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FERJEFRI E39 - RAMMEAVTALE FJORDKRYSNINGSPROSJEKTET

Independent Analyses of OON Floating Bridge BJF 2019

Statens vegvesen region vest

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Objective: Perform independent global analyses of OON K12 concept.

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Appendix E Stress factors

Appendix F Fatigue lives

1 EXECUTIVE SUMMARY

1.1 General

This report documents the independent analyses for OON concept K12 alternative for Bjørnafjorden crossing.

Per agreement with SVV, revision 0 of this report has been issued without any adjustments compared to revision A.

The independent analyses are focused on the capacity of the bridge girder and the mooring lines.

Independent analyses are based on a coupled time domain analysis model in SIMO/RIFLEX. Each simulation has an effective duration of 3 hours, and each ULS/ALS simulation has been repeated with 30 different realizations of wind and waves.

The geometry of the bridge has been received from the designer.

Cross-section properties of the steel girder has been based on latest drawings while designer's cross section data has been used for tower, columns, cables and concrete sections.

Hydrodynamic loads on the pontoons are based on WADAM.

Analysis cases are based on DNV GL interpretation of the Metocean design basis (Statens Vegvesen, 30.11.18).

The designer has used quasi-static stiffness for the mooring lines, while DNV GL has used dynamic stiffness, which is more appropriate. This results in larger dynamic line tensions than the designer. Apart from the small effect on the eigen periods, the use of quasi-static stiffness is probably slightly conservative with respect to the response in the girder. Otherwise, the analysis results are generally in line with designer's results.

1.2 Conclusions

1.2.1 ULS

The ULS capacity made as a von-Mises stress check is exceeded at Axis 3 to 9 and close to the abutment North. Independent buckling checks are not carried out, but it is expected that reinforcement at these cross-sections will also make the buckling capacity acceptable. The stress check is based on beam theory and that stress increase due to local stiffening and shear lag is not accounted for.

The available free movement space for the bridge girder at the tower is not sufficient to avoid contact from the bridge girder into the tower for ULS loads. The risk of clash will be drastically reduced by narrowing the girder to the width without the wind nose.

1.2.2 FLS

The independent analyses carried out by DNV GL determine the contribution to damage from environmental loads in the bridge girder. The results from the screening analysis show a minimum fatigue life of 148 years. This number should be reduced with the local stress increase as shown in Section 7.3.5. A reduction similar to the example in Section 7.3.6 could be expected that will bring the fatigue damage from environmental loads significantly below the required life of 250 years.

The contributions from traffic and tidal variation is not part of the independent analyses by DNV GL. The damages will add only at certain details in the bridge. Tidal variation will only lead to damage close to the ends and traffic will predominantly give damage in the bridge deck. However, the fatigue loading as determined by DNV GL seems to be above the required capacity for large part of the structure.

1.2.3 Mooring system

The size of the bottom chain needs to be increased and this can be included at a small cost increase. Thereby, the strength of the polyester lines will become governing with a safety factor just above the requirement.

The fatigue in the bottom chain is below the requirement, but this will be changed if the dimension of the bottom chain is increased due to the strength requirement.

The increased dynamic loads in mooring lines may also affect the out-of-plane bending of the top chain. This should be further evaluated.

2 INTRODUCTION

2.1 General

During fall of 2018 SVV set out two conceptual studies to develop a floating bridge concept for crossing Bjørnafjorden (BJF). DNV GL has been chosen as independent verifier by SVV for this conceptual work. This is reflected in Frame agreement no 15/255967. DNV GL scope of work related to 'BJF 2019' is described in Ctrs 610, 615, 620, 625 and 630. For this report reference is made to Ctr 625 with focus on independent analyses of OON chosen bridge concept. This DNV GL report is charged to Ctr 630, reporting to SVV.

This report deals with the concepts evaluated by design group OON. A total of four (4) concepts will be investigated by each of the design groups and one of these considered concepts will be recommended for the next phase (part B, Dec. 2019 – Dec. 2020). The activity plan (part A) set up by SVV were as follows:

Time	SVV activity plan	Responsible
19/11-18	SVV hand over design basis documentation to the two chosen design groups for Part A and project kick-off	SVV
18/01-19	Routing of roads for the 4 bridge alternatives accepted by SVV	OON
28/01-19	Status report no 1 with concept ranking issued by OON	OON
29/03-19	Status report no 2 with estimates of masses, costs and updated drawings/descriptions for all 4 alternatives issued by OON	OON
07/05-19	Verification of technical quality completed based on review of existing documentation for the 4 bridge alternatives. This verification also including interviews of OON. Interviews to be performed by DNV GL.	SVV
24/05-19	Report from OON on their chosen bridge concept including evaluations for the three other bridge concepts.	OON
30/06-19	Documentation basis (drawings and descriptions) for investment estimates of chosen bridge concept	OON
15/08-19	Final documentation delivery of recommended bridge concept	OON
31/08-19	Final documentation of the three (3) other bridge concepts	OON
31/08-19	Resource-diagram prognosis for the period Dec. 2019 – Dec- 2020 (part B)	OON
31/08-19	Part A completed	OON

For Bjørnafjorden several different bridge alternatives have been considered over the last 2 – 3 years for crossing. Currently the BJF crossing is into phase 5 and the following 4 floating bridge concepts have been up for evaluations:

K11 – Curved, end-anchored floating bridge in accordance with phase 4 of the project.

K12 – Curved, end-anchored floating bridge with supplementary side moorings

K13 – Straight, side anchored floating bridge

K14 – ‘Straight’ S-shaped, side anchored bridge

2.2 Objective

The objective of the analyses is to check that the conceptual design is sound and that the concept can be realized according to the designers plans. This is achieved through identification of the most onerous environmental conditions and ULS code checks for these, and fatigue damage estimation due to environmental loads for selected regions and details in the bridge girder.

2.3 Scope of work

The work includes developing a global analysis model for the bridge.

The global model is established as follows:

1. WADAM frequency domain hydrodynamic model for calculation of first and second order (drift) wave loads on the pontoons. It is assumed that the hydrodynamic coupling between the different pontoons is negligible.
2. SIMO model for time domain simulations of the pontoon response. In addition to 1st and 2nd order wave loads on the pontoons (based on results from 1.), the model incorporates current and wind loads on the pontoons as relevant.
3. RIFLEX model of the global bridge structure: bridge girder, columns, tower, cables and mooring lines. The model incorporates load coupling to the SIMO pontoon models (from 2.) and aerodynamic loads on the bridge structure where relevant.
4. The 3-dimensional and 3-component wind field will be simulated using TURBSIM and imported to the integrated SIMO-RIFLEX model.

The critical conditions for ULS are analysed to evaluate structural capacity. In addition, a series of sensitivity analysis are carried out to gain insight in bridge performance.

Fatigue damage on the bridge girder and the mooring lines is calculated based on the long-term conditions for Bjørnafjorden.

Bridge girder stresses are calculated from the global model based on transfer factors derived from the cross-section geometry. For fatigue analyses, local stress concentration factors are calculated based on a local model of the bridge girder.

2.4 Changes from previous revision

The report has been updated as indicated in Table 2-1.

Table 2-1 Changes from previous revision

Section	What is updated
All	This is the first revision

3 BASIS FOR WORK

3.1 Nomenclature and coordinate system

3.1.1 Overview of the bridge structure

The bridge will cross Bjørnafjorden, south of Bergen.

The position of axis 1 is specified in UTM32 coordinates as 6666207.52 N, 298017.58 E. The profile line level is 62 m above baseline/still water line.

The North abutment is located at Gulholmane and its calculated coordinates are 6671282.49 N, 299036.27 E in UTM32 system.

The overall bridge heading is therefore 11.35 degrees from True North.

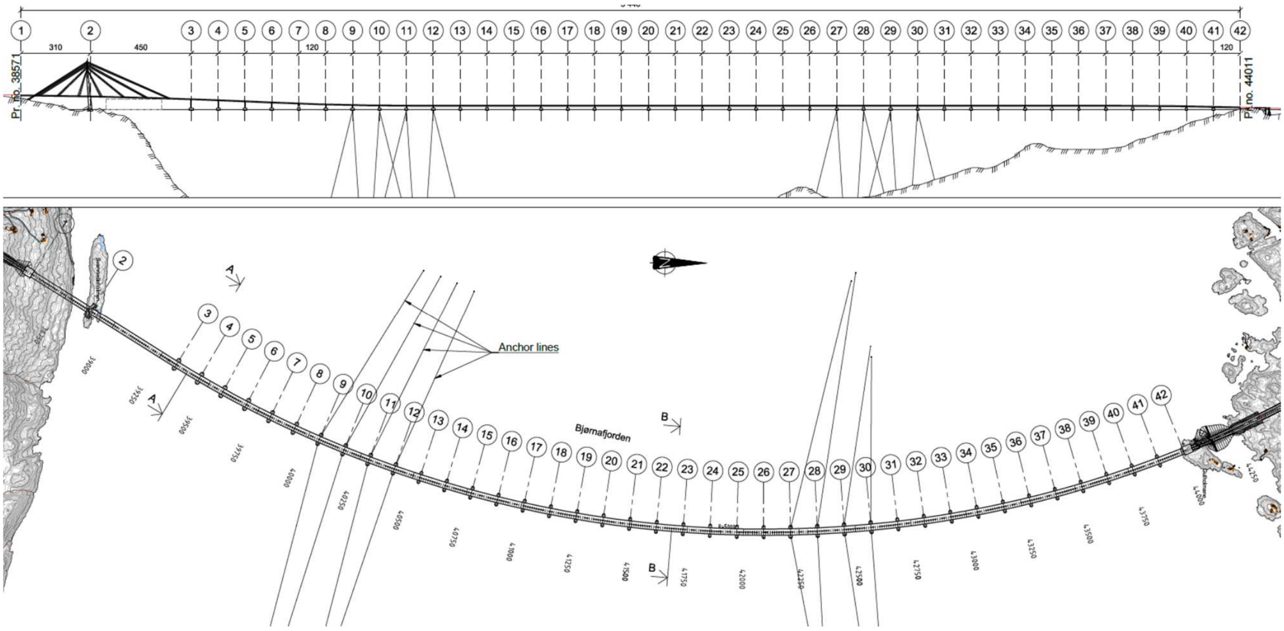


Figure 3-1 Curved bridge overview

3.1.2 Global metocean coordinate system

A right-handed earth-fixed coordinate system is used for all reference to meteorological and ocean data and environmental conditions, unless otherwise noted. It is defined as follows:

- X-axis points towards North.
- Y-axis points towards East.
- Z-axis points downwards.
- Rotations in the XY-plane are positive clockwise from North.
- Wind, wave and current are defined as "coming from" (note that in met ocean reports current is often specified with "going to" direction). This definition is used for environmental directions presented in this report.

3.1.3 Global model coordinate system

The right-handed and earth-fixed global model coordinate system is defined as

- X-axis points towards North.
- Y-axis points towards West.
- Z-axis points upwards.
- Rotations in the XY-plane are positive counter-clockwise from North.
- Wind, wave and current directions are defined as propagation directions (i.e. "going to"). This definition is used in the input files for the analyses.
- The baseline (Z=0m) is the mean surface level (MSL).
- The origin of the coordinate system is set at 6668744.33 N, 299215.63 E (UTM32) at MSL. Consequently, the positions of Axes 1 and 42 in the global coordinate system are:
    - Axis 1: x = -2536.81 m, y = 1198.05 m
    - Axis 42: x = 2538.16 m, y = 179.36 m

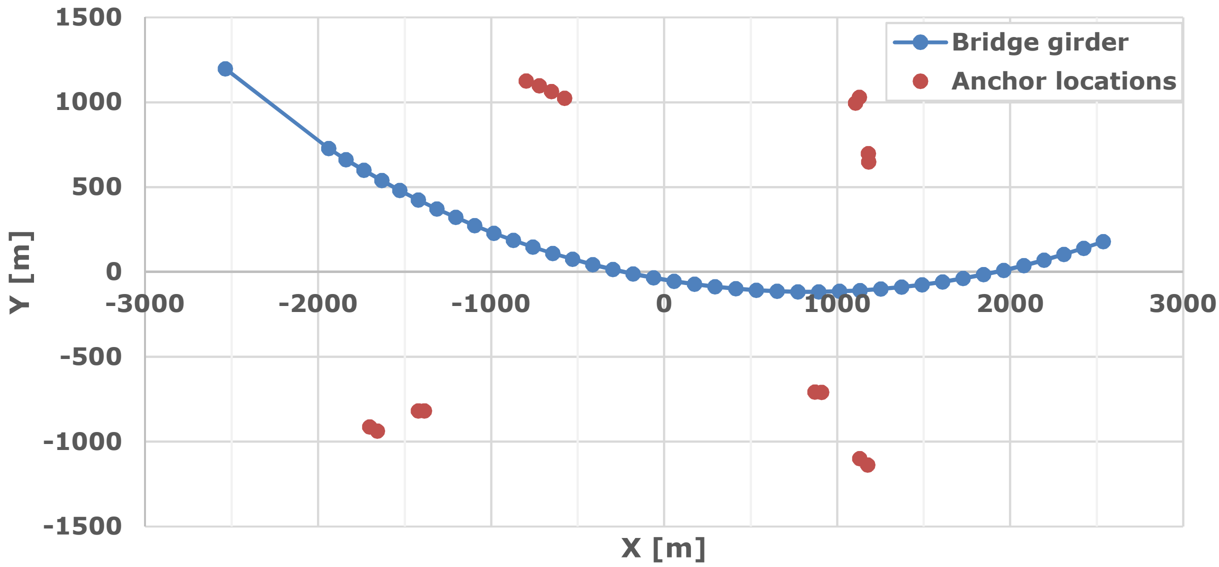


Figure 3-2 Coordinates in the analysis model

3.1.4 Pontoon coordinate system

The right-handed pontoon coordinate system is defined as

- X-axis points towards pontoon's longitudinal direction, towards bridge's West.
- Y-axis points towards pontoon's transversal direction, towards bridge's South.
- Z-axis points upwards.
- The origin is located at the still water line (coincide with global baseline), and the longitudinal and transverse mid-point.

All pontoons (axes 3- 41) are oriented perpendicular to bridge's girder.

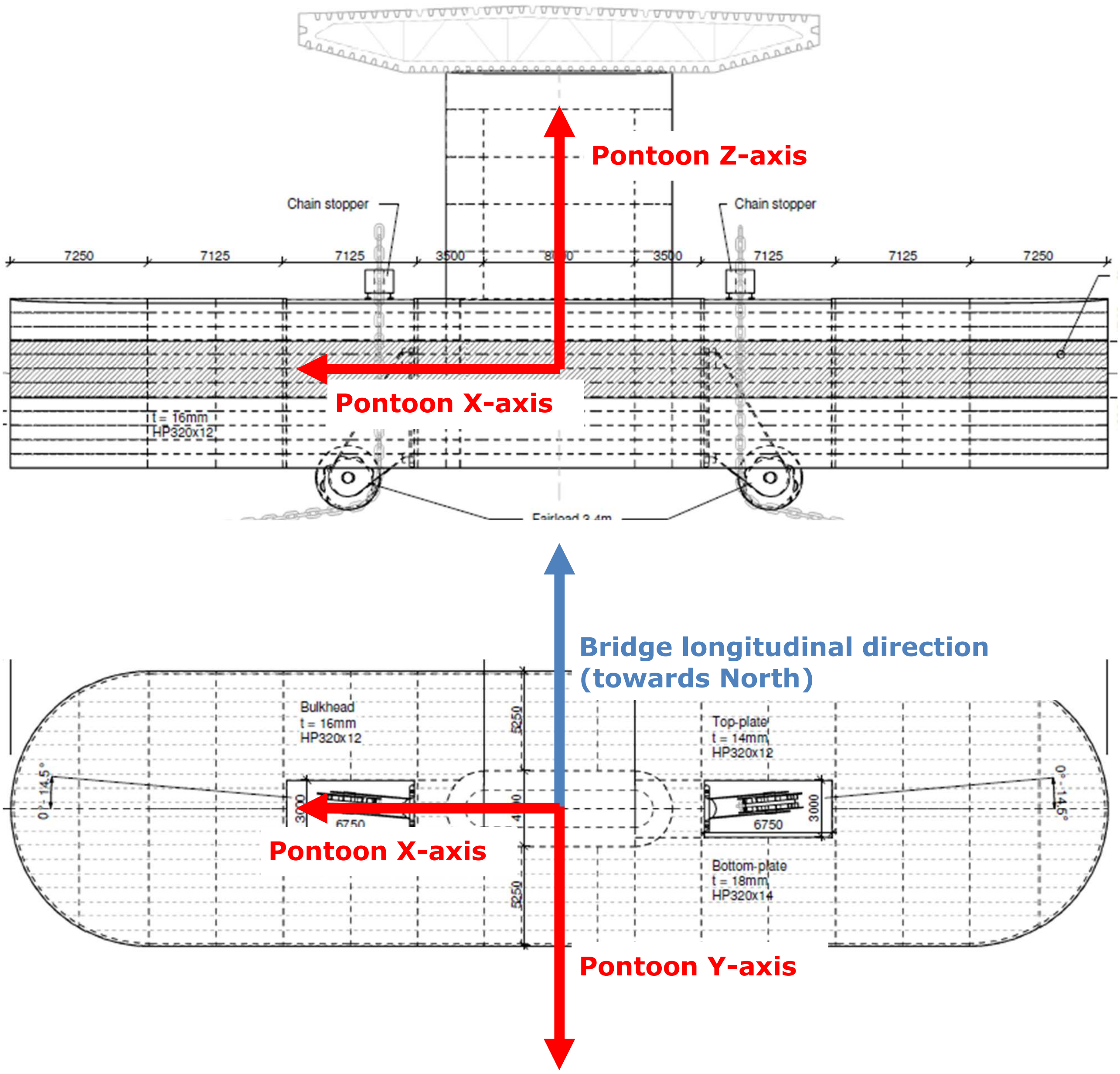


Figure 3-3 Pontoon local coordinate system

3.1.5 RIFLEX local element coordinate system

The right-handed local element coordinate system is defined as:

- X-axis is oriented along the secant between the two end nodes 1 and 2 of the element and goes through the centroid of the cross-section.
- Y-axis is defined towards bridge west direction.
- Z-axis is in general perpendicular to the global X-Y plane, except for the vertical elements where it can be defined as the cross-product between the local X- and Y-axes.

3.1.6 Definition of load effects

3.1.6.1 Bridge girder, tower and stay cables

Motions (displacement, accelerations etc.) refer to the global coordinate system.

The following load effects refer to the local element coordinate system:

- Axial force (X-axis)
- Shear forces (Y- and Z-axis, only beam elements)
- Bending moments about weak and strong axis (Y- and Z-axis, only beam elements)
- Torque (about X-axis, only beam elements)

3.1.6.2 Pontoons

The pontoon instantaneous position (X, Y and Z coordinate) refers to the global coordinate system. The pontoon motions e.g. roll and pitch, forces and moments refer to the pontoon coordinate system.

3.1.7 Units

Applied units in this report are unless otherwise noted:

- Length is given in meters (m)
- Time is given in seconds (s)
- Mass is given in 10^3 kg (ton)
- Force is given in 10^6 N (MN)
- Stress is given in 10^6 Pa (MPa)

3.2 Model description

3.2.1 General arrangement

The general arrangement of the bridge is modelled per drawings listed in Appendix A.

The bridge consists of

a) cable-stayed part called the "high bridge" arching the navigation channel in the South end

b) "floating bridge" supported by pontoons

The limits for the global model are axis 1 (at South abutment) and axis 42 (at Gulholmane abutment).

The 310 m back-span of the "high bridge" starts at axis 1 and ends at the tower at axis 2. The 450m "main-span" starts at axis 2, arches the navigation channel and ends at axis 3. There are 18 pairs of tendons in each span of the "high bridge", arranged in 5 groups. The 5 pairs of tendons on the southern part of the bridge are anchored to the ground, not to the bridge girder.

The "floating bridge" between axis 3 and axis 42 is supported by 39 floating pontoons separated by 120 metres. The "floating bridge" is moored at two groups of four pontoons located in axes 9, 10, 11 and 12 and axes 27, 28, 29 and 30. The mooring system for each of these groups consists of one line at each side of the pontoons.

3.2.2 Boundary conditions

Table 3-1 summarizes the boundary conditions applied to the global analysis model. All boundary conditions are applied in the RIFLEX local element coordinate system, defined in Section 3.1.5.

Table 3-1 Model boundary conditions

Location	X motion	Y motion	Z motion	X rotation	Y rotation	Z rotation
Axis 1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Axis 42	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Bottom of the first five rows of stay cables in the Southern side	Fixed	Fixed	Fixed	Fixed*	Fixed*	Fixed*
Bottom of East tower leg	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Bottom of West tower leg	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
All anchors	Fixed	Fixed	Fixed	Fixed*	Fixed*	Fixed*

* Since the anchor lines and the stay cables are modelled as bar elements, these boundary conditions have no effect.

Figure 3-4 to Figure 3-9 show different views of the independent global response analysis model.

The bridge geometry is described in more detail with coordinates in Appendix B.

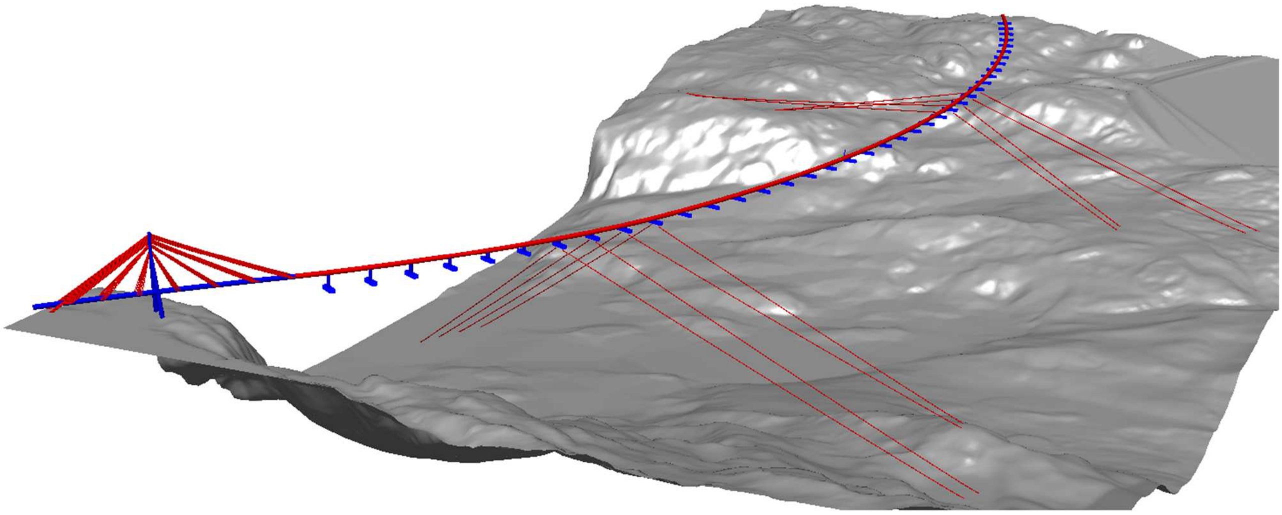


Figure 3-4 Bridge model in SIMA including Bjørnafjorden seabed surface.

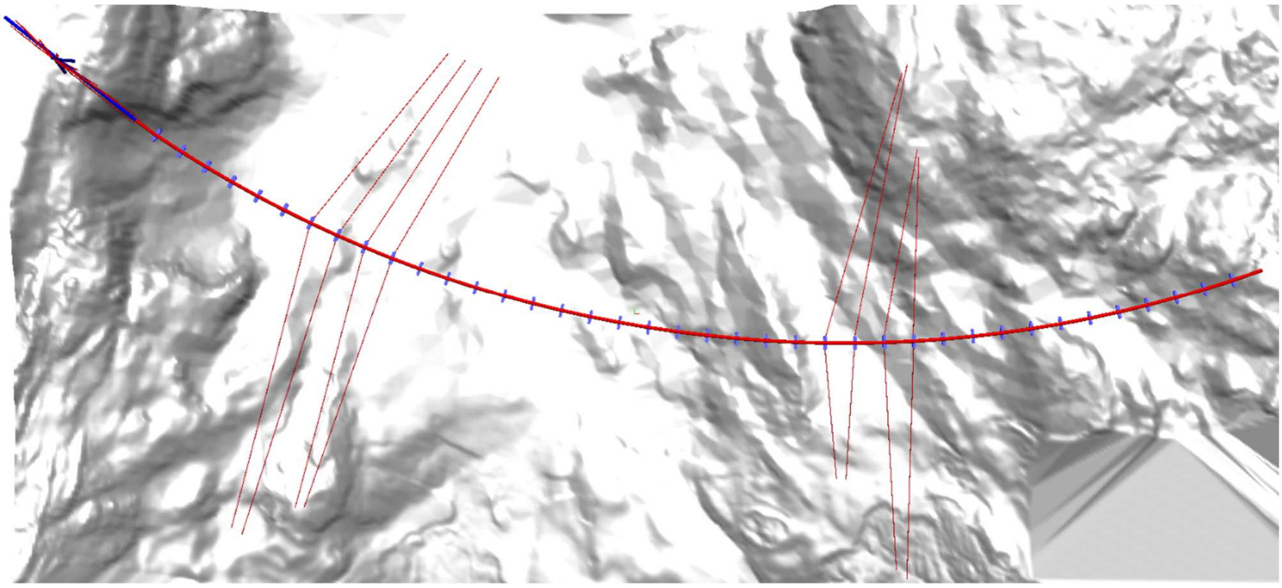


Figure 3-5 Bridge model seen from above, South end is on the left-hand side.

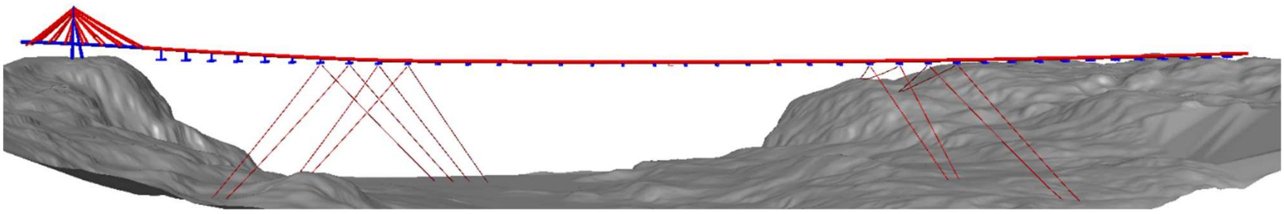


Figure 3-6 Bridge model as seen from East. Note that Bjørnafjorden elevation above mean sea level is not represented. The bottom of the columns in axes 1B, 1C and 1D and the bottom of the high bridge tower are fixed.

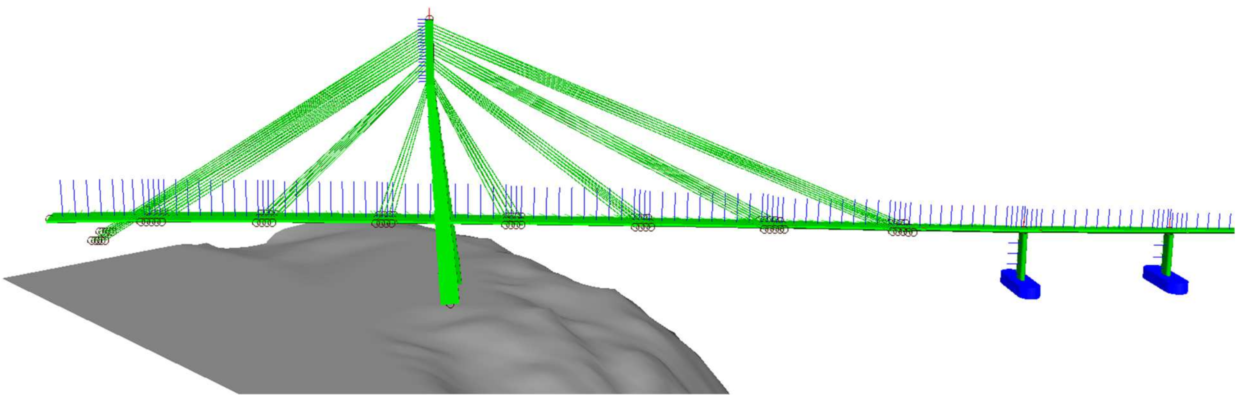


Figure 3-7 View of the "high bridge".

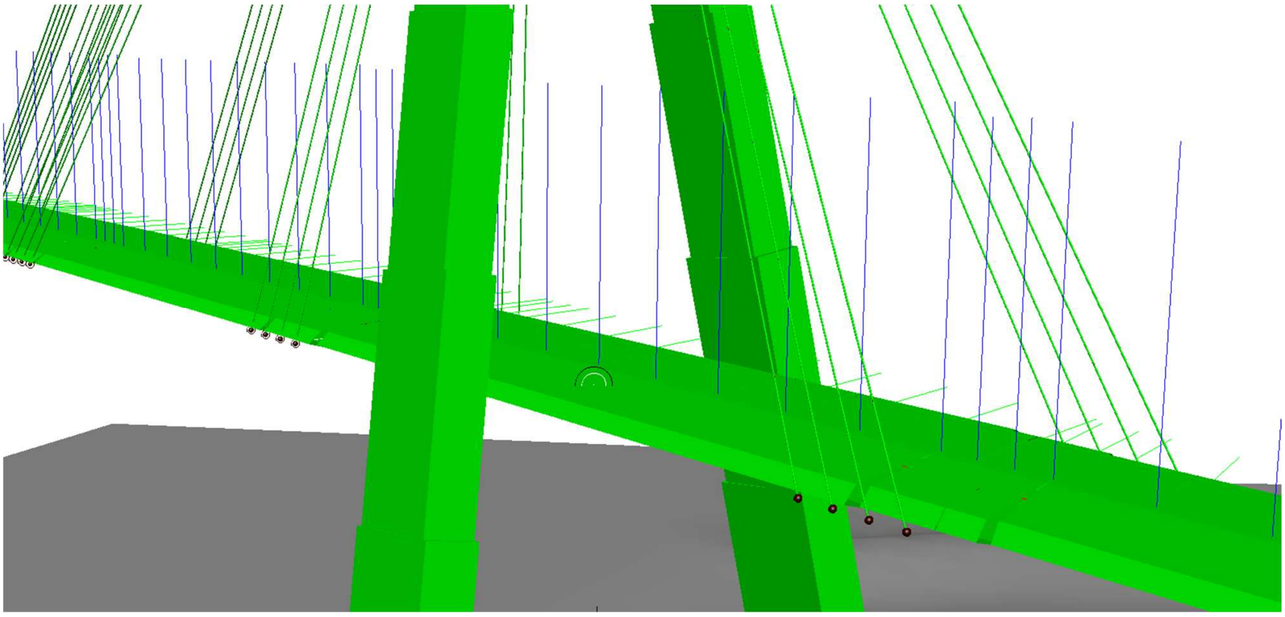


Figure 3-8 Close view of the "high bridge". The stay cables bottom connectors are slaved to the bridge girder.

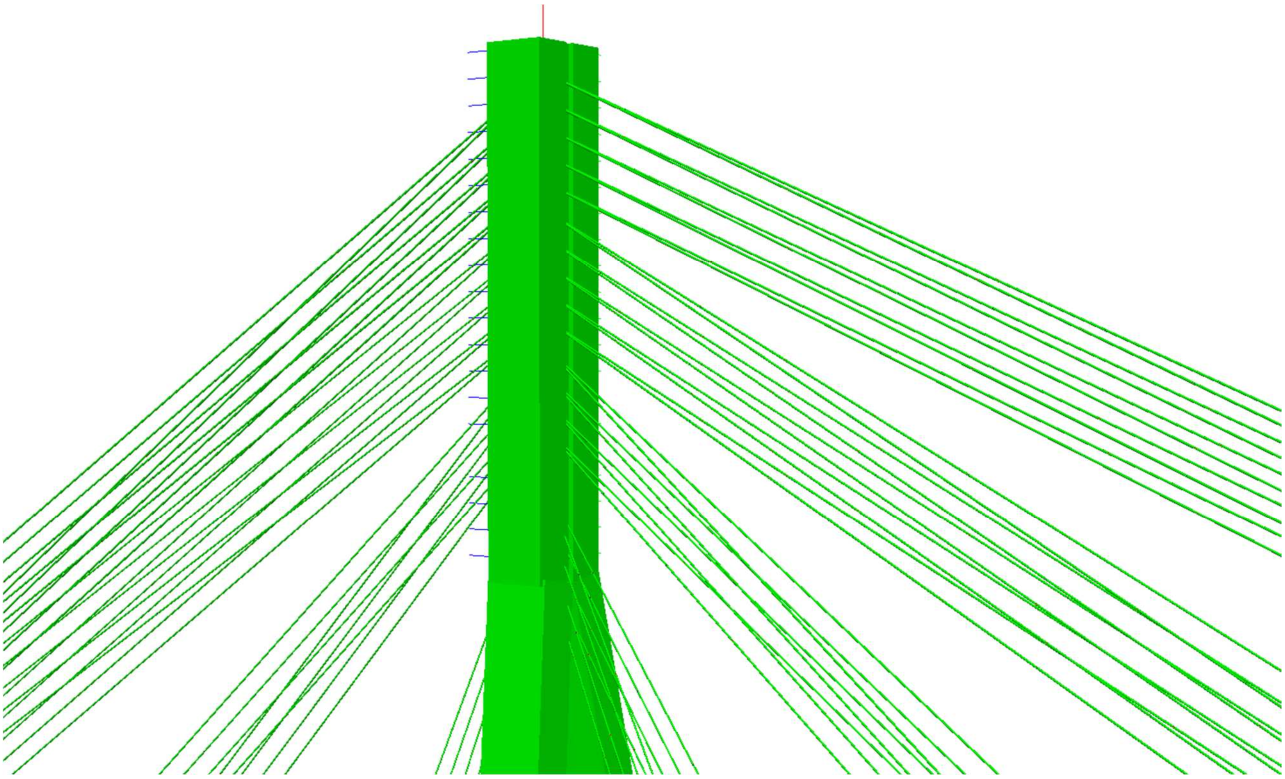


Figure 3-9 Close view of the top of the tower. The stay cables top attachments are placed at the centre of the tower.

3.2.3 Materials

The mechanical properties of the structural members in the finite element model are defined based on the material properties listed in Table 3-2:

Table 3-2 Material properties

Material	E [MPa]	G [MPa]	ρ[kN/m³]
Structural Steel	210000	80770	77
Concrete	29760	12400	26
Stay cables	195000	-	77·1.2=92.4

3.2.4 Bridge girder properties

3.2.4.1 General

The bridge girder consists in four traffic lanes each 3.5 metres wide and a 3 metres wide pedestrian line. In addition, 1.5 metres shoulder is kept on both sides of the girder. Figure 3-10 shows the distribution of the different lanes on the bridge girder, with the pedestrian lane on the right of the figure.

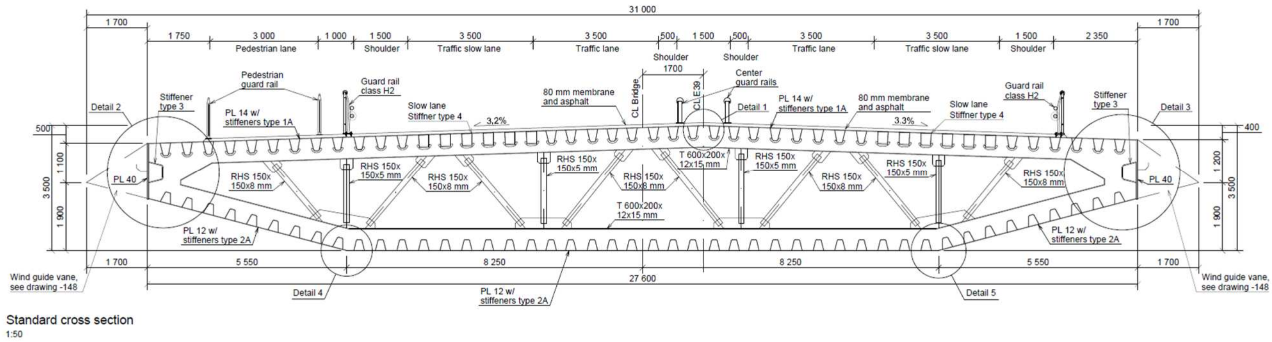


Figure 3-10 Bridge girder cross-section

3.2.4.2 Mass and stiffness properties

The bridge girder is modelled as a single beam with properties calculated from the cross-sections in (Norconsult - Dr. Techn. Olav Olsen), (Norconsult - Dr. Techn. Olav Olsen), (Norconsult - Dr. Techn. Olav Olsen), (Norconsult - Dr. Techn. Olav Olsen) and (Norconsult - Dr. Techn. Olav Olsen). Figure 3-11 shows how the cross-sections are distributed in the bridge.

The bridge girder is reinforced at the connection with the pontoons as described in (Norconsult - Dr. Techn. Olav Olsen) and presented in Figure 3-12. It should be noticed that in addition to sections B and C, two additional sections have been considered: D and E. In addition, the bottom plate thickness in axes 3 to 6 is increased resulting in another set of properties for those axes, as presented in Table 3-4.

The extent of the reinforcements above the columns is approximately 1/8 of the column span.

The mechanical properties for the different bridge girder cross-sections as applied in the analysis are presented in the following tables:

- Table 3-3: Standard cross-section.
- Table 3-4: Reinforced cross-section between axes 3 and 6.
- Table 3-5: Reinforced cross-section in axes 7 and 8.
- Table 3-6: Cross-sections in the south and north abutments

The bridge girder section properties are derived from the Nauticus Hull software 'Cross Sections' or Autodesk Inventor and by hand calculations. Examples of modelled cross sections are shown in Figure 3-13 and Figure 3-14. Detailed cross section properties are given in Appendix XXX.

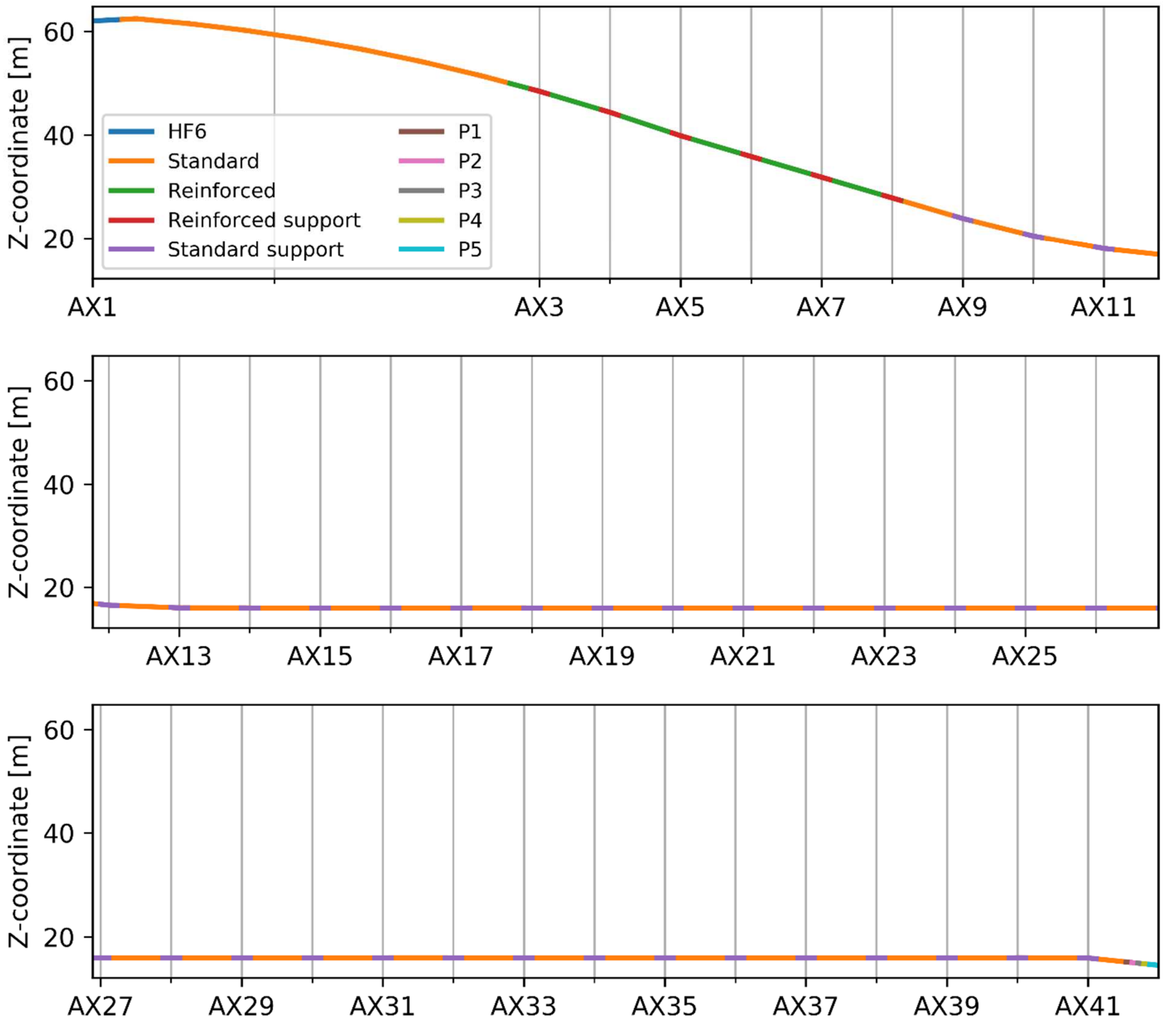


Figure 3-11 Distribution of girder cross-sections along the bridge.

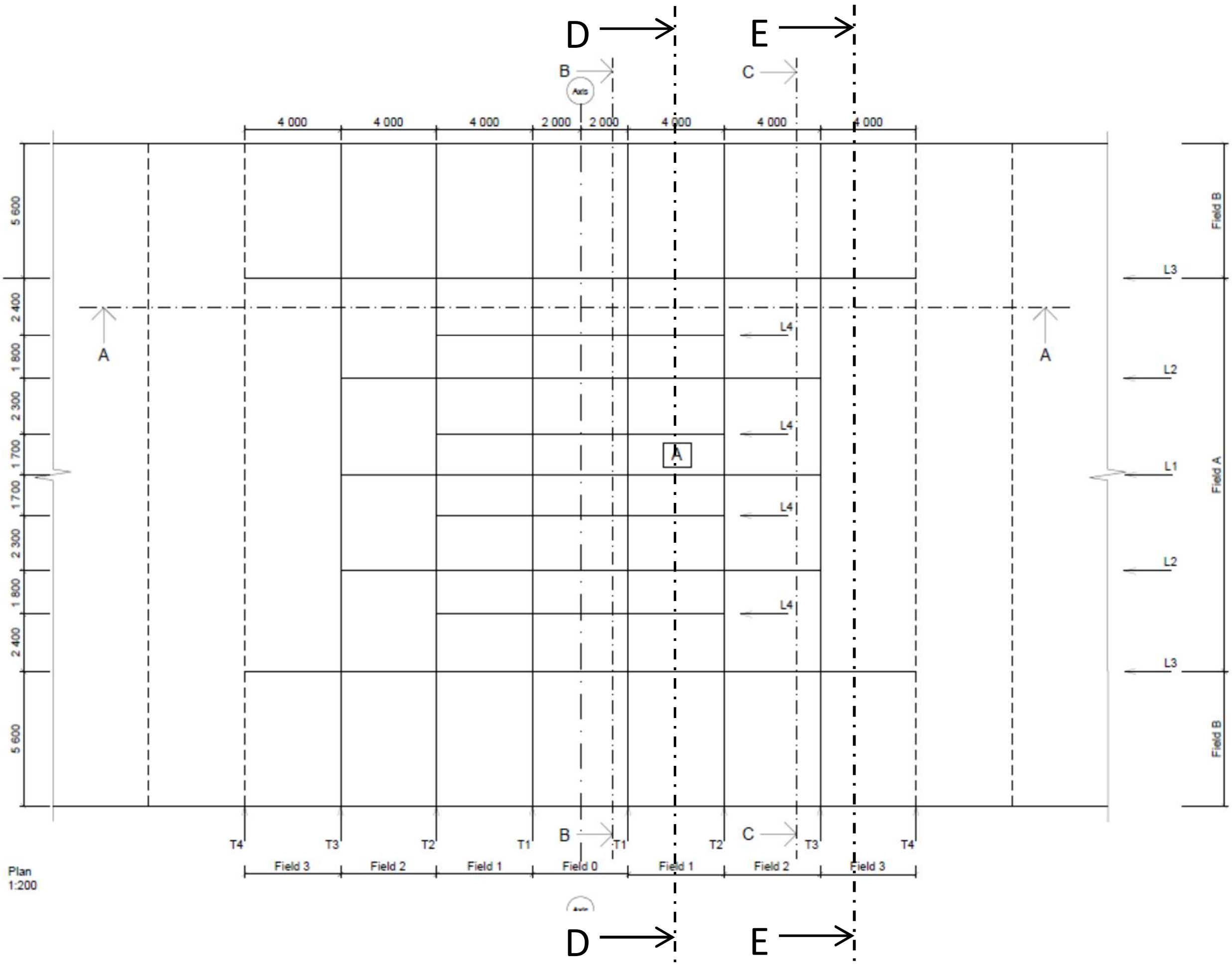


Figure 3-12 Cross-section reinforcements above the column attachments.

Table 3-3 Standard cross-section mechanical properties

Magnitude	Unit	Field	Support section B	Support section C	Support section D	Support section E
Weight*	ton/m	17.85	17.85	17.85	17.85	17.85
Area	m^2	1.59	2.61	1.81	1.92	1.65
Torsional inertia	m^4	6.20	7.08	6.20	6.20	6.20
Inertia around weak axis	m^4	2.75	3.89	2.94	3.01	2.80
Inertia around strong axis	m^4	120.3	148.5	125.9	131.1	124.2
Axial stiffness, EA	kN	$3.33 \cdot 10^8$	$5.48 \cdot 10^8$	$3.80 \cdot 10^8$	$4.02 \cdot 10^8$	$3.47 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$5.77 \cdot 10^8$	$8.16 \cdot 10^8$	$6.17 \cdot 10^8$	$6.32 \cdot 10^8$	$5.89 \cdot 10^8$
Strong axis bending stiffness, EI_Z	kNm^2	$2.53 \cdot 10^{10}$	$3.12 \cdot 10^{10}$	$2.64 \cdot 10^{10}$	$2.75 \cdot 10^{10}$	$2.61 \cdot 10^{10}$
Torsion stiffness, GI_X	kNm^2	$5.00 \cdot 10^8$	$5.72 \cdot 10^8$	$5.00 \cdot 10^8$	$5.00 \cdot 10^8$	$5.00 \cdot 10^8$
Gyration radius	m	1.98	1.65	1.85	1.80	1.94

Table 3-4 Reinforced cross-section mechanical properties between axes 3 and 6

Magnitude	Unit	Field	Support section B	Support section C	Support section D	Support section E
Weight*	ton/m	19.99	19.99	19.99	19.99	19.99
Area	m^2	1.84	2.86	2.11	2.86	1.95
Torsional inertia	m^4	6.20	7.08	6.20	7.08	6.20
Inertia around weak axis	m^4	3.20	4.33	3.45	4.33	3.49
Inertia around strong axis	m^4	136.4	164.7	145.2	164.7	143.5
Axial stiffness, EA	kN	$3.86 \cdot 10^8$	$6.01 \cdot 10^8$	$4.43 \cdot 10^8$	$6.01 \cdot 10^8$	$4.09 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$6.72 \cdot 10^8$	$9.09 \cdot 10^8$	$7.24 \cdot 10^8$	$9.09 \cdot 10^8$	$7.32 \cdot 10^8$
Strong axis bending stiffness, EI_Z	kNm^2	$2.86 \cdot 10^{10}$	$3.46 \cdot 10^{10}$	$3.05 \cdot 10^{10}$	$3.46 \cdot 10^{10}$	$3.01 \cdot 10^{10}$
Torsion stiffness, GI_X	kNm^2	$5.00 \cdot 10^8$	$5.72 \cdot 10^8$	$5.00 \cdot 10^8$	$5.72 \cdot 10^8$	$5.00 \cdot 10^8$
Gyration radius	m	1.84	1.57	1.71	1.57	1.78

Table 3-5 Reinforced cross-section mechanical properties for axes 7 and 8

Magnitude	Unit	Field	Support section B	Support section C	Support section D	Support section E
Weight*	ton/m	19.99	19.99	19.99	19.99	19.99
Area	m^2	1.84	2.86	2.11	2.73	1.95
Torsional inertia	m^4	6.20	7.08	6.20	6.20	6.20
Inertia around weak axis	m^4	3.20	4.33	3.45	3.93	3.49
Inertia around strong axis	m^4	136.4	164.7	145.2	161.7	143.5
Axial stiffness, EA	kN	$3.86 \cdot 10^8$	$6.01 \cdot 10^8$	$4.43 \cdot 10^8$	$5.73 \cdot 10^8$	$4.09 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$6.72 \cdot 10^8$	$9.09 \cdot 10^8$	$7.24 \cdot 10^8$	$8.25 \cdot 10^8$	$7.32 \cdot 10^8$
Strong axis bending stiffness, EI_Z	kNm^2	$2.86 \cdot 10^{10}$	$3.46 \cdot 10^{10}$	$3.05 \cdot 10^{10}$	$3.40 \cdot 10^{10}$	$3.01 \cdot 10^{10}$
Torsion stiffness, GI_X	kNm^2	$5.00 \cdot 10^8$	$5.72 \cdot 10^8$	$5.00 \cdot 10^8$	$5.00 \cdot 10^8$	$5.00 \cdot 10^8$
Gyration radius	m	1.84	1.57	1.71	1.51	1.78

Table 3-6 Bridge ends cross-sections mechanical properties

Magnitude	Unit	HF6	P1	P2	P3	P4	P5
Weight*	ton/m	22.31	18.30	19.19	20.08	20.98	21.87
Area	m^2	3.59	1.90	2.02	2.14	2.27	2.66
Torsional inertia	m^4	16.83	6.39	6.78	7.17	7.56	9.48
Inertia around weak axis	m^4	7.38	3.49	3.73	3.97	4.20	4.91
Inertia around strong axis	m^4	258.9	140.1	147.4	154.7	162.0	193.8
Axial stiffness, EA	kN	$7.54 \cdot 10^8$	$3.99 \cdot 10^8$	$4.25 \cdot 10^8$	$4.50 \cdot 10^8$	$4.76 \cdot 10^8$	$5.59 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$1.55 \cdot 10^9$	$7.33 \cdot 10^8$	$7.83 \cdot 10^8$	$8.33 \cdot 10^8$	$8.83 \cdot 10^8$	$1.03 \cdot 10^9$
Strong axis bending stiffness, EI_Z	kNm^2	$5.44 \cdot 10^{10}$	$2.94 \cdot 10^{10}$	$3.09 \cdot 10^{10}$	$3.25 \cdot 10^{10}$	$3.40 \cdot 10^{10}$	$4.07 \cdot 10^{10}$
Torsion stiffness, GI_X	kNm^2	$1.36 \cdot 10^9$	$5.16 \cdot 10^8$	$5.48 \cdot 10^8$	$5.79 \cdot 10^8$	$6.11 \cdot 10^8$	$7.66 \cdot 10^8$
Gyration radius	m	2.16	1.83	1.83	1.83	1.83	1.89

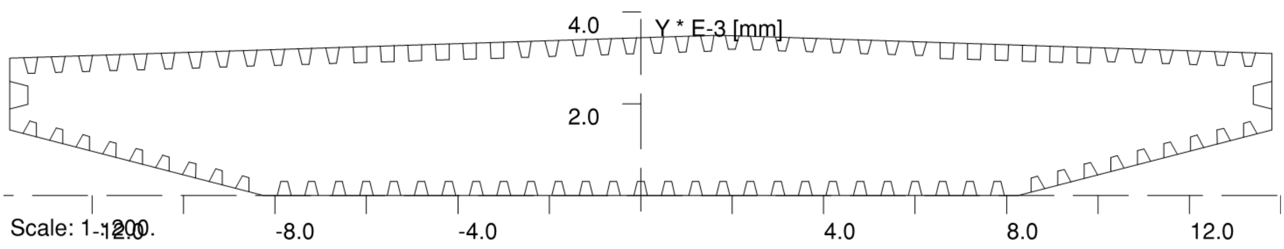


Figure 3-13 Midspan low bridge – modelled in Nauticus Hull

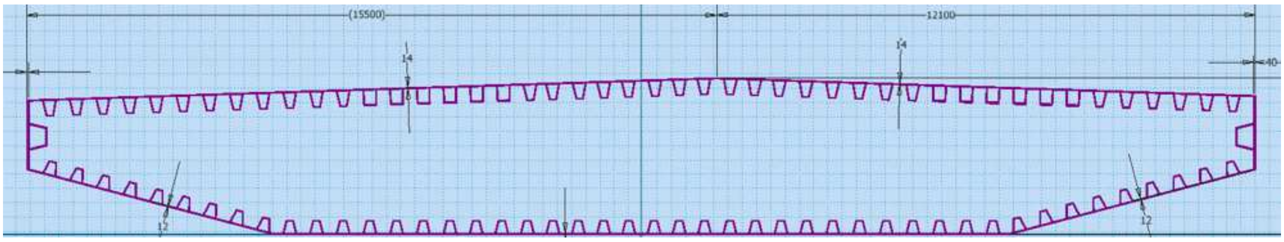


Figure 3-14 Midspan low bridge – modelled in Autodesk Inventor

3.2.4.3 Girder stiffness modification due to shear lag effects

A study was performed to check whether inertias around weak axis were affected by shear lag effect/ normal stress distribution in the girder cross sections. An initial assumption was that the moment of inertia was reduced by 5%. This stiffness reduction was used in the global analyses for the high bridge and low bridge parts.

This study was based on the comparison of a local beam model and a local shell model, as seen in Figure 3-15 and Figure 3-16 respectively.

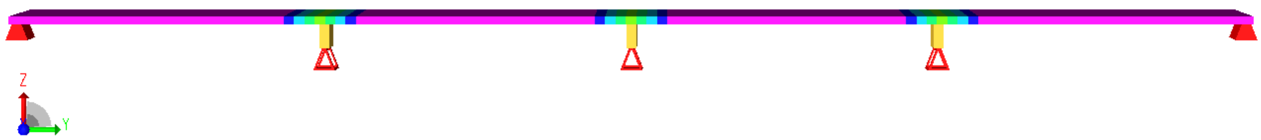


Figure 3-15 Local beam model of low bridge

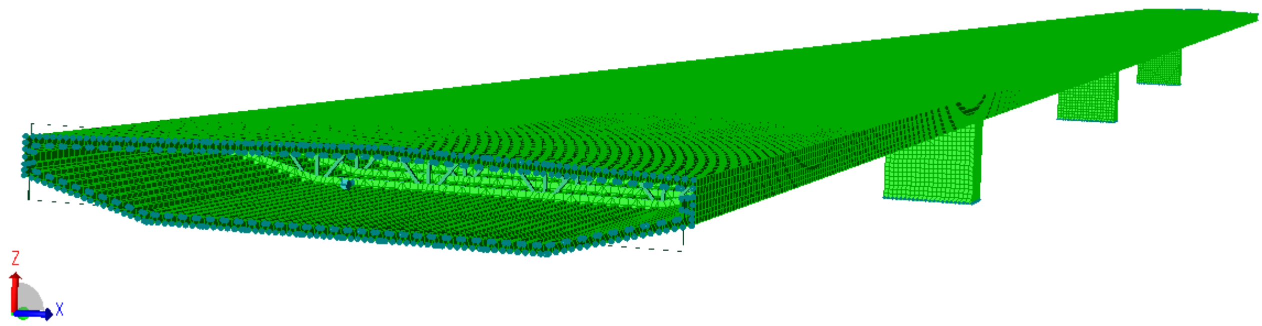


Figure 3-16 Local shell model of low bridge

The models represent the same segment of the low bridge which was modelled straight in the bridge longitudinal direction. Four bridge spans were modelled with symmetry conditions at each end. By controlling the vertical displacement of the three modelled columns sought deformation patterns were achieved. Two cases were investigated; a single and a double sine pattern. These are shown in Figure 3-17 and in Figure 3-18. By comparing reaction forces in the beam model with the shell model for the same load cases the stiffness difference was found. As can be seen in Table 3-7 and Table 3-8 the effect was found to be approximately 5% in average in the investigated cases. This was the same stiffness reduction that were included in the global analysis. Support point numbering is shown in Figure 3-19. The effect of shear lag on fatigue is presented in Section 7.3.

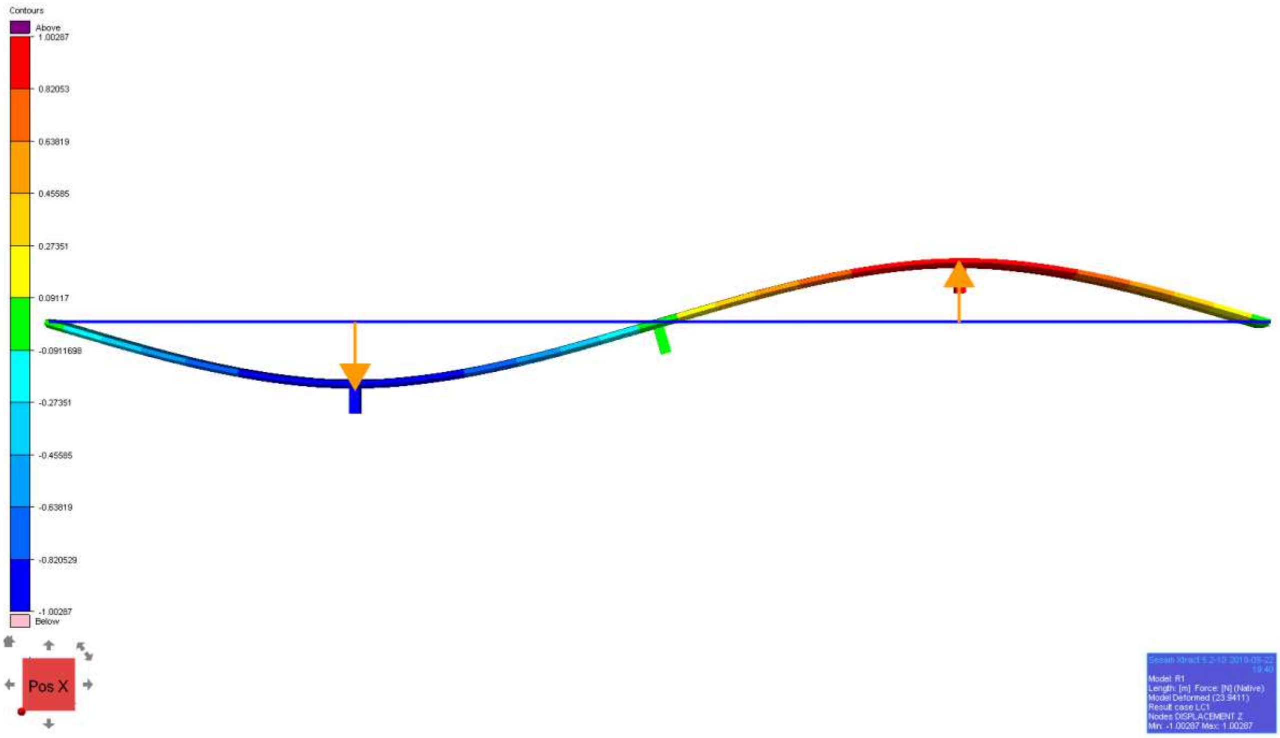


Figure 3-17 Vertical deformation of shell model – case 1

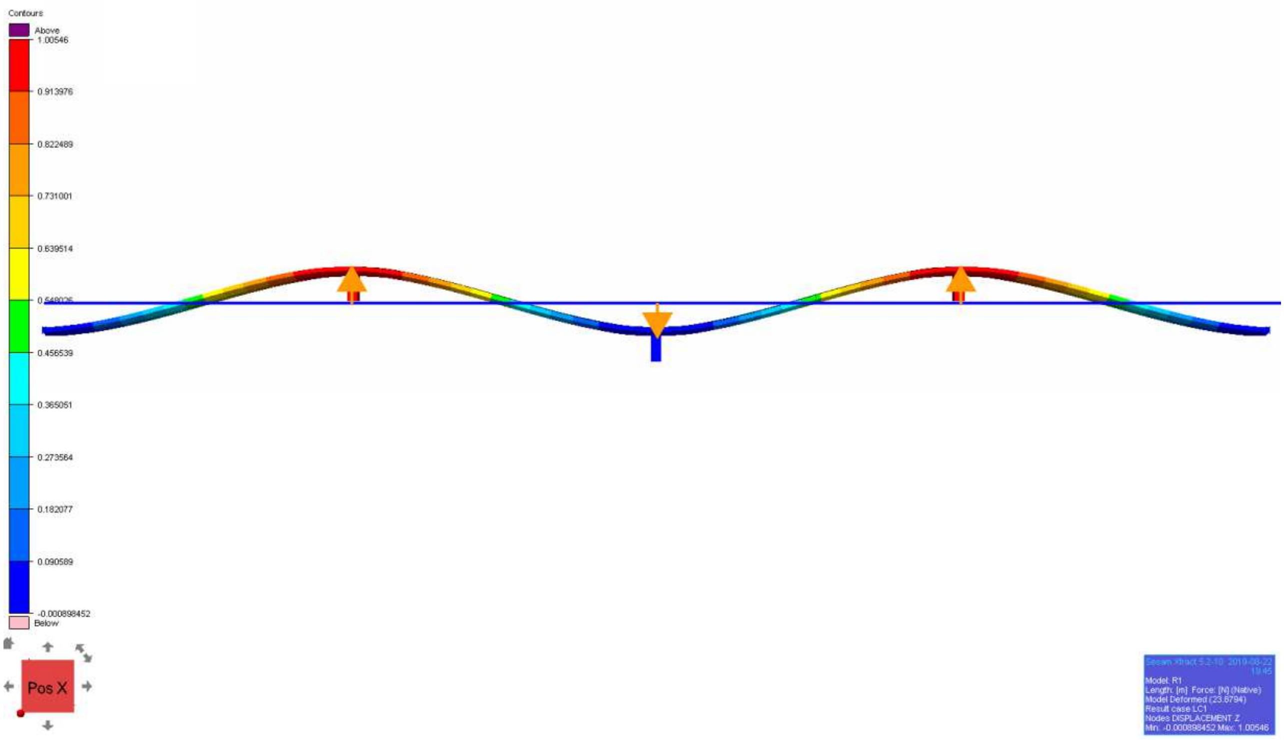


Figure 3-18 Vertical deformation of shell model – case 2

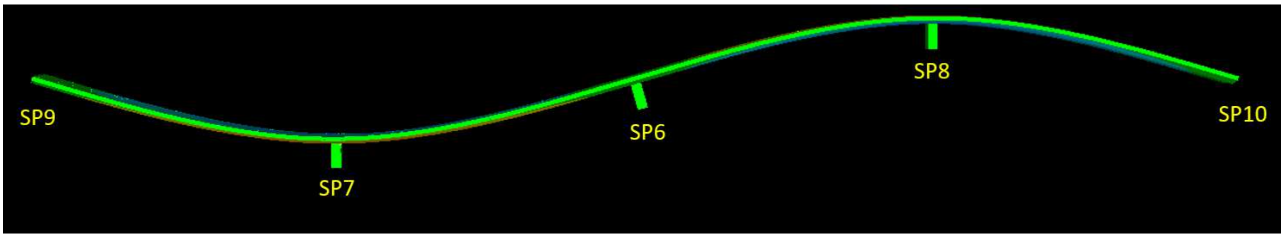


Figure 3-19 Support point numbering

Table 3-7 Comparison of beam and shell model reaction forces - case 1

Support	F_z [MN] – beam model	F_z [MN] – shell model	Stiffness comparison
Sp6	0.00	0.00	-
Sp7	-2.11	-2.06	102%
Sp8	2.11	2.06	102%
Sp9	1.06	1.03	102%
Sp10	-1.06	-1.03	102%

Table 3-8 Comparison of beam and shell model reaction forces - case 2

Support	F_z [MN] – beam model	F_z [MN] – shell model	Stiffness comparison
Sp6	-7.78	-7.22	108%
Sp7	7.73	7.14	108%
Sp8	7.73	7.14	108%
Sp9	-3.84	-3.53	108%
Sp10	-3.84	-3.53	108%

3.2.4.4 Aerodynamic properties

The aerodynamic properties are based on information provided in (Svend Ole Hansen ApS, 21.06.2018). The wind load coefficients for the bridge girder in the high bridge and the low bridge are different due to the boundary effect of the sea surface. The coefficients without and with passing traffic are used for ultimate limit state and fatigue conditions, respectively.

The lift (C_L), drag (C_D) and moment (C_M) coefficients are obtained by interpolation in Table 3-9 and Table 3-10 based on angle of attack (α). The same set of load coefficients is applied regardless of the Reynolds number (Re). The coefficients for other angles than 0 and 180 degrees have been established based on the derivatives of the coefficients up to rotations of 10 degrees. The forces and moment per unit length are defined per equation **(1)**.

$$F_L = \frac{1}{2} C_L \rho_{air} \cdot c \cdot (V_{r,x}^2 + V_{r,y}^2)$$

$$F_D = \frac{1}{2} C_D \rho_{air} \cdot c \cdot (V_{r,x}^2 + V_{r,y}^2) \quad \textbf{(1)}$$

$$M = \frac{1}{2} C_M \rho_{air} \cdot c^2 \cdot (V_{r,x}^2 + V_{r,y}^2)$$

The lift, drag and moment are normalized on the foil chord length *c*. Bridge girder width is used as chord length for normalization: 31 metres.

Table 3-9 Aerodynamic properties of bridge girder in ULS/ALS conditions

Angle of attack (deg)	"High bridge"			"Floating bridge"		
	C_D [-]*	C_L [-]	C_M [-]	C_D [-]*	C_L [-]	C_M [-]
-180	0.084	0.503	0.050	0.107	0.447	0.007
-177	0.084	0.690	0.114	0.107	0.647	0.071
-170	0.084	1.125	0.265	0.107	1.115	0.219
-90	0.226	0.000	0.000	0.226	0.000	0.000
-10	0.085	-1.008	-0.203	0.101	-1.079	-0.228
-3	0.085	-0.567	-0.071	0.101	-0.637	-0.077
0	0.085	-0.378	-0.015	0.101	-0.448	-0.013
3	0.085	-0.189	0.041	0.101	-0.259	0.051
10	0.085	0.252	0.173	0.101	0.183	0.202
90	0.226	0.000	0.000	0.226	0.000	0.000
170	0.084	-0.119	-0.165	0.107	-0.221	-0.205
177	0.084	0.316	-0.014	0.107	0.247	-0.057
180	0.084	0.503	0.050	0.107	0.447	0.007
-180	0.084	0.503	0.050	0.107	0.447	0.007

* The drag coefficients defined in (Svend Ole Hansen ApS, 21.06.2018) are normalized on the girder height not the breadth. Therefore, they have been scaled in this table.

Table 3-10 Aerodynamic properties of bridge girder in FLS conditions

Angle of attack (deg)	"High bridge"			"Floating bridge"		
	C_D [-]*	C_L [-]	C_M [-]	C_D [-]*	C_L [-]	C_M [-]
-180	0.128	0.257	0.083	0.159	0.267	0.058
-177	0.128	0.328	0.108	0.159	0.323	0.089
-170	0.128	0.492	0.167	0.159	0.453	0.162
-90	0.226	0.000	0.000	0.226	0.000	0.000
-10	0.123	-0.728	-0.224	0.135	-0.708	-0.211
-3	0.123	-0.450	-0.121	0.135	-0.474	-0.113
0	0.123	-0.331	-0.077	0.135	-0.374	-0.071
3	0.123	-0.212	-0.033	0.135	-0.274	-0.029
10	0.123	0.066	0.070	0.135	-0.040	0.069
90	0.226	0.000	0.000	0.226	0.000	0.000
170	0.128	0.022	-0.001	0.159	0.081	-0.046
177	0.128	0.186	0.058	0.159	0.211	0.027
180	0.128	0.257	0.083	0.159	0.267	0.058
-180	0.128	0.257	0.083	0.159	0.267	0.058

* The drag coefficients defined in (Svend Ole Hansen ApS, 21.06.2018) are normalized on the girder height not the breadth. Therefore, they have been scaled in this table.

3.2.5 Stay cable properties

3.2.5.1 General

The "high bridge" is supported by 18 pairs of stay cables at each side of the tower.

3.2.5.2 Mass and stiffness properties

The mechanical properties of the stay cables are presented in Table 3-11. The cable identification numbers are explained in Figure 3-20. The adjacent cables on East and West side of bridge girder form a cable pair. The cross-sectional properties are identical for both cables in a pair.

The cables are modelled bar elements without any bending stiffness.

The coordinates of the cable connection points are described in detail in Appendix XXX.

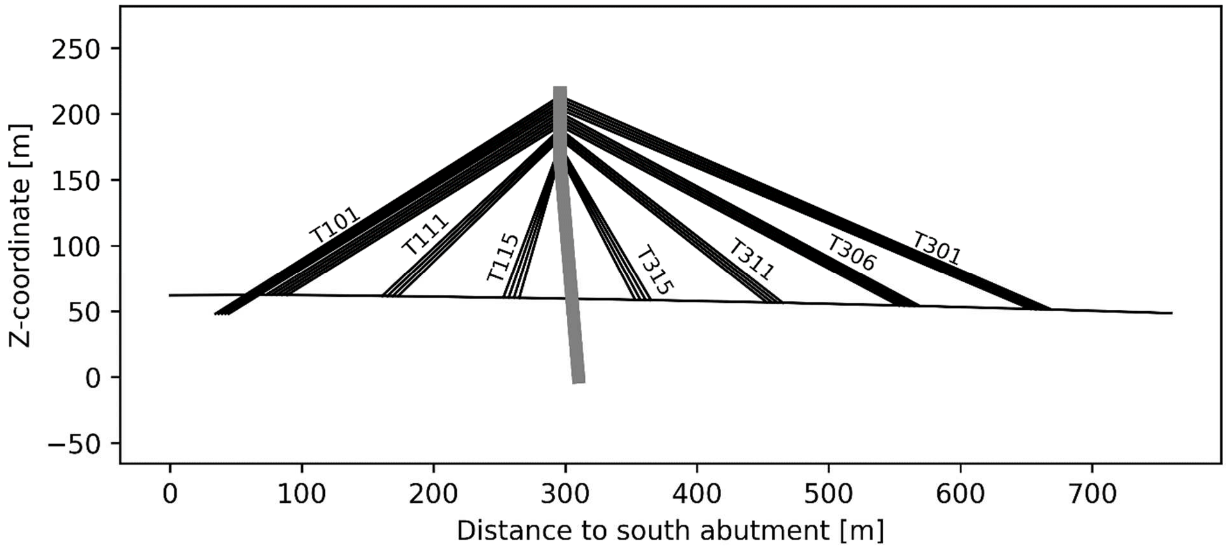


Figure 3-20 Stay cable identification numbering. Tendons numbered 1xx and 2xx are located in the southern side of the bridge, being the tendons 3xx and 4xx attached to high bridge north.

Table 3-11 Cross-sectional properties of stay cables in "high bridge". Tendons 2xx and 4xx have the same properties as 1xx and 3xx, respectively.

Cable pair number	Mass [ton/m]	Axial stiffness [kN]	Streched length [m]	Unstreched length* [m]
101	0.090	$1.76 \cdot 10^6$	309.80	308.75
102	0.085	$1.66 \cdot 10^6$	306.35	305.32
103	0.083	$1.64 \cdot 10^6$	302.91	301.89
104	0.085	$1.67 \cdot 10^6$	299.47	298.46
105	0.088	$1.73 \cdot 10^6$	296.03	295.04
106	0.042	$8.40 \cdot 10^5$	262.93	262.05
107	0.034	$6.72 \cdot 10^5$	258.24	257.38
108	0.036	$7.17 \cdot 10^5$	253.55	252.71
109	0.046	$9.15 \cdot 10^5$	248.86	248.03
110	0.047	$9.29 \cdot 10^5$	244.17	243.36
111	0.045	$9.07 \cdot 10^5$	185.88	185.27
112	0.036	$7.20 \cdot 10^5$	181.30	180.71
113	0.036	$7.24 \cdot 10^5$	176.73	176.15
114	0.042	$8.40 \cdot 10^5$	172.17	171.60
115	0.036	$7.28 \cdot 10^5$	124.27	123.87
116	0.030	$6.10 \cdot 10^5$	120.65	120.26
117	0.031	$6.30 \cdot 10^5$	117.11	116.73
118	0.037	$7.59 \cdot 10^5$	113.65	113.28
301	0.047	$9.54 \cdot 10^5$	407.04	405.72

Cable pair number	Mass [ton/m]	Axial stiffness [kN]	Streched length [m]	Unstreched length* [m]
302	0.044	$8.94 \cdot 10^5$	402.33	401.02
303	0.046	$9.31 \cdot 10^5$	397.63	396.34
304	0.054	$1.10 \cdot 10^6$	392.92	391.65
305	0.067	$1.35 \cdot 10^6$	388.22	386.95
306	0.065	$1.31 \cdot 10^6$	310.44	309.42
307	0.071	$1.42 \cdot 10^6$	305.69	304.68
308	0.089	$1.78 \cdot 10^6$	300.94	299.95
309	0.092	$1.80 \cdot 10^6$	296.19	295.20
310	0.079	$1.54 \cdot 10^6$	291.45	290.47
311	0.072	$1.41 \cdot 10^6$	215.00	214.28
312	0.073	$1.42 \cdot 10^6$	210.27	209.56
313	0.087	$1.70 \cdot 10^6$	205.53	204.83
314	0.098	$1.86 \cdot 10^6$	200.80	200.10
315	0.090	$1.71 \cdot 10^6$	137.10	136.62
316	0.087	$1.65 \cdot 10^6$	132.89	132.43
317	0.091	$1.72 \cdot 10^6$	128.73	128.28
318	0.105	$1.99 \cdot 10^6$	124.61	124.17

3.2.5.3 Aerodynamic properties

Wind loads on the stay cables are modelled as Morison-like drag loads defined as per **(2)**. ρ_{air} is the density of air, *D* is the diameter and *v* is the wind velocity. A drag coefficient, C_D, of 0.8 is applied to all the tendons.

$$\overrightarrow{F_D} = \frac{1}{2} C_D \rho_{air} \cdot D \cdot |\vec{v}| \cdot \vec{v} \qquad \textbf{(2)}$$

3.2.6 Tower properties

3.2.6.1 General

The “high bridge” tower is divided in three different elements:

- The two legs, defined from the tower foundation to the tower crown.
- The tower top, modelled from the crown to the very top of the tower.

3.2.6.2 Mass and stiffness properties

The tower legs are discretized in seven sections. Applied mechanical properties for the different cross-sections are presented in Table 3-12 and Table 3-13.

Table 3-12 Tower leg cross-sectional properties. Numbered from tower bottom.

Magnitude	Unit	Section 1	Section 2	Section 3
Weight	ton/m	110.57	99.58	88.59
Area	m^2	7.21	6.49	5.78
Torsional inertia	m^4	213.89	183.68	153.48
Inertia around y-axis	m^4	164.54	140.93	117.32
Inertia around z-axis	m^4	32.9	28.6	24.3
Axial stiffness, EA	kN	$1.51 \cdot 10^9$	$1.36 \cdot 10^9$	$1.21 \cdot 10^9$
Weak axis bending stiffness, EI_Y	kNm^2	$3.46 \cdot 10^{10}$	$2.96 \cdot 10^{10}$	$2.46 \cdot 10^{10}$
Strong axis bending stiffness, EI_Z	kNm^2	$6.91 \cdot 10^9$	$6.01 \cdot 10^9$	$5.11 \cdot 10^9$
Torsion stiffness, GI_X	kNm^2	$1.73 \cdot 10^{10}$	$1.48 \cdot 10^{10}$	$1.24 \cdot 10^{10}$
Gyration radius	m	5.23	5.11	4.95

Table 3-13 Tower leg cross-sectional properties. Numbered from tower bottom.

Magnitude	Unit	Section 4	Section 5	Section 6	Section 7
Weight	ton/m	77.59	66.60	55.60	44.61
Area	m^2	5.06	4.34	3.63	2.91
Torsional inertia	m^4	123.27	93.07	62.87	32.66
Inertia around y-axis	m^4	93.72	70.11	46.50	22.90
Inertia around z-axis	m^4	20.1	15.8	11.5	7.3
Axial stiffness, EA	kN	$1.06 \cdot 10^9$	$9.12 \cdot 10^8$	$7.61 \cdot 10^8$	$6.11 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$1.97 \cdot 10^{10}$	$1.47 \cdot 10^{10}$	$9.77 \cdot 10^9$	$4.81 \cdot 10^9$
Strong axis bending stiffness, EI_Z	kNm^2	$4.22 \cdot 10^9$	$3.32 \cdot 10^9$	$2.42 \cdot 10^9$	$1.52 \cdot 10^9$
Torsion stiffness, GI_X	kNm^2	$9.96 \cdot 10^9$	$7.52 \cdot 10^9$	$5.08 \cdot 10^9$	$2.64 \cdot 10^9$
Gyration radius	m	4.74	4.45	4.00	3.22

Tower top is split in 19 sections to accommodate for the connections of the different stay cables. Table 3-14 presents the mechanical properties of the tower top sections.

Table 3-14 Tower top cross-sectional properties.

Magnitude	Unit	Tower top cross-section
Weight	ton/m	57.24
Area	m^2	3.73
Torsional inertia	m^4	33.92
Inertia around y-axis	m^4	15.97
Inertia around z-axis	m^4	15.3
Axial stiffness, EA	kN	$7.84 \cdot 10^8$
Weak axis bending stiffness, EI_Y	kNm^2	$3.35 \cdot 10^9$
Strong axis bending stiffness, EI_Z	kNm^2	$3.22 \cdot 10^9$
Torsion stiffness, GI_X	kNm^2	$2.74 \cdot 10^9$
Gyration radius	m	2.90

3.2.6.3 Aerodynamic properties

The aerodynamic coefficients for the tower are defined as Morison drag loads based on the coefficients included in Table 3-15.

The aerodynamic coefficients are scaled to compensate for the wind profile as described in Section **Error! Reference source not found.**.

Table 3-15 Aerodynamic coefficients for the "high bridge" tower

Element	Drag coefficient	Lift coefficient	Length [m]	Breadth [m]
Tower leg – Section 1	2.50	1.52	14.36	5.86
Tower leg – Section 2	2.50	1.54	13.07	5.57
Tower leg – Section 3	2.50	1.56	11.79	5.29
Tower leg – Section 4	2.50	1.58	10.50	5.00
Tower leg – Section 5	2.50	1.61	9.21	4.71
Tower leg – Section 6	2.49	1.64	7.93	4.43
Tower leg – Section 7	2.47	1.74	6.64	4.14
Tower top	1.82	2.45	6.00	9.00

3.2.7 Column properties

3.2.7.1 General

The 39 columns in the bridge are all built in steel, measuring 12 by 4 metres. A representation of the columns cross-sections is presented in Figure 3-21.

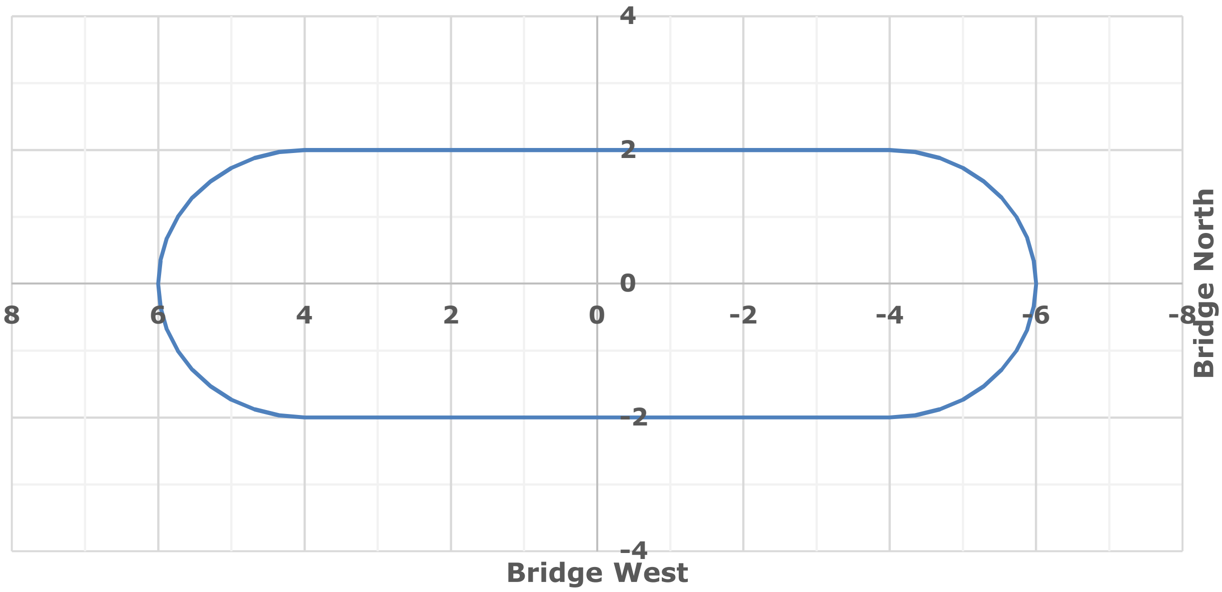


Figure 3-21 Columns cross-section

3.2.7.2 Mass and stiffness properties

The steel columns can be subdivided in 3 different types, only differing on their equivalent linear weight density. Column mechanical properties are presented in Table 3-16.

Table 3-16 Column cross-sectional properties.

Magnitude	Unit	Axes 3-7	Axes 8-27	Axes 28-35
Weight	ton/m	13.62	15.54	6.50
Area	m^2		1.46	
Torsional inertia	m^4		24.45	
Inertia around y-axis	m^4		3.57	
Inertia around z-axis	m^4		20.9	
Axial stiffness, EA	kN		$3.07{\cdot}10^8$	
Weak axis bending stiffness, EI_Y	kNm^2		$7.49{\cdot}10^8$	
Strong axis bending stiffness, EI_Z	kNm^2		$4.39{\cdot}10^9$	
Torsion stiffness, GI_X	kNm^2		$1.98{\cdot}10^9$	
Gyration radius	m		4.09	

3.2.7.3 Aerodynamic properties

Wind loads in the columns are modelled as Morison drag loads with a drag coefficient of 0.37 and 1.61 in the column’s longitudinal and transversal directions, respectively.

As described in Section **Error! Reference source not found.**, the drag coefficients for each column are scaled down to compensate for the larger wind velocity for the length of the columns laying below the input wind field.

3.2.8 Pontoon properties

3.2.8.1 General

There are 39 pontoons in the floating section of the bridge. Based on their dimensions, 3 different types of pontoons can be defined. Table 3-17 contains the dimensions of all the different types of pontoons.

A 3D model of the pontoon is included in Figure 3-22.

Table 3-17 Pontoon dimensions

Type	Axes	Length [m]	Width [m]	Draft [m]	Freeboard [m]
Type1	General	58	12	5	4
Type2	7 to 12 and 27 to 30	58	14.5	5	4
Type3	3 to 6	58	17	5	4

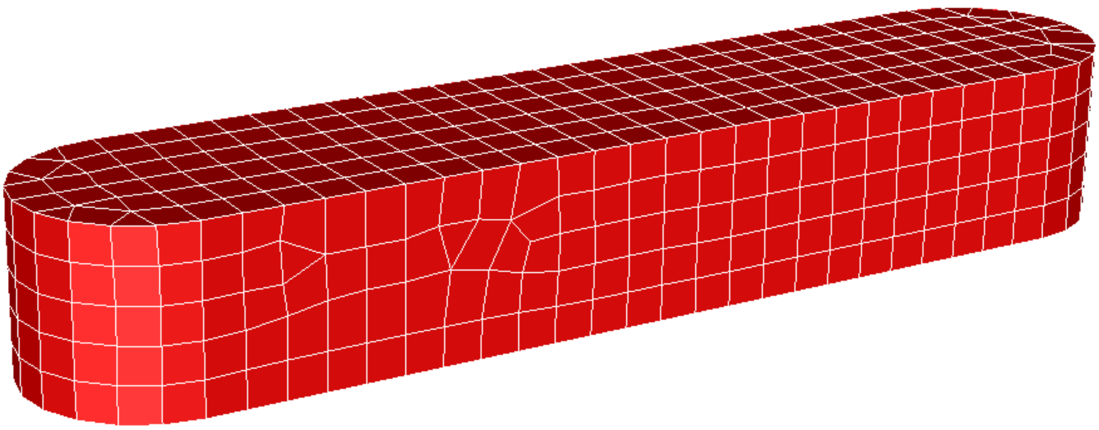


Figure 3-22 Pontoon panel model

3.2.8.2 Pontoon positions

The pontoons are positioned directly underneath the axes of the "floating bridge", i.e. axes 3-41. The positions and heading provided in Table 3-18 refer to the global model coordinate system, see Section 3.1.3. All the pontoons are initially located at the nominal draft on an even keel, i.e. with zero heel or list angles.

Table 3-18 Pontoon positions in the global model coordinate system

Axis	X (m)	Y (m)	Heading (deg)
3	-1939.00	728.50	56.19
4	-1839.00	663.00	57.57
5	-1737.00	599.80	58.94
6	-1633.00	539.20	60.32
7	-1528.00	481.00	61.69
8	-1422.00	425.30	63.07
9	-1314.00	372.30	64.44
10	-1205.00	321.90	65.82
11	-1095.00	274.00	67.19

Axis	X (m)	Y (m)	Heading (deg)
12	-984.20	228.80	68.57
13	-872.10	186.30	69.94
14	-758.80	146.50	71.32
15	-644.60	109.50	72.69
16	-529.60	75.14	74.07
17	-413.90	43.59	75.44
18	-297.40	14.84	76.82
19	-180.30	-11.14	78.19
20	-62.54	-34.23	79.57
21	55.78	-54.56	80.95
22	174.50	-72.03	82.32
23	293.60	-86.62	83.70
24	413.00	-98.41	85.07
25	532.60	-107.20	86.45
26	652.50	-113.20	87.82
27	772.40	-116.40	89.20
28	892.40	-116.60	90.57
29	1012.00	-114.00	91.95
30	1132.00	-108.50	93.32
31	1252.00	-100.10	94.70
32	1371.00	-88.80	96.07
33	1491.00	-74.74	97.45
34	1609.00	-57.71	98.82
35	1728.00	-37.86	100.20
36	1846.00	-15.22	101.60
37	1963.00	10.24	102.90
38	2079.00	38.52	104.30
39	2195.00	69.63	105.70
40	2310.00	103.50	107.10
41	2425.00	140.10	108.40

3.2.8.3 Hydrostatic and mass data

Table 3-19 presents the main hydrostatic results for each of the pontoon types. Note that all the included properties are exclusively dependent on the outer geometry of the pontoons.

In a free-floating vessel, the metacentric height (GM) is the key parameter on initial stability. However, in these analyses, the weight and the buoyancy of the SIMO pontoon bodies are not balance. The weight of the column and the bridge girder is applied as a force acting at pontoon's deck.

For a floating body, the restoring moment for a certain heel angle θ can be calculated as:

$$Moment = (\nabla \cdot \rho \cdot g \cdot (KB + BM) - M \cdot g \cdot KG) \cdot \theta \qquad \textbf{(3)}$$

where ∇ is the displaced volume, *ρ* is water density, *g* is gravity acceleration and *M* is the mass of the structure plus its ballast. *KB* is the distance between the keel and the centre of buoyancy of the body and *BM* is the distance from the centre of buoyancy to the metacentre, i.e. the point where the buoyancy force vector intersects the centreline of the vessel. It should be noted that the location of the metacentre differs between roll and pitch.

Out of the three components of **(3)**, the mass term is applied as follows:

- Pontoon and ballast mass is represented by a vertical force acting at pontoon's centre of gravity.
- The weight of the bridge girder and the column is a force applied at the pontoon's deck level.

- Mooring lines loads are applied at the fairleads.

The *KB* term represents the buoyancy force, which is explicitly modelled as a vertical force acting at pontoon's centre of buoyancy.

The *BM* term is the only one included as roll and pitch stiffness of the pontoons, denoted as C44 and C55 in Table 3-20.

