Base Load Power Hub (BLPH)

BLPH Platform Transition Piece Lifting Analysis

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APPENDIX A – MEMBER GROUPS AND SECTION PROPERTIES

APPENDIX B - WIREFRAME SCHEMES

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

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

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

1.1.1 Project Location

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

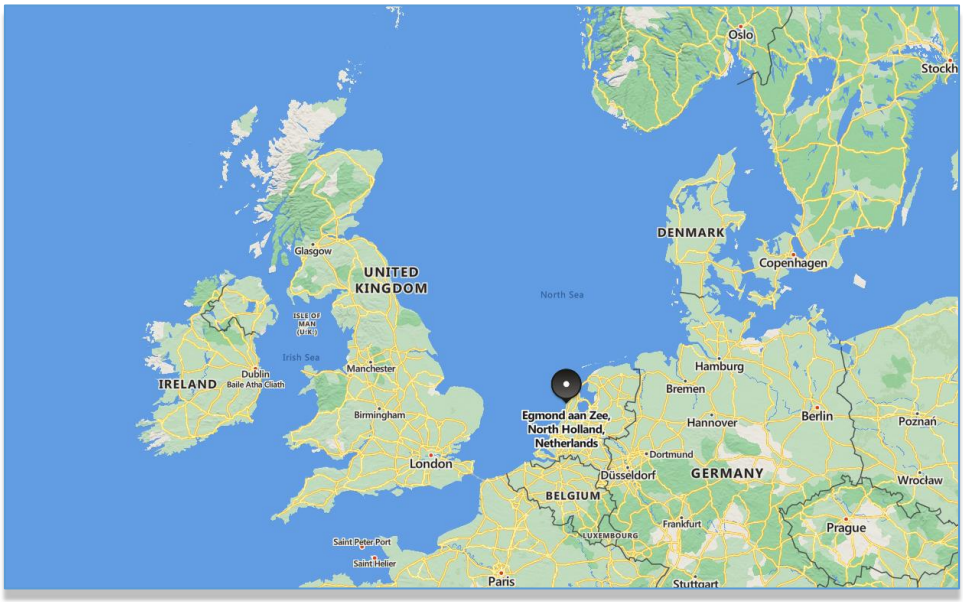


Figure 1.1 - HOLLANDSE KUST NOORD WIND PARK Location Map

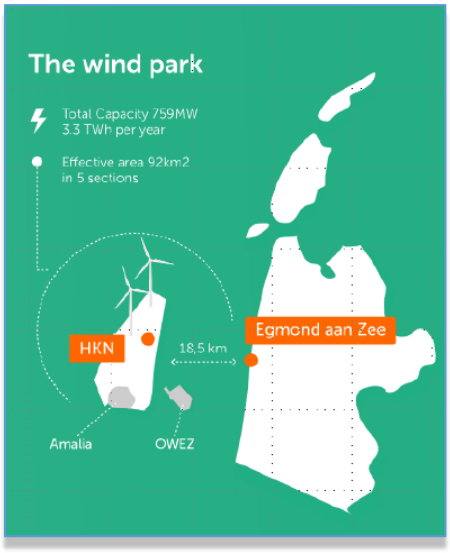


Figure 1.2 - Wind Park Details

The wind farm 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.

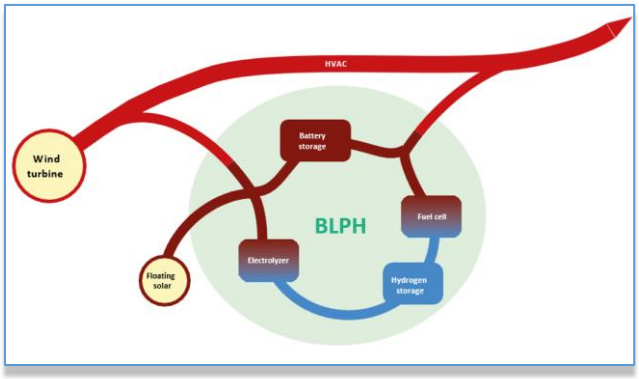


Figure 1.3 – BLPH Concept

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 structural analysis performed on the BLPH Transition Piece structure for the lifting condition.

The analysis has been performed in compliance with the requirements, criteria and parameters reported in the Structural Design Premises, Ref./16/.

Lifting analysis is performed in accordance with DNV-ST-N001, Ref./9/.

Structural Code checks are performed according to 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. /29/.

Lift points have been verified using FE analysis in a separate document, Ref. /25/.

Lifting slings selection, shackle selection and rigging design is scope of installation contractor and it is covered in a separate document.

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/ DNV-ST-N001	DNV - Marine operation and marine warranty - 2021
/10/ DNV-RP-C201	DNV, Buckling Strength of Plated Structures, October 2010.
/11/ DNV-ST-0145	DNV, Offshore substations
/12/ DNV-ST-0126	Support structures for wind turbine, 2018

3.2 COMPANY SPECIFICATIONS

Doc. No.	Description
/13/ DEP 37.19.00.12	Gen - Offshore Topsides Structures
/14/ DEP 37.19.00.30	Gen - Fixed Steel Offshore Structures (Adoption of IOGP S-631-11, Amendments / Supplements to ISO 19902:2020).
/15/ DEP 37.81.10.19	Gen - Marine Operations Requirements – Lifting, Transportation and Installation of Offshore Structures (Amendments / Supplements to ISO 19901-6)

3.3 PROJECT DOCUMENTS

Doc. No.	Description
/16/ 123A90-DDL-ST-SP-90017	Structural Design Basis
/17/ 123A90-DDL-MD-RE-01006	Monthly Weight Report – Rev.03
/18/ 123A90-DDL-PP-DS-70070	Plot Plans
/19/ 123A90-DDL-ST-SP-90018	Structural Material Specification for Topside and TP
/20/ 123A90-DDL-ST-SP-90118	Structural Material Specification for Flange and Bolts
/21/ 123A90-DDL-ST-RE-90000	BLPH Platform – In service Analysis
/22/ 123A90-DDL-ST-RE-90009	TP – Transportation analysis Report
/23/ 123A90-DDL-TI-SP-99014	Specification for TP, Topside and Caissons Transportation and Installation
/24/ 123A90-DDL-ST-TN-90119	Evaluating ISO and DNV approaches
/25/ 123A90-DDL-ST-RE-90012	BLPH Platform – TP Joint Check Design Report
/26/ 123A90-DDL-ST-DD-90087	BLPH Platform – TP Lifting Points General Arrangement
/27/ 123A90-DDL-ST-DD-90088	BLPH Platform – TP Lifting Points Details
/28/ 123A90-DDL-MO-CA-91073	Lifting Engineering Including Rigging Calculation

3.4 SOFTWARE

Doc. No.	Description
/29/ SACS	Structural Analysis Computer System – BENTLEY Inc. v15

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
BLPH	Base Load Power Hub
CL	Concentrated Load
CoG	Centre of Gravity
CW	CrossWind
DAF	Dynamic Amplification Factor
DLB	Ductility Level Blast
DNV	Det Norske Veritas
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
MSL	Mean Sea Level
NTE	Not-to-Exceed
PAU	Pre-Assembled Unit (H2 Vessels)
PG	Plate Girder
SHL	Static Hook Load
T&I	Transport & Installation
ToS	Top of Steel

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TP	Transition piece
UC	Unity Check
UDL	Uniformly Distributed Load
WTG	Wind Turbine Generator
W2W	Walk to Work
UG	Upper grillage

Table 4.1 - Definitions and Abbreviations

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5 SUMMARY AND CONCLUSIONS

The analyses performed show that the Transition Piece, as configured, can withstand all possible combinations of loads during offshore lifting phase. The software SACS™, ref./29/, is used for all global analyses of the structures in the SOW.

Structural model of TP is the same used for transportation analysis, Ref. /22/, updated with lift points and lifting slings.

5.1 WEIGHT RESULTANTS

The TP weight considered in the analysis is presented here below and then it is compared with the weight defined in the WCR, ref. /17/. COG location comparison between SACS structural model for Lifting Analysis and WCR is reported in following tables.

- The TP weight during Lifting is 254 t according to WCR rev.03.

WCR vs SACS	
Load Comb.	**Fz [t]**
WCR (gross expected weight)	-254
SACS (lcomb TPLF)	-259

Table 5.1 – SACS-WCR CoG comparison

COG NOMINAL POSITION			
CASE	x [m]	y [m]	z [m]
COG_WCR	-0.300	-0.600	5.900
COG_SACS (lcomb TPLF)	-0.390	-0.750	5.850
Δ	*0.09* *(1%)*	*0.15* *(1%)*	*0.05* *(1%)*

Table 5.2 – SACS-WCR CoG position comparison. Z measured from barge Deck in SACS ref. system (ref to section 9.1 for SACS ref system)

BLPH - TRANSITION PIECE (TP) - 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	263	19,8	8,5	20,1	290	19,8	8,5	18,2	290	19,8	8,5	20,1	290	19,8	8,5	20,1
ST	Sea Transport	263	19,8	8,5	20,1	290	19,8	8,5	18,2	290	19,8	8,5	20,1	290	19,8	8,5	20,1
OP	Operating weight (Dry + Contents)	253	19,9	8,5	20,3	280	19,9	8,5	18,3	280	19,9	8,5	20,3	280	19,9	8,5	20,3
L	Lifting	230	19,7	8,6	20,3	254	19,7	8,6	18,4	254	19,7	8,6	20,3	254	19,7	8,6	20,3

Table 5.3 – WCR weight and CoG during Lifting. X measured towards NORTH, Y measured towards EAST from C1, Z from LAT.

5.2 MEMBER CHECKS

Structural members with maximum Unity Check (UC) are detailed in the following table. The maximum UC of TP results 0.35. Please note that pad eye check is performed in separate document.

MEMBER	GROUP	DESCRIPTION	SECTION	COMBINATION	UC
SM15-SS08	UN2	Stair stringer UPN220	UPN220	2A23	0.28
TA24-TU02	TPS	Topside support can on TP	800x40	1A23	0.22
TA44-TU03	TPS	Topside support can on TP	800x40	LA41	0.19

Table 5.4 – Member UC Summary

5.3 PLATE CHECKS

Maximum Von Mises stress of plate elements in the lower part of main column (7m diameter, thickness 65mm) is negligible.

5.4 TUBULAR JOINT CHECKS

Structural tubular joints with maximum Unity Checks (UC) for punching shear are all lower than 0.2 in the access stair.

5.5 PAD-EYE CHECKS

Structural checks for Padeye are performed for the maximum force at ULS included CF:

Fd=2412.3 kN = assumed 2500 kN.

Maximum structural Unity Check (UC) for Pad-eye is UC = 0.74.

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6 TRANSITION PIECE DESCRIPTION

The connection of Topside with Monopile is realized through a **Transition Piece (TP)** structure. TP is composed by a central column with an outer diameter of 7m and Four (4) boxed girders with height ranging from 2.5 m to 1.4 m, oriented along the main diagonals of the TP.

TP main dimensions are 16m x 16m with height 7.9m.

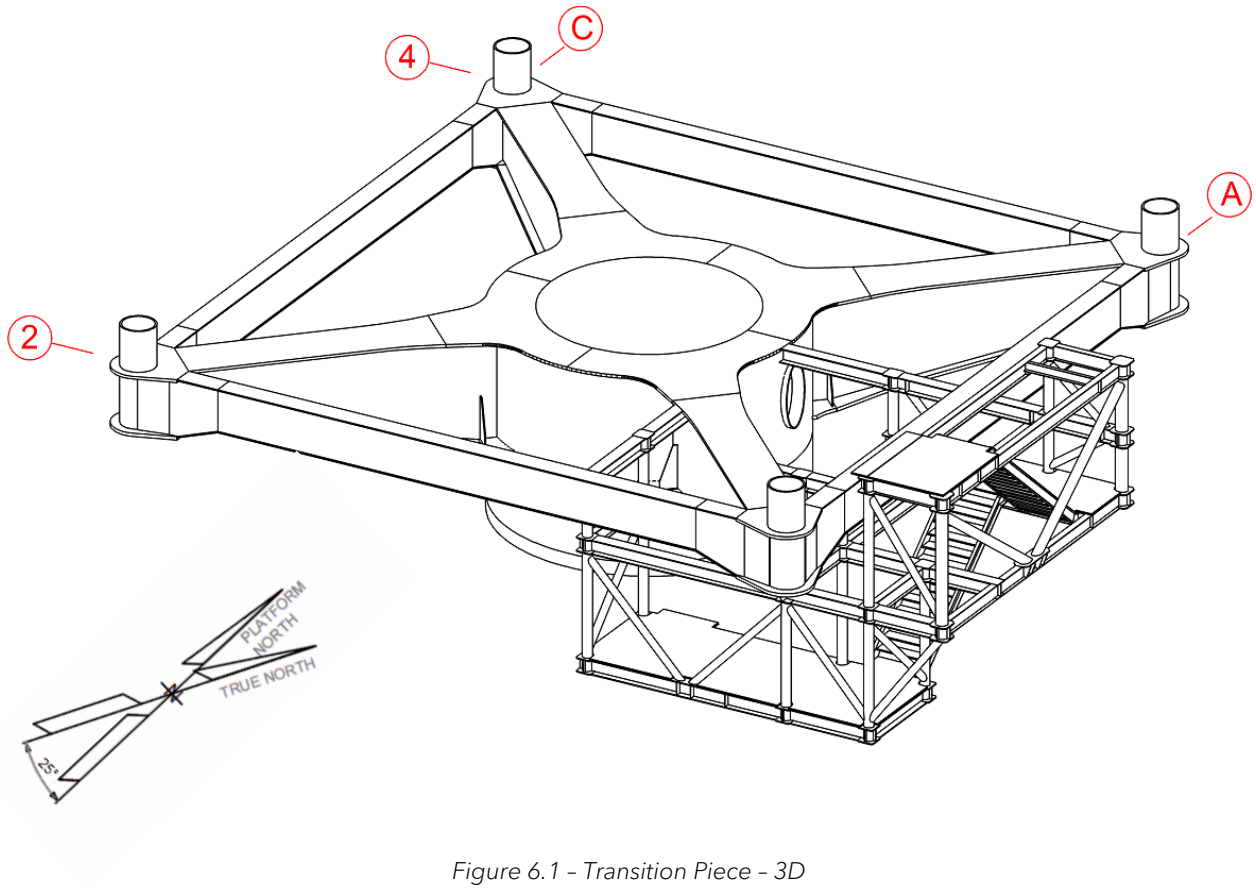


Figure 6.1 – Transition Piece – 3D

6.1 TP LIFTING ARRANGEMENT

The lifting is assumed to be performed by means of 4-slings converging to HLV 's PS crane main hook.

7 MATERIALS

7.1 STRUCTURAL STEEL PROPERTIES

For the structural analyses, steel types and grades to be used for the platform structures are summarised in Table 7.1 and specified in Ref. /19/. The material selection criteria are based on the requirements of ISO 19906:2019, ISO 19902:2020 and ISO 19901-3:2014. The materials are in accordance with the EN standard 10225:2019 and 10025:2019 and are suitable for plates, rolled sections and welded / seamless tubulars.

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

Table 7.1 - Material Selection, Ref /19/

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

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

Thickness (mm)	Min. Tensile Strength (N/mm^2)	Min. Yield Strength (N/mm2)	Steel Type (1)
t ≤ 16	500	420	I & II
16 < t ≤ 40	500	400	I & II
40 < t ≤ 63	480	390	I & II
63 < t ≤ 100	480	380	I & II

Note: 1) Type I steel has Z (through the thickness) properties.

Table 7.2 – Mechanical properties of Plates

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

Table 7.3 – Mechanical properties of Structural Seamless Tubulars

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

Table 7.4 – Mechanical properties for Structural Sections

7.2 PLATING

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

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

7.3 GRATING

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

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8 DESIGN CRITERIA AND REQUIREMENTS

8.1 GENERAL

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

8.2 PARTIAL RESISTANCE FACTORS

8.2.1 Partial Resistance Factors for Tubular Sections:

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

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

Table 8.1- Resistance Factors for Tubular Sections

8.2.2 Partial Resistance Factors for Non-tubular Sections

Referring to ISO 19901-3, Ref./3/, section 8, to be consistent with ISO 19900 inherent the level of safety, a "building code correspondence factor" is to be applied to the AISC partial factors.

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}	1.00	Cross-section resistance to excessive yield strain including local buckling
γ_{M1}	1.00	Resistance of unstable elements measured during element inspection
γ_{M2}	1.25	Tensile cross-section resistance to mechanical breakdown
Resistance of connections		

γ_{M2}	1.25	Bolts, rivets, pins, welds and slabs on supporting surface
γ_{M3}	1.25	Sliding resistance at Ultimate Limit State Category C
$\gamma_{M3,SER}$	1.10	Sliding resistance at Serviceability Limit State
γ_{M4}	1.10	Injection bolt collapse resistance
γ_{M5}	1.10	Resistance of connections in open lattice trusses
$\gamma_{M6,SER}$	1.00	Resistance of pins at Serviceability Limit State
γ_{M7}	1.10	Preload of high strength bolts

Table 8.2- Resistance for Non-Tubular Section

8.2.3 Partial Resistance Factors for Tubular Joints Check

The partial resistance factors for tubular joints checks are provided in following table.

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

Table 8.3 - Resistance Factors for Tubular Joints

8.3 LOAD CLASSIFICATIONS

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

Load Type	ISO Designation	Description
Permanent (Dead)	G1	Structure self-weight; Equipment & piping dry weight;
Permanent (Dead)	G2	permanent action imposed on the topsides structure by self-weight of equipment and other objects, bulk loads
Variable (Live)	Q1	Equipment & piping contents weight
Transient	T	Transient Loads for Pre-Service Analyses

Table 8.4 - ISO Loads Classification

8.4 PARTIAL ACTION FACTORS

8.4.1 Partial Action Factors for Pre-Service Analyses

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

- G_T are the permanent actions during the transient situation.
- Q_T are the variable actions during the transient situation.
- T represents the actions from the transient situation being considered.

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

Table 8.5 – Partial action factors for Pre-service Analyses

8.5 ACCEPTANCE CRITERIA

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

9 BASIC LOAD CASES

All the design loads have defined according to the Weight Control Report and Plot Plans, respectively Ref./17/ and /18/, 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.

9.1 PERMANENT ACTIONS

9.1.1 Modelled structural dead weights

Dead weights of the modelled structures have been automatically evaluated by SACS and included in following basic load conditions.

- Load condition DZTP: Modelled structures total weight

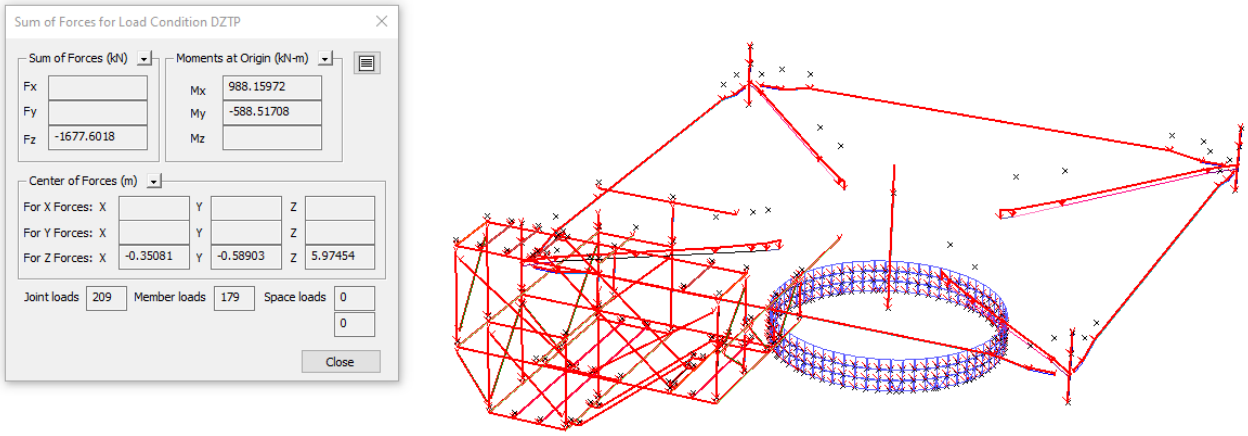


Figure 9.1 – TP basic load condition DZTP

9.1.2 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

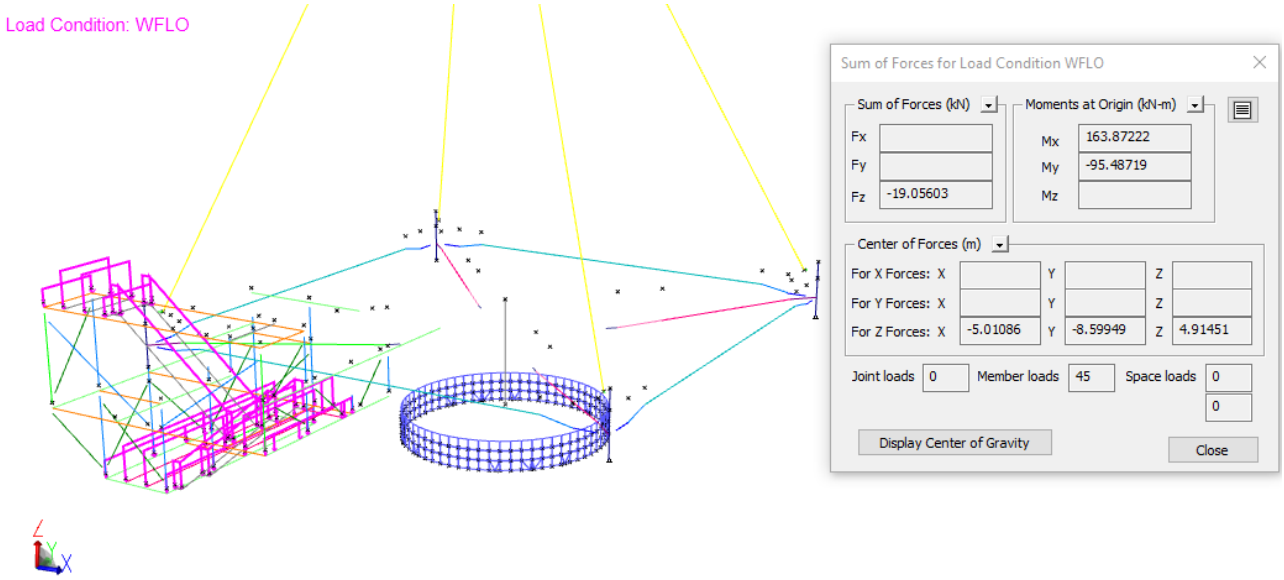


Figure 9.2 – TP basic load conditions WFLO

- <u>Load condition WPER: SECONDARY STRUCTURES PERMANENT LOADS</u>

Not modelled structural weights based on WCR, ref./17/.

PERMANENT STRUCTURAL WEIGHTS - WPER - TP		
LOAD ID	**W**	**Description**
[-]	**[kN]**	
ST_GUIDE	40	Stabbing Guides
HR_ST_TP	20	Hand Rails
PF_BOTFL	90	Bottom MP Flange Weight
ACCWLK_T	10	access stair to MP pltf
SACS LOAD COND.	**159.6**	**Not Modelled Permanent Structural Weights**

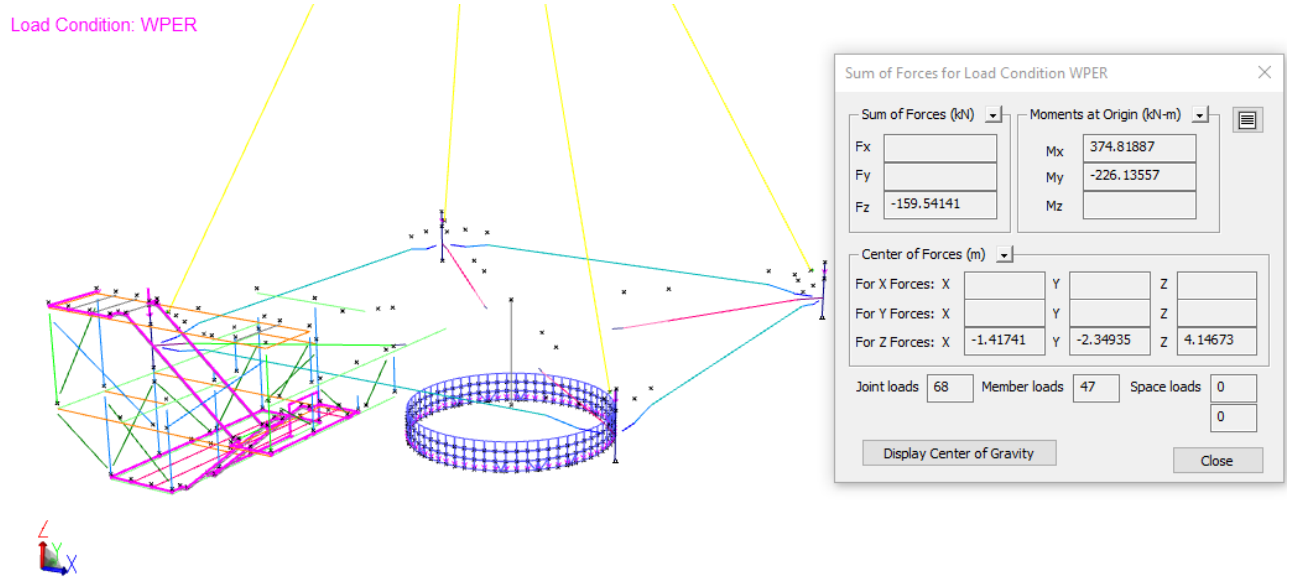


Figure 9.3 – Load Condition WPER

- <u>Load condition MECD: EQUIPMENT DRY WEIGHTS (contingency included)</u>

Transition Piece's Equipment dry weights, already including 12% contingency have been included in load condition MECD.

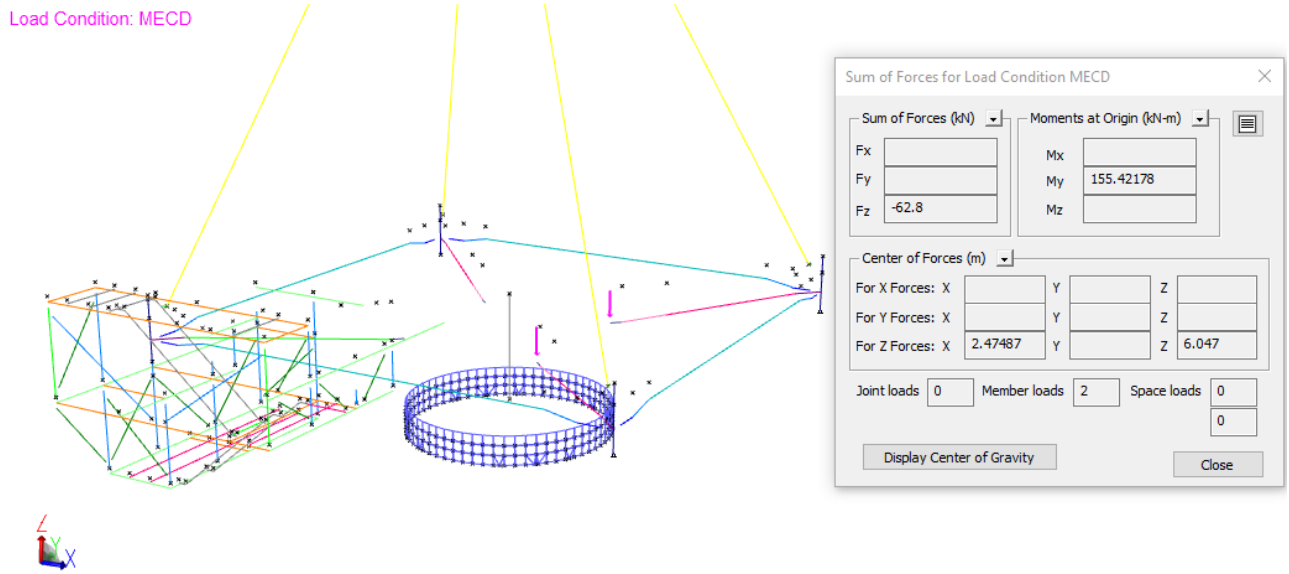


Figure 9.4 - Load Condition MECD

9.1.3 Installation Aids

Basic load condition AIDS has been included in the structural model to account for installation aids and temporary handrails:

- Load condition AIDS: installation aids

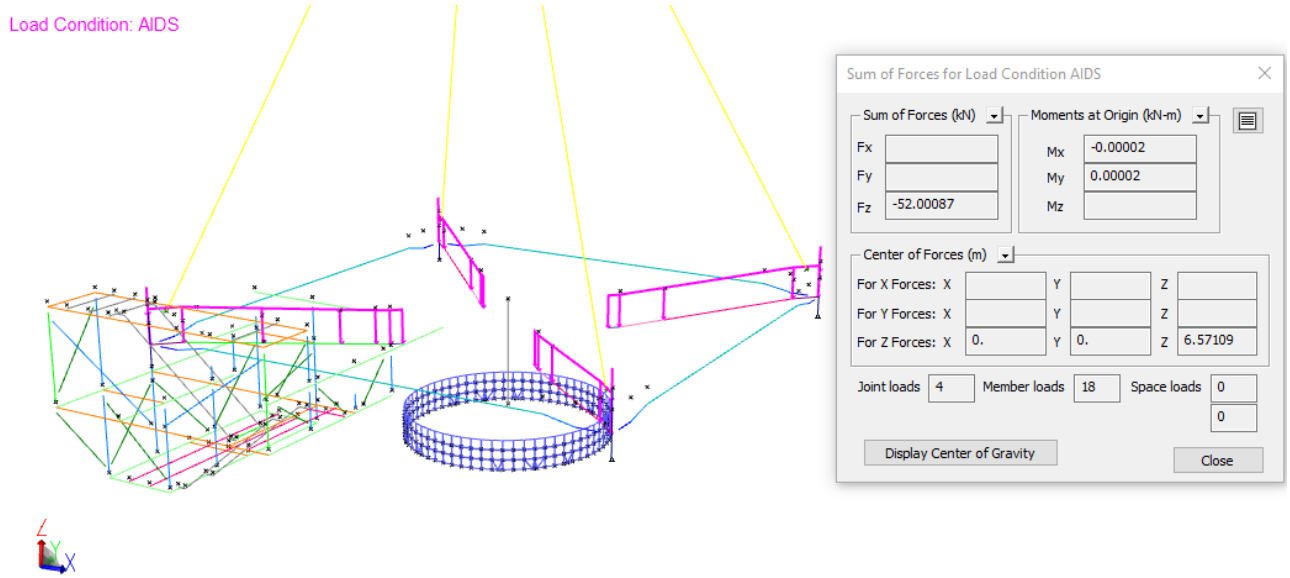


Figure 9.5 - TP basic load conditions AIDS

Note: stabbing guides weight included in WPER load condition as permanent part of TP.

9.1.4 Permanent Actions Basic Load Combination

Permanent actions basic load cases have been combined in load combination G001 accounting for different weight contingencies of basic load conditions.

Permanent Loads – Basic Load combination G001		
Basic Load Cases	Description	Load Factors
DZTP	TP MODELLED STRUCTURE DEAD WEIGHTS	1.30
WFLO	FLOORING AND GRATING PERMANENT LOADS	1.10
WPER	SECONDARY STRUCTURES PERMANENTS LOADS	1.10
MECD	EQUIPMENT DRY WEIGHTS (cont. included)	1.00

Table 9.1 - 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          ********* X - DIRECTION *********      ********* Y - DIRECTION *********      ********* Z - DIRECTION *********
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)

DZTP           0.00                                    0.00                                -1677.60     -0.35     -0.59      5.97
WFLO           0.00                                    0.00                                  -19.06     -5.01     -8.60      4.91
WPER           0.00                                    0.00                                 -159.54     -1.42     -2.35      4.15
MECD           0.00                                    0.00                                  -62.80      2.47      0.00      6.05

G001           0.00                                    0.00                                -2440.14     -0.39     -0.77      5.84
```

9.2 WCR – STRUCTURAL MODEL COMPARISON

Load combination TPLF includes maximum permanent loads summed up in G001 with installation aids.

TP in Lifting conditions – Load combination TPLF		
Basic Load Cases	Description	Load Factors
G001	TP PERMANENT LOAD BASIC COMBINATION	1.02
AIDS	INSTALLATION AIDS AND RIGGING LOADS	1.00

Table 9.2 – Lifting Basic Combination TPLF

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

G001          0.00                                    0.00                                -2440.14     -0.39     -0.77      5.84
AIDS          0.00                                    0.00                                  -52.00      0.00      0.00      6.57

TPLF          0.00                                    0.00                                -2540.94     -0.39     -0.75      5.85
```

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

SACS Model - TP in lifting condition					
SACS Load comb.	Fz [kN]	Fz [t]	X [mm]	Y [mm]	Z [mm]
G001	2440.14	248.74	-390	-750	5840
TPLF	2540.94	259.02	-390	-750	5850

SACS-WCR - TP in lifting conditions - Comparison							
ΔFz [t]	ΔFz [%]	ΔX [mm]	ΔY [mm]	ΔZ [mm]	ΔX [%]	ΔY [%]	ΔZ [%]
5.02	1.97%	-90	-150	-50	-1%	-1%	-1%

Table 9.3 – SACS-to WCR CoG comparison

9.3 TRANSIENT LOADS

9.3.1 Wind loads

Lifting will be performed in good environmental conditions, with limited wind speed. This will be reflected in the Offshore Installation manual.

10 STRUCTURAL ANALYSIS

10.1 STRUCTURAL MODEL

The software SACS™, ref./29/, is used for all global analyses of the structures in the SOW. The structural model of the TP is shown here below, and it is based on transportation analysis model, ref. /22/.

TP is assumed to be installed using single hook.

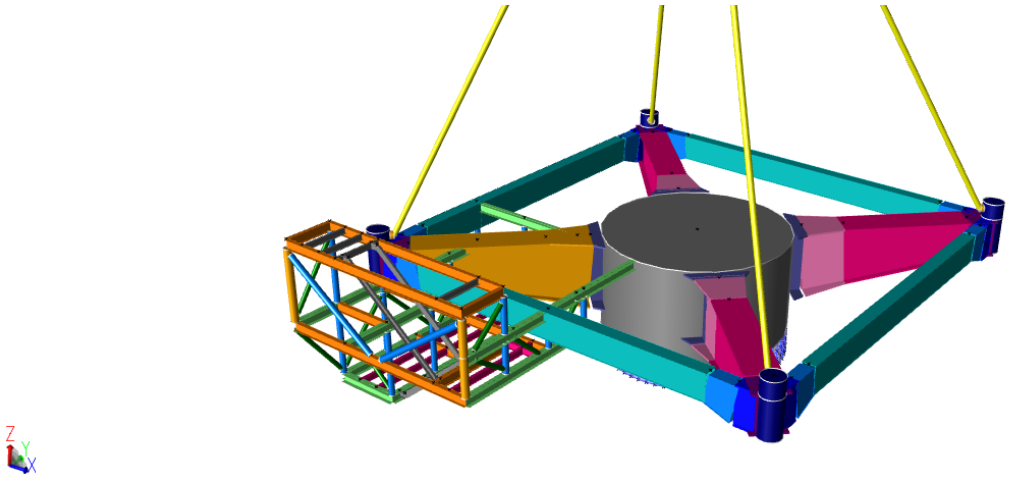


Figure 10.1 - TP structural model

The SACS reference system is in the center of the TP with X dir along Row B and Y-dir along Rows A2/4. Z is measured from barge elevation.

