Base Load Power Hub (BLPH)

BLPH Platform Topside Transportation Analysis

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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.

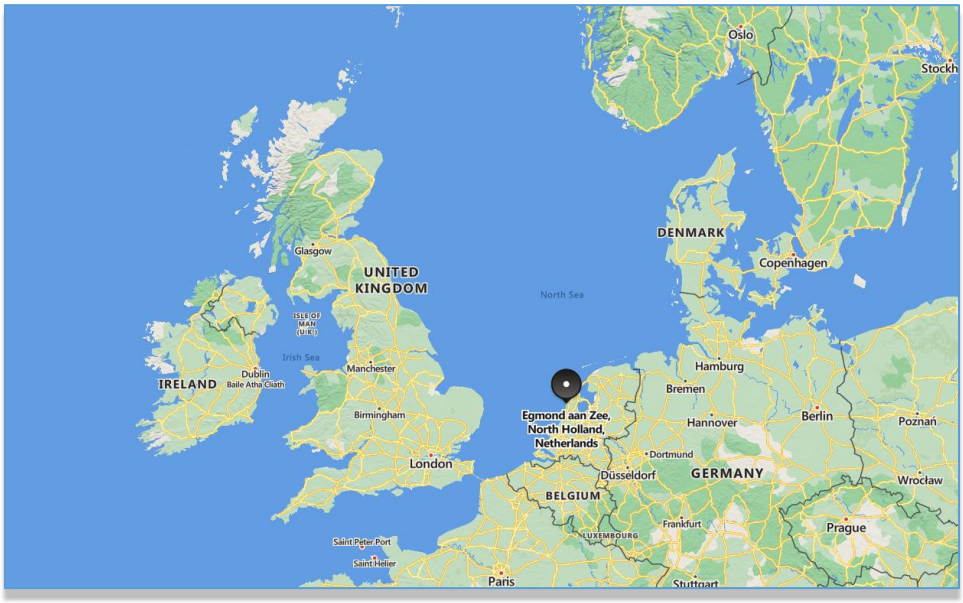


Figure 1.1 - HOLLANDSE KUST NOORD WIND PARK Location Map

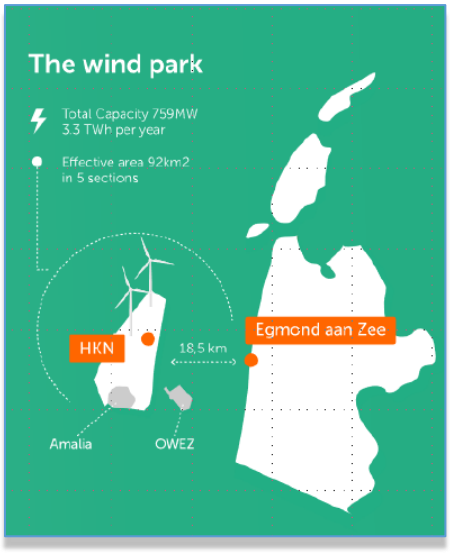


Figure 1.2 - Wind Park Details

The wind farm 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.

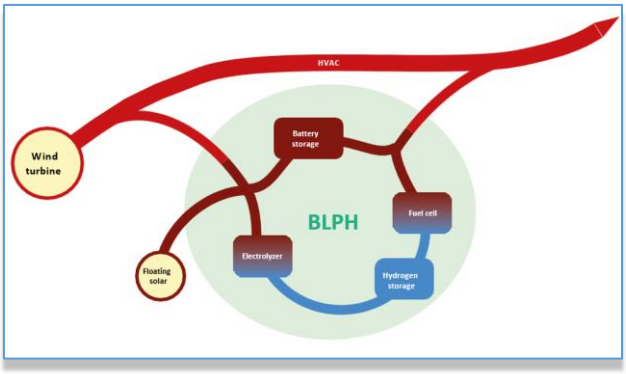


Figure 1.3 – BLPH Concept

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 objective of this report is to present the results of the Transportation Analysis performed for the Topside of the BLPH platform.

The Topsides is to be transported on 300 ft Barge and loaded out by means of the hydraulic trailers (SPMT) on board of the cargo barge with the Rows A and C aligned with the barge longitudinal axis.

The inertia forces are calculated considering the accelerations according to DNV criteria, Ref./10/.

The analysis has been performed in compliance with the requirements, criteria and parameters reported in the Structural Design Premises, Ref./20/.

Transportation analysis is performed in accordance with DNV-ST-N001, Ref./10/.

Structural Code checks are performed according to BD EN ISO 19902 for tubular members and tubular joints, Ref./6/, and according to Eurocode 3 for non-tubular structural elements, Ref./8/.

All structural analyses have been carried out using the structural analysis program SACS, the proprietary software developed by Bentley, Ref. /35/.

The International System of Units (SI) has been used in all engineering assessments and calculations.

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3 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

3.2 COMPANY SPECIFICATIONS

Doc. No.	Description
/17/ DEP 37.19.00.12	Gen - Offshore Topsides Structures
/18/ DEP 37.19.00.30	Gen - Fixed Steel Offshore Structures (Adoption of IOGP S-631-11, Amendments / Supplements to ISO 19902:2020).

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/19/ 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
/20/ 123A90-DDL-ST-SP-90017	Structural Design Basis
/21/ 123A90-DDL-MD-RE-01006	Weight Control Report – Rev. 03
/22/ 123A90-DDL-PP-DS-70070	BLPH Platform - Plot Plans
/23/ 123A90-DDL-ST-SP-90018	Structural Material Specification for Topside and TP
/24/ 123A90-DDL-ST-RE-90000	BLPH Platform – In service Analysis
/25/ 123A90-DDL-ST-RE-90001	BLPH Platform -Load-out Analysis
/26/ 123A90-DDL-ST-RE-90005	BLPH Platform – Topside Joint Check Design Report
/27/ 123A90-DDL-TI-SP-99014	Specification for TP, Topside and Caissons Transportation and Installation
/28/ 123A90-DDL-ST-TN-90119	Evaluating ISO and DNV Approaches
/29/ 123A90-DDL-TI-DD-99015	BLPH Platform – Barge Layout
/30/ 123A90-DDL-ST-DD-90021	TOPSIDE – BLPH GRILLAGE - ASSEMBLY
/31/ 123A90-DDL-ST-DD-90022	TOPSIDE - BLPH LOWER GRILLAGE
/32/ 123A90-DDL-ST-DD-90023	TOPSIDE - BLPH LOWER GRILLAGE
/33/ 123A90-DDL-ST-DD-90024	TOPSIDE - BLPH LOWER GRILLAGE
/34/ 123A90-DDL-ST-DD-90025	TOPSIDE - SEA FASTENING DRAWINGS

3.4 SOFTWARE

Doc. No.	Description
/35/ SACS	Structural Analysis Computer System – BENTLEY Inc- v15
/36/ MOSES	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
BEB	Best Estimate Bathymetry
BESS	BATTERY ENERGY STORAGE SYSTEM
BG	Box Girder
BLPH	Base Load Power Hub
Ce	Snow Exposure Coefficient
CF	Caisson Frame
CL	Concentrated Load
CoG	Centre of Gravity
CTV	Crew Transfer Vessel
CW	CrossWind
DAF	Dynamic Amplification Factor
DFF	Damage Fatigue Factors
DNV	Det Norske Veritas
DOP	Dropped Object Protection
DP	Dynamic Positioning
El.	Elevation
EPCI	Engineering Procurement Construction and Installation
FEED	Front End Engineering Design
HAT	Highest Astronomical Tide
HKN	Hollandse Kust Noord
ICCP	Impressed Current Corrosion Protection
LAT	Lowest Astronomical Tide
LRFD	Load and Resistance Factor Design

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MSL	Mean Sea Level
NTE	Not-to-Exceed
OD	Outside Diameter
PAU	Pre-Assembled Unit (H2 Vessels)
PG	Plate Girder
PV	Photovoltaic
SCE	Safety Critical Equipment
sk	Characteristic Value of Snow on the Ground/Platform
SHL	Static Hook Load
SPMT	Self-propelled modular Trailer
T&I	Transport & Installation
ToS	Top of Steel
TP	Transition Piece
TSO	Transmission System Operator
UC	Unity Check
UDL	Uniformly Distributed Load
VIV	Vortex Induced Vibration
VOOW	Van Oord Offshore Wind
WTG	Wind Turbine Generator
W2W	Walk to Work

Table 4.1 - Definitions and Abbreviations

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5 SUMMARY AND CONCLUSIONS

The analyses performed show that the Topsides can withstand all possible combinations of environmental, operational and transient loads occurring during transportation, according to the applicable codes.

The software SACS™, ref./35/, is used for all global analyses of the structures in the SOW. Structural model of the Topside is the same used for loadout analysis, ref. /25/ with the loads coming from in service analysis, Ref. /24/.

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. /21/. COG location comparison between SACS structural model for Loadout 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 STAT)	-18540	-1890
WCR	-17678	-1802
Δ	862	88
Δ (%)	+4.8%	

COG NOMINAL POSITION			
CASE	**x [m]**	**y [m]**	**z [m]**
COG_SACS (lcomb STAT)	0.02	0.00	29.21
COG_WCR	-0.10	-0.30	29.30
Δ	-0.08	-0.30	-0.09
Topside Main Dimension	16.00	40.00	17.66
Δ (%)	0.5%	0.8%	0.5%

Table 5.2 – 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 5.3 – WCR weight and CoG during LO and transportation. X measured towards NORTH, Y measured towards EAST from C1 (WCR ref. system)

5.2 REACTION FORCES

Maximum and minimum Topside base reaction forces in transportation conditions are reported in the following table. Reactions forces for gravity loads, transient loads and their combinations in transportation conditions are fully detailed in sec. 13.1 for all load combinations.

JOINT	Rx [kN]				Ry [kN]				Rz [kN]			
	MAX	LCOND	MIN	LCOND	MAX	LCOND	MIN	LCOND	MAX	LCOND	MIN	LCOND
TU01	4227	C214	-3816	C209	2327	C202	-2580	C205	10112	C214	-989	C311
TU02	3732	C214	-4138	C209	2364	C202	-2715	C205	10008	C209	-547	C316
TU03	3669	C214	-4024	C209	2640	C202	-2296	C205	10036	C205	-735	C304
TU04	4188	C214	-3839	C209	2652	C202	-2392	C205	10285	C205	-678	C304

Table 5.4 – Topside base reaction forces in Transportation Conditions

5.3 MEMBER CHECKS

Structural members with maximum Unity Check (UC) are detailed in the following table.

MEMBER	GROUP	DESCRIPTION	SECTION	COMBINATION	UC
LD04-L190	B01	Plate girder beam – lower deck – Row A	PG01	C202	0.96
L184-LD01	B01	Plate girder beam – lower deck – Row C	PG01	C205	0.93
L183-LD02	B01	Plate girder beam – lower deck – Row A	PG01	C205	0.93
LD05-L185	B01	Plate girder beam – lower deck – Row C	PG01	C202	0.91
L181-L011	B02	Plate girder beam – lower deck – Row B	PG02	C105	0.87
L003-LD04	B31	Plate girder beam – Lower deck – Row A	PG31	C202	0.84
U006-U081	B12	Plate girder beam – Upper deck – Row C	PG02	C209	0.82
LD01-L015	B31	Plate girder beam – lower deck – Row C	PG31	C205	0.81
LD02-L013	B31	Plate girder beam – lower deck – Row A	PG31	C205	0.80
L005-L204	B22	Plate girder beam – lower deck – Row 2	PG22	C214	0.80

Table 5.5 – Member UC Summary > 0.8

5.4 TUBULAR JOINT CHECKS

Structural tubular joints with maximum Unity Checks (UC) for punching shear are detailed in the following table.

COMMON JOINT	DESCRIPTION	CHORD	BRACE	COMBINATION	UC
D004	Bracing - Main Diagonal Row C	550 x 20	323.9 x 12.7	C205	0.746
D006	Bracing - Main Diagonal Row A	550 x 20	323.9 x 12.7	C205	0.706

D003	Bracing - Main Diagonal Row C	550 x 20	323.9 x 12.7	C202	0.593
L015	Main column Row C-4 – Bracing Row C	800 x 40	550 x 20	C205	0.587
L013	Main column Row A-4 - Bracing Row A	800 x 40	550 x 20	C205	0.571
D005	Bracing - Main Diagonal Row A	550 x 20	323.9 x 12.7	C202	0.552
L005	Main column Row C-2 – Bracing Row C	800 x 40	550 x 20	C202	0.516
L003	Main column Row A-2 - Bracing Row A	800 x 40	550 x 20	C202	0.481
U015	Main column Row C-4 – Bracing Row C	800 x 30	406.4 x 12.7	C105	0.479
0002	X-Bracing Row A	406.4 x 20.62	406.4 x 15.88	C105	0.454

Table 5.6 – Tubular joint UC summary

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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:

- Target top of TP, El. + 22.310 m;
- 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.

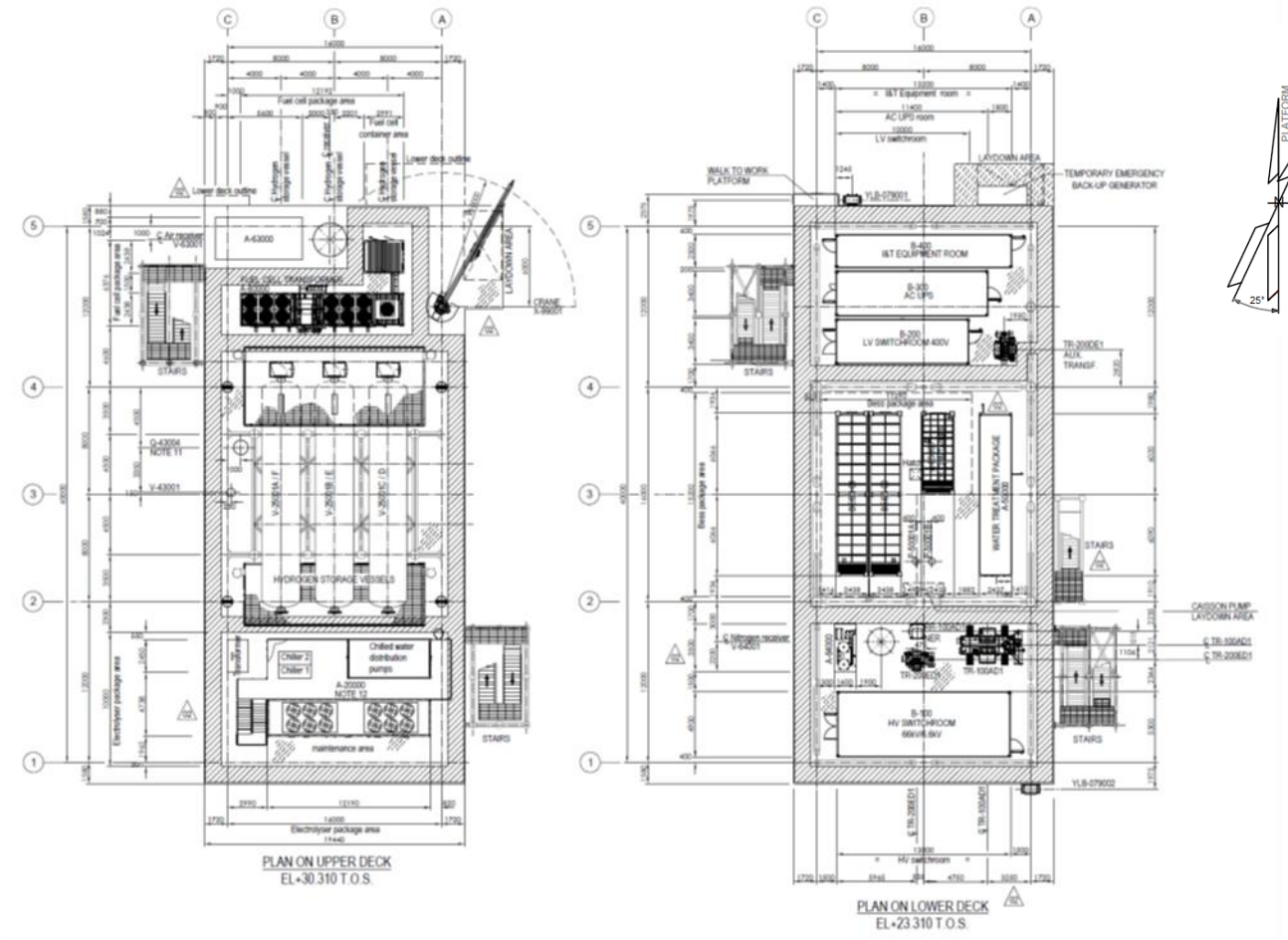


Figure 6.1 – Base Load Power Hub Plot Plan

7 DESIGN DATA

Design loads considered for the transportation include wind loads and transient actions from barge motions as per data reported in the following from Design Basis, Ref./20/.

7.1 WIND DATA

Omni-Directional wind speed data are reported in Table 7.1 , from Ref. /24/

Averaging Time	Return period (years)						
	1	2	5	10	50	100	1000
1hr	31.8	33.4	35.1	36.4	39.1	40.1	43.4
10 min	33.7	35.5	37.4	38.8	41.7	42.9	46.5
3s	39.4	41.6	44.1	45.9	49.7	51.1	56.0

Table 7.1 - Omni-Directional Wind velocities [m/s] at 125 m MSL

Wind speeds are provided at 125m MSL. Wind speeds at any specified averaging time or elevation, will be calculated according to following equations, Ref./2/:

$U(z, t) = U(z) * [1 - 0.41 * Iu(z) * \ln(t/t0)]$

$U(z) =$ 1-hour mean wind speed given by:

$U(z) = U0 * [1 + C * \ln(z/zr)]$

$C = 0.0573 * (1 + 0.15 * U0)^{1/2}$

$Iu = 0.06 * [1 + 0.043 * U0] * (z/zr)^{-0.22}$

$U0 =$ 1-hour average at the reference elevation, zr

$zr =$ 10 m above sea level.

Directional exceedance data for wind is presented in Figure 7.1. The wind predominantly blows from the south- west.

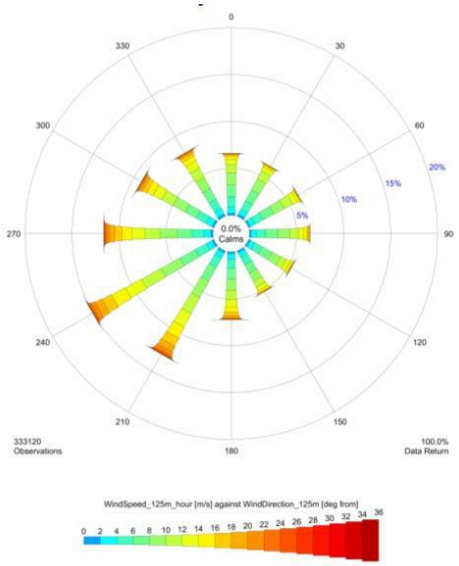


Figure 7.1 - Mean Hourly Wind Speed Distribution at 125 m MSL

7.2 MOTION CRITERIA

Motion criteria are defined according to DNV for unrestricted world-wide tows, ref. /10/, for 300ft standard barge and to Design Basis, ref. /20/.

Item	Amplitude	Period
Roll	20 degrees	10 seconds
Pitch	12.5 degrees	10 seconds
Heave	0.20 g	

Table 7.2 - DNV Default Motion Criteria

8 MATERIALS

8.1 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./23/. 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 t > 50	-40 -40	DC1-I-420-40_Z DC1-I-460-40_Z	2, 7, 8, 11, 12, 17, 18
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 12 < t <= 25 25 < t <= 50 t > 50	0 -20 -40 -40	NA DC2-II-420-20 / DC2-II-460-20 DC2-II-420-40 DC2-II-460-40	- 2, 7, 8, 11 17 for t > 40mm
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 12 < t <= 25 25 < t <= 50 t > 50	0 -20 -40 -40	DC3-II-355-0 / DC3-II-X52-0 DC3-II-355-20 / DC3-II-X52-20 DC3-II-355-40 / DC3-II-X52-40	2, 7, 8 11 for plate 17 for t > 40mm
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 12 < t <= 25	0 0	DC4-III-355-0 / DC4-III-X52-0 / DC4-III-X60-0	-
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 12 < t <= 25	10 10	DC5-IV-235-10 / DC5-IV-275-10 / DC5-IV-355-10 / DC5-IV-GRB-10	-

Table 8.1 - Material Selection, Ref /1/

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 8.2 – 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 8.3 – 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 8.4 – Mechanical properties for Structural Sections

8.2 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.

8.3 GRATING

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

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9 DESIGN CRITERIA AND REQUIREMENTS

9.1 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.

9.2 PARTIAL RESISTANCE FACTORS

9.2.1 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 9.1- Resistance Factors for Tubular Sections

9.2.2 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 9.2- Resistance for Non Tubular Section

9.2.3 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 9.3 - Resistance Factors for Tubular Joints

9.3 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 9.4.

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 9.4 - ISO Loads Classification

9.4 PARTIAL ACTION FACTORS

9.4.1 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 9.5 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 9.5 – Partial action factors for Pre-service Analyses

9.5 ACCEPTANCE CRITERIA

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

10 STRUCTURAL ANALYSIS

10.1 TRANSPORTATION ANALYSIS

The Topside analysis in transportation conditions include permanent, variable and transient actions as wind loads and accelerations from barge motions, according to design data reported in sec.7.

The transportation analysis is performed considering a two steps analysis with different restraint conditions, in order to ensure that the whole mass is reacted by the preinstalled vertical supports only and the dynamic loads by these and by supports suitably designed for horizontal loads.

The centre of rotation is assumed to be at the centre of the barge.

Partial action factors for pre-service analyses as per Table 9.5 will be considered and sixteen (16) basic combinations of wind and inertia loads are therefore defined for each design situation (± Pitch ± Heave ± Wind and ± R ± H ± Wind).

10.2 TRANSPORTATION ARRANGEMENT

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 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 centre of rotation is assumed to be at the centre of the barge.

An overview of the transportation layout is shown in the following figure from Ref. /29/.

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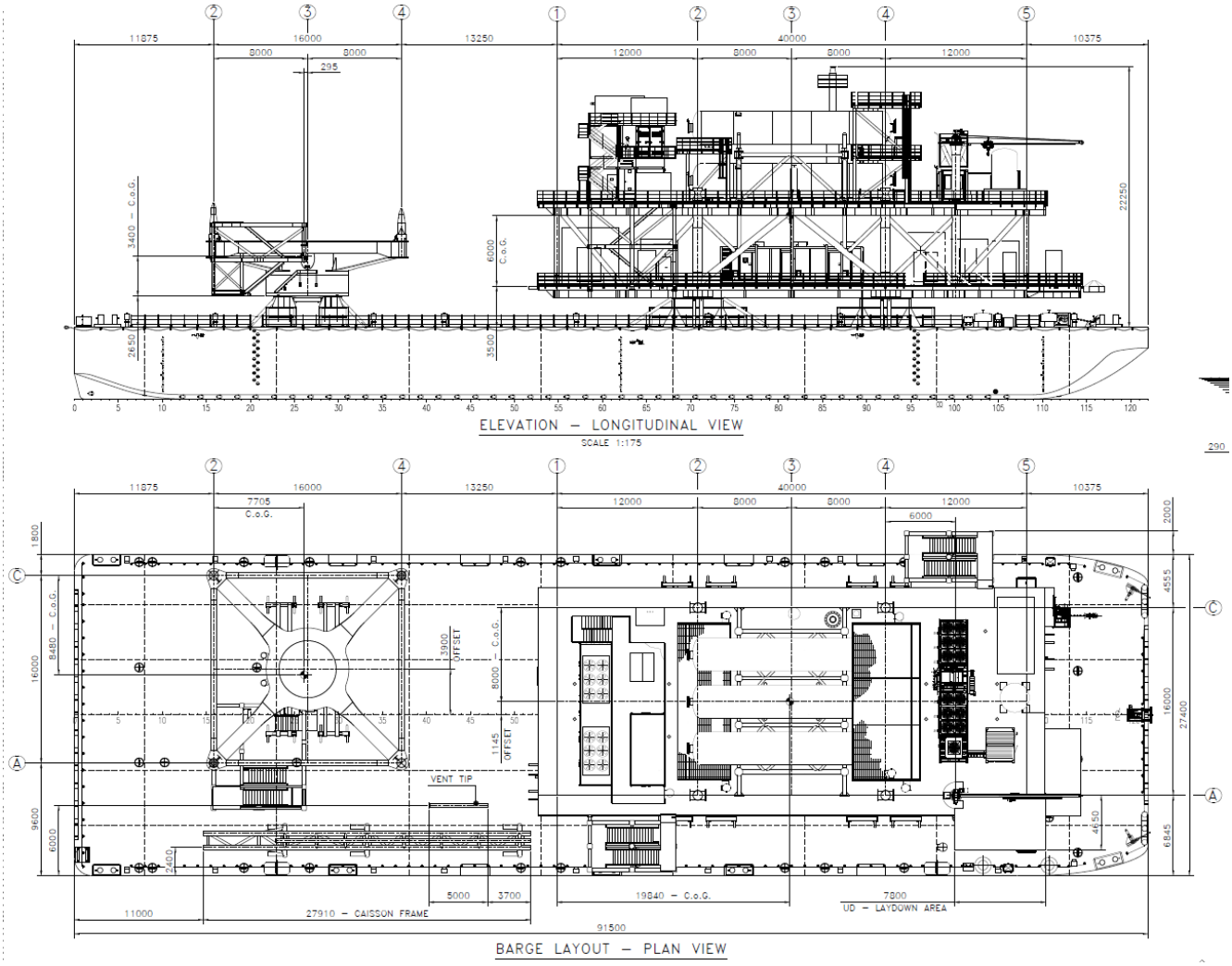


Figure 10.1 – Transportation Arrangement, Ref. /29/ – Side and Plan views

10.3 STRUCTURAL MODEL

10.3.1 Structural Model Description

The software SACS™, ref./35/, is used for all global analyses of the structures in the SoW. The Topsides SACS model used for the Transportation analysis is derived from the one used for the In-Service analysis, Ref. /24/.

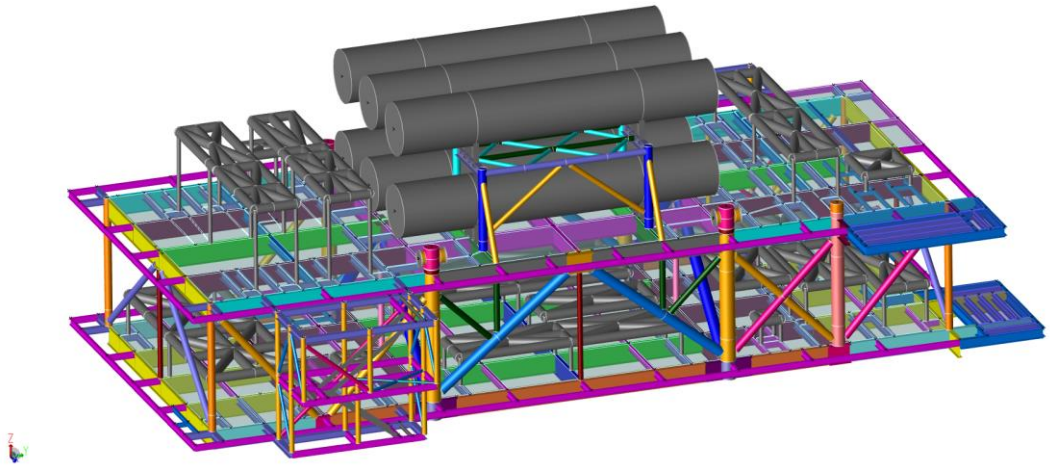


Figure 10.2 - Topside structural model

10.3.2 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.

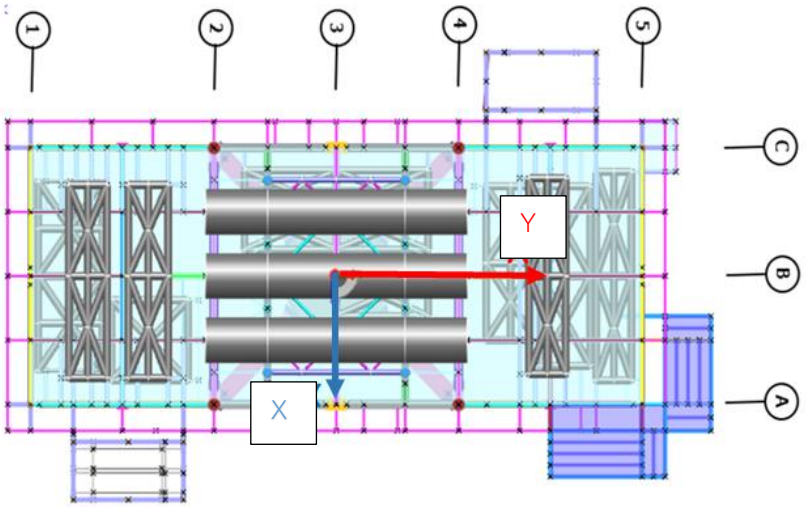


Figure 10.3 - BLPH Topsides Structural Model - Top View

10.4 ANALYSIS PROCEDURE

The calculation procedure adopted for transportation analysis is aimed at obtaining the correct distribution on supports of static (dead weight) and transportation loads (inertia forces due to barge motion and wind) properly accounting for grillage and lateral restraints loading sequence.

The distribution of Topsides dead weight at the cargo set-up on barge is calculated excluding the lateral restrain contribution at grillage level that are activated to resist the transportation lateral loads.

The above loading sequence is therefore analysed by two separate computer runs, with different constraint conditions. The actual loads distribution is obtained by suitably combining the two analyses with the Combine module of SACS.

In order to ensure the full compatibility and the superposition of the two analyses, the processed models are identical, only loads and constraints are different.

In accordance with the above-described procedure, the transportation analysis is performed through the following three steps.

STEP 1

A first analysis is performed considering the Topsides supported in vertical direction only in correspondence of the grillage supports at the base of Topside main columns A2, A4, C2 and C4, as per following figure. Additional horizontal restraints are introduced to avoid numerical instability (SACS joints TU01 and TU02). The restraint configuration for step 1 in terms of joint fixities is shown in the following figure (0/1 digits sequences associated with each joint represent the restraint condition referred to the 6 dof, with 0 = free and 1 = fixed). Only vertical loads, load combination STAT, sec.11.3, are considered in Step 1 analysis.

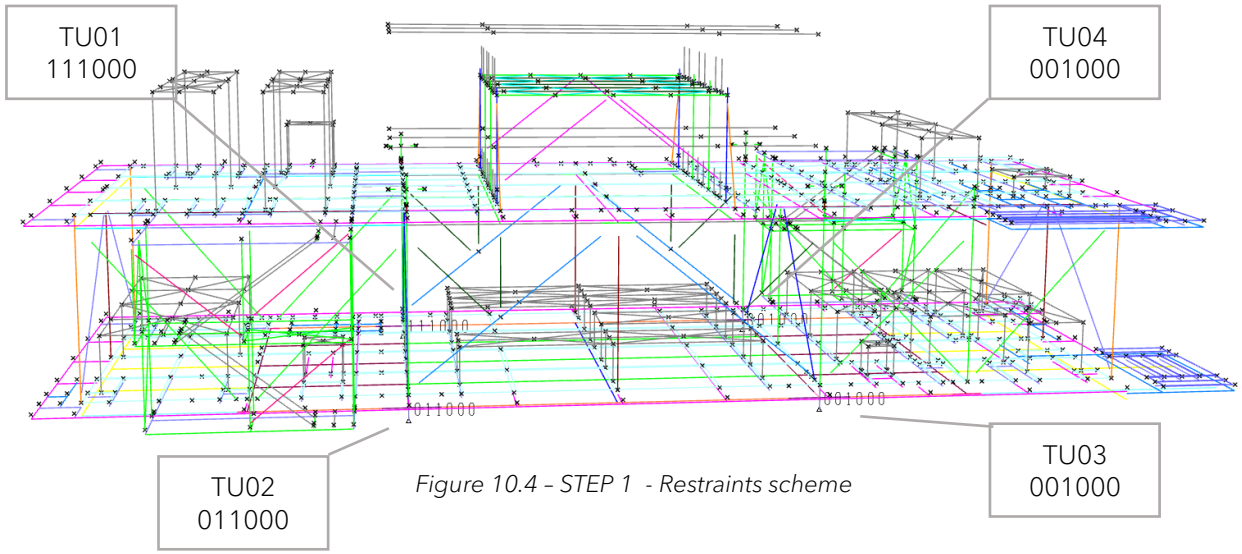


Figure 10.4 – STEP 1 - Restraints scheme

STEP 2

In this analysis the horizontal restraint, provided by seafastening elements (pipes and stoppers), placed at grillage level, are made effective as per restraint configuration shown in the following figure (111000 at all main column base joints).

Only transient loads (wind and inertia forces, sec.11.4) are considered in Step 2 analysis.

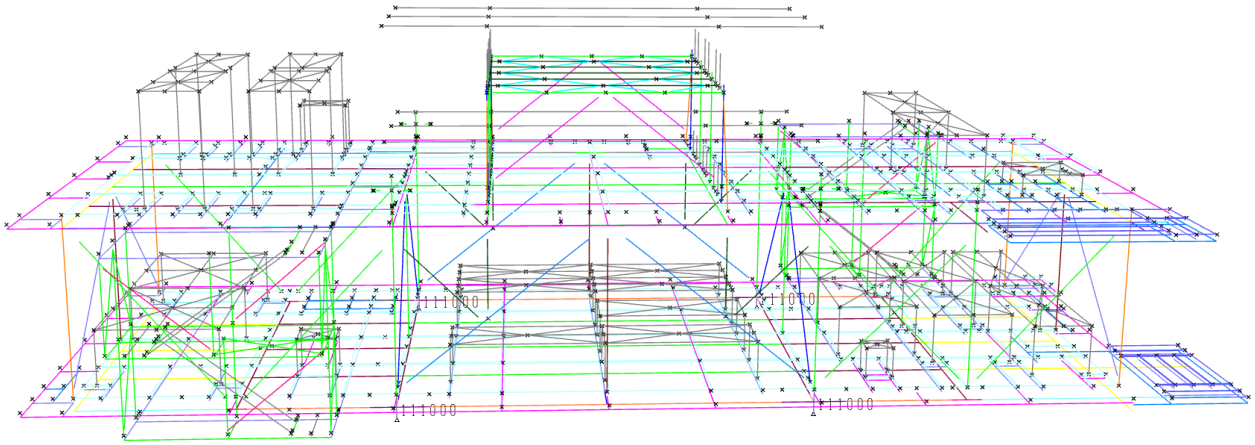


Figure 10.5 - STEP 2 - Restraints scheme

STEP 3

The two analyses above described are superimposed by SACS Combine module.

As per Transportation load combinations described in sec. 12, the permanent and variable loads from Analysis step 1 and Transient loads from analysis step 2 are included and suitably combined.

The actual support reactions are evaluated and the resulting internal loads in members are used for the structural checks of the Topsides structure.

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11 BASIC LOAD CASES

All the design loads have defined according to the Weight Control Report and Plot Plans, Ref./21/ and /22/, in terms of weights, CoG position and contingency factors. The datum for weight reporting is different to that for the SACS structural analysis. The origin for the weight reporting is at gridline intersection C1 at LAT.

The below load cases were taken from in-service analyses, Ref. /24/, with values and contingencies validated by comparison with WCR.

11.1 PERMANENT ACTIONS

11.1.1 Modelled structural dead weights

Dead weights of the modelled structures have been automatically evaluated by SACS and included in following basic load conditions: DEAZ = DZTO + DZPU.