Table 3-19 Pontoons hydrostatic results

Type	Displacement [ton]	Water plane area [m²]	Center of buoyancy vertical position [m]	BM_T [m]	BM_L [m]
Type1	3408.6	665.1	-2.50	2.30	51.55
Type2	4078.9	795.9	-2.50	3.32	50.72
Type3	4735.4	924.0	-2.50	4.52	49.94

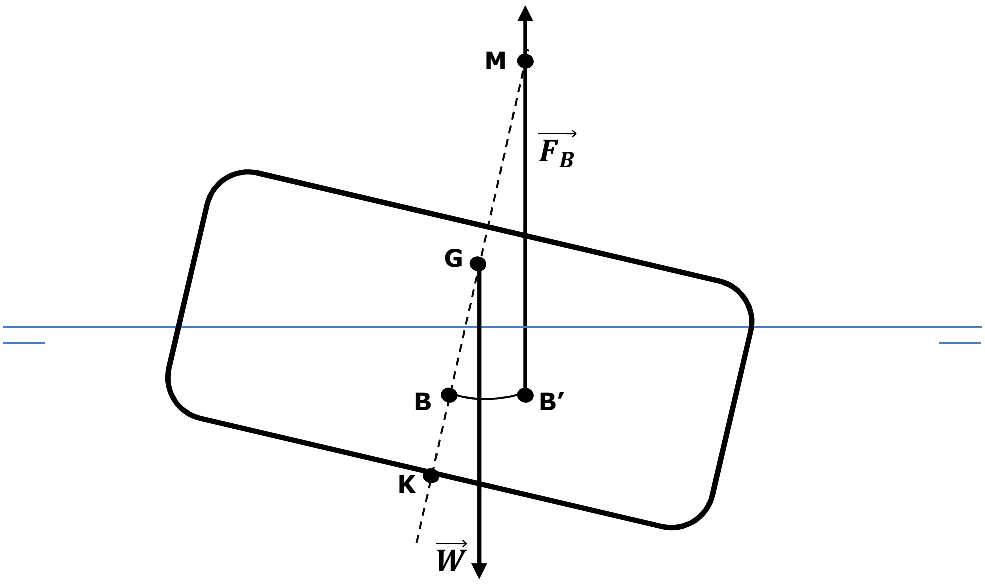


Figure 3-23 Initial stability of floating vessels. After heeling, the centre of buoyancy B moves to B' and the force pair produced by the weight ($\vec{W}$) and the buoyancy ($\vec{F_B}$) result in a restoring moment as long as the metacentre (M) is over the centre of gravity (G).

The resultant mass and hydrostatic model are given in Table 3-20.

Table 3-20 Pontoons hydrostatic and mass data

Axis	Mass [ton]	KG [m]	Ixx [t·m²]	Iyy [t·m²]	Izz [t·m²]	C44 [N·m]	C55 [N·m]	Buoyancy [kN]
3	2032	-0.80	$8.359 \cdot 10^4$	$9.065 \cdot 10^5$	$9.502 \cdot 10^5$	$2.100 \cdot 10^5$	$2.320 \cdot 10^6$	46454
4	2085	-0.80	$8.580 \cdot 10^4$	$9.304 \cdot 10^5$	$9.752 \cdot 10^5$	$2.100 \cdot 10^5$	$2.320 \cdot 10^6$	46454
5	2145	-0.80	$8.825 \cdot 10^4$	$9.570 \cdot 10^5$	$1.003 \cdot 10^6$	$2.100 \cdot 10^5$	$2.320 \cdot 10^6$	46454
6	2198	-0.80	$9.043 \cdot 10^4$	$9.806 \cdot 10^5$	$1.028 \cdot 10^6$	$2.100 \cdot 10^5$	$2.320 \cdot 10^6$	46454
7	1594	-0.62	$5.760 \cdot 10^4$	$7.195 \cdot 10^5$	$7.417 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
8	1647	-0.62	$5.951 \cdot 10^4$	$7.434 \cdot 10^5$	$7.663 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
9	1700	-0.62	$6.141 \cdot 10^4$	$7.671 \cdot 10^5$	$7.908 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
10	1744	-0.62	$6.303 \cdot 10^4$	$7.873 \cdot 10^5$	$8.116 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
11	1777	-0.62	$6.420 \cdot 10^4$	$8.019 \cdot 10^5$	$8.267 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
12	1796	-0.62	$6.490 \cdot 10^4$	$8.107 \cdot 10^5$	$8.357 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
13	1109	-0.86	$3.376 \cdot 10^4$	$5.131 \cdot 10^5$	$5.204 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439

Axis	Mass [ton]	KG [m]	Ixx [t·m²]	Iyy [t·m²]	Izz [t·m²]	C44 [N·m]	C55 [N·m]	Buoyancy [kN]
14	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
15	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
16	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
17	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
18	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
19	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
20	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
21	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
22	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
23	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
24	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
25	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
26	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
27	1803	-0.62	$6.516 \cdot 10^4$	$8.139 \cdot 10^5$	$8.390 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
28	1803	-0.62	$6.516 \cdot 10^4$	$8.139 \cdot 10^5$	$8.390 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
29	1803	-0.62	$6.516 \cdot 10^4$	$8.139 \cdot 10^5$	$8.390 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
30	1803	-0.62	$6.516 \cdot 10^4$	$8.139 \cdot 10^5$	$8.390 \cdot 10^5$	$1.329 \cdot 10^5$	$2.030 \cdot 10^6$	40014
31	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
32	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
33	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
34	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
35	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
36	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
37	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
38	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
39	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
40	1110	-0.86	$3.376 \cdot 10^4$	$5.133 \cdot 10^5$	$5.206 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439
41	1110	-0.86	$3.376 \cdot 10^4$	$5.136 \cdot 10^5$	$5.209 \cdot 10^5$	$7.684 \cdot 10^4$	$1.724 \cdot 10^6$	33439

3.2.8.4 Hydrodynamic data

The wave excitation forces, 2nd order wave drift forces, added mass and potential damping are computed in frequency domain by WADAM. An example of the panel models is given in Figure 3-22.

The wave drift forces are influenced by the magnitude of the 1st order wave induced motions of the pontoons. Based on the experience of previous phases, drift forces are computed based on fully fixed pontoons. Only the horizontal drift forces are computed.

Added mass, potential damping, first order wave excitation forces and moments, second order wave drift forces and moments are documented in more detail in Appendix /XXXX/.

3.2.8.5 Current load

Current load is computed based on the drag coefficient of a rectangle with round corners. The load on longitudinal and transversal directions is then calculated as follows:

$$F_{curr,x}(\alpha) = \frac{1}{2}\rho C_{D,x} T B \frac{2 \cdot cos\alpha}{1 + cos^2\alpha} {v_{curr,x}}^2 \qquad \textbf{(4)}$$

$$F_{curr,y}(\alpha) = \frac{1}{2}\rho C_{D,y} T L \frac{2 \cdot sin\alpha}{1 + sin^2\alpha} {v_{curr,y}}^2 \qquad \textbf{(5)}$$

where α is the relative current heading angle, ρ is seawater density, T is the draught, B is the breadth and L is the pontoon length.

Table 3-21 Pontoon's quadratic current drag coefficients

Type	Drag coefficient	
	Longitudinal direction, $C_{D,x}$	Transversal direction, $C_{D,y}$
Type1	0.32	1.80
Type2	0.34	1.70
Type3	0.36	1.61

3.2.8.6 Wind load

Wind loads are calculated in a similar manner as the current load, except using the projected area over the sea. The wind drag coefficients are also the same as the current coefficient.

$$F_{wind,x}(\alpha) = \frac{1}{2}\rho C_{D,x} f B \frac{2 \cdot cos\alpha}{1 + cos^2\alpha} v_{wind,x}{}^2 \quad (6)$$

$$F_{wind,y}(\alpha) = \frac{1}{2}\rho C_{D,y} f L \frac{2 \cdot sin\alpha}{1 + sin^2\alpha} v_{wind,y}{}^2 \quad (7)$$

where *f* is the freeboard.

3.2.8.7 Mooring system

Pontoons 9, 10, 11, 12, 27, 28, 29 and 30 are moored to the seabed with two lines each. The mooring lines are made up of chain and polyester rope segments which are described in Table 3-22. Segment lengths are defined in Table 3-23. The drag coefficients for the mooring lines are based on DNVGL-OS-E301, (DNVGL-OS-E301, July 2018) and the used coefficients can be taken as upper limit for mooring design. This is also the value that has been used for design analyses.

Table 3-22 Mooring components mechanical and hydrodynamic properties without marine growth

Magnitude	Unit	Chain			Polyester rope			
Type	-	Studless chain, R4			Fibre rope			
Nominal diameter	mm	92	100	146	155	168	177	185
Sheating thickness	mm	-	-	-	-	-	-	-
Outer diameter	mm	92	100	146	155	168	177	185
Corrosion rate	mm/year	0.2	0.2	0.8	-	-	-	-
Design life	years	100	100	25	100	100	100	100
Corrosion allowance	mm	20	20	20	-	-	-	-
Weight in air	kg/m	169.3	200.0	426.3	18.10	19.40	22.00	24.10
Weight in water	kg/m	147.2	173.9	370.7	4.70	5.00	5.70	6.27
MBL (uncorroded)	kN	8497	9864	15363	7845	8826	9807	10800
MBL (corroded)*	kN	5432	6594	12009	7845	8826	9807	10800
Cross-sectional area**	mm^2	13295	15708	33483	18869	22167	24606	26880
SCF	-	1	1	1.15***	1	1	1	1
a_D (fatigue parameter)****	-	$6.0 \cdot 10^{10}$	$6.0 \cdot 10^{10}$	$6.0 \cdot 10^{10}$	0.259	0.259	0.259	0.259
m (fatigue parameter)****	-	3	3	3	13.46	13.46	13.46	13.46
Axial stiffness	kN	$6.94 \cdot 10^5$	$8.17 \cdot 10^5$	$1.61 \cdot 10^6$	$1.96 \cdot 10^5$	$2.21 \cdot 10^5$	$2.45 \cdot 10^5$	$2.70 \cdot 10^5$
Drag coefficient in longitudinal direction	-	1.15	1.15	1.15	0	0	0	0
Drag coefficient in transversal direction	-	2.4	2.4	2.4	1.6	1.6	1.6	1.6
Added mass coeff. in longitudinal direction	-	0.05	0.05	0.05	0	0	0	0

Magnitude	Unit	Chain			Polyester rope			
Added mass coeff. in transversal direction	-	1	1	1	1	1	1	1

* The catalogue value is presented. Expected corroded MBL is less than this.
** For fatigue calculations. The area is based on a reduction in diameter of 50% of the corrosion allowance.
*** Used for the chain link in the fairlead due to out of plane bending, taken from (DNVGL-OS-E301, July 2018)
**** The fatigue capacity curve for polyester rope is based on the ratio of tension range to characteristic strength.

Table 3-23 Mooring lines segment length

Line number	Bottom chain segment		Fibre rope segment		Top chain segment		Pretension [kN]
	Nominal diameter [mm]	Length [m]	Nominal diameter [mm]	Length [m]	Nominal diameter [mm]	Length [m]	
1	100	60.0	177	962.1	146	25.0	2602
2	100	60.0	177	964.4	146	25.0	2135
3	92	60.0	177	958.3	146	25.0	1877
4	92	60.0	177	949.3	146	25.0	1640
5	100	75.0	185	1251.4	146	35.0	2754
6	100	75.0	185	1249.6	146	35.0	2124
7	92	50.0	168	1066.6	146	35.0	1979
8	92	50.0	168	1049.4	146	35.0	1977
9	92	70.0	168	1024.1	146	50.0	1969
10	92	175.0	168	930.3	146	50.0	1970
11	92	70.0	155	704.5	146	50.0	1955
12	92	50.0	155	654.0	146	50.0	2022
13	92	50.0	168	611.2	146	25.0	3035
14	92	50.0	168	606.6	146	25.0	2585
15	92	150.0	168	873.5	146	25.0	2227
16	92	100.0	168	958.8	146	25.0	2111

* Adjusted to reduce bridge transverse deformations under permanent loads while keeping a pretension close to the design value.

The fairlead locations are extracted from (Norconsult - Dr. Techn. Olav Olsen, 28.03.2019). Applied fairlead locations are listed in Table 3-24 and the anchor coordinates are included in Table 3-25.

Table 3-24 Fairlead coordinates. Given in local pontoon coordinate system.

Fairlead number	X-location [m]*	Y-location [m]	Z-location [m]*
Fairlead West	14.6 (11.063)	0.0	-6.3 (-6.7)
Fairlead East	-14.6 (-11.063)	0.0	-6.3 (-6.7)

* Fairlead coordinates are based in a previous revision of the drawings. The coordinates based on (Norconsult - Dr. Techn. Olav Olsen, 28.03.2019) are included in parenthesis.

Table 3-25 Mooring anchors location

Line number	Pontoon	Fairlead	Anchor X location [m]	Anchor Y location [m]	Anchor Z location [m]
1	Pontoon 9	West	-798.63	1126.32	-561.50
2	Pontoon 10	West	-723.05	1098.41	-561.20
3	Pontoon 11	West	-651.87	1063.78	-561.10
4	Pontoon 12	West	-576.43	1024.50	-561.20
5	Pontoon 9	East	-1703.63	-913.31	-359.30
6	Pontoon 10	East	-1658.41	-937.49	-359.20
7	Pontoon 11	East	-1422.44	-818.80	-291.70
8	Pontoon 12	East	-1385.61	-818.24	-296.50
9	Pontoon 27	West	1105.46	996.01	-123.20
10	Pontoon 28	West	1127.37	1030.98	-123.50
11	Pontoon 29	West	1179.27	698.61	-167.20
12	Pontoon 30	West	1181.11	649.32	-158.10
13	Pontoon 27	East	869.89	-707.05	-382.20

Line number	Pontoon	Fairlead	Anchor X location [m]	Anchor Y location [m]	Anchor Z location [m]
14	Pontoon 28	East	909.79	-709.45	-380.50
15	Pontoon 29	East	1130.25	-1098.96	-410.30
16	Pontoon 30	East	1175.43	-1137.60	-411.80

3.2.9 Structural damping

Structural damping is applied using the stiffness and mass proportional Rayleigh damping which estimates the damping matrix as a coefficient a_1 times the mass matrix and another coefficient a_2 multiplied with the stiffness matrix (both geometric stiffness and material stiffness). (Statens Vegvesen, 2018) defines the structural damping to be used for each material, as shown in Table 3-26.

The a1 and a2 coefficients are calculated so the desired critical damping is achieved for oscillations with periods of 2 and 40 seconds. With the Rayleigh model, it is only possible to set the structural damping value at two frequencies. The resulting structural damping is lower than the target value in between those frequencies and larger outside that range. It will then vary for other oscillation periods as shown in Figure 3-24. The calculation of a1 and a2 is done as follows:

$$a_1 = \frac{2\omega_1\omega_2}{{\omega_2}^2 - {\omega_1}^2}(\lambda_1\omega_2 - \lambda_2\omega_1) \quad \textbf{(8)}$$

$$a_2 = \frac{2(\lambda_2\omega_2 - \lambda_1\omega_1)}{{\omega_2}^2 - {\omega_1}^2} \quad \textbf{(9)}$$

where ω_1 and ω_2 are the angular frequencies at which the structural damping is defined, i.e. corresponding to 2 and 40 seconds in this case; λ_1 and λ_2 are the values of the critical damping at those frequencies.

Table 3-26 Structural damping values for each material

Material	Structural damping as percentage of critical damping	a1	a2
Steel	0.50%	0.00150	0.00303
Concrete	0.80%	0.00239	0.00485
Stay cable	1.00% (0.1%)*	0.00299	0.00606

* The project design basis (Statens Vegvesen, 2018) defines a structural damping of 0.1%, but it has been increased because of numerical stability reasons.

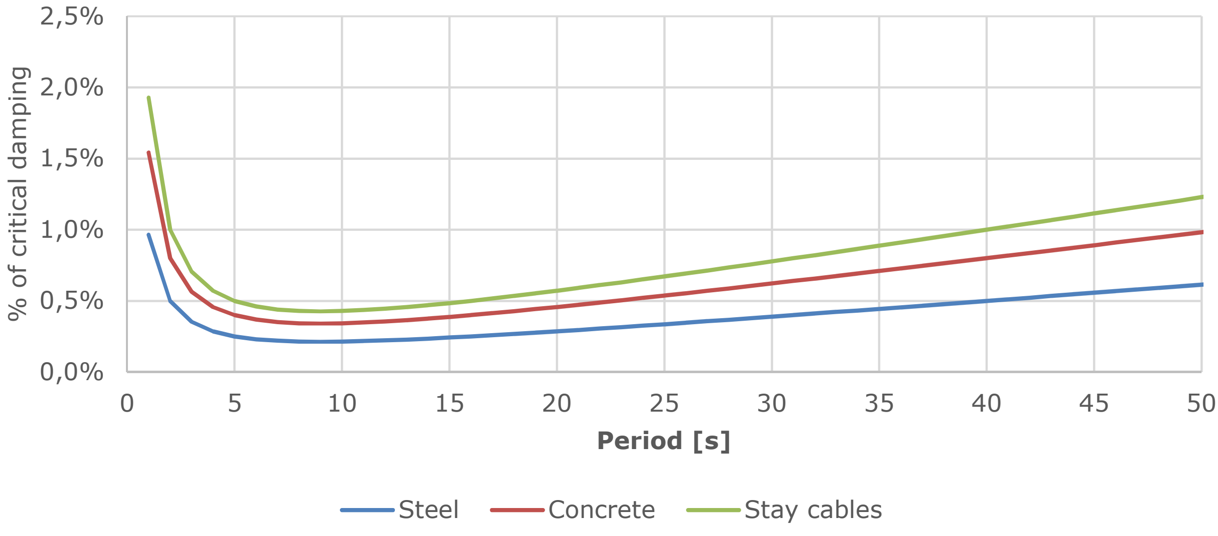


Figure 3-24 Structural damping variation for different oscillation periods

3.3 Environmental data

3.3.1 General

This section summarizes the metocean model included in (Statens Vegvesen, 30.11.18). The applied environmental conditions for each of the analyses is afterwards detailed in the relevant section for the analyses.

3.3.2 Wind waves

The wind generated wave conditions with the largest significant wave height for different return periods are included in Table 3-27. This wind sea conditions correspond to the maximum value in 1 hour; they can be scaled to 3-hour maxima with the factors included in Table 3-28.

Table 3-27 Extreme wind sea conditions

Return period/	1 year		10 years		50 years		100 years		10000 years	
Heading	Hs [m]	Tp [s]	Hs [m]	Tp [s]	Hs [m]	Tp [s]	Hs [m]	Tp [s]	Hs [m]	Tp [s]
Omni	1.3	4.3	1.7	4.8	2.0	5.2	2.1	5.3	2.9	6.1
345°-15°	0.3	2.5	0.6	3.5	0.8	4.0	0.8	4.0	1.3	4.7
15°-45°	0.2	1.9	0.5	3.3	0.7	4.2	0.7	4.2	1.2	4.9
45°-75°	0.5	3.1	0.7	3.6	0.8	3.9	0.9	4.1	1.2	4.8
75°-105°	1.0	4.0	1.5	4.7	1.9	5.2	2.1	5.5	3.1	6.5
105°-135°	0.9	3.7	1.1	4.1	1.3	4.4	1.4	4.6	2.0	5.4
135°-165°	0.9	3.4	1.1	3.8	1.2	4.0	1.2	4.0	1.6	4.7
165°-195°	0.8	3.3	1.0	3.6	1.2	3.9	1.2	3.9	1.6	4.3
195°-225°	0.9	3.7	1.2	4.3	1.3	4.4	1.4	4.6	1.8	5.2
225°-255°	0.8	3.1	1.1	3.6	1.3	3.9	1.4	4.0	1.9	4.6
255°-285°	1.0	3.5	1.4	4.0	1.7	4.4	1.8	4.5	2.7	5.3
285°-315°	1.2	4.3	1.6	4.8	1.8	5.0	2.0	5.2	2.7	5.9
315°-345°	0.7	3.7	0.9	4.1	1.1	4.5	1.2	4.6	1.7	5.3

Table 3-28 Correction factor from 1-hour to 3-hour maximum wind sea significant wave height

Return period	Correction factor from 1-hour to 3-hour maximum Hs
1 year	0.917

Return period	Correction factor from 1-hour to 3-hour maximum Hs
10 years	0.934
50 years	0.942
100 years	0.945
10000 years	0.959

Suggested wind waves spectral parameters are included in Table 3-29.

Table 3-29 Wind wave spectral parameters according to the Metocean design basis (Statens Vegvesen, 30.11.18)

Parameter	Recommended value
Spectrum	JONSWAP with average spectral width (σ_a=0.07 and σ_b=0.09)
JONSWAP peakedness factor	Between 1.8 and 2.3 (2.3 is used in the analyses)
Spreading function exponent (cos^n)	Between 3 and 8 (5 is used in the analyses)

3.3.3 Swell

The maximum swell significant wave height for different return periods is included in Table 3-30. The swell significant wave height shall be scaled for peak periods below 12 seconds as defined in Table 3-31. In addition, a factor of 0.917 shall be used to convert from the 1-hour to the 3-hour maximum swell significant wave height.

Table 3-30 Extreme swell conditions

Return period	1 year	10 years	50 years	100 years	10000 years
Significant wave height [m]	0.22	0.28	0.33	0.34	0.46

Table 3-31 Swell significant wave height scaling factor

Swell peak period [s]	Swell significant wave height scaling factor [-]
6	0.50
7	0.58
8	0.67
9	0.75
10	0.83
11	0.92
12	1.00
18	1.00
20	1.00

Suggested wind waves spectral parameters are included in Table 3-32.

Table 3-32 Swell spectral parameters according to the Metocean design basis (Statens Vegvesen, 30.11.18)

Parameter	Recommended value
Spectrum	JONSWAP with average spectral width (σ_a=0.07 and σ_b=0.09)
JONSWAP peakedness factor	Between 3 and 5 (5 is used in the analyses)
Spreading function exponent (cos^n)	Between 10 and 20 (20 is used in the analyses)
Mean swell direction	Between 300 and 330 degrees

3.3.4 Wind

Extreme wind speeds for different return periods are specified in Table 3-33; they shall be scaled depending on the incoming direction with the factors included in Table 3-34.

Table 3-33 Extreme wind speeds according to the Metocean design basis (Statens Vegvesen, 30.11.18)

Return period	Maximum 1-hour average wind speed [m/s]	Maximum 10-minutes average wind speed [m/s]
1 year	21.4	22.9
10 years	25.8	27.6
50 years	28.5	30.5
100 years	29.6	31.7
10000 years	35.9	38.4

Table 3-34 Extreme wind speed directional correction factor

Direction	Reduction coefficient
345°-15°	0.7
15°-45°	0.7
45°-75°	0.7
75°-105°	0.85
105°-135°	0.85
135°-165°	0.85
165°-195°	0.85
195°-225°	0.85
225°-255°	0.9
255°-285°	1.0
285°-315°	1.0
315°-345°	1.0

For the analyses herein, the 10-minutes average wind values have been applied, even though the simulation time is longer. This is a conservative choice which was made because it is not granted that the low-frequency content of the wind spectra ensures that the extreme 10-minute average wind speed values are achieved when simulating a wind time series with mean equal the 1-hour average wind speed.

The **wind profile** specified in the Metocean design basis (Statens Vegvesen, 30.11.18) is given as

$$V(z) = C_r(z) * C_{prob} * 24.3 \, , \qquad (3\text{-}10)$$

where $V(z)$ is the 1-hour average wind speed at height z and

$$C_r(z) = k_T * \ln(\frac{z}{z_0}) \text{ and } C_{prob} = \left(\frac{1-K*\ln(-\ln(1-p))}{1-K*\ln(-\ln(0.98))}\right)^n \, , \qquad (3\text{-}11)$$

where z_0=0.01, k_T=0.17, K=0.2, n=0.5 and $p=1$-exp(-$1/T$) where T is the return period in years.

The **turbulence intensity for winds from 0°-150° and 210°-360°** of the along wind component I_u is set in accordance with the Metocean design basis (Statens Vegvesen, 30.11.18) to

$$I_u = \frac{k_{tt}}{\ln(\frac{z}{z_0})} \qquad (3\text{-}12)$$

where k_{tt}=1.0, z_0=0.01 and z is the height above sea level. As the mean wind speed $V(z)$ also is proportional to ln(z/z_0), the standard deviation σ_u of the wind component within a stationary time period is constant with height, i.e.

$$\sigma_u = I_u * v_m = k_{tt} k_T C_{prob} * 24.3 = 4.29\ m/s\ (for\ 100\ year\ return\ period) \tag{3-13}$$

The standard deviation given in the Metocean design basis (Statens Vegvesen, 30.11.18) is assumed here to be representative for a stationary 10 minutes period. Since the analyses of the floating bridge will be performed on 3-hour periods, the 3-hour long wind fields will contain fluctuation at a larger range of frequencies (i.e. the wind field will contain also slower fluctuations). To maintain the energy level contained in the higher frequencies, it is necessary to increase the standard deviation of the wind time series. The required scaling factor is found by the ratio between the integral of the frequency spectrum in the frequency range f=[1/3hour, *inf*] and the range f=[1/10min, *inf*]:

$$\sigma_{u,3hr} = \sigma_{u,10\ min} \times \frac{\sqrt{\int_{f=\frac{1}{3hr}}^{\infty} S_i}}{\sqrt{\int_{f=\frac{1}{10min}}^{\infty} S_i}} \tag{3-14}$$

where S_i is the power spectral density, see below. For the P50 spectrum specified in the MDB, the factor is found to be 1.024, resulting in a 3-hour standard deviation of $\sigma_{u,3hr} = 4.39\ m/s$. The effect of this correction is considered to be minor.

The **turbulence intensity for winds from 150°-210°** is high on the southern side of the fjord before becoming more steady during the travel across the fjord. In the Metocean design basis (Statens Vegvesen, 30.11.18), the turbulence intensity is specified as given in Table 3-35. It is further stated that linear interpolation can be used between 50 m and 200 m above sea level.

Table 3-35 Turbulence intensities for southerly winds (coming from 150°-210°)

Sector/Height above sea level	Turbulence Intensity, I_u
10 m - 50 m	Linearly decreasing from 30% at southern tower to 17% in the north
200 m	15%

In TurbSim, the wind field is generated in three dimensions: a two-dimensional plane (y,z) and a time dimension. The third spatial dimension is, when the wind field is imported in Sima, taken as the time dimension with a one-to-one conversion based on the mean wind speed. This implies that a variation in turbulence intensity along the wind direction is not possible to model with the present modelling tool. As a conservative approach, the wind along the bridge is therefore modelled with a constant turbulence intensity along the bridge corresponding to the largest standard deviation (30% at 50 m height). The standard deviation of the *u*-component is constant with height and across the wind field in the present analyses.

Regardless of wind direction, the transverse and vertical turbulence components I_v and I_w are set (in accordance with the Metocean design basis (Statens Vegvesen, 30.11.18)) to

$$\begin{bmatrix} I_v \\ I_w \end{bmatrix} = \begin{bmatrix} 0.84 \\ 0.60 \end{bmatrix} I_u \tag{3-15}$$

The **one-point frequency spectra** $S_i(n)$ for all wind components are specified in the Metocean design basis (Statens Vegvesen, 30.11.18) as

$$\frac{nS_i}{\sigma_i^2} = \frac{A_i \hat{n}_i}{(1 + 1.5 A_i \hat{n}_i)^{5/3}} \quad \text{for} \quad i = u, v, w\,, \tag{3-16}$$

where A_i is the spectral density coefficient, σ_i is the standard deviation of the wind component and

$$\hat{n}_i = \frac{n\, {}^{x}L_i}{V(z)} \tag{3-17}$$

where n is the frequency and ${}^{x}L_i$ is an integral length scale parameter. The different parameters in this specification are given at 50 m above ground level in Table 3-36. In an e-mail from SVV /xx/, it was clarified that the spectral density coefficients (A_i's) were obtained through fitting to the observed data keeping the integral length scale parameters from N400. In other words, to best represent the spectral properties observed at site, the P10/P50/P90 value of the spectral density coefficients should be applied together with the integral length scales from N400.

In equation (5.2) of N400 (Norwegian public roads adm, 2015), a vertical variation in the integral length scale is indicated. In a clarification from SVV (Statens Vegvesen, Sent on 01.04.2019 at 13:42) it was stated that this height dependency should be considered also at this site. This leads to the following height dependent expression for $\hat{n}_i$:

$$\hat{n}_i = n \frac{L_{1,i}\left(\frac{z}{z_1}\right)^{0.3}}{V_c \ln\left(\frac{z}{z_0}\right)} \tag{3-18}$$

where $L_{1,I}$ is a the reference length scale for component *i,* in accordance with N400, $z_1=10$ m, $z_0=0.01$ m, and V_c is a constant found from the wind profile (see eq. (3-10)). With these values, a factor of 1.23 between $\hat{n}_i(z = 15\,m)$ and $\hat{n}_i(z = 50\,m)$ is obtained as an example. This height dependency is not possible to model in TurbSim. In the present work a reference height of 50 m is selected and used in the analyses, as this is the height at which site-specific wind data has been evaluated. The height dependency of the spectrum is negligible compared to the statistical variations of the spectral coefficients: the difference between P10 and P90 corresponds to a factor of 4.

In conclusion, the P50 values of A_i have been applied for the present analyses. The integral length scales have been set equal to the values listed in N400 (and replicated in Table 3-36 below.)

Table 3-36 Parameters for the definition of turbulence spectra and coherence functions, as specified in (Statens Vegvesen, Sent on 01.04.2019 at 13:42) (which was a correction to (Statens Vegvesen, 30.11.18)).

Parameter	N400	P10	P50	P90
^xL_u	162 m	108 m	232 m	586 m
^xL_v	40.5 m	50 m	141 m	472 m
^xL_w	13.5 m	21 m	40 m	81 m
^yL_u	54.0 m	X	X	X
^yL_v	40.5 m	X	X	X
^yL_w	9.0 m	X	X	X
^zL_u	32.4 m	X	X	X
^zL_v	13.5 m	X	X	X
^zL_w	9.0 m	X	X	X
A_u	6.8	3.9	7.3	16.3
A_v	9.4	5.6	13.3	32.5
A_w	9.4	7.7	12.3	18.2
C_{uy}	10.0	6.4	8.0	10.8
C_{uz}	10.0	8.3	11.5	17.6
C_{vy}	6.5	3.0	3.8	4.9
C_{vz}	6.5	6.0	8.8	16.5
C_{wy}	6.5	4.5	5.8	8.3
C_{wz}	3.0	2.8	3.7	5.7

The **normalized co-spectra** $S_{i1,i2}$ (for $i=u,v,w$) between points 1 and 2 separated in the (y,z)-plane (normal to the main wind direction) is specified in the Metocean design basis (Statens Vegvesen, 30.11.18) as

$$\frac{RE[S_{i_1 i_2}(n,\Delta s_j]}{\sqrt{S_{i_1}(n)S_{i_2}(n)}} = exp\left(-C_{ij}\frac{n\Delta s_j}{V(z)}\right), \text{for } i_1, i_2 = u,v,w \;\; and\; j = y,z, \qquad (3\text{-}19)$$

where Δs_j is the horizontal or vertical distance between the points. Values for C_{ij} are given in Table 3-36. $V(z)$ is assumed by DNV GL to be the mean wind speed averaged at the two points.

The P10 values for C_{ij} in Table 3-36 have been selected here, as these give a more coherent wind field than the larger values. This is assumed to give a higher global response than less coherent wind fields.

Eq. (3-19) is an exponential Davenport coherence function, where it can be noted that none of the six C_{ij} values are equal. In TurbSim, it is not possible to specify different coherence for vertical and horizontal separations. For the floating part of the bridge, the horizontal coherence is more important than the vertical coherence. Therefore, the vertical coherence coefficients are in practice set equal to the horizontal ones, i.e. $C_{uz}=C_{uy}=6.4$, $C_{vz}=C_{vy}=3.0$, and $C_{wz}=C_{wy}=4.5$.

In TurbSim, a more general expression than eq. (3-19) is implemented. The "IEC Coherence" model, which is applied here, is given as

$$\frac{RE[S_{i_1 i_2}(n,\Delta s]}{\sqrt{S_{i_1}(n)S_{i_2}(n)}} = exp\left(-a_i\sqrt{\left(\frac{n\Delta s}{\bar{V}_{hub}}\right)^2 + (b_i\Delta s)^2}\right), \text{for i} = u,v,w\,. \qquad (3\text{-}20)$$

where $\bar{V}_{hub}$ is the mean wind velocity at "hub height", which in practice is the height of the middle of the defined wind field. This value is therefore not varying across the wind field, in contrast to the coherence function defined in eq. (3-19). In the wind field applied in the present analyses, the $\bar{V}_{hub}$ is evaluated at a height of 42.5 m, which leads to a slight increase in the coherence for most of the bridge girder. However, this effect is small compared to the variation in coherence represented by the P10 and P90 values in Table 3-36. Another limitation in the TurbSim implementation is that it is not possible to set b_i to zero. Hence, it is set as low as possible in the present analyses (b_i=0.00001). As can be seen in Figure 3-25, the effect of this is negligible.

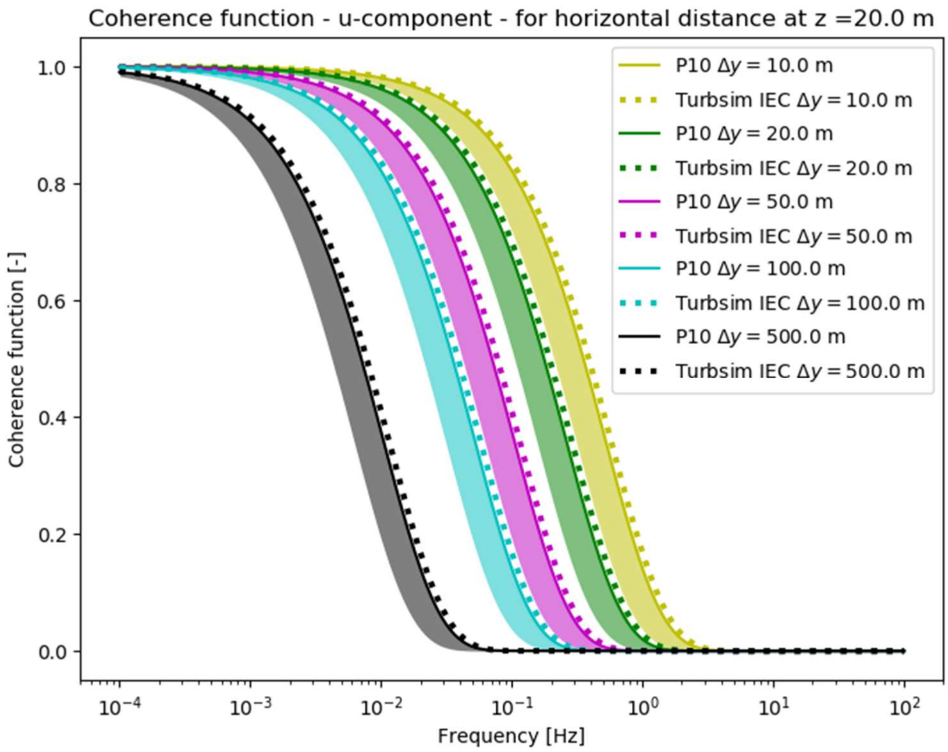


Figure 3-25: Coherence function for *u*-component, for horizontal separations (Δy). The shadowed areas represent P10 to P90 values as given in the Metocean design basis (Statens Vegvesen, 30.11.18).

3.3.5 Current

The maximum current velocities at different locations in the fjord are included in Table 3-37.

The current velocity is assumed constant and uniform in the water column.

Table 3-37 Extreme current velocity at different locations in Bjørnafjord (Statens Vegvesen, 30.11.18), see Figure 3-27

Return period	Depth [m]	Current velocity [m/s]				
		S1	S2	S3	S4	Average
10 years	1.5	1.49	1.45	1.27	1.30	1.38
	5	1.26	1.55	1.26	1.55	
	10	1.23	1.18	1.08	1.14	
	15	0.96	0.99	1.11	1.29	
50 years	1.5	1.68	1.63	1.46	1.54	1.58
	5	1.45	1.85	1.51	1.94	
	10	1.39	1.34	1.24	1.38	
	15	1.15	1.14	1.31	1.54	
100 years	1.5	1.76	1.71	1.54	1.64	1.66
	5	1.53	1.97	1.62	2.11	
	10	1.46	1.40	1.31	1.48	
	15	1.23	1.21	1.39	1.65	

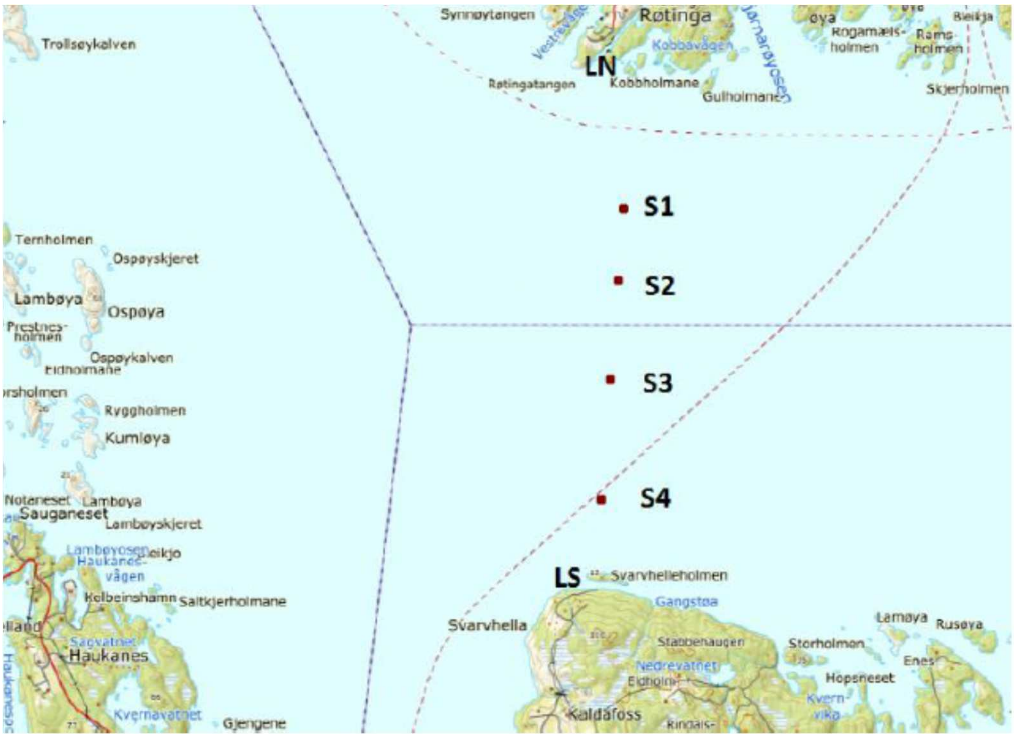


Figure 3-27 Location of the current measurement stations, from (Statens Vegvesen, 30.11.18)

3.3.6 Tidal variations

The water level variation is defined a combination of an astronomical component and the effect of atmospheric sources. Table 3-38 summarizes the different astronomical extreme tidal amplitudes. The extreme water levels for different return periods are included in Table 3-39. The atmospherical component can be calculated as the difference between the extreme levels and the MSL.

Table 3-38 Tidal amplitudes

Component	Amplitude [m]
Lowest Astronomical Tide (LAT)	0.00
Mean Low Water (MLW)	0.39
Mean Sea Level (MSL)	0.77
Mean high water (MHW)	1.15
Highest Astronomical Tide (HAT)	1.53
NN 1954	0.88
NN 2000	0.97

Table 3-39 Extreme water level for different return periods

Return period	Highest water level [m]	Lowest water level [m]
1 years	1.81	-0.20
10 years	1.97	-0.30
100 years	2.10	-0.50
10000 years	2.50	-0.65

The mean water level shall be increased by 0.74 metres due to climate change where this is unfavourable.

3.3.7 Temperature loads

Table 3-40 Extreme temperatures for different return periods

Return period	Minimum temperature [deg]	Maximum temperature [deg]
1 years	-7	25
10 years	-12	29
100 years	-15	32
10000 years	-17	33

3.3.8 Environmental load combinations

Table 3-41 presents the return period for each of the environmental effects for the applicable environmental load combinations, as defined in (Statens Vegvesen, 2018).

Table 3-41 Return period for each component for the environmental load combinations

Return period	Wind	Waves		Current	Sea level	
		Wind sea	Swell		Astonomical	Atmospheric surge
1 years	1	1	1	1	HAT	1
10 years	10	10	1	10	HAT	10
	1	1	10	1	HAT	1
100 years	100	100	10	100	HAT	100
	10	10	100	10	HAT	10
10000 years	10000	10000	100	10000	MSL	10000
	100	100	10000	100	MSL	100

3.3.9 Fatigue conditions

The Metocean Design Basis for Bjørnafjorden (Statens Vegvesen, 30.11.18) includes wind sea scatter diagrams for different sectors and an omni-directional scatter diagram. A relation between wind speed and significant wave height is also specified for each sector. Wind sea from East shall not be combined with swell.

The load cases for fatigue analyses are generated according to the following procedure:

- The sea states outside the 210-330 degrees sector are included with their probabilities as defined in the wind waves scatter diagrams.
- The wind wave sea states in the 210-330 degrees sector shall be combined with swell. Both the wind sea and swell conditions in the scatter diagrams are sorted by decreasing probability of occurrence. The wind sea and swell conditions are combined pairwise in this decreasing probability order. The following considerations are made:
    - If wind sea probability is larger than swell probability, the sea state is split in two: one with swell and with the swell case probability; and one with wind sea only with the remaining probability.
    - If swell probability is larger than wind sea probability, the wind sea probability is assigned. This happens for 70 sea states, all of them with a low probability. Only 0.34% of the swell probability is lost by this procedure.
    - Swell direction is randomly selected in the 300-330 degrees range.

- Swell conditions with less than 3 cm significant wave height are discarded.

- Current speed is set to zero. This is a conservative assumption, as the main effect of current is damping.

It should be noted that this combination of wind sea and swell will be somewhat random.

A total of 580 load cases are established for the fatigue analyses. The complete list of sea states for the fatigue analyses is included in Appendix XXXX.

3.3.10 Marine fouling

Marine fouling, also referred to as marine growth, is not considered in the base case analysis.

4 METHOD DESCRIPTION

4.1 Time domain simulations

4.1.1 General

Time domain simulations have been performed with a net duration of 3 hours when the initial 1200 seconds are removed before further processing. Output from the simulations are time series of sectional loads (axial force, shear forces, bending moments and torque) at selected elements in the global model and motions at the pontoons and at the bridge girder at each axis.

For ULS/ALS code checks envelopes of 3-hour P90 extreme values along the bridge loads will be provided, hence information about concurrency between the different sectional loads will not be used and the most onerous combinations must be applied.

For FLS code checks time series of stress resultant will be calculated based on mechanical transfer functions and time series of sectional loads as input. The stress time series will then be used for fatigue calculations through rainflow-counting, using appropriate SN curves for the actual details.

4.1.2 Fitting statistical distribution to samples of extreme load effects

30 simulations with randomized wind and wave field for each 100-year environmental condition were run.

Before further processing, the permanent/functional component (self-weight) was removed.

For each load effect, e.g. axial force, the largest value from each of the 30 repetitions was found, resultimg in an extreme value sample of size 30.

Then a generic Gumbel distribution, c.f. equation **(21)**, is fitted to the extreme value samples using equations **(22)** and **(23)**.

$$F(x_e; 3hr) = \exp\left(-\exp\left[-\frac{x_e - \mu}{\beta}\right]\right) \qquad \textbf{(21)}$$

where:

x_e = 3-hour extreme value [kN]

μ = Gumbel location parameter [kN]

β = Gumbel scale parameter [kN]

$$\beta = \frac{\sqrt{6}}{\pi} \cdot S_{Xe} \qquad \textbf{(22)}$$

$$\mu = \overline{x_e} - 0.57722 \cdot \beta \qquad \textbf{(23)}$$

where:

$\overline{x_e}$ = Extreme value sample mean

S_{Xe} = Extreme value sample (unbiased) standard deviation

The estimate the 100-year load effect as the 0.90 fractile of the fitted Gumbel distribution.

Note the following relations:

- Expected 3 hour maximum = $\overline{x_e}$. Corresponds to 0.57 fractile (43% probability of exceedance).
- Most Probable 3-hour Maximum (MPM) = α**.** Corresponds to 0.37 fractile (63% probability of exceedance).

Examples of Gumbel extreme value distributions are shown in Figure 4-1.

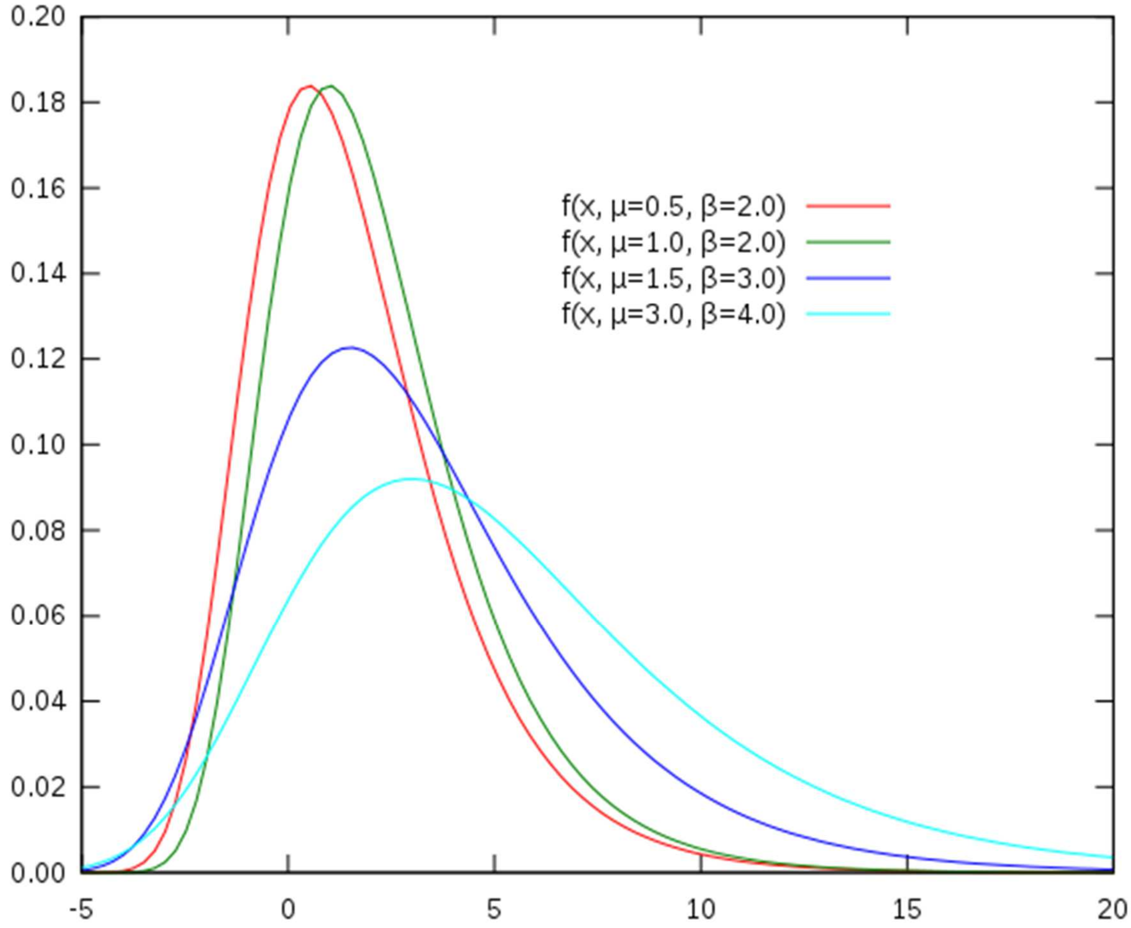


Figure 4-1 Gumbel probability distributions with different location parameter (μ), and different scale parameter (β).

4.1.3 Estimating the characteristic load effects

The exact 100-year load effect can only be found trough a proper long-term analysis accounting for both the variability in the short-term environmental conditions and the long-term variability of the climate parameters defining the short-term environmental conditions e.g. H_S. For marine structures, DNV GL typically apply the 0.9 fractile (10% probability of exceedance) in the extreme value distribution of largest 3-hour maximum based on 100-year environmental conditions as an estimate of the 100-year load effect. Calibration with long-term calculations may prove other fractiles to be more precise estimates, but a priory this is not known.

4.1.4 Calculation of stresses

For extraction of normal and shear stresses from the model; stress transfer factors have been established for the bridge cross sections. For each cross section, factors have been derived for eight selected points for responses in all six degrees of freedom. The locations of the selected points are shown in Figure 4-2. As can be seen; stresses were calculated for all knuckle points in the outer plating as well as in bottom plating at bridge girder centre line. The stress transfer factors for the typical low bridge midspan are listed in Table 4-1. The signing of the stress factors was based on combinations of forces and moments assuring that the resulting stress is given the right signing. For normal stress; tension was defined as positive. The stress transfer factors for other cross sections are listed in Appendix XXX. It should be noted that the stresses were based on the lesser plate thickness in the knuckle points.

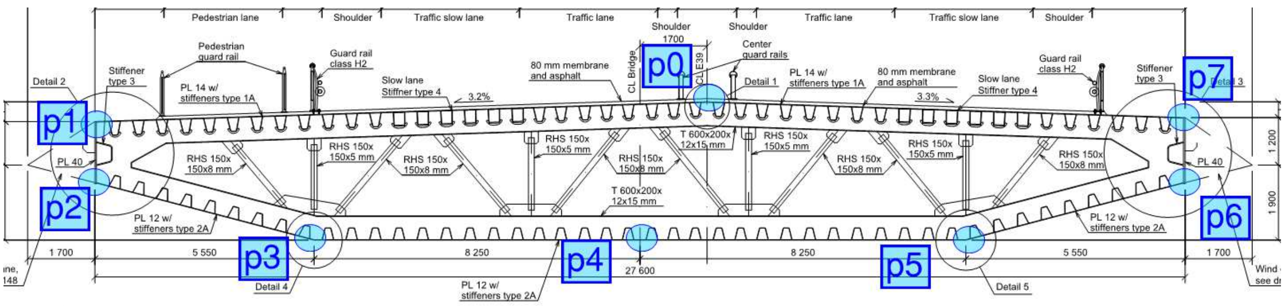


Figure 4-2 Selected points for stress transfer factor calculations

Table 4-1 Midspan low bridge – Stress factors

Position	**C_{xA} [m^{-2}]**	**C_{xMs} [m^{-3}]**	**C_{xMw} [m^{-3}]**	**$C_{\tau z}$ [m^{-2}]**	**$C_{\tau y}$ [m^{-2}]**	**$C_{\tau M}$ [m^{-3}]**
Point 0	0.63	-0.013	-0.526	0.000	1.695	0.432
Point 1	0.63	0.116	-0.353	11.734	0.000	0.432
Point 2	0.63	0.116	0.192	13.489	0.000	0.504
Point 3	0.63	0.069	0.685	0.000	1.469	-0.504
Point 4	0.63	0.000	0.685	0.000	1.99	-0.504
Point 5	0.63	-0.068	0.685	0.000	1.485	-0.504
Point 6	0.63	-0.114	0.192	11.562	0.000	-0.504
Point 7	0.63	-0.114	-0.388	13.69	0.000	-0.432

The axial and shear stresses at check point i are calculated as:

$$\sigma_x = C_{xA} * P_A + C_{xiMs} * M_S + C_{xiMw} * M_w$$

$$\tau_{xy} = C_{\tau iy} * Q_y + C_{\tau iz} * Q_z + C_{\tau iM} * M_{tor}$$

Where:

P_a – axial load (positive when tension)

Ms – Strong axis moment (positive when tension in negative y-axis – east side)

Mw – Weak axis moment (positive when tension in negative z-axis - bottom flange)

M_{tor} – torsional moment (positive when rotation is clockwise in x-direction)

C_{xA} Stress factor axial

C_{xMs} Stress factor strong axis bending

C_{xMw} Stress factor weal axis bending

$C_{\tau z}$	Stress factor vertical shear
$C_{\tau 1y}$ (horizontal shear)	Stress factor horizontal shear
$C_{\tau 1Mtor}$	Stress factor torsional moment

The combined stresses are calculated as follows:

$$\sigma_{comb} = \sqrt{\sigma_x{}^2 + 3 \cdot \tau_{xy}{}^2}$$

4.1.5 Calculation of stress cycles for FLS analyses

An internal rainflow-counting algorithm is used to estimate the number of cycles for each of the stress ranges in the FLS analysis.

4.2 Applied software

The software suite consisting of SIMO (SINTEF Ocean, 2017), RIFLEX (SINTEF Ocean, 2017) and SIMA (SINTEF Ocean, 2017) from SINTEF Ocean is applied for the static and dynamic load effect calculations. The software suite is validated trough decades of application to offshore, subsea and maritime problems. The following program versions have been used for these analyses:

- SIMO 4.12.3
- RIFLEX 4.12.3
- SIMA 3.4-00

TurbSim version 2.00.07 (B.J. Jonkmann, 2012) has been applied to simulate three component wind fields in a three-dimensional domain. TurbSim is developed by the federal National Renewable Energy Laboratory (NREL) in US, and is used extensively for load and response analyses of wind turbines within the wind energy industry. Output from TurbSim is read directly by SIMO/RIFLEX and SIMA.

5 GLOBAL ANALYSIS RESULTS

5.1 General

Load effect calculations are performed based on the information in Section 3.

The results from the eigen value calculations are documented in Section 5.2.

The static load effects such as permanent loads are documented in Section 5.3.

The dynamic load effects from environmental loading are documented in Section 5.4.

The combination of the different contributors in the environmental loads is investigated in Section 5.4.6.5.

Mooring line loads in extreme and fatigue conditions are reported in Section 5.5.

Functional requirements are checked in Section **Error! Reference source not found.**

A series of sensitivity analyses are presented in Section **Error! Reference source not found.**.

Calculated loads are compared against designer's analyses in Section 5.6.

Permanent loads and stresses are subtracted from the rest of static and dynamic loads and stresses.

5.2 Natural periods and modes

The eigen modes are calculated based on the full SIMO-RIFLEX model of the bridge, including the mooring lines and stay cables. These calculations therefore include several modes corresponding to the mooring line vibrations.

In the present version of SIMA it was only possible to calculate eigen values with frequency independent added mass. Therefore 7 different calculations were done, each with constant added mass for the pontoons based on period 5 seconds to 35 seconds in steps of 5 seconds. The resulting eigen period for a specific mode is then taken from the analyses with the period for added mass that is closest to actual natural period.

Table 5-1 presents the first eigen periods. The first horizontal and the first vertical modes are shown in Figure 5-1 and Figure 5-2.

Table 5-1 Comparison of natural periods

Description	Independent analysis	
	Mode #	**Period [s]**
First transverse mode	1	54.4
Second transverse mode	2	39.7
Third transverse mode	3	28.1
Fourth transverse mode	4	18.6
Fifth transverse mode	5	14.8
First vertical mode	33	7.66

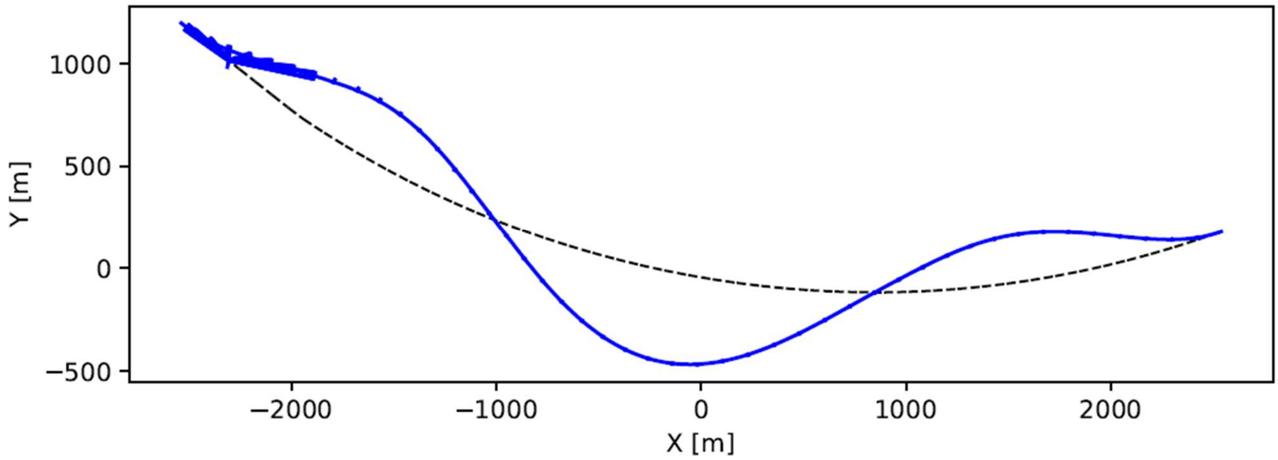


Figure 5-1 Mode 1 in the independent coupled analysis model

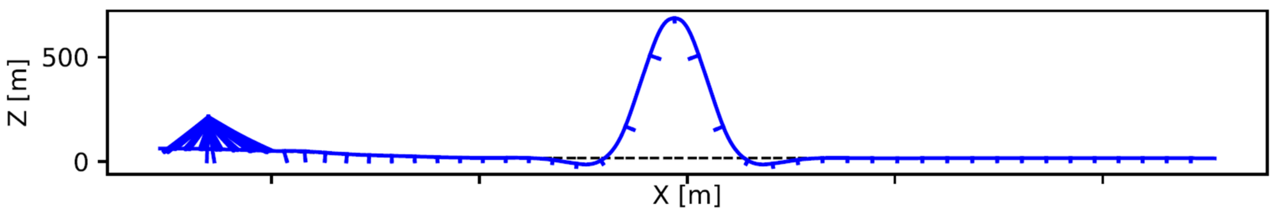


Figure 5-2 Mode 33 in the independent coupled analysis model

5.3 Static load effects

5.3.1 General

Static load cases are presented in this section. Environmental and traffic loads are not considered in this analyses.

Permanent loads and deformations due to self-weight, buoyancy and mooring and stay cables pretension are presented in Section 5.3.2. It shall be noted that these permanent loads are subtracted from all the other load cases results presented in this report, both static and dynamic.

The loads produced by the expansion and contraction of the bridge girder due to temperature changes are reported in Section 5.3.3.

The effects of water level variations are studied in Section 5.3.4.

Plots with the different loads for each load case are presented in Appendix XXXX.

5.3.2 Permanent loads

The static configuration of the bridge under permanent loads is not completely as designed as presented in Figure 5-3. The bridge girder presents small deviations from its straight shape due to the difficulty of adjusting mooring line pretension to accurately match both design line tension and shape. In addition, deformations due to self-weight weak axis bending moment are not compensated in the analysis.

The following figures present the loads on the bridge girder, while Table 5-2 summarizes the maximum loads on the “high-bridge” tower.

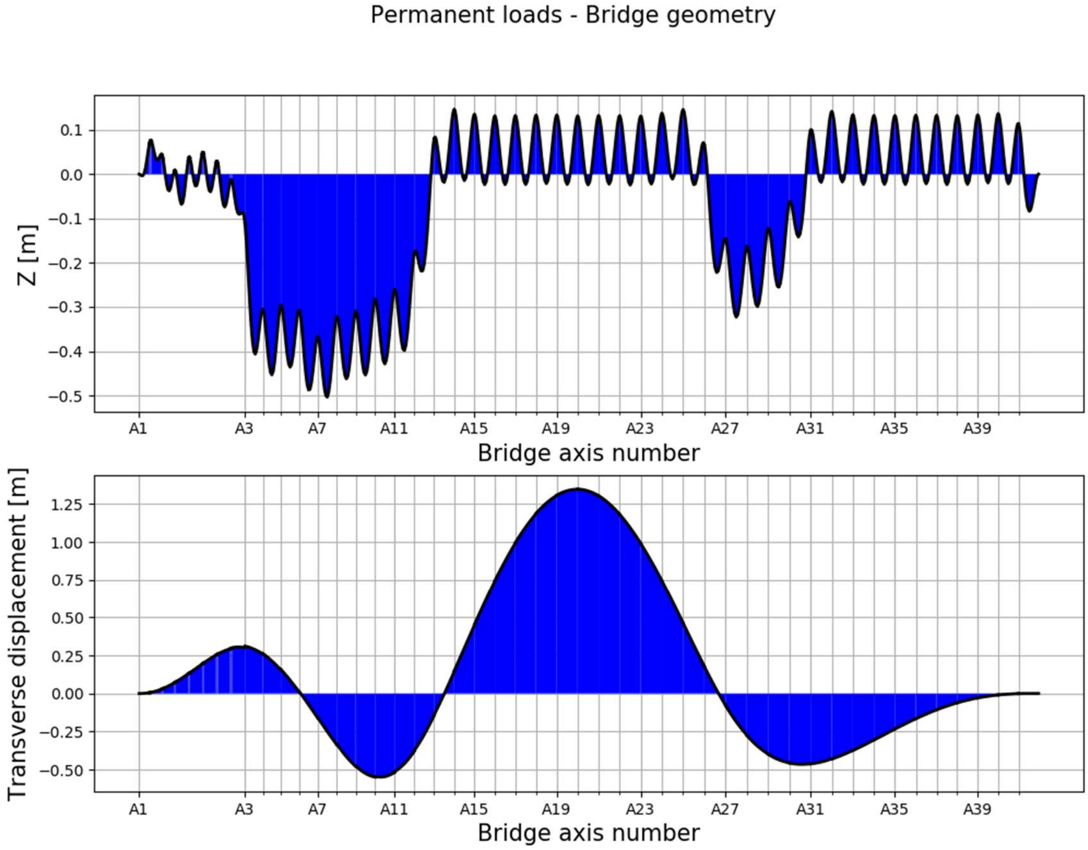


Figure 5-3 Deformed shape of the bridge girder under permanent loads

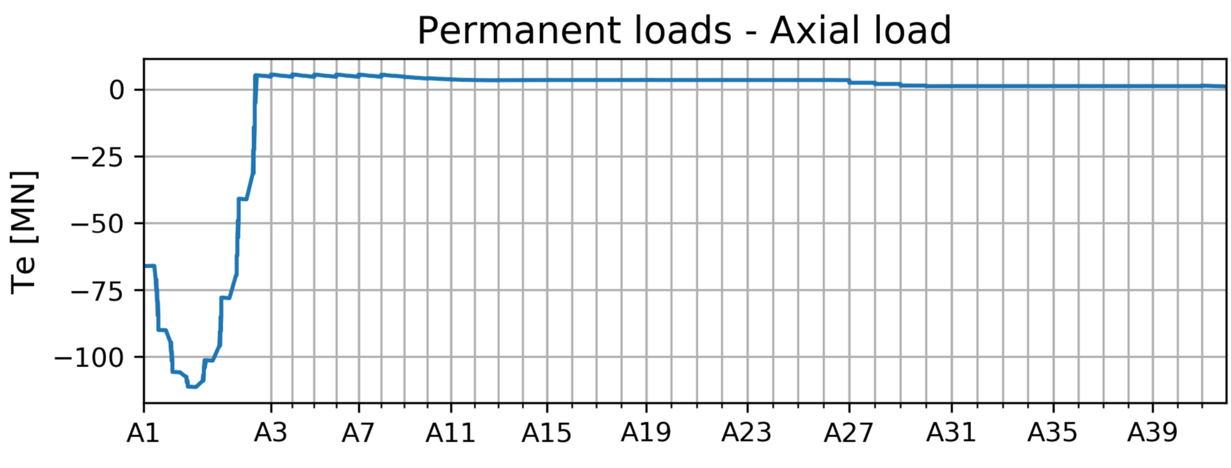


Figure 5-4 Axial loads in bridge girder under permanent loads

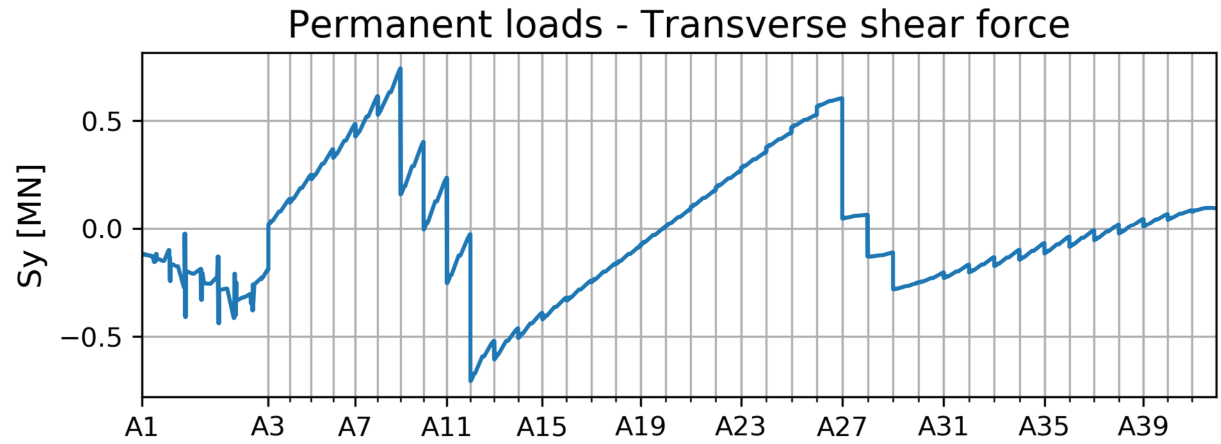


Figure 5-5 Transverse shear force in bridge girder under permanent loads

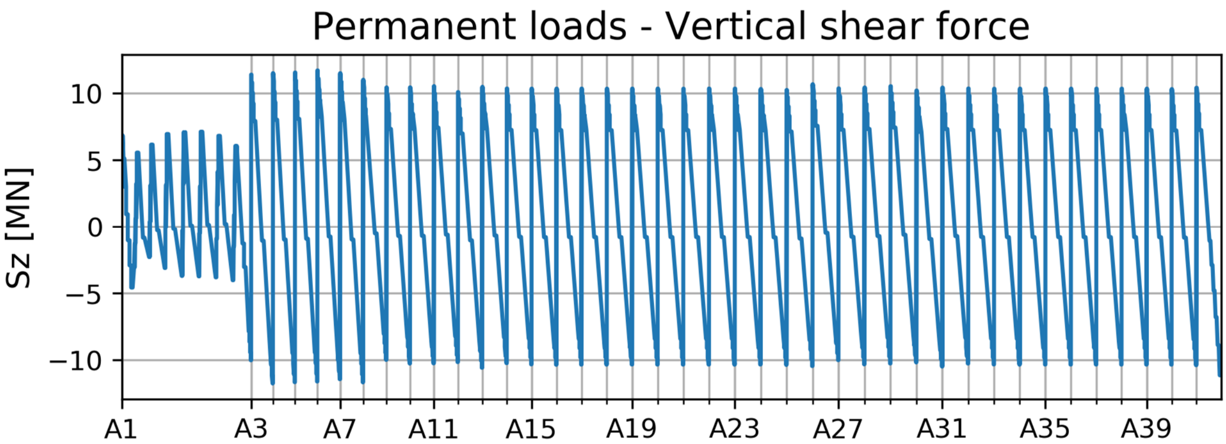


Figure 5-6 Vertical shear force in bridge girder under permanent loads

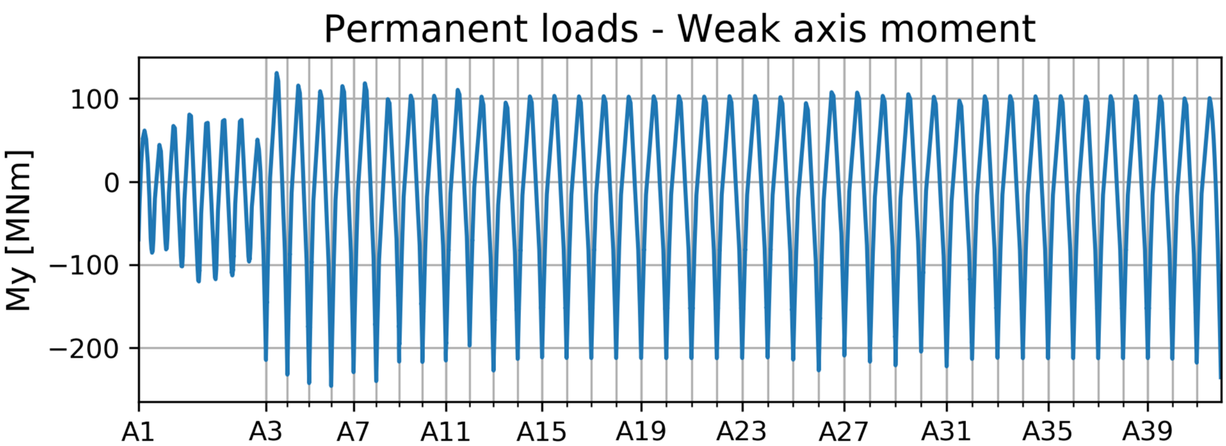


Figure 5-7 Weak axis moment in bridge girder under permanent loads

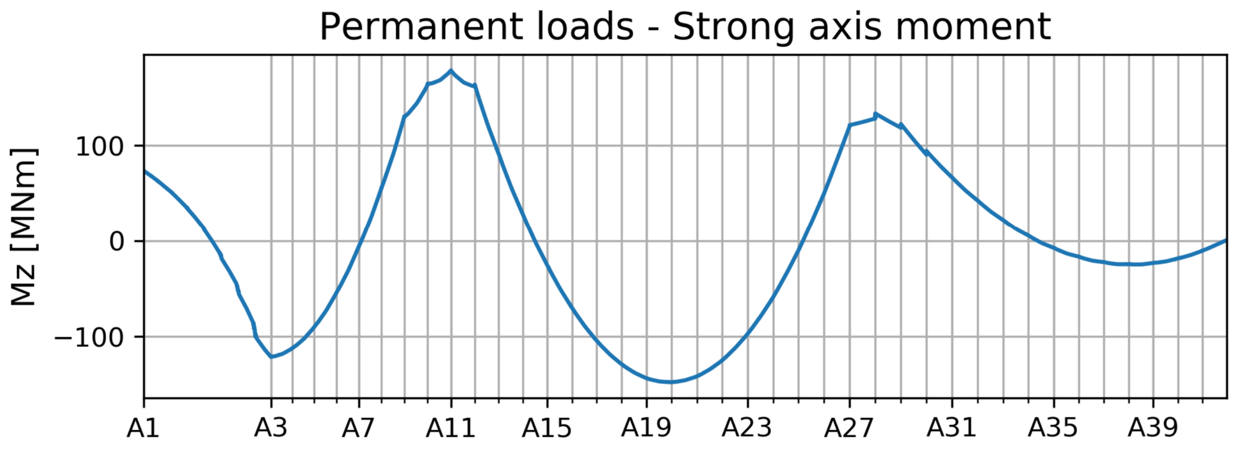


Figure 5-8 Strong axis moment in bridge girder under permanent loads

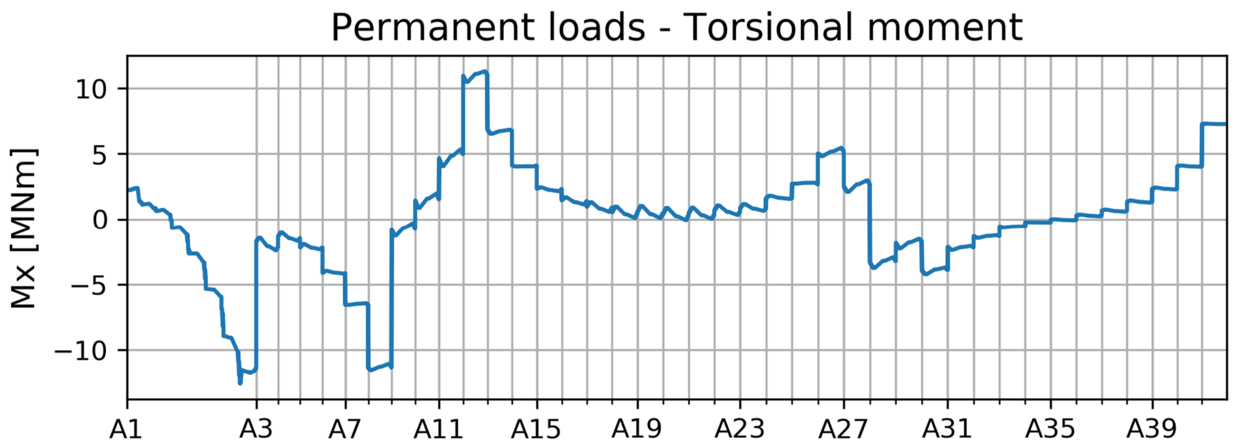


Figure 5-9 Torsional moment in bridge girder under permanent loads

Table 5-2 High bridge tower loads under permanent loads

Parameter	Unit	Tower legs	Tower top
Min axial force	MN	-220.7	-188.4
Max axial force	MN	-98.2	0
Min bending moment y-axis	MNm	-179.1	-295.9
Max bending moment y-axis	MNm	389.9	0
Min bending moment z-axis	MNm	-152.4	0
Max bending moment z-axis	MNm	429.9	2.6
Max torsional moment	MNm	9670	0

5.3.3 Temperature loads

The effect of temperature oscillations is studied by modifying the unstressed bridge girder length. A positive 10 degrees difference is expected to produce a 0.012% expansion of the bridge girder.

Both positive and negative temperature variations are studied, although its effect is very linear.

The most significant effects of a temperature change are the strong axis bending moment, the transverse shear force and the torsional moment, as shown below.

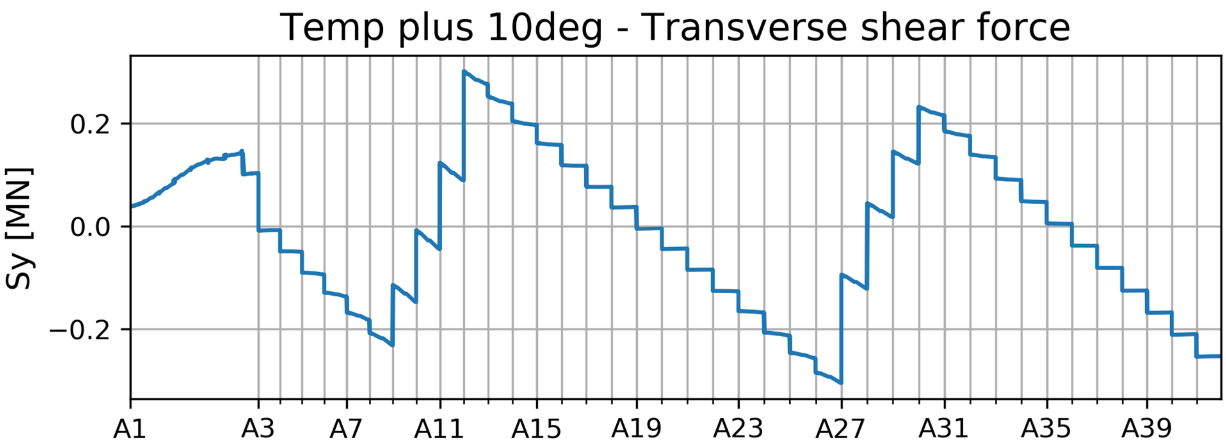


Figure 5-10 Vertical shear force in bridge girder due to a 10 degrees temperature increase

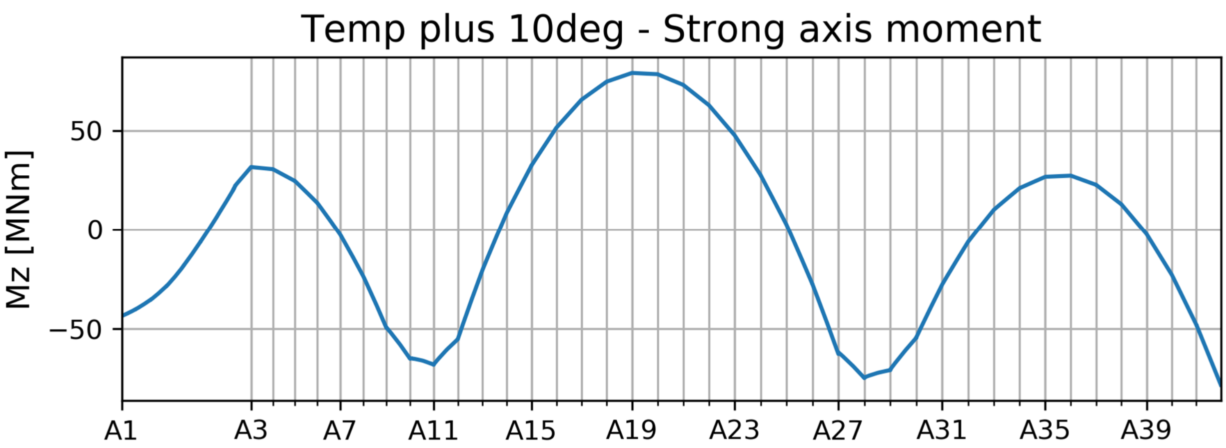


Figure 5-11 Strong axis bending moment in bridge girder due to a 10 degrees temperature increase

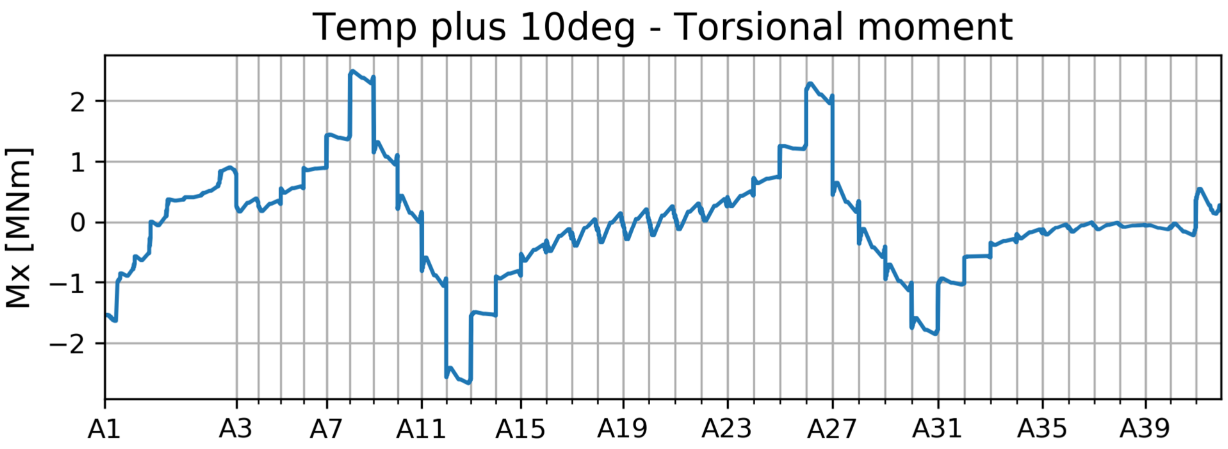


Figure 5-12 Torsional moment in bridge girder due to a 10 degrees temperature increase

5.3.4 Tidal loads

The loads induced by a 1-metre variation of the water level are studied in this section. The results for a decrease in the water level show a linear response.

The effect of tidal variations is more noticeable in the North end and at Axis 3, where there is a large weak axis bending moment, comparable to the permanent loads, presented in Figure 5-7. The following figures summarize the main loads due to water level variations.

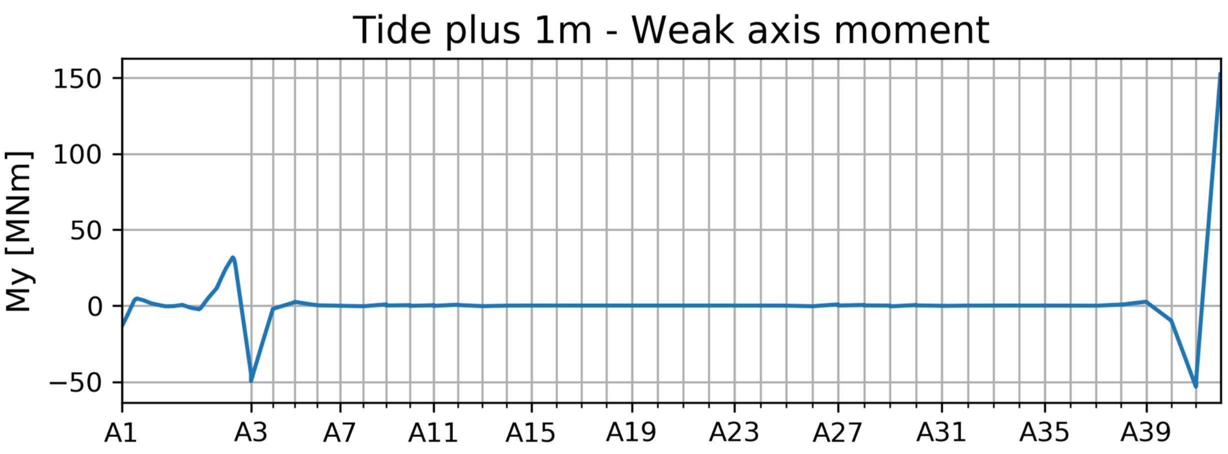


Figure 5-13 Weak axis bending moment in bridge girder due to a 1 metre water level increase

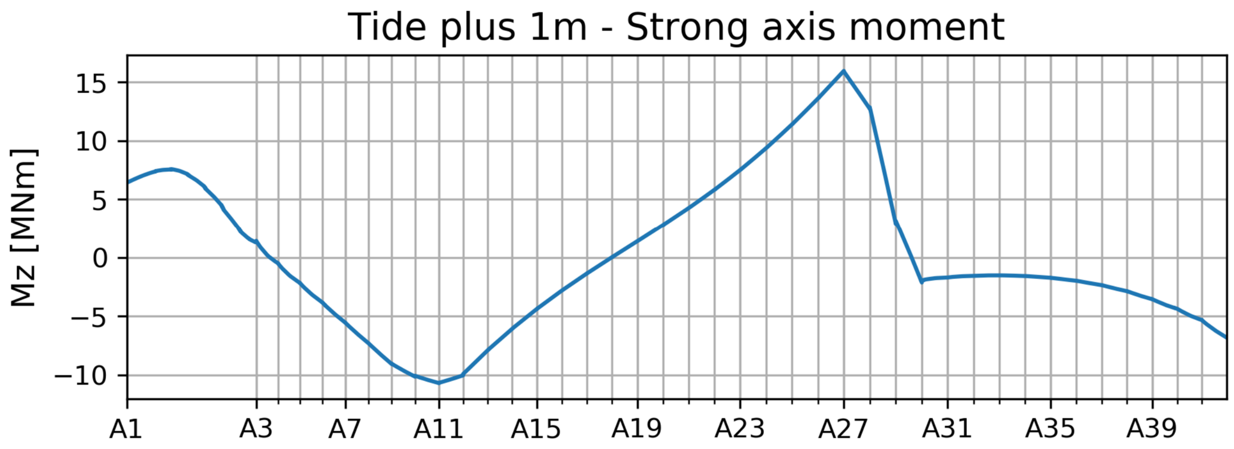


Figure 5-14 Strong axis bending moment in bridge girder due to a 1 metre water level increase

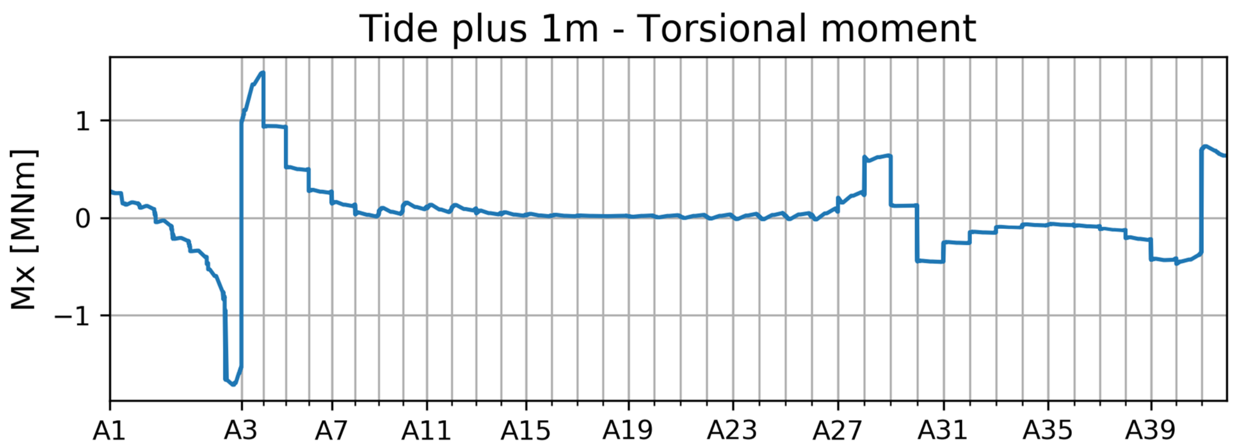


Figure 5-15 Torsional moment in bridge girder due to a 1 metre water level increase

5.4 Environmental load effects

5.4.1 General

Wave-, wind- and current loading is calculated simultaneously based on the SIMO-RIFLEX coupled analysis model. An initial screening analysis is performed for a reduced number of wave- and wind realizations to identify the governing conditions. The 1-, 100- and 10000-year loads are calculated for those governing conditions, assuming they do not vary across return periods.

The sea states are denoted by the following notation: *XXXyy_ZZZ*, where:

- *XXX* corresponds to the return period: *1*, *100* or *10000*.
- *yy* identifies the dominating wave component: *wa* for wind waves or *sw* for swell.
- *ZZZ* corresponds to the wind-, wind waves- and current incoming direction in degrees.

5.4.2 100-years return period conditions screening analyses

A screening analysis is performed for all the directions using 5 wave realizations to estimate the 90% fractile maximum of the different loads and stresses. Both wind wave dominating- and swell dominating load cases are tested. A summary of the analysis parameters is included in Table 5-3 and the applied sea states are presented in Table 5-4.

Table 5-3 Analysis parameters for the 100-years return period conditions screening analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	From 0 to 330 degrees every 30 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	5

Table 5-4 Environmental conditions for the 100-years return period conditions screening analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
100wa_000	0.76	4.00	0				22.2	0	0.80	0
100wa_030	0.66	4.20	30				22.2	30	0.88	30
100wa_060	0.85	4.10	60				22.2	60	0.97	60
100wa_090	1.98	5.50	90				26.9	90	1.08	90
100wa_120	1.32	4.60	120				26.9	120	0.81	120
100wa_150	1.13	4.00	150				26.9	150	0.90	150
100wa_180	1.13	3.90	180				26.9	180	1.34	180
100wa_210	1.32	4.60	210	0.26	12	320	26.9	210	1.53	210
100wa_240	1.32	4.00	240	0.26	12	320	28.5	240	1.46	240
100wa_270	1.70	4.50	270	0.26	12	320	31.7	270	1.13	270
100wa_300	1.89	5.20	300	0.26	12	320	31.7	300	0.91	300
100wa_330	1.13	4.60	330	0.26	12	320	31.7	330	0.80	330
100sw_210	1.12	4.30	210	0.31	12	320	23.5	210	1.26	210
100sw_240	1.03	3.60	240	0.31	12	320	24.8	240	1.21	240
100sw_270	1.31	4.00	270	0.31	12	320	27.6	270	0.94	270
100sw_300	1.49	4.80	300	0.31	12	320	27.6	300	0.76	300
100sw_330	0.84	4.10	330	0.31	12	320	27.6	330	0.66	330

The selection of the governing sea states is based on the conditions resulting on the envelope of the combined stresses at all the knuckle points in the cross sections along the bridge girder, as defined in Figure 4-2. As an example, Figure 5-16 shows the combined stress at Point 3, while Figure 5-17 shows the same results for the selected governing conditions.