10.1.1 Boundary Conditions

The TP is vertically suspended from the pad-eyes joints (LIF1, LIF2, LIF3, LIF4) located at el. +22.050 LAT with 4 slings to lift point.

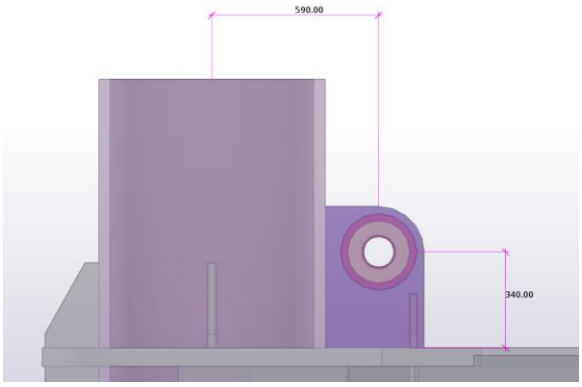


Figure 10.2 - TP lifting points

Horizontal (isostatic) restrains have been applied to avoid numerical instability.

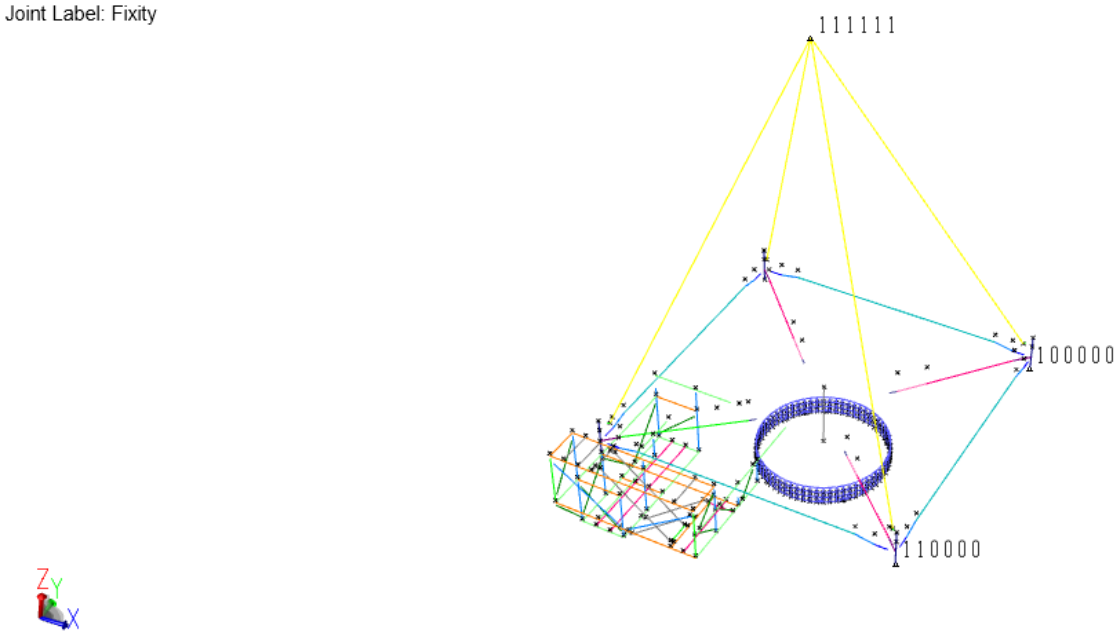


Figure 10.3 - TP fixity

JOINT ID	Fixity	Comment
TL03	110000	Fixed in X and Y
TL04	100000	Fixed in X
HK00 HK01	111111	Hook point (CoG nominal position) – 2 coincident joint, one for each pair of slings

Table 10.1 – TP restraints

The model includes two coincident hook joints aligned with each CoG position and their elevation is defined to have a minimum sling angle of 60 deg.

The slings are modeled with elements having axial stiffness only and are considered of Grommets type and modelled according to section 16.2.6.11 of Ref. /9/.

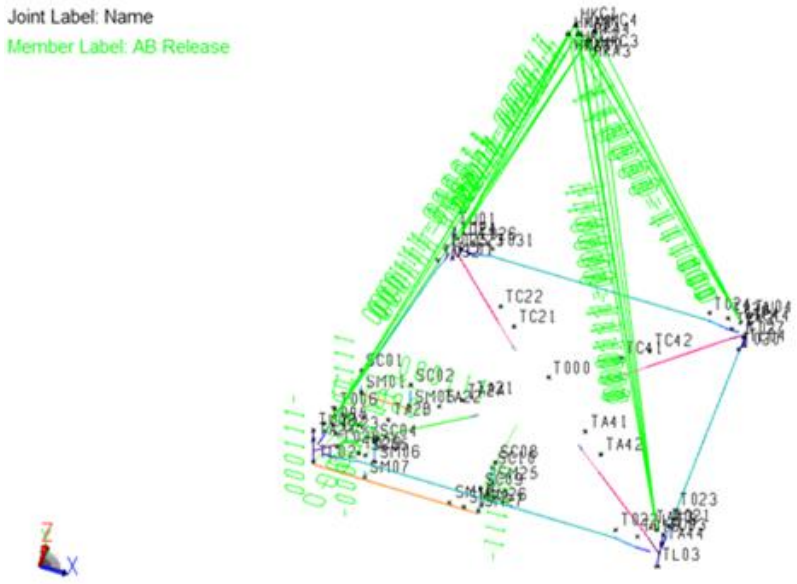


Figure 10.4 - Lifting Analysis – SACS Model – Sling Release

10.1.2 Cog Shift Load Conditions

For the purpose of TP detail design lifting analyses, the topsides CoG location is considered to be within a CoG tolerance envelope of 5% the distance between the structure length and breadth:

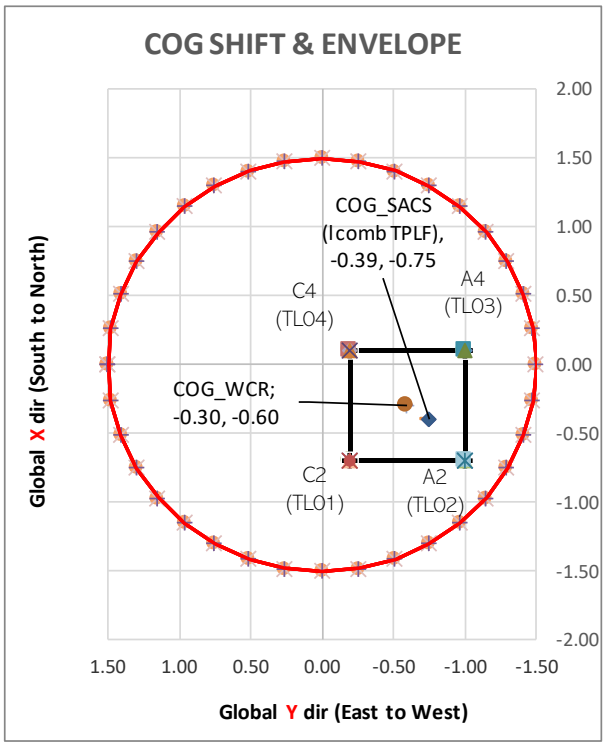
- Longitudinal Cog shift envelope (along global X axis; E-W direction) = 5% x 16 m = 0.8 m (±0.4m);
- Transversal Cog shift envelope (along global Y axis; N-S direction) = 5% x 16 m = 0.8 m (±0.4m).

CoG shift (from WCR position) is obtained by applying suitable couples made by vertical upward and downward forces applied at the corner joints of the structural model (joints TL01, TL02, TL03, TL04).

Four load cases with 0kN vertical resultant have been defined, one for each CoG shifted position, to produce the shifting of CoG in combination with load combination TPLF (load combination comprehensive of total permanent loads) without increasing the global weight resultant:

- POS. 1 - Cog shift toward intersection between rows A and 4: load condition SHA4;
- POS. 2 - Cog shift toward intersection between rows A and 2: load condition SHA2;
- POS. 3 - Cog shift toward intersection between rows C and 4: load condition SHC4;
- POS. 4 - Cog shift toward intersection between rows C and 2: load condition SHC2.

The original CoG position from WCR and the four shifted positions are reported in following figure, with the indication of the vertical forces at corner joints for each load condition.



W = -2540.94 kN

X and Y = SACS ref. system

COG NOMINAL POSITION			
CASE	x [m]	y [m]	z [m]
COG_SACS (Icomb TPLF)	-0.39	-0.75	20.25
COG_WCR	-0.30	-0.60	20.30
COG shift Values			
Shift toward	x [m]	y [m]	POS
A4	0.40	-0.40	1
A2	-0.40	-0.40	2
C4	0.40	0.40	3
C2	-0.40	0.40	4

COG SHIFT FROM WCR VALUE			
Shift toward	x [m]	y [m]	POS
A4	0.10	-1.00	1
A2	-0.70	-1.00	2
C4	0.10	-0.20	3
C2	-0.70	-0.20	4

COG SHIFT FROM SACS VALUE			
Shift toward	**x [m]**	**y [m]**	**POS**
A4	0.01	-1.15	1
A2	-0.79	-1.15	2
C4	0.01	-0.35	3
C2	-0.79	-0.35	4

SACS FORCES for COG shifting				
COG Position	1	2	3	4
COG SHIFT toward	A4	A2	C4	C2
Fz [kN] @ joint TL01	58.759	-4.764	-4.764	-68.288
Fz [kN] @ joint TL02	19.057	-44.466	82.581	19.057
Fz [kN] @ joint TL03	-58.759	4.764	4.764	68.288
Fz [kN] @ joint TL04	-19.057	44.466	-82.581	-19.057
Load condition	SHA4	SHA2	SHC4	SHC2

Figure 10.5 - CoG shifting - Forces and Positions

To check the correct execution of CoG shifting the following four load cases have been defined:

- LA40 = SHA4 + TPLF
- LA20 = SHA2 + TPLF
- LC40 = SHC4 + TPLF
- LC20 = SHC2 + TPLF

Following excerpt from SACS output provide the CoG shifting as per Figure 10.5.

```
                                  ************* SEASTATE LOAD CASE CENTER REPORT *************
                                                  RELATIVE TO STRUCTURAL ORIGIN
LOAD        ********* X - DIRECTION *********    ********* Y - DIRECTION *********    ********* Z - DIRECTION ********
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)

SHA2          0.00                               0.00                               COUPLE
SHA4          0.00                               0.00                               COUPLE
SHC2          0.00                               0.00                               COUPLE
SHC4          0.00                               0.00                               COUPLE
```

LA20	0.00	0.00	-2540.94	-0.70	-1.00	5.85
LA40	0.00	0.00	-2540.94	0.10	-1.00	5.85
LC20	0.00	0.00	-2540.94	-0.70	-0.20	5.85
LC40	0.00	0.00	-2540.94	0.10	-0.20	5.85

For each CoG position, one pair of opposite slings is connected to one hook joint and the opposite pair to the second joint. The model includes five sets of coupled pair of slings. They are modelled with GAP elements that are activated in turn according to the CoG position as tension only members.

The hooks joints were named HKA2/HKA1, HKA4/HKA3, HKC2/HKC1 and HKC4/HKC3 respectively for the four shifted conditions plus the base hook position HK00/HK01 on the vertical of the nominal CoG position.

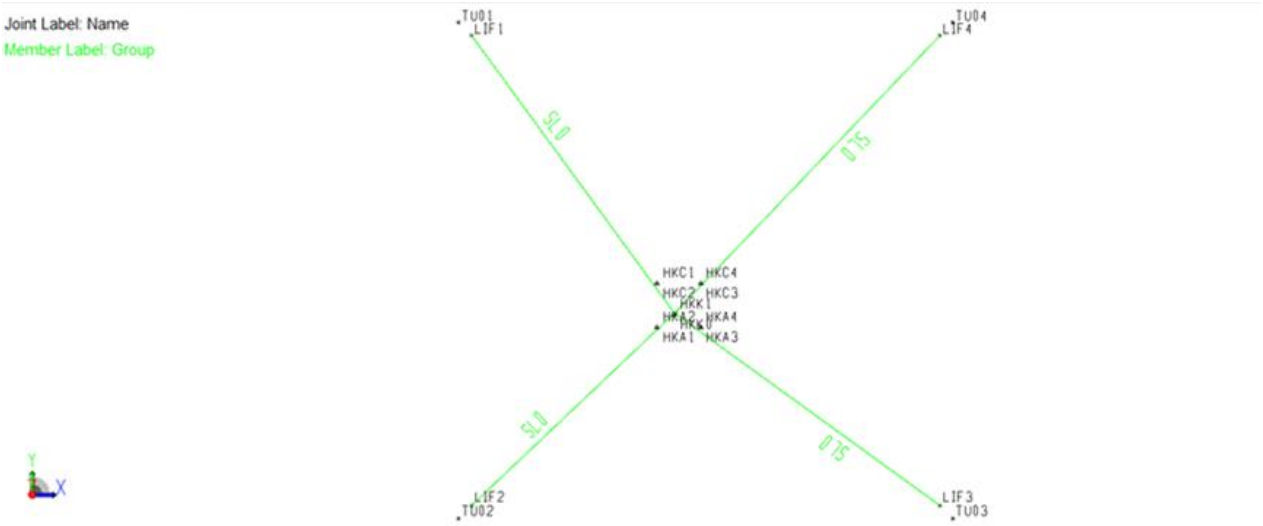


Figure 10.6 - Rigging Model – Member groups and joint codes – CoG Nominal Position

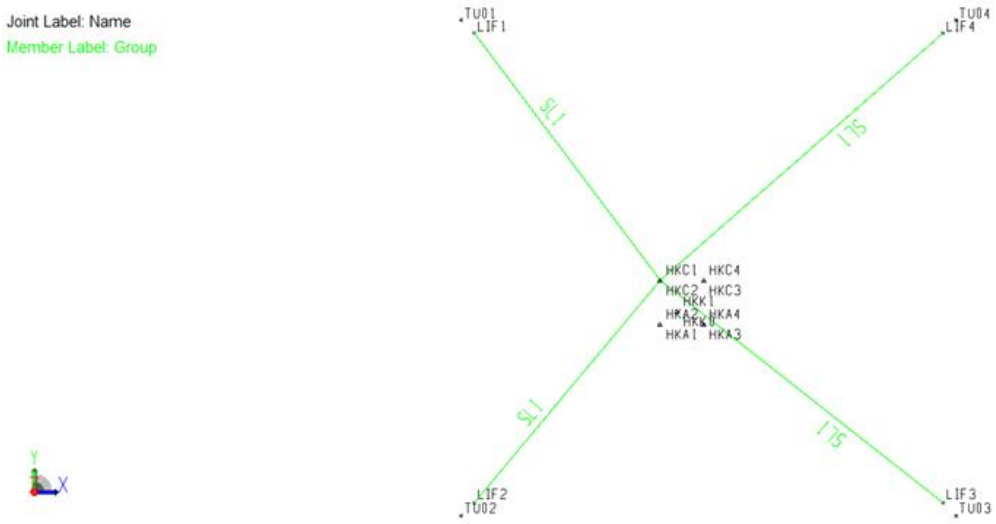


Figure 10.7 - Rigging Model – Member groups and joint codes – CoG Shift C2

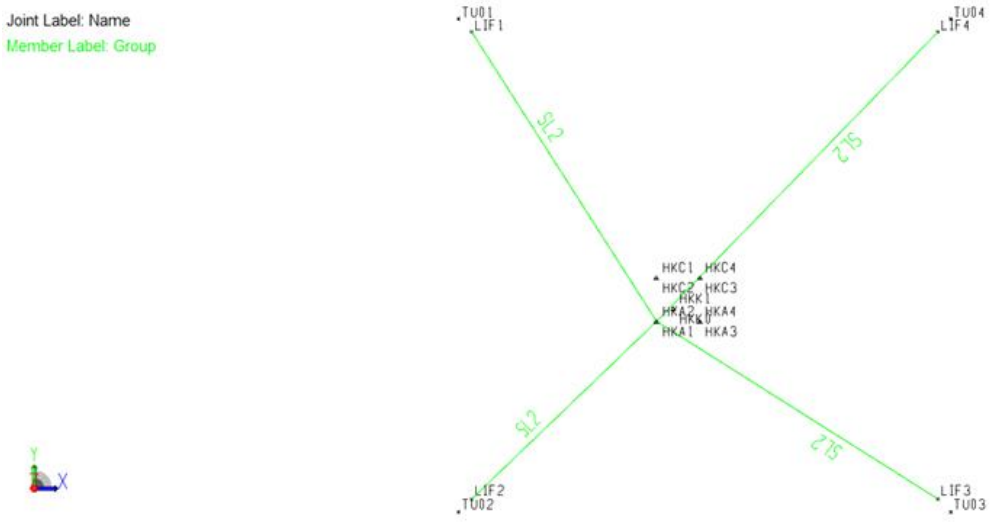


Figure 10.8 - Rigging Model – Member groups and joint codes – CoG Shift A2

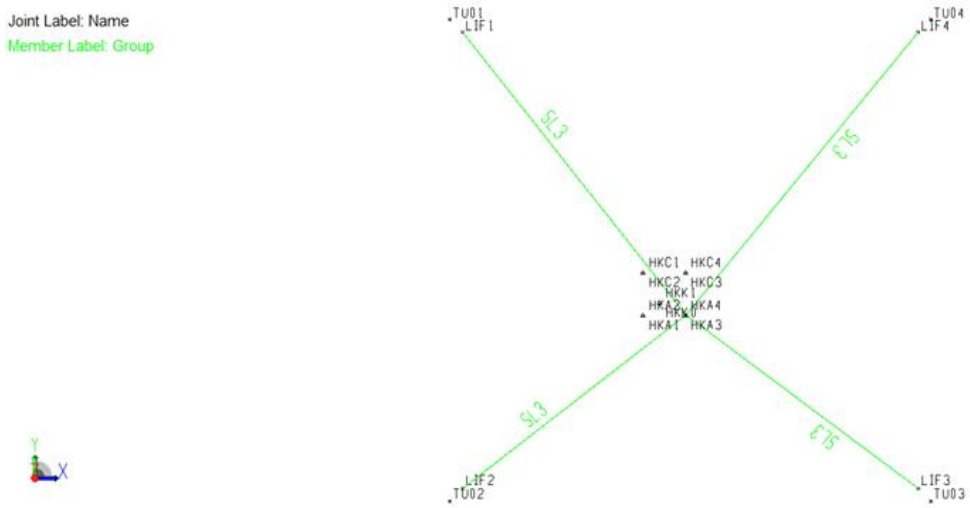


Figure 10.9 - Rigging Model – Member groups and joint codes – CoG Shift A4

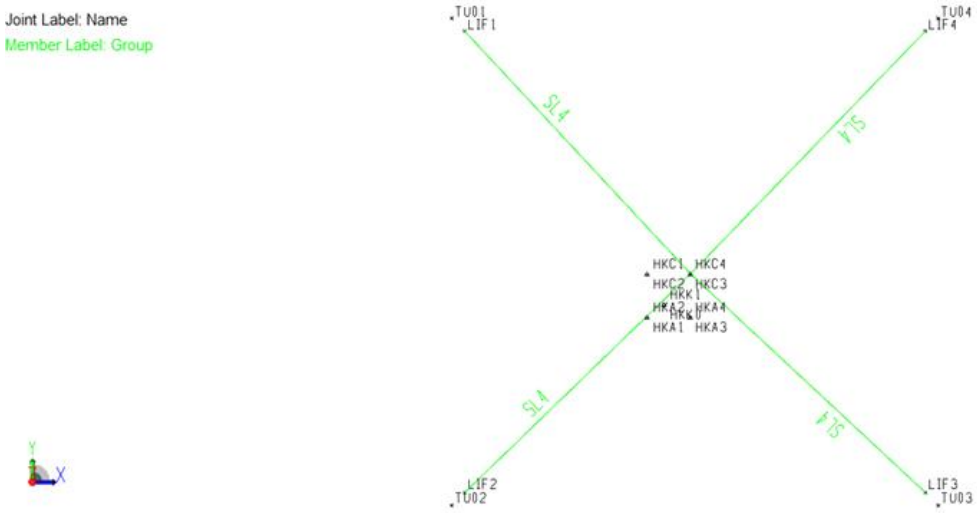


Figure 10.10 - Rigging Model – Member groups and joint codes – CoG Shift C4

10.2 ANALYSIS PROCEDURE

The actual steps of the analysis are:

- LIFTING analysis with one fixed joint (Z direction) for each pair of sling.
- Extrapolation of the reaction forces on the two nodes.
- Deletion of one fixed joints (Z direction) and substitution with the corresponding REACTION force.
- LIFTING analysis with one fixed joints and force substituting the fixed joint on the other node.

11 LOAD COMBINATIONS

11.1 BASIC LOAD COMBINATIONS

Basic Load cases and load combinations detailed in chapter 9, have been combined together to define the final Load Combinations to be used in the lifting global analysis, according to Partial Action Factor as per sec. 8.4.1 for all the five positions of CoG.

11.1.1 Lift Coefficients

The following lift factors will be applied following the DNV code, Ref./9/, and in accordance with Structural Design basis, Ref./16/:

Weight contingency factor as Ref./9/, sec. 16.2.2.1	1.05
DAF for the gross weight 300<W<1000 T, Ref./9/, Sect 16.2.5	1.25

11.1.2 SKL Factor

The SKL factor is applied in terms of joint reaction variation at the hook.

Skew Factor as Ref./9/, section 16.2.6.12	1.25

The extrapolation of the vertical reaction forces at the two joints for each of the 5 cases is shown in the following SACS excerpt. The reactions are calculated by running a preliminary analysis with all the hook joints restrained.

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)
HKA1	LA20	64.817	43.426	1328.197	0.000	0.000	0.000
HKA2	LA20	-64.816	-43.425	1212.738	0.000	0.000	0.000
HKA3	LA40	66.984	-9.393	1322.698	0.000	0.000	0.000
HKA4	LA40	-67.381	9.826	1218.236	0.000	0.000	0.000
HKC1	LC20	11.349	46.129	1325.096	0.000	0.000	0.000
HKC2	LC20	-11.746	-45.695	1215.838	0.000	0.000	0.000
HKC3	LC40	13.634	-7.206	1323.334	0.000	0.000	0.000
HKC4	LC40	-14.031	7.640	1217.601	0.000	0.000	0.000
HKK0	TPLF	-49.137	-23.613	1215.380	0.000	0.000	0.000
HKK1	TPLF	49.137	23.614	1325.555	0.000	0.000	0.000

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The table 11.1 shows the reactions at 2nd joints increased or decreased by 25% in dedicated load conditions.

joint	vertical reaction (kN)	LOAD CONDITION (with 2nd joint reaction)									
		SK00	SK01	SK02	SK03	SK04	SK05	SK06	SK07	SK08	SK09
HKK0	1215.38	-	-	-	-	-	-	-	-	-	-
HKK1	1325.55	1656.94	1060.44	-	-	-	-	-			
HKA2	1212.74	-	-	-	-	-	-	-	-	-	-
HKA1	1328.20	-	-	1660.25	1062.56	-	-	-	-	-	-
HKA4	1218.24	-	-	-	-	-	-	-	-	-	-
HKA3	1322.70	-	-	-	-	1653.38	1058.16	-	-	-	-
HKC2	1215.84	-	-	-	-	-	-	-	-	-	-
HKC1	1323.33	-	-	-	-	-	-	1654.16	1058.66	-	-
HKC4	1217.60	-	-	-	-	-	-	-	-	-	-
HKC3	1323.33	-	-	-	-	-	-	-	-	1654.16	1058.66

Table 11.1 – Reactions at second joint (and reaction increased or decreased by 25%)

The following 10 basic combinations were therefore generated considering the increase or decrease of slings reaction of 25%:

C000 = TPLF*1.000 + SK00*1.000

C001 = TPLF*1.000 + SK01*1.000

C002 = LA20*1.000 + SK02*1.000

C003 = LA20*1.000 + SK03*1.000

C004 = LA40*1.000 + SK04*1.000

C005 = LA40*1.000 + SK05*1.000

C006 = LC20*1.000 + SK06*1.000

C007 = LC20*1.000 + SK07*1.000

C008 = LC40*1.000 + SK08*1.000

C009 = LC40*1.000 + SK09*1.000

And corresponding SACS output:

```
                                ************* SEASTATE LOAD CASE CENTER REPORT *************
                                               RELATIVE TO STRUCTURAL ORIGIN
 LOAD       ********* X - DIRECTION *********      ********* Y - DIRECTION *********   ********* Z - DIRECTION *********
 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)

SK00          0.00                                    0.00                                    1656.94    -0.39     -0.75     26.70
SK01          0.00                                    0.00                                    1060.44    -0.39     -0.75     26.70
SK02          0.00                                    0.00                                    1660.25    -0.70     -1.00     26.70
SK03          0.00                                    0.00                                    1062.56    -0.70     -1.00     26.70
```

SK04	0.00	0.00	1653.38	0.10	-1.00	26.70
SK05	0.00	0.00	1058.16	0.10	-1.00	26.70
SK06	0.00	0.00	1654.16	-0.70	-0.20	26.70
SK07	0.00	0.00	1058.66	-0.70	-0.20	26.70
SK08	0.00	0.00	1654.16	0.10	-0.20	26.70
SK09	0.00	0.00	1058.66	0.10	-0.20	26.70
C000	0.00	0.00	-884.00	-0.38	-0.76	-33.23
C001	0.00	0.00	-1480.50	-0.38	-0.76	-9.08
C002	0.00	0.00	-880.69	-0.69	-1.01	-33.45
C003	0.00	0.00	-1478.38	-0.69	-1.01	-9.13
C004	0.00	0.00	-887.56	0.11	-1.01	-32.99
C005	0.00	0.00	-1482.78	0.11	-1.01	-9.03
C006	0.00	0.00	-886.78	-0.69	-0.21	-33.04
C007	0.00	0.00	-1482.28	-0.69	-0.21	-9.04
C008	0.00	0.00	-886.78	0.11	-0.21	-33.04
C009	0.00	0.00	-1482.28	0.11	-0.21	-9.04

11.1.3 Consequence Factor

Consequence factor		Coefficients		
Description		**Lifting points**	**Other elements**	**Other elements**
Consequence Factors as per Ref./9/, section 16.2.2.1	Lift points, spreader bars	1.30		
	Non-redundant members framing into the lift point.			
	Load transferring redundant members framing directly into the lift point.		1.15	
	All other members of the lifted structure			1.00

Table 11.2 - Lift total factors for ULS lifting analyses

11.2 LIFTING LOAD COMBINATIONS

The lifting combination 1001 is generated applying the lift coefficients listed in section 11.1.1 to the C000 combination. The combination 2001 is the same but using C001 (SKL negative). Same approach is used for the conditions with shifted COG. On top of that, the dead load factor 1.30 as per ISO 19902 and ISO 19901-6 is applied.

The last digit "1" or "3" means CF = 1.00 or 1.30.

Note, structure is all checked considering CF = 1.30 included and therefore only 4 combinations were generated for each COG position.

LOAD COMB	LOAD CASE	
	C000	C001
1001	1.30*(1.05*1.25)=1.706	
2001		1.30*(1.05*1.25)=1.706
1003	1.30*(1.05*1.25)*1.30=2.218	
2003		1.30*(1.05*1.25)*1.30=2.218

Table 11.3 - Load Combinations with CoG in Nominal Position

LOAD COMB	LOAD CASE	
	C002	C003
1A21	1.706	
2A21		1.706
1A23	2.218	
2A23		2.218

Table 11.4 - Load Combinations SHIFT A2

LOAD COMB	LOAD CASE	
	C004	C005
1A41	1.706	
2A41		1.706
1A43	2.218	
2A43		2.218

Table 11.5 - Load Combinations SHIFT A4

LOAD COMB	LOAD CASE	
	C006	C007
1C21	1.706	
2C21		1.706
1C23	2.218	
2C23		2.218

Table 11.6 - Load Combinations SHIFT C2

LOAD COMB	LOAD CASE	
	C008	C009
1C41	1.706	
2C41		1.706
1C43	2.218	
2C43		2.218

Table 11.7 - Load Combinations SHIFT C4

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Following excerpt from SACS output provide the Load Combinations resultants, with contingency, DAF, SKL and ULS factor included:

********** SEASTATE LOAD CASE CENTER REPORT **********
RELATIVE TO STRUCTURAL ORIGIN

LOAD LABEL	********* X - DIRECTION ****** FORCE (KN)	X (M)	Y (M)	Z (M)	********* Y - DIRECTION ********* FORCE (KN)	X (M)	Y (M)	Z (M)	********* Z - DIRECTION ******** FORCE (KN)	X (M)	Y (M)	Z (M)
1001	0.00				0.00				-1508.11	-0.38	-0.76	-33.23
2001	0.00				0.00				-2525.74	-0.38	-0.76	-9.08
1A21	0.00				0.00				-1502.46	-0.69	-1.01	-33.45
2A21	0.00				0.00				-2522.12	-0.69	-1.01	-9.13
1A41	0.00				0.00				-1514.18	0.11	-1.01	-32.99
2A41	0.00				0.00				-2529.63	0.11	-1.01	-9.03
1C21	0.00				0.00				-1512.85	-0.69	-0.21	-33.04
2C21	0.00				0.00				-2528.78	-0.69	-0.21	-9.04
1C41	0.00				0.00				-1512.85	0.11	-0.21	-33.04
2C41	0.00				0.00				-2528.78	0.11	-0.21	-9.04

And also including theCF = 1.30:

********** SEASTATE LOAD CASE CENTER REPORT **********
RELATIVE TO STRUCTURAL ORIGIN

LOAD LABEL	********* X - DIRECTION ****** FORCE (KN)	X (M)	Y (M)	Z (M)	********* Y - DIRECTION ********* FORCE (KN)	X (M)	Y (M)	Z (M)	********* Z - DIRECTION ******** FORCE (KN)	X (M)	Y (M)	Z (M)
1003	0.00				0.00				-1960.72	-0.38	-0.76	-33.23
2003	0.00				0.00				-3283.76	-0.38	-0.76	-9.08
1A23	0.00				0.00				-1953.38	-0.69	-1.01	-33.45
2A23	0.00				0.00				-3279.06	-0.69	-1.01	-9.13
1A43	0.00				0.00				-1968.62	0.11	-1.01	-32.99
2A43	0.00				0.00				-3288.81	0.11	-1.01	-9.03
1C23	0.00				0.00				-1966.89	-0.69	-0.21	-33.04
2C23	0.00				0.00				-3287.71	-0.69	-0.21	-9.04
1C43	0.00				0.00				-1966.89	0.11	-0.21	-33.04
2C43	0.00				0.00				-3287.71	0.11	-0.21	-9.04

Table 11.8 - Load Combinations center report

12 ANALYSIS RESULTS

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

- Structural checks of structural members.
- Structural checks of tubular connections.
- Definition of the lifting slings loads.
- Definition of the lifting padeye design load.

