Base Load Power Hub (BLPH)

BLPH Platform Topside Transportation Fatigue Analysis

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Attachment B – P-MAK barge RAO
Attachment C – Wireframe schemes

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

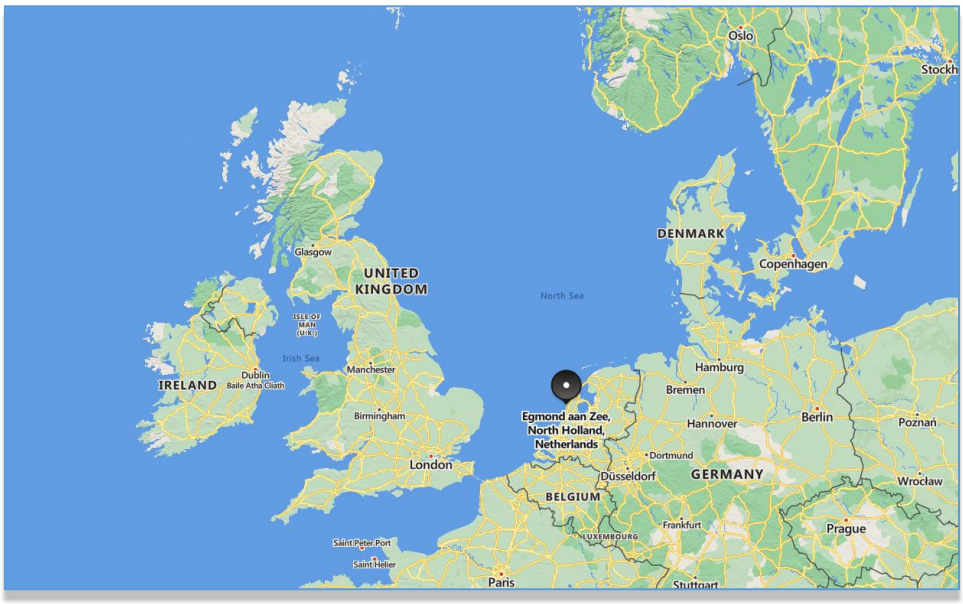


Figure 1.1 - HOLLANDSE KUST NOORD WIND PARK Location Map

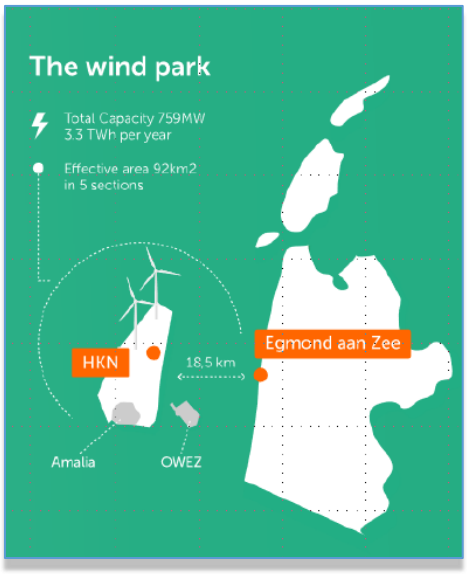


Figure 1.2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

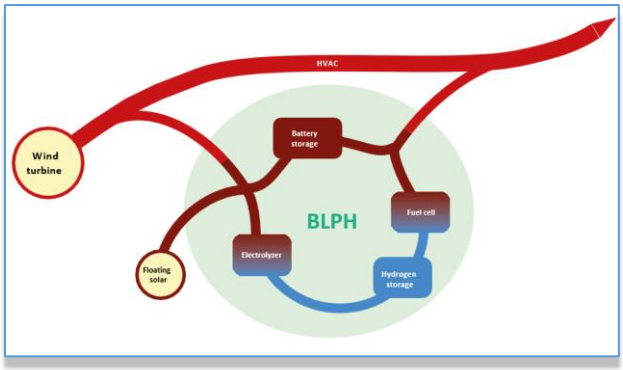


Figure 1.3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

The purpose of this report is to present the results of the fatigue analysis of BLPH topside for the transportation from the Fabrication yard in Ravenna to the installation site.

Scope of the analysis is to check that the joints of primary structure are capable of withstanding the fatigue loads occurring during the sea-transportation in accordance with the design requirements, criteria and parameters reported int Structural Design Premises, Ref./25/.

The structural fatigue analysis is performed in accordance with DNV code /13/.

The structural check of topside during transportation is presented in Ref./27/. The structural check of grillage and seafastening are reported in Ref./37/.

All structural analyses have been carried out using the structural analysis program SACS, the proprietary software developed by Bentley, Ref/38/. Barge RAO's are presented in Appendix C and were calculated using /39/.

The international system of unit (SI) is used in all engineering assessment and calculations.

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3 CODES, STANDARDS AND REFERENCES

3.1 CODES AND STANDARDS

Doc. No.	Description
/1/ BS EN ISO 19900	General requirements for offshore structures - 2019
/2/ BS EN ISO 19901-1	Specific requirements for offshore structures - Part 1: Metocean design and operating considerations - 2015
/3/ BS EN ISO 19901-3	Specific requirements for offshore structures – Part 3: Topsides structure - 2014
/4/ BS EN ISO 19901-5	Specific requirements for offshore structures – Part 5: Weight Management - 2021
/5/ BS EN ISO 19901-6	Specific requirements for offshore structures – Part 6: Marine Operations – 2009
/6/ BS EN ISO 19902	Petroleum and natural gas industries - Fixed steel offshore structures – 2020
/7/ ISO 19906:2019	Petroleum and natural gas industries — Arctic offshore structures
/8/ UNI EN 1993-1-1	Design of steel structures - Part 1-1: General rules and rules for buildings
/9/ UNI EN 1993-1-5	Design of Steel Structures – Part 1-5: Plated structural elements
/10/ DNV-ST-N001	DNV - Marine operation and marine warranty - 2021
/11/ DNV-ST-0145	DNV, Offshore substations
/12/ DNV-RP-C201	DNV, Buckling Strength of Plated Structures, October 2010.
/13/ DNV-RP-C203	DNV, Fatigue design of offshore steel structures, September 2019 and Amendment January 2020
/14/ DNV-RP-C204	DNV-RP-C204 Design against accidental loads – 2019
/15/ DNV-RP-C205	DNV - Environmental conditions and environmental loads - September 2019, amended September 2021.
/16/ DNV-ST-0126	Support structures for wind turbine, 2018
/17/ DNV-OS-H101	Marine operations, General, Appendix A, 2011

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3.2 COMPANY SPECIFICATIONS

Doc. No.	Description
/18/ DEP 37.19.00.12	Gen - Offshore Topsides Structures
/19/ DEP 37.19.00.30	Gen - Fixed Steel Offshore Structures (Adoption of IOGP S-631-11, Amendments / Supplements to ISO 19902:2020).
/20/ DEP 37.81.10.19	Gen - Marine Operations Requirements – Loadout, Transportation and Installation of Offshore Structures (Amendments / Supplements to ISO 19901-6)

3.3 PROJECT DOCUMENTS

Doc. No.	Description
/21/ 123A90-DDL-ST-SP-90017	Structural Design Basis
/22/ 123A90-DDL-MD-RE-01006	Weight Control Report – Rev. 03
/23/ 123A90-DDL-PP-DS-70070	BLPH Platform - Plot Plans
/24/ 123A90-DDL-ST-SP-90018	Structural Material Specification for Topside and TP
/25/ 123A90-DDL-ST-RE-90000	BLPH Platform – In service Analysis
/26/ 123A90-DDL-ST-RE-90001	BLPH Platform - Load-out Analysis
/27/ 123A90-DDL-ST-RE-90002	BLPH Platform – Transportation Analysis
/28/ 123A90-DDL-ST-RE-90005	BLPH Platform – Topside Joint Check Design Report
/29/ 123A90-DDL-TI-SP-99014	Specification for TP, Topside and Caissons Transportation and Installation
/30/ 123A90-DDL-ST-TN-90119	Evaluating ISO and DNV Approaches
/31/ 123A90-DDL-TI-DD-99015	BLPH Platform – Barge Layout
/32/ 123A90-DDL-ST-DD-90021	TOPSIDE – BLPH GRILLAGE - ASSEMBLY
/33/ 123A90-DDL-ST-DD-90022	TOPSIDE - BLPH LOWER GRILLAGE
/34/ 123A90-DDL-ST-DD-90023	TOPSIDE - BLPH LOWER GRILLAGE
/35/ 123A90-DDL-ST-DD-90024	TOPSIDE - BLPH LOWER GRILLAGE
/36/ 123A90-DDL-ST-DD-90025	TOPSIDE - SEA FASTENING DRAWINGS
/37/ 123A90-DDL-ST-RE-99001	TOPSIDE – GRILLAGE & SEAFASTENING DESIGN REPORT

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3.4 SOFTWARE

Doc. No.	Description
/38/ SACS	Structural Analysis Computer System – BENTLEY Inc- v15
/39/ MOSES	Advanced Hydrostatic and Hydrodynamic Simulation Software – BENTLEY Inc. v.12

3.5 REFERENCE DOCUMENTS

Doc. No.	Description
/40/ DK-TYYY-TNI-RPT-000-10002_B	Meteocean data for Tyra field development, 15/06/2018
/41/ 123A90-PML-PM-TQ-00046	Advanced Hydrostatic and Hydrodynamic Simulation Software – BENTLEY Inc. v.12

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4 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY)	Crosswind
CONTRACTOR (CTR)	ROSETTI MARINO S.p.A.
PROJECT	HOLLANDSE KUST NOORD WIND PARK Project
T&I CONTRACTOR	DEME
ALS	Accidental Limit State
NA	Not applicable
BLPH	Base Load Power Hub
COG	Centre of Gravity
DAF	Dynamic Amplification Factor
EL	Elevation
HLV	Heavy Lift Vessel
LAT	Lower Astronomical Tide
MBL	Minimum breaking load
MRP	Motion Reference Point
MP	Monopile
MWS	Marine Warranty surveyor
OD	Outside Diameter
SOW	Scope of Work
T	Metric tons
TOS	Top of sSteel
THK	Thickness
RAO	Response Amplitude Operator
SCF	Stress Concentration Factor
DFF	Design Fatigue Factor
TPR	Towline Pull Requirement
WT	Wall Thickness
WLL	Work Limit Load
WTW	Walk to work Platform

Table 4.1 - Definitions and Abbreviations

5 SUMMARY AND CONCLUSIONS

A brief summary of the analysis performed is given below:

- The topside will be transported horizontally on the barge P-MAK together with Transition Piece and caisson frame, as shown in section 11. It will be supported such as to minimize the effect of the barge displacement on the item and its supports. Therefore, the barge flexibility is neglected.
- The expected tow duration is about 30 days with departure date planned in mid-May 2025. Therefore 3 months have been assumed as possible windows. the planned tow route is given in section 9.
- The analyses are based on the RAOs derived from Naval simulation for the defined ballast plan of the topside and TP transport on the barge P-MAK. Ref. Appendix C
- The software SACS™, ref./38/, is used for all global analyses of the structure. Structural model of the Topside is the same used for transportation analysis, ref. /27/ with the loads coming from in service analysis, Ref. /25/.
- Wave criteria (Hs,Tp) have been derived for the way points along the tow route from Ravenna to site using data from the Fugro report, Ref./40/, are used in the spectral fatigue analysis to generate wave loads and resulting member stresses;
- JONSWAP wave spectrum with γ=3.3 has been adopted to obtain the spectral densities.
- Efthymiou's parametric formulae (Efthymiou 1988) have been used for calculation of all unstiffened tubular joint SCFs; reduced Efthymiou SCFs for single-sided welds have been calculated in compliance with the DNV standard Ref. /13/.
- SCFs of girth welds have been calculated in accordance with Ref. /13/;
- S-N curves are listed in Section 10.2;
- DFF is applied to all main structural joints in transportation, see Section 10.1.

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5.1 WEIGHT RESULTANTS

The topside weight considered in the analysis is presented here below and then it is compared with the weight defined in the WCR, ref. /22/. COG location comparison between SACS structural model for Transportation Analysis and WCR is reported in following tables.

- The topside weight transportation was 1850 ton according to WCR rev.2 dated 06/05/2024 and decreased to 1802 ton in rev. 03, dated 23/07/2024.

SACS-WCR – Weight Comparison		
Load Comb.	**Fz [kN]**	**Fz [t]**
SACS (lcomb TWTR)	-18540	-1890
WCR	-17678	-1802
Δ	862	88
Δ (%)	+4.8%	

COG NOMINAL POSITION			
CASE	**x [m]**	**y [m]**	**z [m]**
COG_SACS (lcomb TWTR)	0.02	0.00	8.41
COG_WCR	-0.10	-0.30	8.50
Δ	-0.08	-0.30	-0.09
Topside Main Dimension	16.00	40.00	17.66
Δ (%)	0.5%	0.8%	0.5%

Table 5.1 – SACS-WCR CoG comparison in SACS ref. system (ref to section 9.1)

BLPH - TOPSIDE (NO LIVE LOAD AND SNOW) - Summary by Phase

Phase Code	Phase Description	Base Wt. (t)	Center of Gravity			Factored Wt. (t)	Center of Gravity			Design Net Wt. (t)	Center of Gravity			Design Gross (Expected) Wt. (t)	Center of Gravity		
			Northing (m)	Easting (m)	Elevation (m)		Northing (m)	Easting (m)	Elevation (m)		Northing (m)	Easting (m)	Elevation (m)		Northing (m)	Easting (m)	Elevation (m)
LO	Loadout	1612	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3
ST	Sea Transport	1612	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3
OP	Operating weight (Dry + Contents)	1655	19,6	8,0	29,3	1851	19,6	8,0	29,3	1851	19,6	8,0	29,3	1851	19,6	8,0	29,3
L	Lifting	1612	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3	1802	19,7	7,9	29,3

Table 5.2 – WCR weight and CoG during Transportation. X measured towards NORTH, Y measured towards EAST from C1 (WCR ref. system)

5.2 FATIGUE ANALYSIS RESULTS

The results of the fatigue analysis of BLPH topside for the transportation from the fabrication yard in Ravenna to the installation site show that the topside main joints are capable of withstanding the fatigue loads occurring during the sea transportation.

The maximum fatigue damages are reported in the following sections.

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5.2.1 Tubular Joints

S-N = F3

SCF = Efthymiou

DFF = 2.0

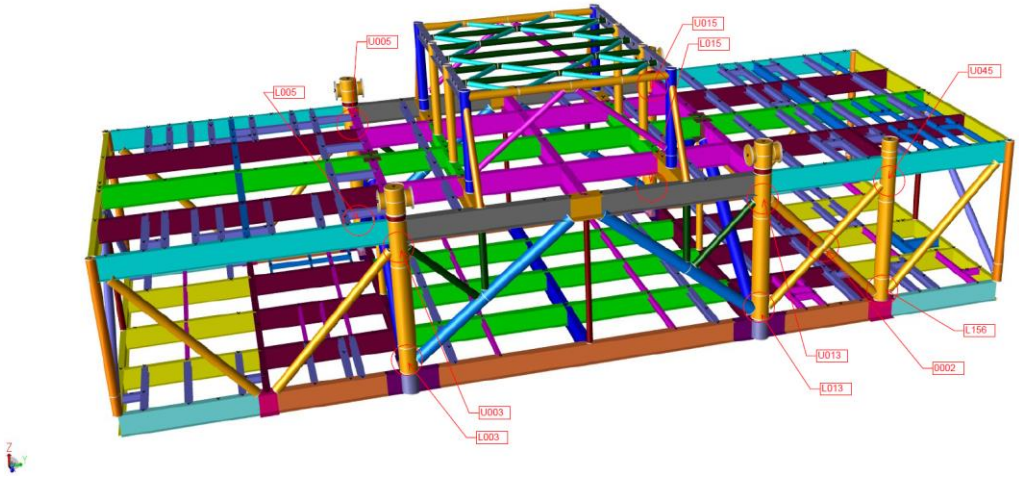


Figure 5.1 – Analyzed Tubular Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	* STRESS CONC. FACTORS * AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
L005	L005-D003	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.1194139	T	.6883618		
L005	L005-U005	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.1713537	T	.4797095		
L003	L003-D005	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.1102727	T	.7454246		
L003	L003-U003	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.1584018	T	.5189334		
L015	L015-D004	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.0523867	T	1.569099		
L015	L015-U015	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.0759067	T	1.082908		

Table 5.3 – Fatigue Damage – Tubular Joints Summary

Using DFF = 3.0 the maximum damage results: 0.17/2.0*3.0 = 0.255 < 1 in joint L005-U005, main column C2.

5.2.2 In-line Tubular Joints

S-N = F3

SCF = 1.68 min. calculated

DFF = 2.0

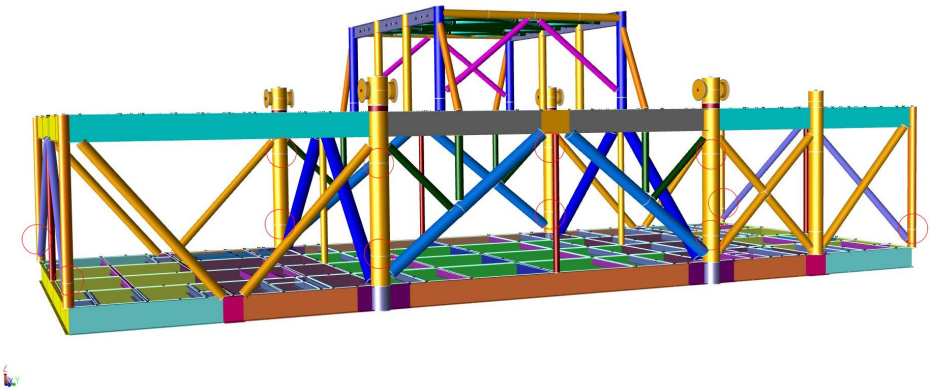


Figure 5.2 – Analyzed Tubular Joints

* * * I N T E R M E D I A T E M E M B E R F A T I G U E R E P O R T * * *

MEMBER	GRUP	DISTANCE FROM END M	OUTSIDE DIAMETER CM	WALL THICK. CM	STRESS. CONC. FACTORS AXIAL	BENDING	** FATIGUE RESULTS ** DAMAGE	LOC	SVC LIFE
L008-U008	C05	0.900	40.640	2.144	1.680	1.680	.23532-3	TR	349.3074
		0.900	40.640	1.270	1.680	1.680	.21180-2	TR	38.80973
L010-U010	C05	0.900	40.640	2.144	1.680	1.680	.49491-3	BR	166.0908
		0.900	40.640	1.270	1.680	1.680	.40357-2	BR	20.36823
L003-U003	C20	1.210	80.000	4.000	1.680	1.680	.28456-2	BL	28.88646
		1.210	80.000	2.000	1.680	1.680	.0196927	BL	4.174136
		4.950	80.000	2.000	1.680	1.680	.52056-2	T	15.79071
		4.950	80.000	3.000	1.680	1.680	.13424-2	T	61.23318
L005-U005	C20	1.210	80.000	4.000	1.680	1.680	.32873-2	TL	25.00523
		1.210	80.000	2.000	1.680	1.680	.0223567	TL	3.676756
		4.950	80.000	2.000	1.680	1.680	.94214-2	B	8.724814
		4.950	80.000	3.000	1.680	1.680	.26078-2	B	31.52074

Table 5.4 – Fatigue Damage – Tubular in-line Joints Summary

Using DFF = 3.0, the maximum damage is: 0.022/2.0*3.0 = 0.033 < 1.

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5.2.3 Beam-to-Beam Connection

S-N = F3

SCF = 1.50 min. calculated

DFF = 2.0

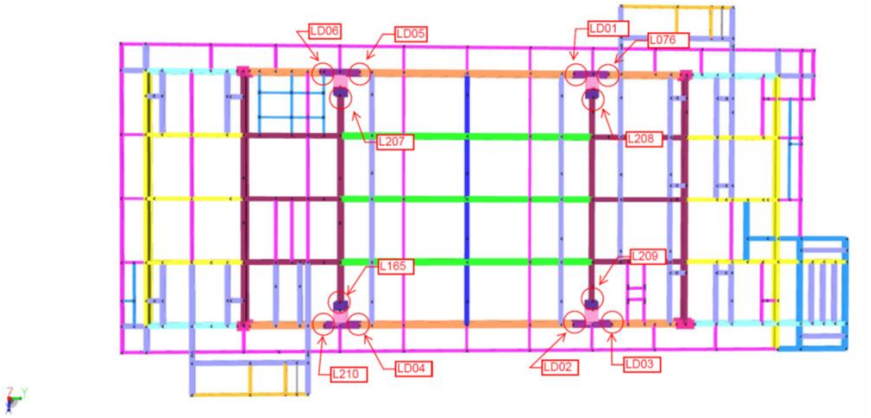


Figure 5.3 – Analyzed Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

MEMBER	JOINT	GRUP ID	TYPE ID	******* STRESS CONC. FACTORS ******** ****** FLANGE ******* AXIAL	MAJOR	MINOR	**** WEB **** AXIAL	MAJOR	** FATIGUE RESULTS ** DAMAGE	LOC	SVC LIFE
L207-L004	L207	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0296738	BL	2.770118
L208-L176	L208	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0265801	BR	3.092537
L002-L165	L165	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0213206	BL	3.855428
L177-L209	L209	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0200176	BL	4.106386

Table 5.5 – Fatigue Damage – Beam-to-Beam Connection Summary

5.2.4 Column Joints (Pipe to Beam)

S-N = F3

SCF = 1.50

DFF = 2.0

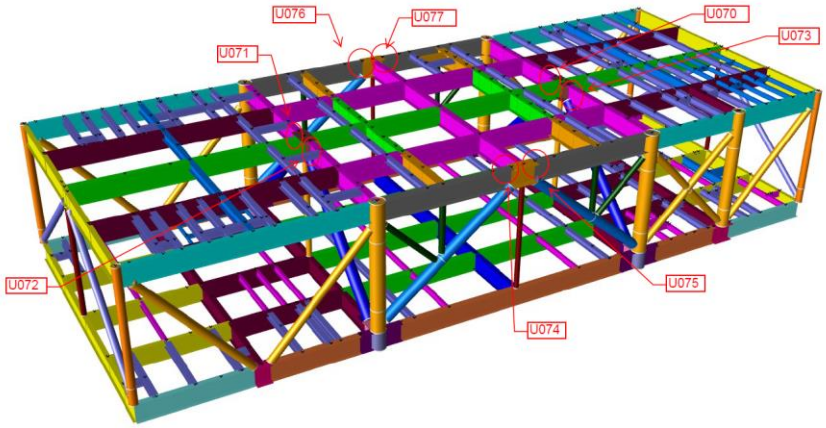


Figure 5.4 – Analyzed Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	CHORD JNT TYP	CHORD MEM TYP	CHORD LEN. (M)	GAP (CM)	STRESS CONC. FACTORS AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
L204	L204-U071	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0278305	R	2.953593		
L203	L203-U072	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0243315	R	3.378331		
U071	L204-U071	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0238889	L	3.440924		
U072	L203-U072	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0189846	L	4.329827		
U070	L206-U070	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0172195	R	4.773646		

Table 5.6 – Fatigue Damage – Column Joints Summary

5.2.5 PAU sea fastening gusset plates (Pipe to Beam)

S-N = F3

SCF = 1.50

DFF = 2.0

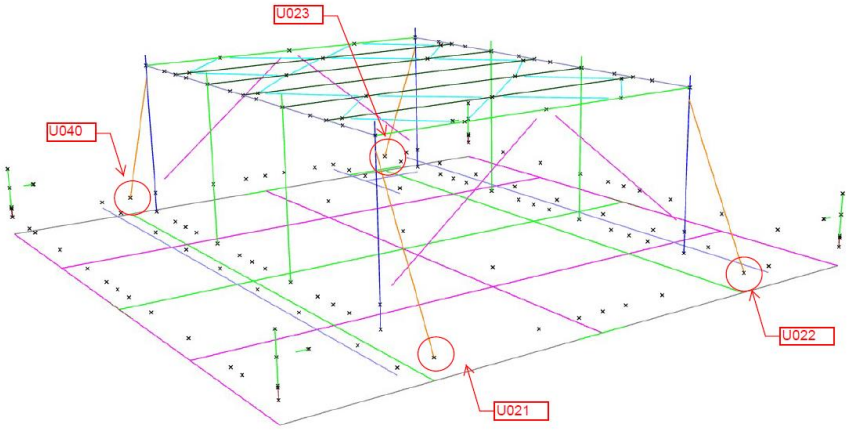


Figure 5.5 – Analyzed Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	STRESS CONC. FACTORS * AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
U040	U040-P101	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0453929	TL	1.810858		
U040	D003-U040	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0453929	TL	1.810858		
U021	U021-P102	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0273232	TL	3.008429		
U021	D005-U021	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0273232	TL	3.008429		
U023	U023-P104	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0224156	TL	3.667083		
U023	D004-U023	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0224156	TL	3.667083		
U022	U022-P103	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0150089	TL	5.476762		
U022	D006-U022	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0150089	TL	5.476762		

Table 5.7 – Fatigue Damage – Column Joints Summary

6 BLPH TOPSIDE DESCRIPTION

The BLPH Topside comprises of two main deck levels with overall deck plan dimensions of 40 m x 16 m, excluding external walkways, laydown areas and stairs, with an overall deck height of 7 m between decks. There are currently 6 hydrogen storage vessels which lie horizontally, aligned north - south, within the PAU structure located above the upper deck. The Topsides layout is shown in Fig. 6.1.

Main Deck elevations are:

- Lower Deck, El. + 23.310 m ToS;
- Upper Deck, El. + 30.310 m ToS.

The PAU steel module 12m x 9m for the storage of N.6 H2 Vessel 60t each is located on top of Topside Upper Deck. PAU height is 9m and on top roof it acts as rigging platform with lifting slings.

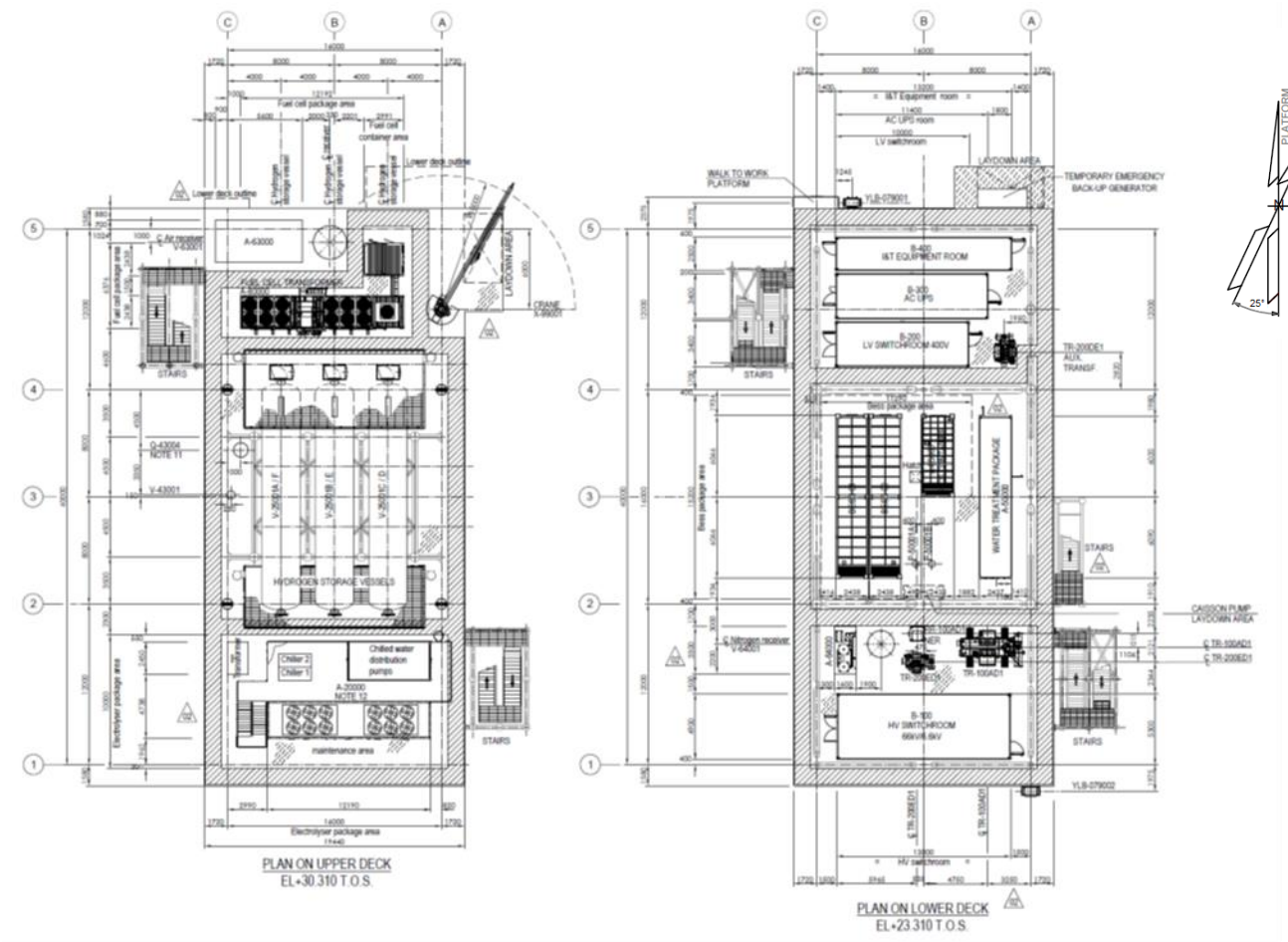


Figure 6.1 – Base Load Power Hub Plot Plan

7 MATERIALS

7.1 STRUCTURAL STEEL PROPERTIES

For the structural analyses, steel types and grades to be used for the platform structures are summarised in Table 8.1and specified in Ref./24/. The material selection criteria are based on the requirements of ISO 19906:2019, ISO 19902:2020 and ISO 19901-3:2014. The materials are in accordance with the EN standard 10225:2019 and 10025:2019 and are suitable for plates, rolled sections and welded / seamless tubulars.

			EN10025-3	ISO EN 19902:2020						
Design Class	**Complexity**	**SQL**	**Hot rolled bar**	**Plates and Welded Tubular**	**Sections**	**SMLS pipes**	**THK**	**CVN inpact test**	**Material Designation**	**List of Options (EN10225-1 to -4) & EN10025-3**
DC1 TP to monopile flange connection	High	**I (Z properties)**	EN 10025 S420 NL	NA	NA	NA	t > 50	-40	DC1-I-420-40_Z	1, 2, 3, 4, 6, 12, 18, 24, 30
DC1 Complex lift-nodes and element connection to topside, Lift points, main complex joints	High	**I (Z properties)**	NA	EN 10225 S420 QLO / ML	NA	NA	25 < t <= 50	-40	DC1-I-420-40_Z DC1-I-460-40_Z	2, 7, 8, 11, 12, 17, 18
							t > 50	-40		
DC2 simple joints, primary deck girders and beams of Topside and TP, column and diagonal to lift points, main columns, Davit crane support, Bolts	Low	**II**	NA	EN 10225 S420 QLO / MLO	NA	NA	t < = 12	0	NA	-
							12 < t <= 25	-20	DC2-II-420-20 / DC2-II-460-20	2, 7, 8, 11 17 for t > 40mm
							25 < t <= 50	-40	DC2-II-420-40 DC2-II-460-40	
							t > 50	-40		
DC3 all other columns and diagonals, stiffeners, Secondary deck beams, Grillage and sea fastening	High	**II**	NA	EN 10225 S355 NLO / MLO	EN 10025 S355 MLO	EN 10225 S355 NLHHO / QLHHO API 5L X52	t < = 12	0	DC3-II-355-0 / DC3-II-X52-0	2, 7, 8 11 for plate 17 for t > 40mm
							12 < t <= 25	-20	DC3-II-355-20 / DC3-II-X52-20	
							25 < t <= 50	-40	DC3-II-355-40 / DC3-II-X52-40	
							t > 50	-40		
DC4 Equipment and vessel supports, modules supports, equipment fixing bolts	Low	**III**	NA	EN 10025 S355 J2	EN 10025 S355 J2	API 5L X52 EN 10210 S355 J2H	t < = 12	0	DC4-III-355-0 / DC4-III-X52-0 / DC4-III-X60-0	-
							12 < t <= 25	0		
DC5 floor plating, grating, Walkways, stairs, handrails	Any	**IV**	NA	EN 10025 S235 JR EN 10025 S275 J0 EN 10025 S355 J0	EN 10025 S235 JR EN 10025 S275 J0 EN 10025 S355 J0	API 5L Gr.B EN 10210 S235 JRH / EN 10210 S275 J0H / EN 10210 S355 J0H	t < = 12	10	DC5-IV-235-10 / DC5-IV-275-10 / DC5-IV-355-10 / DC5-IV-GRB-10	-
							12 < t <= 25	10		

Table 7.1 - Material Selection, Ref /24/

Mechanical properties for structural materials are presented in Table 8-2, Table 8-3 and Table 8-4.

- Young's Modulus = 205,000 N/mm^2
- Density = 7850 kg/m^3
- Poisson's Ratio = 0.3

Thickness (mm)	Min. Tensile Strength (N/mm^2)	Min. Yield Strength (N/mm2)	Steel Type (1)
t ≤ 16	500	420	I & II
16 < t ≤ 40	500	400	I & II
40 < t ≤ 63	480	390	I & II
63 < t ≤ 100	480	380	I & II
Note: 1) Type I steel has Z (through the thickness) properties.			

Table 7.2 – Mechanical properties of Plates

Thickness (mm)	Min. Tensile Strength (N/mm²)	Min. Yield Strength (N/mm2)	Steel Type
t ≤ 20	460	355	III
20 < t ≤ 40	460	345	III

Table 7.3 – Mechanical properties of Structural Seamless Tubulars

Thickness (mm)	Min. Tensile Strength (N/mm2)	Min. Yield Strength (N/mm2)	Steel Type
t ≤ 16	460/360	355/275	IV
16 < t ≤ 40	460	345	IV

Table 7.4 – Mechanical properties for Structural Sections

7.2 PLATING

Plate thicknesses for primary structural steel starts at a minimum of 10 mm and increase in 5 mm steps Secondary steel lower and upper deck plates are 8 mm thick and 10mm for laydown areas for Dropped Object Protection (DOP).

Blast walls are not to be provided on a hydrogen processing facility, as free ventilation and free explosion venting is more important, and supportable, than obstruction walls.

7.3 GRATING

Gratings are characterized by bearing bars 30 mm x 5 mm and mesh 30 mm x 50 mm

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8 DESIGN CRITERIA AND REQUIREMENTS

8.1 GENERAL

Structures in SOW are designed in accordance with limit states approach of ISO codes 19901 and 19902, Refs./2/, /3/ and /6/. For non-tubular sections, Eurocode, Ref./8/, is adopted. Member forces and moments derived from the global analyses are used for checking member strength and stability, and joint strength.

8.2 PARTIAL RESISTANCE FACTORS

8.2.1 Partial Resistance Factors for Tubular Sections:

The partial resistance factors for tubular sections from ISO 19902, Ref./6/, are listed below.

Resistance factor	Value	Definition
$\gamma_{R,t}$	1.05	Partial resistance factor for axial tensile strength
$\gamma_{R,c}$	1.18	Partial resistance factor for axial compressive strength
$\gamma_{R,b}$	1.05	Partial resistance factor for bending strength
$\gamma_{R,v}$	1.05	Partial resistance factor for shear strength
$\gamma_{R,h}$	1.25	Partial resistance factor for hoop buckling strength

Table 8.1- Resistance Factors for Tubular Sections

8.2.2 Partial Resistance Factors for Non-tubular Sections

The partial resistance factors for non-tubular sections from Eurocode 3, Ref./8/, are listed below.

Resistance factor	Value	Definition
Resistance of members and cross sections		
γ_{M0}	1.10	Cross-section resistance to excessive yield strain including local buckling
γ_{M1}	1.10	Resistance of unstable elements measured during element inspection
γ_{M2}	1.25	Tensile cross-section resistance to mechanical breakdown
Resistance of connections		
γ_{M2}	1.25	Bolts, rivets, pins, welds and slabs on supporting surface
γ_{M3}	1.25	Sliding resistance at Ultimate Limit State Category C
$\gamma_{M3,SER}$	1.10	Sliding resistance at Serviceability Limit State
γ_{M4}	1.10	Injection bolt collapse resistance
γ_{M5}	1.10	Resistance of connections in open lattice trusses
$\gamma_{M6,SER}$	1.00	Resistance of pins at Serviceability Limit State
γ_{M7}	1.10	Preload of high strength bolts

Table 8.2- Resistance for Non Tubular Section

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8.2.3 Partial Resistance Factors for Tubular Joints Check

The partial resistance factors for tubular joints checks are provided in following table according to ISO 19902, Ref./6/.

Resistance factor	Value	Definition
$\gamma_{R,j}$	1.05	Partial resistance factor for joints
$\gamma_{z,j}$	1.17	Additional partial resistance factor for members during joint pre-strain collapse

Table 8.3 - Resistance Factors for Tubular Joints

8.3 LOAD CLASSIFICATIONS

Design loads are classified as either global or local within ISO 19901-3, Ref. /3/ and ISO 19902, Ref./6/ and summarized in Table 8.4.

Load Type	ISO Designation	Description
Permanent (Dead)	G1	Structure self-weight; Equipment & piping dry weight; Any actions due to misalignment of structures such as between the topside and TP
Permanent (Dead)	G2	permanent action imposed on the topsides structure by self-weight of equipment and other objects that remain constant for long periods of time, but which can change from one mode of operation to another, or during a mode of operation, bulk loads
Variable (Live)	Q1	Equipment & piping contents weight; Superimposed area loads; Ice and snow accretions
Environmental Transient	T_{Eo}	1-yr storm wind (wind in transportation conditions is assimilated to a Transient Load)
Transient	T	Transient Loads for Pre-Service Analyses (inertial loads from barge motion)

Table 8.4 - ISO Loads Classification

8.4 PARTIAL ACTION FACTORS

8.4.1 Partial Action Factors for Pre-Service Analysis

Partial Action Factors for Pre-Service analysis (e.g. Lifting, Transportation, Load-out) conditions are shown in Table 8.5 with reference to three design situations, according to ISO 19902, Ref./6/. where:

- G_T are the permanent actions during the transient situation;
- Q_T are the variable actions during the transient situation;

- T represents the actions from the transient situation being considered.

SITUATION	ACTION		
	Permanent (GT)	**Variable (QT)**	Transient (T)
1	1.3	1.3	1.0
2	1.1	1.1	1.35
3	0.95	0.9	1.35

Table 8.5 – Partial action factors for Pre-service Analyses

8.5 ACCEPTANCE CRITERIA

The maximum member Unity Check (UC) will be less than unity

9 DESIGN DATA

The Metocean study performed by Fugro, Ref./40/, is used as a provision of the data for the calculation of the transportation fatigue. The agreement with client is covered by TQ 0046, Ref./41/.

The report contains metocean data along 3 different routes to Tyra field, located in North Sea; one of these routes (North route 2) covers at 95% the route – Ravenna to WTG location and has been considered appropriate for the scope of the analysis.

Report presents Monthly occurrence of fatigue waves, eight directional sectors (headings) at 45° intervals centered on North.

The transportation from Ravenna to the field is planned to start mid-May 2025. The months of May, June and July were considered for the assessment. As per table 9.3 the month of August is covered by month of May.

The selected months were based on HLV schedule, with early date of installation at site 15/06 and late 20/08; accordingly, 30days of tow were subtracted obtaining 15/05 early sail away date and 20/07 as the late one.

9.1 TOW ROUTE AND METOCEAN DATA

The route is shown in the following figure, Ref../40/.

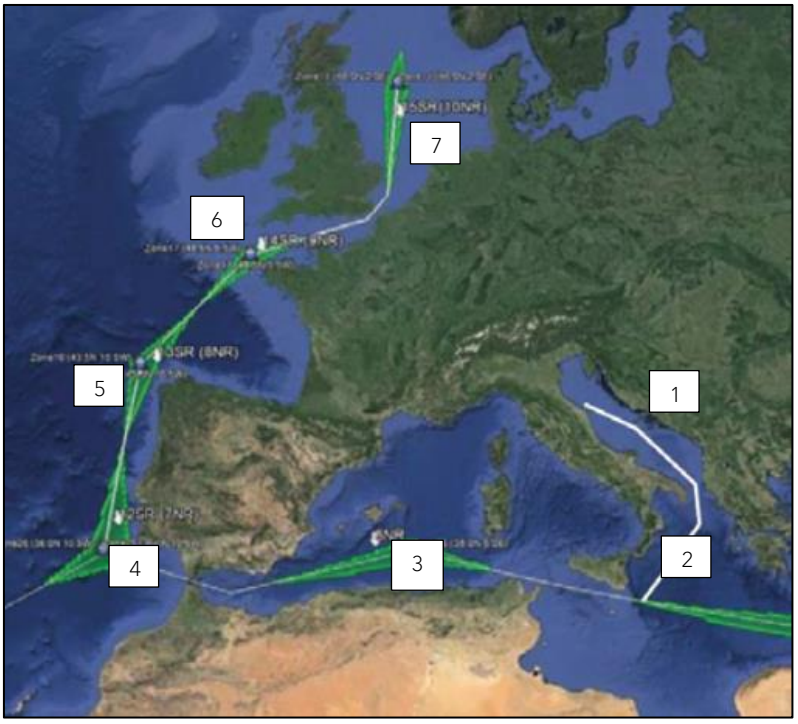


Figure 7.1 – Voyage Route – Sectors of North route – Route 2, ref ./40/

The route is divided into 7 sectors with different wave data. For each sector corresponding DNV navigation zones were defined, Ref. ./40/.

The expected tow duration is 30 days, including 3 days for weather delay at 6 knots speed.

Table 1.1.3 Transportation route 2 from Ravenna to Tyra field

Sector	1	2	3	4	5	6	7
Latitude	42.5°N	38.5°N	38.0°N	36.0°N	43.5°N	48.5°N	56.0°N
Longitude	16.0°E	19.0°E	5.0°E	10.5°W	10.5°W	5.5°W	2.0°E
DNV	27	27	26	25	16	17	11

Table 9.1 – Sectors coordinates and corresponding DNV zones

Voyage from Ravenna to Tyra Field						
Sector	Distance [nm]	Progres. Distance [nm]	Distance [%]	Average Speed [knots]	Duration [h]	Duration x 1.5 [h]
1	192	192	0.078	6.00	32.0	48.0
1	140	332	0.057	6.00	23.3	35.0
2	140	472	0.057	6.00	23.3	35.0
2	271	743	0.109	6.00	45.2	67.8
3	496	1239	0.200	6.00	82.7	124.0
4	255	1494	0.103	6.00	42.5	63.8
5	346	1840	0.140	6.00	57.7	86.5
6	279	2119	0.113	6.00	46.5	69.8
7	357	2476	0.144	6.00	59.5	161.3 (3 days added)
totals	2476		1.000		412.7	691.0

Table 9.2 – Sectors of the Voyage Route

The 10-years return period waves, 10-years monthly extreme, are listed in Table 7-3 for Route 2 for information.

Table IX. 10-year extremes for transportation route 2

Sectors	10-year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Hs [m]	4.4	3.6	4.5	3.8	3.2	3.1	2.3	2.5	3.2	3.6	4.2	4.9
	Ws [m/s]	18.8	17.3	21.8	18.3	17.6	16.5	13.5	14.5	19.6	17.3	19.1	19.8
2	Hs [m]	7.0	7.2	5.3	5.2	4.4	4.5	3.7	4.1	3.5	5.8	6.1	7.3
	Ws [m/s]	23.0	23.8	22.2	21.0	18.2	17.9	16.5	16.7	17.3	21.0	21.9	23.4
3	Hs [m]	6.8	8.7	7.4	6.5	4.2	4.2	3.2	2.8	4.5	5.3	6.9	7.5
	Ws [m/s]	23.1	23.0	23.6	22.8	18.1	16.9	15.0	14.9	15.6	19.2	21.9	21.4
4	Hs [m]	9.5	9.1	7.3	7.6	5.1	3.9	3.9	4.3	5.3	8.0	8.9	8.8
	Ws [m/s]	19.4	20.1	19.2	17.0	17.7	16.6	14.9	16.6	15.3	20.5	19.8	22.3
5	Hs [m]	11.7	10.1	10.2	8.2	7.6	5.8	4.8	5.2	7.8	10.0	11.9	10.2
	Ws [m/s]	23.2	20.5	21.0	18.9	18.3	18.1	15.7	18.1	19.0	23.7	22.8	26.5
6	Hs [m]	11.3	10.4	13.1	9.7	6.9	5.8	6.8	6.4	6.5	10.0	9.5	12.6
	Ws [m/s]	24.1	22.7	26.8	20.6	23.3	18.0	18.3	17.8	18.6	21.7	21.5	24.6
7	Hs [m]	8.8	7.5	7.6	6.6	6.8	6.4	6.3	5.5	7.3	7.1	9.8	9.4
	Ws [m/s]	29.9	25.7	24.0	21.6	20.6	19.6	22.8	18.8	20.6	24.6	23.1	29.6

Table 9.3 – 10-years extreme waves along route 2 – for information

9.2 FATIGUE DESIGN DATA

Monthly Hs vs Tp wave scatter diagrams are presented in Attachment A; due to large amount of tables. Hs resolution is 0.5m and wave period resolution is 1s for each of the eight directional sectors at 45° intervals centred on North.

The scatter diagram tables show the expected number of events during transportation, for a range of wave height Hs up to 7.6m and peak period Tp up to 18s.

9.2.1 Scatted diagrams Coordinate System

The random behavior of waves is characterized by wave spectra, relating to each wave direction, wave height and period. Scatter diagrams are provided for sectors of 45°, quoted with respect to the transport heading as shown below.

C **APPENDIX C. MONTHLY WAVE SCATTER DIAGRAMS**

In this section, the direction used is defined as the mean wave direction relative to vessel heading (see below figure and Table 1.1.5)

Vessel heading 0 degrees: stern seas

Vessel heading 90 degrees: beam seas SB

Vessel heading 180 degrees: head seas

Vessel heading 270 degrees: beam seas PS

Vessel heading 360 degrees: stern seas

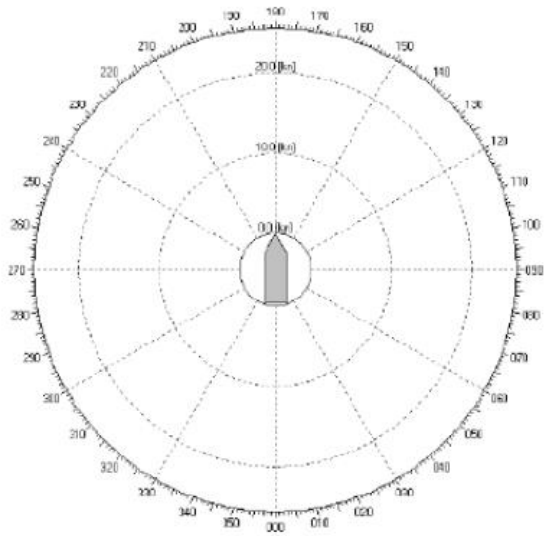


Figure 9.1 – Direction convention for wave fatigue tables – 8 directions presented in scatter diagram of impacting waves describes the direction from which the waves were travelling.