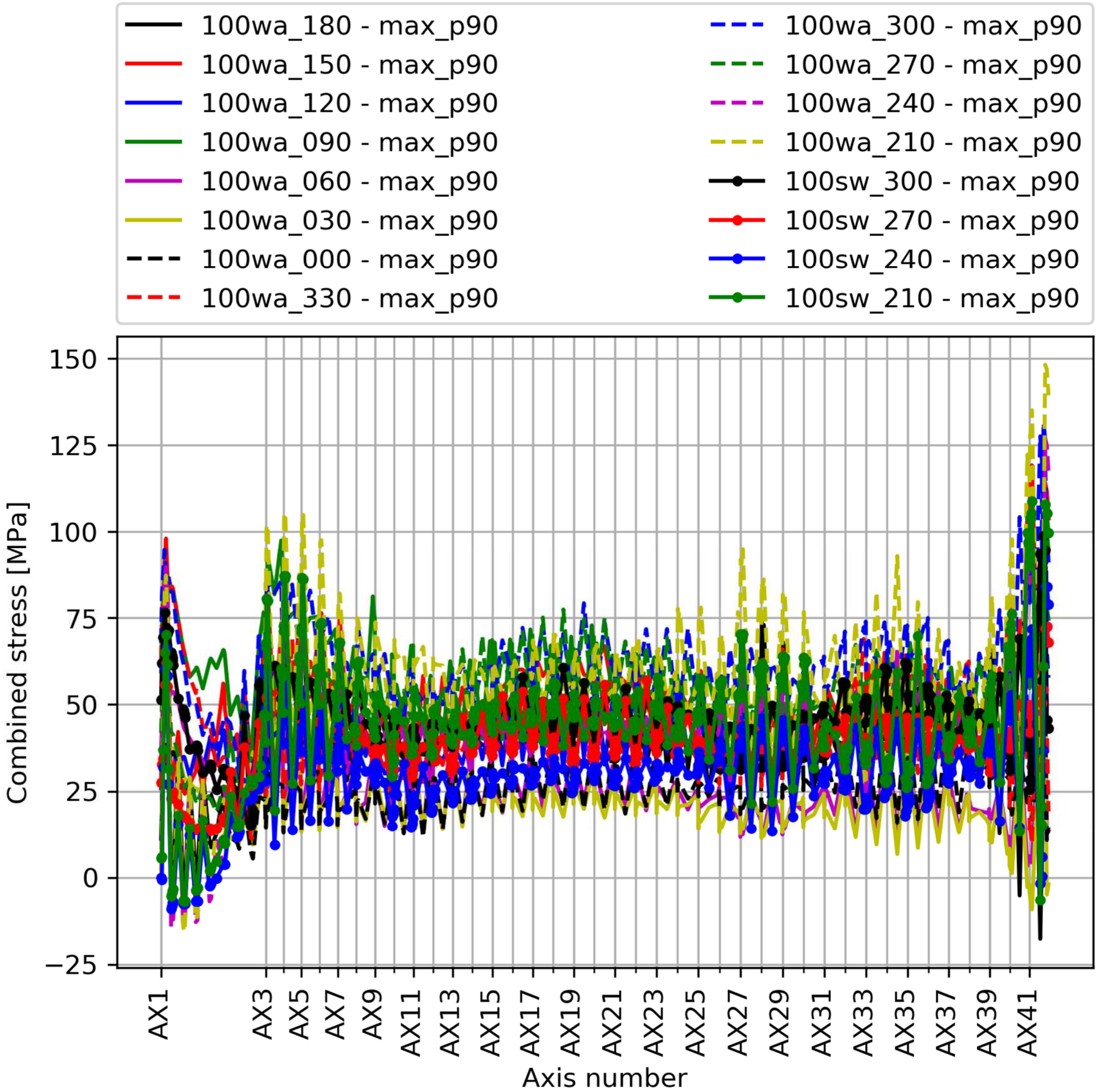


Figure 5-16 Combined stress at Point 3 based on the 100-years return period condition screening analysis

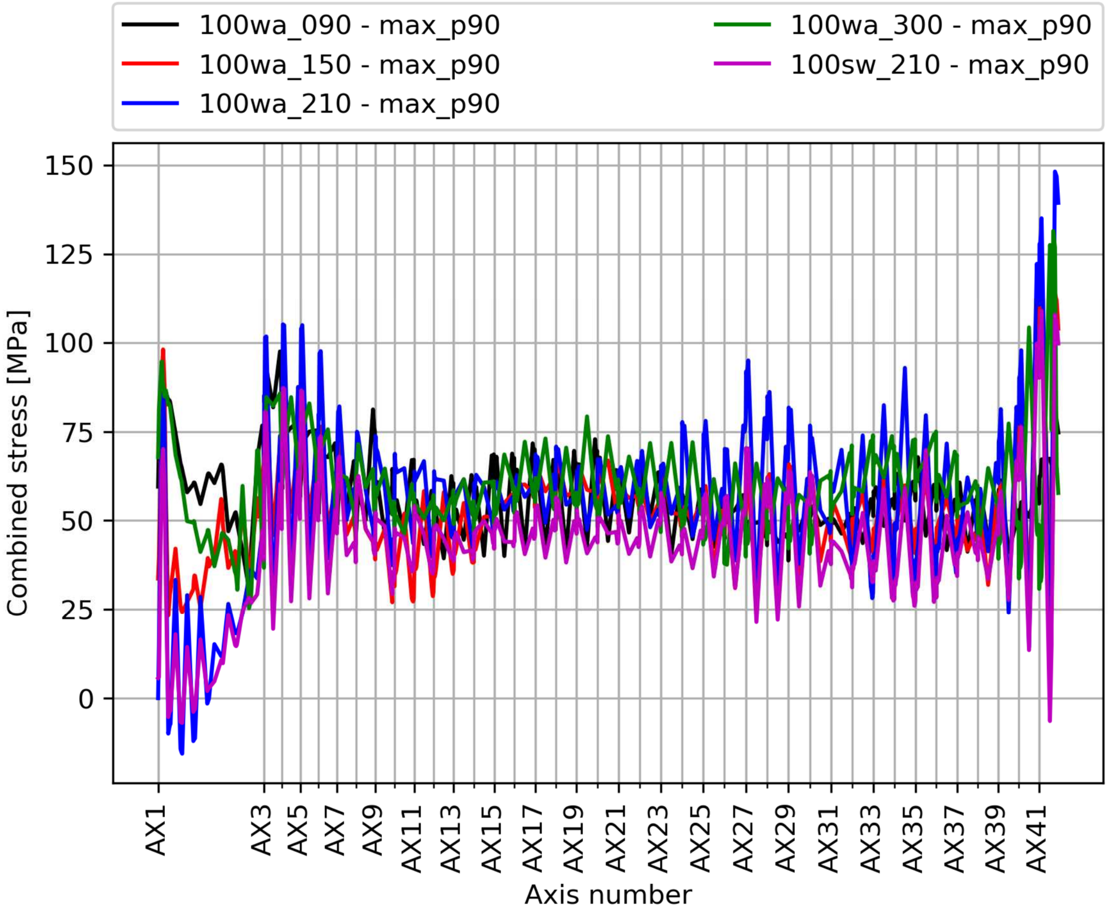


Figure 5-17 Combined stress at Point 3 based on the 100-years return period condition screening analysis for the governing conditions

5.4.3 100-years return period conditions analysis of the governing conditions

The 90% fractile loads and stresses are calculated based on 30 different wave- and wind- realizations, as indicated in Table 5-5. The five governing sea states are presented in Table 5-6.

Table 5-5 Analysis parameters for the 100-years return period conditions analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	Wind wave dominating: 90, 150, 210, 300 degrees Swell dominating:210 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	30

Table 5-6 Environmental conditions for the 100-years return period conditions analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
100wa_090	1.98	5.50	90				26.9	90	1.08	90
100wa_150	1.13	4.00	150				26.9	150	0.90	150
100wa_210	1.32	4.60	210	0.26	12	320	26.9	210	1.53	210
100wa_300	1.89	5.20	300	0.26	12	320	31.7	300	0.91	300
100sw_210	1.12	4.30	210	0.31	12	320	23.5	210	1.26	210

Figure 5-18 includes the 100-years return period combined stress at Point 3 in the bridge girder. There are minor differences between these results and those shown in Figure 5-17.

The characteristic loads for the 100-years environmental loads are presented in Figure 5-19 through Figure 5-24. It is observed that the transverse shear force distribution in Figure 5-20 presents a large extreme at axis 8. The large response is linked to a large torsion rotation of the bridge girder. It only occurs for the 90- and 300-degrees directions which have the longest wind waves peak period which can excite some torsional modes in the 7 seconds range.

Table 5-7 contains the 100-years conditions loads for the high bridge tower.

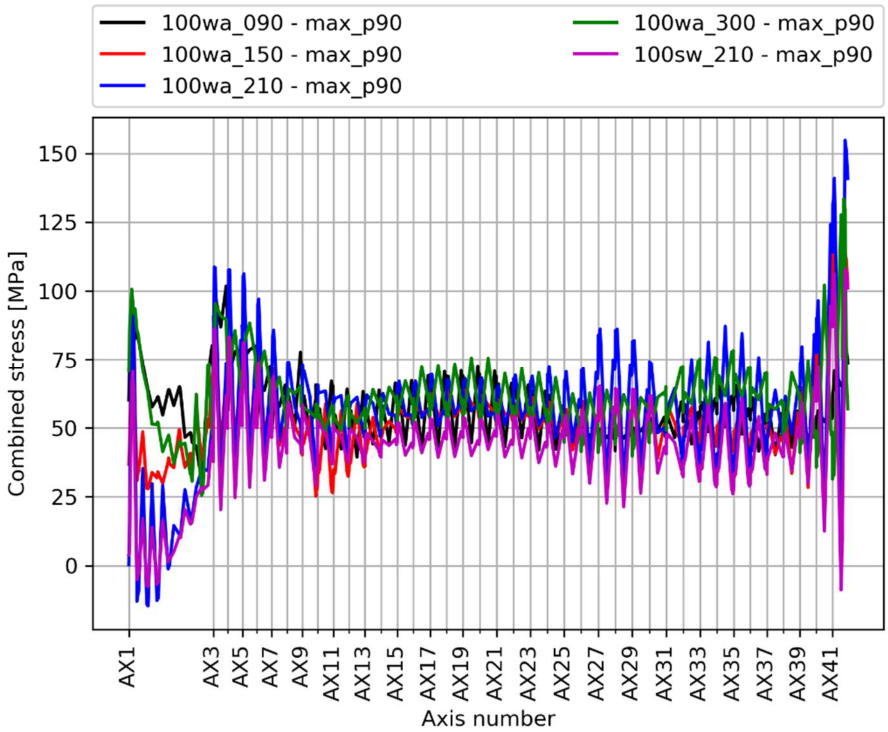


Figure 5-18 Combined stress at Point 3 in the governing 100-years conditions

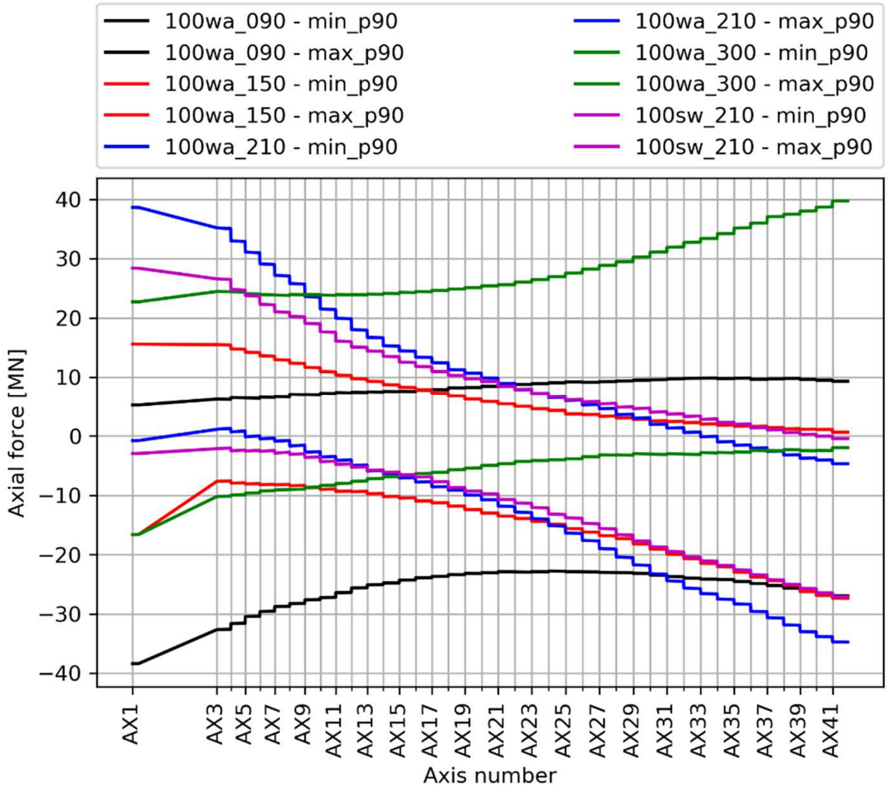


Figure 5-19 Axial force in the governing 100-years conditions

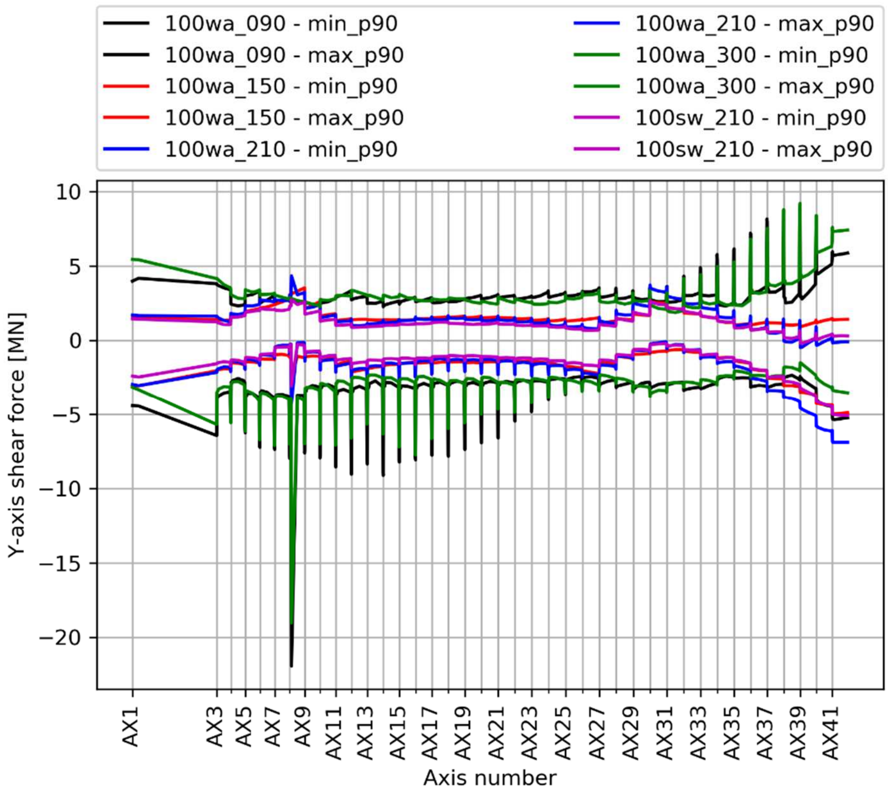


Figure 5-20 Transversal shear force in the governing 100-years conditions

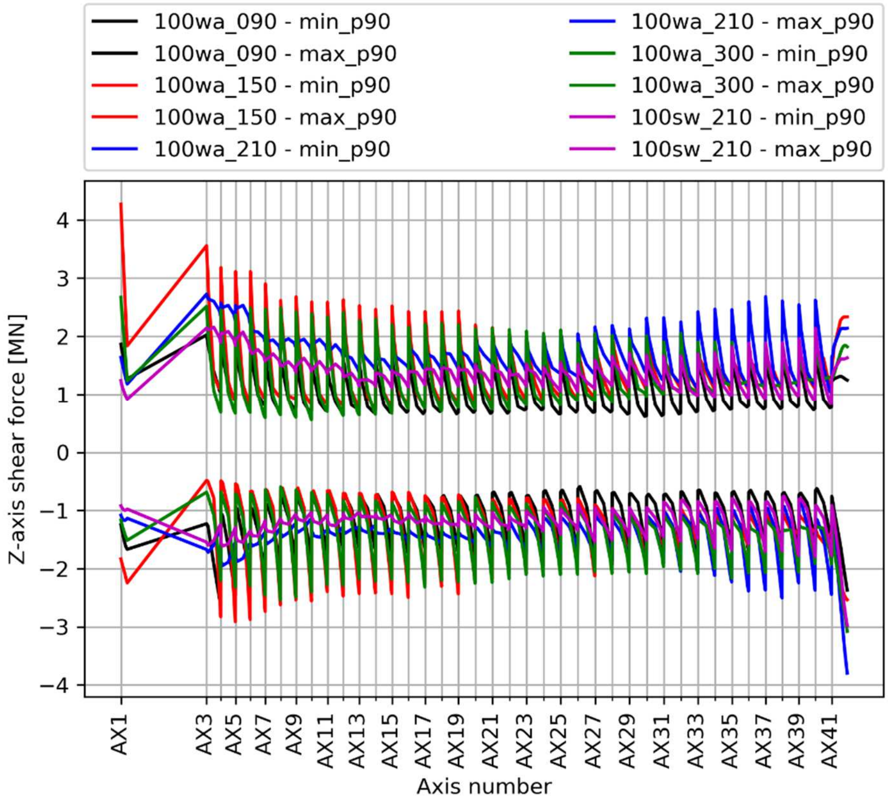


Figure 5-21 Vertical shear force in the governing 100-years conditions

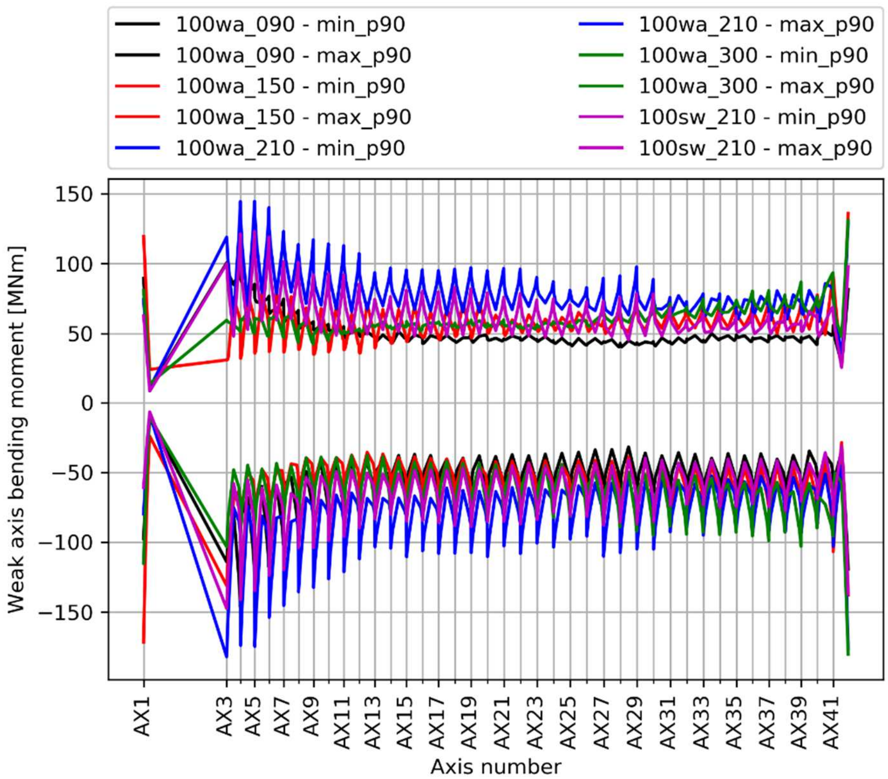


Figure 5-22 Weak axis bending moment in the governing 100-years conditions

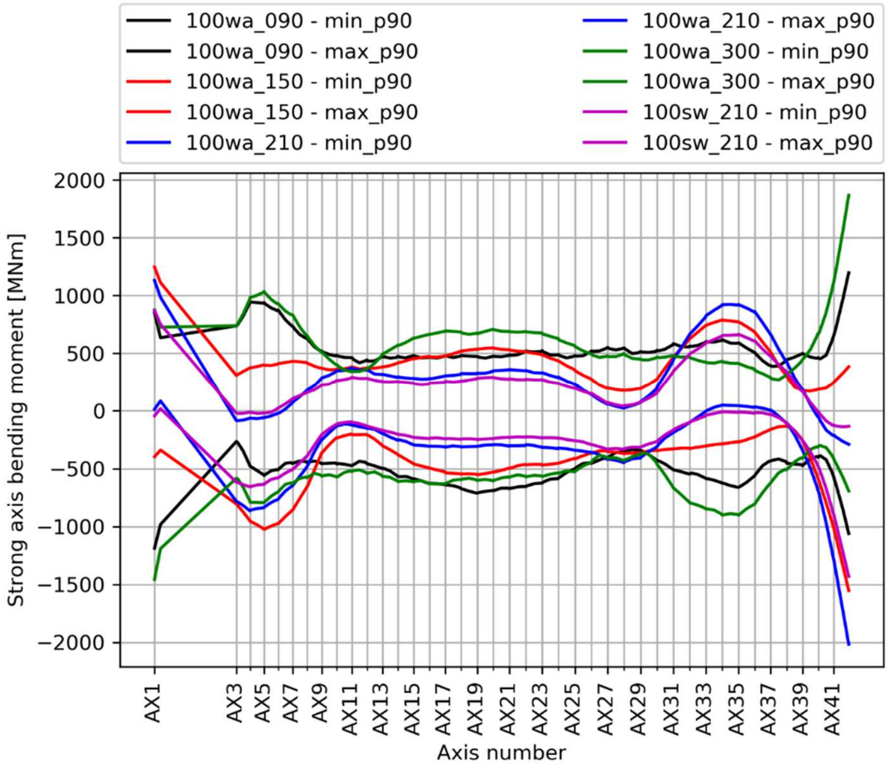


Figure 5-23 Strong axis bending moment in the governing 100-years conditions

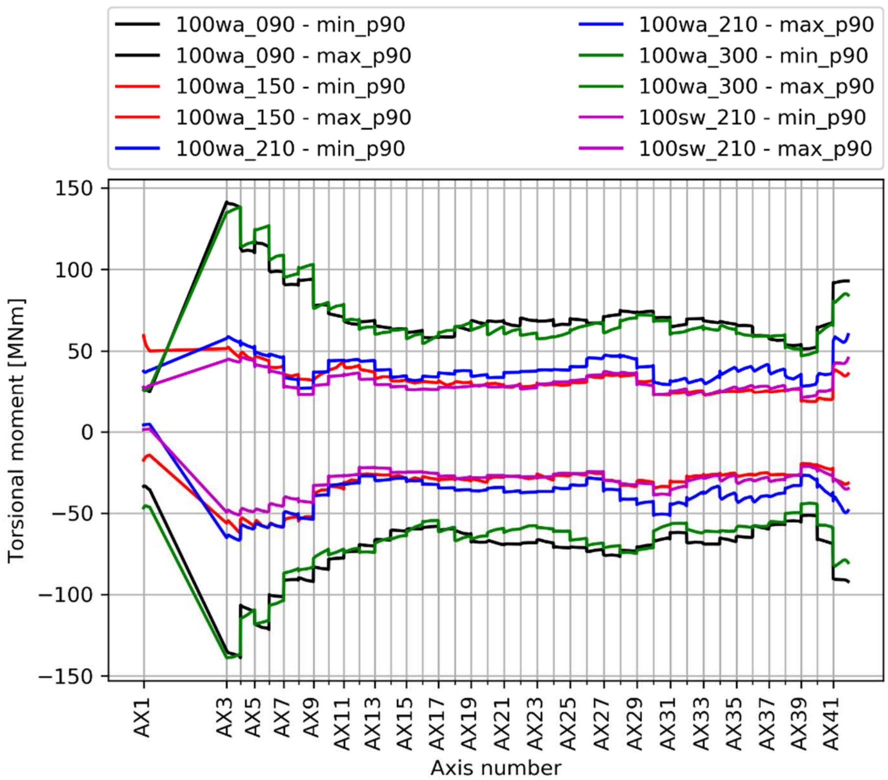


Figure 5-24 Torsional moment in the governing 100-years conditions

Table 5-7 High bridge tower loads for the 100-year return period load cases

Parameter	Unit	Tower legs	Tower top
Min axial force	MN	-40.4	-28.2
Max axial force	MN	28.3	8.1
Min shear force transverse direction	MN	-9.3	-3.5
Max shear force transverse direction	MN	6.3	3.4
Min shear force bridge direction	MN	-2.1	-7.3
Max shear force bridge direction	MN	4.1	7.7
Min bending moment around transverse axis	MNm	-565.2	-129.5
Max bending moment around transverse axis	MNm	300.1	109.1
Min bending moment around bridge direction	MNm	-300.4	-83.7
Max bending moment around bridge direction	MNm	451.7	89.0
Max torsional moment	MNm	18.0	0.0

5.4.4 1-year return period conditions analysis of the governing conditions

The analysis of the 1-year return period conditions is equivalent to the 100-years return period conditions analysis. However, as indicated in Table 5-9, only four conditions are analysed, since the swell dominating sea state in 210 degrees direction becomes the same as the *1wa_210* case.

Figure 5-25 presents the results for the combined stress at Point 3 for comparison against the 100-years return period results.

Table 5-8 Analysis parameters for the 1-year return period conditions analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	90, 150, 210, 300 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	30

Table 5-9 Environmental conditions for the 1-year return period conditions analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
1wa_090	0.92	4.00	90				19.5	90	0.69	90
1wa_150	0.83	3.40	150				19.5	150	0.57	150
1wa_210	0.83	3.70	210	0.20	12	320	19.5	210	0.98	210
1wa_300	1.10	4.30	300	0.20	12	320	22.9	300	0.58	300

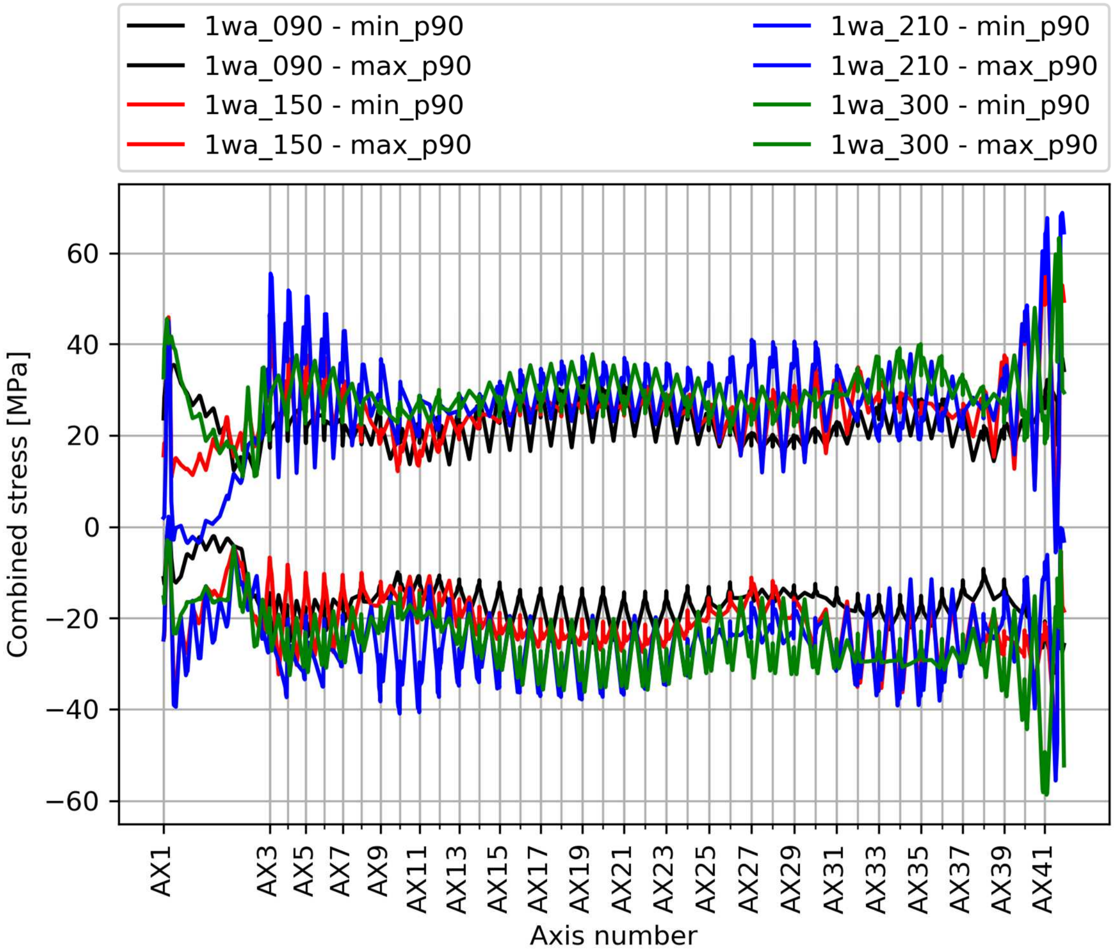


Figure 5-25 Combined stress at Point 3 in the governing 1-year conditions

5.4.5 10000-years return period conditions analysis of the governing conditions

The analysis of the 10000-years conditions is carried out for the same governing conditions as selected above, with the same analysis parameters as the 1- and 100-years return period analyses, see Table 5-10. The analysed sea states are given in Table 5-11.

The combined stresses for Point 3 are presented in Figure 5-26.

Table 5-10 Analysis parameters for the 10000-years return period conditions analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	Wind wave dominating: 90, 150, 210, 300 degrees Swell dominating:210 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	30

Table 5-11 Environmental conditions for the 10000-years return period conditions analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
10000wa_090	2.97	6.50	90				32.6	90	1.47	90
10000wa_150	1.53	4.70	150				32.6	150	1.22	150
10000wa_210	1.73	5.20	210	0.31	12	320	32.6	210	2.07	210
10000wa_300	2.59	5.90	300	0.31	12	320	38.4	300	1.24	300
10000sw_210	1.32	4.60	210	0.42	12	320	26.9	210	1.53	210

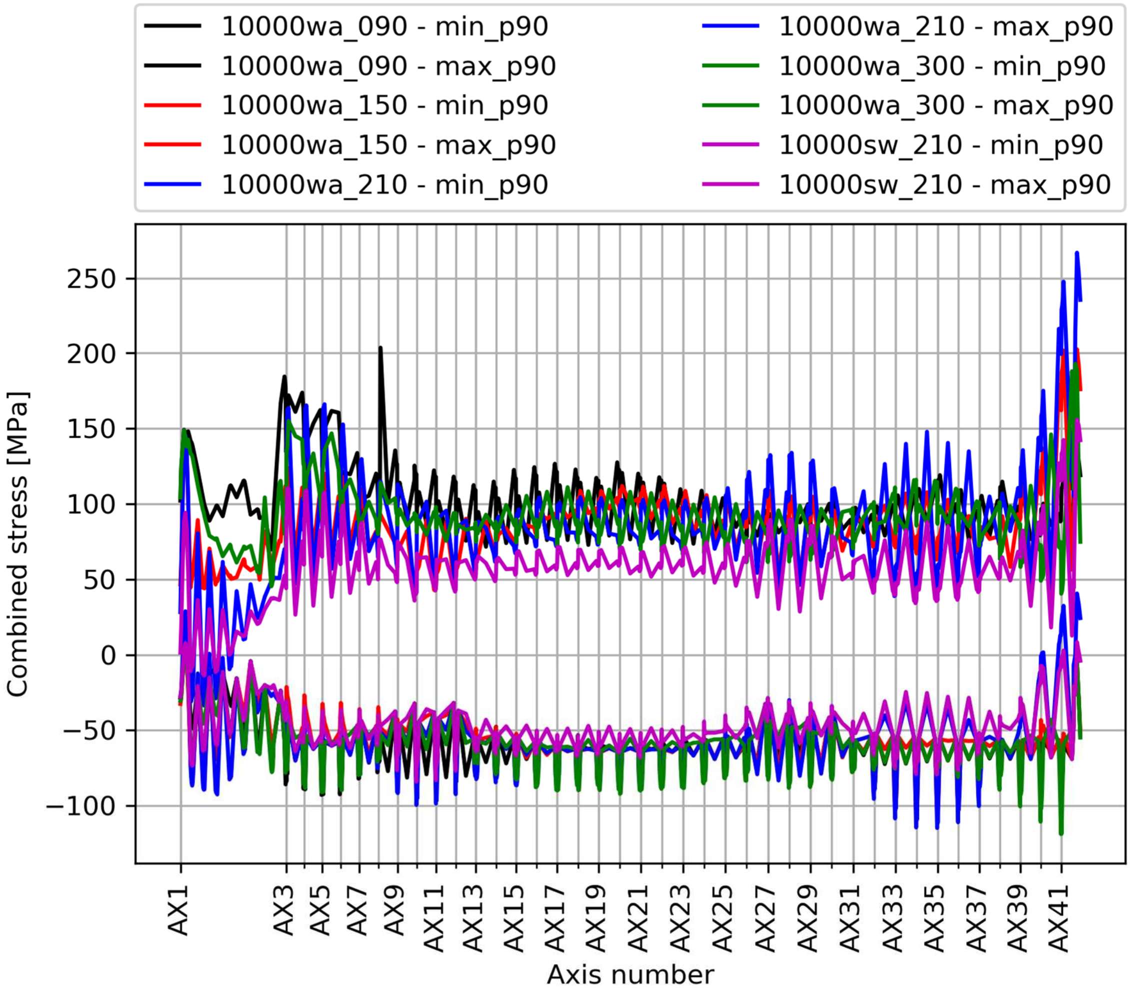


Figure 5-26 Combined stress at Point 3 in the governing 10000-years conditions

5.4.6 Sensitivity analyses

5.4.6.1 General

A series of sensitivity analyses are performed with two objectives: to validate some of the assumptions made in the independent analyses; and to gain knowledge on the dynamic behaviour of the curved bridge concept.

5.4.6.2 Wind velocity distribution along the bridge

(Statens Vegvesen, 30.11.18) proposes three different mean wind speed (*V*) distribution along the bridge axis:

- Constant
- Linearly varying from 60% of *V* at one end to *V* on the other end
- Linearly varying from 80% of *V* at one end to *V* in the middle to 80% of *V* on the other end

The three alternatives are represented in Figure 5-27 and have been applied for the governing conditions acting in sideways to the bridge, i.e. *100wa_090* and *100wa_300*.

Figure 5-28 and Figure 5-29 present the combine stress envelope for all the knuckle points in the bridge girder. The uniform distribution applied in the 100-years return period analysis is a conservative approach. Nevertheless, there is not a large difference among the three alternatives.

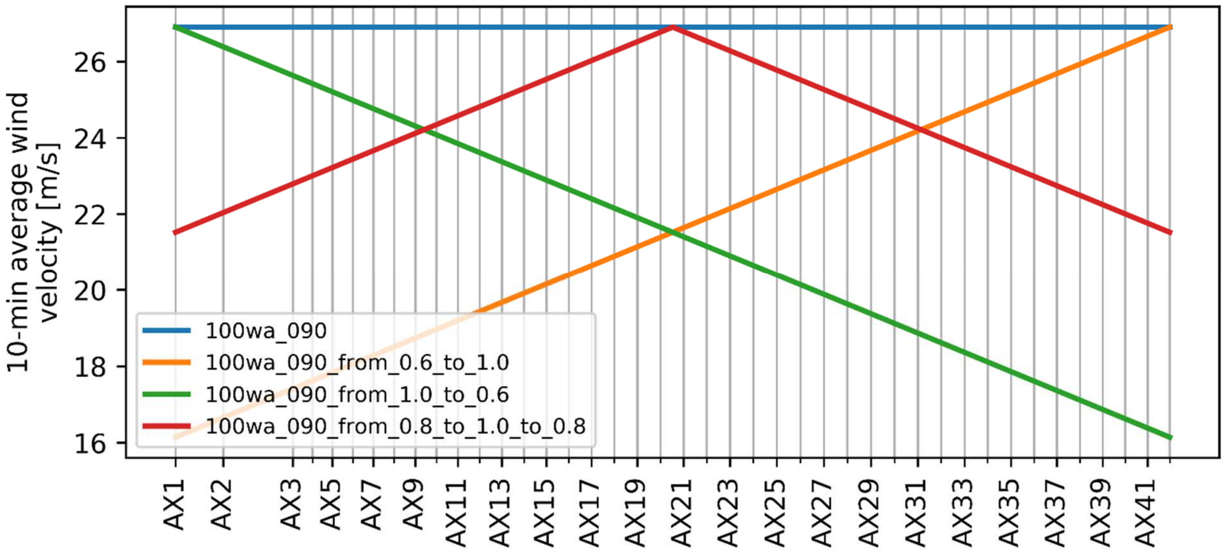


Figure 5-27 Average wind velocity alternatives along the bridge for the 100-years return period case in 90 degrees direction

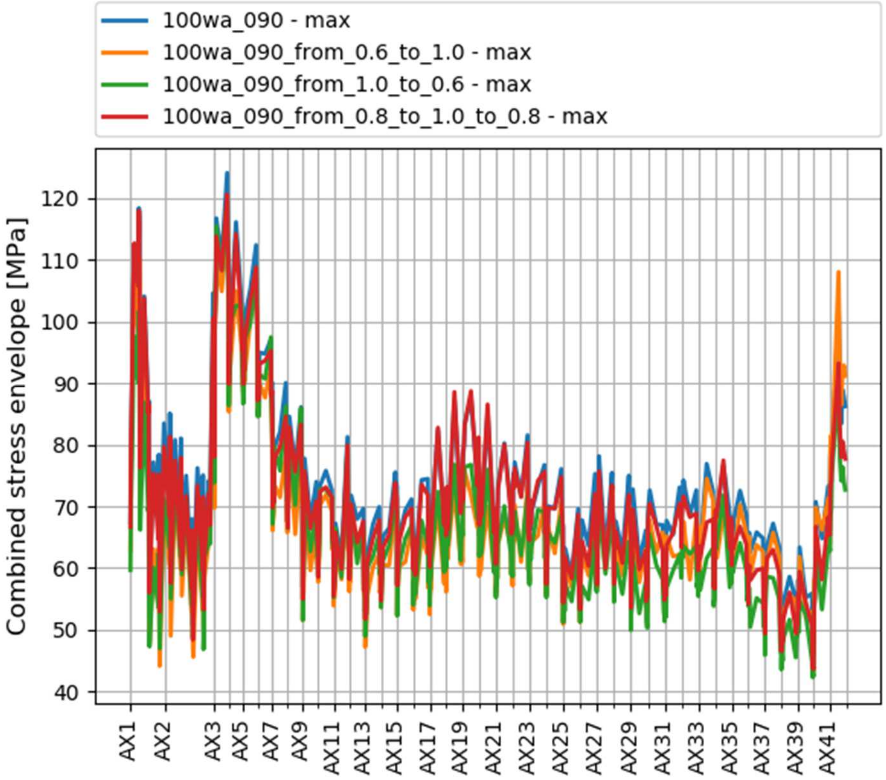


Figure 5-28 Combined stress envelope for the wind velocity distribution sensitivity analysis for 90 degrees direction

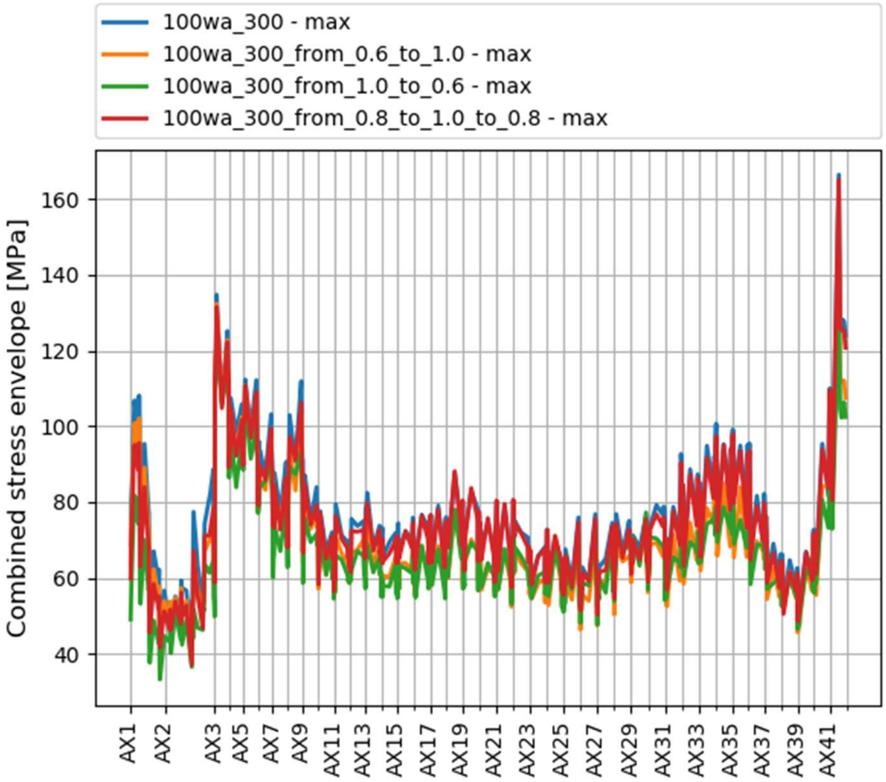


Figure 5-29 Combined stress envelope for the wind velocity distribution sensitivity analysis for 300 degrees direction

5.4.6.3 Wind waves peak period

A sensitivity analysis on the wave peak period is run for the governing conditions. Reported results are based on 5 different wave realizations. Table 5-12 and Table 5-13 present the basis for the analysis.

In general, longer peak periods have a large impact on girder stresses. Those sea conditions excite some longer torsional and horizontal bending eigen modes around 7 seconds. Then, the stresses are increased by up to 50%. However, it should be noted that the 100-years return period Hs-Tp contour is not applied, so the results are too conservative.

Figure 5-30 and Figure 5-31 show the effect of the wind wave period on the combined stress at Point 3 for two incoming wave directions.

Table 5-12 Analysis parameters for the wind wave peak period sensitivity analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	Wind wave dominating: 90, 150, 210, 300 degrees Swell dominating:210 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	5

Table 5-13 Environmental conditions for the wind wave peak period sensitivity analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
100wa_090_tp4.68	1.98	4.68	90				26.9	90	1.08	90
100wa_090_tp4.95	1.98	4.95	90				26.9	90	1.08	90
100wa_090_tp6.05	1.98	6.05	90				26.9	90	1.08	90
100wa_090_tp6.60	1.98	6.60	90				26.9	90	1.08	90
100wa_150_tp3.40	1.13	3.40	150				26.9	150	0.90	150
100wa_150_tp3.60	1.13	3.60	150				26.9	150	0.90	150
100wa_150_tp4.40	1.13	4.40	150				26.9	150	0.90	150
100wa_150_tp4.80	1.13	4.80	150				26.9	150	0.90	150
100wa_210_tp3.91	1.32	3.91	210	0.257	12.00	320	26.9	210	1.53	210
100wa_210_tp4.14	1.32	4.14	210	0.257	12.00	320	26.9	210	1.53	210
100wa_210_tp5.06	1.32	5.06	210	0.257	12.00	320	26.9	210	1.53	210
100wa_210_tp5.52	1.32	5.52	210	0.257	12.00	320	26.9	210	1.53	210
100wa_300_tp4.42	1.89	4.42	300	0.257	12.00	320	31.7	300	0.91	300
100wa_300_tp4.68	1.89	4.68	300	0.257	12.00	320	31.7	300	0.91	300
100wa_300_tp5.72	1.89	5.72	300	0.257	12.00	320	31.7	300	0.91	300
100wa_300_tp6.24	1.89	6.24	300	0.257	12.00	320	31.7	300	0.91	300
100sw_210_tp3.66	1.12	3.66	210	0.312	12.00	320	23.5	210	1.26	210
100sw_210_tp3.87	1.12	3.87	210	0.312	12.00	320	23.5	210	1.26	210
100sw_210_tp4.73	1.12	4.73	210	0.312	12.00	320	23.5	210	1.26	210
100sw_210_tp5.16	1.12	5.16	210	0.312	12.00	320	23.5	210	1.26	210

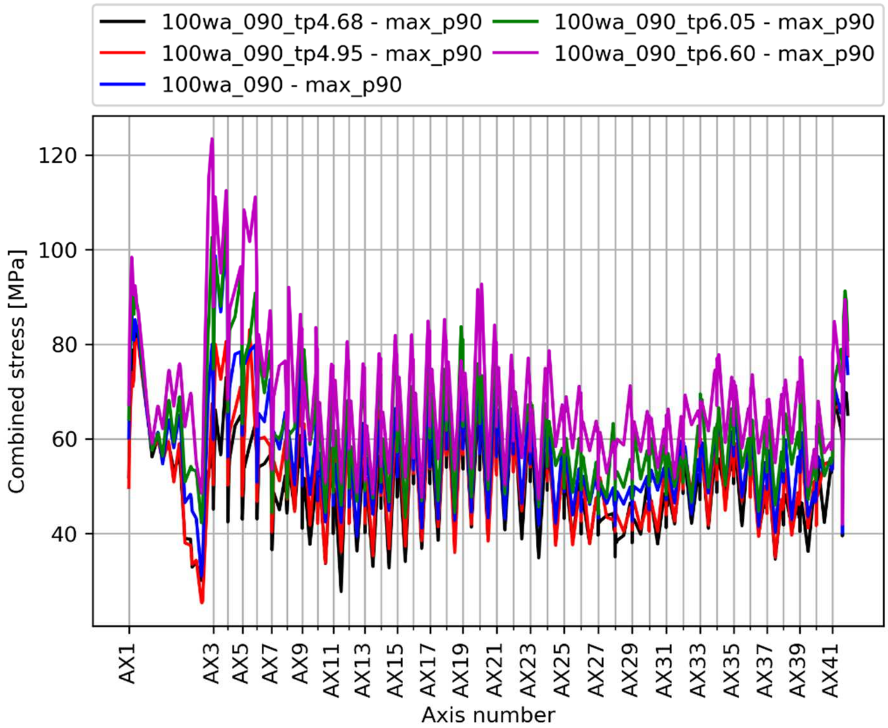


Figure 5-30 Combined stress at Point 3 for the 90 degrees sea states

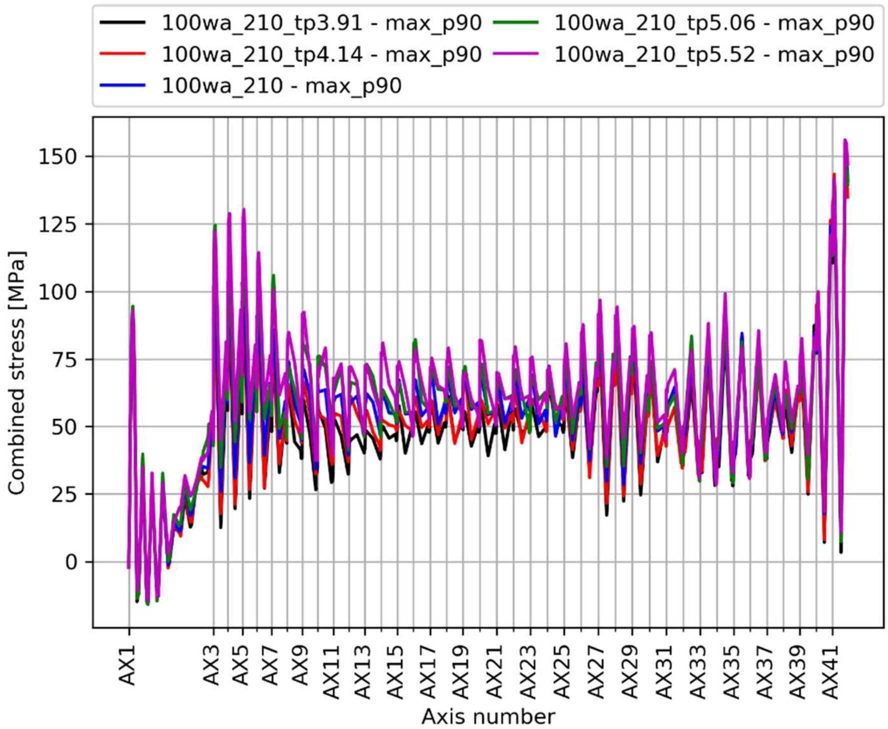


Figure 5-31 Combined stress at Point 3 for the 210 degrees sea states

5.4.6.4 Swell peak period

The influence of the swell peak period on the bridge girder stresses is evaluated. The Metocean design basis (Statens Vegvesen, 30.11.18) defines a set of scaling factors for the swell significant wave height depending on the peak period, included in Table 3-31. Table 5-15 summarizes all the environmental conditions analysed as per Table 5-14.

As shown in Figure 5-32, there is little impact of swell peak period on the combined stress for Point 3.

Table 5-14 Analysis parameters for the swell peak period sensitivity analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	Swell dominating:210 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	5

Table 5-15 Environmental conditions for swell peak period sensitivity analysis

Case id	Wind waves			Swell			Wind		Current	
	Hs [m]	Tp [s]	Dir. [deg]	Hs [m]	Tp [s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]	Velocity [m/s]	Dir. [deg]
100sw_210_tp6	1.12	4.30	210	0.16	6.00	320	23.5	210	1.26	210
100sw_210_tp7	1.12	4.30	210	0.18	7.00	320	23.5	210	1.26	210
100sw_210_tp8	1.12	4.30	210	0.21	8.00	320	23.5	210	1.26	210
100sw_210_tp9	1.12	4.30	210	0.23	9.00	320	23.5	210	1.26	210
100sw_210_tp10	1.12	4.30	210	0.26	10.00	320	23.5	210	1.26	210
100sw_210_tp11	1.12	4.30	210	0.29	11.00	320	23.5	210	1.26	210
100sw_210	1.12	4.30	210	0.31	12.00	320	23.5	210	1.26	210
100sw_210_tp18	1.12	4.30	210	0.31	18.00	320	23.5	210	1.26	210

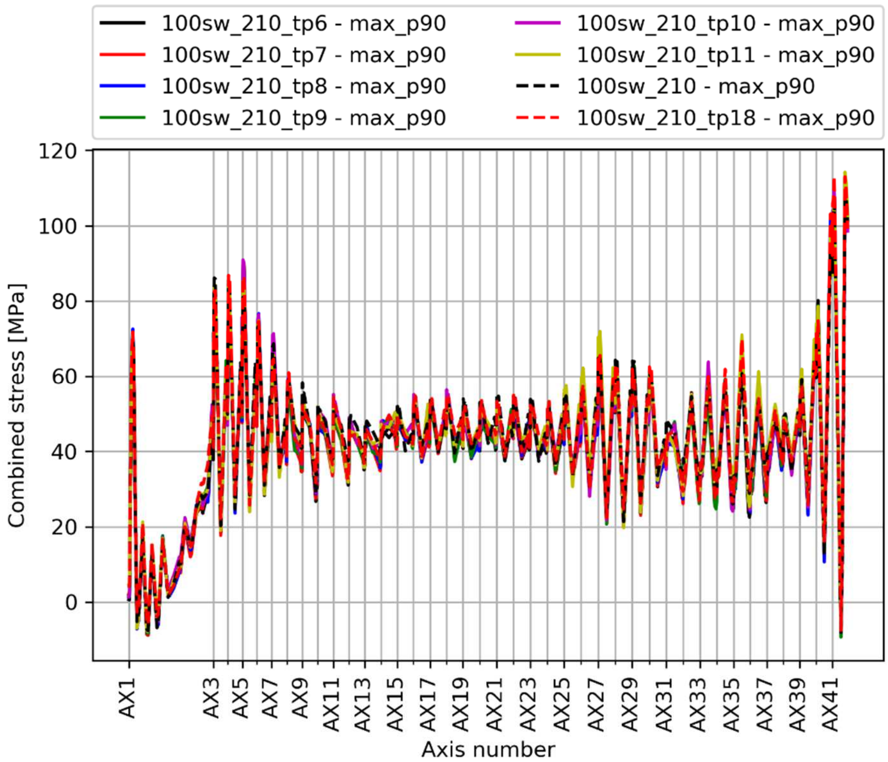


Figure 5-32 Combined stress at point 3 for the swell peak period sensitivity analysis

5.4.6.5 Wave spectrum parameters

General

A series of sensitivity analyses are run on one of the governing conditions to evaluate the influence of different wave spectrum parameters. Table 5-12 shows the basis for these analyses.

Table 5-16 Analysis parameters for the wave spectrum parameters sensitivity analysis

Analysis parameter	Value
Wind-, wind waves- and current headings	Wind wave dominating: 210 degrees
Effective analysis duration (after transient effects)	10800 seconds
Number of wave-, wind realizations	5

Wave spectrum peakedness parameter

As indicated in Table 3-29, JONSWAP wave spectrum peakedness parameter is set to 2.3 for all the analyses in this report. The analysis presented in this section evaluates the influence of this assumption by comparing the results for one of the governing conditions against the same environmental condition using a gamma value of 1.8.

As it can be observed in Figure 5-39, there is a limited effect of the wave spectrum shape on the combined stress, being the chosen value of 2.3 more conservative for the critical areas around axes 3 and 42.

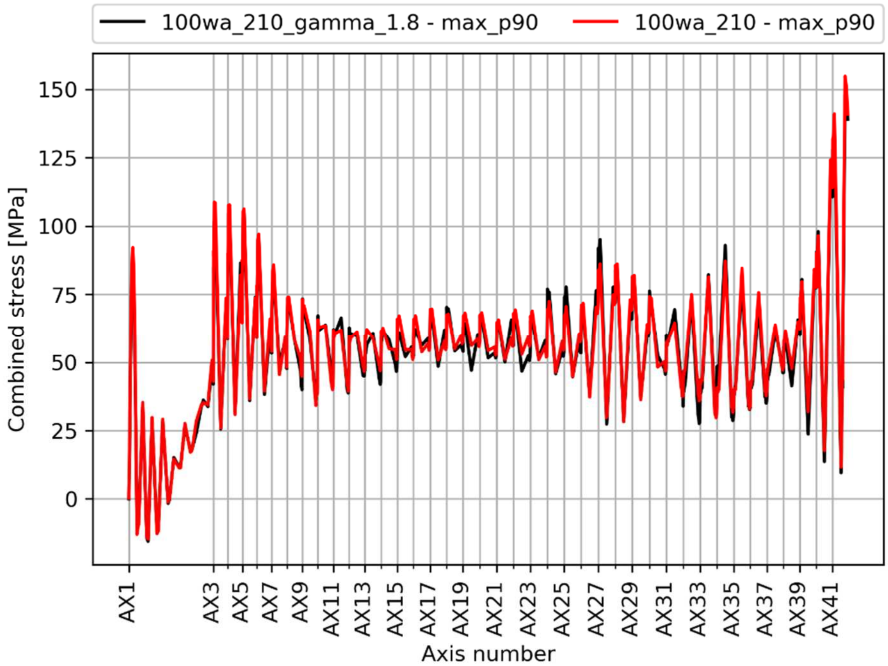


Figure 5-33 Effect of JONSWAP wind wave spectrum gamma factor in the combined stresses at Point 3

Wind waves spreading function

(Statens Vegvesen, 30.11.18) defines the suggested wind waves spreading function as a cosine powered to an exponent between 3 and 8. A value of 5 has been used in the independent analyses presented in this report. However, a sensitivity analysis on this parameter is carried out and presented herein.

The combined stresses are not sensitive to the spreading function exponent as shown in Figure 5-34.

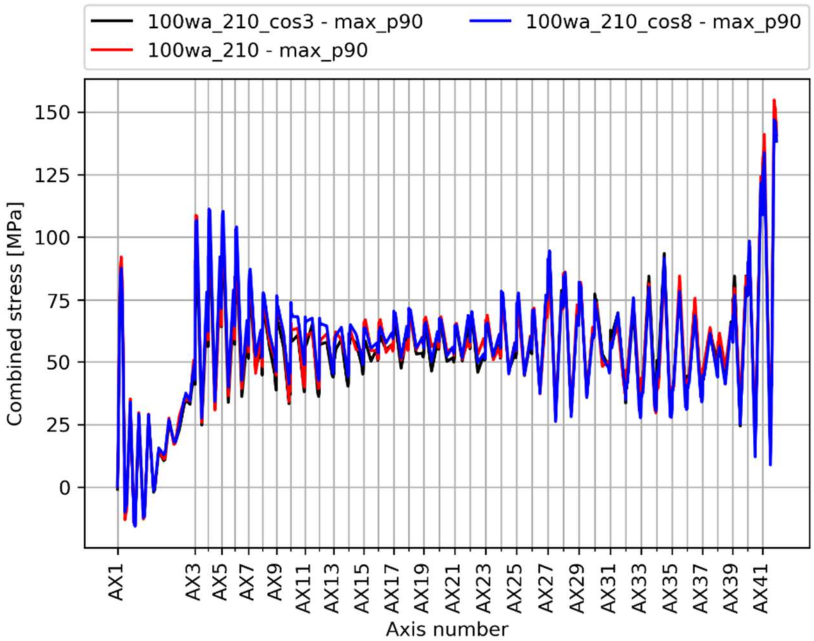


Figure 5-34 Effect of wind waves spreading function exponent in the combined stresses at Point 3

Swell spectrum peakedness parameter

According to (Statens Vegvesen, 30.11.18), the swell spectrum peakedness factor may vary between 3 to 5. As included in Table 3-32, a gamma value of 5 is used in the independent analyses. A gamma factor of 3 is applied in this sensitivity analysis showing very little impact on the results, see Figure 5-35.

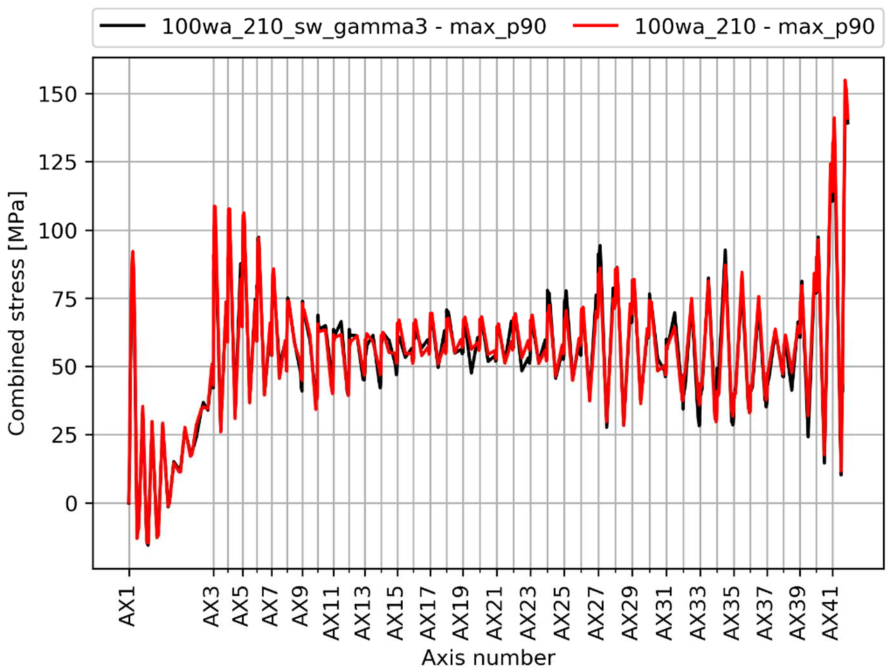


Figure 5-35 Effect of JONSWAP swell spectrum gamma factor in the combined stresses at Point 3

Swell spreading function

The spreading function exponent may be taken between 10 and 20, as per Table 3-32. 20 is used in the independent analyses and a value of 10 is evaluated in this sensitivity analysis.

The effect of this parameter in the combined stress is marginal as shown in Figure 5-36.

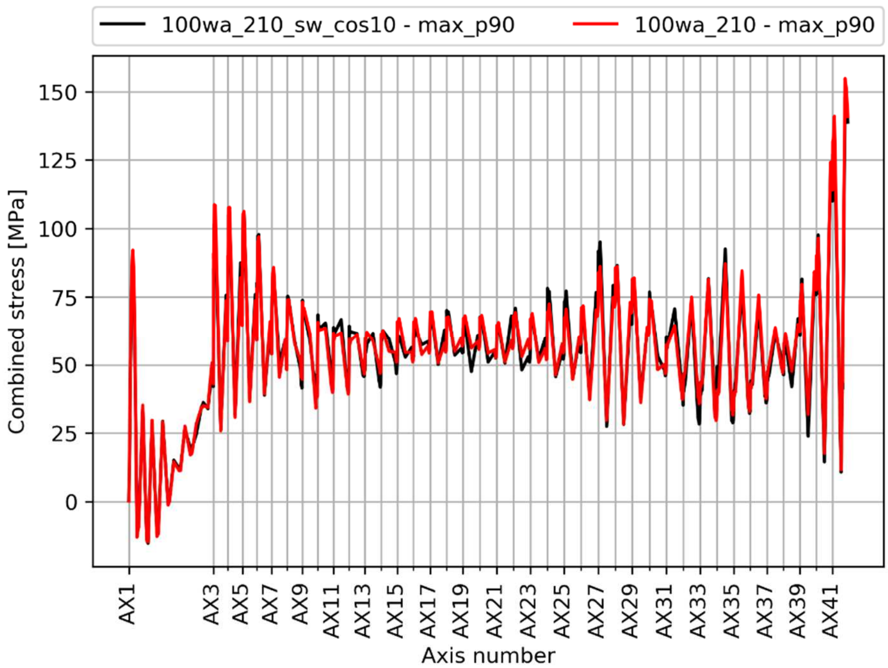


Figure 5-36 Effect of swell spreading function exponent in the combined stresses at Point 3

5.4.6.6 Relative contribution of environmental loads

The relative importance of each of the environmental load contributions is examined in this section. The following figures present how wind-, current-, swell- and wind waves- loads compared to the resultant load from the 100-years return period analysis.

As it can be observed in the figures, wind waves are the main contributor to weak axis bending and torsional moments, while wind is the main source of strong axis bending moment. Current damping is expected to contribute more than the drag forces current may produce.

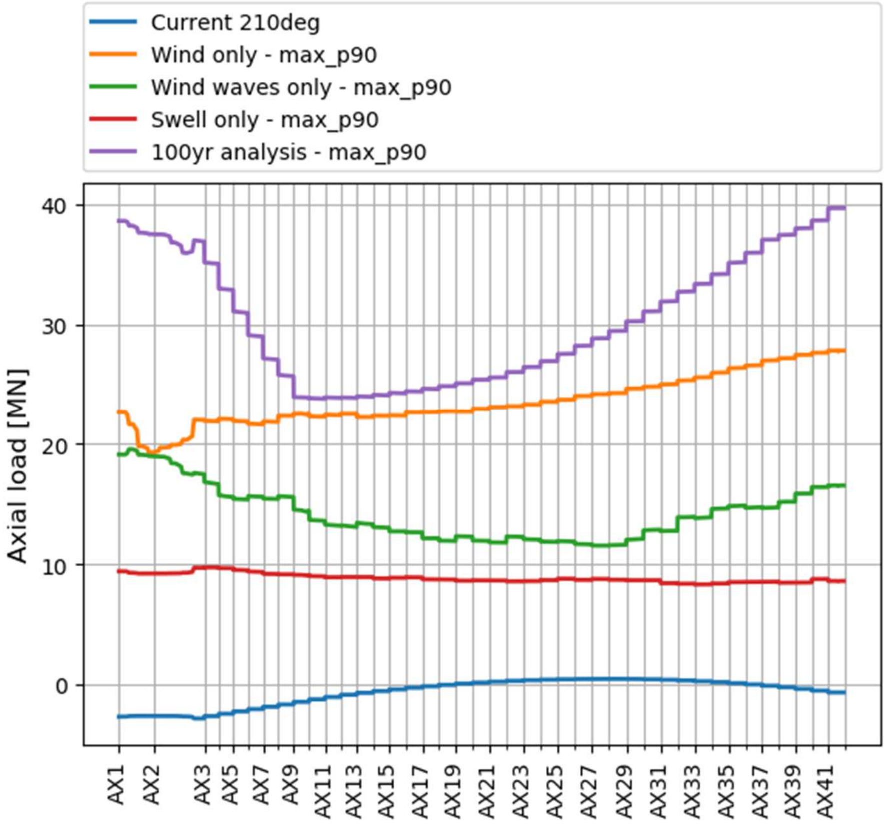


Figure 5-37 Axial force from the 100-years return period environment

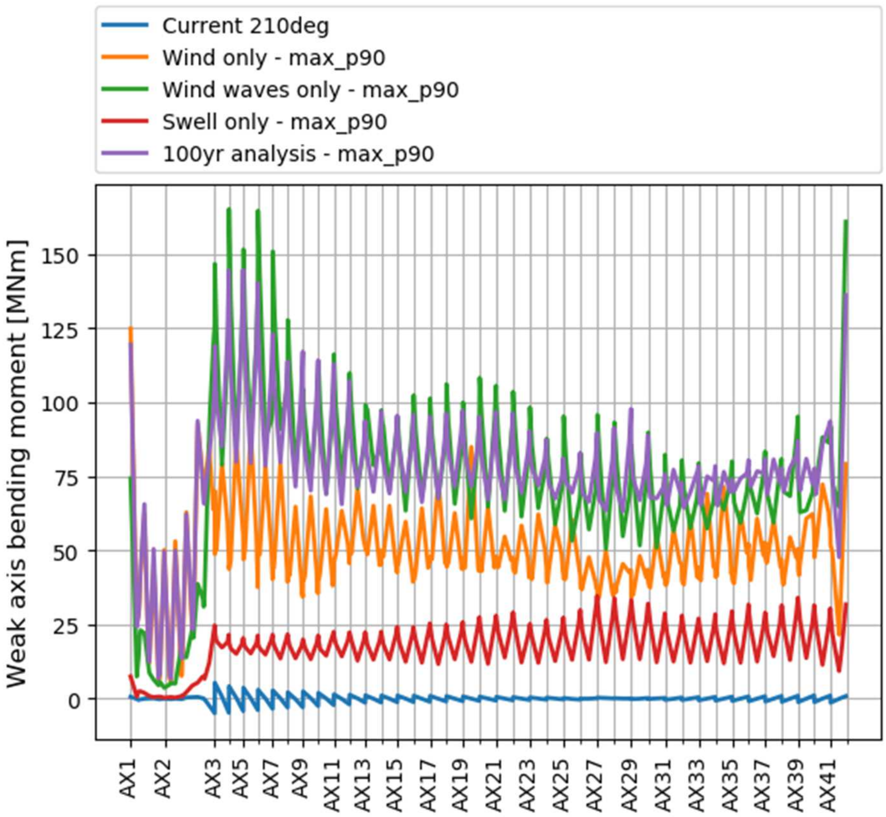


Figure 5-38 Weak axis bending moment from the 100-years return period environment

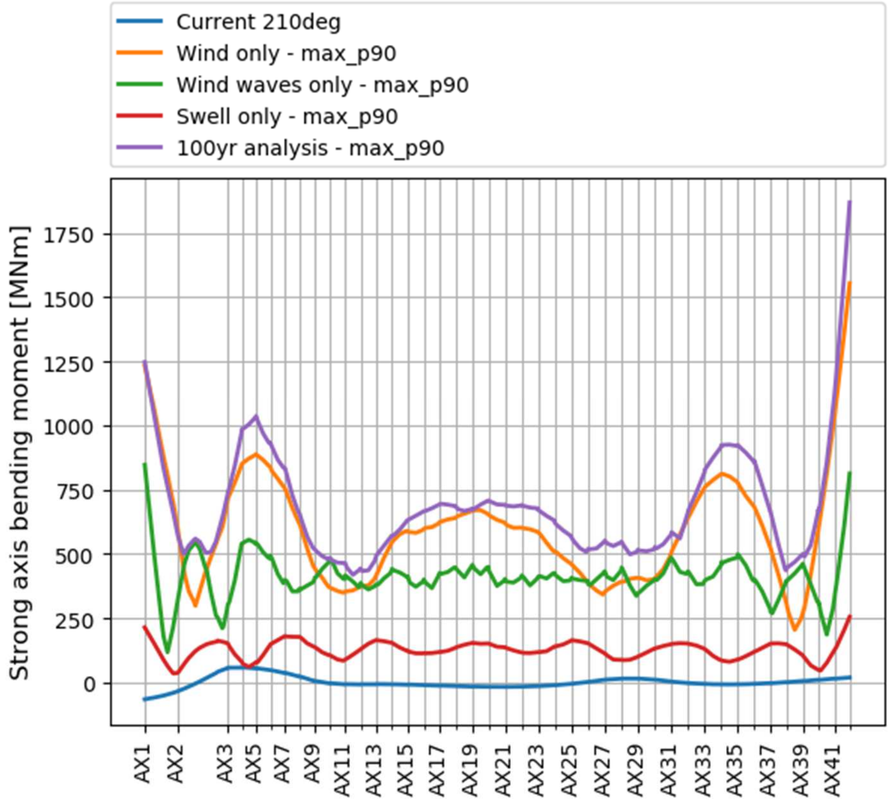


Figure 5-39 Strong axis bending moment from the 100-years return period environment

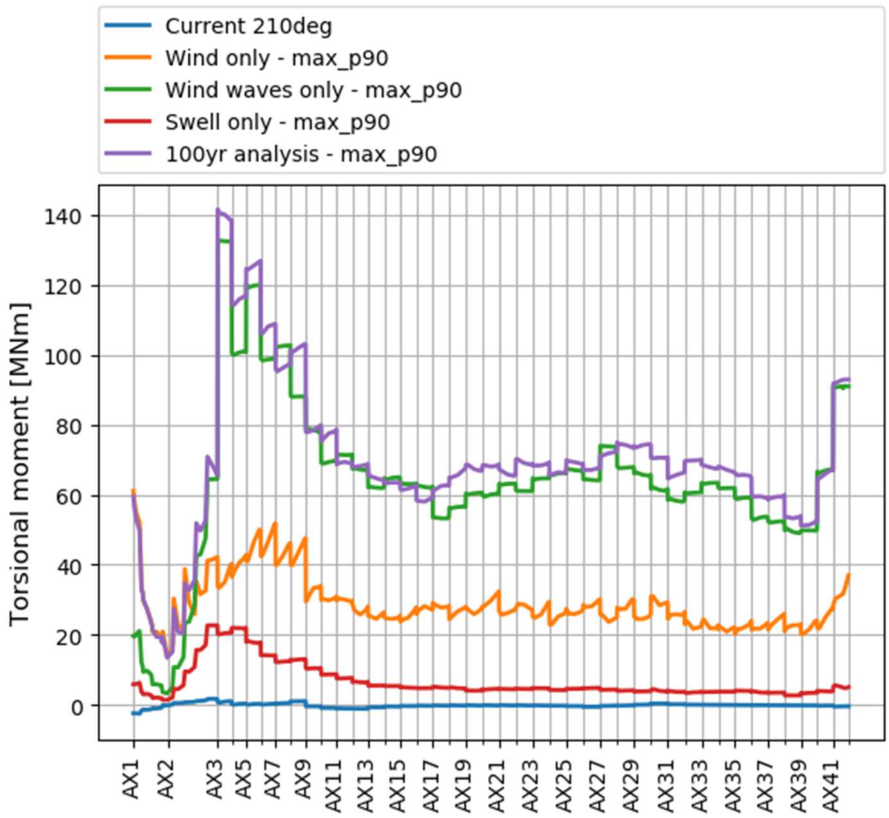


Figure 5-40 Torsional moment from the 100-years return period environment

5.5 Mooring line loads

5.5.1 ULS condition

Maximum 100-year return period line tensions are presented in Figure 5-41 for both the screening and the governing condition analyses. As it can be observed, the governing conditions for the bridge girder are also the critical conditions for the mooring system.

Maximum loaded lines are line 5 and line 13. The maximum line tension is 3702 kN. Figure 5-42 shows the maximum load at the top element of each of the mooring line segments.

The minimum safety factor is 1.49 at line 13, which is below the required 2.2. A total of 13 lines do not meet the required safety factor as shown in Figure 5-43. Differences in the polyester stiffness discussed in Section 5.6.1 are likely to explain this deviation from designer's results. The safety factors for the polyester rope and the top chain segments are acceptable for all lines.

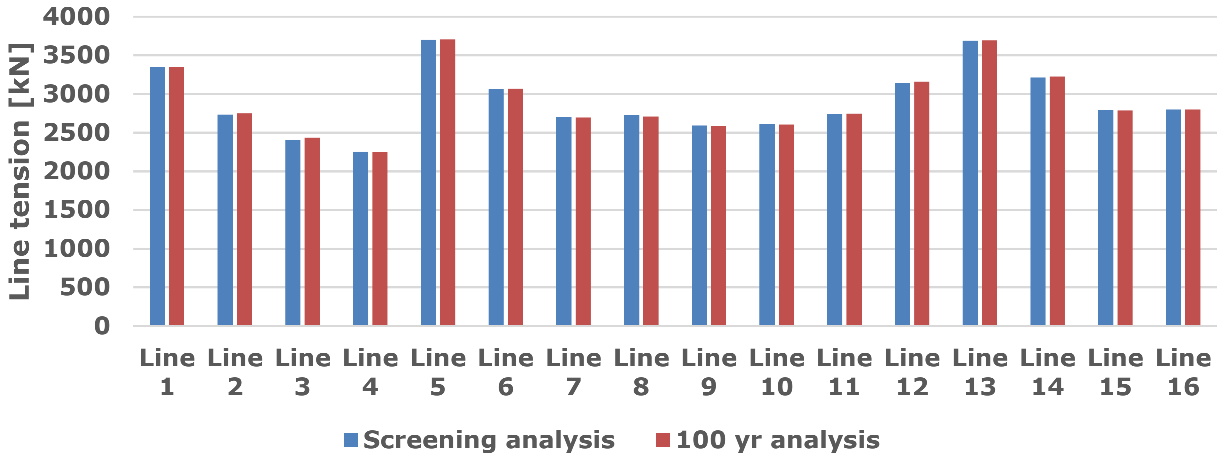


Figure 5-41 Line tension for the 100-year return period conditions

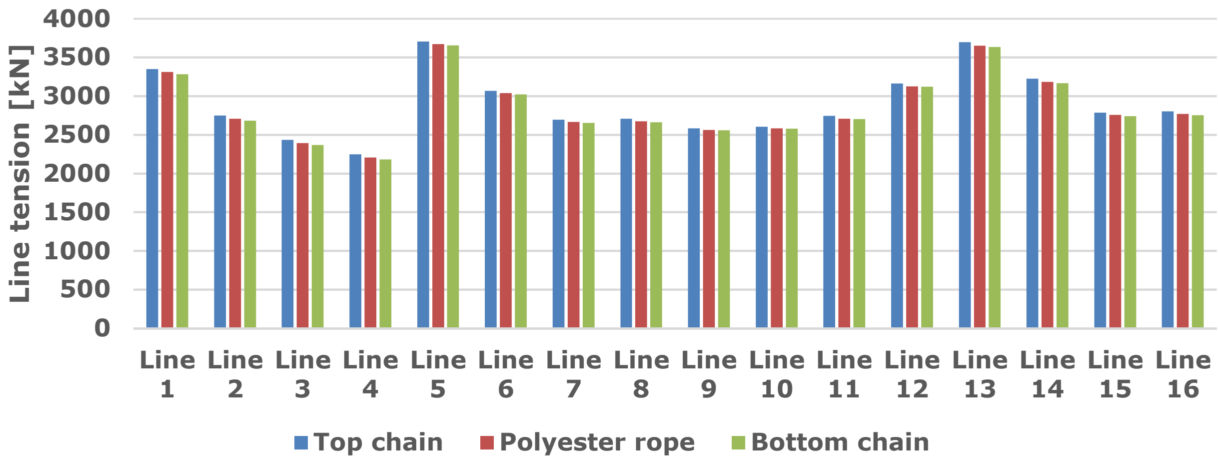


Figure 5-42 Line tension for the 100-year return period conditions for the different segments

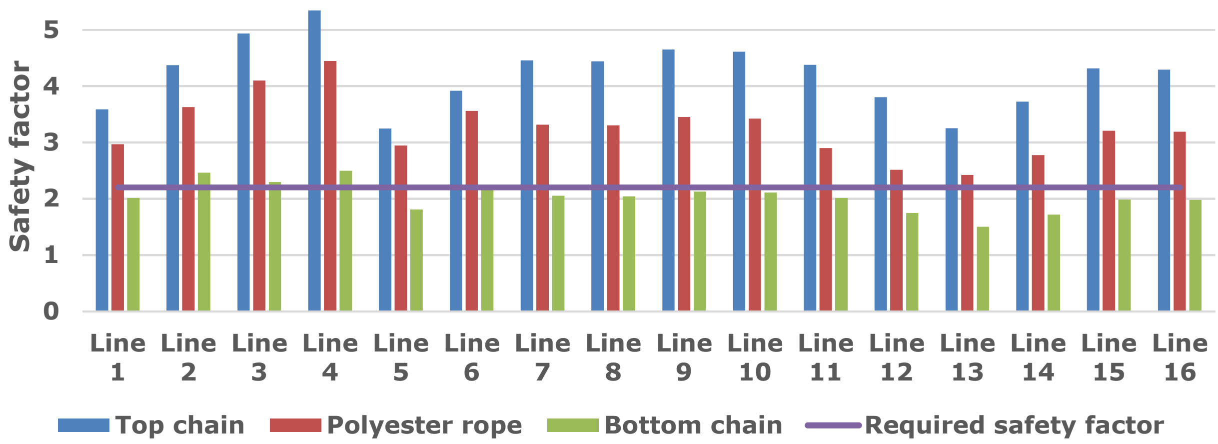


Figure 5-43 Obtained safety factor for the different segments

The effect of temperature and water level variations is included in the safety factor calculation by combining the different load cases with the load factors in Table 5-17. It is for later discussion how temperature loads should be included in this calculation.

Maximum mooring line loads are 20% higher when highest astronomical tide (HAT), a 25 degrees cooling of the bridge girder and the storm surge are included. The safety factor for all the bottom chain segments is below 2.2, the required value. In addition, the polyester rope segment in line 13 do not fulfil the requirement either.

Based on these results it is recommended to increase the dimensions of the bottom chain.

Table 5-17 Load factors for mooring line load combinations

Load	Load factor
Permanent loads	1.0
Environmental loads without traffic	1.0
Temperature	0.84
Water level variation	1.0

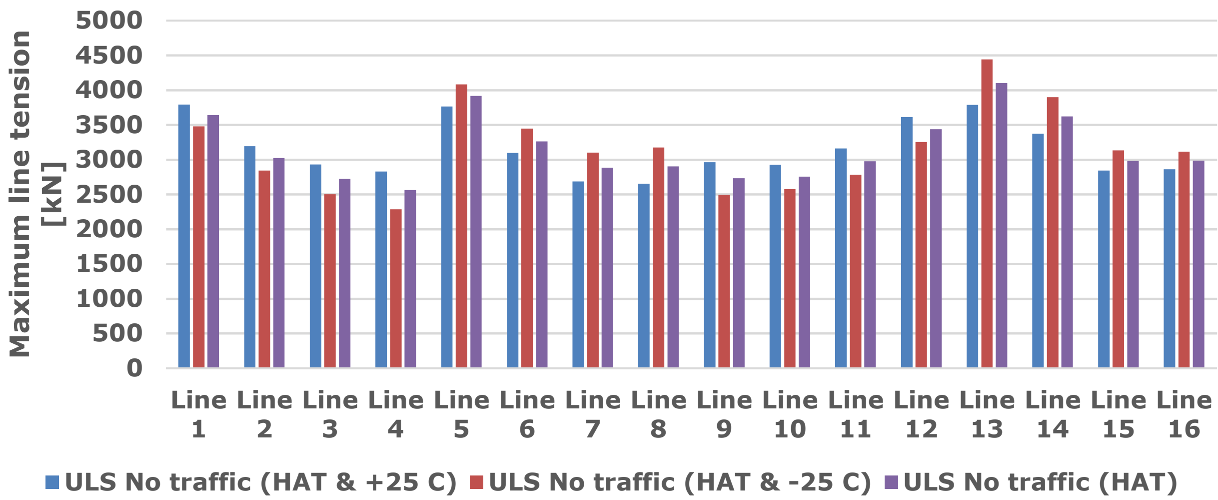


Figure 5-44 Maximum mooring line tension for the different load combinations

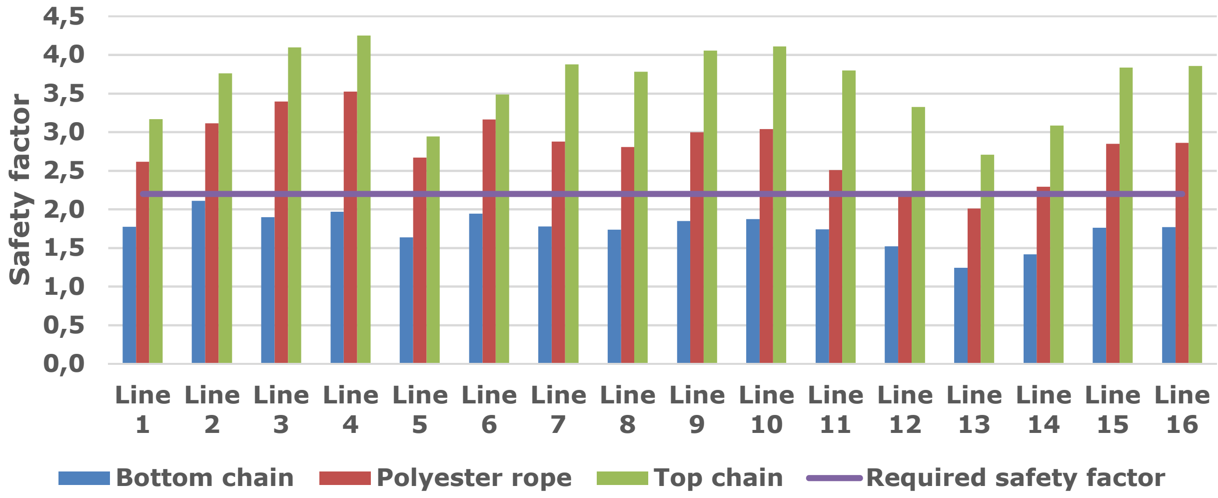


Figure 5-45 Minimum mooring line safety factors based on the load combinations

5.5.2 FLS condition

Fatigue analysis of top and bottom chain of all mooring lines is performed with the global analysis model. Calculated axial forces are divided by the cross-sectional area of the chain to obtain the fatigue stress. The number of loading cycles for each fatigue stress range is calculated using the rain-flow counting method. A single-slope SN curve is applied as given in DNVGL-OS-E301 (DNVGL-OS-E301, July 2018).

For fatigue calculations, half of the corrosion allowance is used to define the cross-sectional area to be used for stress calculation.

The fatigue loading of the polyester rope segments is not calculated since this type of components have a much better fatigue behaviour than mooring chain.

Calculated bottom chain fatigue life is presented in Figure 5-46. As shown in the figure, the line most exposed to fatigue damage is mooring line 12 with a calculated fatigue life of 408 years. The design specification requires a design fatigue factor of 10 and an operational fatigue life of 100 years, i.e., the calculated fatigue life of the chain should be larger than 1000 years. Simulation results show that mooring lines 12, 13, 14 and 16 do not fulfil the design's specification.

If the dimension of the bottom chain is increased, it is expected that the fatigue in the bottom chain becomes within requirements.

Top chain fatigue life is above 6000 years for all lines. A 1.15 stress concentration factor (SCF) has been used in the top chain to account for out-of-plane bending effects. However, a more refined SCF could be investigated and applied to the analysis.

These calculations are done without accounting for marine growth. Since the mooring lines are taut, line dynamics and marine growth are not expected to have a large influence of mooring line fatigue life.

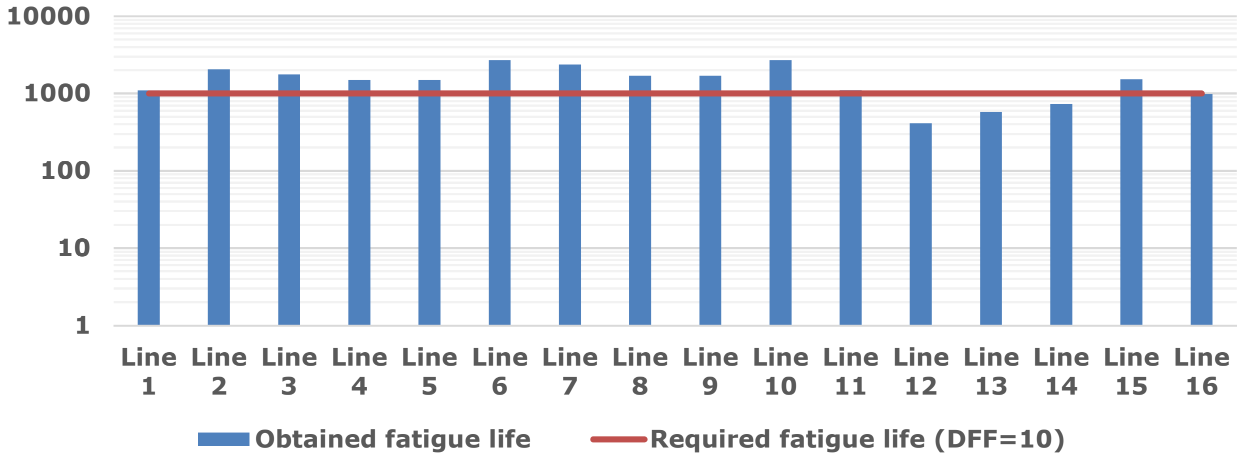


Figure 5-46 Bottom chain fatigue life

5.6 Comparison against designer's analysis

5.6.1 Input data

The following differences are detected between the two analysis models:

- The axial stiffness of the polyester ropes in the design analysis corresponds to a typical quasi-static stiffness of 12.5 times the minimum breaking load (MBL) of the rope. However, the independent analysis model is based on a stiffness value of 25 times the MBL. This is more in line with typical dynamic behaviour of the mooring ropes and it is understood to represent better the dynamic behaviour of the bridge.
- Design analysis considers the variation of wave conditions along the bridge girder, while the independent analysis is based on homogeneous conditions. A sensitivity analysis is performed to evaluate the influence of different wave conditions along the bridge.
- The independent analysis model includes all the girder reinforcements above the pontoons, as indicated in (Norconsult - Dr. Techn. Olav Olsen). This is not included in the design analysis.
- The reinforcement of the south end in the design analysis is not according to (Norconsult - Dr. Techn. Olav Olsen). The independent analysis model is built as per the drawing.

5.6.2 Natural periods and modes

Comparison of selected natural periods is presented in Table 5-18. The first natural mode is compared in Figure 5-47 and Figure 5-48.

Shorter natural periods for the transverse modes can be expected in the independent analysis due to the difference in the polyester stiffness.

There is a clear difference in the first vertical mode between the models, as shown in Figure 5-49 and Figure 5-50. It is difficult to explain this difference without a detailed comparison of both models.

Table 5-18 Comparison of natural periods

Description	Design		Independent analysis	
	Mode #	Period [s]	Mode #	Period [s]
First transverse mode	1	55.9	1	54.4
Second transverse mode	2	49.0	2	39.7
Third transverse mode	3	31.7	3	28.1
Fourth transverse mode	4	21.1	4	18.6
Fifth transverse mode	5	15.8	5	14.8
First vertical mode	12	6.9	33	7.66

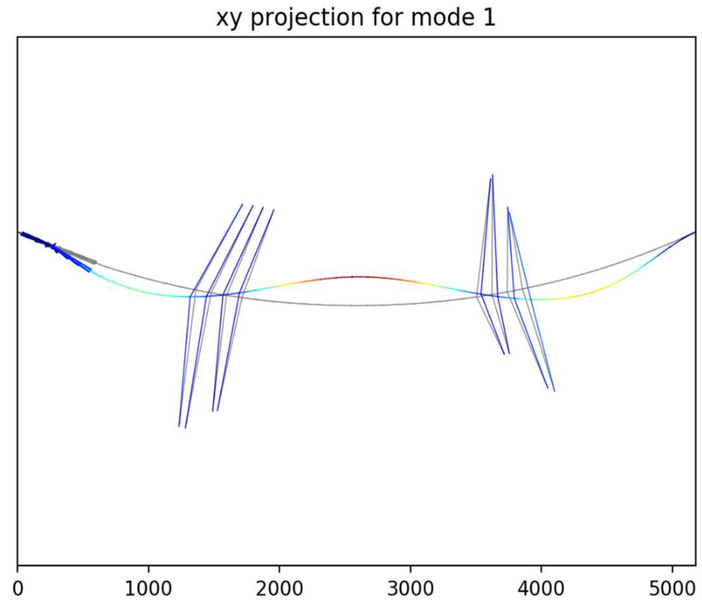


Figure 5-47 Mode 1 deformations from design calculations (Norconsult - Dr. Techn. Olav Olsen, n.d.)

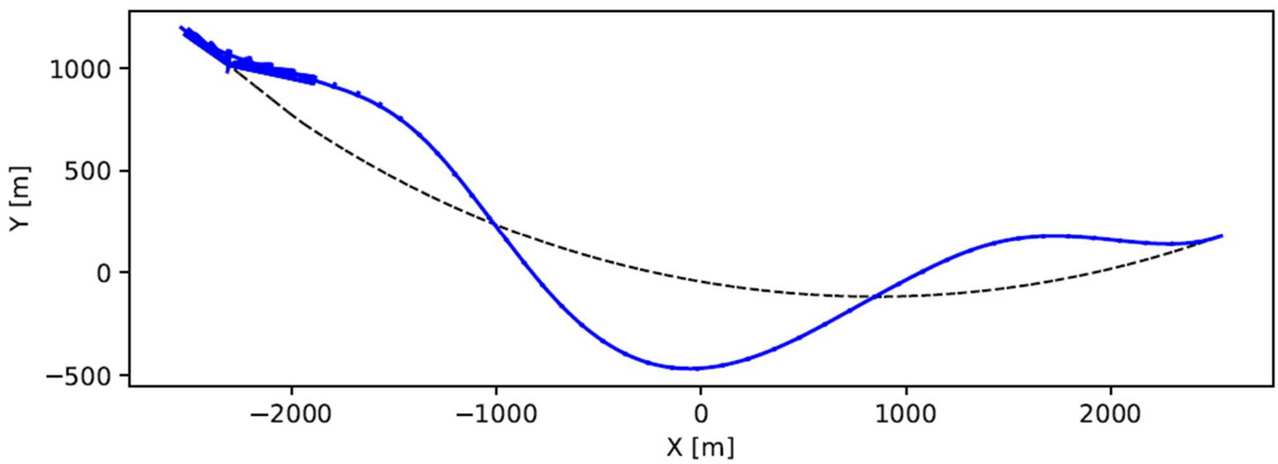


Figure 5-48 Mode 1 in the independent coupled analysis model

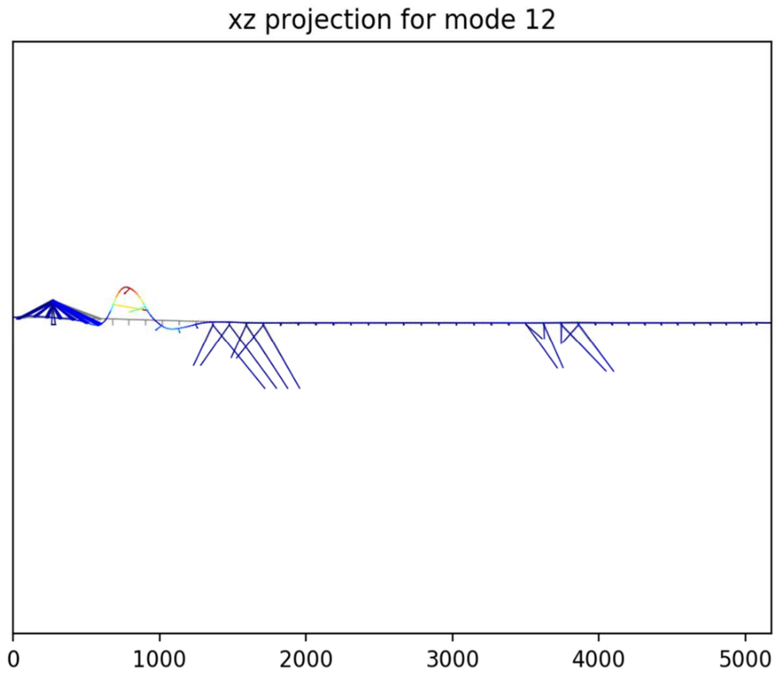


Figure 5-49 First vertical mode from design calculations (Norconsult - Dr. Techn. Olav Olsen, n.d.)