12.1 JOINTS REACTIONS

The Hooks joint reactions are detailed in the next tables:

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
HKK0	1001	-72.235	-17.635	1501.779	0.000	0.000	0.000
	2001	-93.249	-57.692	2522.294	0.000	0.000	0.000
	1003	-93.916	-22.929	1952.528	0.000	0.000	0.000
	2003	-121.235	-75.007	3279.309	0.000	0.000	0.000
	1A21	-0.064	-0.028	1.536	0.000	0.000	0.000
	2A21	-0.029	-0.021	0.847	0.000	0.000	0.000
	1A23	-0.083	-0.036	1.997	0.000	0.000	0.000
	2A23	-0.038	-0.028	1.101	0.000	0.000	0.000
	1A41	-0.155	0.063	1.544	0.000	0.000	0.000
	2A41	-0.104	0.013	1.512	0.000	0.000	0.000
	1A43	-0.202	0.081	2.008	0.000	0.000	0.000
	2A43	-0.135	0.017	1.966	0.000	0.000	0.000
	1C21	0.025	-0.117	1.534	0.000	0.000	0.000
	2C21	-0.001	-0.049	0.842	0.000	0.000	0.000
	1C23	0.033	-0.152	1.994	0.000	0.000	0.000
	2C23	-0.002	-0.064	1.095	0.000	0.000	0.000
	1C41	-0.065	-0.026	1.530	0.000	0.000	0.000
	2C41	-0.030	-0.020	0.840	0.000	0.000	0.000
	1C43	-0.085	-0.034	1.989	0.000	0.000	0.000
	2C43	-0.039	-0.026	1.092	0.000	0.000	0.000
HKA2	1001	-0.050	-0.077	1.422	0.000	0.000	0.000
	2001	-0.023	-0.050	0.812	0.000	0.000	0.000
	1003	-0.066	-0.099	1.849	0.000	0.000	0.000
	2003	-0.030	-0.064	1.055	0.000	0.000	0.000
	1A21	-89.623	-43.883	1496.057	0.000	0.000	0.000
	2A21	-127.321	-97.441	2518.657	0.000	0.000	0.000
	1A23	-116.523	-57.056	1945.095	0.000	0.000	0.000
	2A23	-165.534	-126.686	3274.587	0.000	0.000	0.000
	1A41	-0.130	0.003	1.427	0.000	0.000	0.000
	2A41	-0.084	-0.045	1.452	0.000	0.000	0.000
	1A43	-0.169	0.004	1.855	0.000	0.000	0.000
	2A43	-0.110	-0.059	1.887	0.000	0.000	0.000
	1C21	0.041	-0.167	1.409	0.000	0.000	0.000
	2C21	0.005	-0.077	0.802	0.000	0.000	0.000
	1C23	0.054	-0.217	1.832	0.000	0.000	0.000
	2C23	0.006	-0.100	1.043	0.000	0.000	0.000
	1C41	-0.045	-0.079	1.389	0.000	0.000	0.000
	2C41	-0.022	-0.049	0.791	0.000	0.000	0.000
	1C43	-0.059	-0.102	1.806	0.000	0.000	0.000
	2C43	-0.029	-0.063	1.028	0.000	0.000	0.000
HKA4	1001	-0.172	0.092	1.694	0.000	0.000	0.000
	2001	-0.102	0.059	0.913	0.000	0.000	0.000
	1003	-0.223	0.119	2.203	0.000	0.000	0.000
	2003	-0.133	0.077	1.186	0.000	0.000	0.000
	1A21	-0.164	0.084	1.692	0.000	0.000	0.000
	2A21	-0.100	0.057	0.914	0.000	0.000	0.000
	1A23	-0.213	0.109	2.200	0.000	0.000	0.000
	2A23	-0.130	0.074	1.188	0.000	0.000	0.000
	1A41	-117.556	46.312	1508.010	0.000	0.000	0.000

	2A41	-112.473	-6.754	2523.627	0.000	0.000	0.000
	1A43	-152.839	60.211	1960.634	0.000	0.000	0.000
	2A43	-146.230	-8.780	3281.050	0.000	0.000	0.000
	1C21	-0.073	-0.005	1.658	0.000	0.000	0.000
	2C21	-0.070	0.028	0.894	0.000	0.000	0.000
	1C23	-0.095	-0.007	2.155	0.000	0.000	0.000
	2C23	-0.092	0.037	1.163	0.000	0.000	0.000
	1C41	-0.165	0.085	1.684	0.000	0.000	0.000
	2C41	-0.100	0.057	0.905	0.000	0.000	0.000
	1C43	-0.214	0.111	2.190	0.000	0.000	0.000
	2C43	-0.130	0.074	1.177	0.000	0.000	0.000
HKC2	1001	0.037	-0.106	1.474	0.000	0.000	0.000
	2001	0.049	-0.087	0.809	0.000	0.000	0.000
	1003	0.048	-0.138	1.916	0.000	0.000	0.000
	2003	0.063	-0.113	1.053	0.000	0.000	0.000
	1A21	0.043	-0.112	1.462	0.000	0.000	0.000
	2A21	0.051	-0.089	0.805	0.000	0.000	0.000
	1A23	0.056	-0.146	1.900	0.000	0.000	0.000
	2A23	0.066	-0.115	1.046	0.000	0.000	0.000
	1A41	-0.047	-0.021	1.448	0.000	0.000	0.000
	2A41	0.039	-0.106	1.422	0.000	0.000	0.000
	1A43	-0.061	-0.028	1.883	0.000	0.000	0.000
	2A43	0.051	-0.138	1.849	0.000	0.000	0.000
	1C21	0.723	-71.895	1506.483	0.000	0.000	0.000
	2C21	-36.598	-82.708	2525.317	0.000	0.000	0.000
	1C23	0.937	-93.471	1958.637	0.000	0.000	0.000
	2C23	-47.584	-107.529	3283.232	0.000	0.000	0.000
	1C41	0.044	-0.114	1.499	0.000	0.000	0.000
	2C41	0.051	-0.089	0.822	0.000	0.000	0.000
	1C43	0.057	-0.149	1.949	0.000	0.000	0.000
	2C43	0.066	-0.116	1.068	0.000	0.000	0.000
HKC4	1001	-0.080	0.071	1.722	0.000	0.000	0.000
	2001	-0.029	0.025	0.893	0.000	0.000	0.000
	1003	-0.103	0.092	2.238	0.000	0.000	0.000
	2003	-0.038	0.032	1.161	0.000	0.000	0.000
	1A21	-0.074	0.065	1.694	0.000	0.000	0.000
	2A21	-0.028	0.024	0.880	0.000	0.000	0.000
	1A23	-0.096	0.084	2.203	0.000	0.000	0.000
	2A23	-0.037	0.031	1.144	0.000	0.000	0.000
	1A41	-0.170	0.161	1.728	0.000	0.000	0.000
	2A41	-0.106	0.097	1.596	0.000	0.000	0.000
	1A43	-0.221	0.209	2.247	0.000	0.000	0.000
	2A43	-0.138	0.127	2.075	0.000	0.000	0.000
	1C21	0.027	-0.036	1.748	0.000	0.000	0.000
	2C21	0.006	-0.011	0.907	0.000	0.000	0.000
	1C23	0.035	-0.047	2.272	0.000	0.000	0.000
	2C23	0.008	-0.014	1.179	0.000	0.000	0.000
	1C41	-26.829	18.920	1506.726	0.000	0.000	0.000
	2C41	-21.555	8.298	2525.401	0.000	0.000	0.000
	1C43	-34.881	24.597	1958.956	0.000	0.000	0.000
	2C43	-28.024	10.789	3283.344	0.000	0.000	0.000

Table 12.1 – Fixed hooks Joint reactions

And the reactions at the restrained joints (used to delete numerical instability):

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)
TL03	1001	0.759	-0.786	0.000	0.000	0.000	0.000
	2001	0.759	-0.763	0.000	0.000	0.000	0.000
	1003	0.986	-1.020	0.000	0.000	0.000	0.000
	2003	0.986	-0.990	0.000	0.000	0.000	0.000
	1A21	0.765	-0.879	0.000	0.000	0.000	0.000
	2A21	0.775	-0.814	0.000	0.000	0.000	0.000
	1A23	0.994	-1.140	0.000	0.000	0.000	0.000
	2A23	1.007	-1.056	0.000	0.000	0.000	0.000
	1A41	0.900	-0.879	0.000	0.000	0.000	0.000
	2A41	0.892	-0.872	0.000	0.000	0.000	0.000
	1A43	1.172	-1.142	0.000	0.000	0.000	0.000
	2A43	1.161	-1.134	0.000	0.000	0.000	0.000
	1C21	0.576	-0.579	0.000	0.000	0.000	0.000

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	2C21	0.656	-0.651	0.000	0.000	0.000	0.000
	1C23	0.751	-0.754	0.000	0.000	0.000	0.000
	2C23	0.855	-0.846	0.000	0.000	0.000	0.000
	1C41	0.714	-0.581	0.000	0.000	0.000	0.000
	2C41	0.711	-0.652	0.000	0.000	0.000	0.000
	1C43	0.928	-0.754	0.000	0.000	0.000	0.000
	2C43	0.924	-0.847	0.000	0.000	0.000	0.000
TL04	1001	-0.118	0.000	0.000	0.000	0.000	0.000
	2001	-0.099	0.000	0.000	0.000	0.000	0.000
	1003	-0.152	0.000	0.000	0.000	0.000	0.000
	2003	-0.127	0.000	0.000	0.000	0.000	0.000
	1A21	-0.240	0.000	0.000	0.000	0.000	0.000
	2A21	-0.178	0.000	0.000	0.000	0.000	0.000
	1A23	-0.310	0.000	0.000	0.000	0.000	0.000
	2A23	-0.229	0.000	0.000	0.000	0.000	0.000
	1A41	-0.077	0.000	0.000	0.000	0.000	0.000
	2A41	-0.069	0.000	0.000	0.000	0.000	0.000
	1A43	-0.098	0.000	0.000	0.000	0.000	0.000
	2A43	-0.088	0.000	0.000	0.000	0.000	0.000
	1C21	-0.053	0.000	0.000	0.000	0.000	0.000
	2C21	-0.061	0.000	0.000	0.000	0.000	0.000
	1C23	-0.068	0.000	0.000	0.000	0.000	0.000
	2C23	-0.078	0.000	0.000	0.000	0.000	0.000
	1C41	0.111	0.000	0.000	0.000	0.000	0.000
	2C41	0.048	0.000	0.000	0.000	0.000	0.000
	1C43	0.145	0.000	0.000	0.000	0.000	0.000
	2C43	0.064	0.000	0.000	0.000	0.000	0.000

Table 12.2 – Restrains reactions

12.2 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.

12.2.1 Member checks

All members were checked according to ISO 19902 and Eurocode 3, Ref./6/and /8/, respectively for tubular and non-tubular elements.

12.2.1.1 Members framing into lifting points: CF = 1.30

Members' code checks are reported in the following and show that the structure can withstand all load combinations, with utilization factors below 1.0.

```
                    SACS-IV   MEMBER UNITY CHECK RANGE SUMMARY

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

                ** NO UNITY CHECKS IN THIS GROUP **

                    SACS-IV   MEMBER UNITY CHECK RANGE SUMMARY

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

                ** NO UNITY CHECKS IN THIS GROUP **
```

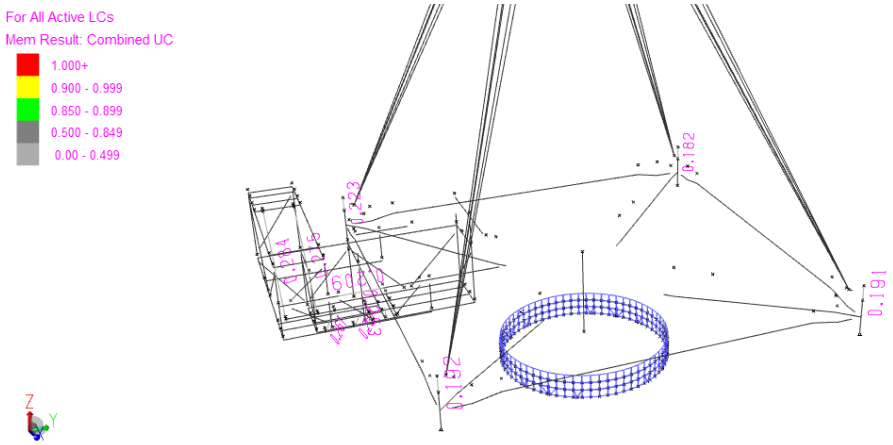


Figure 12.1 - TP Structural Model 3D view - UC>0.18

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 19902:2007 / EC3:2005
(EN 1993-1-1:2005/NA NONE)

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
HA3	SC09-SM35	1A43	0.21	0.0	9.7	-39.4	30.2	322.7	764.3	338.6	487.7	BN+AX	1.65	3.84	0.00	0.00
IP2	SM23-SM24	1C43	0.05	1.3	-0.0	10.5	-0.2	95.1	131.5	222.5	826.8	BN+COM	3.84	3.34	0.98	0.60
IP3	SM22-SM27	1A43	0.11	0.7	5.1	-27.9	-5.8	322.7	90.7	345.1	496.3	BN+AX	5.30	5.30	0.00	0.00
L15	SM15-SM14	2C23	0.01	0.4	-0.2	-1.4	-0.8	190.5	673.5	249.9	249.4	BN+COM	1.20	1.20	0.00	0.00
M01	TMJ1-T000	1003	0.00	3.7	1.2	0.0	0.0	361.9	4865.8	366.6	366.6	TEN	50.00	50.00	0.85	0.85
SL0	LIF2-HKK1	1003	0.02	0.0	11.8	0.0	0.0	476.2	83.5	808.4	808.4	TEN	21.50	21.50	0.85	0.85
SL1	LIF2-HKC1	1C23	0.02	0.0	11.6	0.0	0.0	476.2	82.9	808.4	808.4	TEN	21.58	21.58	0.85	0.85
SL2	LIF2-HKA1	1A23	0.03	0.0	12.3	0.0	0.0	476.2	84.9	808.4	808.4	TEN	21.32	21.32	0.85	0.85
SL3	LIF2-HKA3	1A43	0.02	0.0	11.6	0.0	0.0	476.2	82.8	808.4	808.4	TEN	21.59	21.59	0.85	0.85
SL4	LIF2-HKC3	1C43	0.02	0.0	10.8	0.0	0.0	476.2	80.9	808.4	808.4	TEN	21.85	21.85	0.85	0.85
ST3	SM29-SM35	2A43	0.10	1.6	-15.7	-21.2	5.5	300.8	2656.0	448.9	448.9	ACBI	1.57	1.57	0.85	0.85
ST4	SM31-SM32	2C43	0.05	0.0	1.1	15.9	-11.3	338.1	8770.5	450.8	450.8	TN+BN	1.40	1.40	0.85	0.85
ST5	SC09-SM27	2C43	0.25	0.4	22.5	40.7	-73.4	.3E+03	.2E+05	.5E+03	.5E+03	TN+BN	0.80	0.40	0.85	0.85
T00	T000-TA21	1C23	0.08	0.4	-0.9	26.4	-1.3	345.5	9524.8	365.1	589.6	BN+AX	16.00	8.00	0.99	0.98
T01	SC09-T022	1A43	0.15	0.0	-9.2	35.0	-1.4	181.5	296.2	363.3	882.1	BN+COM	16.00	16.00	0.58	0.40
T02	TC41-TC42	1A43	0.09	1.6	-0.8	34.6	-0.5	345.5	6244.3	380.1	524.8	BN+AX	16.00	8.00	0.93	0.85
T03	TA42-TA43	2C43	0.10	1.0	-0.4	33.0	0.2	345.5	3951.8	345.5	345.5	BN+AX	16.00	8.00	0.72	0.40
T04	TC43-TC44	1C43	0.07	1.0	-1.4	1.9	0.2	345.5	2716.3	388.8	523.2	SHEAR	16.00	8.00	0.66	0.85
T05	T006-T005	1A23	0.08	0.0	-8.2	-8.6	-4.0	184.8	337.9	343.7	350.5	BN+COM	16.00	16.00	0.97	0.85
T06	TA24-T028	2A23	0.07	0.0	-5.1	-9.2	1.2	153.7	260.3	315.1	306.2	BN+COM	16.00	16.00	0.83	0.89
T07	T028-T029	1A23	0.09	0.0	-7.9	-9.6	-1.5	153.7	276.4	352.2	282.8	BN+COM	16.00	16.00	0.75	0.89

```
T2A TA21-TA2A 1C23   0.08   0.5    -0.7   28.5   -1.1    345.5 6811.6  368.6  580.8   BN+AX   16.00   8.00   0.98   0.98
T2B TA2A-TA22 1C23   0.10   1.1    -0.8   35.3   -1.0    345.5 5604.3  380.2  524.8   BN+AX   16.00   8.00   0.95   0.86
```

12.2.1.2 Members not directly framing into lifting points: consequence factor of 1.15

All the elements have been verified with CF 1.30.

12.2.1.3 Other members: consequence factor of 1.00

All the elements have been verified with CF 1.30.

12.2.2 Plate checks

```
                                SACS-IV SYSTEM   PLATE STRESS UNITY CHECK RANGE SUMMARY

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

                                   ** NO UNITY CHECKS IN THIS GROUP **

                                SACS-IV SYSTEM   PLATE STRESS UNITY CHECK RANGE SUMMARY

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

                                   ** NO UNITY CHECKS IN THIS GROUP **


                                   ***** PLATE STRESS GROUP SUMMARY *****
                                                  N/MM2

     CRIT.          MAX  LOAD     **** MEMBRANE ****  BENDING-UPPER SURF. ** MAX ** X-STIFFENER   Y-STIFFENER
GRUP PLATE TYPE   UNITY COND     SX     SY     TXY     SX     SY     TXY     VM    S-TOP  S-BOT  S-TOP  S-BOT
                  CHECK  NO.

M65   A906 ISO   0.001 2A23     0.1    0.3    0.0     0.0    0.0    0.0     0.4
```

12.2.3 ULS 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/. All the verifications were performed against combination with CF = 1.3.

```
                                        * * J O I N T   C A N   S U M M A R Y * *
                                              (UNITY CHECK ORDER)
      ***************** ORIGINAL ******************   ************ LOAD DESIGN ***********   *** STRENGTH ANALYSIS ****
                                        LOAD    STRN                                    LOAD    STRN    BRACE   LOAD
JOINT  DIAMETER  THICKNESS  YLD STRS     UC      UC     DIAMETER  THICKNESS  YLD STRS     UC      UC     JOINT   CASE
         (CM)       (CM)     (N/MM2)                      (CM)       (CM)     (N/MM2)

 SM30   21.910     1.031    355.000    0.133   0.155    21.910     1.031    355.000    0.133    0.155   SM33   1A43
 SM02   21.910     1.031    355.000    0.072   0.084    21.910     1.031    355.000    0.072    0.084   SL06   1C43
 SL06   21.910     1.031    355.000    0.071   0.083    21.910     1.031    355.000    0.071    0.083   SM04   1A23
 SM01   21.910     1.031    355.000    0.068   0.079    21.910     1.031    355.000    0.068    0.079   SL02   1C43
 SU01   21.910     1.031    355.000    0.033   0.039    21.910     1.031    355.000    0.033    0.039   SM04   1C23
 SU11   21.910     1.031    355.000    0.033   0.038    21.910     1.031    355.000    0.033    0.038   SM33   1C23
 SU02   27.310     1.270    355.000    0.022   0.025    27.310     1.270    355.000    0.022    0.025   SM10   1A43
 SL18   21.910     1.031    355.000    0.018   0.022    21.910     1.031    355.000    0.018    0.022   SM03   1C43
 SM03   21.910     1.031    355.000    0.014   0.017    21.910     1.031    355.000    0.014    0.017   SL18   1A43
 SU12   27.310     1.270    355.000    0.008   0.010    27.310     1.270    355.000    0.008    0.010   SM11   2C23
 SL01   21.910     1.031    355.000    0.008   0.009    21.910     1.031    355.000    0.008    0.009   SM05   1A43
```

```
SM05  21.910    1.031    355.000   0.008   0.009     21.910    1.031    355.000   0.008     0.009   SL01   1C23
```

12.3 LIFTING SLINGS INTERNAL ACTIONS

As anticipated in sections 10.1.2 and 11.2, five sets of slings were modelled. The lifting slings internal actions are presented in the following tables:

- Tables 12.3 to 12.7 show the results for the 5 positions of CoG.
- Table 12.8 summarizes the max forces (including CF = 1.30), to be used for padeye design.
- Table 12.9 shows the above actions without CF and ULS factors, for the definition of slings MBL.

12.3.1 COG nominal position

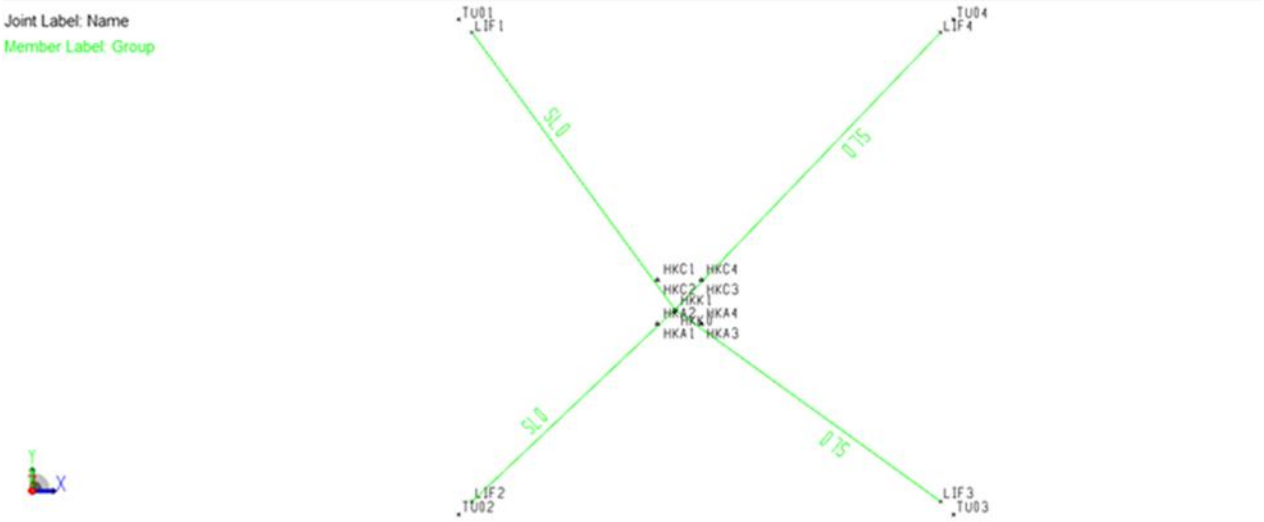


Figure 12.2 - TP Lifting arrangement – nominal position

SACS-IV SYSTEM MEMBER FORCES AND MOMENTS

MEMBER NUMBER	MEMBER END	GROUP ID	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
LIF1-HKK0	LIF1	SL0	1001	808.30	-0.00	-0.00	0.00	0.00	0.00
			2001	1398.15	0.00	-0.00	0.00	0.00	0.00
			1003	1050.91	-0.00	-0.00	0.00	0.00	0.00
			2003	1817.78	0.00	-0.00	0.00	0.00	0.00
			1A21	0.84	-0.00	-0.00	0.00	0.00	0.00
			2A21	0.47	0.00	-0.00	0.00	0.00	0.00
			1A23	1.09	-0.00	-0.00	0.00	0.00	0.00
			2A23	0.61	0.00	-0.00	0.00	0.00	0.00
			1A41	0.71	-0.00	-0.00	0.00	0.00	0.00
			2A41	0.77	0.00	-0.00	0.00	0.00	0.00
			1A43	0.93	-0.00	-0.00	0.00	0.00	0.00
			2A43	1.00	0.00	-0.00	0.00	0.00	0.00
			1C21	0.97	-0.00	-0.00	0.00	0.00	0.00
			2C21	0.51	0.00	-0.00	0.00	0.00	0.00
			1C23	1.26	-0.00	-0.00	0.00	0.00	0.00
			2C23	0.66	0.00	-0.00	0.00	0.00	0.00
			1C41	0.84	-0.00	-0.00	0.00	0.00	0.00

			2C41	0.47	0.00	-0.00	0.00	0.00	0.00
			1C43	1.09	-0.00	-0.00	0.00	0.00	0.00
			2C43	0.61	0.00	-0.00	0.00	0.00	0.00
LIF2-HKK1	LIF2	SL0	1001	1778.09	-0.00	-0.00	0.00	0.00	0.00
			2001	1203.91	0.00	-0.00	0.00	0.00	0.00
			1003	2311.72	-0.00	-0.00	0.00	0.00	0.00
			2003	1565.23	0.00	-0.00	0.00	0.00	0.00
			1A21	0.23	-0.00	-0.00	0.00	0.00	0.00
			2A21	0.08	0.00	-0.00	0.00	0.00	0.00
			1A23	0.30	-0.00	-0.00	0.00	0.00	0.00
			2A23	0.10	0.00	-0.00	0.00	0.00	0.00
			1A41	0.17	-0.00	-0.00	0.00	0.00	0.00
			2A41	0.09	0.00	-0.00	0.00	0.00	0.00
			1A43	0.22	-0.00	-0.00	0.00	0.00	0.00
			2A43	0.11	0.00	-0.00	0.00	0.00	0.00
			1C21	0.16	0.00	-0.00	0.00	0.00	0.00
			2C21	0.05	0.00	-0.00	0.00	0.00	0.00
			1C23	0.21	0.00	-0.00	0.00	0.00	0.00
			2C23	0.06	0.00	-0.00	0.00	0.00	0.00
			1C41	0.10	-0.00	-0.00	0.00	0.00	0.00
			2C41	0.02	0.00	-0.00	0.00	0.00	0.00
			1C43	0.13	-0.00	-0.00	0.00	0.00	0.00
			2C43	0.03	0.00	-0.00	0.00	0.00	0.00
LIF3-HKK0	LIF3	SL0	1001	917.69	0.00	-0.00	0.00	0.00	0.00
			2001	1501.17	0.00	-0.00	0.00	0.00	0.00
			1003	1193.12	0.00	-0.00	0.00	0.00	0.00
			2003	1951.72	0.00	-0.00	0.00	0.00	0.00
			1A21	0.92	0.00	-0.00	0.00	0.00	0.00
			2A21	0.50	0.00	-0.00	0.00	0.00	0.00
			1A23	1.20	0.00	-0.00	0.00	0.00	0.00
			2A23	0.65	0.00	-0.00	0.00	0.00	0.00
			1A41	1.06	0.00	-0.00	0.00	0.00	0.00
			2A41	0.97	0.00	-0.00	0.00	0.00	0.00
			1A43	1.38	0.00	-0.00	0.00	0.00	0.00
			2A43	1.26	0.00	-0.00	0.00	0.00	0.00
			1C21	0.80	0.00	-0.00	0.00	0.00	0.00
			2C21	0.46	0.00	-0.00	0.00	0.00	0.00
			1C23	1.03	0.00	-0.00	0.00	0.00	0.00
			2C23	0.60	0.00	-0.00	0.00	0.00	0.00
			1C41	0.92	0.00	-0.00	0.00	0.00	0.00
			2C41	0.50	0.00	-0.00	0.00	0.00	0.00
			1C43	1.20	0.00	-0.00	0.00	0.00	0.00
			2C43	0.65	0.00	-0.00	0.00	0.00	0.00
LIF4-HKK1	LIF4	SL0	1001	1464.74	0.00	0.00	0.00	0.00	0.00
			2001	869.06	0.00	0.00	0.00	0.00	0.00
			1003	1904.33	0.00	0.00	0.00	0.00	0.00
			2003	1129.88	0.00	0.00	0.00	0.00	0.00
			1A21	-0.24	0.00	0.00	0.00	0.00	0.00
			2A21	-0.08	0.00	0.00	0.00	0.00	0.00
			1A23	-0.31	0.00	0.00	0.00	0.00	0.00
			2A23	-0.10	0.00	0.00	0.00	0.00	0.00
			1A41	-0.17	0.00	0.00	0.00	0.00	0.00
			2A41	-0.09	0.00	0.00	0.00	0.00	0.00
			1A43	-0.22	0.00	0.00	0.00	0.00	0.00
			2A43	-0.12	0.00	0.00	0.00	0.00	0.00
			1C21	-0.17	0.00	0.00	0.00	0.00	0.00
			2C21	-0.05	0.00	0.00	0.00	0.00	0.00
			1C23	-0.22	0.00	0.00	0.00	0.00	0.00
			2C23	-0.06	0.00	0.00	0.00	0.00	0.00
			1C41	-0.10	0.00	0.00	0.00	0.00	0.00
			2C41	-0.02	0.00	0.00	0.00	0.00	0.00
			1C43	-0.13	0.00	0.00	0.00	0.00	0.00
			2C43	-0.03	0.00	0.00	0.00	0.00	0.00

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Table 12.3 – Slings internal actions: CoG in nominal position

12.3.2 COG shift C2

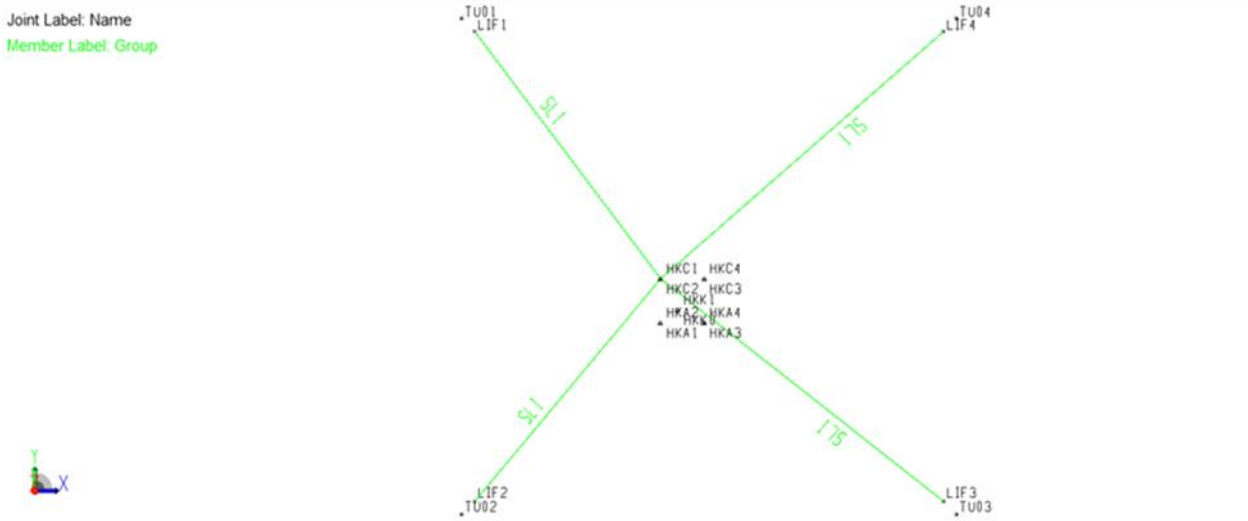


Figure 12.3 - TP Lifting arrangement – CoG shifted towards C2

SACS-IV SYSTEM MEMBER FORCES AND MOMENTS

MEMBER	MEMBER	GROUP	LOAD	FORCE(X)	FORCE(Y)	FORCE(Z)	MOMENT(X)	MOMENT(Y)	MOMENT(Z)
				KN	KN	KN	KN-M	KN-M	KN-M
			NUMBER	END	ID	CASE			
LIF1-HKC2	LIF1	SL1	1001	0.97	-0.00	-0.00	0.00	0.00	0.00
			2001	0.57	0.00	-0.00	0.00	0.00	0.00
			1003	1.26	-0.00	-0.00	0.00	0.00	0.00
			2003	0.75	0.00	-0.00	0.00	0.00	0.00
			1A21	0.97	-0.00	-0.00	0.00	0.00	0.00
			2A21	0.57	0.00	-0.00	0.00	0.00	0.00
			1A23	1.26	-0.00	-0.00	0.00	0.00	0.00
			2A23	0.74	0.00	-0.00	0.00	0.00	0.00
			1A41	0.83	-0.00	-0.00	0.00	0.00	0.00
			2A41	0.94	0.00	-0.00	0.00	0.00	0.00
			1A43	1.08	-0.00	-0.00	0.00	0.00	0.00
			2A43	1.22	0.00	-0.00	0.00	0.00	0.00
			1C21	938.92	-0.00	-0.00	0.00	0.00	0.00
			2C21	1520.01	0.00	-0.00	0.00	0.00	0.00
			1C23	1220.72	-0.00	-0.00	0.00	0.00	0.00
			2C23	1976.21	0.00	-0.00	0.00	0.00	0.00
			1C41	1.00	-0.00	-0.00	0.00	0.00	0.00
			2C41	0.58	0.00	-0.00	0.00	0.00	0.00
			1C43	1.29	-0.00	-0.00	0.00	0.00	0.00
			2C43	0.76	0.00	-0.00	0.00	0.00	0.00
LIF2-HKC1	LIF2	SL1	1001	0.11	0.00	0.00	0.00	0.00	0.00
			2001	0.04	-0.00	0.00	0.00	0.00	0.00
			1003	0.14	0.00	0.00	0.00	0.00	0.00
			2003	0.05	-0.00	0.00	0.00	0.00	0.00
			1A21	0.15	0.00	0.00	0.00	0.00	0.00
			2A21	0.06	-0.00	0.00	0.00	0.00	0.00
			1A23	0.20	0.00	0.00	0.00	0.00	0.00
			2A23	0.08	-0.00	0.00	0.00	0.00	0.00
			1A41	0.08	0.00	0.00	0.00	0.00	0.00

		2A41	0.05	0.00	0.00	0.00	0.00	0.00
		1A43	0.11	0.00	0.00	0.00	0.00	0.00
		2A43	0.07	0.00	0.00	0.00	0.00	0.00
		1C21	1743.41	0.00	0.00	0.00	0.00	0.00
		2C21	1168.06	-0.00	0.00	0.00	0.00	0.00
		1C23	2266.63	0.00	0.00	0.00	0.00	0.00
		2C23	1518.62	-0.00	0.00	0.00	0.00	0.00
		1C41	0.03	0.00	0.00	0.00	0.00	0.00
		2C41	0.01	-0.00	0.00	0.00	0.00	0.00
		1C43	0.04	0.00	0.00	0.00	0.00	0.00
		2C43	0.01	-0.00	0.00	0.00	0.00	0.00
LIF3-HKC2	LIF3	SL1	1001	0.72	0.00	-0.00	0.00	0.00	0.00
			2001	0.36	0.00	-0.00	0.00	0.00	0.00
			1003	0.94	0.00	-0.00	0.00	0.00	0.00
			2003	0.46	0.00	-0.00	0.00	0.00	0.00
			1A21	0.71	0.00	-0.00	0.00	0.00	0.00
			2A21	0.35	0.00	-0.00	0.00	0.00	0.00
			1A23	0.92	0.00	-0.00	0.00	0.00	0.00
			2A23	0.45	0.00	-0.00	0.00	0.00	0.00
			1A41	0.83	0.00	-0.00	0.00	0.00	0.00
			2A41	0.69	0.00	-0.00	0.00	0.00	0.00
			1A43	1.08	0.00	-0.00	0.00	0.00	0.00
			2A43	0.90	0.00	-0.00	0.00	0.00	0.00
			1C21	791.52	0.00	-0.00	0.00	0.00	0.00
			2C21	1381.58	0.00	-0.00	0.00	0.00	0.00
			1C23	1029.09	0.00	-0.00	0.00	0.00	0.00
			2C23	1796.24	0.00	-0.00	0.00	0.00	0.00
			1C41	0.73	0.00	-0.00	0.00	0.00	0.00
			2C41	0.36	0.00	-0.00	0.00	0.00	0.00
			1C43	0.94	0.00	-0.00	0.00	0.00	0.00
			2C43	0.47	0.00	-0.00	0.00	0.00	0.00
LIF4-HKC1	LIF4	SL1	1001	-0.11	0.00	0.00	0.00	0.00	0.00
			2001	-0.04	0.00	0.00	0.00	0.00	0.00
			1003	-0.14	0.00	0.00	0.00	0.00	0.00
			2003	-0.05	0.00	0.00	0.00	0.00	0.00
			1A21	-0.16	0.00	0.00	0.00	0.00	0.00
			2A21	-0.06	0.00	0.00	0.00	0.00	0.00
			1A23	-0.20	0.00	0.00	0.00	0.00	0.00
			2A23	-0.08	0.00	0.00	0.00	0.00	0.00
			1A41	-0.09	-0.00	0.00	0.00	0.00	0.00
			2A41	-0.05	0.00	0.00	0.00	0.00	0.00
			1A43	-0.11	-0.00	0.00	0.00	0.00	0.00
			2A43	-0.07	0.00	0.00	0.00	0.00	0.00
			1C21	1496.08	0.00	0.00	0.00	0.00	0.00
			2C21	903.69	0.00	0.00	0.00	0.00	0.00
			1C23	1945.08	0.00	0.00	0.00	0.00	0.00
			2C23	1174.91	0.00	0.00	0.00	0.00	0.00
			1C41	-0.03	0.00	0.00	0.00	0.00	0.00
			2C41	-0.01	0.00	0.00	0.00	0.00	0.00
			1C43	-0.04	0.00	0.00	0.00	0.00	0.00
			2C43	-0.01	0.00	0.00	0.00	0.00	0.00