Table 1.1.5 Summary of transportation routes and vessel bearing

Transport 1 Batam - Tyra			Transport 2 Ravenna - Tyra			Transport 3* Cadiz - Tyra		
Sector	Distance [nm]	Vessel Bearing [deg]	Sector	Distance [nm]	Vessel Bearing [deg]	Sector	Distance [nm]	Vessel Bearing [deg]
1NR-1**	723	295	1-1**	192	124	7NR-1***	226	265
1NR-2**	597	266	1-2**	140	150	7NR	255	346
2NR	887	291	2-1**	140	150	8NR	346	16
3NR	475	276	2-2**	271	220	9NR	279	46
4NR	948	330	3	496	264	10NR	357	358
5NR	870	292	4	255	346			
6NR	496	264	5	346	16			
7NR	255	346	6	279	46			
8NR	346	16	7	357	358			
9NR	279	46						
10NR	357	358						

Table 9.4 – Distances and directional sectors relative to vessel bearing

Month of May results the worst month among May, June, July and August, ref table 6-3.

Therefore, scatter tables of month of May are:

- factored to account for the weight in terms of distance of each sector,
- then they are added together for each direction
- and finally, they are normalized for SACS input.

The above process of wave data is shown in the next tables for the heading 0 of the first sector. The complete set of the tables is reported in Section 9.2.1.

Sectors 1.1+1.2 - Direction 0 deg		Number of Occurrences																				Totals
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
0	0.5	0	0	68	141	58	15	0	0	0	3	0	0	0	0	0	0	0	0	1	0	286
0.5	1	0	0	8	128	154	29	4	1	0	0	0	0	0	0	0	0	0	0	0	0	324
1	1.5	0	0	0	3	27	39	8	0	0	0	0	0	0	0	0	0	0	0	0	0	77
1.5	2	0	0	0	0	1	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	11
2	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.5	3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
3	3.5	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
3.5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	76	272	240	90	15	5	0	3	0	0	0	0	0	0	0	0	1	0	702

Table 9.5 – Sector 1 – Direction 0 deg. (scatter ref. system) – Scatter Table

Distance [nm]			332	2476																		
Sectors 1.1+1.2 - Direction 0 deg											Durations											Totals
	Tp	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																						
0.25		0	0	9.117932	18.9063	7.77706	2.011309	0	0	0	0.402262	0	0	0	0	0	0	0	0	0.134087	0	
0.75		0	0	1.072698	17.16317	20.64943	3.88853	0.536349	0.134087	0	0	0	0	0	0	0	0	0	0	0	0	
1.25		0	0	0	0.402262	3.620355	5.229402	1.072698	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.75		0	0	0	0	0.134087	0.938611	0.268174	0.134087	0	0	0	0	0	0	0	0	0	0	0	0	
2.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.75		0	0	0	0	0	0	0.134087	0.134087	0	0	0	0	0	0	0	0	0	0	0	0	
3.25		0	0	0	0	0	0	0	0.268174	0	0	0	0	0	0	0	0	0	0	0	0	
3.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	10.19063	36.47173	32.18094	12.06785	2.011309	0.670436	0	0.402262	0	0	0	0	0	0	0	0	0.134087	0	94.12924071

Table 9.6 – Sector 1 – Direction 0 deg. (scatter ref. system) – Factored Scatter Table

Direction	0 deg										Durations											Totals
	Tp	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																						
0.25		0	0	12.84572	33.37601	15.51979	4.353796	0.766963	0	0.056543	0.402262	0	0.144184	0	0	0	0	0	0	0.134087	0	
0.75		0	0	1.182149	31.43538	52.15832	26.1462	10.07876	2.904685	1.045638	1.014136	0.369548	0	0	0	0	0	0	0	0	0	
1.25		0	0	0	0.602585	17.24273	33.53352	12.458	6.275444	3.318255	1.214459	0.563409	0.112682	0.225363	0	0	0	0	0	0	0	
1.75		0	0	0	0	0.591276	9.126414	11.71931	4.31664	1.723748	1.83441	1.358643	0.67609	0.338045	0.112682	0	0	0	0	0	0	
2.25		0	0	0	0	0	0.303716	6.899838	2.890145	2.357835	1.466882	0.450727	0.338045	0.225363	0	0	0	0	0	0	0	
2.75		0	0	0	0	0	0	1.504039	2.152262	1.592084	1.439822	0.563409	0.225363	0.112682	0	0	0	0	0	0	0	
3.25		0	0	0	0	0	0	0.144184	1.266155	1.216882	0.450727	0.795234	0.338045	0	0	0	0	0	0	0	0	
3.75		0	0	0	0	0	0	0	0.056543	0.113086	0.112682	0.450727	0.450727	0	0	0	0	0	0	0	0	
4.25		0	0	0	0	0	0	0	0	0.225767	0.225363	0.450727	0.788772	0.225363	0	0	0	0	0	0	0	
4.75		0	0	0	0	0	0	0	0	0.112682	0	0.225363	0.112682	0.112682	0	0	0	0	0	0	0	
5.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75		0	0	0	0	0	0	0	0	0	0	0	0.112682	0.112682	0.112682	0	0	0	0	0	0	
6.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0.112682	0	0	0	0	0	0	
7.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	14.02787	65.41397	85.51212	73.46365	43.57108	19.86187	11.76252	8.160743	5.227787	3.299273	1.352181	0.225363	0	0	0	0	0.134087	0	**332.0125202**

Table 9.7 – All Sectors – Direction 0 deg (scatter ref. system) – Factored Scatter Table summed up dir. 0

Direction	0 deg										Durations											Totals
	Tp	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																						
0.25		0	0	0.006122	0.015905	0.007396	0.002075	0.000365	0	2.69E-05	0.000192	0	6.87E-05	0	0	0	0	0	0	6.39E-05	0	
0.75		0	0	0.000563	0.01498	0.024856	0.01246	0.004803	0.001384	0.000498	0.000483	0.000176	0	0	0	0	0	0	0	0	0	
1.25		0	0	0	0.000287	0.008217	0.01598	0.005937	0.002991	0.001581	0.000579	0.000268	5.37E-05	0.000107	0	0	0	0	0	0	0	
1.75		0	0	0	0	0.000282	0.004349	0.005585	0.002057	0.000821	0.000874	0.000647	0.000322	0.000161	5.37E-05	0	0	0	0	0	0	
2.25		0	0	0	0	0	0.000145	0.003288	0.001377	0.001124	0.000699	0.000215	0.000161	0.000107	0	0	0	0	0	0	0	
2.75		0	0	0	0	0	0	0.000717	0.001026	0.000759	0.000686	0.000268	0.000107	5.37E-05	0	0	0	0	0	0	0	
3.25		0	0	0	0	0	0	6.87E-05	0.000603	0.00058	0.000215	0.000379	0.000161	0	0	0	0	0	0	0	0	
3.75		0	0	0	0	0	0	0	2.69E-05	5.39E-05	5.37E-05	0.000215	0.000215	0	0	0	0	0	0	0	0	
4.25		0	0	0	0	0	0	0	0	0.000108	0.000107	0.000215	0.000376	0.000107	0	0	0	0	0	0	0	
4.75		0	0	0	0	0	0	0	0	5.37E-05	0	0.000107	5.37E-05	5.37E-05	0	0	0	0	0	0	0	
5.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75		0	0	0	0	0	0	0	0	0	0	0	5.37E-05	5.37E-05	5.37E-05	0	0	0	0	0	0	
6.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25		0	0	0	0	0	0	0	0	0	0	0	0	0	5.37E-05	0	0	0	0	0	0	
7.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0.006685	0.031172	0.04075	0.035008	0.020763	0.009465	0.005605	0.003889	0.002491	0.001572	0.000644	0.000161	0	0	0	0	6.39E-05	0	**0.158**

Table 9.8 – All Sectors – Direction 0 deg. (scatter ref. system) – Normalized Table

The normalized scatter diagrams applicable for the whole route and all the headings are reported in the following tables. The complete SACS input file is reported in Appendix A.

9.2.2 Directional waves Scatter diagrams

After the above explained elaboration, eight directional scatter diagrams were obtained and input in SACS, every 45 deg.

The ref. system of the Scatter tables is shown in Fig. 9.1 above.

Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0061	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0067
4.5	0.0000	0.0159	0.0150	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0312
5.5	0.0000	0.0074	0.0249	0.0082	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0408
6.5	0.0000	0.0021	0.0125	0.0160	0.0043	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0350
7.5	0.0000	0.0004	0.0048	0.0059	0.0056	0.0033	0.0007	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0208
8.5	0.0000	0.0000	0.0014	0.0030	0.0021	0.0014	0.0010	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0095
9.5	0.0000	0.0000	0.0005	0.0016	0.0008	0.0011	0.0008	0.0006	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0056
10.5	0.0000	0.0002	0.0005	0.0006	0.0009	0.0007	0.0007	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0039
11.5	0.0000	0.0000	0.0002	0.0003	0.0006	0.0002	0.0003	0.0004	0.0002	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0025
12.5	0.0000	0.0001	0.0000	0.0001	0.0003	0.0002	0.0001	0.0002	0.0002	0.0004	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016
13.5	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
14.5	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0002
15.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Omnidir	0.0000	0.0322	0.0602	0.0360	0.0152	0.0071	0.0036	0.0020	0.0006	0.0009	0.0003	0.0000	0.0002	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.1583

Table 9.9 – All Sectors – Direction 0 deg. (scatter ref. system) – Normalized Table

Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0022	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0025
4.5	0.0000	0.0073	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0113
5.5	0.0000	0.0054	0.0086	0.0023	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0166
6.5	0.0000	0.0012	0.0060	0.0049	0.0012	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0135
7.5	0.0000	0.0000	0.0024	0.0029	0.0028	0.0010	0.0004	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0096
8.5	0.0000	0.0000	0.0006	0.0019	0.0009	0.0007	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0046
9.5	0.0000	0.0001	0.0001	0.0009	0.0003	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018
10.5	0.0000	0.0000	0.0001	0.0002	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
11.5	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
12.5	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
13.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
14.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15.5	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0163	0.0224	0.0134	0.0056	0.0021	0.0008	0.0004	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0611

Table 9.10 – All Sectors – Direction 45 deg. (scatter ref. system) – Normalized Table

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Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0019	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020
4.5	0.0000	0.0061	0.0035	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0098
5.5	0.0000	0.0055	0.0078	0.0018	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0153
6.5	0.0000	0.0038	0.0072	0.0054	0.0012	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0180
7.5	0.0000	0.0011	0.0090	0.0050	0.0022	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0188
8.5	0.0000	0.0003	0.0046	0.0064	0.0016	0.0009	0.0001	0.0002	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0145
9.5	0.0000	0.0003	0.0007	0.0046	0.0037	0.0016	0.0006	0.0004	0.0004	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0123
10.5	0.0000	0.0002	0.0003	0.0010	0.0038	0.0022	0.0010	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0090
11.5	0.0000	0.0001	0.0001	0.0002	0.0003	0.0006	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0023
12.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
13.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
14.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
15.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18.5	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0196	0.0334	0.0246	0.0130	0.0072	0.0030	0.0008	0.0009	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1027

Table 9.11 – All Sectors – Direction 90 deg. (scatter ref. system) – Normalized Table

Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0025	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031
4.5	0.0000	0.0041	0.0020	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0062
5.5	0.0000	0.0031	0.0030	0.0016	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0079
6.5	0.0000	0.0017	0.0040	0.0037	0.0023	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0120
7.5	0.0000	0.0009	0.0041	0.0048	0.0031	0.0038	0.0014	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0184
8.5	0.0000	0.0002	0.0021	0.0028	0.0019	0.0018	0.0024	0.0015	0.0006	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0133
9.5	0.0000	0.0004	0.0010	0.0021	0.0024	0.0013	0.0010	0.0003	0.0006	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0094
10.5	0.0000	0.0003	0.0008	0.0008	0.0009	0.0004	0.0005	0.0002	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0041
11.5	0.0000	0.0001	0.0003	0.0003	0.0006	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018
12.5	0.0000	0.0000	0.0003	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
13.5	0.0000	0.0000	0.0001	0.0001	0.0000	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
14.5	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
15.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0132	0.0182	0.0164	0.0114	0.0085	0.0055	0.0024	0.0013	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0775

Table 9.12 – All Sectors – Direction 135 deg. (scatter ref. system) – Normalized Table

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Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0040	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0052
4.5	0.0000	0.0066	0.0064	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0135
5.5	0.0000	0.0079	0.0075	0.0027	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0183
6.5	0.0000	0.0053	0.0119	0.0085	0.0046	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0311
7.5	0.0000	0.0016	0.0114	0.0083	0.0073	0.0051	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0352
8.5	0.0000	0.0019	0.0049	0.0084	0.0074	0.0052	0.0022	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0309
9.5	0.0000	0.0009	0.0033	0.0058	0.0065	0.0041	0.0037	0.0020	0.0006	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0270
10.5	0.0000	0.0010	0.0027	0.0046	0.0058	0.0040	0.0018	0.0013	0.0010	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0228
11.5	0.0000	0.0005	0.0012	0.0028	0.0060	0.0034	0.0013	0.0005	0.0004	0.0004	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0165
12.5	0.0000	0.0003	0.0004	0.0017	0.0027	0.0029	0.0010	0.0007	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0100
13.5	0.0000	0.0002	0.0003	0.0009	0.0017	0.0021	0.0016	0.0008	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0079
14.5	0.0000	0.0001	0.0002	0.0001	0.0005	0.0005	0.0004	0.0004	0.0004	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0029
15.5	0.0000	0.0001	0.0000	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0011
16.5	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
17.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Omnidir	0.0000	0.0304	0.0514	0.0444	0.0431	0.0284	0.0134	0.0069	0.0032	0.0015	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2228

Table 9.13 – All Sectors – Direction 180 deg. (scatter ref. system) – Normalized Table

Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0014	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016
4.5	0.0000	0.0034	0.0027	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0062
5.5	0.0000	0.0029	0.0039	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0082
6.5	0.0000	0.0016	0.0036	0.0025	0.0016	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0096
7.5	0.0000	0.0008	0.0039	0.0048	0.0033	0.0015	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0146
8.5	0.0000	0.0004	0.0018	0.0048	0.0023	0.0016	0.0008	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0119
9.5	0.0000	0.0001	0.0014	0.0056	0.0032	0.0015	0.0012	0.0006	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0139
10.5	0.0000	0.0004	0.0022	0.0076	0.0048	0.0019	0.0014	0.0005	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0191
11.5	0.0000	0.0001	0.0010	0.0064	0.0089	0.0053	0.0018	0.0007	0.0003	0.0002	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0249
12.5	0.0000	0.0000	0.0002	0.0034	0.0078	0.0070	0.0041	0.0013	0.0005	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0245
13.5	0.0000	0.0000	0.0002	0.0020	0.0034	0.0043	0.0033	0.0013	0.0006	0.0004	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0158
14.5	0.0000	0.0000	0.0002	0.0009	0.0012	0.0017	0.0016	0.0012	0.0014	0.0002	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0088
15.5	0.0000	0.0001	0.0000	0.0001	0.0004	0.0006	0.0002	0.0003	0.0004	0.0003	0.0002	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0112	0.0213	0.0396	0.0371	0.0258	0.0147	0.0064	0.0038	0.0015	0.0008	0.0004	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.1629

Table 9.14 – All Sectors – Direction 225 deg. (scatter ref. system) – Normalized Table

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Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0006	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008
4.5	0.0000	0.0014	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0030
5.5	0.0000	0.0015	0.0035	0.0016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066
6.5	0.0000	0.0007	0.0024	0.0034	0.0014	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0080
7.5	0.0000	0.0003	0.0016	0.0020	0.0028	0.0020	0.0005	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0092
8.5	0.0000	0.0002	0.0020	0.0021	0.0015	0.0016	0.0011	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0087
9.5	0.0000	0.0001	0.0019	0.0054	0.0019	0.0017	0.0007	0.0003	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0122
10.5	0.0000	0.0000	0.0013	0.0060	0.0046	0.0019	0.0011	0.0004	0.0003	0.0001	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0161
11.5	0.0000	0.0001	0.0010	0.0035	0.0072	0.0030	0.0014	0.0006	0.0003	0.0004	0.0001	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0177
12.5	0.0000	0.0000	0.0006	0.0016	0.0025	0.0032	0.0022	0.0006	0.0010	0.0002	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0121
13.5	0.0000	0.0000	0.0003	0.0006	0.0018	0.0016	0.0018	0.0009	0.0005	0.0003	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0078
14.5	0.0000	0.0000	0.0000	0.0001	0.0007	0.0007	0.0005	0.0005	0.0002	0.0003	0.0003	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0000	0.0000	0.0037
15.5	0.0000	0.0000	0.0000	0.0002	0.0002	0.0001	0.0000	0.0003	0.0000	0.0001	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0011
16.5	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
17.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0048	0.0163	0.0266	0.0245	0.0159	0.0092	0.0038	0.0026	0.0015	0.0007	0.0004	0.0004	0.0003	0.0002	0.0000	0.0001	0.0000	0.0000	0.1073

Table 9.15 – All Sectors – Direction 270 deg. (scatter ref. system) – Normalized Table

Hs (m) vs Tp(s) - TOTAL																				
Tp	Hs(m)																			
(sec)	0.25	0.75	1.25	1.75	2.25	2.75	3.25	3.75	4.25	4.75	5.25	5.75	6.25	6.75	7.25	7.75	8.25	8.75	9.25	Total
0.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3.5	0.0000	0.0017	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0019
4.5	0.0000	0.0044	0.0035	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0080
5.5	0.0000	0.0025	0.0076	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0121
6.5	0.0000	0.0005	0.0035	0.0052	0.0023	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0123
7.5	0.0000	0.0003	0.0012	0.0021	0.0035	0.0027	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0109
8.5	0.0000	0.0002	0.0006	0.0011	0.0008	0.0011	0.0014	0.0005	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0062
9.5	0.0000	0.0001	0.0023	0.0026	0.0013	0.0014	0.0009	0.0005	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0095
10.5	0.0000	0.0000	0.0017	0.0034	0.0028	0.0017	0.0014	0.0009	0.0002	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0123
11.5	0.0000	0.0000	0.0012	0.0031	0.0039	0.0024	0.0017	0.0013	0.0005	0.0007	0.0002	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0151
12.5	0.0000	0.0000	0.0010	0.0022	0.0026	0.0021	0.0015	0.0006	0.0005	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0111
13.5	0.0000	0.0000	0.0003	0.0003	0.0012	0.0008	0.0007	0.0003	0.0002	0.0003	0.0003	0.0002	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0048
14.5	0.0000	0.0000	0.0000	0.0003	0.0006	0.0003	0.0005	0.0002	0.0001	0.0002	0.0002	0.0001	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0024
15.5	0.0000	0.0000	0.0001	0.0003	0.0001	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
16.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
17.5	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
18.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omnidir	0.0000	0.0097	0.0233	0.0227	0.0191	0.0133	0.0091	0.0043	0.0023	0.0019	0.0009	0.0005	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.1074

Table 9.16 – All Sectors – Direction 315 deg. (scatter ref. system) – Normalized Table

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10 PARAMETERS DESCRIPTION

The following Table provides a summary description of the primary metocean parameters presented in this report.

Abbreviation	Unit	Parameter	Comments
Ws	m/s	1-minute mean wind speed at 10 m above sea level	Estimated using ISO relationships from 10-minute wind speed.
γ		JONSWAP peakedness parameter	
s		Exponent of the $\cos^{2s}$ directional distribution	
Hs	m	Significant wave height	Equivalent to the mean height of the highest one-third of the waves in a sea-state.
Mdir	deg	Mean wave direction	
Tp_l	s	Peak period – lower limit	1 percentile of the peak period conditional on Hs
Tp_m	s	Peak period – most likely	The period associated with the peak in the wave energy spectrum.
Tp_u	s	Peak period – upper limit	99 percentile of the peak period conditional on Hs

Table 10.1 – Parameters description

10.1 DESIGN FATIGUE FACTORS (DFF)

The Design Fatigue Factors used in the analysis are described in Table 9.3. Reference is made to DNV-ST-N001, ref. /10/, section 5.9.4.2, Tab 5-4, for the selection of transport DFF.

Table 5-4 Design fatigue factors (DFF)

Inspection during operation (and repair) planned	*Elements in inspection category I*	*Elements in inspection categories II & III*
Yes	2.0	1.0
No	3.0	2.0

Notes:
1. The elements shall be categorised according to the definitions in Table 5-9.
2. Higher DFF than indicated may be applicable based on other (project) governing codes.
3. The indicated DFF are applicable only for the fatigue utilization during the considered marine operation. Hence, if the fatigue utilization is combined with the utilization from other phases, see [d)], a different DFF may be applicable.

Table 10.2 –Design Fatigue Factor (DFF) – ref. /10/

According to Design Basis, DFF = 3.0 is used for deck main joints and equal to 2.0 for the other joints.

10.2 S-N CURVES

The S-N curves used for fatigue life evaluation are in accordance with DNVGL RP C203, Ref./13/. S-N curve in air apply to all welds, in detail the used S-N curves are listed below:

Environment	m_1	$\log \bar{a}_1$	m_2	$\log \bar{a}_2$	*Fatigue limit at 10^7 cycles [MPa]*)*	*Thickness exponent k*
Air	$N \le 10^7$ cycles		$N > 10^7$ cycles			
	3.0	12.48	5.0	16.13	67.09	0.25
Seawater with cathodic protection	$N \le 1.8 \cdot 10^6$ cycles		$N > 1.8 \cdot 10^6$ cycles			
	3.0	12.18	5.0	16.13	67.09	0.25
Seawater free corrosion	3.0	12.03	3.0	12.03	0	0.25
*) See also [2.12].						

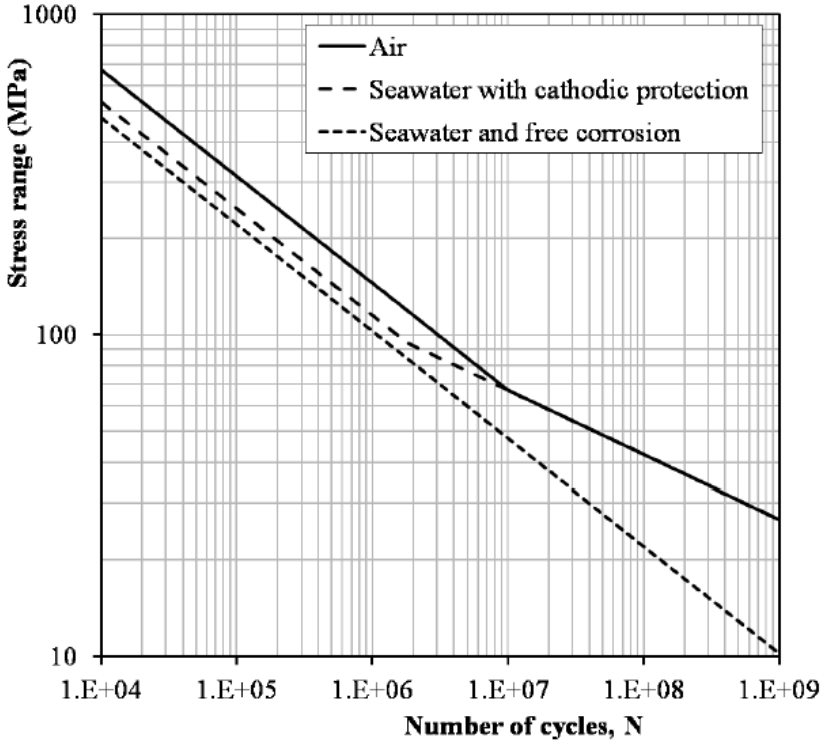


Table 10-3 - S-N Curves for Tubular Joints

S-N curve	$N \le 10^7$ cycles		$N > 10^7$ cycles $\log \bar{a}_2$ $m_2 = 5.0$	Fatigue limit at 10^7 cycles [MPa] *)	Thickness exponent k	Structural stress concentration embedded in the detail (S-N class), see also equation (2.3.2)
	m_1	$\log \bar{a}_1$				
B1	4.0	15.117	17.146	106.97	0	
B2	4.0	14.885	16.856	93.59	0	
C	3.0	12.592	16.320	73.10	0.05	
C1	3.0	12.449	16.081	65.50	0.10	
C2	3.0	12.301	15.835	58.48	0.15	
D	3.0	12.164	15.606	52.63	0.20	1.00
E	3.0	12.010	15.350	46.78	0.20	1.13
F	3.0	11.855	15.091	41.52	0.25	1.27
F1	3.0	11.699	14.832	36.84	0.25	1.43
F3	3.0	11.546	14.576	32.75	0.25	1.61
G	3.0	11.398	14.330	29.24	0.25	1.80
W1	3.0	11.261	14.101	26.32	0.25	2.00
W2	3.0	11.107	13.845	23.39	0.25	2.25
W3	3.0	10.970	13.617	21.05	0.25	2.50
*) See also [2.12].						

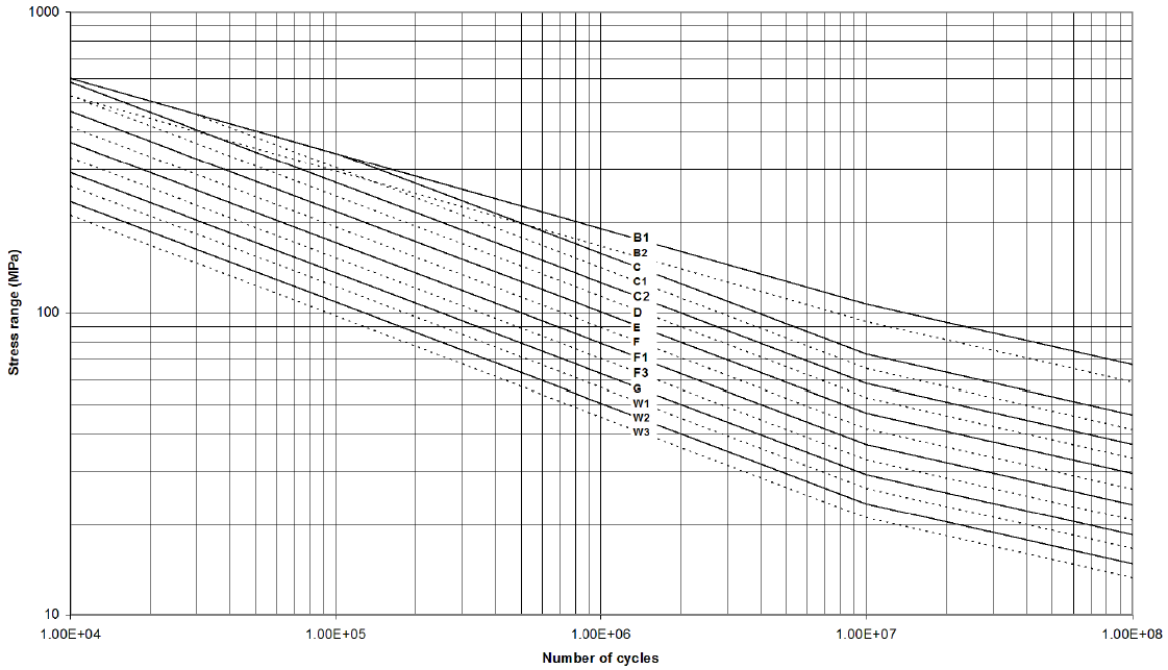


Table 10-4 - S-N Curves in Air for Other Joints

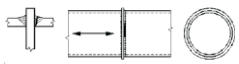
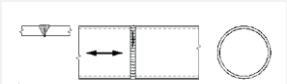
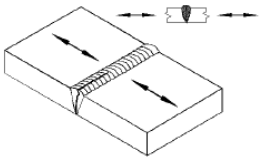
CONNECTION TYPE	DNVGL DETAIL	DNVGL CURVE	SELECTED CURVE	EXAMINATED CONNECTION
Pipe to beam joint	A-9.15 	thk ≤ 8 mm: G thk > 8 mm: F3	F3	Diagonals on main beams
Tubular butt welds	A-9.7 	E F2 F3	F3	In-line joints in topside and PAU
Pipe to gusset plate	Section 3.3.12	F3	F3	PAU sea fastening
Pipe to pipe	Section 2.4.6 Section F.10.2	Toe: T Root: F3	T F3	Tubular joints in Topside and PAU
Transverse butt weld, welded from 1 side	Section A.6.1 	E F2 F3	F3	Plate girder connection

Table 10-5 – S-N curves

10.3 STRESS CONCENTRATION FACTORS – SCF

A minimum SCF equal to 1.50 was used for all welded connections.

10.3.1 Simple Tubular joints

The SCFs for simple tubular joints were evaluated using the Efthymiou's parametric equations, ref. /13/

10.3.2 Single side Tubular joints

The SCF for single side tubular joints are evaluated as follows:

- Efthymiou's parametric equations for weld toe locations
- Efthymiou's parametric equations with DNV reduction factors for weld root locations

The reduction factors are applied automatically by SACS

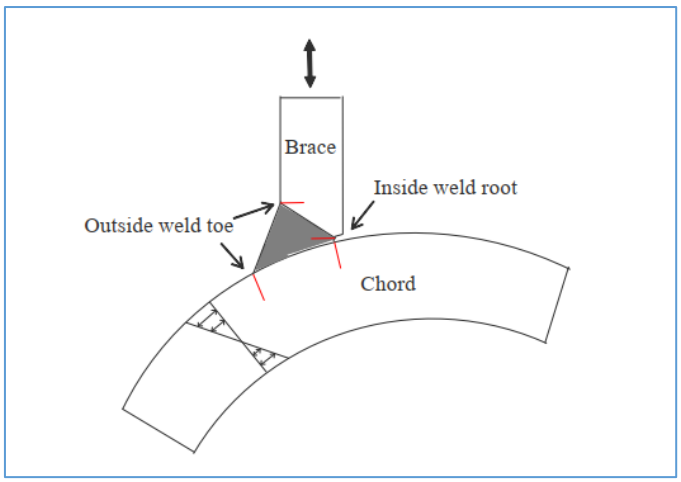


Figure 10.1 – Single side welds potential fatigue cracks in simple tubular joints

10.3.3 Tubular butt weld connections – Thickness Transition

Butt welds are normally located at thickness transitions, which can be on the inside or the outside of the tubular (see figure below, taken from Ref. /13/).

Inside thickness transition

For the inside weld root (eq. (3.3.5), Ref. /13/)

$$SCF = 1 + \frac{6(\delta_t + \delta_m - \delta_0)}{t} \frac{1}{1 + \left(\frac{T}{t}\right)^{\beta}} e^{-\alpha}$$

For the outside weld toe (eq. (3.3.6), Ref. /13/):

$$SCF = 1 - \frac{6(\delta_t - \delta_m + \delta_0)}{t} \frac{1}{1 + \left(\frac{T}{t}\right)^{\beta}} e^{-\alpha}$$

Where the misalignment δ_0 is equal to:

- $\delta 0 = 0$ Welding from outside only
- $\delta 0 = 0.05\ t$ Welding from both sides

A minimum of 3mm were considered as misalignment effects.

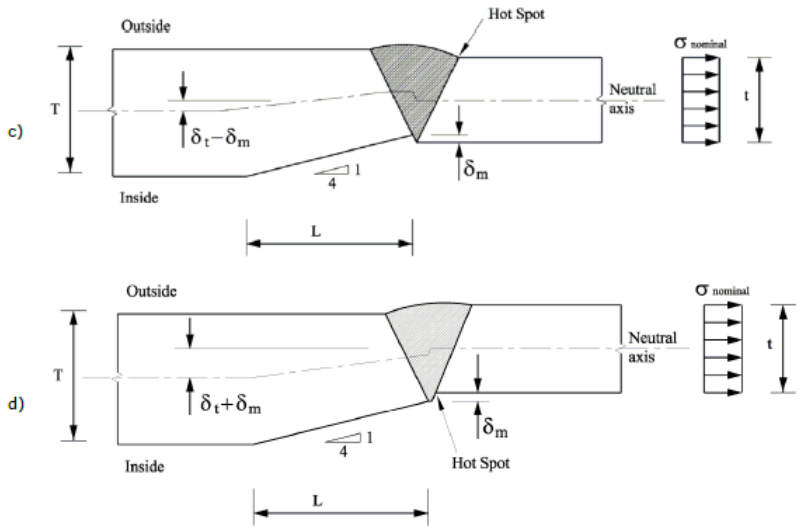


Figure 10.2 – Inside Thickness Transition - Weld in Tubulars Made from the Outside

Thickness transitions with welds from outside only, are foreseen for BLPH Topside modules.

										inside weld root Fig. 3-12 d (3.3.5)	outside weld toe Fig. 3-12 c (3.3.6)
JOINT NAME	D [mm]	T [mm]	t [mm]	L [mm]	β [-]	α [-]	δ_t [mm]	δ_m [mm]	δ_0 [mm]	SCF	SCF
	800	40	20	82.46	2.04	0.23	10.0	3.0	0.0	1.60	0.67
	800	30	20	41.23	2.04	0.18	5.0	3.0	0.0	1.61	0.85
	406.4	21.44	12.7	36.04	2.16	0.22	4.4	3.0	0.0	1.68	0.87
									MAX	1.68	0.87
										inside	outside

Table 10.6 – Fatigue SCF – Tubular in-line Joints

Outside thickness transition

Outside thickness transition is foreseen for BLPH topside modules only at lifting trunnion connection with main column. Joint will not be checked, and description is given for completeness only.

For the outside weld root (eq. (3.3.5), Ref. /13/)):

$$SCF = 1 + \frac{6(\delta_t + \delta_m - \delta_0)}{t} \frac{1}{1 + \left(\frac{T}{t}\right)^{\beta}} e^{-\alpha}$$

For the inside weld toe (eq. (3.3.6), Ref. /13/)):

$$SCF = 1 - \frac{6(\delta_t - \delta_m + \delta_0)}{t} \frac{1}{1 + \left(\frac{T}{t}\right)^{\beta}} e^{-\alpha}$$

Where the misalignment δ_0 is equal to:

- $\delta_0 = 0$ Welding from outside only
- $\delta_0 = 0.05\ t$ Welding from both sides

A minimum of 3mm were considered as misalignment effects.

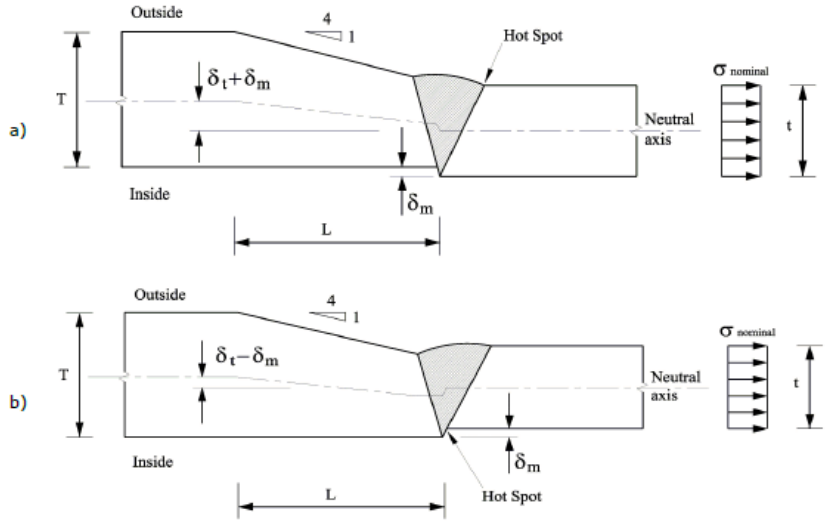


Figure 10.3 – Outside Thickness Transition - Weld in Tubulars Made from the Outside

10.3.4 Tubular butt weld connections – Equal thickness

No equal thickness transition is foreseen for BLPH Topside modules and thus no tables with SCF calculations are provided. Description is kept for completeness only.

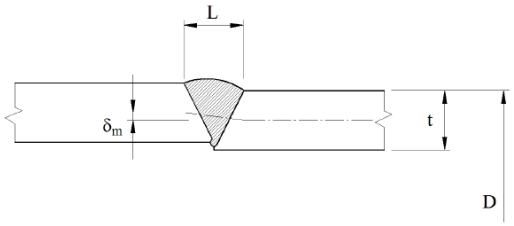


Figure 10.4 – Equal Thickness Transition

For weld toes at butt welds between members with equal plate thickness (eq. (3.3.4), Ref. /13/):

$$SCF = 1 + \frac{3(\delta_m - \delta_0)}{t} e^{-\alpha}$$

10.3.5 Butt Welds in Plated Structures – Thickness Transition

For welds between plates with different thickness on the side of the thickness transition (eq. (3.1.2), Ref. /13/):

$$SCF = 1 + \frac{6(\delta_m + \delta_t - \delta_0)}{t[1 + \frac{T^{1.5}}{t^{1.5}}]}$$

For welds between plates with different thickness on the opposite side of the thickness transition (eq. (3.1.3), Ref. /13/):

$$SCF = 1 - \frac{6(\delta_t + \delta_0 - \delta_m)}{t[1 + \frac{T^{1.5}}{t^{1.5}}]}$$

Where the misalignments δ is equal to:

- $\delta_m = 0$ max fabrication misalignment
- $\delta t = ½*(T-t)$ eccentricity due to change in thk
- $\delta_0 = 0$ Single side weld
- $\delta_0 = 0.05\ t$ Welding from both sides

BLPH topside joints list belonging to this category is given below, as SACS excerpt.

```
*   Lower deck
JSLC  LD01    LD02    L076    LD03
JSLC  L208    L209
JSLC  LD06    LD05    LD04    L210
JSLC  L207    L165
```

Maximum calculated SCF = 1.50.

						same side of thk transition (3.1.2)	opposite side of thk transition (3.1.3)
JOINT NAME	T [mm]	t [mm]	δ_t [mm]	δ_m [mm]	δ_0 [mm]	SCF	SCF
	40	25	7.5	0.0	1.3	1.50	0.31
	30	25	2.5	0.0	1.3	1.13	0.61
					MAX	1.50	0.61
						same	opposite

Table 10-7 - SCF for Butt Welds in Plated Structures with Thickness Transition

11 TRANSPORTATION LAYOUT

The Topsides is to be transported on 300ft cargo barge P-MAK with the Rows A and C aligned with the barge longitudinal axis.

The topside will be supported on the upper grillage in correspondence of the four legs. It is assumed located on the barge deck as follows:

- Topside is not longitudinally centered on barge (STB side to be free of protruding items for offshore mooring operation)
- Row 5 is located at 11.50m from barge bow;
- Bottom of topside is located +2.50m from barge deck;

The P-MAK barge is a standard 300ft barge, characterized by following main dimensions:

- Length: 91.50 m
- Breadth 27.40 m
- Side height: 6.10 m

The following figure shows the arrangement on barge deck.

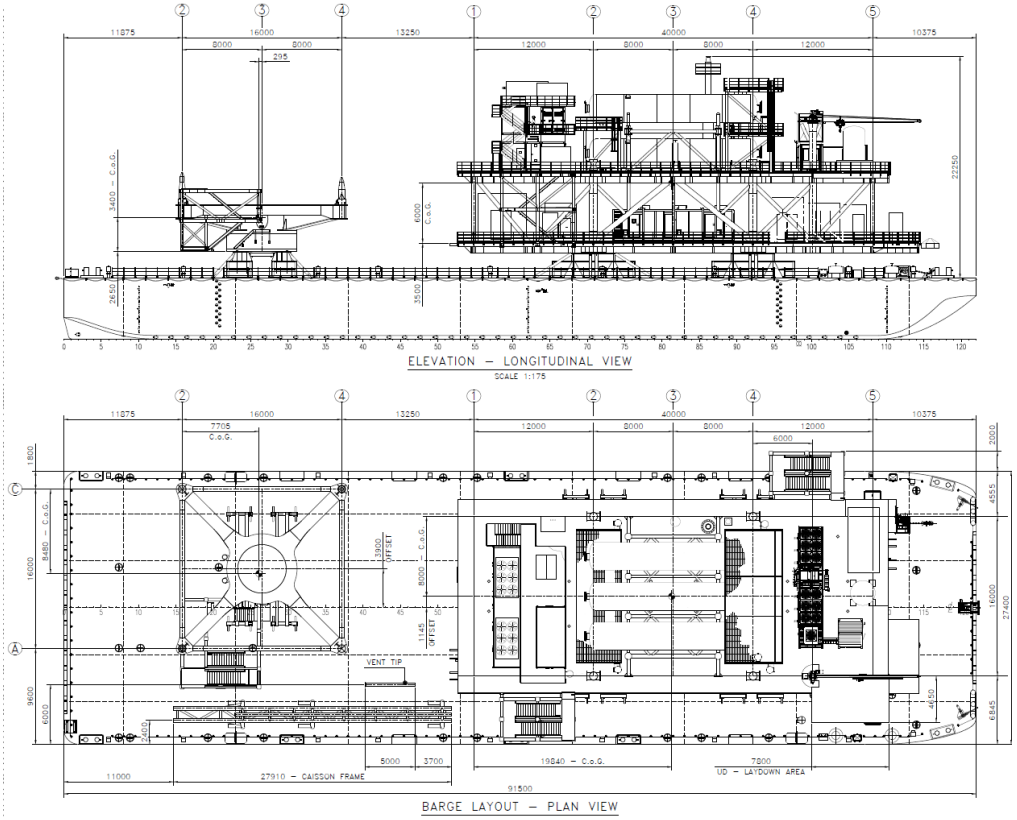


Figure 11.1 – Transportation Arrangement, Ref. /31/ – Side and Plan views

Ones the topside is loaded-out onto the barge by means of the hydraulic trailers, it is lowered and it is supported on the lower grillage beams (no upper grillage is foreseen).

The transportation restraint scheme is finally completed with seafastening.

Considering the depth of the lower grillage (including possible shim plates), the bottom ends of topside legs are located at elevation +2.50m above the barge deck.

The assumed barge draft is set equal to 2.70m with Trim 0.30deg by stern.

11.1 CARGO BARGE MODEL & COORDINATE SYSTEM

AMT Carrier model was set out in MOSES language, Ref. /39/, based on the hull drawings and of the tank capacities and weight distribution included in the barge documents.

The standard Moses reference system has the origin at the bow of the barge, on the centreline and at keel elevation, the X axis positive from bow to stern, the Y axis positive to starboard and the Z axis positive upwards.

The Moses barge hull model is shown in the following figures:

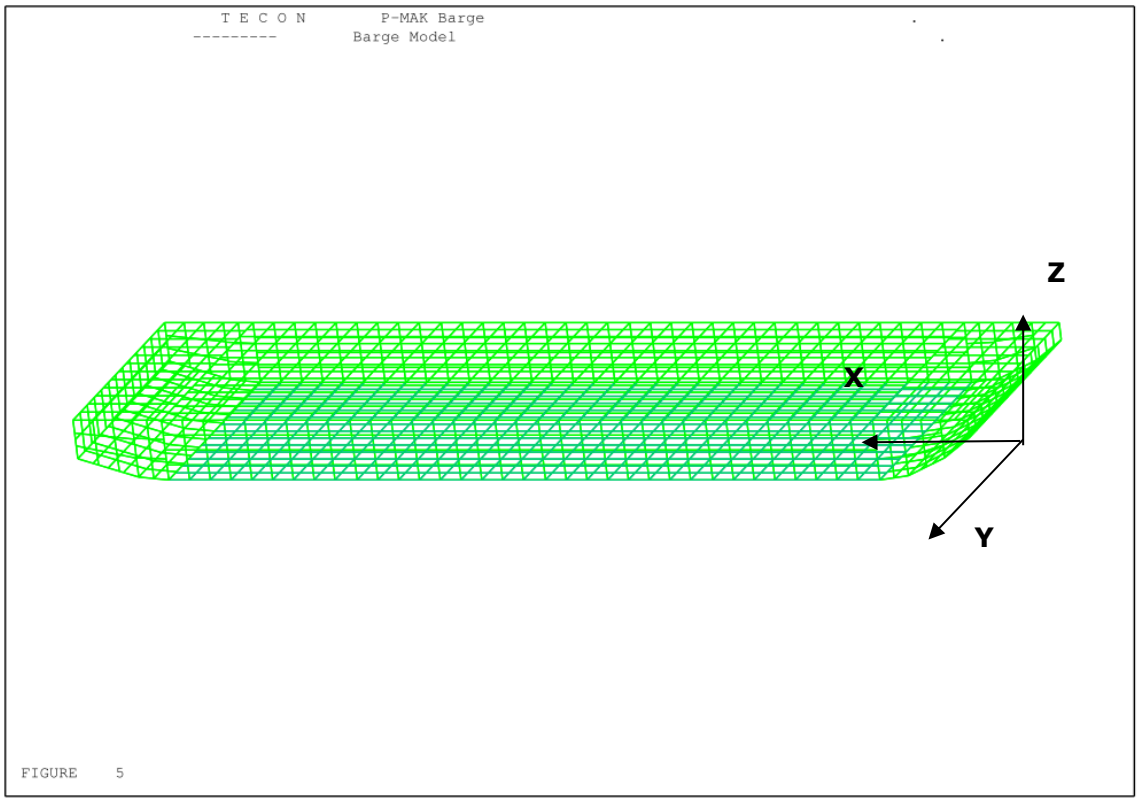


Figure 11.2 – Barge MOSES model and Ref. System

The density used for sea water is 1.025 t/m3.

11.1.1 RAO

Response amplitude operators are calculated for the transit conditions. RAO are provided with respect to the motion reference point (MRP) and with ref to barge reference system.

Barge MRP is located at:

- Barge stern
- Centre line
- Deck elevation.

RAO headings are reported in fig. 11.2 below.

