,704
							max	Co #1		**−2,1**	0,8	2,2	2,568
						Rz	min	Co #2		−2,1	**0,1**	2,1	16,704
							max	Co #1		−2,1	**0,8**	2,2	2,568
						αR	min	Co #1		−2,1	0,8	2,2	2,568
							max	Co #2		−2,1	0,1	2,1	16,704
8	22	−0,240	3,446	0	Glob.	Rx	min	Co #1	**1,3**	−1,9	0,8	2,5	2,876
							max	Co #2	**1,5**	−1,9	0,1	2,4	19,133
						Ry	min	Co #2	1,5	**−1,9**	0,1	2,4	19,133
							max	Co #1	1,3	**−1,9**	0,8	2,5	2,876
						Rz	min	Co #2	1,5	−1,9	**0,1**	2,4	19,133
							max	Co #1	1,3	−1,9	**0,8**	2,5	2,876
						αR	min	Co #1	1,3	−1,9	0,8	2,5	2,876
							max	Co #2	1,5	−1,9	0,1	2,4	19,133
9	27	0,060	0,200	0	Glob.	Rx	min	Co #1	**3,1**		−3,0	4,4	−1,030
							max	Co #2	**3,8**		−4,2	5,7	−0,898
						Rz	min	Co #2	3,8		**−4,2**	5,7	−0,898
							max	Co #1	3,1		**−3,0**	4,4	−1,030
						αR	min	Co #1	3,1		−3,0	4,4	−1,030
							max	Co #2	3,8		−4,2	5,7	−0,898
10	28	0,060	−0,200	0	Glob.	Rx	min	Co #1	**1,6**	10,0	−3,0	10,5	−3,343
							max	Co #2	**2,4**	8,7	−4,2	10,0	−2,163
						Ry	min	Co #2	2,4	**8,7**	−4,2	10,0	−2,163
							max	Co #1	1,6	**10,0**	−3,0	10,5	−3,343
						Rz	min	Co #2	2,4	8,7	**−4,2**	10,0	−2,163
							max	Co #1	1,6	10,0	**−3,0**	10,5	−3,343
						αR	min	Co #1	1,6	10,0	−3,0	10,5	−3,343

Interne krachten knoopoplegging [Lineair, Omhullende (Alle UGT), Liggers]

	Knoop	*X [m]*	*Y [m]*	*Z [m]*	*Type*	*C*	*min. max.*	*Geval*	*Rx [kN]*	*Ry [kN]*	*Rz [kN]*	*Rr [kN]*	*αR*
							max	Co #2	2,4	8,7	−4,2	10,0	−2,163
11	30	−0,060	0,200	0	Glob.	Rx	min	Co #2	**−1,7**		−4,2	4,5	−0,415
							max	Co #1	**−1,1**		−3,0	3,2	−0,377
						Rz	min	Co #2	−1,7		**−4,2**	4,5	−0,415
							max	Co #1	−1,1		**−3,0**	3,2	−0,377
						αR	min	Co #2	−1,7		−4,2	4,5	−0,415
							max	Co #1	−1,1		−3,0	3,2	−0,377
12	31	−0,060	−0,200	0	Glob.	Rx	min	Co #2	**−1,7**	4,2	−4,2	6,2	−1,070
							max	Co #1	**−1,1**	4,7	−3,0	5,7	−1,604
						Ry	min	Co #2	−1,7	**4,2**	−4,2	6,2	−1,070
							max	Co #1	−1,1	**4,7**	−3,0	5,7	−1,604
						Rz	min	Co #2	−1,7	4,2	**−4,2**	6,2	−1,070
							max	Co #1	−1,1	4,7	**−3,0**	5,7	−1,604
						αR	min	Co #1	−1,1	4,7	−3,0	5,7	−1,604
							max	Co #2	−1,7	4,2	−4,2	6,2	−1,070
Ext.													
11	30	−0,060	0,200	0	Glob.	Rx	min	Co #2	**−1,7**		−4,2	4,5	−0,415
12	31	−0,060	−0,200	0	Glob.		min	Co #2	**−1,7**	4,2	−4,2	6,2	−1,070
9	27	0,060	0,200	0	Glob.		max	Co #2	**3,8**		−4,2	5,7	−0,898
3	9	0,640	2,446	0	Glob.	Ry	min	Co #2		**−2,1**	0,1	2,1	31,297
10	28	0,060	−0,200	0	Glob.		max	Co #1	1,6	**10,0**	−3,0	10,5	−3,343
9	27	0,060	0,200	0	Glob.	Rz	min	Co #2	3,8		**−4,2**	5,7	−0,898
12	31	−0,060	−0,200	0	Glob.		min	Co #2	−1,7	4,2	**−4,2**	6,2	−1,070
8	22	−0,240	3,446	0	Glob.		max	Co #1	1,3	−1,9	**0,8**	2,5	2,876
10	28	0,060	−0,200	0	Glob.	αR	min	Co #1	1,6	10,0	−3,0	10,5	−3,343
4	10	−0,640	2,446	0	Glob.		max	Co #2	1,5	−2,1	0,1	2,6	35,297