Table 12.4 – Slings internal actions: CoG shifted towards C2

12.3.3 COG shift A2

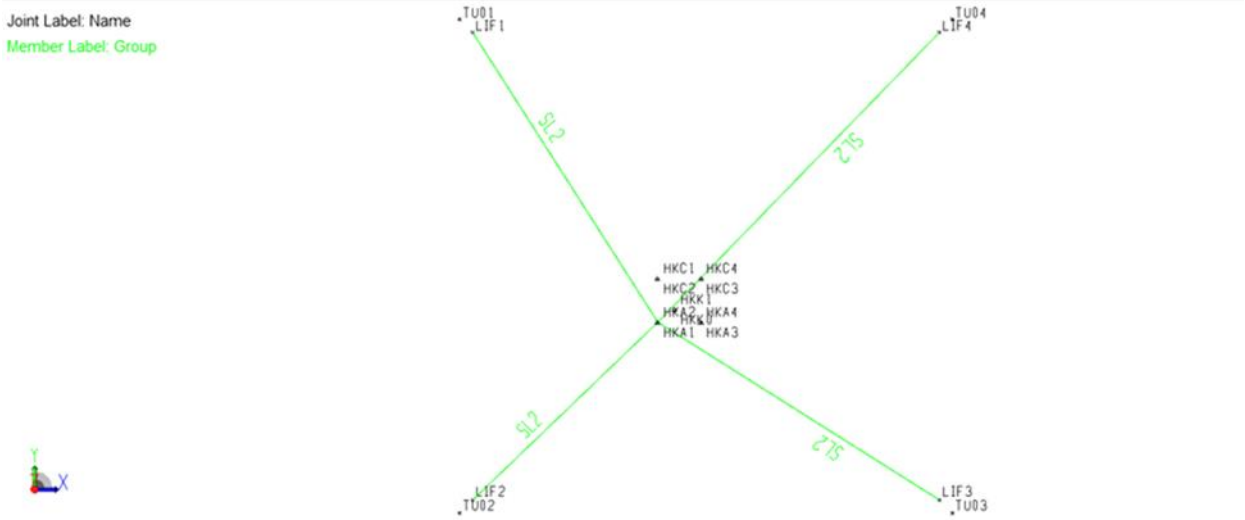


Figure 12.4 - TP Lifting arrangement – CoG shifted towards A2

SACS-IV SYSTEM MEMBER FORCES AND MOMENTS

MEMBER NUMBER	MEMBER END	GROUP ID	LOAD CASE	FORCE(X) (KN)	FORCE(Y) (KN)	FORCE(Z) (KN)	MOMENT(X) (KN-M)	MOMENT(Y) (KN-M)	MOMENT(Z) (KN-M)
LIF1-HKA2	LIF1	SL2	1001	0.82	-0.00	-0.00	0.00	0.00	0.00
			2001	0.48	0.00	-0.00	0.00	0.00	0.00
			1003	1.07	-0.00	-0.00	0.00	0.00	0.00
			2003	0.62	0.00	-0.00	0.00	0.00	0.00
			1A21	814.76	-0.00	-0.00	0.00	0.00	0.00
			2A21	1405.73	0.00	-0.00	0.00	0.00	0.00
			1A23	1059.32	-0.00	-0.00	0.00	0.00	0.00
			2A23	1827.64	0.00	-0.00	0.00	0.00	0.00
			1A41	0.71	-0.00	-0.00	0.00	0.00	0.00
			2A41	0.79	0.00	-0.00	0.00	0.00	0.00
			1A43	0.93	-0.00	-0.00	0.00	0.00	0.00
			2A43	1.03	0.00	-0.00	0.00	0.00	0.00
			1C21	0.95	-0.00	-0.00	0.00	0.00	0.00
			2C21	0.51	0.00	-0.00	0.00	0.00	0.00
			1C23	1.23	-0.00	-0.00	0.00	0.00	0.00
			2C23	0.67	0.00	-0.00	0.00	0.00	0.00
			1C41	0.81	0.00	-0.00	0.00	0.00	0.00
			2C41	0.47	0.00	-0.00	0.00	0.00	0.00
			1C43	1.05	0.00	-0.00	0.00	0.00	0.00
			2C43	0.61	0.00	-0.00	0.00	0.00	0.00
LIF2-HKA1	LIF2	SL2	1001	0.44	0.00	0.00	0.00	0.00	0.00
			2001	0.10	-0.00	0.00	0.00	0.00	0.00
			1003	0.57	0.00	0.00	0.00	0.00	0.00
			2003	0.12	-0.00	0.00	0.00	0.00	0.00
			1A21	1855.46	0.00	0.00	0.00	0.00	0.00
			2A21	1284.89	-0.00	0.00	0.00	0.00	0.00
			1A23	2412.31	0.00	0.00	0.00	0.00	0.00
			2A23	1670.50	-0.00	0.00	0.00	0.00	0.00
			1A41	0.42	0.00	0.00	0.00	0.00	0.00
			2A41	0.16	-0.00	0.00	0.00	0.00	0.00
			1A43	0.54	0.00	0.00	0.00	0.00	0.00
			2A43	0.20	-0.00	0.00	0.00	0.00	0.00

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		1C21	0.42	-0.00	0.00	0.00	0.00	0.00
		2C21	0.09	-0.00	0.00	0.00	0.00	0.00
		1C23	0.54	-0.00	0.00	0.00	0.00	0.00
		2C23	0.11	-0.00	0.00	0.00	0.00	0.00
		1C41	0.35	0.00	0.00	0.00	0.00	0.00
		2C41	0.06	-0.00	0.00	0.00	0.00	0.00
		1C43	0.46	0.00	0.00	0.00	0.00	0.00
		2C43	0.08	-0.00	0.00	0.00	0.00	0.00
LIF3-HKA2	LIF3	SL2	1001	0.81	-0.00	0.00	0.00	0.00	0.00
			2001	0.45	-0.00	0.00	0.00	0.00	0.00
			1003	1.06	-0.00	0.00	0.00	0.00	0.00
			2003	0.59	-0.00	0.00	0.00	0.00	0.00
			1A21	906.25	-0.00	0.00	0.00	0.00	0.00
			2A21	1491.97	-0.00	0.00	0.00	0.00	0.00
			1A23	1178.26	-0.00	0.00	0.00	0.00	0.00
			2A23	1939.76	-0.00	0.00	0.00	0.00	0.00
			1A41	0.93	-0.00	0.00	0.00	0.00	0.00
			2A41	0.88	-0.00	0.00	0.00	0.00	0.00
			1A43	1.21	-0.00	0.00	0.00	0.00	0.00
			2A43	1.14	-0.00	0.00	0.00	0.00	0.00
			1C21	0.67	-0.00	0.00	0.00	0.00	0.00
			2C21	0.41	-0.00	0.00	0.00	0.00	0.00
			1C23	0.88	-0.00	0.00	0.00	0.00	0.00
			2C23	0.53	-0.00	0.00	0.00	0.00	0.00
			1C41	0.79	-0.00	0.00	0.00	0.00	0.00
			2C41	0.44	-0.00	0.00	0.00	0.00	0.00
			1C43	1.02	-0.00	0.00	0.00	0.00	0.00
			2C43	0.58	-0.00	0.00	0.00	0.00	0.00
LIF4-HKA1	LIF4	SL2	1001	-0.46	-0.00	-0.00	0.00	0.00	0.00
			2001	-0.10	-0.00	-0.00	0.00	0.00	0.00
			1003	-0.60	-0.00	-0.00	0.00	0.00	0.00
			2003	-0.13	-0.00	-0.00	0.00	0.00	0.00
			1A21	1387.59	-0.00	-0.00	0.00	0.00	0.00
			2A21	785.26	-0.00	-0.00	0.00	0.00	0.00
			1A23	1804.02	-0.00	-0.00	0.00	0.00	0.00
			2A23	1020.93	-0.00	-0.00	0.00	0.00	0.00
			1A41	-0.44	-0.00	-0.00	0.00	0.00	0.00
			2A41	-0.16	-0.00	-0.00	0.00	0.00	0.00
			1A43	-0.57	-0.00	-0.00	0.00	0.00	0.00
			2A43	-0.21	-0.00	-0.00	0.00	0.00	0.00
			1C21	-0.44	-0.00	-0.00	0.00	0.00	0.00
			2C21	-0.09	-0.00	-0.00	0.00	0.00	0.00
			1C23	-0.57	-0.00	-0.00	0.00	0.00	0.00
			2C23	-0.12	-0.00	-0.00	0.00	0.00	0.00
			1C41	-0.37	-0.00	-0.00	0.00	0.00	0.00
			2C41	-0.06	-0.00	-0.00	0.00	0.00	0.00
			1C43	-0.48	-0.00	-0.00	0.00	0.00	0.00
			2C43	-0.08	-0.00	-0.00	0.00	0.00	0.00

Table 12.5 – Slings internal actions: CoG shifted towards A2

12.3.4 COG shift A4

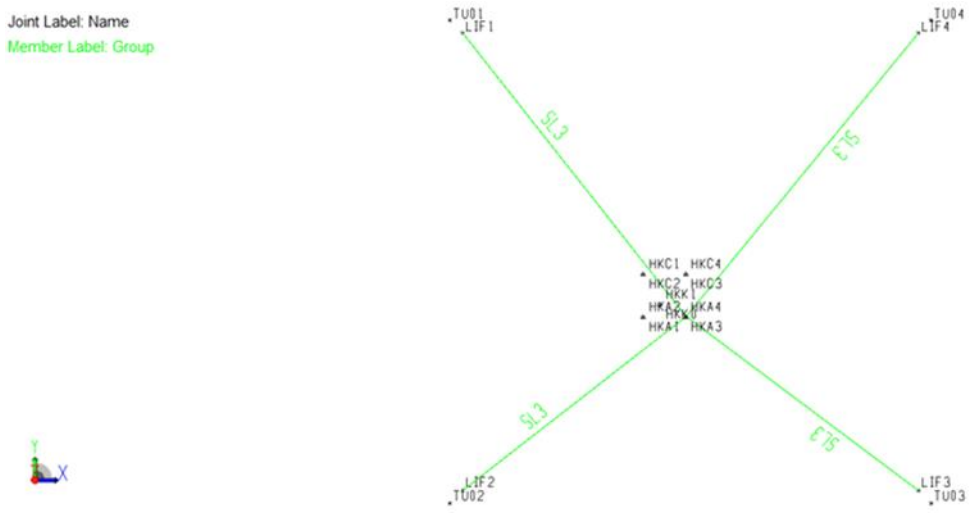


Figure 12.5 - TP Lifting arrangement – CoG shifted towards A4

SACS-IV SYSTEM MEMBER FORCES AND MOMENTS

MEMBER NUMBER	MEMBER END	GROUP ID	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
LIF1-HKA4	LIF1	SL3	1001	0.73	0.00	0.00	0.00	0.00	0.00
			2001	0.38	0.00	0.00	0.00	0.00	0.00
			1003	0.95	0.00	0.00	0.00	0.00	0.00
			2003	0.49	0.00	0.00	0.00	0.00	0.00
			1A21	0.74	0.00	0.00	0.00	0.00	0.00
			2A21	0.38	0.00	0.00	0.00	0.00	0.00
			1A23	0.96	0.00	0.00	0.00	0.00	0.00
			2A23	0.50	0.00	0.00	0.00	0.00	0.00
			1A41	698.70	0.00	0.00	0.00	0.00	0.00
			2A41	1292.49	0.00	0.00	0.00	0.00	0.00
			1A43	908.42	0.00	0.00	0.00	0.00	0.00
			2A43	1680.41	0.00	0.00	0.00	0.00	0.00
			1C21	0.85	0.00	0.00	0.00	0.00	0.00
			2C21	0.41	0.00	0.00	0.00	0.00	0.00
			1C23	1.11	0.00	0.00	0.00	0.00	0.00
			2C23	0.54	0.00	0.00	0.00	0.00	0.00
			1C41	0.73	0.00	0.00	0.00	0.00	0.00
			2C41	0.38	0.00	0.00	0.00	0.00	0.00
			1C43	0.95	0.00	0.00	0.00	0.00	0.00
			2C43	0.49	0.00	0.00	0.00	0.00	0.00
LIF2-HKA3	LIF2	SL3	1001	0.05	0.00	0.00	0.00	0.00	0.00
			2001	0.04	-0.00	0.00	0.00	0.00	0.00
			1003	0.06	0.00	0.00	0.00	0.00	0.00
			2003	0.05	-0.00	0.00	0.00	0.00	0.00
			1A21	0.10	0.00	0.00	0.00	0.00	0.00
			2A21	0.06	-0.00	0.00	0.00	0.00	0.00
			1A23	0.13	0.00	0.00	0.00	0.00	0.00
			2A23	0.08	-0.00	0.00	0.00	0.00	0.00
			1A41	1743.49	0.00	0.00	0.00	0.00	0.00
			2A41	1168.06	-0.00	0.00	0.00	0.00	0.00
			1A43	2266.74	0.00	0.00	0.00	0.00	0.00
			2A43	1518.62	-0.00	0.00	0.00	0.00	0.00
			1C21	0.02	-0.00	0.00	0.00	0.00	0.00

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			2C21	0.02	-0.00	0.00	0.00	0.00	0.00
			1C23	0.03	-0.00	0.00	0.00	0.00	0.00
			2C23	0.03	-0.00	0.00	0.00	0.00	0.00
			1C41	-0.04	0.00	0.00	0.00	0.00	0.00
			2C41	-0.00	-0.00	0.00	0.00	0.00	0.00
			1C43	-0.06	0.00	0.00	0.00	0.00	0.00
			2C43	-0.00	-0.00	0.00	0.00	0.00	0.00
LIF3-HKA4	LIF3	SL3	1001	1.21	-0.00	0.00	0.00	0.00	0.00
			2001	0.67	-0.00	0.00	0.00	0.00	0.00
			1003	1.58	-0.00	0.00	0.00	0.00	0.00
			2003	0.87	-0.00	0.00	0.00	0.00	0.00
			1A21	1.20	-0.00	0.00	0.00	0.00	0.00
			2A21	0.66	-0.00	0.00	0.00	0.00	0.00
			1A23	1.56	-0.00	0.00	0.00	0.00	0.00
			2A23	0.86	-0.00	0.00	0.00	0.00	0.00
			1A41	1029.13	-0.00	0.00	0.00	0.00	0.00
			2A41	1603.23	-0.00	0.00	0.00	0.00	0.00
			1A43	1338.02	-0.00	0.00	0.00	0.00	0.00
			2A43	2084.42	-0.00	0.00	0.00	0.00	0.00
			1C21	1.05	-0.00	0.00	0.00	0.00	0.00
			2C21	0.61	-0.00	0.00	0.00	0.00	0.00
			1C23	1.37	-0.00	0.00	0.00	0.00	0.00
			2C23	0.79	-0.00	0.00	0.00	0.00	0.00
			1C41	1.20	-0.00	0.00	0.00	0.00	0.00
			2C41	0.66	-0.00	0.00	0.00	0.00	0.00
			1C43	1.56	-0.00	0.00	0.00	0.00	0.00
			2C43	0.86	-0.00	0.00	0.00	0.00	0.00
LIF4-HKA3	LIF4	SL3	1001	-0.05	-0.00	-0.00	0.00	0.00	0.00
			2001	-0.04	-0.00	-0.00	0.00	0.00	0.00
			1003	-0.07	-0.00	-0.00	0.00	0.00	0.00
			2003	-0.05	-0.00	-0.00	0.00	0.00	0.00
			1A21	-0.10	-0.00	-0.00	0.00	0.00	0.00
			2A21	-0.06	-0.00	-0.00	0.00	0.00	0.00
			1A23	-0.13	-0.00	-0.00	0.00	0.00	0.00
			2A23	-0.08	-0.00	-0.00	0.00	0.00	0.00
			1A41	1496.10	-0.00	-0.00	0.00	0.00	0.00
			2A41	903.75	-0.00	-0.00	0.00	0.00	0.00
			1A43	1945.10	-0.00	-0.00	0.00	0.00	0.00
			2A43	1174.98	-0.00	-0.00	0.00	0.00	0.00
			1C21	-0.02	-0.00	-0.00	0.00	0.00	0.00
			2C21	-0.03	-0.00	-0.00	0.00	0.00	0.00
			1C23	-0.03	-0.00	-0.00	0.00	0.00	0.00
			2C23	-0.03	-0.00	-0.00	0.00	0.00	0.00
			1C41	0.05	-0.00	-0.00	0.00	0.00	0.00
			2C41	0.00	-0.00	-0.00	0.00	0.00	0.00
			1C43	0.06	-0.00	-0.00	0.00	0.00	0.00
			2C43	0.00	-0.00	-0.00	0.00	0.00	0.00

Table 12.6 – Slings internal actions: CoG shifted towards A4

12.3.5 COG shift C4

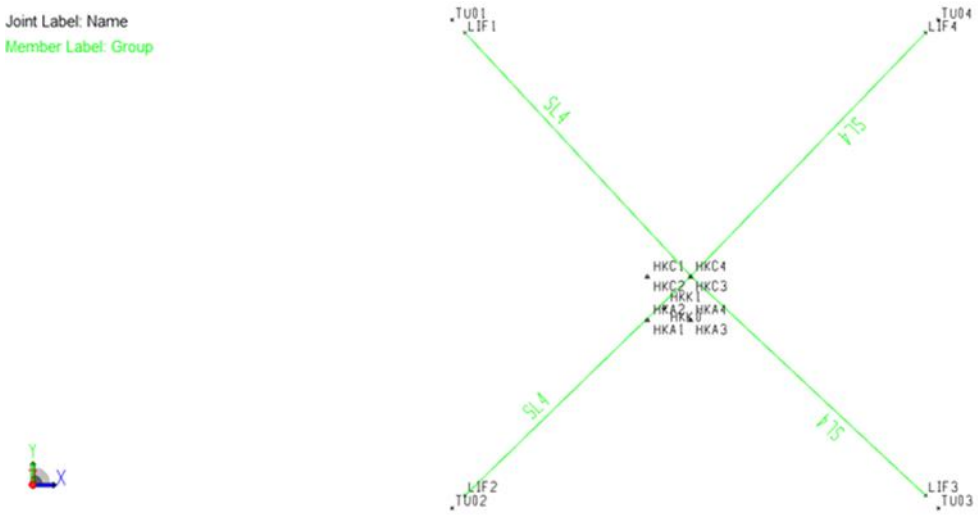


Figure 12.6 - TP Lifting arrangement – CoG shifted towards C4

SACS-IV SYSTEM MEMBER FORCES AND MOMENTS

MEMBER NUMBER	MEMBER END	GROUP ID	LOAD CASE	FORCE(X) KN	FORCE(Y) KN	FORCE(Z) KN	MOMENT(X) KN-M	MOMENT(Y) KN-M	MOMENT(Z) KN-M
LIF1-HKC4	LIF1	SL4	1001	0.87	0.00	0.00	0.00	0.00	0.00
			2001	0.47	-0.00	0.00	0.00	0.00	0.00
			1003	1.13	0.00	0.00	0.00	0.00	0.00
			2003	0.61	-0.00	0.00	0.00	0.00	0.00
			1A21	0.86	0.00	0.00	0.00	0.00	0.00
			2A21	0.46	0.00	0.00	0.00	0.00	0.00
			1A23	1.12	0.00	0.00	0.00	0.00	0.00
			2A23	0.60	0.00	0.00	0.00	0.00	0.00
			1A41	0.74	0.00	0.00	0.00	0.00	0.00
			2A41	0.76	-0.00	0.00	0.00	0.00	0.00
			1A43	0.96	0.00	0.00	0.00	0.00	0.00
			2A43	0.98	-0.00	0.00	0.00	0.00	0.00
			1C21	1.03	0.00	0.00	0.00	0.00	0.00
			2C21	0.53	-0.00	0.00	0.00	0.00	0.00
			1C23	1.35	0.00	0.00	0.00	0.00	0.00
			2C23	0.68	-0.00	0.00	0.00	0.00	0.00
			1C41	819.58	0.00	0.00	0.00	0.00	0.00
			2C41	1407.48	-0.00	0.00	0.00	0.00	0.00
			1C43	1065.58	0.00	0.00	0.00	0.00	0.00
			2C43	1829.90	-0.00	0.00	0.00	0.00	0.00
LIF2-HKC3	LIF2	SL4	1001	-0.29	0.00	0.00	0.00	0.00	0.00
			2001	-0.02	0.00	0.00	0.00	0.00	0.00
			1003	-0.38	0.00	0.00	0.00	0.00	0.00
			2003	-0.02	0.00	0.00	0.00	0.00	0.00
			1A21	-0.25	0.00	0.00	0.00	0.00	0.00
			2A21	0.00	0.00	0.00	0.00	0.00	0.00
			1A23	-0.32	0.00	0.00	0.00	0.00	0.00
			2A23	0.00	0.00	0.00	0.00	0.00	0.00
			1A41	-0.31	0.00	0.00	0.00	0.00	0.00
			2A41	-0.05	0.00	0.00	0.00	0.00	0.00
			1A43	-0.41	0.00	0.00	0.00	0.00	0.00
			2A43	-0.06	0.00	0.00	0.00	0.00	0.00
			1C21	-0.31	0.00	0.00	0.00	0.00	0.00

		2C21	-0.03	0.00	0.00	0.00	0.00	0.00
		1C23	-0.41	0.00	0.00	0.00	0.00	0.00
		2C23	-0.04	0.00	0.00	0.00	0.00	0.00
		1C41	1634.55	0.00	0.00	0.00	0.00	0.00
		2C41	1052.19	0.00	0.00	0.00	0.00	0.00
		1C43	2125.11	0.00	0.00	0.00	0.00	0.00
		2C43	1367.98	0.00	0.00	0.00	0.00	0.00
LIF3-HKC4	LIF3	SL4	1001	1.11	-0.00	0.00	0.00	0.00	0.00
			2001	0.56	-0.00	0.00	0.00	0.00	0.00
			1003	1.44	-0.00	0.00	0.00	0.00	0.00
			2003	0.73	-0.00	0.00	0.00	0.00	0.00
			1A21	1.09	-0.00	0.00	0.00	0.00	0.00
			2A21	0.55	-0.00	0.00	0.00	0.00	0.00
			1A23	1.41	-0.00	0.00	0.00	0.00	0.00
			2A23	0.71	-0.00	0.00	0.00	0.00	0.00
			1A41	1.24	-0.00	0.00	0.00	0.00	0.00
			2A41	1.08	-0.00	0.00	0.00	0.00	0.00
			1A43	1.62	-0.00	0.00	0.00	0.00	0.00
			2A43	1.40	-0.00	0.00	0.00	0.00	0.00
			1C21	0.97	-0.00	0.00	0.00	0.00	0.00
			2C21	0.52	-0.00	0.00	0.00	0.00	0.00
			1C23	1.27	-0.00	0.00	0.00	0.00	0.00
			2C23	0.67	-0.00	0.00	0.00	0.00	0.00
			1C41	911.11	-0.00	0.00	0.00	0.00	0.00
			2C41	1493.63	-0.00	0.00	0.00	0.00	0.00
			1C43	1184.57	-0.00	0.00	0.00	0.00	0.00
			2C43	1941.91	-0.00	0.00	0.00	0.00	0.00
LIF4-HKC3	LIF4	SL4	1001	0.29	0.00	0.00	0.00	0.00	0.00
			2001	0.02	0.00	0.00	0.00	0.00	0.00
			1003	0.38	0.00	0.00	0.00	0.00	0.00
			2003	0.02	0.00	0.00	0.00	0.00	0.00
			1A21	0.25	0.00	0.00	0.00	0.00	0.00
			2A21	-0.00	0.00	0.00	0.00	0.00	0.00
			1A23	0.32	0.00	0.00	0.00	0.00	0.00
			2A23	-0.00	0.00	0.00	0.00	0.00	0.00
			1A41	0.31	0.00	0.00	0.00	0.00	0.00
			2A41	0.05	0.00	0.00	0.00	0.00	0.00
			1A43	0.41	0.00	0.00	0.00	0.00	0.00
			2A43	0.06	0.00	0.00	0.00	0.00	0.00
			1C21	0.31	0.00	0.00	0.00	0.00	0.00
			2C21	0.03	0.00	0.00	0.00	0.00	0.00
			1C23	0.41	0.00	0.00	0.00	0.00	0.00
			2C23	0.04	0.00	0.00	0.00	0.00	0.00
			1C41	1607.79	0.00	0.00	0.00	0.00	0.00
			2C41	1022.88	0.00	0.00	0.00	0.00	0.00
			1C43	2090.32	0.00	0.00	0.00	0.00	0.00
			2C43	1329.86	0.00	0.00	0.00	0.00	0.00

Table 12.7 – Slings internal actions: CoG shifted towards C4

Lift point	critical load comb.	Max force (kN) (CF and ULS included)
LIF1	2**C2**3 (cog shift towards C2)	1976.21
LIF2	1**A2**3 (cog shift towards A2)	2412.31
LIF3	2**A4**3 (cog shift towards A4)	2084.42
LIF4	1**C4**3 (cog shift towards C4)	2090.32

Table 12.8 – Summary Table - Slings internal actions: CF = 1.30 and ULS factor = 1.30 included. To be used for padeye design

Lift point	Max force (kN) (nominal)
LIF1	1169.36
LIF2	1427.40
LIF3	1233.38
LIF4	1236.88

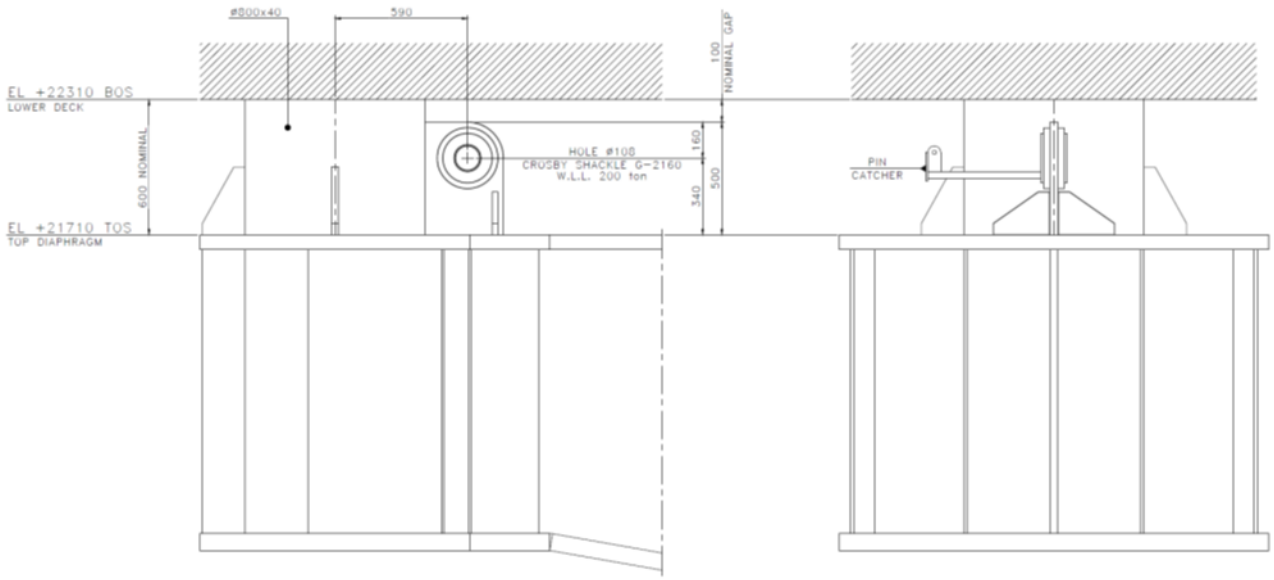
Table 12.9 – Summary Table - Slings internal actions: CF = 1.00 and ULS factor = 1.00

12.4 LIFTING PADEYE

Padeyes elements were modelled in SACS with beam element to correctly consider the forces transfer to TP cans. Dedicated report, Ref. /25/ presents the padeye verification.

The scope of this section is the check of padeye geometry and definition of lifting shackles. Design Load of padeye is derived from combinations with CF= 1.3 and ULS factor = 1.3 are computed in addition to the other factors presented in table 11.1, see section 11.2.

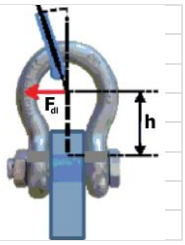
Max design load = 2412.3 kN.



PADEYE CHECK ACCORDING TO DNVGL-ST-N001			
LIFTING PADEYE			
Hole diameter - D_H	108	mm	
Main plate diameter - D_{pl}	320	mm	
Cheeck plate diameter - D_{ch}	270	mm	
Main plate thickness - t_{pl}	40	mm	
Cheek plate thickness - t_{ch}	25	mm	
Cheek plate weld leg size - t_w	20	mm	
Minimum yield strength - F_y	400	MPa	
Elastic modulus - E	210000	MPa	
Design load - F_d	2500	kN	
Material factor - γ_m	1.15		
Weld material factor - γ_{mW}	1.15		
Adjustment factor - β	0.50		UC
Bearing stress	187	MPa	0.54
Tear out stress	256	MPa	**0.74**
Cheek plate weld check	243	MPa	0.70

Figure 12.7 - TP Lifting padeye check

Out-of-plane loading factor δ			
ν =	3	deg	Out-of-(padeye)plane angle
h =	400	mm	Distance between centre of pinhole and application force
δ =	1.9317		Out-of-plane loading factor
δ' =	2		Selected out-of-plane loading factor



12.4.1 Definition of lifting shackle

Shackle design load does not consider CF and ULS factor.

From above table 12.9: F = 1427.4 kN / 9.81 = 145.5 ton

wide body shackle type Crosby G-2160 WLL= 200 t is preliminary selected.

APPENDIX A – MEMBER GROUPS AND SECTION PROPERTIES

TECON - BLPH TRANSITION PIECE - LIFTING DATE 23-AUG-2024 TIME 10:22:41 PRE PAGE 2

TUBULAR MEMBER PROPERTIES

GRP	M/S	JOINT THICK M	WALL THICK CM	OUTSIDE DIAM. CM	E 1000 KN/CM2	G 1000 KN/CM2	AXIAL AREA CM**2	***** MOMENTS OF INERTIA **** X-X CM**4	Y-Y CM**4	Z-Z CM**4	YIELD STRESS KN/CM2	KY	KZ	SHEAR AREA CM**2	RING SPACE M	SECT LENG M	TAPER
M01	1	0.00	6.500	700.00	20.5	7.9	14162.	0.17029E+10	0.85144E+09	0.85144E+09	38.0	1.0	1.0	7080.78	0.00	0.00	
PAD	9	0.00	3.000	30.00	20.5	7.9	254.47	46950.	23475.	23475.	35.0	1.0	1.0	127.23	0.00	0.00	
SL0	1	0.00	24.000	50.00	25.0	8.0	1960.4	0.61359E+06	0.30680E+06	0.30680E+06	50.0	1.0	1.0	1960.36	0.00	0.00	
SL1	1	0.00	24.000	50.00	25.0	8.0	1960.4	0.61359E+06	0.30680E+06	0.30680E+06	50.0	1.0	1.0	1960.36	0.00	0.00	
SL2	1	0.00	24.000	50.00	25.0	8.0	1960.4	0.61359E+06	0.30680E+06	0.30680E+06	50.0	1.0	1.0	1960.36	0.00	0.00	
SL3	1	0.00	24.000	50.00	25.0	8.0	1960.4	0.61359E+06	0.30680E+06	0.30680E+06	50.0	1.0	1.0	1960.36	0.00	0.00	
SL4	1	0.00	24.000	50.00	25.0	8.0	1960.4	0.61359E+06	0.30680E+06	0.30680E+06	50.0	1.0	1.0	1960.36	0.00	0.00	
ST3	1	0.00	0.711	16.83	20.5	7.7	36.005	2343.3	1171.6	1171.6	35.5	1.0	1.0	18.00	0.00	0.00	
ST4	1	0.00	1.270	27.31	20.5	7.7	103.90	17654.	8827.2	8827.2	35.5	1.0	1.0	51.95	0.00	0.00	
ST5	1	0.00	1.031	21.91	20.5	7.7	67.627	7388.2	3694.1	3694.1	35.5	1.0	1.0	33.81	0.00	0.00	
TPS	1	0.00	4.000	80.00	20.5	7.9	955.05	0.13829E+07	0.69146E+06	0.69146E+06	40.0	1.0	1.0	477.52	0.00	0.00	

WIDE FLANGE/WIDE FLANGE COMPACT,MEMBER PROPERTIES

GRP	M/S	** FLANGE ** THICK CM	WIDTH CM	WEB THICK CM	FILET RAD. CM	DEPTH CM	E 1000 KN/CM2	G 1000 KN/CM2	AXIAL AREA CM**2	**** MOMENTS OF INERTIA **** X-X CM**4	Y-Y CM**4	Z-Z CM**4	YIELD STRESS KN/CM2	KY	KZ	FLANGE-BRC TOP M	BOT M	SECT LEN M	TPR
HA3	1	1.65	30.00	0.950	2.700	33.00	20.5	7.7	133.5	131.4	0.2770E+05	7436.	35.5	1.0	1.0	0.0	0.0	0.00	
IP2	1	0.98	12.00	0.620	1.500	24.00	20.5	7.7	39.12	12.88	3892.	283.6	35.5	1.0	1.0	0.0	0.0	0.00	
IP3	1	1.15	16.00	0.750	1.800	33.00	20.5	7.7	62.61	28.15	0.1177E+05	788.1	35.5	1.0	1.0	0.0	0.0	0.00	

ANGLE MEMBER PROPERTIES

GRP	M S	STIFN USAGE	HGT CM	WDTH CM	THICK CM	Y-C CM	Z-C CM	ALPHA DEG	E 1000 KN/CM2	G 1000 KN/CM2	AXIAL AREA CM**2	***** MOMENTS OF INERTIA ***** X-X CM**4	Y-Y CM**4	Z-Z CM**4	YIELD STRESS KN/CM2	PRINCIPAL KY	KZ	BRACE LEN. M	SECT LEN. M
L15	1	NO	15.0	10.0	1.00	2.4	4.9	23.98	20.5	7.7	24.00	8.454	645.2	115.0	27.5	1.0	1.0	0.00	0.00

CHANNEL MEMBER REPORT

GRP	M S	STIFN USAGE	HEIGHT CM	WIDTH CM	WEB THICK CM	FLANGE THICK CM	Y-BAR CM	E 1000 KN/CM2	G 1000 KN/CM2	AXIAL AREA CM**2	***** MOMENTS OF INERTIA ***** X-X CM**4	Y-Y CM**4	Z-Z CM**4	YIELD STRESS KN/CM2	KY	KZ	BRACE LEN. M	SECT LEN. M
UN2	1	NO	22.00	8.00	0.900	1.250	2.1	20.5	7.7	37.40	16.00	2690.	197.0	27.5	1.0	1.0	0.0	0.00