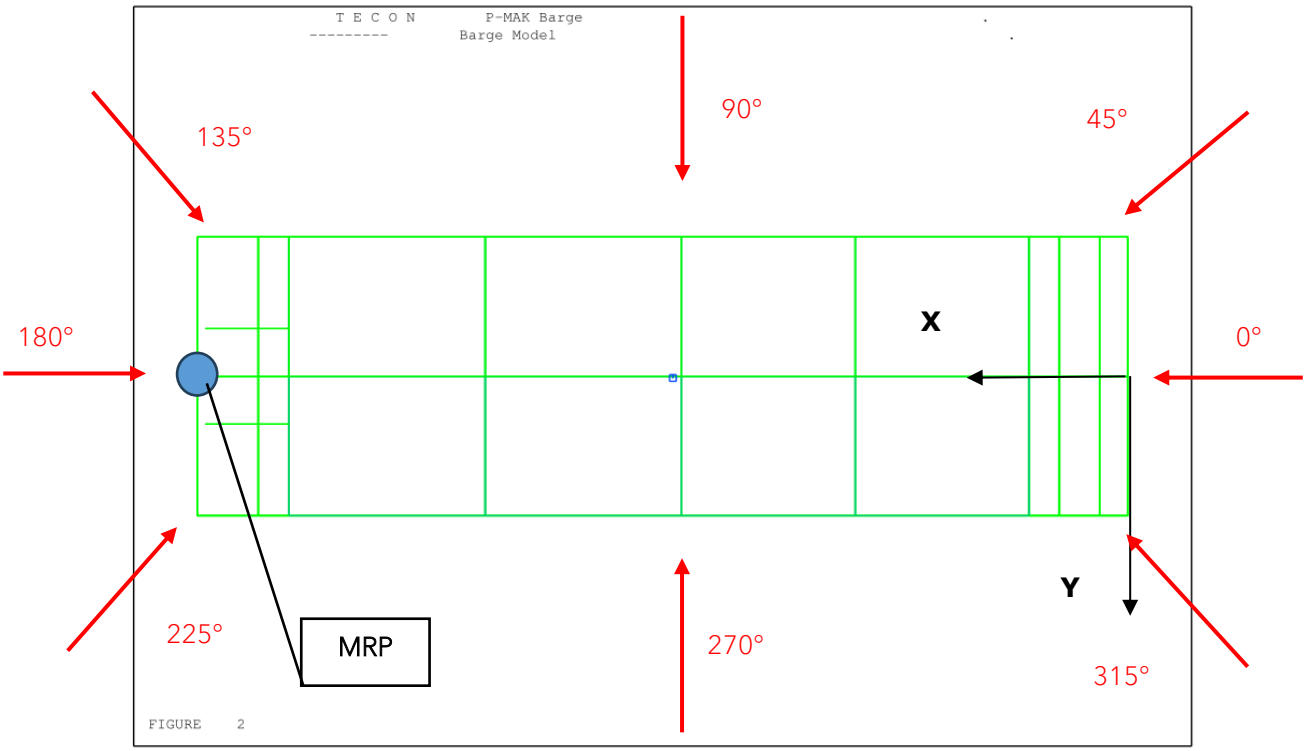


Figure 11.3 – Considered headings for RAO (barge ref. system)

11.2 BLPH TOPSIDE MODEL

11.2.1 Structural Model Description

The Topsides SACS model used for the Transportation analysis is utilized for the Fatigue check, Ref. /25/.

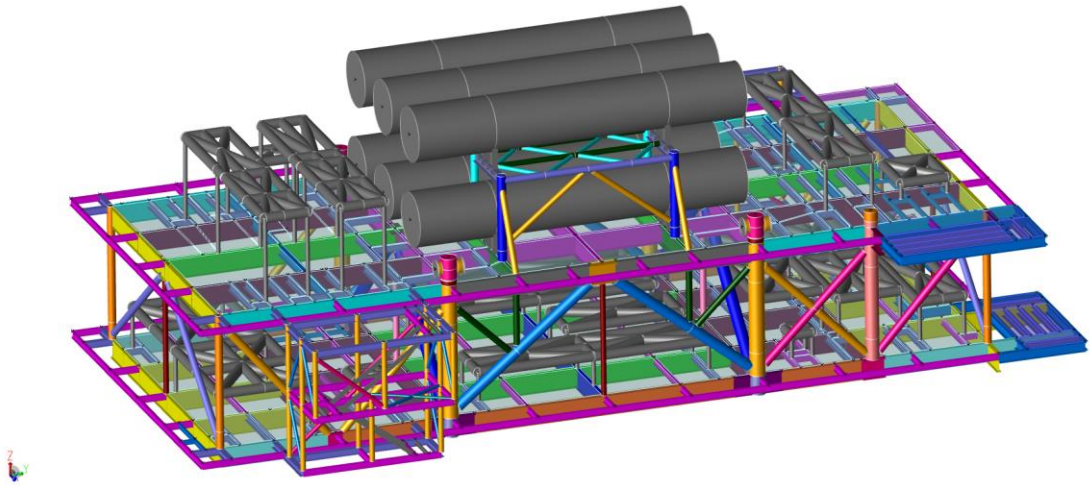


Figure 11.4 - Topside structural model

11.2.2 Coordinate System

The model geometry is referred to a right-handed orthogonal Cartesian coordinate system with the origin located at the centre of the topside structure and level +0.0 m at barge deck. The X-axis is positive toward East, the Y-axis is positive toward North and the Z-axis is positive upward.

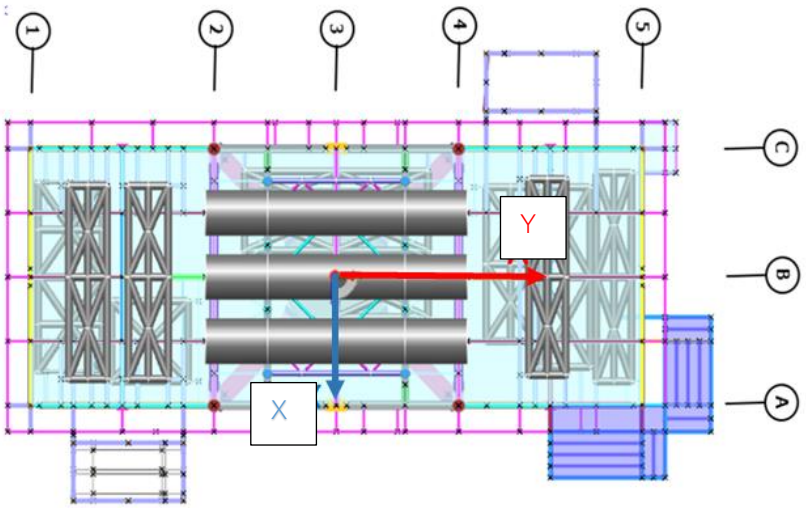


Figure 11.5 - BLPH Topsides Structural Model - Top View and SACS Ref, system

11.2.3 Structural Model Weight

Permanent and variable loads description and validation are reported in Ref. /27/ and /25/.

Load combination TWTR includes permanent and maximum variable loads and is defined as per following SACS excerpt.

```
                                    ************* SEASTATE LOAD CASE CENTER REPORT *************
                                                    RELATIVE TO STRUCTURAL ORIGIN
 LOAD  LOAD        ********* X - DIRECTION *********      ********* Y - DIRECTION *********      ********* Z - DIRECTION *********
 CASE  LABEL       FORCE       X         Y         Z       FORCE       X         Y         Z       FORCE       X         Y         Z
                     (KN)      (M)       (M)       (M)       (KN)      (M)       (M)       (M)       (KN)      (M)       (M)       (M)

  21   TWTR        -0.00      7.30    178.88     11.03       0.00     -7.64    -32.25     14.30   -18546.81     0.02      0.00      8.41
```

COG location comparison between current structural model for Transportation Analysis and WCR is reported in following tables.

SACS-WCR - Permanent & Variable Loads Comparison		
Load Comb.	**Fz [kN]**	**Fz [t]**
SACS (lcomb TWTR)	-18540	-1890
WCR	-17678	-1802
Δ	862	88
Δ (%)	4.8%	

COG NOMINAL POSITION			
CASE	**x [m]**	**y [m]**	**z [m]**
COG_SACS (lcomb TWTR)	0.02	0.00	8.41
COG_WCR	-0.10	-0.30	8.50
Δ	-0.08	-0.30	-0.09
Topside Main Dimension	16.00	40.00	17.66
Δ (%)	0.5%	0.8%	0.5%

Table 11.1 – SACS-WCR CoG comparison

12 FATIGUE ANALYSIS

Spectral fatigue is a statistical approach for calculating the fatigue damage in a structure.

It is based on the wave spectra, which accounts for the actual distribution of energy over the entire wave frequency range, and the transfer functions, which relate the ratio of the structural response by wave height to wave frequency range.

Stress for tubular around welded connections are evaluated at eight critical points, named hot spots, and then multiplied by the Stress Concentration Factors (SCF) derived from Efthymiou formulation and DNV formulae, tubular and in-line welds respectively.

The resulting stress ranges are then used to find the damage ratio at each hot spot by calculating the ratio:

$$\frac{Number\ of\ occurrences\ of\ the\ resulting\ stress\ range}{Number\ of\ occurrences\ which\ would\ produce\ failure}$$

The number of occurrences to produce failure is determined from the appropriate S-N curve. The total accumulated damage, based on Miner-Palmgren failure theory, is calculated as the sum of the calculated damages at each fatigue case (making up the overall fatigue environment).

The following sections describe the required steps to determine the transfer functions, which relate the wave spectrum to the response spectrum.

12.1 ANALYSIS PROCEDURE

The spectral fatigue analysis is performed starting from the scatter diagrams correlating the significant wave height and period, with respect to transport heading for the all-route sectors.

Fatigue analysis is performed in two steps:

a) Motion calculation

b) Structural computation

12.1.1 Motion Calculation

Motion calculations are based on a 3D diffraction analysis and the whole analysis is done in frequency domain, i.e. spectral load cases are generated. A set of RAOs are computed and used along a scatter diagram of environments, acting for a specified time.

Frequency domain dynamic responses of the vessel (transfer functions) in six degrees of freedom are determined for a set of encounter periods, ranging from 2.5 to 24 s, and headings from 0 to 360 deg. Barge light weight, water ballast and cargo loads are taken into account.

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12.1.2 Structural Computation

The structural analysis is based on the computation of transfer functions at each point of interest and assessment of fatigue damages.

The evaluation of fatigue cumulative damage related to each stress range is calculated as the ratio of the occurrence of that stress range respect to the corresponding allowable number of occurrences given by the selected S-N curve. The fatigue damage is calculated following the Miner-Palmgren theory, i.e. as the sum of the cumulative damage due to all pertinent fatigue stress ranges. Fatigue life is then defined as the inverse of the fatigue damage.

Action factors for fatigue analyses will be set equal to 1.0.

12.1.3 Correspondence of Reference systems to SACS

Relative orientations of scatters and RAO's with respect to SACS ref. system are presented in the next figures.

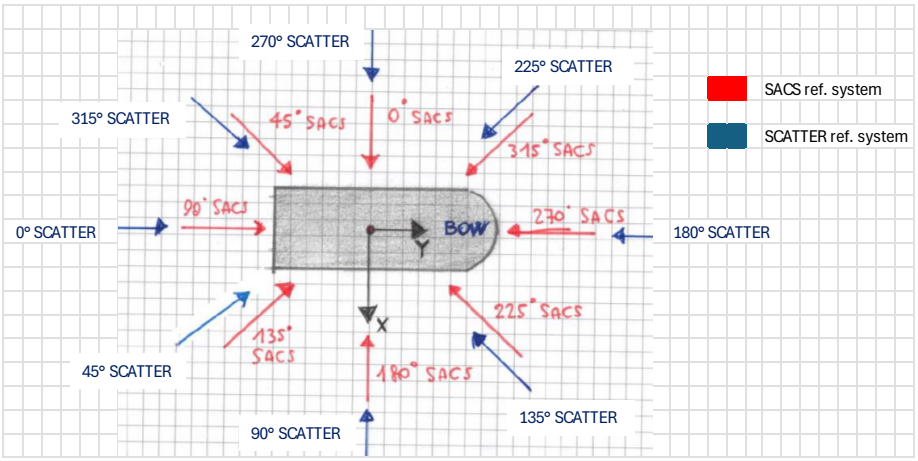


Figure 12.1 – SACS Ref. system vs. SCATTERs Ref. system

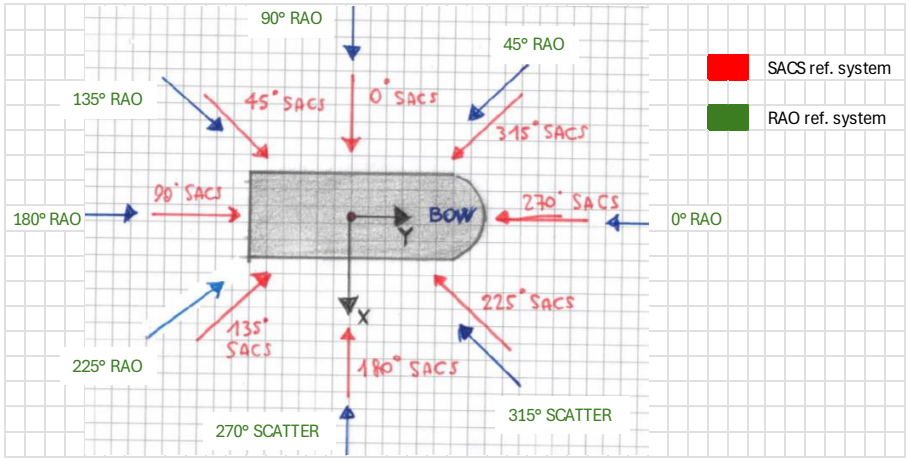


Figure 12.2 – SACS Ref. system vs. RAOs Ref. system

12.2 ANALYSIS RESULTS

12.2.1 Tubular Joints

S-N = F3

SCF = Efthymiou (min. 1.50)

DFF = 2.0

In this section are presented the fatigue damage of the BLPH topside and PAU tubular joints, all the welds are single side full pen. welds.

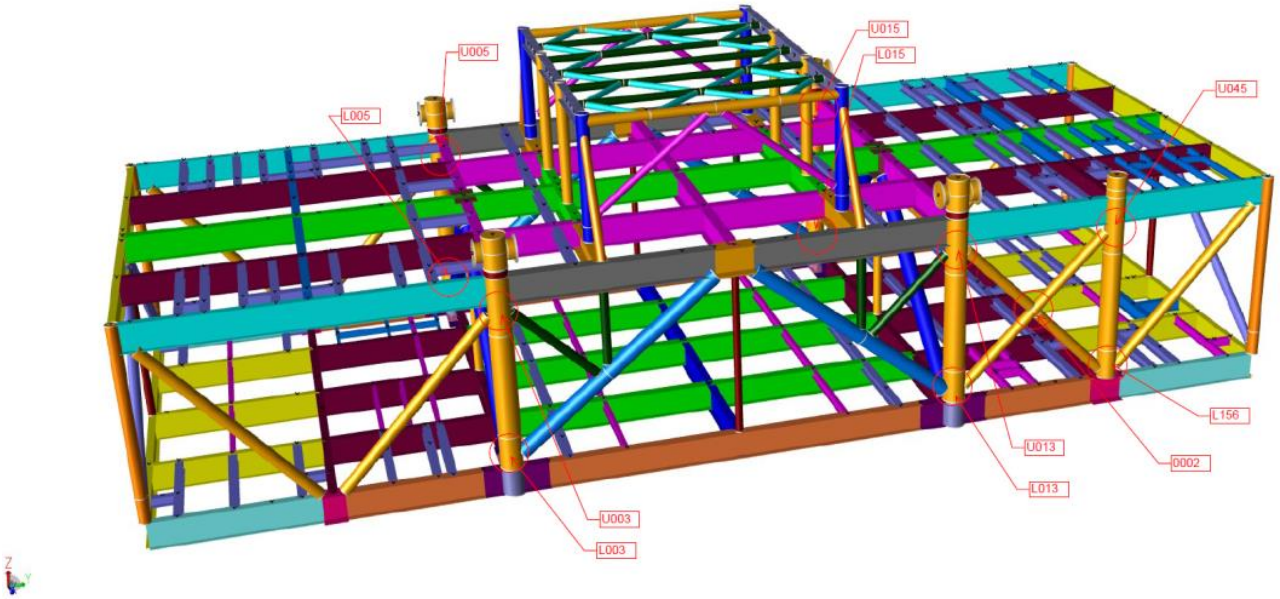


Figure 12.3 - Analyzed Tubular Joints - Topside

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	STRESS CONC. FACTORS AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
L005	L005-D003	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.1194139	T	.6883618		
L005	L005-U005	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.1713537	T	.4797095		
L003	L003-D005	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.1102727	T	.7454246		
L003	L003-U003	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.1584018	T	.5189334		
L015	L015-D004	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.50	1.50	1.53	.0523867	T	1.569099		
L015	L015-U015	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.50	1.50	1.73	.0759067	T	1.082908		
L013	L013-D006	D01	TUB	55.00	2.000	Y	BRC	4.00		1.50	1.53	1.50	1.52	.0467337	T	1.758902		
L013	L013-U013	C20	TUB	80.00	4.000	Y	CHD	4.00		1.50	1.68	1.50	1.66	.0677787	T	1.212771		

L013 L013-0002 D36	TUB	40.64	2.062	Y	BRC	4.00	1.50	1.61	1.50	1.50	.23384-2	T	35.15158
L013 L013-U013 C20	TUB	80.00	4.000	Y	CHD	4.00	1.50	1.95	1.50	1.50	.37360-2	T	22.00239
U005 D003-U005 D03	TUB	32.39	1.270	Y	BRC	4.90	1.50	1.99	1.50	1.52	.57559-2	R	14.28101
U005 L005-U005 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	2.35	1.50	1.50	.0114559	R	7.175367
U005 L110-U005 D05	TUB	40.64	1.270	Y	BRC	4.90	1.50	1.68	1.51	1.66	.0207928	TL	3.953300
U005 L005-U005 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	1.88	1.50	1.60	.0327666	L	2.508650
U003 D005-U003 D03	TUB	32.39	1.270	Y	BRC	4.90	1.50	1.97	1.50	1.53	.24395-2	BL	33.69548
U003 L003-U003 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	2.33	1.50	1.50	.50607-2	L	16.24273
U003 L033-U003 D05	TUB	40.64	1.270	Y	BRC	4.90	1.50	1.65	1.52	1.68	.0222569	TR	3.693233
U003 L003-U003 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	1.82	1.50	1.61	.0321322	R	2.558180
U015 D004-U015 D03	TUB	32.39	1.270	Y	BRC	4.90	1.50	1.88	1.50	1.56	.67728-3	L	121.3684
U015 L015-U015 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	2.17	1.50	1.51	.14895-2	L	55.18510
U015 L113-U015 D05	TUB	40.64	1.270	Y	BRC	4.90	1.50	1.70	1.51	1.65	.15340-2	R	53.58469
U015 L015-U015 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	1.93	1.50	1.59	.29108-2	R	28.23983
U013 D006-U013 D03	TUB	32.39	1.270	Y	BRC	4.90	1.50	1.78	1.50	1.60	.25505-3	BR	322.2931
U013 L013-U013 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	1.98	1.50	1.51	.40389-3	R	203.5190
U013 U013-0002 D06	TUB	40.64	1.588	Y	BRC	4.90	1.50	1.74	1.50	1.71	.78111-4	BL	1052.352
U013 L013-U013 C20	TUB	80.00	3.000	Y	CHD	4.90	1.50	2.32	1.50	1.78	.19139-3	L	429.4861
U045 U045-0002 D36	TUB	40.64	2.062	Y	BRC	4.30	1.50	1.50	1.50	1.60	.10625-3	TL	773.6321
U045 L156-U045 C11	TUB	70.00	3.000	Y	CHD	4.30	1.50	1.81	1.50	2.04	.31388-3	L	261.8873
L156 L156-0002 D06	TUB	40.64	1.588	Y	BRC	7.00	1.50	1.53	1.50	1.64	.14984-3	R	548.5675
L156 L156-U045 C11	TUB	70.00	3.000	Y	CHD	7.00	1.50	1.77	1.50	1.79	.29199-3	R	281.5157
L156 L156-U153 D36	TUB	40.64	2.062	Y	BRC	7.00	1.50	1.50	1.50	1.50	.38068-4	R	2159.318
L156 L156-U045 C11	TUB	70.00	3.000	Y	CHD	7.00	1.50	1.81	1.50	1.84	.11317-3	R	726.3386
0002 L156-0002 D06	TUB	40.64	1.588	T	BRC	3.69	1.50	1.50	1.50	1.50	.23322-4	T	3524.498
0002 U045-0002 D36	TUB	40.64	2.062	T	CHD	3.69	1.50	1.50	1.50	1.50	.23322-4	T	3524.498
0002 U013-0002 D06	TUB	40.64	1.588	T	BRC	3.69	1.50	1.50	1.50	1.50	.52444-4	T	1567.396
0002 L013-0002 D36	TUB	40.64	2.062	T	CHD	3.69	1.50	1.50	1.50	1.50	.52444-4	T	1567.396

Table 12.1 – Fatigue Damage – Topside Tubular Joints Summary

Using DFF = 3.0, according to Design Basis, the maximum damage is: 0.17/2.0*3.0 = 0.255 < 1 in joint L005-U005, main column C2.

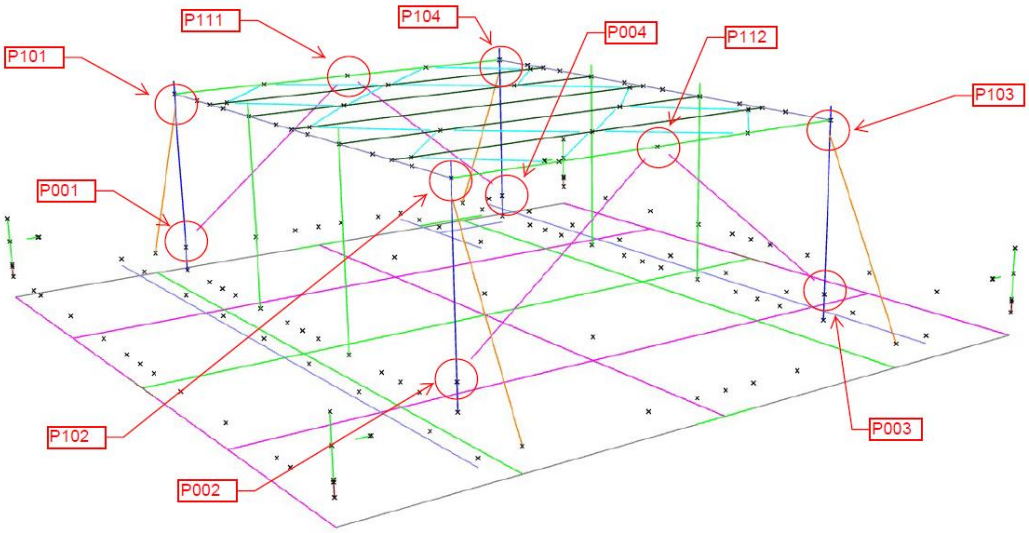


Figure 12.4 – Analyzed Tubular Joints - PAU

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	STRESS CONC. FACTORS AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
P101	P101-P120	PL1	TUB	35.50	1.588	T	BRC	5.90		1.50	1.87	1.50	1.78	.82837-3	L	99.23062		
P101	P001-P101	PC3	TUB	45.72	1.905	T	CHD	5.90		2.16	2.48	1.50	2.79	.45661-2	L	18.00221		
P101	U040-P101	SF1	TUB	32.39	1.270	Y	BRC	5.90		1.50	1.50	2.40	1.50	.0612922	BL	1.341117		
P101	P001-P101	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.50	1.50	1.50	1.50	.0465334	BL	1.766474		
P001	P001-P111	PD3	TUB	27.31	1.270	Y	BRC	5.90		1.50	1.66	1.50	1.90	.0219642	TL	3.742452		
P001	P001-P101	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.78	2.44	1.50	2.40	.0408822	TL	2.010653		
P102	P102-P122	PL1	TUB	35.50	1.588	T	BRC	5.90		1.50	1.87	1.50	1.78	.75606-3	R	108.7219		
P102	P002-P102	PC3	TUB	45.72	1.905	T	CHD	5.90		2.16	2.48	1.50	2.79	.41653-2	R	19.73470		
P102	U021-P102	SF1	TUB	32.39	1.270	Y	BRC	5.90		1.50	1.50	2.39	1.50	.0365576	BR	2.248507		
P102	P002-P102	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.50	1.50	1.50	1.50	.0281268	BR	2.922484		
P002	P002-P112	PD3	TUB	27.31	1.270	Y	BRC	5.90		1.50	1.66	1.50	1.90	.0187764	TR	4.377831		
P002	P002-P102	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.78	2.44	1.50	2.40	.0350350	TR	2.346223		
P104	P121-P104	PL1	TUB	35.50	1.588	T	BRC	5.90		1.50	1.87	1.50	1.78	.45697-4	BR	1798.815		
P104	P004-P104	PC3	TUB	45.72	1.905	T	CHD	5.90		2.16	2.48	1.50	2.79	.30571-3	R	268.8811		
P104	U023-P104	SF1	TUB	32.39	1.270	Y	BRC	5.90		1.50	1.50	2.39	1.50	.0331958	B	2.476213		
P104	P004-P104	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.50	1.50	1.50	1.50	.0213138	B	3.856649		

P003	P003-P112	PD3	TUB	27.31	1.270	Y	BRC	5.90		1.50	1.66	1.50	1.90	.0130986	T	6.275458
P003	P003-P103	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.78	2.44	1.50	2.40	.0226656	TL	3.626640
P004	P004-P111	PD3	TUB	27.31	1.270	Y	BRC	5.90		1.50	1.66	1.50	1.90	.0130130	T	6.316750
P004	P004-P104	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.78	2.44	1.50	2.40	.0213626	TR	3.847842
P103	P123-P103	PL1	TUB	35.50	1.588	T	BRC	5.90		1.50	1.87	1.50	1.78	.46932-4	BL	1751.489
P103	P003-P103	PC3	TUB	45.72	1.905	T	CHD	5.90		2.16	2.48	1.50	2.79	.33203-3	L	247.5653
P103	U022-P103	SF1	TUB	32.39	1.270	Y	BRC	5.90		1.50	1.50	2.39	1.50	.0203308	B	4.043119
P103	P003-P103	PC3	TUB	45.72	1.905	Y	CHD	5.90		1.50	1.50	1.50	1.50	.0132510	B	6.203299
P111	P001-P111	PD3	TUB	27.31	1.270	K	BRC	4.50	10.58	1.50	1.50	1.50	1.53	.54364-2	BL	15.12039
P111	P120-P111	PL1	TUB	35.50	1.588	K	CHD	4.50		1.93	1.93	1.50	2.23	.0139499	BL	5.892504
P111	P004-P111	PD3	TUB	27.31	1.270	K	BRC	4.50	10.58	1.50	1.50	1.50	1.53	.27546-2	BL	29.84109
P111	P111-P121	PL1	TUB	35.50	1.588	K	CHD	4.50		1.92	1.92	1.50	2.21	.75902-2	BL	10.82973
P112	P002-P112	PD3	TUB	27.31	1.270	K	BRC	4.50	10.58	1.50	1.50	1.50	1.53	.45458-2	BR	18.08279
P112	P122-P112	PL1	TUB	35.50	1.588	K	CHD	4.50		1.95	1.95	1.50	2.26	.0116131	BR	7.078234
P112	P003-P112	PD3	TUB	27.31	1.270	K	BRC	4.50	10.58	1.50	1.50	1.50	1.53	.25312-2	B	32.47436
P112	P112-P123	PL1	TUB	35.50	1.588	K	CHD	4.50		1.95	1.95	1.50	2.26	.63065-2	BL	13.03416

Table 12.2 – Fatigue Damage – PAU Tubular Joints Summary

12.2.2 In-line Tubular Joints

S-N = F3

SCF = min. 1.61 thickness transition, see 10.3.3

DFF = 2.0

In-line tubular joints check covers all columns connections with thickness transition. Crane column is without thk transition and therefore analyzed in previous section.

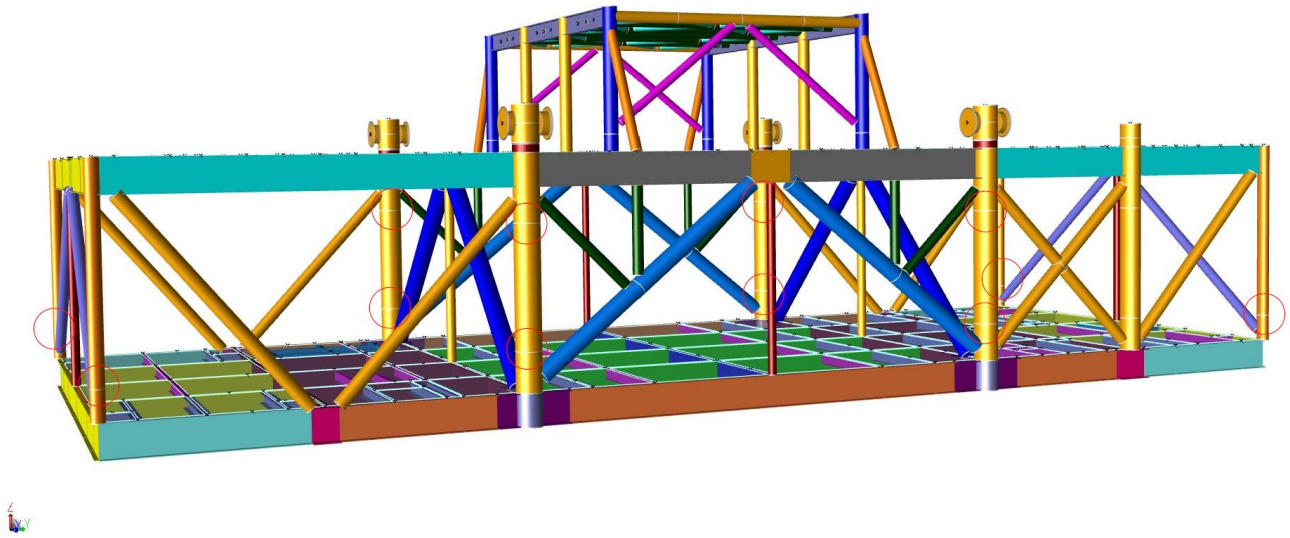


Figure 12.5 – Analyzed Tubular in line Joints

* * * I N T E R M E D I A T E M E M B E R F A T I G U E R E P O R T * * *

MEMBER	GRUP	DISTANCE FROM END M	OUTSIDE DIAMETER CM	WALL THICK. CM	STRESS. CONC. FACTORS AXIAL	BENDING	** FATIGUE RESULTS ** DAMAGE	LOC	SVC LIFE
L008-U008	C05	0.900	40.640	2.144	1.680	1.680	.23532-3	TR	349.3074
		0.900	40.640	1.270	1.680	1.680	.21180-2	TR	38.80973
L010-U010	C05	0.900	40.640	2.144	1.680	1.680	.49491-3	BR	166.0908
		0.900	40.640	1.270	1.680	1.680	.40357-2	BR	20.36823
L018-U018	C05	0.900	40.640	2.144	1.680	1.680	.95408-5	L	8615.601
		0.900	40.640	1.270	1.680	1.680	.10322-3	L	796.3704
L020-U020	C05	0.900	40.640	2.144	1.680	1.680	.10486-4	BL	7838.989
		0.900	40.640	1.270	1.680	1.680	.11401-3	BL	721.0027
L156-U045	C11	1.100	70.000	3.000	1.680	1.680	.12420-4	T	6618.597
		1.100	70.000	2.000	1.680	1.680	.60724-4	T	1353.670
		4.900	70.000	2.000	1.680	1.680	.54587-5	B	15058.43
		4.900	70.000	3.000	1.680	1.680	.10777-5	B	76276.43
L003-U003	C20	1.210	80.000	4.000	1.680	1.680	.28456-2	BL	28.88646
		1.210	80.000	2.000	1.680	1.680	.0196927	BL	4.174136
		4.950	80.000	2.000	1.680	1.680	.52056-2	T	15.79071
		4.950	80.000	3.000	1.680	1.680	.13424-2	T	61.23318
L005-U005	C20	1.210	80.000	4.000	1.680	1.680	.32873-2	TL	25.00523
		1.210	80.000	2.000	1.680	1.680	.0223567	TL	3.676756
		4.950	80.000	2.000	1.680	1.680	.94214-2	B	8.724814
		4.950	80.000	3.000	1.680	1.680	.26078-2	B	31.52074
L013-U013	C20	1.210	80.000	4.000	1.680	1.680	.89452-4	L	918.9291
		1.210	80.000	2.000	1.680	1.680	.95098-3	L	86.43676
L013-U013	C20	4.950	80.000	2.000	1.680	1.680	.18051-3	T	455.3830
		4.950	80.000	3.000	1.680	1.680	.36820-4	T	2232.463
L015-U015	C20	1.210	80.000	4.000	1.680	1.680	.23064-3	R	356.4044
		1.210	80.000	2.000	1.680	1.680	.22025-2	R	37.32127
		4.950	80.000	2.000	1.680	1.680	.12646-2	B	64.99974
		4.950	80.000	3.000	1.680	1.680	.30250-3	B	271.7311

Table 12.3 – Fatigue Damage – Tubular in-line Joints Summary

Using DFF = 3.0, the maximum damage is: 0.022/2.0*3.0 = 0.033 < 1.

12.2.3 Beam-to-Beam Connection

S-N = F3

SCF = min. 1.50 SCF calculated, see 10.3.5

DFF = 2.0

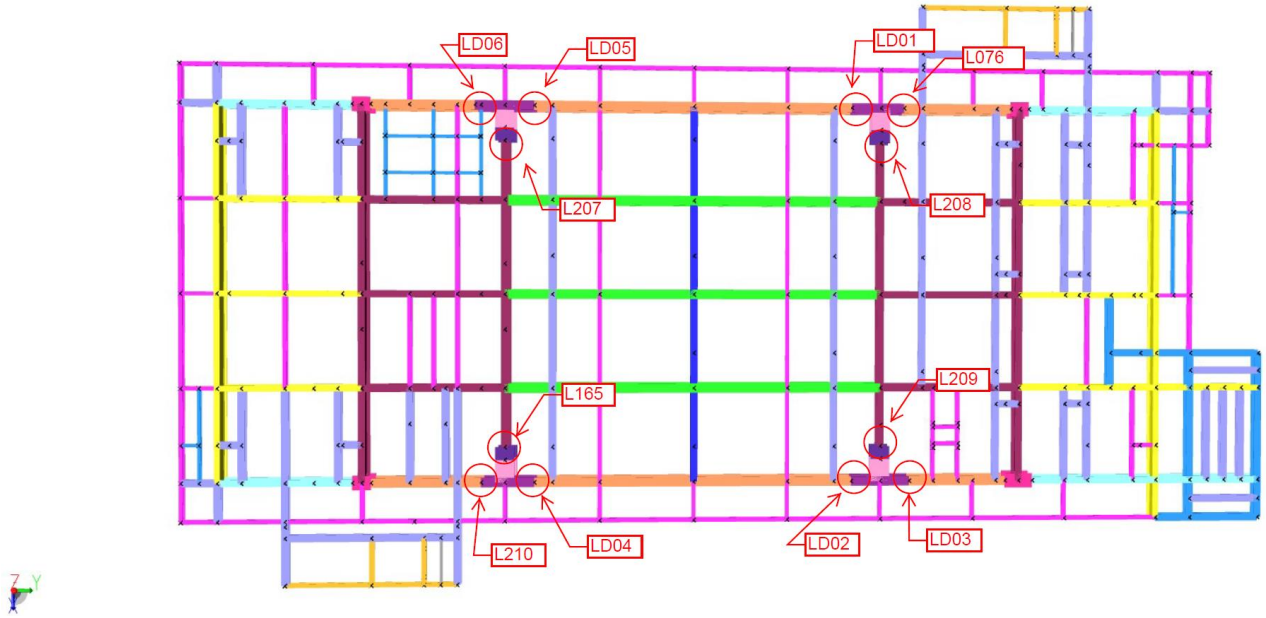


Figure 12.6 – Analyzed Joints – lower deck

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

MEMBER	JOINT	GRUP ID	TYPE ID	******* STRESS CONC. FACTORS ******** ****** FLANGE ******* AXIAL	MAJOR	MINOR	**** WEB **** AXIAL	MAJOR	** FATIGUE RESULTS ** DAMAGE	LOC	SVC LIFE
L207-L004	L207	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0296738	BL	2.770118
L208-L176	L208	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0265801	BR	3.092537
L002-L165	L165	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0213206	BL	3.855428
L177-L209	L209	B03	PLG	1.50	1.50	1.50	1.50	1.50	.0200176	BL	4.106386
L076-L029	L076	B01	PLG	1.50	1.50	1.50	1.50	1.50	.0165475	BR	4.967510
LD05-L185	LD05	B01	PLG	1.50	1.50	1.50	1.50	1.50	.0151503	BR	5.425646
LD04-L190	LD04	B01	PLG	1.50	1.50	1.50	1.50	1.50	.0143440	BR	5.730623
L015-L076	L076	B31	PLG	1.50	1.50	1.50	1.50	1.50	.80248-2	BR	10.24319
L005-LD05	LD05	B31	PLG	1.50	1.50	1.50	1.50	1.50	.71501-2	BR	11.49635
L003-LD04	LD04	B31	PLG	1.50	1.50	1.50	1.50	1.50	.66071-2	BR	12.44109
L168-LD06	LD06	B01	PLG	1.50	1.50	1.50	1.50	1.50	.64976-2	BR	12.65073
LD03-L215	LD03	B01	PLG	1.50	1.50	1.50	1.50	1.50	.52296-2	BL	15.71820
L184-LD01	LD01	B01	PLG	1.50	1.50	1.50	1.50	1.50	.51428-2	BR	15.98337
L183-LD02	LD02	B01	PLG	1.50	1.50	1.50	1.50	1.50	.48223-2	BL	17.04595
L048-L210	L210	B01	PLG	1.50	1.50	1.50	1.50	1.50	.46857-2	BL	17.54274

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LD06-L521	LD06	B31	PLG	1.50	1.50	1.50	1.50	1.50	.31405-2	BR	26.17401
L013-LD03	LD03	B31	PLG	1.50	1.50	1.50	1.50	1.50	.23704-2	BL	34.67793
LD01-L015	LD01	B31	PLG	1.50	1.50	1.50	1.50	1.50	.22392-2	BR	36.70943
L210-L003	L210	B31	PLG	1.50	1.50	1.50	1.50	1.50	.21679-2	BL	37.91619
LD02-L013	LD02	B31	PLG	1.50	1.50	1.50	1.50	1.50	.20547-2	BL	40.00630
L206-L208	L208	B23	PLG	1.50	1.50	1.50	1.50	1.50	.53080-3	BR	154.8618
L204-L207	L207	B23	PLG	1.50	1.50	1.50	1.50	1.50	.46850-3	BL	175.4547
L209-L205	L209	B23	PLG	1.50	1.50	1.50	1.50	1.50	.40727-3	BL	201.8309
L165-L203	L165	B23	PLG	1.50	1.50	1.50	1.50	1.50	.32272-3	BL	254.7096

Table 12.4 – Fatigue Damage – Beam-to-Beam Connection Summary

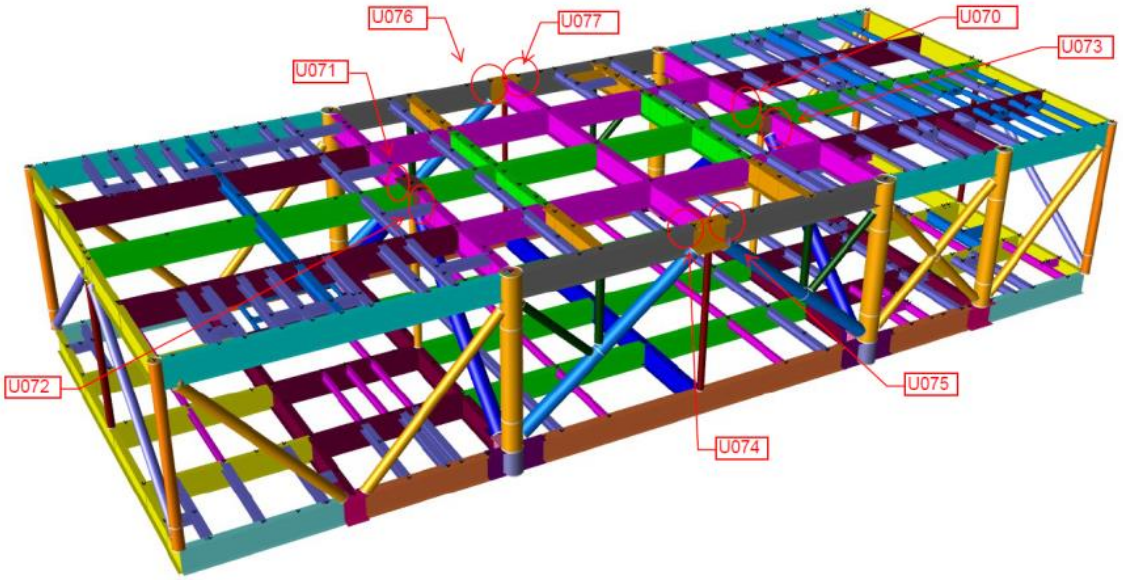
12.2.4 Column Joints (Pipe to Beam)

S-N = F3

SCF = 1.50 Minimum SCF

DFF = 2.0

Connections between columns and the upper plate of nodal joints have been considered as butt welds made from one side. The minimum SCF = 1.50 has been applied.