- Load condition DEAZ: Modelled structures total weight

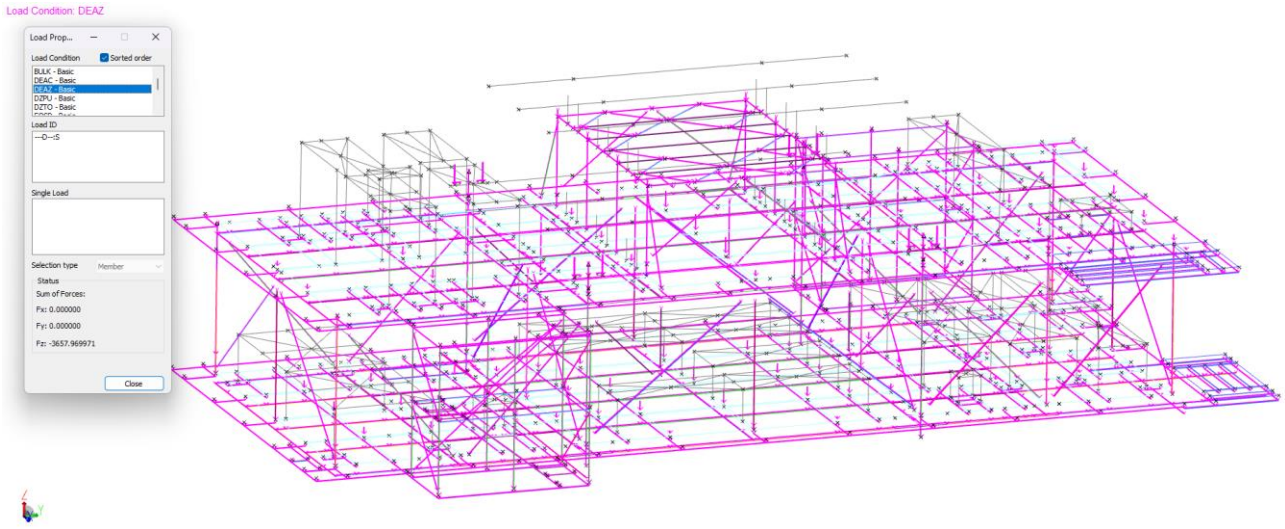


Figure 11.1 – Topside Load condition DEAZ

- Load condition DZTO: TOPSIDE MODELLED WEIGHT

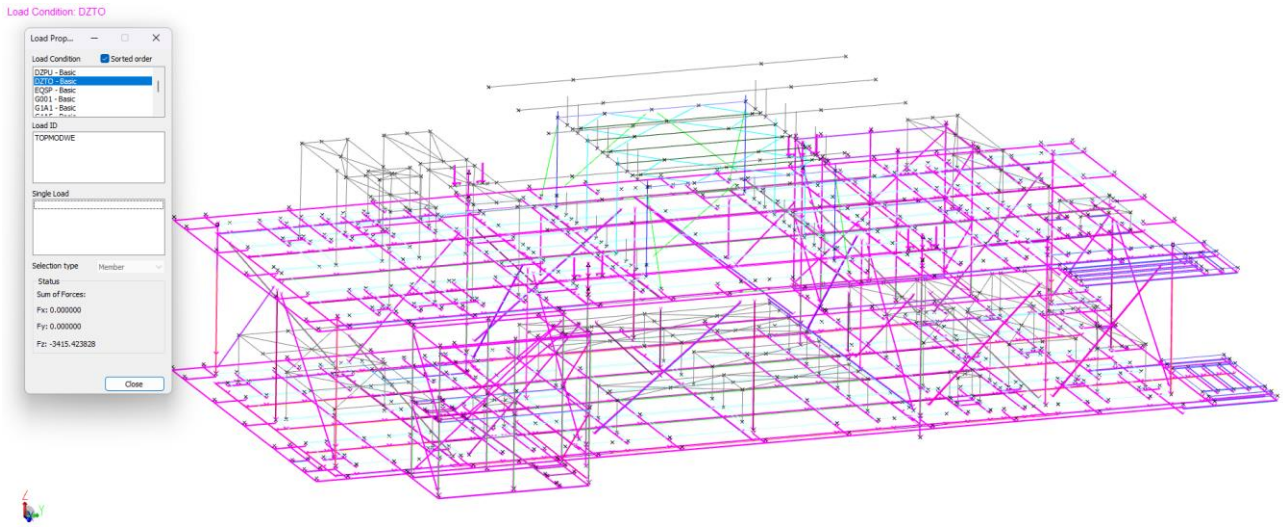


Figure 11.2 – Topside basic load conditions forming DEAZ

- Load condition DZPU: PAU MODELLED WEIGHT

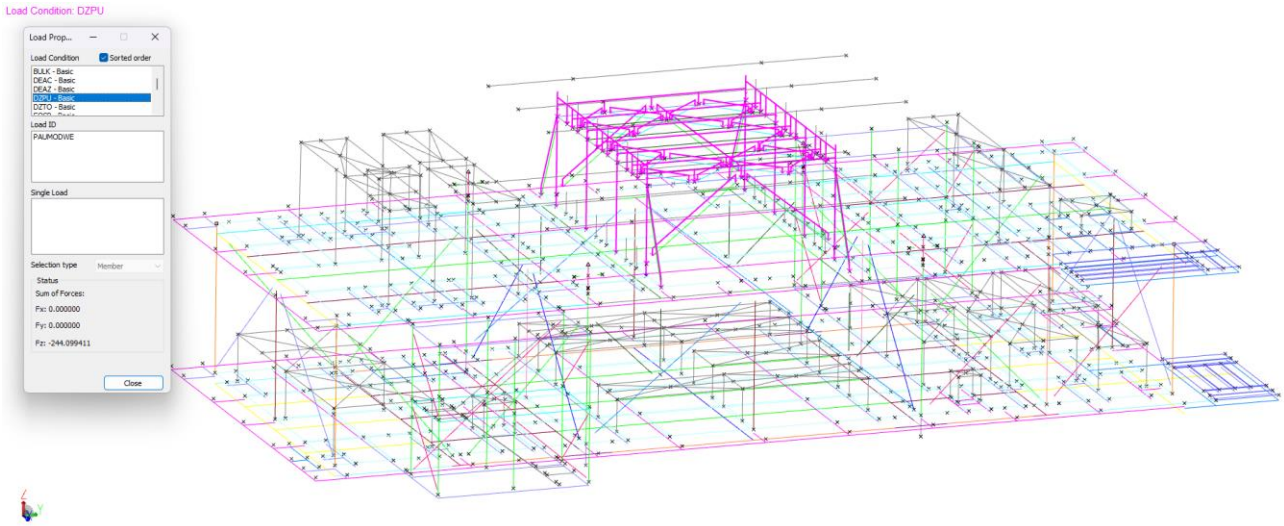


Figure 11.3 – Topside basic load conditions forming DEAZ

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11.1.2 Not modelled structural dead weights

Following basic Load conditions have been defined for not modelled structural dead weights.

- Load condition WFLO: FLOORING AND GRATING PERMANENT LOADS

Flooring and grating weights have been defined in SACS load combination WFLO according to calculations reported in following table.

PLATING & GRATING GRAVITY WEIGHTS - WFLO							
g_grat =	0.500	kN/m2	GRATING 30X50 - 30X5				
g_plat 8mm =	0.650	kN/m2	PLATING THK=8mm				
g_plat 10mm =	0.800	kN/m2	PLATING THK=10mm				
LOAD ID	**Dim.**		**EL.**	**W**	**W tot**	**Description**	**TEKLA**
	x	**y**	**z**				
[-]	**[m]**	**[m]**	**[m]**	**[kN]**	**[kN]**		**[kN]**
L_GR_0.5	1.640	42.250	23.310	69.3	92.2	Lower deck grating	88.3
L_GR_0.5	15.300	1.500	23.310	23.0			
U_GR_0.5	1.640	43.000	30.310	35.3	88.4	Upper Deck grating	73.6
U_GR_0.5	1.640	35.500	30.310	29.1			
U_GR_0.5	16.000	1.500	30.310	24.0			
L_P10	7.000	3.000	23.310	16.8	16.8	Lower Deck flooring 10mm	17.6
U_P10	4.500	7.500	30.310	27.0	27.0	Upper Deck flooring 10mm	29.4
L_P8	12.900	4.700	23.310	39.4	416.0	Lower Deck Plating 8mm in Equipment area	400.0
	5.000	4.300	23.310	14.0			
	4.950	12.200	23.310	39.3			
	2.450	6.100	23.310	9.7			
	11.200	9.540	23.310	69.5			
	16.000	40.000	23.310	244.2		Lower Deck Plating 8mm	
U_P8	12.200	2.440	30.310	19.3	431.0	Upper Deck Plating 8mm in Equipment area	400.0
	12.000	4.820	30.310	37.6			
	16.000	40.000	30.310	359.1		Upper Deck Plating 8mm	
STGR_0.5				27.1	27.1	tower stairs grating	26.5
SACS LOAD CONDITION				**WFLO**	**1098.5**	**Total Flooring & grating structural weight**	**1035.4**

Table 11.1 – Load Condition WFLO: Plating and grating weights' calculation.

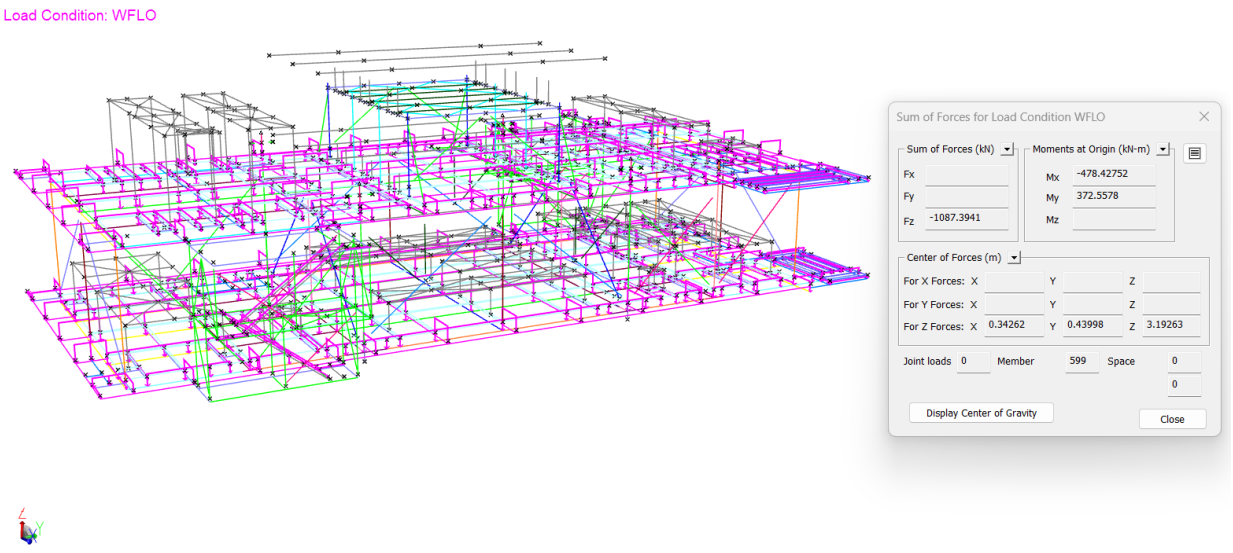


Figure 11.4 – Topside basic load conditions WFLO

- Load condition WPER: SECONDARY STRUCTURES PERMANENT LOADS

Not modelled structural weights have been defined in SACS load condition WPER as per following table, based on WCR, ref./21/.

PERMANENT STRUCTURAL WEIGHTS - WPER						
LOAD ID	Dim.		EL.	W	W tot	Description
	x	y	z			
[-]	[m]	[m]	[m]	[kN]	[kN]	
DAV_CR	8	14	31.1	60	60	DAVIT Crane
ACCSTS			30.31	360	360	PAU Access Stairs
HAND_L			23.31	43.2	43.2	Handrail Lower deck
HAND_U			30.31	45	45.0	Handrail Upper deck
HANDHD			23.31 / 30.31	51.5	51.1	Heavy Duty Handrail U&LD
HAND_ST			23.31 / 30.310	33.9	33.9	Tower Stairs Handrail
1 kN/m2W			23.31	37.8	37.8	not-modelled walkways sec. beams LD
U1kN/m2W			30.31	37.8	37.8	not-modelled walkways sec. beams UD
SACS LOAD CONDITION				WPER	668.8	Not Modelled Permanent Structural Weights

Table 11.2 – Load Condition WPER

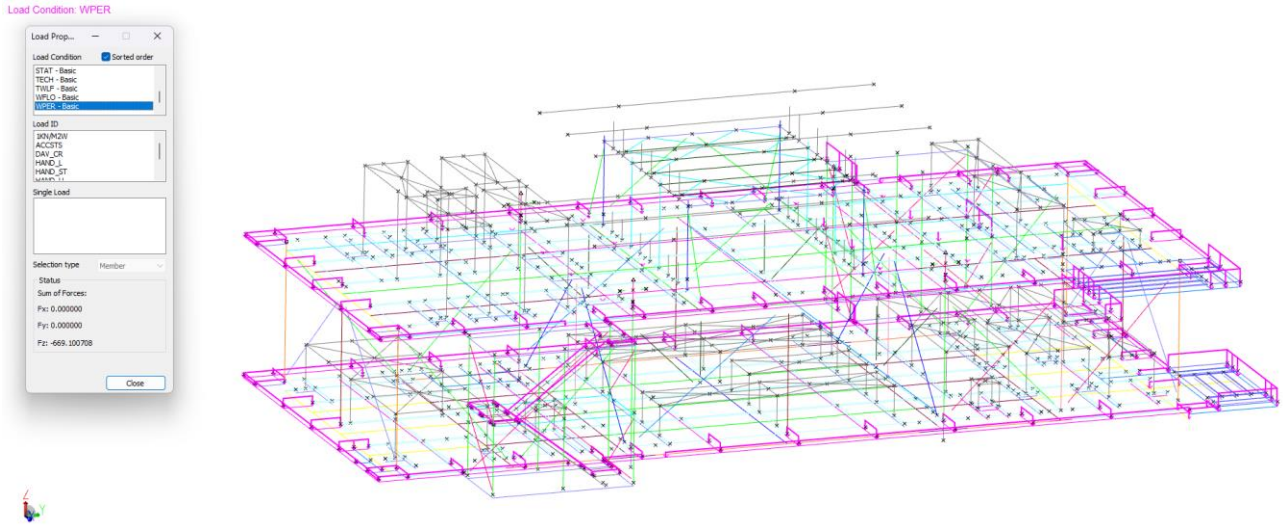


Figure 11.5 – Topside basic load conditions WPER

- Load condition EQSP: EQUIPMENT SUPPORTS WEIGHT

Equipment supports weights have been included in load condition EQSP. As per current WCR estimate, equipment's support weights are assumed as 15% of equipment gross weights (including dry and content weights).

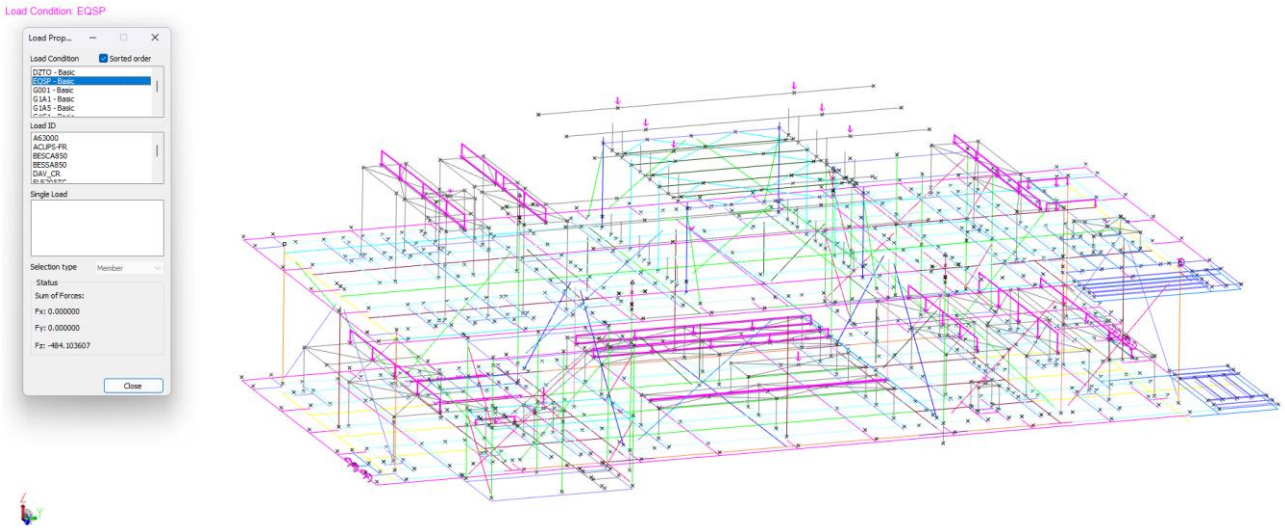


Figure 11.6 – Topside basic load conditions EQSP

11.1.3 Equipment Dry weights and other disciplines' bulk loads

These loads include dry weight of all platform process/utility equipment and electrical & instrumentation equipment and other objects permanently mounted on the structure that do not change with the mode of operation. Equipment loads have been modelled in SACS as uniform or concentrated loads at proper location. For main equipment, dummy structural elements have been included in the global model to account for equipment's CoG location as per WCR and Plot Plans.

EQUIPMENT WEIGHTS										
Loc.	DISC	DESCRIPTION	TAG	Wdry [t]	Wdry [kN]	Wcontent [t]	Wcontent [kN]	contingency [%]	Wdry [kN]	Wcontent [kN]
UD	MEC	H2 STORAGE VESSEL	V-25001A/F	352.20	3455.08	1.50	14.72	12%	3869.69	16.48
UD	MEC	ELECTROLYSER	A-20000	135.30	1327.29	11.50	112.82	12%	1486.57	126.35
UD	MEC	TRANSFORMER	A-20000-T	8.20	80.44	1.00	9.81	12%	90.10	10.99
UD	MEC	FUEL CELL	A-80000A+B	34.02	333.73	5.00	49.05	12%	373.77	54.94
UD	MEC	FUEL CELL TRANSF	A-80000-C	7.14	70.02	1.00	9.81	12%	78.43	10.99
UD	MEC	AIR SYSTEM	A-63000	10.80	105.95			12%	118.66	
UD	MEC	AIR RECEIVER	V-63001	7.42	72.79			12%	81.53	
UD	MEC	HYDROGEN VENT KO DRUM	V-43001	0.78	7.65	0.50	4.91	12%	8.57	5.49
UD	MEC	HYDROGEN VENT HEATER	H-43002	1.30	12.75	0.75	7.36	12%	14.28	8.24
UD	MEC	HYDROGEN VENT	Q-43004	3.40	33.35	1.00	9.81	12%	37.36	10.99
			TOT UD	560.56	5499.06	22.25	218.27		6158.95	244.47
LD	MEC	Nitrogen package	A-64000	7.50	73.58	1.00	9.81	12%	82.40	10.99
LD	MEC	N2 RECEIVER	V-64001	4.00	39.24			12%	43.95	
LD	MEC	BESS (PCS CONTAINER)	A-85000	15.00	147.15	3.00	29.43	12%	164.81	32.96
LD	MEC	BESS (BC1)	A-85001	35.00	343.35	5.00	49.05	12%	384.55	54.94
LD	MEC	BESS (BC2)	A-85002	35.00	343.35	5.00	49.05	12%	384.55	54.94
LD	MEC	WATER treatment package	A-50000	10.50	103.01	5.50	53.96	12%	115.37	60.43
LD	MEC	seawater lift pump A / B	P-50001 A/B	3.25	31.88	10.00	98.10	12%	35.71	109.87
LD	MEC	LIFE RAFT	YLB-079002	5.50	53.96			12%	60.43	
LD	MEC	NER	RR-100AD1	0.38	3.73			12%	4.18	
LD	MEC	Solar TRAFO	TR-200ED1	3.34	32.77	1.00	9.81	15%	37.68	11.28
LD	MEC	TRANSFORMER AUX 6.6/0.4kV	TR-200DE1	5.05	49.54	1.50	14.72	15%	56.97	16.92
LD	MEC	MAIN TRANSFORMER 66kV/6.6kV	TR-100AD1	22.75	223.18	3.00	29.43	15%	256.65	33.84
			TOT LD	147.27	1444.72	35.00	343.35		1627.25	386.17
			TOT MECD	**6943.8**			561.6		7786.2	

Table 11.3 - WCR Equipment dry and content weights

- Load condition MECD: EQUIPMENT DRY WEIGHTS (contingency included)

Equipment dry weights at Upper and Lower Deck, already including 12% contingency for mechanical discipline and 15% contingency for others) have been included in load condition MECD which provide a resultant conservatively larger than WCR values ().

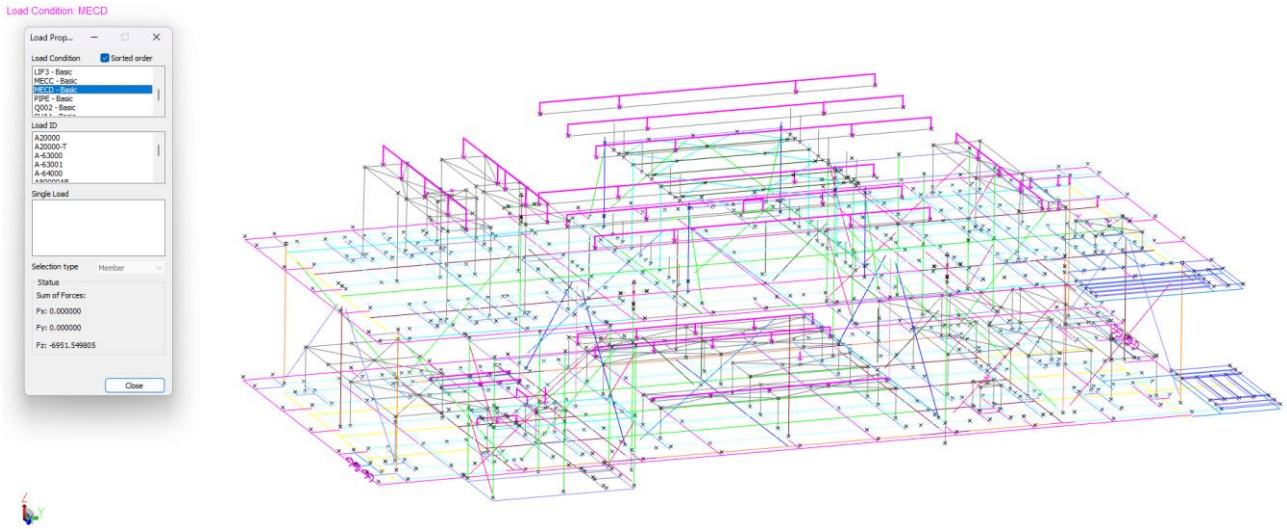


Figure 11.7 – Topside basic load conditions MECD

11.1.4 Other disciplines' bulk loads

Following basic load conditions have been included in the structural model to account for bulk loads:

- Load condition TECH: Technical Room Weight

Considers the weights of the four technical rooms, including architectural, structure, safety etc.

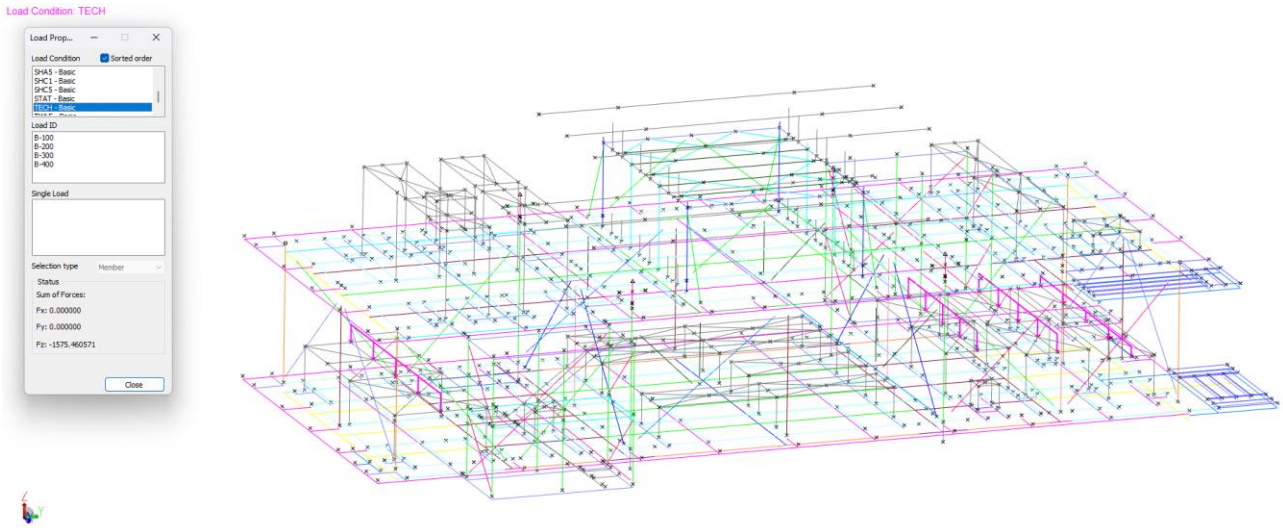


Figure 11.8 – Topside basic load conditions ARCH

- Load condition BULK: Electrical and Instrumental Bulk Weights

Load condition BULK includes weights resulting from a uniform distributed load of 1 kN/m2 at BLPH Upper and Lower Deck, excluding external walkways.

This auxiliary load condition has been defined to account for all disciplines' bulk load (structural, architectural, electrical, instrumentation, HVAC, piping, mechanical, fire and safety).

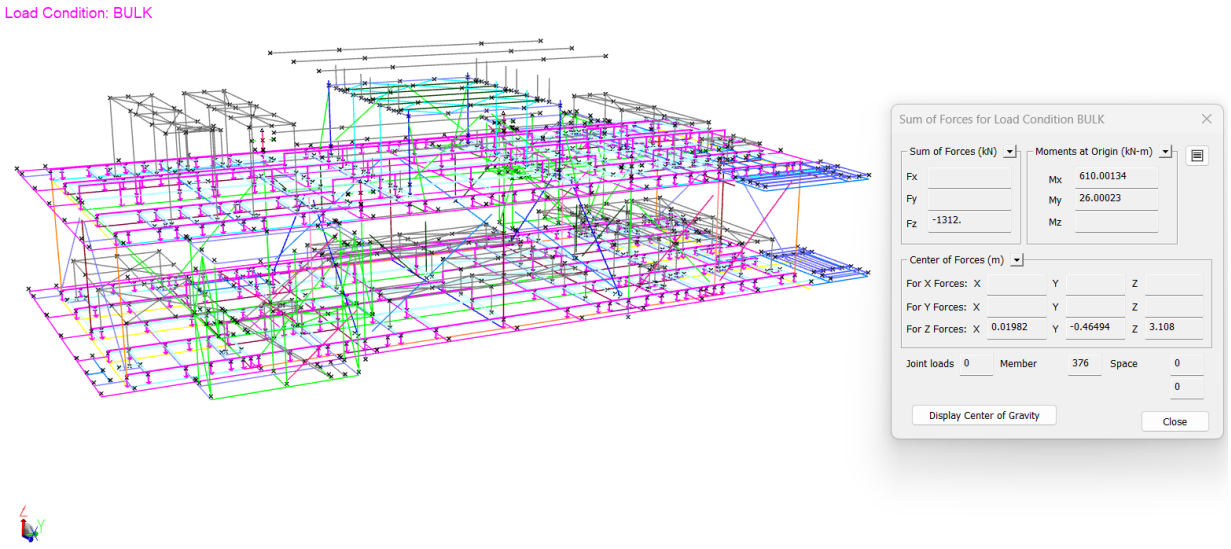


Figure 11.9 – Topside basic load conditions BULK

- Load condition PIPE: Piping Weights

PIPING WEIGHS										
LD	PIP	Distributed LD		1.76	17.3		0.0	12%	19.4	0.00
UD	PIP	Distributed UD		0.35	3.4		0.0	12%	3.8	0.00
LD-UD	PIP	BULK LOAD		17.20	168.7		0.0	12%	189.0	0.00
			TOT	19.31	189.4		0.0		212.2	0

Table 11.4 - Load Condition PIPE: Piping weights

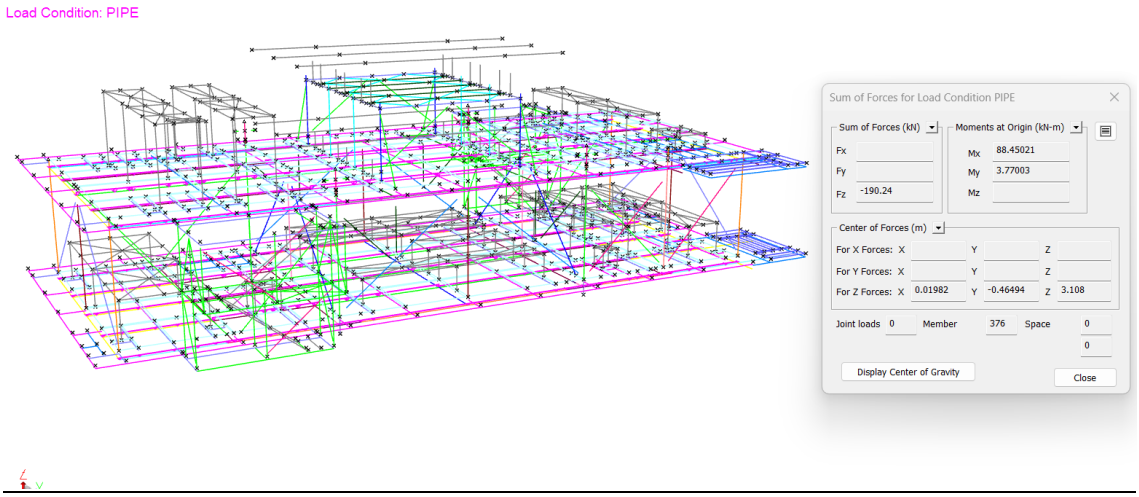


Figure 11.10 – Topside basic load conditions PIPE

11.1.5 Permanent Actions Basic Load Combination

Auxiliar load combination DEAC has been defined to account for different contingencies of modelled structure (Topside, Pau).

Permanent actions basic load cases have been combined in load combination G001 accounting for different weight contingencies of basic load conditions (the same used in WCR). Refer to in-service analysis for comparison of WCR values and modelled ones.

Auxiliar Basic Load Combination DEAC		
Basic Load cases	Description	Load Factors
DZTO	TOPSIDE MODELED WEIGHT	0.145
DZPU	PAU MODELLED WEIGHT	0.030

Permanent Basic Load combination G001		
Basic Load case	Description	Load Factor
DEAZ	Modelled structural Element weight	1.10
DEAC	Modelled structural Element CONTINGENCY weight	1.00
WFLO	Flooring & grating permanent loads	1.12
WPER	Permanent not modelled loads	1.12
MECD	Equipment dry weight (+ contingency)	1.12
TECH	Technical rooms dry weight (incl. safety/ele and + contingency)	1.15
EQSP	Equipment support weight	1.00
PIPE	Piping Loads	1.12
BULK	Bulk loads contingency (1 kN/m2 no ext walkways)	1.00

Table 11.5 - Permanent Actions - Basic Load Combination

Following SACS excerpt details the basic load conditions and load combination G001 resultant, accounting for gross permanent weights.

```
                                        ************* 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)

  1   BULK         0.00                                   0.00                                -1312.00     0.02    -0.46    26.42
  2   DEAZ         0.00                                   0.00                                -3657.95     0.45     1.07    27.21
  3   DZPU         0.00                                   0.00                                 -244.10     0.00     0.00    33.74
  4   DZTO         0.00                                   0.00                                -3415.42     0.41     1.12    27.24
  5   EQSP         0.00                                   0.00                                 -484.10    -0.37     0.03    29.26
  7   MECD         0.00                                   0.00                                -6951.55    -0.21    -1.92    32.22
 12   TECH         0.00                                   0.00                                -1575.46    -0.65     5.00    25.37
 13   WFLO         0.00                                   0.00                                -1087.39     0.34     0.44    26.51
 14   WPER         0.00                                   0.00                                 -670.33     1.11     4.05    28.99
 15   DEAC         0.00                                   0.00                                 -502.56     0.49     1.11    26.86
 16   PIPE         0.00                                   0.00                                 -190.24     0.02    -0.46    26.42

 17   G001         0.00                                   0.00                               -18112.90     0.02     0.10    29.20
```

11.2 VARIABLE ACTIONS

11.2.1 Equipment content weights

Equipment mechanical content weights at Upper and Lower Deck, not including 12% contingency foreseen by WCR, have been included in load condition MECC.

- Load condition MECC: EQUIPMENT CONTENT WEIGHTS (contingency not included)

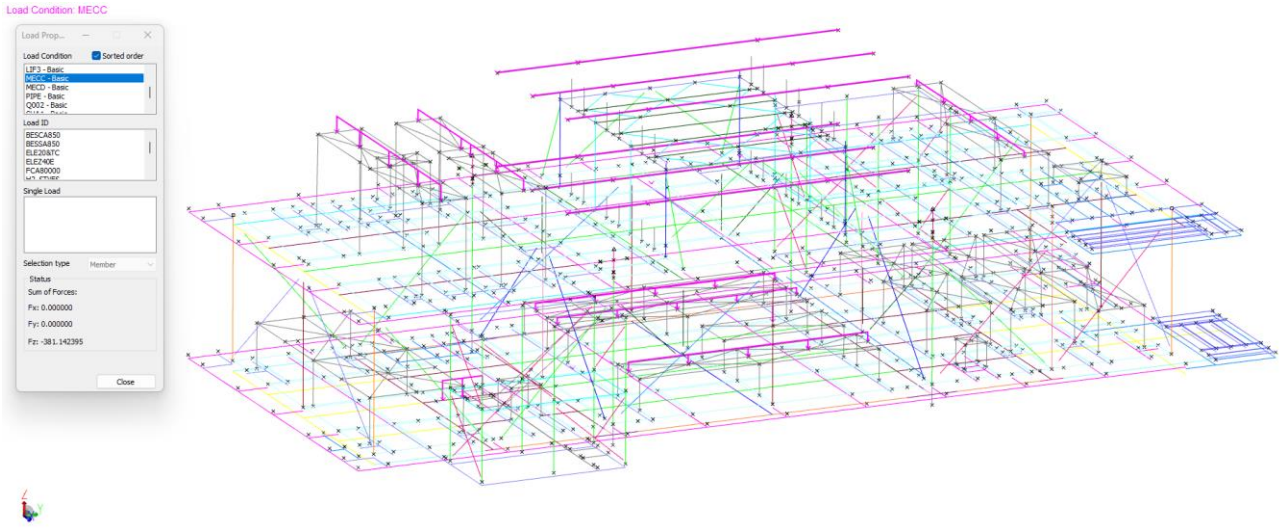


Figure 11.11 – Topside basic load conditions MECC

11.2.2 Variable Actions Basic Load Combination

Variable actions basic load cases have been combined in load combination.

Variable Loads Basic Load Combination Q002		
Basic Load cases	Description	Load Factors
MECC	EQUIPMENT CONTENT LOADS (CONT EXCL)	1.120

Following excerpt of SACS output details the basic load cases and combinations accounting for variable loads.

```
                                          ************* 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)

   6   MECC          0.00                                    0.00                                  -381.14     0.20     -4.61     30.19
  18   Q002          0.00                                    0.00                                  -426.88     0.20     -4.61     30.19
```

11.3 WCR – STRUCTURAL MODEL COMPARISON

Load combination STAT includes permanent and maximum variable loads and is defined as per following table and SACS excerpt for WCR cross check.

WCR Comparison - Load Combination STAT		
Basic Load cases	Description	Load Factors
G001	BLPH TOPSIDES PERMANENT LOADS	1.000
Q002	BLPH TOPSIDES VARIABLE LOADS	1.000

```
                                    ************* 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)

   19  STAT         0.00                                   0.00                                -18539.78     0.02      0.00     29.21
```

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

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

COG NOMINAL POSITION			
CASE	**x [m]**	**y [m]**	**z [m]**
COG_SACS (lcomb STAT)	0.02	0.00	29.21
COG_WCR	-0.10	-0.30	29.30
Δ	-0.08	-0.30	-0.09
Topside Main Dimension	16.00	40.00	17.66
Δ (%)	0.5%	0.8%	0.5%

Table 11.6 – SACS-WCR CoG comparison

After this comparison the modelled structure has been shifted from the Z elevation of the platform in service, to the elevation of topside on barge, e.g. LD from +23.310m LAT to +3.50m from barge deck.

Dedicated load combination TWTR (topside weight in transportation) was generated after shifting the structure for clarity as a copy of STAT combination but showing updated Z of CoG..

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11.4 TRANSIENT LOADS

Transient action considered for the transportation includes:

- Wind loads (1yr wind 5 sec gusts at platform location);
- Inertia forces coming from the motion criteria, defined in DNV, ref. /10/, for unrestricted world-wide tows.