DOUBLE WEB PLATE GIRDER MEMBER PROPERTIES

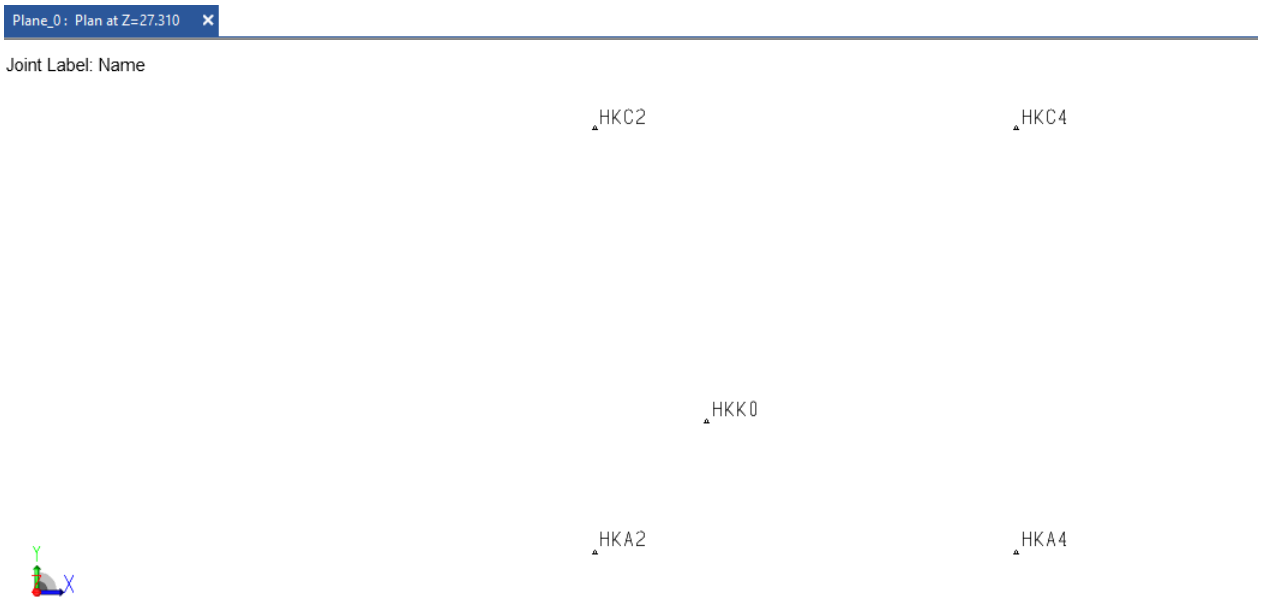
GRUP	*** FLANGE *** WIDTH CM	THICK CM	TOTAL HEIGHT CM	**** WEB **** THICK. CM	SPACE CM	FILLET RADIUS CM	MATERIAL PROPERTIES EM 1000 KN/CM2	G 1000 KN/CM2	YIELD STRESS KN/CM2	******** SECTION PROPERTIES ******** AXIAL AREA CM**2	***** MOMENTS OF INERTIA ***** IXX CM**4	IYY CM**4	IZZ CM**4	EFF.LENGTH FACTORS KY	KZ	SECT LEN.
T00	230.0	6.500	252.5	3.000	78.0	3.000	20.50	7.89	38.00	4427.01	0.7881E+07	0.5212E+08	0.1537E+08	1.00	1.00	0.00
T00	179.4	6.500	252.5	3.000	78.0	3.000	20.50	7.89	38.00	3769.21	0.7872E+07	0.4216E+08	0.8442E+07	1.00	1.00	0.00
T01	50.0	2.500	100.0	2.000	44.0	2.000	20.50	7.89	40.00	630.00	0.5559E+06	0.8801E+06	0.2361E+06	1.00	1.00	0.00
T02	179.4	6.500	252.5	3.000	78.0	3.000	20.50	7.89	38.00	3769.21	0.7872E+07	0.4216E+08	0.8442E+07	1.00	1.00	0.00
T02	120.0	6.500	224.8	3.000	78.0	3.000	20.50	7.89	38.00	2830.81	0.6867E+07	0.2334E+08	0.3806E+07	1.00	1.00	0.00
T03	120.0	6.500	224.8	3.000	78.0	3.000	20.50	7.89	38.00	2830.81	0.6867E+07	0.2334E+08	0.3806E+07	1.00	1.00	0.00
T03	120.0	6.500	140.0	3.000	78.0	3.000	20.50	7.89	38.00	2322.01	0.3863E+07	0.7980E+07	0.3032E+07	1.00	1.00	0.00
T04	120.0	6.500	140.0	3.000	78.0	3.000	20.50	7.89	38.00	2322.01	0.3863E+07	0.7980E+07	0.3032E+07	1.00	1.00	0.00
T05	50.0	2.500	100.0	2.000	44.0	2.000	20.50	7.89	40.00	630.00	0.5559E+06	0.8801E+06	0.2361E+06	1.00	1.00	0.00
T05	50.0	2.500	135.0	2.000	44.0	2.000	20.50	7.89	40.00	770.00	0.8120E+06	0.1830E+07	0.3039E+06	1.00	1.00	0.00
T06	50.0	6.500	140.0	2.000	44.0	2.000	20.50	7.89	38.00	1158.00	0.9483E+06	0.3581E+07	0.3815E+06	1.00	1.00	0.00
T07	50.0	2.500	135.0	2.000	44.0	2.000	20.50	7.89	40.00	770.00	0.8120E+06	0.1830E+07	0.3039E+06	1.00	1.00	0.00
T07	50.0	2.500	100.0	2.000	44.0	2.000	20.50	7.89	40.00	630.00	0.5559E+06	0.8801E+06	0.2361E+06	1.00	1.00	0.00
T2A	179.4	6.500	252.5	3.000	78.0	3.000	20.50	7.89	38.00	3769.21	0.7872E+07	0.4216E+08	0.8442E+07	1.00	1.00	0.00
T2A	162.1	6.500	244.4	3.000	78.0	3.000	20.50	7.89	38.00	3495.76	0.7579E+07	0.3603E+08	0.6727E+07	1.00	1.00	0.00
T2B	162.1	6.500	244.4	3.000	78.0	3.000	20.50	7.89	38.00	3495.76	0.7579E+07	0.3603E+08	0.6727E+07	1.00	1.00	0.00
T2B	120.0	6.500	224.8	3.000	78.0	3.000	20.50	7.89	38.00	2830.81	0.6867E+07	0.2334E+08	0.3806E+07	1.00	1.00	0.00
T3A	120.0	6.500	224.8	3.000	78.0	3.000	20.50	7.89	38.00	2830.81	0.6867E+07	0.2334E+08	0.3806E+07	1.00	1.00	0.00
T3A	120.0	6.500	182.2	3.000	78.0	3.000	20.50	7.89	38.00	2575.09	0.5348E+07	0.1446E+08	0.3417E+07	1.00	1.00	0.00
T3B	120.0	6.500	182.2	3.000	78.0	3.000	20.50	7.89	38.00	2575.09	0.5348E+07	0.1446E+08	0.3417E+07	1.00	1.00	0.00
T3B	120.0	6.500	140.0	3.000	78.0	3.000	20.50	7.89	38.00	2322.01	0.3863E+07	0.7980E+07	0.3032E+07	1.00	1.00	0.00

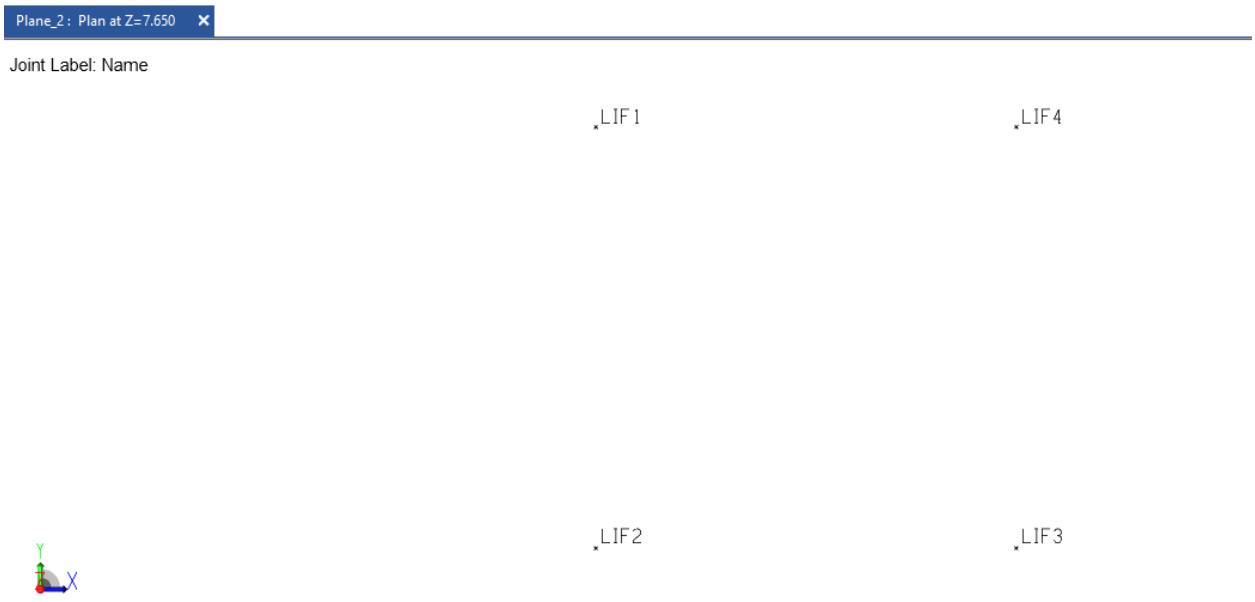
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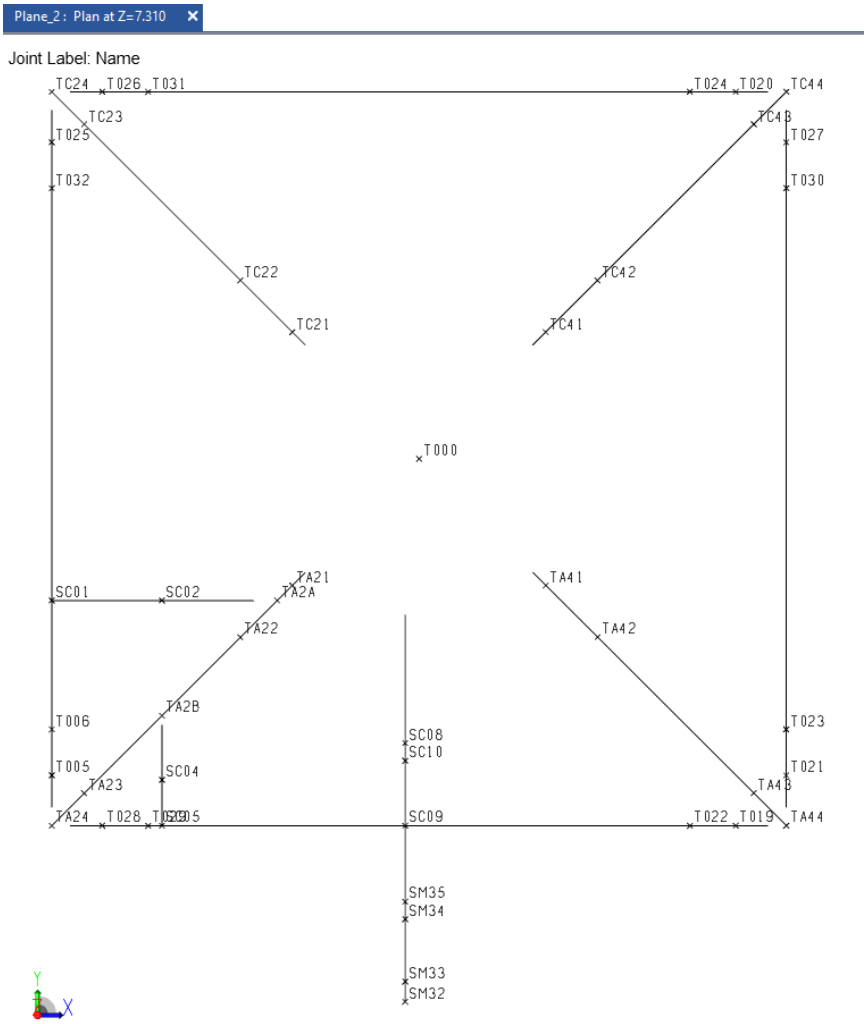
PLATE GROUP REPORT

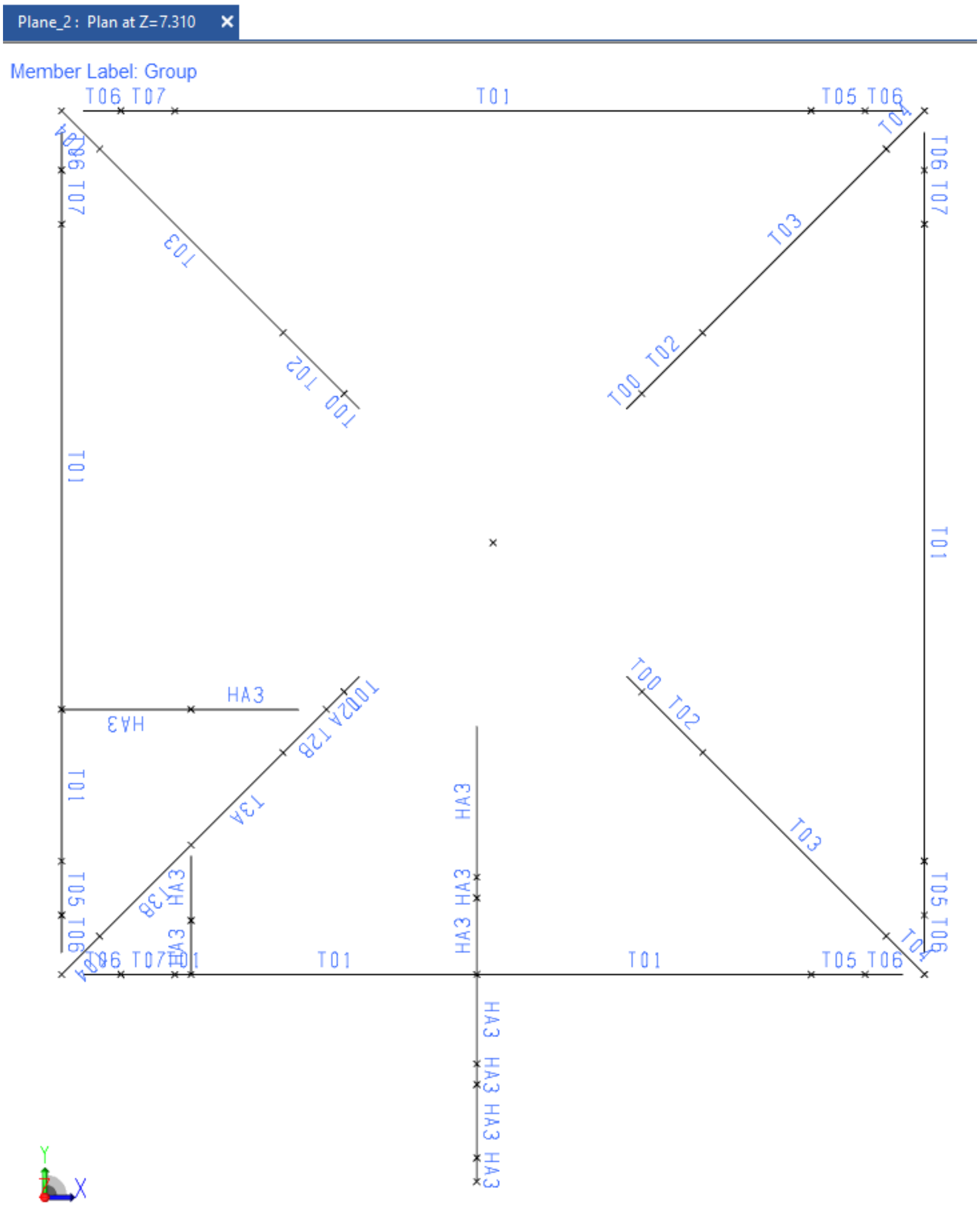
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	CM		KN/CM2		KN/CM2	CM/CM	CM**4/CM	CM	CM	CM	CM/CM	CM**4/CM	CM	CM	CM	CM	CM	CM
M65	6.500	ISO	20.50.300		38.00	0.000	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX B - WIREFRAME SCHEMES

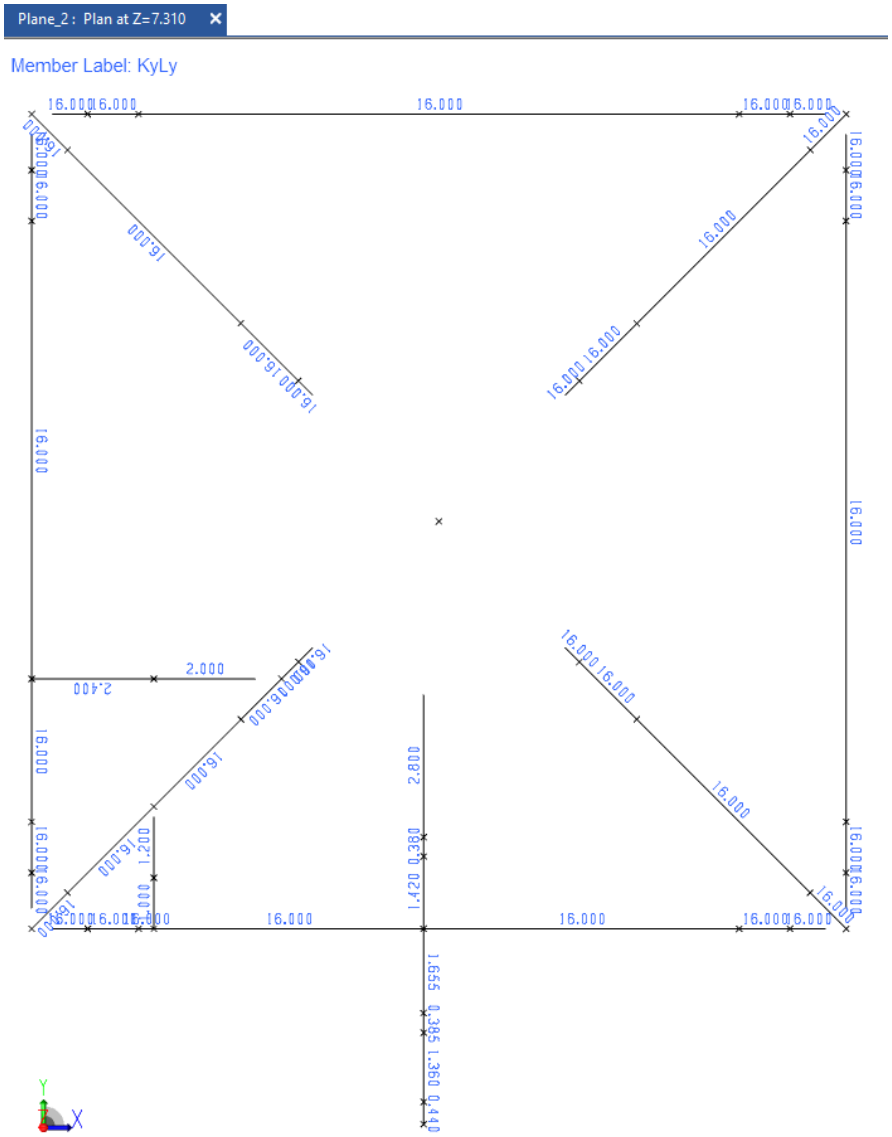


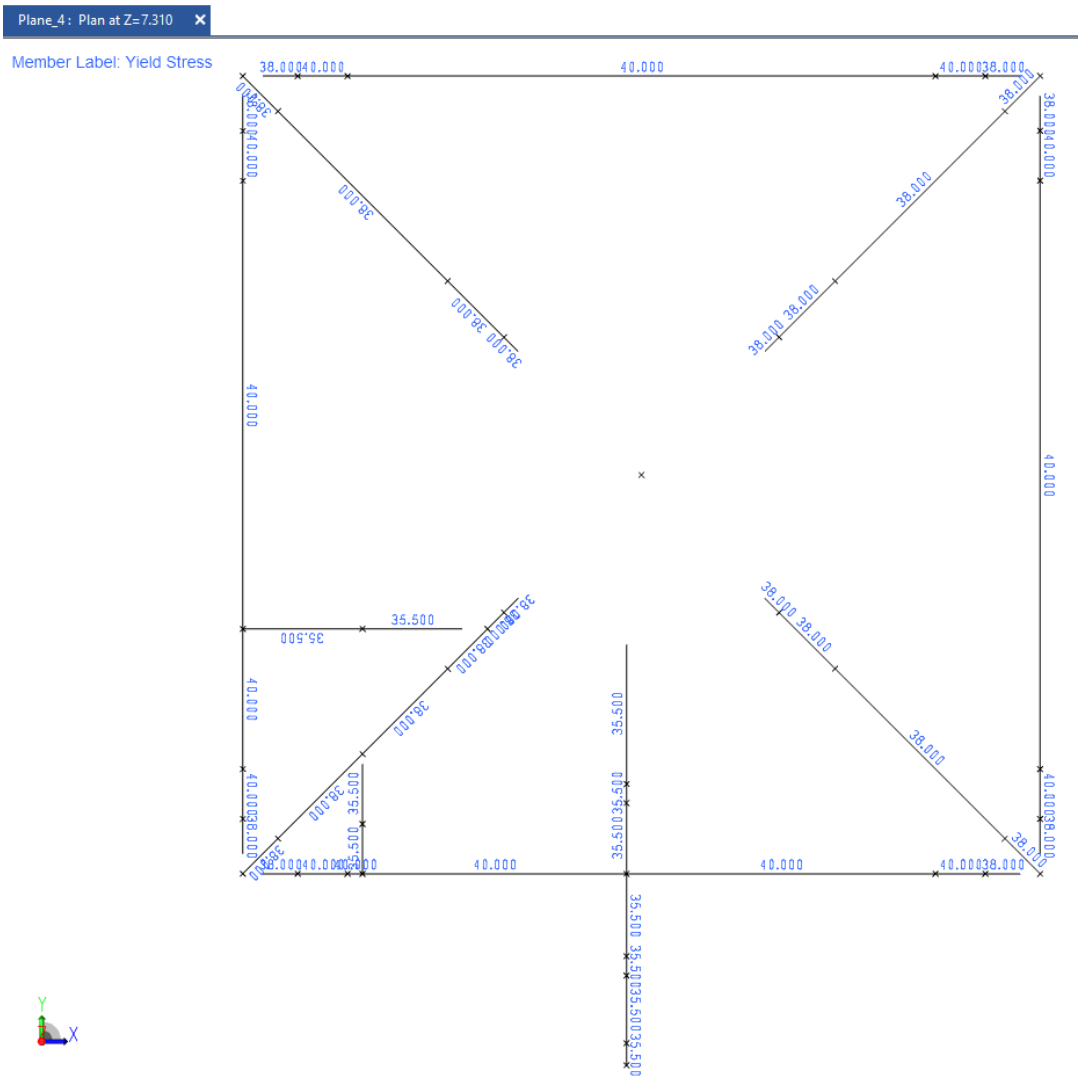


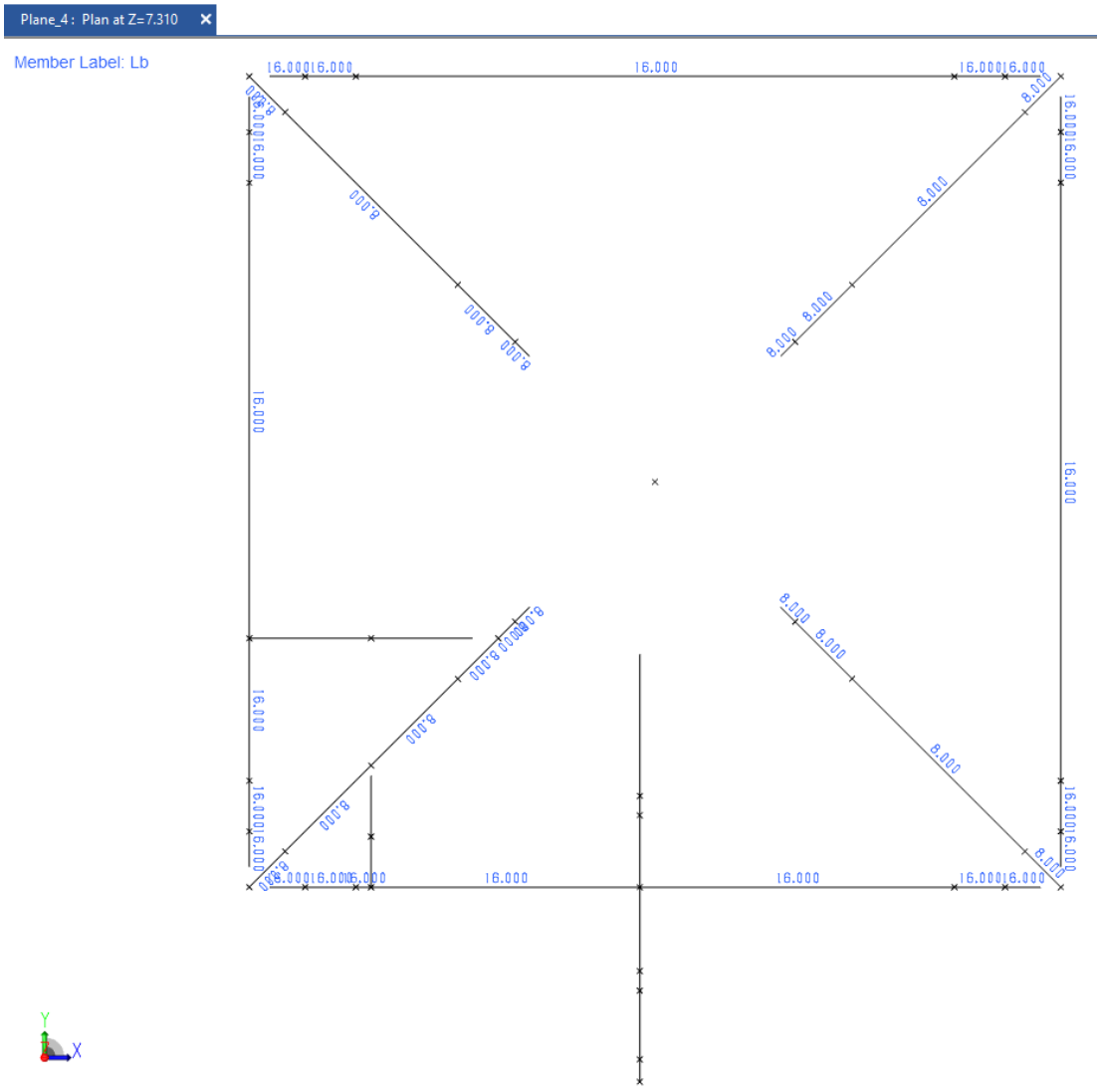

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T031
T024
T020
TC44
TC23
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T025
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TC41
T000
SC01
SC02
TA21
TA2A
TA41
TA22
TA42
T006
TA2B
T023
SC08
SC10
T005
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T019
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SM35
SM34
SM33
SM32

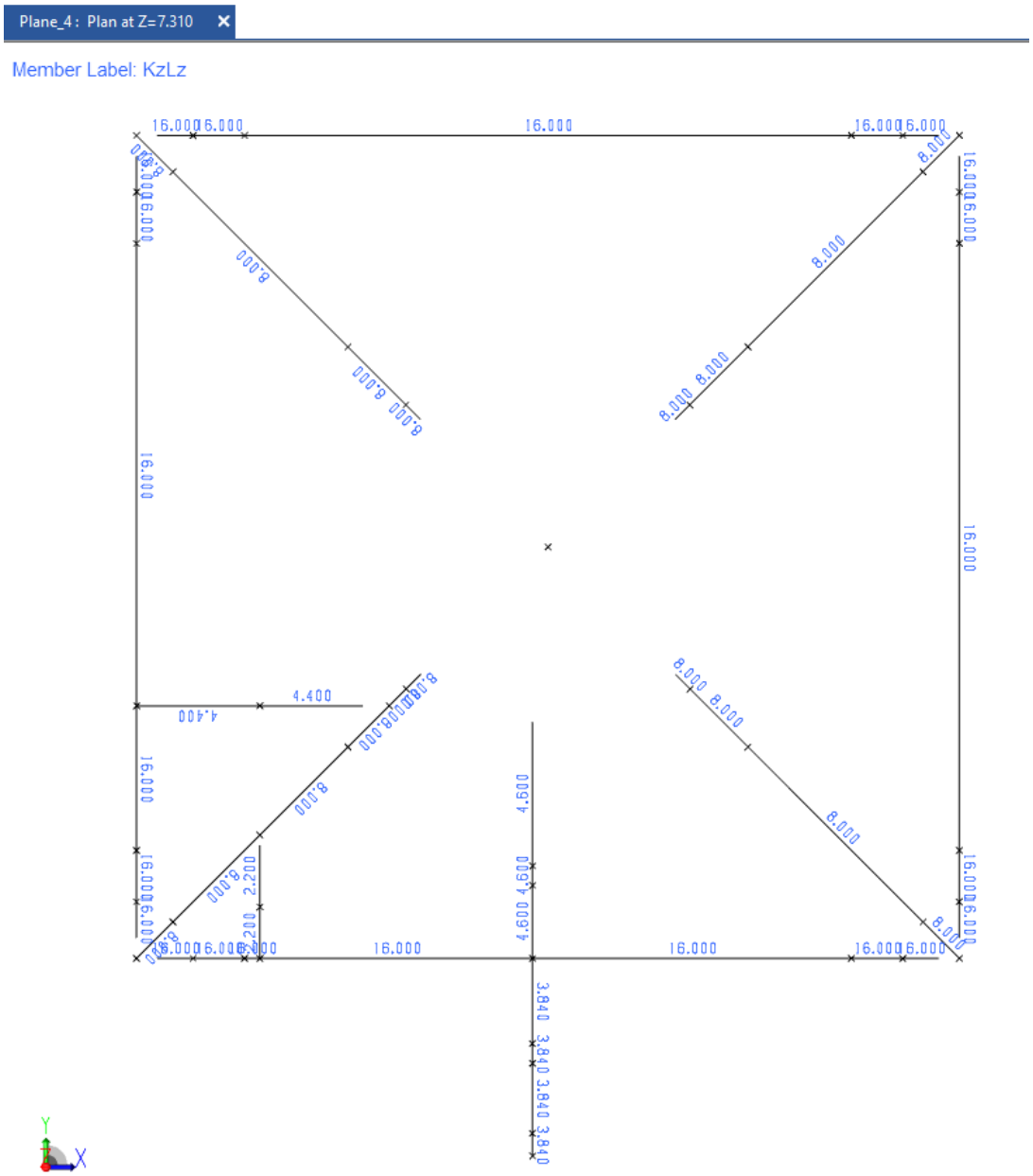


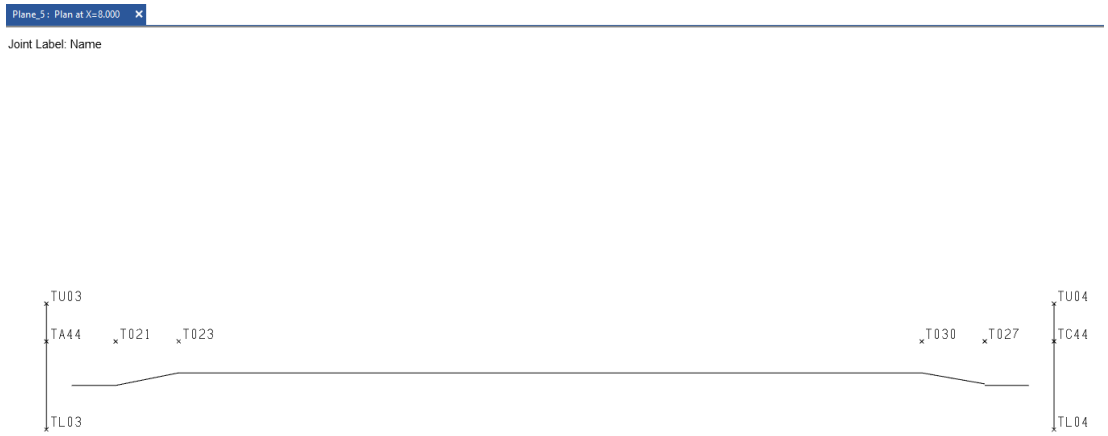
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T12B
T02A
Y
X

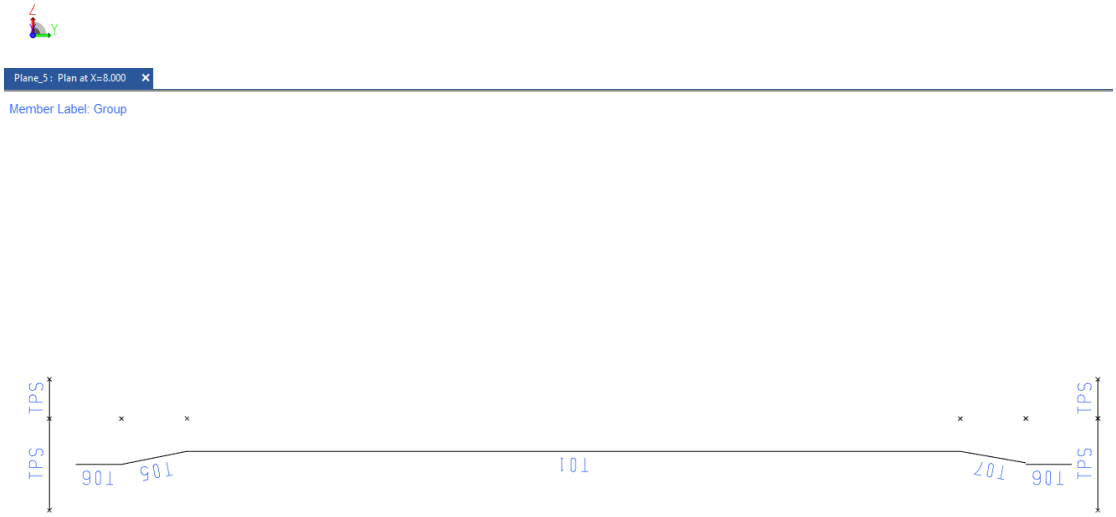

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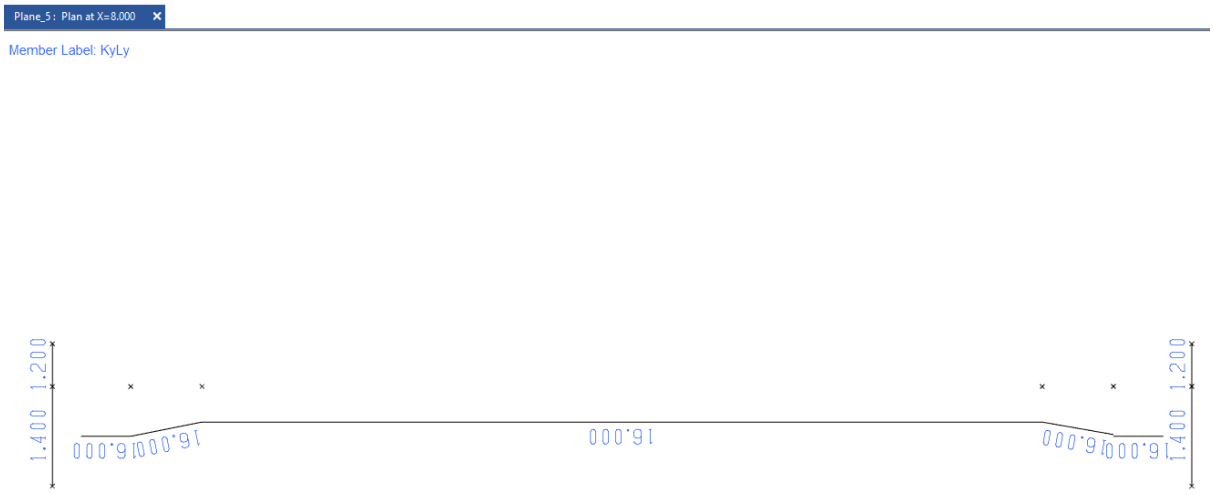