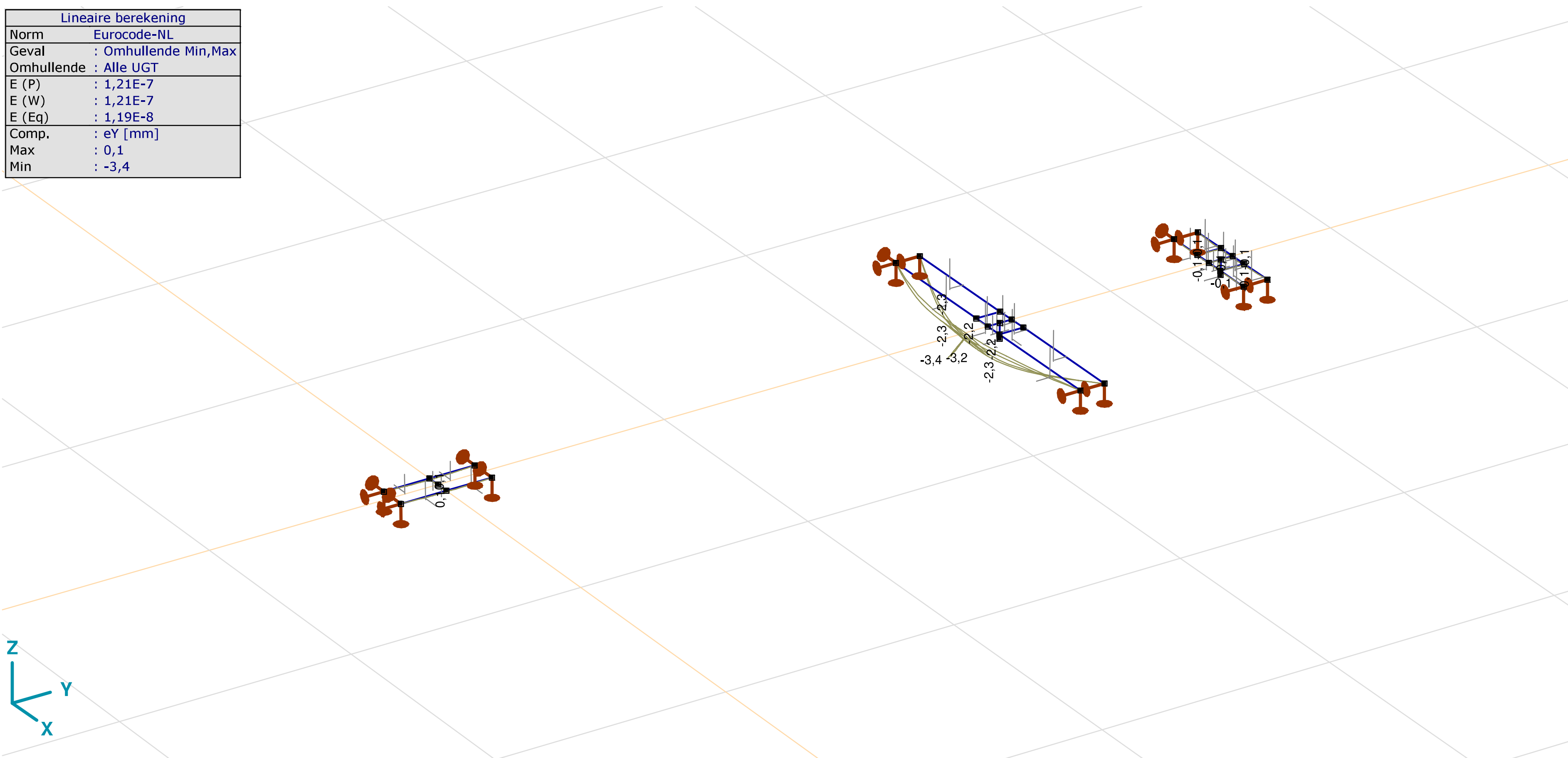
Knoop: Ondersteunde knoop; **Type:** Opleggingstype; **C:** Extreme component; **min. max.:** Extreme type; **Geval:** Belastinggeval van de extreme; **Rx:** X-component opleggingsreactiekracht; **Ry:** Y-component opleggingsreactiekracht; **Rz:** Z-component opleggingsreactiekracht; **Rr:** Resulterende opleggingsreactiekracht; **αR:** Verhouding verticale oplegkracht / horizontale oplegkracht;