11.4.1 Wind loads

Transportation wind loads have been computed considering 1-year return period, according to design data reported in sec.7, Structural Design Premises, Ref./20/ and requirements of ISO 19902, Ref. /6/. The 3 s gust wind speed has been conservatively considered for maximum quasi-static global actions on structures. A shape coefficient Cs=1 has been considered for overall projected area of structures in global In-service analyses. Wind forces have been applied at main structural joints of Topside and in correspondence of dummy elements simulating main equipment above upper deck, if subjected to wind loads. Wind forces have been split 50% for upwind and 50% for downwind areas. Since wind loads are assumed concurrent with transportation inertial loads, four load conditions have been defined for wind loads, considering positive and negative X and Y directions (WTPX, WTNX, WTPY and WTNY)

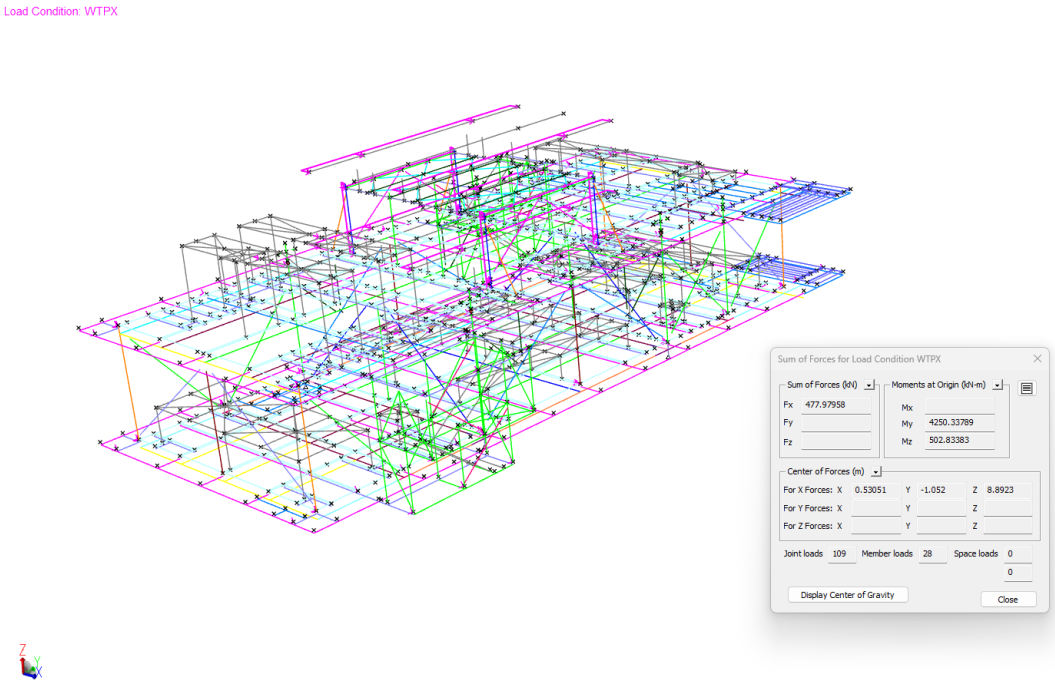
Operating Wind Global forces X direction (Positive / Negative)									
Load Condition	**Location**	**Descr.**	**L [m]**	**H [m]**	**N**	**A [m2]**	**max el.**	**p [kN/m2]**	**F [kN]**
WTPX	BETWEEN DECKS	walkways	1.5	1.5	1	2.25	10	0.70	1.6
		center	32.8	7	1	229.60	10	0.70	160.6
		laydown	4.5	1.5	1	6.75	10	0.70	4.7
	ABOVE UPPER DECK	walkways	1.5	1.5	2	4.50	15	0.70	3.1
		center	14	1.5	1	21.00	15	0.70	14.7
		fuel cell	3	6.4	1	19.20	15	0.70	13.4
		Pau	16	8	1	128.00	15	0.70	89.5
		Elogen	7	9	1	63.00	15	0.70	44.1
		Crane	10	7	1	70.00	15	0.70	49.0
	STAIRS	stairs	7.2	3.5	1	25.20	12	0.70	17.6
	PAU	(from AUTOCAD propmass area)				102.07	15	0.77	78.6
							TOT		**476.9**

Operating Wind Global Forces Y direction (Positive / Negative)									
Load Condition	**Location**	**Descr.**	**L [m]**	**H [m]**	**N**	**A [m2]**	**max el.**	**p [kN/m2]**	**F [kN]**
WTPY	BETWEEN DECKS	walkways	1.64	1.5	2	4.92	10	0.70	3.44
		center	16	7	1	112.00	10	0.70	78.32
	ABOVE UPPER DECK	walkways	1.64	1.5	2	4.92	15	0.70	3.44
		center	16	6.4	1	102.40	15	0.70	71.61
		laydown	3	1.5	1	4.50	15	0.70	3.15
		Crane	3	7	1	21.00	15	0.70	14.7
	STAIRS	stairs	3.6	3.5	2	25.20	12	0.70	17.62
		stairs	3.6	1.5	2	10.80	12	0.70	7.55
	PAU	(from AUTOCAD propmass area)				144.00	15	0.77	110.88
							TOT		**310.7**

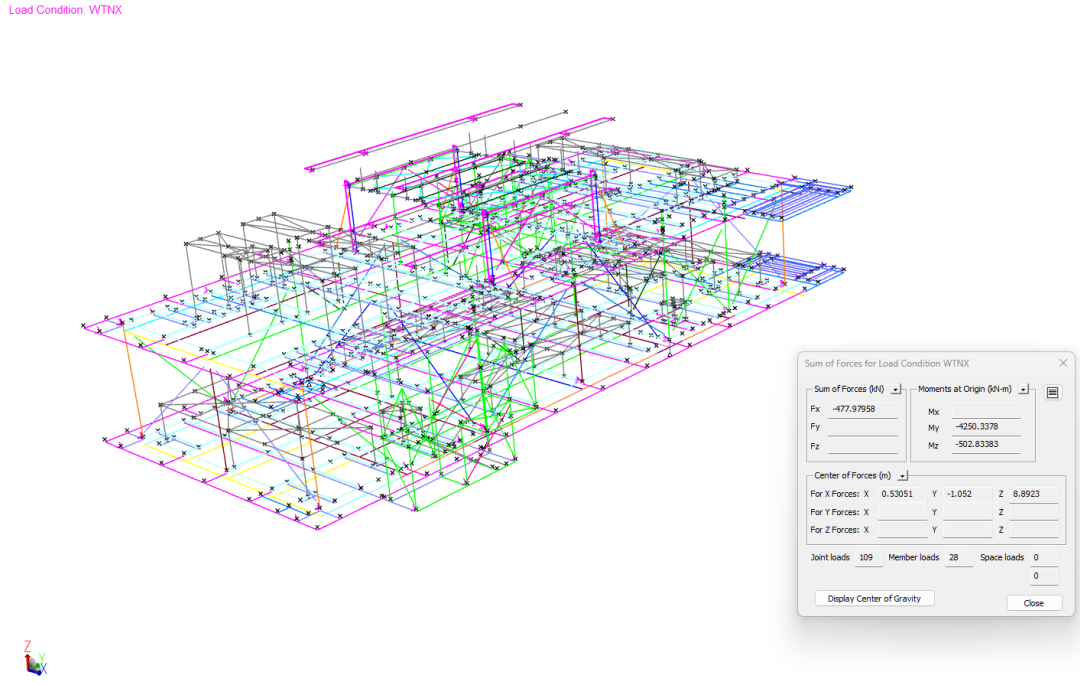
Table 11.7- 1-year wind force

The four load cases are reported in following figures.

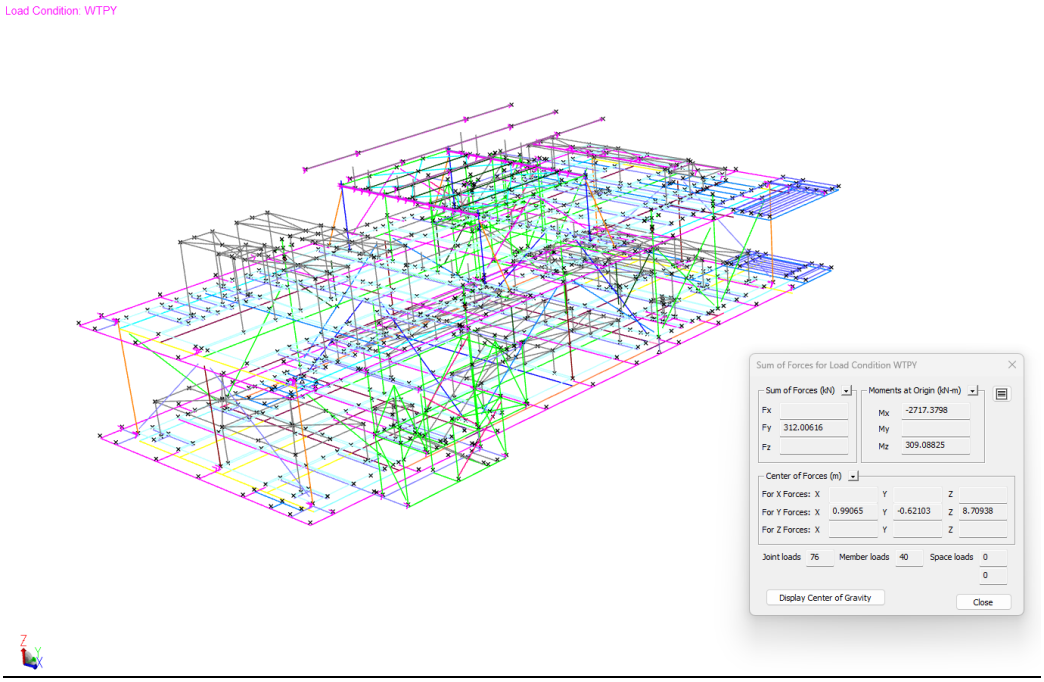
- Load condition WTPX: Transportation Wind Loads Positive X direction



- Load condition WTNX: Transportation Wind Loads Negative X direction



- Load condition WTPY: Transportation Wind Loads Positive Y direction



- Load condition WTNY: Transportation Wind Loads Negative Y direction

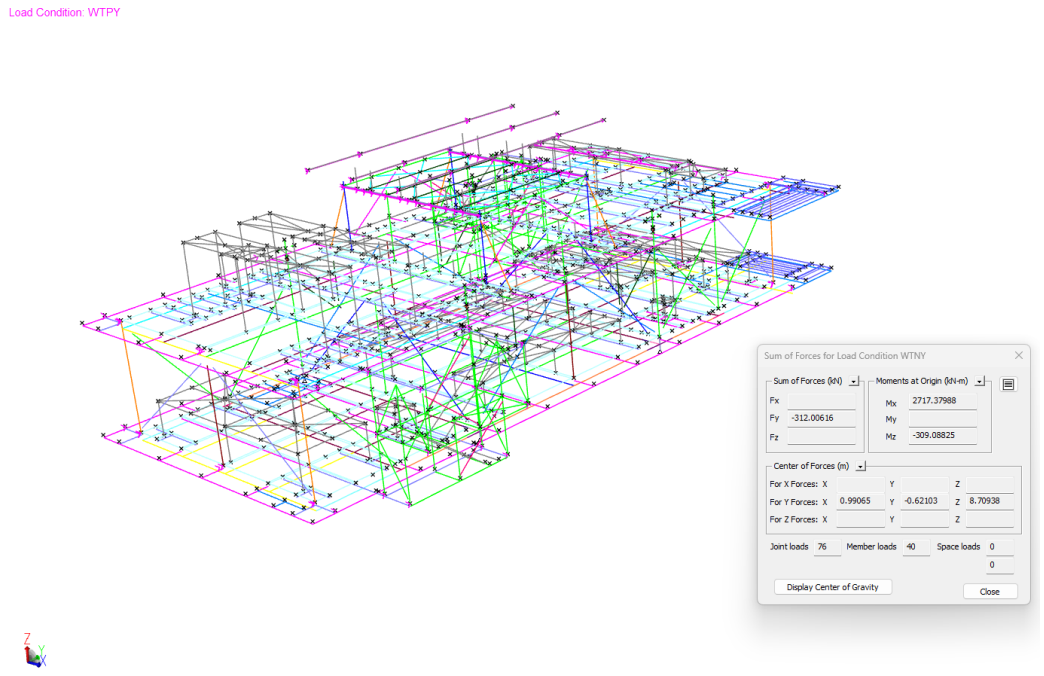


Figure 11.12 -Wind Load Basic Conditions

***** SEASTATE COMBINED LOAD CASE SUMMARY *****
RELATIVE TO MUDLINE ELEVATION

LOAD CASE	LOAD LABEL	FX (KN)	FY (KN)	FZ (KN)	MX (KN-M)	MY (KN-M)	MZ (KN-M)
22	WTPX	477.98	0.00	0.00	0.0	4250.3	502.8
23	WTNX	-477.98	0.00	0.00	0.0	-4250.3	-502.8
24	WTPY	0.00	312.01	0.00	-2717.4	0.0	309.1
25	WTNY	0.00	-312.01	0.00	2717.4	0.0	-309.1

11.4.2 Inertial Forces

The complete set of towing forces include all the motion effects on the structure. Inertia forces are generated considering the motion criteria defined in the DNV criteria for weather unrestricted, Ref. /10/, according to design data reported in Sec.7 and Structural Design Premises, Ref./20/.

The dynamic forces, due to the rotations around the roll and pitch axes (respectively global Y and X structural model), are automatically generated by the TOW module of SACS software package, by processing the overall transported weight (load combination TWTR).

The centre of rotation is assumed to be at the centre of the barge and eight (8) basic combinations of inertia loads are considered in the design (± P ± H and ± R ± H).

The following Table is an excerpt of the SACS output and reports the barge accelerations and the resultant dynamic forces for each generated load case considered in the analysis.

* * * D Y N A M I C L O A D I N G S U M M A T I O N * * *
(MOMENTS ABOUT CENTER OF GRAVITY)
(NOTE: ASTERISK BY LOAD CASE ID INDICATES STRUCTURAL WEIGHT EXCLUDED)

LOAD CASE	* JACKET POSITION * PITCH X	ROLL Y	YAW Z	** ANGULAR ACCEL ** PITCH X	ROLL Y	YAW Z	*** TRANS ACCEL *** SWAY X	SURGE Y	HEAVE Z	**** FORCE SUMMATION **** SWAY X	SURGE Y	HEAVE Z	***** MOMENT SUMMATION ***** PITCH X	ROLL Y	YAW Z
	(DEG)			(DEG/SEC**2)			(G)			(KN)			(KN-M)		
CHCK*	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.000	1.000	0.0	0.0	-18546.8	20592.0	-7350.6	0.0
+R+H*	0.0	0.0	0.0	0.0	-7.9	0.0	-0.410	0.000	0.128	11237.9	0.0	-1757.7	2834.3	33715.0	14579.5
+R-H*	0.0	0.0	0.0	0.0	-7.9	0.0	-0.274	0.000	-0.248	8700.6	0.0	5213.6	-4905.8	31437.5	11762.4
-R+H*	0.0	0.0	0.0	0.0	7.9	0.0	0.410	0.000	0.128	-11237.9	0.0	-2976.6	2422.1	-35591.6	-14579.5
-R-H*	0.0	0.0	0.0	0.0	7.9	0.0	0.274	0.000	-0.248	-8700.6	0.0	3994.7	-5318.0	-27788.1	-11762.4
+P+H*	0.0	0.0	0.0	-4.9	0.0	0.0	0.000	0.260	0.172	0.0	-7083.3	-859.5	39567.5	211.1	2668.8
+P-H*	0.0	0.0	0.0	-4.9	0.0	0.0	0.000	0.173	-0.219	0.0	-5477.6	6383.4	28336.0	3081.6	2032.4
-P+H*	0.0	0.0	0.0	4.9	0.0	0.0	0.000	-0.260	0.172	0.0	7083.3	-5504.1	-32502.3	-2733.2	-2668.8
-P-H*	0.0	0.0	0.0	4.9	0.0	0.0	0.000	-0.173	-0.219	0.0	5477.6	1738.7	-37353.8	137.4	-2032.4

Table 11.8- Transportation Load Combinations – Inertia Forces

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12 LOAD COMBINATIONS

12.1 TRANSPORTATION LOAD COMBINATIONS

Basic Load cases and load combinations, detailed in chapter 11, have been combined together to define the design Load Combinations to be used in the transportation analysis, according to Partial Action Factor as per sec. 9.4.1.

12.2 DESIGN LOAD COMBINATIONS

A total of 48 load combinations, according to ISO 19902 Transportation Design Situations, have been defined as per the following tables.

TRANSPORTATION LOAD COMBINATIONS - DESIGN SITUATION 1													
LOAD COMB.	LOAD CASES												
	TWTR	+P+H	+P-H	-P+H	-P-H	+R+H	+R-H	-R+H	-R-H	WTPX	WTNX	WTPY	WTNY
C101	1.30	1.00										1.00	
C102	1.30	1.00											1.00
C103	1.30		1.00									1.00	
C104	1.30		1.00										1.00
C105	1.30			1.00								1.00	
C106	1.30			1.00									1.00
C107	1.30				1.00							1.00	
C108	1.30				1.00								1.00
C109	1.30					1.00				1.00			
C110	1.30					1.00					1.00		
C111	1.30						1.00			1.00			
C112	1.30						1.00				1.00		
C113	1.30							1.00		1.00			
C114	1.30							1.00			1.00		
C115	1.30								1.00	1.00			
C116	1.30								1.00		1.00		

Table 12.1- Transportation Load Combinations – Design situation 1

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TRANSPORTATION LOAD COMBINATIONS - DESIGN SITUATION 2													
LOAD COMB.	LOAD CASES												
	TWTR	+P+H	+P-H	-P+H	-P-H	+R+H	+R-H	-R+H	-R-H	WTPX	WTNX	WTPY	WTNY
C201	1.10	1.35										1.35	
C202	1.10	1.35											1.35
C203	1.10		1.35									1.35	
C204	1.10		1.35										1.35
C205	1.10			1.35								1.35	
C206	1.10			1.35									1.35
C207	1.10				1.35							1.35	
C208	1.10				1.35								1.35
C209	1.10					1.35				1.35			
C210	1.10					1.35					1.35		
C211	1.10						1.35			1.35			
C212	1.10						1.35				1.35		
C213	1.10							1.35		1.35			
C214	1.10							1.35			1.35		
C215	1.10								1.35	1.35			
C216	1.10								1.35		1.35		

Table 12.2 - Transportation Load Combinations – Design situation 2

TRANSPORTATION LOAD COMBINATIONS - DESIGN SITUATION 3													
LOAD COMB.	LOAD CASES												
	TWTR	+P+H	+P-H	-P+H	-P-H	+R+H	+R-H	-R+H	-R-H	WTPX	WTNX	WTPY	WTNY
C301	0.90	1.35										1.35	
C302	0.90	1.35											1.35
C303	0.90		1.35									1.35	
C304	0.90		1.35										1.35
C305	0.90			1.35								1.35	
C306	0.90			1.35									1.35
C307	0.90				1.35							1.35	
C308	0.90				1.35								1.35
C309	0.90					1.35				1.35			
C310	0.90					1.35					1.35		
C311	0.90						1.35			1.35			
C312	0.90						1.35				1.35		
C313	0.90							1.35		1.35			
C314	0.90							1.35			1.35		
C315	0.90								1.35	1.35			
C316	0.90								1.35		1.35		

Table 12.3 - Transportation Load Combinations – Design situation 3

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12.3 LOAD COMBINATIONS SUMMARY

Following excerpt from SACS output provide the Load Combinations resultants.

FORCES AND MOMENTS SUMMARY
*** MOMENTS SUMMED ABOUT ORIGIN ***

LOAD CASE	FORCE(X)	FORCE(Y)	FORCE(Z)	MOMENT(X)	MOMENT(Y)	MOMENT(Z)
	********** KN **********			********** KN-M **********		
C101	0.000	6771.274	24970.211	-81220.820	-852.142	-89.790
C102	0.000	7395.287	24970.211	-86655.570	-852.132	528.388
C103	0.000	5165.568	17727.373	-67763.867	-769.524	-108.093
C104	0.000	5789.580	17727.373	-73198.617	-769.529	510.086
C105	0.000	-7395.285	29614.859	87070.352	198.370	-528.378
C106	0.000	-6771.272	29614.859	81635.594	198.362	89.801
C107	0.000	-5789.585	22372.027	73511.703	280.958	-510.069
C108	0.000	-5165.573	22372.027	68076.984	280.963	108.109
C109	-11715.898	-0.000	25868.398	-685.431	-111185.453	-2526.200
C110	-10759.940	0.000	25868.398	-685.430	-102684.781	-1520.529
C111	-9178.552	-0.000	18897.111	-734.396	-89760.930	-2544.006
C112	-8222.593	0.000	18897.111	-734.403	-81260.281	-1538.328
C113	10759.896	-0.000	27087.387	1088.679	102049.016	1520.872
C114	11715.854	0.000	27087.387	1088.660	110549.656	2526.551
C115	8222.633	-0.000	20116.100	1039.725	80784.664	1538.360
C116	9178.590	-0.000	20116.098	1039.720	89285.312	2544.035
C201	0.000	9141.220	21561.678	-109741.344	-1003.959	-121.217
C202	0.000	9983.638	21561.678	-117078.258	-1003.958	713.326
C203	-0.000	6973.518	11783.846	-91574.453	-892.433	-145.922
C204	-0.000	7815.934	11783.846	-98911.359	-892.432	688.621
C205	0.000	-9983.634	27831.947	117451.734	414.211	-713.315
C206	0.000	-9141.218	27831.953	110114.852	414.219	121.232
C207	0.000	-7815.940	18054.131	99147.594	525.720	-688.594
C208	-0.000	-6973.524	18054.131	91810.672	525.723	145.948
C209	-15816.464	0.000	22774.230	-1018.564	-149953.953	-3410.377
C210	-14525.920	0.000	22774.229	-1018.565	-138478.078	-2052.714
C211	-12391.043	-0.000	13362.989	-1084.659	-121030.812	-3434.409
C212	-11100.501	0.000	13362.989	-1084.660	-109554.930	-2076.747
C213	14525.859	0.000	24419.863	1376.482	137912.594	2053.181
C214	15816.402	0.000	24419.865	1376.478	149388.453	3410.852
C215	11100.555	0.000	15008.625	1310.400	109205.711	2076.786
C216	12391.097	0.000	15008.625	1310.404	120681.594	3434.444
C301	0.000	9141.220	17852.328	-109769.797	-959.253	-121.217
C302	0.000	9983.638	17852.328	-117106.719	-959.259	713.326
C303	-0.000	6973.518	8074.498	-91602.914	-847.734	-145.922
C304	-0.000	7815.934	8074.498	-98939.820	-847.737	688.621
C305	0.000	-9983.634	24122.604	117423.273	458.902	-713.315
C306	0.000	-9141.218	24122.602	110086.367	458.912	121.232
C307	0.000	-7815.940	14344.782	99119.133	570.425	-688.594
C308	-0.000	-6973.524	14344.782	91782.211	570.426	145.948
C309	-15816.464	0.000	19064.881	-1047.016	-149909.219	-3410.377
C310	-14525.920	0.000	19064.881	-1047.010	-138433.359	-2052.714
C311	-12391.043	-0.000	9653.643	-1113.123	-120986.102	-3434.409
C312	-11100.501	0.000	9653.644	-1113.128	-109510.234	-2076.747
C313	14525.859	0.000	20710.516	1348.006	137957.281	2053.181
C314	15816.402	0.000	20710.516	1348.009	149433.156	3410.852
C315	11100.555	0.000	11299.277	1281.943	109250.430	2076.786
C316	12391.097	0.000	11299.278	1281.943	120726.320	3434.444

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13 ANALYSIS RESULTS

This section presents the results of the performed Transportation analysis in terms of:

- Reaction forces;
- Structural checks of members;
- Structural checks of tubular connections.

13.1 REACTION FORCES

Maximum joint reactions at Topside support are reported in the following paragraphs for the two preliminary analyses (STEP 1 and 2) and final Transportation configuration (STEP 3).

13.1.1 Reaction Forces due to Transportation Topside weight only (STEP 1)

SACS-IV SYSTEM FIXED JOINTS REACTION FORCES AND MOMENTS

JOINT NUMBER	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
TU01	TWTR	0.000	0.000	4540.299	0.000	0.000	0.000
TU02	TWTR	0.000	-0.000	4724.173	0.000	0.000	0.000
TU03	TWTR	0.000	0.000	4563.165	0.000	0.000	0.000
TU04	TWTR	0.000	0.000	4719.097	0.000	0.000	0.000

13.1.2 Reaction Forces due Transportation Transient Loads only (STEP 2)

SACS-IV SYSTEM FIXED JOINTS REACTION FORCES AND MOMENTS

JOINT NUMBER	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
TU01	+R+H	-2700.440	410.461	-2509.498	0.000	0.000	0.000
	+R-H	-2520.227	519.081	-3638.047	0.000	0.000	0.000
	-R+H	3004.745	-549.905	3669.219	0.000	0.000	0.000
	-R-H	1928.343	-247.874	1382.356	0.000	0.000	0.000
	+P+H	207.629	1655.315	2478.057	0.000	0.000	0.000
	+P-H	-268.595	1486.492	355.508	0.000	0.000	0.000
	-P+H	201.410	-1842.739	-919.209	0.000	0.000	0.000
	-P-H	-253.481	-1247.278	-2345.142	0.000	0.000	0.000
TU02	+R+H	-2938.445	-555.080	3442.723	0.000	0.000	0.000
	+R-H	-1864.604	-171.334	1088.690	0.000	0.000	0.000
	-R+H	2637.804	361.521	-2237.380	0.000	0.000	0.000
	-R-H	2449.354	547.824	-3433.102	0.000	0.000	0.000
	+P+H	-190.112	1668.165	2545.329	0.000	0.000	0.000
	+P-H	278.882	1578.651	355.931	0.000	0.000	0.000
	-P+H	-213.984	-1928.346	-925.191	0.000	0.000	0.000
	-P-H	236.884	-1246.573	-2423.791	0.000	0.000	0.000
TU03	+R+H	-2868.110	448.544	3047.843	0.000	0.000	0.000
	+R-H	-1848.006	78.305	815.074	0.000	0.000	0.000
	-R+H	2605.701	-258.651	-1882.638	0.000	0.000	0.000
	-R-H	2358.378	-447.641	-3081.405	0.000	0.000	0.000
	+P+H	87.226	1869.664	-2080.503	0.000	0.000	0.000
	+P-H	476.171	1162.412	-3517.687	0.000	0.000	0.000
	-P+H	-439.920	-1614.425	3646.685	0.000	0.000	0.000
	-P-H	-26.011	-1488.182	1518.706	0.000	0.000	0.000
TU04	+R+H	-2730.925	-303.925	-2223.423	0.000	0.000	0.000
	+R-H	-2467.735	-426.052	-3479.358	0.000	0.000	0.000
	-R+H	2989.624	447.036	3427.434	0.000	0.000	0.000

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-R-H	1964.536	147.691	1137.497	0.000	0.000	0.000
+P+H	-104.744	1890.137	-2083.423	0.000	0.000	0.000
+P-H	-486.457	1250.019	-3577.130	0.000	0.000	0.000
-P+H	452.493	-1697.768	3701.822	0.000	0.000	0.000
-P-H	42.608	-1495.547	1511.503	0.000	0.000	0.000

13.1.3 Combined Reaction Forces in Transportation Conditions (STEP 3)

The table reports the summary of the actions obtained in STEP 1 and STEP 2 combined with the load factors explained n section 12.

SACS-IV SYSTEM FIXED JOINTS REACTION FORCES AND MOMENTS

JOINT NUMBER	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
TU01	C101	204.642	1586.909	8309.040	0.000	0.000	0.000
	C102	210.617	1723.721	8451.850	0.000	0.000	0.000
	C103	-271.583	1418.086	6186.492	0.000	0.000	0.000
	C104	-265.608	1554.898	6329.301	0.000	0.000	0.000
	C105	198.423	-1911.145	4911.775	0.000	0.000	0.000
	C106	204.398	-1774.333	5054.584	0.000	0.000	0.000
	C107	-256.468	-1315.684	3485.842	0.000	0.000	0.000
	C108	-250.493	-1178.872	3628.651	0.000	0.000	0.000
	C109	-2826.596	438.311	3271.288	0.000	0.000	0.000
	C110	-2574.284	382.611	3514.492	0.000	0.000	0.000
	C111	-2646.384	546.931	2142.739	0.000	0.000	0.000
	C112	-2394.072	491.230	2385.943	0.000	0.000	0.000
	C113	2878.589	-522.055	9450.005	0.000	0.000	0.000
	C114	3130.901	-577.756	9693.210	0.000	0.000	0.000
	C115	1802.187	-220.024	7163.142	0.000	0.000	0.000
	C116	2054.499	-275.725	7406.346	0.000	0.000	0.000
	C201	276.267	2142.327	8243.309	0.000	0.000	0.000
	C202	284.332	2327.023	8436.103	0.000	0.000	0.000
	C203	-366.636	1914.416	5377.869	0.000	0.000	0.000
	C204	-358.571	2099.112	5570.662	0.000	0.000	0.000
	C205	267.871	-2580.046	3657.000	0.000	0.000	0.000
	C206	275.937	-2395.350	3849.793	0.000	0.000	0.000
	C207	-346.232	-1776.174	1731.991	0.000	0.000	0.000
	C208	-338.166	-1591.477	1924.784	0.000	0.000	0.000
	C209	-3815.905	591.720	1442.344	0.000	0.000	0.000
	C210	-3475.284	516.524	1770.670	0.000	0.000	0.000
	C211	-3572.618	738.357	-81.197	0.000	0.000	0.000
	C212	-3231.997	663.161	247.128	0.000	0.000	0.000
	C213	3886.096	-704.775	9783.612	0.000	0.000	0.000
	C214	4226.717	-779.970	10111.938	0.000	0.000	0.000
	C215	2432.953	-297.033	6696.347	0.000	0.000	0.000
	C216	2773.574	-372.228	7024.672	0.000	0.000	0.000
	C301	276.267	2142.327	7335.249	0.000	0.000	0.000
	C302	284.332	2327.023	7528.042	0.000	0.000	0.000
	C303	-366.636	1914.416	4469.809	0.000	0.000	0.000
	C304	-358.571	2099.112	4662.602	0.000	0.000	0.000
	C305	267.871	-2580.046	2748.940	0.000	0.000	0.000
	C306	275.937	-2395.350	2941.733	0.000	0.000	0.000
	C307	-346.232	-1776.174	823.931	0.000	0.000	0.000
	C308	-338.166	-1591.477	1016.724	0.000	0.000	0.000
	C309	-3815.905	591.720	534.284	0.000	0.000	0.000
	C310	-3475.284	516.524	862.609	0.000	0.000	0.000
	C311	-3572.618	738.357	-989.257	0.000	0.000	0.000
	C312	-3231.997	663.161	-660.932	0.000	0.000	0.000
	C313	3886.096	-704.775	8875.553	0.000	0.000	0.000
	C314	4226.717	-779.970	9203.877	0.000	0.000	0.000
	C315	2432.953	-297.033	5788.287	0.000	0.000	0.000
	C316	2773.574	-372.228	6116.612	0.000	0.000	0.000
TU02	C101	-193.188	1585.109	8617.572	0.000	0.000	0.000
	C102	-187.036	1751.220	8755.935	0.000	0.000	0.000
	C103	275.806	1495.595	6428.175	0.000	0.000	0.000
	C104	281.958	1661.706	6566.537	0.000	0.000	0.000
	C105	-217.060	-2011.401	5147.052	0.000	0.000	0.000
	C106	-210.908	-1845.291	5285.415	0.000	0.000	0.000
	C107	233.808	-1329.628	3648.453	0.000	0.000	0.000
	C108	239.960	-1163.517	3786.815	0.000	0.000	0.000
	C109	-3065.312	-582.435	9705.751	0.000	0.000	0.000

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	C110	-2811.578	-527.725	9462.546	0.000	0.000	0.000
	C111	-1991.471	-198.688	7351.716	0.000	0.000	0.000
	C112	-1737.737	-143.979	7108.512	0.000	0.000	0.000
	C113	2510.937	334.166	4025.646	0.000	0.000	0.000
	C114	2764.672	388.875	3782.443	0.000	0.000	0.000
	C115	2322.487	520.470	2829.924	0.000	0.000	0.000
	C116	2576.221	575.179	2586.720	0.000	0.000	0.000
	C201	-260.803	2139.897	8539.391	0.000	0.000	0.000
	C202	-252.498	2364.147	8726.180	0.000	0.000	0.000
	C203	372.338	2019.054	5583.704	0.000	0.000	0.000
	C204	380.643	2243.303	5770.492	0.000	0.000	0.000
	C205	-293.031	-2715.392	3854.188	0.000	0.000	0.000
	C206	-284.726	-2491.143	4040.977	0.000	0.000	0.000
	C207	315.641	-1794.998	1831.079	0.000	0.000	0.000
	C208	323.946	-1570.748	2017.868	0.000	0.000	0.000
	C209	-4138.171	-786.287	10008.431	0.000	0.000	0.000
	C210	-3795.630	-712.429	9680.105	0.000	0.000	0.000
	C211	-2688.486	-268.229	6830.484	0.000	0.000	0.000
	C212	-2345.944	-194.371	6502.158	0.000	0.000	0.000
	C213	3389.765	451.124	2340.290	0.000	0.000	0.000
	C214	3732.307	524.982	2011.965	0.000	0.000	0.000
	C215	3135.357	702.634	726.065	0.000	0.000	0.000
	C216	3477.898	776.492	397.740	0.000	0.000	0.000
	C301	-260.803	2139.897	7594.556	0.000	0.000	0.000
	C302	-252.498	2364.147	7781.344	0.000	0.000	0.000
	C303	372.338	2019.054	4638.869	0.000	0.000	0.000
	C304	380.643	2243.303	4825.657	0.000	0.000	0.000
	C305	-293.031	-2715.392	2909.353	0.000	0.000	0.000
	C306	-284.726	-2491.143	3096.142	0.000	0.000	0.000
	C307	315.641	-1794.998	886.244	0.000	0.000	0.000
	C308	323.946	-1570.748	1073.032	0.000	0.000	0.000
	C309	-4138.171	-786.287	9063.595	0.000	0.000	0.000
	C310	-3795.630	-712.429	8735.270	0.000	0.000	0.000
	C311	-2688.486	-268.229	5885.649	0.000	0.000	0.000
	C312	-2345.944	-194.371	5557.324	0.000	0.000	0.000
	C313	3389.765	451.124	1395.455	0.000	0.000	0.000
	C314	3732.307	524.982	1067.130	0.000	0.000	0.000
	C315	3135.357	702.634	-218.770	0.000	0.000	0.000
	C316	3477.898	776.492	-547.095	0.000	0.000	0.000
TU03	C101	89.230	1783.461	3920.791	0.000	0.000	0.000
	C102	85.222	1955.867	3782.429	0.000	0.000	0.000
	C103	478.174	1076.210	2483.607	0.000	0.000	0.000
	C104	474.167	1248.615	2345.245	0.000	0.000	0.000
	C105	-437.916	-1700.628	9647.979	0.000	0.000	0.000
	C106	-441.923	-1528.222	9509.617	0.000	0.000	0.000
	C107	-24.008	-1574.385	7520.001	0.000	0.000	0.000
	C108	-28.015	-1401.980	7381.639	0.000	0.000	0.000
	C109	-2980.530	458.506	9079.190	0.000	0.000	0.000
	C110	-2755.689	438.583	8880.724	0.000	0.000	0.000
	C111	-1960.427	88.267	6846.421	0.000	0.000	0.000
	C112	-1735.586	68.344	6647.954	0.000	0.000	0.000
	C113	2493.280	-248.690	4148.709	0.000	0.000	0.000
	C114	2718.121	-268.612	3950.242	0.000	0.000	0.000
	C115	2245.958	-437.680	2949.943	0.000	0.000	0.000
	C116	2470.798	-457.602	2751.476	0.000	0.000	0.000
	C201	120.460	2407.673	2304.195	0.000	0.000	0.000
	C202	115.050	2640.420	2117.407	0.000	0.000	0.000
	C203	645.535	1452.883	363.997	0.000	0.000	0.000
	C204	640.126	1685.630	177.208	0.000	0.000	0.000
	C205	-591.187	-2295.847	10035.898	0.000	0.000	0.000
	C206	-596.596	-2063.100	9849.110	0.000	0.000	0.000
	C207	-32.410	-2125.419	7163.128	0.000	0.000	0.000
	C208	-37.820	-1892.672	6976.340	0.000	0.000	0.000
	C209	-4023.716	618.983	9268.033	0.000	0.000	0.000
	C210	-3720.181	592.088	9000.104	0.000	0.000	0.000
	C211	-2646.576	119.160	6253.795	0.000	0.000	0.000
	C212	-2343.041	92.265	5985.865	0.000	0.000	0.000
	C213	3365.929	-335.731	2611.884	0.000	0.000	0.000
	C214	3669.463	-362.626	2343.954	0.000	0.000	0.000
	C215	3032.043	-590.867	993.550	0.000	0.000	0.000
	C216	3335.578	-617.763	725.620	0.000	0.000	0.000
	C301	120.460	2407.673	1391.562	0.000	0.000	0.000
	C302	115.050	2640.420	1204.774	0.000	0.000	0.000
	C303	645.535	1452.883	-548.636	0.000	0.000	0.000
	C304	640.126	1685.630	-735.425	0.000	0.000	0.000
	C305	-591.187	-2295.847	9123.267	0.000	0.000	0.000
	C306	-596.596	-2063.100	8936.478	0.000	0.000	0.000
	C307	-32.410	-2125.419	6250.496	0.000	0.000	0.000
	C308	-37.820	-1892.672	6063.707	0.000	0.000	0.000

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	C309	-4023.716	618.983	8355.401	0.000	0.000	0.000
	C310	-3720.181	592.088	8087.471	0.000	0.000	0.000
	C311	-2646.576	119.160	5341.163	0.000	0.000	0.000
	C312	-2343.041	92.265	5073.232	0.000	0.000	0.000
	C313	3365.929	-335.731	1699.251	0.000	0.000	0.000
	C314	3669.463	-362.626	1431.321	0.000	0.000	0.000
	C315	3032.043	-590.867	80.917	0.000	0.000	0.000
	C316	3335.578	-617.763	-187.013	0.000	0.000	0.000
TU04	C101	-100.684	1815.795	4122.807	0.000	0.000	0.000
	C102	-108.803	1964.479	3979.997	0.000	0.000	0.000
	C103	-482.398	1175.677	2629.099	0.000	0.000	0.000
	C104	-490.517	1324.362	2486.289	0.000	0.000	0.000
	C105	456.553	-1772.110	9908.053	0.000	0.000	0.000
	C106	448.434	-1623.426	9765.242	0.000	0.000	0.000
	C107	46.667	-1569.889	7717.732	0.000	0.000	0.000
	C108	38.548	-1421.204	7574.923	0.000	0.000	0.000
	C109	-2843.460	-314.382	3812.169	0.000	0.000	0.000
	C110	-2618.390	-293.469	4010.636	0.000	0.000	0.000
	C111	-2580.270	-436.509	2556.234	0.000	0.000	0.000
	C112	-2355.199	-415.596	2754.701	0.000	0.000	0.000
	C113	2877.089	436.579	9463.026	0.000	0.000	0.000
	C114	3102.160	457.492	9661.493	0.000	0.000	0.000
	C115	1852.001	137.234	7173.089	0.000	0.000	0.000
	C116	2077.072	158.148	7371.556	0.000	0.000	0.000
	C201	-135.923	2451.323	2474.782	0.000	0.000	0.000
	C202	-146.885	2652.047	2281.989	0.000	0.000	0.000
	C203	-651.237	1587.164	458.277	0.000	0.000	0.000
	C204	-662.198	1787.888	265.484	0.000	0.000	0.000
	C205	616.347	-2392.349	10284.863	0.000	0.000	0.000
	C206	605.385	-2191.625	10092.070	0.000	0.000	0.000
	C207	63.001	-2119.350	7327.932	0.000	0.000	0.000
	C208	52.039	-1918.626	7135.139	0.000	0.000	0.000
	C209	-3838.672	-424.416	2055.421	0.000	0.000	0.000
	C210	-3534.826	-396.183	2323.351	0.000	0.000	0.000
	C211	-3483.365	-589.287	359.909	0.000	0.000	0.000
	C212	-3179.519	-561.054	627.839	0.000	0.000	0.000
	C213	3884.070	589.382	9684.079	0.000	0.000	0.000
	C214	4187.915	617.615	9952.008	0.000	0.000	0.000
	C215	2500.201	185.266	6592.663	0.000	0.000	0.000
	C216	2804.046	213.499	6860.593	0.000	0.000	0.000
	C301	-135.923	2451.323	1530.962	0.000	0.000	0.000
	C302	-146.885	2652.047	1338.169	0.000	0.000	0.000
	C303	-651.237	1587.164	-485.543	0.000	0.000	0.000
	C304	-662.198	1787.888	-678.336	0.000	0.000	0.000
	C305	616.347	-2392.349	9341.043	0.000	0.000	0.000
	C306	605.385	-2191.625	9148.250	0.000	0.000	0.000
	C307	63.001	-2119.350	6384.112	0.000	0.000	0.000
	C308	52.039	-1918.626	6191.318	0.000	0.000	0.000
	C309	-3838.672	-424.416	1111.601	0.000	0.000	0.000
	C310	-3534.826	-396.183	1379.531	0.000	0.000	0.000
	C311	-3483.365	-589.287	-583.911	0.000	0.000	0.000
	C312	-3179.519	-561.054	-315.981	0.000	0.000	0.000
	C313	3884.070	589.382	8740.258	0.000	0.000	0.000
	C314	4187.915	617.615	9008.188	0.000	0.000	0.000
	C315	2500.201	185.266	5648.843	0.000	0.000	0.000
	C316	2804.046	213.499	5916.773	0.000	0.000	0.000

Table 13.1 - Reaction Forces in Transportation Conditions

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13.2 STRUCTURAL CHECKS

The results of the performed analysis in terms of members' Unity Check (UC) and Joints' Punching Shear Unity Checks are detailed in the following.