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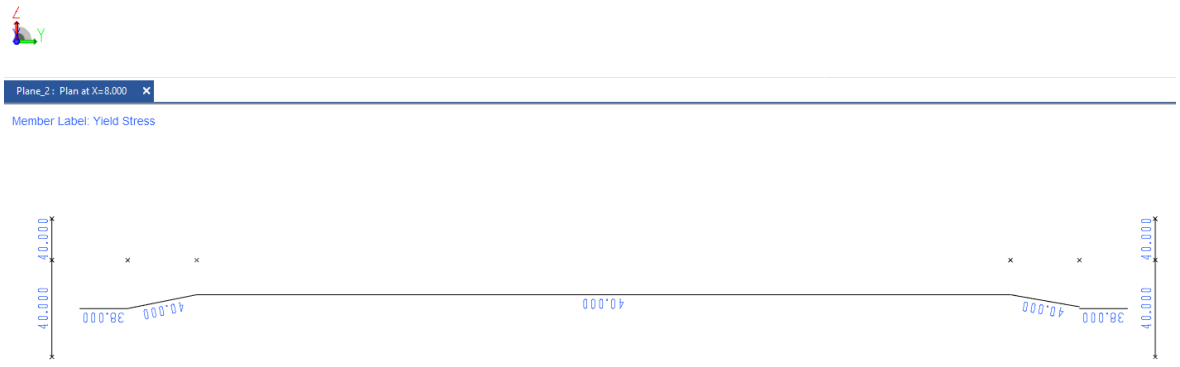

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Y
X

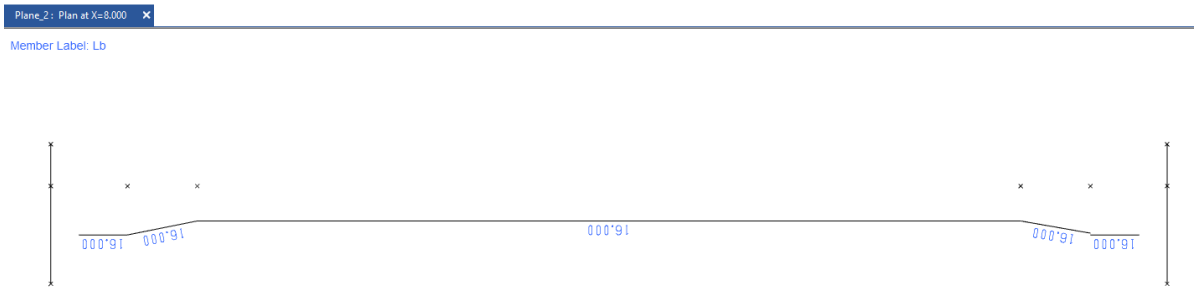

Plane_4 : Plan at Z=7.310
Member Label: KzLz
16.000
8.000
4.400
2.200
4.600
3.840
Y
X

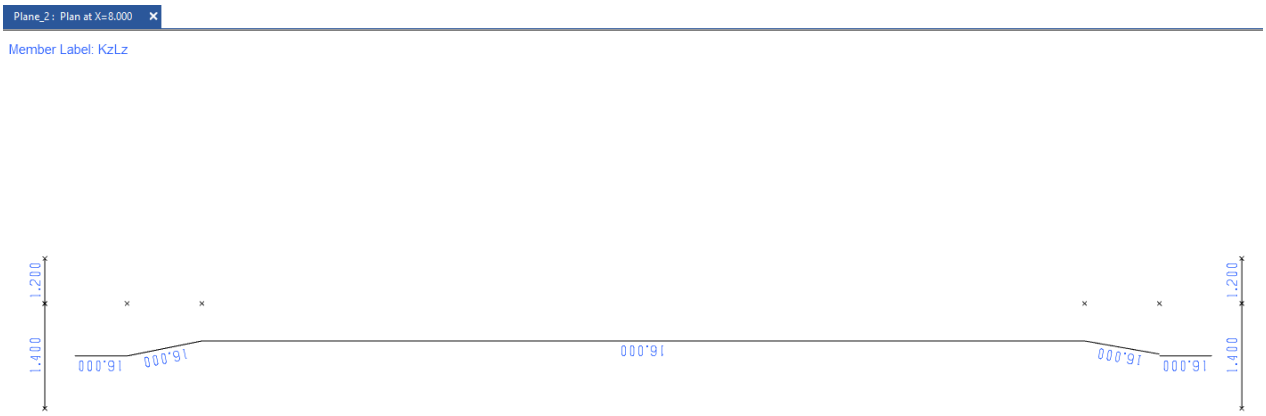

Plane_5 : Plan at X=8.000
Joint Label: Name
TU03
TA44
T021
T023
T030
T027
TU04
TC44
TL03
TL04

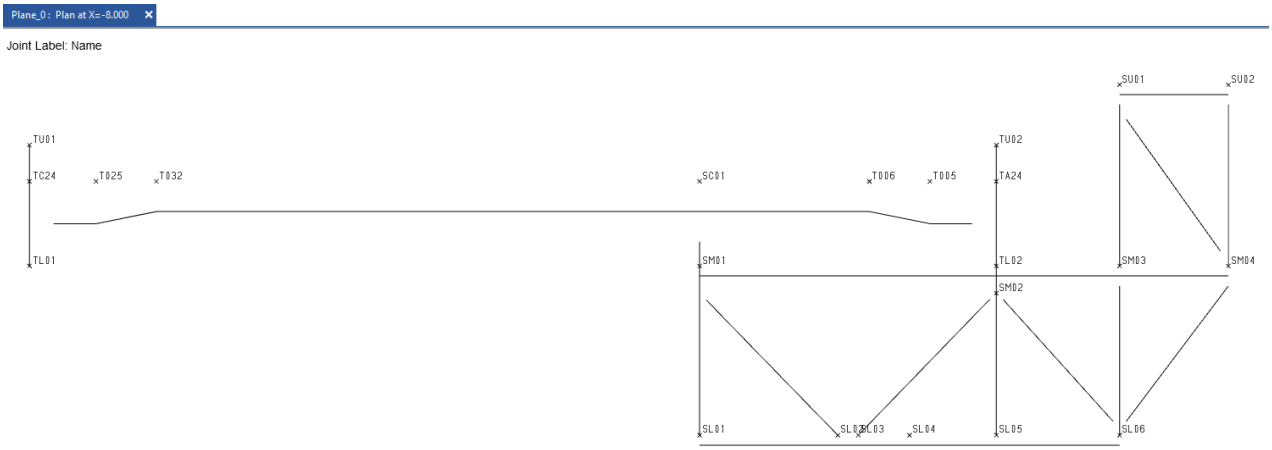

Plane_5 : Plan at X=8.000
Member Label: Group
TPS
TPS
T06
T05
T01
T07
T06
TPS
TPS

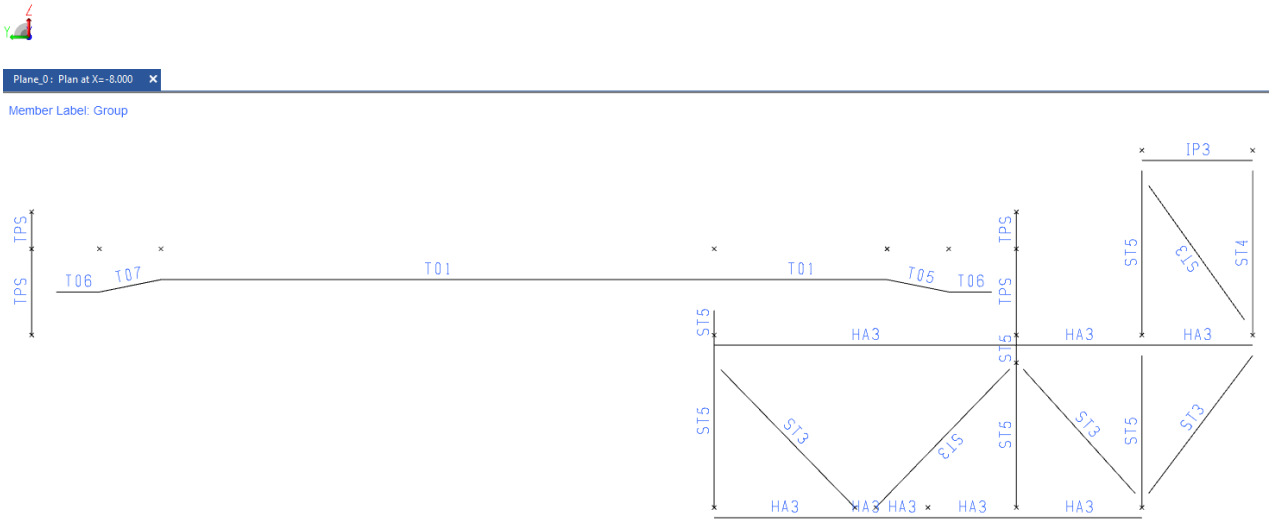

Plane_5 : Plan at X=8.000
Member Label: KyLy
1.400
1.200
16.000
16.000
16.000
16.000
1.400
1.200

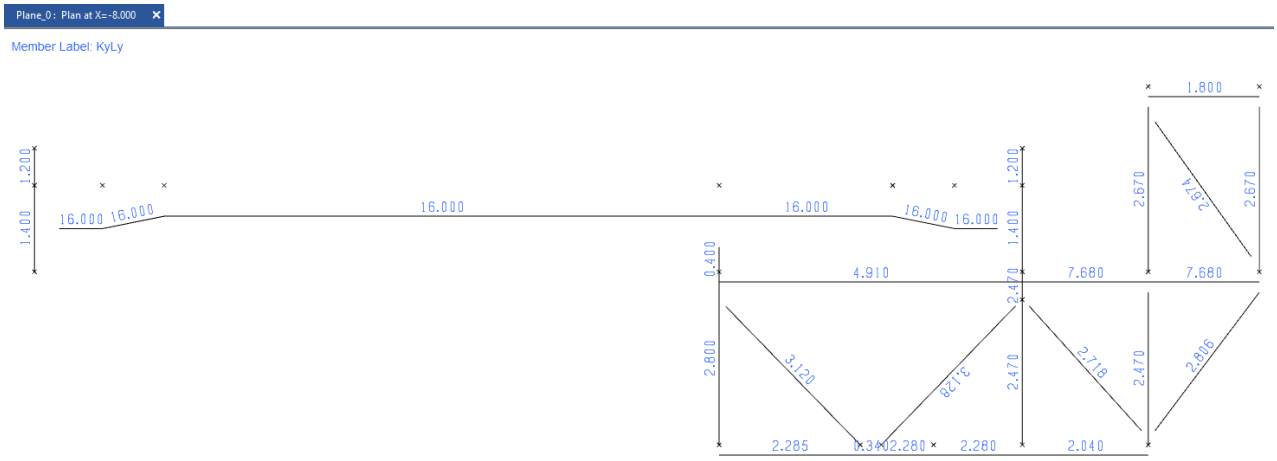

Plane_2 : Plan at X=8.000
Member Label: Yield Stress
40.000
40.000
38.000
40.000
40.000
40.000
38.000
40.000
40.000

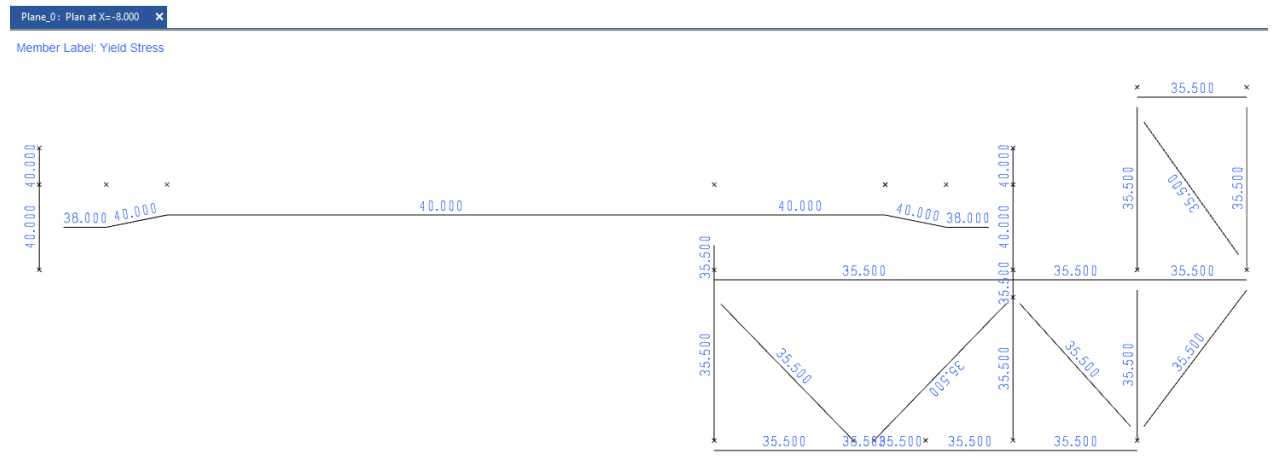

Plane_2 : Plan at X=8.000
Member Label: Lb
16.000
16.000
16.000
16.000
16.000

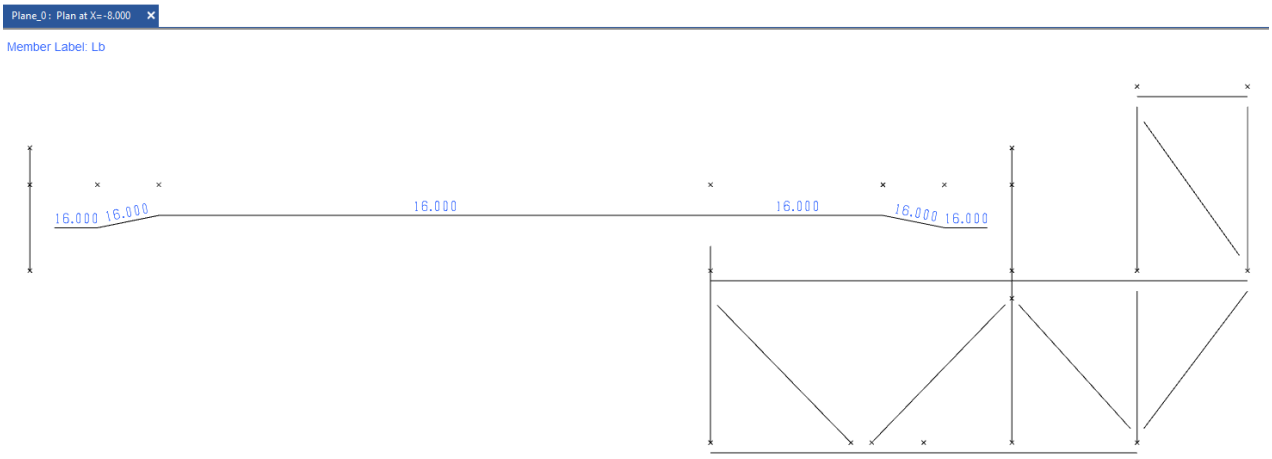

Plane_2 : Plan at X=8.000
Member Label: KzLz
1.200
1.400
16.000
16.000
16.000
16.000
16.000
1.200
1.400

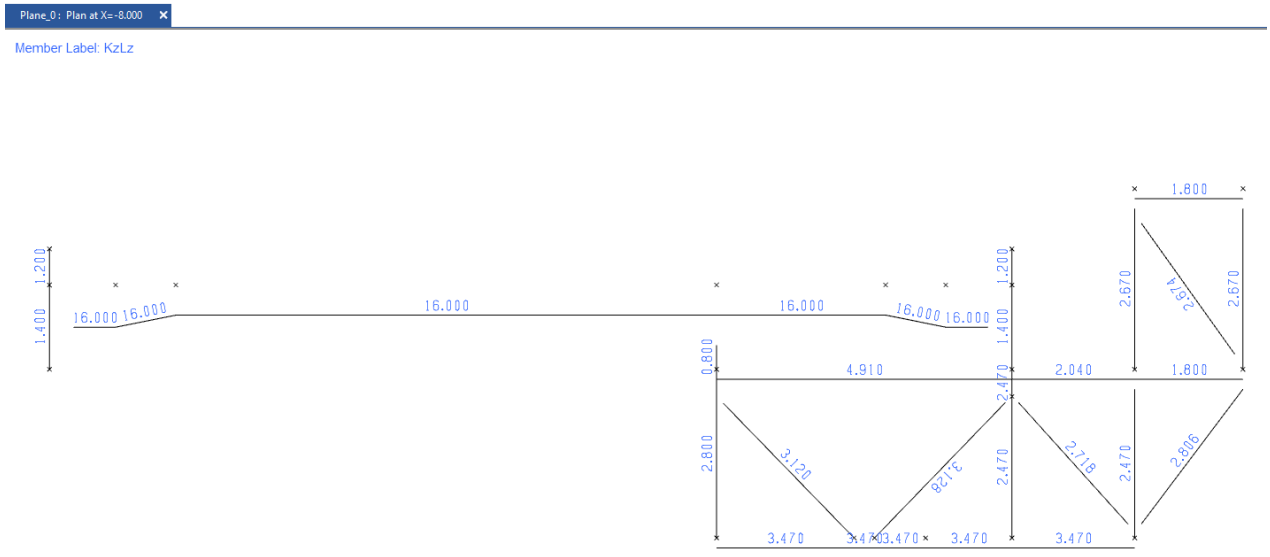

Plane_0 : Plan at X=-8.000
Joint Label: Name
SU01
SU02
TU01
TC24
T025
T032
SC01
T006
T005
TU02
TA24
TL01
SM01
TL02
SM03
SM04
SM02
SL01
SL02
SL03
SL04
SL05
SL06

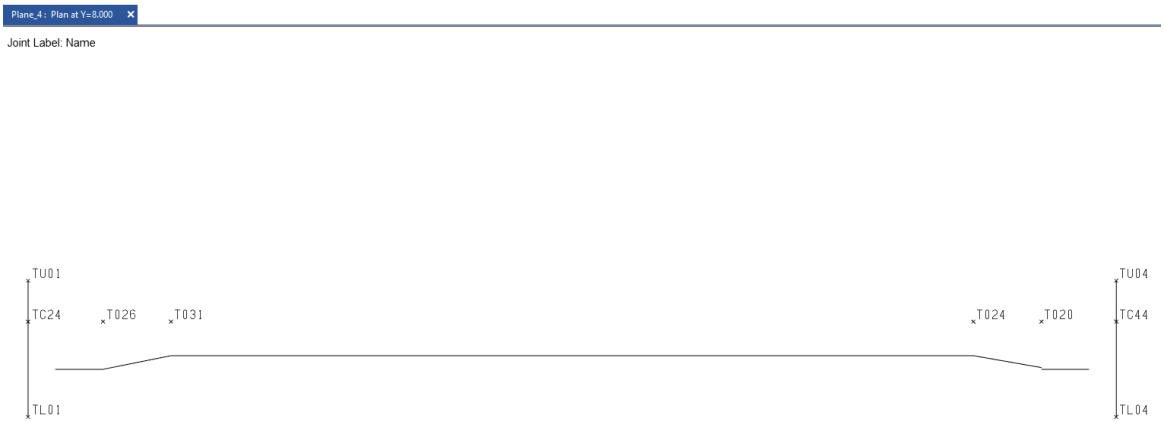

Plane_0 : Plan at X=-8.000
Member Label: Group
IP3
TPS
T06
T07
T01
T01
T05
T06
ST5
ST3
ST4
HA3

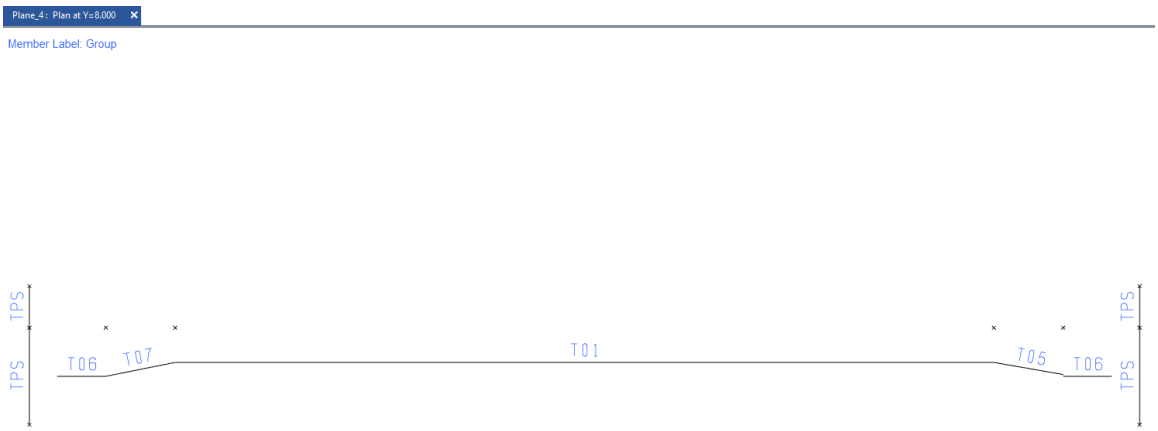

Plane_0 : Plan at X=-8.000
Member Label: KyLy
1.800
1.200
1.400
16.000
16.000
16.000
16.000
16.000
16.000
1.200
1.400
2.670
2.670
2.670
0.400
4.910
7.680
7.680
2.470
2.800
3.120
3.128
2.470
2.718
2.470
2.806
2.285
2.280
2.280
2.040

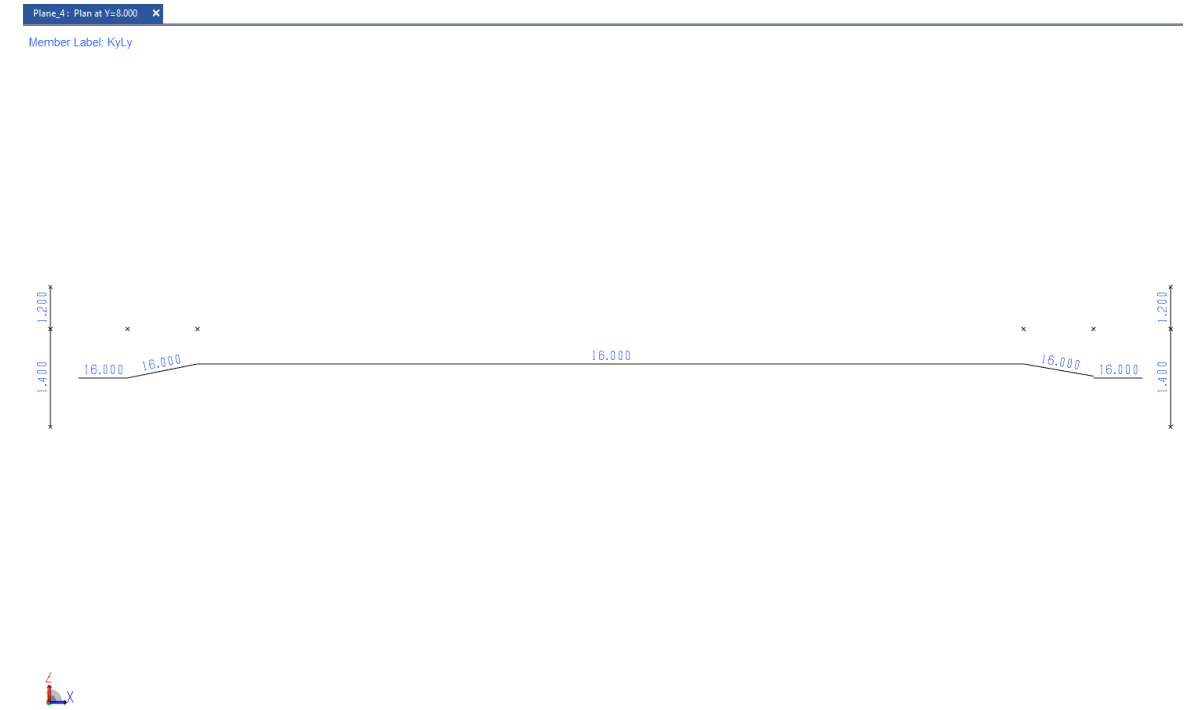

Plane_0 : Plan at X=-8.000
Member Label: Yield Stress
35.500
40.000
40.000
38.000
40.000
40.000
40.000
40.000
38.000
40.000
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500


Plane_0 : Plan at X=-8.000
Member Label: Lb
16.000
16.000
16.000
16.000
16.000
16.000
16.000

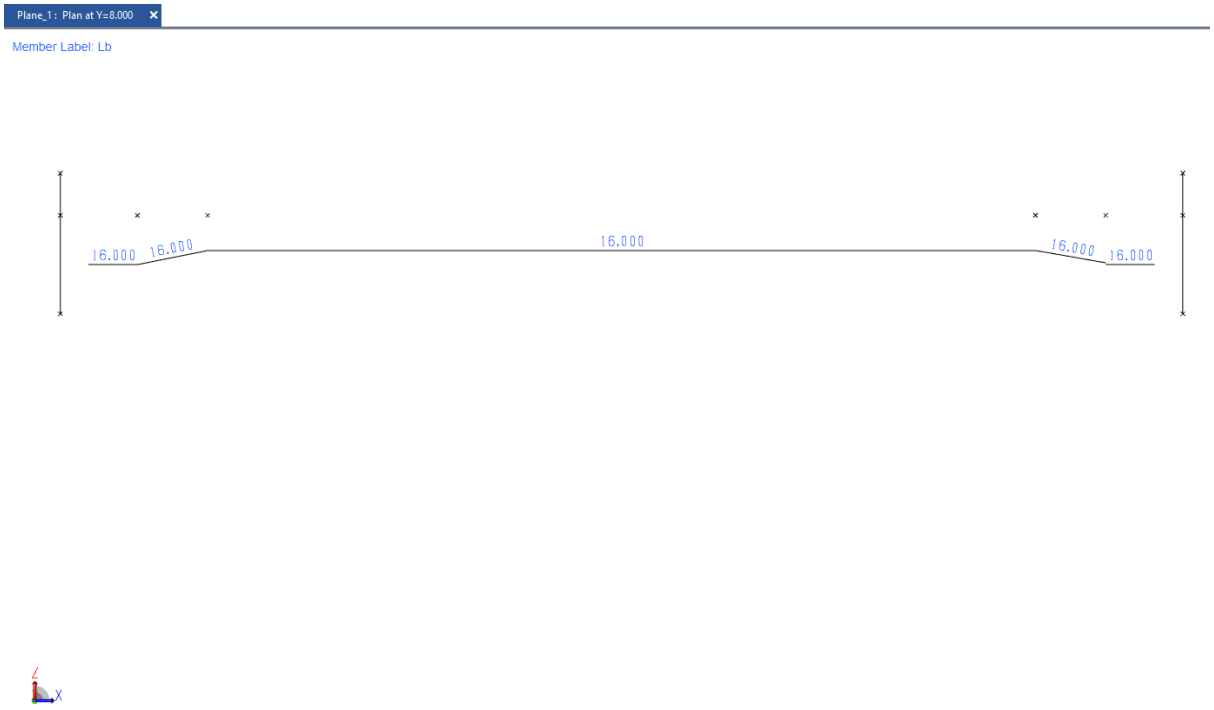

Plane_0 : Plan at X=-8.000
Member Label: KzLz
1.200
1.400
16.000
16.000
16.000
16.000
16.000
16.000
16.000
1.800
2.670
2.670
0.800
4.910
2.040
1.800
2.800
3.120
3.128
2.718
2.806
3.470
3.470
3.470
3.470
3.470


Plane_4 : Plan at Y=8.000
Joint Label: Name
TU01
TC24
T026
T031
T024
T020
TU04
TC44
TL01
TL04

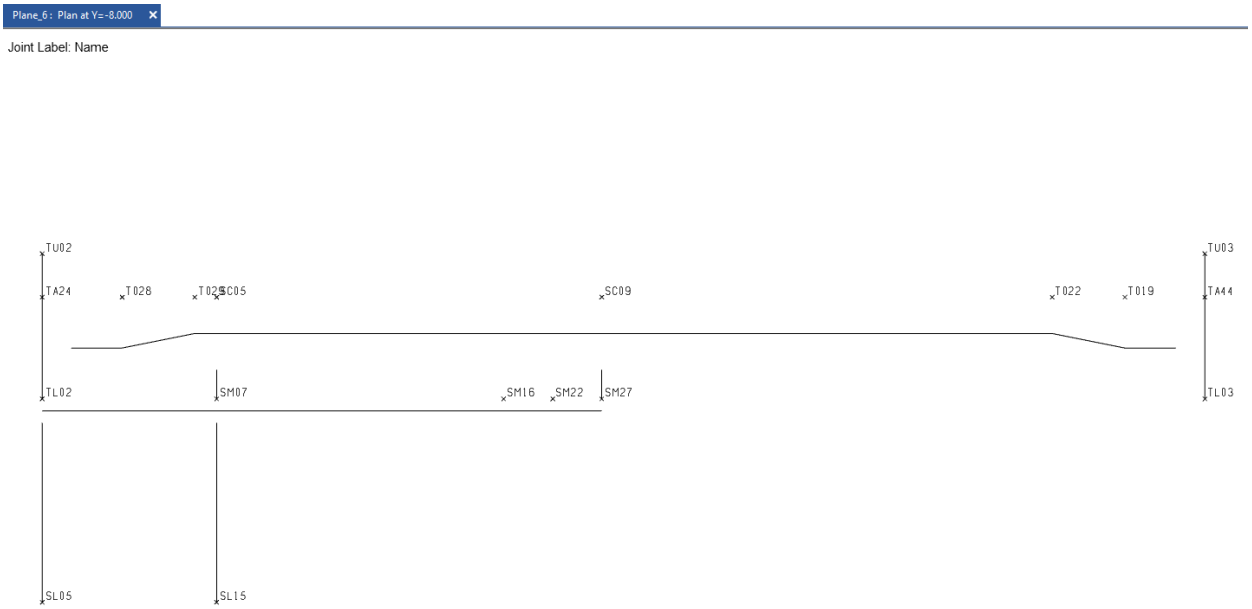

Plane_4 : Plan at Y=8.000
Member Label: Group
TPS
TPS
T06
T07
T01
T05
T06
TPS
TPS

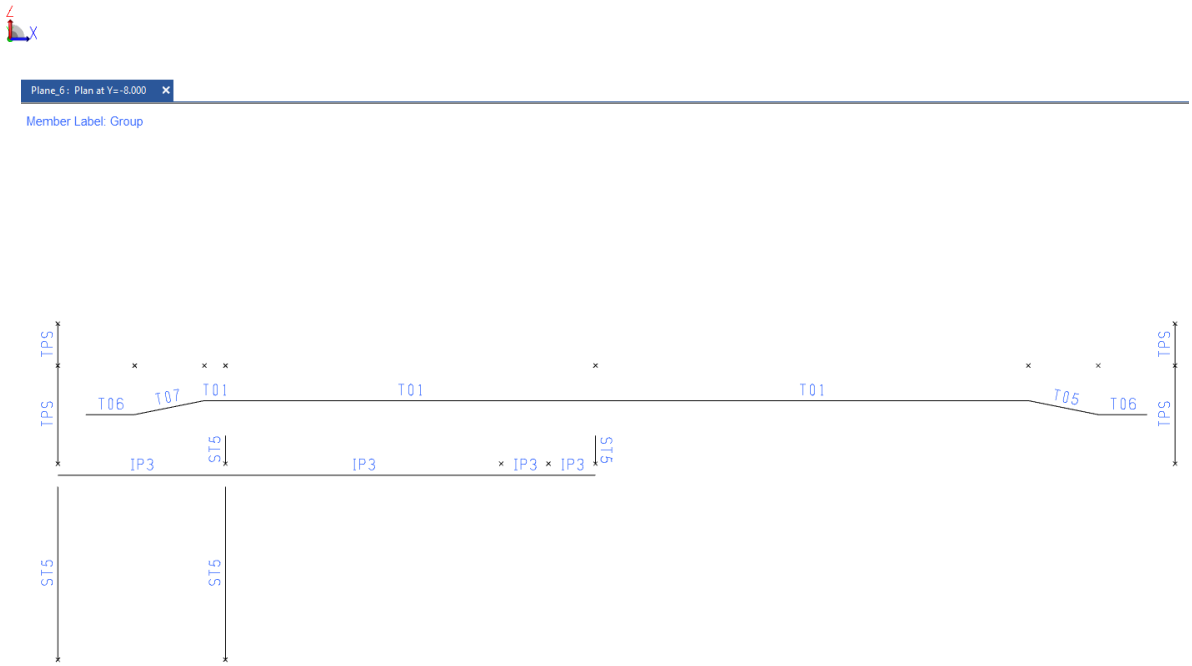

Plane_4 : Plan at Y=8.000
Member Label: KyLy
1.200
1.400
16.000
16.000
16.000
16.000
16.000
1.200
1.400
Z
X

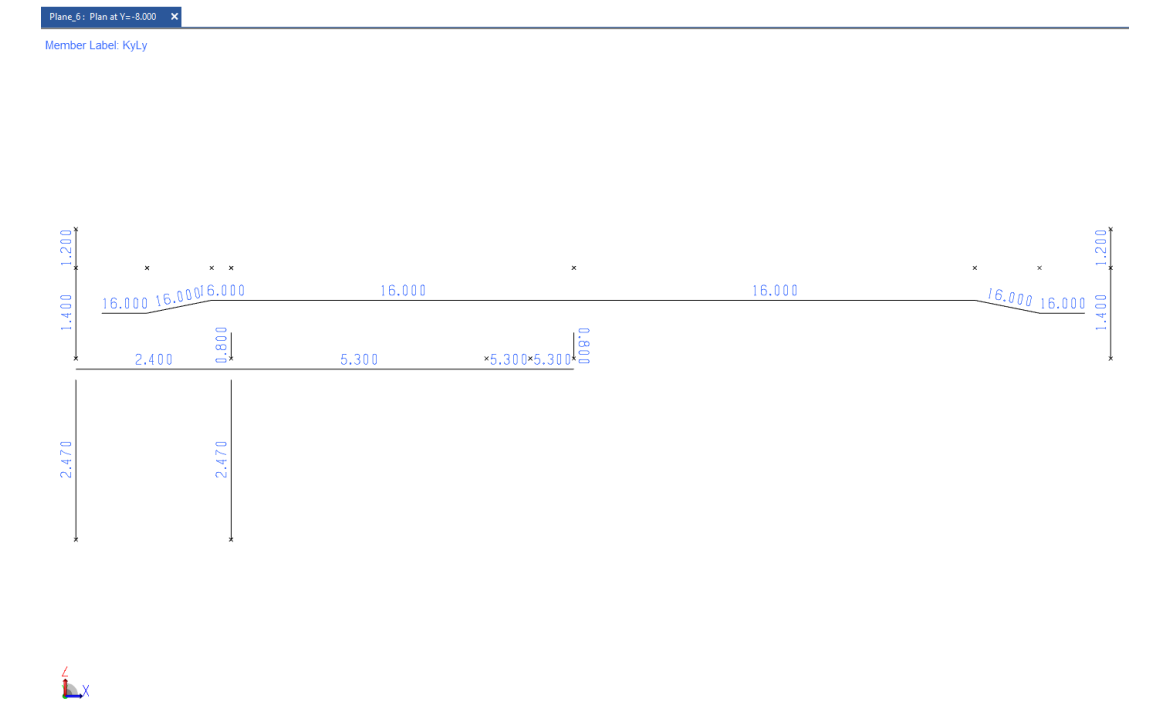

Plane_1 : Plan at Y=8.000
Member Label: Yield Stress
40.000
40.000
38.000
40.000
40.000
40.000
40.000
38.000
40.000
40.000
Z
X