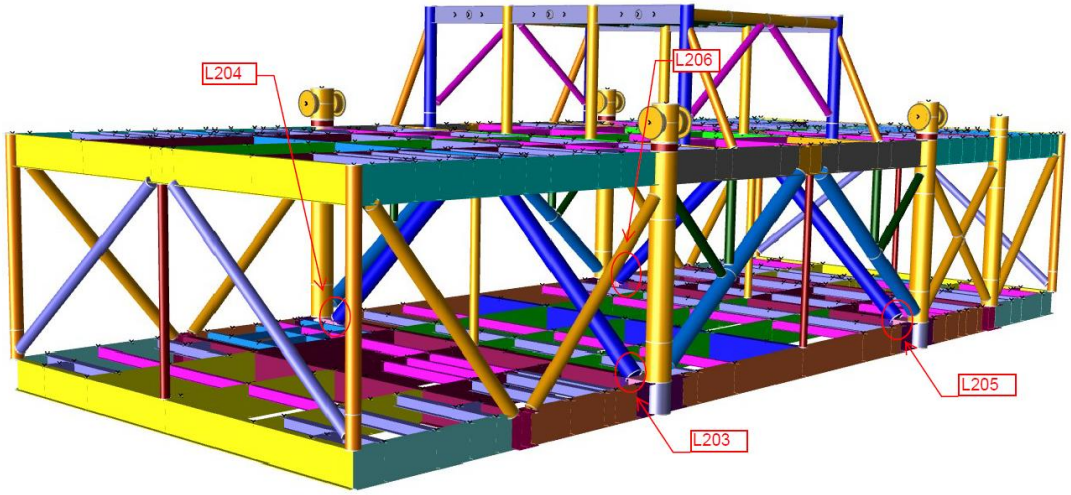


Figure 12.7 – Analyzed Joints Topside

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	* STRESS CONC. FACTORS * AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
L204	L204-U071	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0278305	R	2.953593		
L203	L203-U072	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0243315	R	3.378331		
U071	L204-U071	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0238889	L	3.440924		
U072	L203-U072	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0189846	L	4.329827		
U070	L206-U070	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0172195	R	4.773646		
L206	L206-U070	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0169172	R	4.858955		
L205	L205-U073	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0135783	R	6.053779		
U073	L205-U073	D04	TUB	60.00	2.000					1.50	1.50	1.50	1.50	.0123811	R	6.639142		

Table 12.5 – Fatigue Damage – Column Joints Summary

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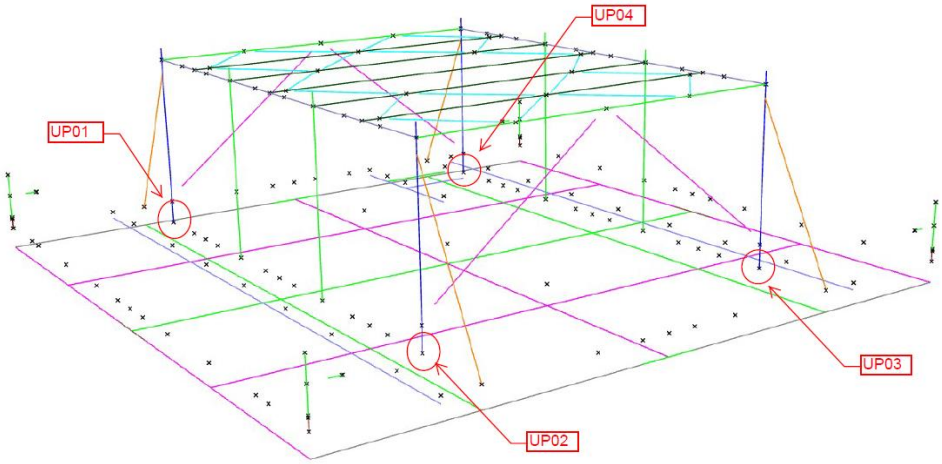


Figure 12.8 – PAU Analyzed Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	ORIGINAL WT (CM)	CHORD JNT TYP	CHORD MEM TYP	CHORD LEN. (M)	GAP (CM)	* STRESS CONC. FACTORS * AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
UP01	UP01-P001	PC3	TUB	45.72	1.905					1.50	1.50	1.50	1.50	.0247057	B	3.327172		
UP04	UP04-P004	PC3	TUB	45.72	1.905					1.50	1.50	1.50	1.50	.0207455	B	3.962307		
UP02	UP02-P002	PC3	TUB	45.72	1.905					1.50	1.50	1.50	1.50	.0141494	T	5.809446		
UP03	UP03-P003	PC3	TUB	45.72	1.905					1.50	1.50	1.50	1.50	.0130518	T	6.297991		

Table 12.6 – Fatigue Damage – PAU Column Joints Summary

12.2.5 Brace Joints (Pipe to Gusset plate)

S-N = F3

SCF = 1.50 Minimum SCF

DFF = 2.0

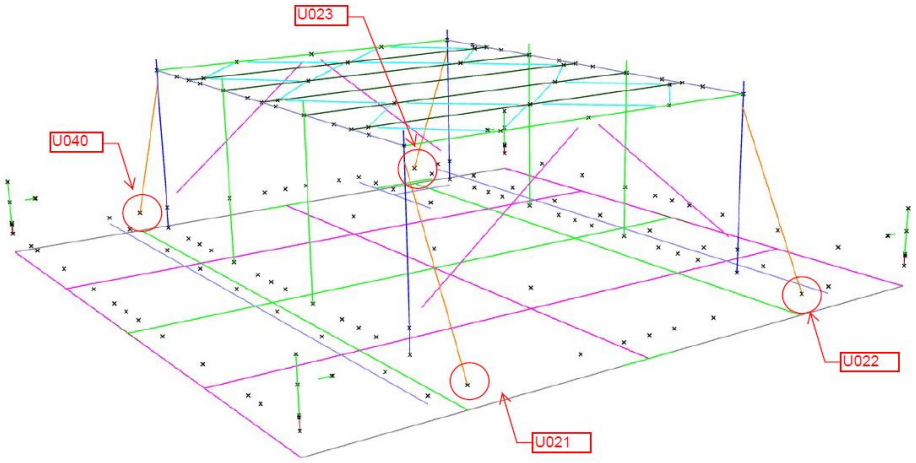


Figure 12.9 – PAU Analyzed Joints

* * * M E M B E R F A T I G U E R E P O R T * * *
(DAMAGE ORDER)

JOINT	MEMBER	GRUP ID	TYPE ID	ORIGINAL OD (CM)	WT (CM)	JNT TYP	MEM TYP	CHORD LEN. (M)	GAP (CM)	* STRESS CONC. FACTORS * AX-CR	AX-SD	IN-PL	OU-PL	FATIGUE RESULTS DAMAGE	LOC	SVC LIFE	REQUIRED OD (CM)	REQUIRED WT (CM)
U040	U040-P101	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0453929	TL	1.810858		
U040	D003-U040	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0453929	TL	1.810858		
U021	U021-P102	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0273232	TL	3.008429		
U021	D005-U021	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0273232	TL	3.008429		
U023	U023-P104	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0224156	TL	3.667083		
U023	D004-U023	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0224156	TL	3.667083		
U022	U022-P103	SF1	TUB	32.39	1.270	Y	BRC	2.71		2.00	2.00	2.00	2.00	.0150089	TL	5.476762		
U022	D006-U022	D03	TUB	32.39	1.270	Y	CHD	2.71		2.00	2.00	2.00	2.00	.0150089	TL	5.476762		

Table 12.7 – Fatigue Damage – PAU SF Joints Summary

APPENDIX A – SCATTER DIAGRAMS

Direction	0	deg								Tp											Totals
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00612	0.01591	0.0074	0.00207	0.00037	0	2.7E-05	0.00019	0	6.9E-05	0	0	0	0	0	0	6.4E-05	0	
0.75	0	0	0.00056	0.01498	0.02486	0.01246	0.0048	0.00138	0.0005	0.00048	0.00018	0	0	0	0	0	0	0	0	0	
1.25	0	0	0	0.00029	0.00822	0.01598	0.00594	0.00299	0.00158	0.00058	0.00027	5.4E-05	0.00011	0	0	0	0	0	0	0	
1.75	0	0	0	0	0.00028	0.00435	0.00558	0.00206	0.00082	0.00087	0.00065	0.00032	0.00016	5.4E-05	0	0	0	0	0	0	
2.25	0	0	0	0	0	0.00014	0.00329	0.00138	0.00112	0.0007	0.00021	0.00016	0.00011	0	0	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00072	0.00103	0.00076	0.00069	0.00027	0.00011	5.4E-05	0	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	6.9E-05	0.0006	0.00058	0.00021	0.00038	0.00016	0	0	0	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	2.7E-05	5.4E-05	5.4E-05	0.00021	0.00021	0	0	0	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	0	0.00011	0.00011	0.00021	0.00038	0.00011	0	0	0	0	0	0	0	
4.75	0	0	0	0	0	0	0	0	5.4E-05	0	0.00011	5.4E-05	5.4E-05	0	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	5.4E-05	5.4E-05	5.4E-05	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	5.4E-05	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00668	0.03117	0.04075	0.03501	0.02076	0.00947	0.00561	0.00389	0.00249	0.00157	0.00064	0.00016	0	0	0	0	6.4E-05	0	**0.158**
Direction	45	deg								Tp											
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00217	0.00731	0.00536	0.00124	2.7E-05	0	5.4E-05	0	6.9E-05	0	6.9E-05	0	0	0	0	0	0	0	
0.75	0	0	0.0003	0.00399	0.00864	0.00599	0.0024	0.00057	9.5E-05	6.9E-05	0.00014	0.00015	0	0	6.4E-05	0	0	0	0	0	
1.25	0	0	0	2.7E-05	0.00231	0.00487	0.00295	0.00193	0.00093	0.00016	0.00011	6.9E-05	0	0	0	0	0	0	0	0	
1.75	0	0	0	0	0.00024	0.00117	0.0028	0.00085	0.00029	0.00019	0	5.4E-05	0	0	0	0	0	0	0	0	
2.25	0	0	0	0	0	0.00025	0.00099	0.00068	9.5E-05	5.4E-05	0	0	0	0	0	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00039	0.00034	9.6E-05	0	0	0	0	0	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	6.4E-05	0.00015	0.00014	2.7E-05	0	0	0	0	0	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	5.4E-05	0.00012	0	0	0	0	0	0	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00246	0.01133	0.01655	0.01352	0.00963	0.00458	0.00181	0.0005	0.00031	0.00027	6.9E-05	0	6.4E-05	0	0	0	0	0	**0.061**

Direction	90	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00185	0.00611	0.00553	0.00377	0.00113	0.00035	0.00028	0.00023	9.5E-05	0	0.00014	0.00014	0	0	0	0	2.7E-05	2.7E-05	
0.75	0	0	0.00015	0.00349	0.00778	0.00717	0.00904	0.00463	0.00065	0.00031	6.9E-05	0	0	0	0	0	0	6.9E-05	0	0	
1.25	0	0	0	0.00018	0.00183	0.00542	0.00501	0.0064	0.00455	0.00098	0.00022	0	0	0	0	0	0	0	0	0	
1.75	0	0	0	0	0.00018	0.00117	0.00225	0.00155	0.0037	0.00382	0.00033	0	0	0	0	0	0	0	0	0	
2.25	0	0	0	0	0	0.0005	0.00127	0.00094	0.00157	0.00223	0.00057	9.5E-05	0	0	0	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00012	0.00014	0.00059	0.00101	0.00095	0.00019	0	0	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	0	0.00022	0.00035	0.00015	9.5E-05	0	0	0	0	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	0.00027	0.00039	0.00022	0	0	0	0	0	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	0	0.00024	0	0	0	0	0	0	0	0	0	0	0	
4.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00201	0.00979	0.01532	0.01803	0.01881	0.01449	0.01233	0.00895	0.00233	0.00029	0.00014	0.00014	0	0	0	6.9E-05	2.7E-05	2.7E-05	**0.103**

Direction	135	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00252	0.00406	0.00313	0.00166	0.00086	0.00018	0.00039	0.00033	6.4E-05	0	0	0	0	0	0	0	0	0	
0.75	0	0	0.00058	0.002	0.00296	0.00399	0.00415	0.00206	0.00096	0.00075	0.00027	0.0003	6.9E-05	6.9E-05	0	0	0	0	0	0	
1.25	0	0	0	0.00018	0.00159	0.00366	0.00478	0.00284	0.00207	0.0008	0.00034	4.9E-05	6.9E-05	0	0	0	0	0	0	0	
1.75	0	0	0	0	0.00018	0.00232	0.00312	0.00189	0.00239	0.00091	0.00056	6.9E-05	0	0	0	0	0	0	0	0	
2.25	0	0	0	0	0	0.00035	0.00378	0.00177	0.00134	0.00042	0.00056	0	0.00025	0	0	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00143	0.00241	0.00098	0.00048	2.7E-05	9.8E-05	6.7E-05	0	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	0.00029	0.00154	0.00032	0.00023	0	0	4.9E-05	0	0	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	0.0006	0.0006	4.9E-05	0	0	0	4.9E-05	0	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	6.7E-05	0.00038	0.00016	0	0	0	0	0	0	0	0	0	0	
4.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00311	0.00625	0.00787	0.01199	0.0184	0.01335	0.00943	0.00414	0.00182	0.00052	0.00051	0.00012	0	0	0	0	0	0	**0.078**

Direction	180	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00397	0.00663	0.00786	0.00529	0.00156	0.00191	0.00089	0.00096	0.00046	0.00033	0.00019	6.4E-05	0.00013	0	6.4E-05	0	5.2E-05	5.2E-05	
0.75	0	0	0.00118	0.00638	0.00747	0.01192	0.01143	0.00485	0.00326	0.00269	0.0012	0.00041	0.00034	0.00021	0	2.7E-05	0	0	0	0	
1.25	0	0	0	0.00047	0.00272	0.00852	0.00828	0.00844	0.00582	0.00455	0.00279	0.00174	0.00091	9.8E-05	0.0001	0	0	0	0	0	
1.75	0	0	0	0	0.00026	0.00459	0.00735	0.00736	0.00648	0.00578	0.00604	0.0027	0.0017	0.00055	0.00021	9.8E-05	0	0	0	0	
2.25	0	0	0	0	0	0.0008	0.00513	0.00523	0.00413	0.00404	0.00337	0.00286	0.00212	0.00054	0.00016	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00134	0.00216	0.00374	0.0018	0.00128	0.00101	0.00158	0.00039	6.7E-05	0	0	0	0	0	
3.25	0	0	0	0	0	0	8.1E-05	0.00079	0.00201	0.00134	0.0005	0.00075	0.00085	0.00041	9.8E-05	4.9E-05	0	0	0	0	
3.75	0	0	0	0	0	0	0	0.00015	0.00064	0.00101	0.00042	0.00016	0.00013	0.0004	0.00021	4.9E-05	4.9E-05	0	0	0	
4.25	0	0	0	0	0	0	0	0	6.7E-05	0.00064	0.00036	4.9E-05	6.7E-05	0.00013	9.8E-05	0	4.9E-05	0	0	0	
4.75	0	0	0	0	0	0	0	0	0	0	6.9E-05	0	0	6.7E-05	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	0	0	0	6.7E-05	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00515	0.01349	0.01832	0.03112	0.03517	0.03089	0.02703	0.02282	0.01648	0.01001	0.00789	0.00293	0.00109	0.00022	0.00016	0	5.2E-05	5.2E-05	**0.223**

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Direction	225	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00142	0.00344	0.0029	0.00155	0.00083	0.00038	0.00012	0.00041	6.9E-05	0	0	0	6.4E-05	0	0	0	0	0	
0.75	0	0	0.00015	0.00272	0.00391	0.00362	0.00391	0.00181	0.00138	0.00217	0.00103	0.00024	0.00017	0.00017	4.9E-05	0	0	0	0	0	
1.25	0	0	0	6.4E-05	0.00143	0.00249	0.00476	0.00476	0.00563	0.00763	0.00641	0.00337	0.00198	0.00093	0.00015	4.9E-05	0	0	0	0	
1.75	0	0	0	0	0	0.00165	0.00327	0.00231	0.0032	0.00483	0.00891	0.00782	0.00343	0.00123	0.00039	0	4.9E-05	0	0	0	
2.25	0	0	0	0	0	0.00032	0.00149	0.00156	0.00147	0.00192	0.0053	0.00698	0.00434	0.00175	0.00064	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00027	0.0008	0.00117	0.00141	0.00184	0.00408	0.0033	0.00155	0.00025	4.9E-05	0	0	0	0	
3.25	0	0	0	0	0	0	5.2E-05	0.00031	0.00063	0.0005	0.00073	0.00135	0.00134	0.00115	0.00035	0	0	0	0	0	
3.75	0	0	0	0	0	0	5.4E-05	0	0.00019	0.00021	0.00032	0.00052	0.00065	0.00141	0.00043	0	6.7E-05	0	0	0	
4.25	0	0	0	0	0	0	0	0	5.4E-05	4.9E-05	0.0002	0.00012	0.0004	0.0002	0.00035	6.7E-05	4.9E-05	0	0	0	
4.75	0	0	0	0	0	0	0	0	6.9E-05	0	0	0	6.7E-05	0.00025	0.00025	6.7E-05	6.7E-05	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0	6.7E-05	0	6.7E-05	0.00013	6.7E-05	0	4.9E-05	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	6.7E-05	6.7E-05	6.7E-05	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.7E-05	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	6.9E-05	0	0	0	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00157	0.00622	0.00823	0.00963	0.01464	0.01194	0.0139	0.01913	0.02494	0.02446	0.0158	0.00884	0.00312	0.00023	0.00028	0	0	0	**0.163**

Direction	270	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00055	0.00144	0.00155	0.00065	0.00029	0.00016	0.00013	0	5.4E-05	0	0	0	0	0	0	0	0	0	
0.75	0	0	0.00024	0.00147	0.00354	0.00239	0.00155	0.00195	0.00186	0.00134	0.00099	0.00062	0.00027	0	0	5.2E-05	0	0	0	0	
1.25	0	0	0	5.2E-05	0.00156	0.00344	0.00201	0.00213	0.0054	0.00598	0.00347	0.0016	0.00061	0.00012	0.00019	0	0	0	0	0	
1.75	0	0	0	0	0	0.00136	0.00282	0.00148	0.00186	0.00459	0.00721	0.00251	0.00176	0.00069	0.00019	0	0	0	0	0	
2.25	0	0	0	0	0	0.00012	0.002	0.00165	0.00165	0.00194	0.00298	0.00317	0.00159	0.00074	0.00011	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00051	0.0011	0.00067	0.00108	0.0014	0.00222	0.00176	0.00047	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	5.2E-05	0.00014	0.00034	0.00044	0.00062	0.00061	0.00088	0.00048	0.00027	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	0.00014	0.0002	0.00025	0.00032	0.00097	0.00049	0.00023	0	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	0	6.7E-05	0.00012	0.00036	0.0002	0.00029	0.00035	0.00011	0	0	0	0	0	
4.75	0	0	0	0	0	0	0	0	0	0.0002	5.4E-05	6.7E-05	0	0.00031	0	0.00011	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	5.4E-05	0.00012	0.00013	5.4E-05	0	0	0	5.4E-05	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	5.4E-05	0	5.4E-05	6.7E-05	0.00012	6.7E-05	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0.00011	0	5.4E-05	6.7E-05	6.7E-05	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00012	6.7E-05	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	6.7E-05	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00079	0.00297	0.00665	0.00797	0.00923	0.00874	0.01218	0.01606	0.01768	0.01215	0.00783	0.00375	0.00105	0.00016	5.4E-05	0	0	0	**0.107**

Direction	315	deg								Tp										
	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	
Hs																					
0.25	0	0	0.00167	0.00442	0.00254	0.00052	0.00031	0.00019	6.4E-05	0	0	0	0	0	0	0	0	0	0	0	
0.75	0	0	0.00024	0.00349	0.00759	0.00354	0.00123	0.0006	0.00234	0.00175	0.00118	0.00097	0.00027	0	5.4E-05	0	5.4E-05	0	0	0	
1.25	0	0	0	0.00013	0.00191	0.00521	0.00214	0.00111	0.00261	0.00338	0.00306	0.0022	0.00032	0.00027	0.00032	0	0	0	0	0	
1.75	0	0	0	0	2.7E-05	0.00234	0.00347	0.0008	0.00127	0.00276	0.00389	0.00263	0.00124	0.00059	5.4E-05	0	0	0	0	0	
2.25	0	0	0	0	0	0.00064	0.00271	0.00115	0.00139	0.00173	0.00243	0.00208	0.00075	0.00032	5.4E-05	0	0	0	0	0	
2.75	0	0	0	0	0	0	0.00102	0.00143	0.00088	0.00138	0.00172	0.00152	0.0007	0.00048	0	0	0	0	0	0	
3.25	0	0	0	0	0	0	6.9E-05	0.00051	0.0005	0.0009	0.00127	0.00064	0.00027	0.00016	0	0	0	0	0	0	
3.75	0	0	0	0	0	0	0	0.00034	0.00031	0.00017	0.00055	0.00055	0.00021	5.4E-05	0.00011	0	0	0	0	0	
4.25	0	0	0	0	0	0	0	6.9E-05	0.0001	0	0.00072	0.00034	0.00032	0.00016	0	5.4E-05	0.00011	0	0	0	
4.75	0	0	0	0	0	0	0	0	6.9E-05	0.00011	0.00016	0.00011	0.00027	0.00016	0	0	0	0	0	0	
5.25	0	0	0	0	0	0	0	0	0	0.00012	6.7E-05	5.4E-05	0.00016	5.4E-05	0	0	0	0	0	0	
5.75	0	0	0	0	0	0	0	0	0	0	0	0	0.00021	0	0	0	0	0	0	0	
6.25	0	0	0	0	0	0	0	0	0	0	0	0	5.4E-05	5.4E-05	0	0	0	0	0	0	
6.75	0	0	0	0	0	0	0	0	0	0	5.4E-05	0	0	5.4E-05	0	0	0	0	0	0	
7.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0.00191	0.00804	0.01207	0.01226	0.01095	0.0062	0.00953	0.0123	0.01511	0.01109	0.00478	0.00236	0.00059	5.4E-05	0.00016	0	0	0	**0.107**

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APPENDIX B – BARGE RAOS

HEADING 0°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.99	113.00	0.00	151.00	1.04	39.00	0.01	108.00	0.44	-70.00	0.00	122.00
0.2708	23.20	0.99	113.00	0.00	150.00	1.04	40.00	0.01	109.00	0.45	-69.00	0.00	123.00
0.2756	22.80	0.99	114.00	0.00	149.00	1.04	42.00	0.01	109.00	0.47	-68.00	0.01	124.00
0.2805	22.40	0.99	115.00	0.00	149.00	1.04	43.00	0.01	110.00	0.49	-67.00	0.01	125.00
0.2856	22.00	0.99	116.00	0.01	148.00	1.05	44.00	0.01	111.00	0.50	-67.00	0.01	126.00
0.2909	21.60	0.99	116.00	0.01	147.00	1.05	46.00	0.01	112.00	0.52	-66.00	0.01	126.00
0.2964	21.20	0.99	117.00	0.01	147.00	1.06	48.00	0.01	113.00	0.54	-65.00	0.01	127.00
0.3021	20.80	0.99	118.00	0.01	147.00	1.06	49.00	0.01	114.00	0.56	-64.00	0.01	128.00
0.3080	20.40	0.98	118.00	0.01	146.00	1.07	51.00	0.02	114.00	0.58	-64.00	0.01	129.00
0.3142	20.00	0.98	119.00	0.01	146.00	1.08	53.00	0.02	115.00	0.60	-63.00	0.01	129.00
0.3206	19.60	0.98	120.00	0.01	146.00	1.09	55.00	0.02	116.00	0.63	-62.00	0.01	130.00
0.3239	19.40	0.98	121.00	0.01	145.00	1.09	56.00	0.02	117.00	0.64	-61.00	0.01	131.00
0.3272	19.20	0.98	121.00	0.01	145.00	1.09	57.00	0.02	118.00	0.65	-61.00	0.01	131.00
0.3307	19.00	0.98	122.00	0.01	145.00	1.10	58.00	0.02	118.00	0.67	-60.00	0.01	132.00
0.3342	18.80	0.97	123.00	0.01	145.00	1.10	59.00	0.02	119.00	0.68	-60.00	0.01	132.00
0.3378	18.60	0.97	123.00	0.01	146.00	1.10	60.00	0.02	120.00	0.69	-59.00	0.01	133.00
0.3415	18.40	0.97	124.00	0.01	146.00	1.11	62.00	0.02	120.00	0.71	-58.00	0.01	133.00
0.3452	18.20	0.97	125.00	0.01	146.00	1.11	63.00	0.02	121.00	0.72	-58.00	0.01	134.00
0.3491	18.00	0.97	125.00	0.01	146.00	1.12	64.00	0.02	122.00	0.74	-57.00	0.01	135.00
0.3530	17.80	0.97	126.00	0.01	146.00	1.12	66.00	0.03	122.00	0.75	-56.00	0.01	135.00
0.3570	17.60	0.96	127.00	0.01	146.00	1.13	67.00	0.03	123.00	0.77	-55.00	0.01	136.00
0.3611	17.40	0.96	128.00	0.01	147.00	1.13	68.00	0.03	124.00	0.79	-55.00	0.01	137.00
0.3653	17.20	0.96	128.00	0.01	147.00	1.14	70.00	0.03	125.00	0.80	-54.00	0.01	137.00
0.3696	17.00	0.96	129.00	0.01	147.00	1.14	71.00	0.03	126.00	0.82	-53.00	0.01	138.00
0.3740	16.80	0.95	130.00	0.01	148.00	1.15	73.00	0.03	127.00	0.84	-52.00	0.01	139.00
0.3785	16.60	0.95	131.00	0.01	148.00	1.15	74.00	0.03	128.00	0.86	-51.00	0.01	140.00
0.3831	16.40	0.95	132.00	0.01	149.00	1.16	76.00	0.04	128.00	0.88	-50.00	0.01	141.00
0.3879	16.20	0.94	133.00	0.01	149.00	1.17	78.00	0.04	129.00	0.90	-49.00	0.01	141.00
0.3927	16.00	0.94	134.00	0.01	150.00	1.17	80.00	0.04	130.00	0.92	-48.00	0.01	142.00
0.3977	15.80	0.94	135.00	0.01	150.00	1.18	81.00	0.04	132.00	0.94	-47.00	0.01	143.00

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0.4028	15.60	0.93	136.00	0.01	151.00	1.18	83.00	0.04	133.00	0.96	-46.00	0.01	144.00
0.4080	15.40	0.93	138.00	0.01	152.00	1.19	85.00	0.05	134.00	0.98	-45.00	0.01	145.00
0.4134	15.20	0.92	139.00	0.01	152.00	1.20	87.00	0.05	135.00	1.01	-44.00	0.01	146.00
0.4189	15.00	0.92	140.00	0.01	153.00	1.21	89.00	0.05	136.00	1.04	-43.00	0.01	147.00
0.4245	14.80	0.92	141.00	0.01	154.00	1.22	91.00	0.06	137.00	1.06	-41.00	0.01	148.00
0.4304	14.60	0.91	143.00	0.01	154.00	1.23	94.00	0.06	139.00	1.09	-40.00	0.01	149.00
0.4363	14.40	0.91	144.00	0.01	155.00	1.24	96.00	0.06	140.00	1.11	-38.00	0.01	151.00
0.4425	14.20	0.90	146.00	0.01	157.00	1.25	98.00	0.07	141.00	1.14	-37.00	0.01	152.00
0.4488	14.00	0.90	147.00	0.01	159.00	1.26	101.00	0.07	143.00	1.17	-36.00	0.01	155.00
0.4654	13.50	0.88	152.00	0.01	162.00	1.29	107.00	0.08	147.00	1.24	-31.00	0.01	160.00
0.4833	13.00	0.86	156.00	0.01	166.00	1.32	114.00	0.10	151.00	1.32	-27.00	0.01	165.00
0.5027	12.50	0.83	162.00	0.01	170.00	1.35	122.00	0.11	156.00	1.40	-22.00	0.01	170.00
0.5236	12.00	0.80	168.00	0.01	174.00	1.39	131.00	0.14	161.00	1.49	-16.00	0.01	177.00
0.5325	11.80	0.79	170.00	0.01	177.00	1.40	135.00	0.15	164.00	1.52	-13.00	0.01	-180.00
0.5417	11.60	0.77	173.00	0.01	179.00	1.41	139.00	0.16	166.00	1.56	-11.00	0.01	-176.00
0.5512	11.40	0.76	176.00	0.01	-179.00	1.43	143.00	0.17	169.00	1.59	-8.00	0.01	-172.00
0.5610	11.20	0.74	179.00	0.01	-177.00	1.44	147.00	0.19	172.00	1.63	-5.00	0.01	-168.00
0.5712	11.00	0.73	-178.00	0.01	-175.00	1.47	151.00	0.20	174.00	1.67	-2.00	0.01	-162.00
0.5818	10.80	0.70	-175.00	0.01	-172.00	1.47	156.00	0.22	177.00	1.69	1.00	0.01	-156.00
0.5928	10.60	0.68	-171.00	0.01	-170.00	1.49	161.00	0.24	-180.00	1.73	5.00	0.01	-147.00
0.6042	10.40	0.66	-167.00	0.01	-168.00	1.50	166.00	0.26	-176.00	1.76	8.00	0.00	-135.00
0.6160	10.20	0.63	-164.00	0.01	-164.00	1.51	171.00	0.28	-173.00	1.78	12.00	0.00	-114.00
0.6283	10.00	0.61	-159.00	0.01	-162.00	1.54	177.00	0.31	-170.00	1.82	16.00	0.00	-85.00
0.6411	9.80	0.57	-155.00	0.01	-160.00	1.53	-178.00	0.34	-166.00	1.81	20.00	0.00	-52.00
0.6545	9.60	0.54	-150.00	0.01	-158.00	1.54	-172.00	0.37	-162.00	1.83	25.00	0.01	-26.00
0.6684	9.40	0.51	-145.00	0.01	-155.00	1.54	-165.00	0.41	-159.00	1.83	29.00	0.01	-10.00
0.6830	9.20	0.47	-140.00	0.01	-154.00	1.52	-159.00	0.45	-155.00	1.82	35.00	0.01	2.00
0.6981	9.00	0.44	-134.00	0.01	-154.00	1.54	-152.00	0.50	-150.00	1.83	40.00	0.01	12.00
0.7140	8.80	0.38	-128.00	0.01	-156.00	1.48	-144.00	0.54	-146.00	1.76	46.00	0.02	20.00
0.7306	8.60	0.34	-121.00	0.01	-162.00	1.46	-136.00	0.60	-141.00	1.73	53.00	0.02	28.00
0.7480	8.40	0.29	-114.00	0.01	-174.00	1.41	-128.00	0.67	-137.00	1.67	59.00	0.03	34.00
0.7662	8.20	0.24	-106.00	0.01	165.00	1.33	-118.00	0.73	-132.00	1.56	67.00	0.03	41.00
0.7854	8.00	0.21	-95.00	0.01	142.00	1.32	-107.00	0.84	-127.00	1.52	77.00	0.04	48.00
0.8055	7.80	0.15	-87.00	0.01	125.00	1.17	-97.00	0.90	-124.00	1.34	85.00	0.05	53.00
0.8267	7.60	0.11	-72.00	0.02	116.00	1.08	-83.00	1.02	-120.00	1.21	97.00	0.06	58.00
0.8491	7.40	0.07	-56.00	0.02	107.00	0.97	-69.00	1.13	-121.00	1.06	109.00	0.07	58.00
0.8727	7.20	0.03	-22.00	0.03	99.00	0.81	-52.00	1.12	-125.00	0.85	125.00	0.07	56.00
0.8976	7.00	0.03	58.00	0.03	95.00	0.81	-28.00	1.13	-126.00	0.79	149.00	0.08	57.00

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0.9240	6.80	0.04	124.00	0.03	86.00	0.59	-8.00	0.73	-133.00	0.55	168.00	0.05	52.00
0.9520	6.60	0.06	146.00	0.02	105.00	0.56	26.00	0.53	-112.00	0.49	-153.00	0.04	73.00
0.9817	6.40	0.06	167.00	0.02	121.00	0.51	51.00	0.39	-94.00	0.44	-124.00	0.03	92.00
1.0134	6.20	0.06	-162.00	0.01	158.00	0.41	93.00	0.27	-55.00	0.37	-77.00	0.02	132.00
1.0472	6.00	0.06	-142.00	0.02	-178.00	0.61	125.00	0.37	-29.00	0.60	-47.00	0.03	158.00
1.0833	5.80	0.03	-108.00	0.01	-154.00	0.34	155.00	0.19	-3.00	0.36	-17.00	0.02	-175.00
1.1220	5.60	0.03	-48.00	0.01	-111.00	0.41	-153.00	0.20	42.00	0.43	30.00	0.02	-130.00
1.1636	5.40	0.02	4.00	0.01	-98.00	0.34	-137.00	0.15	56.00	0.36	46.00	0.02	-115.00
1.2083	5.20	0.02	123.00	0.00	-27.00	0.13	-56.00	0.05	129.00	0.14	121.00	0.01	-42.00
1.2566	5.00	0.04	160.00	0.01	22.00	0.36	-9.00	0.13	179.00	0.36	172.00	0.01	9.00
1.3090	4.80	0.01	163.00	0.00	-20.00	0.11	-44.00	0.04	138.00	0.12	132.00	0.01	-32.00
1.3659	4.60	0.02	-12.00	0.00	-129.00	0.14	-164.00	0.04	31.00	0.14	27.00	0.01	-138.00
1.4280	4.40	0.03	-21.00	0.00	-161.00	0.17	170.00	0.05	0.00	0.16	-4.00	0.01	-170.00
1.4960	4.20	0.03	-60.00	0.00	157.00	0.13	131.00	0.04	-40.00	0.13	-44.00	0.01	150.00
1.5708	4.00	0.04	-89.00	0.00	123.00	0.15	97.00	0.04	-73.00	0.16	-76.00	0.01	117.00
1.6535	3.80	0.03	-93.00	0.00	111.00	0.11	89.00	0.03	-82.00	0.12	-85.00	0.00	109.00
1.7453	3.60	0.03	-107.00	0.00	95.00	0.09	79.00	0.02	-94.00	0.09	-97.00	0.00	96.00
1.8480	3.40	0.02	-118.00	0.00	75.00	0.06	65.00	0.01	-110.00	0.06	-113.00	0.00	80.00
1.9635	3.20	0.02	-136.00	0.00	48.00	0.05	46.00	0.01	-133.00	0.05	-136.00	0.00	57.00
2.0944	3.00	0.02	-158.00	0.00	17.00	0.04	21.00	0.01	-161.00	0.05	-164.00	0.00	29.00
2.2440	2.80	0.02	-159.00	0.00	16.00	0.04	20.00	0.01	-163.00	0.04	-165.00	0.00	27.00
2.4166	2.60	0.02	-157.00	0.00	15.00	0.03	20.00	0.01	-163.00	0.03	-166.00	0.00	26.00

HEADING 45°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.71	107.00	0.66	129.00	1.02	28.00	0.35	103.00	0.31	-76.00	0.33	-147.00
0.2708	23.20	0.71	108.00	0.66	130.00	1.02	29.00	0.37	104.00	0.32	-75.00	0.33	-147.00
0.2756	22.80	0.71	108.00	0.66	131.00	1.02	30.00	0.38	105.00	0.33	-74.00	0.34	-147.00
0.2805	22.40	0.71	109.00	0.67	131.00	1.02	31.00	0.39	105.00	0.35	-74.00	0.34	-147.00
0.2856	22.00	0.71	109.00	0.67	132.00	1.03	32.00	0.41	106.00	0.36	-73.00	0.35	-147.00
0.2909	21.60	0.70	110.00	0.67	133.00	1.03	33.00	0.42	106.00	0.37	-73.00	0.35	-147.00
0.2964	21.20	0.70	110.00	0.67	133.00	1.03	34.00	0.44	107.00	0.39	-72.00	0.35	-147.00
0.3021	20.80	0.70	110.00	0.68	134.00	1.04	35.00	0.46	107.00	0.40	-72.00	0.36	-147.00
0.3080	20.40	0.70	111.00	0.68	134.00	1.04	37.00	0.47	108.00	0.42	-72.00	0.36	-147.00
0.3142	20.00	0.70	111.00	0.68	135.00	1.05	38.00	0.49	108.00	0.43	-71.00	0.36	-147.00
0.3206	19.60	0.70	112.00	0.68	136.00	1.05	39.00	0.52	109.00	0.45	-70.00	0.37	-146.00

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0.3239	19.40	0.70	112.00	0.68	137.00	1.05	40.00	0.53	110.00	0.46	-70.00	0.37	-146.00
0.3272	19.20	0.70	113.00	0.68	137.00	1.05	41.00	0.54	110.00	0.47	-69.00	0.38	-146.00
0.3307	19.00	0.70	113.00	0.68	139.00	1.06	42.00	0.55	109.00	0.48	-69.00	0.34	-143.00
0.3342	18.80	0.70	114.00	0.68	140.00	1.06	43.00	0.57	109.00	0.49	-69.00	0.35	-143.00
0.3378	18.60	0.70	114.00	0.68	141.00	1.06	44.00	0.58	110.00	0.50	-68.00	0.36	-143.00
0.3415	18.40	0.70	115.00	0.69	141.00	1.06	44.00	0.59	112.00	0.51	-68.00	0.39	-145.00
0.3452	18.20	0.70	115.00	0.69	141.00	1.06	45.00	0.60	112.00	0.52	-67.00	0.40	-144.00
0.3491	18.00	0.70	115.00	0.69	142.00	1.07	46.00	0.62	113.00	0.53	-67.00	0.40	-144.00
0.3530	17.80	0.70	116.00	0.69	143.00	1.07	47.00	0.63	113.00	0.54	-66.00	0.41	-144.00
0.3570	17.60	0.70	117.00	0.69	144.00	1.07	48.00	0.65	114.00	0.56	-66.00	0.42	-143.00
0.3611	17.40	0.70	117.00	0.69	145.00	1.07	49.00	0.66	114.00	0.57	-65.00	0.42	-143.00
0.3653	17.20	0.69	118.00	0.69	146.00	1.08	51.00	0.68	115.00	0.58	-64.00	0.43	-142.00
0.3696	17.00	0.69	118.00	0.69	147.00	1.08	52.00	0.69	116.00	0.59	-64.00	0.43	-142.00
0.3740	16.80	0.69	119.00	0.70	148.00	1.08	53.00	0.71	116.00	0.61	-63.00	0.44	-141.00
0.3785	16.60	0.69	120.00	0.70	149.00	1.09	54.00	0.73	117.00	0.62	-63.00	0.45	-141.00
0.3831	16.40	0.69	120.00	0.70	150.00	1.09	55.00	0.75	118.00	0.64	-62.00	0.46	-140.00
0.3879	16.20	0.69	121.00	0.70	151.00	1.09	57.00	0.77	118.00	0.65	-61.00	0.47	-140.00
0.3927	16.00	0.69	122.00	0.70	152.00	1.10	58.00	0.79	119.00	0.67	-61.00	0.47	-139.00
0.3977	15.80	0.69	122.00	0.70	154.00	1.10	59.00	0.81	120.00	0.68	-60.00	0.48	-138.00
0.4028	15.60	0.68	123.00	0.70	155.00	1.11	61.00	0.83	120.00	0.70	-59.00	0.49	-137.00
0.4080	15.40	0.68	124.00	0.70	156.00	1.11	62.00	0.85	121.00	0.72	-58.00	0.50	-136.00
0.4134	15.20	0.68	125.00	0.70	158.00	1.12	64.00	0.87	122.00	0.74	-57.00	0.50	-136.00
0.4189	15.00	0.68	126.00	0.70	159.00	1.12	65.00	0.89	123.00	0.76	-57.00	0.51	-135.00
0.4245	14.80	0.68	127.00	0.70	160.00	1.13	67.00	0.92	124.00	0.78	-56.00	0.52	-134.00
0.4304	14.60	0.68	128.00	0.70	162.00	1.13	69.00	0.94	125.00	0.80	-55.00	0.53	-133.00
0.4363	14.40	0.68	129.00	0.71	164.00	1.14	70.00	0.97	125.00	0.82	-54.00	0.54	-132.00
0.4425	14.20	0.67	130.00	0.71	166.00	1.15	72.00	0.99	126.00	0.84	-53.00	0.55	-131.00
0.4488	14.00	0.67	131.00	0.72	168.00	1.16	74.00	1.02	127.00	0.86	-52.00	0.57	-131.00
0.4654	13.50	0.66	134.00	0.73	172.00	1.17	79.00	1.09	130.00	0.92	-49.00	0.60	-129.00
0.4833	13.00	0.66	137.00	0.74	178.00	1.20	85.00	1.18	134.00	0.99	-46.00	0.63	-125.00
0.5027	12.50	0.65	141.00	0.75	-176.00	1.22	91.00	1.28	138.00	1.06	-42.00	0.67	-122.00
0.5236	12.00	0.64	145.00	0.76	-170.00	1.25	98.00	1.39	142.00	1.14	-38.00	0.70	-117.00
0.5325	11.80	0.63	147.00	0.76	-167.00	1.26	101.00	1.44	144.00	1.17	-36.00	0.72	-115.00
0.5417	11.60	0.62	149.00	0.76	-164.00	1.28	104.00	1.49	146.00	1.21	-34.00	0.74	-114.00
0.5512	11.40	0.62	151.00	0.77	-161.00	1.29	107.00	1.54	148.00	1.24	-32.00	0.75	-111.00
0.5610	11.20	0.61	153.00	0.77	-157.00	1.30	110.00	1.60	150.00	1.28	-30.00	0.77	-109.00
0.5712	11.00	0.61	155.00	0.77	-154.00	1.33	113.00	1.66	152.00	1.32	-28.00	0.78	-107.00
0.5818	10.80	0.60	157.00	0.77	-150.00	1.34	117.00	1.72	155.00	1.36	-26.00	0.80	-104.00

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0.5928	10.60	0.59	159.00	0.78	-147.00	1.36	121.00	1.79	157.00	1.40	-24.00	0.81	-102.00
0.6042	10.40	0.58	162.00	0.78	-143.00	1.38	125.00	1.86	160.00	1.44	-21.00	0.83	-99.00
0.6160	10.20	0.57	165.00	0.78	-139.00	1.39	129.00	1.93	162.00	1.48	-19.00	0.84	-96.00
0.6283	10.00	0.56	167.00	0.78	-134.00	1.43	133.00	2.01	165.00	1.53	-16.00	0.86	-93.00
0.6411	9.80	0.54	170.00	0.78	-130.00	1.44	137.00	2.08	168.00	1.56	-13.00	0.87	-89.00
0.6545	9.60	0.53	174.00	0.78	-125.00	1.46	142.00	2.16	171.00	1.60	-10.00	0.89	-86.00
0.6684	9.40	0.51	177.00	0.78	-120.00	1.48	146.00	2.25	174.00	1.64	-7.00	0.90	-82.00
0.6830	9.20	0.49	-179.00	0.77	-114.00	1.50	151.00	2.34	178.00	1.67	-3.00	0.91	-77.00
0.6981	9.00	0.48	-176.00	0.77	-109.00	1.54	157.00	2.46	-179.00	1.73	0.00	0.92	-73.00
0.7140	8.80	0.45	-172.00	0.75	-102.00	1.53	162.00	2.54	-176.00	1.73	4.00	0.93	-67.00
0.7306	8.60	0.43	-167.00	0.74	-96.00	1.55	168.00	2.68	-172.00	1.77	8.00	0.93	-62.00
0.7480	8.40	0.41	-162.00	0.73	-89.00	1.56	174.00	2.85	-166.00	1.79	13.00	0.93	-57.00
0.7662	8.20	0.38	-157.00	0.71	-79.00	1.55	180.00	2.86	-167.00	1.78	18.00	0.95	-50.00
0.7854	8.00	0.36	-152.00	0.71	-71.00	1.57	-173.00	3.01	-165.00	1.80	23.00	0.97	-43.00
0.8055	7.80	0.32	-146.00	0.68	-60.00	1.51	-167.00	3.03	-164.00	1.75	29.00	0.97	-36.00
0.8267	7.60	0.29	-139.00	0.67	-50.00	1.49	-159.00	3.10	-163.00	1.73	35.00	0.98	-28.00
0.8491	7.40	0.26	-132.00	0.65	-38.00	1.44	-151.00	3.09	-166.00	1.67	42.00	0.98	-21.00
0.8727	7.20	0.22	-125.00	0.64	-26.00	1.36	-141.00	2.87	-170.00	1.58	50.00	0.97	-14.00
0.8976	7.00	0.20	-115.00	0.65	-15.00	1.36	-130.00	2.54	-173.00	1.57	60.00	0.95	-6.00
0.9240	6.80	0.16	-108.00	0.60	-4.00	1.20	-119.00	1.68	176.00	1.40	69.00	0.84	1.00
0.9520	6.60	0.13	-99.00	0.55	9.00	1.15	-105.00	0.92	-174.00	1.34	80.00	0.74	13.00
0.9817	6.40	0.11	-95.00	0.48	23.00	1.05	-94.00	0.44	-148.00	1.22	90.00	0.65	27.00
1.0134	6.20	0.07	-93.00	0.40	41.00	0.88	-79.00	0.27	-79.00	1.01	102.00	0.54	42.00
1.0472	6.00	0.05	-88.00	0.37	64.00	0.86	-59.00	0.44	-49.00	0.94	121.00	0.49	62.00
1.0833	5.80	0.04	-110.00	0.26	80.00	0.56	-47.00	0.33	-18.00	0.62	130.00	0.36	74.00
1.1220	5.60	0.03	-124.00	0.20	111.00	0.43	-14.00	0.31	8.00	0.43	160.00	0.26	98.00
1.1636	5.40	0.03	-123.00	0.14	134.00	0.32	11.00	0.21	20.00	0.30	-173.00	0.18	112.00
1.2083	5.20	0.03	-108.00	0.04	163.00	0.16	68.00	0.02	60.00	0.13	-110.00	0.08	102.00
1.2566	5.00	0.03	-81.00	0.07	-80.00	0.29	116.00	0.15	-174.00	0.28	-58.00	0.04	-19.00
1.3090	4.80	0.02	-66.00	0.03	18.00	0.09	132.00	0.11	-95.00	0.08	-42.00	0.08	58.00
1.3659	4.60	0.01	7.00	0.10	61.00	0.10	-119.00	0.21	-60.00	0.10	69.00	0.15	71.00
1.4280	4.40	0.01	45.00	0.11	69.00	0.11	-115.00	0.19	-56.00	0.11	72.00	0.15	79.00
1.4960	4.20	0.01	-9.00	0.04	97.00	0.03	-155.00	0.04	-82.00	0.03	35.00	0.07	104.00
1.5708	4.00	0.01	-71.00	0.05	-152.00	0.06	96.00	0.08	148.00	0.06	-78.00	0.06	180.00
1.6535	3.80	0.01	-62.00	0.04	-148.00	0.04	95.00	0.06	147.00	0.04	-79.00	0.05	-175.00
1.7453	3.60	0.01	-48.00	0.03	-144.00	0.02	94.00	0.05	140.00	0.02	-79.00	0.03	-166.00
1.8480	3.40	0.00	-33.00	0.02	-128.00	0.01	96.00	0.03	143.00	0.01	-73.00	0.03	-144.00
1.9635	3.20	0.00	45.00	0.02	-97.00	0.00	-133.00	0.02	137.00	0.00	60.00	0.03	-111.00

2.0944	3.00	0.01	75.00	0.02	-68.00	0.01	-99.00	0.02	132.00	0.01	81.00	0.03	-84.00
2.2440	2.80	0.01	74.00	0.02	-71.00	0.01	-100.00	0.01	128.00	0.01	80.00	0.02	-88.00
2.4166	2.60	0.00	71.00	0.02	-71.00	0.01	-99.00	0.01	137.00	0.01	81.00	0.02	-85.00

HEADING 90°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.03	-179.00	0.94	100.00	1.00	0.00	0.50	88.00	0.00	-28.00	0.18	-148.00
0.2708	23.20	0.03	-180.00	0.94	100.00	1.00	0.00	0.52	88.00	0.00	-30.00	0.18	-148.00
0.2756	22.80	0.03	-180.00	0.94	99.00	1.00	0.00	0.54	88.00	0.00	-33.00	0.17	-147.00
0.2805	22.40	0.02	-180.00	0.94	99.00	1.00	0.00	0.56	88.00	0.00	-36.00	0.17	-146.00
0.2856	22.00	0.02	-180.00	0.93	99.00	1.00	0.00	0.58	88.00	0.00	-39.00	0.17	-145.00
0.2909	21.60	0.02	180.00	0.93	99.00	1.00	0.00	0.60	88.00	0.00	-42.00	0.16	-143.00
0.2964	21.20	0.02	180.00	0.93	98.00	1.00	0.00	0.63	88.00	0.00	-45.00	0.16	-142.00
0.3021	20.80	0.02	180.00	0.92	98.00	1.00	0.00	0.65	88.00	0.00	-49.00	0.15	-141.00
0.3080	20.40	0.02	179.00	0.92	98.00	1.01	0.00	0.67	88.00	0.00	-52.00	0.15	-139.00
0.3142	20.00	0.02	179.00	0.92	97.00	1.01	0.00	0.70	88.00	0.00	-56.00	0.14	-138.00
0.3206	19.60	0.02	179.00	0.91	97.00	1.01	0.00	0.73	88.00	0.00	-60.00	0.14	-137.00
0.3239	19.40	0.02	179.00	0.91	97.00	1.01	0.00	0.75	88.00	0.00	-62.00	0.14	-136.00
0.3272	19.20	0.02	179.00	0.91	97.00	1.01	0.00	0.76	88.00	0.00	-64.00	0.14	-135.00
0.3307	19.00	0.02	179.00	0.91	97.00	1.01	0.00	0.78	88.00	0.00	-66.00	0.14	-134.00
0.3342	18.80	0.02	175.00	0.91	97.00	1.01	0.00	0.80	87.00	0.00	-69.00	0.12	-126.00
0.3378	18.60	0.02	175.00	0.91	97.00	1.01	0.00	0.82	87.00	0.00	-71.00	0.12	-125.00
0.3415	18.40	0.02	175.00	0.91	97.00	1.01	0.00	0.84	87.00	0.00	-72.00	0.12	-124.00
0.3452	18.20	0.02	175.00	0.90	97.00	1.01	0.00	0.85	87.00	0.00	-74.00	0.12	-123.00
0.3491	18.00	0.02	175.00	0.90	97.00	1.01	0.00	0.87	87.00	0.00	-76.00	0.12	-123.00
0.3530	17.80	0.02	175.00	0.90	97.00	1.01	0.00	0.89	87.00	0.00	-77.00	0.12	-122.00
0.3570	17.60	0.02	175.00	0.90	96.00	1.01	0.00	0.92	87.00	0.00	-79.00	0.12	-121.00
0.3611	17.40	0.02	175.00	0.90	96.00	1.01	0.00	0.94	87.00	0.00	-80.00	0.12	-120.00
0.3653	17.20	0.02	175.00	0.90	96.00	1.01	0.00	0.96	87.00	0.00	-82.00	0.12	-120.00
0.3696	17.00	0.02	175.00	0.90	96.00	1.01	0.00	0.98	87.00	0.00	-84.00	0.12	-119.00
0.3740	16.80	0.02	175.00	0.90	96.00	1.01	0.00	1.01	87.00	0.00	-85.00	0.12	-118.00
0.3785	16.60	0.02	175.00	0.89	95.00	1.01	0.00	1.04	87.00	0.00	-87.00	0.12	-117.00
0.3831	16.40	0.02	175.00	0.89	95.00	1.01	0.00	1.06	87.00	0.00	-88.00	0.12	-116.00
0.3879	16.20	0.02	175.00	0.89	95.00	1.01	0.00	1.09	87.00	0.00	-89.00	0.12	-116.00
0.3927	16.00	0.02	175.00	0.89	95.00	1.01	0.00	1.12	87.00	0.00	-91.00	0.12	-115.00
0.3977	15.80	0.02	175.00	0.89	95.00	1.01	0.00	1.15	87.00	0.00	-92.00	0.12	-113.00