13.2.1 Member checks

All members were checked according to ISO 19902 and Eurocode 3, Ref./6/and /8/, respectively for tubular and non-tubular elements. Members' code checks are reported in the following and show that the structure can withstand Transportation load combinations, with utilization factors below 1.0.

The maximum UC value is equal to 0.958 on member LD04-L190 for load combination C202. Maximum member UC are reported in following SACS excerpt and figures.

SACS-IV MEMBER UNITY CHECK RANGE SUMMARY

GROUP II - UNITY CHECKS GREATER THAN 0.70 AND LESS THAN 0.90

MEMBER	GROUP ID	MAXIMUM COMBINED UNITY CK	LOAD COND NO.	DIST FROM END	AXIAL STRESS N/MM2	BENDING STRESS Y N/MM2	BENDING STRESS Z N/MM2	SHEAR FORCE FY KN	SHEAR FORCE FZ KN	KLY/RY	KLZ/RZ	SECOND-HIGHEST UNITY CHECK	SECOND-HIGHEST LOAD COND	THIRD-HIGHEST UNITY CHECK	THIRD-HIGHEST LOAD COND
L120-L184	B01	0.757	C205	2.0	-17.70	-107.34	4.82	6.89	-350.18	20.1	96.6	0.723	C206	0.711	C305
L121-L183	B01	0.767	C205	2.0	-30.60	-88.24	-10.22	-7.15	-283.78	20.1	96.6	0.732	C206	0.715	C305
L168-LD06	B01	0.712	C214	0.7	-64.86	-65.53	18.18	43.31	-257.49	15.1	72.5	0.688	C213	0.683	C114
L185-L104	B01	0.725	C202	0.0	-19.94	-96.45	11.39	-11.51	302.69	20.1	96.6	0.690	C201	0.681	C302
L190-L077	B01	0.783	C202	0.0	-27.34	-95.19	-10.48	8.18	283.27	20.1	96.6	0.746	C201	0.728	C302
L180-L014	B02	0.704	C105	2.0	-15.75	-115.08	16.78	11.24	-485.13	38.8	90.6	0.703	C205	0.699	C106
L181-L011	B02	0.870	C105	2.0	-20.28	-143.12	-14.21	-16.99	-564.64	38.8	90.6	0.866	C106	0.860	C205
L011-L040	B03	0.712	C105	0.0	-19.35	-185.44	-30.81	23.82	643.24	30.1	96.6	0.710	C106	0.693	C205
L230-L234	B04	0.775	C106	0.4	10.51	103.25	-17.12	-9.97	64.75	31.7	129.5	0.765	C105	0.752	C206
L234-L133	B04	0.777	C106	0.0	6.66	109.94	-22.94	25.45	-235.20	31.7	129.5	0.761	C105	0.756	C206
L255-L230	B04	0.735	C106	0.6	10.56	99.39	-7.60	-9.97	70.63	31.7	129.5	0.724	C105	0.713	C206
U006-U081	B12	0.815	C209	2.8	17.01	136.43	137.29	89.72	679.71	29.1	68.0	0.771	C309	0.767	C210
U127-U130	B12	0.736	C209	1.0	17.04	109.61	-163.71	-252.60	-483.83	29.1	68.0	0.696	C210	0.693	C309
U084-U171	B13	0.700	C214	1.0	9.66	122.23	-7.60	30.33	80.44	30.1	96.6	0.666	C213	0.660	C114
U006-U069	B14	0.746	C214	0.5	-31.92	-51.84	-71.79	11.96	-242.02	21.1	86.4	0.738	C114	0.730	C213
U068-U006	B14	0.765	C214	0.0	-39.24	-54.29	58.42	10.00	403.27	21.1	86.4	0.743	C213	0.742	C114
L005-L204	B22	0.803	C214	0.0	-43.13	-106.19	-2.71	9.92	4741.64	18.7	16.7	0.766	C213	0.748	C314
L015-L206	B22	0.756	C214	0.0	-42.08	-104.08	4.26	-14.64	4460.48	18.7	16.7	0.723	C213	0.705	C314
L203-L003	B22	0.792	C209	0.9	-43.04	-99.51	-3.84	-13.97	-4673.09	18.7	16.7	0.754	C210	0.736	C309
L003-LD04	B31	0.838	C202	0.0	-20.23	-106.52	34.33	-43.95	331.53	19.3	86.9	0.803	C201	0.787	C102
L005-LD05	B31	0.798	C202	0.0	-14.14	-112.69	-24.58	33.93	370.71	19.3	86.9	0.764	C201	0.738	C302
L521-L005	B31	0.704	C214	1.0	-50.19	-66.31	41.89	57.17	-281.60	14.5	65.2	0.679	C213	0.661	C114
LD01-L015	B31	0.810	C205	1.2	-12.70	-126.94	-28.72	-33.87	-433.50	19.3	86.9	0.780	C206	0.764	C105
LD02-L013	B31	0.804	C205	1.2	-22.94	-101.48	23.55	32.16	-337.07	19.3	86.9	0.770	C206	0.744	C305
L013-D006	D01	0.701	C205	0.0	-145.04	-93.76	43.99	-53.73	119.99	48.0	48.0	0.665	C305	0.664	C206
L015-D004	D01	0.760	C205	0.0	-137.18	-138.60	-48.82	61.53	192.31	48.0	48.0	0.723	C206	0.718	C305
L00B-Y000	IP3	0.779	C205	0.0	-0.50	-0.35	250.07	-60.18	39.16	26.3	12.7	0.770	C105	0.700	C305

U274-U287	S02	0.758	C205	1.1	-0.65	129.31	-184.18	-7.60	37.08	40.1	40.8	0.720	C305	0.656	C105
L193-L180	S04	0.731	C205	0.0	9.28	46.85	-103.99	35.54	-11.81	27.8	53.6	0.730	C206	0.710	C305
L195-L186	S04	0.706	C202	0.0	10.52	38.93	102.71	-35.41	-9.99	27.8	53.6	0.705	C201	0.685	C302
TU01-L005	TS1	0.727	C214	1.0	-105.74	-45.12	244.33	4220.40	-779.97	3.7	3.7	0.699	C314	0.683	C213
TU02-L003	TS1	0.715	C209	1.0	-104.66	-45.49	-239.21	-4131.85	-786.29	3.7	3.7	0.686	C309	0.671	C210
TU04-L015	TS1	0.716	C214	1.0	-104.07	35.73	242.08	4181.60	617.61	3.7	3.7	0.687	C314	0.678	C213

SACS-IV MEMBER UNITY CHECK RANGE SUMMARY

GROUP III - UNITY CHECKS GREATER THAN 0.90 AND LESS THAN 999.00

MEMBER	GROUP ID	MAXIMUM COMBINED UNITY CK	LOAD COND NO.	DIST FROM END	AXIAL STRESS N/MM2	BENDING STRESS Y N/MM2	BENDING STRESS Z N/MM2	SHEAR FORCE FY KN	SHEAR FORCE FZ KN	KLY/RY	KLZ/RZ	SECOND-HIGHEST UNITY CHECK	SECOND-HIGHEST LOAD COND	THIRD-HIGHEST UNITY CHECK	THIRD-HIGHEST LOAD COND
L183-LD02	B01	0.928	C205	0.7	-29.52	-109.16	7.57	32.16	-320.07	20.1	96.6	0.887	C206	0.867	C305
L184-LD01	B01	0.930	C205	0.7	-16.29	-135.14	-14.22	-33.87	-416.49	20.1	96.6	0.892	C206	0.880	C105
LD04-L190	B01	0.958	C202	0.0	-26.02	-116.62	13.77	-43.95	318.14	20.1	96.6	0.913	C201	0.890	C302
LD05-L185	B01	0.914	C202	0.0	-18.16	-121.31	-7.56	33.93	357.32	20.1	96.6	0.872	C201	0.855	C302

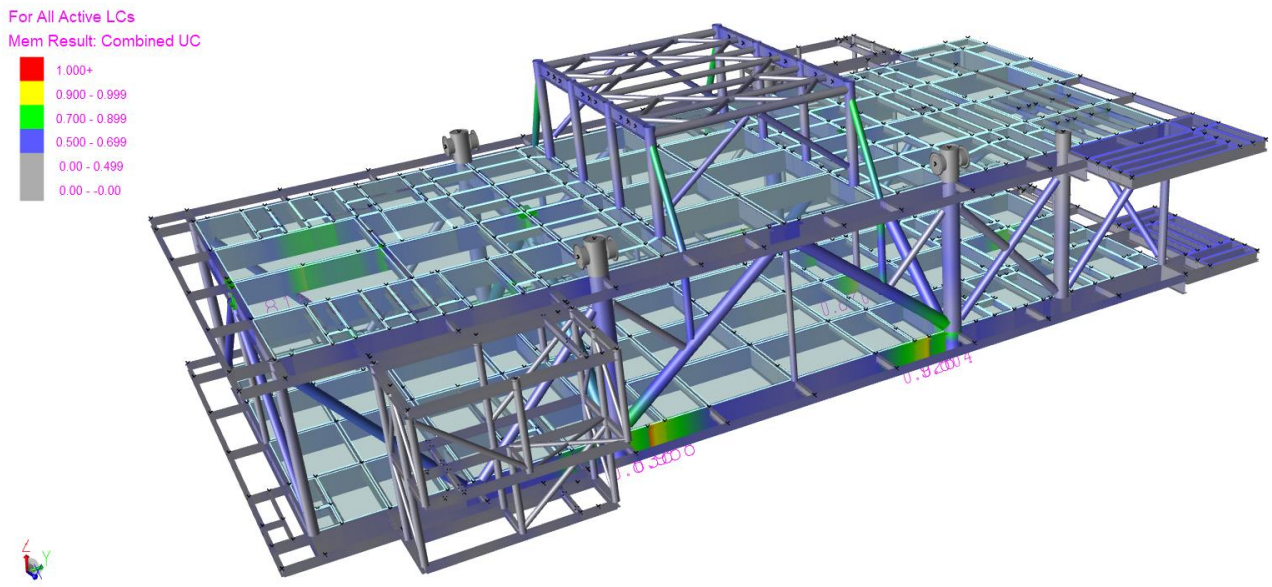


Figure 13.1 - Topside Structural Model 3D view

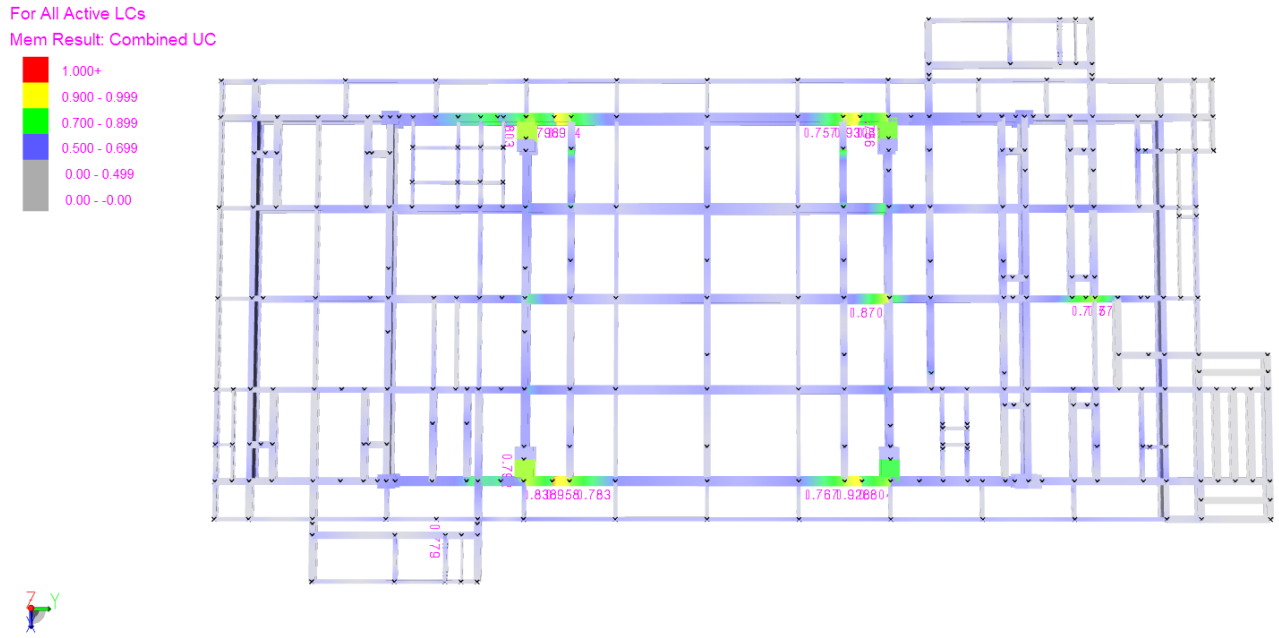


Figure 13.2 - Lower Deck - Member UC

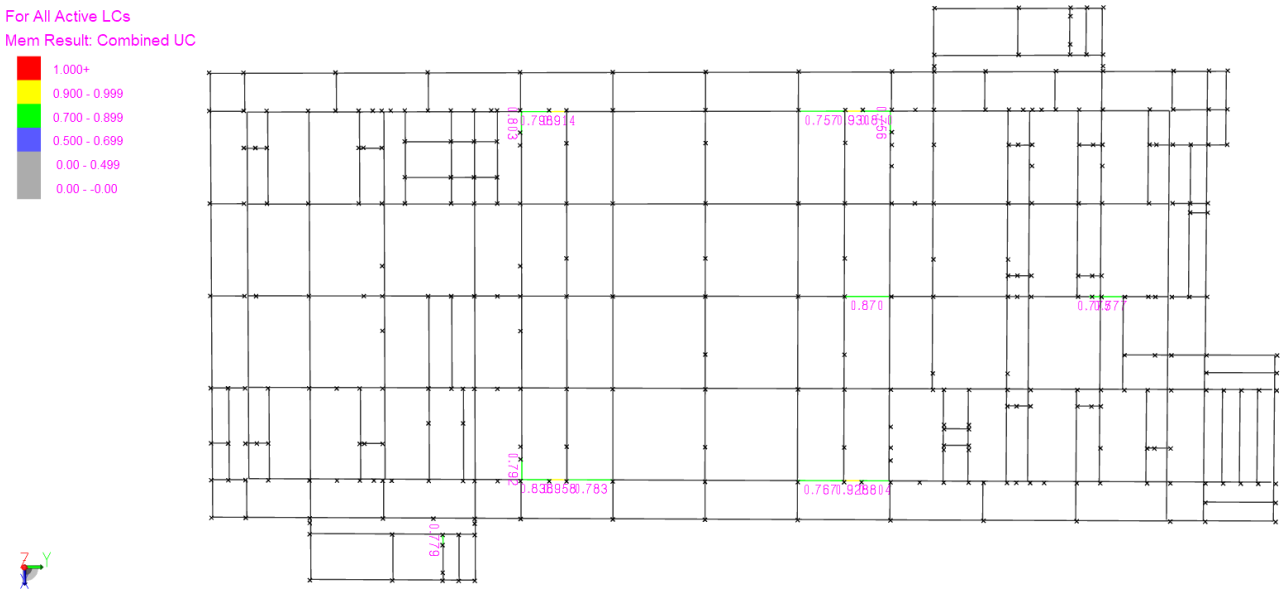


Figure 13.3 - Lower Deck - Member UC>0.75

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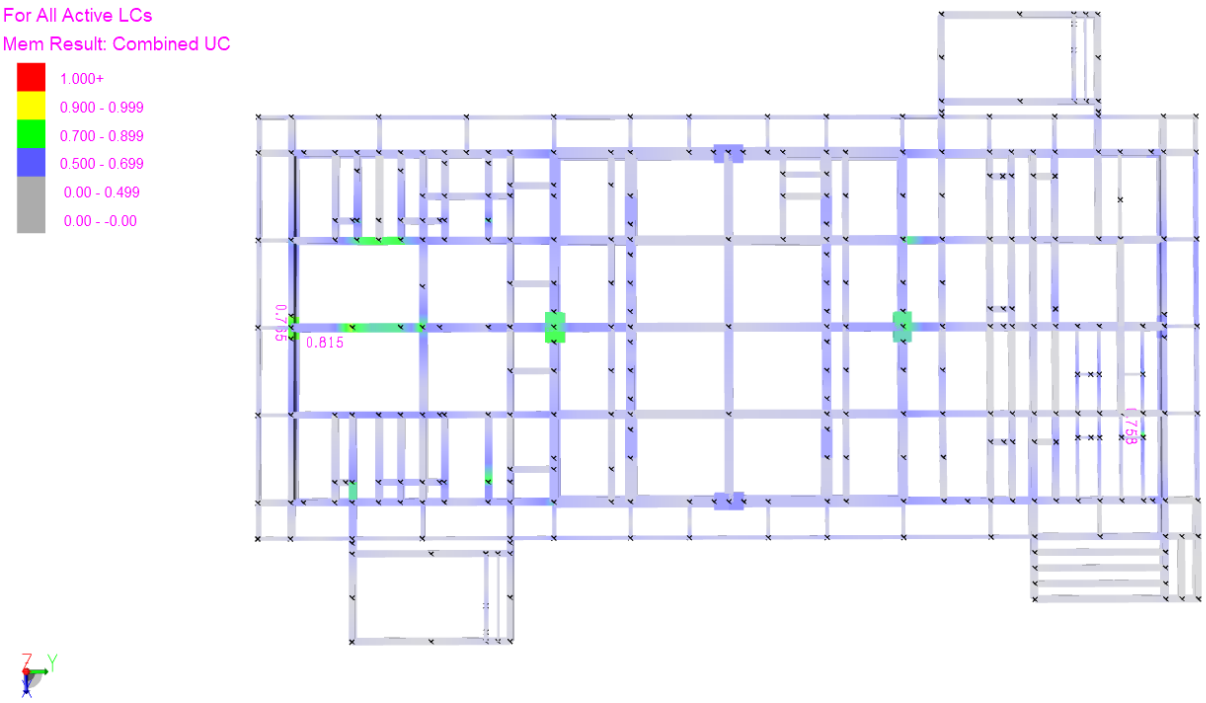


Figure 13.4 - Upper Deck - Member UC

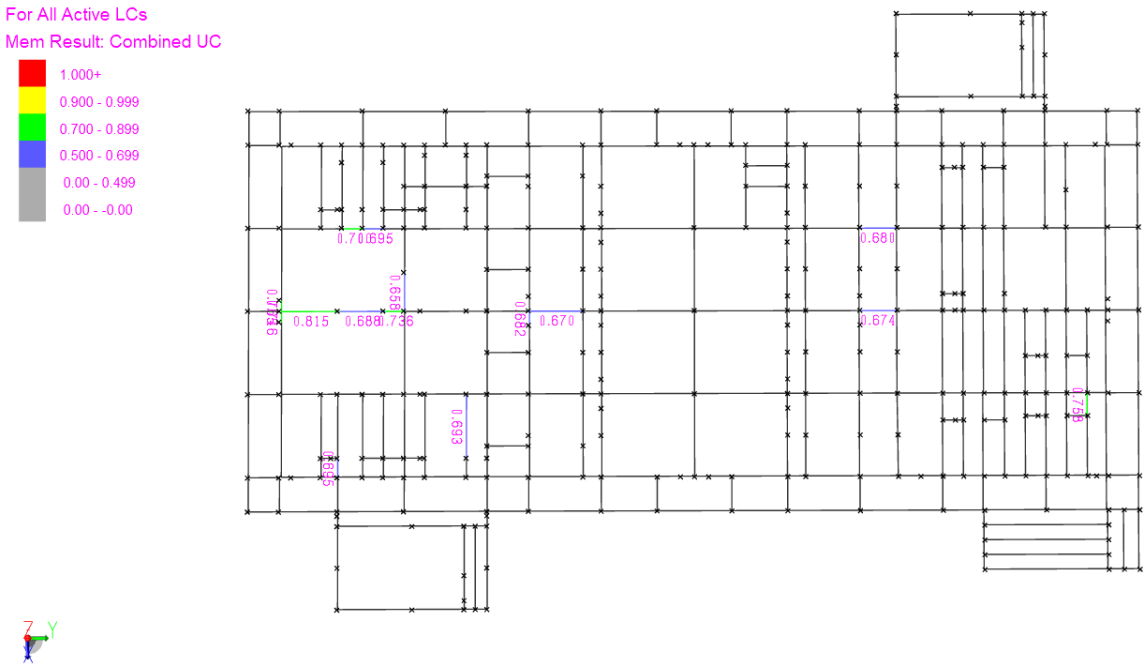


Figure 13.5 - Upper Deck - Member UC>0.65

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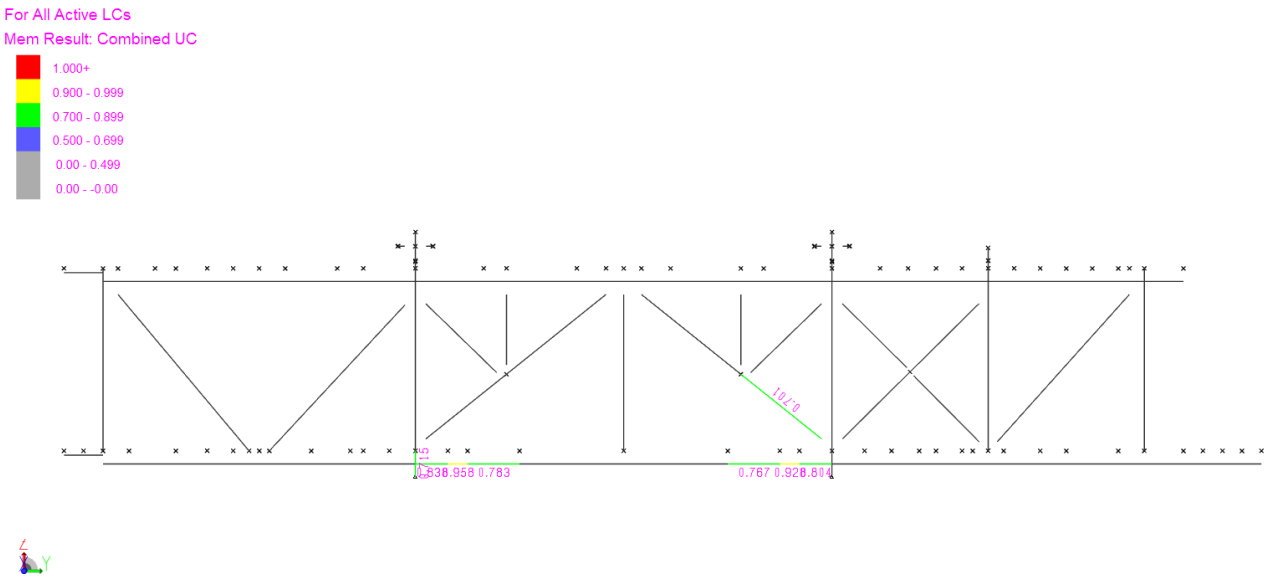