Project:

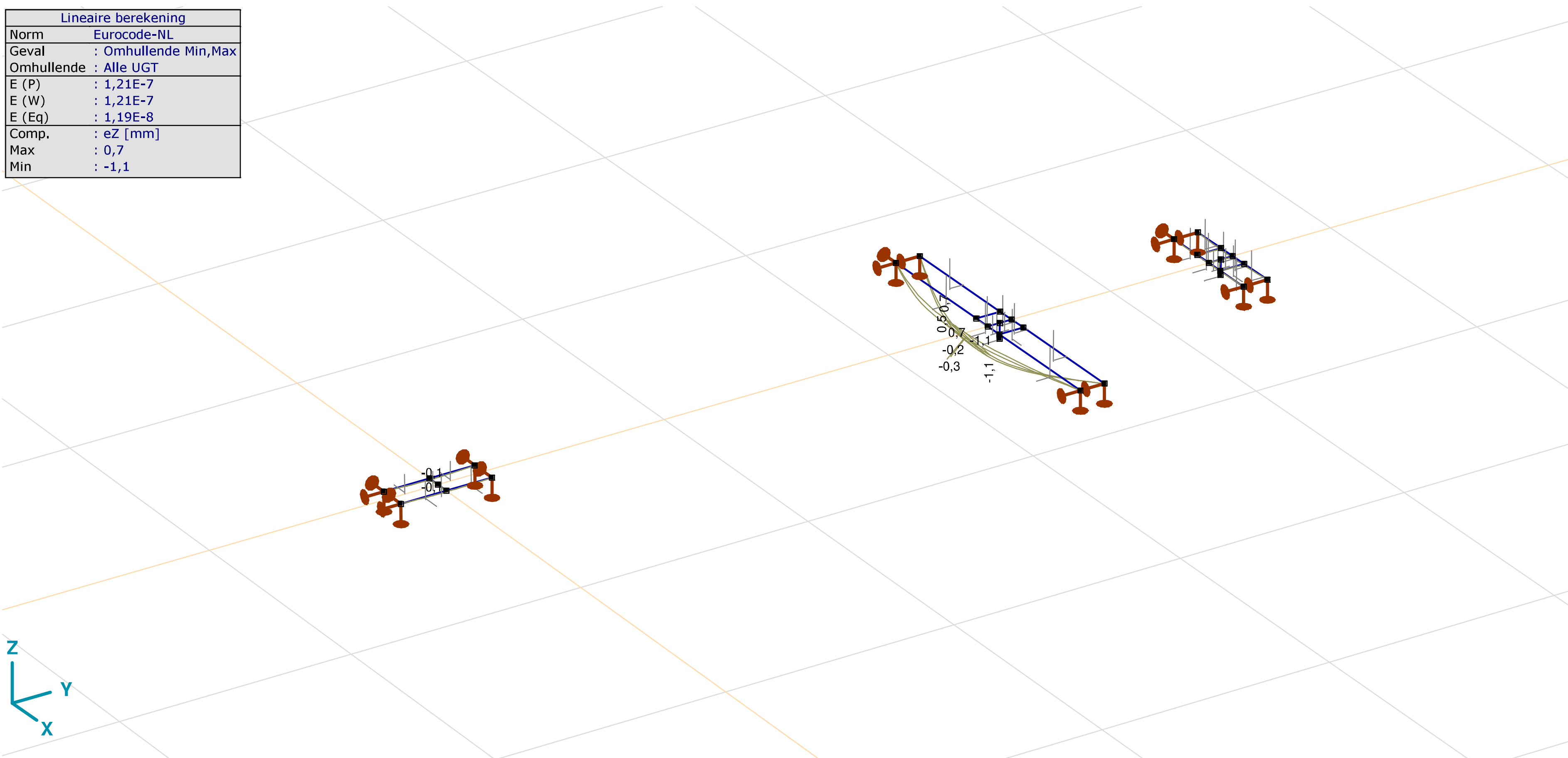
Constructeur: DNV GL - Energy

Model: **Liggers D+3.6 HAF.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: eY [mm]
Max	: 0,1
Min	: -3,4