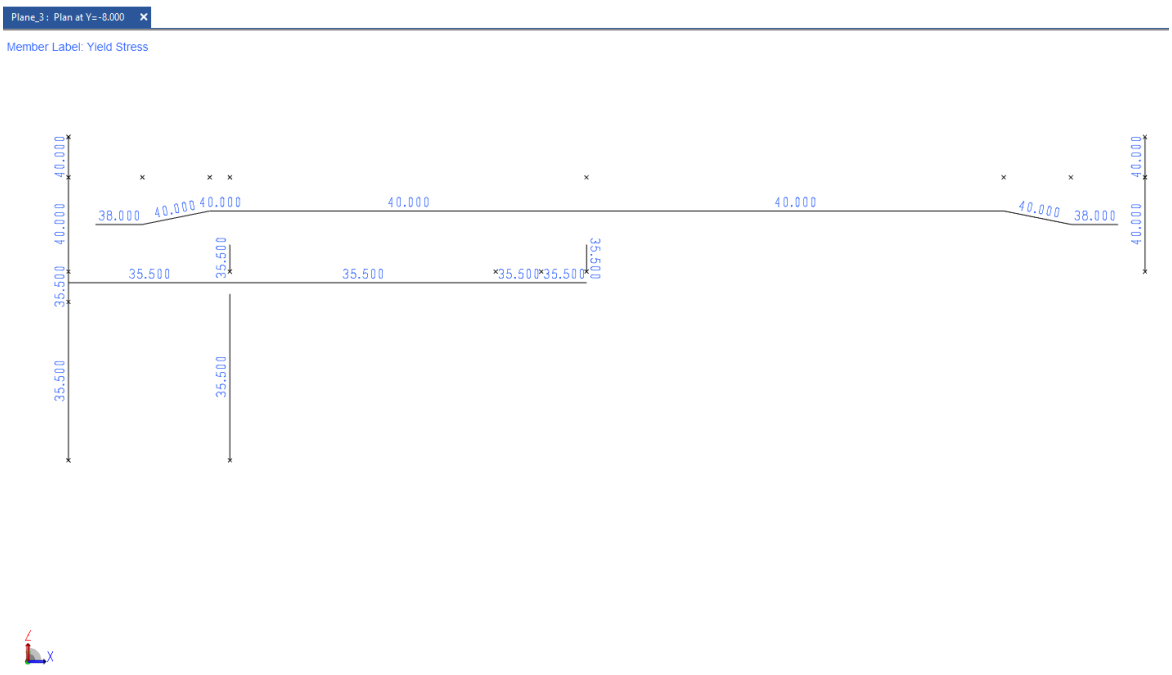

Plane_1 : Plan at Y=8.000
Member Label: Lb
16.000
16.000
16.000
16.000
16.000
Y
X

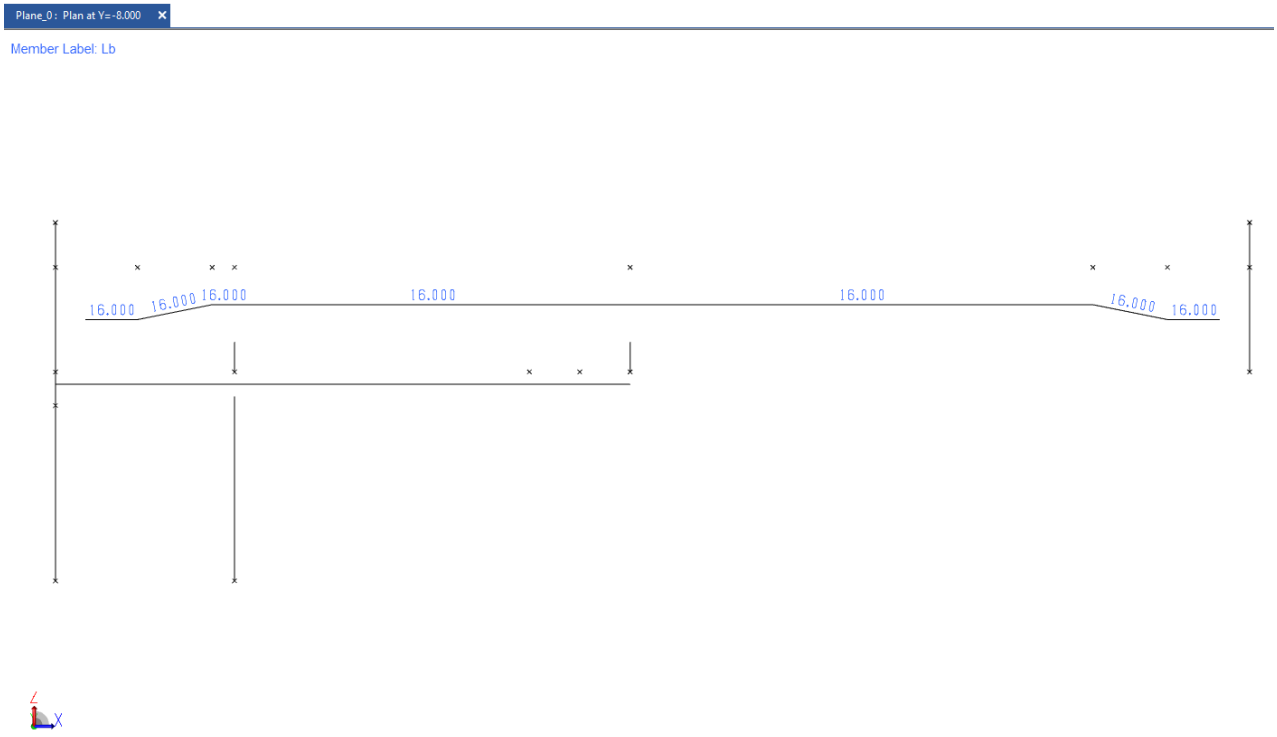

Plane_1 : Plan at Y=8.000
Member Label: KzLz
1.200
1.400
16.000
16.000
16.000
16.000
16.000
1.200
1.400
Y
X

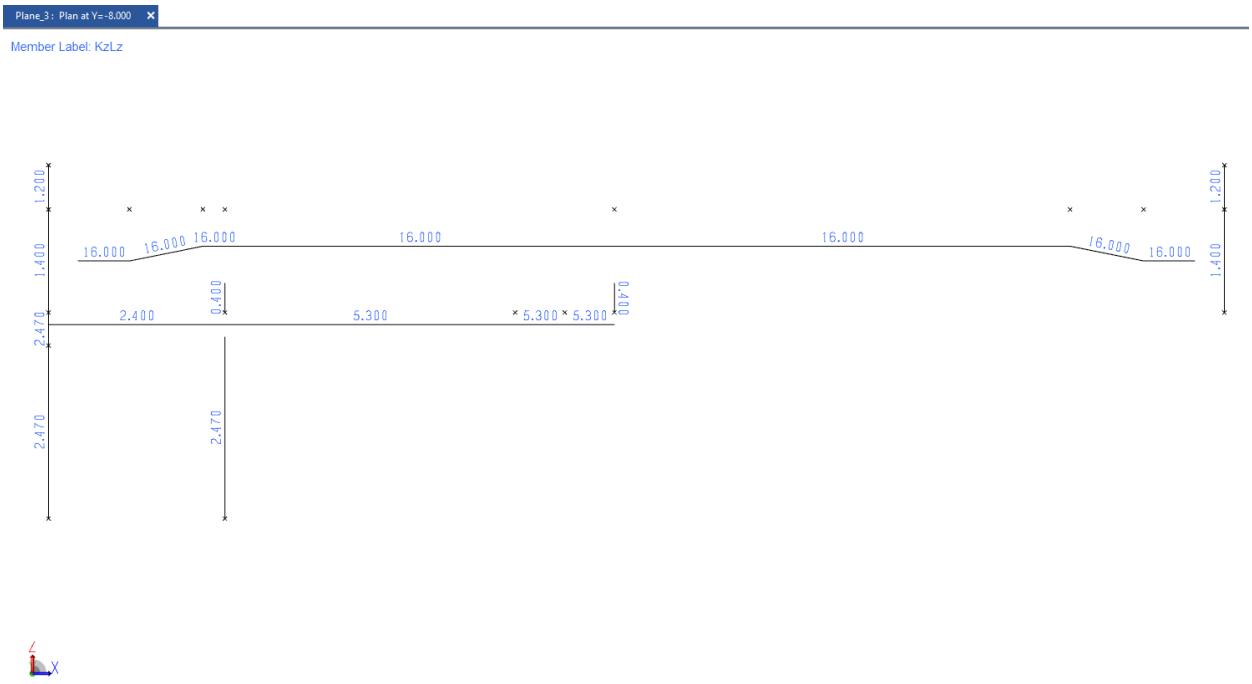

Plane_6 : Plan at Y=-8.000
Joint Label: Name
TU02
TA24
T028
T025
SC05
SC09
T022
T019
TU03
TA44
TL02
SM07
SM16
SM22
SM27
TL03
SL05
SL15

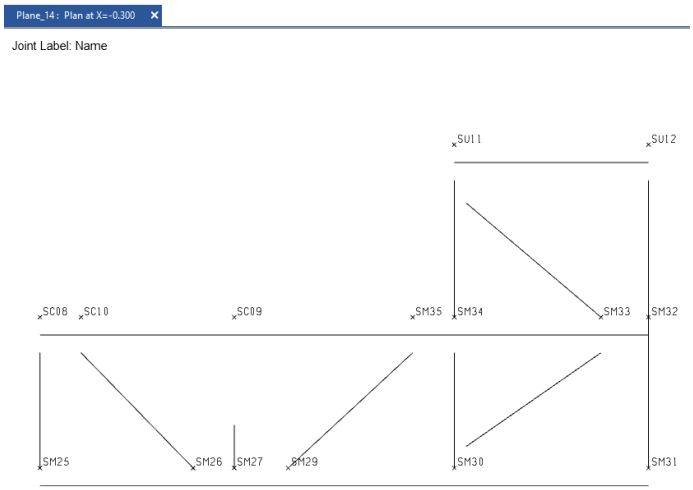

Plane_6 : Plan at Y=-8.000
Member Label: Group
TPS
TPS
T06
T07
T01
T01
T01
T05
T06
TPS
TPS
ST5
IP3
IP3
IP3
IP3
ST5
ST5
ST5

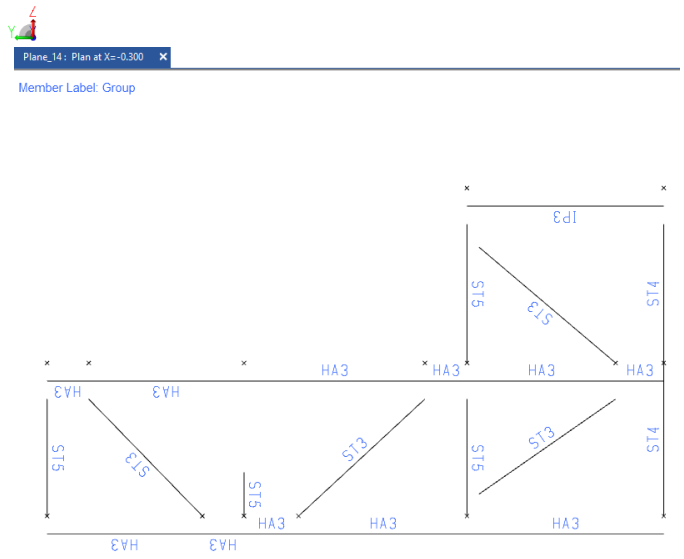

Plane_6 : Plan at Y=-8.000
Member Label: KyLy
1.200
1.400
16.000
16.000
16.000
16.000
16.000
16.000
16.000
1.200
1.400
2.400
0.800
5.300
5.300
5.300
0.800
2.470
2.470

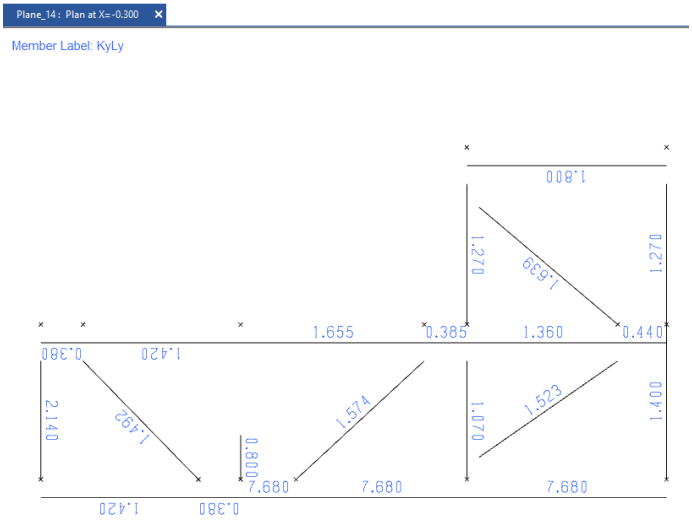

Plane_3 : Plan at Y=-8.000
Member Label: Yield Stress
40.000
40.000
38.000
40.000
40.000
40.000
40.000
40.000
38.000
40.000
40.000
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500

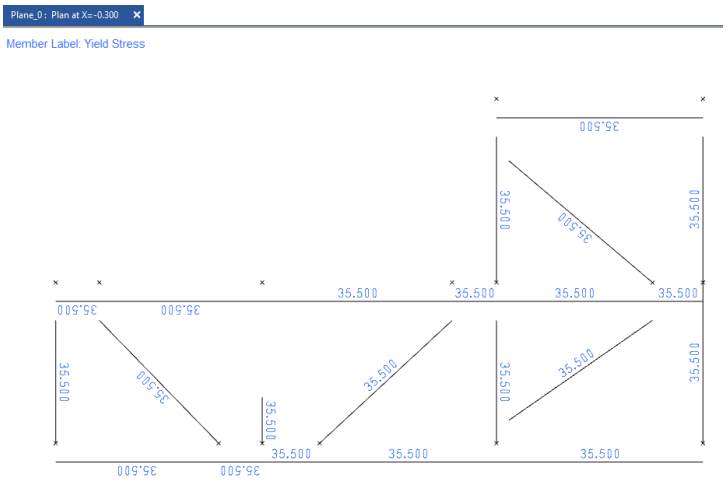

Plane_0 : Plan at Y=-8.000
Member Label: Lb
16.000
16.000
16.000
16.000
16.000
16.000
16.000
Z
X

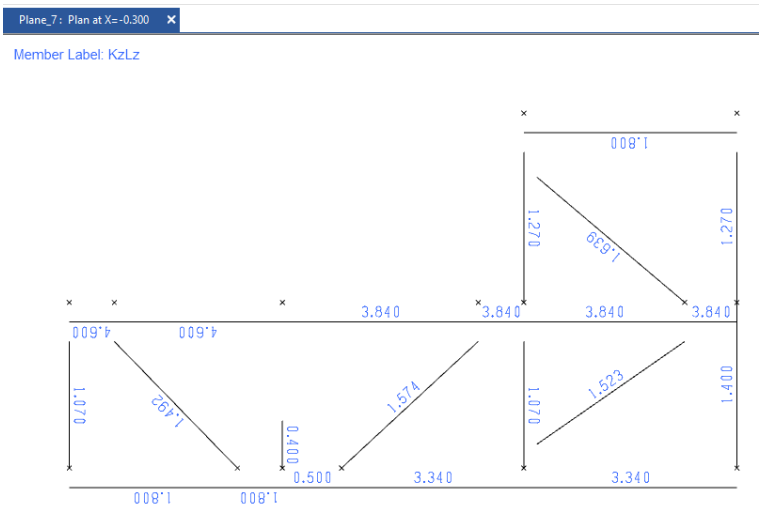

Plane_3 : Plan at Y=-8.000
Member Label: KzLz
1.200
1.400
2.470
2.470
16.000
16.000
16.000
16.000
16.000
16.000
16.000
1.200
1.400
2.400
0.400
5.300
5.300
5.300
0.400
2.470
Z
X


Plane_14 : Plan at X=-0.300
Joint Label: Name
SU11
SU12
SC08
SC10
SC09
SM35
SM34
SM33
SM32
SM25
SM26
SM27
SM29
SM30
SM31

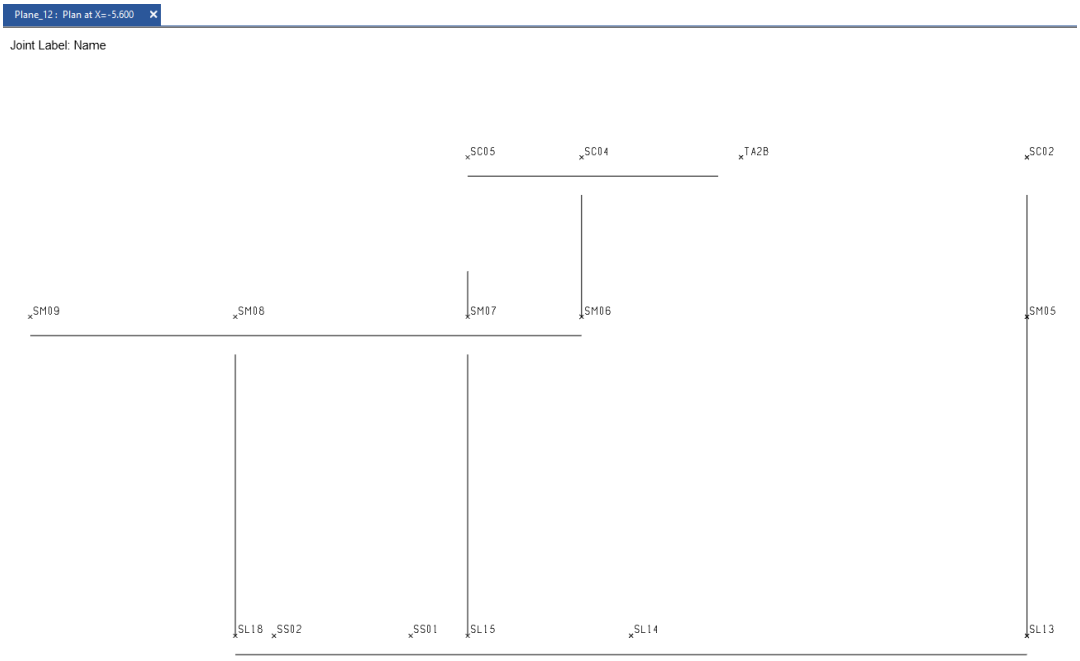

Plane_14 : Plan at X=-0.300
Member Label: Group
IP3
ST5
ST2
ST4
HA3
ST3

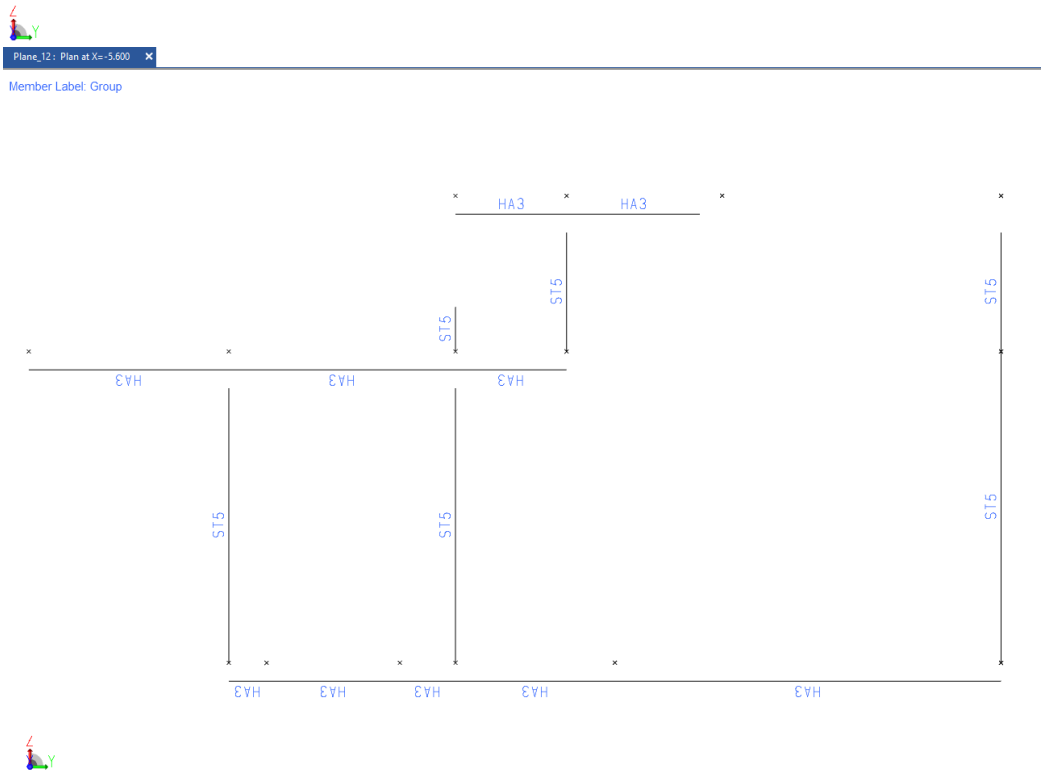

Plane_14 : Plan at X=-0.300
Member Label: KyLy
1.800
1.270
1.639
1.270
1.655
0.385
1.360
0.440
0.380
1.420
2.140
1.492
0.800
1.574
1.070
1.523
1.400
7.680
7.680
7.680
1.420
0.380

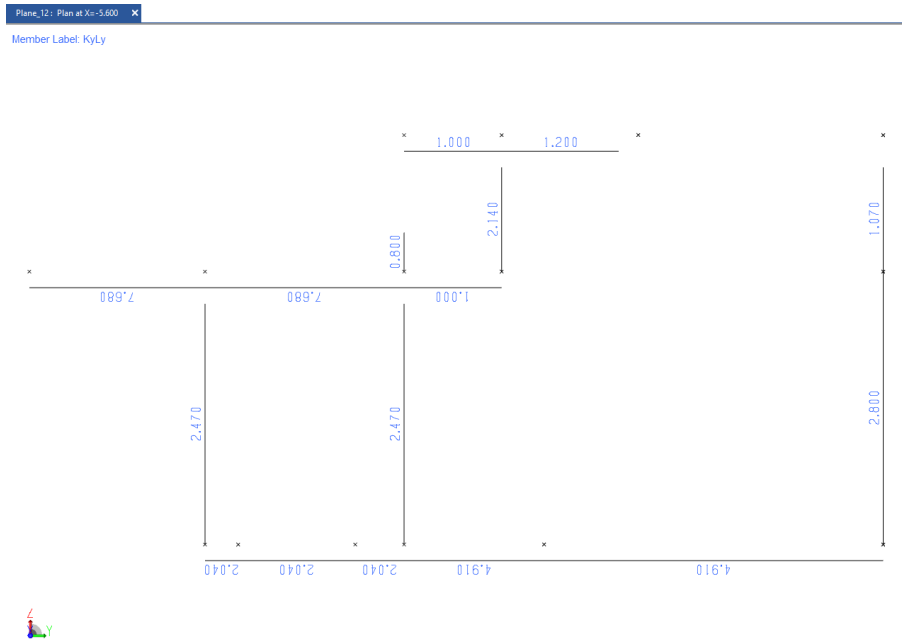

Plane_0 : Plan at X=-0.300
Member Label: Yield Stress
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500

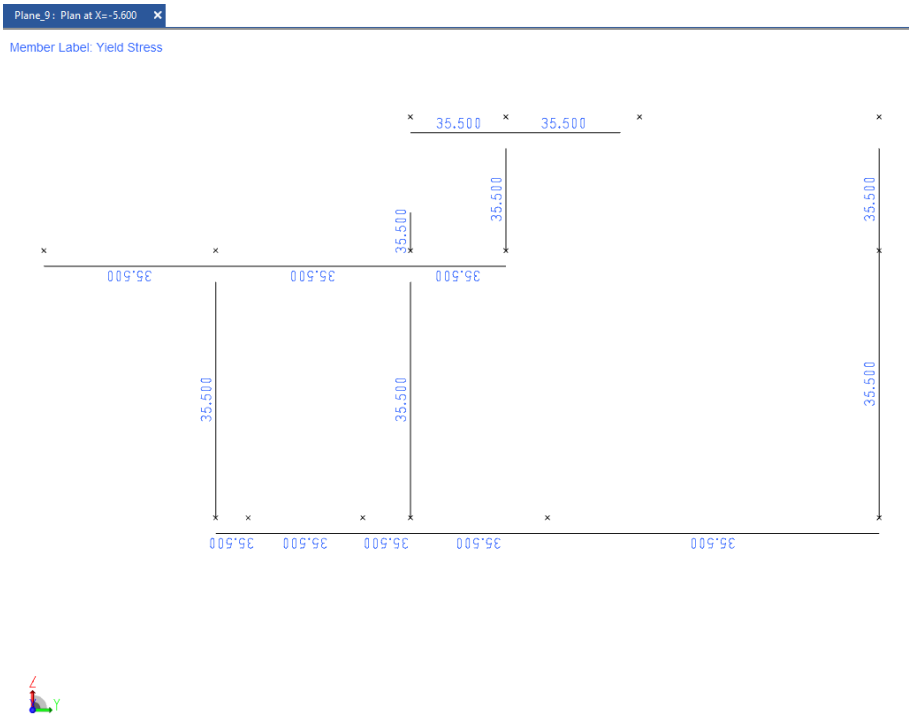

Plane_7 : Plan at X=-0.300
Member Label: KzLz
1.800
1.270
1.639
1.270
3.840
3.840
3.840
3.840
4.600
4.600
1.070
1.492
0.400
1.574
1.070
1.523
1.400
0.500
3.340
3.340
1.800
1.800

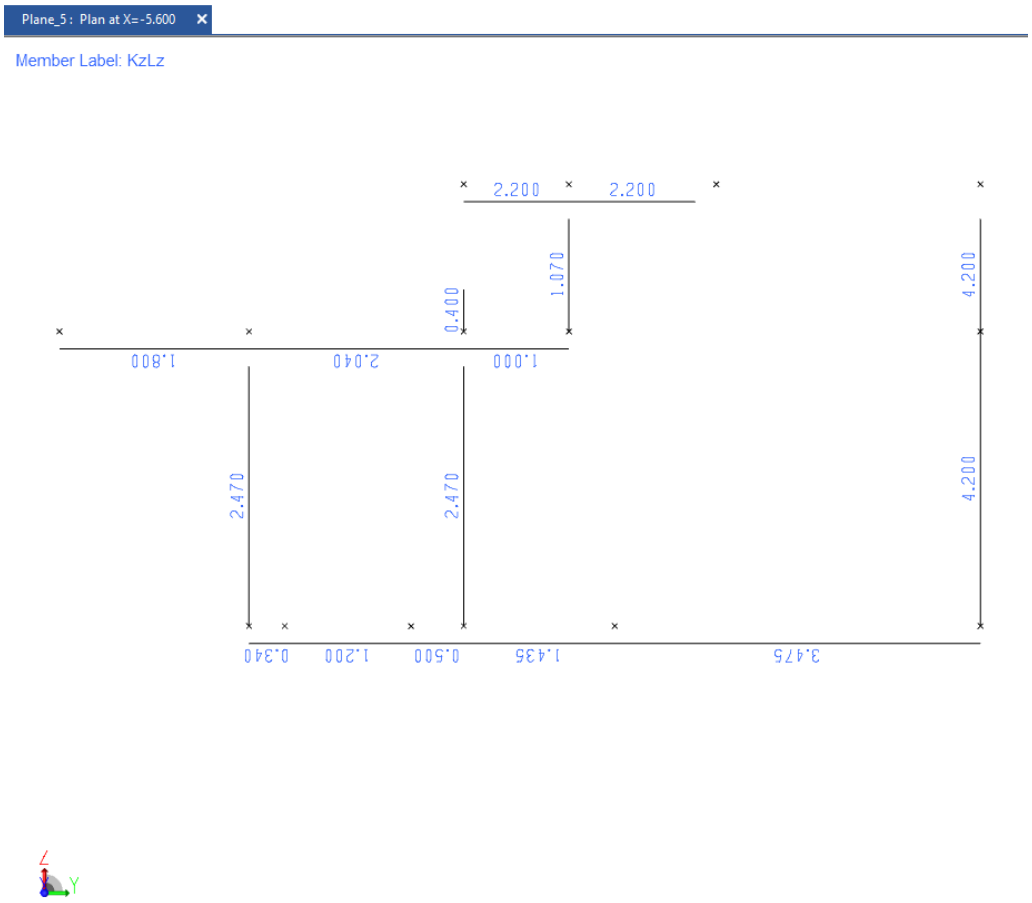


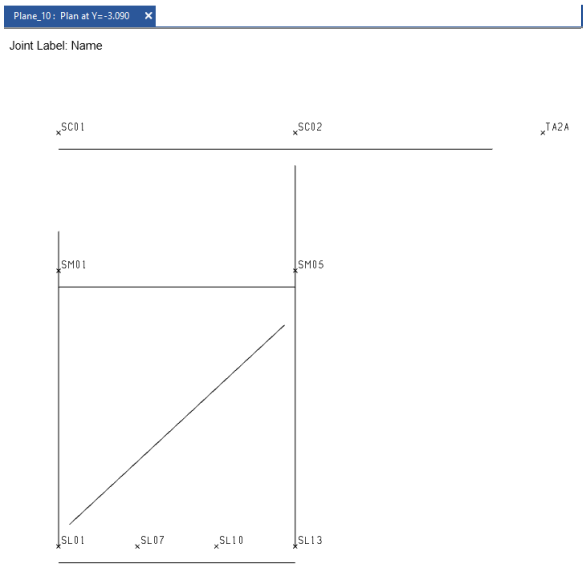

Plane_12 : Plan at X=-5.600
Joint Label: Name
SC05
SC04
TA2B
SC02
SM09
SM08
SM07
SM06
SM05
SL18
SS02
SS01
SL15
SL14
SL13

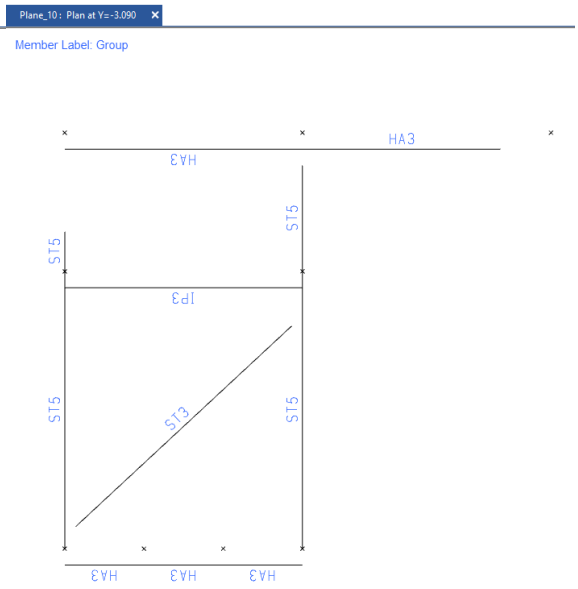

Plane_12 : Plan at X=-5.600
Member Label: Group
HA3
HA3
ST5
ST5
ST5
ST5
ST5
HA3
HA3
HA3
HA3
HA3
HA3
HA3
HA3

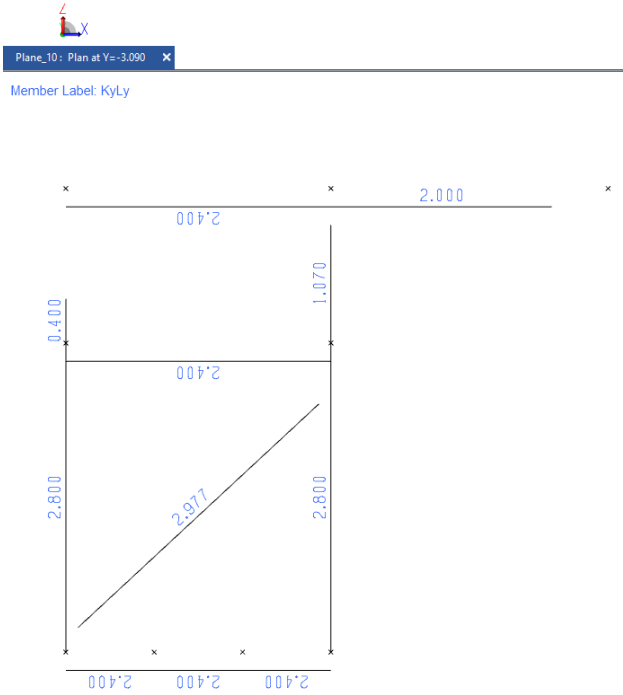

Plane_12 : Plan at X=-5.600
Member Label: KyLy
1.000
1.200
2.140
0.800
1.070
7.680
7.680
1.000
2.470
2.470
2.800
2.040
2.040
2.040
4.910
4.910

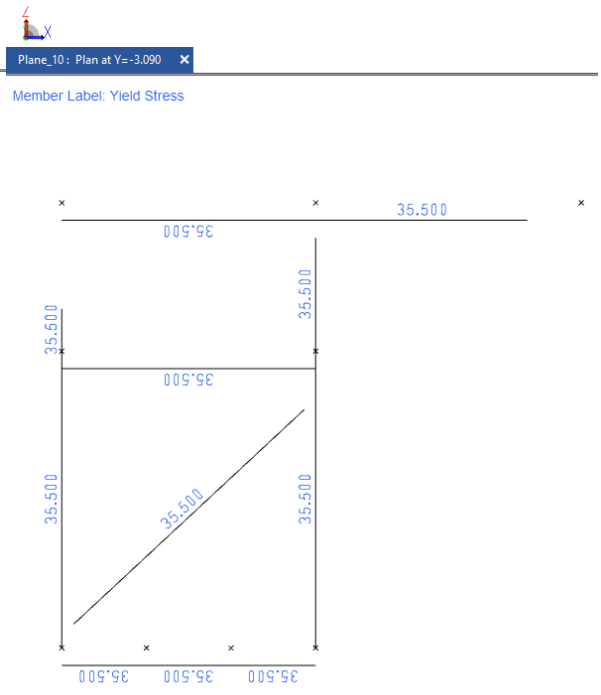

Plane_9 : Plan at X=-5.600
Member Label: Yield Stress
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500
35.500