Figure 13.6 - Row A - UC>0.7

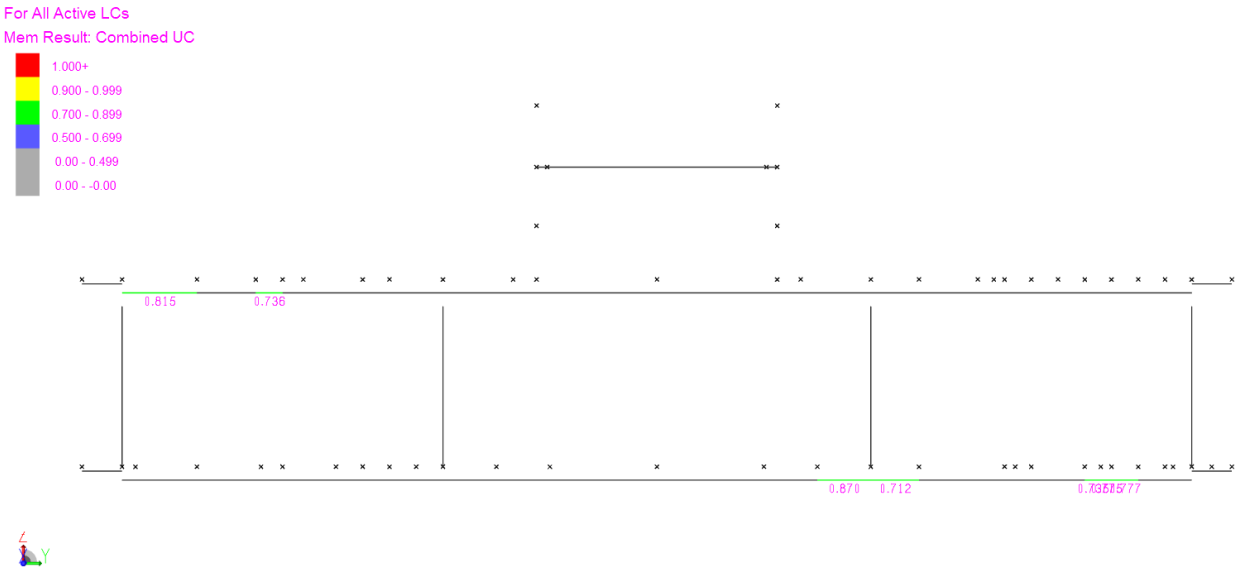


Figure 13.7 - Row B - UC>0.7

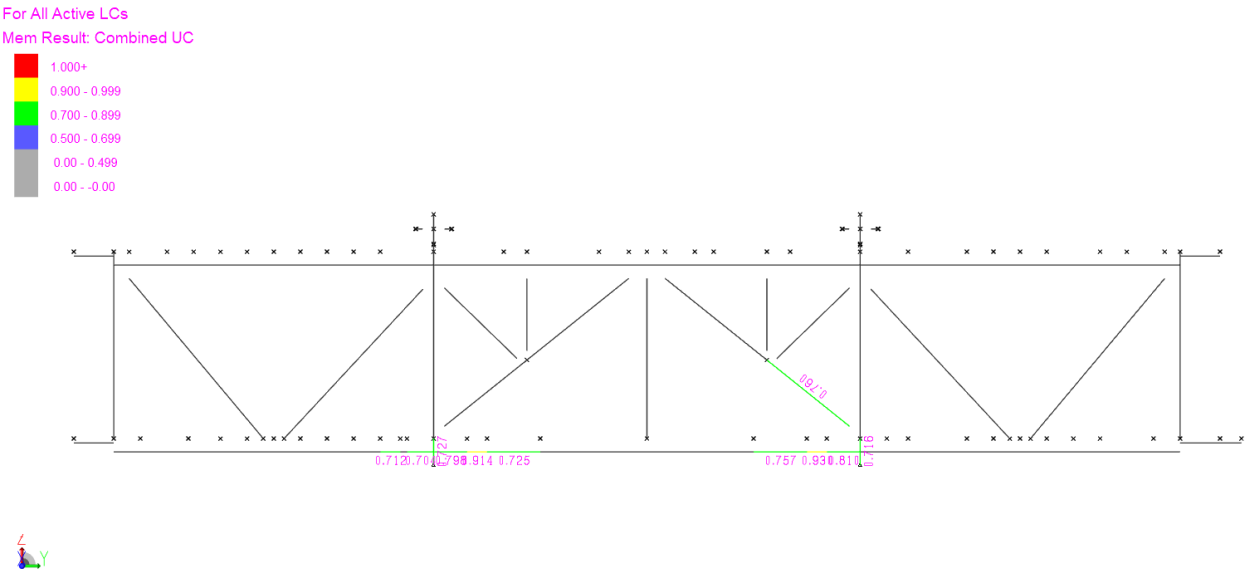


Figure 13.8 - Row C - UC>0.7

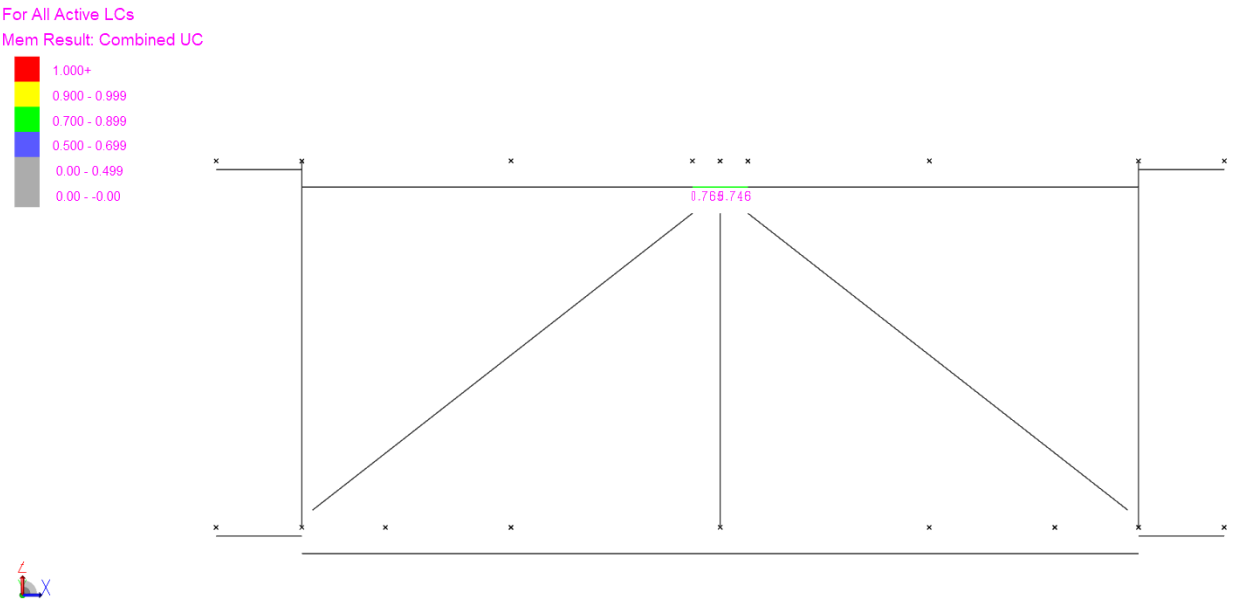


Figure 13.9 - Row 1- UC>0.6

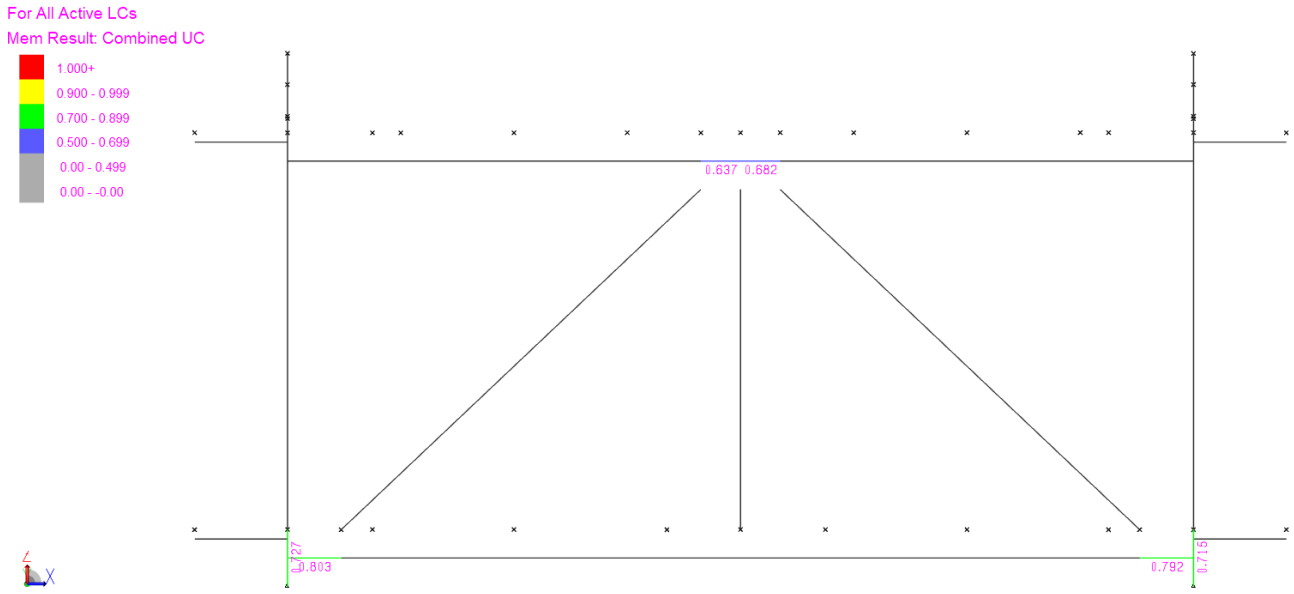


Figure 13.10 - Row 2 – UC>0.6

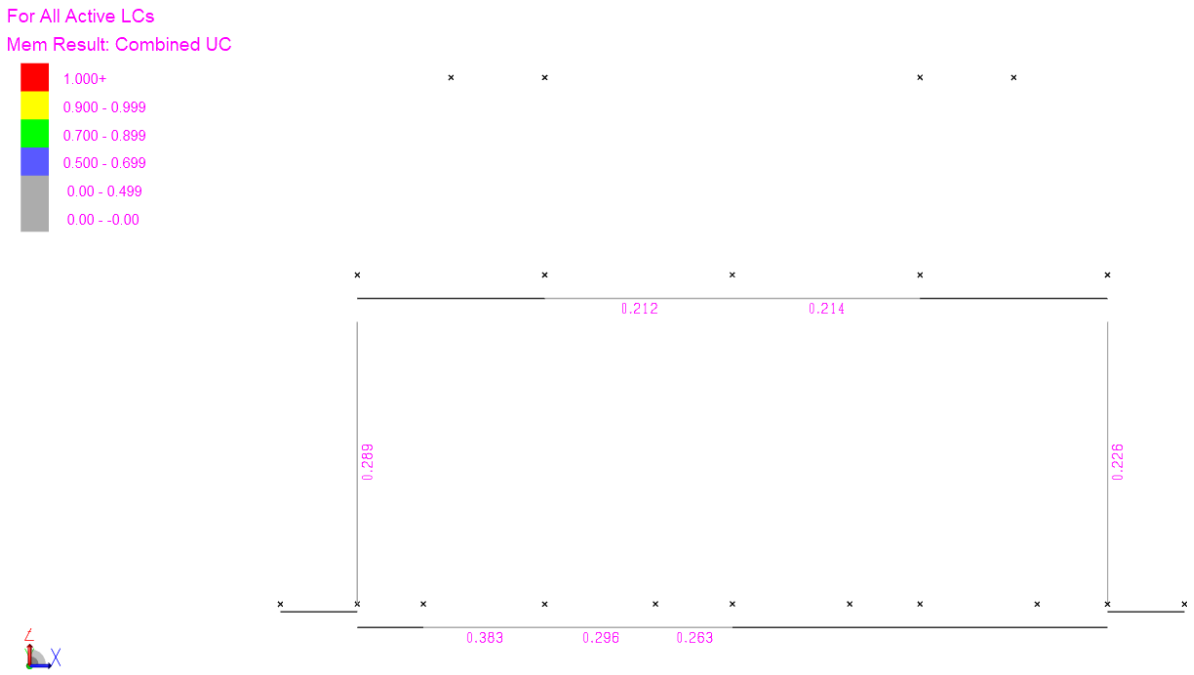


Figure 13.11 - Row 3 - UC>0.2

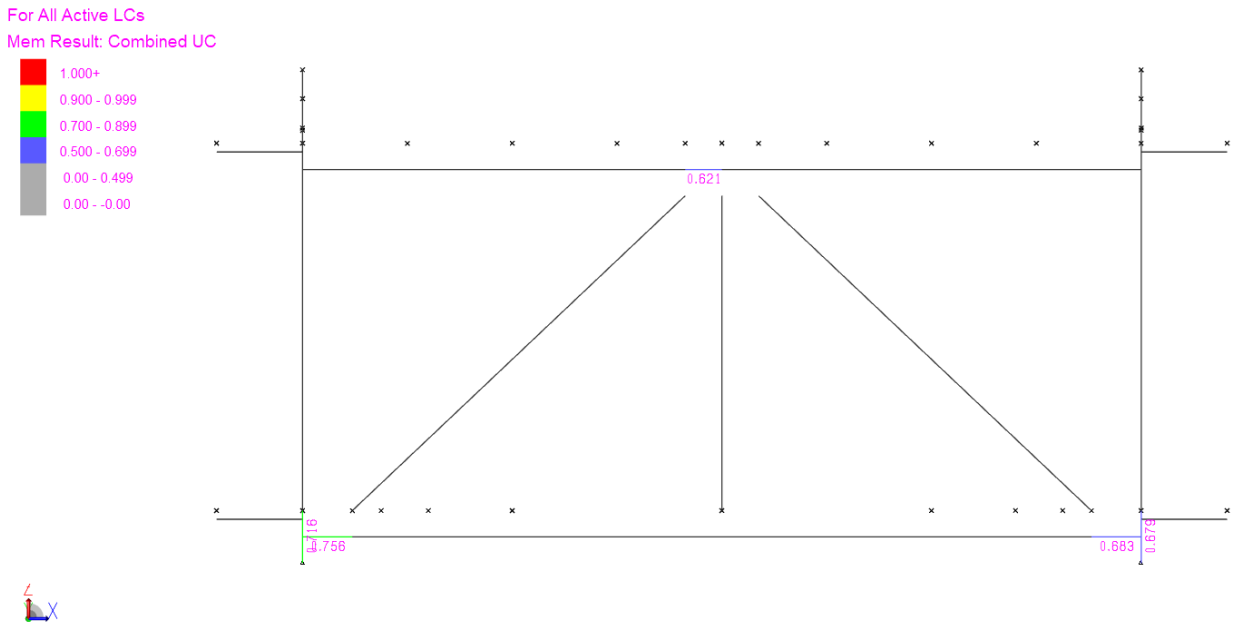


Figure 13.12 – Row 4 – UC>0.6

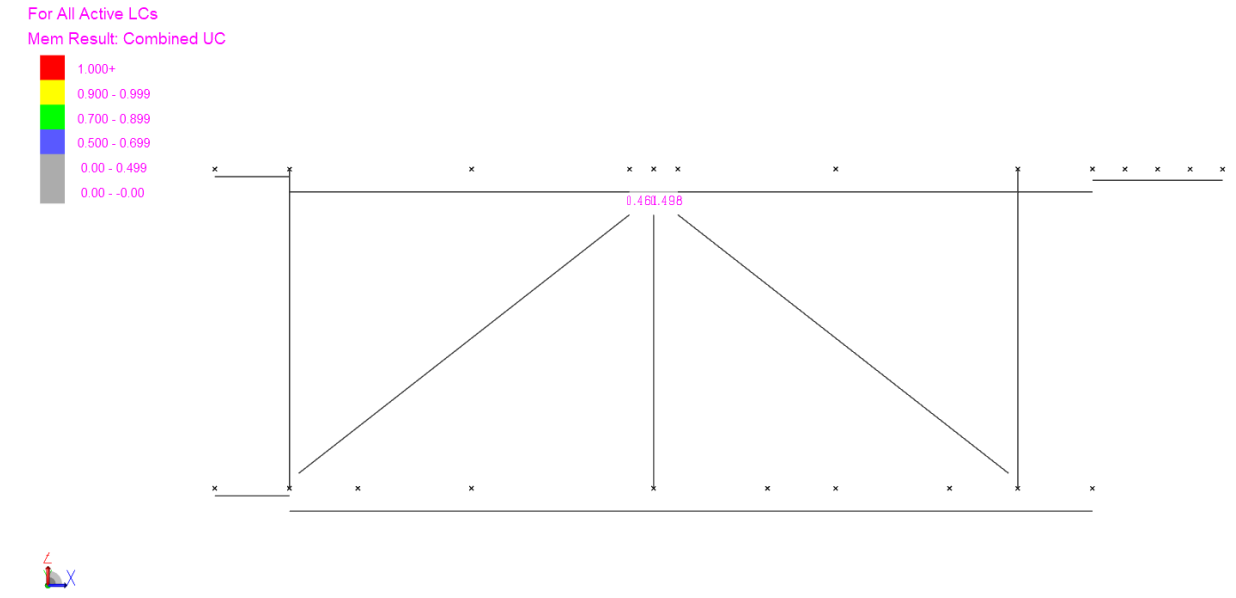


Figure 13.13 - Row 5 - UC>0.3

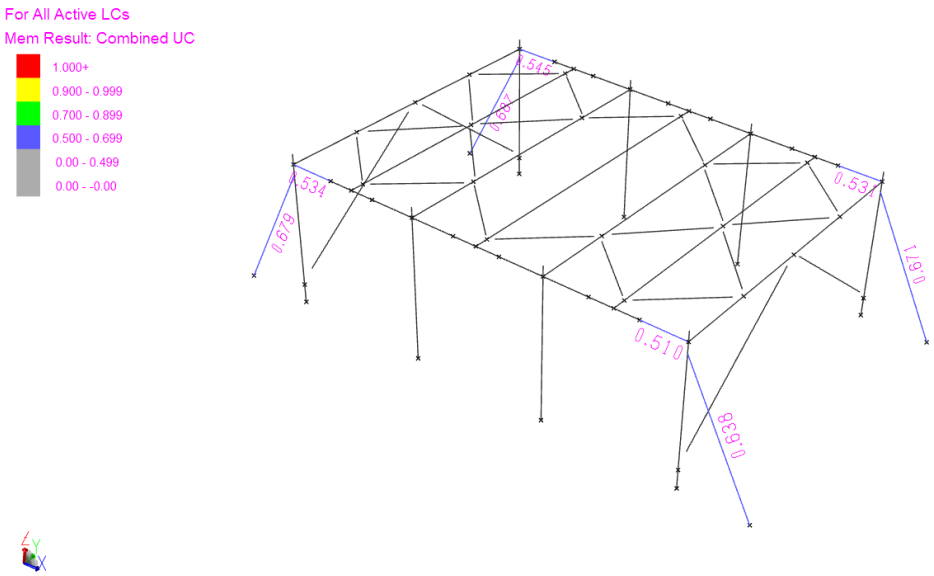


Figure 13.14 -PAU Structure – UC>0.4

Maximum UC per member's group are reported in following SACS excerpt.

* * * M E M B E R G R O U P S U M M A R Y * * *
ISO 19902:2020 / EC3:2005

GRUP ID	CRITICAL MEMBER	LOAD COND	MAX. UNITY CHECK	DIST FROM END M	* APPLIED STRESSES * AXIAL N/MM2	BEND-Y N/MM2	BEND-Z N/MM2	*** ALLOWABLE STRESSES *** AXIAL N/MM2	EULER N/MM2	BEND-Y N/MM2	BEND-Z N/MM2	CRIT COND	EFFECTIVE LENGTHS KLY M	KLZ M	CM * VALUES * Y	Z
B01	LD04-L190	C202	0.96	0.0	-26.0	-116.6	13.8	121.6	216.7	160.8	738.6	BN+COM	8.00	8.00	0.93	0.40
B02	L181-L011	C105	0.87	2.0	-20.3	-143.1	-14.2	133.3	246.4	203.0	1057.0	BN+COM	16.00	8.00	0.74	0.40
B03	L011-L040	C105	0.71	0.0	-19.4	-185.4	-30.8	121.6	216.7	354.6	1068.3	BN+COM	12.00	6.00	0.74	0.40
B04	L234-L133	C106	0.78	0.0	6.7	109.9	-22.9	363.6	120.6	132.9	589.5	LATBUC	12.00	6.00	0.00	0.00
B05	L157-L127	C206	0.27	0.0	10.9	-57.2	-6.0	363.6	187.0	172.2	588.2	LATBUC	6.00	6.00	0.00	0.00
B06	U238-U071	C209	0.39	0.0	-50.1	41.6	10.6	220.5	1178.8	278.6	738.1	BN+COM	8.00	4.00	0.81	0.42
B07	U256-U013	C205	0.24	2.6	48.7	-39.5	-4.7	363.6	2358.6	405.0	555.1	BN+AX	8.00	3.50	0.00	0.00
B09	UP04-H214	C214	0.33	0.0	8.8	-59.4	9.8	363.6	1497.6	399.0	550.9	WSHBUC	16.00	4.00	0.00	0.00
B10	L194-L022	C105	0.38	2.6	12.7	113.7	3.2	363.6	487.5	263.5	570.0	LATBUC	16.00	4.00	0.00	0.00
B12	U006-U081	C209	0.82	2.8	17.0	136.4	137.3	363.6	438.0	403.3	559.5	BN+AX	12.00	6.00	0.00	0.00
B13	U084-U171	C214	0.70	1.0	9.7	122.2	-7.6	363.6	216.7	160.8	570.0	LATBUC	12.00	6.00	0.00	0.00
B14	U068-U006	C214	0.77	0.0	-39.2	-54.3	58.4	128.9	271.3	205.9	303.5	BN+COM	8.00	4.00	0.78	0.93
B15	U116-U003	C209	0.59	2.0	-5.0	-194.8	-4.7	109.0	187.0	360.7	949.5	BN+COM	12.00	6.00	0.70	0.53
B20	U041-U075	C205	0.48	0.7	4.6	-57.5	1.3	363.6	3585.1	397.0	549.8	SHEAR	8.00	4.50	0.00	0.00
B21	U001-U072	C209	0.68	0.7	-29.6	-69.2	-2.7	350.9	4963.0	392.0	550.6	SHEAR	8.00	4.00	0.51	0.89
B22	L005-L204	C214	0.80	0.0	-43.1	-106.2	-2.7	348.6	5763.9	391.8	525.1	WSHBUC	8.00	4.00	0.49	0.89
B23	L206-L208	C214	0.29	0.0	1.8	-43.2	4.3	363.6	5548.4	391.8	547.6	WSHBUC	8.00	4.00	0.00	0.00
B31	L003-LD04	C202	0.84	0.0	-20.2	-106.5	34.3	122.5	268.0	179.4	433.1	BN+COM	8.00	8.00	0.91	0.70

B32	L113-L153	C105	0.45	0.0	-16.1	-49.4	1.1	363.6	9670.7	406.0	556.2	WSHBUC	6.00	2.00	0.66	0.53
C03	L021-U078	C114	0.29	0.0	31.0	1.4	-125.0	338.1	482.6	448.2	448.2	TN+BN	6.00	6.00	0.85	0.85
C05	L010-U010	C102	0.20	7.0	67.1	-42.8	50.6	338.1	808.7	438.3	438.3	TN+BN	7.00	7.00	0.85	0.85
C06	U015-PEC4	C213	0.00	0.0	-0.4	0.9	0.0	.3E+03	.2E+05	.5E+03	.5E+03	ACBI	2.80	2.80	0.85	0.85
C07	U045-CR01	C209	0.01	0.0	-1.6	0.0	4.6	.3E+03	.4E+05	.5E+03	.5E+03	ACBI	1.60	1.60	0.85	0.85
C08	CR01-CR03	C209	0.02	0.0	-2.2	0.0	4.0	.3E+03	.5E+05	.4E+03	.4E+03	ACBI	1.60	1.60	0.85	0.85
C11	L156-U045	C106	0.14	1.1	21.7	-6.9	66.0	381.0	2518.1	476.0	476.0	TN+BN	7.00	7.00	0.85	0.85
C20	L015-U015	C205	0.49	1.2	-81.6	-73.3	-103.2	327.7	3330.5	461.8	461.8	ACBI	7.00	7.00	0.85	0.85
CT7	PFC4-PGC4	C213	0.00	0.0	-0.3	0.0	-0.4	.3E+03	.2E+05	.5E+03	.5E+03	ACBI	2.80	2.80	0.85	0.85
CT8	PSC4-PGC4	C213	0.00	0.2	0.0	-0.1	0.0	.4E+03	.6E+05	.5E+03	.5E+03	SHEAR	1.37	1.37	0.85	0.85
CT9	SSC4-PSC4	C113	0.00	0.0	0.0	-0.0	0.0	.4E+03	.6E+05	.6E+03	.6E+03	SHEAR	1.37	1.37	0.85	0.85
D01	L015-D004	C205	0.76	0.0	-137.2	-138.6	-48.8	296.1	878.3	498.6	498.6	ACBI	9.00	9.00	0.85	0.85
D02	L010-U068	C114	0.46	0.0	-82.7	-30.0	5.6	216.1	350.5	446.0	446.0	ACBI	9.22	9.22	0.85	0.85
D03	D004-U023	C205	0.66	2.7	-113.7	-89.9	104.6	292.0	3352.8	447.5	447.5	ACBI	2.71	2.71	0.85	0.85
D04	L203-U072	C209	0.56	0.0	-166.7	7.6	-2.2	305.2	1116.1	490.8	490.8	ACBI	8.74	8.74	0.85	0.85
D05	L154-U152	C105	0.54	0.0	-122.1	24.9	1.7	254.4	639.6	438.3	438.3	ACBI	7.83	7.83	0.85	0.85
D06	L156-0002	C105	0.17	0.0	73.4	23.6	42.8	338.1	3038.3	447.5	447.5	TN+BN	3.57	3.57	0.85	0.85
D16	L001-U001	C105	0.18	6.0	70.5	-58.6	-5.6	338.1	655.4	456.2	456.2	TN+BN	6.00	6.00	0.85	0.85
D36	L013-0002	C205	0.38	0.0	-84.3	-27.0	39.2	290.4	2829.5	452.6	452.6	ACBI	3.65	3.36	0.85	0.85
IP3	L00B-Y000	C205	0.78	0.0	-0.5	-0.3	250.1	322.7	2934.8	322.7	322.7	BN+AX	3.60	0.45	0.59	0.56
PB1	P104-H241	C214	0.54	0.0	-39.3	-119.7	10.3	244.0	2535.2	324.9	664.7	BN+COM	4.00	2.00	0.50	0.65
PC2	U00G-U00L	C214	0.37	4.5	-16.1	-161.8	-9.9	274.1	1109.9	447.5	447.5	ACBI	5.90	5.90	0.85	0.85
PC3	UP04-P004	C214	0.36	0.0	39.3	3.9	-155.7	338.1	1397.4	448.6	448.6	TN+BN	5.90	5.90	0.85	0.85
PD1	P149-P107	C305	0.24	0.0	-24.1	2.1	47.0	157.7	207.4	455.9	455.9	ACBI	9.00	0.40	0.85	0.85
PD2	P123-P118	C205	0.17	0.0	-30.1	-29.4	-14.0	284.0	1761.4	455.8	455.8	ACBI	2.48	2.48	0.85	0.85
PD3	P003-P112	C205	0.35	0.0	-55.2	-58.7	33.5	257.5	685.6	450.8	450.8	ACBI	5.01	5.01	0.85	0.85
PL1	P122-P112	C305	0.13	2.2	-26.0	17.6	-1.4	280.2	1439.5	450.0	450.0	ACBI	4.50	4.50	0.85	0.85
S01	U218-U130	C209	0.66	1.9	13.3	157.6	70.0	313.6	348.0	337.0	476.8	BN+AX	16.00	4.00	0.00	0.00
S02	U274-U287	C205	0.76	1.1	-0.7	129.3	-184.2	322.7	1212.5	344.3	496.2	BN+AX	4.00	1.10	0.60	0.61
S03	L253-L231	C312	0.65	0.3	-0.2	-0.1	135.3	322.7	2546.9	322.7	322.7	BN+AX	1.00	1.00	0.40	0.73
S04	L193-L180	C205	0.73	0.0	9.3	46.8	-104.0	322.7	704.5	338.7	487.7	BN+AX	4.00	4.00	0.00	0.00
S07	N048-N049	C205	0.12	0.0	-2.0	-2.6	25.5	45.2	66.6	111.2	515.9	LATBUC	4.00	4.00	0.85	0.40
SF1	U023-P104	C214	0.69	4.4	-157.3	-55.7	-4.6	277.7	1285.0	447.5	447.5	ACBI	4.37	4.37	0.85	0.85
ST1	N038-U00M	C205	0.18	3.2	13.8	68.3	-38.2	338.1	1721.3	445.2	445.2	TN+BN	3.20	3.20	0.85	0.85
ST2	N040-U00N	C205	0.11	4.5	-15.6	2.9	-22.0	248.6	567.9	446.7	446.7	ACBI	4.45	4.45	0.85	0.85
ST6	L11D-US06	C209	0.16	0.0	-21.5	-7.2	-10.2	178.0	451.1	313.6	313.6	ACBI	3.77	3.77	0.85	0.85
ST7	M00Q-M204	C205	0.10	0.0	-6.1	2.4	23.8	196.5	1059.2	314.8	314.8	ACBI	2.06	2.06	0.85	0.85
TS1	TU01-L005	C214	0.73	1.0	-105.7	-45.1	244.3	.3E+03	.1E+06	.5E+03	.5E+03	ACBI	1.00	1.00	0.85	0.85
VHE	0003-0004	C214	0.13	1.0	-0.0	16.7	38.9	322.7	1883.0	358.8	491.5	BN+AX	2.00	2.00	1.00	1.00

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13.2.2 Tubular Joint checks

All tubular joints punching shear checks and strength checks are detailed in following SACS excerpt and provide utilization factors lower than 1.0, according to ISO19902, ref./6/.

* * J O I N T C A N S U M M A R Y * *
(UNITY CHECK ORDER)

ORIGINAL JOINT	DIAMETER (CM)	LOAD THICKNESS (CM)	STRN YLD STRS (CM)	UC (N/MM2)	UC	LOAD DESIGN DIAMETER (CM)	THICKNESS (CM)	STRN YLD STRS (CM)	BRACE UC (N/MM2)	LOAD UC	JOINT	CASE
D004	55.000	2.000	400.000	0.746	0.873	55.000	2.000	400.000	0.746	0.873	U023	C205
D006	55.000	2.000	400.000	0.706	0.826	55.000	2.000	400.000	0.706	0.826	U022	C205
D003	55.000	2.000	400.000	0.593	0.694	55.000	2.000	400.000	0.593	0.694	U040	C202
L015	80.000	4.000	400.000	0.587	0.686	80.000	4.000	400.000	0.587	0.686	D004	C205
L013	80.000	4.000	400.000	0.571	0.668	80.000	4.000	400.000	0.571	0.668	D006	C205
D005	55.000	2.000	400.000	0.552	0.646	55.000	2.000	400.000	0.552	0.646	U021	C202
L005	80.000	4.000	400.000	0.516	0.604	80.000	4.000	400.000	0.516	0.604	D003	C202
L003	80.000	4.000	400.000	0.481	0.562	80.000	4.000	400.000	0.481	0.562	D005	C202
U015	80.000	3.000	400.000	0.479	0.560	80.000	3.000	400.000	0.479	0.560	L113	C105
0002	40.640	2.062	355.000	0.454	0.531	40.640	2.062	355.000	0.454	0.531	U013	C105
U003	80.000	3.000	400.000	0.445	0.521	80.000	3.000	400.000	0.445	0.521	L033	C102
P104	45.720	1.905	355.000	0.399	0.467	45.720	1.905	355.000	0.399	0.467	U023	C214
P101	45.720	1.905	355.000	0.392	0.459	45.720	1.905	355.000	0.392	0.459	U040	C214
P103	45.720	1.905	355.000	0.391	0.458	45.720	1.905	355.000	0.391	0.458	U022	C205
U005	80.000	3.000	400.000	0.391	0.457	80.000	3.000	400.000	0.391	0.457	L110	C102
U045	70.000	3.000	400.000	0.391	0.457	70.000	3.000	400.000	0.391	0.457	0002	C106
P102	45.720	1.905	355.000	0.366	0.428	45.720	1.905	355.000	0.366	0.428	U021	C209
U013	80.000	3.000	400.000	0.330	0.386	80.000	3.000	400.000	0.330	0.386	0002	C105
L156	70.000	3.000	400.000	0.324	0.379	70.000	3.000	400.000	0.324	0.379	U153	C105
P112	35.500	1.588	355.000	0.298	0.349	35.500	1.588	355.000	0.298	0.349	P003	C205
P111	35.500	1.588	355.000	0.292	0.342	35.500	1.588	355.000	0.292	0.342	P004	C205
L018	40.640	2.144	355.000	0.245	0.286	40.640	2.144	355.000	0.245	0.286	U067	C105
L010	40.640	2.144	355.000	0.239	0.280	40.640	2.144	355.000	0.239	0.280	U068	C114
L008	40.640	2.144	355.000	0.233	0.272	40.640	2.144	355.000	0.233	0.272	U069	C109
P123	35.500	1.588	355.000	0.218	0.255	35.500	1.588	355.000	0.218	0.255	P118	C205
P121	35.500	1.588	355.000	0.216	0.253	35.500	1.588	355.000	0.216	0.253	P119	C205
P120	35.500	1.588	355.000	0.199	0.233	35.500	1.588	355.000	0.199	0.233	P119	C202
P122	35.500	1.588	355.000	0.197	0.230	35.500	1.588	355.000	0.197	0.230	P118	C202
L020	40.640	2.144	355.000	0.194	0.227	40.640	2.144	355.000	0.194	0.227	U057	C105
U00J	40.640	1.588	355.000	0.153	0.179	40.640	1.588	355.000	0.153	0.179	P140	C202
P139	27.310	1.588	355.000	0.151	0.177	27.310	1.588	355.000	0.151	0.177	P148	C205
P118	27.310	1.588	355.000	0.149	0.174	27.310	1.588	355.000	0.149	0.174	P123	C205
U00I	40.640	1.588	355.000	0.146	0.171	40.640	1.588	355.000	0.146	0.171	P139	C202
P119	27.310	1.588	355.000	0.146	0.170	27.310	1.588	355.000	0.146	0.170	P120	C202
P140	27.310	1.588	355.000	0.143	0.168	27.310	1.588	355.000	0.143	0.168	P148	C205
P137	27.310	1.588	355.000	0.141	0.164	27.310	1.588	355.000	0.141	0.164	P119	C202
P138	27.310	1.588	355.000	0.135	0.158	27.310	1.588	355.000	0.135	0.158	P118	C202
U00K	40.640	1.588	355.000	0.100	0.117	40.640	1.588	355.000	0.100	0.117	P138	C205
U00L	40.640	1.588	355.000	0.094	0.110	40.640	1.588	355.000	0.094	0.110	P137	C205

Maximum joints' UC (>0.70) are detailed in the following.

* * J O I N T C A N D E T A I L R E P O R T * *
(UNITY CHECK ORDER)

COMM JNT	CHRD JNT	BRCE JNT	CHORD O.D. CM	CHORD WT CM	CHORD FY N/MM2	EFFT. LNGTH M	JNT TYP	GAP CM	BRACE O.D. CM	BRACE WT CM	BRACE ANGLE DEG	LOAD CASE	ACTING STRESSES *CHORD** STRESS N/MM2	ACTING STRESSES *CHORD** FA N/MM2	ACTING STRESSES BRACE OPB N/MM2	ACTING STRESSES BRACE IPB N/MM2	PUNCHING SHEAR ALLOWABLE STRESSES FA N/MM2	PUNCHING SHEAR ALLOWABLE STRESSES OPB N/MM2	PUNCHING SHEAR ALLOWABLE STRESSES IPB N/MM2	UNITY CHECK
D004	U077	U023	55.00	2.000	400.0		K	10.40	32.39	1.270	51.32	C101	35.20	-28.85	38.82	19.63	276.51	298.28	533.69	0.236
							K	10.40				C105	105.88	-106.56	58.70	101.46	245.94	271.93	486.54	0.693
							K	10.40				C106	101.02	-104.29	58.43	98.96	247.44	273.41	489.18	0.676
							K	10.40				C107	85.15	-83.39	47.02	79.97	251.80	277.55	496.59	0.527
							K	10.40				C108	80.29	-81.11	46.75	77.47	253.17	278.88	498.97	0.512
							K	10.40				C113	49.25	-84.94	42.83	70.76	262.57	287.36	514.14	0.491
							K	10.40				C114	49.87	-86.28	42.53	71.57	262.44	287.25	513.94	0.496
							K	10.40				C115	38.07	-65.00	34.23	54.36	264.77	289.26	517.54	0.375
							K	10.40				C116	38.70	-66.34	33.93	55.17	264.66	289.16	517.36	0.379
							K	10.40				C205	125.93	-114.11	57.12	110.42	239.31	265.47	474.97	0.746

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D006 U075 U022  55.00 2.000 400.0       K  10.40  32.39 1.270  51.32 C101  30.24 -30.45  33.93  11.59 279.29 298.14 533.43    0.223
                                        K  10.40                    C105 108.75-106.79  51.95  87.67 248.54 270.11 483.28    0.655
                                        K  10.40                    C106 103.48-104.62  51.65  85.18 250.13 271.71 486.15    0.639
                                        K  10.40                    C107  87.65 -83.48  41.91  69.24 254.16 276.17 494.13    0.500
                                        K  10.40                    C205 129.86-114.03  50.59  96.68 241.78 263.28 471.06    0.706
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APPENDIX A – MEMBER GROUPS AND SECTION PROPERTIES

Member Group Report

Name	Section	OD (cm)	WT (cm)	E (kN/cm2)	G (kN/cm2)	Fy (kN/cm2)	Ky	Kz	SPC	SAM	F	Density (tonne/m3)	Length (m)	Section
B01	PG01			20500.000	7885.000	40.000	1.00	1.00				7.850		
B02	PG02			20500.000	7885.000	40.000	1.00	1.00				7.850		
B03	PG03			20500.000	7885.000	40.000	1.00	1.00				7.850		
B04	PG04			20500.000	7885.000	40.000	1.00	1.00				7.850		
B05	PG05			20500.000	7885.000	40.000	1.00	1.00				7.850		
B06	PG06			20500.000	7885.000	40.000	1.00	1.00				7.850		
B07	PG07			20500.000	7885.000	40.000	1.00	1.00				7.850		
B09	PG09			20500.000	7885.000	40.000	1.00	1.00				7.850		
B10	PG10			20500.000	7885.000	40.000	1.00	1.00				7.850		
B12	PG02			20500.000	7885.000	40.000	1.00	1.00				7.850		
B13	PG03			20500.000	7885.000	40.000	1.00	1.00				7.850		
B14	PG04			20500.000	7885.000	40.000	1.00	1.00				7.850		
B15	PG05			20500.000	7885.000	40.000	1.00	1.00				7.850		
B20	PG20			20500.000	7885.000	40.000	1.00	1.00				7.850		
B21	PG21			20500.000	7885.000	40.000	1.00	1.00				7.850		
B22	PG22			20500.000	7885.000	40.000	1.00	1.00				7.850		
B23	PG23			20500.000	7885.000	40.000	1.00	1.00				7.850		
B31	PG31			20500.000	7885.000	40.000	1.00	1.00				7.850		
B32	PG32			20500.000	7885.000	40.000	1.00	1.00				7.850		
C03		27.300	1.113	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
C05		40.640	2.144	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850	0.90	
C05		40.640	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
C06		80.000	3.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
C07		70.000	3.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
C08		70.000	2.000	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
C11		70.000	3.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850	1.10	
C11		70.000	2.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
C11		70.000	3.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850	2.10	
C20		80.000	4.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850	1.21	
C20		80.000	2.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
C20		80.000	3.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850	2.05	
CT7		82.000	4.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
CT8		70.000	3.500	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
CT9		95.000	47.400	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
D01		55.000	2.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
D02		35.560	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
D03		32.390	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
D04		60.000	2.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
D05		40.640	1.270	20500.000	7886.000	35.500	1.00	1.00		0.50		7.850		
D06		40.640	1.588	20500.000	7886.000	35.500	1.00	1.00		0.50		7.850		
D16		32.390	1.905	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
D36		40.640	2.062	20500.000	7886.000	35.500	1.00	1.00		0.50		7.850		
DU1	HEA800			20500.000	7885.000	40.000	1.00	1.00				9.99999905-6		
DU2		284.000	2.000	20500.000	7885.000	40.000	1.00	1.00		0.50		9.99999905-6		
DU3		21.910	1.000	205.000	79.000	40.000	1.00	1.00		0.50		9.99999905-6		
DU4		50.800	2.540	205.000	79.000	40.000	1.00	1.00		0.50		9.99999905-6		
PB1	HE600B			20500.000	7885.000	34.500	1.00	1.00				7.850		
PC2		40.640	1.588	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
PC3		45.720	1.905	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
PD1		27.310	1.588	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
PD2		21.910	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
PD3		27.310	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
PL1		35.500	1.588	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
S01	HE500A			20500.000	7885.000	34.500	1.00	1.00				7.850		
S02	IPE240			20500.000	7885.000	35.500	1.00	1.00				7.850		
S03	IPE330			20500.000	7885.000	35.500	1.00	1.00				7.850		
S04	HE340A			20500.000	7885.000	35.500	1.00	1.00				7.850		
S06	HEA220			20500.000	7885.000	35.500	1.00	1.00				7.850		
S07	UPN220			20500.000	7885.000	35.500	1.00	1.00				7.850		
SF1		32.390	1.270	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
ST1		27.310	0.927	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
ST2		21.910	0.818	20500.000	7885.000	35.500	1.00	1.00		0.50		7.850		
TS1		80.000	4.000	20500.000	7885.000	40.000	1.00	1.00		0.50		7.850		
VHE	VHESEC			20500.000	7885.000	35.500	1.00	1.00				7.850		

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Member Section Report

Section	Type	AX(cm2)	J(cm4)	IY(cm4)	IZ(cm4)	A(cm)	B(cm)	C(cm)	D(cm)	E(cm)	F(cm)
HE500A	WF	197.500	309.300	86970.000	10370.000	30.000	2.300	49.000	1.200	2.700	
PG01	PLG *	390.000	551.140	618312.50	26730.001	40.000	2.500	100.000	2.000		
PG02	PLG *	342.500	452.849	582588.50	26693.384	40.000	2.500	100.000	1.500		
PG03	PLG *	292.500	348.683	463734.37	11276.719	30.000	2.500	100.000	1.500		
PG04	PLG *	244.000	198.460	350725.34	5235.333	25.000	2.000	100.000	1.500		
PG05	PLG *	340.000	446.973	499458.31	11313.334	30.000	2.500	100.000	2.000		
PG06	PLG *	458.000	1550.254	835042.68	42692.539	40.000	4.000	100.000	1.500		
PG07	PLG *	584.000	2022.513	1051914.7	83394.671	50.000	4.000	100.000	2.000		
PG09	PLG *	538.000	1976.921	1019469.4	83359.210	50.000	4.000	100.000	1.500		
PG10	PLG *	292.500	348.683	463734.37	11276.719	30.000	2.500	100.000	1.500		
PG20	PLG *	784.000	3089.179	1512981.3	281311.34	75.000	4.000	100.000	2.000		
PG21	PLG *	870.000	3397.574	1637640.1	341453.12	80.000	4.000	100.000	2.500		
PG22	PGD *	916.000	606003.37	1670085.3	524390.31	80.000	4.000	100.000	1.500		51.500
PG23	PLG *	778.000	3256.920	1572749.5	341359.18	80.000	4.000	100.000	1.500		1.000
PG31	PLG *	504.000	1595.846	867488.00	42728.000	40.000	4.000	100.000	2.000		
PG32	PLG *	495.000	769.890	867906.25	94638.757	61.000	2.500	100.000	2.000		
VHESEC	WF *	105.000	55.327	20868.748	3908.750	25.000	1.500	33.000	1.000		

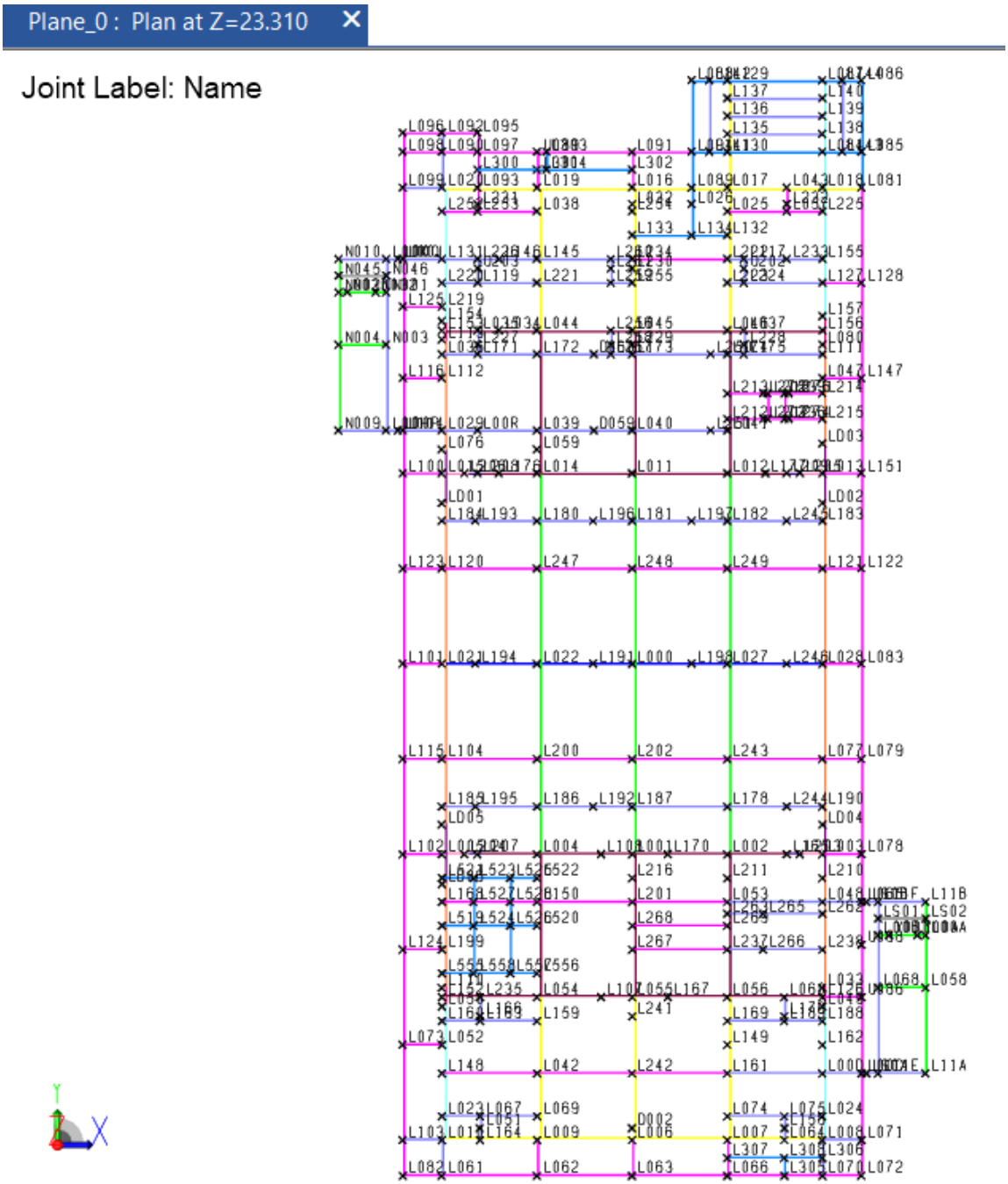
An * indicates that AX, J, IY and IZ are computed values, not user defined.