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0.4028	15.60	0.02	175.00	0.89	94.00	1.01	0.00	1.18	87.00	0.00	-93.00	0.12	-111.00
0.4080	15.40	0.01	175.00	0.88	94.00	1.01	0.00	1.21	86.00	0.00	-94.00	0.12	-109.00
0.4134	15.20	0.01	175.00	0.88	94.00	1.01	0.00	1.25	86.00	0.00	-95.00	0.12	-107.00
0.4189	15.00	0.01	175.00	0.88	94.00	1.01	0.00	1.28	86.00	0.00	-97.00	0.12	-105.00
0.4245	14.80	0.01	174.00	0.88	93.00	1.01	0.00	1.32	86.00	0.00	-98.00	0.13	-104.00
0.4304	14.60	0.01	174.00	0.87	93.00	1.01	0.00	1.36	86.00	0.01	-99.00	0.13	-102.00
0.4363	14.40	0.01	174.00	0.87	93.00	1.01	0.00	1.40	86.00	0.01	-100.00	0.13	-103.00
0.4425	14.20	0.01	174.00	0.87	94.00	1.01	0.00	1.45	86.00	0.01	-101.00	0.13	-104.00
0.4488	14.00	0.01	173.00	0.86	94.00	1.01	0.00	1.49	86.00	0.01	-102.00	0.14	-106.00
0.4654	13.50	0.01	172.00	0.85	94.00	1.01	0.00	1.62	85.00	0.01	-104.00	0.15	-106.00
0.4833	13.00	0.01	171.00	0.84	94.00	1.01	0.00	1.76	85.00	0.01	-107.00	0.16	-104.00
0.5027	12.50	0.01	169.00	0.83	93.00	1.01	0.00	1.93	85.00	0.01	-109.00	0.17	-102.00
0.5236	12.00	0.01	166.00	0.81	93.00	1.01	0.00	2.12	85.00	0.01	-111.00	0.18	-100.00
0.5325	11.80	0.01	165.00	0.81	93.00	1.01	0.00	2.20	85.00	0.02	-112.00	0.18	-100.00
0.5417	11.60	0.01	163.00	0.80	93.00	1.01	0.00	2.30	85.00	0.02	-113.00	0.19	-99.00
0.5512	11.40	0.01	162.00	0.79	93.00	1.01	0.00	2.40	85.00	0.02	-114.00	0.19	-99.00
0.5610	11.20	0.01	159.00	0.78	93.00	1.01	0.00	2.50	85.00	0.02	-116.00	0.20	-98.00
0.5712	11.00	0.01	157.00	0.77	93.00	1.01	0.00	2.62	85.00	0.02	-117.00	0.21	-98.00
0.5818	10.80	0.01	154.00	0.76	93.00	1.02	0.00	2.74	84.00	0.03	-119.00	0.22	-97.00
0.5928	10.60	0.01	150.00	0.75	93.00	1.02	0.00	2.88	84.00	0.03	-120.00	0.22	-97.00
0.6042	10.40	0.01	145.00	0.74	93.00	1.02	0.00	3.02	83.00	0.03	-123.00	0.23	-98.00
0.6160	10.20	0.01	140.00	0.73	93.00	1.02	0.00	3.18	82.00	0.04	-125.00	0.24	-98.00
0.6283	10.00	0.01	132.00	0.72	93.00	1.03	0.00	3.36	81.00	0.04	-128.00	0.26	-99.00
0.6411	9.80	0.01	122.00	0.70	93.00	1.03	0.00	3.55	80.00	0.05	-131.00	0.27	-99.00
0.6545	9.60	0.00	108.00	0.69	93.00	1.04	0.00	3.76	79.00	0.05	-134.00	0.28	-99.00
0.6684	9.40	0.00	88.00	0.67	93.00	1.04	0.00	3.99	78.00	0.06	-138.00	0.30	-100.00
0.6830	9.20	0.00	62.00	0.65	93.00	1.05	0.00	4.25	76.00	0.07	-142.00	0.31	-100.00
0.6981	9.00	0.00	34.00	0.63	94.00	1.06	0.00	4.54	74.00	0.08	-147.00	0.33	-102.00
0.7140	8.80	0.01	13.00	0.61	94.00	1.07	-1.00	4.85	72.00	0.09	-152.00	0.35	-103.00
0.7306	8.60	0.01	-5.00	0.58	95.00	1.09	-1.00	5.20	69.00	0.10	-158.00	0.37	-105.00
0.7480	8.40	0.01	-19.00	0.55	96.00	1.10	-2.00	5.57	65.00	0.12	-164.00	0.40	-108.00
0.7662	8.20	0.01	-31.00	0.52	97.00	1.12	-3.00	5.97	61.00	0.14	-172.00	0.42	-111.00
0.7854	8.00	0.02	-44.00	0.49	99.00	1.13	-5.00	6.38	56.00	0.16	180.00	0.44	-116.00
0.8055	7.80	0.02	-55.00	0.45	103.00	1.15	-7.00	6.76	49.00	0.18	170.00	0.47	-121.00
0.8267	7.60	0.02	-67.00	0.42	109.00	1.16	-9.00	7.10	42.00	0.20	160.00	0.49	-127.00
0.8491	7.40	0.02	-79.00	0.40	116.00	1.16	-12.00	7.35	34.00	0.22	148.00	0.50	-135.00
0.8727	7.20	0.03	-92.00	0.40	125.00	1.14	-16.00	7.47	24.00	0.24	136.00	0.51	-143.00
0.8976	7.00	0.03	-105.00	0.42	132.00	1.12	-20.00	7.43	14.00	0.26	123.00	0.50	-153.00

0.9240	6.80	0.03	-119.00	0.45	139.00	1.07	-25.00	7.15	3.00	0.27	108.00	0.48	-163.00
0.9520	6.60	0.03	-133.00	0.49	142.00	1.00	-30.00	6.65	-8.00	0.27	94.00	0.45	-174.00
0.9817	6.40	0.03	-147.00	0.51	143.00	0.91	-35.00	5.92	-18.00	0.27	79.00	0.40	176.00
1.0134	6.20	0.03	-160.00	0.52	143.00	0.80	-39.00	5.05	-27.00	0.25	66.00	0.34	168.00
1.0472	6.00	0.03	-171.00	0.51	144.00	0.70	-42.00	4.21	-32.00	0.23	55.00	0.28	162.00
1.0833	5.80	0.02	178.00	0.49	146.00	0.59	-44.00	3.41	-36.00	0.20	43.00	0.23	158.00
1.1220	5.60	0.02	169.00	0.46	148.00	0.49	-45.00	2.75	-36.00	0.17	35.00	0.18	156.00
1.1636	5.40	0.02	162.00	0.43	152.00	0.40	-45.00	2.19	-36.00	0.14	28.00	0.14	156.00
1.2083	5.20	0.01	156.00	0.40	157.00	0.31	-42.00	1.72	-34.00	0.12	23.00	0.11	158.00
1.2566	5.00	0.01	155.00	0.37	163.00	0.25	-37.00	1.35	-29.00	0.09	21.00	0.09	162.00
1.3090	4.80	0.01	153.00	0.33	170.00	0.19	-30.00	1.01	-26.00	0.07	16.00	0.06	164.00
1.3659	4.60	0.01	158.00	0.30	179.00	0.15	-19.00	0.75	-19.00	0.05	16.00	0.04	170.00
1.4280	4.40	0.00	162.00	0.27	-171.00	0.11	-7.00	0.54	-13.00	0.04	20.00	0.03	176.00
1.4960	4.20	0.00	169.00	0.23	-158.00	0.08	7.00	0.36	-5.00	0.03	28.00	0.02	-178.00
1.5708	4.00	0.00	-169.00	0.21	-143.00	0.07	27.00	0.23	11.00	0.02	41.00	0.01	-161.00
1.6535	3.80	0.00	177.00	0.15	-141.00	0.05	33.00	0.18	6.00	0.01	11.00	0.01	-164.00
1.7453	3.60	0.00	166.00	0.09	-133.00	0.03	39.00	0.14	3.00	0.01	-29.00	0.01	-163.00
1.8480	3.40	0.00	169.00	0.04	-101.00	0.02	48.00	0.11	2.00	0.01	-64.00	0.02	-159.00
1.9635	3.20	0.00	178.00	0.04	-28.00	0.01	63.00	0.09	4.00	0.01	-86.00	0.02	-155.00
2.0944	3.00	0.00	-176.00	0.08	-5.00	0.01	95.00	0.07	12.00	0.01	-101.00	0.02	-151.00
2.2440	2.80	0.00	-174.00	0.07	-5.00	0.01	94.00	0.05	12.00	0.01	-102.00	0.02	-151.00
2.4166	2.60	0.00	-172.00	0.06	-6.00	0.01	93.00	0.04	12.00	0.01	-103.00	0.01	-151.00

HEADING 135°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.71	-107.00	0.66	72.00	1.02	-27.00	0.34	73.00	0.31	75.00	0.12	-40.00
0.2708	23.20	0.71	-107.00	0.66	72.00	1.02	-28.00	0.36	70.00	0.32	75.00	0.15	-32.00
0.2756	22.80	0.71	-108.00	0.66	71.00	1.02	-29.00	0.37	70.00	0.33	74.00	0.16	-31.00
0.2805	22.40	0.71	-108.00	0.66	69.00	1.03	-30.00	0.39	69.00	0.34	74.00	0.17	-31.00
0.2856	22.00	0.71	-109.00	0.66	68.00	1.03	-32.00	0.40	69.00	0.36	73.00	0.18	-30.00
0.2909	21.60	0.70	-109.00	0.66	67.00	1.03	-33.00	0.41	68.00	0.37	73.00	0.19	-30.00
0.2964	21.20	0.70	-110.00	0.66	65.00	1.03	-34.00	0.43	68.00	0.38	72.00	0.19	-30.00
0.3021	20.80	0.70	-110.00	0.66	64.00	1.04	-35.00	0.44	68.00	0.40	72.00	0.20	-30.00
0.3080	20.40	0.70	-111.00	0.66	62.00	1.04	-36.00	0.46	67.00	0.41	71.00	0.21	-30.00
0.3142	20.00	0.70	-111.00	0.66	61.00	1.04	-38.00	0.48	67.00	0.43	71.00	0.22	-31.00
0.3206	19.60	0.70	-112.00	0.66	59.00	1.05	-39.00	0.50	66.00	0.45	70.00	0.23	-31.00

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0.3239	19.40	0.70	-112.00	0.66	58.00	1.05	-40.00	0.51	66.00	0.46	69.00	0.24	-31.00
0.3272	19.20	0.70	-113.00	0.67	56.00	1.05	-41.00	0.51	66.00	0.47	69.00	0.24	-33.00
0.3307	19.00	0.70	-113.00	0.67	55.00	1.05	-42.00	0.53	65.00	0.48	69.00	0.25	-33.00
0.3342	18.80	0.70	-114.00	0.67	54.00	1.05	-43.00	0.54	65.00	0.49	68.00	0.25	-34.00
0.3378	18.60	0.70	-114.00	0.67	53.00	1.06	-44.00	0.55	64.00	0.50	68.00	0.26	-34.00
0.3415	18.40	0.70	-115.00	0.67	52.00	1.06	-44.00	0.56	64.00	0.51	67.00	0.27	-34.00
0.3452	18.20	0.70	-115.00	0.67	51.00	1.06	-45.00	0.57	63.00	0.52	67.00	0.28	-35.00
0.3491	18.00	0.69	-116.00	0.67	50.00	1.06	-46.00	0.58	63.00	0.53	66.00	0.29	-35.00
0.3530	17.80	0.69	-116.00	0.67	49.00	1.07	-47.00	0.60	62.00	0.54	66.00	0.29	-35.00
0.3570	17.60	0.69	-117.00	0.67	47.00	1.07	-48.00	0.61	62.00	0.55	65.00	0.30	-36.00
0.3611	17.40	0.69	-118.00	0.67	46.00	1.07	-49.00	0.62	61.00	0.57	64.00	0.31	-36.00
0.3653	17.20	0.69	-118.00	0.67	45.00	1.07	-51.00	0.64	60.00	0.58	64.00	0.32	-37.00
0.3696	17.00	0.69	-119.00	0.67	44.00	1.08	-52.00	0.65	60.00	0.59	63.00	0.33	-37.00
0.3740	16.80	0.69	-119.00	0.67	42.00	1.08	-53.00	0.67	59.00	0.60	63.00	0.34	-38.00
0.3785	16.60	0.69	-120.00	0.68	41.00	1.08	-54.00	0.68	58.00	0.62	62.00	0.35	-38.00
0.3831	16.40	0.69	-121.00	0.68	39.00	1.09	-55.00	0.70	57.00	0.63	61.00	0.36	-39.00
0.3879	16.20	0.69	-121.00	0.68	38.00	1.09	-57.00	0.71	57.00	0.65	61.00	0.37	-39.00
0.3927	16.00	0.68	-122.00	0.68	36.00	1.09	-58.00	0.73	56.00	0.66	60.00	0.38	-40.00
0.3977	15.80	0.68	-123.00	0.68	35.00	1.10	-59.00	0.75	55.00	0.68	59.00	0.39	-41.00
0.4028	15.60	0.68	-124.00	0.68	33.00	1.10	-61.00	0.76	54.00	0.70	58.00	0.41	-41.00
0.4080	15.40	0.68	-125.00	0.69	31.00	1.11	-62.00	0.78	53.00	0.71	57.00	0.42	-42.00
0.4134	15.20	0.68	-125.00	0.69	30.00	1.11	-64.00	0.80	52.00	0.73	57.00	0.43	-43.00
0.4189	15.00	0.68	-126.00	0.69	28.00	1.12	-65.00	0.83	51.00	0.75	56.00	0.44	-43.00
0.4245	14.80	0.67	-127.00	0.69	26.00	1.12	-67.00	0.85	50.00	0.77	55.00	0.46	-44.00
0.4304	14.60	0.67	-128.00	0.69	24.00	1.13	-69.00	0.87	49.00	0.79	54.00	0.47	-45.00
0.4363	14.40	0.67	-129.00	0.69	22.00	1.13	-70.00	0.89	47.00	0.81	53.00	0.48	-46.00
0.4425	14.20	0.67	-130.00	0.69	21.00	1.14	-72.00	0.91	46.00	0.83	52.00	0.49	-48.00
0.4488	14.00	0.67	-131.00	0.69	19.00	1.15	-74.00	0.94	45.00	0.85	51.00	0.50	-49.00
0.4654	13.50	0.66	-134.00	0.69	13.00	1.16	-79.00	1.00	41.00	0.91	48.00	0.54	-52.00
0.4833	13.00	0.65	-138.00	0.70	7.00	1.19	-85.00	1.07	38.00	0.98	44.00	0.57	-55.00
0.5027	12.50	0.64	-141.00	0.70	1.00	1.21	-91.00	1.14	34.00	1.05	41.00	0.61	-59.00
0.5236	12.00	0.63	-146.00	0.71	-7.00	1.24	-98.00	1.21	29.00	1.13	37.00	0.66	-63.00
0.5325	11.80	0.62	-147.00	0.71	-10.00	1.25	-101.00	1.23	27.00	1.16	35.00	0.67	-65.00
0.5417	11.60	0.62	-149.00	0.72	-13.00	1.26	-104.00	1.26	25.00	1.19	33.00	0.69	-67.00
0.5512	11.40	0.61	-152.00	0.72	-16.00	1.27	-107.00	1.29	23.00	1.23	31.00	0.71	-69.00
0.5610	11.20	0.60	-154.00	0.72	-20.00	1.28	-110.00	1.32	20.00	1.26	29.00	0.72	-71.00
0.5712	11.00	0.60	-156.00	0.73	-23.00	1.30	-114.00	1.35	18.00	1.30	26.00	0.74	-73.00
0.5818	10.80	0.59	-158.00	0.73	-27.00	1.31	-117.00	1.37	15.00	1.34	24.00	0.76	-76.00

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0.5928	10.60	0.58	-161.00	0.73	-31.00	1.33	-121.00	1.40	12.00	1.38	21.00	0.78	-78.00
0.6042	10.40	0.57	-164.00	0.73	-35.00	1.34	-125.00	1.43	9.00	1.42	19.00	0.79	-81.00
0.6160	10.20	0.56	-167.00	0.74	-39.00	1.35	-129.00	1.45	5.00	1.46	16.00	0.81	-83.00
0.6283	10.00	0.55	-170.00	0.74	-43.00	1.37	-134.00	1.48	2.00	1.50	13.00	0.82	-86.00
0.6411	9.80	0.54	-173.00	0.74	-48.00	1.38	-138.00	1.49	-2.00	1.54	10.00	0.84	-89.00
0.6545	9.60	0.52	-177.00	0.74	-53.00	1.39	-143.00	1.51	-7.00	1.58	6.00	0.85	-92.00
0.6684	9.40	0.51	180.00	0.74	-58.00	1.40	-148.00	1.51	-11.00	1.62	2.00	0.86	-96.00
0.6830	9.20	0.49	176.00	0.74	-63.00	1.41	-153.00	1.51	-17.00	1.65	-2.00	0.87	-99.00
0.6981	9.00	0.48	171.00	0.74	-68.00	1.42	-159.00	1.51	-23.00	1.69	-6.00	0.87	-102.00
0.7140	8.80	0.46	167.00	0.73	-74.00	1.42	-164.00	1.47	-29.00	1.72	-10.00	0.87	-106.00
0.7306	8.60	0.44	162.00	0.73	-80.00	1.42	-171.00	1.44	-36.00	1.75	-15.00	0.87	-110.00
0.7480	8.40	0.42	157.00	0.72	-86.00	1.42	-177.00	1.37	-44.00	1.77	-20.00	0.87	-114.00
0.7662	8.20	0.39	151.00	0.71	-93.00	1.41	176.00	1.27	-54.00	1.79	-26.00	0.86	-118.00
0.7854	8.00	0.37	145.00	0.70	-99.00	1.41	169.00	1.17	-69.00	1.80	-31.00	0.85	-122.00
0.8055	7.80	0.34	138.00	0.67	-106.00	1.38	161.00	0.93	-84.00	1.79	-38.00	0.83	-126.00
0.8267	7.60	0.32	131.00	0.65	-112.00	1.36	153.00	0.68	-118.00	1.78	-45.00	0.81	-130.00
0.8491	7.40	0.29	123.00	0.63	-119.00	1.32	144.00	0.56	171.00	1.76	-52.00	0.81	-133.00
0.8727	7.20	0.25	115.00	0.61	-125.00	1.26	134.00	1.03	90.00	1.69	-61.00	0.84	-137.00
0.8976	7.00	0.22	105.00	0.63	-132.00	1.19	123.00	1.72	50.00	1.61	-69.00	0.88	-144.00
0.9240	6.80	0.19	96.00	0.60	-143.00	1.08	114.00	1.96	11.00	1.49	-77.00	0.85	-156.00
0.9520	6.60	0.16	85.00	0.58	-155.00	0.99	103.00	2.04	-15.00	1.38	-86.00	0.81	-167.00
0.9817	6.40	0.13	72.00	0.53	-168.00	0.88	92.00	1.88	-37.00	1.25	-95.00	0.72	-177.00
1.0134	6.20	0.10	58.00	0.46	178.00	0.75	80.00	1.63	-56.00	1.10	-104.00	0.62	172.00
1.0472	6.00	0.07	36.00	0.43	163.00	0.61	66.00	1.45	-70.00	0.92	-115.00	0.56	159.00
1.0833	5.80	0.05	18.00	0.32	149.00	0.47	57.00	1.11	-82.00	0.75	-122.00	0.42	150.00
1.1220	5.60	0.03	-18.00	0.25	128.00	0.32	50.00	0.86	-94.00	0.56	-128.00	0.31	136.00
1.1636	5.40	0.02	-60.00	0.17	110.00	0.23	50.00	0.66	-100.00	0.43	-130.00	0.21	125.00
1.2083	5.20	0.01	-109.00	0.07	84.00	0.20	59.00	0.47	-99.00	0.37	-126.00	0.09	126.00
1.2566	5.00	0.02	-158.00	0.07	-10.00	0.18	70.00	0.31	-95.00	0.32	-120.00	0.02	-53.00
1.3090	4.80	0.01	-153.00	0.04	-101.00	0.15	63.00	0.27	-86.00	0.26	-126.00	0.08	-144.00
1.3659	4.60	0.00	-152.00	0.11	-141.00	0.12	60.00	0.26	-75.00	0.21	-129.00	0.15	-152.00
1.4280	4.40	0.00	-64.00	0.11	-152.00	0.10	60.00	0.25	-70.00	0.16	-129.00	0.15	-159.00
1.4960	4.20	0.01	-88.00	0.05	174.00	0.07	62.00	0.21	-73.00	0.11	-127.00	0.09	177.00
1.5708	4.00	0.01	-95.00	0.06	95.00	0.04	68.00	0.18	-76.00	0.07	-122.00	0.07	115.00
1.6535	3.80	0.01	-102.00	0.05	97.00	0.03	66.00	0.14	-71.00	0.05	-124.00	0.05	122.00
1.7453	3.60	0.01	-98.00	0.03	110.00	0.02	69.00	0.11	-66.00	0.03	-122.00	0.04	136.00
1.8480	3.40	0.01	-77.00	0.03	130.00	0.01	81.00	0.08	-62.00	0.02	-113.00	0.04	153.00
1.9635	3.20	0.00	-58.00	0.03	147.00	0.01	131.00	0.06	-49.00	0.01	-59.00	0.03	167.00

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2.0944	3.00	0.00	-18.00	0.03	175.00	0.01	179.00	0.05	-40.00	0.01	4.00	0.03	-171.00
2.2440	2.80	0.00	-12.00	0.02	175.00	0.01	174.00	0.04	-38.00	0.01	0.00	0.03	-172.00
2.4166	2.60	0.00	-15.00	0.02	169.00	0.01	174.00	0.03	-40.00	0.01	-1.00	0.03	-177.00

HEADING 180°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.99	-112.00	0.00	-115.00	1.04	-39.00	0.01	-108.00	0.44	70.00	0.01	-90.00
0.2708	23.20	0.99	-113.00	0.00	-115.00	1.04	-40.00	0.01	-109.00	0.45	69.00	0.01	-91.00
0.2756	22.80	0.99	-114.00	0.00	-114.00	1.04	-41.00	0.01	-110.00	0.47	68.00	0.01	-92.00
0.2805	22.40	0.99	-115.00	0.00	-114.00	1.04	-43.00	0.01	-111.00	0.48	67.00	0.01	-94.00
0.2856	22.00	0.98	-115.00	0.00	-114.00	1.05	-44.00	0.01	-112.00	0.50	66.00	0.01	-95.00
0.2909	21.60	0.98	-116.00	0.00	-114.00	1.05	-46.00	0.01	-113.00	0.52	66.00	0.01	-96.00
0.2964	21.20	0.98	-117.00	0.01	-113.00	1.06	-47.00	0.01	-114.00	0.54	65.00	0.01	-98.00
0.3021	20.80	0.98	-117.00	0.01	-113.00	1.06	-49.00	0.01	-115.00	0.56	64.00	0.01	-99.00
0.3080	20.40	0.98	-118.00	0.01	-113.00	1.07	-51.00	0.02	-115.00	0.58	64.00	0.01	-100.00
0.3142	20.00	0.97	-119.00	0.01	-112.00	1.08	-53.00	0.02	-116.00	0.61	63.00	0.01	-101.00
0.3206	19.60	0.97	-120.00	0.01	-113.00	1.09	-55.00	0.02	-118.00	0.63	62.00	0.01	-102.00
0.3239	19.40	0.97	-121.00	0.01	-113.00	1.09	-56.00	0.02	-118.00	0.64	61.00	0.01	-103.00
0.3272	19.20	0.97	-121.00	0.01	-113.00	1.09	-57.00	0.02	-119.00	0.65	60.00	0.01	-104.00
0.3307	19.00	0.97	-122.00	0.01	-114.00	1.10	-58.00	0.02	-120.00	0.67	60.00	0.01	-105.00
0.3342	18.80	0.97	-122.00	0.01	-114.00	1.10	-59.00	0.02	-120.00	0.68	59.00	0.01	-106.00
0.3378	18.60	0.96	-123.00	0.01	-115.00	1.10	-61.00	0.02	-121.00	0.70	59.00	0.01	-107.00
0.3415	18.40	0.96	-124.00	0.01	-115.00	1.11	-62.00	0.02	-122.00	0.71	58.00	0.01	-108.00
0.3452	18.20	0.96	-125.00	0.01	-116.00	1.11	-63.00	0.02	-123.00	0.73	57.00	0.01	-108.00
0.3491	18.00	0.96	-125.00	0.01	-116.00	1.12	-64.00	0.02	-123.00	0.74	56.00	0.01	-109.00
0.3530	17.80	0.96	-126.00	0.01	-117.00	1.12	-66.00	0.03	-124.00	0.76	56.00	0.01	-110.00
0.3570	17.60	0.95	-127.00	0.01	-117.00	1.12	-67.00	0.03	-125.00	0.77	55.00	0.01	-111.00
0.3611	17.40	0.95	-128.00	0.01	-118.00	1.13	-69.00	0.03	-126.00	0.79	54.00	0.01	-113.00
0.3653	17.20	0.95	-129.00	0.01	-119.00	1.13	-70.00	0.03	-127.00	0.81	53.00	0.01	-114.00
0.3696	17.00	0.95	-129.00	0.01	-119.00	1.14	-72.00	0.03	-128.00	0.83	52.00	0.01	-115.00
0.3740	16.80	0.94	-130.00	0.01	-120.00	1.14	-73.00	0.03	-129.00	0.84	51.00	0.01	-116.00
0.3785	16.60	0.94	-131.00	0.01	-121.00	1.15	-75.00	0.03	-130.00	0.86	50.00	0.01	-117.00
0.3831	16.40	0.94	-132.00	0.01	-122.00	1.16	-76.00	0.04	-131.00	0.88	50.00	0.01	-118.00
0.3879	16.20	0.93	-133.00	0.01	-123.00	1.16	-78.00	0.04	-132.00	0.90	49.00	0.01	-119.00
0.3927	16.00	0.93	-134.00	0.01	-124.00	1.17	-80.00	0.04	-133.00	0.92	48.00	0.01	-120.00
0.3977	15.80	0.93	-135.00	0.01	-125.00	1.18	-82.00	0.04	-134.00	0.94	46.00	0.01	-122.00

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0.4028	15.60	0.92	-137.00	0.01	-126.00	1.18	-84.00	0.04	-135.00	0.96	45.00	0.01	-123.00
0.4080	15.40	0.92	-138.00	0.01	-127.00	1.19	-86.00	0.05	-136.00	0.99	44.00	0.01	-124.00
0.4134	15.20	0.91	-139.00	0.01	-128.00	1.20	-88.00	0.05	-138.00	1.01	43.00	0.01	-126.00
0.4189	15.00	0.91	-140.00	0.01	-130.00	1.21	-90.00	0.05	-139.00	1.04	42.00	0.01	-127.00
0.4245	14.80	0.91	-142.00	0.01	-131.00	1.22	-92.00	0.06	-140.00	1.06	40.00	0.01	-129.00
0.4304	14.60	0.90	-143.00	0.01	-133.00	1.23	-94.00	0.06	-142.00	1.09	39.00	0.01	-130.00
0.4363	14.40	0.90	-144.00	0.01	-134.00	1.24	-96.00	0.06	-143.00	1.12	38.00	0.01	-132.00
0.4425	14.20	0.89	-146.00	0.01	-136.00	1.24	-99.00	0.07	-145.00	1.14	36.00	0.01	-133.00
0.4488	14.00	0.88	-147.00	0.01	-137.00	1.26	-101.00	0.07	-146.00	1.17	35.00	0.01	-135.00
0.4654	13.50	0.87	-152.00	0.01	-141.00	1.28	-108.00	0.08	-151.00	1.25	30.00	0.01	-138.00
0.4833	13.00	0.84	-156.00	0.01	-146.00	1.31	-115.00	0.10	-156.00	1.33	26.00	0.01	-143.00
0.5027	12.50	0.82	-162.00	0.01	-152.00	1.35	-123.00	0.11	-161.00	1.41	21.00	0.01	-148.00
0.5236	12.00	0.79	-168.00	0.01	-158.00	1.38	-132.00	0.14	-167.00	1.50	15.00	0.01	-153.00
0.5325	11.80	0.78	-170.00	0.01	-161.00	1.39	-135.00	0.15	-170.00	1.53	12.00	0.01	-155.00
0.5417	11.60	0.76	-173.00	0.01	-165.00	1.41	-139.00	0.16	-173.00	1.57	9.00	0.01	-157.00
0.5512	11.40	0.75	-176.00	0.01	-168.00	1.42	-143.00	0.17	-176.00	1.60	7.00	0.01	-159.00
0.5610	11.20	0.73	-179.00	0.01	-172.00	1.43	-147.00	0.19	-179.00	1.64	4.00	0.01	-161.00
0.5712	11.00	0.71	178.00	0.01	-175.00	1.44	-152.00	0.20	177.00	1.68	0.00	0.01	-162.00
0.5818	10.80	0.69	174.00	0.01	-180.00	1.45	-156.00	0.22	173.00	1.71	-3.00	0.01	-163.00
0.5928	10.60	0.67	171.00	0.01	176.00	1.46	-161.00	0.24	170.00	1.74	-7.00	0.01	-162.00
0.6042	10.40	0.65	167.00	0.01	171.00	1.47	-166.00	0.26	165.00	1.78	-10.00	0.00	-157.00
0.6160	10.20	0.62	163.00	0.01	167.00	1.47	-172.00	0.29	160.00	1.80	-15.00	0.00	-142.00
0.6283	10.00	0.60	158.00	0.01	161.00	1.47	-178.00	0.31	155.00	1.83	-19.00	0.00	-121.00
0.6411	9.80	0.57	154.00	0.01	154.00	1.46	177.00	0.34	150.00	1.84	-23.00	0.00	-94.00
0.6545	9.60	0.54	149.00	0.01	147.00	1.45	170.00	0.38	144.00	1.86	-28.00	0.01	-78.00
0.6684	9.40	0.51	143.00	0.01	139.00	1.44	164.00	0.41	138.00	1.86	-34.00	0.01	-71.00
0.6830	9.20	0.47	138.00	0.01	129.00	1.41	157.00	0.46	132.00	1.86	-39.00	0.01	-69.00
0.6981	9.00	0.43	131.00	0.01	118.00	1.39	149.00	0.50	124.00	1.85	-45.00	0.01	-72.00
0.7140	8.80	0.39	126.00	0.01	104.00	1.34	142.00	0.56	117.00	1.81	-51.00	0.02	-75.00
0.7306	8.60	0.35	119.00	0.01	85.00	1.29	134.00	0.62	109.00	1.77	-58.00	0.02	-81.00
0.7480	8.40	0.31	112.00	0.01	60.00	1.23	126.00	0.68	100.00	1.71	-64.00	0.03	-88.00
0.7662	8.20	0.26	105.00	0.01	25.00	1.14	118.00	0.76	90.00	1.63	-71.00	0.03	-96.00
0.7854	8.00	0.22	97.00	0.01	-14.00	1.06	108.00	0.85	78.00	1.53	-79.00	0.04	-107.00
0.8055	7.80	0.17	92.00	0.01	-46.00	0.95	100.00	0.95	66.00	1.41	-85.00	0.05	-118.00
0.8267	7.60	0.13	85.00	0.02	-74.00	0.83	91.00	1.07	50.00	1.27	-92.00	0.06	-132.00
0.8491	7.40	0.09	81.00	0.02	-102.00	0.71	83.00	1.19	30.00	1.13	-99.00	0.07	-151.00
0.8727	7.20	0.06	85.00	0.03	-131.00	0.58	77.00	1.26	7.00	0.97	-103.00	0.08	-173.00
0.8976	7.00	0.03	105.00	0.03	-163.00	0.44	72.00	1.15	-22.00	0.80	-107.00	0.08	159.00

0.9240	6.80	0.04	128.00	0.03	171.00	0.37	77.00	0.94	-46.00	0.72	-106.00	0.07	137.00
0.9520	6.60	0.04	145.00	0.03	154.00	0.31	86.00	0.69	-61.00	0.64	-103.00	0.05	123.00
0.9817	6.40	0.05	145.00	0.02	143.00	0.31	93.00	0.54	-71.00	0.61	-101.00	0.04	114.00
1.0134	6.20	0.05	134.00	0.02	133.00	0.36	92.00	0.46	-79.00	0.64	-102.00	0.04	107.00
1.0472	6.00	0.05	125.00	0.02	124.00	0.40	89.00	0.40	-86.00	0.66	-104.00	0.04	101.00
1.0833	5.80	0.03	116.00	0.02	109.00	0.39	76.00	0.34	-99.00	0.64	-114.00	0.03	88.00
1.1220	5.60	0.02	105.00	0.02	95.00	0.37	62.00	0.28	-112.00	0.61	-124.00	0.03	76.00
1.1636	5.40	0.01	120.00	0.02	83.00	0.33	52.00	0.23	-122.00	0.54	-132.00	0.02	66.00
1.2083	5.20	0.01	171.00	0.01	73.00	0.27	43.00	0.18	-131.00	0.46	-139.00	0.02	58.00
1.2566	5.00	0.02	-167.00	0.01	66.00	0.22	37.00	0.14	-138.00	0.39	-145.00	0.02	52.00
1.3090	4.80	0.02	-157.00	0.01	58.00	0.18	35.00	0.11	-143.00	0.32	-149.00	0.01	47.00
1.3659	4.60	0.01	-155.00	0.01	52.00	0.15	35.00	0.08	-147.00	0.27	-152.00	0.01	43.00
1.4280	4.40	0.02	-165.00	0.01	47.00	0.13	33.00	0.07	-151.00	0.23	-156.00	0.01	39.00
1.4960	4.20	0.02	-167.00	0.01	42.00	0.12	29.00	0.05	-155.00	0.20	-159.00	0.01	35.00
1.5708	4.00	0.02	-162.00	0.01	38.00	0.11	26.00	0.05	-158.00	0.19	-161.00	0.01	33.00
1.6535	3.80	0.02	-173.00	0.00	27.00	0.09	17.00	0.04	-165.00	0.15	-168.00	0.01	26.00
1.7453	3.60	0.02	-179.00	0.00	17.00	0.07	10.00	0.03	-172.00	0.11	-175.00	0.00	19.00
1.8480	3.40	0.02	170.00	0.00	5.00	0.05	-2.00	0.02	179.00	0.09	176.00	0.00	10.00
1.9635	3.20	0.01	161.00	0.00	-9.00	0.04	-15.00	0.01	169.00	0.07	166.00	0.00	-1.00
2.0944	3.00	0.01	140.00	0.00	-28.00	0.03	-36.00	0.01	153.00	0.05	151.00	0.00	-16.00
2.2440	2.80	0.01	139.00	0.00	-29.00	0.02	-37.00	0.01	152.00	0.04	150.00	0.00	-18.00
2.4166	2.60	0.01	142.00	0.00	-29.00	0.02	-38.00	0.01	152.00	0.03	149.00	0.00	-19.00

HEADING 225°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.71	-107.00	0.66	-106.00	1.02	-28.00	0.36	-109.00	0.31	75.00	0.13	150.00
0.2708	23.20	0.71	-107.00	0.67	-108.00	1.02	-28.00	0.37	-109.00	0.32	75.00	0.14	151.00
0.2756	22.80	0.71	-108.00	0.67	-109.00	1.02	-29.00	0.39	-110.00	0.33	74.00	0.15	151.00
0.2805	22.40	0.71	-108.00	0.67	-111.00	1.03	-30.00	0.40	-110.00	0.35	74.00	0.16	152.00
0.2856	22.00	0.71	-109.00	0.67	-112.00	1.03	-32.00	0.41	-111.00	0.36	73.00	0.17	152.00
0.2909	21.60	0.70	-109.00	0.67	-113.00	1.03	-33.00	0.43	-111.00	0.37	73.00	0.18	152.00
0.2964	21.20	0.70	-110.00	0.67	-115.00	1.03	-34.00	0.45	-112.00	0.39	72.00	0.19	152.00
0.3021	20.80	0.70	-110.00	0.67	-116.00	1.04	-35.00	0.46	-112.00	0.40	72.00	0.20	152.00
0.3080	20.40	0.70	-111.00	0.67	-118.00	1.04	-37.00	0.48	-113.00	0.42	71.00	0.21	152.00
0.3142	20.00	0.70	-111.00	0.67	-119.00	1.05	-38.00	0.50	-113.00	0.43	71.00	0.22	151.00
0.3206	19.60	0.70	-112.00	0.67	-121.00	1.05	-39.00	0.52	-114.00	0.45	70.00	0.23	151.00

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0.3239	19.40	0.70	-112.00	0.67	-122.00	1.05	-40.00	0.53	-114.00	0.46	69.00	0.24	151.00
0.3272	19.20	0.70	-113.00	0.67	-123.00	1.05	-41.00	0.54	-114.00	0.47	69.00	0.24	149.00
0.3307	19.00	0.70	-113.00	0.67	-124.00	1.05	-42.00	0.55	-114.00	0.48	69.00	0.24	149.00
0.3342	18.80	0.70	-114.00	0.67	-125.00	1.06	-43.00	0.57	-115.00	0.49	68.00	0.25	148.00
0.3378	18.60	0.70	-114.00	0.68	-127.00	1.06	-44.00	0.58	-116.00	0.50	68.00	0.26	148.00
0.3415	18.40	0.70	-115.00	0.68	-128.00	1.06	-45.00	0.59	-116.00	0.51	67.00	0.27	148.00
0.3452	18.20	0.70	-115.00	0.68	-129.00	1.06	-45.00	0.60	-117.00	0.52	67.00	0.27	147.00
0.3491	18.00	0.69	-116.00	0.68	-130.00	1.06	-46.00	0.62	-117.00	0.53	66.00	0.28	147.00
0.3530	17.80	0.69	-116.00	0.68	-131.00	1.07	-47.00	0.63	-118.00	0.54	66.00	0.29	147.00
0.3570	17.60	0.69	-117.00	0.68	-132.00	1.07	-48.00	0.65	-118.00	0.56	65.00	0.30	146.00
0.3611	17.40	0.69	-118.00	0.68	-133.00	1.07	-50.00	0.66	-119.00	0.57	64.00	0.31	146.00
0.3653	17.20	0.69	-118.00	0.68	-135.00	1.07	-51.00	0.68	-120.00	0.58	64.00	0.32	145.00
0.3696	17.00	0.69	-119.00	0.68	-136.00	1.08	-52.00	0.69	-120.00	0.59	63.00	0.32	145.00
0.3740	16.80	0.69	-119.00	0.68	-137.00	1.08	-53.00	0.71	-121.00	0.61	63.00	0.34	144.00
0.3785	16.60	0.69	-120.00	0.69	-139.00	1.08	-54.00	0.73	-122.00	0.62	62.00	0.35	144.00
0.3831	16.40	0.69	-121.00	0.69	-140.00	1.09	-55.00	0.75	-122.00	0.64	61.00	0.36	143.00
0.3879	16.20	0.69	-121.00	0.69	-142.00	1.09	-57.00	0.77	-123.00	0.65	61.00	0.37	143.00
0.3927	16.00	0.69	-122.00	0.69	-143.00	1.10	-58.00	0.79	-124.00	0.67	60.00	0.38	142.00
0.3977	15.80	0.68	-123.00	0.69	-145.00	1.10	-59.00	0.81	-125.00	0.68	59.00	0.39	141.00
0.4028	15.60	0.68	-124.00	0.69	-147.00	1.10	-61.00	0.83	-126.00	0.70	58.00	0.40	140.00
0.4080	15.40	0.68	-125.00	0.70	-148.00	1.11	-62.00	0.85	-127.00	0.72	57.00	0.42	140.00
0.4134	15.20	0.68	-125.00	0.70	-150.00	1.11	-64.00	0.87	-128.00	0.74	57.00	0.43	139.00
0.4189	15.00	0.68	-126.00	0.70	-151.00	1.12	-66.00	0.90	-129.00	0.76	56.00	0.44	138.00
0.4245	14.80	0.68	-127.00	0.70	-153.00	1.12	-67.00	0.92	-130.00	0.78	55.00	0.45	137.00
0.4304	14.60	0.67	-128.00	0.71	-155.00	1.13	-69.00	0.95	-131.00	0.80	54.00	0.47	137.00
0.4363	14.40	0.67	-129.00	0.71	-157.00	1.14	-71.00	0.98	-132.00	0.82	53.00	0.48	135.00
0.4425	14.20	0.67	-130.00	0.70	-159.00	1.14	-73.00	1.01	-134.00	0.84	52.00	0.49	134.00
0.4488	14.00	0.67	-131.00	0.70	-160.00	1.15	-74.00	1.04	-135.00	0.86	51.00	0.50	133.00
0.4654	13.50	0.66	-134.00	0.70	-166.00	1.17	-80.00	1.12	-138.00	0.92	48.00	0.53	129.00
0.4833	13.00	0.65	-138.00	0.71	-172.00	1.19	-85.00	1.21	-142.00	0.99	44.00	0.57	126.00
0.5027	12.50	0.64	-141.00	0.71	-178.00	1.22	-91.00	1.31	-146.00	1.06	41.00	0.61	122.00
0.5236	12.00	0.63	-146.00	0.72	175.00	1.24	-98.00	1.41	-151.00	1.14	36.00	0.65	118.00
0.5325	11.80	0.63	-148.00	0.72	171.00	1.26	-101.00	1.46	-153.00	1.18	35.00	0.67	116.00
0.5417	11.60	0.62	-150.00	0.73	168.00	1.27	-104.00	1.50	-155.00	1.21	33.00	0.68	114.00
0.5512	11.40	0.61	-152.00	0.73	165.00	1.28	-107.00	1.55	-157.00	1.25	31.00	0.70	112.00
0.5610	11.20	0.61	-154.00	0.73	162.00	1.30	-111.00	1.61	-160.00	1.29	28.00	0.72	110.00
0.5712	11.00	0.60	-156.00	0.74	158.00	1.31	-114.00	1.67	-162.00	1.33	26.00	0.73	108.00
0.5818	10.80	0.59	-159.00	0.74	154.00	1.32	-118.00	1.72	-165.00	1.37	24.00	0.75	105.00

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0.5928	10.60	0.58	-161.00	0.74	150.00	1.34	-122.00	1.78	-168.00	1.41	21.00	0.77	103.00
0.6042	10.40	0.58	-164.00	0.75	146.00	1.35	-126.00	1.85	-171.00	1.45	18.00	0.78	100.00
0.6160	10.20	0.57	-167.00	0.75	142.00	1.37	-130.00	1.91	-175.00	1.49	15.00	0.80	97.00
0.6283	10.00	0.55	-170.00	0.75	138.00	1.38	-135.00	1.99	-179.00	1.53	12.00	0.81	94.00
0.6411	9.80	0.54	-174.00	0.75	133.00	1.39	-139.00	2.05	177.00	1.58	9.00	0.83	91.00
0.6545	9.60	0.53	-177.00	0.75	128.00	1.41	-144.00	2.14	173.00	1.62	5.00	0.84	87.00
0.6684	9.40	0.51	179.00	0.75	123.00	1.42	-149.00	2.22	168.00	1.66	1.00	0.85	84.00
0.6830	9.20	0.50	175.00	0.75	118.00	1.43	-155.00	2.30	162.00	1.70	-3.00	0.85	80.00
0.6981	9.00	0.48	170.00	0.75	113.00	1.43	-160.00	2.41	156.00	1.73	-7.00	0.86	76.00
0.7140	8.80	0.46	165.00	0.74	107.00	1.44	-166.00	2.49	150.00	1.76	-12.00	0.86	72.00
0.7306	8.60	0.44	160.00	0.74	101.00	1.43	-173.00	2.60	142.00	1.79	-17.00	0.85	67.00
0.7480	8.40	0.42	155.00	0.73	94.00	1.43	-179.00	2.70	134.00	1.80	-22.00	0.84	63.00
0.7662	8.20	0.39	149.00	0.72	87.00	1.41	174.00	2.80	124.00	1.81	-28.00	0.82	58.00
0.7854	8.00	0.36	143.00	0.71	80.00	1.39	166.00	2.94	112.00	1.80	-34.00	0.79	53.00
0.8055	7.80	0.34	137.00	0.67	72.00	1.36	159.00	3.02	99.00	1.79	-40.00	0.75	48.00
0.8267	7.60	0.31	130.00	0.64	65.00	1.32	151.00	3.09	81.00	1.75	-47.00	0.70	44.00
0.8491	7.40	0.28	123.00	0.60	57.00	1.27	143.00	3.11	61.00	1.70	-54.00	0.65	41.00
0.8727	7.20	0.25	115.00	0.55	50.00	1.22	134.00	2.97	35.00	1.64	-61.00	0.60	40.00
0.8976	7.00	0.22	107.00	0.52	45.00	1.17	125.00	2.64	0.00	1.58	-67.00	0.62	42.00
0.9240	6.80	0.19	98.00	0.49	40.00	1.11	116.00	1.96	-35.00	1.52	-75.00	0.65	37.00
0.9520	6.60	0.17	85.00	0.49	31.00	1.05	104.00	1.28	-79.00	1.45	-84.00	0.68	27.00
0.9817	6.40	0.14	71.00	0.47	20.00	0.95	91.00	0.87	-122.00	1.33	-95.00	0.65	16.00
1.0134	6.20	0.11	55.00	0.42	6.00	0.81	78.00	0.64	-163.00	1.17	-106.00	0.58	4.00
1.0472	6.00	0.08	32.00	0.39	-11.00	0.66	62.00	0.64	157.00	0.99	-118.00	0.53	-10.00
1.0833	5.80	0.05	13.00	0.29	-24.00	0.50	53.00	0.51	138.00	0.79	-126.00	0.40	-19.00
1.1220	5.60	0.03	-23.00	0.22	-46.00	0.34	44.00	0.43	114.00	0.58	-133.00	0.29	-35.00
1.1636	5.40	0.02	-61.00	0.15	-66.00	0.23	43.00	0.34	102.00	0.44	-134.00	0.19	-45.00
1.2083	5.20	0.02	-103.00	0.05	-97.00	0.19	54.00	0.22	106.00	0.37	-130.00	0.08	-35.00
1.2566	5.00	0.02	-154.00	0.08	157.00	0.18	67.00	0.12	120.00	0.32	-123.00	0.04	100.00
1.3090	4.80	0.01	-147.00	0.06	80.00	0.15	60.00	0.17	131.00	0.26	-129.00	0.09	43.00
1.3659	4.60	0.00	-124.00	0.12	42.00	0.12	56.00	0.20	135.00	0.22	-132.00	0.17	31.00
1.4280	4.40	0.00	-58.00	0.12	31.00	0.10	55.00	0.21	132.00	0.17	-133.00	0.16	24.00
1.4960	4.20	0.01	-84.00	0.06	0.00	0.06	56.00	0.18	123.00	0.11	-132.00	0.09	2.00
1.5708	4.00	0.01	-94.00	0.06	-84.00	0.04	59.00	0.15	114.00	0.07	-129.00	0.06	-61.00
1.6535	3.80	0.01	-101.00	0.04	-81.00	0.03	56.00	0.12	118.00	0.05	-131.00	0.05	-55.00
1.7453	3.60	0.01	-96.00	0.03	-68.00	0.02	57.00	0.10	120.00	0.03	-131.00	0.04	-41.00
1.8480	3.40	0.01	-77.00	0.03	-48.00	0.01	64.00	0.08	122.00	0.02	-127.00	0.04	-26.00
1.9635	3.20	0.00	-59.00	0.03	-33.00	0.00	123.00	0.06	131.00	0.01	-74.00	0.03	-12.00