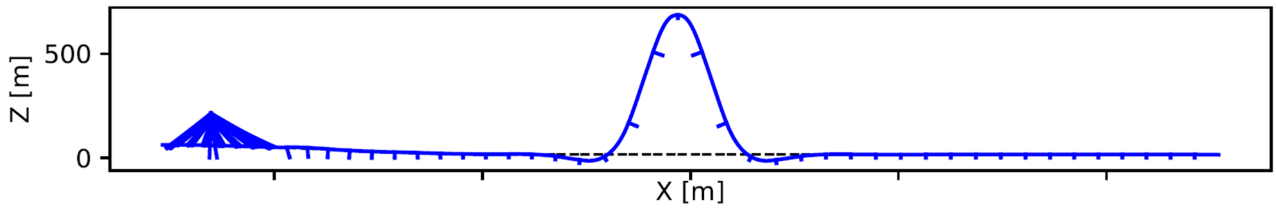


Figure 5-50 First vertical mode in the independent coupled analysis model

5.6.3 Permanent loads

Table 5-19 and Table 5-20 present the comparison of load effects under permanent loads. In general, there is good agreement with designer's analysis. Nevertheless, the differences in transverse deformations due to mooring system adjustment produce deviations in the strong axis bending moment. Figure 5-51 and Figure 5-52 show the weak axis bending moment loads for the independent and the design analyses, respectively. Strong axis bending moment distributions are presented in Figure 5-53 and Figure 5-54.

Figure 5-55 and Figure 5-56 show the deformed shape of the bridge under permanent loads. As it can be observed, the adjustment of the mooring line pretension leads to different configurations, being difficult to achieve the desired geometry.

Table 5-19 High bridge static loads under permanent loads

Parameter	Unit	Permanent loads	
		DNV GL	Designer
Min axial force	MN	-111.3	-114.9
Max axial force	MN	5.24	2.1
Max weak axis bending moment	MNm	80.7	71.9
Min weak axis bending moment	MNm	-214.4	-190.5
Max strong axis bending moment	MNm	73.7	44.9
Min strong axis bending moment	MNm	-121.3	-62.5
Max torsional moment	MNm	2.39	1.93

Table 5-20 Low bridge static loads under permanent loads

Parameter	Unit	Permanent loads	
		DNV GL	Designer
Min axial force	MN	1.02	-1.6
Max axial force	MN	5.49	2.2
Max weak axis bending moment	MNm	130.6	132.5
Min weak axis bending moment	MNm	-245.6	-260.1
Max strong axis bending moment	MNm	178.7	93.8
Min strong axis bending moment	MNm	-147.6	-47.5
Max torsional moment	MNm	11.3	18.9

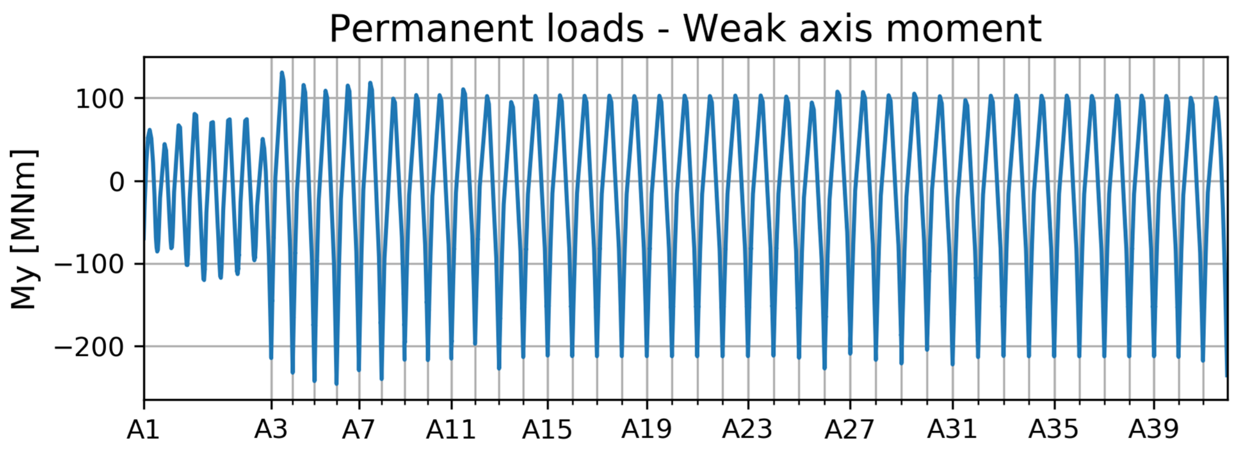


Figure 5-51 Weak axis bending moment distribution for permanent loads in the independent analysis

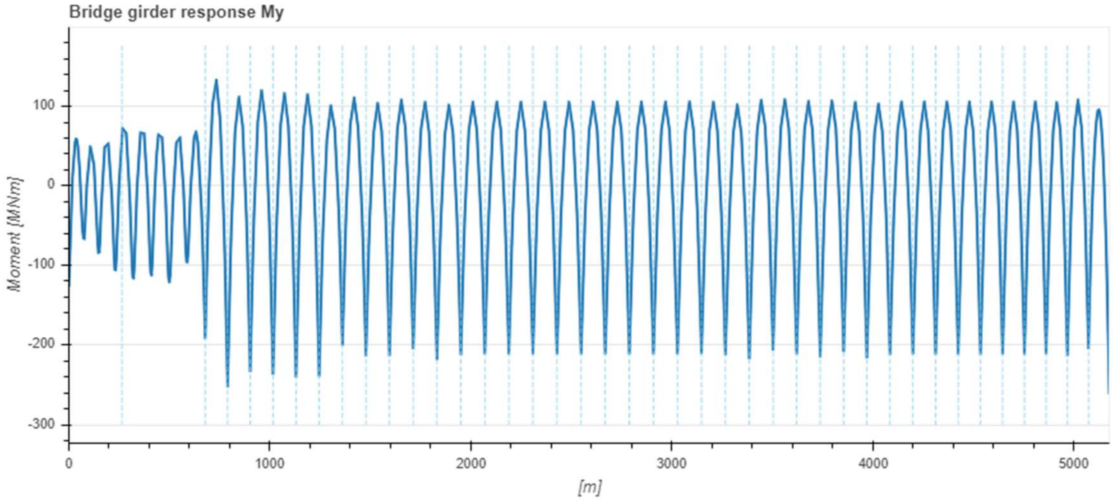


Figure 5-52 Weak axis bending moment distribution for permanent loads in the design analysis

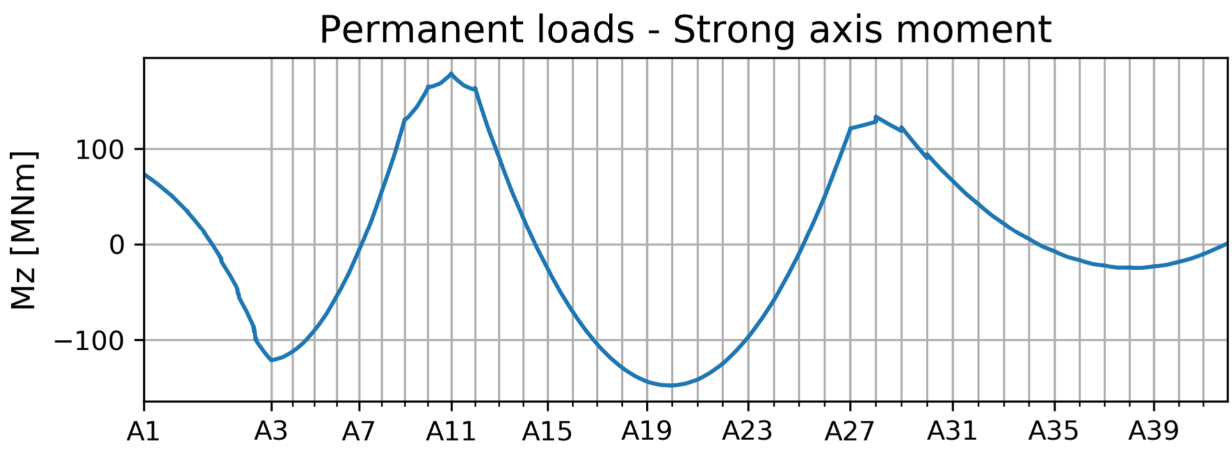


Figure 5-53 Strong axis bending moment distribution for permanent loads in the independent analysis

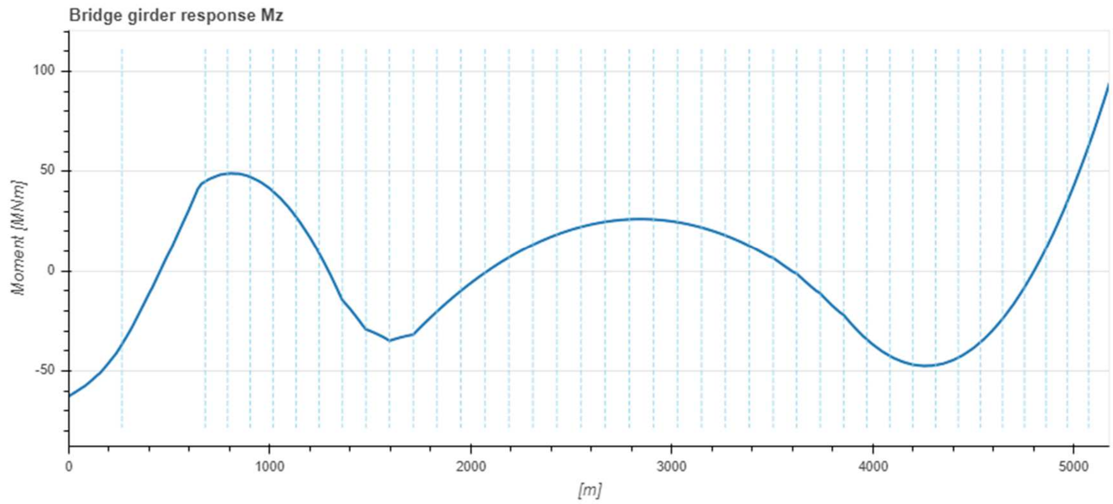


Figure 5-54 Strong axis bending moment distribution for permanent loads in the design analysis

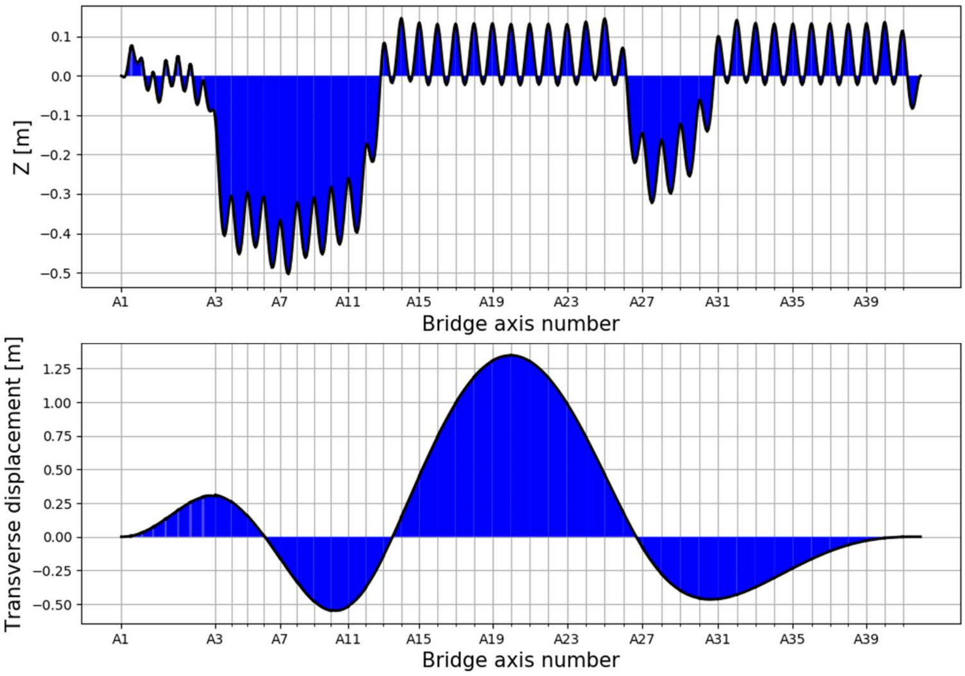


Figure 5-55 Bridge deformation in the design analysis

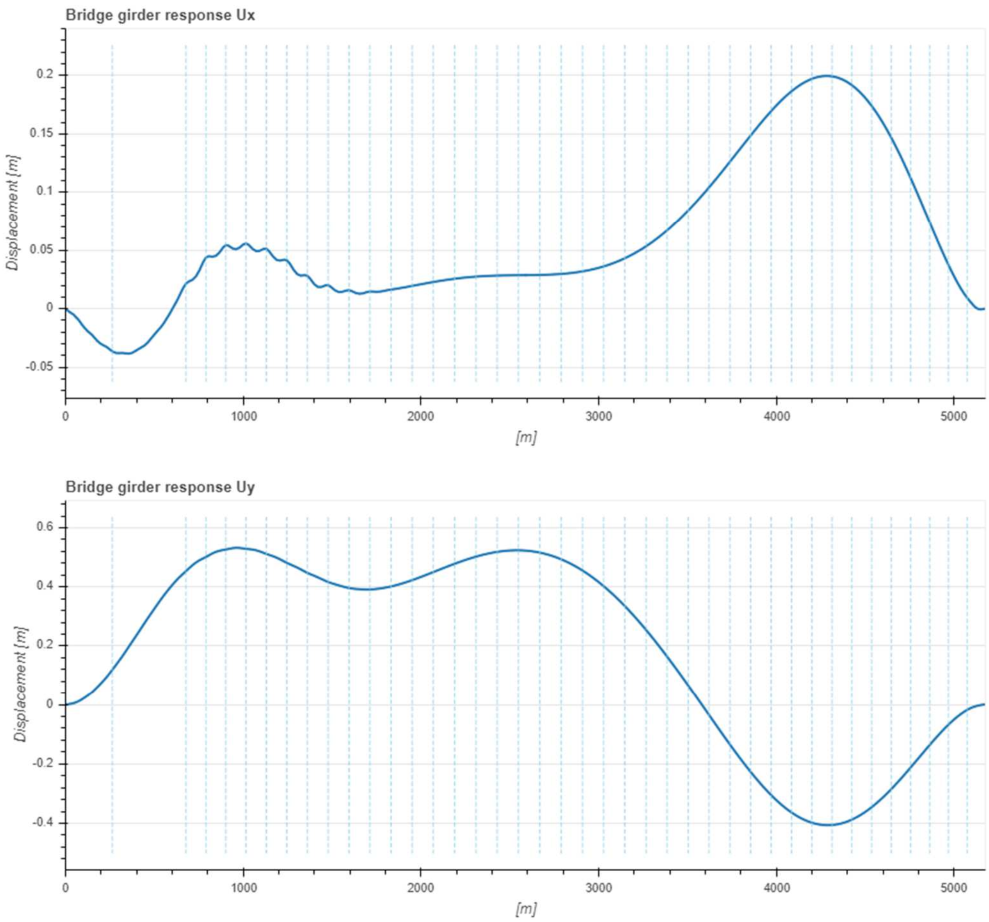


Figure 5-56 Deformations in x- (upper plot) and y- (lower plot) directions from the design analysis

5.6.4 Dynamic loads

In general, there is good agreement between the independent analysis and the design analysis loads. Nevertheless, the following differences are identified:

- A 30% additional strong axis bending moment at the North abutment is obtained in the independent analysis.
- Although the maximum and minimum weak axis bending moment is good agreement, the independent analysis show a higher loading in the low bridge than the design analysis.
- 50% less torsional moment is obtained in the design analysis compared to the independent calculation.

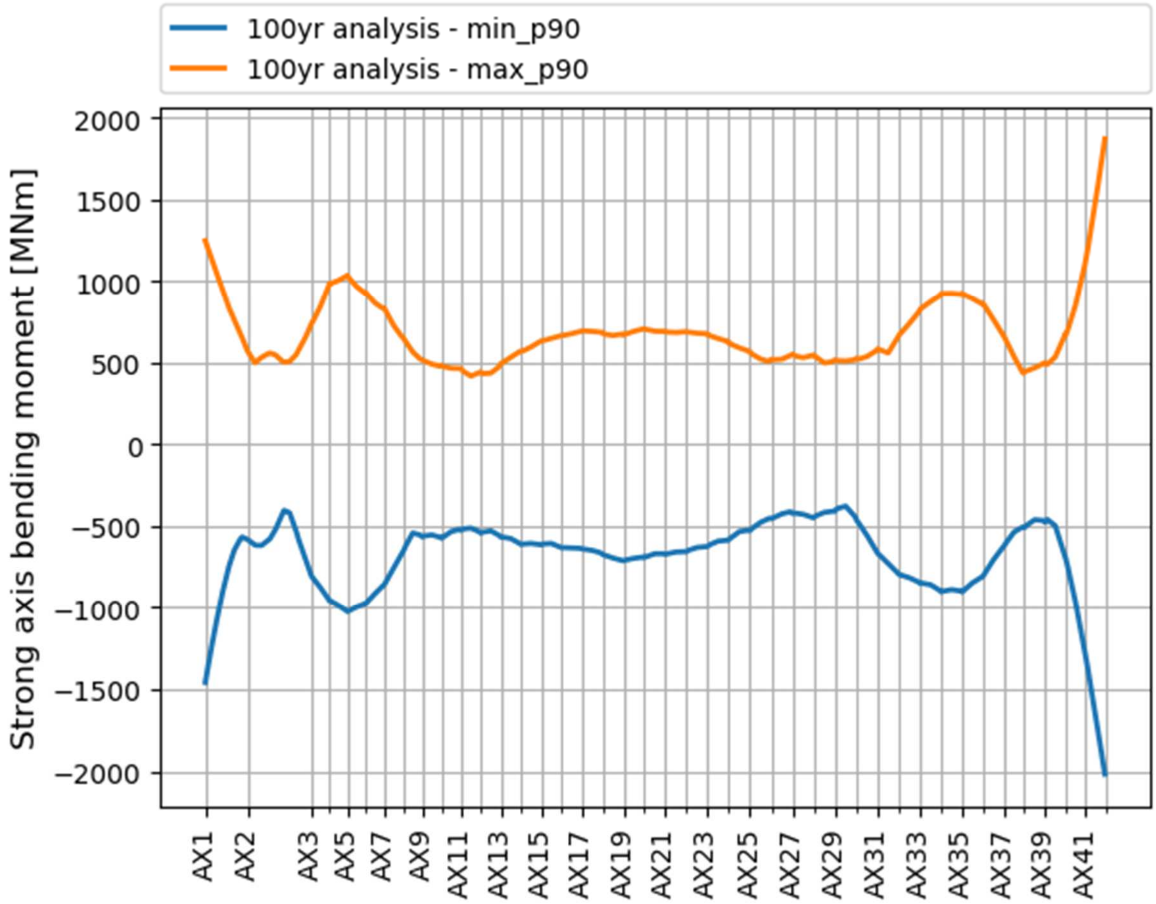


Figure 5-57 Strong axis bending moment for the 100-years conditions in the independent analysis

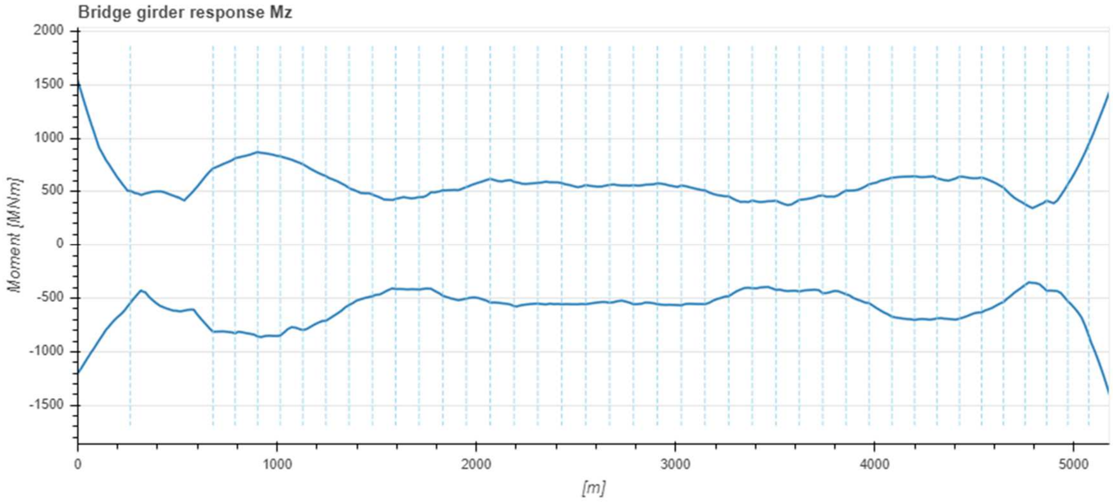


Figure 5-58 Design analysis 100-years return period characteristic strong axis bending moment

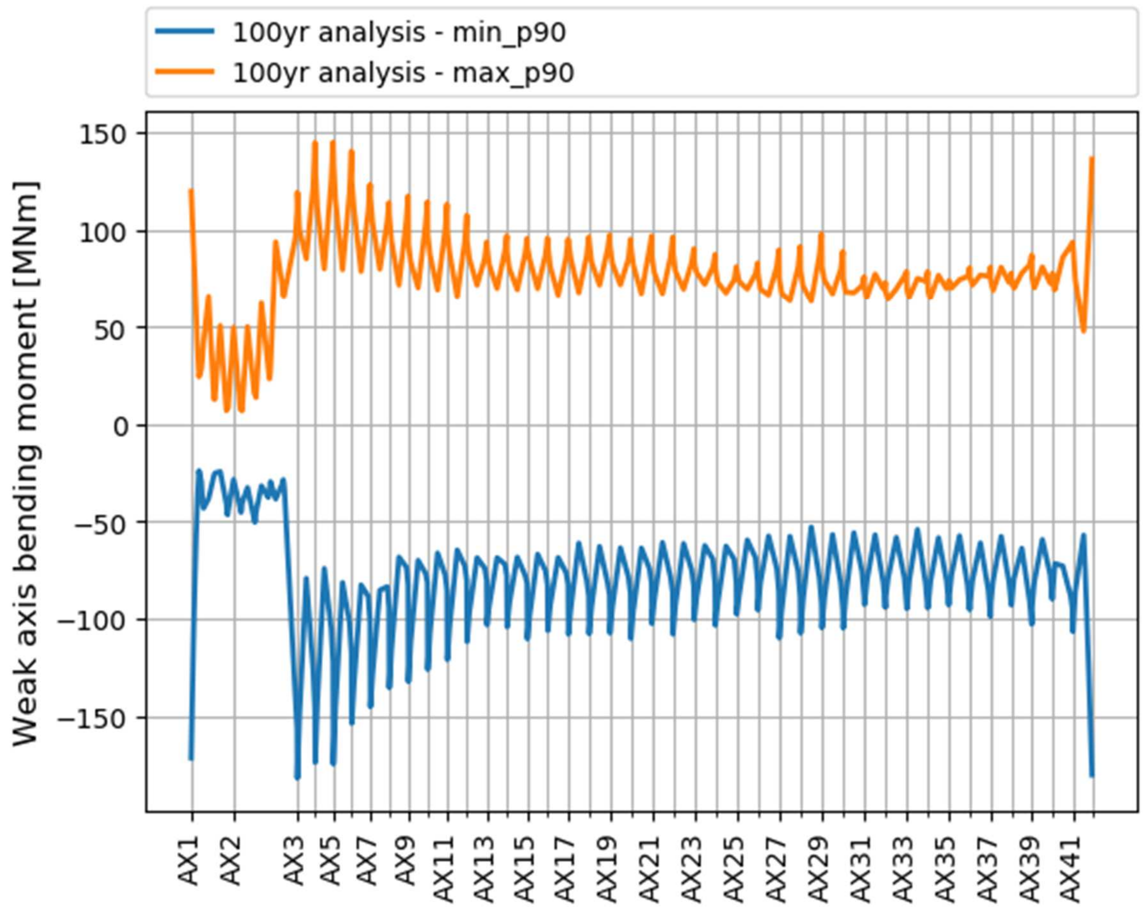


Figure 5-59 Weak axis bending moment for the 100-years conditions in the independent analysis

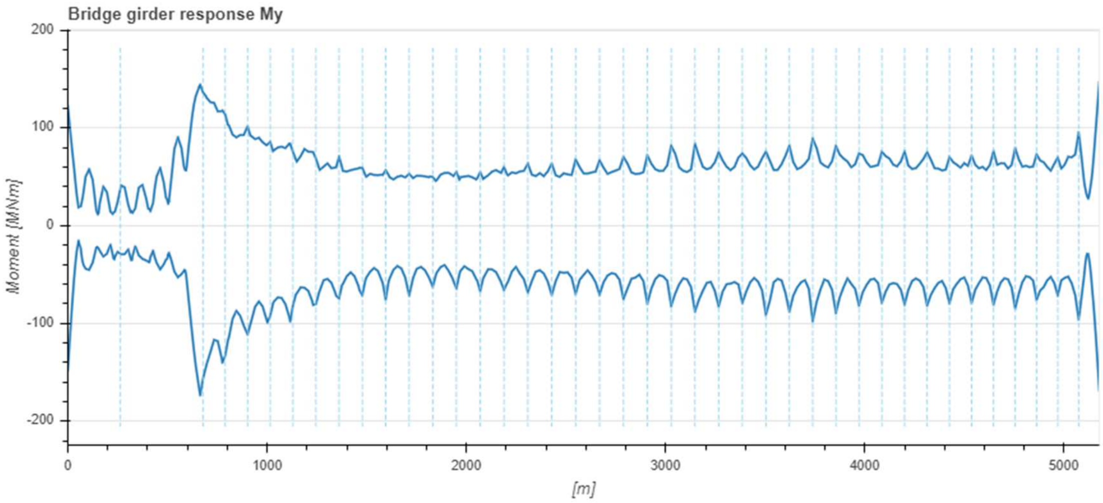


Figure 5-60 Design analysis 100-years return period characteristic weak axis bending moment

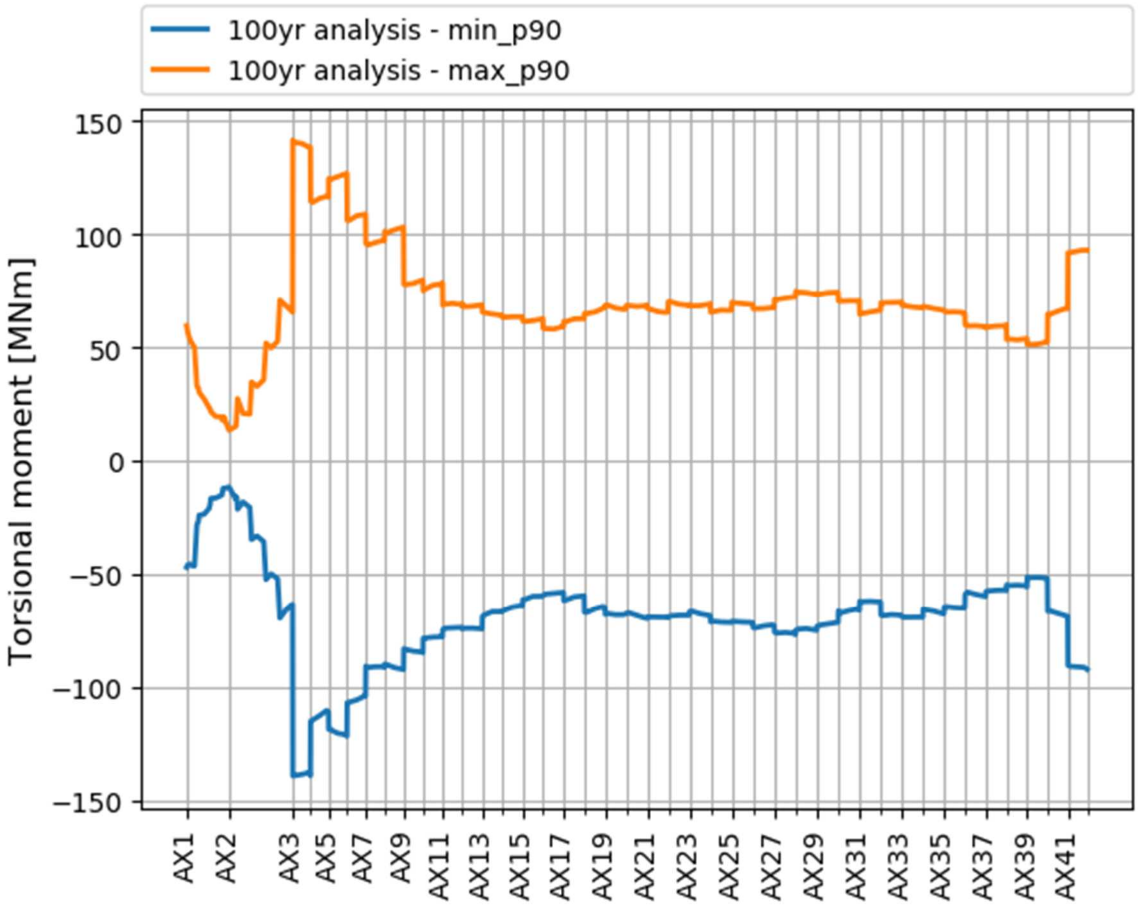


Figure 5-61 Torsional moment for the 100-years conditions in the independent analysis

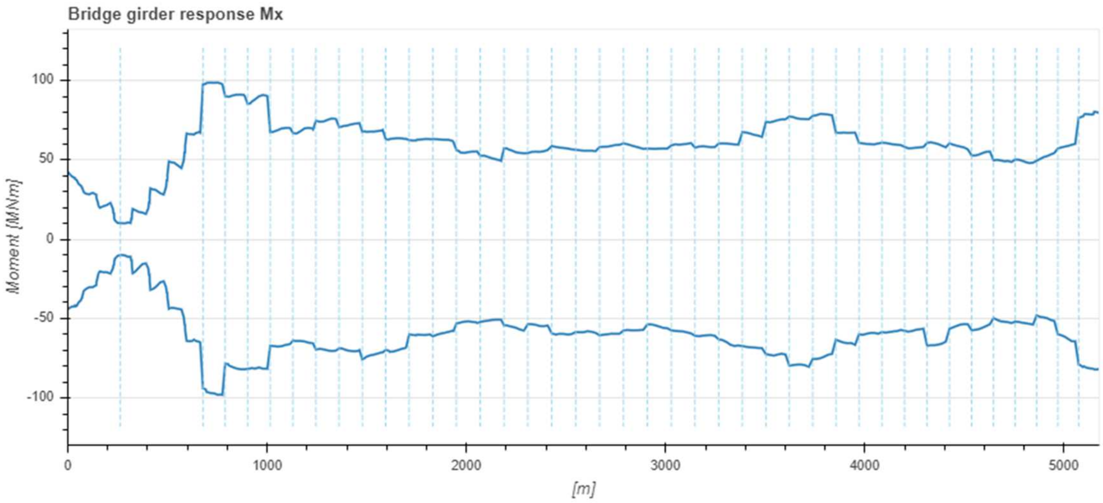


Figure 5-62 Design analysis 100-years return period characteristic torsional moment

6 CAPACITY CHECKS FOR THE ULTIMATE LIMIT STATES

6.1 General

The ULS checks are carried out for the case without traffic on the bridge and with 100-years return period for the environmental loads. Other ULS cases that shall be checked as specified in the design basis (Statens Vegvesen, 2018) are not covered by the independent global analyses and hence not covered by the capacity checks.

6.2 Assumptions

The following assumptions are made:

- The extreme combined stresses from the different load effects are added without taking into account the non-linearity of the combined stress formulation.

6.3 Load and material factors

The capacity in ordinary ultimate limit state (STR) is checked for the case with dominant 100-years return period environmental condition. The load factors given in Table 6-1 are used.

Table 6-1 Load factors

Load	Load factor
Permanent loads	1.2
Environmental loads without traffic	1.6
Temperature	0.84
Water level variation	1.6

Based on the requirements in the Design Basis for Bjørnafjorden (Statens Vegvesen, 2018), the material factors given in Table 6-2 are used.

Table 6-2 Material factors

Limit state	Material factor
Ultimate strength	1.1

With a material factor of 1.1, as given in Table 6-2, the steel yield capacity becomes 382 MPa.

6.4 ULS checks

The following load effects are combined:

- Permanent loads
- Astronomical tide: both HAT and LAT are checked.
- Storm surge: 1.33 metres increase of the sea level is assumed based on the data presented in Section 3.3.6.
- Temperature loads: both positive and negative 25 degrees temperature variations are considered.
- 100-years return period loads

Figure 6-1, Figure 6-2 and Figure 6-3 present the normal, shear and combined ULS stresses, respectively. Steel capacity is exceeded at axes 41 and 42 and at the support areas in axes 3 to 9.

Numerical values of the stresses at the stress points for the various cross-sections as described in **Error! Reference source not found.** are listed in Appendix **Error! Reference source not found.**.

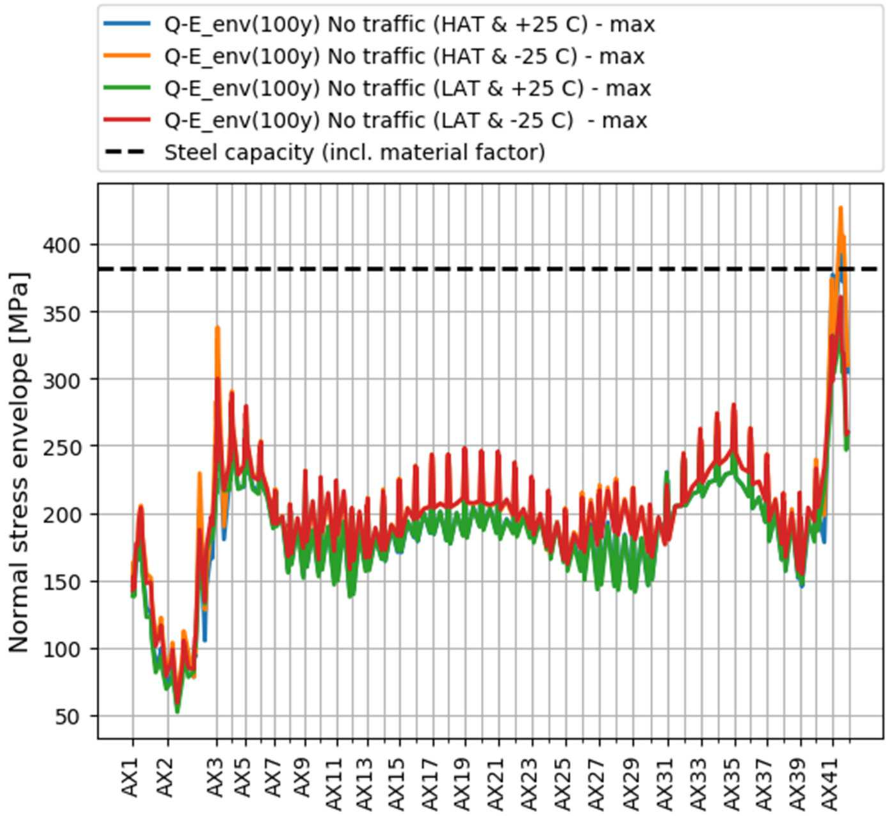


Figure 6-1 Maximum normal stress in the bridge girder for ULS conditions

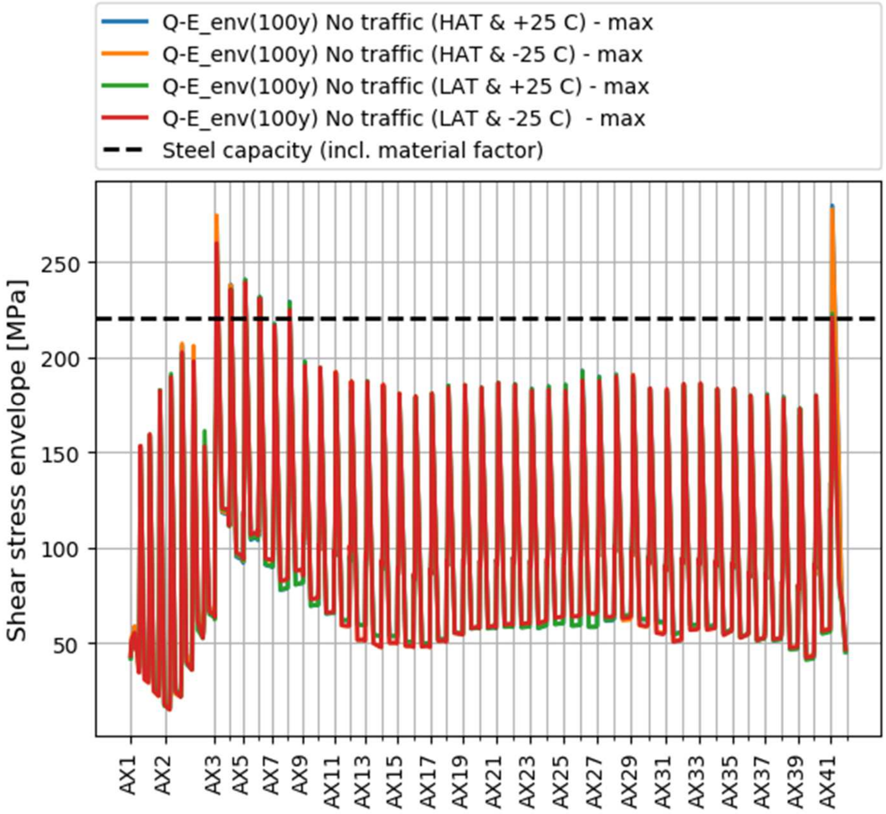


Figure 6-2 Maximum shear stress in the bridge girder for ULS conditions

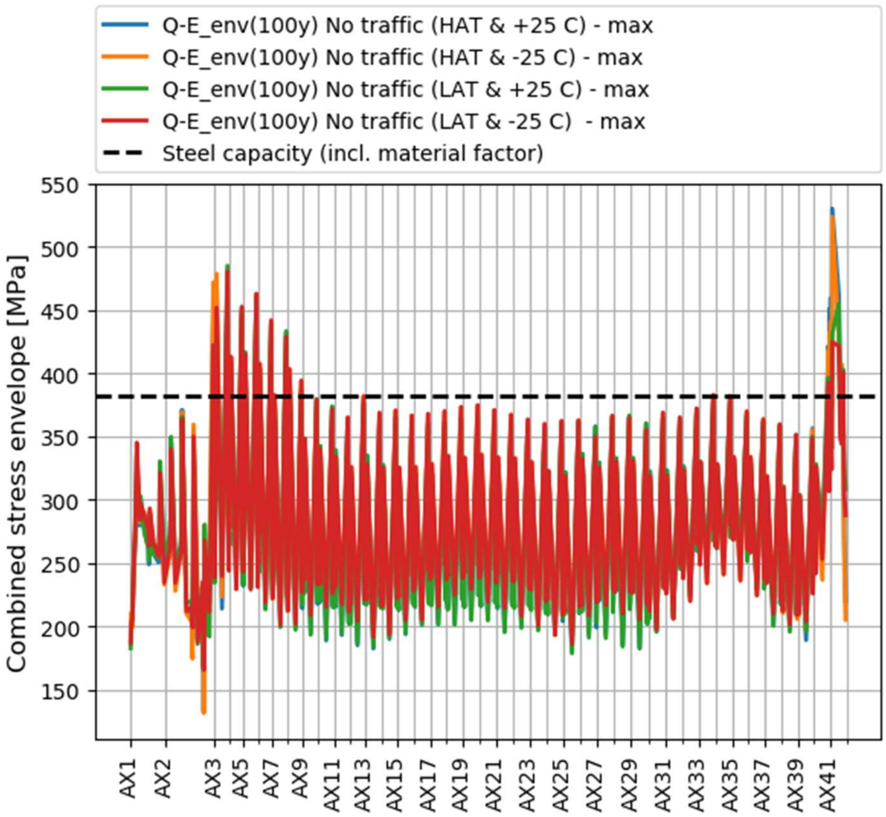


Figure 6-3 Maximum combined stress in the bridge girder for ULS conditions

6.5 Axis 2 transverse displacement

The transverse displacement of the bridge girder is checked at axis 2 to detect potential clashing against the tower legs. Table 6-3 includes the transverse displacement produced by the different load components after applying the load factors. At bridge girder height, the available width between the tower legs is 33.54 metres, which leaves a margin for transverse motions of 1.27 metres. The maximum ULS displacement is 2.95 metres towards the leg on the bridge West side, exceeding the available gap by approximately 1.7 metres.

Figure 6-4 shows the relative contribution of each load component and the accumulated displacement when applying the loads in the same order they are given in Table 6-3.

Figure 6-5 presents the envelope of the displacements of the bridge girder in global x- and y- directions in the design analysis. A transverse displacement of 3.2 metres is calculated after combining the x- and y- components, which is in line with the predicted value from the independent analysis.

Table 6-3 Transverse displacement in ULS conditions per load component (includes load factors per Table 6-1)

Load component	Tower leg West	Tower leg East
Permanent loads	0.12	0.12
Astronomical tide	0.01	-0.01
Storm surge	0.03	0.03
Temperature change	0.15	-0.14
100-years return period conditions	2.64	-2.61
Total	2.95	-2.61

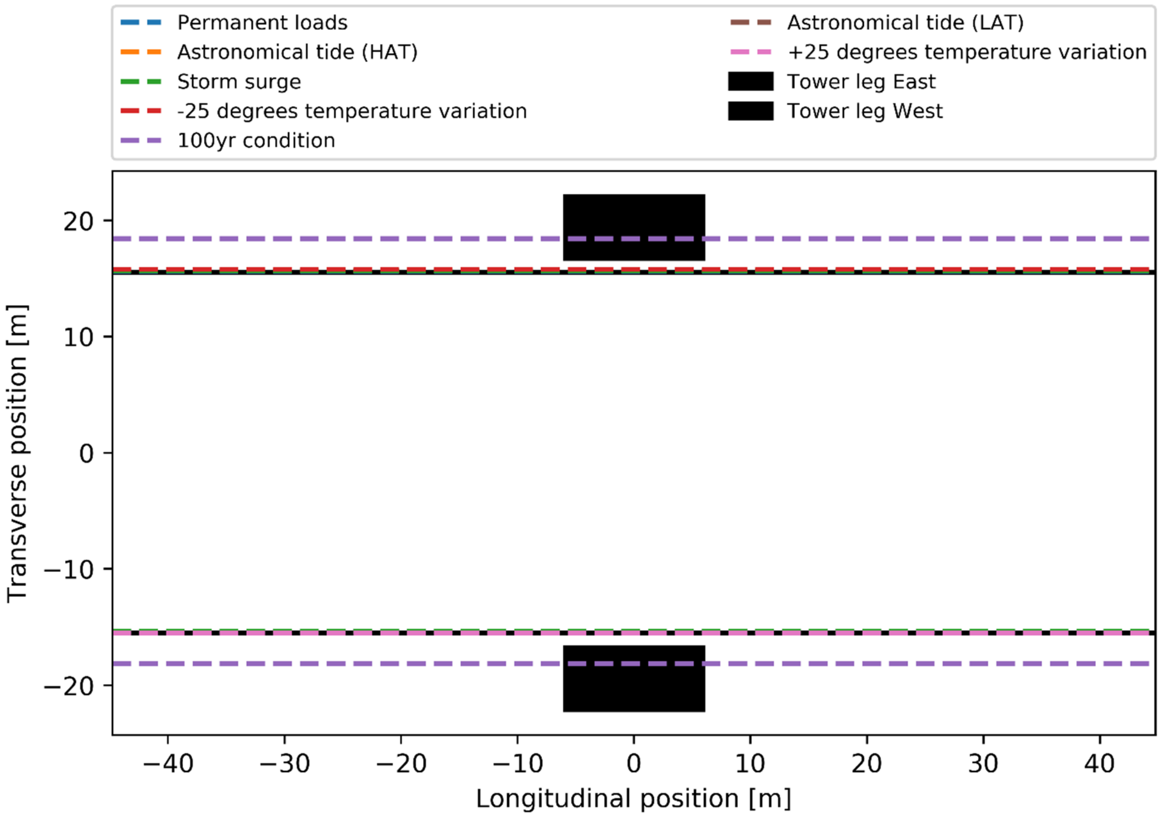


Figure 6-4 Plan view of the bridge girder and tower columns including the accumulated transverse displacement from the different load components in the sequence defined in Table 6-3. Transverse position is positive towards bridge West.

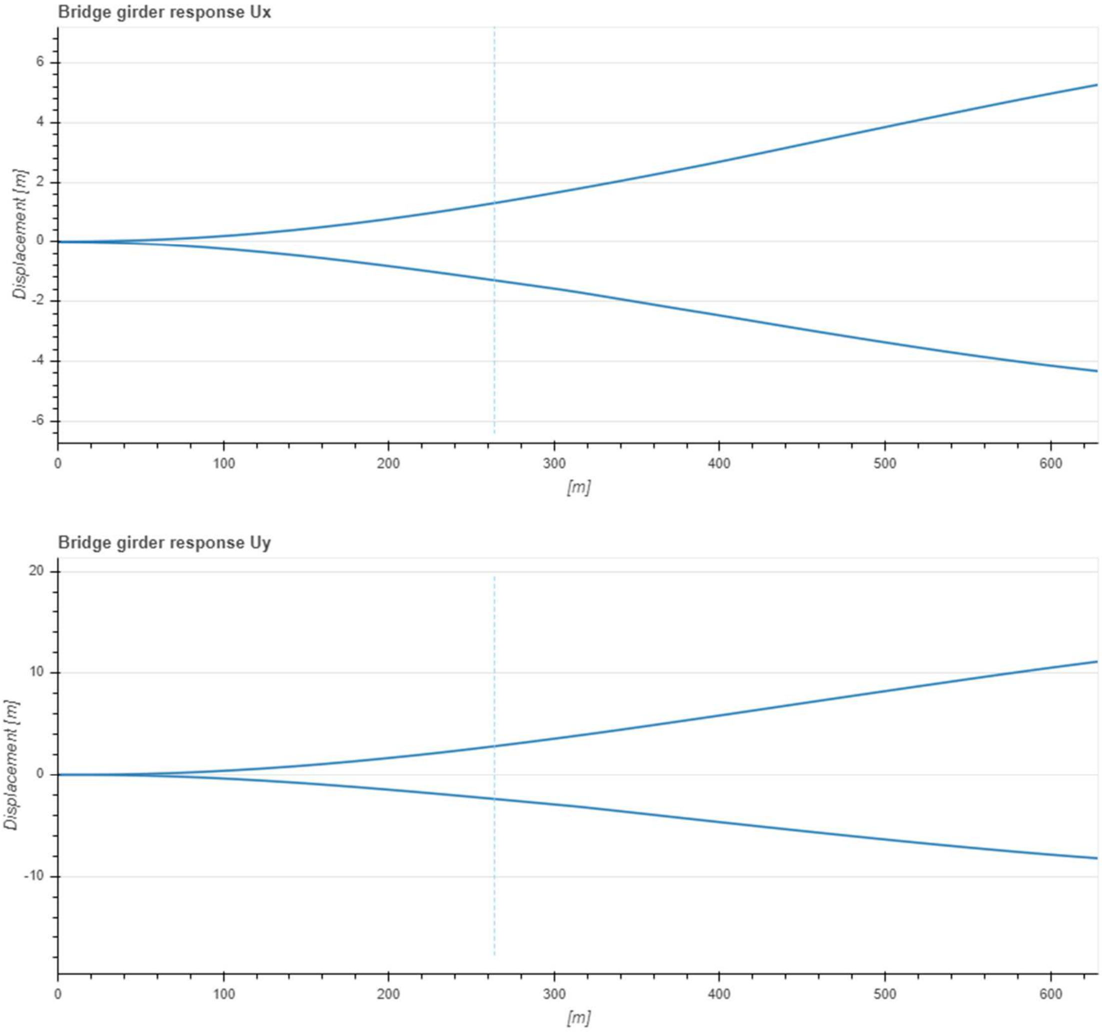


Figure 6-5 Displacement in global x- and y- directions in the design analysis in ULS conditions. The displacements are given in a coordinate system which is skewed -26.8 degrees with respect to the high bridge heading

The ULS capacity made as a von-Mises stress check is exceeded at Axis 3 to 9 and close to the abutment North. Independent buckling checks are not carried out, but it is expected that reinforcement at these cross-sections will also make the buckling capacity acceptable. The stress check is based on beam theory and that stress increase due to local stiffening and shear lag is not accounted for.

The available free movement space for the bridge girder at the tower is not sufficient to avoid contact from the bridge girder into the tower for ULS loads. The risk of clash will be drastically reduced by narrowing the girder to the width without the wind nose.

7 FATIGUE DAMAGE FROM ENVIRONMENTAL LOADS

7.1 General

The proposed concept for crossing of the Bjørnafjorden strait possesses several parts that need to be checked for fatigue. The bridge girder and pontoon columns are exposed to dynamic loads from waves, wind, tidal variation and traffic. The pontoons are exposed to variable load pressure and the high bridge and its cables are dynamically loaded. The independent analyses are directed to check that the bridge girder can be given satisfactory fatigue life as this is the dominating structural element and possible need for design changes here will have the largest impact on cost and schedule.

It should be realized that a floating bridge is considerably more exposed to fatigue loads than a conventional steel bridge girder with a steel orthotropic stiffened plate deck. Since the same structural detail may be exposed to dynamic loads from several sources, traditional considerations of suitable fatigue details may not be sufficient. In other words, as the bridge is exposed to much larger fatigue loads from environmental loads also the fatigue loading from traffic need to be treated more accurately.

The fatigue checks are made by analysing the fatigue from the wind and wave loads. The fatigue from traffic and tidal variations is not studied in this report.

The fatigue capacity of a structural detail will depend upon the local geometry and fabrication methods that will be determined at a later design phase. Consequently, the independent fatigue checks are focused on details where improvement will require changes that will impact the total cost or schedule.

7.2 Results from screening of fatigue damage from wind and waves for the bridge girder

7.2.1 Screening analysis results

Screening of the fatigue damage of details in the bridge girder is made by analysing fatigue in typical details that will be present in the dominant cross-sections along the bridge. The damage is calculated at the selected points as shown in Figure 4-2.

The screening is made with the assumption of a typical detail that will be present at various positions along the bridge. The typical detail is selected as a buttweld assumed fabricated in accordance with NS-EN-1090-2 and a fabrication tolerance of 2 mm. A two-sided buttweld was assumed with a maximum thickness increase in plate thickness of 2 mm. Consequently, a stress concentration factor of 1.50 is applied for all the sections and the corresponding SN curve to be used is D curve according to DNVGL-RP-C203 (DNVGL-RP-C203, April 2016).

Rainflow counting is used to calculate the stress range distribution from time series of stresses from the global analysis. The fatigue damage is calculated separately for normal stresses and shear stresses. The reason is that combination of these stresses in a time domain analysis with a beam model is difficult.

In order to account for local stress-concentrations certain points are recalculated with stresses found from local analyses as shown in 7.3.5.

Figure 7-1 to Figure 7-8 show calculated fatigue lives induced by normal stress along the bridge girder at the location points defined in Figure 4-2. Figure 7-9 presents the envelope of the fatigue life, i.e., minimum fatigue life of different locations, along the girder. As seen from the results, the most critical fatigue life is 148 years and occurs at axis 20, at the transition between the support reinforcement sections D and B, towards axis 19. The critical hotspot is Point 3. The details can be found in Appendix xxxx

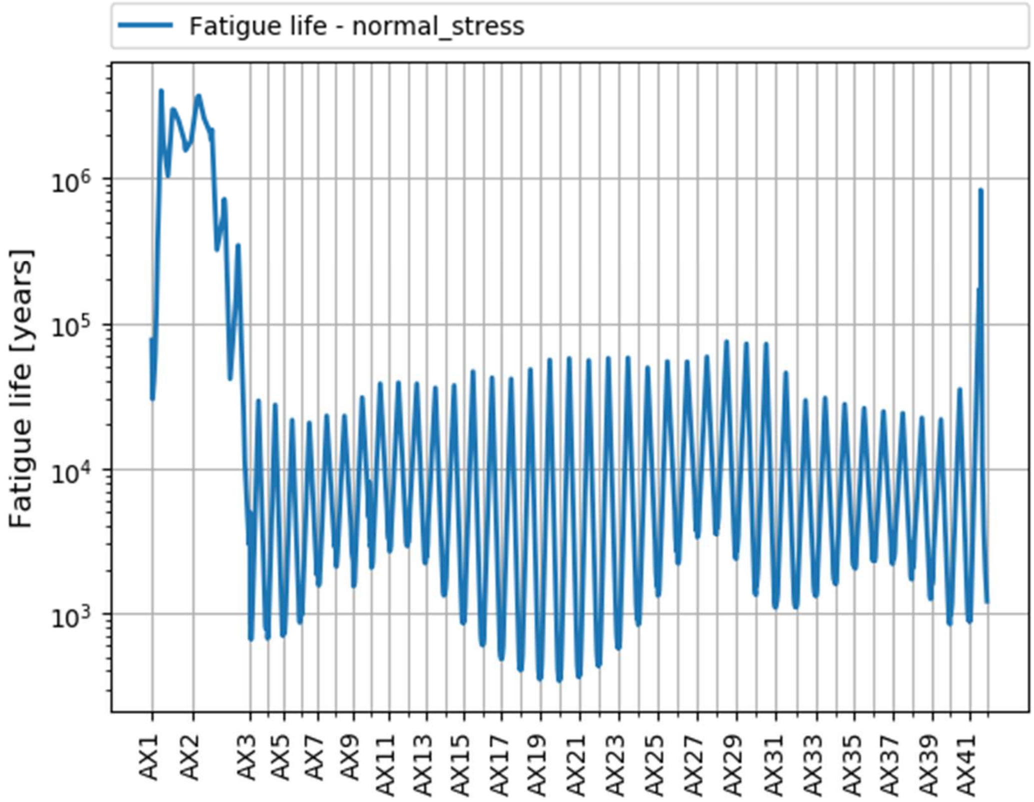


Figure 7-1 Fatigue life based on normal stresses for Point 0

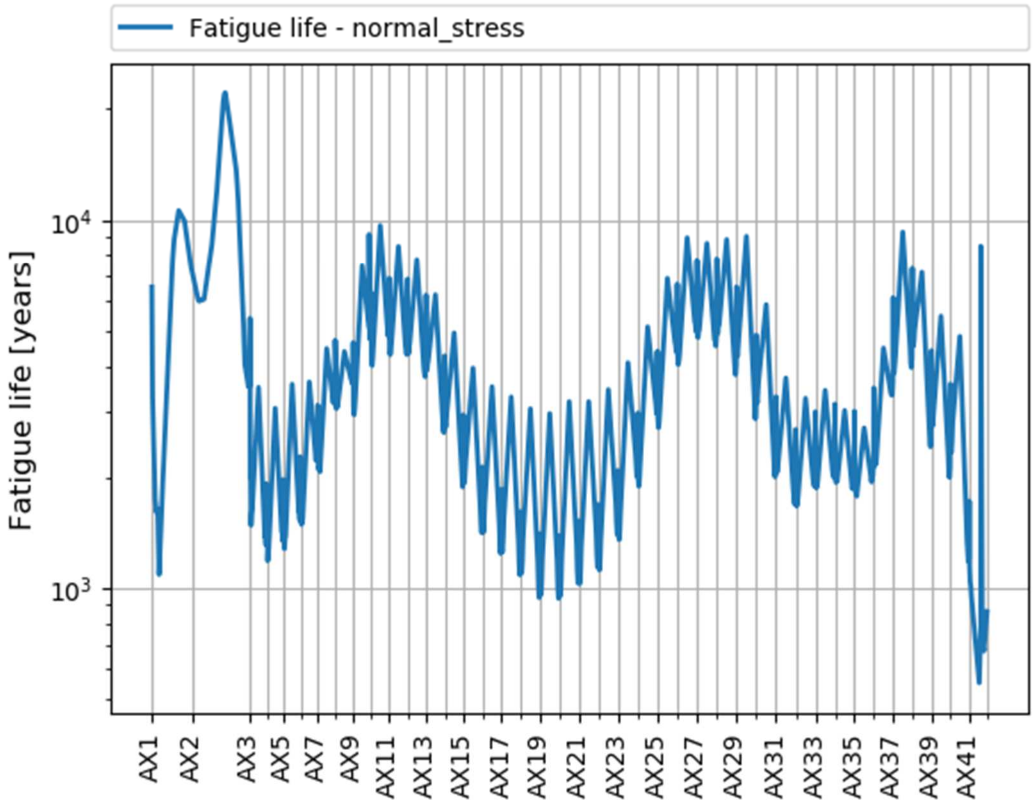


Figure 7-2 Fatigue life based on normal stresses for Point 1

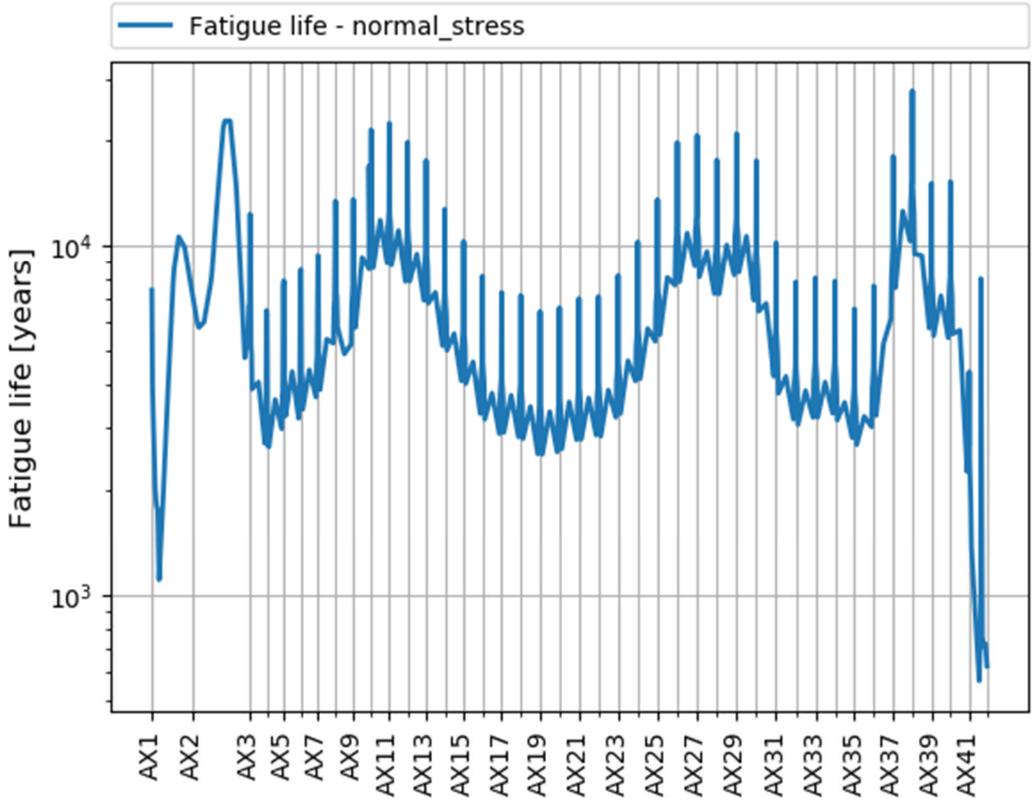


Figure 7-3 Fatigue life based on normal stresses for Point 2

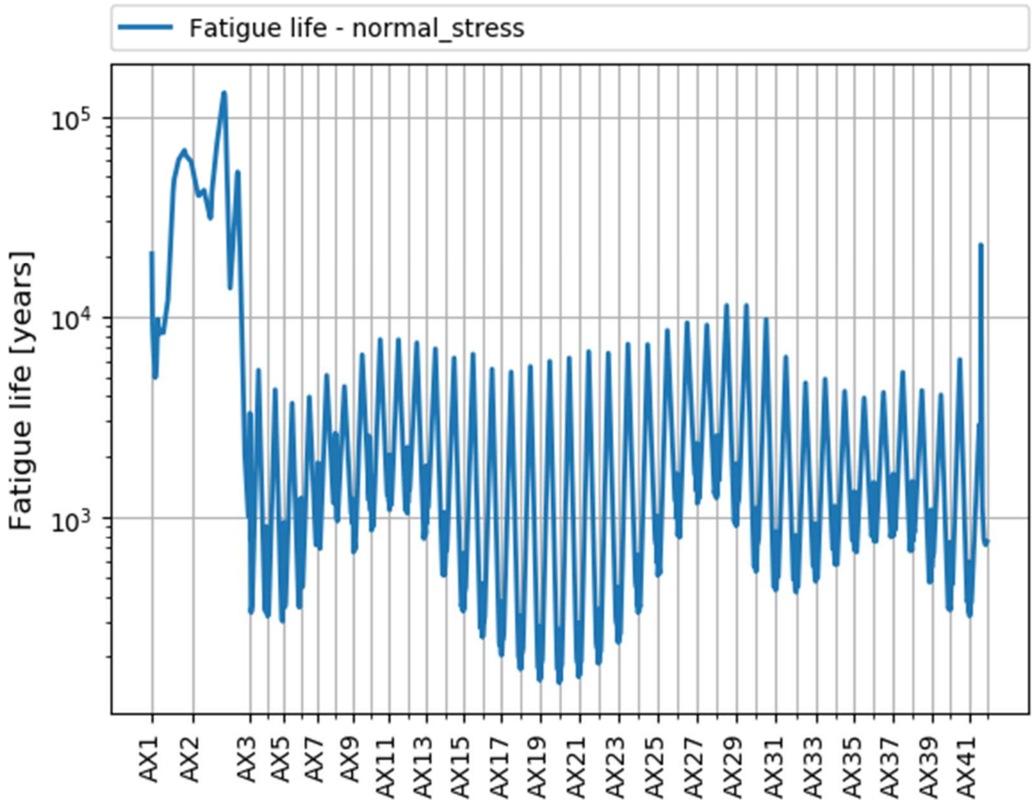


Figure 7-4 Fatigue life based on normal stresses for Point 3

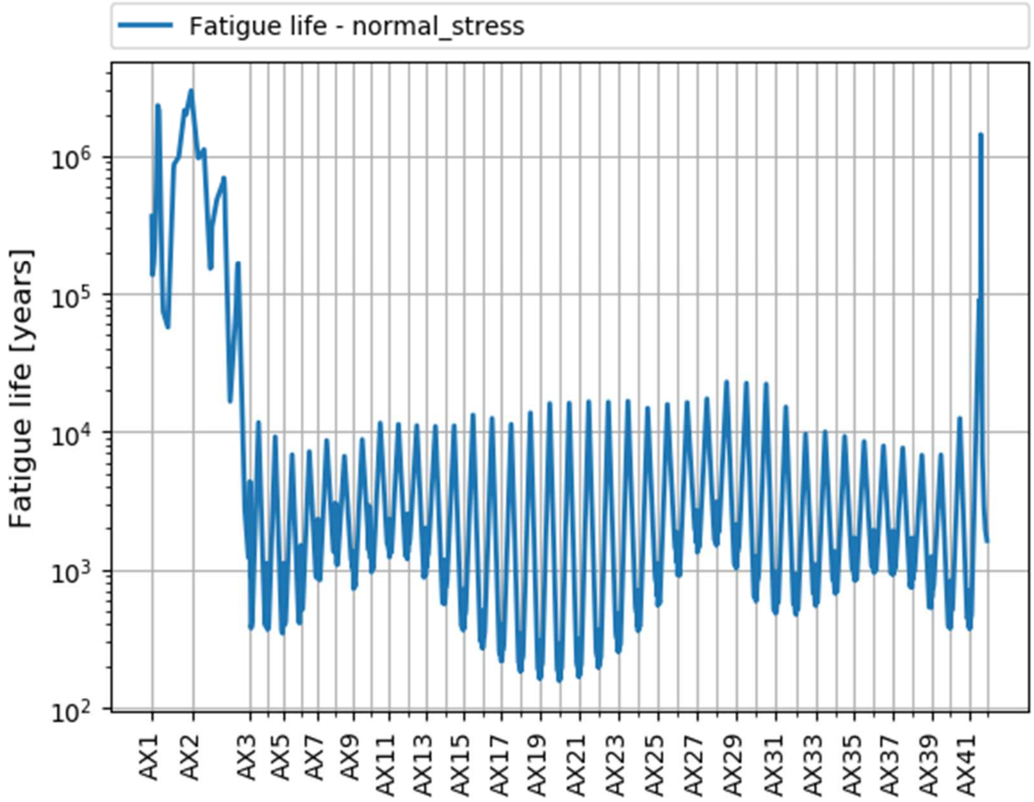


Figure 7-5   Fatigue life based on normal stresses for Point 4

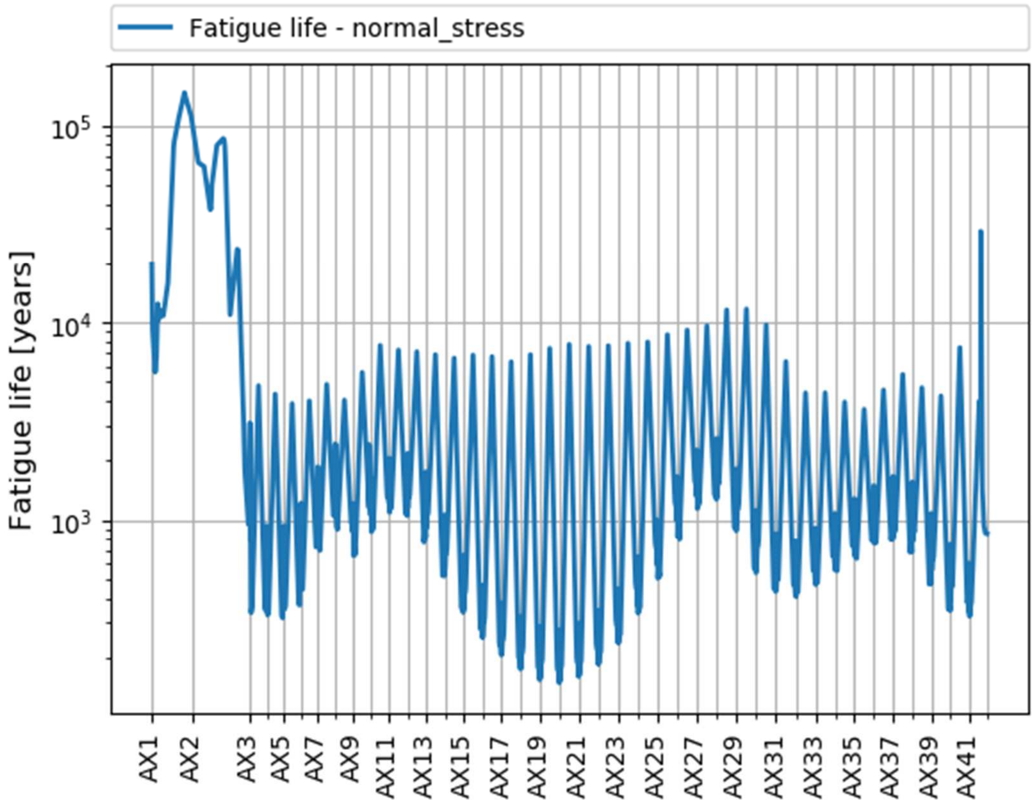


Figure 7-6   Fatigue life based on normal stresses for Point 5

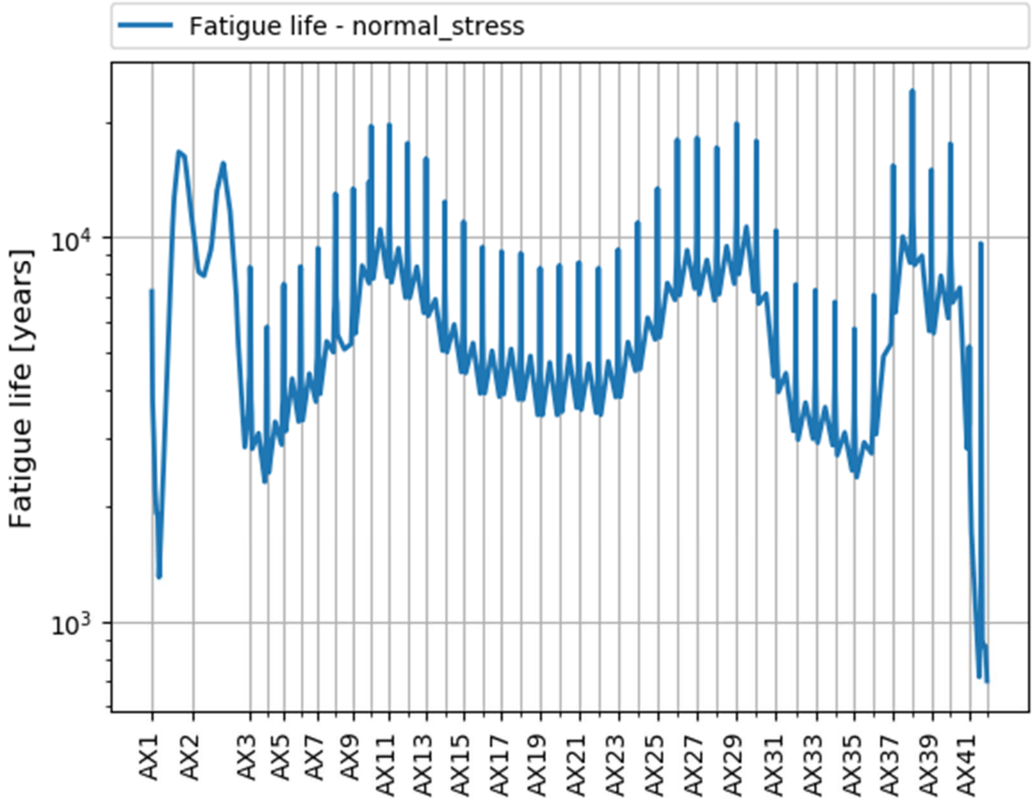


Figure 7-7 Fatigue life based on normal stresses for Point 6

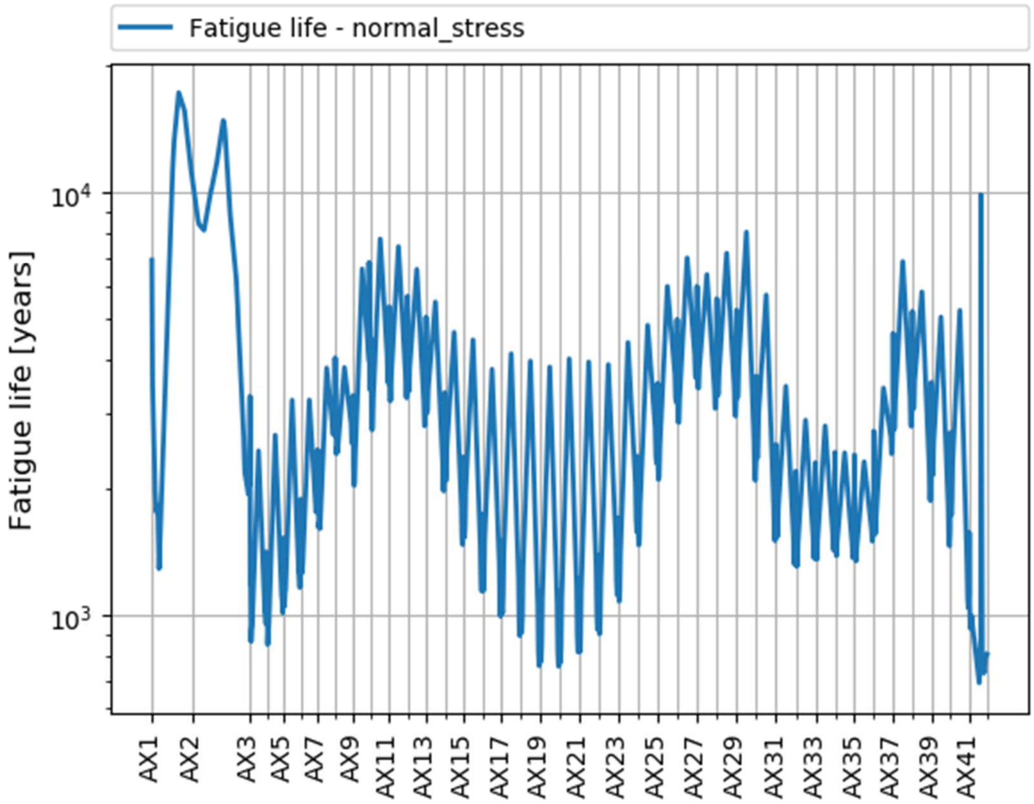


Figure 7-8 Fatigue life based on normal stresses for Point 7

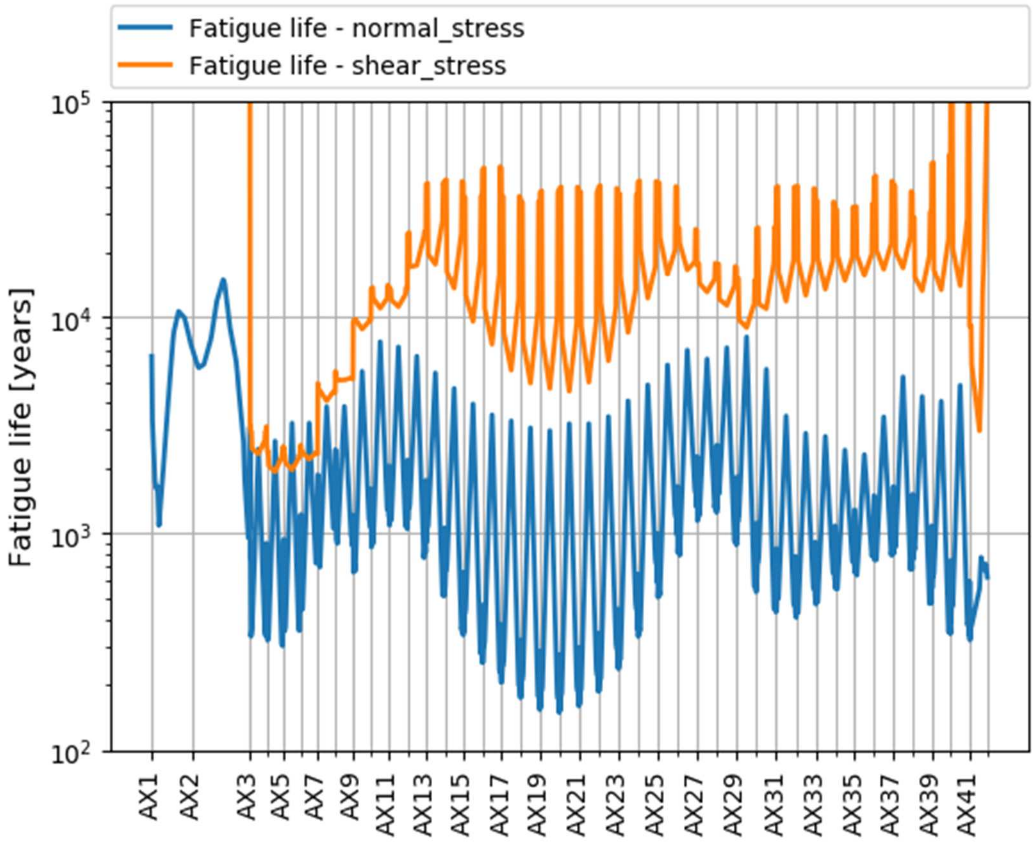


Figure 7-9 Minimum fatigue life based on normal and shear stresses for all points

7.2.2 Influence of applying variable wave conditions along the bridge

According to (Statens Vegvesen, 30.11.18), the wind wave conditions along the bridge may be varied along the bridge. A set of factors depending on the distance to the South abutment and the wave direction are given for the significant wave height and the wave peak period.

A fatigue analysis using the 10 most critical cases for fatigue is performed. These cases account for more than 60% of the damage at Axis 20. The screening analysis presented above is the basis for this selection.

Figure 7-10 and Figure 7-11 present the fatigue life based on normal and shear stresses, respectively, calculated based on the selected 10 sea states. Applying variable wave conditions along the bridge increases the fatigue life by 20%.

The most critical sea states come from 180 and 210 degrees. Then, the wave conditions increase in severity from South to North. This is reflected in the results, since the fatigue life is increased between axes 3 and 11. On the other hand, it has limited effect in the low bridge and a negative effect on the North end. The wave conditions at the centre of the bridge are the nominal conditions applied in the screening analysis. The waves at the north end are increased by 20%.

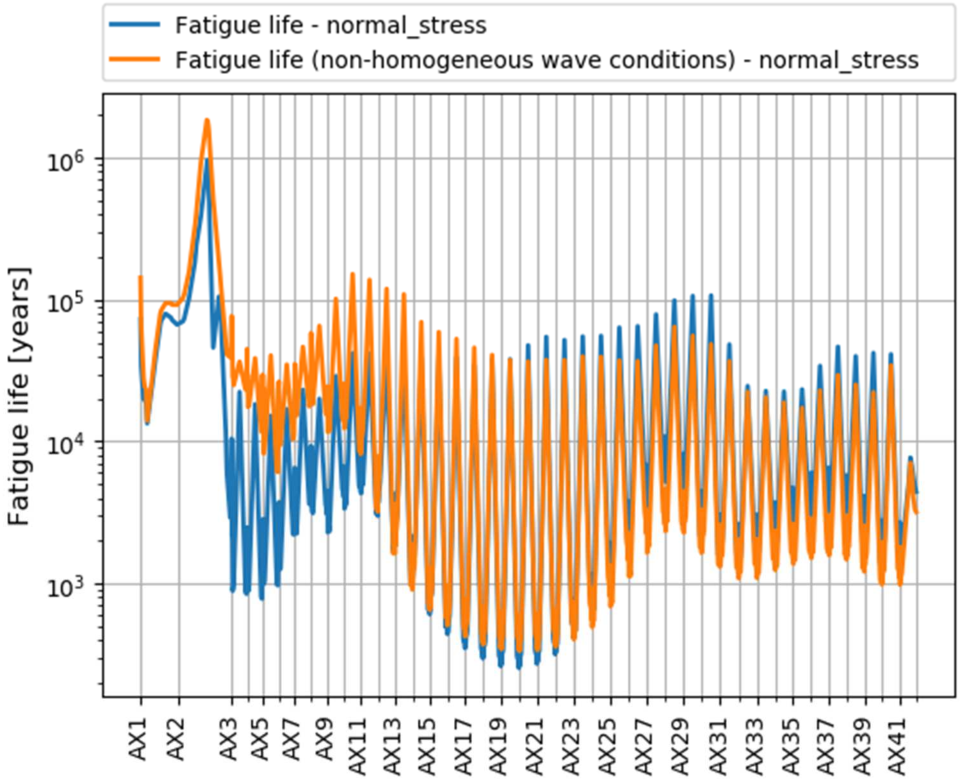


Figure 7-10 Influence of non-homogeneous wave conditions on the fatigue life based on normal stresses and the 10 most contributing sea states

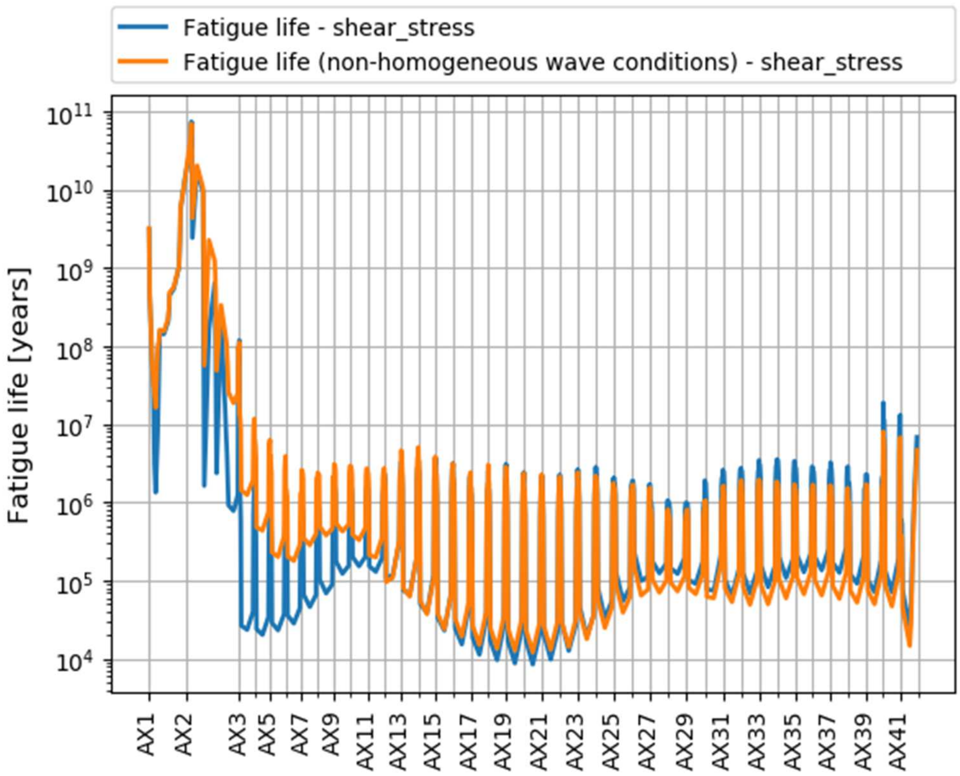


Figure 7-11 Influence of non-homogeneous wave conditions on the fatigue life based on shear stresses and the 10 most contributing sea states

7.3 Local stress concentrations in bridge girder due to shear lag and cross-sectional changes

7.3.1 General

The stresses used as basis for the fatigue calculations presented in 7.2 is based on beam theory. Due to the wide flange compared with the span length between pontoons shear lag effects may increase the stresses at certain points. Furthermore, the beam support is on the column in the middle of the cross-section and the cross section has internal bulkheads and longitudinal trusses that makes need to adjust the stresses that are found from beam theory. Therefore, a set of local analyses that compares results from beam theory with a detailed shell model of a selected part of the girder is made and stress concentration factors are determined.

7.3.2 Selection of local models

In order to compare stresses from beam theory with a local model using shell elements a small part of the low bridge is studied. The model consists of 4 span of the girder and is simplified to be straight over this length. Then 4 load-cases are analysed both with a beam model with the same properties as in the global analysis and with a shell model where the cross-section details are modelled more accurately.

7.3.3 Description of the local models

A local shell model of the bridge is developed to:

1. Verify the stiffness of the global beam model.
2. Locate and examine local stress concentration factors (SCFs).

The shell model includes all longitudinal stiffeners, transverse frames with diagonal beams, internal bulkheads above the column and simplified columns, see Figure 7-12 and Figure 7-13. The mesh density of the shell model is 0.4 m. The total length of the local model is 480 m, i.e. 4 spans of 120 m which is the distance between the pontoons. The origin of the models is in the middle of the bridge with y-axis in the longitudinal direction.

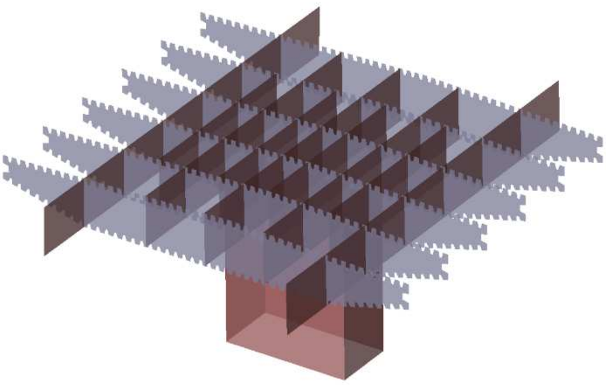


Figure 7-12 Transverse & longitudinal bulkheads above columns

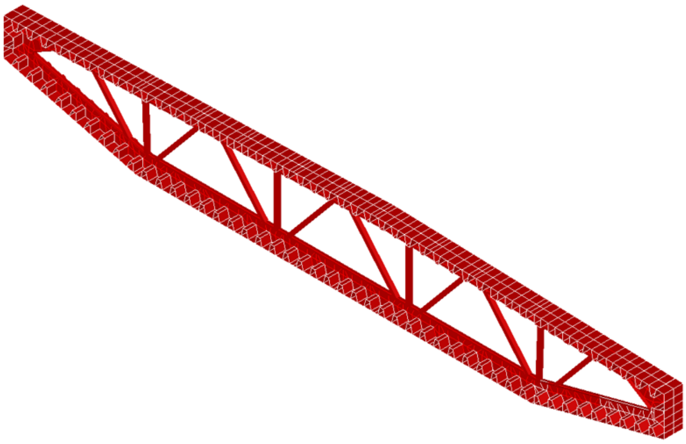


Figure 7-13 Typical transverse frame

The model is supported at five locations, at the bridge girder ends and at the bottom of the three columns, see Figure 7-14. Different boundary conditions are applied to the support points to achieve the desired deformation shapes.

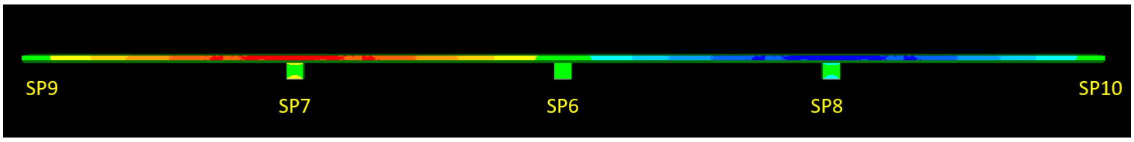


Figure 7-14 Side view showing support locations

Four load cases representing different bridge deformations are analyzed:

1. Bridge girder weak axis bending (1 sinus) around transverse x-axis, see Figure 7-15
2. Bridge girder weak axis bending (2 sinus) around transverse x-axis, see Figure 7-16
3. Bridge girder strong axis bending (½ sinus) around vertical z-axis, see Figure 7-17
4. Bridge girder strong axis bending (1 sinus) around vertical z-axis, see Figure 7-18

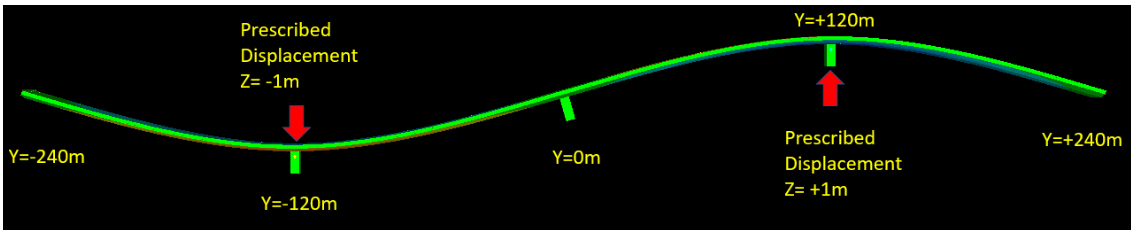


Figure 7-15 Side view 1 sinus

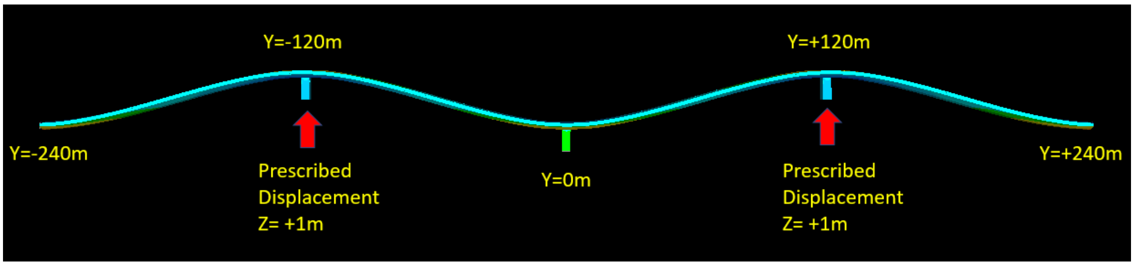


Figure 7-16 Side view 2 sinus

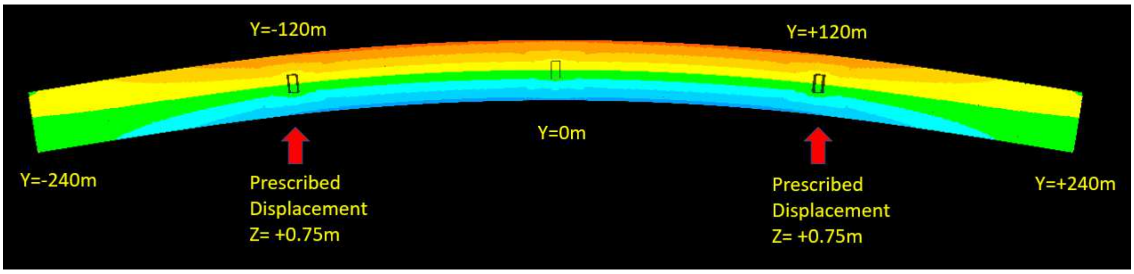


Figure 7-17 Top view ½ sinus

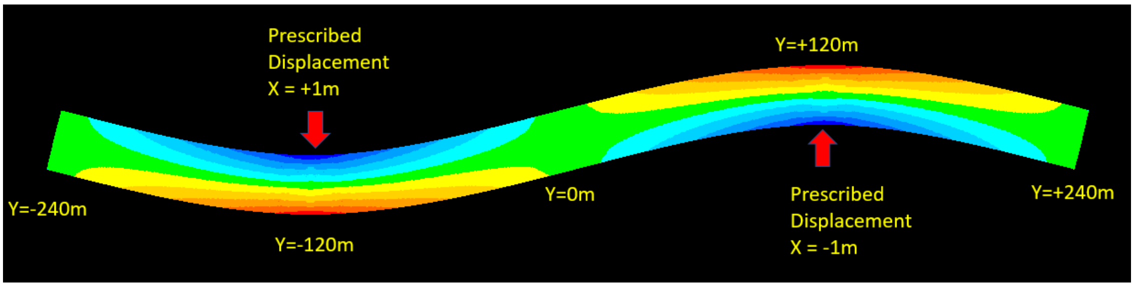


Figure 7-18 Top view 1 sinus

The same analysis is performed with a beam model with same dimensions and configurations as the shell model. The beam model has the same stiffness and properties as the global beam model.