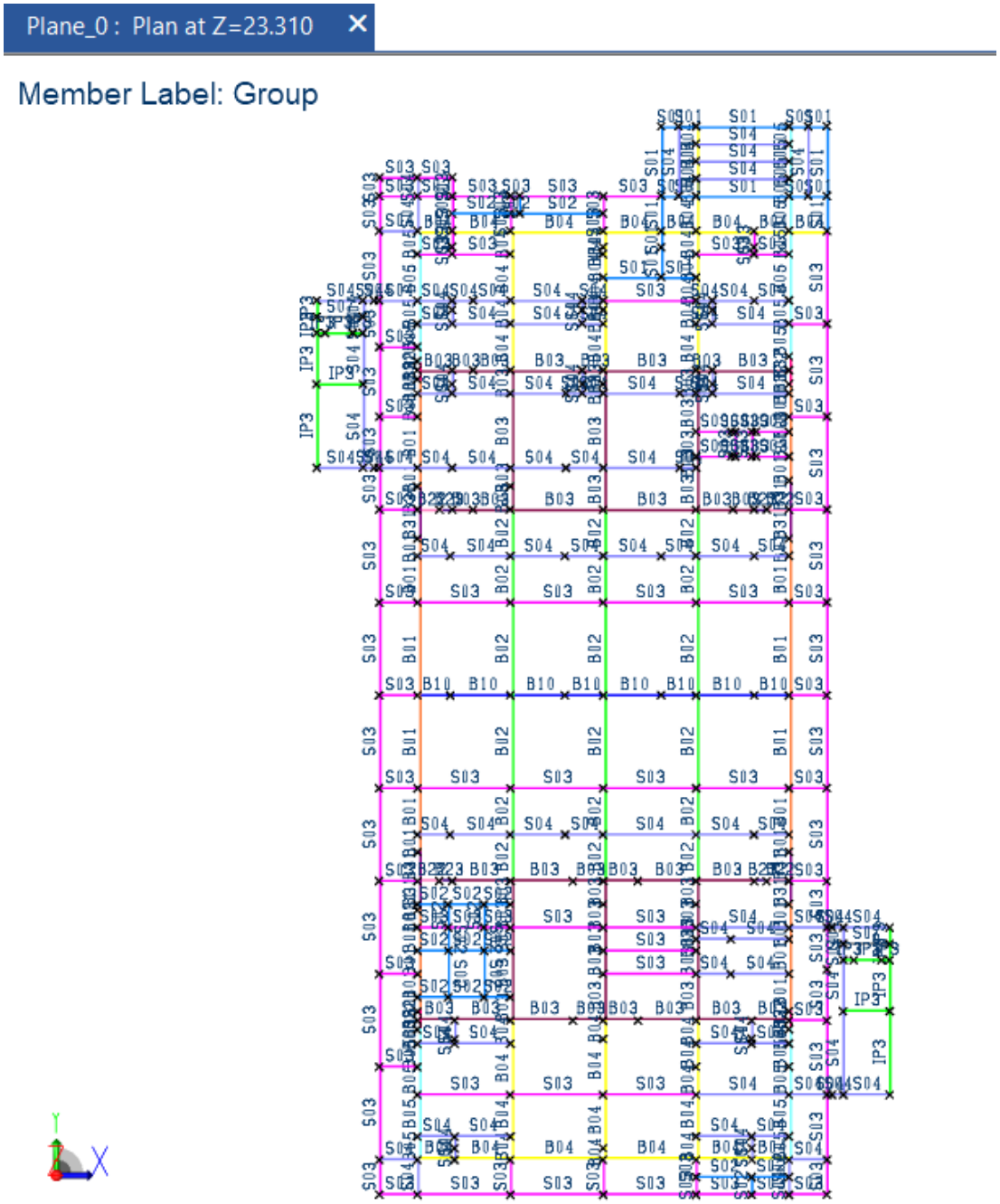
Plate Group Report

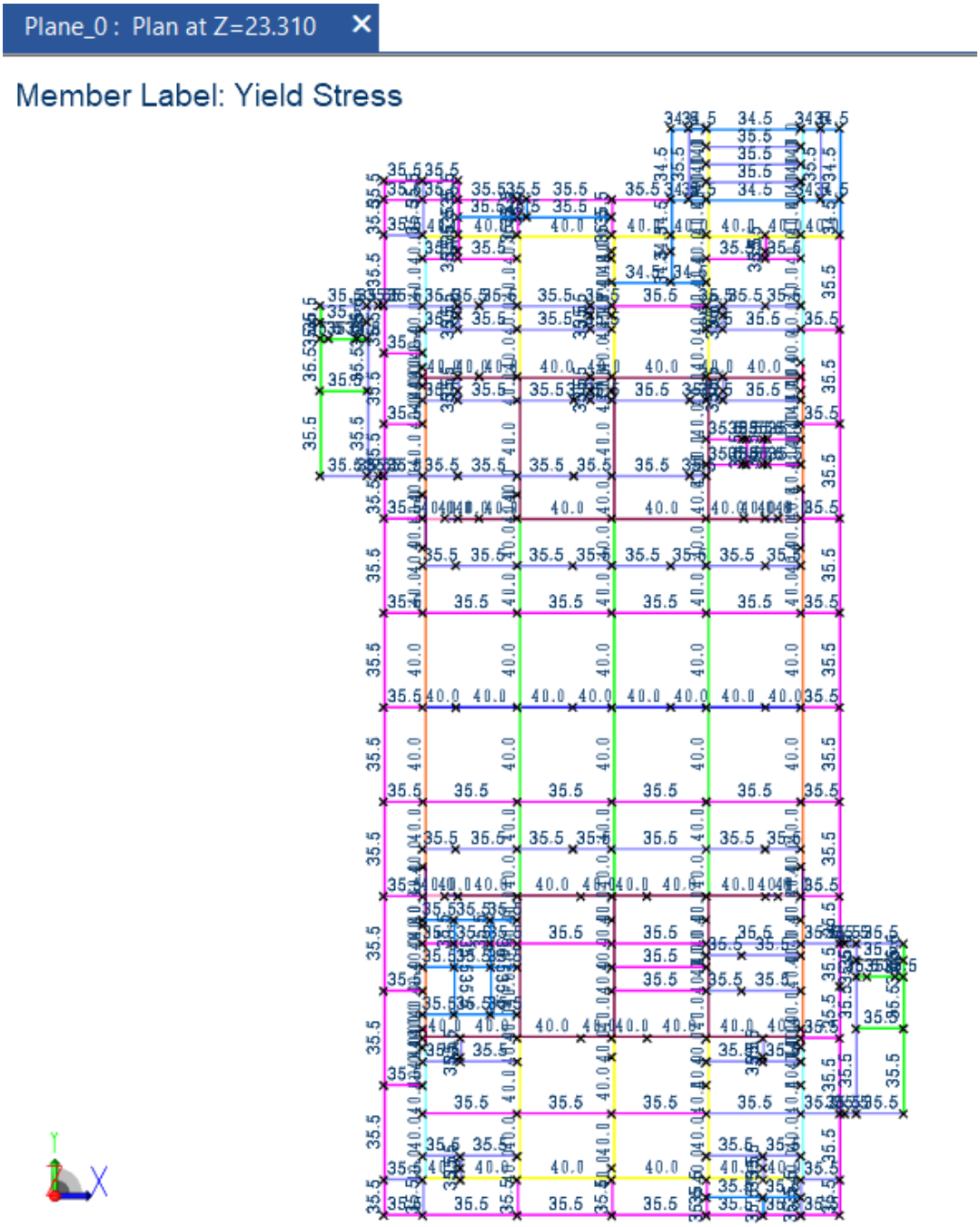
Name	Z Thickness (cm)	M	E (kN/cm2)	U	Fy (kN/cm2)	Z Offset (cm)	Section	Spacing (cm)	L	T	Density (tonne/m3)
P08	0.800	S	20500.000	0.300	35.500						10.0000029-5
P10	1.000	S	20500.000	0.300	35.500						10.0000029-5

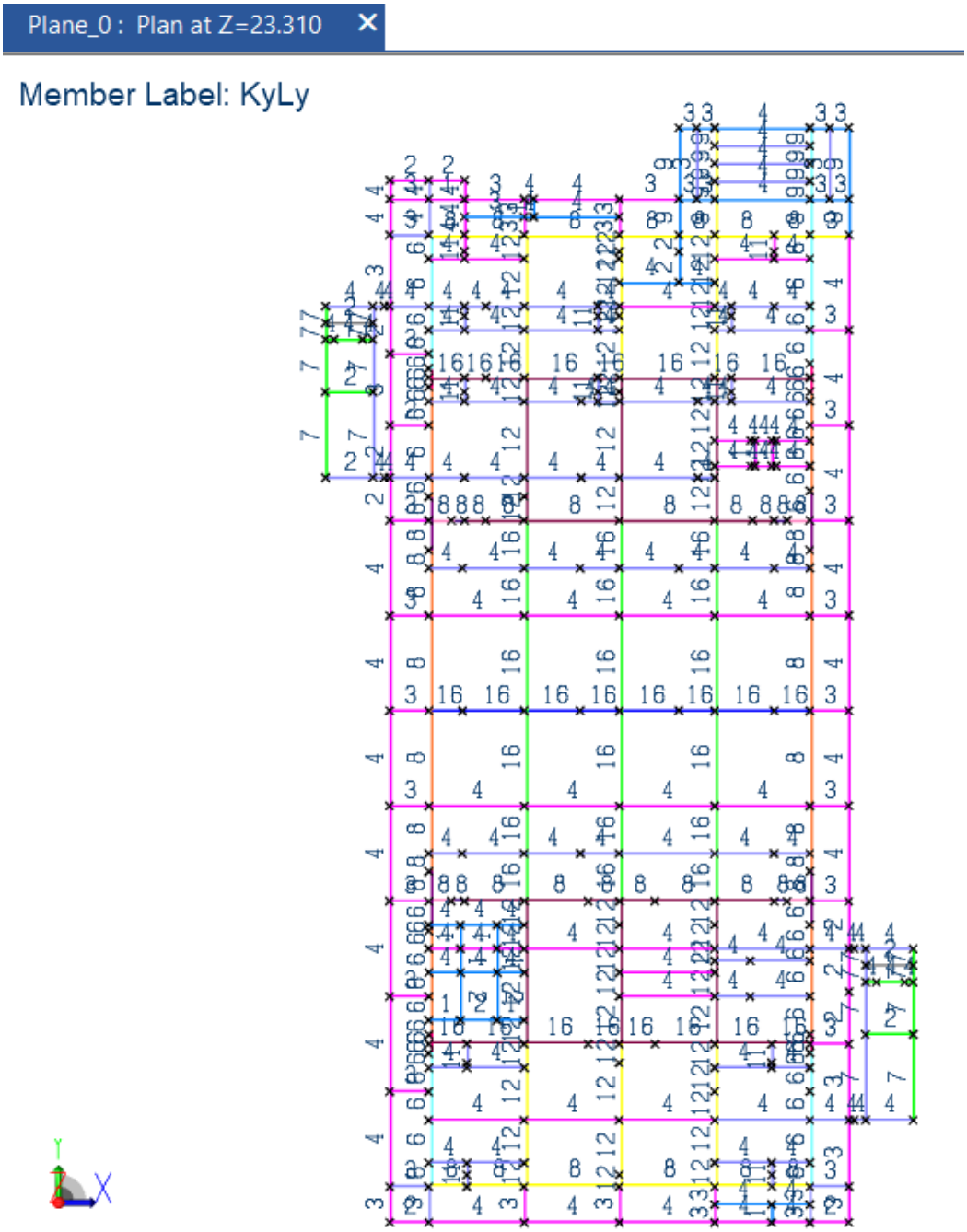
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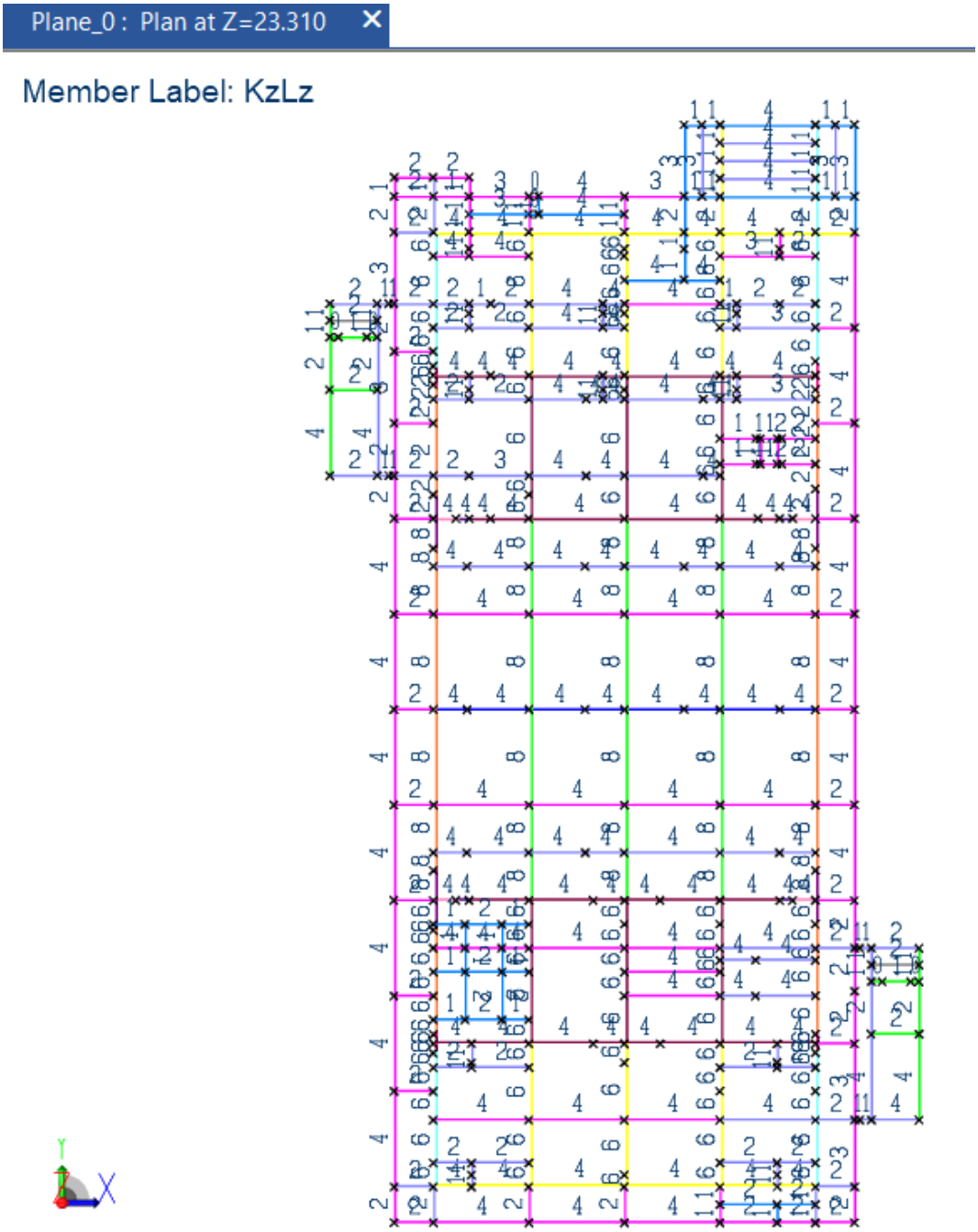
APPENDIX B - WIREFRAME SCHEMES

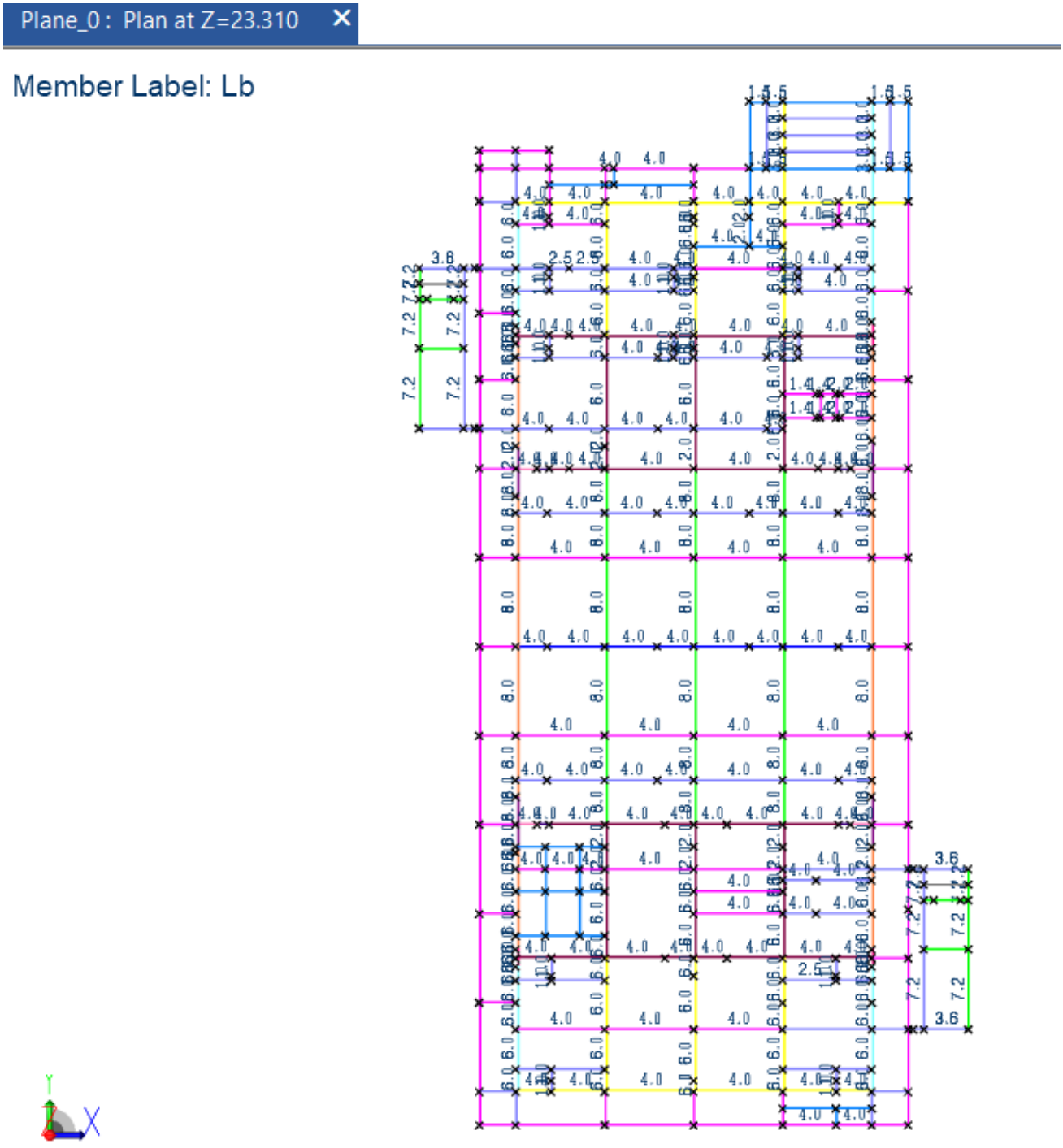


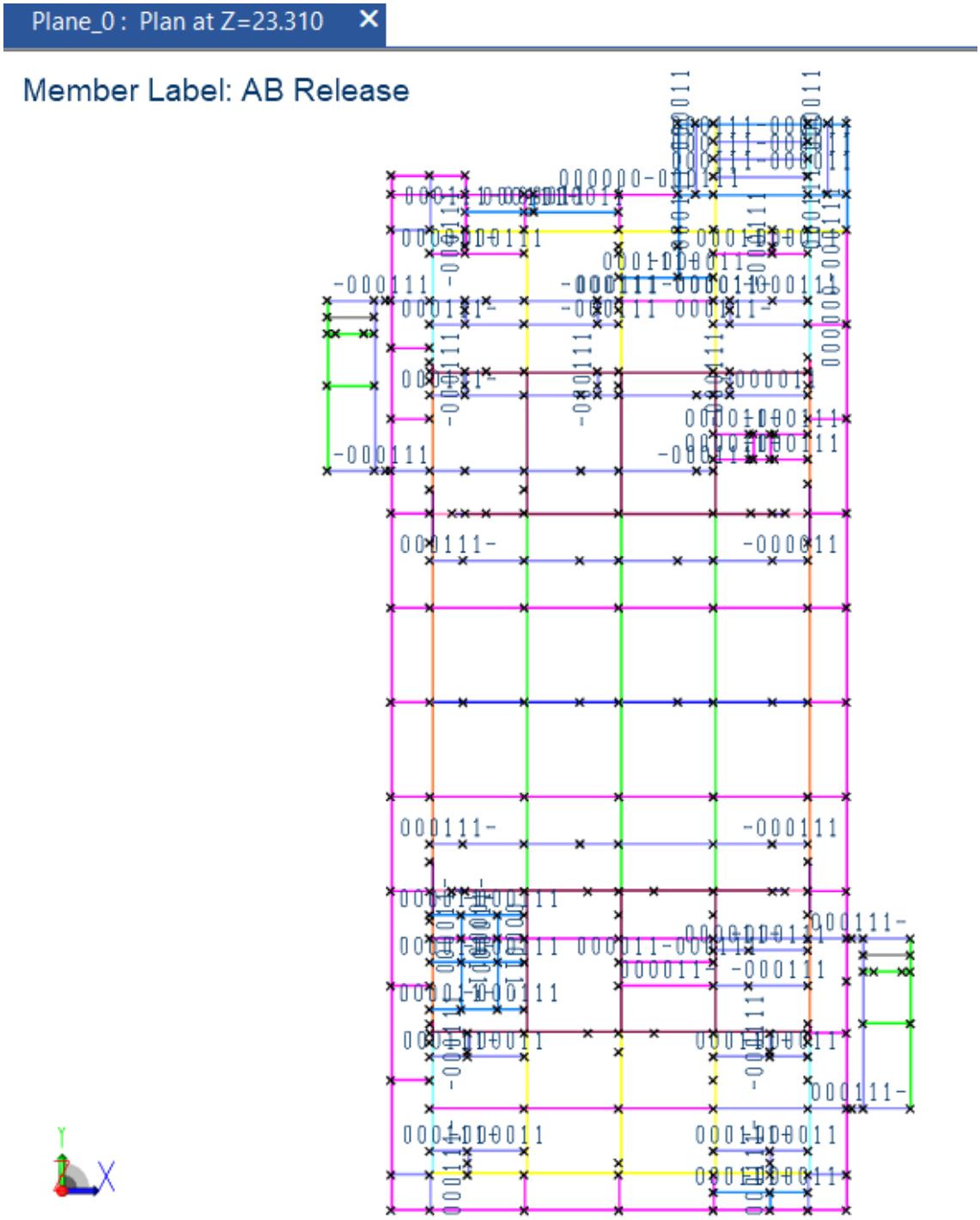

Plane_0 : Plan at Z=23.310
Member Label: Group

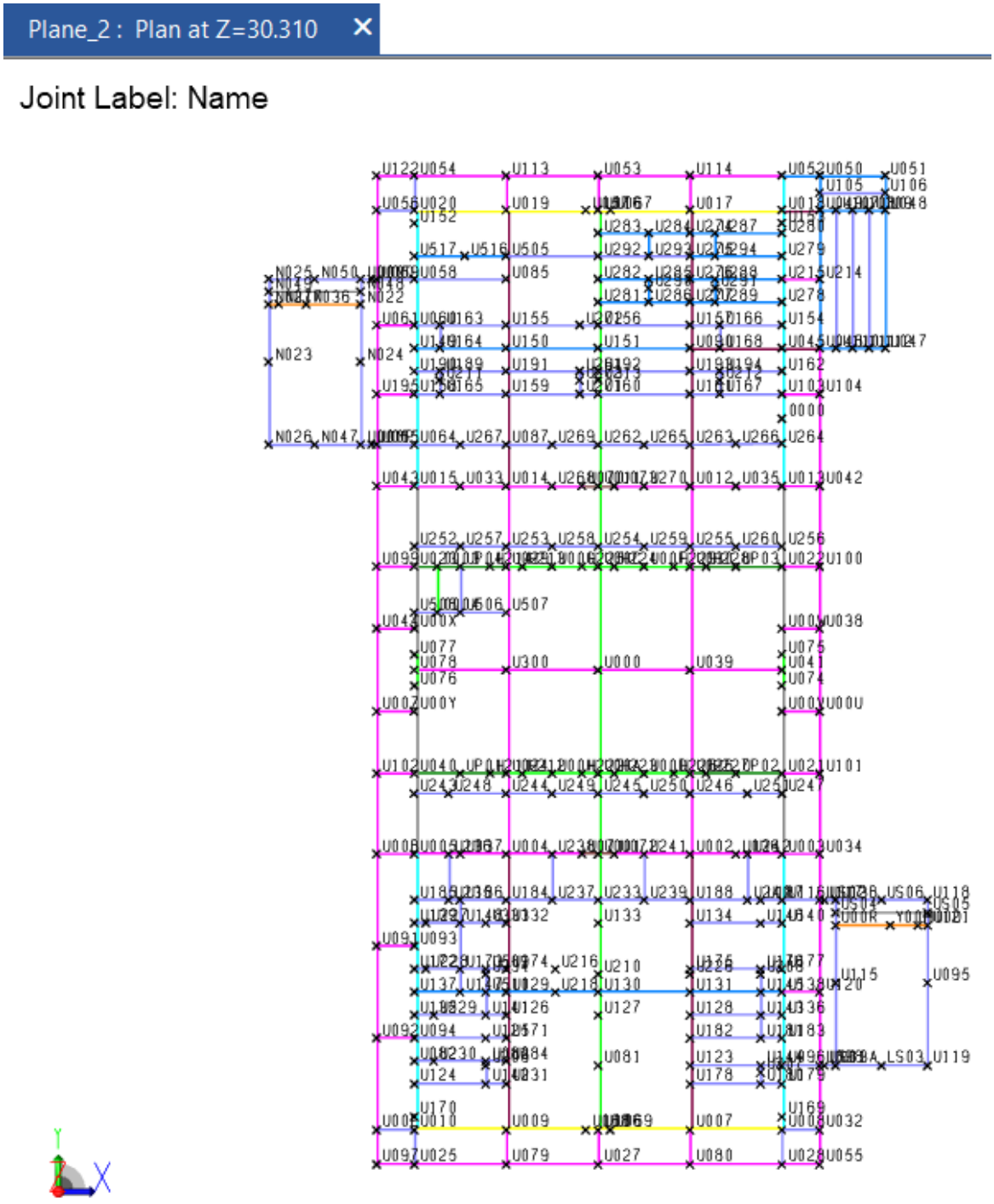

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Member Label: Yield Stress
Y
X

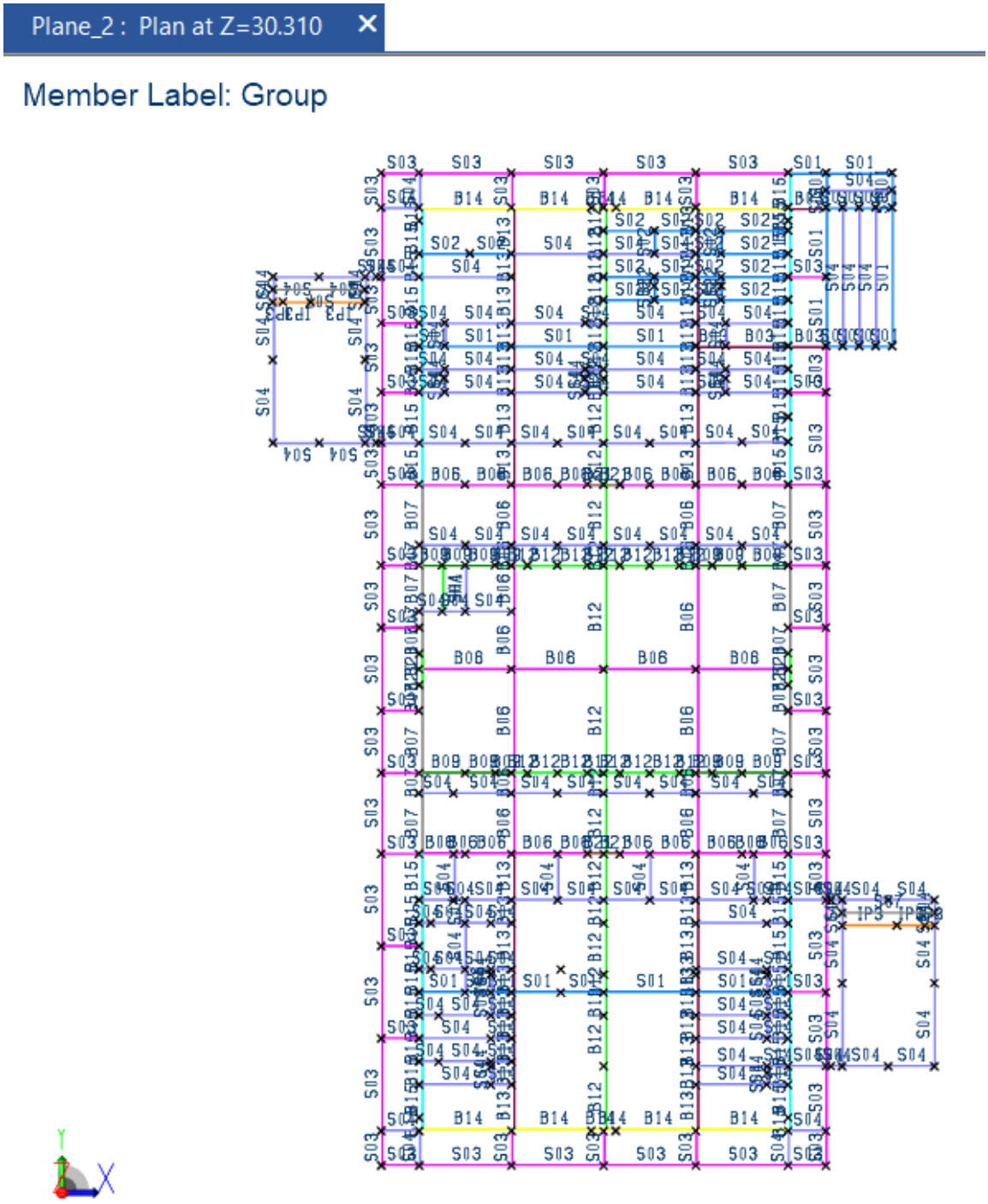

Plane_0 : Plan at Z=23.310
Member Label: KyLy


Plane_0 : Plan at Z=23.310
Member Label: KzLz

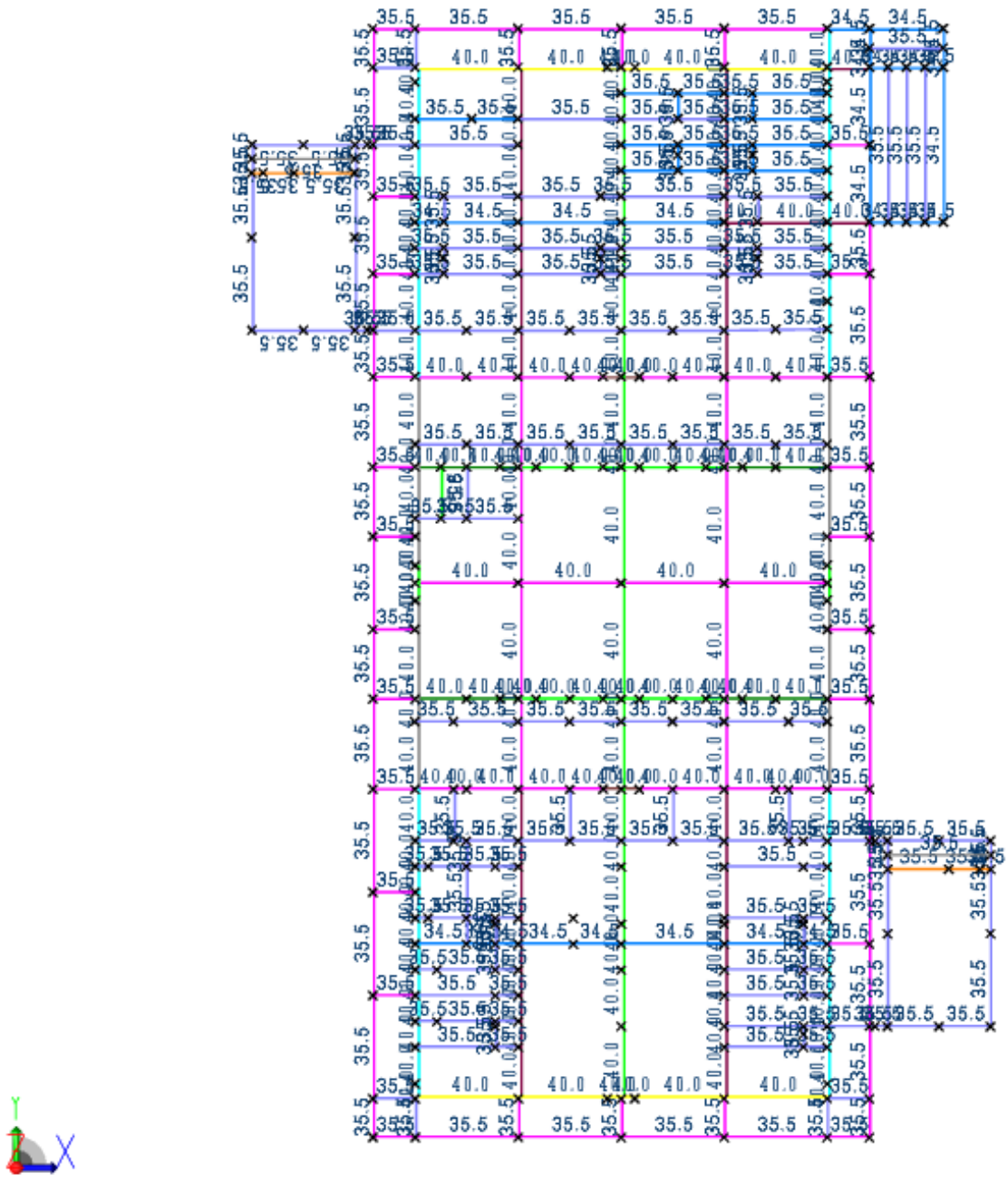

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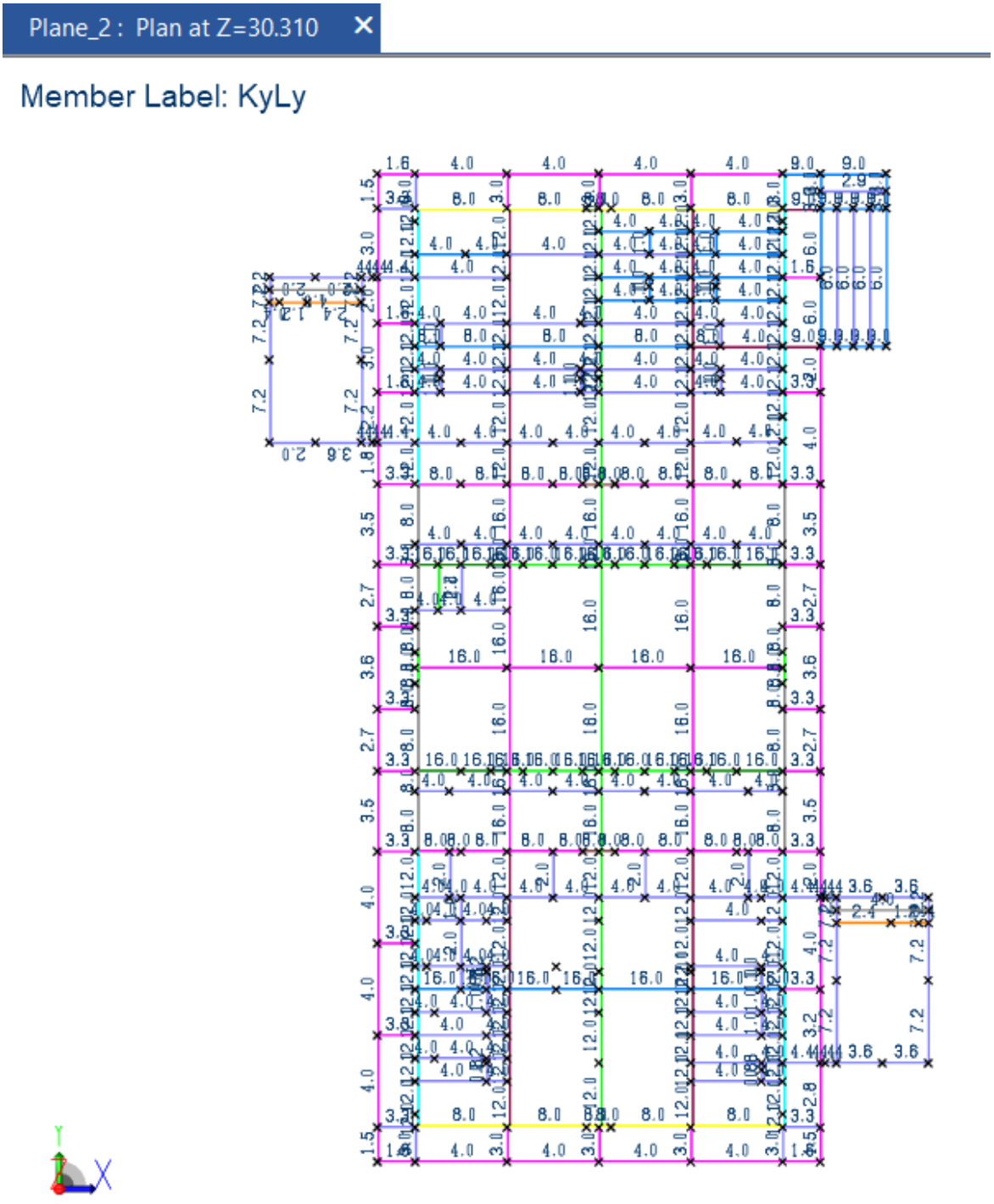