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2.0944	3.00	0.00	-18.00	0.02	-5.00	0.01	-175.00	0.05	136.00	0.01	10.00	0.03	8.00
2.2440	2.80	0.00	-13.00	0.02	-5.00	0.01	179.00	0.04	139.00	0.01	5.00	0.03	8.00
2.4166	2.60	0.00	-16.00	0.02	-11.00	0.01	179.00	0.03	137.00	0.01	4.00	0.02	3.00

HEADING 270°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.03	-179.00	0.94	-80.00	1.00	0.00	0.50	-92.00	0.00	31.00	0.18	31.00
0.2708	23.20	0.03	-179.00	0.94	-80.00	1.00	0.00	0.52	-92.00	0.00	33.00	0.18	32.00
0.2756	22.80	0.03	-179.00	0.94	-81.00	1.00	0.00	0.54	-92.00	0.00	35.00	0.17	33.00
0.2805	22.40	0.02	-179.00	0.94	-81.00	1.00	0.00	0.56	-92.00	0.00	37.00	0.17	34.00
0.2856	22.00	0.02	-179.00	0.93	-81.00	1.00	0.00	0.58	-92.00	0.00	39.00	0.17	35.00
0.2909	21.60	0.02	-179.00	0.93	-82.00	1.00	0.00	0.60	-92.00	0.00	41.00	0.16	37.00
0.2964	21.20	0.02	-179.00	0.93	-82.00	1.00	0.00	0.62	-92.00	0.00	44.00	0.16	38.00
0.3021	20.80	0.02	-179.00	0.92	-82.00	1.00	0.00	0.65	-92.00	0.00	47.00	0.15	39.00
0.3080	20.40	0.02	-179.00	0.92	-83.00	1.01	0.00	0.67	-92.00	0.00	49.00	0.15	40.00
0.3142	20.00	0.02	-179.00	0.92	-83.00	1.01	0.00	0.70	-92.00	0.00	52.00	0.15	42.00
0.3206	19.60	0.02	-179.00	0.91	-83.00	1.01	0.00	0.73	-92.00	0.00	55.00	0.14	43.00
0.3239	19.40	0.02	-179.00	0.91	-83.00	1.01	0.00	0.75	-92.00	0.00	57.00	0.14	44.00
0.3272	19.20	0.02	-179.00	0.91	-83.00	1.01	0.00	0.76	-92.00	0.00	58.00	0.14	45.00
0.3307	19.00	0.02	-179.00	0.91	-84.00	1.01	0.00	0.78	-92.00	0.00	60.00	0.14	45.00
0.3342	18.80	0.02	-179.00	0.91	-84.00	1.01	0.00	0.80	-92.00	0.00	62.00	0.14	46.00
0.3378	18.60	0.02	177.00	0.91	-83.00	1.01	0.00	0.82	-93.00	0.00	63.00	0.12	55.00
0.3415	18.40	0.02	177.00	0.91	-83.00	1.01	0.00	0.84	-93.00	0.00	64.00	0.12	56.00
0.3452	18.20	0.02	177.00	0.90	-83.00	1.01	0.00	0.85	-93.00	0.00	66.00	0.12	56.00
0.3491	18.00	0.02	178.00	0.90	-83.00	1.01	0.00	0.87	-93.00	0.00	67.00	0.12	57.00
0.3530	17.80	0.02	178.00	0.90	-84.00	1.01	0.00	0.89	-93.00	0.00	69.00	0.12	58.00
0.3570	17.60	0.02	178.00	0.90	-84.00	1.01	0.00	0.92	-93.00	0.00	70.00	0.12	59.00
0.3611	17.40	0.02	178.00	0.90	-84.00	1.01	0.00	0.94	-93.00	0.00	72.00	0.12	59.00
0.3653	17.20	0.02	178.00	0.90	-84.00	1.01	0.00	0.96	-93.00	0.00	73.00	0.12	60.00
0.3696	17.00	0.02	178.00	0.90	-84.00	1.01	0.00	0.98	-93.00	0.00	75.00	0.12	61.00
0.3740	16.80	0.02	178.00	0.90	-85.00	1.01	0.00	1.01	-93.00	0.00	76.00	0.12	62.00
0.3785	16.60	0.02	179.00	0.89	-85.00	1.01	0.00	1.04	-93.00	0.00	77.00	0.12	63.00
0.3831	16.40	0.02	179.00	0.89	-85.00	1.01	0.00	1.06	-93.00	0.00	78.00	0.12	63.00
0.3879	16.20	0.02	179.00	0.89	-85.00	1.01	0.00	1.09	-93.00	0.00	79.00	0.12	64.00
0.3927	16.00	0.02	179.00	0.89	-85.00	1.01	0.00	1.12	-93.00	0.00	80.00	0.12	65.00
0.3977	15.80	0.02	179.00	0.89	-85.00	1.01	0.00	1.15	-93.00	0.00	81.00	0.12	67.00

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0.4028	15.60	0.02	180.00	0.89	-86.00	1.01	0.00	1.18	-93.00	0.00	82.00	0.12	69.00
0.4080	15.40	0.02	180.00	0.88	-86.00	1.01	0.00	1.21	-93.00	0.00	83.00	0.12	71.00
0.4134	15.20	0.01	-180.00	0.88	-86.00	1.01	0.00	1.25	-94.00	0.00	84.00	0.12	73.00
0.4189	15.00	0.01	-180.00	0.88	-87.00	1.01	0.00	1.28	-94.00	0.00	85.00	0.12	75.00
0.4245	14.80	0.01	-179.00	0.88	-87.00	1.01	0.00	1.32	-94.00	0.00	85.00	0.13	76.00
0.4304	14.60	0.01	-179.00	0.87	-87.00	1.01	0.00	1.36	-94.00	0.01	86.00	0.13	77.00
0.4363	14.40	0.01	-178.00	0.87	-87.00	1.01	0.00	1.40	-94.00	0.01	86.00	0.13	77.00
0.4425	14.20	0.01	-178.00	0.87	-87.00	1.01	0.00	1.45	-94.00	0.01	87.00	0.13	76.00
0.4488	14.00	0.01	-178.00	0.86	-86.00	1.01	0.00	1.49	-94.00	0.01	87.00	0.14	74.00
0.4654	13.50	0.01	-176.00	0.85	-86.00	1.01	-1.00	1.62	-95.00	0.01	87.00	0.15	74.00
0.4833	13.00	0.01	-175.00	0.84	-86.00	1.01	-1.00	1.76	-95.00	0.01	87.00	0.16	76.00
0.5027	12.50	0.01	-173.00	0.83	-87.00	1.01	-1.00	1.93	-95.00	0.01	87.00	0.17	78.00
0.5236	12.00	0.01	-171.00	0.81	-87.00	1.01	-1.00	2.12	-95.00	0.01	86.00	0.18	80.00
0.5325	11.80	0.01	-171.00	0.81	-87.00	1.01	-1.00	2.20	-95.00	0.01	86.00	0.18	80.00
0.5417	11.60	0.01	-170.00	0.80	-87.00	1.01	-1.00	2.30	-95.00	0.02	85.00	0.19	81.00
0.5512	11.40	0.01	-169.00	0.79	-87.00	1.01	-1.00	2.40	-95.00	0.02	84.00	0.20	81.00
0.5610	11.20	0.01	-168.00	0.78	-87.00	1.01	-1.00	2.50	-95.00	0.02	83.00	0.20	82.00
0.5712	11.00	0.01	-167.00	0.77	-87.00	1.00	-1.00	2.62	-95.00	0.02	82.00	0.21	82.00
0.5818	10.80	0.01	-166.00	0.76	-87.00	1.00	-2.00	2.74	-96.00	0.02	81.00	0.22	83.00
0.5928	10.60	0.01	-165.00	0.75	-87.00	1.00	-2.00	2.88	-96.00	0.03	79.00	0.23	83.00
0.6042	10.40	0.01	-165.00	0.74	-87.00	1.00	-2.00	3.03	-96.00	0.03	77.00	0.24	83.00
0.6160	10.20	0.01	-165.00	0.73	-87.00	1.00	-2.00	3.18	-98.00	0.03	75.00	0.25	82.00
0.6283	10.00	0.02	-165.00	0.72	-87.00	1.00	-3.00	3.36	-98.00	0.04	72.00	0.26	82.00
0.6411	9.80	0.02	-166.00	0.70	-87.00	1.00	-3.00	3.55	-99.00	0.04	69.00	0.27	82.00
0.6545	9.60	0.02	-167.00	0.69	-87.00	1.00	-3.00	3.76	-101.00	0.05	65.00	0.28	81.00
0.6684	9.40	0.02	-168.00	0.67	-87.00	0.99	-4.00	3.99	-102.00	0.05	61.00	0.30	81.00
0.6830	9.20	0.02	-170.00	0.65	-87.00	0.99	-4.00	4.25	-104.00	0.06	57.00	0.32	80.00
0.6981	9.00	0.02	-173.00	0.63	-86.00	0.98	-4.00	4.54	-106.00	0.06	52.00	0.33	79.00
0.7140	8.80	0.02	-176.00	0.61	-86.00	0.98	-5.00	4.85	-108.00	0.07	46.00	0.35	77.00
0.7306	8.60	0.02	179.00	0.58	-86.00	0.97	-6.00	5.20	-111.00	0.08	39.00	0.38	75.00
0.7480	8.40	0.02	174.00	0.55	-85.00	0.96	-6.00	5.58	-115.00	0.09	32.00	0.40	73.00
0.7662	8.20	0.02	168.00	0.52	-83.00	0.94	-7.00	5.98	-119.00	0.10	23.00	0.42	69.00
0.7854	8.00	0.03	160.00	0.48	-81.00	0.93	-7.00	6.39	-124.00	0.11	13.00	0.45	65.00
0.8055	7.80	0.03	151.00	0.44	-77.00	0.91	-7.00	6.77	-130.00	0.12	2.00	0.47	60.00
0.8267	7.60	0.03	141.00	0.41	-72.00	0.90	-7.00	7.11	-138.00	0.13	-10.00	0.49	54.00
0.8491	7.40	0.03	129.00	0.39	-64.00	0.89	-7.00	7.37	-146.00	0.14	-24.00	0.51	46.00
0.8727	7.20	0.03	117.00	0.39	-55.00	0.88	-8.00	7.50	-155.00	0.15	-40.00	0.51	38.00
0.8976	7.00	0.03	103.00	0.41	-47.00	0.88	-8.00	7.47	-166.00	0.15	-57.00	0.51	28.00

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0.9240	6.80	0.02	87.00	0.44	-41.00	0.88	-9.00	7.20	-177.00	0.15	-76.00	0.48	18.00
0.9520	6.60	0.02	71.00	0.48	-38.00	0.88	-11.00	6.71	172.00	0.14	-97.00	0.45	7.00
0.9817	6.40	0.02	53.00	0.51	-36.00	0.86	-15.00	6.00	162.00	0.13	-118.00	0.40	-4.00
1.0134	6.20	0.01	37.00	0.52	-36.00	0.82	-19.00	5.12	153.00	0.11	-140.00	0.34	-13.00
1.0472	6.00	0.01	23.00	0.52	-36.00	0.75	-23.00	4.27	147.00	0.09	-160.00	0.29	-19.00
1.0833	5.80	0.01	11.00	0.49	-35.00	0.66	-27.00	3.45	143.00	0.07	179.00	0.23	-24.00
1.1220	5.60	0.00	6.00	0.47	-32.00	0.57	-30.00	2.77	142.00	0.05	160.00	0.18	-26.00
1.1636	5.40	0.00	24.00	0.43	-28.00	0.47	-31.00	2.19	143.00	0.03	139.00	0.14	-26.00
1.2083	5.20	0.00	0.00	0.40	-24.00	0.37	-31.00	1.71	144.00	0.02	111.00	0.11	-26.00
1.2566	5.00	0.00	147.00	0.37	-18.00	0.30	-26.00	1.34	149.00	0.01	79.00	0.08	-20.00
1.3090	4.80	0.00	141.00	0.33	-10.00	0.23	-22.00	1.00	153.00	0.01	57.00	0.06	-18.00
1.3659	4.60	0.00	150.00	0.30	-1.00	0.18	-14.00	0.74	160.00	0.01	48.00	0.04	-12.00
1.4280	4.40	0.00	156.00	0.26	9.00	0.13	-5.00	0.53	167.00	0.01	47.00	0.03	-6.00
1.4960	4.20	0.00	174.00	0.23	22.00	0.10	8.00	0.35	174.00	0.01	49.00	0.02	-1.00
1.5708	4.00	0.00	-159.00	0.21	37.00	0.08	27.00	0.23	-170.00	0.01	55.00	0.01	15.00
1.6535	3.80	0.00	-179.00	0.15	39.00	0.06	31.00	0.18	-174.00	0.01	-5.00	0.01	16.00
1.7453	3.60	0.00	165.00	0.09	48.00	0.04	36.00	0.14	-176.00	0.01	-69.00	0.01	19.00
1.8480	3.40	0.00	170.00	0.04	80.00	0.03	43.00	0.11	-176.00	0.01	-91.00	0.02	23.00
1.9635	3.20	0.00	179.00	0.05	151.00	0.02	55.00	0.09	-172.00	0.01	-103.00	0.02	27.00
2.0944	3.00	0.00	-175.00	0.08	175.00	0.01	81.00	0.07	-163.00	0.01	-111.00	0.02	32.00
2.2440	2.80	0.00	-174.00	0.07	174.00	0.01	82.00	0.06	-164.00	0.01	-111.00	0.02	31.00
2.4166	2.60	0.00	-171.00	0.06	174.00	0.01	82.00	0.04	-163.00	0.01	-110.00	0.01	31.00

HEADING 315°													
Pulsation (rad/s)	Period (s)	SURGE		SWAY		HEAVE		ROLL		PITCH		YAW	
		Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (m/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)	Amplitude (°/m)	Phase (deg)
0.2662	23.60	0.71	107.00	0.65	-51.00	1.02	28.00	0.34	-76.00	0.31	-76.00	0.33	34.00
0.2708	23.20	0.71	108.00	0.66	-50.00	1.02	29.00	0.35	-76.00	0.32	-75.00	0.33	34.00
0.2756	22.80	0.71	108.00	0.66	-50.00	1.02	30.00	0.37	-75.00	0.33	-74.00	0.34	34.00
0.2805	22.40	0.71	109.00	0.66	-49.00	1.02	31.00	0.38	-75.00	0.35	-74.00	0.34	35.00
0.2856	22.00	0.71	109.00	0.66	-48.00	1.03	32.00	0.39	-74.00	0.36	-73.00	0.35	35.00
0.2909	21.60	0.70	110.00	0.66	-47.00	1.03	33.00	0.41	-74.00	0.37	-73.00	0.35	35.00
0.2964	21.20	0.70	110.00	0.67	-47.00	1.03	34.00	0.42	-73.00	0.39	-72.00	0.35	35.00
0.3021	20.80	0.70	110.00	0.67	-46.00	1.04	35.00	0.44	-72.00	0.40	-72.00	0.36	35.00
0.3080	20.40	0.70	111.00	0.67	-46.00	1.04	37.00	0.45	-72.00	0.42	-72.00	0.36	35.00
0.3142	20.00	0.70	111.00	0.67	-45.00	1.05	38.00	0.47	-71.00	0.43	-71.00	0.36	35.00
0.3206	19.60	0.70	112.00	0.67	-44.00	1.05	39.00	0.49	-71.00	0.45	-70.00	0.37	35.00

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0.3239	19.40	0.70	112.00	0.67	-43.00	1.05	40.00	0.50	-70.00	0.46	-70.00	0.37	35.00
0.3272	19.20	0.70	113.00	0.67	-43.00	1.05	41.00	0.51	-70.00	0.47	-69.00	0.38	35.00
0.3307	19.00	0.70	113.00	0.67	-41.00	1.06	42.00	0.53	-71.00	0.48	-69.00	0.35	38.00
0.3342	18.80	0.70	114.00	0.67	-40.00	1.06	43.00	0.54	-71.00	0.49	-69.00	0.35	39.00
0.3378	18.60	0.70	114.00	0.67	-39.00	1.06	43.00	0.55	-70.00	0.50	-68.00	0.36	39.00
0.3415	18.40	0.70	115.00	0.68	-39.00	1.06	44.00	0.56	-68.00	0.51	-68.00	0.39	37.00
0.3452	18.20	0.70	115.00	0.68	-39.00	1.06	45.00	0.57	-68.00	0.52	-67.00	0.40	37.00
0.3491	18.00	0.70	115.00	0.68	-38.00	1.07	46.00	0.58	-67.00	0.53	-67.00	0.40	37.00
0.3530	17.80	0.70	116.00	0.68	-37.00	1.07	47.00	0.60	-67.00	0.54	-66.00	0.41	38.00
0.3570	17.60	0.70	117.00	0.68	-36.00	1.07	48.00	0.61	-66.00	0.55	-66.00	0.42	38.00
0.3611	17.40	0.69	117.00	0.68	-35.00	1.07	49.00	0.62	-65.00	0.57	-65.00	0.42	39.00
0.3653	17.20	0.69	118.00	0.68	-34.00	1.08	50.00	0.64	-65.00	0.58	-64.00	0.43	39.00
0.3696	17.00	0.69	118.00	0.68	-33.00	1.08	52.00	0.65	-64.00	0.59	-64.00	0.43	40.00
0.3740	16.80	0.69	119.00	0.68	-32.00	1.08	53.00	0.67	-64.00	0.60	-63.00	0.44	40.00
0.3785	16.60	0.69	120.00	0.69	-31.00	1.09	54.00	0.68	-63.00	0.62	-63.00	0.45	41.00
0.3831	16.40	0.69	120.00	0.69	-30.00	1.09	55.00	0.70	-62.00	0.63	-62.00	0.46	41.00
0.3879	16.20	0.69	121.00	0.69	-29.00	1.09	56.00	0.71	-62.00	0.65	-61.00	0.47	42.00
0.3927	16.00	0.69	122.00	0.69	-28.00	1.10	58.00	0.73	-61.00	0.66	-61.00	0.47	42.00
0.3977	15.80	0.69	122.00	0.69	-26.00	1.10	59.00	0.75	-60.00	0.68	-60.00	0.48	43.00
0.4028	15.60	0.68	123.00	0.69	-25.00	1.10	61.00	0.76	-59.00	0.70	-59.00	0.49	44.00
0.4080	15.40	0.68	124.00	0.69	-23.00	1.11	62.00	0.78	-59.00	0.71	-58.00	0.50	45.00
0.4134	15.20	0.68	125.00	0.69	-22.00	1.11	63.00	0.80	-58.00	0.73	-57.00	0.50	46.00
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0.4245	14.80	0.68	127.00	0.69	-19.00	1.13	67.00	0.84	-56.00	0.77	-56.00	0.52	48.00
0.4304	14.60	0.68	128.00	0.69	-18.00	1.13	68.00	0.86	-55.00	0.79	-55.00	0.53	48.00
0.4363	14.40	0.67	129.00	0.70	-16.00	1.14	70.00	0.88	-54.00	0.81	-54.00	0.54	49.00
0.4425	14.20	0.67	130.00	0.70	-14.00	1.14	72.00	0.90	-53.00	0.83	-53.00	0.56	50.00
0.4488	14.00	0.67	131.00	0.71	-12.00	1.15	74.00	0.92	-52.00	0.85	-52.00	0.57	51.00
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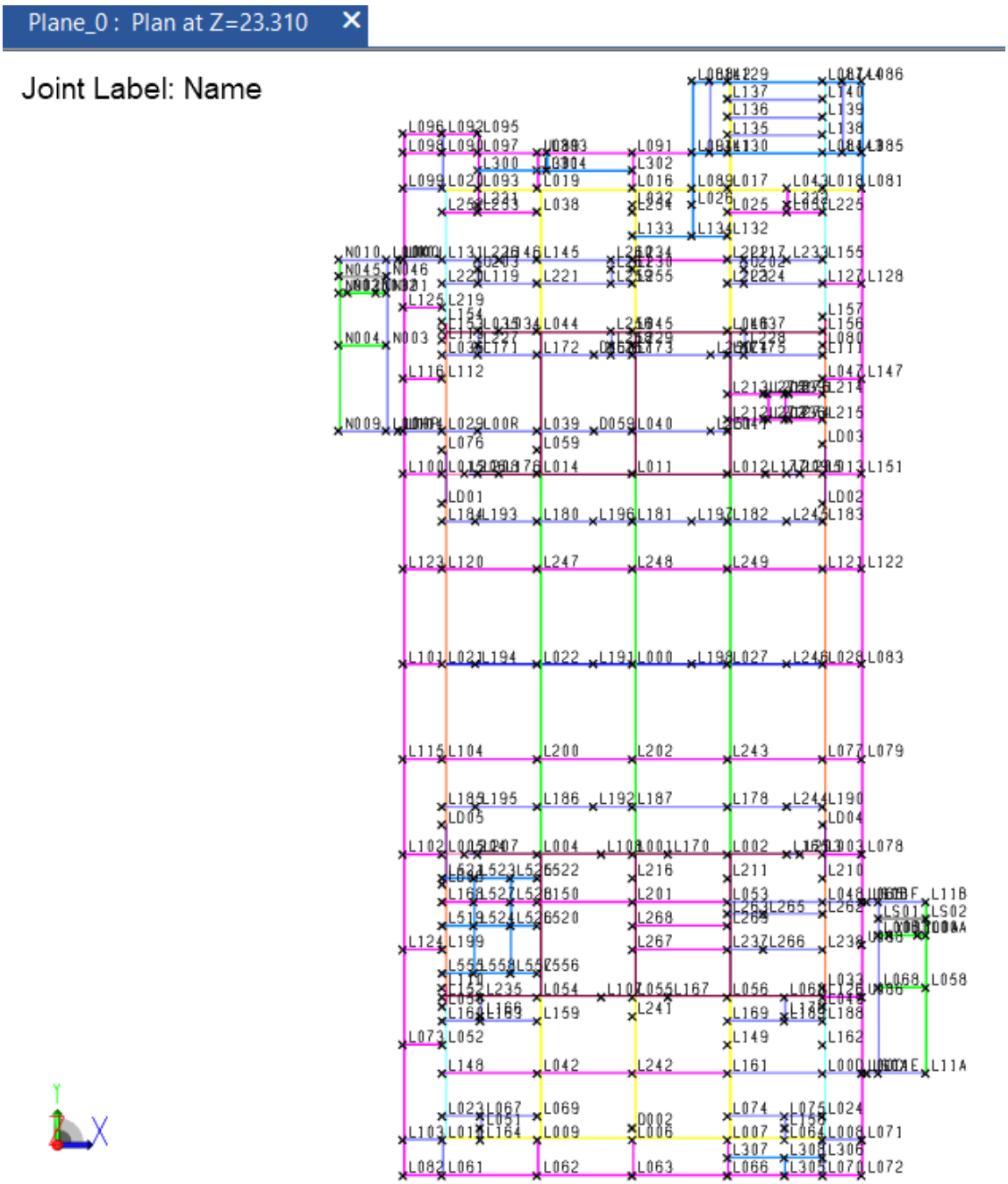
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1.1220	5.60	0.03	-120.00	0.20	-61.00	0.44	-10.00	0.72	-178.00	0.44	165.00	0.27	-73.00
1.1636	5.40	0.03	-121.00	0.14	-39.00	0.33	14.00	0.47	-160.00	0.31	-169.00	0.18	-59.00
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1.2566	5.00	0.03	-83.00	0.08	109.00	0.29	119.00	0.31	-26.00	0.28	-55.00	0.06	153.00
1.3090	4.80	0.02	-68.00	0.04	-165.00	0.09	134.00	0.10	56.00	0.08	-39.00	0.08	-127.00
1.3659	4.60	0.01	-2.00	0.11	-117.00	0.11	-113.00	0.27	111.00	0.11	77.00	0.16	-108.00
1.4280	4.40	0.01	38.00	0.11	-109.00	0.12	-111.00	0.24	113.00	0.12	77.00	0.16	-101.00
1.4960	4.20	0.01	-13.00	0.04	-84.00	0.03	-150.00	0.06	83.00	0.03	41.00	0.07	-77.00
1.5708	4.00	0.01	-71.00	0.05	31.00	0.06	98.00	0.11	-42.00	0.06	-75.00	0.06	3.00
1.6535	3.80	0.01	-62.00	0.04	35.00	0.04	97.00	0.07	-43.00	0.04	-76.00	0.04	8.00
1.7453	3.60	0.01	-48.00	0.03	39.00	0.02	96.00	0.05	-46.00	0.02	-77.00	0.03	17.00
1.8480	3.40	0.00	-31.00	0.02	53.00	0.01	100.00	0.04	-40.00	0.01	-68.00	0.03	37.00
1.9635	3.20	0.00	46.00	0.02	83.00	0.00	-168.00	0.02	-39.00	0.00	42.00	0.03	69.00

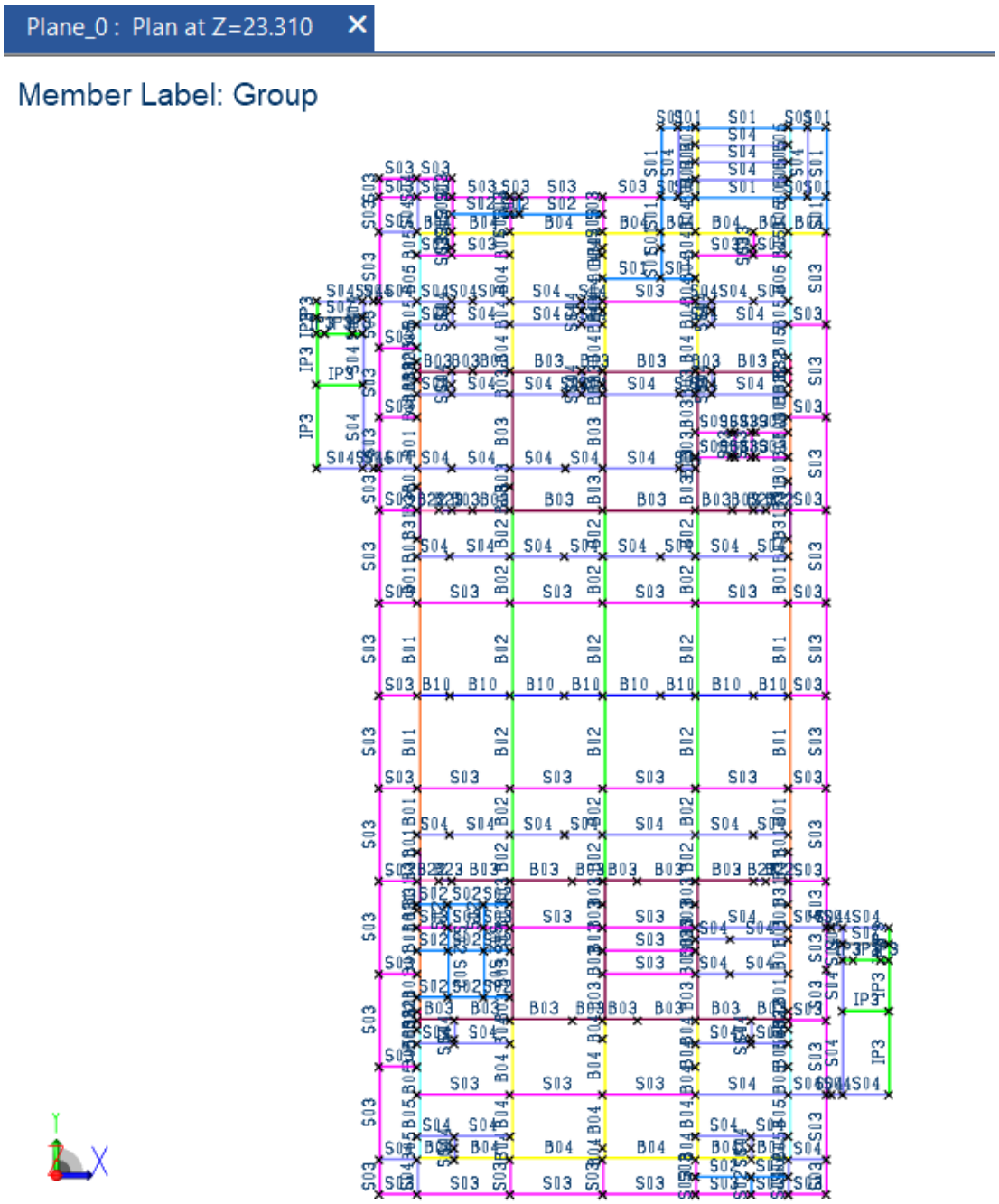
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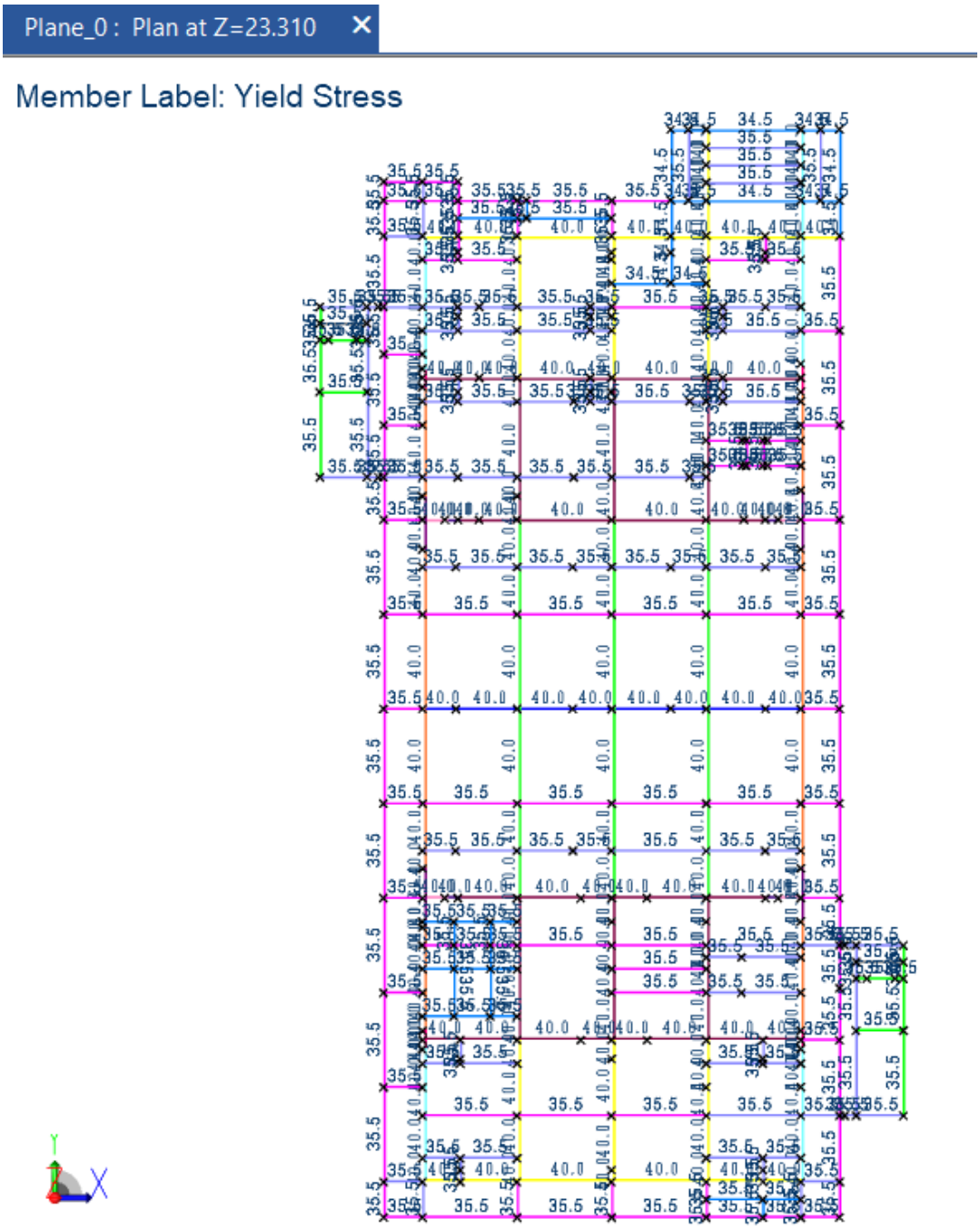
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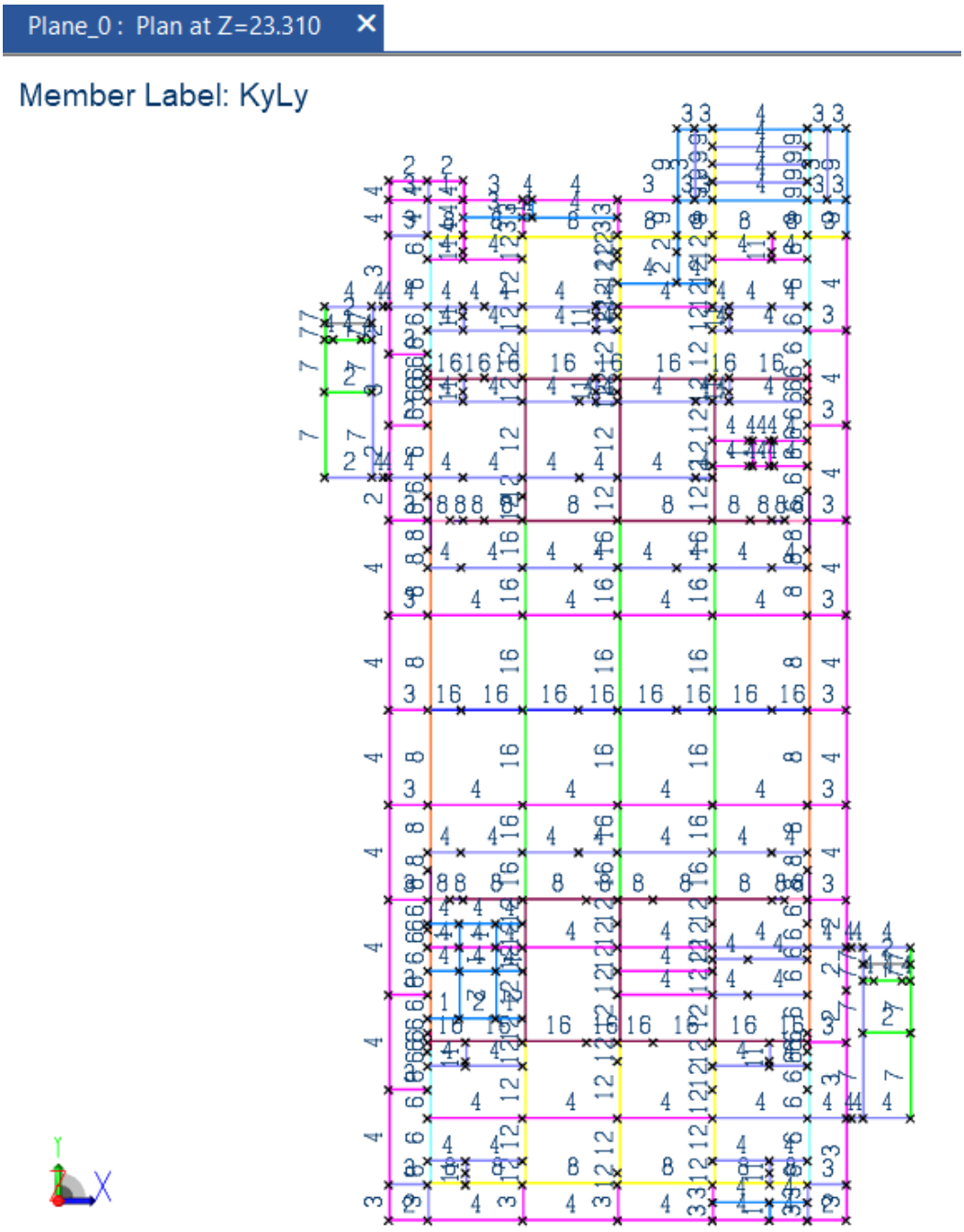
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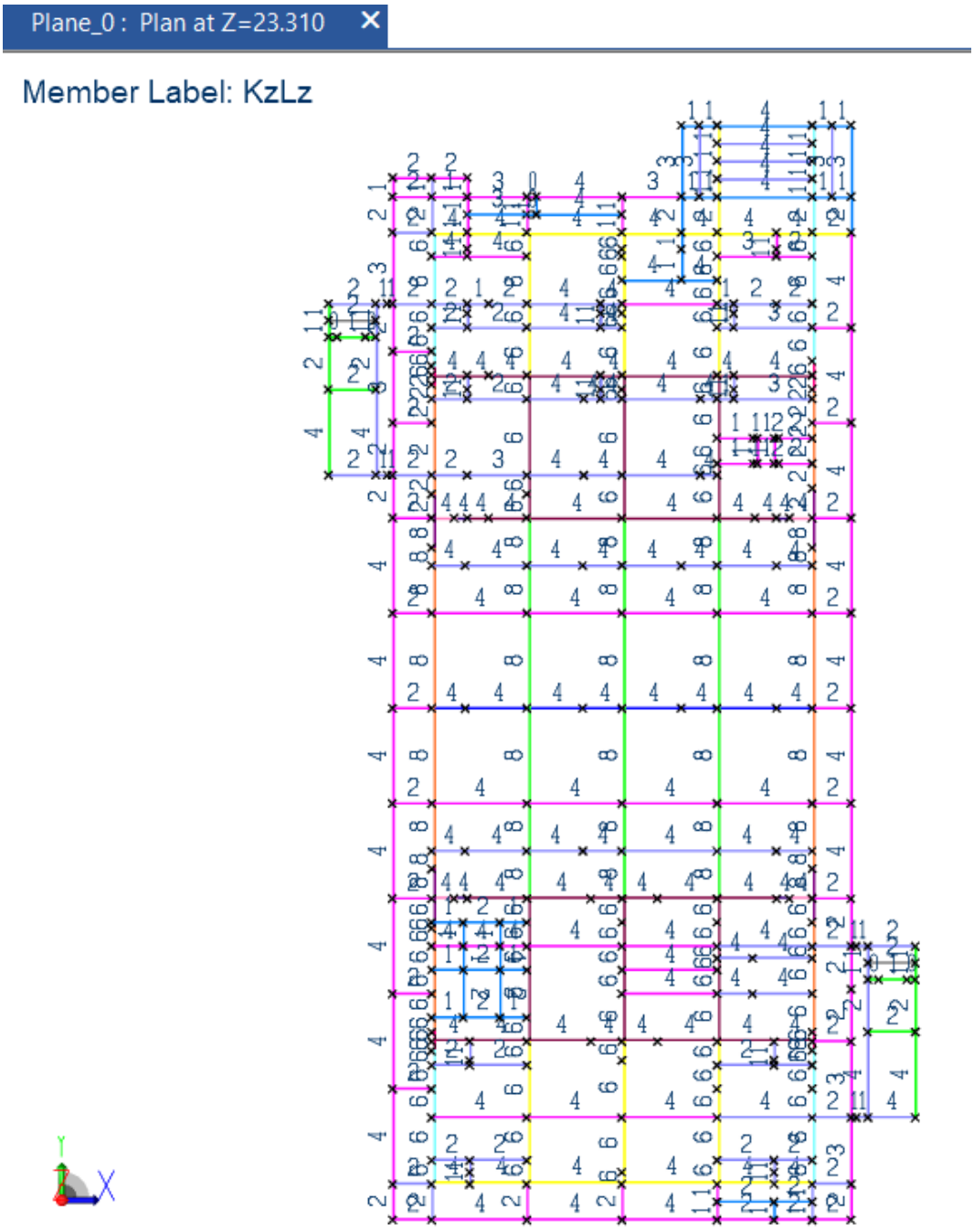
APPENDIX C - WIREFRAME SCHEMES