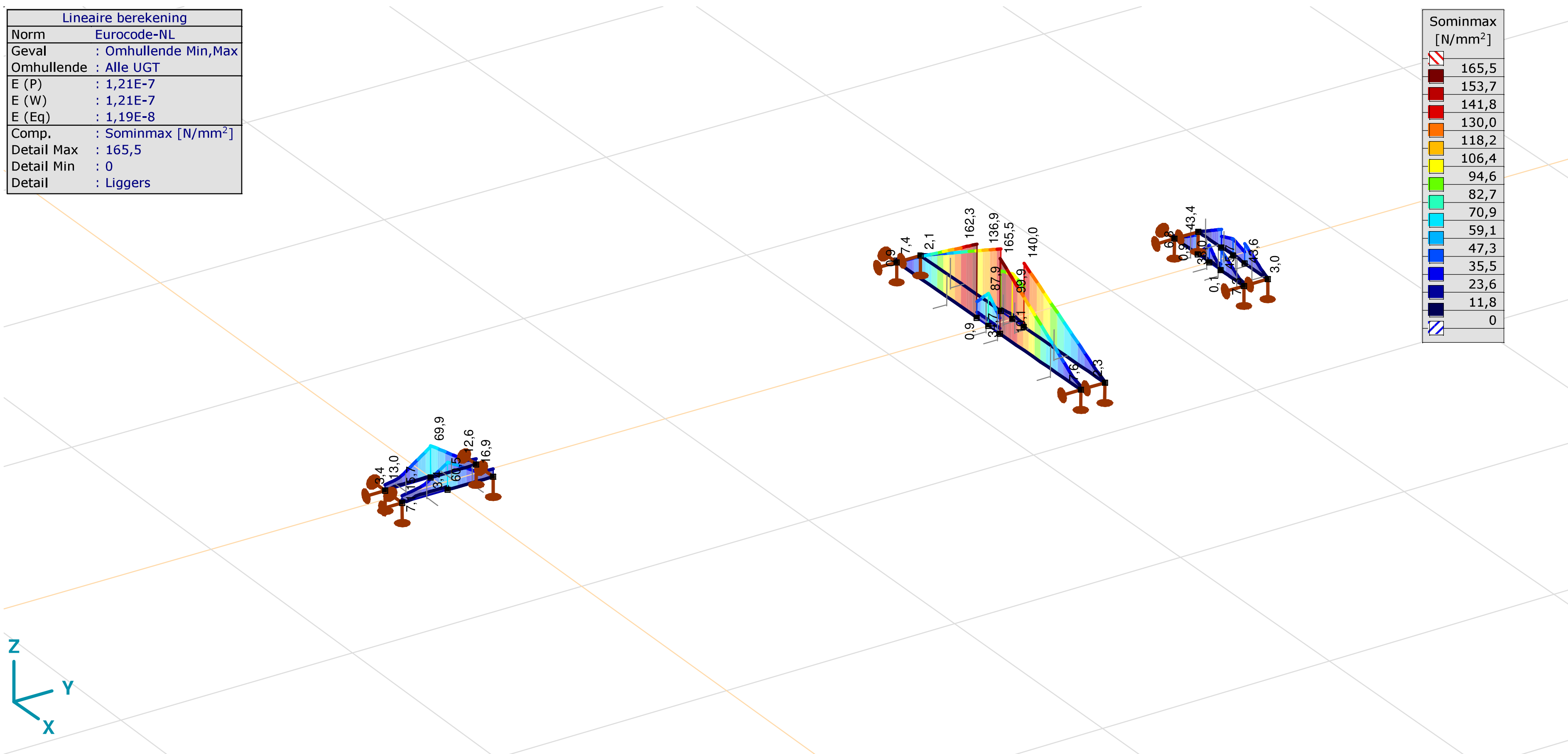


[I], Lineair, Omhullende (Alle UGT), eY, Lijnen



[I], Lineair, Omhullende (Alle UGT), eZ, Lijnen

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Sominmax [N/mm^2]
Detail Max	: 165,5
Detail Min	: 0
Detail	: Liggers