Plane_0 : Plan at Z=23.310
Member Label: AB Release


Plane_2 : Plan at Z=30.310
Joint Label: Name


Plane_2 : Plan at Z=30.310
Member Label: Group

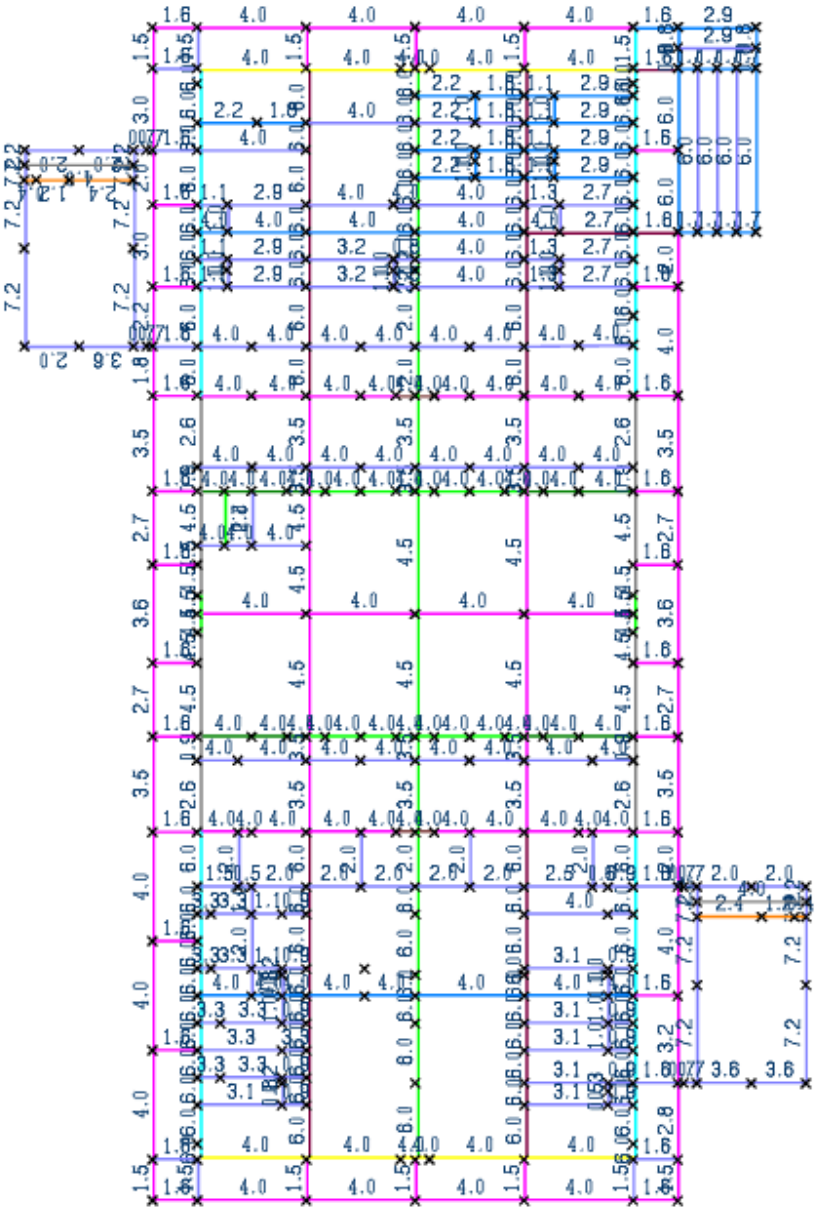
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Plane_2 : Plan at Z=30.310
Member Label: KyLy

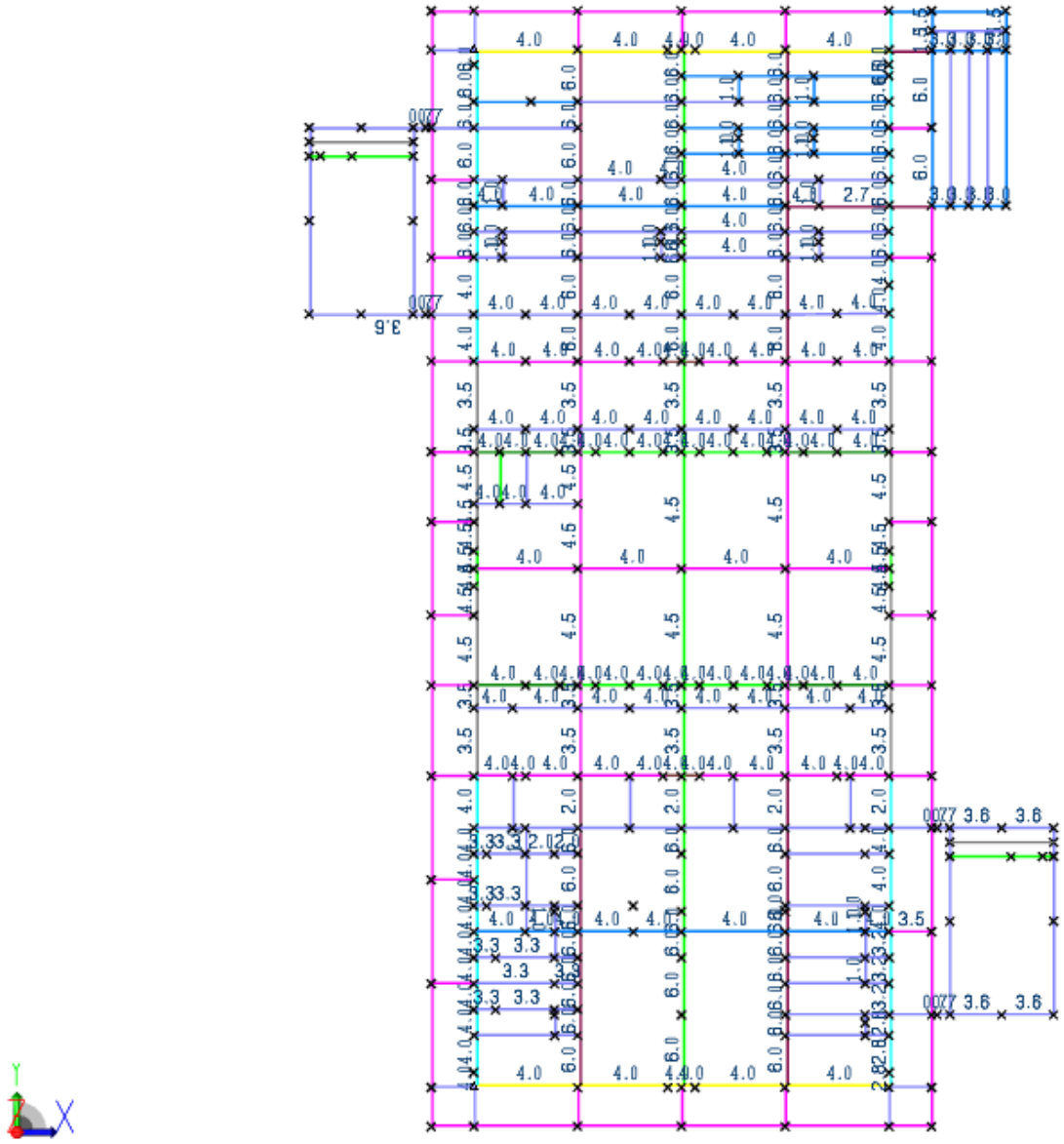
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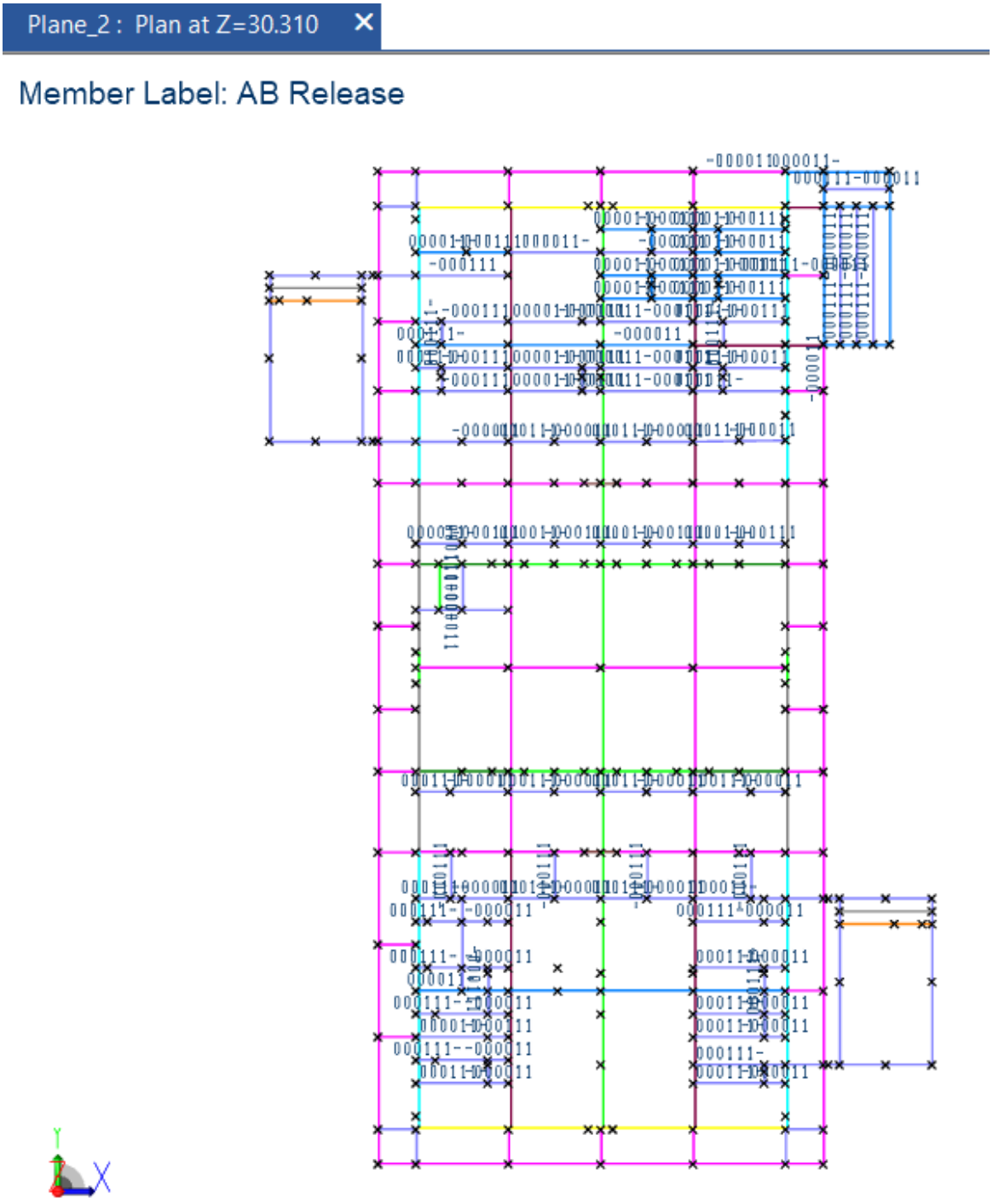
Member Label: KzLz



Plane_1 : Plan at Z=30.310

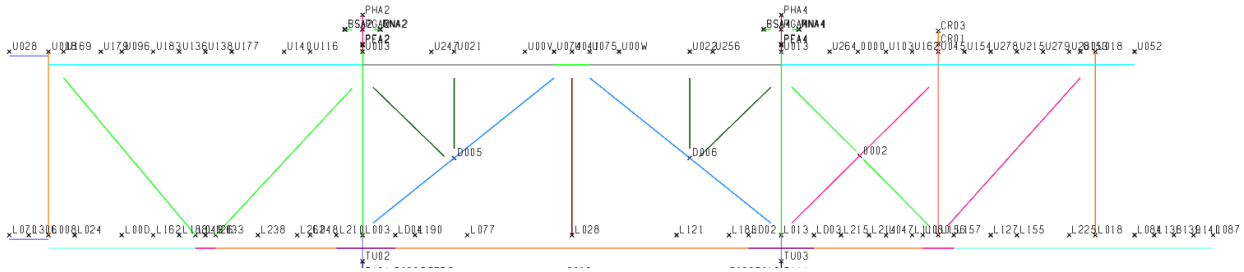
Member Label: Lb




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

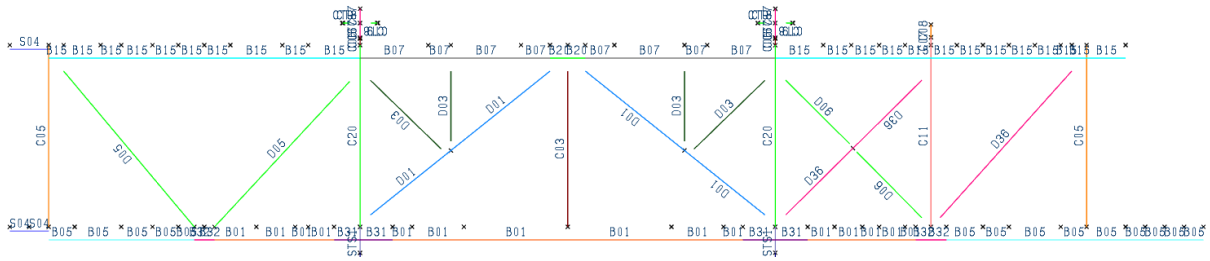
Plane_3 : Plan at X=8.000

Joint Label: Name



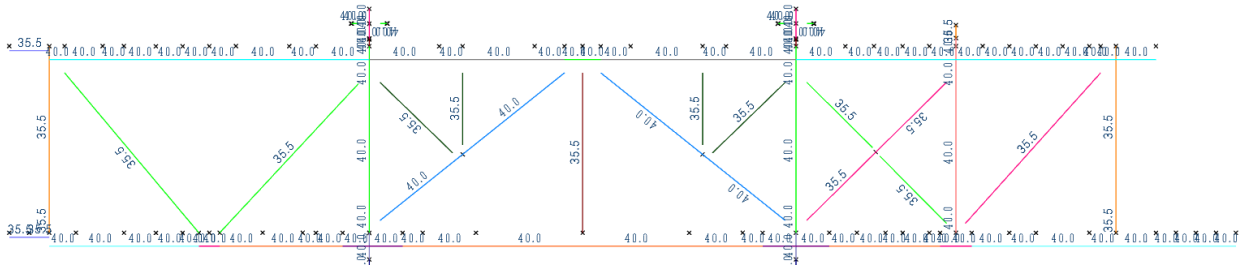
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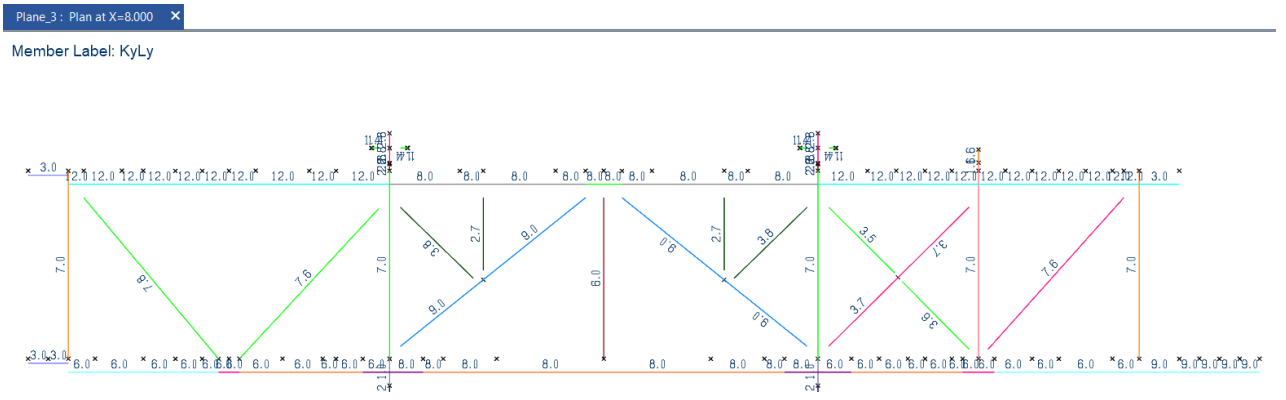
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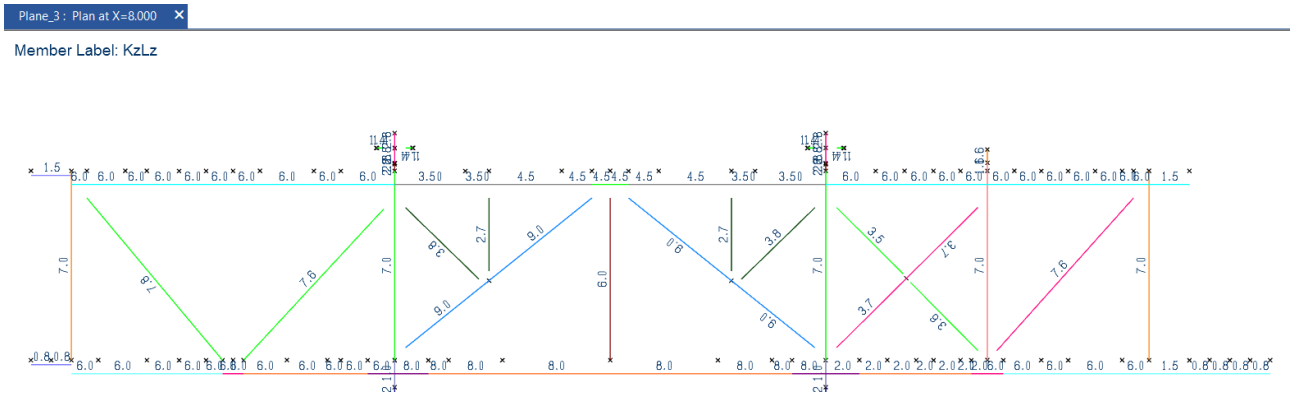


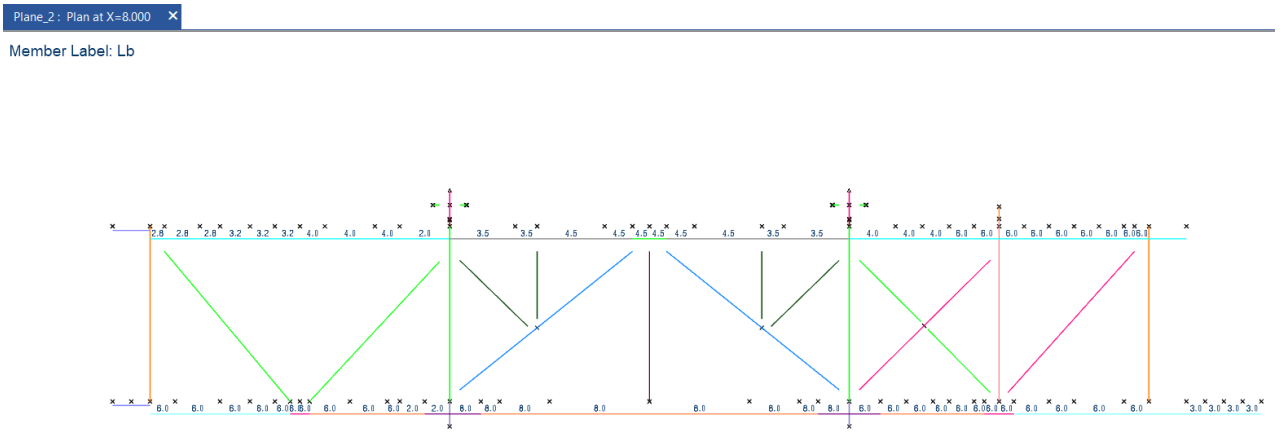
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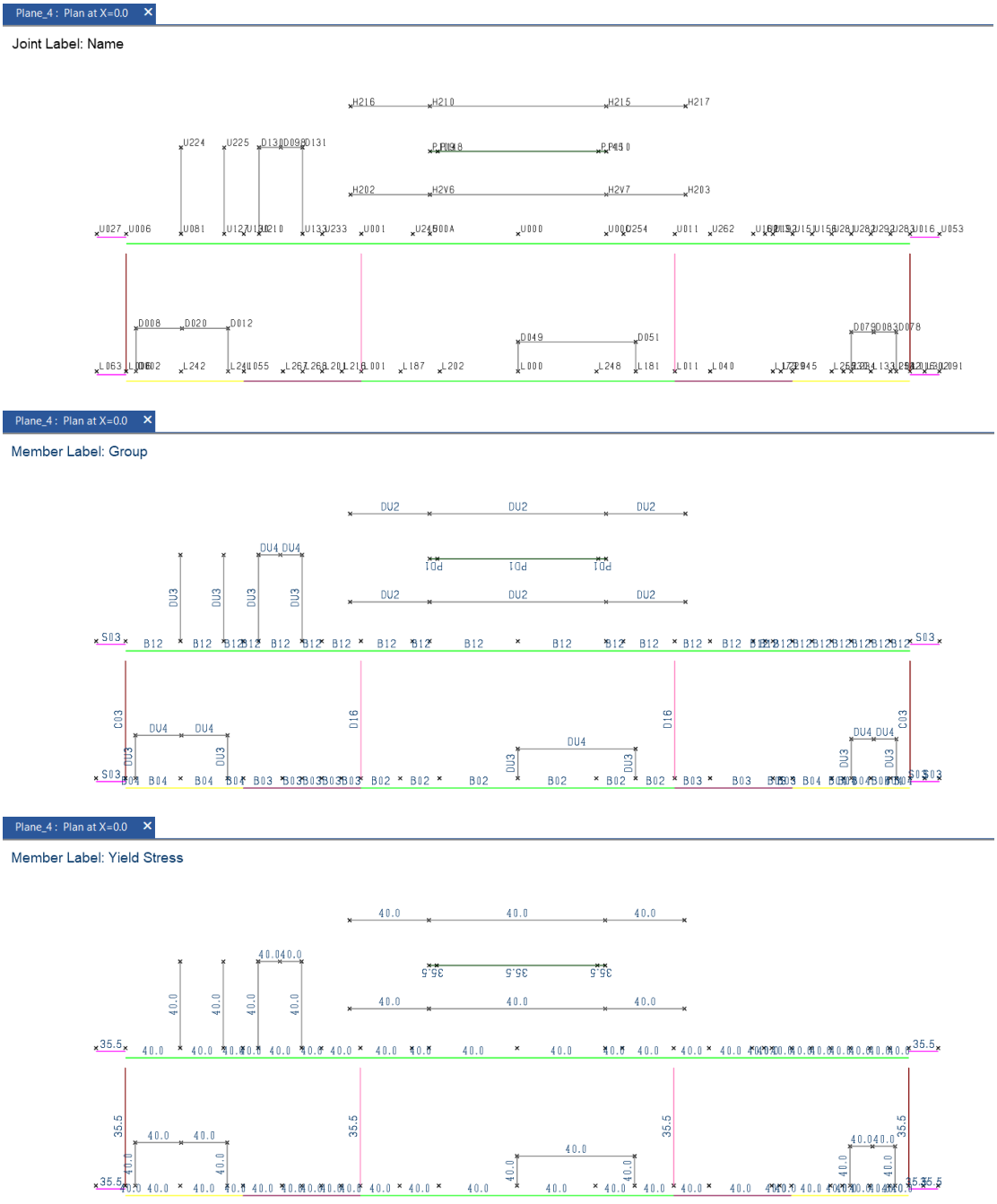
Member Label: Yield Stress




Plane_3 : Plan at X=8.000
Member Label: KyLy

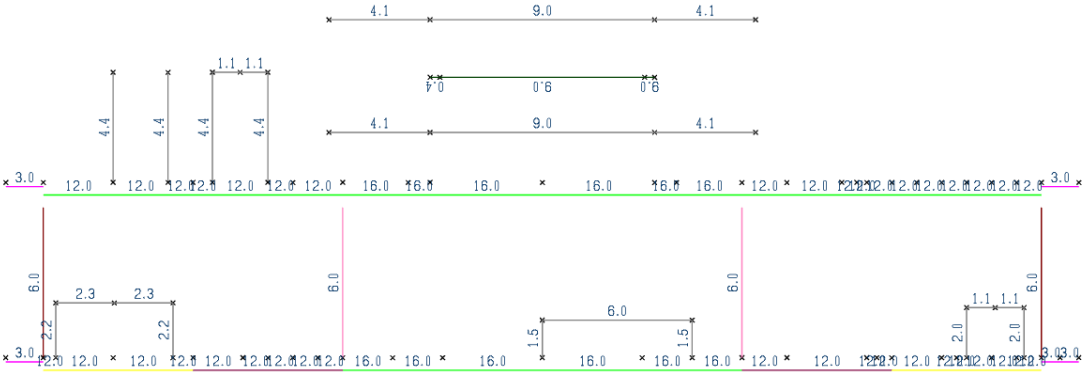

Plane_3 : Plan at X=8.000
Member Label: KzLz


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

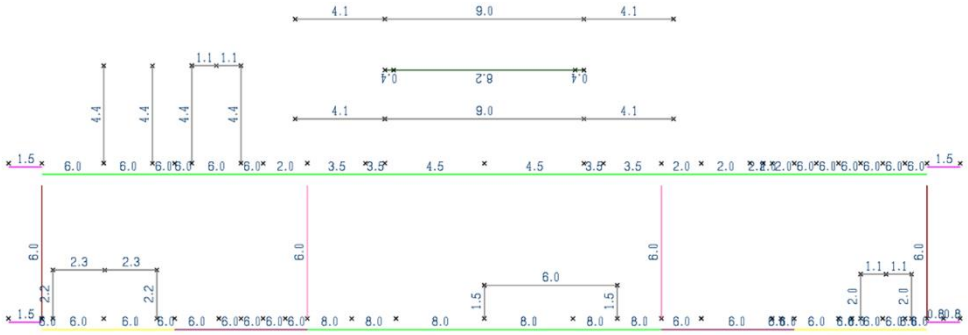
Plane_4 : Plan at X=0.0

Member Label: KyLy



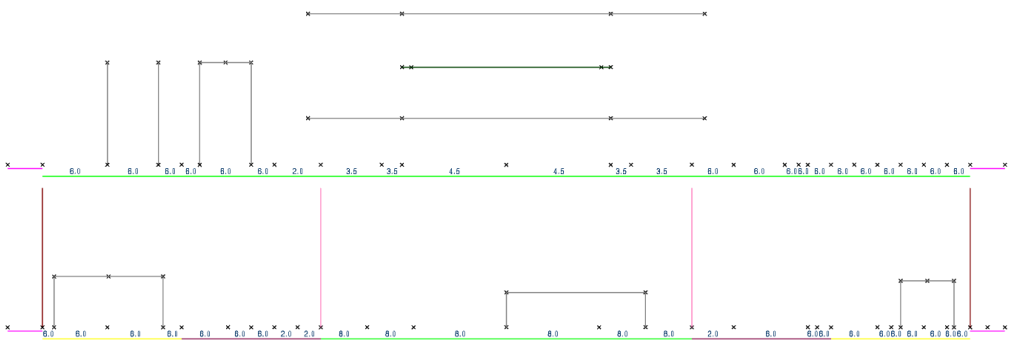
Plane_4 : Plan at X=0.0

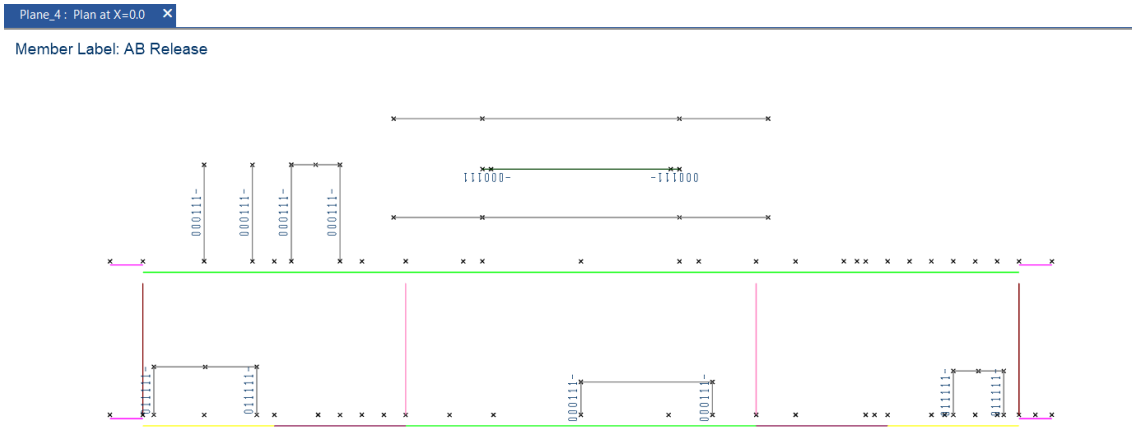
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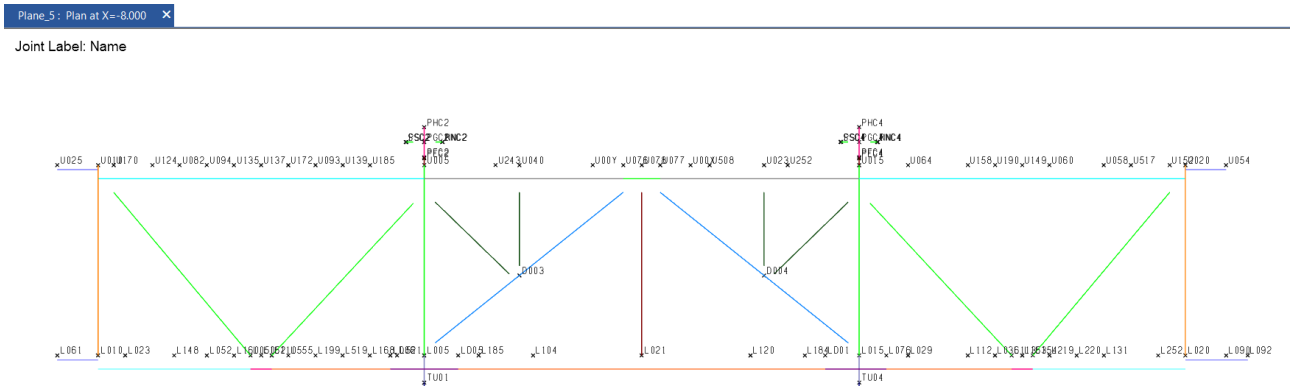


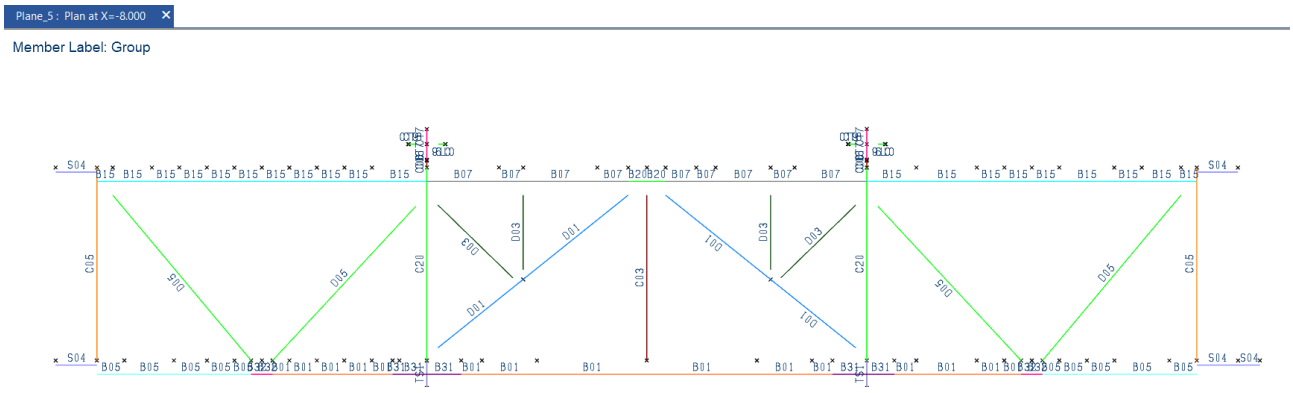
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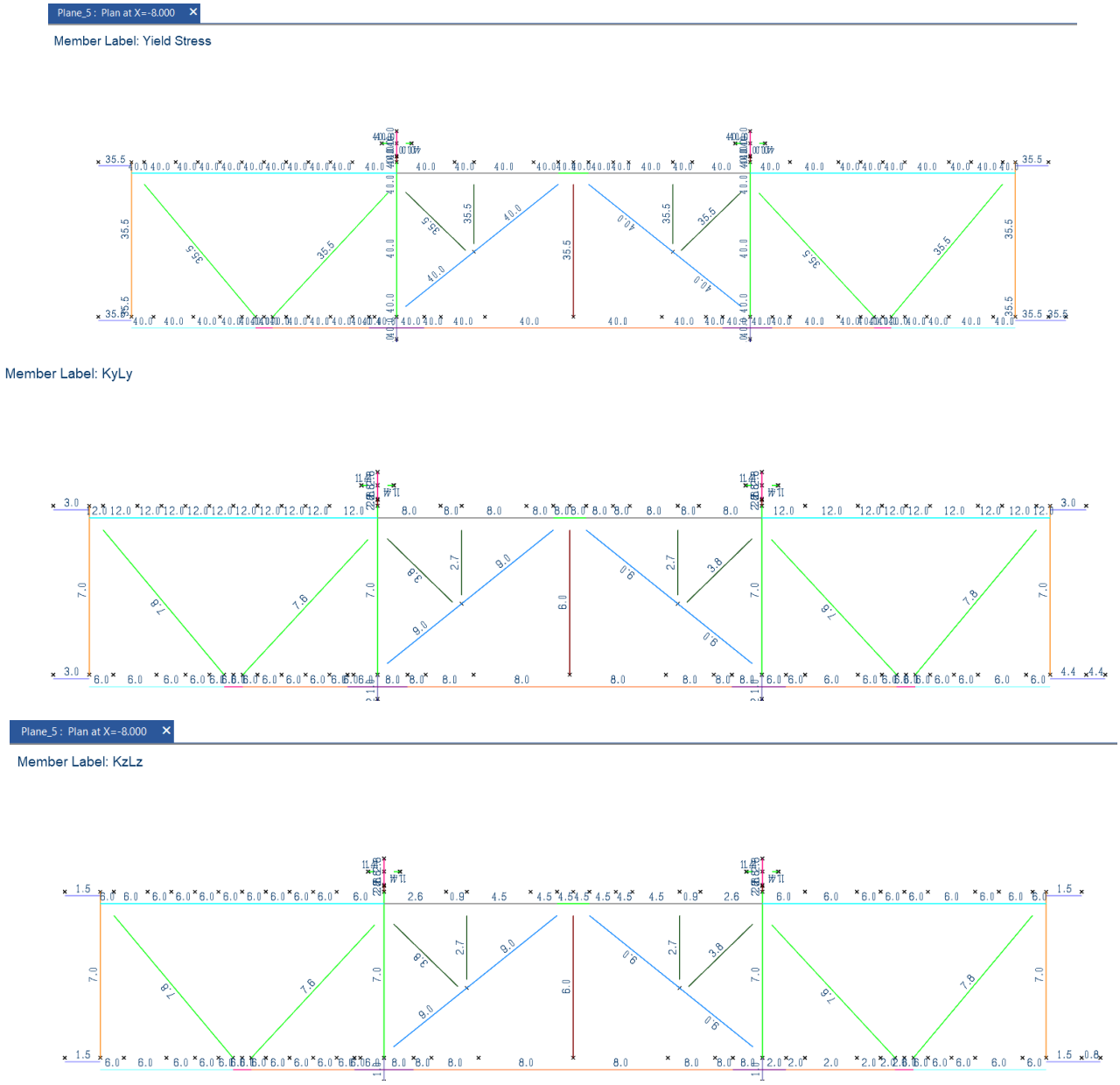
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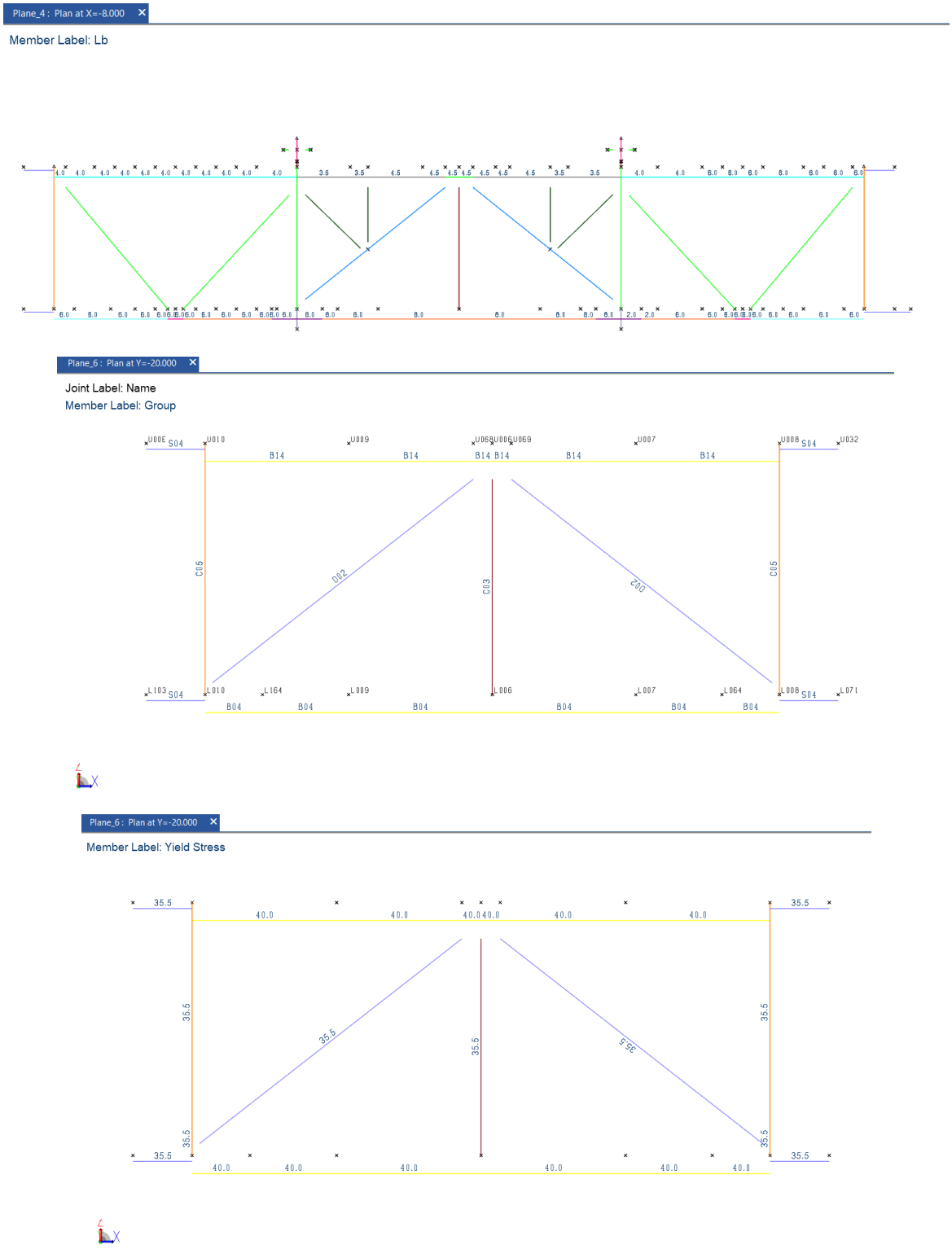