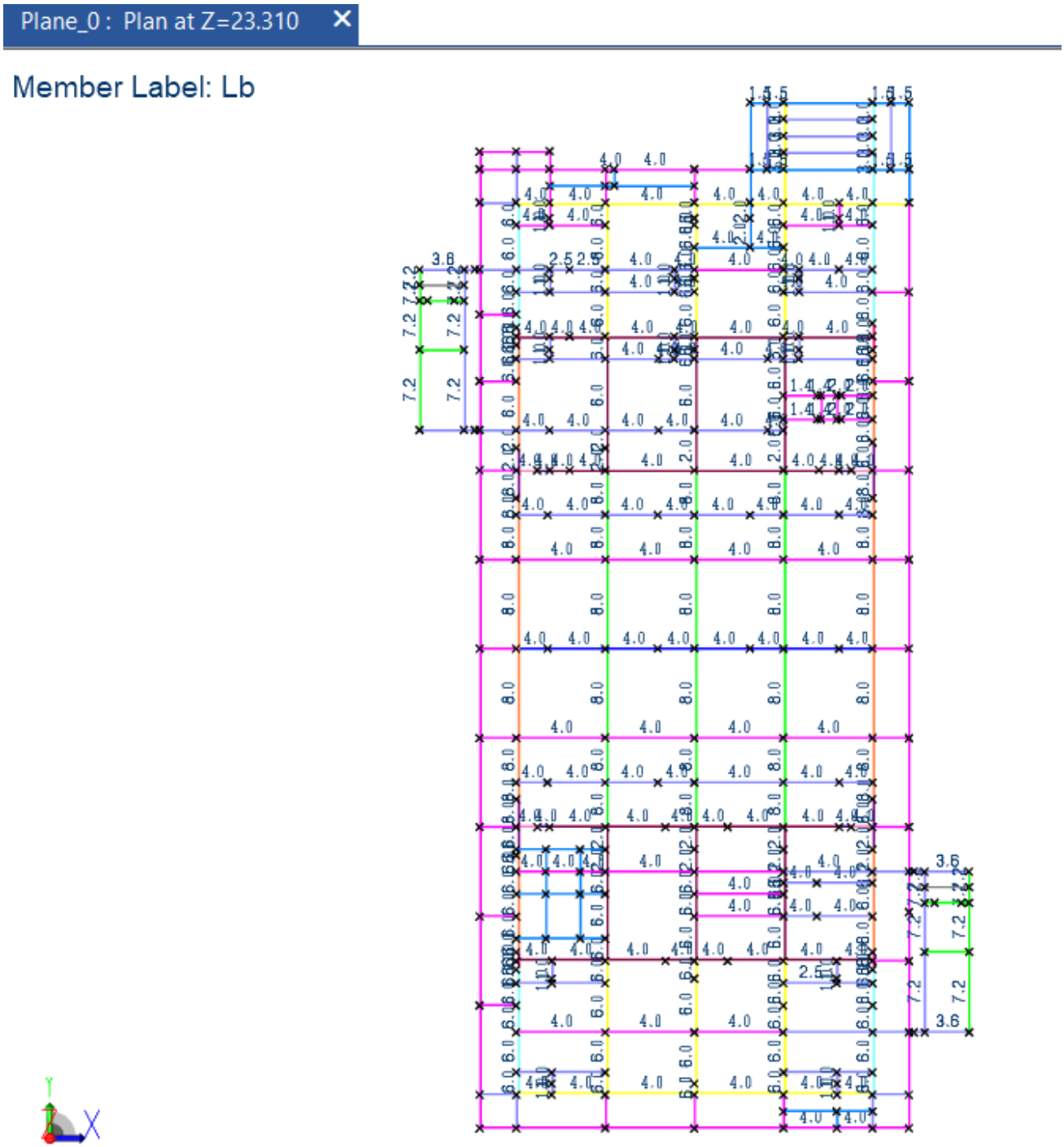


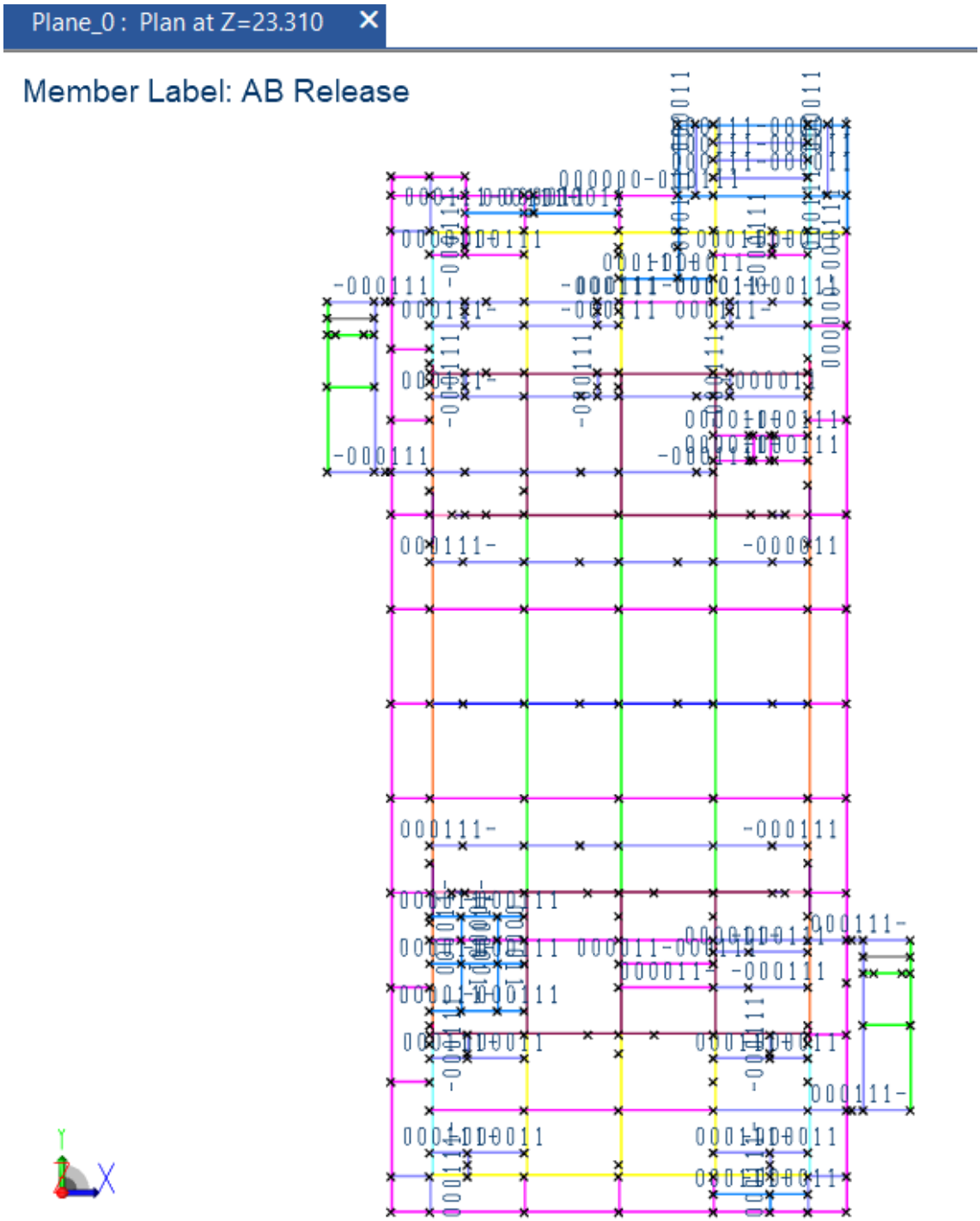

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Member Label: Group

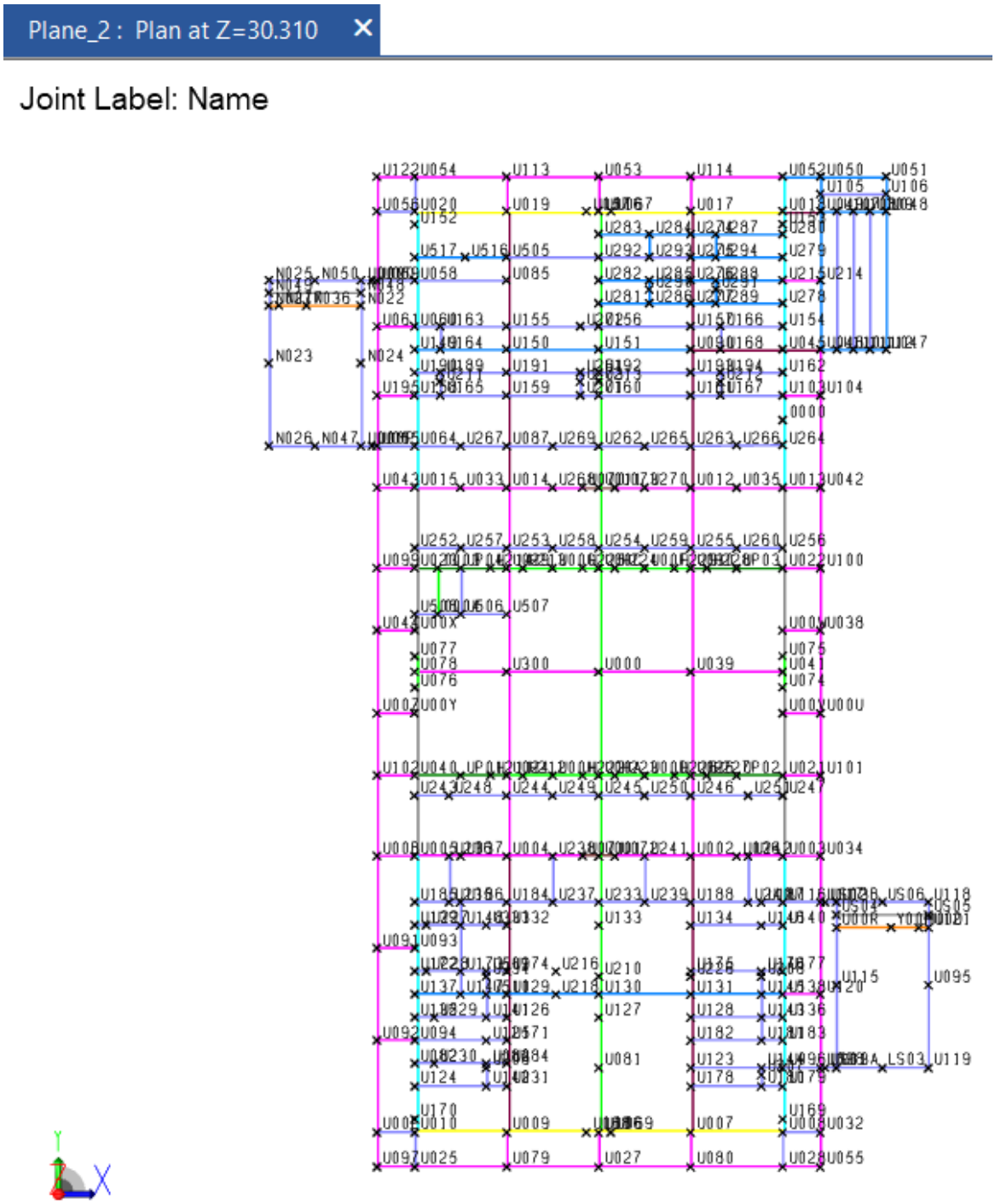

Plane_0 : Plan at Z=23.310
Member Label: Yield Stress


Plane_0 : Plan at Z=23.310
Member Label: KyLy
Y
X


Plane_0 : Plan at Z=23.310
Member Label: KzLz


Plane_0 : Plan at Z=23.310
Member Label: Lb


Plane_0 : Plan at Z=23.310
Member Label: AB Release

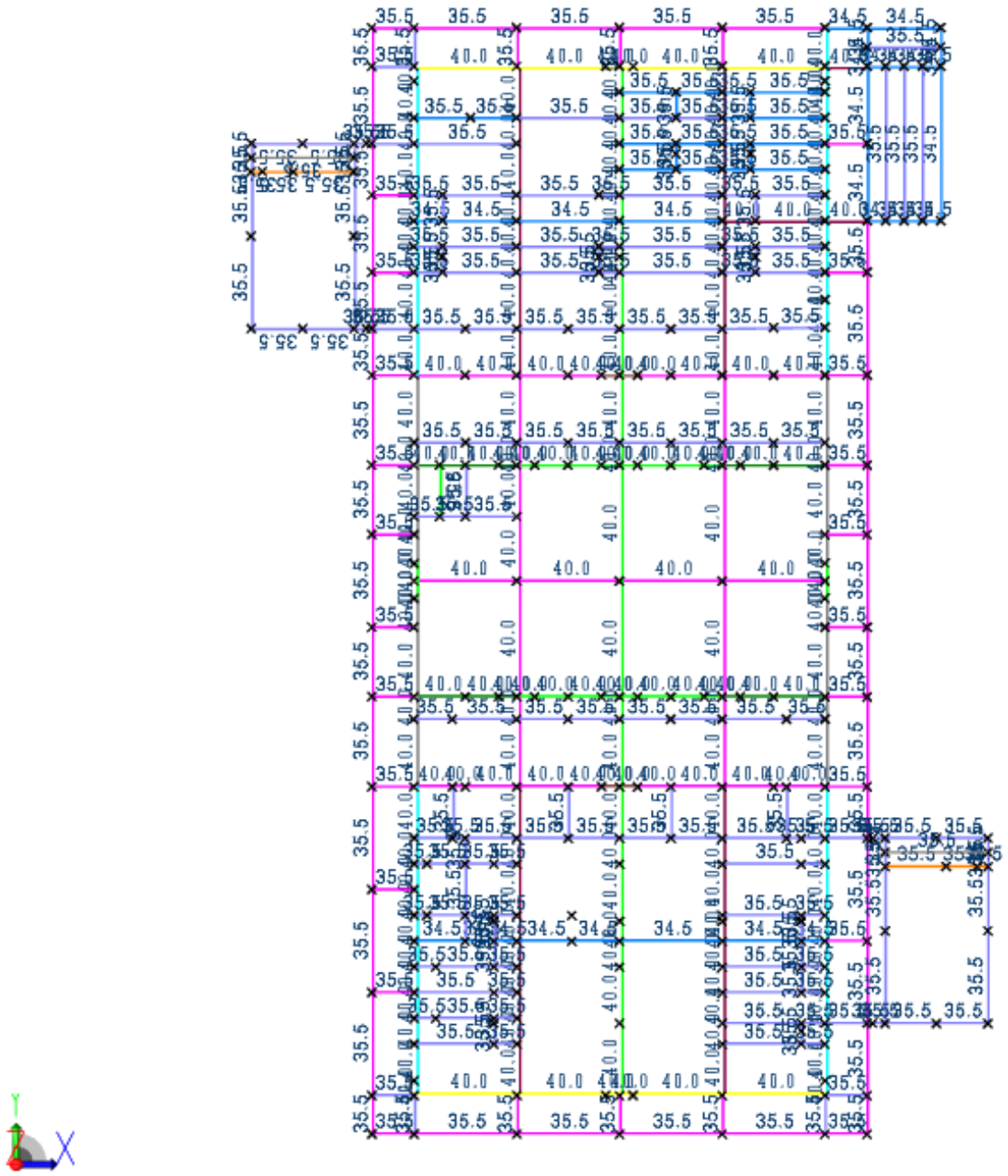

Plane_2 : Plan at Z=30.310
Joint Label: Name

Plane_2 : Plan at Z=30.310

Member Label: Group

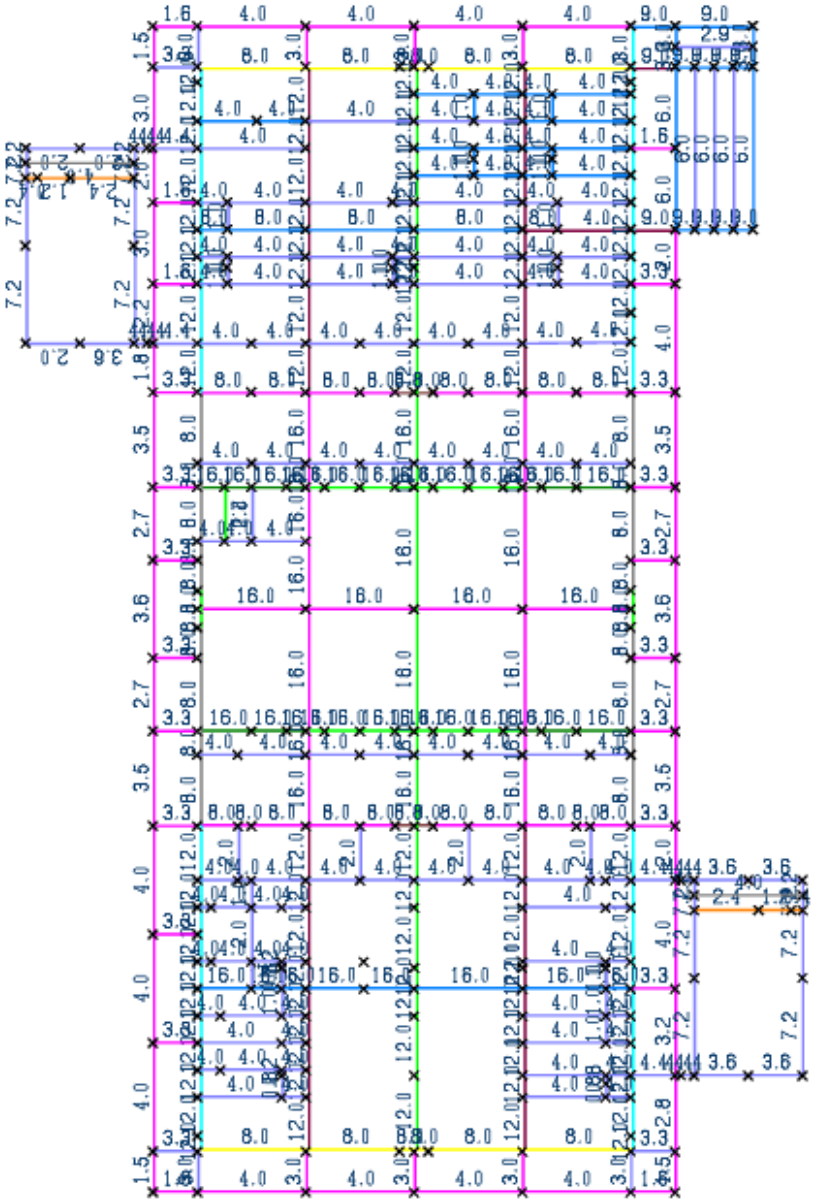


Member Label: Yield Stress



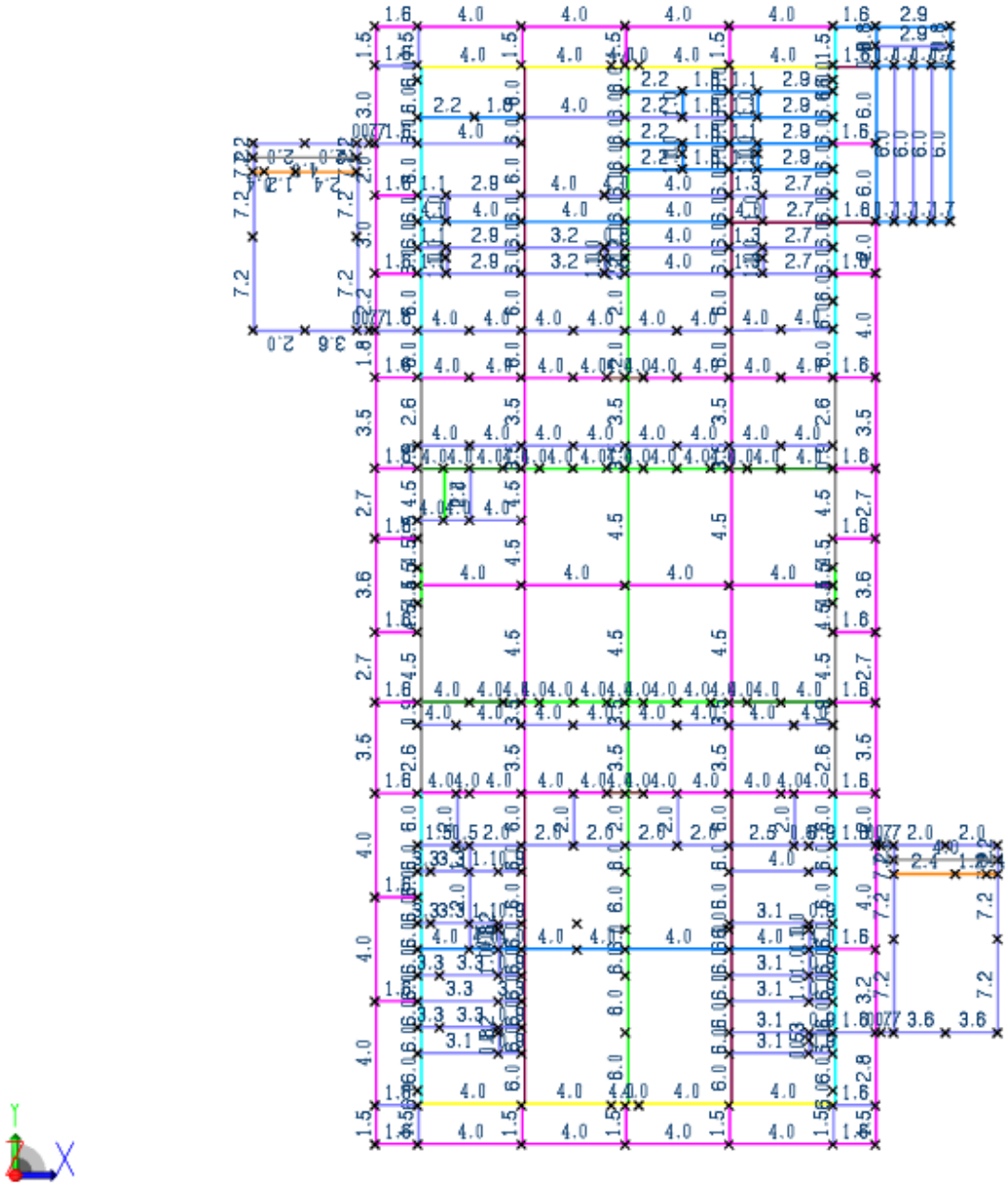
Plane_2 : Plan at Z=30.310

Member Label: KyLy



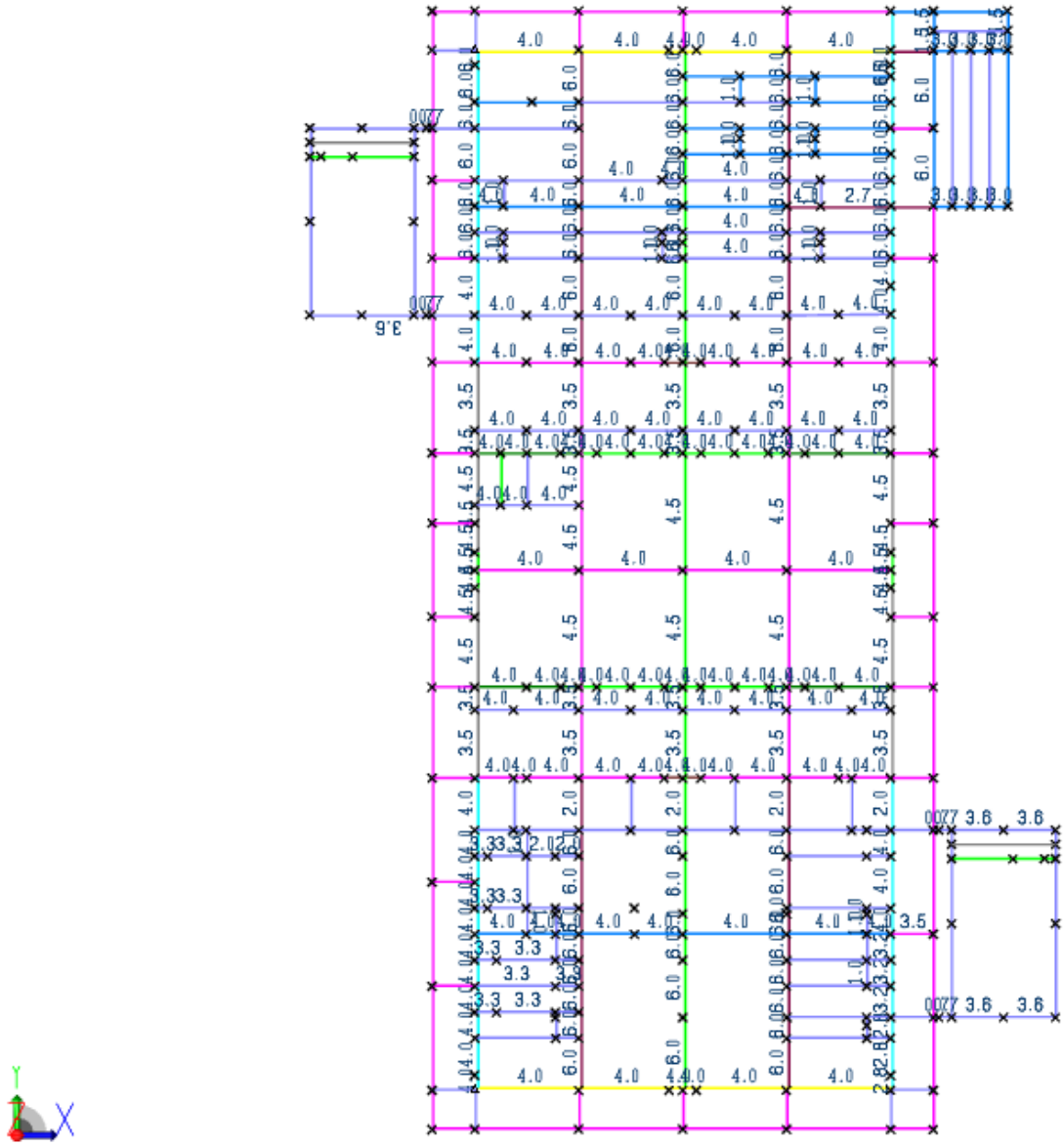
Plane_2 : Plan at Z=30.310

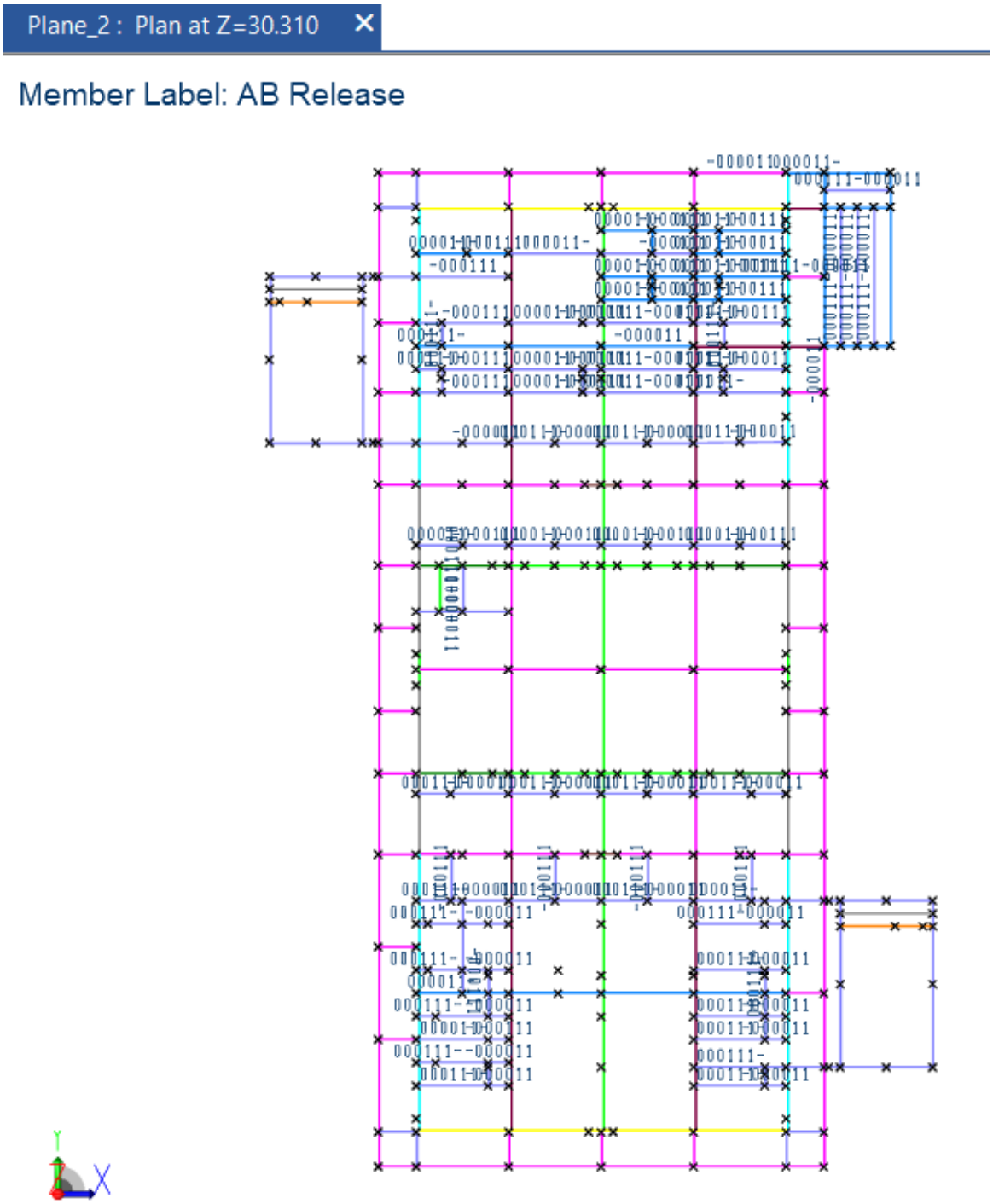
Member Label: KzLz



Plane_1 : Plan at Z=30.310

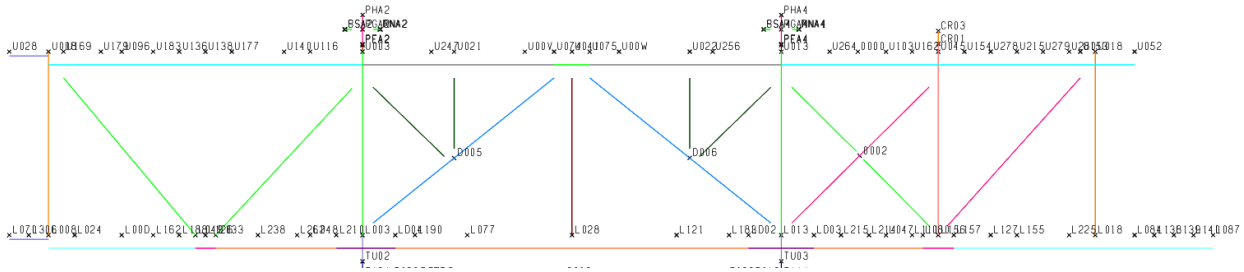
Member Label: Lb




Plane_2 : Plan at Z=30.310
Member Label: AB Release
Y
X

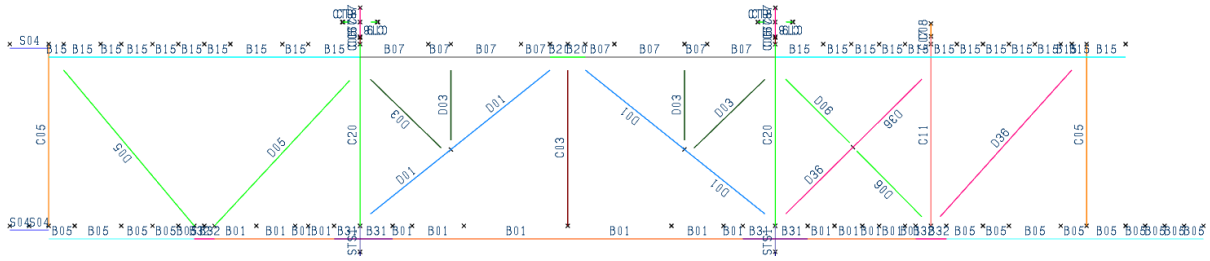
Plane_3 : Plan at X=8.000

Joint Label: Name



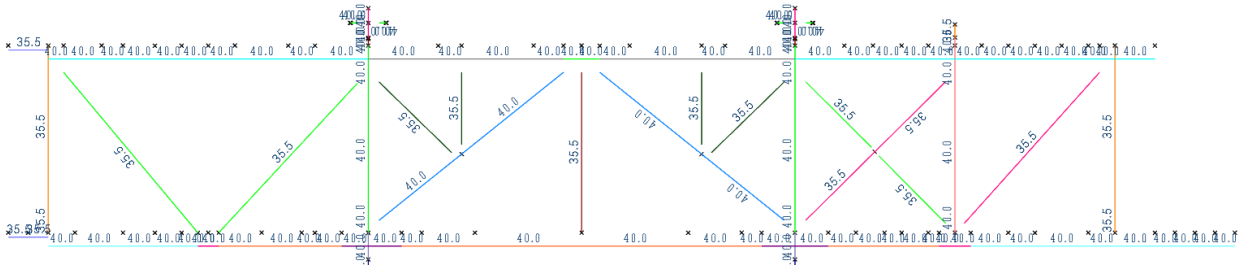
Plane_3 : Plan at X=8.000

Member Label: Group



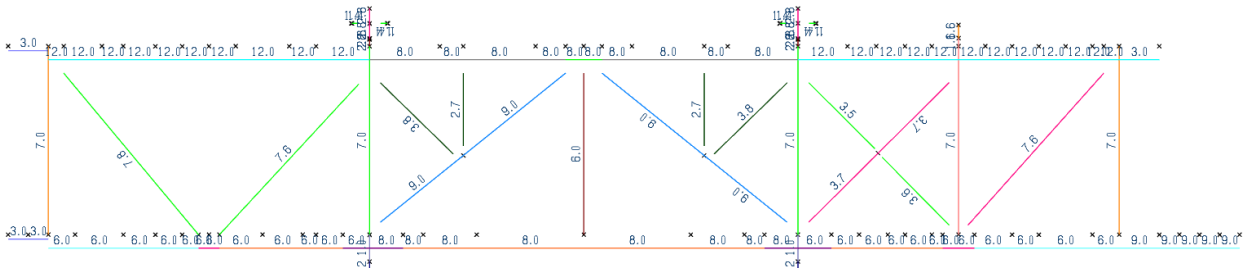
Plane_3 : Plan at X=8.000

Member Label: Yield Stress



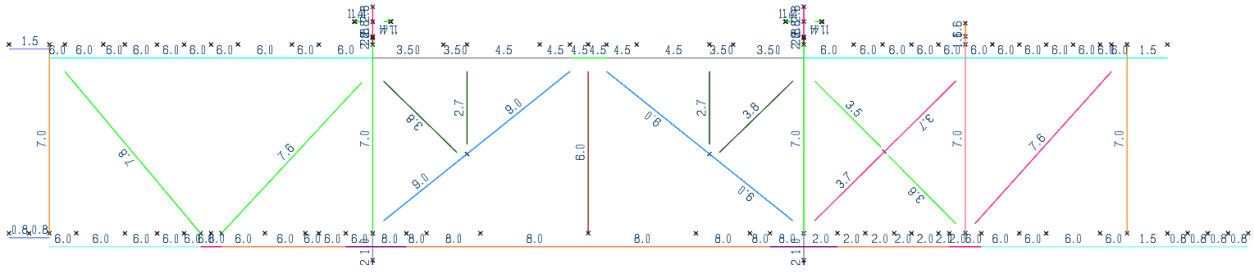
Plane_3 : Plan at X=8.000

Member Label: KyLy



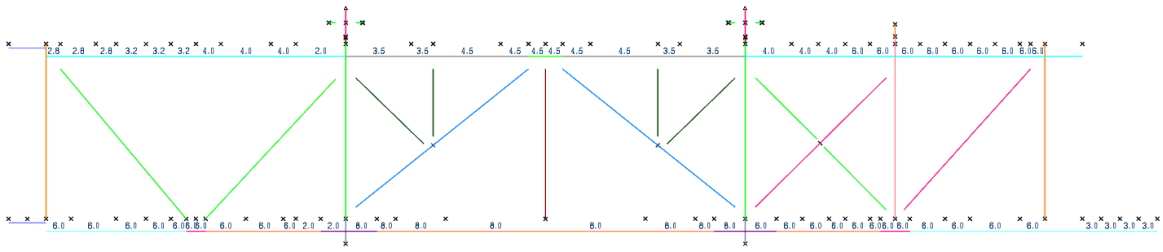
Plane_3 : Plan at X=8.000

Member Label: KzLz

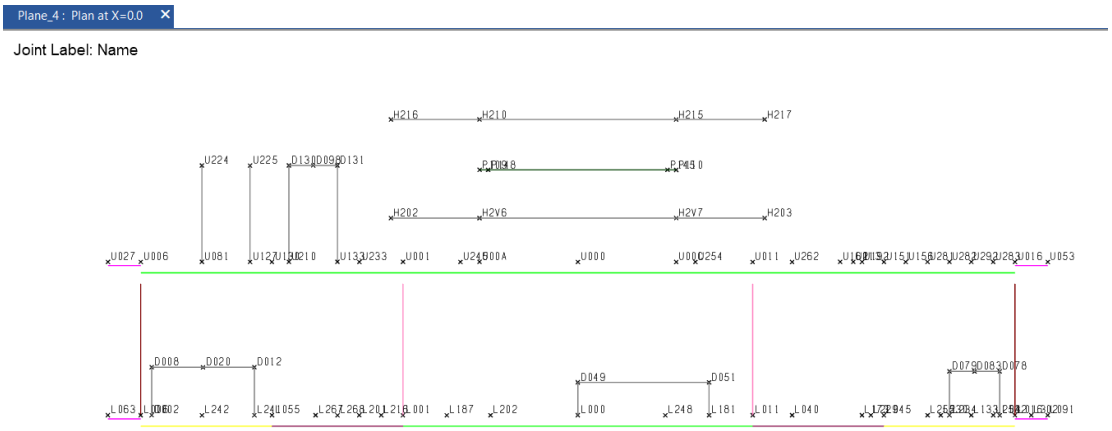


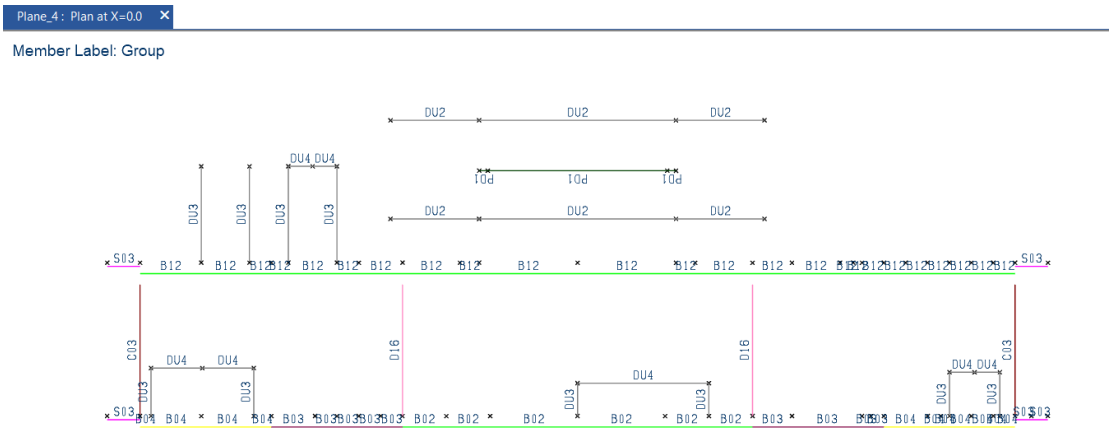
Plane_2 : Plan at X=8.000

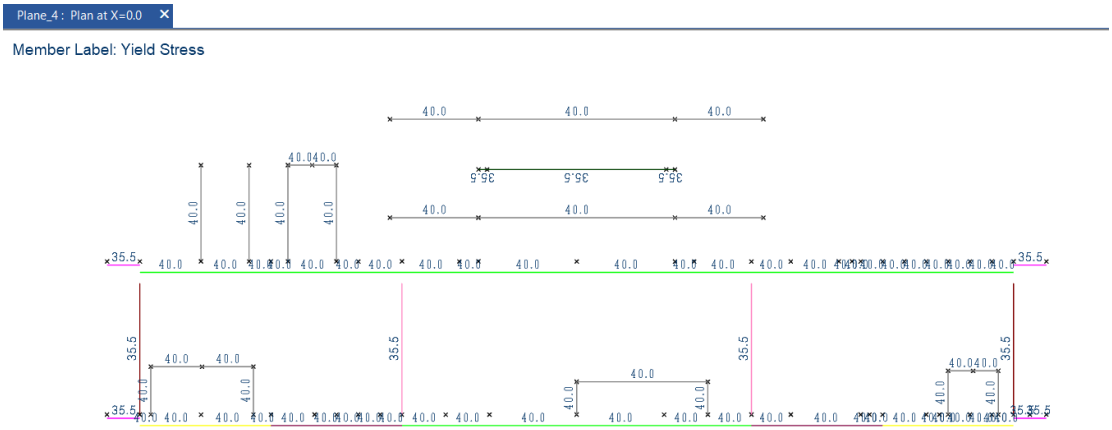
Member Label: Lb





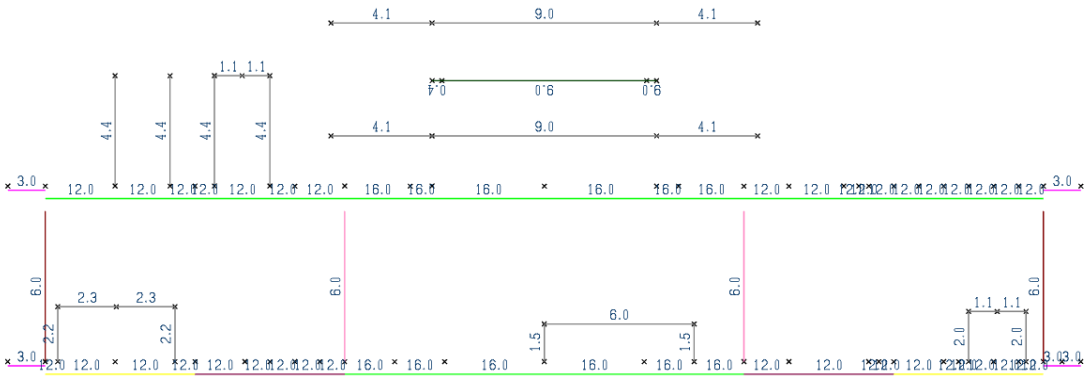

Plane_4 : Plan at X=0.0
Joint Label: Name


Plane_4 : Plan at X=0.0
Member Label: Group


Plane_4 : Plan at X=0.0
Member Label: Yield Stress

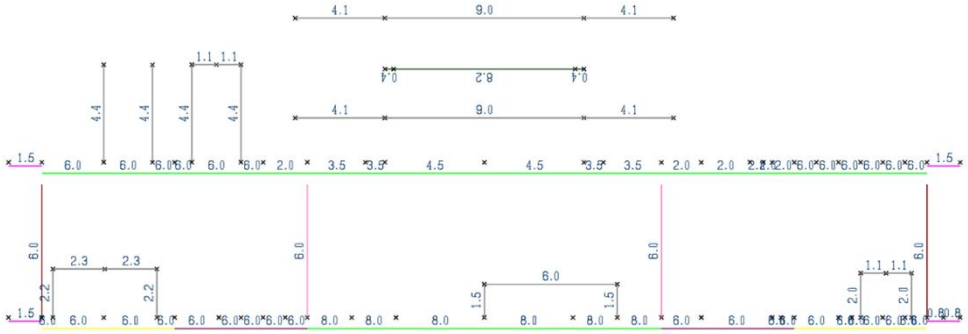
Plane_4 : Plan at X=0.0

Member Label: KyLy



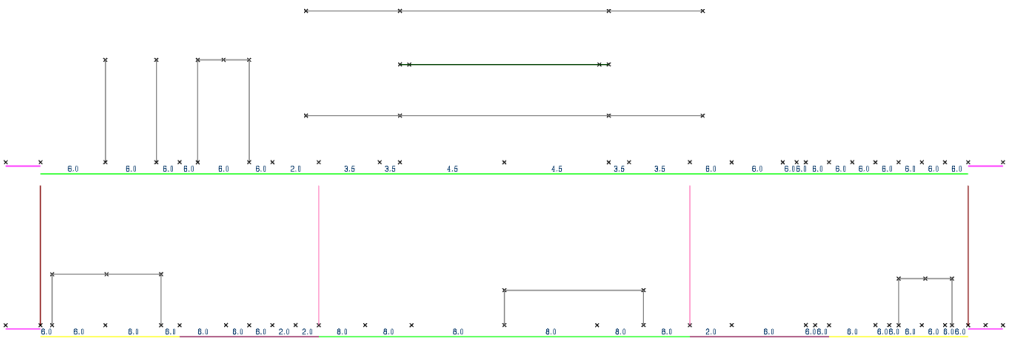
Plane_4 : Plan at X=0.0

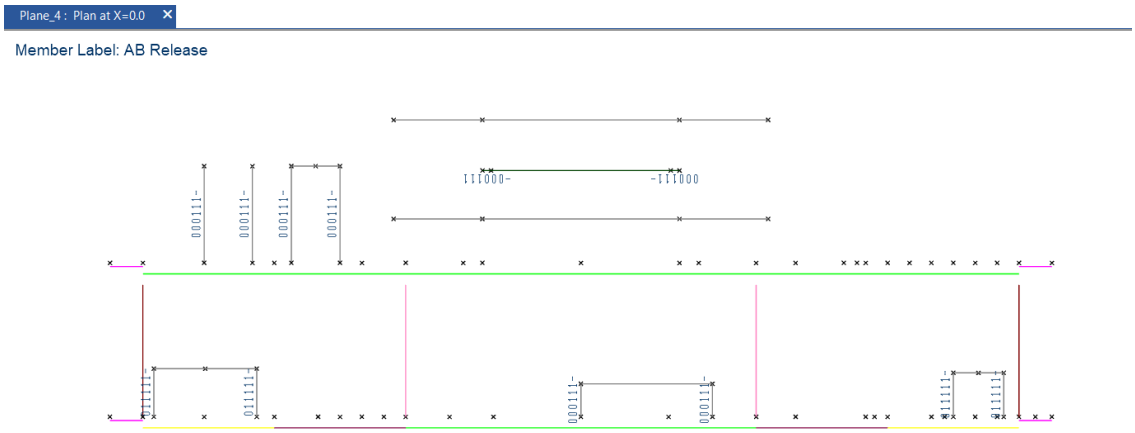
Member Label: KzLz

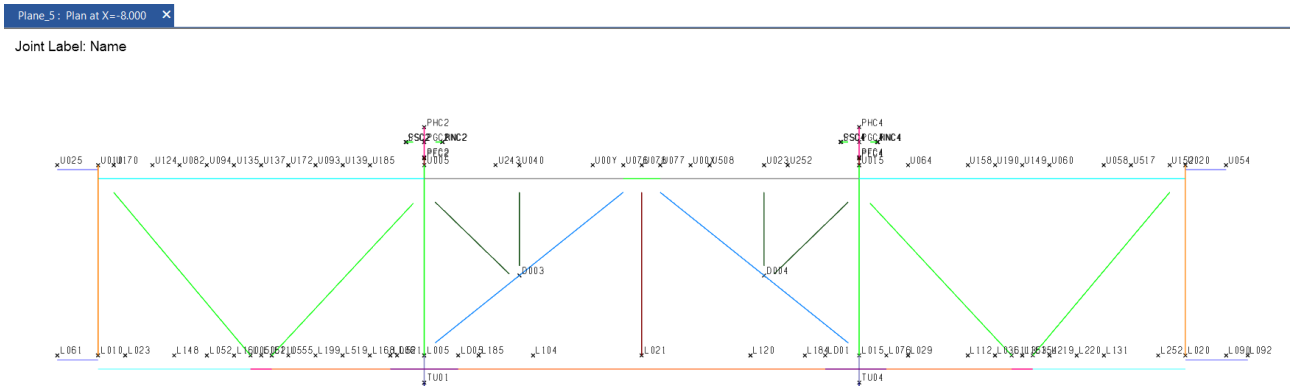


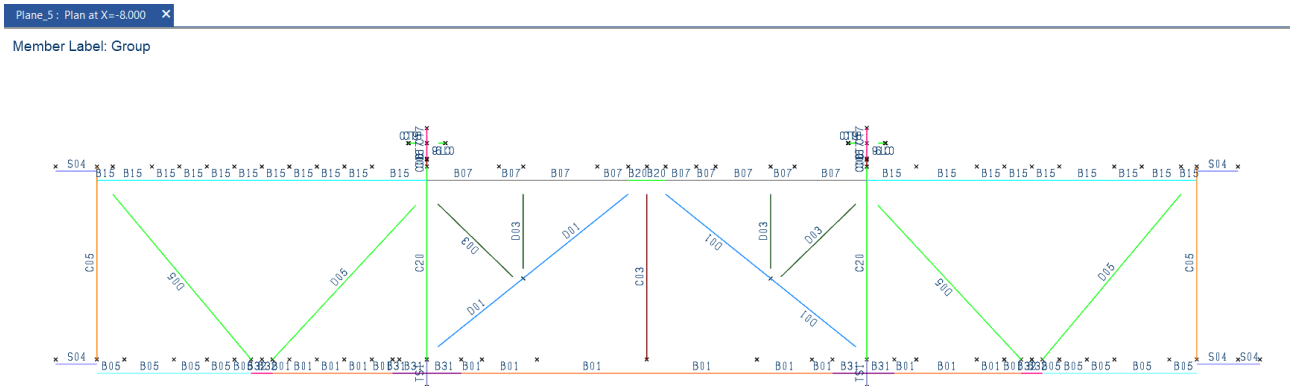
Plane_3 : Plan at X=0.0

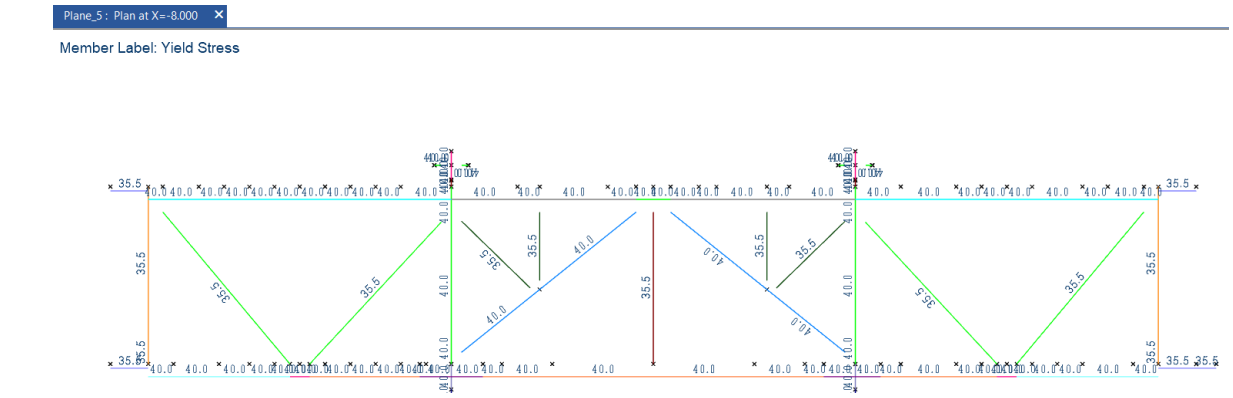
Member Label: Lb



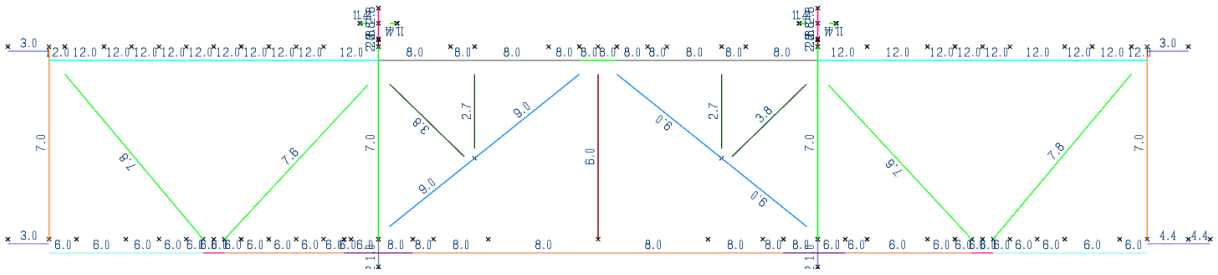

Plane_4 : Plan at X=0.0
Member Label: AB Release

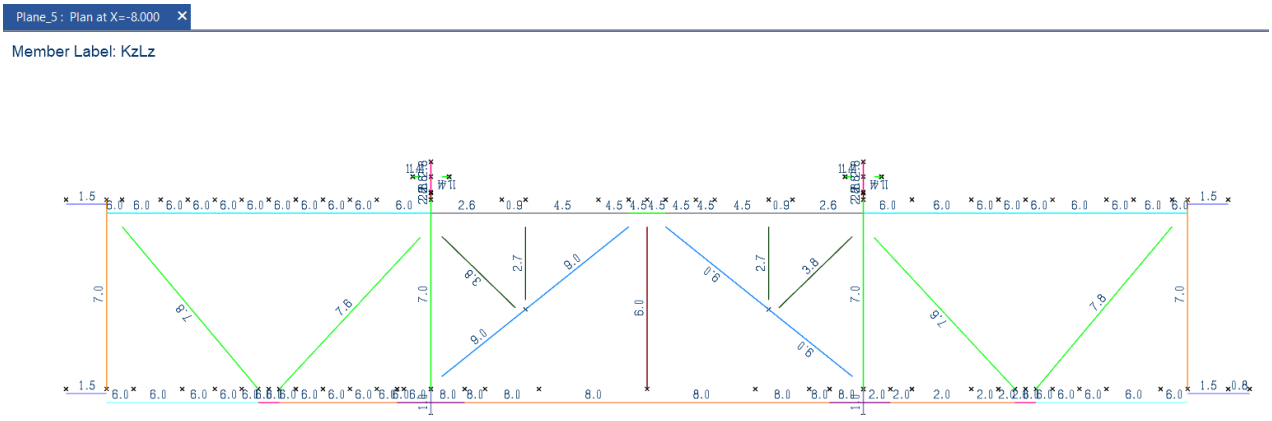

Plane_5 : Plan at X=-8.000
Joint Label: Name

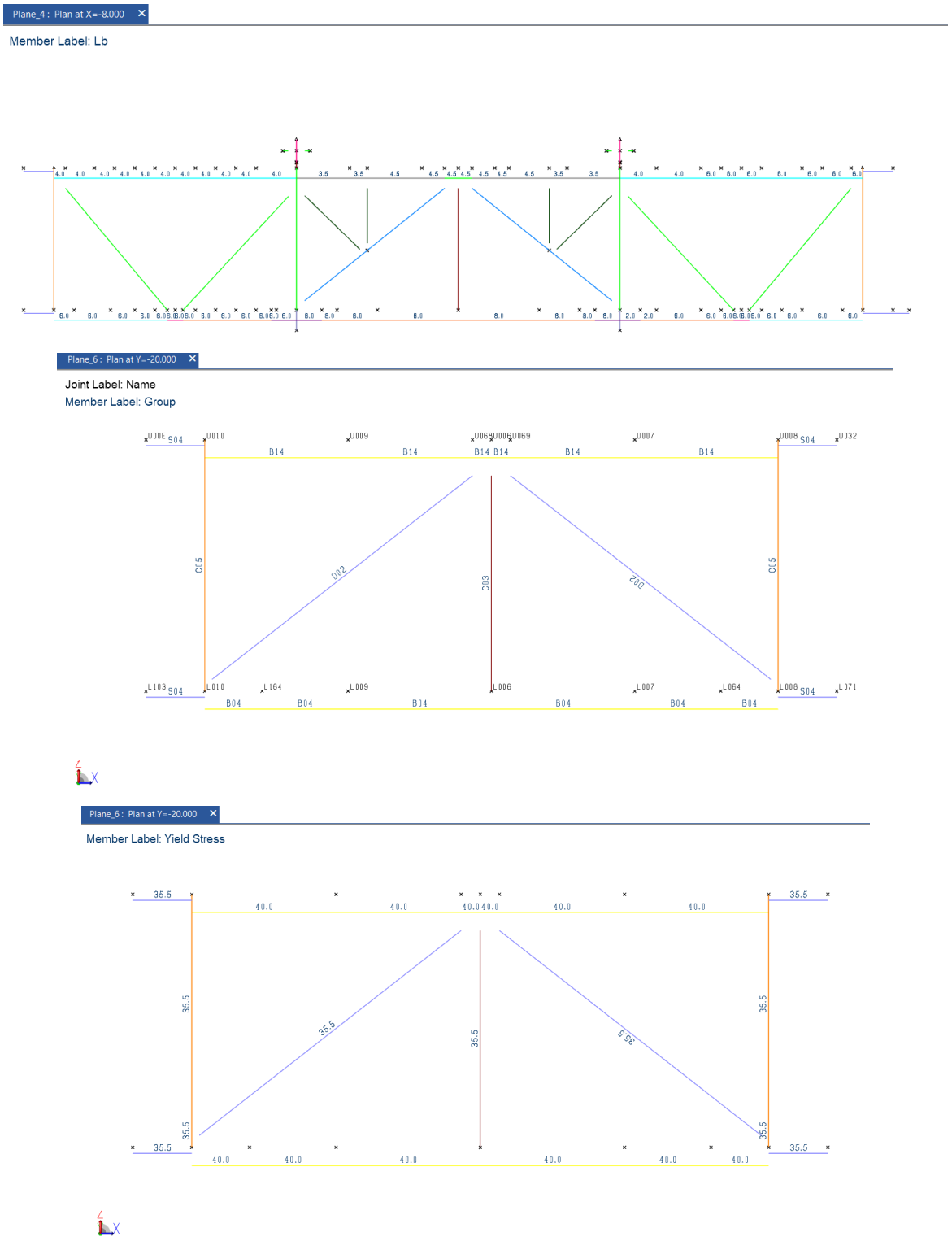

Plane_5 : Plan at X=-8.000
Member Label: Group

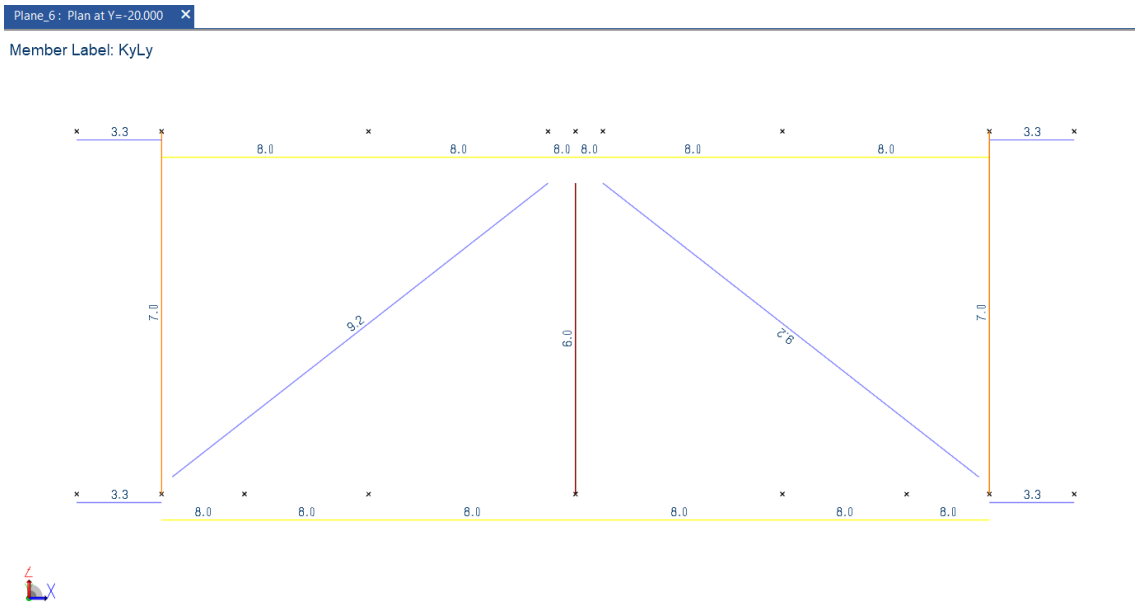


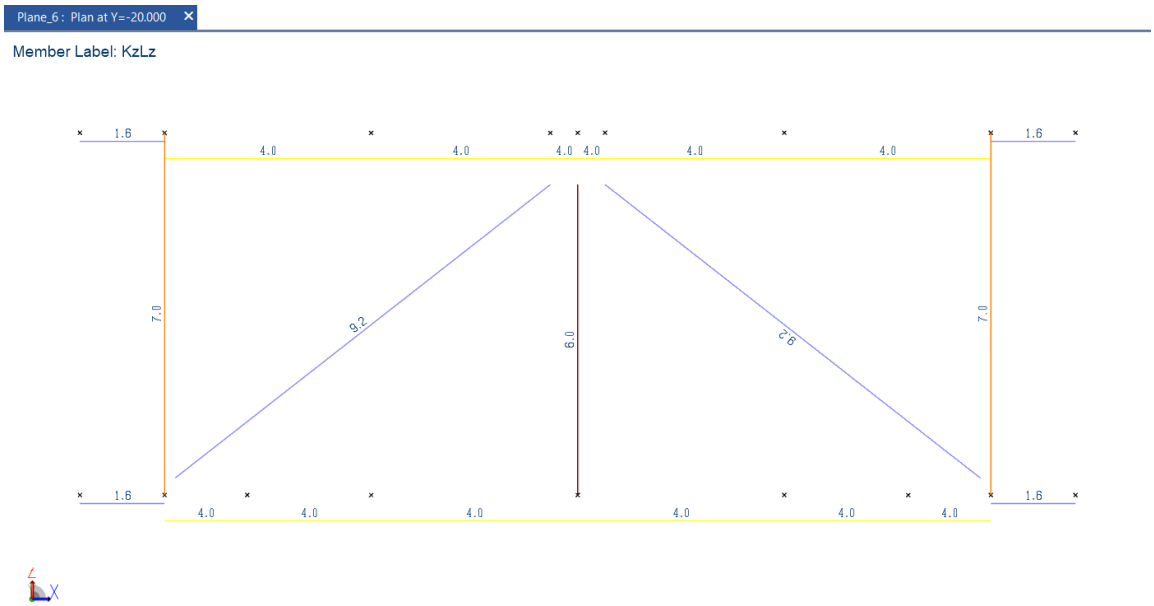
Member Label: KyLy

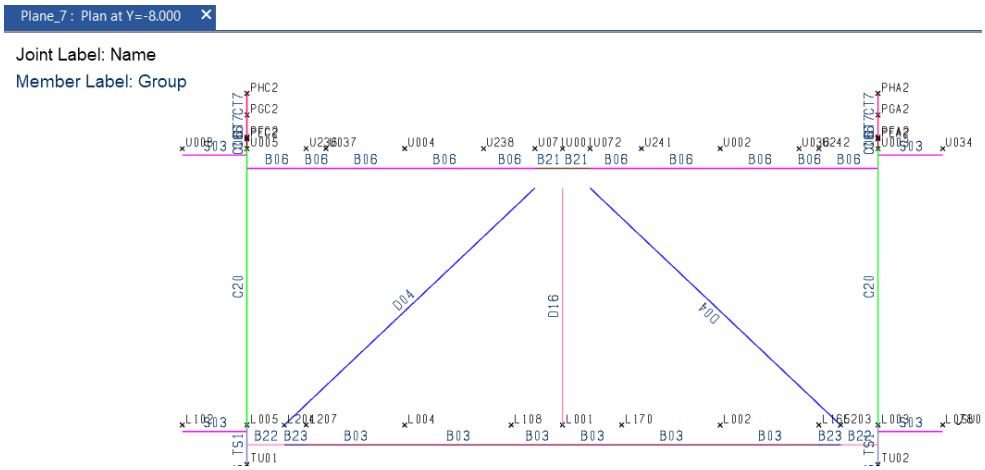