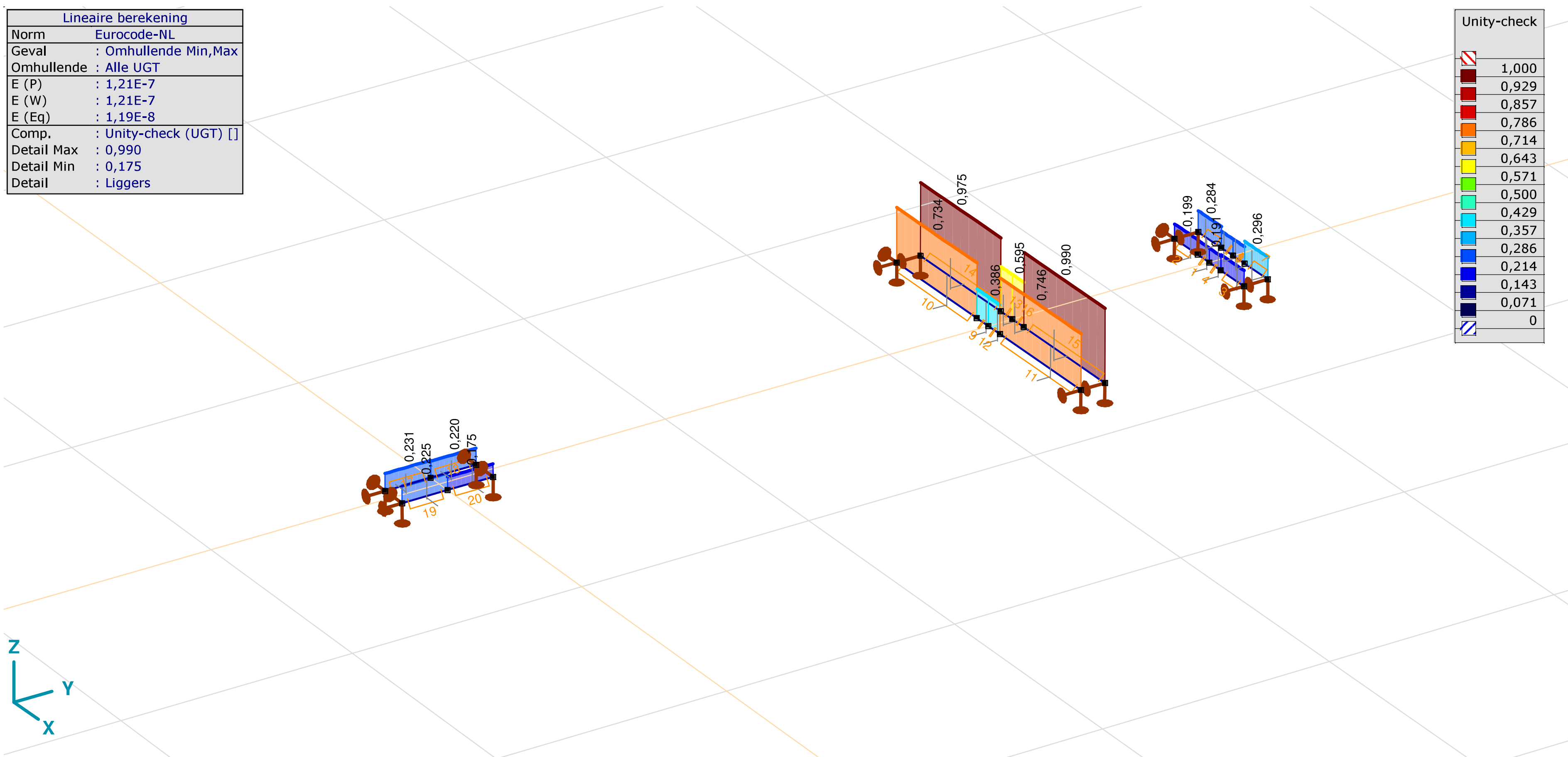


Sominmax [N/mm^2]
165,5
153,7
141,8
130,0
118,2
106,4
94,6
82,7
70,9
59,1
47,3
35,5
23,6
11,8
0

[I], > Liggers, Lineair, Omhullende (Alle UGT), Sominmax, Lijnen (gevuld)

Project:
Constructeur: DNV GL - Energy
Model: **Liggers D+3.6 HAF.axs**

Lineaire berekening	
Norm	Eurocode-NL
Geval	: Omhullende Min,Max
Omhullende	: Alle UGT
E (P)	: 1,21E-7
E (W)	: 1,21E-7
E (Eq)	: 1,19E-8
Comp.	: Unity-check (UGT) []
Detail Max	: 0,990
Detail Min	: 0,175
Detail	: Liggers



[Stl], > Liggers, Lineair, Omhullende (Alle UGT), Unity-check, Lijnen (gevuld)

About DNV

DNV is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.