The reaction forces at the support points are extracted for the beam models and the shell models. The difference in reaction forces between the beam and shell model shows the shear lag effect on the girder stiffness and is used to scale the calculated stresses in the beam model so that the stresses in both models are calculated for the same bending moment at the chosen cross section.

A spreadsheet has been developed to extract the stresses at eight different locations of the cross section of the bridge girder. The locations are shown in Figure 7-19.

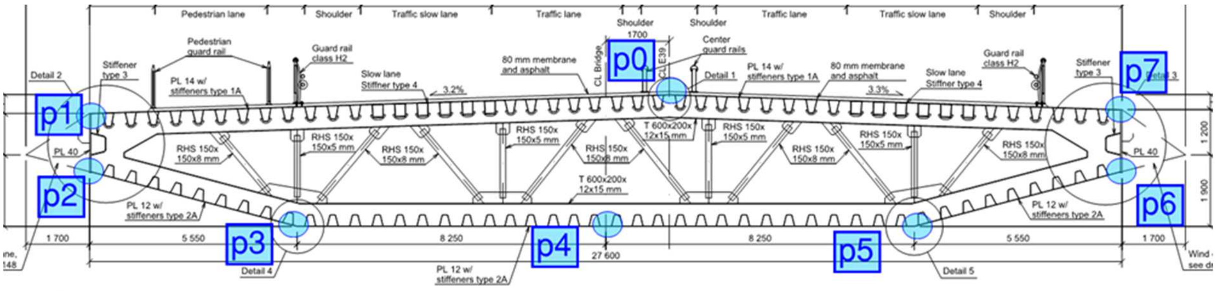


Figure 7-19 Stress point locations

From the shell analysis result file, the longitudinal element average D-stress (SIGMY) is exported. Only elements in the top and bottom plates are included. The exported listing contains longitudinal membrane stresses with associated coordinates for each element in the entire model. The listing is then imported in the spreadsheet and sorted on coordinates to easily present the stresses for any chosen cross section along the bridge girder.

From the beam model analysis result file, the weak/strong (MXY/MXZ) axis bending moment is extracted. The listing contains the moment and position along every meter of the bridge girder due to the 1 m mesh density. The moment is used to calculate the longitudinal stresses at the same cross section as for the shell model. Because the shell model and the beam model have different mesh density, the moment extracted from the beam model is interpolated to match the same longitudinal coordinate as the shell model.

The conclusion of this exercise shows that the highest local SCF's are found in the regions of the bridge girder above the columns at the intersection of bulkheads and top/bottom plates.

In order to study the effect of shear lag an assumption about the distance between zero moment locations have to be made. For weak axis bending the wave response spectrum is developed for the sea-states that contribute the most to fatigue damage. An example is shown in Figure 7-20. It is found that a large part of the fatigue damage is due to wave periods from 3.2 to 4.2 seconds.

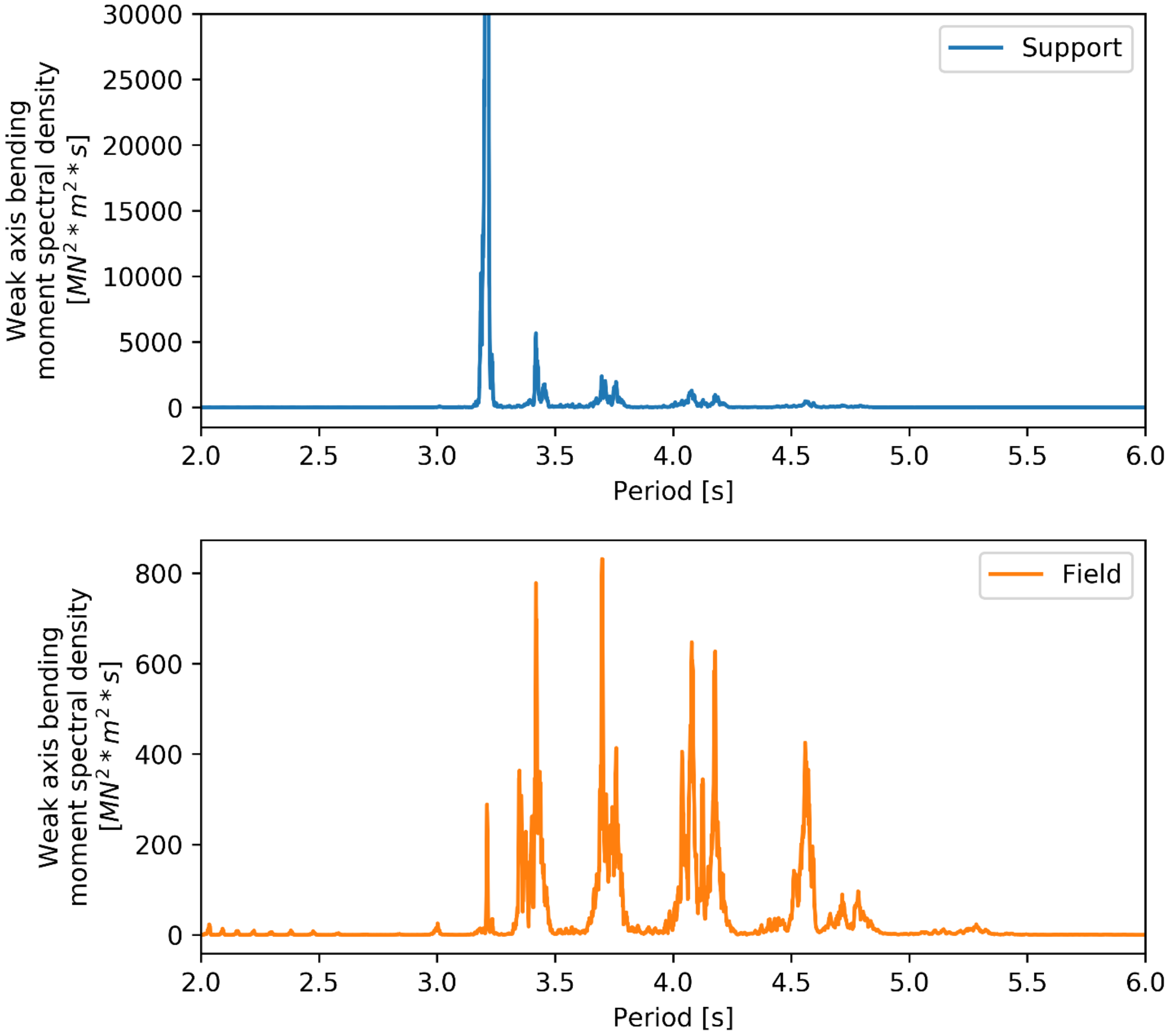


Figure 7-20 Weak axis response spectrum for the sea-state that contribute the most to fatigue for the middle part of the bridge

The eigen modes for periods in this range were investigated and it is was found that the distance between locations of zero weak axis moments where at the same distance as the span between pontoons. See Figure 7-21.

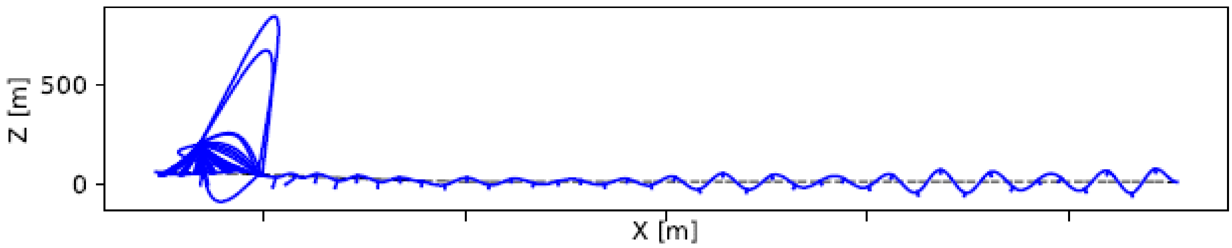


Figure 7-21 Plot of eigenmodes period 3.3 seconds showing example of mode shape with span length as distance between zero moments

7.3.4 Comparison of beam model and shell model stresses

In the following the stresses are compared between stress calculated from the shell and the beam model for various positions along the bridge.

Figure 7-22 to Figure 7-27 shows results from weak axis bending with a 2 sinus deformation, see Figure 7-16.

Figure 7-28 to Figure 7-33 shows results from strong axis bending with a 1/2 sinus deformation, see Figure 7-17

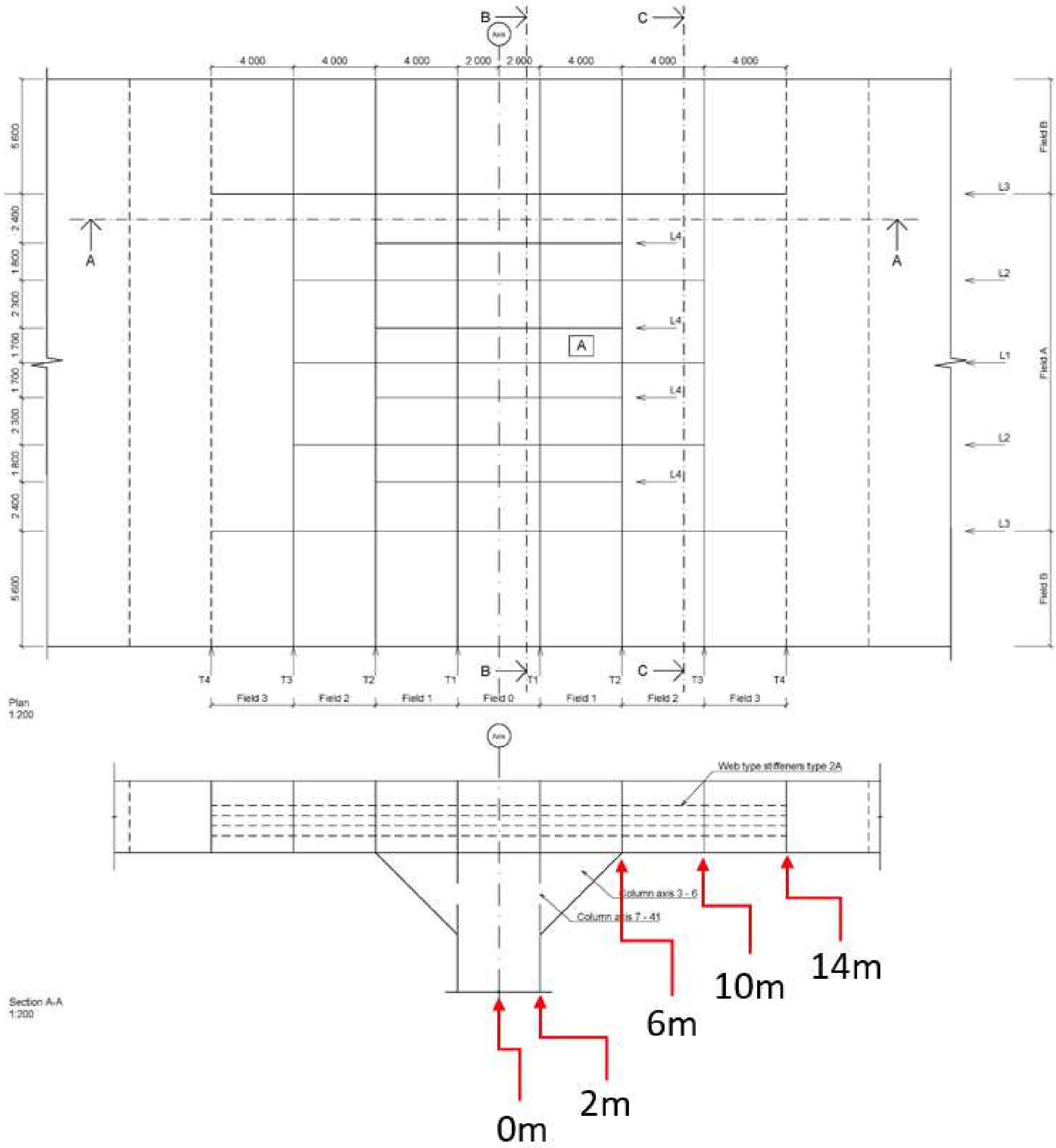
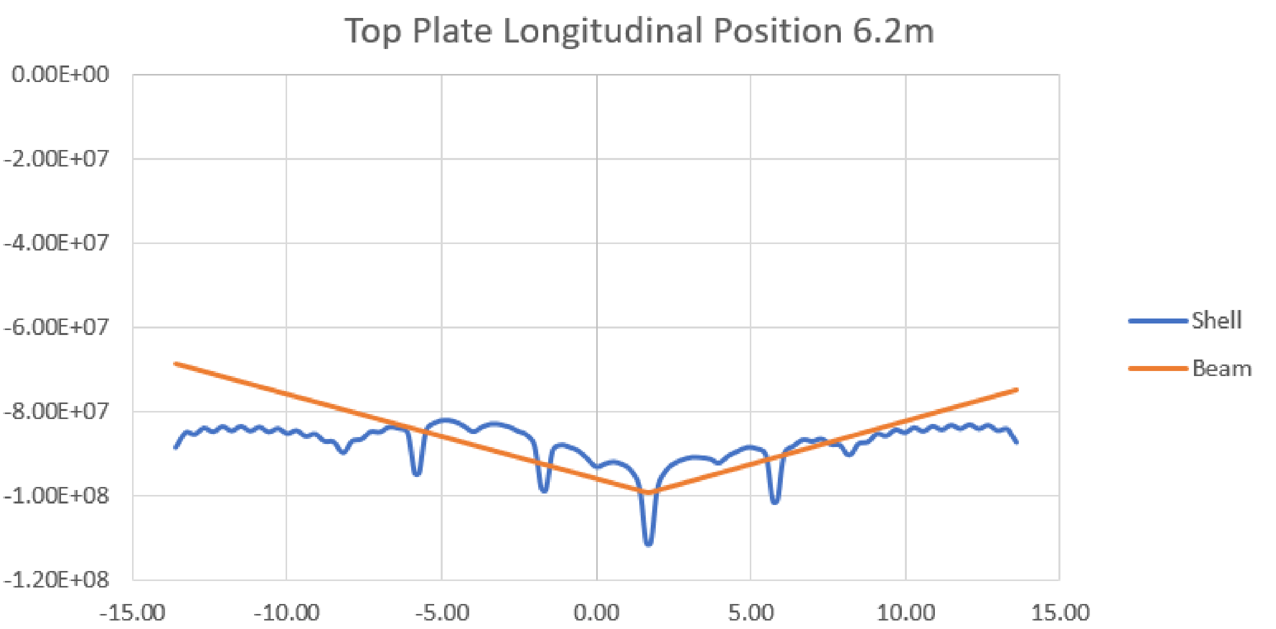


Figure 7-22 Typical positions for reported cross sections

Figure 7-23 Stress comparison from weak axis bending at position 0,2 m

Figure 7-24 Stress comparison from weak axis bending at position 2,2 m



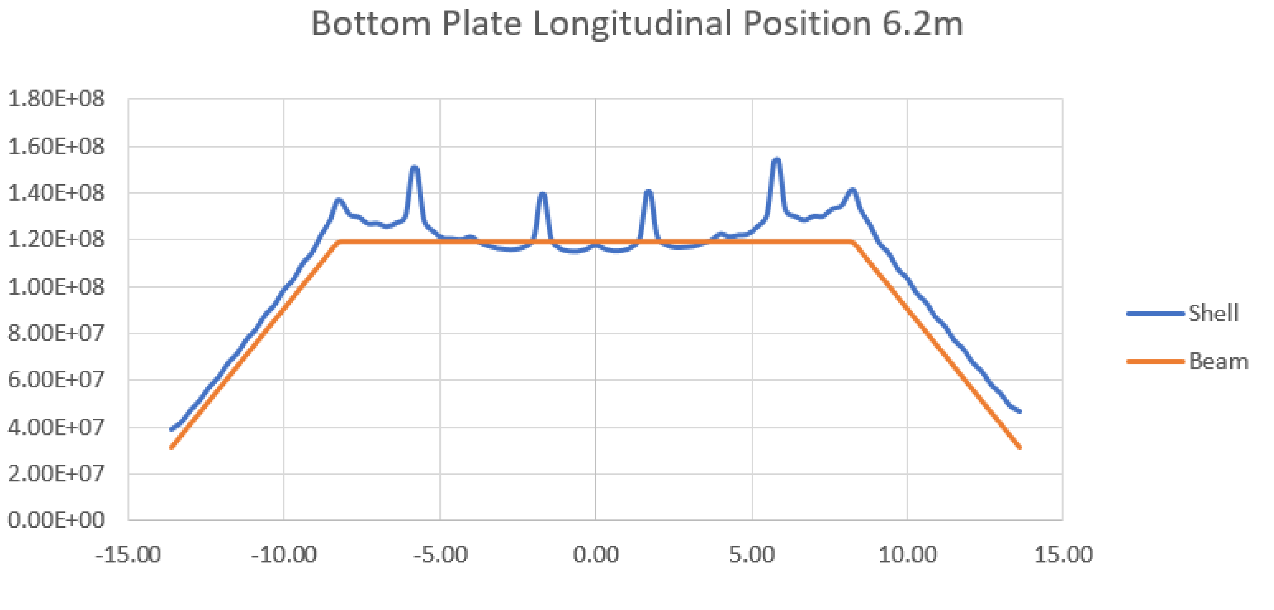


Figure 7-25 Stress comparison from weak axis bending at position 6,2 m

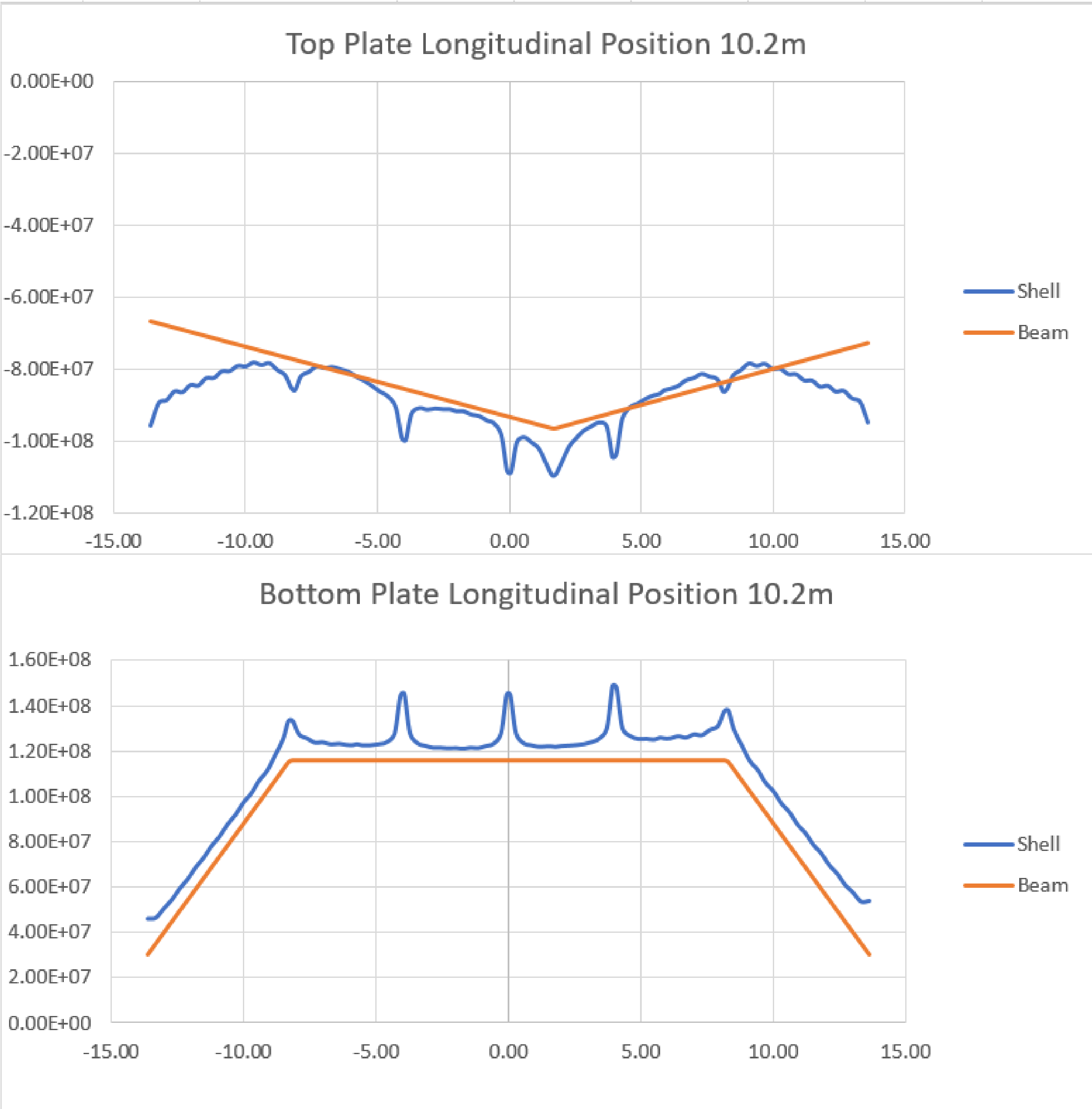


Figure 7-26 Stress comparison from weak axis bending at position 10,2 m

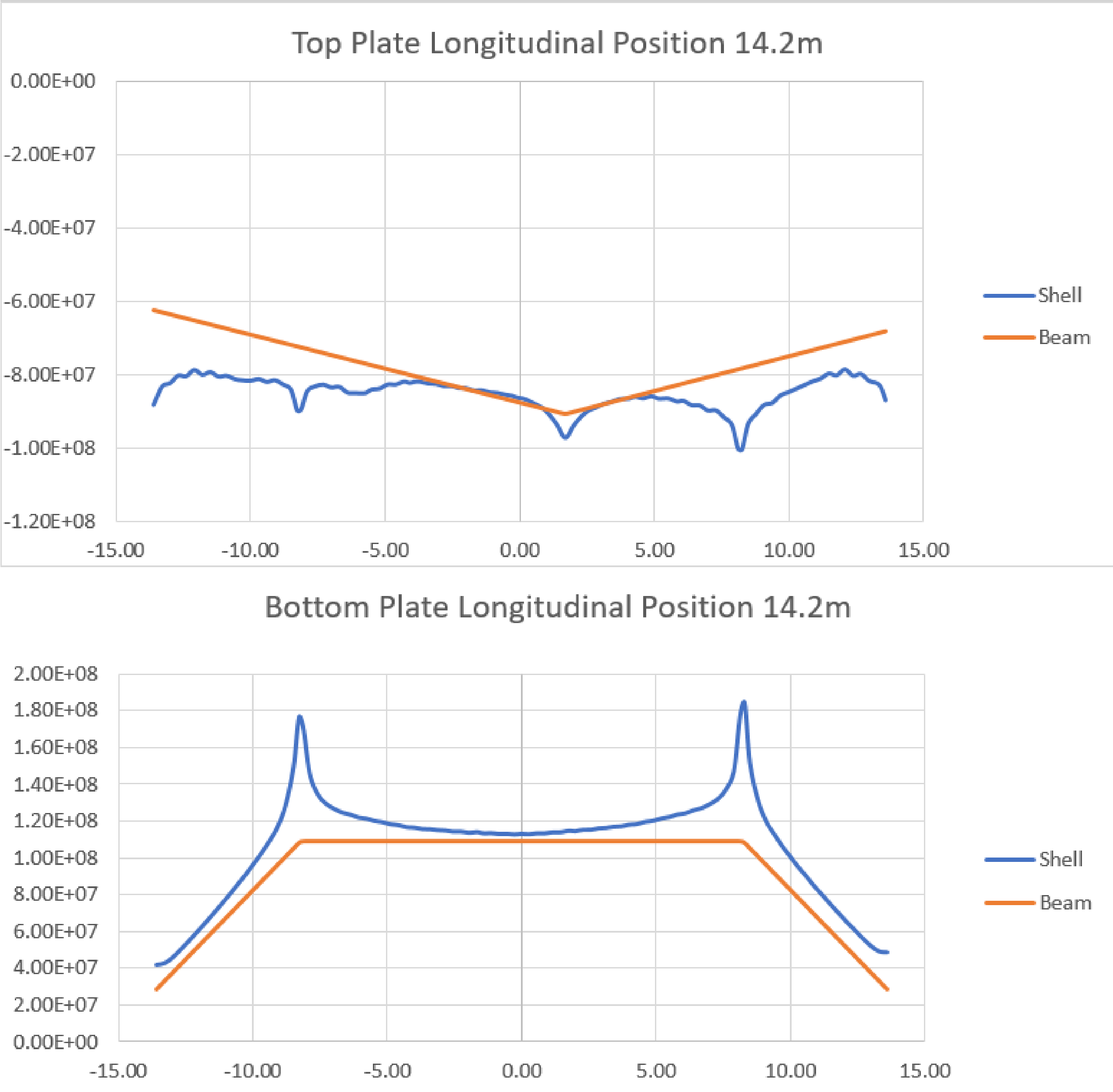


Figure 7-27 Stress comparison from weak axis bending at position 14,2 m

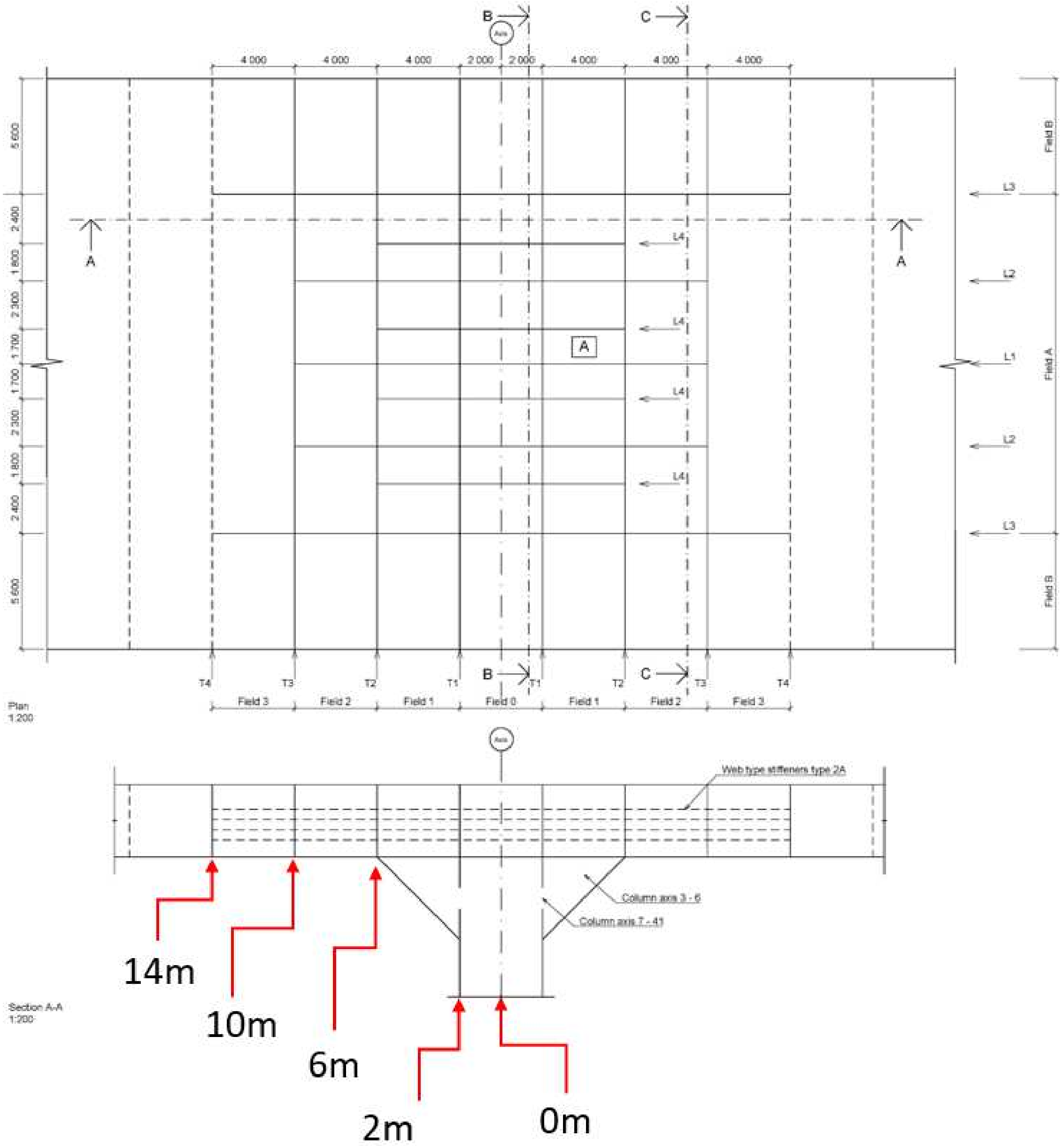
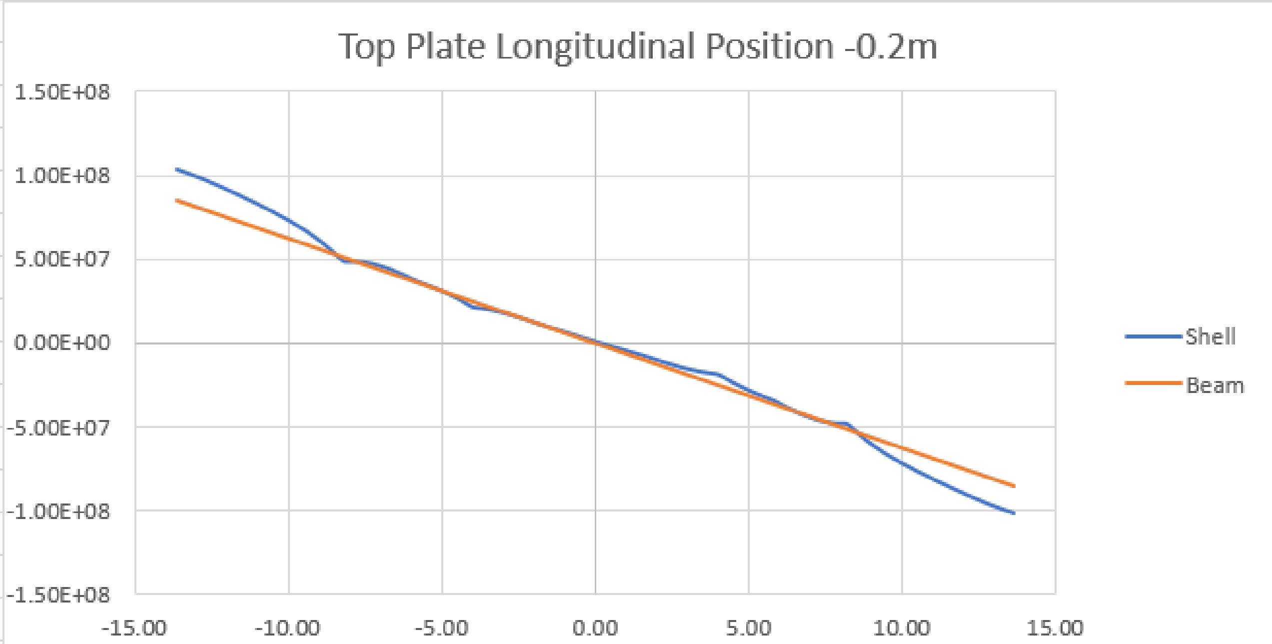


Figure 7-28   Typical positions for reported cross sections for strong axis bending ½ sin



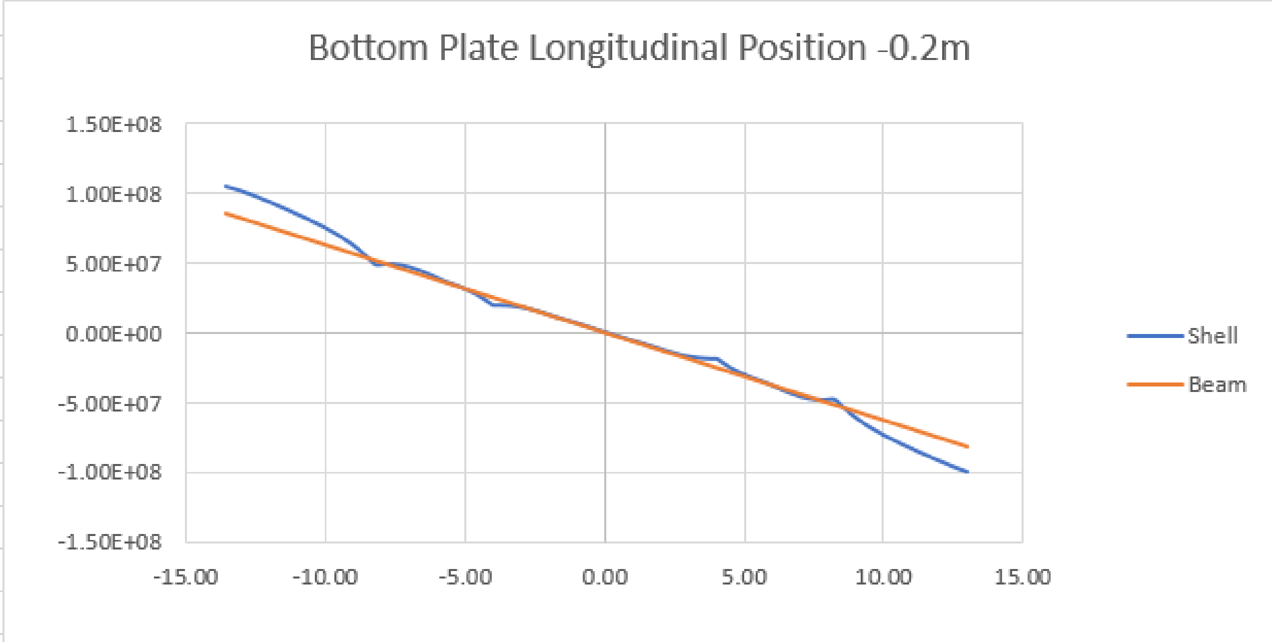
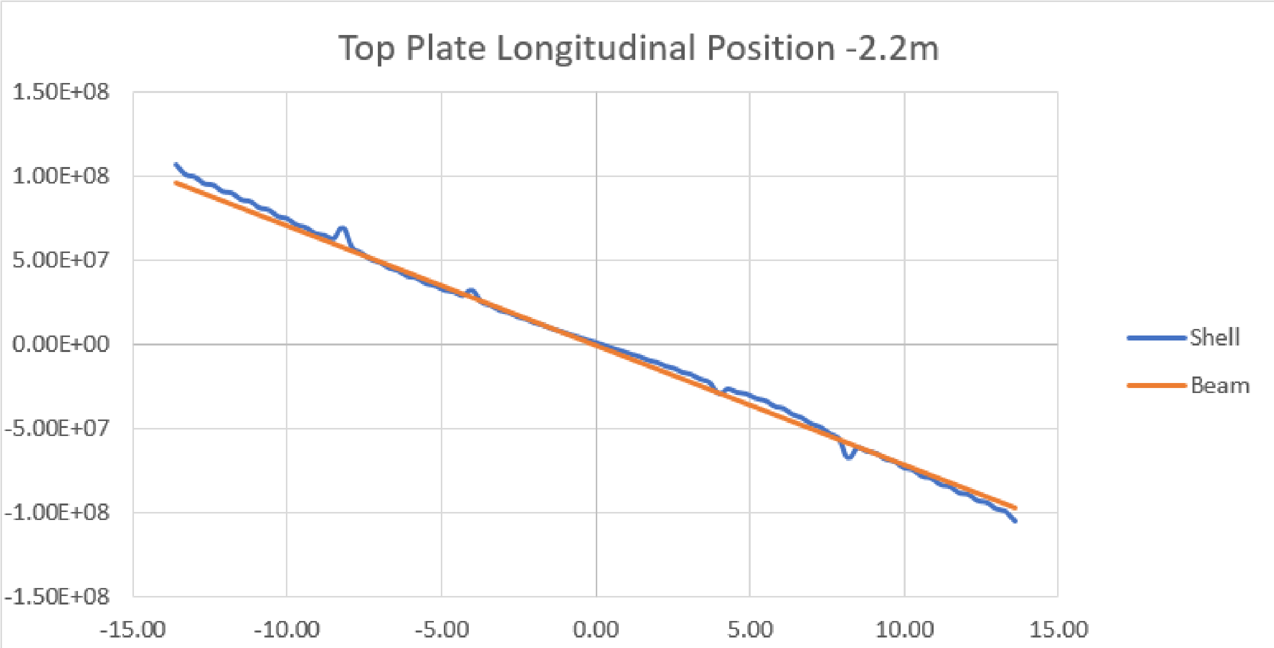


Figure 7-29 Stress comparison from strong axis bending at position -0,2 m



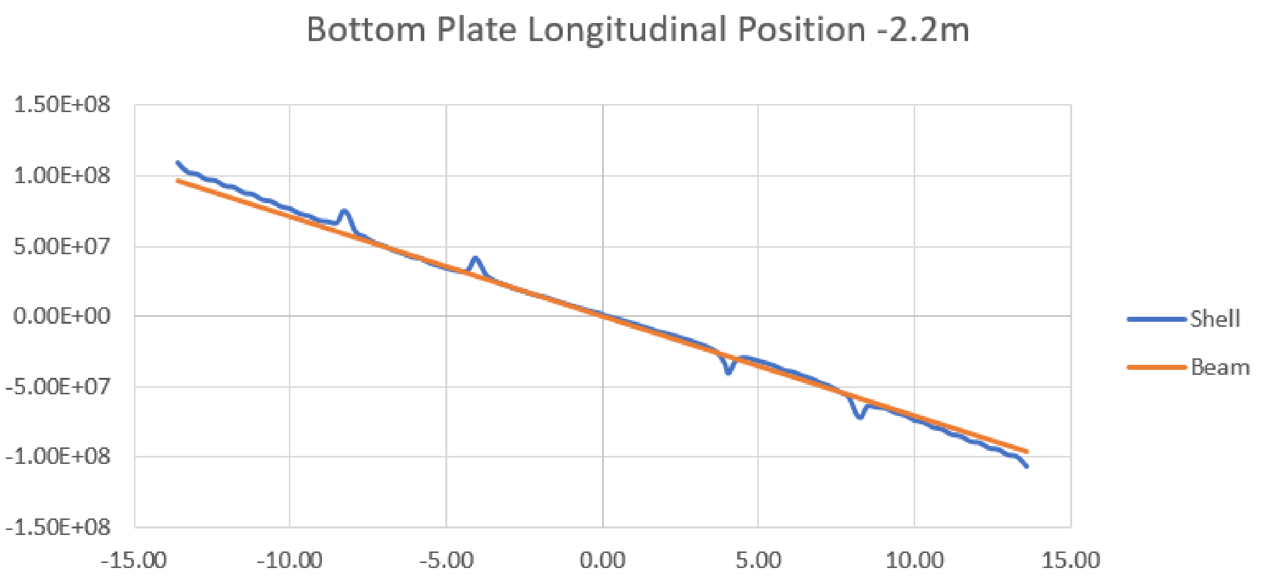


Figure 7-30 Stress comparison from strong axis bending at position -2,2 m

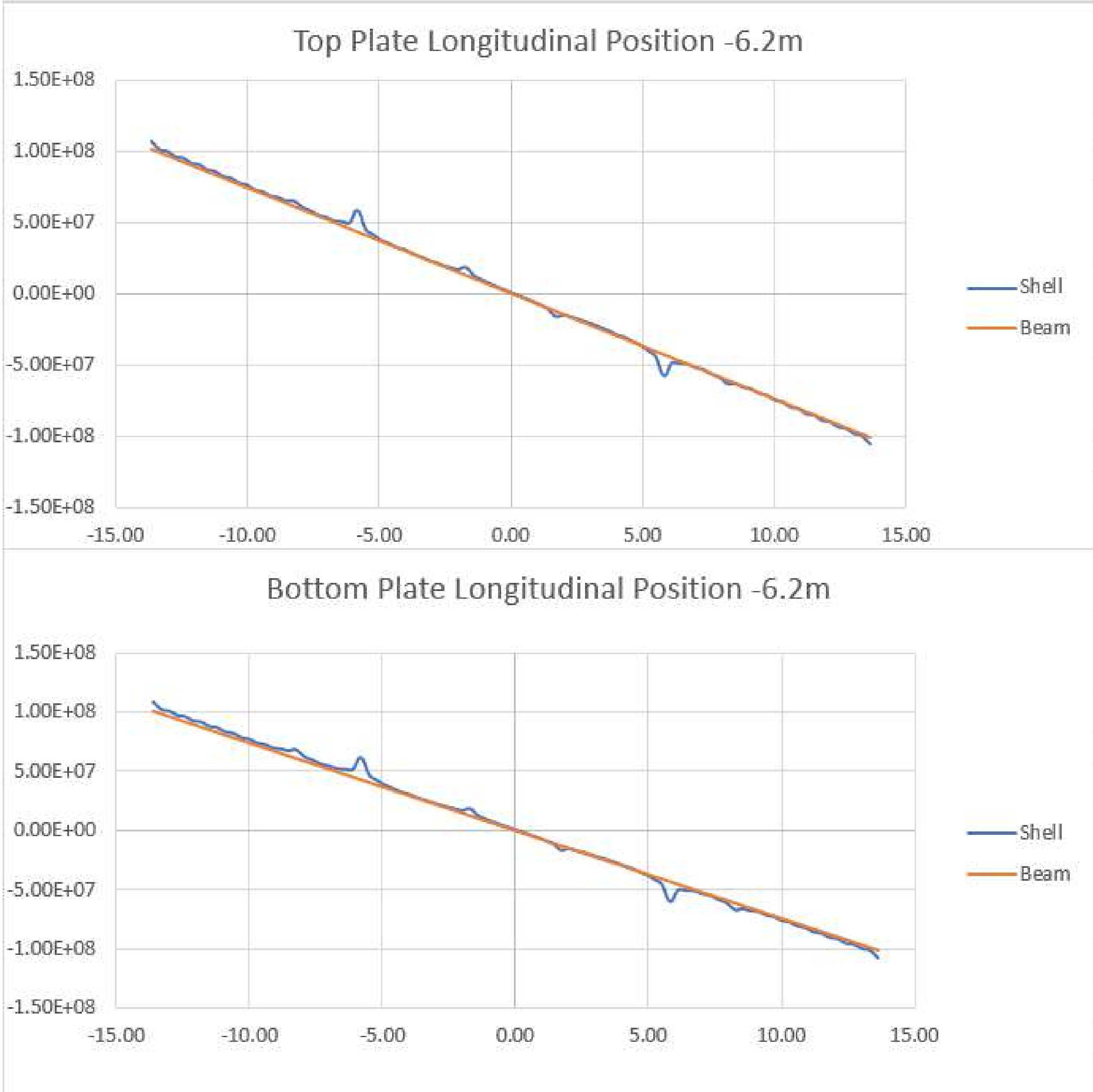


Figure 7-31 Stress comparison from strong axis bending at position -6,2 m

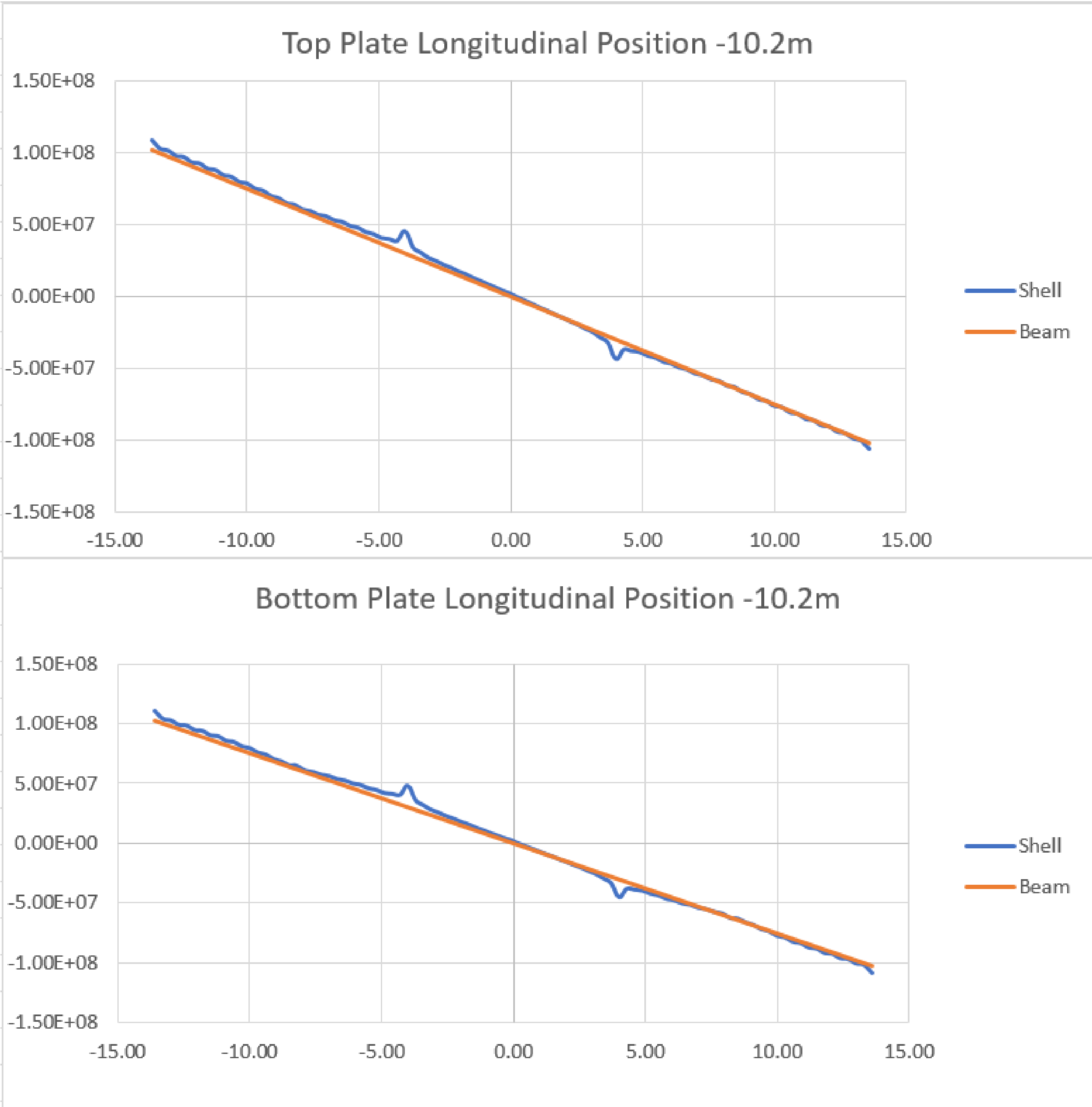
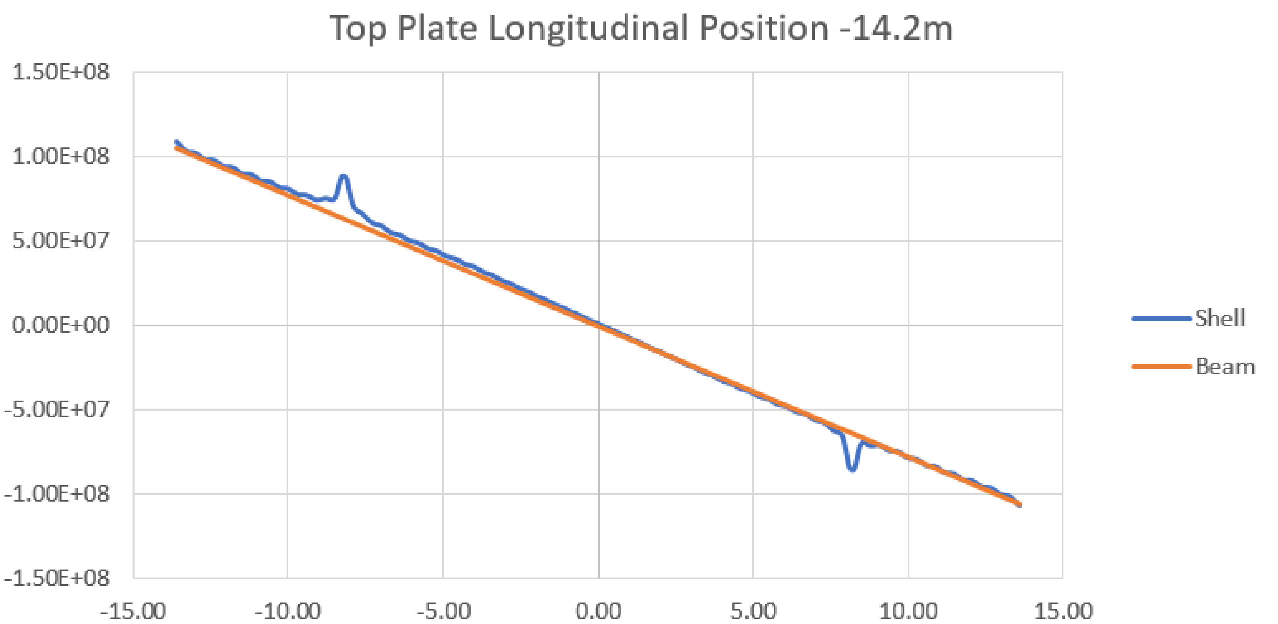


Figure 7-32 Stress comparison from strong axis bending at position -10,2 m



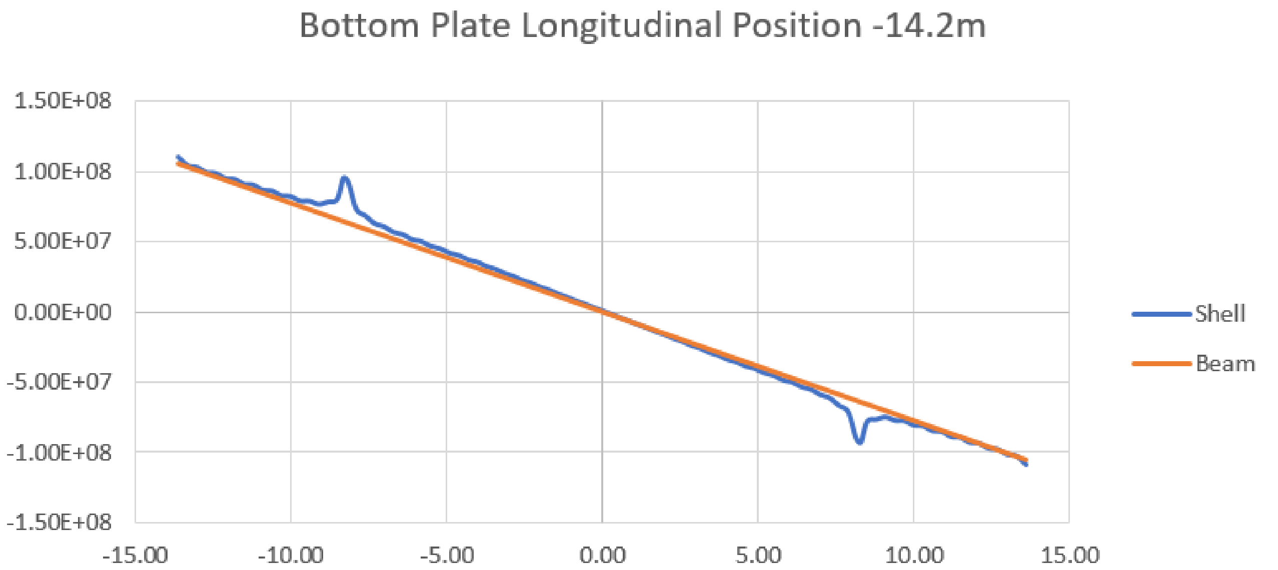


Figure 7-33 Stress comparison from strong axis bending at position -14,2 m

7.3.5 Stress concentration factors

Stress concentration factors (SCF) have been calculated for the eight different stress point locations shown in Figure 7-19.

The results from weak axis bending with a 2 sinus bridge girder deformation are shown in Figure 7-34. Deformation plot can be found in Figure 7-16.

The results from strong axis bending with a ½ sinus bridge girder deformation are shown in Figure 7-35. Deformation plot can be found in Figure 7-17.

OON-weak-2-sin

OON - Position 0m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0	-97.8	-83.5	1.17
p1	-81.2	-57.6	1.41
p2	33.8	26.1	1.30
p3	119	100	1.19
p4	113.0	100	1.13
p5	122	100	1.22
p6	52.3	34.5	1.52
p7	-79.8	-62.9	1.27
		Max:	1.52

OON - Position 2m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0	-110	-104	1.06
p1	-84.4	-71.9	1.17
p2	36.1	32.6	1.11
p3	151	125	1.21
p4	182.0	125	1.46
p5	155	125	1.24
p6	37.9	32.6	1.16
p7	-82.8	-78.5	1.05
		Max:	1.46

OON - Position 6m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0	-111	-99.3	1.12
p1	-84.9	-69.1	1.23
p2	36.1	36.1	1.00
p3	150	119	1.26
p4	140.0	119	1.18
p5	153	119	1.29
p6	47.1	31	1.52
p7	-87.2	-75.1	1.16
		Max:	1.52

OON - Position 10m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0	-109	-96.4	1.13
p1	-89.5	-67.1	1.33
p2	46.6	35.1	1.33
p3	133	116	1.15
p4	149.0	116	1.28
p5	138	116	1.19
p6	54.0	30.1	1.79
p7	-98.4	-72.6	1.36
		Max:	1.79

OON - Position 14m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0	-96.7	-90.6	1.07
p1	-83.2	-63	1.32
p2	42.5	28.3	1.50
p3	176	109	1.61
p4	113.0	109	1.04
p5	184	109	1.69
p6	48.4	28.3	1.71
p7	-86.9	-68.2	1.27
		Max:	1.71

Figure 7-34 Stress concentration factors for weak axis bending 2 sinus deformation

OON-strong-0,5-sin

OON - Position 0m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0			
p1	102	85.4	1.19
p2	103	85.4	1.21
p3			
p4			
p5			
p6	-99.4	-81.6	1.22
p7	-102	-85.5	1.19
		Max:	1.22

OON - Position 2m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0			
p1	107	94.4	1.13
p2	102	94.4	1.08
p3			
p4			
p5			
p6	-107	-96.6	1.11
p7	-105	-96.7	1.09
		Max:	1.13

OON - Position 6m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0			
p1	107	101	1.06
p2	109	101	1.08
p3			
p4			
p5			
p6	-107	-101	1.06
p7	-105	-101	1.04
		Max:	1.08

OON - Position 10m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0			
p1	109	102	1.07
p2	110	102	1.08
p3			
p4			
p5			
p6	-108	-102	1.06
p7	-106	-102	1.04
		Max:	1.08

OON - Position 14m from centerline column

	Shell (Mpa)	Beam (Mpa)	SCF
p0			
p1	109	105	1.04
p2	110	105	1.05
p3	92.3	61.2	1.51
p4			
p5	-92.6	-65.9	1.41
p6	-108	-106	1.02
p7	-106	-106	1.00
		Max:	1.51

Figure 7-35 Stress concentration factors for strong axis bending 1/2 sinus deformation

7.3.6 Fatigue life for selected points including local stress concentrations

The stress concentration factors for weak and strong axes bending moments are applied at two locations in the support area at Axis 20. Table 7-1 presents the applied stress concentration factors and the obtained fatigue life. The fatigue life at 10 and 14 metres from Axis 20 at Point 1 is reduced 60% and 55%, respectively, due to local stress concentration.

Table 7-1 Fatigue life of Axis 20 support locations including local stress concentrations

Location	Cross-sections	Weak axis SCF	Strong axis SCF	Fatigue life from screening analysis [years]	Fatigue life including local stress concentration [years]
Span between axis 20 and 21 at 10 metres from axis 20. Point 1	Support reinforcement transition from sections C to E	1.33	1.07	1031	399
Span between axis 20 and 21 at 14 metres from axis 20. Point 1	Support reinforcement transition from sections E to standard cross-section	1.32	1.04	1211	547

It may be argued that it is conservative to multiply the stress concentration factor from the local analysis with the typical 1.5 SCF that is assumed to account for eccentricities at buttwelds and welded details like attachments for rails etc. as the stress peaks found in the local analysis are limited in size and one can avoid that buttwelds or attachments are located in areas with increased stresses. But as there are numerous regions with increase in stresses it would be recommended to design with allowance of additional stress concentration from differences from stresses calculated with beam theory.

The example above shows that accounting for the local stress concentration will considerably reduce the fatigue life.

7.4 Fatigue in stay cables

The fatigue life for the stay cables is over one million years. The fatigue damage of the cables is normally not governed by the environmental loads, but by traffic loads or construction temporary conditions.

7.5 Summary and recommendations fatigue capacity

The independent analyses carried out by DNV GL determines the contribution to damage from environmental loads in the bridge girder. The results from the screening analysis show a minimum fatigue life of 148 years. This number should be reduced with the local stress increase as shown in Section 7.3.5. A reduction similar to the example in Section 7.3.6 could be expected that will bring the fatigue damage from environmental loads significant below the required life of 250 years.

The contributions from traffic and tidal variation is not part of the independent analyses by DNV GL. The damages will add only at certain details in the bridge. Tidal variation will only lead to damage close to the ends and traffic will predominantly give damage in the bridge deck. However, the fatigue loading as determined by DNV GL seems to be above the required design life for large part of the structure.

8 REFERENCES

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APPENDIX A
Structural drawings

The table below contains the main drawings provided by the designer:

Drawing no.	Drawing title
SBJ-33-C5-OON-22-DR-133	Concept development floating bridge – K12 - Anchors.pdf
SBJ-33-C5-OON-22-DR-151	Concept development floating bridge - K12 - Cable-stayed bridge - Plan and elevation.pdf
SBJ-33-C5-OON-22-DR-154	Concept development floating bridge - Cable-stayed bridge - Bridge girder.pdf
SBJ-33-C5-OON-22-DR-158	Concept development floating bridge - K12 - Cable-stayed bridge - Rock anchoring.pdf
SBJ-33-C5-OON-22-DR-159	Concept development floating bridge - K12 - Temporary bridge deck connection.pdf
SBJ-33-C5-OON-22-DR-155	Concept development floating bridge - K12 - Cable-stayed bridge - Bridge girder - Cable attachment.pdf
SBJ-33-C5-OON-22-DR-156	Concept development floating bridge - K12 - Cable-stayed bridge - Reinforcement in critical sections.pdf
SBJ-33-C5-OON-22-DR-163	Concept development floating bridge - K12 - Cable-stayed bridge - Construction sequences.pdf
SBJ-33-C5-OON-22-DR-171	Concept development floating bridge K12 - Abutment Gulholmane - General Arrangement.pdf
SBJ-33-C5-OON-22-DR-172	Concept development floating bridge K12 - Abutment Gulholmane - Sections and details I.pdf
SBJ-33-C5-OON-22-DR-173	Concept development floating bridge K12 - Abutment Gulholmane - Sections and details II.pdf
SBJ-33-C5-OON-22-DR-174	Concept development floating bridge K12 - Abutment Gulholmane - Post-tensioning.pdf
SBJ-33-C5-OON-22-DR-177	K12 - Abutment South - Sections and details.pdf
SBJ-33-C5-OON-22-DR-181	Concept development floating bridge - Gulholmane approach brigde - General arrangement.pdf
SBJ-33-C5-OON-22-DR-191	Concept development floating bridge - Corrosion protection and membrane.pdf
SBJ-33-C5-OON-22-DR-160	Cable-stayed bridge - Isometric 3D View.pdf
SBJ-33-C5-OON-22-RE-023	K12 - Execution of construction.pdf
SBJ-33-C5-OON-22-RE-023	AppA Temporary connection for bridge closure joints.pdf
SBJ-33-C5-OON-22-RE-023	AppB Marine operation analyses and calculations.pdf
SBJ-33-C5-OON-22-RE-024	K12-weight report.pdf
SBJ-33-C5-OON-22-RE-023	AppC Technical drawings lifting crane Han%F8ytangen.pdf
SBJ-33-C5-OON-22-RE-025	Anslagsnotat.pdf
SBJ-33-C5-OON-05-DR-001	Concept development floating bridge - Road alignment - Plan and Profile - Profile 35500 - 39250.pdf
SBJ-33-C5-OON-05-DR-002	Concept development floating bridge - Road alignment - Plan and Profile - Profile 39250 - 43000.pdf
SBJ-33-C5-OON-05-DR-003	Concept development floating bridge - Road alignment - Plan and Profile - Profile 43000 - 46750.pdf
SBJ-33-C5-OON-22-DR-001	Concept development floating bridge General Arrangement- Elevation, plan, detail and sections.pdf
SBJ-33-C5-OON-22-DR-111	Concept development floating bridge – Plan and elevation.pdf
SBJ-33-C5-OON-22-DR-122	Concept development floating bridge – K12 - Pontoons and columns - Type 2.pdf
SBJ-33-C5-OON-22-DR-121	Concept development floating bridge – K12 - Pontoons and columns - Type 1.pdf
SBJ-33-C5-OON-22-DR-123	Concept development floating bridge – K12 - Pontoons and columns - Type 2A.pdf
SBJ-33-C5-OON-22-DR-124	Concept development floating bridge – K12 - Pontoons and columns - Type 3.pdf
SBJ-33-C5-OON-22-DR-125	Concept development floating bridge – K12 - Pontoons and columns.pdf
SBJ-33-C5-OON-22-DR-131	Concept development floating bridge – K12 - Anchors and mooring lines.pdf
SBJ-33-C5-OON-22-DR-132	Concept development floating bridge – K12 - Anchors.pdf
SBJ-33-C5-OON-22-DR-141	Concept development floating bridge – Grinder – Cross-section 1.pdf
SBJ-33-C5-OON-22-DR-142	Concept development floating bridge – Grinder – Cross-section 2.pdf
SBJ-33-C5-OON-22-DR-143	Concept development floating bridge – Grinder – Reinforced bridge girder ends.pdf
SBJ-33-C5-OON-22-DR-144	Concept development floating bridge – Grinder – Details part 1.pdf
SBJ-33-C5-OON-22-DR-146	Concept development floating bridge – Girder-Column connection - Arrangement.pdf

SBJ-33-C5-OON-22-DR-147	Concept development floating bridge – Girder - Column connection 2.pdf
SBJ-33-C5-OON-22-DR-148	Concept development floating bridge – Wind guide and drainage - Sections and details.pdf
SBJ-33-C5-OON-22-DR-152	Concept development floating bridge - K12 - Cable-stayed bridge - Tower - Plan and sections.pdf
SBJ-33-C5-OON-22-DR-153	Concept development floating bridge - K12 - Cable-stayed bridge - Tower - Cable attachement.pdf
SBJ-33-C5-OON-22-DR-157	Concept development floating bridge - K12 - Cable-stayed bridge - Cable system - Arrangement and details.pdf
SBJ-33-C5-OON-22-DR-161	Concept development floating bridge - K12 - Cable-stayed bridge - Tower. Post-tensioning layout.pdf
SBJ-33-C5-OON-22-DR-162	Concept development floating bridge - K12 - Cable-stayed bridge - Temperary connection of tower and girder.pdf
SBJ-33-C5-OON-22-DR-164	Concept development floating bridge - K12 - Cable-stayed bridge - Ballasting for installment.pdf
SBJ-33-C5-OON-22-DR-175	Concept development floating bridge K12 - Abutment Gulholmane - Connection to bridge girder end.pdf
SBJ-33-C5-OON-22-DR-176	K12 - Abutment South – General - Arrangement.pdf
SBJ-33-C5-OON-22-DR-192	K12 - Bjørnafjorden bridge - Railings - Principle drawing.pdf

APPENDIX B
Geometric description of the bridge

This appendix describes the coordinates for the structure nodes, their boundary conditions and any master-slave pairs.

The geometric input refers to a coordinate system as described in Section 3.1.3.

ID	Bridge geometry and coordinates				Boundary conditions (1=fixed, 0=free)						Master node	Floater
	Acc. (m)	X (m)	Y (m)	Z (m)	ix	iy	iz	irx	iry	irz	ID	ID
AX1	0	0.0	0.0	62.0	1	1	1	1	1	1		
INT106	73	65.0	-33.1	62.4	0	0	0	0	0	0		
INT107	77	68.6	-34.9	62.4	0	0	0	0	0	0		
INT108	81	72.2	-36.8	62.4	0	0	0	0	0	0		
INT109	85	75.7	-38.6	62.3	0	0	0	0	0	0		
INT110	89	79.3	-40.4	62.3	0	0	0	0	0	0		
INT111	161	143.5	-73.1	61.5	0	0	0	0	0	0		
INT112	165	147.0	-74.9	61.5	0	0	0	0	0	0		
INT113	169	150.6	-76.7	61.4	0	0	0	0	0	0		
INT114	173	154.2	-78.5	61.4	0	0	0	0	0	0		
INT115	253	225.5	-114.8	60.3	0	0	0	0	0	0		
INT116	257	229.0	-116.6	60.2	0	0	0	0	0	0		
INT117	261	232.6	-118.5	60.2	0	0	0	0	0	0		
INT118	265	236.1	-120.3	60.1	0	0	0	0	0	0		
INT318	353	314.6	-160.2	58.6	0	0	0	0	0	0		
INT317	357	318.1	-162.0	58.5	0	0	0	0	0	0		
INT316	361	321.7	-163.8	58.5	0	0	0	0	0	0		
INT315	365	325.3	-165.7	58.4	0	0	0	0	0	0		
INT314	453	403.7	-205.6	56.6	0	0	0	0	0	0		
INT313	457	407.2	-207.4	56.5	0	0	0	0	0	0		
INT312	461	410.8	-209.2	56.5	0	0	0	0	0	0		
INT311	465	414.4	-211.0	56.4	0	0	0	0	0	0		
INT310	553	492.8	-251.0	54.3	0	0	0	0	0	0		
INT309	557	496.3	-252.8	54.2	0	0	0	0	0	0		
INT308	561	499.9	-254.6	54.1	0	0	0	0	0	0		
INT307	565	503.5	-256.4	54.0	0	0	0	0	0	0		
INT306	569	507.0	-258.2	53.9	0	0	0	0	0	0		
INT305	653	581.9	-296.4	51.6	0	0	0	0	0	0		
INT304	657	585.5	-298.2	51.5	0	0	0	0	0	0		
INT303	661	589.0	-300.0	51.4	0	0	0	0	0	0		
INT302	665	592.6	-301.8	51.3	0	0	0	0	0	0		
INT301	669	596.1	-303.6	51.2	0	0	0	0	0	0		
AX3	760	678.2	-342.7	48.4	0	0	0	0	0	0		
AX4	880	789.7	-387.3	44.4	0	0	0	0	0	0		
AX5	1000	902.1	-429.1	39.8	0	0	0	0	0	0		
AX6	1120	1015.6	-468.2	35.8	0	0	0	0	0	0		
AX7	1240	1129.9	-504.5	31.8	0	0	0	0	0	0		
AX8	1360	1245.1	-538.2	27.8	0	0	0	0	0	0		
AX9	1480	1361.1	-569.0	23.9	0	0	0	0	0	0		
AX10	1600	1477.8	-597.0	20.5	0	0	0	0	0	0		
AX11	1720	1595.1	-622.3	18.0	0	0	0	0	0	0		
AX12	1840	1713.0	-644.7	16.5	0	0	0	0	0	0		
AX13	1960	1831.3	-664.3	16.0	0	0	0	0	0	0		
AX14	2080	1950.2	-681.1	16.0	0	0	0	0	0	0		

AX15	2200	2069.4	-694.9	16.0	0	0	0	0	0	0	
AX16	2320	2188.9	-705.9	16.0	0	0	0	0	0	0	
AX17	2440	2308.6	-714.1	16.0	0	0	0	0	0	0	
AX18	2560	2428.5	-719.3	16.0	0	0	0	0	0	0	
AX19	2680	2548.4	-721.8	16.0	0	0	0	0	0	0	
AX20	2800	2668.4	-721.2	16.0	0	0	0	0	0	0	
AX21	2920	2788.4	-717.9	16.0	0	0	0	0	0	0	
AX22	3040	2908.2	-711.7	16.0	0	0	0	0	0	0	
AX23	3160	3027.9	-702.5	16.0	0	0	0	0	0	0	
AX24	3280	3147.3	-690.6	16.0	0	0	0	0	0	0	
AX25	3400	3266.3	-675.7	16.0	0	0	0	0	0	0	
AX26	3520	3385.0	-658.0	16.0	0	0	0	0	0	0	
AX27	3640	3503.2	-637.5	16.0	0	0	0	0	0	0	
AX28	3760	3620.9	-614.1	16.0	0	0	0	0	0	0	
AX29	3880	3738.0	-587.9	16.0	0	0	0	0	0	0	
AX30	4000	3854.5	-558.9	16.0	0	0	0	0	0	0	
AX31	4120	3970.2	-527.1	16.0	0	0	0	0	0	0	
AX32	4240	4085.1	-492.5	16.0	0	0	0	0	0	0	
AX33	4360	4199.2	-455.3	16.0	0	0	0	0	0	0	
AX34	4480	4312.3	-415.2	16.0	0	0	0	0	0	0	
AX35	4600	4424.4	-372.5	16.0	0	0	0	0	0	0	
AX36	4720	4535.5	-327.1	16.0	0	0	0	0	0	0	
AX37	4840	4645.4	-279.0	16.0	0	0	0	0	0	0	
AX38	4960	4754.2	-228.4	16.0	0	0	0	0	0	0	
AX39	5080	4861.7	-175.1	16.0	0	0	0	0	0	0	
AX40	5200	4967.9	-119.2	16.0	0	0	0	0	0	0	
AX41	5320	5072.8	-60.8	16.0	0	0	0	0	0	0	
AX42	5440	5176.2	0.0	14.5	1	1	1	1	1	1	
C_TOP03		678.2	-342.7	46.7	0	0	0	0	0	0	AX3
C_TOP04		789.7	-387.3	42.6	0	0	0	0	0	0	AX4
C_TOP05		902.1	-429.1	38.1	0	0	0	0	0	0	AX5
C_TOP06		1015.6	-468.2	34.1	0	0	0	0	0	0	AX6
C_TOP07		1129.9	-504.5	30.1	0	0	0	0	0	0	AX7
C_TOP08		1245.1	-538.2	26.1	0	0	0	0	0	0	AX8
C_TOP09		1361.1	-569.0	22.1	0	0	0	0	0	0	AX9
C_TOP10		1477.8	-597.0	18.7	0	0	0	0	0	0	AX10
C_TOP11		1595.1	-622.3	16.3	0	0	0	0	0	0	AX11
C_TOP12		1713.0	-644.7	14.8	0	0	0	0	0	0	AX12
C_TOP13		1831.3	-664.3	14.3	0	0	0	0	0	0	AX13
C_TOP14		1950.2	-681.1	14.2	0	0	0	0	0	0	AX14
C_TOP15		2069.4	-694.9	14.2	0	0	0	0	0	0	AX15
C_TOP16		2188.9	-705.9	14.2	0	0	0	0	0	0	AX16
C_TOP17		2308.6	-714.1	14.2	0	0	0	0	0	0	AX17
C_TOP18		2428.5	-719.3	14.2	0	0	0	0	0	0	AX18
C_TOP19		2548.4	-721.8	14.2	0	0	0	0	0	0	AX19
C_TOP20		2668.4	-721.2	14.2	0	0	0	0	0	0	AX20
C_TOP21		2788.4	-717.9	14.2	0	0	0	0	0	0	AX21
C_TOP22		2908.2	-711.7	14.2	0	0	0	0	0	0	AX22
C_TOP23		3027.9	-702.5	14.2	0	0	0	0	0	0	AX23
C_TOP24		3147.3	-690.6	14.2	0	0	0	0	0	0	AX24
C_TOP25		3266.3	-675.7	14.2	0	0	0	0	0	0	AX25
C_TOP26		3385.0	-658.0	14.2	0	0	0	0	0	0	AX26
C_TOP27		3503.2	-637.5	14.2	0	0	0	0	0	0	AX27
C_TOP28		3620.9	-614.1	14.2	0	0	0	0	0	0	AX28
C_TOP29		3738.0	-587.9	14.2	0	0	0	0	0	0	AX29
C_TOP30		3854.5	-558.9	14.2	0	0	0	0	0	0	AX30

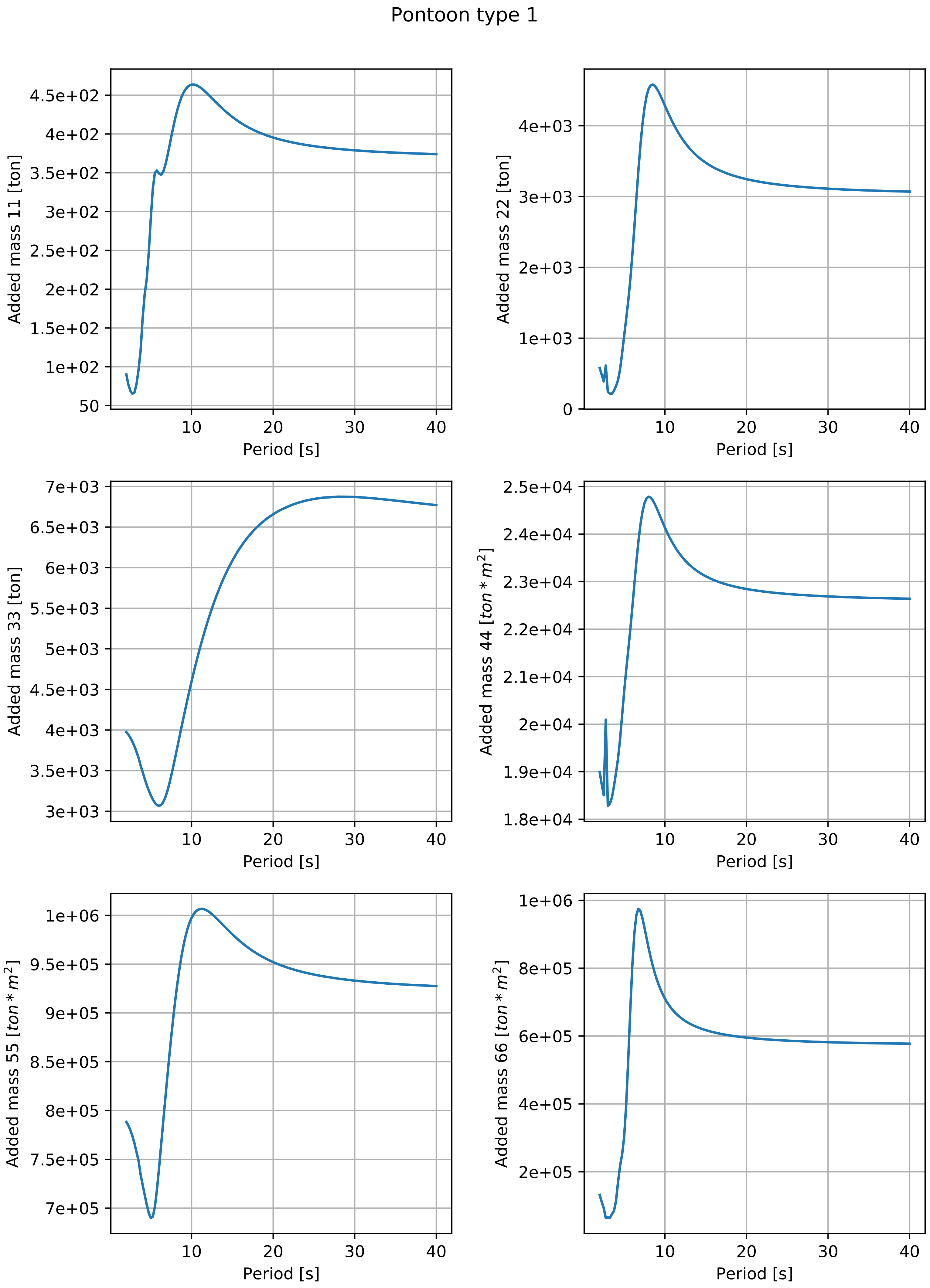
C_TOP31	3970.2	-527.1	14.2	0	0	0	0	0	0	AX31	
C_TOP32	4085.1	-492.5	14.2	0	0	0	0	0	0	AX32	
C_TOP33	4199.2	-455.3	14.2	0	0	0	0	0	0	AX33	
C_TOP34	4312.3	-415.2	14.2	0	0	0	0	0	0	AX34	
C_TOP35	4424.4	-372.5	14.2	0	0	0	0	0	0	AX35	
C_TOP36	4535.5	-327.1	14.2	0	0	0	0	0	0	AX36	
C_TOP37	4645.4	-279.0	14.2	0	0	0	0	0	0	AX37	
C_TOP38	4754.2	-228.4	14.2	0	0	0	0	0	0	AX38	
C_TOP39	4861.7	-175.1	14.2	0	0	0	0	0	0	AX39	
C_TOP40	4967.9	-119.2	14.2	0	0	0	0	0	0	AX40	
C_TOP41	5072.8	-60.8	14.2	0	0	0	0	0	0	AX41	
C_BOT03	678.2	-342.7	4.0	0	0	0	0	0	0		PAX3
C_BOT04	789.7	-387.3	4.0	0	0	0	0	0	0		PAX4
C_BOT05	902.1	-429.1	4.0	0	0	0	0	0	0		PAX5
C_BOT06	1015.6	-468.2	4.0	0	0	0	0	0	0		PAX6
C_BOT07	1129.9	-504.5	4.0	0	0	0	0	0	0		PAX7
C_BOT08	1245.1	-538.2	4.0	0	0	0	0	0	0		PAX8
C_BOT09	1361.1	-569.0	4.0	0	0	0	0	0	0		PAX9
C_BOT10	1477.8	-597.0	4.0	0	0	0	0	0	0		PAX10
C_BOT11	1595.1	-622.3	4.0	0	0	0	0	0	0		PAX11
C_BOT12	1713.0	-644.7	4.0	0	0	0	0	0	0		PAX12
C_BOT13	1831.3	-664.3	4.0	0	0	0	0	0	0		PAX13
C_BOT14	1950.2	-681.1	4.0	0	0	0	0	0	0		PAX14
C_BOT15	2069.4	-694.9	4.0	0	0	0	0	0	0		PAX15
C_BOT16	2188.9	-705.9	4.0	0	0	0	0	0	0		PAX16
C_BOT17	2308.6	-714.1	4.0	0	0	0	0	0	0		PAX17
C_BOT18	2428.5	-719.3	4.0	0	0	0	0	0	0		PAX18
C_BOT19	2548.4	-721.8	4.0	0	0	0	0	0	0		PAX19
C_BOT20	2668.4	-721.2	4.0	0	0	0	0	0	0		PAX20
C_BOT21	2788.4	-717.9	4.0	0	0	0	0	0	0		PAX21
C_BOT22	2908.2	-711.7	4.0	0	0	0	0	0	0		PAX22
C_BOT23	3027.9	-702.5	4.0	0	0	0	0	0	0		PAX23
C_BOT24	3147.3	-690.6	4.0	0	0	0	0	0	0		PAX24
C_BOT25	3266.3	-675.7	4.0	0	0	0	0	0	0		PAX25
C_BOT26	3385.0	-658.0	4.0	0	0	0	0	0	0		PAX26
C_BOT27	3503.2	-637.5	4.0	0	0	0	0	0	0		PAX27
C_BOT28	3620.9	-614.1	4.0	0	0	0	0	0	0		PAX28
C_BOT29	3738.0	-587.9	4.0	0	0	0	0	0	0		PAX29
C_BOT30	3854.5	-558.9	4.0	0	0	0	0	0	0		PAX30
C_BOT31	3970.2	-527.1	4.0	0	0	0	0	0	0		PAX31
C_BOT32	4085.1	-492.5	4.0	0	0	0	0	0	0		PAX32
C_BOT33	4199.2	-455.3	4.0	0	0	0	0	0	0		PAX33
C_BOT34	4312.3	-415.2	4.0	0	0	0	0	0	0		PAX34
C_BOT35	4424.4	-372.5	4.0	0	0	0	0	0	0		PAX35
C_BOT36	4535.5	-327.1	4.0	0	0	0	0	0	0		PAX36
C_BOT37	4645.4	-279.0	4.0	0	0	0	0	0	0		PAX37
C_BOT38	4754.2	-228.4	4.0	0	0	0	0	0	0		PAX38
C_BOT39	4861.7	-175.1	4.0	0	0	0	0	0	0		PAX39
C_BOT40	4967.9	-119.2	4.0	0	0	0	0	0	0		PAX40
C_BOT41	5072.8	-60.8	4.0	0	0	0	0	0	0		PAX41
TOWERFW	289.4	-114.8	0.1	1	1	1	1	1	1		
TOWERFE	263.1	-166.6	0.1	1	1	1	1	1	1		
TWRTOPW	264.7	-132.6	166.7	0	0	0	0	0	0	TWRTOPB	
TWRTOPE	262.9	-136.1	166.7	0	0	0	0	0	0	TWRTOPB	
TWRTOPB	263.8	-134.3	166.7	0	0	0	0	0	0		
TWRTND18	263.8	-134.3	168.5	0	0	0	0	0	0		

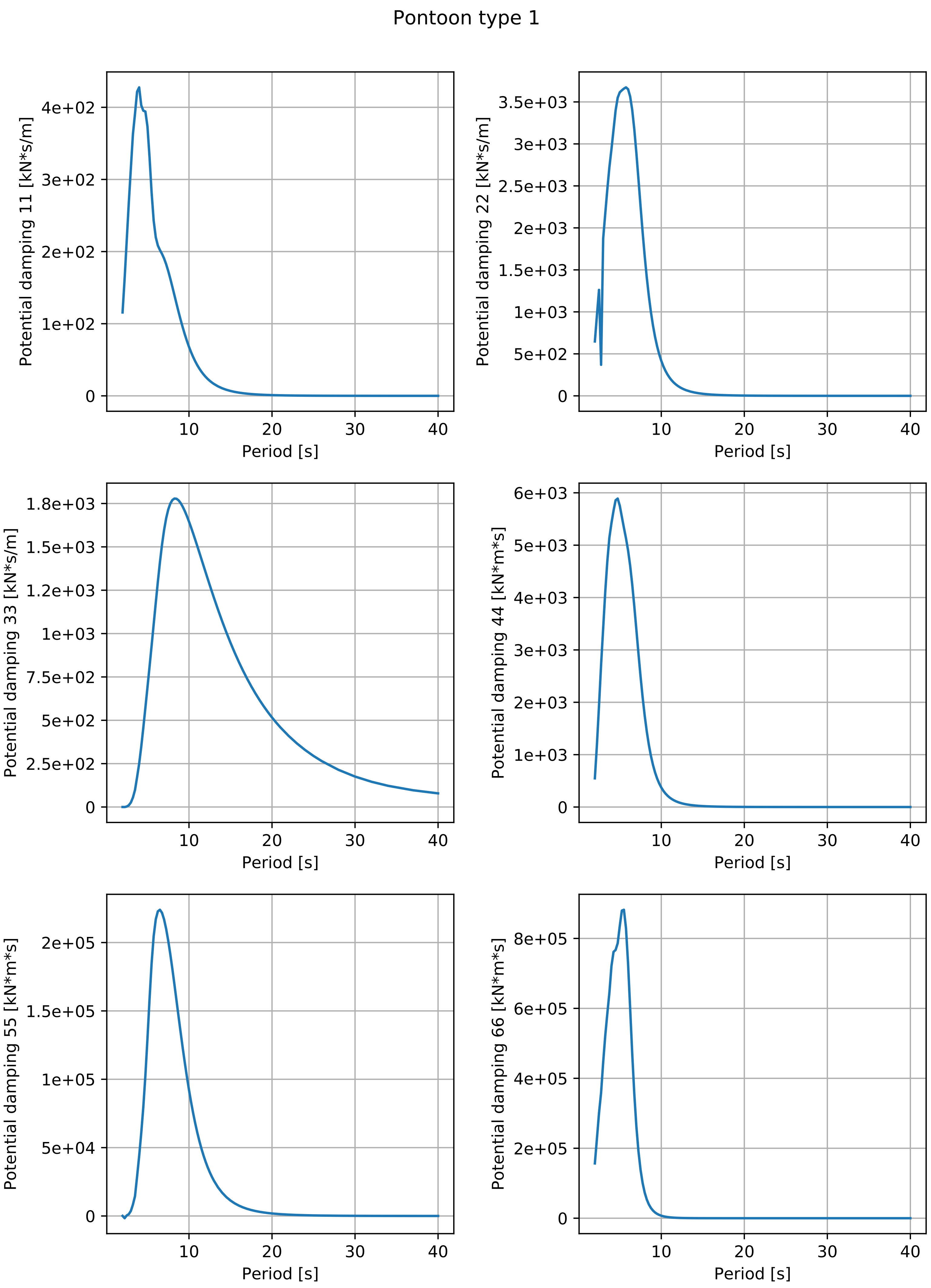
TWRTND17	263.8	-134.3	171.0	0	0	0	0	0	0	
TWRTND16	263.8	-134.3	173.5	0	0	0	0	0	0	
TWRTND15	263.8	-134.3	176.0	0	0	0	0	0	0	
TWRTND14	263.8	-134.3	181.0	0	0	0	0	0	0	
TWRTND13	263.8	-134.3	183.5	0	0	0	0	0	0	
TWRTND12	263.8	-134.3	186.0	0	0	0	0	0	0	
TWRTND11	263.8	-134.3	188.5	0	0	0	0	0	0	
TWRTND10	263.8	-134.3	191.0	0	0	0	0	0	0	
TWRTND09	263.8	-134.3	193.5	0	0	0	0	0	0	
TWRTND08	263.8	-134.3	196.0	0	0	0	0	0	0	
TWRTND07	263.8	-134.3	198.5	0	0	0	0	0	0	
TWRTND06	263.8	-134.3	201.0	0	0	0	0	0	0	
TWRTND05	263.8	-134.3	203.5	0	0	0	0	0	0	
TWRTND04	263.8	-134.3	206.0	0	0	0	0	0	0	
TWRTND03	263.8	-134.3	208.5	0	0	0	0	0	0	
TWRTND02	263.8	-134.3	211.0	0	0	0	0	0	0	
TWRTND01	263.8	-134.3	213.5	0	0	0	0	0	0	
TWRTOPT	263.8	-134.3	216.0	0	0	0	0	0	0	
T101_L	37.2	-3.0	48.0	1	1	1	0	0	0	
T102_L	26.5	-29.5	48.0	1	1	1	0	0	0	
T103_L	41.7	-5.2	48.0	1	1	1	0	0	0	
T104_L	43.9	-6.4	48.0	1	1	1	0	0	0	
T105_L	46.1	-7.5	48.0	1	1	1	0	0	0	
T106_L	71.5	-20.4	62.4	0	0	0	0	0	0	INT106
T107_L	62.1	-47.6	62.4	0	0	0	0	0	0	INT107
T108_L	78.6	-24.1	62.4	0	0	0	0	0	0	INT108
T109_L	82.2	-25.9	62.3	0	0	0	0	0	0	INT109
T110_L	72.8	-53.1	62.3	0	0	0	0	0	0	INT110
T111_L	137.0	-85.8	61.5	0	0	0	0	0	0	INT111
T112_L	140.6	-87.6	61.5	0	0	0	0	0	0	INT112
T113_L	144.1	-89.4	61.4	0	0	0	0	0	0	INT113
T114_L	160.6	-65.8	61.4	0	0	0	0	0	0	INT114
T115_L	231.9	-102.1	60.3	0	0	0	0	0	0	INT115
T116_L	222.5	-129.3	60.2	0	0	0	0	0	0	INT116
T117_L	226.1	-131.2	60.2	0	0	0	0	0	0	INT117
T118_L	229.7	-133.0	60.1	0	0	0	0	0	0	INT118
T201_L	24.3	-28.4	48.0	1	1	1	0	0	0	
T202_L	39.4	-4.1	48.0	1	1	1	0	0	0	
T203_L	28.7	-30.6	48.0	1	1	1	0	0	0	
T204_L	31.0	-31.8	48.0	1	1	1	0	0	0	
T205_L	33.2	-32.9	48.0	1	1	1	0	0	0	
T206_L	58.6	-45.8	62.4	0	0	0	0	0	0	INT106
T207_L	75.1	-22.2	62.4	0	0	0	0	0	0	INT107
T208_L	65.7	-49.5	62.4	0	0	0	0	0	0	INT108
T209_L	69.3	-51.3	62.3	0	0	0	0	0	0	INT109
T210_L	85.8	-27.7	62.3	0	0	0	0	0	0	INT110
T211_L	149.9	-60.4	61.5	0	0	0	0	0	0	INT111
T212_L	153.5	-62.2	61.5	0	0	0	0	0	0	INT112
T213_L	157.1	-64.0	61.4	0	0	0	0	0	0	INT113
T214_L	147.7	-91.2	61.4	0	0	0	0	0	0	INT114
T215_L	219.0	-127.5	60.3	0	0	0	0	0	0	INT115
T216_L	235.5	-103.9	60.2	0	0	0	0	0	0	INT116
T217_L	239.0	-105.8	60.2	0	0	0	0	0	0	INT117
T218_L	242.6	-107.6	60.1	0	0	0	0	0	0	INT118
T318_L	308.1	-172.9	58.6	0	0	0	0	0	0	INT318
T317_L	311.7	-174.7	58.5	0	0	0	0	0	0	INT317