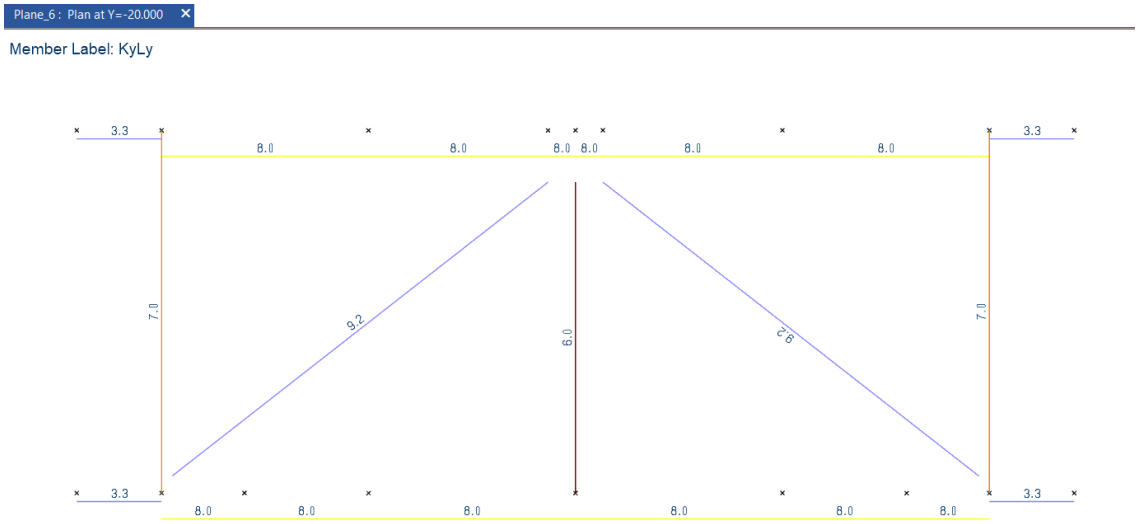

Plane_4 : Plan at X=0.0
Member Label: AB Release

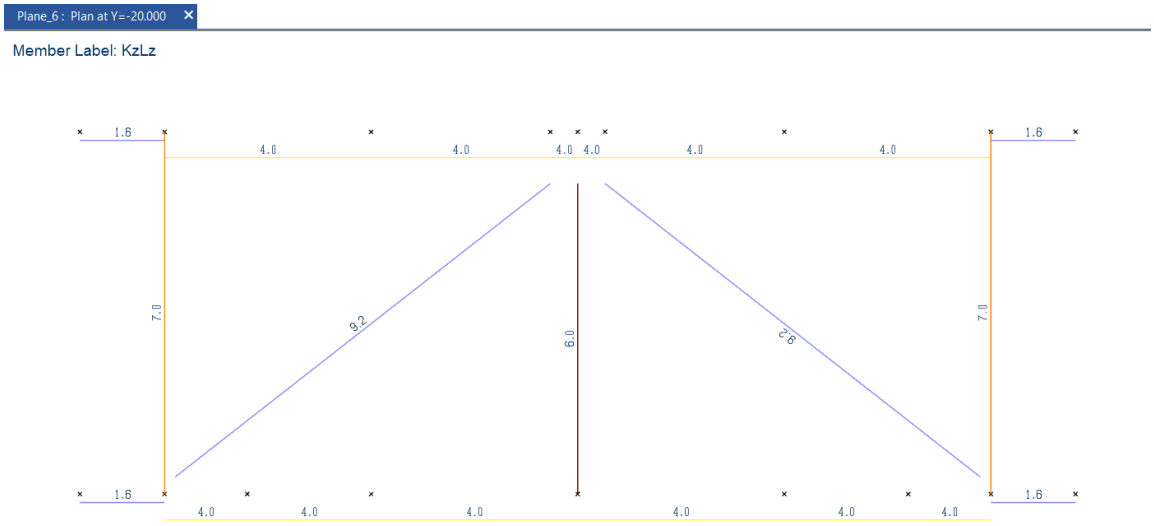

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Joint Label: Name

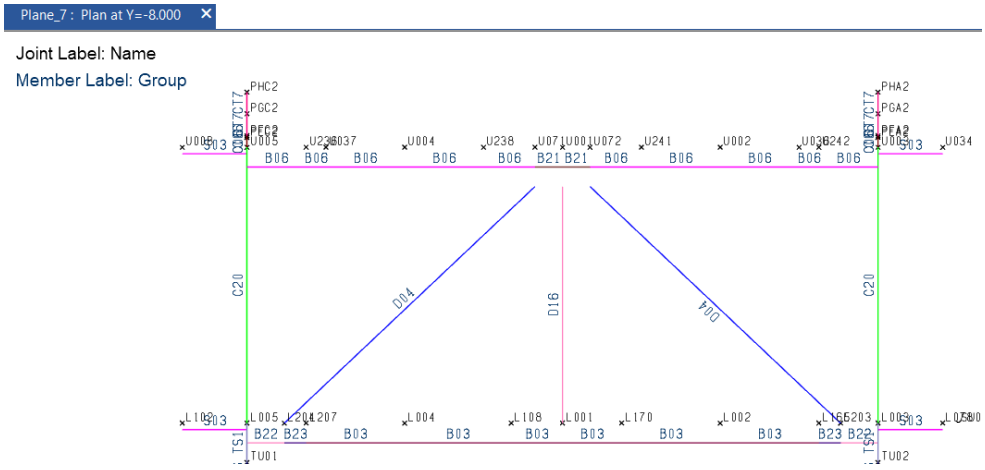

Plane_5 : Plan at X=-8.000
Member Label: Group

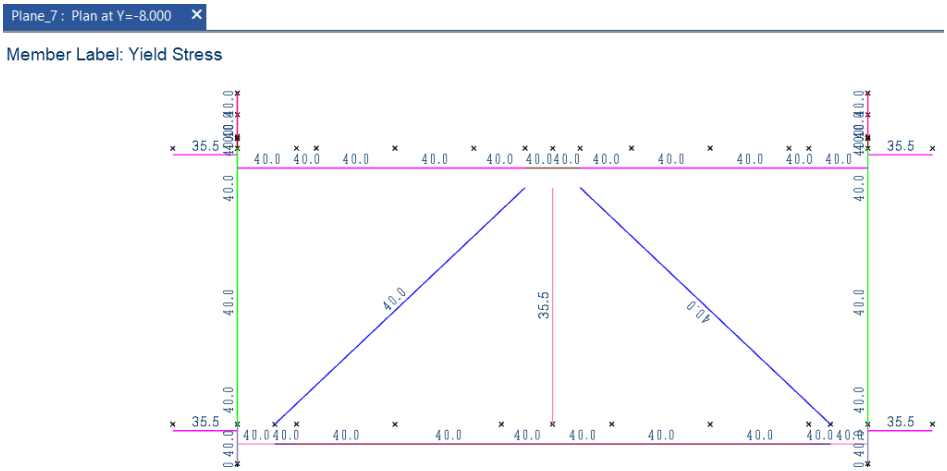

Plane_5 : Plan at X=-8.000
Member Label: Yield Stress
Member Label: KyLy
Plane_5 : Plan at X=-8.000
Member Label: KzLz

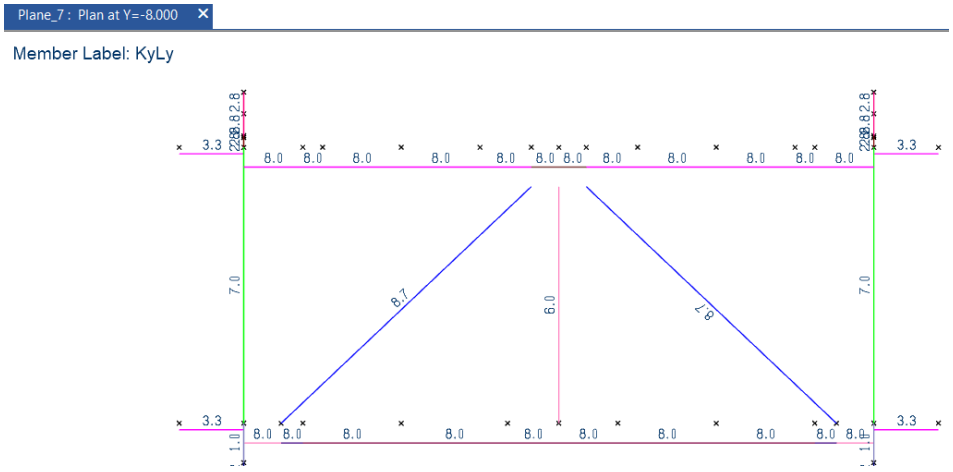

Plane_4 : Plan at X=-8.000
Member Label: Lb
Plane_6 : Plan at Y=-20.000
Joint Label: Name
Member Label: Group
Plane_6 : Plan at Y=-20.000
Member Label: Yield Stress

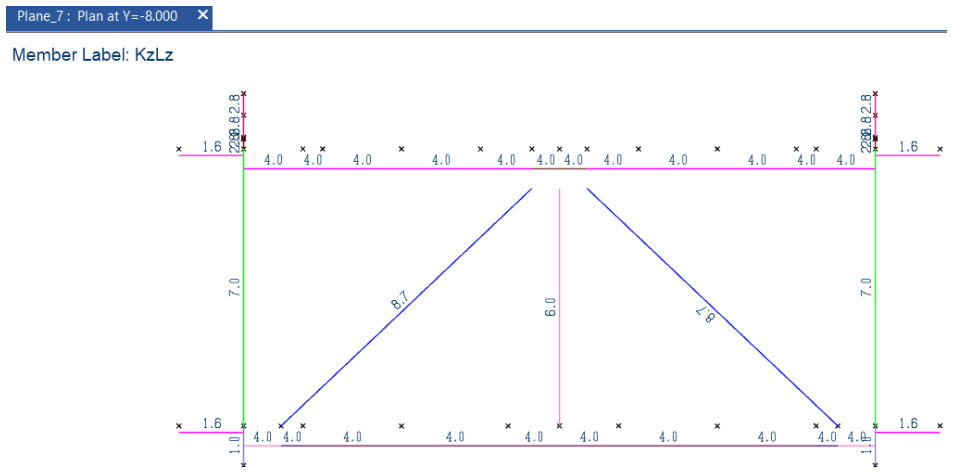

Plane_6 : Plan at Y=-20.000
Member Label: KyLy
3.3
8.0
7.0
9.2
6.0

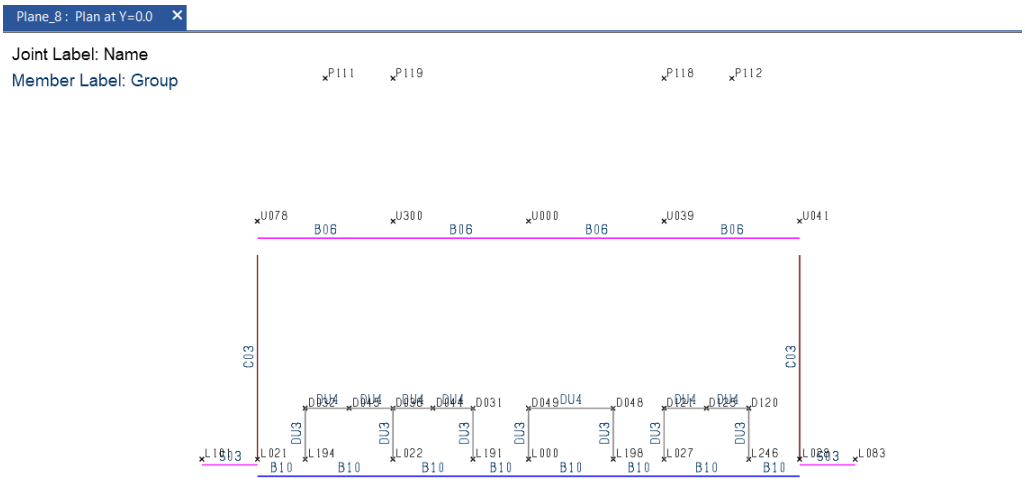

Plane_6 : Plan at Y=-20.000
Member Label: KzLz
1.6
4.0
7.0
9.2
6.0

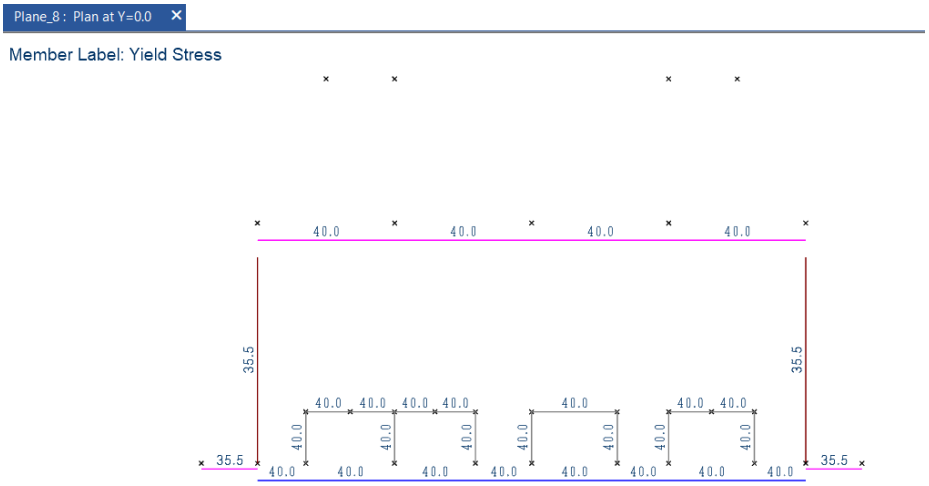

Plane_7 : Plan at Y=-8.000
Joint Label: Name
Member Label: Group
PHC2
PGC2
PHA2
PGA2
C20
D04
D16
B06
B21
B22
B23
B03
S03
TS1
TS2
TU01
TU02

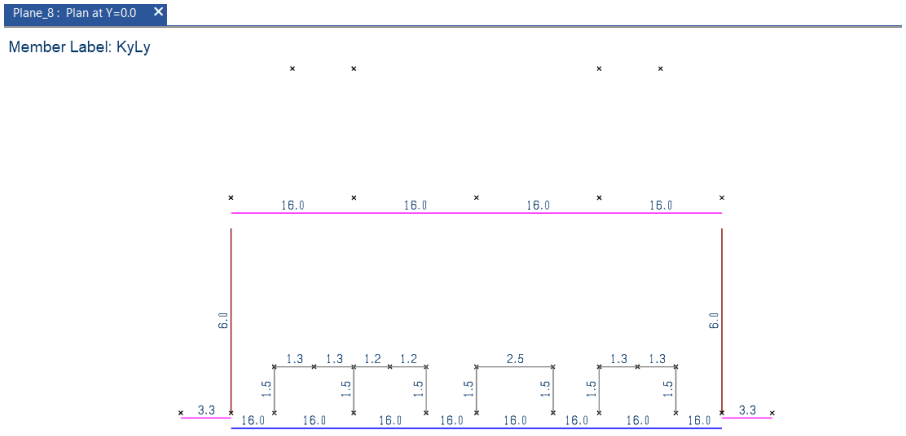

Plane_7 : Plan at Y=-8.000
Member Label: Yield Stress
35.5
40.0

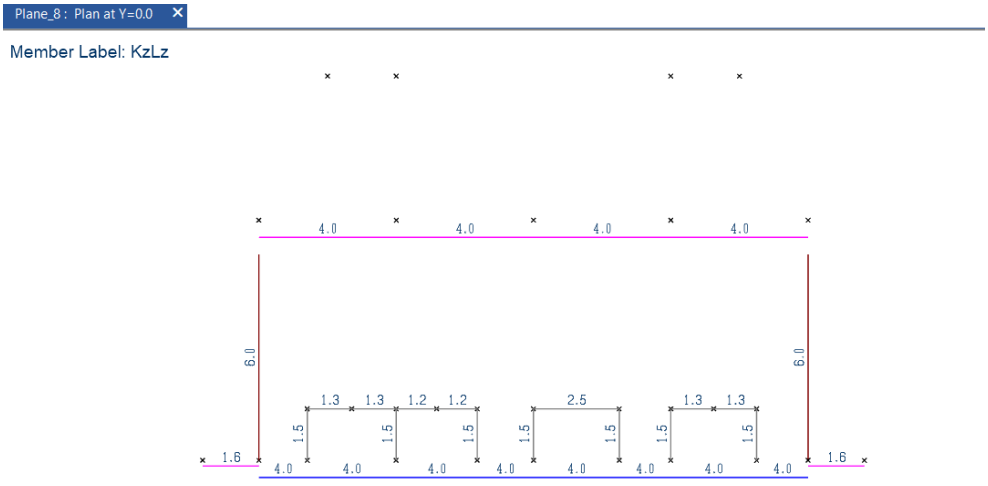

Plane_7 : Plan at Y=-8.000
Member Label: KyLy

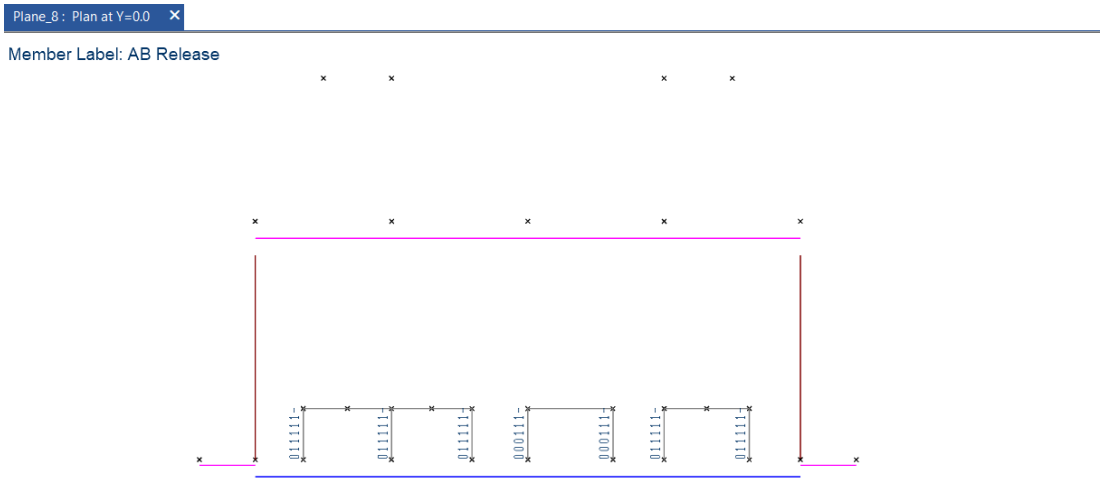

Plane_7 : Plan at Y=-8.000
Member Label: KzLz

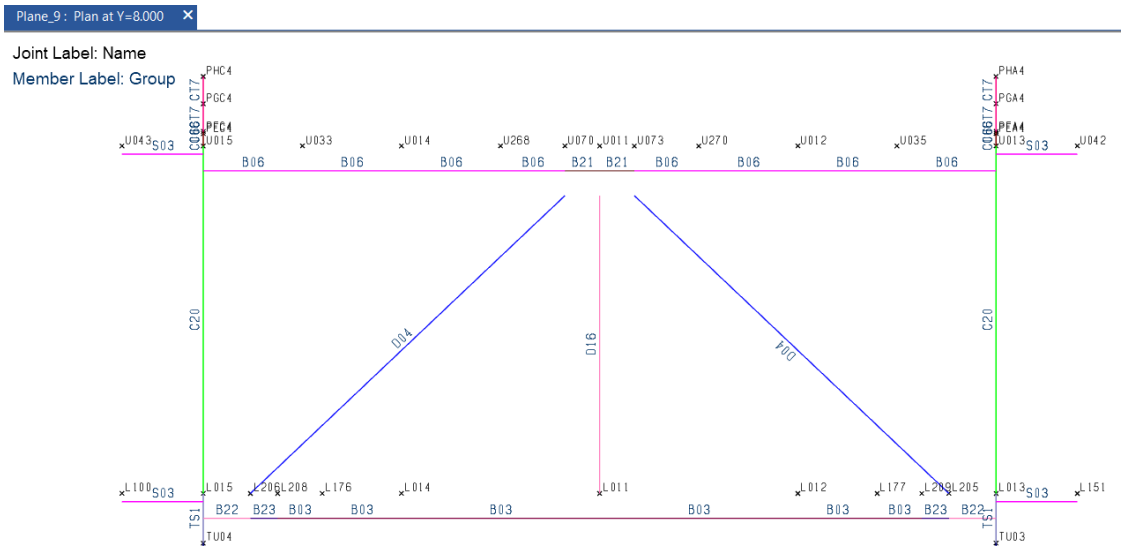

Plane_8 : Plan at Y=0.0
Joint Label: Name
Member Label: Group

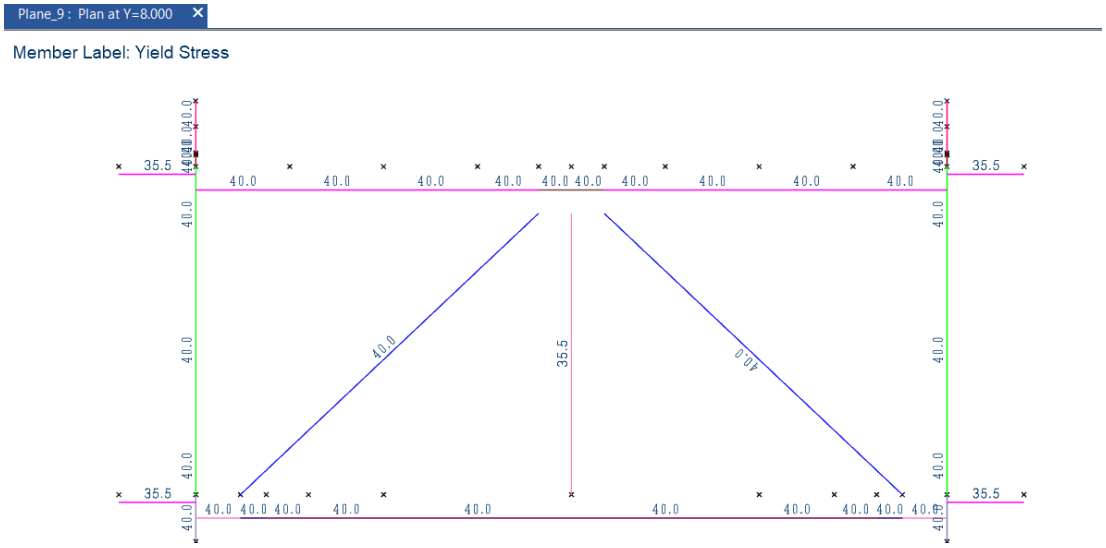

Plane_8 : Plan at Y=0.0
Member Label: Yield Stress

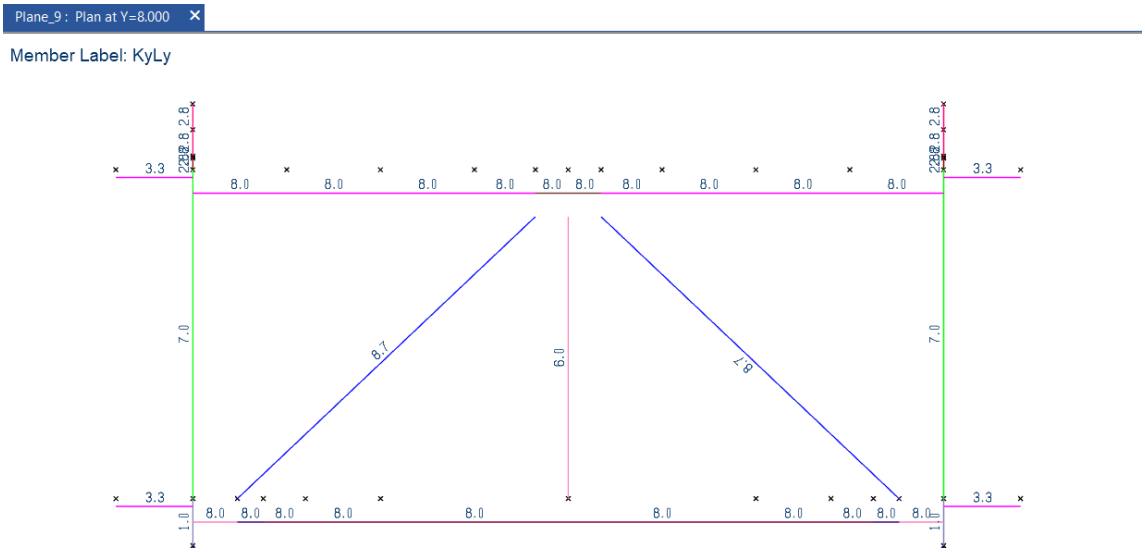

Plane_8 : Plan at Y=0.0
Member Label: KyLy

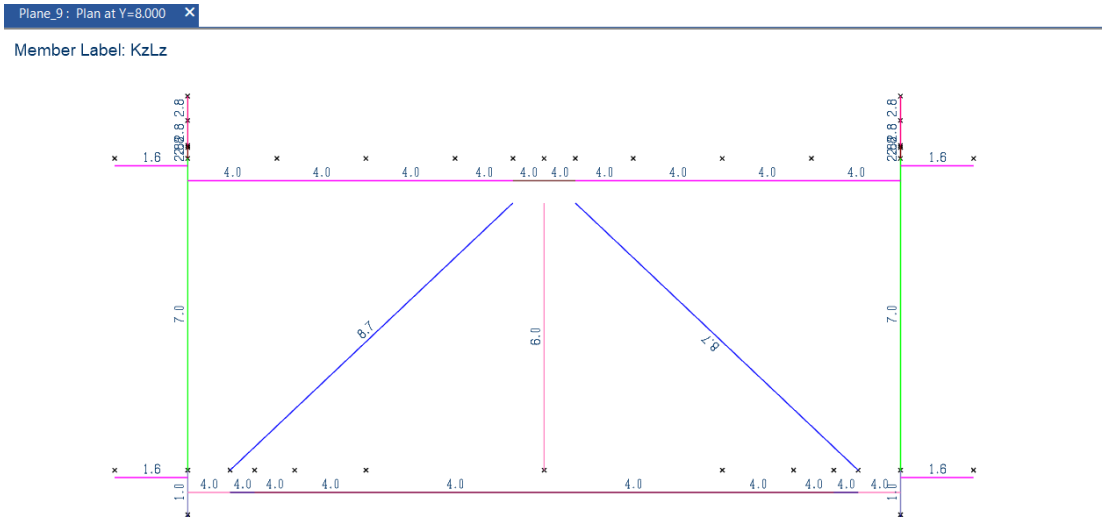

Plane_8 : Plan at Y=0.0
Member Label: KzLz

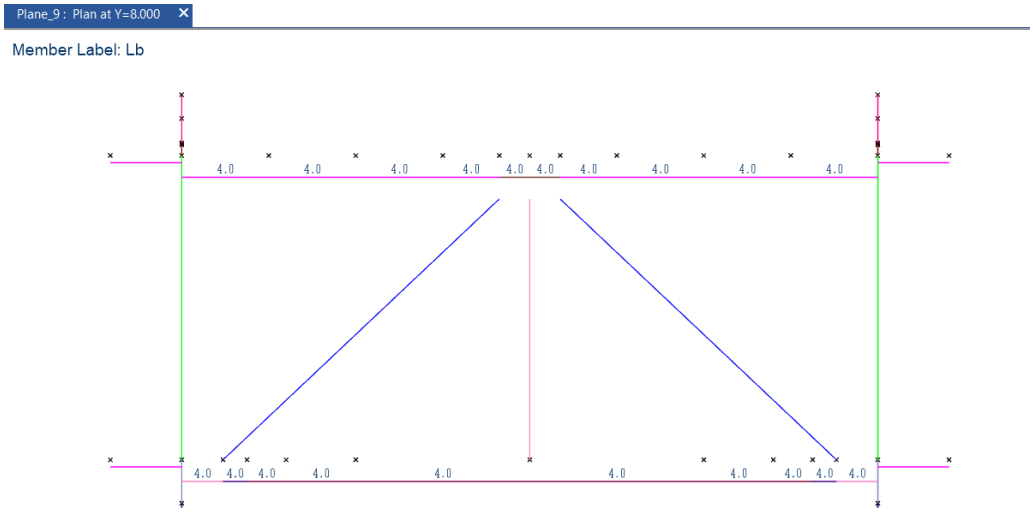

Plane_8 : Plan at Y=0.0
Member Label: AB Release

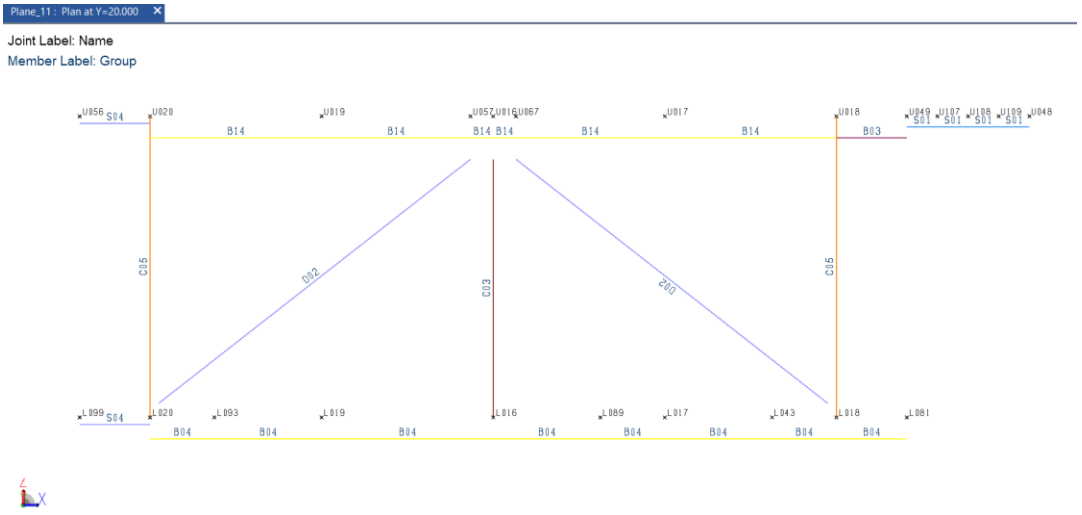

Plane_9 : Plan at Y=8.000
Joint Label: Name
Member Label: Group
B06
B21
B03
B22
B23
C20
D04
D16
TS1

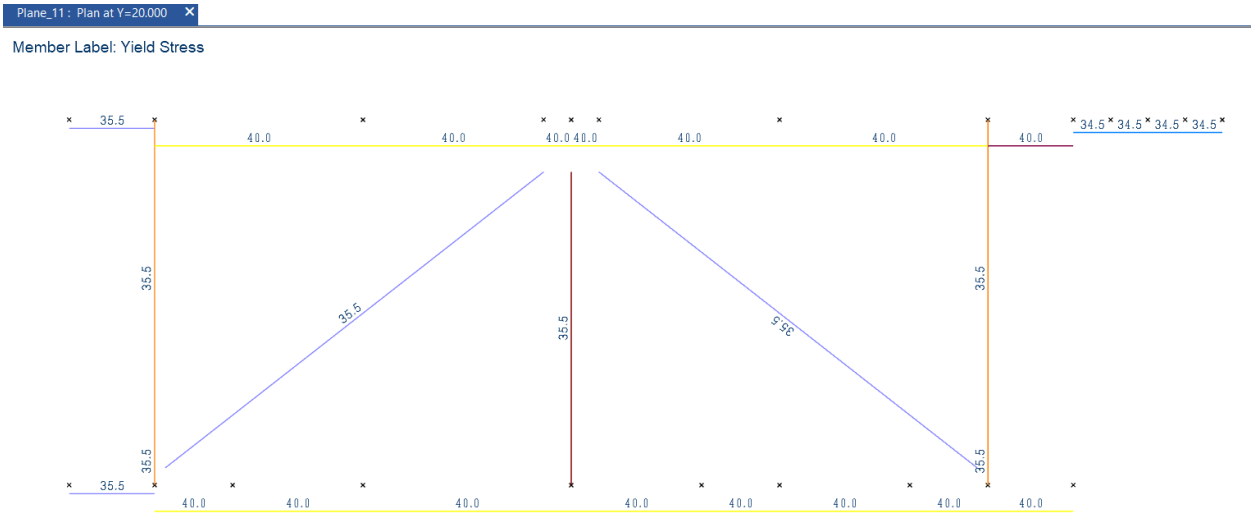

Plane_9 : Plan at Y=8.000
Member Label: Yield Stress
35.5
40.0
35.5


Plane_9 : Plan at Y=8.000
Member Label: KyLy
3.3
8.0
7.0
6.0
8.7
3.3

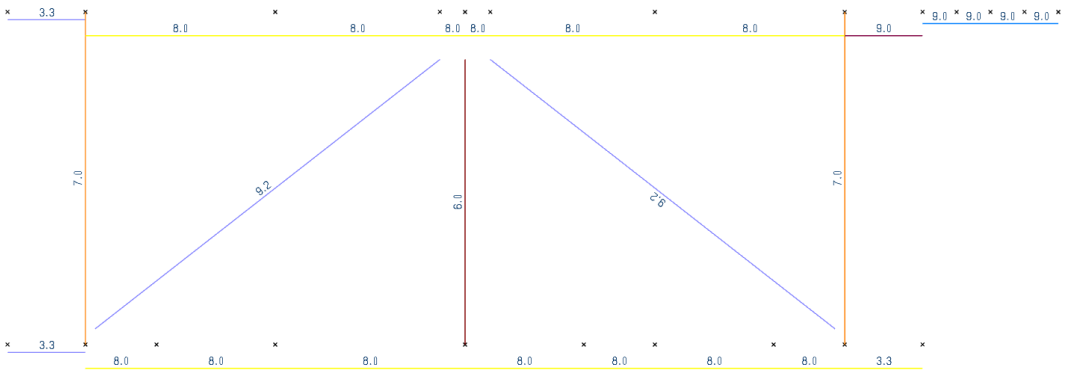

Plane_9 : Plan at Y=8.000
Member Label: KzLz
1.6
4.0
7.0
8.7
6.0
1.0


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


Plane_11 : Plan at Y=20.000
Member Label: Yield Stress
35.5
40.0
34.5

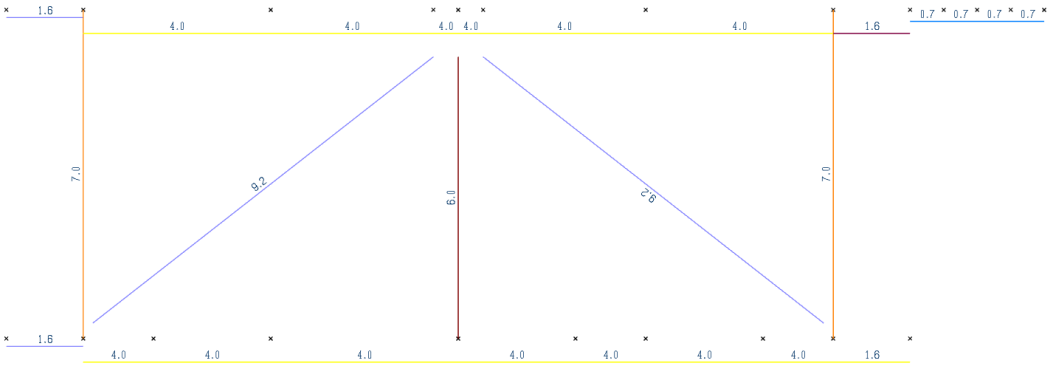
Member Label: KyLy



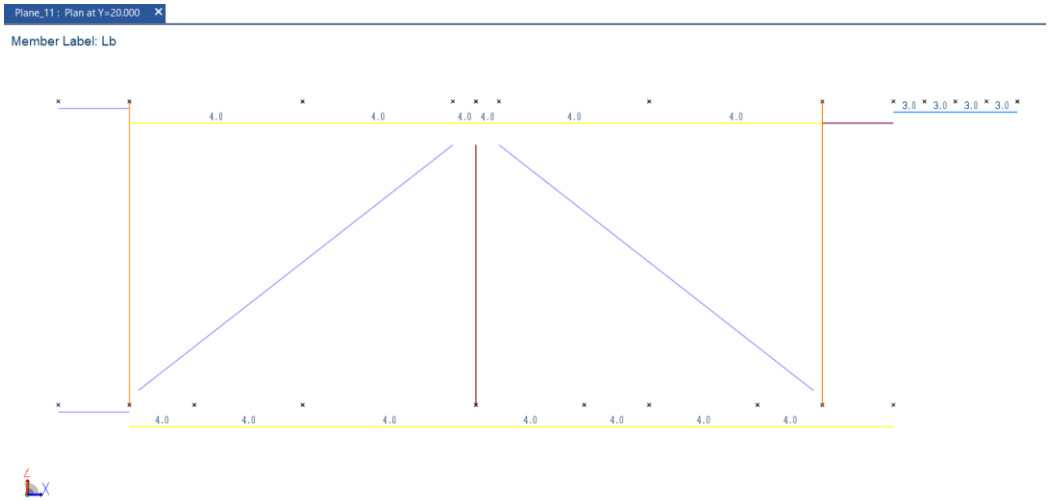


Plane_11 : Plan at Y=20.000

Member Label: KzLz






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
Z
X