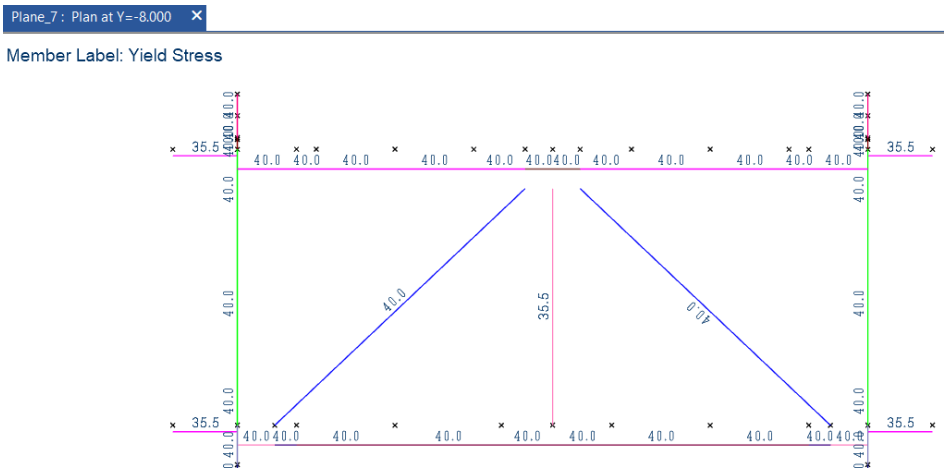


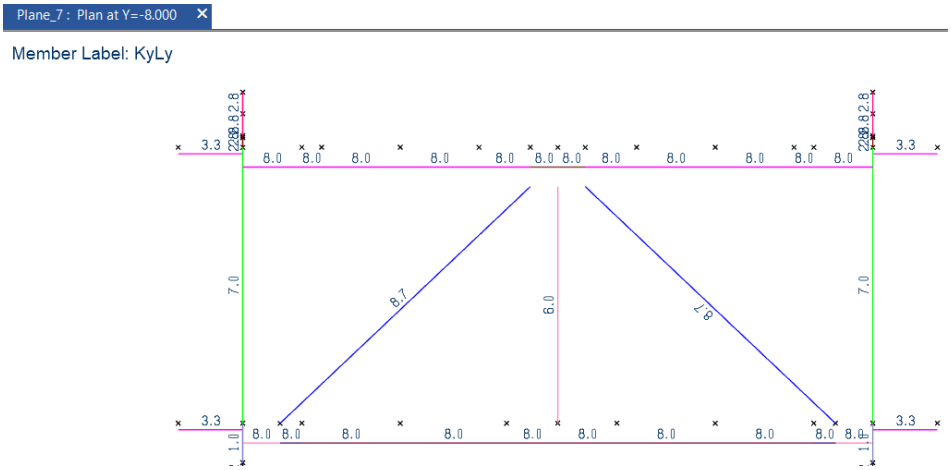

Plane_4 : Plan at X=-8.000
Member Label: Lb
Plane_6 : Plan at Y=-20.000
Joint Label: Name
Member Label: Group
Plane_6 : Plan at Y=-20.000
Member Label: Yield Stress

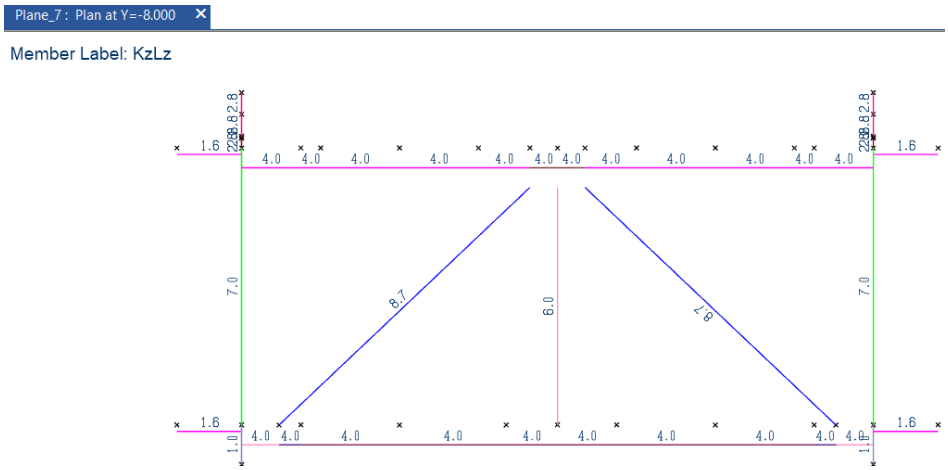

Plane_6 : Plan at Y=-20.000
Member Label: KyLy
3.3
8.0
7.0
9.2
6.0

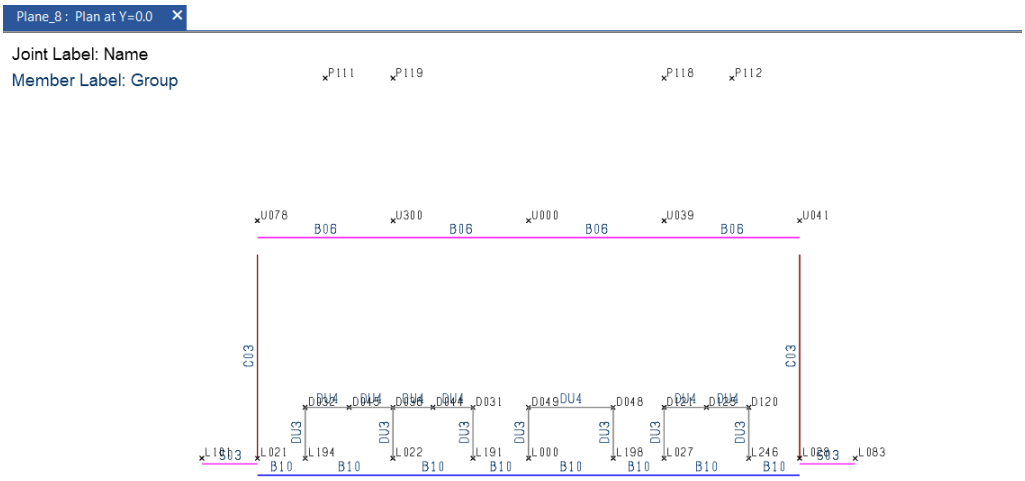

Plane_6 : Plan at Y=-20.000
Member Label: KzLz
1.6
4.0
7.0
9.2
6.0

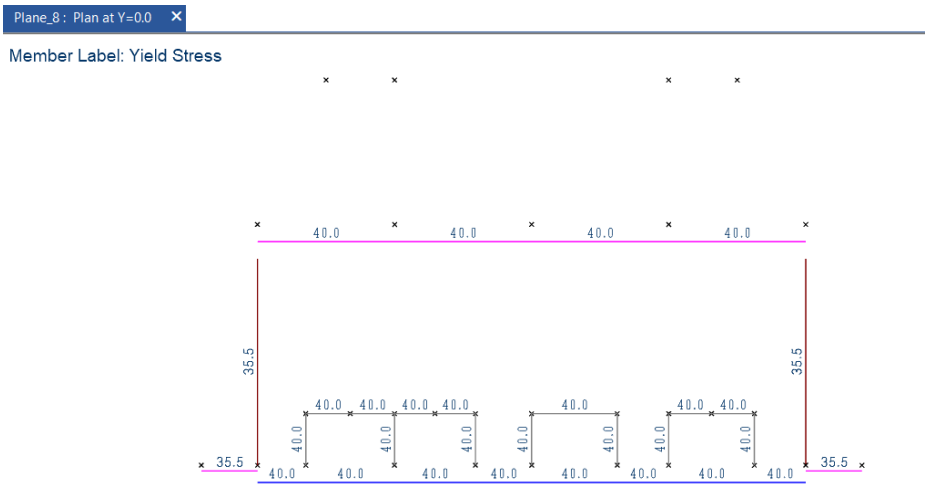

Plane_7 : Plan at Y=-8.000
Joint Label: Name
Member Label: Group
PHC2
PGC2
PHA2
PGA2
C20
C20
D04
D16
D04
TS1
TS2
TU01
TU02

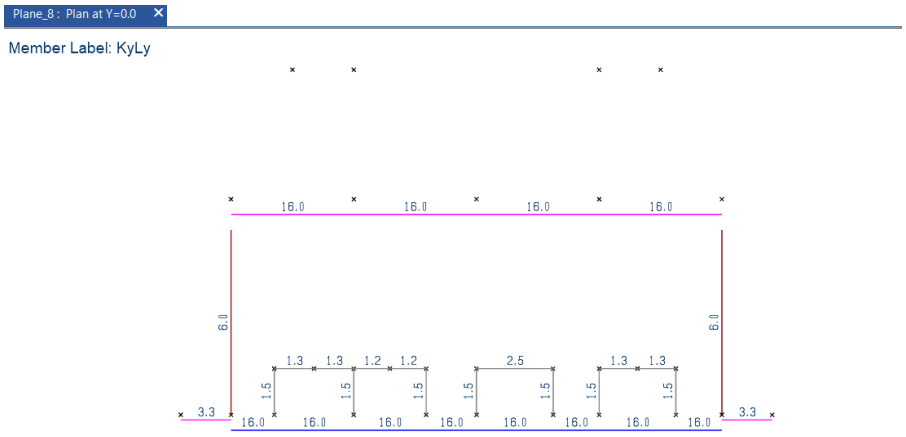

Plane_7 : Plan at Y=-8.000
Member Label: Yield Stress
35.5
40.0
35.5
40.0
35.5
35.5

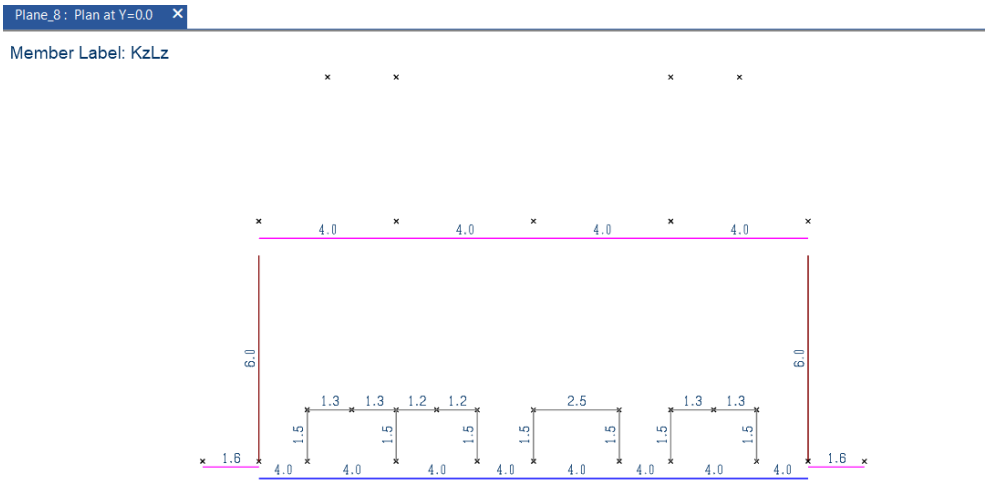

Plane_7 : Plan at Y=-8.000
Member Label: KyLy
3.3
8.0
3.3
7.0
8.7
6.0
8.7
3.3
3.3

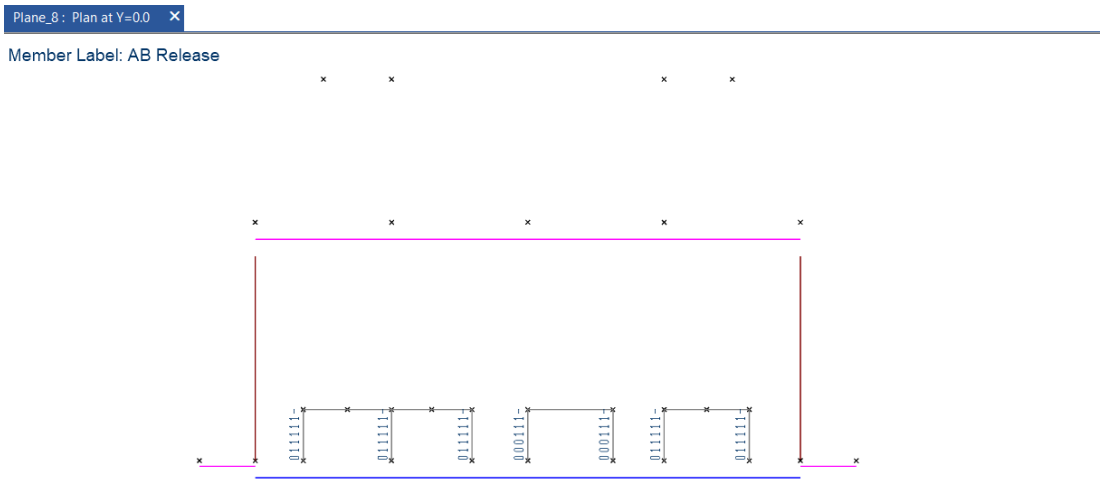

Plane_7 : Plan at Y=-8.000
Member Label: KzLz
1.6
4.0
7.0
8.7
6.0
1.0

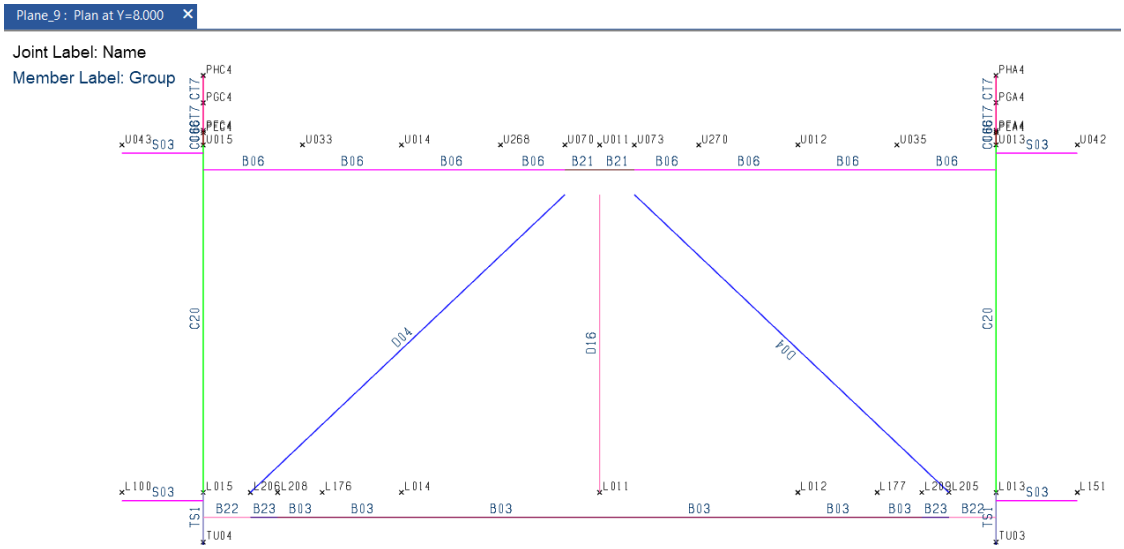

Plane_8 : Plan at Y=0.0
Joint Label: Name
Member Label: Group
P111
P119
P118
P112
U078
U300
U000
U039
U041
B06
C03
DU3
DU4
B10

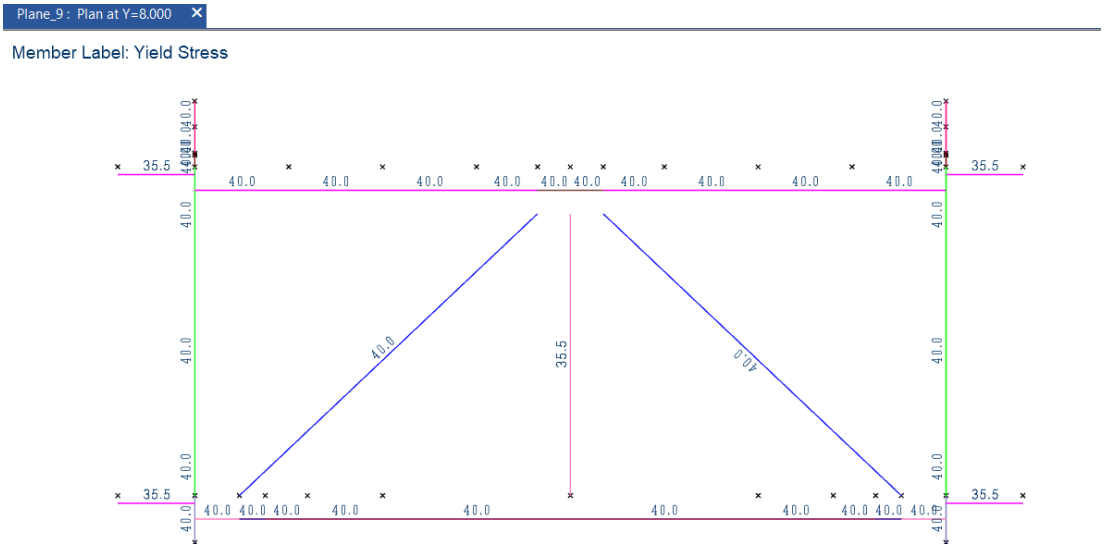

Plane_8 : Plan at Y=0.0
Member Label: Yield Stress
40.0
35.5

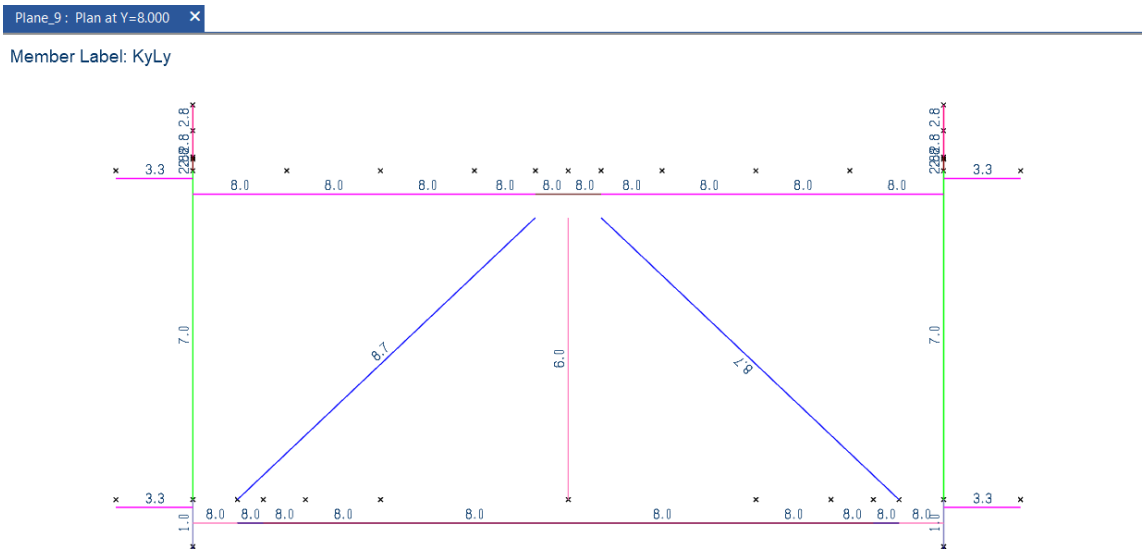

Plane_8 : Plan at Y=0.0
Member Label: KyLy
16.0
6.0
1.3
1.2
2.5
1.5
3.3

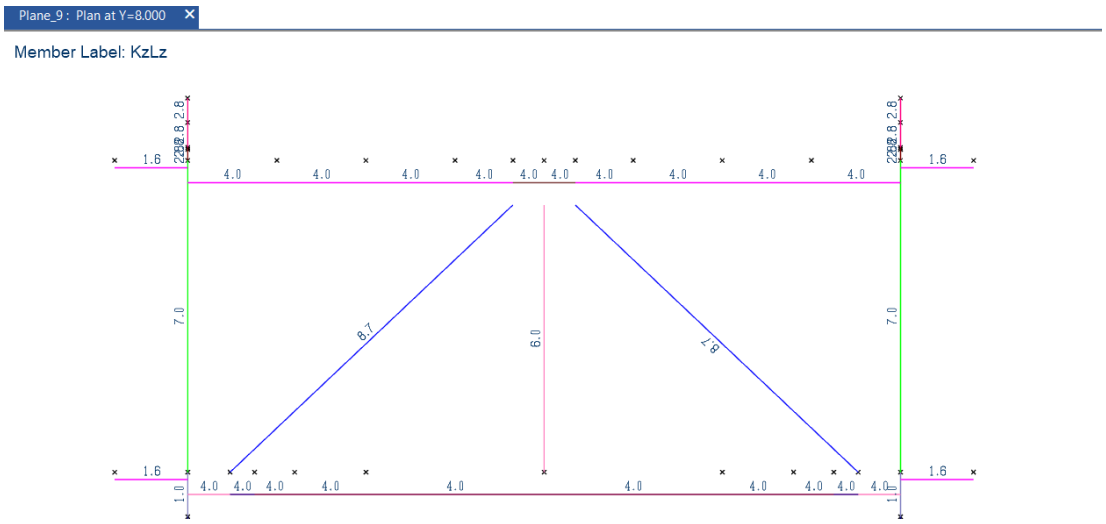

Plane_8 : Plan at Y=0.0
Member Label: KzLz
4.0
6.0
1.3
1.2
2.5
1.5
1.6

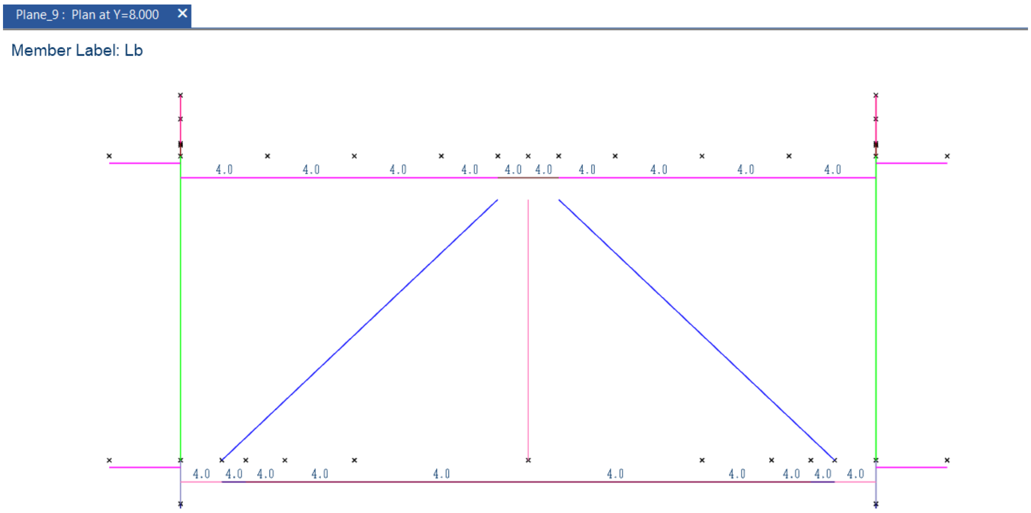

Plane_8 : Plan at Y=0.0
Member Label: AB Release


Plane_9 : Plan at Y=8.000
Joint Label: Name
Member Label: Group
B06
B21
B22
B23
B03
C20
D04
D16
D00
S03
TS1

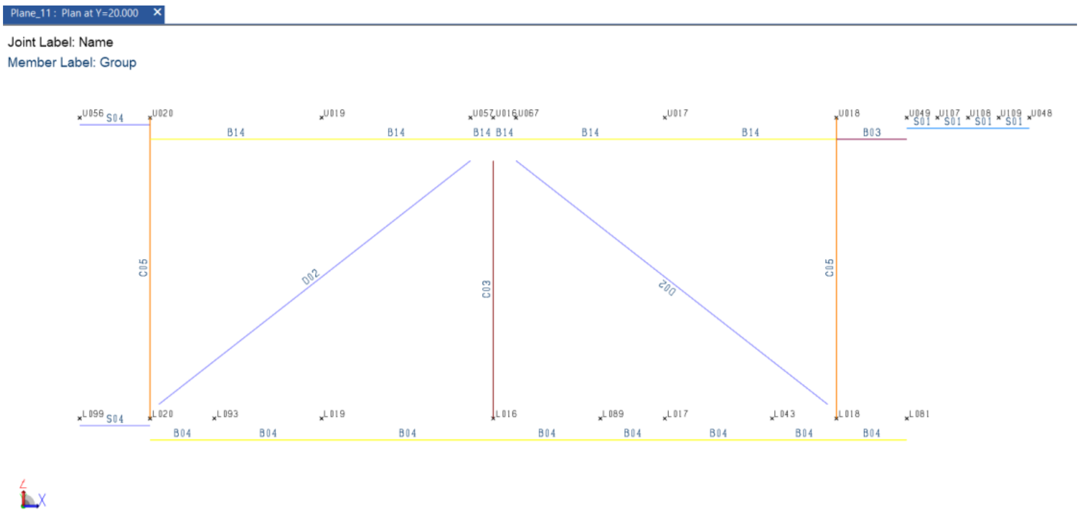

Plane_9 : Plan at Y=8.000
Member Label: Yield Stress
40.0
35.5


Plane_9 : Plan at Y=8.000
Member Label: KyLy

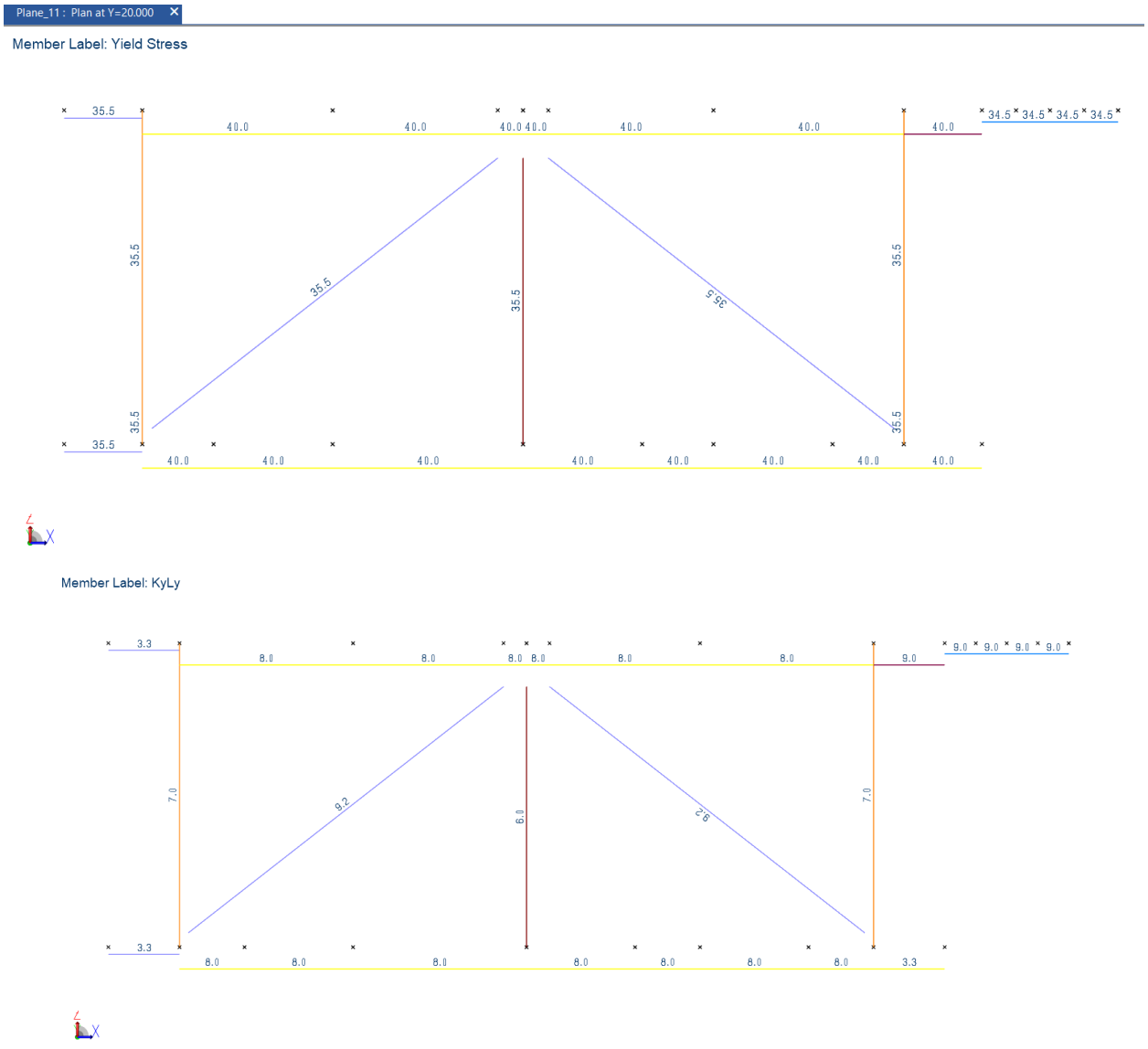

Plane_9 : Plan at Y=8.000
Member Label: KzLz

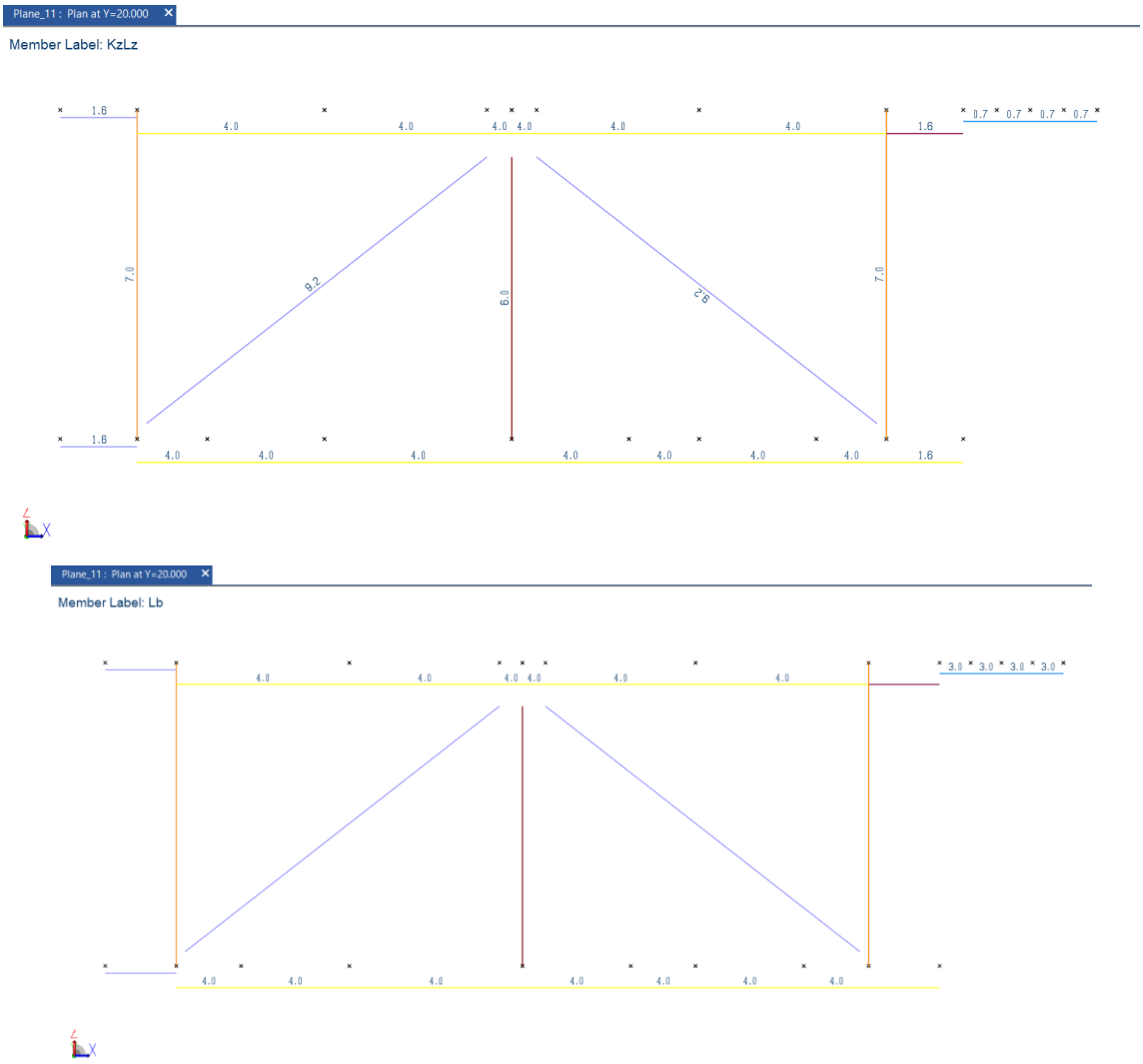


Plane_9 : Plan at Y=8.000
Member Label: Lb
4.0



Plane_11 : Plan at Y=20.000
Joint Label: Name
Member Label: Group
U056
S04
U020
U019
U057
U016
U067
U017
U018
B14
B03
C05
C03
D02
L099
L020
L093
L019
L016
L089
L017
L043
L018
L081
B04


Plane_11 : Plan at Y=20.000
Member Label: Yield Stress
35.5
40.0
34.5
35.5
Member Label: KyLy
3.3
8.0
9.0
7.0
9.2
6.0


Plane_11 : Plan at Y=20.000
Member Label: KzLz
1.6
4.0
4.0
4.0 4.0
4.0
4.0
1.6
0.7 0.7 0.7 0.7
7.0
9.2
6.0
2.8
7.0
1.6
4.0 4.0 4.0 4.0 4.0 4.0 4.0 1.6
Plane_11 : Plan at Y=20.000
Member Label: Lb
4.0
4.0
4.0 4.0
4.0
4.0
3.0 3.0 3.0 3.0
4.0 4.0 4.0 4.0 4.0 4.0 4.0