T316_L	328.2	-151.1	58.5	0	0	0	0	0	0	INT316
T315_L	331.7	-153.0	58.4	0	0	0	0	0	0	INT315
T314_L	410.1	-192.9	56.6	0	0	0	0	0	0	INT314
T313_L	413.7	-194.7	56.5	0	0	0	0	0	0	INT313
T312_L	417.3	-196.5	56.5	0	0	0	0	0	0	INT312
T311_L	407.9	-223.7	56.4	0	0	0	0	0	0	INT311
T310_L	486.3	-263.7	54.3	0	0	0	0	0	0	INT310
T309_L	489.9	-265.5	54.2	0	0	0	0	0	0	INT309
T308_L	506.4	-241.9	54.1	0	0	0	0	0	0	INT308
T307_L	509.9	-243.7	54.0	0	0	0	0	0	0	INT307
T306_L	513.5	-245.5	53.9	0	0	0	0	0	0	INT306
T305_L	588.4	-283.7	51.6	0	0	0	0	0	0	INT305
T304_L	591.9	-285.5	51.5	0	0	0	0	0	0	INT304
T303_L	595.5	-287.3	51.4	0	0	0	0	0	0	INT303
T302_L	586.1	-314.5	51.3	0	0	0	0	0	0	INT302
T301_L	602.6	-290.9	51.2	0	0	0	0	0	0	INT301
T418_L	321.0	-147.5	58.6	0	0	0	0	0	0	INT318
T417_L	324.6	-149.3	58.5	0	0	0	0	0	0	INT317
T416_L	315.2	-176.5	58.5	0	0	0	0	0	0	INT316
T415_L	318.8	-178.4	58.4	0	0	0	0	0	0	INT315
T414_L	397.2	-218.3	56.6	0	0	0	0	0	0	INT314
T413_L	400.8	-220.1	56.5	0	0	0	0	0	0	INT313
T412_L	404.3	-221.9	56.5	0	0	0	0	0	0	INT312
T411_L	420.8	-198.3	56.4	0	0	0	0	0	0	INT311
T410_L	499.2	-238.3	54.3	0	0	0	0	0	0	INT310
T409_L	502.8	-240.1	54.2	0	0	0	0	0	0	INT309
T408_L	493.4	-267.3	54.1	0	0	0	0	0	0	INT308
T407_L	497.0	-269.1	54.0	0	0	0	0	0	0	INT307
T406_L	500.6	-270.9	53.9	0	0	0	0	0	0	INT306
T405_L	575.4	-309.1	51.6	0	0	0	0	0	0	INT305
T404_L	579.0	-310.9	51.5	0	0	0	0	0	0	INT304
T403_L	582.5	-312.7	51.4	0	0	0	0	0	0	INT303
T402_L	599.0	-289.1	51.3	0	0	0	0	0	0	INT302
T401_L	589.7	-316.3	51.2	0	0	0	0	0	0	INT301
FAIR_01	1364.7	-554.8	-6.0	0	0	0	0	0	0	C_BOT09
FAIR_02	1481.0	-582.8	-6.0	0	0	0	0	0	0	C_BOT10
FAIR_03	1598.0	-608.0	-6.0	0	0	0	0	0	0	C_BOT11
FAIR_04	1715.6	-630.3	-6.0	0	0	0	0	0	0	C_BOT12
FAIR_05	1357.5	-583.2	-6.0	0	0	0	0	0	0	C_BOT09
FAIR_06	1474.6	-611.3	-6.0	0	0	0	0	0	0	C_BOT10
FAIR_07	1592.2	-636.7	-6.0	0	0	0	0	0	0	C_BOT11
FAIR_08	1710.4	-659.1	-6.0	0	0	0	0	0	0	C_BOT12
FAIR_09	3500.5	-623.1	-6.0	0	0	0	0	0	0	C_BOT27
FAIR_10	3617.9	-599.7	-6.0	0	0	0	0	0	0	C_BOT28
FAIR_11	3734.6	-573.6	-6.0	0	0	0	0	0	0	C_BOT29
FAIR_12	3850.8	-544.8	-6.0	0	0	0	0	0	0	C_BOT30
FAIR_13	3505.9	-651.8	-6.0	0	0	0	0	0	0	C_BOT27
FAIR_14	3623.9	-628.4	-6.0	0	0	0	0	0	0	C_BOT28
FAIR_15	3741.4	-602.1	-6.0	0	0	0	0	0	0	C_BOT29
FAIR_16	3858.2	-573.0	-6.0	0	0	0	0	0	0	C_BOT30
ANCHOR01	1718.3	271.8	-561.5	1	1	1	0	0	0	
ANCHOR02	1797.9	259.3	-561.2	1	1	1	0	0	0	
ANCHOR03	1874.5	239.3	-561.1	1	1	1	0	0	0	
ANCHOR04	1956.2	215.7	-561.2	1	1	1	0	0	0	
ANCHOR05	1232.4	-1906.1	-359.3	1	1	1	0	0	0	
ANCHOR06	1281.5	-1920.9	-359.2	1	1	1	0	0	0	

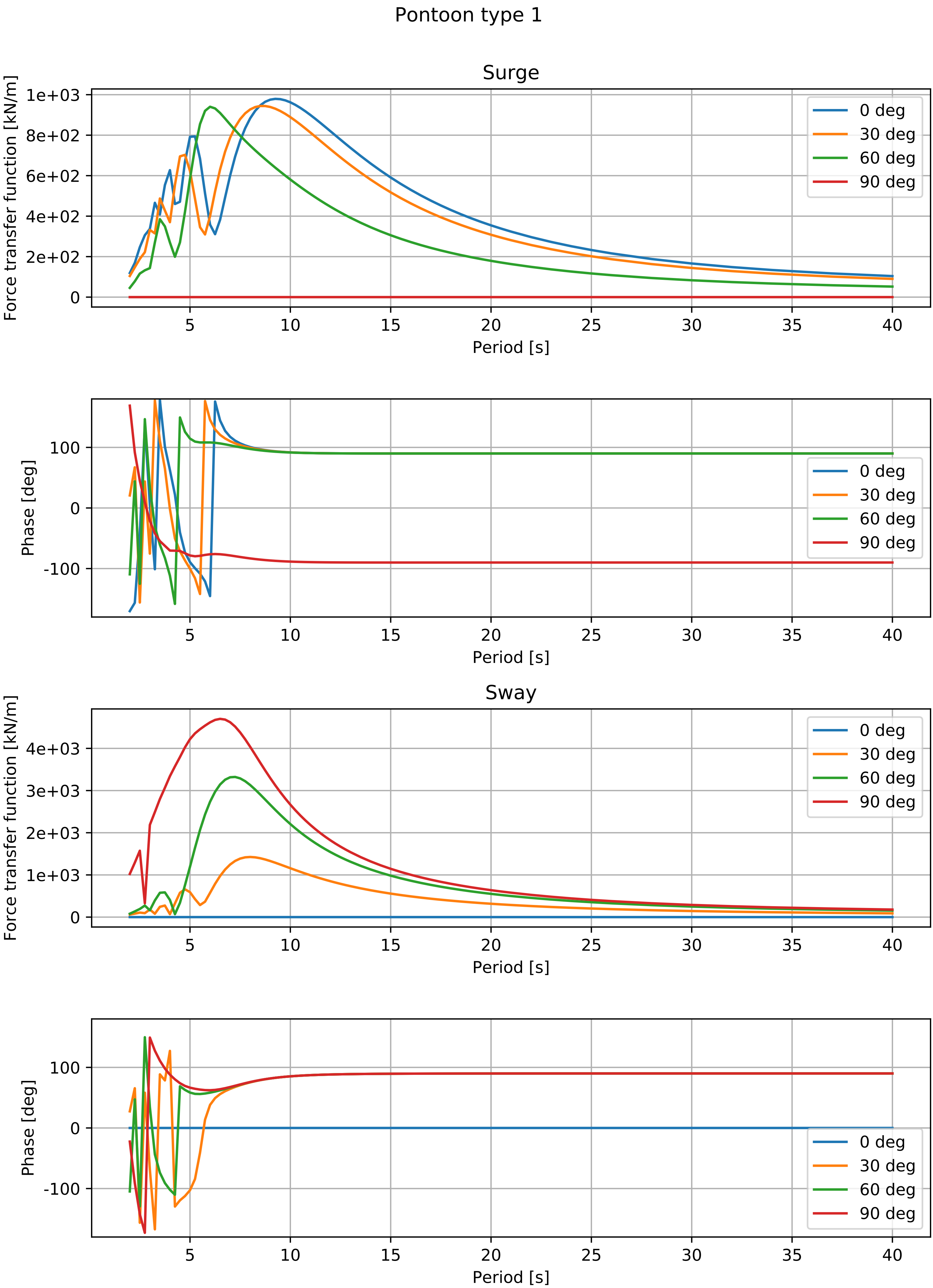
ANCHOR07	1489.5	-1758.1	-291.7	1	1	1	0	0	0
ANCHOR08	1525.5	-1750.3	-296.5	1	1	1	0	0	0
ANCHOR09	3610.8	518.7	-123.2	1	1	1	0	0	0
ANCHOR10	3625.4	557.3	-123.5	1	1	1	0	0	0
ANCHOR11	3741.7	241.7	-167.2	1	1	1	0	0	0
ANCHOR12	3753.2	193.7	-158.1	1	1	1	0	0	0
ANCHOR13	3715.0	-1197.4	-382.2	1	1	1	0	0	0
ANCHOR14	3754.6	-1191.9	-380.5	1	1	1	0	0	0
ANCHOR15	4047.4	-1530.4	-410.3	1	1	1	0	0	0
ANCHOR16	4099.3	-1559.4	-411.8	1	1	1	0	0	0

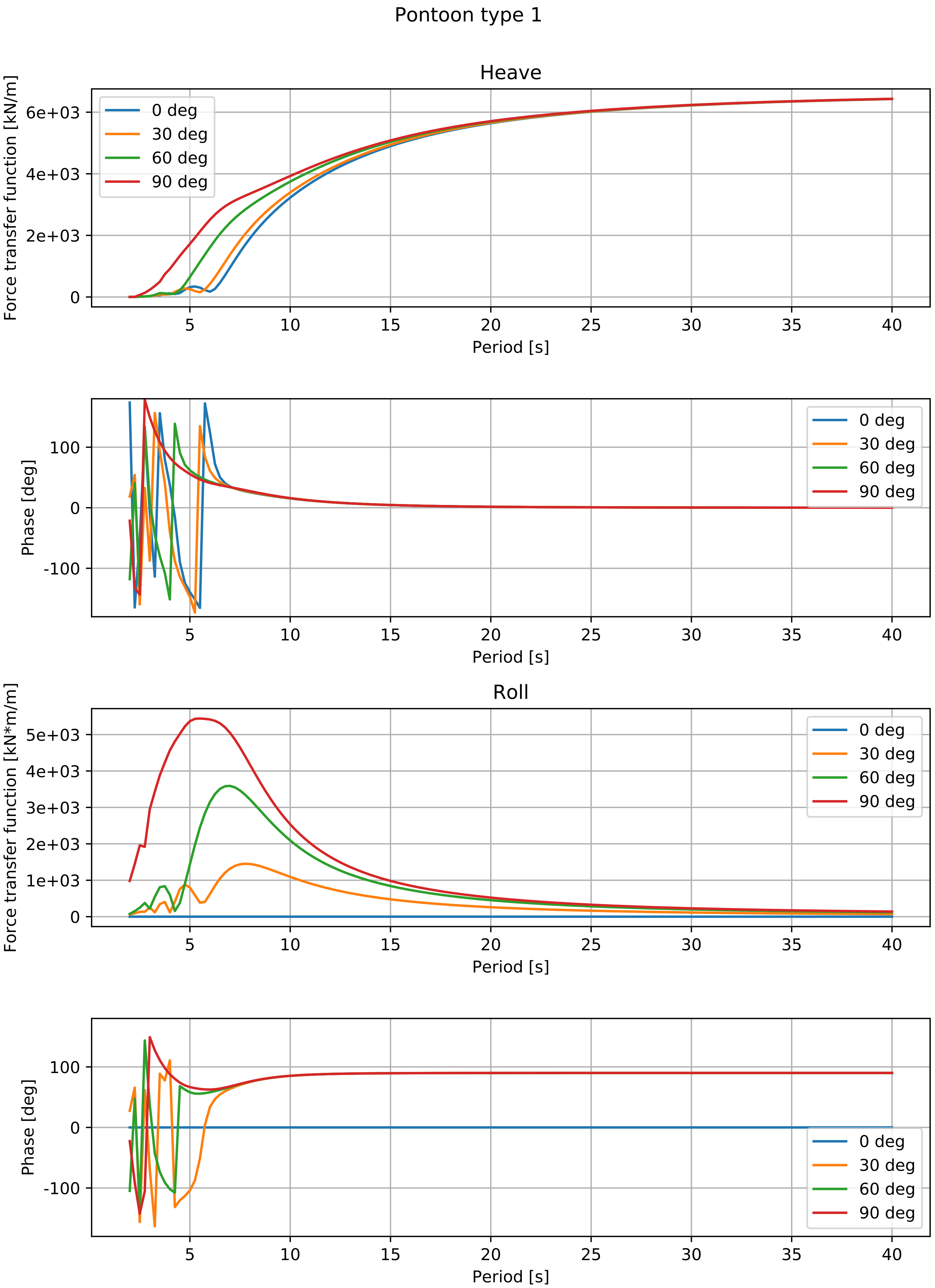
APPENDIX C
Pontoons frequency domain analyses results


Pontoon type 1
Added mass 11 [ton]
4.5e+02
4e+02
3.5e+02
3e+02
2.5e+02
2e+02
1.5e+02
1e+02
50
Added mass 22 [ton]
4e+03
3e+03
2e+03
1e+03
0
Added mass 33 [ton]
7e+03
6.5e+03
6e+03
5.5e+03
5e+03
4.5e+03
4e+03
3.5e+03
3e+03
Added mass 44 [ton * m^2]
2.5e+04
2.4e+04
2.3e+04
2.2e+04
2.1e+04
2e+04
1.9e+04
1.8e+04
Added mass 55 [ton * m^2]
1e+06
9.5e+05
9e+05
8.5e+05
8e+05
7.5e+05
7e+05
Added mass 66 [ton * m^2]
1e+06
8e+05
6e+05
4e+05
2e+05
10
20
30
40
Period [s]

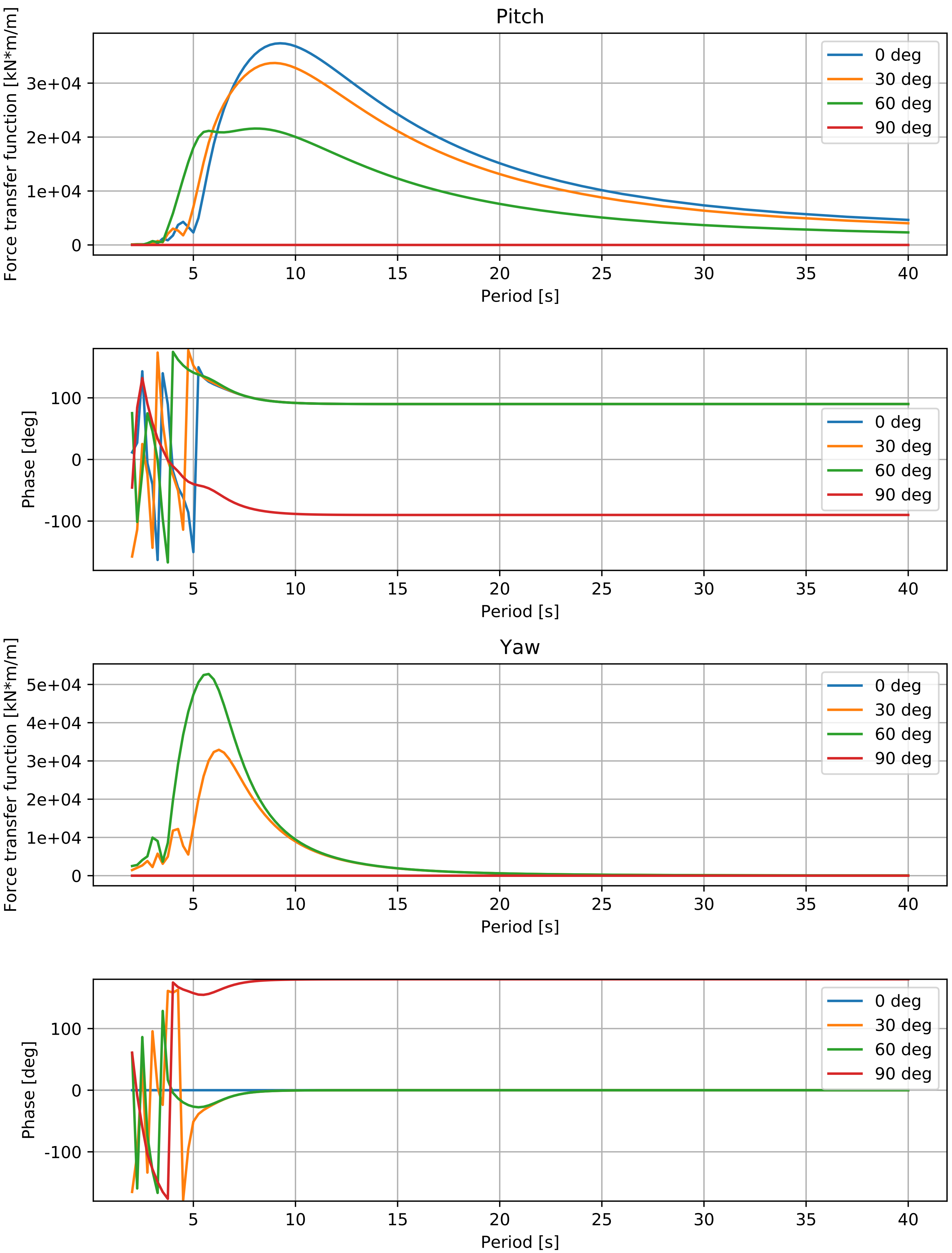


Pontoon type 1
Potential damping 11 [kN*s/m]
4e+02
3e+02
2e+02
1e+02
0
10
20
30
40
Period [s]
Potential damping 22 [kN*s/m]
3.5e+03
3e+03
2.5e+03
2e+03
1.5e+03
1e+03
5e+02
0
10
20
30
40
Period [s]
Potential damping 33 [kN*s/m]
1.8e+03
1.5e+03
1.2e+03
1e+03
7.5e+02
5e+02
2.5e+02
0
10
20
30
40
Period [s]
Potential damping 44 [kN*m*s]
6e+03
5e+03
4e+03
3e+03
2e+03
1e+03
0
10
20
30
40
Period [s]
Potential damping 55 [kN*m*s]
2e+05
1.5e+05
1e+05
5e+04
0
10
20
30
40
Period [s]
Potential damping 66 [kN*m*s]
8e+05
6e+05
4e+05
2e+05
0
10
20
30
40
Period [s]

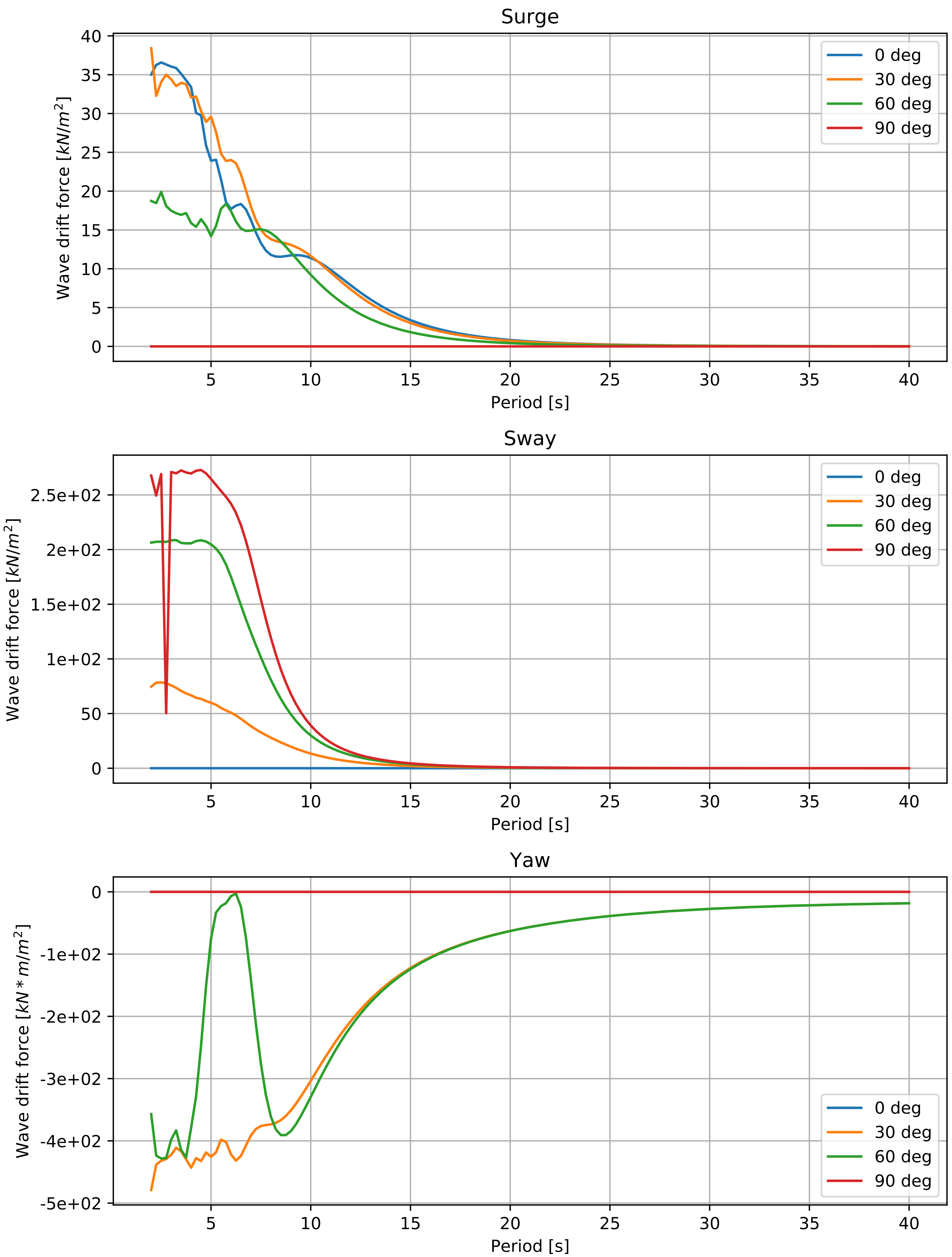

Pontoon type 1
Surge
Force transfer function [kN/m]
1e+03
8e+02
6e+02
4e+02
2e+02
0
5
10
15
20
25
30
35
40
Period [s]
0 deg
30 deg
60 deg
90 deg
Phase [deg]
100
0
-100
Sway
4e+03
3e+03
2e+03
1e+03


Pontoon type 1
Heave
Force transfer function [kN/m]
6e+03
4e+03
2e+03
0
Period [s]
Phase [deg]
100
0
-100
Roll
Force transfer function [kN*m/m]
5e+03
4e+03
3e+03
2e+03
1e+03
5
10
15
20
25
30
35
40
0 deg
30 deg
60 deg
90 deg

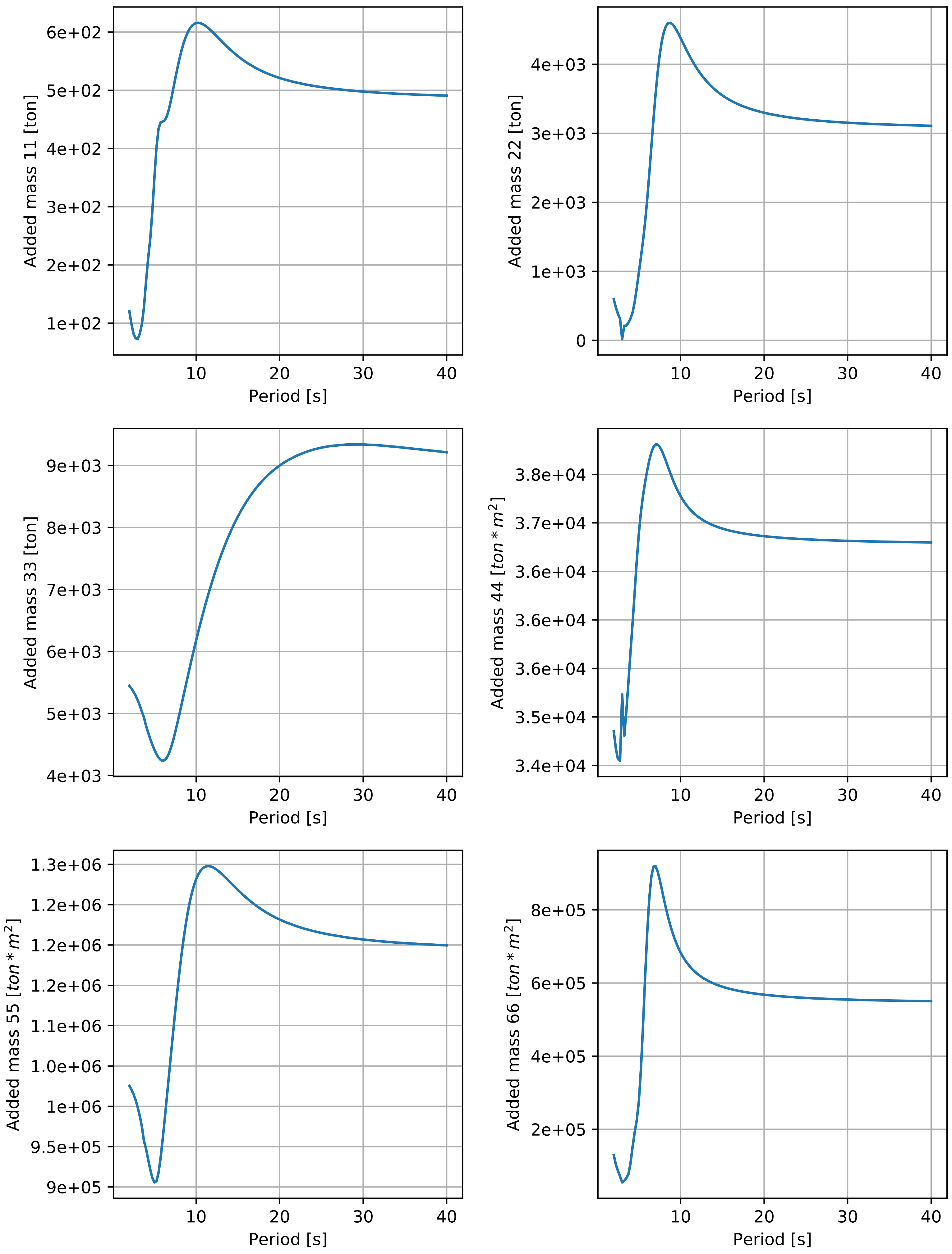
Pontoon type 1



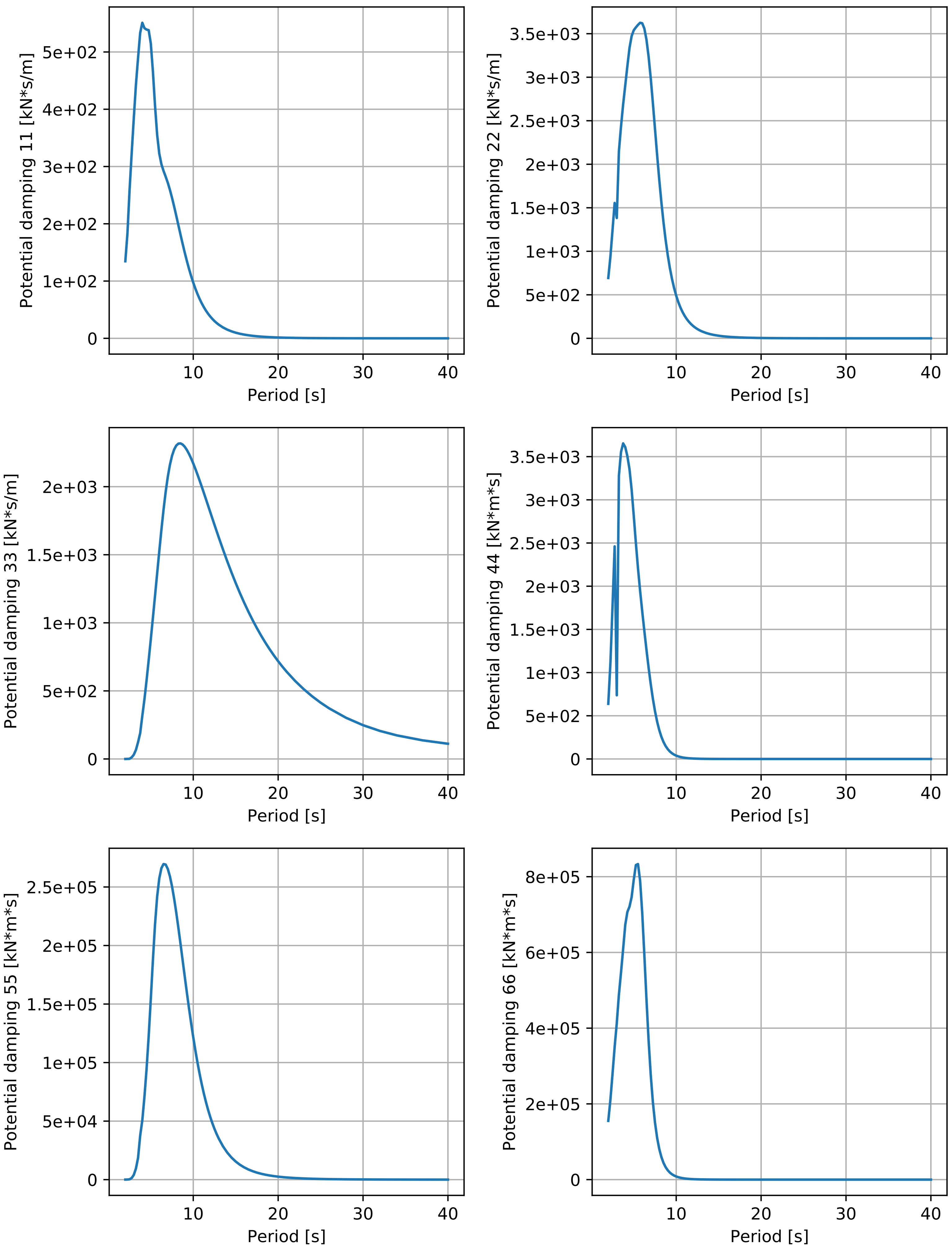
Pontoon type 1

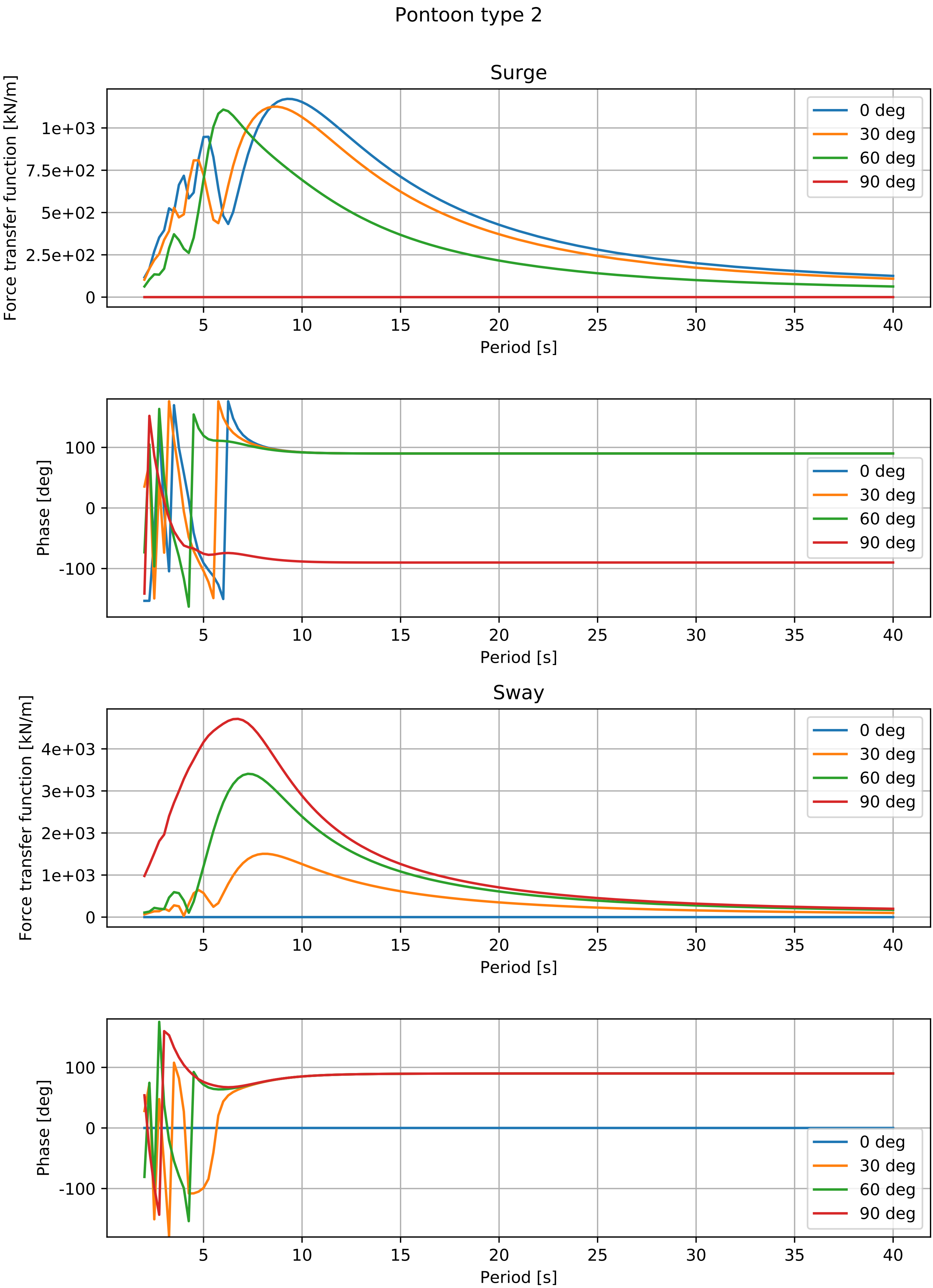


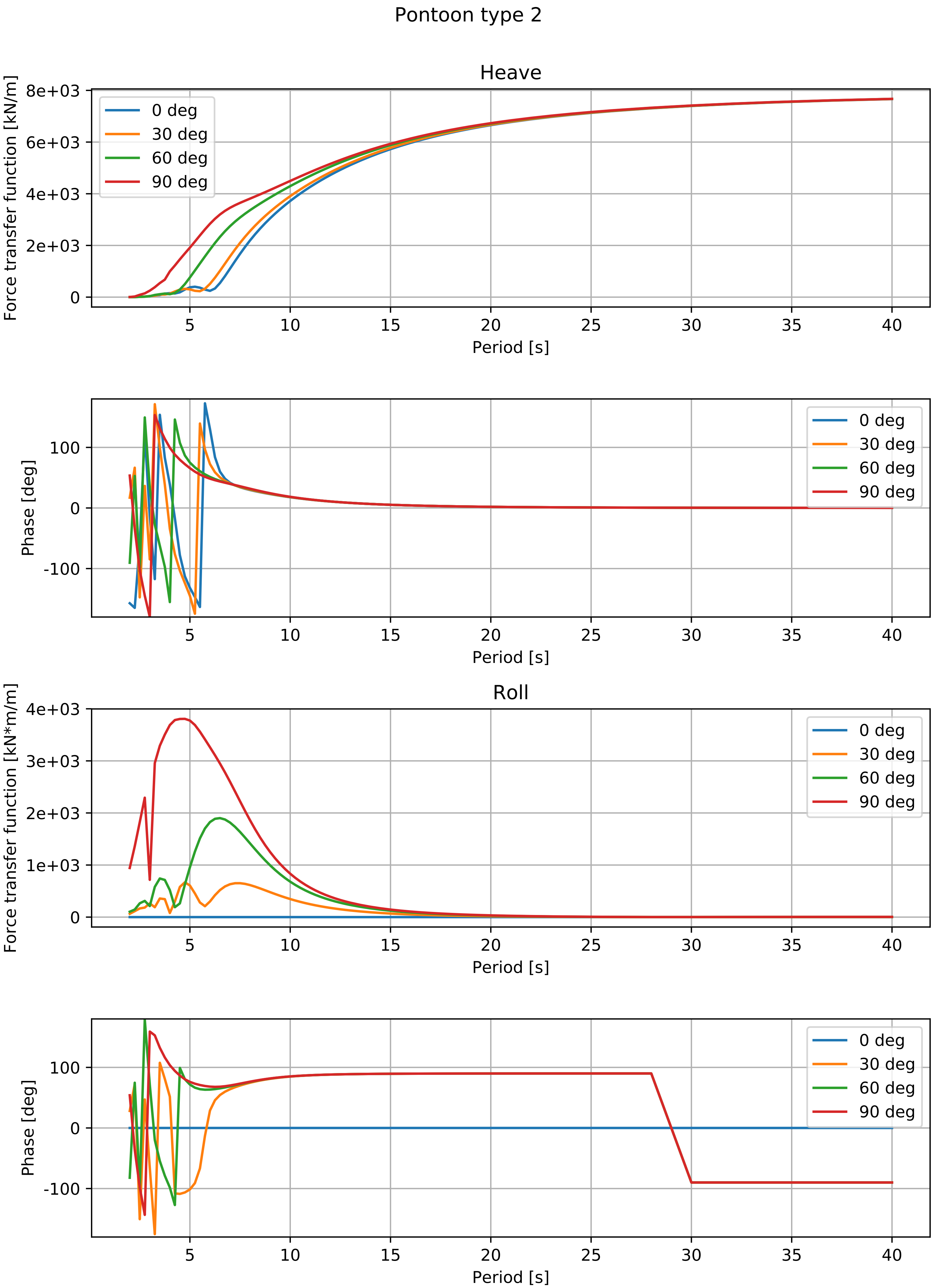
Pontoon type 2



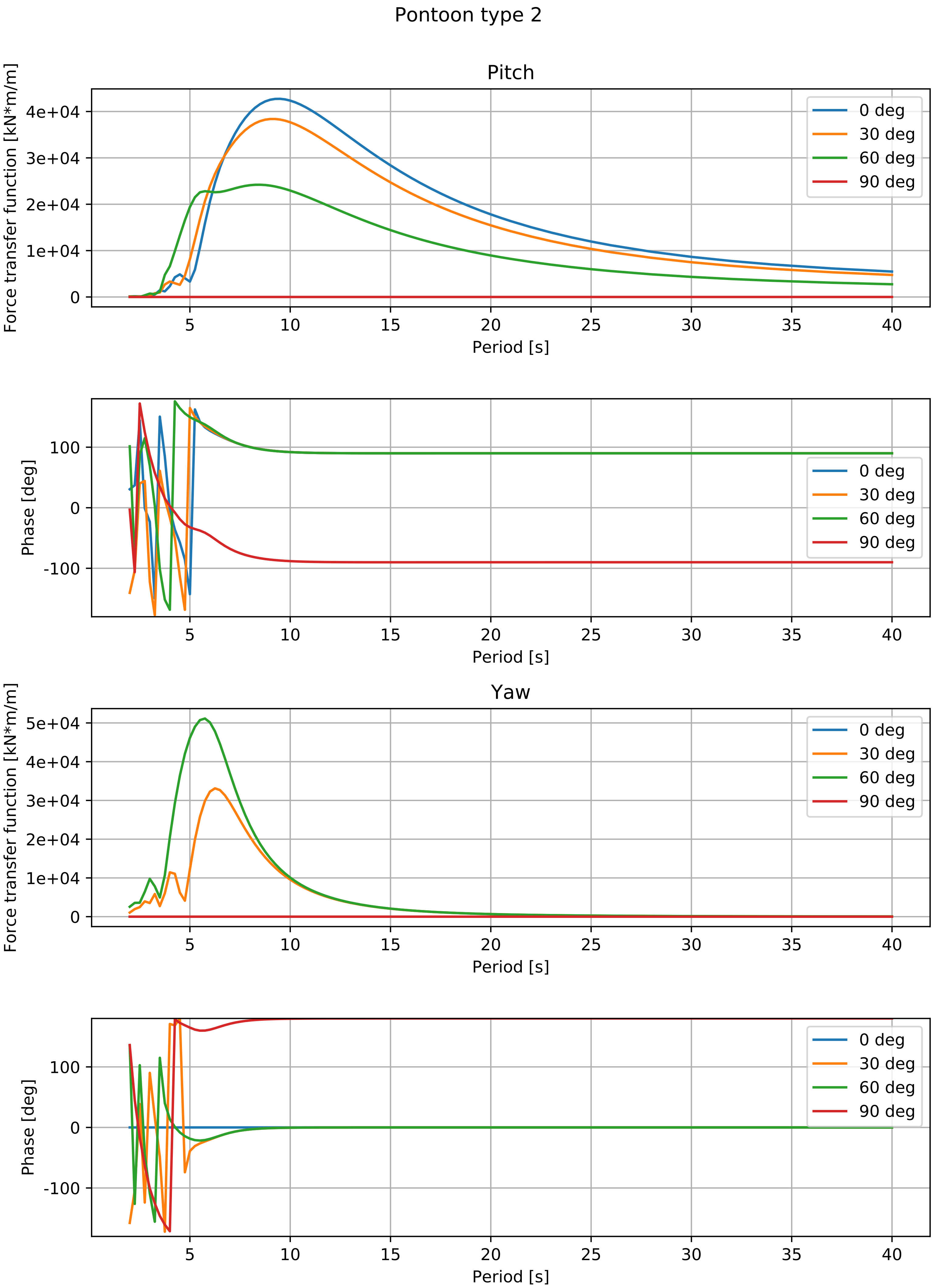
Pontoon type 2




Pontoon type 2
Surge
Force transfer function [kN/m]
1e+03
7.5e+02
5e+02
2.5e+02
0
Period [s]
5
10
15
20
25
30
35
40
0 deg
30 deg
60 deg
90 deg
Phase [deg]
100
0
-100
Sway
4e+03
3e+03
2e+03
1e+03

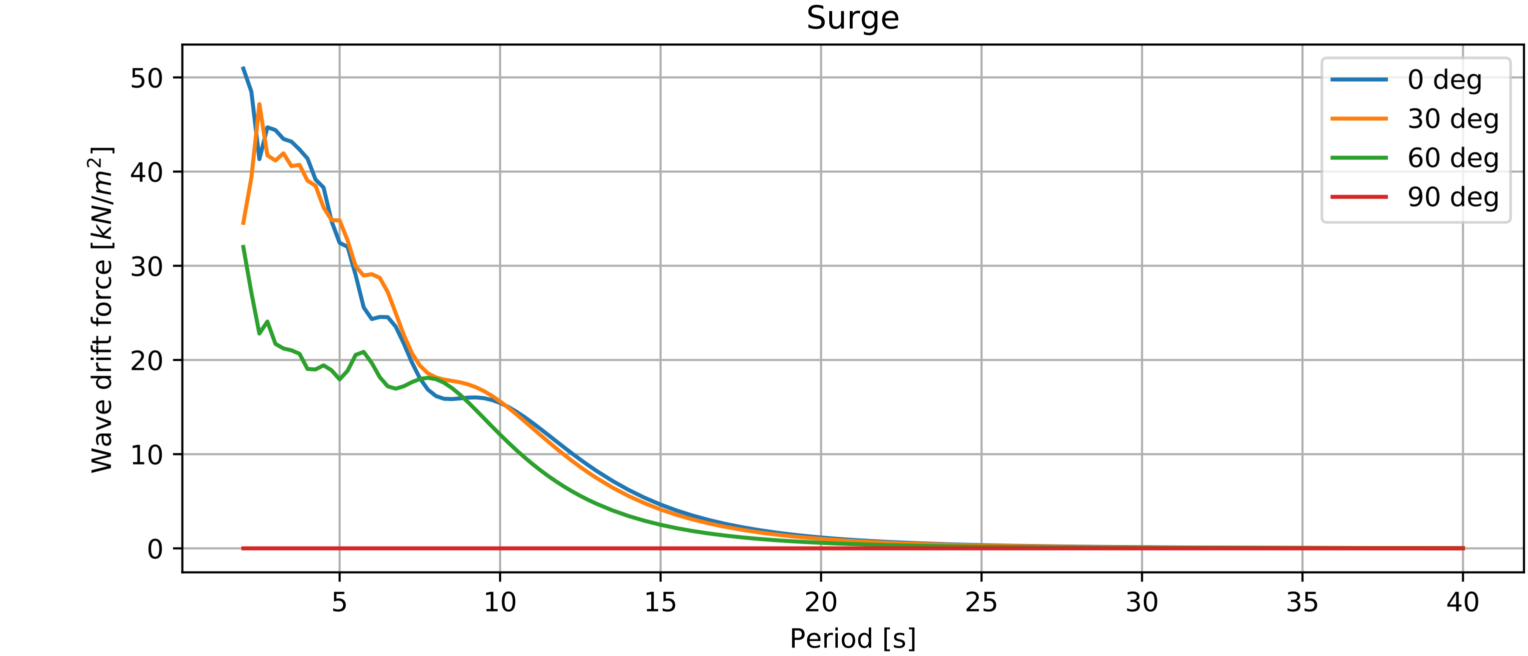


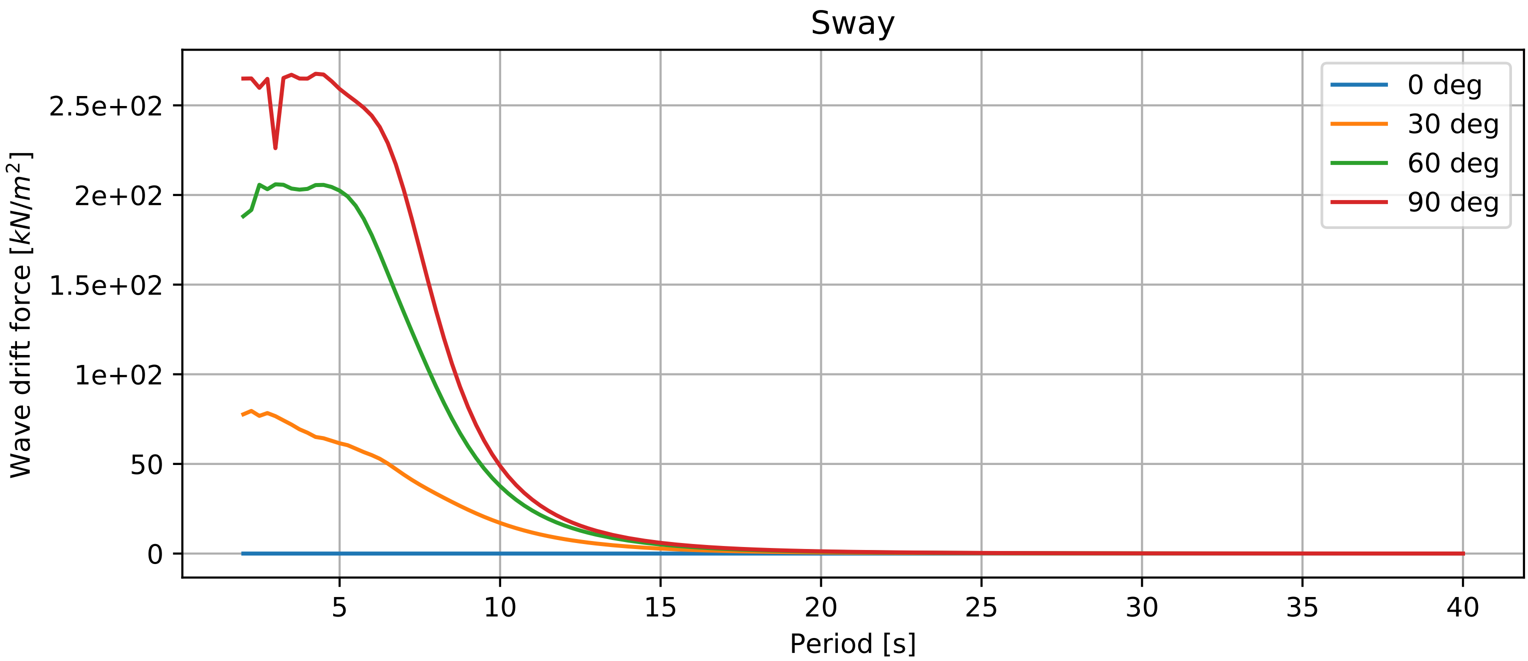
Pontoon type 2
Heave
Force transfer function [kN/m]
8e+03
6e+03
4e+03
2e+03
0
0 deg
30 deg
60 deg
90 deg
5
10
15
20
25
30
35
40
Period [s]
Phase [deg]
100
0
-100
Roll
Force transfer function [kN*m/m]
4e+03
3e+03
2e+03
1e+03

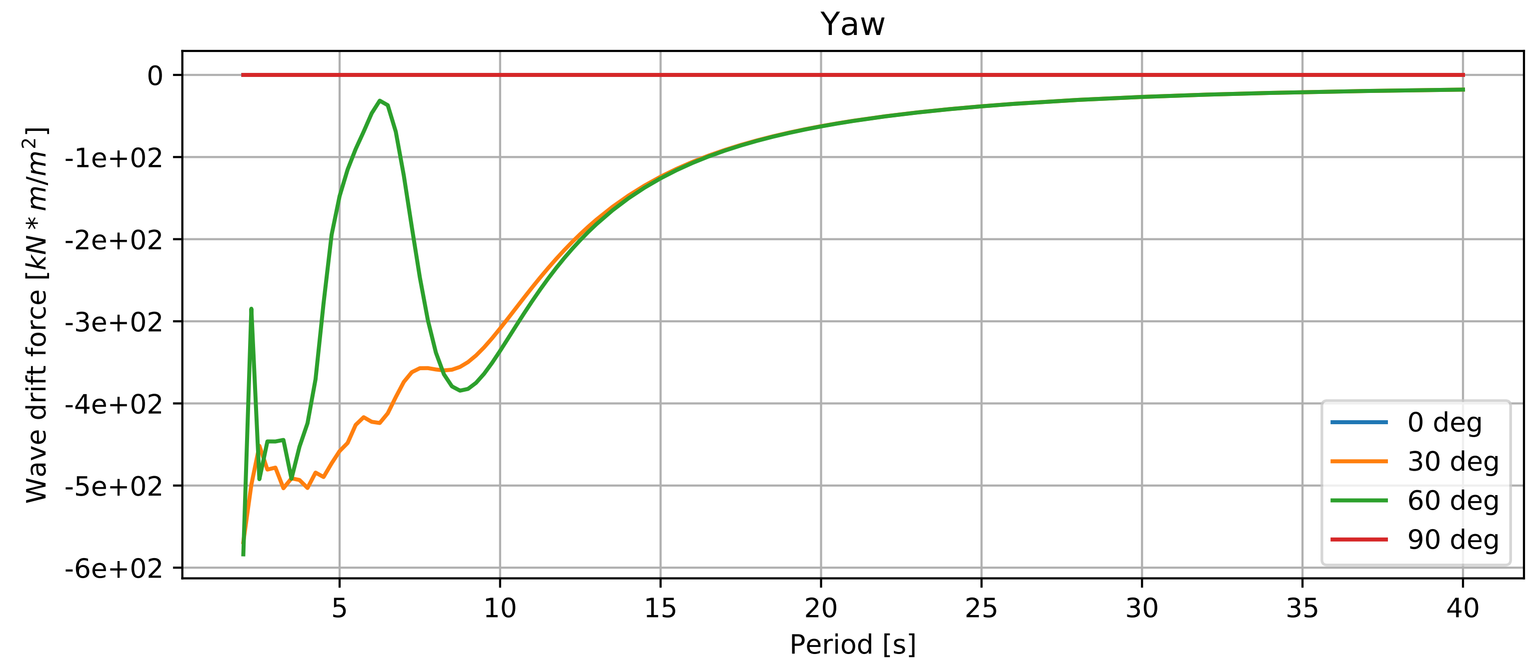


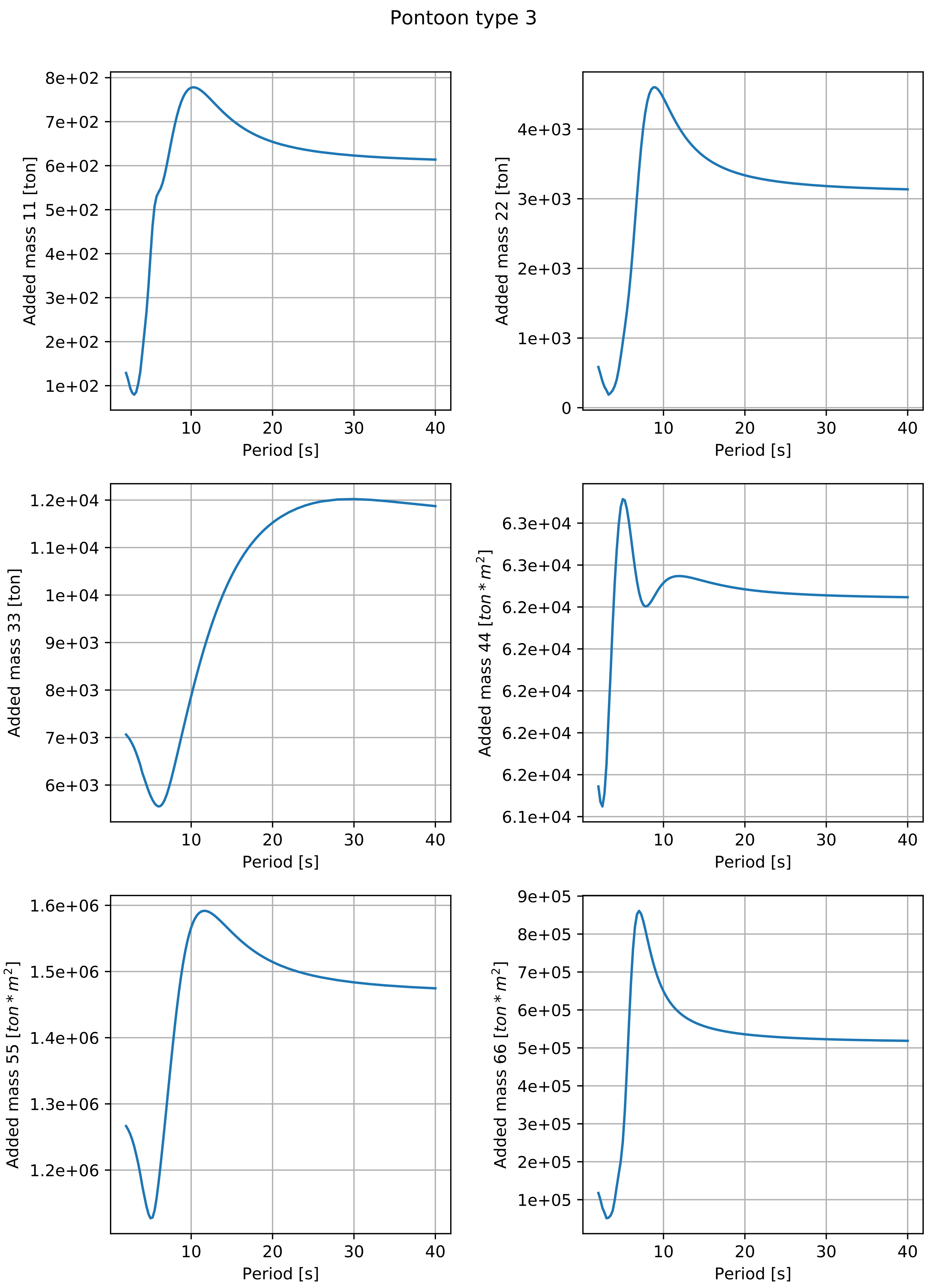
Pontoon type 2
Pitch
Force transfer function [kN*m/m]
4e+04
3e+04
2e+04
1e+04
0
5
10
15
20
25
30
35
40
Period [s]
0 deg
30 deg
60 deg
90 deg
Phase [deg]
100
0
-100
Yaw
5e+04

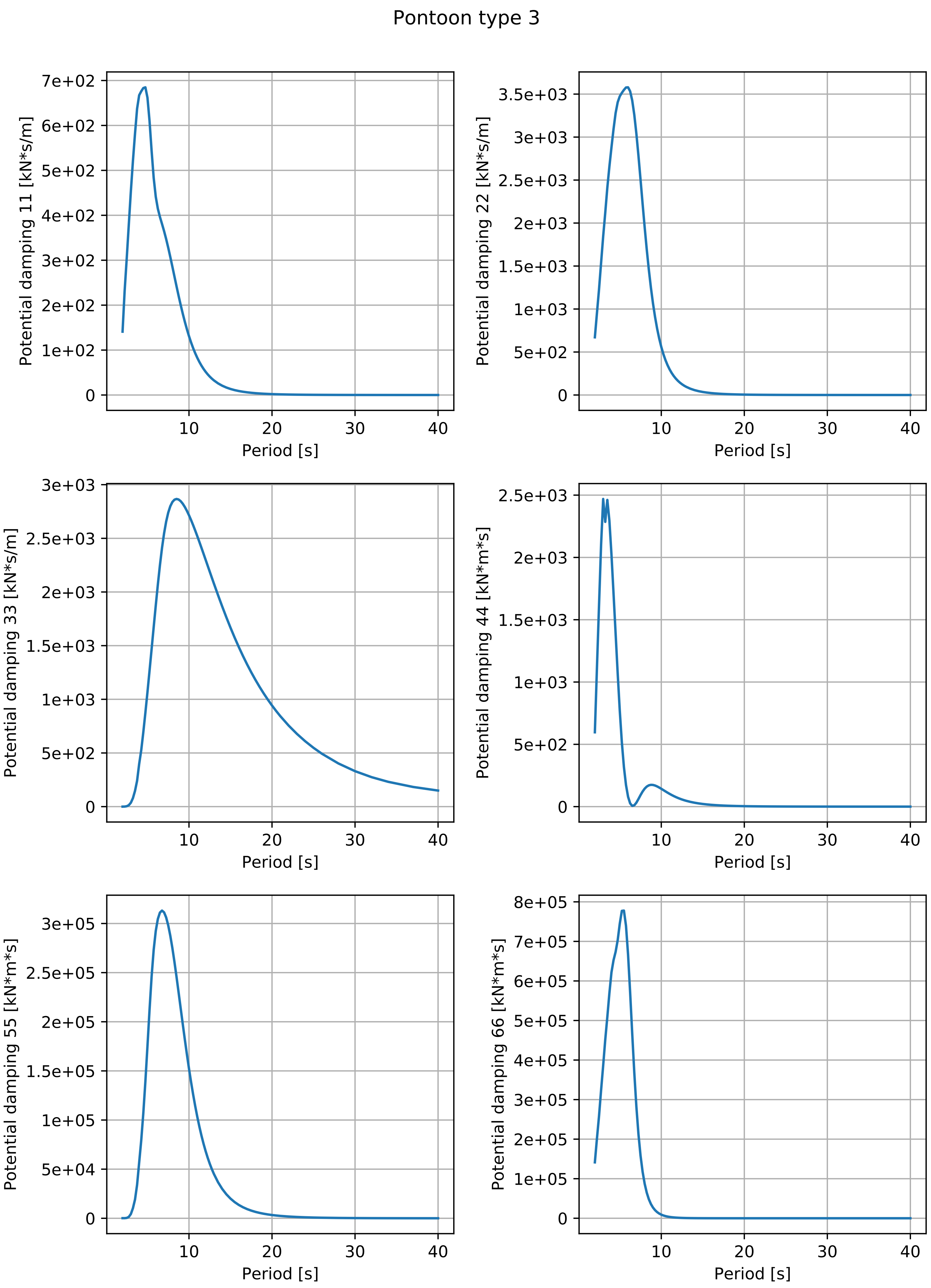
Pontoon type 2





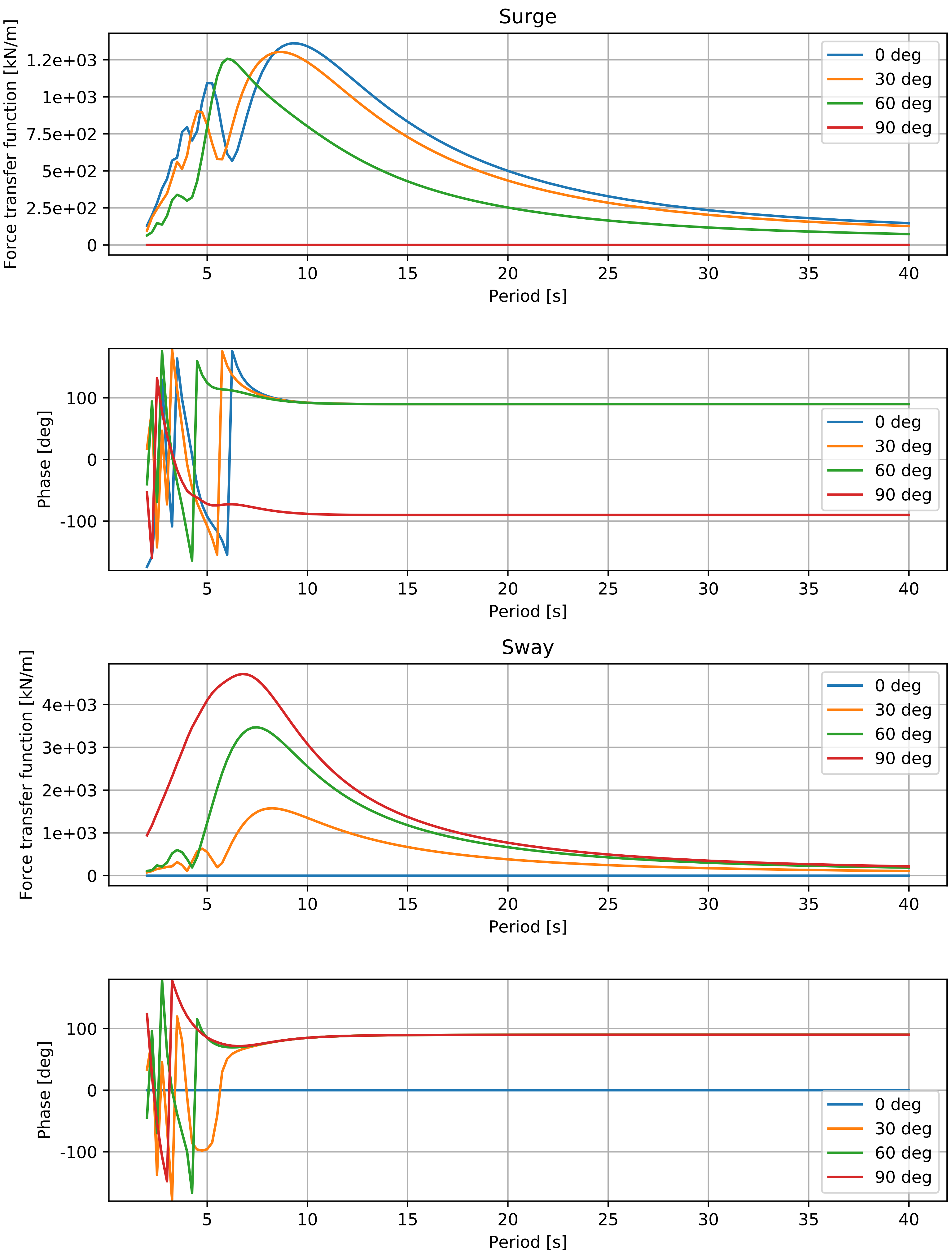



Pontoon type 3
Added mass 11 [ton]
8e+02
7e+02
6e+02
5e+02
4e+02
3e+02
2e+02
1e+02
10
20
30
40
Period [s]
Added mass 22 [ton]
4e+03
3e+03
2e+03
1e+03
0
Added mass 33 [ton]
1.2e+04
1.1e+04
1e+04
9e+03
8e+03
7e+03
6e+03
Added mass 44 [ton * m^2]
6.3e+04
6.3e+04
6.2e+04
6.2e+04
6.2e+04
6.2e+04
6.2e+04
6.1e+04
Added mass 55 [ton * m^2]
1.6e+06
1.5e+06
1.4e+06
1.3e+06
1.2e+06
Added mass 66 [ton * m^2]
9e+05
8e+05
7e+05
6e+05
5e+05
4e+05
3e+05
2e+05
1e+05

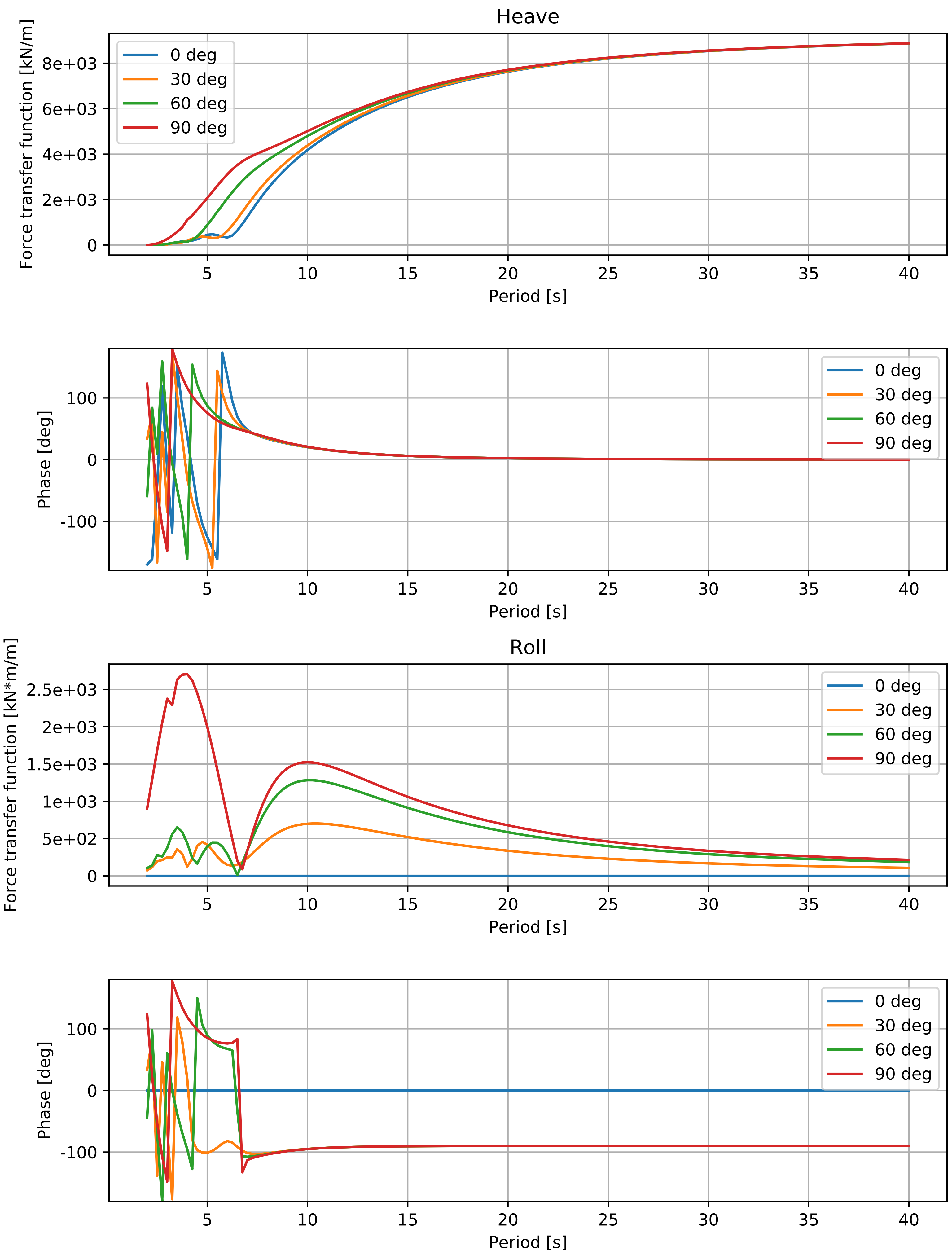


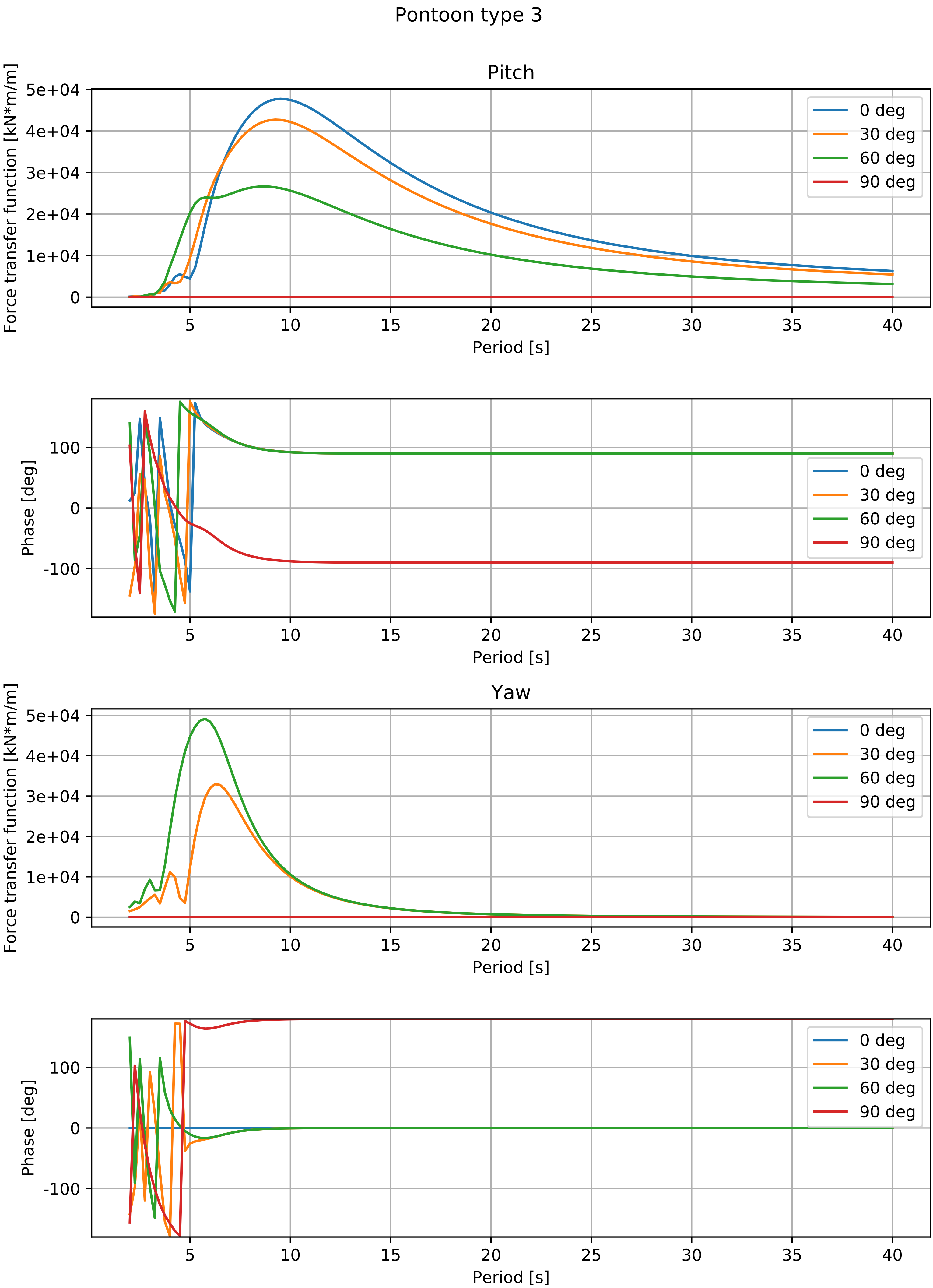
Pontoon type 3
Potential damping 11 [kN*s/m]
0
1e+02
2e+02
3e+02
4e+02
5e+02
6e+02
7e+02
Potential damping 22 [kN*s/m]
0
5e+02
1e+03
1.5e+03
2e+03
2.5e+03
3e+03
3.5e+03
Potential damping 33 [kN*s/m]
0
5e+02
1e+03
1.5e+03
2e+03
2.5e+03
3e+03
Potential damping 44 [kN*m*s]
0
5e+02
1e+03
1.5e+03
2e+03
2.5e+03
Potential damping 55 [kN*m*s]
0
5e+04
1e+05
1.5e+05
2e+05
2.5e+05
3e+05
Potential damping 66 [kN*m*s]
0
1e+05
2e+05
3e+05
4e+05
5e+05
6e+05
7e+05
8e+05
10
20
30
40
Period [s]

Pontoon type 3

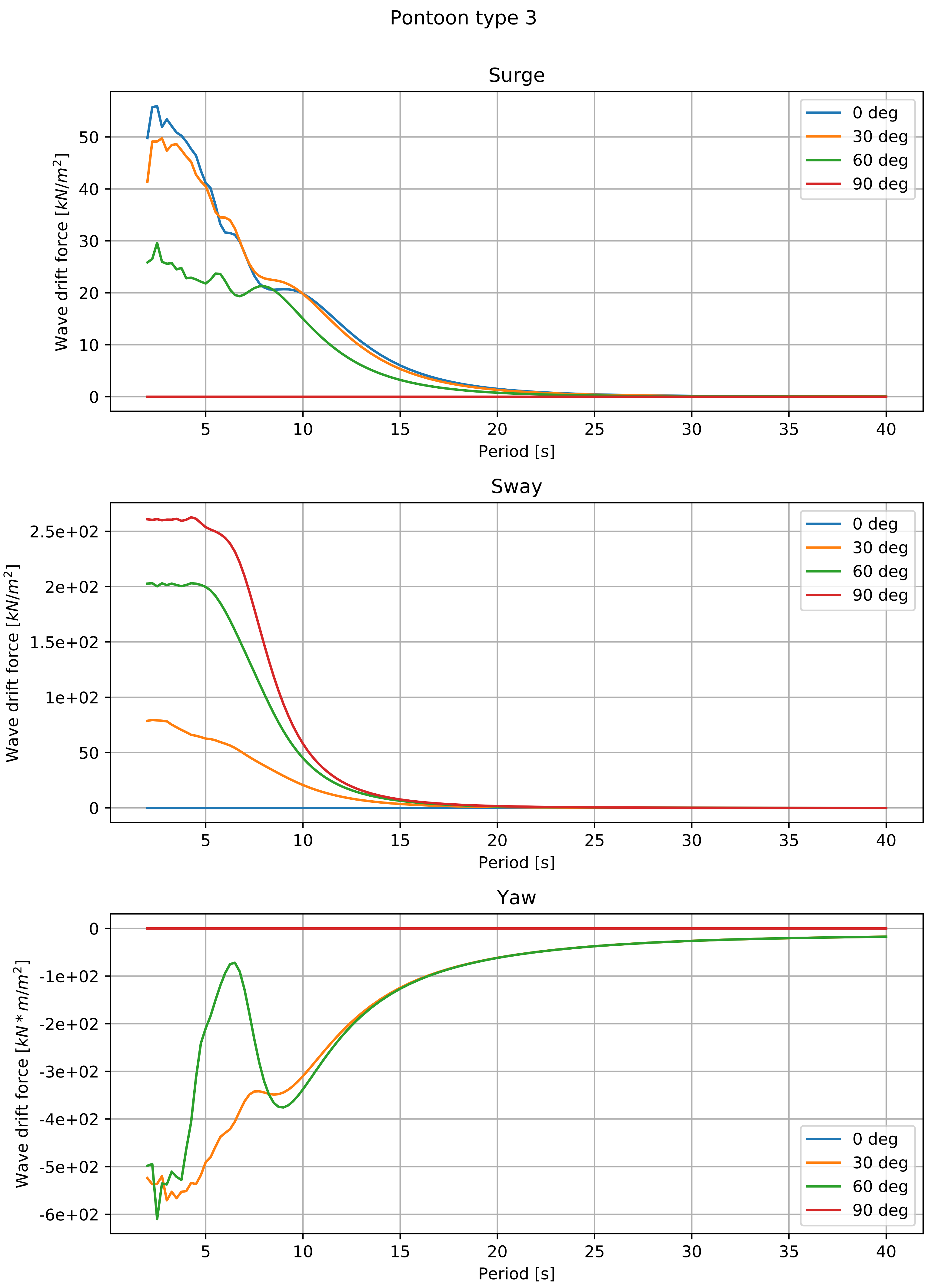


Pontoon type 3





Pontoon type 3
Pitch
Force transfer function [kN*m/m]
5e+04
4e+04
3e+04
2e+04
1e+04
0
5
10
15
20
25
30
35
40
Period [s]
0 deg
30 deg
60 deg
90 deg
Phase [deg]
100
0
-100
Yaw



Pontoon type 3
Surge
Wave drift force [kN/m^2]
Period [s]
0 deg
30 deg
60 deg
90 deg
Sway
Wave drift force [kN/m^2]
Period [s]
Yaw
Wave drift force [$kN*m/m^2$]
Period [s]

APPENDIX D
Fatigue environmental conditions

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0001	0.1	1.25	0	0.01	5	0	2.3	0	0.027578
case0002	0.1	1.75	0	0.01	5	0	2.3	0	0.001208
case0003	0.1	2.25	0	0.01	5	0	2.3	0	0.000154
case0004	0.2	1.25	0	0.01	5	0	2.9	0	0.006087
case0005	0.2	1.75	0	0.01	5	0	2.9	0	0.001477
case0006	0.2	2.25	0	0.01	5	0	2.9	0	0.000669
case0007	0.2	2.75	0	0.01	5	0	2.9	0	0.000115
case0008	0.3	1.75	0	0.01	5	0	5.5	0	0.0002
case0009	0.3	2.25	0	0.01	5	0	5.5	0	8.46E-05
case0010	0.3	2.75	0	0.01	5	0	5.5	0	0.000146
case0011	0.3	3.25	0	0.01	5	0	5.5	0	3.08E-05
case0012	0.4	1.75	0	0.01	5	0	6.7	0	1.54E-05
case0013	0.4	2.25	0	0.01	5	0	6.7	0	4.61E-05
case0014	0.4	2.75	0	0.01	5	0	6.7	0	6.92E-05
case0015	0.4	3.25	0	0.01	5	0	6.7	0	2.31E-05
case0016	0.4	3.75	0	0.01	5	0	6.7	0	7.7E-06
case0017	0.5	2.25	0	0.01	5	0	8	0	7.7E-06
case0018	0.5	2.75	0	0.01	5	0	8	0	7.7E-06
case0019	0.5	3.25	0	0.01	5	0	8	0	5.38E-05
case0020	0.5	3.75	0	0.01	5	0	8	0	1.54E-05
case0021	0.6	2.75	0	0.01	5	0	9.3	0	7.7E-06
case0022	0.6	3.25	0	0.01	5	0	9.3	0	2.31E-05
case0023	0.6	3.75	0	0.01	5	0	9.3	0	7.7E-06
case0024	0.7	3.75	0	0.01	5	0	12.2	0	1.54E-05
case0025	0.8	3.75	0	0.01	5	0	11.5	0	1.54E-05
case0026	0.9	3.75	0	0.01	5	0	13.8	0	2.31E-05
case0027	0.1	1.25	30	0.01	5	30	2.3	30	0.021368
case0028	0.1	1.75	30	0.01	5	30	2.3	30	0.000754
case0029	0.1	2.25	30	0.01	5	30	2.3	30	3.08E-05
case0030	0.2	1.25	30	0.01	5	30	2.7	30	0.007995
case0031	0.2	1.75	30	0.01	5	30	2.7	30	0.00077
case0032	0.2	2.25	30	0.01	5	30	2.7	30	0.000531
case0033	0.2	2.75	30	0.01	5	30	2.7	30	3.85E-05
case0034	0.3	1.75	30	0.01	5	30	5.3	30	4.61E-05
case0035	0.3	2.25	30	0.01	5	30	5.3	30	7.69E-05
case0036	0.3	2.75	30	0.01	5	30	5.3	30	6.15E-05
case0037	0.3	3.25	30	0.01	5	30	5.3	30	1.54E-05
case0038	0.4	1.75	30	0.01	5	30	6.4	30	7.7E-06
case0039	0.4	2.25	30	0.01	5	30	6.4	30	4.61E-05
case0040	0.4	2.75	30	0.01	5	30	6.4	30	2.31E-05

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0041	0.4	3.25	30	0.01	5	30	6.4	30	1.54E-05
case0042	0.5	3.25	30	0.01	5	30	9.2	30	3.85E-05
case0043	0.6	3.25	30	0.01	5	30	9.8	30	7.7E-06
case0044	0.1	1.25	60	0.01	5	60	2.6	60	0.011988
case0045	0.1	1.75	60	0.01	5	60	2.6	60	0.001901
case0046	0.1	2.25	60	0.01	5	60	2.6	60	0.000215
case0047	0.2	1.25	60	0.01	5	60	3.5	60	0.007525
case0048	0.2	1.75	60	0.01	5	60	3.5	60	0.00634
case0049	0.2	2.25	60	0.01	5	60	3.5	60	0.002862
case0050	0.2	2.75	60	0.01	5	60	3.5	60	0.0002
case0051	0.3	1.75	60	0.01	5	60	5.1	60	0.000692
case0052	0.3	2.25	60	0.01	5	60	5.1	60	0.002809
case0053	0.3	2.75	60	0.01	5	60	5.1	60	0.000677
case0054	0.3	3.25	60	0.01	5	60	5.1	60	3.08E-05
case0055	0.4	2.25	60	0.01	5	60	6.5	60	0.000608
case0056	0.4	2.75	60	0.01	5	60	6.5	60	0.000808
case0057	0.4	3.25	60	0.01	5	60	6.5	60	0.000131
case0058	0.5	2.75	60	0.01	5	60	7.7	60	0.000292
case0059	0.5	3.25	60	0.01	5	60	7.7	60	9.24E-05
case0060	0.6	2.75	60	0.01	5	60	8.8	60	5.38E-05
case0061	0.6	3.25	60	0.01	5	60	8.8	60	0.000162
case0062	0.7	3.25	60	0.01	5	60	10.4	60	1.54E-05
case0063	0.7	3.75	60	0.01	5	60	10.4	60	1.54E-05
case0064	0.1	1.25	90	0.01	5	90	2.8	90	0.010927
case0065	0.1	1.75	90	0.01	5	90	2.8	90	0.00384
case0066	0.1	2.25	90	0.01	5	90	2.8	90	0.000277
case0067	0.2	1.25	90	0.01	5	90	4.1	90	0.012055
case0068	0.2	1.75	90	0.01	5	90	4.1	90	0.029802
case0069	0.2	2.25	90	0.01	5	90	4.1	90	0.009988
case0070	0.2	2.75	90	0.01	5	90	4.1	90	0.000585
case0071	0.3	1.75	90	0.01	5	90	5.8	90	0.006202
case0072	0.3	2.25	90	0.01	5	90	5.8	90	0.025608
case0073	0.3	2.75	90	0.01	5	90	5.8	90	0.003455
case0074	0.3	3.25	90	0.01	5	90	5.8	90	0.000154
case0075	0.4	2.25	90	0.01	5	90	7.1	90	0.008372
case0076	0.4	2.75	90	0.01	5	90	7.1	90	0.009935
case0077	0.4	3.25	90	0.01	5	90	7.1	90	0.00077
case0078	0.5	2.25	90	0.01	5	90	8.3	90	8.46E-05
case0079	0.5	2.75	90	0.01	5	90	8.3	90	0.007241
case0080	0.5	3.25	90	0.01	5	90	8.3	90	0.002178
case0081	0.5	3.75	90	0.01	5	90	8.3	90	5.38E-05
case0082	0.6	2.75	90	0.01	5	90	9.2	90	0.001362
case0083	0.6	3.25	90	0.01	5	90	9.2	90	0.003278
case0084	0.6	3.75	90	0.01	5	90	9.2	90	0.000223

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0085	0.7	2.75	90	0.01	5	90	10.1	90	6.15E-05
case0086	0.7	3.25	90	0.01	5	90	10.1	90	0.002008
case0087	0.7	3.75	90	0.01	5	90	10.1	90	0.000531
case0088	0.7	4.25	90	0.01	5	90	10.1	90	2.31E-05
case0089	0.8	3.25	90	0.01	5	90	11.2	90	0.000716
case0090	0.8	3.75	90	0.01	5	90	11.2	90	0.000677
case0091	0.8	4.25	90	0.01	5	90	11.2	90	6.15E-05
case0092	0.9	3.25	90	0.01	5	90	12.1	90	0.000131
case0093	0.9	3.75	90	0.01	5	90	12.1	90	0.000616
case0094	0.9	4.25	90	0.01	5	90	12.1	90	8.46E-05
case0095	1	3.25	90	0.01	5	90	13.1	90	1.54E-05
case0096	1	3.75	90	0.01	5	90	13.1	90	0.000323
case0097	1	4.25	90	0.01	5	90	13.1	90	0.000231
case0098	1.1	3.75	90	0.01	5	90	14.6	90	5.38E-05
case0099	1.1	4.25	90	0.01	5	90	14.6	90	0.000123
case0100	1.2	3.75	90	0.01	5	90	15	90	2.31E-05
case0101	1.2	4.25	90	0.01	5	90	15	90	0.000108
case0102	1.3	4.25	90	0.01	5	90	17.1	90	0.000192
case0103	1.3	4.75	90	0.01	5	90	17.1	90	7.7E-06
case0104	1.4	4.25	90	0.01	5	90	15.9	90	1.54E-05
case0105	1.4	4.75	90	0.01	5	90	15.9	90	3.08E-05
case0106	1.5	4.75	90	0.01	5	90	17.1	90	3.85E-05
case0107	1.6	4.75	90	0.01	5	90	19	90	5.38E-05
case0108	0.1	1.25	120	0.01	5	120	2.7	120	0.010988
case0109	0.1	1.75	120	0.01	5	120	2.7	120	0.00267
case0110	0.1	2.25	120	0.01	5	120	2.7	120	6.92E-05
case0111	0.2	1.25	120	0.01	5	120	4.2	120	0.010588
case0112	0.2	1.75	120	0.01	5	120	4.2	120	0.014366
case0113	0.2	2.25	120	0.01	5	120	4.2	120	0.004401
case0114	0.2	2.75	120	0.01	5	120	4.2	120	9.24E-05
case0115	0.3	1.75	120	0.01	5	120	6.1	120	0.004748
case0116	0.3	2.25	120	0.01	5	120	6.1	120	0.008672
case0117	0.3	2.75	120	0.01	5	120	6.1	120	0.001631
case0118	0.3	3.25	120	0.01	5	120	6.1	120	2.31E-05
case0119	0.3	3.75	120	0.01	5	120	6.1	120	7.7E-06
case0120	0.4	1.75	120	0.01	5	120	7.7	120	2.31E-05
case0121	0.4	2.25	120	0.01	5	120	7.7	120	0.004278
case0122	0.4	2.75	120	0.01	5	120	7.7	120	0.004171
case0123	0.4	3.25	120	0.01	5	120	7.7	120	2E-05
case0124	0.5	2.25	120	0.01	5	120	9.1	120	0.000462
case0125	0.5	2.75	120	0.01	5	120	9.1	120	0.002832
case0126	0.5	3.25	120	0.01	5	120	9.1	120	0.000708
case0127	0.5	3.75	120	0.01	5	120	9.1	120	7.7E-06
case0128	0.6	2.75	120	0.01	5	120	10.7	120	0.000977

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0129	0.6	3.25	120	0.01	5	120	10.7	120	0.000931
case0130	0.6	3.75	120	0.01	5	120	10.7	120	7.69E-05
case0131	0.7	2.75	120	0.01	5	120	11.7	120	0.000123
case0132	0.7	3.25	120	0.01	5	120	11.7	120	0.000623
case0133	0.7	3.75	120	0.01	5	120	11.7	120	3.08E-05
case0134	0.7	4.25	120	0.01	5	120	11.7	120	1.54E-05
case0135	0.8	3.25	120	0.01	5	120	12.9	120	0.000431
case0136	0.8	3.75	120	0.01	5	120	12.9	120	0.000177
case0137	0.8	4.25	120	0.01	5	120	12.9	120	1.54E-05
case0138	0.9	3.25	120	0.01	5	120	13.6	120	0.000123
case0139	0.9	3.75	120	0.01	5	120	13.6	120	0.0002
case0140	0.9	4.25	120	0.01	5	120	13.6	120	3.85E-05
case0141	1	3.25	120	0.01	5	120	15	120	2.31E-05
case0142	1	3.75	120	0.01	5	120	15	120	0.0001
case0143	1	4.25	120	0.01	5	120	15	120	1.54E-05
case0144	1.1	3.75	120	0.01	5	120	15.3	120	1.54E-05
case0145	1.1	4.25	120	0.01	5	120	15.3	120	6.92E-05
case0146	1.2	4.25	120	0.01	5	120	17.9	120	7.7E-06
case0147	0.1	1.25	150	0.01	5	150	2.5	150	0.018252
case0148	0.1	1.75	150	0.01	5	150	2.5	150	0.001531
case0149	0.1	2.25	150	0.01	5	150	2.5	150	2.31E-05
case0150	0.2	1.25	150	0.01	5	150	4.3	150	0.011173
case0151	0.2	1.75	150	0.01	5	150	4.3	150	0.01422
case0152	0.2	2.25	150	0.01	5	150	4.3	150	0.002039
case0153	0.2	2.75	150	0.01	5	150	4.3	150	0.000223
case0154	0.3	1.75	150	0.01	5	150	6.5	150	0.012835
case0155	0.3	2.25	150	0.01	5	150	6.5	150	0.00681
case0156	0.3	2.75	150	0.01	5	150	6.5	150	0.001039
case0157	0.3	3.25	150	0.01	5	150	6.5	150	7.69E-05
case0158	0.4	1.75	150	0.01	5	150	8	150	0.000839
case0159	0.4	2.25	150	0.01	5	150	8	150	0.014305
case0160	0.4	2.75	150	0.01	5	150	8	150	0.001562
case0161	0.4	3.25	150	0.01	5	150	8	150	0.000246
case0162	0.4	3.75	150	0.01	5	150	8	150	7.7E-06
case0163	0.4	4.25	150	0.01	5	150	8	150	7.7E-06
case0164	0.5	2.25	150	0.01	5	150	9.6	150	0.006233
case0165	0.5	2.75	150	0.01	5	150	9.6	150	0.004425
case0166	0.5	3.25	150	0.01	5	150	9.6	150	0.000208
case0167	0.6	2.25	150	0.01	5	150	11.2	150	0.000477
case0168	0.6	2.75	150	0.01	5	150	11.2	150	0.005386
case0169	0.6	3.25	150	0.01	5	150	11.2	150	0.000408
case0170	0.6	3.75	150	0.01	5	150	11.2	150	1.54E-05
case0171	0.6	4.25	150	0.01	5	150	11.2	150	7.7E-06
case0172	0.7	2.75	150	0.01	5	150	12.6	150	0.002024

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0173	0.7	3.25	150	0.01	5	150	12.6	150	0.000562
case0174	0.7	3.75	150	0.01	5	150	12.6	150	4.61E-05
case0175	0.7	4.25	150	0.01	5	150	12.6	150	7.7E-06
case0176	0.8	2.75	150	0.01	5	150	14.3	150	0.000308
case0177	0.8	3.25	150	0.01	5	150	14.3	150	0.0009
case0178	0.8	3.75	150	0.01	5	150	14.3	150	2.31E-05
case0179	0.9	2.75	150	0.01	5	150	15.2	150	1.54E-05
case0180	0.9	3.25	150	0.01	5	150	15.2	150	0.0007
case0181	0.9	3.75	150	0.01	5	150	15.2	150	3.08E-05
case0182	1	3.25	150	0.01	5	150	15.7	150	7.69E-05
case0183	1	3.75	150	0.01	5	150	15.7	150	0.0001
case0184	1.1	3.75	150	0.01	5	150	17.6	150	2.31E-05
case0185	1.2	3.75	150	0.01	5	150	18	150	7.7E-06
case0186	0.1	1.25	180	0.01	5	180	2.3	180	0.030848
case0187	0.1	1.75	180	0.01	5	180	2.3	180	0.001962
case0188	0.1	2.25	180	0.01	5	180	2.3	180	3.08E-05
case0189	0.1	2.75	180	0.01	5	180	2.3	180	7.7E-06
case0190	0.2	1.25	180	0.01	5	180	3.9	180	0.011157
case0191	0.2	1.75	180	0.01	5	180	3.9	180	0.008618
case0192	0.2	2.25	180	0.01	5	180	3.9	180	0.003886
case0193	0.2	2.75	180	0.01	5	180	3.9	180	0.000631
case0194	0.3	1.75	180	0.01	5	180	6	180	0.004332
case0195	0.3	2.25	180	0.01	5	180	6	180	0.004509
case0196	0.3	2.75	180	0.01	5	180	6	180	0.002401
case0197	0.3	3.25	180	0.01	5	180	6	180	0.000131
case0198	0.3	3.75	180	0.01	5	180	6	180	1.54E-05
case0199	0.3	4.25	180	0.01	5	180	6	180	7.7E-06
case0200	0.4	1.75	180	0.01	5	180	7.4	180	0.000339
case0201	0.4	2.25	180	0.01	5	180	7.4	180	0.004401
case0202	0.4	2.75	180	0.01	5	180	7.4	180	0.002832
case0203	0.4	3.25	180	0.01	5	180	7.4	180	0.0006
case0204	0.4	3.75	180	0.01	5	180	7.4	180	3.08E-05
case0205	0.5	2.25	180	0.01	5	180	8.9	180	0.00207
case0206	0.5	2.75	180	0.01	5	180	8.9	180	0.002439
case0207	0.5	3.25	180	0.01	5	180	8.9	180	0.001131
case0208	0.5	3.75	180	0.01	5	180	8.9	180	2.31E-05
case0209	0.6	2.25	180	0.01	5	180	10.5	180	0.000292
case0210	0.6	2.75	180	0.01	5	180	10.5	180	0.001724
case0211	0.6	3.25	180	0.01	5	180	10.5	180	0.001085
case0212	0.6	3.75	180	0.01	5	180	10.5	180	8.46E-05
case0213	0.7	2.75	180	0.01	5	180	11.8	180	0.001123
case0214	0.7	3.25	180	0.01	5	180	11.8	180	0.000585
case0215	0.7	3.75	180	0.01	5	180	11.8	180	0.000308
case0216	0.8	2.75	180	0.01	5	180	13.5	180	0.000346

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0217	0.8	3.25	180	0.01	5	180	13.5	180	0.000277
case0218	0.8	3.75	180	0.01	5	180	13.5	180	0.000169
case0219	0.9	2.75	180	0.01	5	180	14.8	180	6.92E-05
case0220	0.9	3.25	180	0.01	5	180	14.8	180	0.000223
case0221	0.9	3.75	180	0.01	5	180	14.8	180	0.000146
case0222	0.9	4.25	180	0.01	5	180	14.8	180	7.7E-06
case0223	1	3.25	180	0.01	5	180	15.4	180	3.08E-05
case0224	1	3.75	180	0.01	5	180	15.4	180	6.92E-05
case0225	1	4.25	180	0.01	5	180	15.4	180	7.7E-06
case0226	1.1	3.75	180	0.01	5	180	15.8	180	7.7E-06
case0227	0.2	1.75	210	0.05	8.5	210	4.1	210	0.008839
case0228	0.1	1.25	210	0.03	7.5	210	2.3	210	0.007857
case0229	0.3	2.25	300	0.07	9.5	300	5.3	300	0.007265
case0230	0.3	2.25	210	0.04	7.5	210	6	210	0.007237
case0231	0.2	1.75	300	0.06	8.5	300	3.9	300	0.007173
case0232	0.4	2.75	300	0.03	10.5	300	6.7	300	0.006997
case0233	0.1	1.25	330	0.03	12.5	330	2.4	330	0.00659
case0234	0.4	2.25	210	0.03	9.5	210	7.5	210	0.006302
case0235	0.2	1.25	210	0.06	9.5	210	4.1	210	0.006228
case0236	0.1	1.25	240	0.03	11.5	240	2.4	240	0.006154
case0237	0.2	1.75	270	0.04	8.5	270	4.2	270	0.005275
case0238	0.5	2.75	210	0.03	13.5	210	9.1	210	0.004544
case0239	0.1	1.25	270	0.05	7.5	270	2.3	270	0.004488
case0240	0.5	2.75	300	0.03	8.5	300	8	300	0.004359
case0241	0.2	2.25	300	0.07	8.5	300	3.9	300	0.004201
case0242	0.1	1.25	300	0.08	9.5	300	2.4	300	0.004118
case0243	0.6	3.25	300	0.09	10.5	300	9.2	300	0.003961
case0244	0.3	1.75	210	0.04	11.5	210	6	210	0.003952
case0245	0.2	2.25	330	0.03	6.5	330	3.3	330	0.003896
case0246	0.4	2.75	210	0.05	9.5	210	7.5	210	0.003859
case0247	0.2	1.75	240	0.04	10.5	240	4.2	240	0.003665
case0248	0.4	2.25	300	0.08	10.5	300	6.7	300	0.003332
case0249	0.3	2.75	300	0.04	12.5	300	5.3	300	0.003202
case0250	0.2	1.75	330	0.03	14.5	330	3.3	330	0.002971
case0251	0.2	1.25	240	0.07	10.5	240	4.2	240	0.002953
case0252	0.2	1.25	270	0.1	10.5	270	4.2	270	0.002832
case0253	0.2	2.25	210	0.04	13.5	210	4.1	210	0.002758
case0254	0.4	2.25	240	0.09	9.5	240	8.2	240	0.002406
case0255	0.2	1.25	300	0.05	12.5	300	3.9	300	0.00223
case0256	0.5	3.25	300	0.04	14.5	300	8	300	0.002184
case0257	0.7	3.25	300	0.04	9.5	300	10.5	300	0.002119
case0258	0.2	1.25	330	0.1	11.5	330	3.3	330	0.001934
case0259	0.3	1.75	240	0.03	15.5	240	6.5	240	0.001925
case0260	0.3	1.75	300	0.05	11.5	300	5.3	300	0.001842

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0261	0.7	3.25	210	0.11	10.5	210	12.3	210	0.001795
case0262	0.4	2.25	270	0.06	7.5	270	7.6	270	0.001721
case0263	0.3	2.25	270	0.05	14.5	270	6	270	0.001573
case0264	0.6	3.25	210	0.05	13.5	210	10.5	210	0.001555
case0265	0.6	2.75	210	0.11	11.5	210	10.5	210	0.001546
case0266	0.3	2.75	330	0.12	11.5	330	5.3	330	0.001527
case0267	0.3	2.25	330	0.06	10.5	330	5.3	330	0.001351
case0268	0.3	2.25	240	0.08	8.5	240	6.5	240	0.001324
case0269	0.3	1.75	270	0.04	15.5	270	6	270	0.001305
case0270	0.4	2.75	330	0.09	11.5	330	6.6	330	0.001268
case0271	0.3	2.75	210	0.05	15.5	210	6	210	0.001259
case0272	0.8	3.75	300	0.06	12.5	300	11.4	300	0.001166
case0273	0.5	2.75	270	0.1	9.5	270	8.8	270	0.00112
case0274	0.1	1.75	300	0.13	11.5	300	2.4	300	0.001074
case0275	0.1	1.75	330	0.05	10.5	330	2.4	330	0.001046
case0276	0.5	2.75	240	0.12	10.5	240	9.6	240	0.001009
case0277	0.9	3.75	300	0.03	5.5	300	12.6	300	0.000991
case0278	0.8	3.25	300	0.16	12.5	300	11.4	300	0.000731
case0279	0.6	2.75	240	0.06	11.5	240	11.2	240	0.000684
case0280	0.6	2.75	270	0.06	14.5	270	10.3	270	0.000684
case0281	0.2	2.75	330	0.08	11.5	330	3.3	330	0.000675
case0282	0.6	2.75	300	0.15	12.5	300	9.2	300	0.000657
case0283	0.4	3.25	300	0.05	16.5	300	6.7	300	0.00062
case0284	0.5	3.25	330	0.07	11.5	330	7.8	330	0.00061
case0285	0.1	1.75	210	0.06	13.5	210	2.3	210	0.000601
case0286	0.5	2.25	240	0.06	15.5	240	9.6	240	0.000601
case0287	0.2	2.75	300	0.14	12.5	300	3.9	300	0.000601
case0288	0.8	3.25	210	0.04	6.5	210	13.5	210	0.000583
case0289	0.7	3.75	300	0.06	16.5	300	10.5	300	0.000573
case0290	0.5	3.25	210	0.07	7.5	210	9.1	210	0.000564
case0291	0.4	3.25	330	0.04	16.5	330	6.6	330	0.000555
case0292	0.1	1.75	270	0.13	12.5	270	2.3	270	0.000518
case0293	1	3.75	300	0.03	16.5	300	13.7	300	0.000509
case0294	0.3	1.75	330	0.13	10.5	330	5.3	330	0.000472
case0295	0.9	3.75	210	0.07	12.5	210	15	210	0.000462
case0296	0.5	2.25	270	0.07	16.5	270	8.8	270	0.000462
case0297	0.1	1.75	240	0.14	11.5	240	2.4	240	0.000444
case0298	0.6	3.25	330	0.17	12.5	330	8.9	330	0.00037
case0299	0.8	3.75	210	0.11	9.5	210	13.5	210	0.000361
case0300	0.7	2.75	240	0.07	13.5	240	12.7	240	0.000314
case0301	0.2	2.25	270	0.12	12.5	270	4.2	270	0.000305
case0302	0.1	2.25	330	0.07	15.5	330	2.4	330	0.000296
case0303	0.4	2.25	330	0.07	14.5	330	6.6	330	0.000287
case0304	0.4	2.75	270	0.09	8.5	270	7.6	270	0.000268

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0305	0.7	2.75	270	0.05	17.5	270	11.6	270	0.00025
case0306	0.1	2.25	300	0.16	11.5	300	2.4	300	0.00025
case0307	0.8	3.25	270	0.03	17.5	270	13	270	0.000231
case0308	0.5	2.75	330	0.18	12.5	330	7.8	330	0.000231
case0309	0.2	2.75	210	0.07	17.5	210	4.1	210	0.000222
case0310	0.8	3.25	240	0.15	11.5	240	14.4	240	0.000213
case0311	0.6	3.75	300	0.04	17.5	300	9.2	300	0.000203
case0312	0.7	3.25	270	0.06	17.5	270	11.6	270	0.000176
case0313	1.1	4.25	300	0.08	13.5	300	14.9	300	0.000176
case0314	0.9	3.25	270	0.16	13.5	270	14.5	270	0.000176
case0315	0.3	3.25	330	0.08	7.5	330	5.3	330	0.000166
case0316	0.5	2.25	210	0.08	12.5	210	9.1	210	0.000166
case0317	0.7	3.75	330	0.08	15.5	330	10.2	330	0.000166
case0318	0.4	3.25	210	0.1	12.5	210	7.5	210	0.000166
case0319	1	4.25	300	0.11	12.5	300	13.7	300	0.000166
case0320	0.3	3.25	300	0.15	13.5	300	5.3	300	0.000166
case0321	1	3.75	210	0.06	18.5	210	16	210	0.000157
case0322	0.9	3.25	300	0.08	14.5	300	12.6	300	0.000157
case0323	0.9	4.25	300	0.08	16.5	300	12.6	300	0.000157
case0324	0.9	3.25	240	0.09	12.5	240	15.4	240	0.000157
case0325	1.2	4.25	300	0.14	10.5	300	15.7	300	0.000157
case0326	1.1	3.75	300	0.03	18.5	300	14.9	300	0.000148
case0327	0.7	3.75	210	0.05	18.5	210	12.3	210	0.000139
case0328	1	3.25	270	0.07	18.5	270	15.7	270	0.000139
case0329	0.7	2.75	210	0.19	12.5	210	12.3	210	0.000129
case0330	0.6	3.75	330	0.08	18.5	330	8.9	330	0.00012
case0331	0.7	3.25	240	0.09	18.5	240	12.7	240	0.00012
case0332	0.7	3.25	330	0.17	11.5	330	10.2	330	0.00012
case0333	0.5	3.75	300	0.08	17.5	300	8	300	0.000111
case0334	0.9	3.25	210	0.14	13.5	210	15	210	0.000111
case0335	0.2	2.25	240	0.17	13.5	240	4.2	240	0.000111
case0336	0.5	2.25	300	0.04	18.5	300	8	300	0.000102
case0337	0.8	3.75	330	0.12	9.5	330	10.6	330	0.000102
case0338	0.4	2.75	240	0.18	13.5	240	8.2	240	0.000102
case0339	1	3.75	270	0.13	13.5	270	15.7	270	9.2E-05
case0340	1	3.25	240	0.09	13.5	240	16.3	240	7.4E-05
case0341	0.6	3.25	270	0.13	9.5	270	10.3	270	7.4E-05
case0342	1.3	4.25	300	0.17	14.5	300	16.6	300	5.5E-05
case0343	0.7	2.75	300	0.18	11.5	300	10.5	300	5.5E-05
case0344	1.4	4.25	300	0.09	14.5	300	18.5	300	4.6E-05
case0345	0.5	3.75	330	0.09	15.5	330	7.8	330	4.6E-05
case0346	1.1	3.75	270	0.09	16.5	270	17.5	270	4.6E-05
case0347	0.8	2.75	240	0.1	8.5	240	14.4	240	4.6E-05
case0348	0.3	2.75	270	0.1	17.5	270	6	270	4.6E-05

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0349	1.1	3.25	270	0.19	13.5	270	17.5	270	4.6E-05
case0350	1.2	3.75	270	0.2	14.5	270	18	270	4.6E-05
case0351	1.1	4.25	210	0.21	14.5	210	17.2	210	4.6E-05
case0352	0.1	2.25	270	0.03	19.5	270	2.3	270	3.7E-05
case0353	0.5	2.25	330	0.1	18.5	330	7.8	330	3.7E-05
case0354	0.1	2.25	210	0.11	13.5	210	2.3	210	3.7E-05
case0355	0.3	3.25	210	0.11	17.5	210	6	210	3.7E-05
case0356	0.6	2.75	330	0.16	14.5	330	8.9	330	3.7E-05
case0357	0.7	4.25	300	0.04	5.5	300	10.5	300	2.8E-05
case0358	0.8	4.25	300	0.09	17.5	300	11.4	300	2.8E-05
case0359	0.2	2.75	270	0.1	14.5	270	4.2	270	2.8E-05
case0360	0.8	2.75	270	0.1	15.5	270	13	270	2.8E-05
case0361	1.2	3.75	300	0.1	16.5	300	15.7	300	2.8E-05
case0362	0.6	3.75	210	0.12	18.5	210	10.5	210	2.8E-05
case0363	1.1	3.75	210	0.15	10.5	210	17.2	210	2.8E-05
case0364	0.2	3.25	330	0.15	14.5	330	3.3	330	2.8E-05
case0365	0.9	3.75	330	0.18	15.5	330	11.4	330	2.8E-05
case0366	1	4.25	210	0.19	14.5	210	16	210	2.8E-05
case0367	0.4	1.75	240	0.2	13.5	240	8.2	240	2.8E-05
case0368	1.1	3.25	240	0.03	20.5	240	18.4	240	1.8E-05
case0369	0.2	3.25	300	0.05	6.5	300	3.9	300	1.8E-05
case0370	0.4	3.75	300	0.08	19.5	300	6.7	300	1.8E-05
case0371	0.4	1.75	330	0.09	7.5	330	6.6	330	1.8E-05
case0372	1.4	4.75	300	0.11	18.5	300	18.5	300	1.8E-05
case0373	1.7	4.75	300	0.12	13.5	300	21.3	300	1.8E-05
case0374	0.8	4.25	330	0.12	14.5	330	10.6	330	1.8E-05
case0375	0.9	4.25	330	0.13	17.5	330	11.4	330	1.8E-05
case0376	0.5	3.25	270	0.14	17.5	270	8.8	270	1.8E-05
case0377	0.9	3.75	270	0.14	18.5	270	14.5	270	1.8E-05
case0378	1.3	3.75	270	0.15	17.5	270	21.6	270	1.8E-05
case0379	0.6	4.25	300	0.16	10.5	300	9.2	300	1.8E-05
case0380	0.2	3.25	210	0.18	14.5	210	4.1	210	1.54E-05
case0381	0.5	3.75	210	0.19	15.5	210	9.1	210	1.54E-05
case0382	0.9	4.25	210	0.19	18.5	210	15	210	1.54E-05
case0383	1.2	4.25	210	0.21	12.5	210	20.9	210	1.54E-05
case0384	0.6	3.25	240	0.04	19.5	240	11.2	240	9E-06
case0385	0.4	1.75	270	0.06	19.5	270	7.6	270	9E-06
case0386	1.4	3.75	270	0.1	13.5	270	22.5	270	9E-06
case0387	1.3	3.75	300	0.11	14.5	300	16.6	300	9E-06
case0388	1.3	4.75	300	0.11	16.5	300	16.6	300	9E-06
case0389	1.5	4.25	300	0.12	8.5	300	19.9	300	9E-06
case0390	1.5	4.75	300	0.12	15.5	300	19.9	300	9E-06
case0391	1.6	4.75	300	0.12	17.5	300	18.2	300	9E-06
case0392	0.4	3.75	330	0.13	14.5	330	6.6	330	9E-06

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0393	0.8	3.25	330	0.13	18.5	330	10.6	330	9E-06
case0394	0.4	1.75	210	0.14	14.5	210	7.5	210	7.7E-06
case0395	0.4	3.75	210	0.14	15.5	210	7.5	210	7.7E-06
case0396	1	3.25	210	0.15	15.5	210	16	210	7.7E-06
case0397	1.2	3.75	210	0.15	18.5	210	20.9	210	7.7E-06
case0398	1.3	4.25	210	0.16	15.5	210	21.5	210	7.7E-06
case0399	1.4	4.25	210	0.16	17.5	210	16.8	210	7.7E-06
case0400	0.1	2.25	240	0.16	18.5	240	2.4	240	7.7E-06
case0401	0.3	3.25	240	0.17	15.5	240	6.5	240	7.7E-06
case0402	1	3.75	240	0.18	18.5	240	16.3	240	7.7E-06
case0403	1.2	3.25	240	0.19	17.5	240	17.2	240	7.7E-06
case0404	1.2	3.75	240	0.2	11.5	240	17.2	240	7.7E-06
case0405	0.8	3.75	270	0.2	12.5	270	13	270	7.7E-06
case0406	0.9	2.75	270	0.21	11.5	270	14.5	270	7.7E-06
case0407	1.3	4.25	270	0.21	13.5	270	21.6	270	7.7E-06
case0408	1.4	4.25	270	0.21	15.5	270	22.5	270	7.7E-06
case0409	1.5	3.75	270	0.21	16.5	270	18.7	270	7.7E-06
case0410	1.5	4.25	270	0.22	14.5	270	18.7	270	7.7E-06
case0411	1	3.25	300	0.23	12.5	300	13.7	300	7.7E-06
case0412	1.2	4.75	300	0.01	5	300	15.7	300	7.7E-06
case0413	1.8	4.75	300	0.01	5	300	21.2	300	7.7E-06
case0414	1.9	4.75	300	0.01	5	300	24.9	300	7.7E-06
case0415	1.9	5.25	300	0.01	5	300	24.9	300	7.7E-06
case0416	0.3	3.75	330	0.01	5	330	5.3	330	7.7E-06
case0417	0.6	4.25	330	0.01	5	330	8.9	330	7.7E-06
case0418	0.2	1.75	210	0.01	5	210	4.1	210	0.016523
case0419	0.1	1.25	210	0.01	5	210	2.3	210	0.015919
case0420	0.3	2.25	300	0.01	5	300	5.3	300	0.015057
case0421	0.3	2.25	210	0.01	5	210	6	210	0.014585
case0422	0.2	1.75	300	0.01	5	300	3.9	300	0.013611
case0423	0.4	2.75	300	0.01	5	300	6.7	300	0.0087
case0424	0.1	1.25	330	0.01	5	330	2.4	330	0.007099
case0425	0.4	2.25	210	0.01	5	210	7.5	210	0.00724
case0426	0.2	1.25	210	0.01	5	210	4.1	210	0.006352
case0427	0.1	1.25	240	0.01	5	240	2.4	240	0.00628
case0428	0.2	1.75	270	0.01	5	270	4.2	270	0.007075
case0429	0.5	2.75	210	0.01	5	210	9.1	210	0.007282
case0430	0.1	1.25	270	0.01	5	270	2.3	270	0.007215
case0431	0.5	2.75	300	0.01	5	300	8	300	0.00726
case0432	0.2	2.25	300	0.01	5	300	3.9	300	0.007125
case0433	0.1	1.25	300	0.01	5	300	2.4	300	0.005446
case0434	0.6	3.25	300	0.01	5	300	9.2	300	0.005134
case0435	0.3	1.75	210	0.01	5	210	6	210	0.005097
case0436	0.2	2.25	330	0.01	5	330	3.3	330	0.004983

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0437	0.4	2.75	210	0.01	5	210	7.5	210	0.004728
case0438	0.2	1.75	240	0.01	5	240	4.2	240	0.004476
case0439	0.4	2.25	300	0.01	5	300	6.7	300	0.003886
case0440	0.3	2.75	300	0.01	5	300	5.3	300	0.004008
case0441	0.2	1.75	330	0.01	5	330	3.3	330	0.003616
case0442	0.2	1.25	240	0.01	5	240	4.2	240	0.003534
case0443	0.2	1.25	270	0.01	5	270	4.2	270	0.003032
case0444	0.2	2.25	210	0.01	5	210	4.1	210	0.003006
case0445	0.4	2.25	240	0.01	5	240	8.2	240	0.00318
case0446	0.2	1.25	300	0.01	5	300	3.9	300	0.003264
case0447	0.5	3.25	300	0.01	5	300	8	300	0.003294
case0448	0.7	3.25	300	0.01	5	300	10.5	300	0.003298
case0449	0.2	1.25	330	0.01	5	330	3.3	330	0.003414
case0450	0.3	1.75	240	0.01	5	240	6.5	240	0.003015
case0451	0.3	1.75	300	0.01	5	300	5.3	300	0.002798
case0452	0.7	3.25	210	0.01	5	210	12.3	210	0.002453
case0453	0.4	2.25	270	0.01	5	270	7.6	270	0.002396
case0454	0.3	2.25	270	0.01	5	270	6	270	0.002444
case0455	0.6	3.25	210	0.01	5	210	10.5	210	0.002246
case0456	0.6	2.75	210	0.01	5	210	10.5	210	0.002194
case0457	0.3	2.75	330	0.01	5	330	5.3	330	0.002205
case0458	0.3	2.25	330	0.01	5	330	5.3	330	0.00205
case0459	0.3	2.25	240	0.01	5	240	6.5	240	0.00207
case0460	0.3	1.75	270	0.01	5	270	6	270	0.001981
case0461	0.4	2.75	330	0.01	5	330	6.6	330	0.001879
case0462	0.3	2.75	210	0.01	5	210	6	210	0.001881
case0463	0.8	3.75	300	0.01	5	300	11.4	300	0.001666
case0464	0.5	2.75	270	0.01	5	270	8.8	270	0.001527
case0465	0.1	1.75	300	0.01	5	300	2.4	300	0.001496
case0466	0.1	1.75	330	0.01	5	330	2.4	330	0.001386
case0467	0.5	2.75	240	0.01	5	240	9.6	240	0.001292
case0468	0.9	3.75	300	0.01	5	300	12.6	300	0.00121
case0469	0.8	3.25	300	0.01	5	300	11.4	300	0.001285
case0470	0.6	2.75	240	0.01	5	240	11.2	240	0.001324
case0471	0.6	2.75	270	0.01	5	270	10.3	270	0.001309
case0472	0.2	2.75	330	0.01	5	330	3.3	330	0.00121
case0473	0.6	2.75	300	0.01	5	300	9.2	300	0.001205
case0474	0.4	3.25	300	0.01	5	300	6.7	300	0.001219
case0475	0.5	3.25	330	0.01	5	330	7.8	330	0.001221
case0476	0.1	1.75	210	0.01	5	210	2.3	210	0.001107
case0477	0.5	2.25	240	0.01	5	240	9.6	240	0.001107
case0478	0.2	2.75	300	0.01	5	300	3.9	300	0.00103
case0479	0.8	3.25	210	0.01	5	210	13.5	210	0.000948
case0480	0.7	3.75	300	0.01	5	300	10.5	300	0.00095

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0481	0.5	3.25	210	0.01	5	210	9.1	210	0.000852
case0482	0.4	3.25	330	0.01	5	330	6.6	330	0.000853
case0483	0.1	1.75	270	0.01	5	270	2.3	270	0.000851
case0484	1	3.75	300	0.01	5	300	13.7	300	0.000845
case0485	0.3	1.75	330	0.01	5	330	5.3	330	0.000713
case0486	0.9	3.75	210	0.01	5	210	15	210	0.000715
case0487	0.5	2.25	270	0.01	5	270	8.8	270	0.0006
case0488	0.1	1.75	240	0.01	5	240	2.4	240	0.000525
case0489	0.6	3.25	330	0.01	5	330	8.9	330	0.000561
case0490	0.8	3.75	210	0.01	5	210	13.5	210	0.000562
case0491	0.7	2.75	240	0.01	5	240	12.7	240	0.000602
case0492	0.2	2.25	270	0.01	5	270	4.2	270	0.000603
case0493	0.1	2.25	330	0.01	5	330	2.4	330	0.000558
case0494	0.4	2.25	330	0.01	5	330	6.6	330	0.000552
case0495	0.4	2.75	270	0.01	5	270	7.6	270	0.000547
case0496	0.7	2.75	270	0.01	5	270	11.6	270	0.000535
case0497	0.1	2.25	300	0.01	5	300	2.4	300	0.000519
case0498	0.8	3.25	270	0.01	5	270	13	270	0.0005
case0499	0.5	2.75	330	0.01	5	330	7.8	330	0.000438
case0500	0.2	2.75	210	0.01	5	210	4.1	210	0.00044
case0501	0.8	3.25	240	0.01	5	240	14.4	240	0.000379
case0502	0.6	3.75	300	0.01	5	300	9.2	300	0.000382
case0503	0.7	3.25	270	0.01	5	270	11.6	270	0.000378
case0504	1.1	4.25	300	0.01	5	300	14.9	300	0.000339
case0505	0.9	3.25	270	0.01	5	270	14.5	270	0.000324
case0506	0.3	3.25	330	0.01	5	330	5.3	330	0.000311
case0507	0.5	2.25	210	0.01	5	210	9.1	210	0.000296
case0508	0.7	3.75	330	0.01	5	330	10.2	330	0.000296
case0509	0.4	3.25	210	0.01	5	210	7.5	210	0.000219
case0510	1	4.25	300	0.01	5	300	13.7	300	0.000219
case0511	0.3	3.25	300	0.01	5	300	5.3	300	0.000211
case0512	1	3.75	210	0.01	5	210	16	210	0.000197
case0513	0.9	3.25	300	0.01	5	300	12.6	300	0.000174
case0514	0.9	4.25	300	0.01	5	300	12.6	300	0.000174
case0515	0.9	3.25	240	0.01	5	240	15.4	240	0.000166
case0516	1.2	4.25	300	0.01	5	300	15.7	300	0.000166
case0517	1.1	3.75	300	0.01	5	300	14.9	300	0.00016
case0518	0.7	3.75	210	0.01	5	210	12.3	210	0.000161
case0519	1	3.25	270	0.01	5	270	15.7	270	0.00013
case0520	0.7	2.75	210	0.01	5	210	12.3	210	0.000109
case0521	0.6	3.75	330	0.01	5	330	8.9	330	0.000118
case0522	0.7	3.25	240	0.01	5	240	12.7	240	0.000103
case0523	0.7	3.25	330	0.01	5	330	10.2	330	9.54E-05
case0524	0.5	3.75	300	0.01	5	300	8	300	7.36E-05

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0525	0.9	3.25	210	0.01	5	210	15	210	6.59E-05
case0526	0.2	2.25	240	0.01	5	240	4.2	240	5.82E-05
case0527	0.5	2.25	300	0.01	5	300	8	300	5.95E-05
case0528	0.8	3.75	330	0.01	5	330	10.6	330	5.95E-05
case0529	0.4	2.75	240	0.01	5	240	8.2	240	5.18E-05
case0530	1	3.75	270	0.01	5	270	15.7	270	6.18E-05
case0531	1	3.25	240	0.01	5	240	16.3	240	7.21E-05
case0532	0.6	3.25	270	0.01	5	270	10.3	270	6.44E-05
case0533	1.3	4.25	300	0.01	5	300	16.6	300	6.8E-05
case0534	0.7	2.75	300	0.01	5	300	10.5	300	4.5E-05
case0535	1.4	4.25	300	0.01	5	300	18.5	300	5.4E-05
case0536	0.5	3.75	330	0.01	5	330	7.8	330	5.4E-05
case0537	1.1	3.75	270	0.01	5	270	17.5	270	4.63E-05
case0538	0.8	2.75	240	0.01	5	240	14.4	240	3.86E-05
case0539	0.3	2.75	270	0.01	5	270	6	270	3.86E-05
case0540	1.1	3.25	270	0.01	5	270	17.5	270	3.86E-05
case0541	1.2	3.75	270	0.01	5	270	18	270	3.86E-05
case0542	1.1	4.25	210	0.01	5	210	17.2	210	3.09E-05
case0543	0.1	2.25	270	0.01	5	270	2.3	270	3.99E-05
case0544	0.5	2.25	330	0.01	5	330	7.8	330	3.99E-05
case0545	0.1	2.25	210	0.01	5	210	2.3	210	3.22E-05
case0546	0.3	3.25	210	0.01	5	210	6	210	3.22E-05
case0547	0.6	2.75	330	0.01	5	330	8.9	330	3.22E-05
case0548	0.7	4.25	300	0.01	5	300	10.5	300	3.35E-05
case0549	0.8	4.25	300	0.01	5	300	11.4	300	3.35E-05
case0550	0.2	2.75	270	0.01	5	270	4.2	270	2.58E-05
case0551	0.8	2.75	270	0.01	5	270	13	270	2.58E-05
case0552	1.2	3.75	300	0.01	5	300	15.7	300	2.58E-05
case0553	0.6	3.75	210	0.01	5	210	10.5	210	1.81E-05
case0554	1.1	3.75	210	0.01	5	210	17.2	210	1.81E-05
case0555	0.2	3.25	330	0.01	5	330	3.3	330	1.81E-05
case0556	0.9	3.75	330	0.01	5	330	11.4	330	1.81E-05
case0557	1	4.25	210	0.01	5	210	16	210	1.05E-05
case0558	0.4	1.75	240	0.01	5	240	8.2	240	1.05E-05
case0559	1.1	3.25	240	0.01	5	240	18.4	240	2.05E-05
case0560	0.2	3.25	300	0.01	5	300	3.9	300	2.05E-05
case0561	0.4	3.75	300	0.01	5	300	6.7	300	2.05E-05
case0562	0.4	1.75	330	0.01	5	330	6.6	330	2.05E-05
case0563	1.4	4.75	300	0.01	5	300	18.5	300	1.28E-05
case0564	1.7	4.75	300	0.01	5	300	21.3	300	1.28E-05
case0565	0.8	4.25	330	0.01	5	330	10.6	330	1.28E-05
case0566	0.9	4.25	330	0.01	5	330	11.4	330	1.28E-05
case0567	0.5	3.25	270	0.01	5	270	8.8	270	5.1E-06
case0568	0.9	3.75	270	0.01	5	270	14.5	270	5.1E-06

ID	Wind waves			Swell			Wind		Prob
	Hs	Tp	Direction	Hs	Tp	Direction	Velocity	Direction	
case0569	1.3	3.75	270	0.01	5	270	21.6	270	5.1E-06
case0570	0.6	4.25	300	0.01	5	300	9.2	300	5.1E-06
case0571	0.6	3.25	240	0.01	5	240	11.2	240	6.4E-06
case0572	0.4	1.75	270	0.01	5	270	7.6	270	6.4E-06
case0573	1.4	3.75	270	0.01	5	270	22.5	270	6.4E-06
case0574	1.3	3.75	300	0.01	5	300	16.6	300	6.4E-06
case0575	1.3	4.75	300	0.01	5	300	16.6	300	6.4E-06
case0576	1.5	4.25	300	0.01	5	300	19.9	300	6.4E-06
case0577	1.5	4.75	300	0.01	5	300	19.9	300	6.4E-06
case0578	1.6	4.75	300	0.01	5	300	18.2	300	6.4E-06
case0579	0.4	3.75	330	0.01	5	330	6.6	330	6.4E-06
case0580	0.8	3.25	330	0.01	5	330	10.6	330	6.4E-06

APPENDIX E
Stress factors

Cross-section	Hotspot	C_xA $[m^{-2}]$	C_xMS $[m^{-3}]$	C_xMW $[m^{-3}]$	C_τz $[m^{-2}]$	C_τy $[m^{-2}]$	C_τMtor $[m^{-3}]$
Standard cross-section	Point 0	0.63	-0.013	-0.526	0	1.695	0.432
	Point 1	0.63	0.116	-0.353	11.734	0	0.432
	Point 2	0.63	0.116	0.192	13.489	0	0.504
	Point 3	0.63	0.069	0.685	0	1.469	-0.504
	Point 4	0.63	0	0.685	0	1.99	-0.504
	Point 5	0.63	-0.068	0.685	0	1.485	-0.504
	Point 6	0.63	-0.114	0.192	11.562	0	-0.504
	Point 7	0.63	-0.114	-0.388	13.69	0	-0.432
Reinforced cross-section	Point 0	0.544	-0.012	-0.465	0	1.695	0.432
	Point 1	0.544	0.101	-0.317	11.734	0	0.432
	Point 2	0.544	0.101	0.15	13.489	0	0.504
	Point 3	0.544	0.061	0.573	0	1.469	-0.504
	Point 4	0.544	0	0.573	0	1.99	-0.504
	Point 5	0.544	-0.06	0.573	0	1.485	-0.504
	Point 6	0.544	-0.101	0.15	11.562	0	-0.504
	Point 7	0.544	-0.101	-0.347	13.69	0	-0.432
Reinforced cross-section – Support section B at axes 3 to 6	Point 0	0.349	-0.01	-0.384	0	1.776	0.432
	Point 1	0.349	0.084	-0.274	1.263	0	0.432
	Point 2	0.349	0.084	0.071	1.263	0	0.504
	Point 3	0.349	0.05	0.384	0	1.385	-0.504
	Point 4	0.349	0	0.384	0	1.227	-0.302
	Point 5	0.349	-0.05	0.384	0	1.44	-0.504
	Point 6	0.349	-0.084	0.071	1.263	0	-0.504
	Point 7	0.349	-0.084	-0.296	1.263	0	-0.432
Reinforced cross-section – Support section D at axes 3 to 6	Point 0	0.349	-0.01	-0.384	0	1.776	0.432
	Point 1	0.349	0.084	-0.274	1.263	0	0.432
	Point 2	0.349	0.084	0.071	1.263	0	0.504
	Point 3	0.349	0.05	0.384	0	1.385	-0.504
	Point 4	0.349	0	0.384	0	1.227	-0.302
	Point 5	0.349	-0.05	0.384	0	1.44	-0.504
	Point 6	0.349	-0.084	0.071	1.263	0	-0.504
	Point 7	0.349	-0.084	-0.296	1.263	0	-0.432

Cross-section	Hotspot	C_xA [m⁻²]	C_xMS [m⁻³]	C_xMW [m⁻³]	C_τz [m⁻²]	C_τy [m⁻²]	C_τMtor [m⁻³]
Reinforced cross-section – Support section D at axes 7 and 8	Point 0	0.366	-0.01	-0.403	0	1.695	0.432
	Point 1	0.366	0.086	-0.282	1.263	0	0.432
	Point 2	0.366	0.086	0.099	1.263	0	0.504
	Point 3	0.366	0.051	0.444	0	1.469	-0.504
	Point 4	0.366	0	0.444	0	1.99	-0.504
	Point 5	0.366	-0.051	0.444	0	1.485	-0.504
	Point 6	0.366	-0.085	0.099	1.263	0	-0.504
	Point 7	0.366	-0.085	-0.306	1.263	0	-0.432
Reinforced cross-section – Support section C	Point 0	0.474	-0.011	-0.446	0	1.695	0.432
	Point 1	0.474	0.095	-0.308	3.032	0	0.432
	Point 2	0.474	0.095	0.126	3.032	0	0.504
	Point 3	0.474	0.057	0.518	0	1.469	-0.504
	Point 4	0.474	0	0.518	0	1.99	-0.504
	Point 5	0.474	-0.057	0.518	0	1.485	-0.504
	Point 6	0.474	-0.095	0.126	3.032	0	-0.504
	Point 7	0.474	-0.095	-0.335	3.032	0	-0.432
Reinforced cross-section – Support section E	Point 0	0.513	-0.012	-0.458	0	1.695	0.432
	Point 1	0.513	0.096	-0.315	4.817	0	0.432
	Point 2	0.513	0.096	0.137	4.817	0	0.504
	Point 3	0.513	0.058	0.546	0	1.469	-0.504
	Point 4	0.513	0	0.546	0	1.99	-0.504
	Point 5	0.513	-0.057	0.546	0	1.485	-0.504
	Point 6	0.513	-0.096	0.137	4.817	0	-0.504
	Point 7	0.513	-0.096	-0.343	4.817	0	-0.432
Standard cross-section – Support section B	Point 0	0.404	-0.011	-0.449	0	1.695	0.432
	Point 1	0.404	0.095	-0.312	1.263	0	0.432
	Point 2	0.404	0.095	0.118	1.263	0	0.504
	Point 3	0.404	0.057	0.508	0	1.469	-0.504
	Point 4	0.404	0	0.508	0	1.99	-0.504
	Point 5	0.404	-0.056	0.508	0	1.485	-0.504
	Point 6	0.404	-0.094	0.118	1.263	0	-0.504
	Point 7	0.404	-0.094	-0.339	1.263	0	-0.432
Standard cross-section – Support section D	Point 0	0.522	-0.012	-0.5	0	1.695	0.432
	Point 1	0.522	0.106	-0.342	3.023	0	0.432
	Point 2	0.522	0.106	0.155	3.023	0	0.504
	Point 3	0.522	0.064	0.605	0	1.469	-0.504
	Point 4	0.522	0	0.605	0	1.99	-0.504
	Point 5	0.522	-0.062	0.605	0	1.485	-0.504
	Point 6	0.522	-0.104	0.155	3.023	0	-0.504
	Point 7	0.522	-0.104	-0.374	3.023	0	-0.432

Cross-section	Hotspot	C_xA [m⁻²]	C_xMS [m⁻³]	C_xMW [m⁻³]	C_τz [m⁻²]	C_τy [m⁻²]	C_τMtor [m⁻³]
Standard cross-section – Support section C	Point 0	0.553	-0.017	-0.52	0	1.695	0.432
	Point 1	0.553	0.109	-0.358	3.032	0	0.432
	Point 2	0.553	0.109	0.151	3.032	0	0.504
	Point 3	0.553	0.065	0.611	0	1.469	-0.504
	Point 4	0.553	0	0.611	0	1.99	-0.504
	Point 5	0.553	-0.066	0.611	0	1.485	-0.504
	Point 6	0.553	-0.11	0.151	3.032	0	-0.504
	Point 7	0.553	-0.11	-0.391	3.032	0	-0.432
Standard cross-section – Support section E	Point 0	0.606	-0.015	-0.536	0	1.695	0.432
	Point 1	0.606	0.11	-0.367	4.819	0	0.432
	Point 2	0.606	0.11	0.167	4.819	0	0.504
	Point 3	0.606	0.065	0.65	0	1.469	-0.504
	Point 4	0.606	0	0.65	0	1.99	-0.504
	Point 5	0.606	-0.067	0.65	0	1.485	-0.504
	Point 6	0.606	-0.112	0.167	4.819	0	-0.504
	Point 7	0.606	-0.112	-0.401	4.819	0	-0.432
HF6	Point 0	0.286	-0.007	-0.263	0.000	0.679	0.204
	Point 1	0.286	0.055	-0.201	1.556	0.000	0.204
	Point 2	0.286	0.055	0.245	1.556	0.000	0.204
	Point 3	0.286	0.042	0.245	0.000	0.680	-0.204
	Point 4	0.286	0.000	0.245	0.000	0.680	-0.204
	Point 5	0.286	-0.042	0.245	0.000	0.680	-0.204
	Point 6	0.286	-0.055	0.245	1.556	0.000	-0.204
	Point 7	0.286	-0.055	-0.215	1.556	0.000	-0.204
P5	Point 0	0.354	-0.008	-0.348	0.000	0.960	0.294
	Point 1	0.354	0.066	-0.251	1.772	0.000	0.294
	Point 2	0.354	0.066	0.297	1.772	0.000	0.303
	Point 3	0.354	0.051	0.328	0.000	0.991	-0.303
	Point 4	0.354	0.000	0.328	0.000	0.991	-0.303
	Point 5	0.354	-0.050	0.328	0.000	0.991	-0.303
	Point 6	0.354	-0.066	0.297	1.772	0.000	-0.303
	Point 7	0.354	-0.066	-0.270	1.772	0.000	-0.294
P4	Point 0	0.401	-0.009	-0.381	0.000	1.085	0.336
	Point 1	0.401	0.076	-0.272	2.223	0.000	0.336
	Point 2	0.401	0.076	0.283	2.223	0.000	0.367
	Point 3	0.401	0.059	0.383	0.000	1.181	-0.367
	Point 4	0.401	0.000	0.383	0.000	1.181	-0.367
	Point 5	0.401	-0.057	0.383	0.000	1.181	-0.367
	Point 6	0.401	-0.075	0.283	2.223	0.000	-0.367
	Point 7	0.401	-0.075	-0.293	2.223	0.000	-0.336

Cross-section	Hotspot	C_xA [m-2]	C_xMS [m-3]	C_xMW [m-3]	C_τz [m-2]	C_τy [m-2]	C_τMtor [m-3]
P3	Point 0	0.454	-0.010	-0.418	0.000	1.224	0.383
	Point 1	0.454	0.087	-0.295	2.724	0.000	0.383
	Point 2	0.454	0.087	0.266	2.724	0.000	0.438
	Point 3	0.454	0.067	0.444	0.000	1.392	-0.438
	Point 4	0.454	0.000	0.444	0.000	1.392	-0.438
	Point 5	0.454	-0.065	0.444	0.000	1.392	-0.438
	Point 6	0.454	-0.086	0.266	2.724	0.000	-0.438
	Point 7	0.454	-0.086	-0.319	2.724	0.000	-0.383
P2	Point 0	0.496	-0.011	-0.443	0.000	1.394	0.413
	Point 1	0.496	0.094	-0.309	5.165	0.000	0.413
	Point 2	0.496	0.094	0.231	5.604	0.000	0.482
	Point 3	0.496	0.069	0.499	0.000	1.491	-0.482
	Point 4	0.496	0.000	0.499	0.000	1.621	-0.482
	Point 5	0.496	-0.067	0.499	0.000	1.495	-0.482
	Point 6	0.496	-0.094	0.231	5.122	0.000	-0.482
	Point 7	0.496	-0.094	-0.336	5.654	0.000	-0.413
P1	Point 0	0.528	-0.012	-0.458	0.000	1.595	0.426
	Point 1	0.528	0.099	-0.314	9.544	0.000	0.426
	Point 2	0.528	0.099	0.177	10.861	0.000	0.497
	Point 3	0.528	0.064	0.548	0.000	1.476	-0.497
	Point 4	0.528	0.000	0.548	0.000	1.867	-0.497
	Point 5	0.528	-0.062	0.548	0.000	1.488	-0.497
	Point 6	0.528	-0.099	0.177	9.415	0.000	-0.497
	Point 7	0.528	-0.099	-0.343	11.011	0.000	-0.426

APPENDIX F
Fatigue lives

Fatigue lives in years induced by normal stress and shear stress are given in the tables below. Noted that position in the table is the horizontal distance from abutment south.

Table F-1 Fatigue lives along the bridge girder. Normal stress is applied.

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
0.0	A1	7.67E+4	6.56E+3	7.43E+3	2.06E+4	3.66E+5	1.98E+4	7.21E+3	6.92E+3
6.0		3.01E+4	3.29E+3	3.82E+3	9.06E+3	1.37E+5	9.26E+3	3.74E+3	3.47E+3
16.0		3.98E+4	2.37E+3	2.82E+3	6.44E+3	1.66E+5	7.13E+3	3.00E+3	2.66E+3
26.0		6.00E+4	1.74E+3	2.03E+3	4.96E+3	2.64E+5	5.60E+3	2.21E+3	1.96E+3
36.0		1.28E+5	1.61E+3	1.80E+3	5.64E+3	6.67E+5	6.65E+3	1.92E+3	1.75E+3
46.0		3.81E+5	1.64E+3	1.75E+3	9.70E+3	2.32E+6	1.24E+4	1.90E+3	1.81E+3
56.0		7.96E+5	1.09E+3	1.10E+3	8.15E+3	2.14E+6	1.04E+4	1.30E+3	1.29E+3
73.0		4.03E+6	1.55E+3	1.46E+3	8.45E+3	2.70E+5	1.14E+4	1.79E+3	1.85E+3
77.0		3.32E+6	1.67E+3	1.57E+3	8.43E+3	1.78E+5	1.13E+4	1.93E+3	2.01E+3
81.0		2.64E+6	1.80E+3	1.69E+3	8.38E+3	1.24E+5	1.11E+4	2.09E+3	2.17E+3
85.0		2.15E+6	1.94E+3	1.81E+3	8.31E+3	9.27E+4	1.09E+4	2.26E+3	2.35E+3
89.0		1.82E+6	2.09E+3	1.94E+3	8.29E+3	7.41E+4	1.08E+4	2.44E+3	2.55E+3
125.0		1.05E+6	4.12E+3	3.85E+3	1.21E+4	5.72E+4	1.59E+4	5.16E+3	5.42E+3
161.0		2.99E+6	7.76E+3	7.35E+3	3.76E+4	4.87E+5	6.04E+4	1.06E+4	1.13E+4
165.0		2.99E+6	8.14E+3	7.79E+3	4.23E+4	6.63E+5	6.98E+4	1.13E+4	1.20E+4
169.0		2.97E+6	8.51E+3	8.20E+3	4.59E+4	8.06E+5	7.74E+4	1.20E+4	1.26E+4
173.0		2.96E+6	8.85E+3	8.56E+3	4.84E+4	8.73E+5	8.25E+4	1.27E+4	1.32E+4
208.6		2.49E+6	1.06E+4	1.06E+4	6.09E+4	9.87E+5	1.09E+5	1.67E+4	1.72E+4
253.0		1.81E+6	9.93E+3	9.90E+3	6.78E+4	2.15E+6	1.46E+5	1.62E+4	1.56E+4
257.0		1.64E+6	9.71E+3	9.72E+3	6.62E+4	2.06E+6	1.42E+5	1.59E+4	1.52E+4
261.0		1.57E+6	9.53E+3	9.54E+3	6.47E+4	2.00E+6	1.39E+5	1.56E+4	1.48E+4
265.0		1.59E+6	9.32E+3	9.32E+3	6.37E+4	2.00E+6	1.36E+5	1.52E+4	1.45E+4
304.1		1.82E+6	7.43E+3	7.61E+3	5.95E+4	2.98E+6	1.11E+5	1.16E+4	1.13E+4
353.0		3.63E+6	6.16E+3	5.98E+3	4.18E+4	1.07E+6	6.87E+4	8.46E+3	8.77E+3
357.0		3.64E+6	6.10E+3	5.91E+3	4.09E+4	1.00E+6	6.65E+4	8.32E+3	8.64E+3
361.0		3.68E+6	6.04E+3	5.85E+3	4.04E+4	9.67E+5	6.50E+4	8.20E+3	8.53E+3
365.0		3.72E+6	6.00E+3	5.81E+3	4.02E+4	9.76E+5	6.44E+4	8.09E+3	8.41E+3
404.1		2.61E+6	6.07E+3	6.02E+3	4.29E+4	1.12E+6	6.19E+4	7.92E+3	8.14E+3
453.0		2.05E+6	7.99E+3	7.63E+3	3.11E+4	1.52E+5	3.74E+4	9.13E+3	9.94E+3
457.0		1.87E+6	8.15E+3	7.82E+3	3.18E+4	1.54E+5	3.78E+4	9.27E+3	1.01E+4
461.0		1.91E+6	8.36E+3	8.05E+3	3.50E+4	1.90E+5	4.17E+4	9.46E+3	1.02E+4
465.0		2.17E+6	8.56E+3	8.30E+3	4.19E+4	3.06E+5	5.00E+4	9.68E+3	1.03E+4
504.1		3.23E+5	1.20E+4	1.30E+4	7.29E+4	4.85E+5	7.92E+4	1.32E+4	1.18E+4
553.0		5.56E+5	2.09E+4	2.17E+4	1.24E+5	6.48E+5	8.58E+4	1.56E+4	1.48E+4
557.0		6.80E+5	2.14E+4	2.20E+4	1.30E+5	6.95E+5	8.51E+4	1.53E+4	1.47E+4

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
561.0		7.21E+5	2.19E+4	2.24E+4	1.31E+5	6.57E+5	8.32E+4	1.50E+4	1.44E+4
565.0		6.81E+5	2.21E+4	2.27E+4	1.27E+5	5.34E+5	7.86E+4	1.47E+4	1.41E+4
569.0		5.71E+5	2.21E+4	2.27E+4	1.09E+5	3.40E+5	6.89E+4	1.43E+4	1.35E+4
606.3		4.15E+4	1.80E+4	2.27E+4	1.38E+4	1.67E+4	1.09E+4	1.17E+4	8.89E+3
653.0		1.59E+5	1.37E+4	1.49E+4	4.02E+4	8.04E+4	2.10E+4	7.10E+3	6.26E+3
657.0		2.08E+5	1.31E+4	1.40E+4	4.65E+4	1.09E+5	2.27E+4	6.62E+3	5.96E+3
661.0		2.63E+5	1.25E+4	1.31E+4	5.11E+4	1.40E+5	2.36E+4	6.17E+3	5.66E+3
665.0		3.16E+5	1.18E+4	1.22E+4	5.28E+4	1.64E+5	2.35E+4	5.73E+3	5.33E+3
669.0		3.46E+5	1.12E+4	1.13E+4	5.02E+4	1.66E+5	2.26E+4	5.31E+3	4.93E+3
710.0		2.38E+4	5.10E+3	5.64E+3	3.90E+3	5.75E+3	3.13E+3	3.23E+3	2.66E+3
719.0		1.13E+4	4.06E+3	4.76E+3	2.07E+3	2.78E+3	1.79E+3	2.84E+3	2.18E+3
745.9		3.59E+3	3.53E+3	5.62E+3	1.01E+3	1.23E+3	9.54E+2	3.45E+3	1.93E+3
749.9		3.16E+3	3.69E+3	6.70E+3	1.05E+3	1.26E+3	9.98E+2	4.16E+3	2.06E+3
753.9		2.97E+3	3.52E+3	6.73E+3	1.10E+3	1.34E+3	1.05E+3	4.34E+3	2.03E+3
757.9		5.01E+3	5.39E+3	1.23E+4	3.30E+3	4.37E+3	3.10E+3	8.33E+3	3.29E+3
759.9	A3	8.71E+2	2.00E+3	1.08E+4	7.71E+2	9.04E+2	7.94E+2	7.88E+3	1.18E+3
761.9		9.80E+2	2.16E+3	1.08E+4	8.62E+2	1.02E+3	8.85E+2	7.92E+3	1.28E+3
765.9		6.61E+2	1.48E+3	5.18E+3	3.33E+2	3.77E+2	3.38E+2	3.79E+3	8.65E+2
769.9		7.58E+2	1.59E+3	4.86E+3	3.44E+2	3.90E+2	3.48E+2	3.50E+3	9.25E+2
773.9		9.28E+2	1.63E+3	3.88E+3	3.62E+2	4.17E+2	3.64E+2	2.82E+3	9.45E+2
819.9		2.93E+4	3.50E+3	4.05E+3	5.40E+3	1.17E+4	4.78E+3	3.09E+3	2.45E+3
865.9		1.09E+3	1.38E+3	2.71E+3	3.51E+2	4.16E+2	3.60E+2	2.31E+3	1.02E+3
869.9		8.97E+2	1.39E+3	3.27E+3	3.40E+2	3.96E+2	3.51E+2	2.81E+3	1.01E+3
873.9		7.86E+2	1.31E+3	3.40E+3	3.36E+2	3.90E+2	3.47E+2	2.96E+3	9.52E+2
877.9		1.19E+3	1.92E+3	6.50E+3	9.00E+2	1.11E+3	9.36E+2	5.70E+3	1.41E+3
879.9	A4	8.85E+2	1.61E+3	6.29E+3	7.45E+2	8.96E+2	7.74E+2	5.76E+3	1.14E+3
881.9		9.96E+2	1.72E+3	6.38E+3	8.30E+2	1.01E+3	8.62E+2	5.84E+3	1.23E+3
885.9		6.70E+2	1.18E+3	3.33E+3	3.20E+2	3.68E+2	3.29E+2	3.08E+3	8.51E+2
889.9		7.71E+2	1.26E+3	3.20E+3	3.28E+2	3.79E+2	3.38E+2	2.95E+3	9.16E+2
893.9		9.44E+2	1.28E+3	2.65E+3	3.43E+2	4.03E+2	3.53E+2	2.44E+3	9.37E+2
939.9		2.74E+4	3.08E+3	3.62E+3	4.32E+3	9.22E+3	4.34E+3	3.31E+3	2.67E+3
985.9		9.68E+2	1.43E+3	2.99E+3	3.10E+2	3.63E+2	3.28E+2	2.89E+3	1.11E+3
989.9		7.97E+2	1.42E+3	3.65E+3	3.03E+2	3.49E+2	3.20E+2	3.53E+3	1.08E+3
993.9		7.01E+2	1.34E+3	3.86E+3	3.02E+2	3.46E+2	3.18E+2	3.76E+3	1.01E+3
997.9		1.07E+3	1.97E+3	7.70E+3	8.19E+2	9.90E+2	8.70E+2	7.40E+3	1.48E+3
999.9	A5	9.81E+2	1.74E+3	7.76E+3	8.55E+2	9.96E+2	8.48E+2	7.40E+3	1.41E+3
1001.9		1.10E+3	1.86E+3	7.90E+3	9.47E+2	1.11E+3	9.39E+2	7.54E+3	1.53E+3
1005.9		7.25E+2	1.28E+3	4.10E+3	3.54E+2	3.97E+2	3.52E+2	3.93E+3	1.05E+3
1009.9		8.22E+2	1.36E+3	3.93E+3	3.58E+2	4.03E+2	3.57E+2	3.76E+3	1.12E+3
1013.9		9.89E+2	1.38E+3	3.25E+3	3.68E+2	4.21E+2	3.67E+2	3.13E+3	1.15E+3
1059.9		2.15E+4	3.57E+3	4.35E+3	3.70E+3	6.84E+3	3.88E+3	4.28E+3	3.22E+3
1105.9		1.18E+3	1.62E+3	3.20E+3	3.59E+2	4.24E+2	3.76E+2	3.31E+3	1.26E+3
1109.9		9.78E+2	1.62E+3	3.89E+3	3.54E+2	4.11E+2	3.70E+2	4.03E+3	1.24E+3
1113.9		8.64E+2	1.53E+3	4.10E+3	3.56E+2	4.11E+2	3.70E+2	4.24E+3	1.16E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
1117.9		1.33E+3	2.27E+3	8.26E+3	9.84E+2	1.20E+3	1.03E+3	8.37E+3	1.71E+3
1119.9	A6	1.35E+3	2.10E+3	8.38E+3	1.14E+3	1.36E+3	1.11E+3	8.16E+3	1.76E+3
1121.9		1.50E+3	2.24E+3	8.51E+3	1.25E+3	1.50E+3	1.22E+3	8.30E+3	1.88E+3
1125.9		9.67E+2	1.49E+3	4.36E+3	4.53E+2	5.18E+2	4.47E+2	4.27E+3	1.25E+3
1129.9		1.07E+3	1.56E+3	4.15E+3	4.47E+2	5.14E+2	4.44E+2	4.07E+3	1.32E+3
1133.9		1.26E+3	1.54E+3	3.39E+3	4.47E+2	5.23E+2	4.45E+2	3.34E+3	1.31E+3
1179.9		2.06E+4	3.62E+3	4.39E+3	3.97E+3	7.21E+3	4.01E+3	4.41E+3	3.23E+3
1225.9		2.42E+3	2.22E+3	3.68E+3	7.25E+2	8.93E+2	7.28E+2	3.73E+3	1.76E+3
1229.9		2.04E+3	2.34E+3	4.55E+3	7.28E+2	8.77E+2	7.30E+2	4.60E+3	1.83E+3
1233.9		1.83E+3	2.28E+3	4.81E+3	7.40E+2	8.87E+2	7.37E+2	4.86E+3	1.76E+3
1237.9		2.32E+3	3.14E+3	7.86E+3	1.17E+3	1.41E+3	1.17E+3	8.31E+3	2.47E+3
1239.9	A7	2.27E+3	3.07E+3	9.36E+3	1.87E+3	2.35E+3	1.86E+3	9.36E+3	2.37E+3
1241.9		2.02E+3	2.88E+3	7.95E+3	1.15E+3	1.38E+3	1.15E+3	8.41E+3	2.26E+3
1245.9		1.56E+3	2.10E+3	4.94E+3	7.30E+2	8.69E+2	7.30E+2	4.99E+3	1.61E+3
1249.9		1.68E+3	2.16E+3	4.73E+3	7.09E+2	8.45E+2	7.12E+2	4.78E+3	1.66E+3
1253.9		1.93E+3	2.07E+3	3.86E+3	6.95E+2	8.43E+2	6.98E+2	3.91E+3	1.60E+3
1299.9		2.30E+4	4.47E+3	5.38E+3	5.09E+3	8.67E+3	4.86E+3	5.35E+3	3.84E+3
1345.9		3.76E+3	3.18E+3	5.24E+3	1.18E+3	1.36E+3	1.05E+3	5.01E+3	2.67E+3
1349.9		3.19E+3	3.42E+3	6.58E+3	1.19E+3	1.34E+3	1.07E+3	6.26E+3	2.86E+3
1353.9		2.88E+3	3.36E+3	7.00E+3	1.22E+3	1.37E+3	1.08E+3	6.67E+3	2.81E+3
1357.9		3.67E+3	4.70E+3	1.15E+4	1.96E+3	2.19E+3	1.73E+3	1.16E+4	4.06E+3
1359.9	A8	3.07E+3	4.46E+3	1.34E+4	2.63E+3	3.07E+3	2.43E+3	1.30E+4	3.56E+3
1361.9		2.72E+3	4.20E+3	1.16E+4	1.59E+3	1.79E+3	1.49E+3	1.17E+4	3.39E+3
1365.9		2.10E+3	3.07E+3	7.28E+3	1.00E+3	1.12E+3	9.38E+2	6.98E+3	2.41E+3
1369.9		2.27E+3	3.20E+3	7.07E+3	9.71E+2	1.09E+3	9.13E+2	6.75E+3	2.50E+3
1373.9		2.61E+3	3.11E+3	5.82E+3	9.57E+2	1.08E+3	8.97E+2	5.57E+3	2.43E+3
1420.4		2.30E+4	4.38E+3	4.88E+3	4.48E+3	6.67E+3	4.05E+3	5.10E+3	3.85E+3
1465.9		3.86E+3	3.68E+3	5.20E+3	1.04E+3	1.18E+3	9.70E+2	5.27E+3	2.84E+3
1469.9		2.76E+3	3.70E+3	6.67E+3	1.05E+3	1.16E+3	9.60E+2	5.88E+3	2.56E+3
1473.9		2.48E+3	3.59E+3	7.13E+3	1.08E+3	1.20E+3	9.98E+2	6.53E+3	2.56E+3
1477.9		2.37E+3	3.80E+3	7.83E+3	9.27E+2	1.01E+3	8.72E+2	8.00E+3	2.86E+3
1479.9	A9	2.24E+3	4.63E+3	1.35E+4	1.23E+3	1.36E+3	1.21E+3	1.34E+4	3.31E+3
1481.9		1.54E+3	3.10E+3	7.85E+3	6.67E+2	7.29E+2	6.58E+2	7.88E+3	2.22E+3
1485.9		1.55E+3	2.95E+3	7.45E+3	7.55E+2	8.30E+2	7.32E+2	6.65E+3	2.03E+3
1489.9		1.66E+3	3.07E+3	7.22E+3	7.11E+2	7.76E+2	6.84E+2	6.14E+3	2.07E+3
1493.9		2.19E+3	3.26E+3	5.80E+3	6.88E+2	7.59E+2	6.67E+2	5.61E+3	2.41E+3
1539.9		3.08E+4	7.49E+3	9.22E+3	6.44E+3	8.81E+3	5.59E+3	8.41E+3	6.58E+3
1586.0		4.60E+3	5.08E+3	8.55E+3	1.21E+3	1.37E+3	1.16E+3	7.57E+3	3.98E+3
1590.0		3.30E+3	4.92E+3	1.09E+4	1.21E+3	1.36E+3	1.15E+3	8.43E+3	3.48E+3
1594.0		2.98E+3	4.73E+3	1.15E+4	1.25E+3	1.41E+3	1.21E+3	9.34E+3	3.40E+3
1598.0		2.85E+3	4.96E+3	1.23E+4	1.08E+3	1.20E+3	1.06E+3	1.13E+4	3.74E+3
1599.9	A10	3.02E+3	6.33E+3	2.14E+4	1.60E+3	1.80E+3	1.63E+3	1.95E+4	4.51E+3
1601.9		2.07E+3	4.22E+3	1.21E+4	8.63E+2	9.60E+2	8.73E+2	1.12E+4	3.01E+3
1605.9		2.10E+3	4.02E+3	1.15E+4	9.79E+2	1.10E+3	9.79E+2	9.42E+3	2.74E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
1609.9		2.25E+3	4.18E+3	1.10E+4	9.24E+2	1.03E+3	9.19E+2	8.60E+3	2.79E+3
1613.9		2.99E+3	4.47E+3	8.62E+3	8.98E+2	1.02E+3	9.02E+2	7.79E+3	3.25E+3
1659.9		3.83E+4	9.65E+3	1.18E+4	7.67E+3	1.16E+4	7.65E+3	1.05E+4	7.76E+3
1705.9		5.02E+3	5.19E+3	8.89E+3	1.30E+3	1.54E+3	1.32E+3	7.88E+3	4.10E+3
1709.9		3.63E+3	5.03E+3	1.13E+4	1.32E+3	1.54E+3	1.32E+3	8.63E+3	3.59E+3
1713.9		3.31E+3	4.82E+3	1.18E+4	1.38E+3	1.61E+3	1.39E+3	9.41E+3	3.54E+3
1717.9		3.21E+3	5.06E+3	1.25E+4	1.19E+3	1.38E+3	1.22E+3	1.13E+4	3.92E+3
1719.9	A11	3.92E+3	6.92E+3	2.24E+4	2.04E+3	2.34E+3	2.06E+3	1.96E+4	5.36E+3
1721.9		2.67E+3	4.55E+3	1.26E+4	1.09E+3	1.23E+3	1.10E+3	1.12E+4	3.55E+3
1725.9		2.73E+3	4.30E+3	1.18E+4	1.25E+3	1.43E+3	1.24E+3	9.27E+3	3.21E+3
1729.9		2.95E+3	4.44E+3	1.12E+4	1.19E+3	1.35E+3	1.17E+3	8.43E+3	3.25E+3
1733.9		3.96E+3	4.60E+3	8.78E+3	1.16E+3	1.34E+3	1.15E+3	7.62E+3	3.72E+3
1779.9		3.90E+4	8.47E+3	1.10E+4	7.66E+3	1.13E+4	7.25E+3	9.36E+3	7.45E+3
1825.9		4.34E+3	4.53E+3	7.87E+3	1.08E+3	1.26E+3	1.08E+3	6.95E+3	3.72E+3
1829.9		3.18E+3	4.43E+3	9.98E+3	1.12E+3	1.28E+3	1.10E+3	7.62E+3	3.29E+3
1833.9		2.95E+3	4.30E+3	1.04E+4	1.19E+3	1.38E+3	1.18E+3	8.32E+3	3.26E+3
1837.9		2.91E+3	4.58E+3	1.11E+4	1.05E+3	1.19E+3	1.05E+3	1.01E+4	3.67E+3
1839.9	A12	4.43E+3	6.89E+3	1.98E+4	2.23E+3	2.55E+3	2.17E+3	1.76E+4	5.67E+3
1841.9		3.03E+3	4.53E+3	1.13E+4	1.17E+3	1.33E+3	1.15E+3	1.02E+4	3.74E+3
1845.9		3.22E+3	4.33E+3	1.05E+4	1.40E+3	1.61E+3	1.35E+3	8.34E+3	3.38E+3
1849.9		3.61E+3	4.52E+3	1.00E+4	1.37E+3	1.57E+3	1.32E+3	7.62E+3	3.44E+3
1853.9		5.09E+3	4.62E+3	7.88E+3	1.38E+3	1.62E+3	1.34E+3	6.94E+3	3.87E+3
1899.9		3.83E+4	7.79E+3	9.44E+3	7.39E+3	1.11E+4	7.11E+3	8.36E+3	6.56E+3
1945.9		3.05E+3	3.94E+3	6.94E+3	7.78E+2	8.78E+2	7.70E+2	6.34E+3	3.16E+3
1949.9		2.30E+3	3.81E+3	8.82E+3	8.27E+2	9.21E+2	8.08E+2	6.97E+3	2.80E+3
1953.9		2.22E+3	3.75E+3	9.23E+3	9.14E+2	1.03E+3	8.95E+2	7.63E+3	2.83E+3
1957.9		2.27E+3	4.04E+3	9.90E+3	8.26E+2	9.18E+2	8.19E+2	9.26E+3	3.23E+3
1959.9	A13	3.60E+3	6.24E+3	1.75E+4	1.81E+3	2.03E+3	1.76E+3	1.60E+4	5.07E+3
1961.9		2.44E+3	4.10E+3	1.00E+4	9.32E+2	1.03E+3	9.11E+2	9.33E+3	3.34E+3
1965.9		2.61E+3	3.90E+3	9.21E+3	1.12E+3	1.27E+3	1.08E+3	7.60E+3	3.01E+3
1969.9		2.96E+3	4.06E+3	8.73E+3	1.11E+3	1.25E+3	1.06E+3	6.89E+3	3.06E+3
1973.9		4.26E+3	4.14E+3	6.82E+3	1.13E+3	1.30E+3	1.10E+3	6.23E+3	3.44E+3
2019.9		3.59E+4	6.25E+3	7.32E+3	6.90E+3	1.10E+4	6.87E+3	6.88E+3	5.50E+3
2065.9		1.91E+3	2.88E+3	5.15E+3	5.15E+2	5.74E+2	5.20E+2	5.06E+3	2.32E+3
2069.9		1.41E+3	2.72E+3	6.50E+3	5.34E+2	5.89E+2	5.34E+2	5.55E+3	1.99E+3
2073.9		1.33E+3	2.64E+3	6.78E+3	5.78E+2	6.40E+2	5.80E+2	6.04E+3	1.97E+3
2077.9		1.33E+3	2.82E+3	7.25E+3	5.13E+2	5.63E+2	5.19E+2	7.29E+3	2.20E+3
2079.9	A14	2.06E+3	4.27E+3	1.27E+4	1.06E+3	1.18E+3	1.06E+3	1.24E+4	3.36E+3
2081.9		1.41E+3	2.84E+3	7.31E+3	5.54E+2	6.10E+2	5.58E+2	7.31E+3	2.25E+3
2085.9		1.53E+3	2.73E+3	6.73E+3	6.74E+2	7.56E+2	6.73E+2	6.02E+3	2.08E+3
2089.9		1.77E+3	2.88E+3	6.38E+3	6.76E+2	7.60E+2	6.74E+2	5.50E+3	2.16E+3
2093.9		2.62E+3	3.01E+3	5.00E+3	7.05E+2	8.11E+2	7.12E+2	5.01E+3	2.52E+3
2139.9		3.73E+4	4.92E+3	5.57E+3	6.21E+3	1.11E+4	6.60E+3	5.92E+3	4.66E+3
2185.9		1.29E+3	2.14E+3	4.09E+3	3.56E+2	3.91E+2	3.58E+2	4.45E+3	1.81E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
2189.9		9.34E+2	1.96E+3	5.19E+3	3.62E+2	3.93E+2	3.60E+2	4.93E+3	1.51E+3
2193.9		8.66E+2	1.88E+3	5.47E+3	3.85E+2	4.19E+2	3.84E+2	5.38E+3	1.47E+3
2197.9		8.55E+2	1.99E+3	5.84E+3	3.38E+2	3.65E+2	3.39E+2	6.44E+3	1.61E+3
2199.9	A15	1.27E+3	2.95E+3	1.03E+4	6.57E+2	7.18E+2	6.59E+2	1.10E+4	2.37E+3
2201.9		8.76E+2	1.99E+3	5.84E+3	3.51E+2	3.80E+2	3.53E+2	6.45E+3	1.62E+3
2205.9		9.52E+2	1.93E+3	5.43E+3	4.25E+2	4.67E+2	4.24E+2	5.37E+3	1.53E+3
2209.9		1.11E+3	2.06E+3	5.11E+3	4.26E+2	4.70E+2	4.25E+2	4.91E+3	1.63E+3
2213.9		1.65E+3	2.22E+3	4.02E+3	4.47E+2	5.02E+2	4.50E+2	4.43E+3	1.98E+3
2259.9		4.65E+4	3.95E+3	4.63E+3	6.49E+3	1.33E+4	6.83E+3	5.30E+3	4.47E+3
2305.9		9.66E+2	1.66E+3	3.30E+3	2.80E+2	3.06E+2	2.82E+2	3.92E+3	1.47E+3
2309.9		6.91E+2	1.49E+3	4.16E+3	2.79E+2	3.02E+2	2.79E+2	4.34E+3	1.20E+3
2313.9		6.30E+2	1.42E+3	4.39E+3	2.91E+2	3.16E+2	2.92E+2	4.72E+3	1.14E+3
2317.9		6.12E+2	1.48E+3	4.67E+3	2.53E+2	2.72E+2	2.55E+2	5.60E+3	1.22E+3
2319.9	A16	8.65E+2	2.13E+3	8.14E+3	4.65E+2	5.04E+2	4.66E+2	9.43E+3	1.74E+3
2321.9		6.02E+2	1.45E+3	4.62E+3	2.52E+2	2.71E+2	2.54E+2	5.58E+3	1.20E+3
2325.9		6.49E+2	1.42E+3	4.30E+3	3.03E+2	3.29E+2	3.03E+2	4.70E+3	1.14E+3
2329.9		7.47E+2	1.52E+3	4.04E+3	3.03E+2	3.30E+2	3.03E+2	4.33E+3	1.23E+3
2333.9		1.10E+3	1.69E+3	3.18E+3	3.17E+2	3.51E+2	3.20E+2	3.93E+3	1.52E+3
2379.9		4.21E+4	3.52E+3	3.77E+3	5.46E+3	1.25E+4	6.72E+3	5.06E+3	3.81E+3
2425.9		7.93E+2	1.49E+3	2.89E+3	2.33E+2	2.53E+2	2.36E+2	3.85E+3	1.32E+3
2429.9		5.62E+2	1.31E+3	3.66E+3	2.30E+2	2.46E+2	2.31E+2	4.26E+3	1.05E+3
2433.9		5.08E+2	1.24E+3	3.90E+3	2.38E+2	2.55E+2	2.39E+2	4.63E+3	9.92E+2
2437.9		4.88E+2	1.29E+3	4.17E+3	2.05E+2	2.18E+2	2.07E+2	5.47E+3	1.05E+3
2439.9	A17	6.96E+2	1.85E+3	7.31E+3	3.77E+2	4.04E+2	3.80E+2	9.18E+3	1.50E+3
2441.9		4.86E+2	1.27E+3	4.15E+3	2.06E+2	2.19E+2	2.08E+2	5.46E+3	1.04E+3
2445.9		5.24E+2	1.25E+3	3.90E+3	2.47E+2	2.65E+2	2.48E+2	4.64E+3	1.01E+3
2449.9		6.03E+2	1.35E+3	3.67E+3	2.47E+2	2.66E+2	2.48E+2	4.30E+3	1.10E+3
2453.9		8.85E+2	1.54E+3	2.91E+3	2.58E+2	2.82E+2	2.62E+2	3.90E+3	1.40E+3
2499.9		4.14E+4	3.30E+3	3.72E+3	5.29E+3	1.14E+4	6.32E+3	5.11E+3	4.15E+3
2545.9		6.63E+2	1.33E+3	2.83E+3	2.00E+2	2.15E+2	2.02E+2	3.78E+3	1.23E+3
2549.9		4.70E+2	1.16E+3	3.57E+3	1.96E+2	2.08E+2	1.97E+2	4.21E+3	9.60E+2
2553.9		4.23E+2	1.08E+3	3.81E+3	2.02E+2	2.15E+2	2.03E+2	4.57E+3	8.93E+2
2557.9		4.05E+2	1.12E+3	4.05E+3	1.74E+2	1.83E+2	1.75E+2	5.36E+3	9.34E+2
2559.9	A18	5.82E+2	1.61E+3	7.17E+3	3.21E+2	3.41E+2	3.22E+2	9.09E+3	1.33E+3
2561.9		4.09E+2	1.11E+3	4.03E+3	1.77E+2	1.86E+2	1.78E+2	5.34E+3	9.33E+2
2565.9		4.41E+2	1.10E+3	3.78E+3	2.11E+2	2.25E+2	2.12E+2	4.56E+3	9.10E+2
2569.9		5.07E+2	1.19E+3	3.54E+3	2.11E+2	2.25E+2	2.12E+2	4.20E+3	9.97E+2
2573.9		7.41E+2	1.37E+3	2.80E+3	2.21E+2	2.39E+2	2.24E+2	3.78E+3	1.29E+3
2619.9		4.80E+4	3.07E+3	3.45E+3	5.64E+3	1.38E+4	6.87E+3	4.90E+3	3.99E+3
2665.9		5.84E+2	1.17E+3	2.53E+3	1.80E+2	1.94E+2	1.82E+2	3.45E+3	1.06E+3
2669.9		4.12E+2	1.01E+3	3.20E+3	1.75E+2	1.86E+2	1.76E+2	3.83E+3	8.20E+2
2673.9		3.68E+2	9.40E+2	3.41E+3	1.79E+2	1.91E+2	1.80E+2	4.15E+3	7.58E+2
2677.9		3.51E+2	9.63E+2	3.61E+3	1.53E+2	1.62E+2	1.54E+2	4.83E+3	7.88E+2
2679.9	A19	5.11E+2	1.41E+3	6.45E+3	2.85E+2	3.04E+2	2.87E+2	8.29E+3	1.14E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
2681.9		3.60E+2	9.73E+2	3.61E+3	1.58E+2	1.67E+2	1.59E+2	4.84E+3	7.99E+2
2685.9		3.85E+2	9.58E+2	3.40E+3	1.87E+2	2.00E+2	1.88E+2	4.15E+3	7.76E+2
2689.9		4.39E+2	1.04E+3	3.19E+3	1.87E+2	2.00E+2	1.88E+2	3.83E+3	8.47E+2
2693.9		6.35E+2	1.20E+3	2.53E+3	1.95E+2	2.11E+2	1.97E+2	3.44E+3	1.10E+3
2739.9		5.59E+4	2.98E+3	3.34E+3	5.98E+3	1.60E+4	7.39E+3	4.72E+3	3.86E+3
2785.9		5.87E+2	1.18E+3	2.56E+3	1.78E+2	1.92E+2	1.80E+2	3.44E+3	1.07E+3
2789.9		4.09E+2	1.01E+3	3.25E+3	1.72E+2	1.83E+2	1.72E+2	3.85E+3	8.22E+2
2793.9		3.62E+2	9.36E+2	3.48E+3	1.75E+2	1.85E+2	1.75E+2	4.19E+3	7.56E+2
2797.9		3.42E+2	9.55E+2	3.69E+3	1.49E+2	1.56E+2	1.49E+2	4.87E+3	7.82E+2
2799.9	A20	4.97E+2	1.39E+3	6.62E+3	2.75E+2	2.91E+2	2.75E+2	8.43E+3	1.13E+3
2801.9		3.49E+2	9.64E+2	3.70E+3	1.52E+2	1.60E+2	1.52E+2	4.90E+3	7.94E+2
2805.9		3.71E+2	9.50E+2	3.51E+3	1.79E+2	1.90E+2	1.79E+2	4.23E+3	7.71E+2
2809.9		4.20E+2	1.03E+3	3.30E+3	1.77E+2	1.88E+2	1.77E+2	3.91E+3	8.42E+2
2813.9		6.03E+2	1.21E+3	2.61E+3	1.84E+2	1.97E+2	1.85E+2	3.51E+3	1.09E+3
2859.9		5.72E+4	3.21E+3	3.56E+3	6.21E+3	1.61E+4	7.74E+3	4.91E+3	4.04E+3
2905.9		6.41E+2	1.31E+3	2.78E+3	1.96E+2	2.11E+2	1.99E+2	3.60E+3	1.16E+3
2909.9		4.42E+2	1.12E+3	3.51E+3	1.88E+2	2.00E+2	1.89E+2	3.99E+3	8.92E+2
2913.9		3.88E+2	1.03E+3	3.73E+3	1.89E+2	2.01E+2	1.90E+2	4.32E+3	8.17E+2
2917.9		3.64E+2	1.04E+3	3.96E+3	1.59E+2	1.68E+2	1.61E+2	5.03E+3	8.40E+2
2919.9	A21	5.29E+2	1.52E+3	7.03E+3	2.95E+2	3.13E+2	2.97E+2	8.59E+3	1.22E+3
2921.9		3.69E+2	1.05E+3	3.97E+3	1.62E+2	1.70E+2	1.63E+2	5.04E+3	8.48E+2
2925.9		3.89E+2	1.03E+3	3.74E+3	1.90E+2	2.01E+2	1.91E+2	4.31E+3	8.18E+2
2929.9		4.37E+2	1.10E+3	3.52E+3	1.86E+2	1.98E+2	1.87E+2	3.96E+3	8.86E+2
2933.9		6.20E+2	1.29E+3	2.79E+3	1.92E+2	2.06E+2	1.94E+2	3.56E+3	1.14E+3
2979.9		5.54E+4	3.21E+3	3.65E+3	6.69E+3	1.65E+4	7.55E+3	4.68E+3	3.97E+3
3025.9		7.95E+2	1.41E+3	2.86E+3	2.35E+2	2.54E+2	2.36E+2	3.49E+3	1.29E+3
3029.9		5.40E+2	1.23E+3	3.61E+3	2.23E+2	2.38E+2	2.22E+2	3.85E+3	1.01E+3
3033.9		4.70E+2	1.14E+3	3.82E+3	2.23E+2	2.38E+2	2.22E+2	4.17E+3	9.24E+2
3037.9		4.36E+2	1.16E+3	4.07E+3	1.86E+2	1.97E+2	1.86E+2	4.90E+3	9.54E+2
3039.9	A22	6.34E+2	1.69E+3	7.12E+3	3.45E+2	3.68E+2	3.45E+2	8.29E+3	1.38E+3
3041.9		4.38E+2	1.15E+3	4.05E+3	1.86E+2	1.97E+2	1.87E+2	4.89E+3	9.52E+2
3045.9		4.57E+2	1.12E+3	3.81E+3	2.17E+2	2.32E+2	2.16E+2	4.16E+3	9.02E+2
3049.9		5.08E+2	1.19E+3	3.60E+3	2.11E+2	2.25E+2	2.10E+2	3.83E+3	9.61E+2
3053.9		7.16E+2	1.36E+3	2.84E+3	2.14E+2	2.31E+2	2.15E+2	3.45E+3	1.21E+3
3099.9		5.73E+4	3.46E+3	3.85E+3	6.56E+3	1.64E+4	7.63E+3	4.75E+3	3.91E+3
3145.9		1.10E+3	1.70E+3	3.22E+3	3.09E+2	3.44E+2	3.13E+2	3.83E+3	1.51E+3
3149.9		7.36E+2	1.51E+3	4.08E+3	2.92E+2	3.20E+2	2.93E+2	4.24E+3	1.21E+3
3153.9		6.34E+2	1.40E+3	4.34E+3	2.91E+2	3.17E+2	2.91E+2	4.62E+3	1.12E+3
3157.9		5.85E+2	1.43E+3	4.65E+3	2.41E+2	2.60E+2	2.43E+2	5.49E+3	1.17E+3
3159.9	A23	8.41E+2	2.09E+3	8.18E+3	4.46E+2	4.82E+2	4.46E+2	9.29E+3	1.70E+3
3161.9		5.73E+2	1.41E+3	4.66E+3	2.36E+2	2.53E+2	2.37E+2	5.47E+3	1.15E+3
3165.9		5.92E+2	1.35E+3	4.39E+3	2.73E+2	2.95E+2	2.72E+2	4.64E+3	1.08E+3
3169.9		6.50E+2	1.43E+3	4.16E+3	2.61E+2	2.82E+2	2.60E+2	4.26E+3	1.13E+3
3173.9		9.06E+2	1.60E+3	3.29E+3	2.62E+2	2.86E+2	2.62E+2	3.84E+3	1.40E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
3219.9		5.78E+4	4.09E+3	4.67E+3	7.28E+3	1.67E+4	7.84E+3	5.33E+3	4.41E+3
3265.9		1.76E+3	2.32E+3	4.09E+3	4.73E+2	5.37E+2	4.82E+2	4.49E+3	2.05E+3
3269.9		1.16E+3	2.15E+3	5.18E+3	4.45E+2	4.95E+2	4.49E+2	4.94E+3	1.68E+3
3273.9		9.91E+2	2.01E+3	5.48E+3	4.41E+2	4.88E+2	4.45E+2	5.38E+3	1.58E+3
3277.9		9.08E+2	2.07E+3	5.90E+3	3.61E+2	3.94E+2	3.67E+2	6.47E+3	1.67E+3
3279.9	A24	1.24E+3	2.99E+3	1.02E+4	6.44E+2	7.03E+2	6.49E+2	1.09E+4	2.38E+3
3281.9		8.35E+2	1.99E+3	5.88E+3	3.33E+2	3.59E+2	3.36E+2	6.48E+3	1.60E+3
3285.9		8.50E+2	1.89E+3	5.51E+3	3.81E+2	4.15E+2	3.82E+2	5.43E+3	1.46E+3
3289.9		9.20E+2	1.98E+3	5.24E+3	3.60E+2	3.91E+2	3.61E+2	5.00E+3	1.51E+3
3293.9		1.27E+3	2.17E+3	4.15E+3	3.54E+2	3.89E+2	3.58E+2	4.53E+3	1.82E+3
3339.9		4.95E+4	5.11E+3	5.77E+3	7.25E+3	1.49E+4	7.97E+3	6.16E+3	4.84E+3
3385.8		2.96E+3	3.28E+3	5.31E+3	7.68E+2	8.83E+2	7.72E+2	5.41E+3	2.78E+3
3389.8		1.96E+3	3.15E+3	6.77E+3	7.30E+2	8.19E+2	7.23E+2	5.94E+3	2.39E+3
3393.8		1.68E+3	2.98E+3	7.16E+3	7.25E+2	8.10E+2	7.19E+2	6.50E+3	2.29E+3
3397.8		1.54E+3	3.09E+3	7.78E+3	5.92E+2	6.50E+2	5.93E+2	7.93E+3	2.49E+3
3399.8	A25	2.01E+3	4.39E+3	1.35E+4	1.01E+3	1.10E+3	9.97E+2	1.34E+4	3.54E+3
3401.8		1.33E+3	2.89E+3	7.77E+3	5.10E+2	5.51E+2	5.05E+2	7.89E+3	2.33E+3
3405.8		1.34E+3	2.72E+3	7.29E+3	5.79E+2	6.31E+2	5.69E+2	6.55E+3	2.09E+3
3409.8		1.43E+3	2.83E+3	6.99E+3	5.39E+2	5.86E+2	5.28E+2	6.02E+3	2.13E+3
3413.8		1.95E+3	3.02E+3	5.53E+3	5.23E+2	5.74E+2	5.17E+2	5.48E+3	2.49E+3
3459.8		5.46E+4	6.92E+3	8.08E+3	8.52E+3	1.58E+4	8.67E+3	7.58E+3	5.98E+3
3505.9		4.93E+3	4.66E+3	7.67E+3	1.23E+3	1.48E+3	1.24E+3	6.86E+3	3.71E+3
3509.9		3.33E+3	4.57E+3	9.88E+3	1.19E+3	1.40E+3	1.19E+3	7.58E+3	3.26E+3
3513.9		2.88E+3	4.38E+3	1.05E+4	1.20E+3	1.40E+3	1.20E+3	8.37E+3	3.19E+3
3517.9		2.68E+3	4.60E+3	1.14E+4	9.87E+2	1.13E+3	1.00E+3	1.03E+4	3.53E+3
3519.9	A26	3.43E+3	6.68E+3	1.97E+4	1.65E+3	1.88E+3	1.66E+3	1.79E+4	5.00E+3
3521.9		2.24E+3	4.34E+3	1.12E+4	8.16E+2	9.17E+2	8.25E+2	1.03E+4	3.25E+3
3525.9		2.21E+3	4.04E+3	1.05E+4	9.13E+2	1.04E+3	9.12E+2	8.54E+3	2.86E+3
3529.9		2.32E+3	4.14E+3	1.00E+4	8.35E+2	9.42E+2	8.31E+2	7.78E+3	2.86E+3
3533.9		3.10E+3	4.33E+3	7.85E+3	7.92E+2	9.04E+2	7.97E+2	7.05E+3	3.26E+3
3579.8		5.44E+4	8.94E+3	1.08E+4	9.30E+3	1.63E+4	9.15E+3	9.25E+3	7.00E+3
3625.8		6.61E+3	5.28E+3	8.72E+3	1.64E+3	2.00E+3	1.59E+3	7.34E+3	4.12E+3
3629.8		4.54E+3	5.20E+3	1.11E+4	1.62E+3	1.92E+3	1.53E+3	8.00E+3	3.68E+3
3633.8		3.98E+3	4.97E+3	1.15E+4	1.63E+3	1.94E+3	1.56E+3	8.73E+3	3.64E+3
3637.8		3.71E+3	5.19E+3	1.22E+4	1.35E+3	1.57E+3	1.32E+3	1.06E+4	4.05E+3
3639.8	A27	5.04E+3	7.76E+3	2.06E+4	2.33E+3	2.69E+3	2.26E+3	1.81E+4	5.99E+3
3641.8		3.35E+3	5.07E+3	1.17E+4	1.17E+3	1.34E+3	1.14E+3	1.05E+4	3.90E+3
3645.8		3.43E+3	4.78E+3	1.09E+4	1.36E+3	1.57E+3	1.30E+3	8.59E+3	3.44E+3
3649.8		3.74E+3	4.95E+3	1.04E+4	1.28E+3	1.47E+3	1.22E+3	7.81E+3	3.44E+3
3653.8		5.17E+3	5.03E+3	8.11E+3	1.24E+3	1.46E+3	1.21E+3	7.10E+3	3.83E+3
3699.8		5.87E+4	8.63E+3	9.59E+3	9.06E+3	1.74E+4	9.59E+3	8.73E+3	6.38E+3
3745.8		5.37E+3	4.72E+3	7.25E+3	1.31E+3	1.64E+3	1.34E+3	6.84E+3	3.42E+3
3749.8		3.89E+3	4.68E+3	9.22E+3	1.36E+3	1.65E+3	1.36E+3	7.48E+3	3.08E+3
3753.8		3.58E+3	4.54E+3	9.61E+3	1.43E+3	1.76E+3	1.44E+3	8.15E+3	3.09E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
3757.8		3.51E+3	4.81E+3	1.03E+4	1.25E+3	1.50E+3	1.27E+3	9.90E+3	3.51E+3
3759.8	A28	5.80E+3	7.83E+3	1.76E+4	2.55E+3	3.13E+3	2.59E+3	1.71E+4	5.60E+3
3761.8		3.92E+3	5.13E+3	1.01E+4	1.31E+3	1.58E+3	1.34E+3	1.01E+4	3.69E+3
3765.8		4.15E+3	4.91E+3	9.48E+3	1.56E+3	1.92E+3	1.56E+3	8.33E+3	3.31E+3
3769.8		4.72E+3	5.15E+3	9.13E+3	1.53E+3	1.87E+3	1.52E+3	7.69E+3	3.36E+3
3773.8		6.82E+3	5.17E+3	7.24E+3	1.53E+3	1.94E+3	1.56E+3	7.09E+3	3.75E+3
3819.8		7.47E+4	8.84E+3	1.00E+4	1.13E+4	2.29E+4	1.16E+4	9.48E+3	7.18E+3
3865.8		3.55E+3	4.14E+3	8.22E+3	9.51E+2	1.10E+3	9.21E+2	7.56E+3	3.45E+3
3869.8		2.59E+3	3.92E+3	1.05E+4	9.76E+2	1.11E+3	9.32E+2	8.42E+3	2.99E+3
3873.8		2.41E+3	3.79E+3	1.11E+4	1.04E+3	1.19E+3	9.95E+2	9.29E+3	2.96E+3
3877.8		2.38E+3	4.03E+3	1.19E+4	9.06E+2	1.02E+3	8.84E+2	1.12E+4	3.30E+3
3879.8	A29	3.93E+3	6.56E+3	2.09E+4	1.85E+3	2.14E+3	1.82E+3	1.97E+4	5.26E+3
3881.8		2.70E+3	4.37E+3	1.17E+4	9.68E+2	1.11E+3	9.56E+2	1.13E+4	3.52E+3
3885.8		2.94E+3	4.26E+3	1.11E+4	1.18E+3	1.38E+3	1.15E+3	9.54E+3	3.27E+3
3889.8		3.44E+3	4.55E+3	1.06E+4	1.19E+3	1.38E+3	1.15E+3	8.76E+3	3.42E+3
3893.8		5.12E+3	4.81E+3	8.37E+3	1.23E+3	1.48E+3	1.21E+3	8.00E+3	4.01E+3
3939.8		7.22E+4	9.02E+3	1.06E+4	1.13E+4	2.25E+4	1.17E+4	1.06E+4	8.06E+3
3985.9		2.02E+3	3.35E+3	6.95E+3	5.67E+2	6.40E+2	5.72E+2	7.21E+3	2.60E+3
3989.9		1.47E+3	3.02E+3	8.83E+3	5.77E+2	6.43E+2	5.75E+2	7.97E+3	2.15E+3
3993.9		1.36E+3	2.88E+3	9.29E+3	6.12E+2	6.84E+2	6.11E+2	8.70E+3	2.08E+3
3997.9		1.34E+3	3.01E+3	9.77E+3	5.34E+2	5.91E+2	5.39E+2	1.02E+4	2.27E+3
3999.9	A30	2.25E+3	4.86E+3	1.75E+4	1.11E+3	1.25E+3	1.12E+3	1.78E+4	3.67E+3
4001.9		1.57E+3	3.26E+3	9.60E+3	5.93E+2	6.62E+2	5.99E+2	1.01E+4	2.49E+3
4005.9		1.72E+3	3.18E+3	8.93E+3	7.28E+2	8.26E+2	7.26E+2	8.36E+3	2.35E+3
4009.9		2.03E+3	3.40E+3	8.33E+3	7.40E+2	8.42E+2	7.34E+2	7.52E+3	2.49E+3
4013.9		3.06E+3	3.67E+3	6.46E+3	7.83E+2	9.12E+2	7.86E+2	6.70E+3	3.00E+3
4059.9		7.18E+4	5.87E+3	6.80E+3	9.66E+3	2.22E+4	9.70E+3	7.11E+3	5.71E+3
4105.9		1.62E+3	2.23E+3	4.22E+3	4.49E+2	5.11E+2	4.49E+2	4.34E+3	1.82E+3
4109.9		1.18E+3	2.08E+3	5.29E+3	4.59E+2	5.16E+2	4.53E+2	4.75E+3	1.54E+3
4113.9		1.10E+3	2.01E+3	5.54E+3	4.89E+2	5.52E+2	4.85E+2	5.14E+3	1.50E+3
4117.9		1.10E+3	2.12E+3	5.85E+3	4.31E+2	4.82E+2	4.33E+2	6.05E+3	1.65E+3
4119.9	A31	1.72E+3	3.31E+3	1.02E+4	8.50E+2	9.66E+2	8.50E+2	1.04E+4	2.53E+3
4121.9		1.17E+3	2.18E+3	5.70E+3	4.45E+2	5.00E+2	4.47E+2	5.99E+3	1.69E+3
4125.9		1.22E+3	2.06E+3	5.23E+3	5.20E+2	5.94E+2	5.16E+2	4.95E+3	1.53E+3
4129.9		1.35E+3	2.13E+3	4.86E+3	5.04E+2	5.75E+2	4.98E+2	4.44E+3	1.56E+3
4133.9		1.91E+3	2.21E+3	3.77E+3	5.06E+2	5.90E+2	5.06E+2	3.95E+3	1.79E+3
4179.9		4.55E+4	3.71E+3	4.21E+3	6.27E+3	1.51E+4	6.34E+3	4.42E+3	3.48E+3
4225.8		1.81E+3	1.83E+3	3.18E+3	4.90E+2	5.72E+2	4.74E+2	3.13E+3	1.55E+3
4229.8		1.27E+3	1.76E+3	4.01E+3	4.88E+2	5.58E+2	4.65E+2	3.44E+3	1.34E+3
4233.8		1.15E+3	1.69E+3	4.22E+3	5.05E+2	5.79E+2	4.84E+2	3.74E+3	1.32E+3
4237.8		1.11E+3	1.78E+3	4.53E+3	4.34E+2	4.89E+2	4.22E+2	4.44E+3	1.45E+3
4239.8	A32	1.65E+3	2.70E+3	7.84E+3	8.14E+2	9.27E+2	7.82E+2	7.52E+3	2.19E+3
4241.8		1.10E+3	1.78E+3	4.48E+3	4.21E+2	4.72E+2	4.07E+2	4.39E+3	1.46E+3
4245.8		1.13E+3	1.67E+3	4.14E+3	4.83E+2	5.49E+2	4.59E+2	3.66E+3	1.30E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
4249.8		1.23E+3	1.72E+3	3.91E+3	4.58E+2	5.20E+2	4.34E+2	3.31E+3	1.31E+3
4253.8		1.69E+3	1.76E+3	3.07E+3	4.49E+2	5.20E+2	4.31E+2	2.97E+3	1.48E+3
4299.9		2.94E+4	3.27E+3	3.83E+3	4.67E+3	9.62E+3	4.40E+3	3.71E+3	2.89E+3
4345.9		2.24E+3	1.97E+3	3.22E+3	5.71E+2	6.93E+2	5.62E+2	2.99E+3	1.54E+3
4349.9		1.57E+3	1.95E+3	4.09E+3	5.70E+2	6.75E+2	5.53E+2	3.29E+3	1.37E+3
4353.9		1.41E+3	1.89E+3	4.32E+3	5.89E+2	6.99E+2	5.74E+2	3.61E+3	1.36E+3
4357.9		1.36E+3	2.00E+3	4.66E+3	5.04E+2	5.86E+2	5.01E+2	4.32E+3	1.52E+3
4359.9	A33	1.98E+3	3.01E+3	8.05E+3	9.31E+2	1.09E+3	9.11E+2	7.27E+3	2.30E+3
4361.9		1.32E+3	1.99E+3	4.63E+3	4.76E+2	5.46E+2	4.68E+2	4.27E+3	1.52E+3
4365.9		1.33E+3	1.87E+3	4.31E+3	5.43E+2	6.32E+2	5.24E+2	3.57E+3	1.35E+3
4369.9		1.44E+3	1.92E+3	4.09E+3	5.11E+2	5.92E+2	4.90E+2	3.23E+3	1.35E+3
4373.9		1.97E+3	1.94E+3	3.22E+3	4.97E+2	5.85E+2	4.83E+2	2.92E+3	1.51E+3
4419.9		3.06E+4	3.44E+3	4.05E+3	4.88E+3	1.00E+4	4.41E+3	3.61E+3	2.80E+3
4465.9		2.70E+3	2.06E+3	3.31E+3	6.95E+2	8.55E+2	6.59E+2	2.88E+3	1.57E+3
4469.9		1.91E+3	2.05E+3	4.16E+3	7.00E+2	8.39E+2	6.53E+2	3.15E+3	1.43E+3
4473.9		1.73E+3	2.00E+3	4.35E+3	7.25E+2	8.73E+2	6.83E+2	3.44E+3	1.43E+3
4477.9		1.67E+3	2.12E+3	4.66E+3	6.22E+2	7.33E+2	6.01E+2	4.11E+3	1.60E+3
4479.9	A34	2.44E+3	3.16E+3	7.89E+3	1.14E+3	1.35E+3	1.08E+3	6.77E+3	2.43E+3
4481.9		1.60E+3	2.09E+3	4.62E+3	5.77E+2	6.71E+2	5.54E+2	4.01E+3	1.60E+3
4485.9		1.59E+3	1.94E+3	4.26E+3	6.51E+2	7.70E+2	6.12E+2	3.33E+3	1.40E+3
4489.9		1.70E+3	1.97E+3	4.02E+3	6.06E+2	7.12E+2	5.67E+2	3.01E+3	1.38E+3
4493.9		2.29E+3	1.95E+3	3.16E+3	5.79E+2	6.95E+2	5.52E+2	2.71E+3	1.50E+3
4539.8		2.77E+4	3.03E+3	3.55E+3	4.24E+3	9.29E+3	3.95E+3	3.10E+3	2.42E+3
4585.8		3.27E+3	1.86E+3	2.82E+3	7.74E+2	1.02E+3	7.44E+2	2.47E+3	1.47E+3
4589.8		2.35E+3	1.91E+3	3.53E+3	7.96E+2	1.01E+3	7.47E+2	2.70E+3	1.36E+3
4593.8		2.15E+3	1.87E+3	3.68E+3	8.34E+2	1.07E+3	7.89E+2	2.94E+3	1.38E+3
4597.8		2.11E+3	2.00E+3	3.96E+3	7.25E+2	9.06E+2	7.06E+2	3.53E+3	1.58E+3
4599.8	A35	3.15E+3	3.02E+3	6.56E+3	1.34E+3	1.71E+3	1.29E+3	5.77E+3	2.40E+3
4601.8		2.05E+3	1.98E+3	3.89E+3	6.78E+2	8.34E+2	6.55E+2	3.47E+3	1.58E+3
4605.8		2.04E+3	1.83E+3	3.58E+3	7.61E+2	9.57E+2	7.14E+2	2.87E+3	1.37E+3
4609.8		2.17E+3	1.84E+3	3.40E+3	7.06E+2	8.79E+2	6.58E+2	2.62E+3	1.34E+3
4613.8		2.92E+3	1.78E+3	2.69E+3	6.69E+2	8.53E+2	6.37E+2	2.38E+3	1.43E+3
4659.8		2.60E+4	2.72E+3	3.24E+3	3.92E+3	8.53E+3	3.63E+3	2.92E+3	2.31E+3
4705.8		3.37E+3	1.94E+3	3.02E+3	8.09E+2	1.07E+3	7.86E+2	2.74E+3	1.59E+3
4709.8		2.48E+3	2.02E+3	3.87E+3	8.46E+2	1.08E+3	8.04E+2	3.05E+3	1.49E+3
4713.8		2.31E+3	2.02E+3	4.12E+3	9.01E+2	1.16E+3	8.65E+2	3.38E+3	1.54E+3
4717.8		2.30E+3	2.20E+3	4.53E+3	7.96E+2	1.00E+3	7.85E+2	4.15E+3	1.78E+3
4719.8	A36	3.53E+3	3.49E+3	7.64E+3	1.49E+3	1.95E+3	1.50E+3	7.06E+3	2.73E+3
4721.8		2.31E+3	2.28E+3	4.48E+3	7.54E+2	9.51E+2	7.60E+2	4.24E+3	1.79E+3
4725.8		2.30E+3	2.15E+3	4.21E+3	8.50E+2	1.10E+3	8.41E+2	3.57E+3	1.57E+3
4729.8		2.46E+3	2.21E+3	4.06E+3	7.94E+2	1.01E+3	7.83E+2	3.31E+3	1.56E+3
4733.8		3.32E+3	2.18E+3	3.26E+3	7.54E+2	9.89E+2	7.65E+2	3.07E+3	1.70E+3
4779.8		2.47E+4	4.48E+3	5.23E+3	4.18E+3	7.91E+3	4.56E+3	4.89E+3	3.44E+3
4825.8		3.13E+3	3.37E+3	6.16E+3	7.94E+2	9.42E+2	7.94E+2	5.27E+3	2.63E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
4829.8		2.32E+3	3.34E+3	8.18E+3	8.34E+2	9.68E+2	8.18E+2	6.00E+3	2.41E+3
4833.8		2.20E+3	3.34E+3	9.00E+3	9.06E+2	1.05E+3	8.89E+2	6.82E+3	2.48E+3
4837.8		2.20E+3	3.64E+3	1.00E+4	8.04E+2	9.18E+2	7.98E+2	8.45E+3	2.87E+3
4839.8	A37	3.62E+3	6.14E+3	1.80E+4	1.64E+3	1.93E+3	1.67E+3	1.54E+4	4.64E+3
4841.8		2.38E+3	4.01E+3	1.02E+4	8.20E+2	9.46E+2	8.35E+2	8.84E+3	3.04E+3
4845.8		2.42E+3	3.84E+3	9.76E+3	9.46E+2	1.11E+3	9.51E+2	7.49E+3	2.75E+3
4849.8		2.62E+3	4.00E+3	9.42E+3	8.91E+2	1.03E+3	8.93E+2	6.90E+3	2.80E+3
4853.8		3.57E+3	4.23E+3	7.54E+3	8.66E+2	1.02E+3	8.82E+2	6.36E+3	3.21E+3
4899.8		2.40E+4	9.27E+3	1.25E+4	5.27E+3	7.66E+3	5.46E+3	1.00E+4	6.87E+3
4945.8		2.41E+3	4.50E+3	1.03E+4	6.76E+2	7.52E+2	6.83E+2	8.56E+3	3.30E+3
4949.8		1.80E+3	4.07E+3	1.33E+4	7.05E+2	7.76E+2	7.06E+2	9.63E+3	2.81E+3
4953.8		1.72E+3	3.97E+3	1.44E+4	7.68E+2	8.49E+2	7.70E+2	1.08E+4	2.80E+3
4957.8		1.73E+3	4.23E+3	1.52E+4	6.80E+2	7.45E+2	6.87E+2	1.30E+4	3.11E+3
4959.8	A38	3.09E+3	7.38E+3	2.77E+4	1.51E+3	1.71E+3	1.56E+3	2.41E+4	5.23E+3
4961.8		2.05E+3	4.80E+3	1.48E+4	7.58E+2	8.47E+2	7.83E+2	1.32E+4	3.40E+3
4965.8		2.13E+3	4.54E+3	1.37E+4	8.89E+2	1.01E+3	9.14E+2	1.08E+4	3.08E+3
4969.8		2.35E+3	4.68E+3	1.25E+4	8.48E+2	9.65E+2	8.71E+2	9.55E+3	3.11E+3
4973.8		3.29E+3	5.01E+3	9.46E+3	8.39E+2	9.75E+2	8.75E+2	8.45E+3	3.59E+3
5019.8		2.23E+4	7.19E+3	9.34E+3	4.28E+3	6.79E+3	4.67E+3	8.96E+3	5.81E+3
5065.8		1.78E+3	2.72E+3	5.79E+3	4.73E+2	5.34E+2	4.71E+2	5.69E+3	2.23E+3
5069.8		1.33E+3	2.49E+3	7.39E+3	4.93E+2	5.50E+2	4.85E+2	6.35E+3	1.89E+3
5073.8		1.26E+3	2.42E+3	7.87E+3	5.36E+2	6.00E+2	5.27E+2	7.02E+3	1.87E+3
5077.8		1.26E+3	2.57E+3	8.32E+3	4.77E+2	5.29E+2	4.74E+2	8.29E+3	2.08E+3
5079.8	A39	2.32E+3	4.41E+3	1.51E+4	1.09E+3	1.24E+3	1.08E+3	1.50E+4	3.55E+3
5081.8		1.56E+3	2.89E+3	8.23E+3	5.57E+2	6.26E+2	5.54E+2	8.36E+3	2.34E+3
5085.8		1.66E+3	2.75E+3	7.64E+3	6.61E+2	7.58E+2	6.50E+2	6.98E+3	2.14E+3
5089.8		1.88E+3	2.86E+3	7.09E+3	6.45E+2	7.40E+2	6.32E+2	6.28E+3	2.20E+3
5093.8		2.72E+3	3.02E+3	5.51E+3	6.53E+2	7.68E+2	6.49E+2	5.62E+3	2.57E+3
5139.8		2.17E+4	5.46E+3	7.15E+3	4.07E+3	6.82E+3	4.24E+3	7.91E+3	5.06E+3
5185.8		1.21E+3	2.30E+3	5.43E+3	3.50E+2	3.91E+2	3.54E+2	6.15E+3	1.80E+3
5189.8		8.97E+2	2.05E+3	7.04E+3	3.60E+2	3.97E+2	3.60E+2	7.05E+3	1.49E+3
5193.8		8.45E+2	2.00E+3	7.66E+3	3.87E+2	4.28E+2	3.88E+2	7.91E+3	1.46E+3
5197.8		8.43E+2	2.13E+3	8.08E+3	3.42E+2	3.75E+2	3.46E+2	9.27E+3	1.60E+3
5199.8	A40	1.46E+3	3.58E+3	1.52E+4	7.49E+2	8.30E+2	7.52E+2	1.75E+4	2.71E+3
5201.8		9.90E+2	2.39E+3	8.18E+3	3.91E+2	4.29E+2	3.94E+2	9.67E+3	1.82E+3
5205.8		1.05E+3	2.34E+3	7.74E+3	4.66E+2	5.19E+2	4.67E+2	8.34E+3	1.73E+3
5209.8		1.19E+3	2.49E+3	7.14E+3	4.60E+2	5.11E+2	4.60E+2	7.56E+3	1.84E+3
5213.8		1.73E+3	2.80E+3	5.57E+3	4.75E+2	5.37E+2	4.81E+2	6.75E+3	2.28E+3
5259.8		3.50E+4	4.82E+3	5.70E+3	6.10E+3	1.25E+4	7.46E+3	7.38E+3	5.25E+3
5305.9		1.41E+3	1.34E+3	2.25E+3	3.78E+2	4.49E+2	3.86E+2	2.82E+3	1.30E+3
5309.9		1.01E+3	1.25E+3	2.64E+3	3.76E+2	4.41E+2	3.78E+2	2.93E+3	1.10E+3
5313.9		9.22E+2	1.18E+3	2.65E+3	3.90E+2	4.60E+2	3.92E+2	3.00E+3	1.04E+3
5317.9		8.99E+2	1.20E+3	2.65E+3	3.38E+2	3.93E+2	3.44E+2	3.30E+3	1.11E+3
5319.9	A41	1.27E+3	1.72E+3	4.34E+3	5.98E+2	7.06E+2	6.02E+2	5.19E+3	1.57E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
5321.9		8.72E+2	1.14E+3	2.44E+3	3.20E+2	3.71E+2	3.24E+2	3.02E+3	1.07E+3
5325.9		9.28E+2	1.03E+3	2.10E+3	3.74E+2	4.47E+2	3.75E+2	2.38E+3	9.40E+2
5329.9		1.07E+3	1.01E+3	1.82E+3	3.69E+2	4.45E+2	3.69E+2	2.03E+3	9.27E+2
5333.9		1.57E+3	9.47E+2	1.37E+3	3.76E+2	4.73E+2	3.85E+2	1.71E+3	9.96E+2
5383.8		1.71E+5	5.52E+2	5.66E+2	2.89E+3	9.01E+4	4.00E+3	7.17E+2	6.91E+2
5393.8		5.23E+4	7.74E+2	8.25E+2	2.43E+3	2.91E+4	3.34E+3	9.78E+2	8.86E+2
5403.8		1.10E+4	6.99E+2	7.58E+2	1.14E+3	7.05E+3	1.44E+3	8.94E+2	7.66E+2
5413.8		3.69E+3	6.73E+2	7.08E+2	7.74E+2	2.96E+3	9.41E+2	8.59E+2	7.28E+2
5423.8		1.92E+3	7.70E+2	7.21E+2	7.25E+2	1.95E+3	8.58E+2	8.61E+2	7.91E+2
5433.8		1.21E+3	8.62E+2	6.24E+2	7.54E+2	1.63E+3	8.54E+2	7.00E+2	8.07E+2

Table F-2 Fatigue lives along the bridge girder. Normal stress is applied.

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
0.0	A1	4.41E+9	5.34E+8	5.34E+8	1.22E+8	1.22E+8	1.22E+8	5.26E+8	5.26E+8
6.0		7.40E+8	1.01E+8	8.79E+7	1.78E+7	1.78E+7	1.78E+7	8.66E+7	9.94E+7
16.0		3.80E+8	4.80E+7	3.23E+7	6.86E+6	6.86E+6	6.86E+6	3.22E+7	4.78E+7
26.0		1.85E+8	2.21E+7	1.22E+7	2.72E+6	2.72E+6	2.72E+6	1.23E+7	2.23E+7
36.0		1.25E+8	7.06E+6	3.72E+6	1.63E+6	1.43E+6	1.62E+6	4.41E+6	6.07E+6
46.0		1.13E+8	1.14E+6	5.76E+5	1.40E+6	9.55E+5	1.38E+6	9.77E+5	6.75E+5
56.0		1.09E+8	5.42E+5	2.66E+5	1.30E+6	7.93E+5	1.28E+6	5.01E+5	2.92E+5
73.0		7.73E+8	3.56E+6	1.76E+6	6.99E+6	3.45E+6	6.83E+6	3.27E+6	1.76E+6
77.0		7.91E+8	7.82E+6	3.84E+6	7.84E+6	3.80E+6	7.66E+6	6.79E+6	3.95E+6
81.0		7.72E+8	1.76E+7	8.62E+6	8.38E+6	4.03E+6	8.18E+6	1.39E+7	9.31E+6
85.0		7.49E+8	4.39E+7	2.13E+7	9.37E+6	4.44E+6	9.14E+6	2.98E+7	2.51E+7
89.0		7.65E+8	1.33E+8	6.36E+7	1.27E+7	5.75E+6	1.24E+7	7.36E+7	8.03E+7
125.0		9.40E+8	2.13E+8	1.00E+8	1.20E+7	5.56E+6	1.17E+7	1.11E+8	1.61E+8
161.0		1.45E+9	8.21E+7	3.99E+7	1.75E+7	7.82E+6	1.71E+7	5.79E+7	4.39E+7
165.0		1.36E+9	3.26E+8	1.55E+8	2.10E+7	9.16E+6	2.05E+7	1.82E+8	2.14E+8
169.0		1.24E+9	7.19E+8	3.39E+8	2.65E+7	1.12E+7	2.58E+7	3.60E+8	5.25E+8
173.0		1.15E+9	6.56E+8	3.15E+8	4.07E+7	1.59E+7	3.94E+7	4.17E+8	4.30E+8
208.6		1.93E+9	8.88E+8	4.23E+8	4.54E+7	1.89E+7	4.41E+7	5.37E+8	6.26E+8
253.0		6.14E+9	5.05E+8	2.44E+8	7.77E+7	3.30E+7	7.56E+7	3.75E+8	3.17E+8
257.0		6.17E+9	2.14E+9	1.02E+9	1.12E+8	4.47E+7	1.08E+8	1.44E+9	1.68E+9
261.0		4.35E+9	3.09E+9	1.49E+9	1.80E+8	6.67E+7	1.74E+8	2.26E+9	2.25E+9
265.0		2.33E+9	1.15E+9	5.64E+8	3.50E+8	1.18E+8	3.38E+8	9.67E+8	6.39E+8
304.1		5.52E+9	1.51E+10	7.34E+9	8.37E+8	2.85E+8	8.07E+8	1.32E+10	9.70E+9
353.0		4.20E+9	3.05E+9	1.48E+9	1.66E+9	6.69E+8	1.61E+9	2.60E+9	2.13E+9
357.0		1.94E+9	3.33E+9	1.60E+9	1.26E+9	5.97E+8	1.23E+9	2.15E+9	2.57E+9
361.0		9.74E+8	1.21E+9	5.77E+8	7.02E+8	3.97E+8	6.90E+8	6.67E+8	7.84E+8
365.0		4.76E+8	2.62E+8	1.26E+8	3.04E+8	2.04E+8	3.01E+8	1.56E+8	1.55E+8
404.1		4.98E+8	9.28E+8	4.34E+8	4.05E+8	2.76E+8	4.00E+8	5.51E+8	9.41E+8
453.0		2.36E+8	3.34E+8	1.57E+8	1.54E+8	1.11E+8	1.52E+8	1.73E+8	2.86E+8
457.0		1.29E+8	1.45E+8	6.82E+7	7.07E+7	5.47E+7	7.02E+7	7.18E+7	1.13E+8
461.0		6.96E+7	1.20E+7	5.87E+6	3.36E+7	2.74E+7	3.34E+7	1.15E+7	7.52E+6
465.0		3.25E+7	9.36E+5	4.64E+5	1.48E+7	1.27E+7	1.48E+7	1.09E+6	5.24E+5
504.1		3.37E+7	2.61E+7	1.23E+7	1.36E+7	1.10E+7	1.35E+7	1.46E+7	2.18E+7
553.0		1.99E+7	1.89E+7	8.77E+6	6.22E+6	4.90E+6	6.18E+6	8.13E+6	1.52E+7
557.0		1.21E+7	1.27E+7	5.88E+6	3.82E+6	3.10E+6	3.80E+6	4.42E+6	8.31E+6
561.0		8.03E+6	6.43E+6	3.02E+6	2.55E+6	2.12E+6	2.54E+6	2.32E+6	3.63E+6
565.0		5.30E+6	2.34E+6	1.12E+6	1.73E+6	1.46E+6	1.72E+6	1.09E+6	1.23E+6
569.0		3.38E+6	7.40E+5	3.60E+5	1.12E+6	9.67E+5	1.12E+6	4.52E+5	3.79E+5
606.3		3.68E+6	3.64E+6	1.68E+6	1.05E+6	8.77E+5	1.04E+6	1.16E+6	2.19E+6
653.0		2.65E+6	1.26E+6	5.96E+5	6.60E+5	5.50E+5	6.56E+5	6.35E+5	7.86E+5
657.0		1.80E+6	8.97E+5	4.26E+5	4.75E+5	4.04E+5	4.73E+5	4.20E+5	5.23E+5
661.0		1.26E+6	6.32E+5	3.01E+5	3.53E+5	3.05E+5	3.52E+5	2.81E+5	3.41E+5

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
665.0		8.91E+5	4.32E+5	2.06E+5	2.62E+5	2.30E+5	2.61E+5	1.85E+5	2.17E+5
669.0		6.38E+5	2.76E+5	1.32E+5	1.85E+5	1.64E+5	1.84E+5	1.18E+5	1.31E+5
710.0		7.09E+5	2.47E+5	1.19E+5	1.78E+5	1.56E+5	1.77E+5	1.24E+5	1.28E+5
719.0		7.29E+5	2.55E+5	1.23E+5	1.76E+5	1.53E+5	1.75E+5	1.28E+5	1.36E+5
745.9		7.97E+5	2.89E+5	1.38E+5	1.69E+5	1.45E+5	1.68E+5	1.43E+5	1.68E+5
749.9		8.10E+5	5.15E+5	2.44E+5	1.67E+5	1.43E+5	1.66E+5	2.26E+5	4.73E+5
753.9		8.23E+5	5.28E+5	2.47E+5	1.65E+5	1.41E+5	1.64E+5	2.37E+5	5.04E+5
757.9		8.46E+5	5.31E+5	2.47E+5	1.67E+5	1.71E+6	1.64E+5	2.44E+5	5.21E+5
759.9	A3	9.02E+3	7.01E+3	3.69E+3	3.13E+3	2.56E+4	3.11E+3	3.67E+3	6.96E+3
761.9		9.02E+3	7.02E+3	3.70E+3	3.14E+3	2.57E+4	3.12E+3	3.68E+3	6.97E+3
765.9		8.91E+3	6.97E+3	3.68E+3	3.12E+3	2.93E+3	3.11E+3	3.63E+3	6.85E+3
769.9		8.90E+3	6.83E+3	3.62E+3	3.12E+3	2.94E+3	3.12E+3	3.54E+3	6.62E+3
773.9		8.86E+3	4.71E+3	2.46E+3	3.14E+3	2.95E+3	3.13E+3	2.61E+3	3.27E+3
819.9		8.70E+3	4.46E+3	2.33E+3	3.16E+3	2.99E+3	3.15E+3	2.54E+3	3.08E+3
865.9		8.90E+3	5.12E+3	2.68E+3	3.13E+3	2.95E+3	3.13E+3	2.79E+3	3.78E+3
869.9		8.92E+3	6.84E+3	3.63E+3	3.12E+3	2.94E+3	3.12E+3	3.56E+3	6.68E+3
873.9		8.94E+3	6.96E+3	3.67E+3	3.11E+3	2.92E+3	3.10E+3	3.64E+3	6.88E+3
877.9		9.05E+3	7.01E+3	3.69E+3	3.13E+3	2.58E+4	3.11E+3	3.68E+3	6.97E+3
879.9	A4	8.68E+3	6.24E+3	3.14E+3	2.56E+3	2.42E+4	2.54E+3	3.14E+3	6.25E+3
881.9		8.70E+3	6.26E+3	3.15E+3	2.57E+3	2.43E+4	2.55E+3	3.15E+3	6.27E+3
885.9		8.58E+3	6.19E+3	3.12E+3	2.55E+3	2.36E+3	2.54E+3	3.13E+3	6.20E+3
889.9		8.57E+3	6.02E+3	3.06E+3	2.56E+3	2.37E+3	2.55E+3	3.07E+3	6.03E+3
893.9		8.56E+3	4.06E+3	2.05E+3	2.57E+3	2.39E+3	2.57E+3	2.32E+3	3.05E+3
939.9		8.38E+3	3.80E+3	1.92E+3	2.57E+3	2.39E+3	2.56E+3	2.21E+3	2.79E+3
985.9		8.55E+3	4.46E+3	2.25E+3	2.54E+3	2.35E+3	2.53E+3	2.39E+3	3.40E+3
989.9		8.57E+3	6.08E+3	3.08E+3	2.53E+3	2.34E+3	2.52E+3	3.03E+3	5.95E+3
993.9		8.58E+3	6.21E+3	3.13E+3	2.52E+3	2.33E+3	2.51E+3	3.10E+3	6.13E+3
997.9		8.70E+3	6.25E+3	3.14E+3	2.54E+3	2.38E+4	2.52E+3	3.13E+3	6.22E+3
999.9	A5	8.82E+3	6.20E+3	3.10E+3	2.48E+3	2.31E+4	2.45E+3	3.10E+3	6.19E+3
1001.9		8.83E+3	6.22E+3	3.11E+3	2.49E+3	2.33E+4	2.47E+3	3.10E+3	6.20E+3
1005.9		8.68E+3	6.16E+3	3.09E+3	2.47E+3	2.27E+3	2.46E+3	3.08E+3	6.12E+3
1009.9		8.67E+3	6.02E+3	3.04E+3	2.48E+3	2.28E+3	2.47E+3	3.01E+3	5.95E+3
1013.9		8.63E+3	4.23E+3	2.12E+3	2.49E+3	2.29E+3	2.48E+3	2.34E+3	3.24E+3
1059.9		8.44E+3	3.90E+3	1.96E+3	2.51E+3	2.32E+3	2.50E+3	2.24E+3	2.96E+3
1105.9		8.56E+3	4.43E+3	2.22E+3	2.49E+3	2.30E+3	2.49E+3	2.44E+3	3.57E+3
1109.9		8.56E+3	6.00E+3	3.03E+3	2.48E+3	2.29E+3	2.48E+3	3.03E+3	5.98E+3
1113.9		8.55E+3	6.13E+3	3.08E+3	2.47E+3	2.27E+3	2.46E+3	3.08E+3	6.13E+3
1117.9		8.65E+3	6.19E+3	3.10E+3	2.49E+3	2.33E+4	2.47E+3	3.10E+3	6.19E+3
1119.9	A6	8.84E+3	6.53E+3	3.18E+3	2.56E+3	2.63E+4	2.54E+3	3.14E+3	6.43E+3
1121.9		8.86E+3	6.55E+3	3.19E+3	2.58E+3	2.65E+4	2.55E+3	3.15E+3	6.45E+3
1125.9		8.74E+3	6.56E+3	3.19E+3	2.56E+3	2.36E+3	2.55E+3	3.10E+3	6.33E+3
1129.9		8.74E+3	6.47E+3	3.17E+3	2.57E+3	2.38E+3	2.56E+3	3.03E+3	6.13E+3
1133.9		8.72E+3	4.83E+3	2.36E+3	2.58E+3	2.39E+3	2.58E+3	2.46E+3	3.83E+3
1179.9		8.57E+3	4.48E+3	2.20E+3	2.58E+3	2.40E+3	2.58E+3	2.39E+3	3.60E+3

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
1225.9		8.80E+3	5.00E+3	2.45E+3	2.55E+3	2.36E+3	2.54E+3	2.58E+3	4.23E+3
1229.9		8.83E+3	6.41E+3	3.14E+3	2.54E+3	2.35E+3	2.54E+3	3.06E+3	6.20E+3
1233.9		8.84E+3	6.50E+3	3.17E+3	2.53E+3	2.33E+3	2.52E+3	3.12E+3	6.37E+3
1237.9		8.84E+3	6.52E+3	3.18E+3	2.52E+3	2.32E+3	2.51E+3	3.15E+3	6.46E+3
1239.9	A7	1.94E+4	1.35E+4	6.43E+3	4.97E+3	5.32E+4	4.92E+3	6.37E+3	1.34E+4
1241.9		1.92E+4	1.36E+4	6.45E+3	4.92E+3	4.47E+3	4.91E+3	6.40E+3	1.34E+4
1245.9		1.92E+4	1.36E+4	6.46E+3	4.95E+3	4.51E+3	4.94E+3	6.32E+3	1.32E+4
1249.9		1.92E+4	1.33E+4	6.40E+3	4.98E+3	4.53E+3	4.97E+3	6.19E+3	1.28E+4
1253.9		1.92E+4	9.48E+3	4.56E+3	5.01E+3	4.56E+3	4.99E+3	5.06E+3	8.11E+3
1299.9		1.87E+4	8.44E+3	4.08E+3	5.00E+3	4.57E+3	4.98E+3	4.69E+3	7.05E+3
1345.9		1.91E+4	9.54E+3	4.59E+3	4.95E+3	4.51E+3	4.93E+3	4.93E+3	7.99E+3
1349.9		1.91E+4	1.33E+4	6.37E+3	4.93E+3	4.49E+3	4.92E+3	6.07E+3	1.26E+4
1353.9		1.91E+4	1.35E+4	6.43E+3	4.91E+3	4.47E+3	4.90E+3	6.23E+3	1.30E+4
1357.9		1.91E+4	1.35E+4	6.42E+3	4.89E+3	4.45E+3	4.88E+3	6.34E+3	1.33E+4
1359.9	A8	2.24E+4	1.55E+4	7.36E+3	5.65E+3	6.00E+4	5.59E+3	7.25E+3	1.52E+4
1361.9		2.21E+4	1.55E+4	7.39E+3	5.60E+3	5.08E+3	5.58E+3	7.28E+3	1.53E+4
1365.9		2.22E+4	1.56E+4	7.43E+3	5.64E+3	5.12E+3	5.62E+3	7.17E+3	1.50E+4
1369.9		2.21E+4	1.54E+4	7.40E+3	5.67E+3	5.16E+3	5.65E+3	7.00E+3	1.45E+4
1373.9		2.15E+4	1.18E+4	5.68E+3	5.63E+3	5.08E+3	5.61E+3	5.76E+3	9.53E+3
1420.4		2.15E+4	1.06E+4	5.10E+3	5.73E+3	5.24E+3	5.72E+3	5.32E+3	8.16E+3
1465.9		2.18E+4	1.14E+4	5.50E+3	5.71E+3	5.21E+3	5.70E+3	5.59E+3	9.03E+3
1469.9		2.18E+4	1.54E+4	7.36E+3	5.70E+3	5.19E+3	5.68E+3	6.94E+3	1.43E+4
1473.9		2.18E+4	1.56E+4	7.41E+3	5.68E+3	5.17E+3	5.66E+3	7.14E+3	1.49E+4
1477.9		2.17E+4	1.55E+4	7.39E+3	5.65E+3	5.15E+3	5.64E+3	7.13E+3	1.49E+4
1479.9	A9	4.17E+4	2.96E+4	1.39E+4	1.05E+4	9.50E+3	1.05E+4	1.38E+4	2.93E+4
1481.9		4.19E+4	2.94E+4	1.39E+4	1.06E+4	9.57E+3	1.06E+4	1.36E+4	2.88E+4
1485.9		4.19E+4	2.95E+4	1.39E+4	1.06E+4	9.63E+3	1.06E+4	1.37E+4	2.89E+4
1489.9		4.18E+4	2.88E+4	1.37E+4	1.07E+4	9.68E+3	1.07E+4	1.33E+4	2.79E+4
1493.9		4.17E+4	2.05E+4	9.78E+3	1.07E+4	9.74E+3	1.07E+4	1.05E+4	1.61E+4
1539.9		4.11E+4	1.83E+4	8.76E+3	1.08E+4	9.82E+3	1.08E+4	9.71E+3	1.37E+4
1586.0		4.19E+4	1.99E+4	9.48E+3	1.08E+4	9.77E+3	1.07E+4	1.05E+4	1.58E+4
1590.0		4.19E+4	2.86E+4	1.36E+4	1.07E+4	9.73E+3	1.07E+4	1.35E+4	2.82E+4
1594.0		4.18E+4	2.93E+4	1.39E+4	1.07E+4	9.67E+3	1.06E+4	1.38E+4	2.91E+4
1598.0		4.16E+4	2.93E+4	1.38E+4	1.06E+4	9.60E+3	1.06E+4	1.37E+4	2.90E+4
1599.9	A10	5.87E+4	4.18E+4	1.96E+4	1.49E+4	1.34E+4	1.48E+4	1.97E+4	4.22E+4
1601.9		5.89E+4	4.09E+4	1.93E+4	1.50E+4	1.35E+4	1.49E+4	1.96E+4	4.18E+4
1605.9		5.89E+4	4.10E+4	1.93E+4	1.50E+4	1.36E+4	1.50E+4	1.97E+4	4.18E+4
1609.9		5.87E+4	3.92E+4	1.87E+4	1.51E+4	1.36E+4	1.51E+4	1.93E+4	4.05E+4
1613.9		5.85E+4	2.56E+4	1.22E+4	1.52E+4	1.37E+4	1.51E+4	1.47E+4	2.18E+4
1659.9		5.74E+4	2.29E+4	1.09E+4	1.54E+4	1.40E+4	1.54E+4	1.37E+4	1.85E+4
1705.9		5.82E+4	2.55E+4	1.21E+4	1.55E+4	1.40E+4	1.54E+4	1.50E+4	2.23E+4
1709.9		5.81E+4	3.91E+4	1.87E+4	1.54E+4	1.40E+4	1.53E+4	1.95E+4	4.10E+4
1713.9		5.80E+4	4.08E+4	1.93E+4	1.53E+4	1.39E+4	1.53E+4	1.98E+4	4.21E+4
1717.9		5.76E+4	4.07E+4	1.92E+4	1.52E+4	1.38E+4	1.52E+4	1.97E+4	4.20E+4

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
1719.9	A11	5.70E+4	4.08E+4	1.91E+4	1.45E+4	1.31E+4	1.45E+4	1.92E+4	4.11E+4
1721.9		5.72E+4	4.00E+4	1.88E+4	1.46E+4	1.32E+4	1.46E+4	1.91E+4	4.06E+4
1725.9		5.72E+4	4.01E+4	1.89E+4	1.47E+4	1.33E+4	1.46E+4	1.91E+4	4.07E+4
1729.9		5.71E+4	3.85E+4	1.83E+4	1.47E+4	1.33E+4	1.47E+4	1.87E+4	3.93E+4
1733.9		5.69E+4	2.52E+4	1.19E+4	1.48E+4	1.34E+4	1.48E+4	1.44E+4	2.18E+4
1779.9		5.61E+4	2.34E+4	1.11E+4	1.50E+4	1.36E+4	1.49E+4	1.37E+4	1.97E+4
1825.9		5.71E+4	2.67E+4	1.27E+4	1.51E+4	1.37E+4	1.50E+4	1.50E+4	2.39E+4
1829.9		5.70E+4	3.92E+4	1.86E+4	1.50E+4	1.36E+4	1.49E+4	1.88E+4	3.97E+4
1833.9		5.69E+4	4.06E+4	1.91E+4	1.49E+4	1.35E+4	1.49E+4	1.92E+4	4.08E+4
1837.9		5.66E+4	4.05E+4	1.90E+4	1.48E+4	1.34E+4	1.48E+4	1.91E+4	4.07E+4
1839.9	A12	1.06E+5	7.74E+4	3.61E+4	2.70E+4	2.42E+4	2.69E+4	3.58E+4	7.66E+4
1841.9		1.07E+5	7.59E+4	3.57E+4	2.72E+4	2.44E+4	2.71E+4	3.49E+4	7.39E+4
1845.9		1.07E+5	7.60E+4	3.58E+4	2.73E+4	2.45E+4	2.72E+4	3.49E+4	7.40E+4
1849.9		1.07E+5	7.18E+4	3.44E+4	2.74E+4	2.46E+4	2.73E+4	3.32E+4	6.90E+4
1853.9		1.06E+5	3.56E+4	1.70E+4	2.75E+4	2.47E+4	2.74E+4	2.08E+4	2.56E+4
1899.9		1.05E+5	3.63E+4	1.73E+4	2.77E+4	2.50E+4	2.76E+4	2.09E+4	2.59E+4
1945.9		1.06E+5	4.99E+4	2.36E+4	2.77E+4	2.49E+4	2.76E+4	2.56E+4	3.92E+4
1949.9		1.06E+5	7.47E+4	3.53E+4	2.76E+4	2.48E+4	2.75E+4	3.41E+4	7.15E+4
1953.9		1.06E+5	7.69E+4	3.60E+4	2.74E+4	2.46E+4	2.73E+4	3.51E+4	7.47E+4
1957.9		1.05E+5	7.66E+4	3.59E+4	2.72E+4	2.44E+4	2.71E+4	3.50E+4	7.44E+4
1959.9	A13	1.64E+5	1.26E+5	5.89E+4	4.54E+4	4.09E+4	4.53E+4	5.89E+4	1.26E+5
1961.9		1.65E+5	1.22E+5	5.74E+4	4.57E+4	4.12E+4	4.56E+4	5.75E+4	1.22E+5
1965.9		1.65E+5	1.22E+5	5.75E+4	4.59E+4	4.14E+4	4.57E+4	5.76E+4	1.22E+5
1969.9		1.65E+5	1.11E+5	5.40E+4	4.60E+4	4.16E+4	4.59E+4	5.45E+4	1.13E+5
1973.9		1.65E+5	4.05E+4	1.95E+4	4.62E+4	4.17E+4	4.60E+4	2.98E+4	3.11E+4
2019.9		1.64E+5	3.64E+4	1.75E+4	4.67E+4	4.23E+4	4.66E+4	2.77E+4	2.73E+4
2065.9		1.69E+5	5.87E+4	2.80E+4	4.65E+4	4.20E+4	4.64E+4	3.68E+4	4.78E+4
2069.9		1.69E+5	1.17E+5	5.62E+4	4.63E+4	4.17E+4	4.61E+4	5.58E+4	1.17E+5
2073.9		1.69E+5	1.25E+5	5.86E+4	4.59E+4	4.14E+4	4.58E+4	5.82E+4	1.24E+5
2077.9		1.67E+5	1.24E+5	5.84E+4	4.55E+4	4.09E+4	4.54E+4	5.80E+4	1.23E+5
2079.9	A14	1.73E+5	1.32E+5	6.13E+4	4.71E+4	4.24E+4	4.70E+4	6.16E+4	1.32E+5
2081.9		1.75E+5	1.26E+5	5.94E+4	4.75E+4	4.28E+4	4.73E+4	6.03E+4	1.28E+5
2085.9		1.76E+5	1.26E+5	5.95E+4	4.77E+4	4.30E+4	4.76E+4	6.05E+4	1.29E+5
2089.9		1.76E+5	1.13E+5	5.53E+4	4.79E+4	4.32E+4	4.77E+4	5.72E+4	1.18E+5
2093.9		1.76E+5	3.35E+4	1.62E+4	4.81E+4	4.34E+4	4.79E+4	2.69E+4	2.40E+4
2139.9		1.75E+5	2.79E+4	1.35E+4	4.80E+4	4.34E+4	4.79E+4	2.36E+4	1.94E+4
2185.9		1.80E+5	5.10E+4	2.44E+4	4.75E+4	4.27E+4	4.73E+4	3.52E+4	3.99E+4
2189.9		1.80E+5	1.18E+5	5.67E+4	4.73E+4	4.25E+4	4.71E+4	5.85E+4	1.22E+5
2193.9		1.80E+5	1.27E+5	5.99E+4	4.70E+4	4.22E+4	4.68E+4	6.10E+4	1.30E+5
2197.9		1.79E+5	1.27E+5	5.98E+4	4.66E+4	4.17E+4	4.65E+4	6.09E+4	1.30E+5
2199.9	A15	1.57E+5	1.14E+5	5.31E+4	3.94E+4	3.51E+4	3.92E+4	5.26E+4	1.13E+5
2201.9		1.59E+5	1.11E+5	5.20E+4	3.96E+4	3.54E+4	3.95E+4	5.09E+4	1.08E+5
2205.9		1.59E+5	1.11E+5	5.21E+4	3.98E+4	3.56E+4	3.97E+4	5.10E+4	1.08E+5
2209.9		1.59E+5	1.00E+5	4.86E+4	3.99E+4	3.57E+4	3.98E+4	4.77E+4	9.86E+4

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
2213.9		1.58E+5	2.59E+4	1.26E+4	4.01E+4	3.59E+4	3.99E+4	2.17E+4	1.88E+4
2259.9		1.57E+5	1.95E+4	9.51E+3	4.06E+4	3.65E+4	4.05E+4	1.80E+4	1.39E+4
2305.9		1.59E+5	3.90E+4	1.87E+4	4.06E+4	3.65E+4	4.05E+4	2.75E+4	2.93E+4
2309.9		1.59E+5	1.05E+5	5.03E+4	4.04E+4	3.63E+4	4.03E+4	4.88E+4	1.02E+5
2313.9		1.59E+5	1.13E+5	5.27E+4	4.02E+4	3.60E+4	4.00E+4	5.14E+4	1.10E+5
2317.9		1.57E+5	1.12E+5	5.25E+4	3.98E+4	3.56E+4	3.97E+4	5.13E+4	1.09E+5
2319.9	A16	1.97E+5	1.50E+5	6.98E+4	5.34E+4	4.79E+4	5.32E+4	6.96E+4	1.50E+5
2321.9		1.99E+5	1.42E+5	6.71E+4	5.38E+4	4.84E+4	5.36E+4	6.72E+4	1.42E+5
2325.9		1.99E+5	1.41E+5	6.70E+4	5.41E+4	4.87E+4	5.39E+4	6.72E+4	1.42E+5
2329.9		1.98E+5	1.21E+5	6.01E+4	5.43E+4	4.89E+4	5.41E+4	6.19E+4	1.26E+5
2333.9		1.97E+5	2.25E+4	1.09E+4	5.45E+4	4.92E+4	5.43E+4	2.23E+4	1.67E+4
2379.9		1.93E+5	1.52E+4	7.46E+3	5.52E+4	5.00E+4	5.50E+4	1.72E+4	1.14E+4
2425.9		1.95E+5	3.25E+4	1.57E+4	5.51E+4	4.98E+4	5.49E+4	2.92E+4	2.58E+4
2429.9		1.95E+5	1.25E+5	6.15E+4	5.49E+4	4.96E+4	5.47E+4	6.38E+4	1.32E+5
2433.9		1.95E+5	1.42E+5	6.71E+4	5.46E+4	4.93E+4	5.44E+4	6.80E+4	1.45E+5
2437.9		1.94E+5	1.42E+5	6.71E+4	5.41E+4	4.88E+4	5.40E+4	6.79E+4	1.44E+5
2439.9	A17	1.50E+5	1.12E+5	5.21E+4	3.95E+4	3.53E+4	3.93E+4	5.19E+4	1.11E+5
2441.9		1.51E+5	1.06E+5	5.03E+4	3.98E+4	3.57E+4	3.96E+4	5.01E+4	1.06E+5
2445.9		1.51E+5	1.06E+5	5.03E+4	4.00E+4	3.59E+4	3.99E+4	5.03E+4	1.06E+5
2449.9		1.51E+5	9.09E+4	4.53E+4	4.02E+4	3.61E+4	4.01E+4	4.64E+4	9.48E+4
2453.9		1.51E+5	1.73E+4	8.45E+3	4.04E+4	3.63E+4	4.03E+4	1.76E+4	1.35E+4
2499.9		1.47E+5	1.16E+4	5.66E+3	4.05E+4	3.66E+4	4.04E+4	1.34E+4	8.96E+3
2545.9		1.49E+5	2.49E+4	1.21E+4	4.03E+4	3.63E+4	4.01E+4	2.21E+4	1.98E+4
2549.9		1.49E+5	9.46E+4	4.63E+4	4.01E+4	3.61E+4	4.00E+4	4.71E+4	9.71E+4
2553.9		1.49E+5	1.07E+5	5.03E+4	3.99E+4	3.59E+4	3.98E+4	5.03E+4	1.07E+5
2557.9		1.48E+5	1.07E+5	5.03E+4	3.97E+4	3.57E+4	3.96E+4	5.02E+4	1.07E+5
2559.9	A18	1.40E+5	1.04E+5	4.85E+4	3.70E+4	3.33E+4	3.69E+4	4.85E+4	1.04E+5
2561.9		1.40E+5	9.86E+4	4.67E+4	3.73E+4	3.35E+4	3.71E+4	4.71E+4	9.98E+4
2565.9		1.40E+5	9.83E+4	4.67E+4	3.74E+4	3.37E+4	3.73E+4	4.72E+4	9.98E+4
2569.9		1.40E+5	8.48E+4	4.22E+4	3.76E+4	3.39E+4	3.74E+4	4.39E+4	8.97E+4
2573.9		1.39E+5	1.59E+4	7.77E+3	3.77E+4	3.40E+4	3.76E+4	1.63E+4	1.21E+4
2619.9		1.37E+5	1.01E+4	4.93E+3	3.81E+4	3.45E+4	3.80E+4	1.20E+4	7.65E+3
2665.9		1.40E+5	2.19E+4	1.07E+4	3.79E+4	3.43E+4	3.78E+4	2.01E+4	1.71E+4
2669.9		1.40E+5	8.84E+4	4.34E+4	3.78E+4	3.41E+4	3.77E+4	4.45E+4	9.15E+4
2673.9		1.39E+5	9.96E+4	4.71E+4	3.76E+4	3.39E+4	3.75E+4	4.72E+4	1.00E+5
2677.9		1.39E+5	9.96E+4	4.71E+4	3.73E+4	3.36E+4	3.72E+4	4.71E+4	9.98E+4
2679.9	A19	1.56E+5	1.18E+5	5.48E+4	4.19E+4	3.77E+4	4.17E+4	5.45E+4	1.17E+5
2681.9		1.57E+5	1.12E+5	5.31E+4	4.21E+4	3.79E+4	4.20E+4	5.27E+4	1.11E+5
2685.9		1.57E+5	1.12E+5	5.30E+4	4.23E+4	3.82E+4	4.22E+4	5.27E+4	1.11E+5
2689.9		1.57E+5	9.60E+4	4.79E+4	4.25E+4	3.83E+4	4.24E+4	4.88E+4	9.94E+4
2693.9		1.57E+5	1.62E+4	7.93E+3	4.27E+4	3.85E+4	4.25E+4	1.73E+4	1.25E+4
2739.9		1.55E+5	9.47E+3	4.66E+3	4.27E+4	3.86E+4	4.26E+4	1.19E+4	7.25E+3
2785.9		1.58E+5	2.09E+4	1.02E+4	4.23E+4	3.81E+4	4.22E+4	2.03E+4	1.61E+4
2789.9		1.58E+5	9.89E+4	4.89E+4	4.22E+4	3.79E+4	4.20E+4	4.92E+4	1.01E+5

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
2793.9		1.58E+5	1.13E+5	5.33E+4	4.19E+4	3.77E+4	4.18E+4	5.28E+4	1.12E+5
2797.9		1.57E+5	1.13E+5	5.33E+4	4.17E+4	3.74E+4	4.15E+4	5.27E+4	1.11E+5
2799.9	A20	1.64E+5	1.23E+5	5.75E+4	4.38E+4	3.93E+4	4.37E+4	5.74E+4	1.23E+5
2801.9		1.65E+5	1.16E+5	5.52E+4	4.41E+4	3.96E+4	4.39E+4	5.55E+4	1.17E+5
2805.9		1.65E+5	1.16E+5	5.51E+4	4.43E+4	3.98E+4	4.42E+4	5.56E+4	1.17E+5
2809.9		1.65E+5	9.79E+4	4.91E+4	4.45E+4	4.00E+4	4.43E+4	5.12E+4	1.04E+5
2813.9		1.64E+5	1.66E+4	8.09E+3	4.47E+4	4.02E+4	4.45E+4	1.79E+4	1.30E+4
2859.9		1.62E+5	9.20E+3	4.53E+3	4.49E+4	4.05E+4	4.47E+4	1.19E+4	7.23E+3
2905.9		1.64E+5	1.93E+4	9.38E+3	4.46E+4	4.01E+4	4.45E+4	1.99E+4	1.54E+4
2909.9		1.65E+5	9.93E+4	4.95E+4	4.44E+4	4.00E+4	4.43E+4	5.15E+4	1.05E+5
2913.9		1.65E+5	1.16E+5	5.52E+4	4.42E+4	3.97E+4	4.41E+4	5.56E+4	1.18E+5
2917.9		1.64E+5	1.17E+5	5.52E+4	4.40E+4	3.95E+4	4.38E+4	5.54E+4	1.17E+5
2919.9	A21	1.51E+5	1.15E+5	5.33E+4	4.13E+4	3.72E+4	4.12E+4	5.36E+4	1.15E+5
2921.9		1.51E+5	1.08E+5	5.12E+4	4.15E+4	3.75E+4	4.14E+4	5.21E+4	1.11E+5
2925.9		1.51E+5	1.08E+5	5.11E+4	4.18E+4	3.77E+4	4.16E+4	5.22E+4	1.11E+5
2929.9		1.51E+5	9.24E+4	4.59E+4	4.19E+4	3.79E+4	4.18E+4	4.85E+4	9.94E+4
2933.9		1.51E+5	1.86E+4	9.04E+3	4.21E+4	3.81E+4	4.20E+4	1.87E+4	1.46E+4
2979.9		1.48E+5	1.02E+4	4.98E+3	4.23E+4	3.83E+4	4.21E+4	1.22E+4	7.76E+3
3025.9		1.51E+5	1.96E+4	9.55E+3	4.20E+4	3.80E+4	4.19E+4	1.93E+4	1.53E+4
3029.9		1.51E+5	9.22E+4	4.58E+4	4.18E+4	3.78E+4	4.17E+4	4.84E+4	9.92E+4
3033.9		1.51E+5	1.07E+5	5.09E+4	4.16E+4	3.76E+4	4.15E+4	5.20E+4	1.10E+5
3037.9		1.51E+5	1.08E+5	5.10E+4	4.14E+4	3.74E+4	4.13E+4	5.19E+4	1.10E+5
3039.9	A22	1.64E+5	1.23E+5	5.74E+4	4.42E+4	3.98E+4	4.41E+4	5.75E+4	1.23E+5
3041.9		1.64E+5	1.17E+5	5.55E+4	4.45E+4	4.01E+4	4.43E+4	5.60E+4	1.19E+5
3045.9		1.65E+5	1.17E+5	5.55E+4	4.48E+4	4.04E+4	4.46E+4	5.62E+4	1.19E+5
3049.9		1.65E+5	1.03E+5	5.07E+4	4.50E+4	4.06E+4	4.48E+4	5.24E+4	1.08E+5
3053.9		1.65E+5	2.40E+4	1.16E+4	4.52E+4	4.08E+4	4.50E+4	2.22E+4	1.86E+4
3099.9		1.63E+5	1.28E+4	6.26E+3	4.47E+4	4.04E+4	4.46E+4	1.44E+4	9.62E+3
3145.9		1.66E+5	2.28E+4	1.11E+4	4.40E+4	3.95E+4	4.38E+4	2.14E+4	1.76E+4
3149.9		1.67E+5	1.01E+5	4.98E+4	4.39E+4	3.94E+4	4.37E+4	5.14E+4	1.05E+5
3153.9		1.67E+5	1.16E+5	5.50E+4	4.37E+4	3.92E+4	4.35E+4	5.54E+4	1.17E+5
3157.9		1.67E+5	1.16E+5	5.51E+4	4.35E+4	3.90E+4	4.33E+4	5.53E+4	1.17E+5
3159.9	A23	1.60E+5	1.16E+5	5.42E+4	4.07E+4	3.64E+4	4.05E+4	5.40E+4	1.16E+5
3161.9		1.61E+5	1.12E+5	5.29E+4	4.09E+4	3.66E+4	4.08E+4	5.27E+4	1.12E+5
3165.9		1.61E+5	1.12E+5	5.30E+4	4.11E+4	3.69E+4	4.10E+4	5.29E+4	1.12E+5
3169.9		1.61E+5	1.02E+5	4.95E+4	4.13E+4	3.70E+4	4.12E+4	5.00E+4	1.04E+5
3173.9		1.61E+5	3.16E+4	1.53E+4	4.15E+4	3.72E+4	4.13E+4	2.55E+4	2.46E+4
3219.9		1.58E+5	1.73E+4	8.46E+3	4.15E+4	3.72E+4	4.13E+4	1.74E+4	1.30E+4
3265.9		1.61E+5	2.75E+4	1.33E+4	4.11E+4	3.68E+4	4.10E+4	2.34E+4	2.12E+4
3269.9		1.61E+5	9.93E+4	4.86E+4	4.10E+4	3.66E+4	4.08E+4	4.92E+4	1.01E+5
3273.9		1.60E+5	1.11E+5	5.25E+4	4.07E+4	3.64E+4	4.06E+4	5.24E+4	1.11E+5
3277.9		1.60E+5	1.11E+5	5.24E+4	4.05E+4	3.62E+4	4.04E+4	5.23E+4	1.11E+5
3279.9	A24	1.64E+5	1.28E+5	5.94E+4	4.63E+4	4.19E+4	4.61E+4	5.89E+4	1.26E+5
3281.9		1.64E+5	1.24E+5	5.82E+4	4.65E+4	4.22E+4	4.64E+4	5.72E+4	1.22E+5

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
3285.9		1.64E+5	1.24E+5	5.82E+4	4.68E+4	4.24E+4	4.66E+4	5.74E+4	1.22E+5
3289.9		1.64E+5	1.14E+5	5.50E+4	4.70E+4	4.27E+4	4.68E+4	5.41E+4	1.12E+5
3293.9		1.63E+5	4.31E+4	2.07E+4	4.72E+4	4.29E+4	4.71E+4	2.99E+4	3.23E+4
3339.9		1.60E+5	2.51E+4	1.22E+4	4.74E+4	4.31E+4	4.72E+4	2.16E+4	1.80E+4
3385.8		1.62E+5	3.55E+4	1.71E+4	4.69E+4	4.26E+4	4.68E+4	2.71E+4	2.64E+4
3389.8		1.62E+5	1.09E+5	5.32E+4	4.68E+4	4.24E+4	4.66E+4	5.38E+4	1.11E+5
3393.8		1.62E+5	1.21E+5	5.72E+4	4.66E+4	4.22E+4	4.64E+4	5.73E+4	1.22E+5
3397.8		1.62E+5	1.21E+5	5.71E+4	4.63E+4	4.20E+4	4.62E+4	5.72E+4	1.21E+5
3399.8	A25	1.55E+5	1.22E+5	5.69E+4	4.49E+4	4.08E+4	4.48E+4	5.71E+4	1.22E+5
3401.8		1.56E+5	1.18E+5	5.55E+4	4.52E+4	4.11E+4	4.51E+4	5.60E+4	1.19E+5
3405.8		1.56E+5	1.18E+5	5.57E+4	4.56E+4	4.14E+4	4.54E+4	5.63E+4	1.20E+5
3409.8		1.56E+5	1.09E+5	5.26E+4	4.58E+4	4.17E+4	4.57E+4	5.37E+4	1.12E+5
3413.8		1.56E+5	4.89E+4	2.34E+4	4.61E+4	4.20E+4	4.60E+4	3.25E+4	3.91E+4
3459.8		1.53E+5	3.27E+4	1.58E+4	4.54E+4	4.14E+4	4.53E+4	2.49E+4	2.40E+4
3505.9		1.56E+5	4.24E+4	2.04E+4	4.45E+4	4.03E+4	4.44E+4	2.91E+4	3.21E+4
3509.9		1.57E+5	1.07E+5	5.16E+4	4.44E+4	4.02E+4	4.43E+4	5.19E+4	1.08E+5
3513.9		1.57E+5	1.17E+5	5.51E+4	4.42E+4	4.00E+4	4.41E+4	5.51E+4	1.17E+5
3517.9		1.57E+5	1.17E+5	5.51E+4	4.41E+4	3.98E+4	4.40E+4	5.50E+4	1.17E+5
3519.9	A26	1.13E+5	8.13E+4	3.79E+4	2.84E+4	2.54E+4	2.83E+4	3.80E+4	8.14E+4
3521.9		1.14E+5	7.97E+4	3.74E+4	2.85E+4	2.55E+4	2.84E+4	3.75E+4	7.99E+4
3525.9		1.14E+5	8.00E+4	3.76E+4	2.87E+4	2.57E+4	2.86E+4	3.77E+4	8.02E+4
3529.9		1.14E+5	7.62E+4	3.63E+4	2.89E+4	2.59E+4	2.88E+4	3.65E+4	7.67E+4
3533.9		1.14E+5	4.61E+4	2.19E+4	2.90E+4	2.60E+4	2.89E+4	2.63E+4	3.83E+4
3579.8		1.13E+5	3.46E+4	1.65E+4	2.89E+4	2.59E+4	2.88E+4	2.17E+4	2.61E+4
3625.8		1.15E+5	3.77E+4	1.80E+4	2.86E+4	2.56E+4	2.85E+4	2.27E+4	2.87E+4
3629.8		1.15E+5	7.46E+4	3.58E+4	2.85E+4	2.55E+4	2.84E+4	3.54E+4	7.36E+4
3633.8		1.15E+5	7.95E+4	3.74E+4	2.84E+4	2.53E+4	2.83E+4	3.71E+4	7.86E+4
3637.8		1.15E+5	7.94E+4	3.73E+4	2.82E+4	2.52E+4	2.81E+4	3.70E+4	7.85E+4
3639.8	A27	7.05E+4	5.26E+4	2.45E+4	1.91E+4	1.74E+4	1.90E+4	2.45E+4	5.24E+4
3641.8		7.06E+4	5.15E+4	2.42E+4	1.92E+4	1.75E+4	1.91E+4	2.40E+4	5.10E+4
3645.8		7.05E+4	5.16E+4	2.42E+4	1.93E+4	1.76E+4	1.92E+4	2.41E+4	5.11E+4
3649.8		7.04E+4	4.90E+4	2.34E+4	1.94E+4	1.76E+4	1.93E+4	2.31E+4	4.85E+4
3653.8		7.01E+4	3.01E+4	1.43E+4	1.94E+4	1.77E+4	1.94E+4	1.65E+4	2.41E+4
3699.8		6.83E+4	2.73E+4	1.30E+4	1.96E+4	1.79E+4	1.95E+4	1.54E+4	2.12E+4
3745.8		6.90E+4	3.14E+4	1.49E+4	1.95E+4	1.78E+4	1.95E+4	1.70E+4	2.56E+4
3749.8		6.90E+4	4.92E+4	2.34E+4	1.94E+4	1.78E+4	1.94E+4	2.32E+4	4.86E+4
3753.8		6.89E+4	5.14E+4	2.41E+4	1.93E+4	1.77E+4	1.93E+4	2.40E+4	5.10E+4
3757.8		6.88E+4	5.13E+4	2.41E+4	1.93E+4	1.76E+4	1.92E+4	2.39E+4	5.09E+4
3759.8	A28	6.38E+4	4.98E+4	2.34E+4	1.88E+4	1.73E+4	1.87E+4	2.33E+4	4.95E+4
3761.8		6.39E+4	4.85E+4	2.30E+4	1.89E+4	1.74E+4	1.88E+4	2.28E+4	4.80E+4
3765.8		6.40E+4	4.87E+4	2.30E+4	1.90E+4	1.75E+4	1.90E+4	2.28E+4	4.81E+4
3769.8		6.40E+4	4.57E+4	2.21E+4	1.91E+4	1.76E+4	1.91E+4	2.18E+4	4.50E+4
3773.8		6.39E+4	2.52E+4	1.20E+4	1.92E+4	1.77E+4	1.91E+4	1.44E+4	1.98E+4
3819.8		6.26E+4	2.35E+4	1.13E+4	1.90E+4	1.75E+4	1.90E+4	1.35E+4	1.79E+4

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
3865.8		6.39E+4	2.91E+4	1.39E+4	1.87E+4	1.72E+4	1.87E+4	1.56E+4	2.33E+4
3869.8		6.40E+4	4.64E+4	2.23E+4	1.87E+4	1.71E+4	1.86E+4	2.17E+4	4.52E+4
3873.8		6.42E+4	4.87E+4	2.30E+4	1.86E+4	1.71E+4	1.86E+4	2.27E+4	4.79E+4
3877.8		6.42E+4	4.87E+4	2.30E+4	1.86E+4	1.70E+4	1.85E+4	2.27E+4	4.79E+4
3879.8	A29	5.95E+4	4.44E+4	2.08E+4	1.63E+4	1.48E+4	1.62E+4	2.09E+4	4.44E+4
3881.8		5.98E+4	4.31E+4	2.04E+4	1.64E+4	1.49E+4	1.63E+4	2.04E+4	4.31E+4
3885.8		5.99E+4	4.32E+4	2.05E+4	1.65E+4	1.50E+4	1.64E+4	2.05E+4	4.33E+4
3889.8		6.00E+4	4.02E+4	1.95E+4	1.65E+4	1.51E+4	1.65E+4	1.96E+4	4.06E+4
3893.8		6.01E+4	2.02E+4	9.67E+3	1.66E+4	1.51E+4	1.66E+4	1.25E+4	1.60E+4
3939.8		5.97E+4	1.85E+4	8.91E+3	1.65E+4	1.50E+4	1.65E+4	1.19E+4	1.46E+4
3985.9		6.14E+4	2.41E+4	1.15E+4	1.63E+4	1.48E+4	1.62E+4	1.44E+4	2.08E+4
3989.9		6.16E+4	4.07E+4	1.96E+4	1.62E+4	1.47E+4	1.62E+4	2.00E+4	4.18E+4
3993.9		6.17E+4	4.32E+4	2.05E+4	1.62E+4	1.46E+4	1.61E+4	2.08E+4	4.39E+4
3997.9		6.17E+4	4.32E+4	2.04E+4	1.61E+4	1.45E+4	1.60E+4	2.07E+4	4.38E+4
3999.9	A30	1.07E+5	7.91E+4	3.70E+4	2.84E+4	2.56E+4	2.83E+4	3.70E+4	7.92E+4
4001.9		1.07E+5	7.56E+4	3.58E+4	2.85E+4	2.57E+4	2.84E+4	3.59E+4	7.58E+4
4005.9		1.07E+5	7.55E+4	3.58E+4	2.86E+4	2.58E+4	2.85E+4	3.59E+4	7.59E+4
4009.9		1.07E+5	6.79E+4	3.32E+4	2.87E+4	2.59E+4	2.86E+4	3.35E+4	6.89E+4
4013.9		1.07E+5	2.37E+4	1.15E+4	2.88E+4	2.61E+4	2.87E+4	1.70E+4	1.73E+4
4059.9		1.06E+5	2.25E+4	1.09E+4	2.91E+4	2.64E+4	2.90E+4	1.63E+4	1.62E+4
4105.9		1.08E+5	3.75E+4	1.79E+4	2.90E+4	2.62E+4	2.89E+4	2.28E+4	3.02E+4
4109.9		1.08E+5	7.24E+4	3.48E+4	2.88E+4	2.60E+4	2.87E+4	3.48E+4	7.26E+4
4113.9		1.08E+5	7.73E+4	3.64E+4	2.86E+4	2.59E+4	2.85E+4	3.64E+4	7.72E+4
4117.9		1.08E+5	7.72E+4	3.63E+4	2.84E+4	2.57E+4	2.84E+4	3.63E+4	7.70E+4
4119.9	A31	1.52E+5	1.18E+5	5.49E+4	4.37E+4	3.97E+4	4.35E+4	5.52E+4	1.19E+5
4121.9		1.52E+5	1.12E+5	5.30E+4	4.38E+4	3.99E+4	4.37E+4	5.37E+4	1.14E+5
4125.9		1.52E+5	1.12E+5	5.29E+4	4.40E+4	4.01E+4	4.39E+4	5.37E+4	1.14E+5
4129.9		1.52E+5	1.00E+5	4.88E+4	4.41E+4	4.02E+4	4.40E+4	5.01E+4	1.03E+5
4133.9		1.52E+5	3.35E+4	1.62E+4	4.43E+4	4.04E+4	4.41E+4	2.45E+4	2.46E+4
4179.9		1.51E+5	2.43E+4	1.18E+4	4.47E+4	4.08E+4	4.45E+4	1.91E+4	1.64E+4
4225.8		1.55E+5	3.84E+4	1.84E+4	4.43E+4	4.03E+4	4.41E+4	2.58E+4	2.77E+4
4229.8		1.55E+5	1.03E+5	5.01E+4	4.40E+4	4.00E+4	4.39E+4	4.97E+4	1.02E+5
4233.8		1.55E+5	1.14E+5	5.38E+4	4.37E+4	3.97E+4	4.36E+4	5.33E+4	1.13E+5
4237.8		1.54E+5	1.14E+5	5.37E+4	4.34E+4	3.94E+4	4.33E+4	5.31E+4	1.13E+5
4239.8	A32	1.52E+5	1.19E+5	5.53E+4	4.37E+4	3.97E+4	4.36E+4	5.51E+4	1.18E+5
4241.8		1.53E+5	1.14E+5	5.38E+4	4.39E+4	4.00E+4	4.38E+4	5.34E+4	1.13E+5
4245.8		1.53E+5	1.14E+5	5.39E+4	4.42E+4	4.03E+4	4.41E+4	5.35E+4	1.13E+5
4249.8		1.53E+5	1.04E+5	5.03E+4	4.44E+4	4.04E+4	4.42E+4	4.99E+4	1.03E+5
4253.8		1.53E+5	3.79E+4	1.82E+4	4.45E+4	4.06E+4	4.44E+4	2.58E+4	2.74E+4
4299.9		1.51E+5	2.59E+4	1.25E+4	4.43E+4	4.04E+4	4.41E+4	2.02E+4	1.79E+4
4345.9		1.54E+5	3.75E+4	1.80E+4	4.35E+4	3.95E+4	4.34E+4	2.61E+4	2.79E+4
4349.9		1.54E+5	1.01E+5	4.93E+4	4.34E+4	3.93E+4	4.33E+4	4.97E+4	1.02E+5
4353.9		1.54E+5	1.13E+5	5.32E+4	4.32E+4	3.91E+4	4.31E+4	5.32E+4	1.13E+5
4357.9		1.54E+5	1.13E+5	5.32E+4	4.30E+4	3.89E+4	4.28E+4	5.32E+4	1.13E+5

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
4359.9	A33	1.42E+5	1.05E+5	4.92E+4	3.77E+4	3.39E+4	3.76E+4	4.94E+4	1.06E+5
4361.9		1.42E+5	1.01E+5	4.79E+4	3.80E+4	3.42E+4	3.78E+4	4.83E+4	1.03E+5
4365.9		1.42E+5	1.02E+5	4.80E+4	3.82E+4	3.44E+4	3.80E+4	4.85E+4	1.03E+5
4369.9		1.42E+5	9.29E+4	4.50E+4	3.83E+4	3.45E+4	3.82E+4	4.59E+4	9.52E+4
4373.9		1.42E+5	3.90E+4	1.87E+4	3.85E+4	3.47E+4	3.83E+4	2.64E+4	3.02E+4
4419.9		1.40E+5	2.77E+4	1.34E+4	3.85E+4	3.47E+4	3.83E+4	2.14E+4	2.05E+4
4465.9		1.43E+5	3.79E+4	1.82E+4	3.80E+4	3.43E+4	3.79E+4	2.60E+4	2.96E+4
4469.9		1.43E+5	9.17E+4	4.45E+4	3.79E+4	3.41E+4	3.78E+4	4.54E+4	9.40E+4
4473.9		1.43E+5	1.01E+5	4.76E+4	3.77E+4	3.39E+4	3.76E+4	4.80E+4	1.02E+5
4477.9		1.43E+5	1.01E+5	4.76E+4	3.75E+4	3.36E+4	3.73E+4	4.79E+4	1.01E+5
4479.9	A34	1.28E+5	9.55E+4	4.46E+4	3.43E+4	3.10E+4	3.42E+4	4.45E+4	9.53E+4
4481.9		1.28E+5	9.23E+4	4.35E+4	3.45E+4	3.12E+4	3.43E+4	4.34E+4	9.19E+4
4485.9		1.28E+5	9.21E+4	4.35E+4	3.46E+4	3.13E+4	3.45E+4	4.34E+4	9.19E+4
4489.9		1.28E+5	8.53E+4	4.11E+4	3.47E+4	3.14E+4	3.46E+4	4.11E+4	8.54E+4
4493.9		1.27E+5	4.03E+4	1.93E+4	3.48E+4	3.15E+4	3.47E+4	2.52E+4	3.11E+4
4539.8		1.25E+5	3.05E+4	1.47E+4	3.55E+4	3.24E+4	3.54E+4	2.16E+4	2.27E+4
4585.8		1.27E+5	3.93E+4	1.88E+4	3.56E+4	3.25E+4	3.55E+4	2.52E+4	3.06E+4
4589.8		1.26E+5	8.52E+4	4.12E+4	3.55E+4	3.23E+4	3.54E+4	4.14E+4	8.58E+4
4593.8		1.26E+5	9.21E+4	4.35E+4	3.52E+4	3.21E+4	3.51E+4	4.35E+4	9.22E+4
4597.8		1.25E+5	9.19E+4	4.34E+4	3.50E+4	3.18E+4	3.49E+4	4.33E+4	9.17E+4
4599.8	A35	1.13E+5	9.17E+4	4.27E+4	3.47E+4	3.20E+4	3.47E+4	4.23E+4	9.07E+4
4601.8		1.13E+5	8.90E+4	4.18E+4	3.49E+4	3.22E+4	3.48E+4	4.10E+4	8.69E+4
4605.8		1.12E+5	8.87E+4	4.17E+4	3.50E+4	3.24E+4	3.49E+4	4.09E+4	8.68E+4
4609.8		1.12E+5	8.25E+4	3.96E+4	3.51E+4	3.25E+4	3.50E+4	3.86E+4	8.01E+4
4613.8		1.11E+5	4.04E+4	1.93E+4	3.52E+4	3.26E+4	3.51E+4	2.36E+4	2.99E+4
4659.8		1.10E+5	3.24E+4	1.56E+4	3.60E+4	3.35E+4	3.59E+4	2.09E+4	2.35E+4
4705.8		1.12E+5	4.11E+4	1.96E+4	3.60E+4	3.34E+4	3.59E+4	2.42E+4	3.09E+4
4709.8		1.12E+5	8.30E+4	3.99E+4	3.59E+4	3.33E+4	3.58E+4	3.91E+4	8.13E+4
4713.8		1.11E+5	8.91E+4	4.19E+4	3.57E+4	3.31E+4	3.56E+4	4.13E+4	8.77E+4
4717.8		1.10E+5	8.89E+4	4.18E+4	3.54E+4	3.28E+4	3.53E+4	4.12E+4	8.74E+4
4719.8	A36	1.32E+5	1.17E+5	5.43E+4	4.70E+4	4.40E+4	4.69E+4	5.48E+4	1.18E+5
4721.8		1.32E+5	1.11E+5	5.24E+4	4.74E+4	4.44E+4	4.73E+4	5.36E+4	1.14E+5
4725.8		1.32E+5	1.11E+5	5.24E+4	4.77E+4	4.47E+4	4.76E+4	5.38E+4	1.14E+5
4729.8		1.32E+5	1.00E+5	4.87E+4	4.79E+4	4.50E+4	4.78E+4	5.10E+4	1.06E+5
4733.8		1.32E+5	4.27E+4	2.04E+4	4.82E+4	4.53E+4	4.81E+4	2.97E+4	3.51E+4
4779.8		1.31E+5	3.46E+4	1.66E+4	4.73E+4	4.43E+4	4.72E+4	2.60E+4	2.77E+4
4825.8		1.35E+5	4.56E+4	2.18E+4	4.60E+4	4.26E+4	4.59E+4	3.00E+4	3.71E+4
4829.8		1.36E+5	1.01E+5	4.87E+4	4.59E+4	4.25E+4	4.58E+4	5.02E+4	1.04E+5
4833.8		1.36E+5	1.11E+5	5.24E+4	4.58E+4	4.24E+4	4.57E+4	5.32E+4	1.13E+5
4837.8		1.36E+5	1.11E+5	5.25E+4	4.56E+4	4.21E+4	4.55E+4	5.32E+4	1.13E+5
4839.8	A37	1.62E+5	1.25E+5	5.83E+4	4.41E+4	3.92E+4	4.39E+4	5.85E+4	1.25E+5
4841.8		1.64E+5	1.19E+5	5.65E+4	4.46E+4	3.98E+4	4.44E+4	5.71E+4	1.21E+5
4845.8		1.65E+5	1.20E+5	5.68E+4	4.50E+4	4.02E+4	4.49E+4	5.75E+4	1.22E+5
4849.8		1.66E+5	1.08E+5	5.28E+4	4.53E+4	4.04E+4	4.52E+4	5.41E+4	1.12E+5

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
4853.8		1.66E+5	4.17E+4	2.00E+4	4.56E+4	4.07E+4	4.55E+4	2.98E+4	3.35E+4
4899.8		1.66E+5	3.51E+4	1.69E+4	4.42E+4	3.94E+4	4.41E+4	2.58E+4	2.68E+4
4945.8		1.72E+5	4.92E+4	2.35E+4	4.30E+4	3.82E+4	4.29E+4	3.02E+4	3.71E+4
4949.8		1.73E+5	1.10E+5	5.30E+4	4.29E+4	3.81E+4	4.28E+4	5.21E+4	1.08E+5
4953.8		1.74E+5	1.20E+5	5.67E+4	4.28E+4	3.79E+4	4.27E+4	5.59E+4	1.18E+5
4957.8		1.74E+5	1.20E+5	5.68E+4	4.26E+4	3.76E+4	4.24E+4	5.59E+4	1.18E+5
4959.8	A38	1.47E+5	9.75E+4	4.53E+4	3.22E+4	2.83E+4	3.21E+4	4.55E+4	9.79E+4
4961.8		1.48E+5	9.29E+4	4.37E+4	3.24E+4	2.85E+4	3.23E+4	4.42E+4	9.40E+4
4965.8		1.48E+5	9.28E+4	4.37E+4	3.25E+4	2.86E+4	3.24E+4	4.42E+4	9.41E+4
4969.8		1.48E+5	8.34E+4	4.05E+4	3.26E+4	2.88E+4	3.25E+4	4.15E+4	8.60E+4
4973.8		1.48E+5	3.18E+4	1.52E+4	3.28E+4	2.90E+4	3.27E+4	2.26E+4	2.50E+4
5019.8		1.45E+5	2.74E+4	1.32E+4	3.39E+4	3.02E+4	3.37E+4	2.03E+4	2.08E+4
5065.8		1.45E+5	4.06E+4	1.93E+4	3.44E+4	3.07E+4	3.43E+4	2.52E+4	3.16E+4
5069.8		1.44E+5	8.73E+4	4.20E+4	3.42E+4	3.06E+4	3.41E+4	4.20E+4	8.73E+4
5073.8		1.43E+5	9.47E+4	4.45E+4	3.40E+4	3.04E+4	3.39E+4	4.43E+4	9.44E+4
5077.8		1.41E+5	9.43E+4	4.43E+4	3.37E+4	3.00E+4	3.35E+4	4.41E+4	9.39E+4
5079.8	A39	2.00E+5	1.54E+5	7.14E+4	5.62E+4	5.11E+4	5.61E+4	7.12E+4	1.53E+5
5081.8		2.00E+5	1.45E+5	6.82E+4	5.65E+4	5.15E+4	5.63E+4	6.80E+4	1.44E+5
5085.8		1.98E+5	1.43E+5	6.77E+4	5.65E+4	5.16E+4	5.64E+4	6.77E+4	1.43E+5
5089.8		1.96E+5	1.25E+5	6.13E+4	5.66E+4	5.18E+4	5.64E+4	6.18E+4	1.26E+5
5093.8		1.93E+5	3.42E+4	1.65E+4	5.68E+4	5.20E+4	5.66E+4	2.65E+4	2.43E+4
5139.8		1.85E+5	2.75E+4	1.33E+4	5.99E+4	5.52E+4	5.98E+4	2.36E+4	1.96E+4
5185.8		1.79E+5	4.81E+4	2.30E+4	6.12E+4	5.62E+4	6.10E+4	3.53E+4	3.82E+4
5189.8		1.78E+5	1.31E+5	6.38E+4	6.08E+4	5.59E+4	6.06E+4	6.65E+4	1.38E+5
5193.8		1.76E+5	1.46E+5	6.90E+4	6.03E+4	5.53E+4	6.01E+4	7.06E+4	1.50E+5
5197.8		1.73E+5	1.46E+5	6.86E+4	5.96E+4	5.46E+4	5.95E+4	7.02E+4	1.50E+5
5199.8	A40	4.03E+5	3.82E+5	1.79E+5	1.39E+5	1.22E+5	1.39E+5	1.80E+5	3.84E+5
5201.8		4.07E+5	3.47E+5	1.67E+5	1.41E+5	1.24E+5	1.41E+5	1.71E+5	3.57E+5
5205.8		4.04E+5	3.46E+5	1.67E+5	1.43E+5	1.26E+5	1.43E+5	1.72E+5	3.59E+5
5209.8		4.00E+5	2.75E+5	1.42E+5	1.44E+5	1.27E+5	1.44E+5	1.53E+5	3.03E+5
5213.8		3.94E+5	4.21E+4	2.06E+4	1.46E+5	1.29E+5	1.45E+5	4.50E+4	3.18E+4
5259.8		3.32E+5	2.83E+4	1.39E+4	1.44E+5	1.28E+5	1.44E+5	3.42E+4	2.13E+4
5305.9		3.01E+5	5.89E+4	2.88E+4	1.42E+5	1.26E+5	1.42E+5	5.80E+4	4.74E+4
5309.9		3.03E+5	2.71E+5	1.37E+5	1.42E+5	1.25E+5	1.42E+5	1.50E+5	3.03E+5
5313.9		3.06E+5	3.27E+5	1.57E+5	1.42E+5	1.25E+5	1.41E+5	1.66E+5	3.47E+5
5317.9		3.07E+5	3.29E+5	1.58E+5	1.41E+5	1.24E+5	1.41E+5	1.66E+5	3.49E+5
5319.9	A41	4.61E+4	3.24E+4	1.54E+4	1.06E+4	9.08E+3	1.05E+4	1.54E+4	3.24E+4
5321.9		4.62E+4	3.12E+4	1.50E+4	1.06E+4	9.08E+3	1.05E+4	1.51E+4	3.14E+4
5325.9		4.62E+4	3.10E+4	1.50E+4	1.06E+4	9.08E+3	1.05E+4	1.51E+4	3.13E+4
5329.9		4.62E+4	2.84E+4	1.40E+4	1.06E+4	9.08E+3	1.05E+4	1.42E+4	2.89E+4
5333.9		4.61E+4	1.23E+4	5.98E+3	1.06E+4	9.08E+3	1.05E+4	8.21E+3	9.75E+3
5383.8		4.30E+4	5.98E+3	2.97E+3	1.09E+4	9.48E+3	1.09E+4	4.86E+3	4.21E+3
5393.8		4.52E+4	9.79E+3	4.91E+3	1.17E+4	1.05E+4	1.17E+4	7.15E+3	7.61E+3
5403.8		5.17E+4	2.69E+4	1.34E+4	1.34E+4	1.29E+4	1.34E+4	1.49E+4	2.61E+4

Position	Axis	Point 0	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7
5413.8		7.43E+4	5.15E+4	2.76E+4	2.10E+4	2.10E+4	2.10E+4	2.81E+4	5.27E+4
5423.8		1.43E+5	9.95E+4	6.56E+4	4.87E+4	4.87E+4	4.87E+4	6.68E+4	1.02E+5
5433.8		2.79E+5	1.95E+5	1.69E+5	1.22E+5	1.22E+5	1.22E+5	1.72E+5	1.99E+5

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