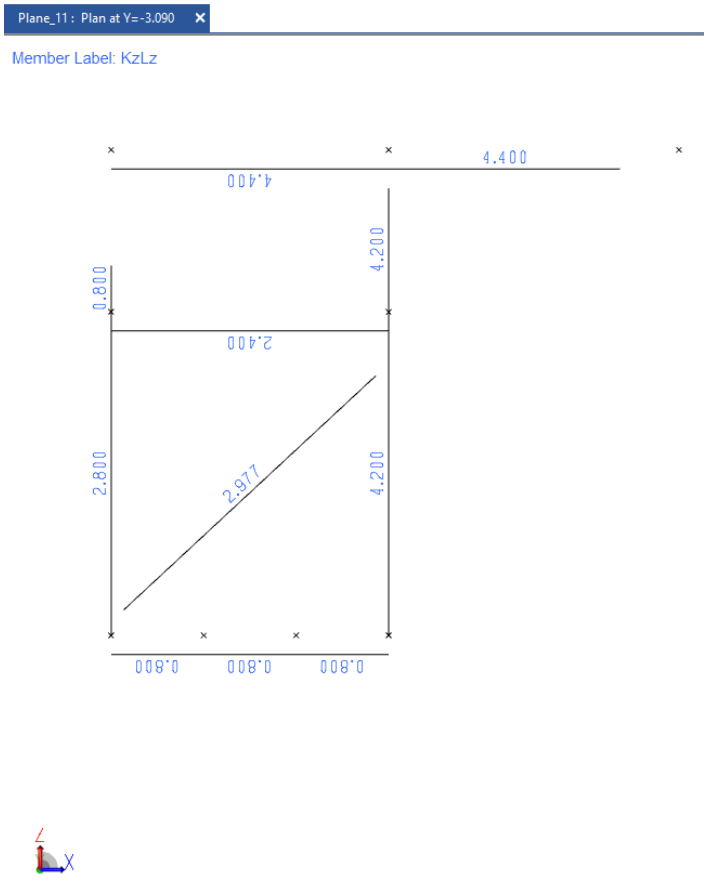

Plane_5 : Plan at X=-5.600
Member Label: KzLz
2.200
2.200
1.070
0.400
4.200
1.800
2.040
1.000
2.470
2.470
4.200
0.340
1.200
0.500
1.435
3.475
Z
Y

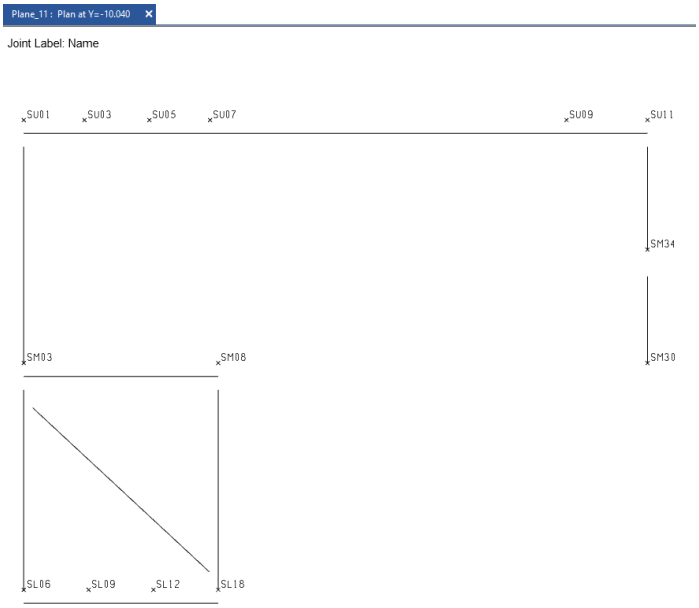

Plane_10 : Plan at Y=-3.090
Joint Label: Name
SC01
SC02
TA2A
SM01
SM05
SL01
SL07
SL10
SL13

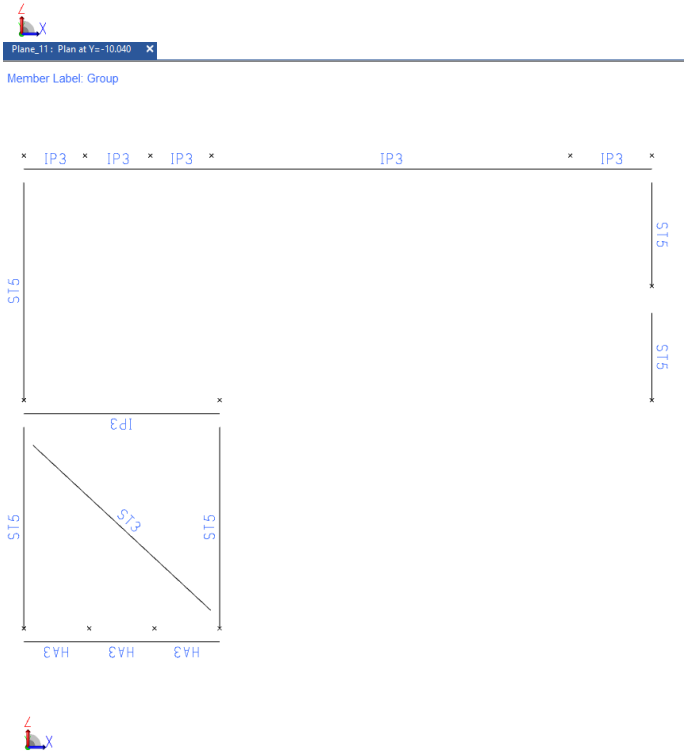

Plane_10 : Plan at Y=-3.090
Member Label: Group
HA3
ST5
IP3
ST3

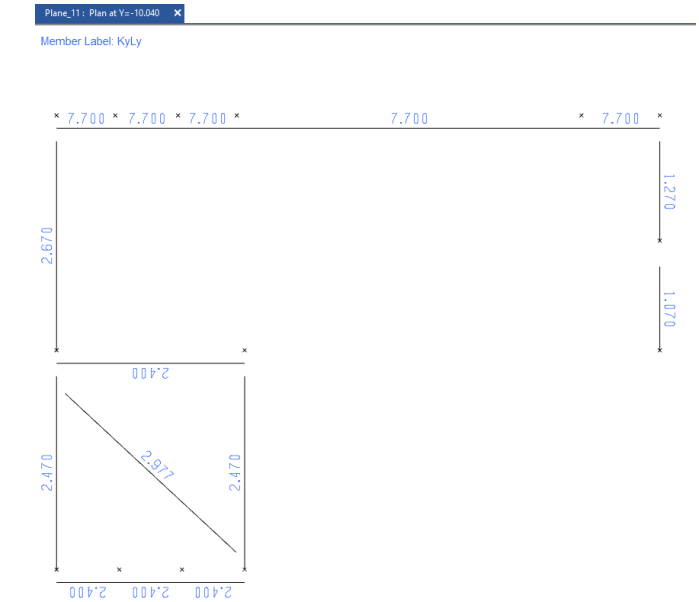

Plane_10 : Plan at Y=-3.090
Member Label: KyLy
2.000
2.400
1.070
0.400
2.800
2.977

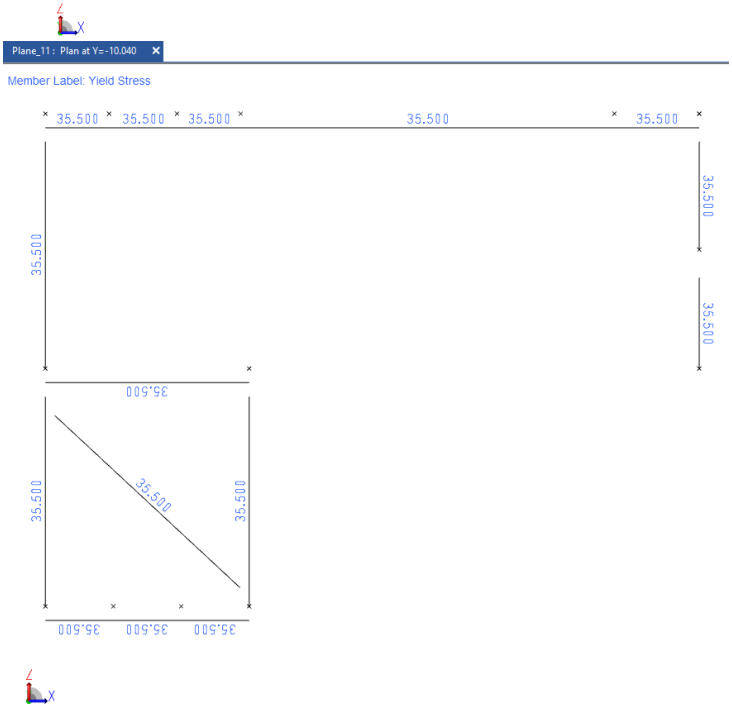

Plane_10 : Plan at Y=-3.090
Member Label: Yield Stress
35.500

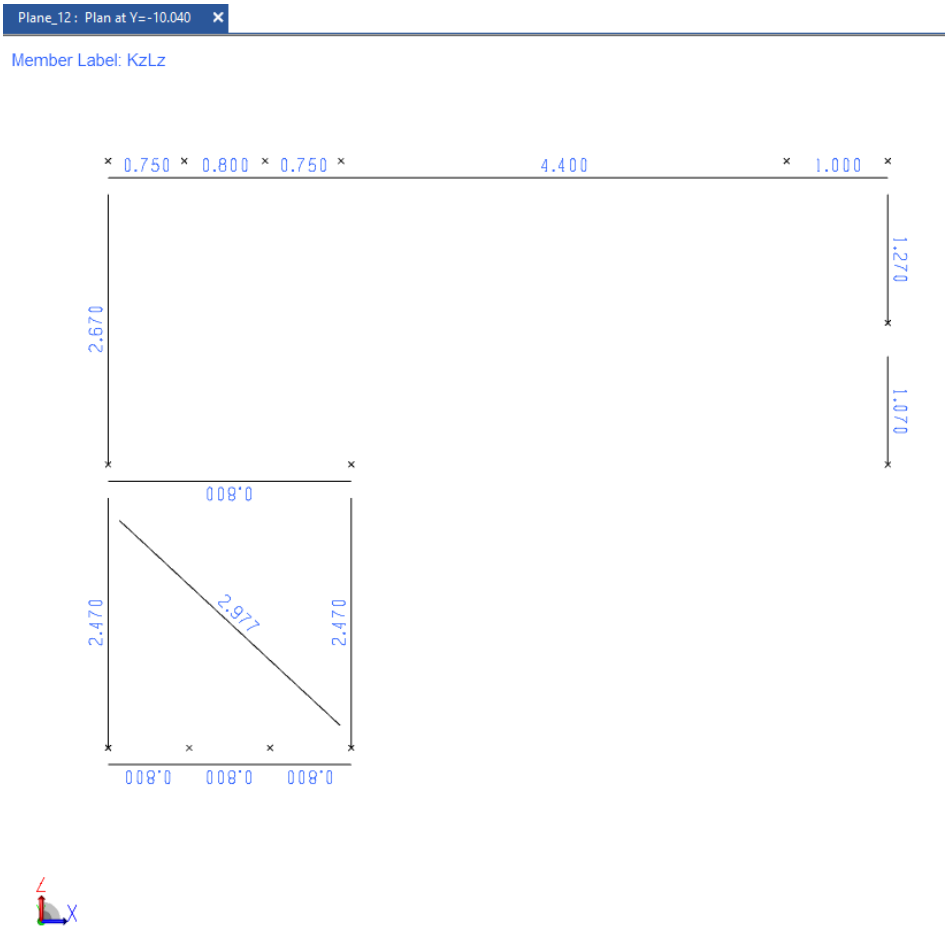

Plane_11 : Plan at Y=-3.090
Member Label: KzLz
4.400
4.400
4.200
0.800
2.400
2.977
2.800
4.200
0.800
0.800
0.800
Z
X

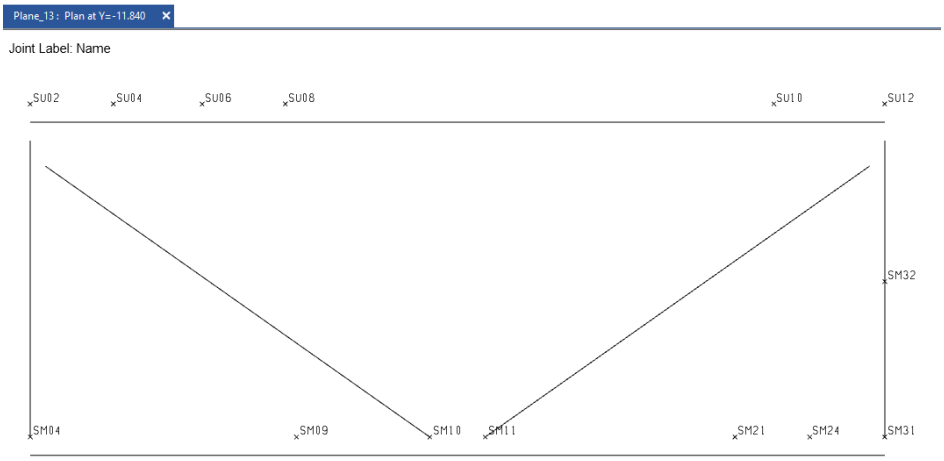

Plane_11 : Plan at Y=-10.040
Joint Label: Name
SU01
SU03
SU05
SU07
SU09
SU11
SM34
SM03
SM08
SM30
SL06
SL09
SL12
SL18

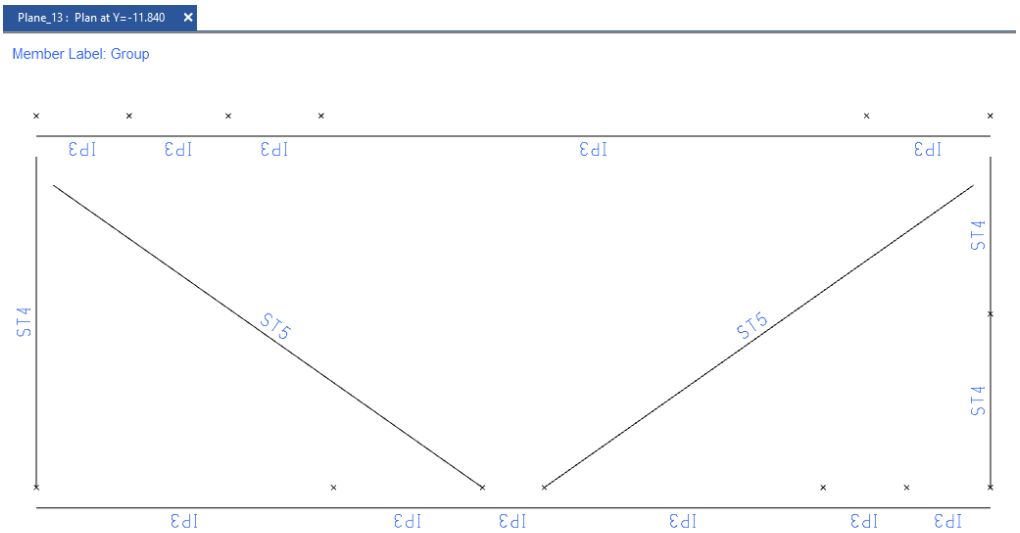

Plane_11 : Plan at Y=-10.040
Member Label: Group
IP3
ST5
HA3

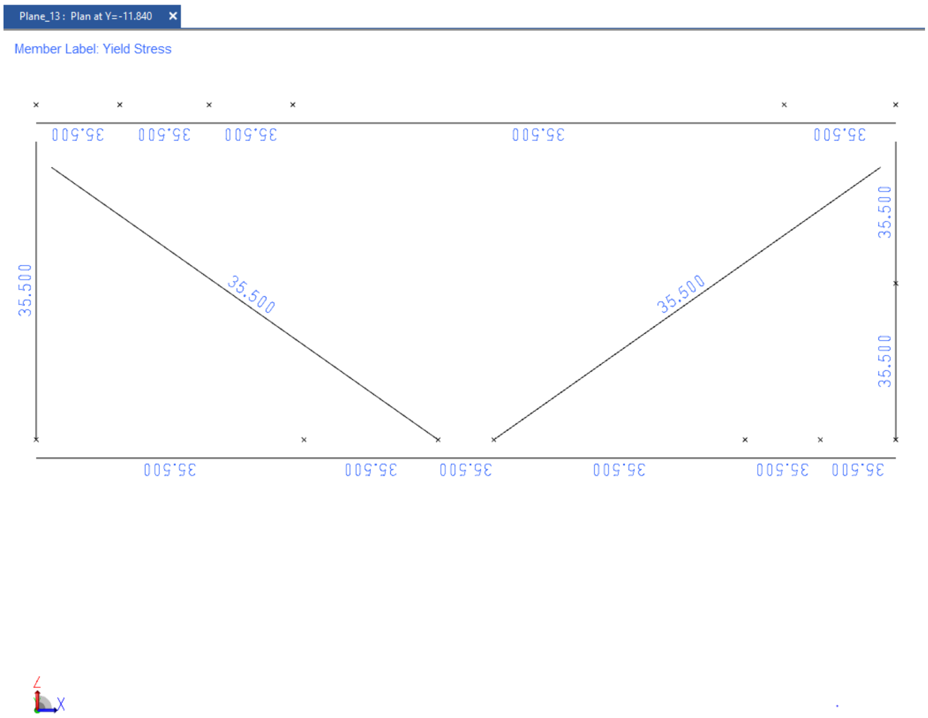

Plane_11 : Plan at Y=-10.040
Member Label: KyLy
7.700
1.270
1.070
2.670
2.400
2.470
2.977

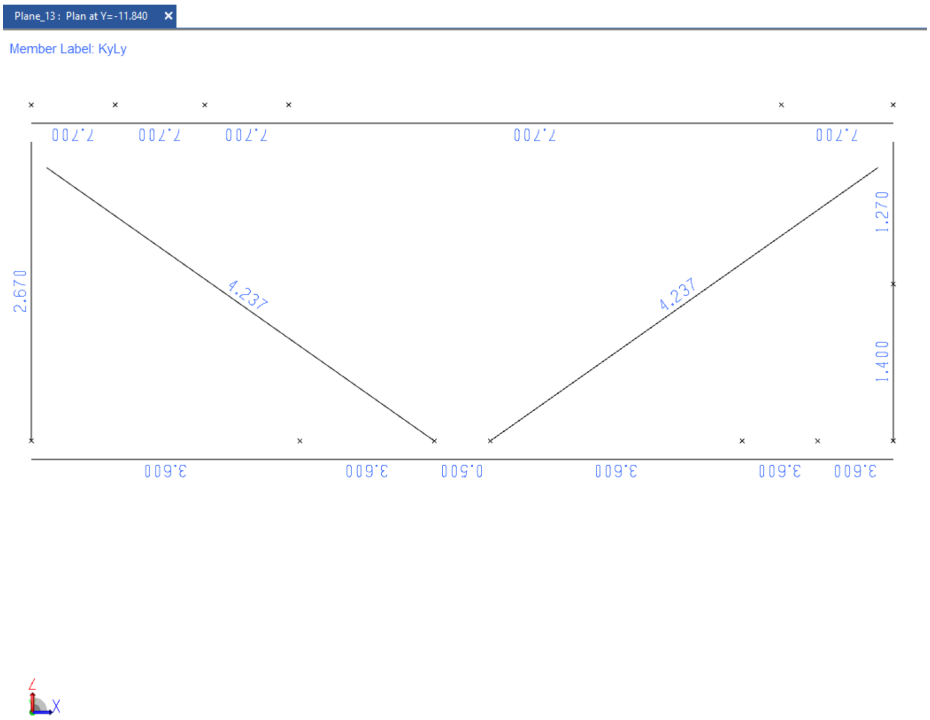

Plane_11 : Plan at Y=-10.040
Member Label: Yield Stress
35.500

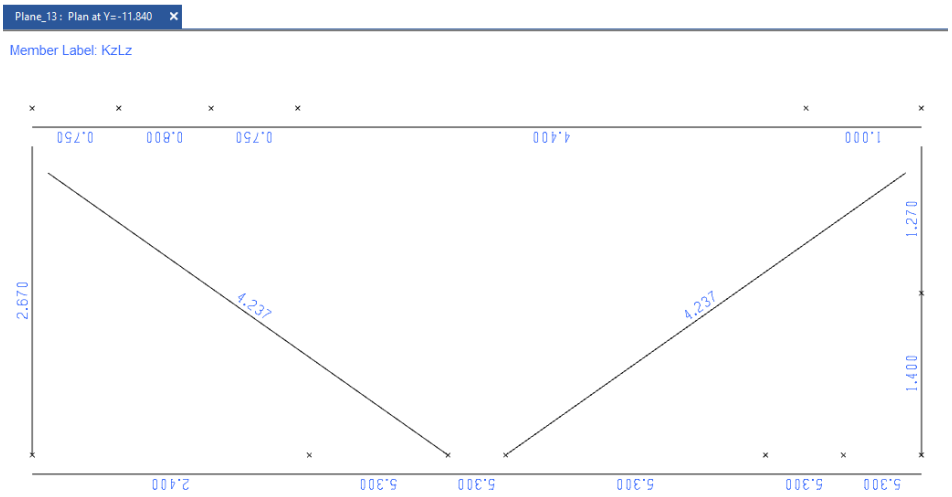

Plane_12 : Plan at Y=-10.040
Member Label: KzLz
0.750
0.800
0.750
4.400
1.000
2.670
1.270
1.070
0.800
2.470
2.977
2.470
0.800
0.800
0.800
Z
X

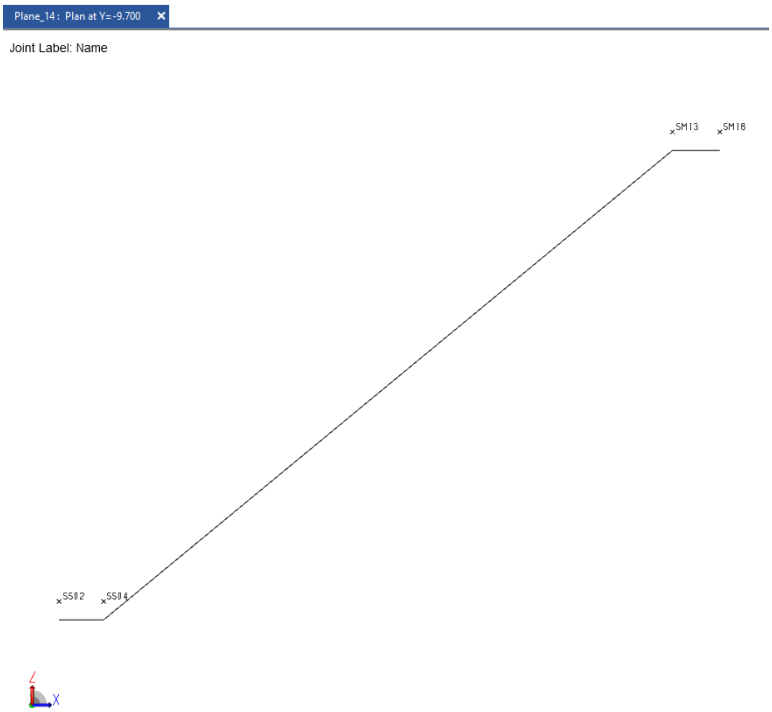

Plane_13 : Plan at Y=-11.840
Joint Label: Name
SU02
SU04
SU06
SU08
SU10
SU12
SM32
SM04
SM09
SM10
SM11
SM21
SM24
SM31

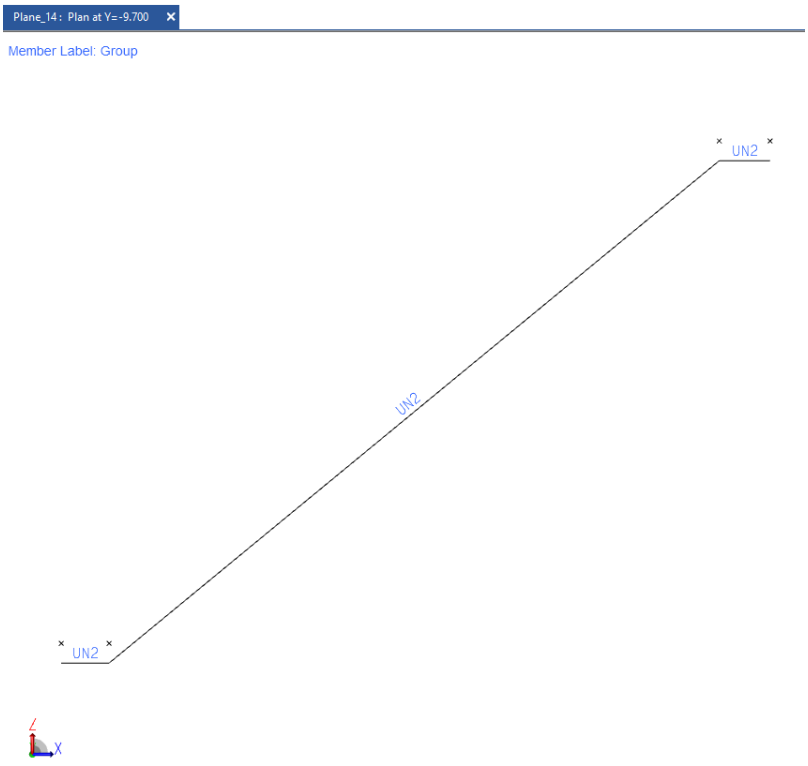

Plane_13 : Plan at Y=-11.840
Member Label: Group
IP3
ST4
ST5

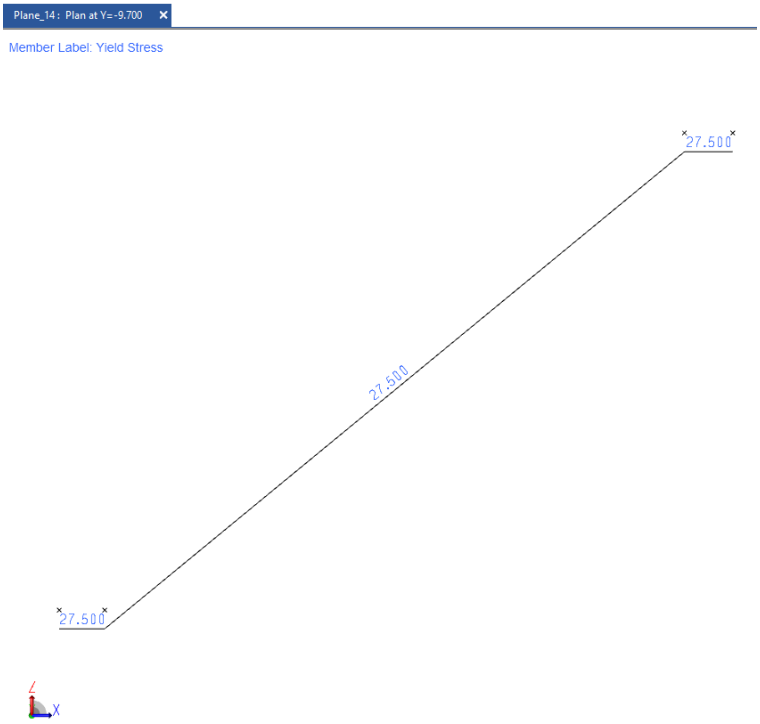

Plane_13 : Plan at Y=-11.840
Member Label: Yield Stress
35.500

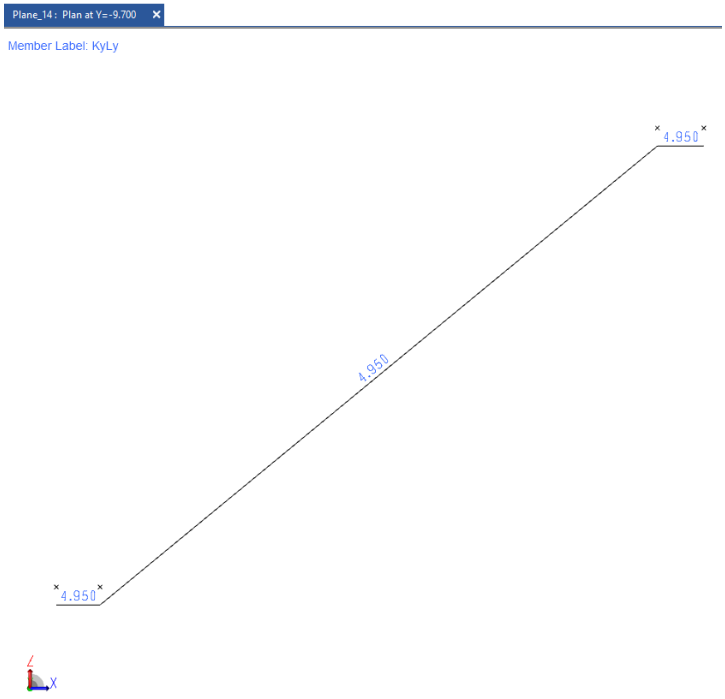

Plane_13 : Plan at Y=-11.840
Member Label: KyLy
2.700
2.670
4.237
1.270
1.400
3.600
0.500

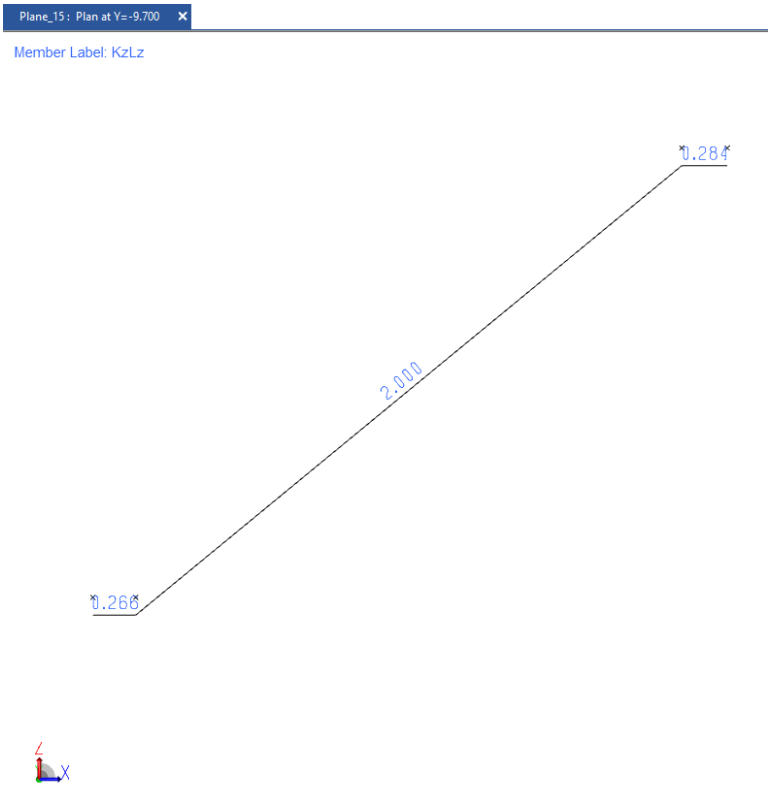

Plane_13 : Plan at Y=-11.840
Member Label: KzLz
0.750
0.800
0.750
4.400
1.000
2.670
4.237
4.237
1.270
1.400
2.400
5.300
5.300
5.300
5.300
5.300
Z
X

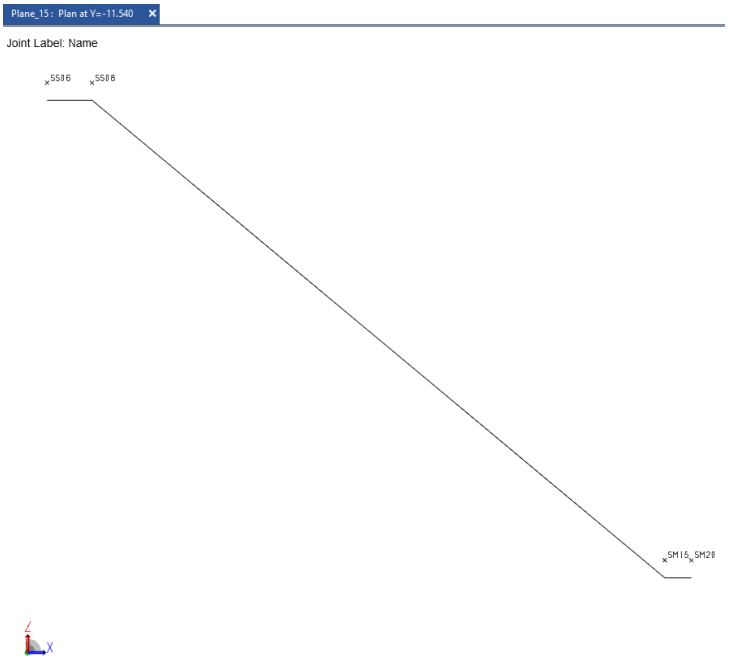

Plane_14 : Plan at Y=-9.700
Joint Label: Name
SM13
SM18
SS02
SS04
Z
X

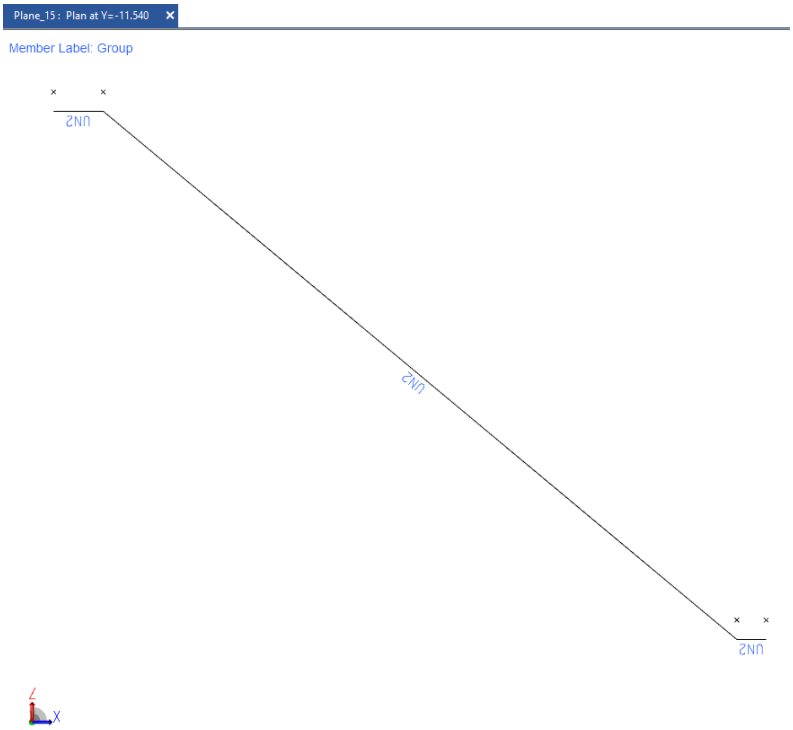

Plane_14 : Plan at Y=-9.700
Member Label: Group
UN2
UN2
UN2
Z
X

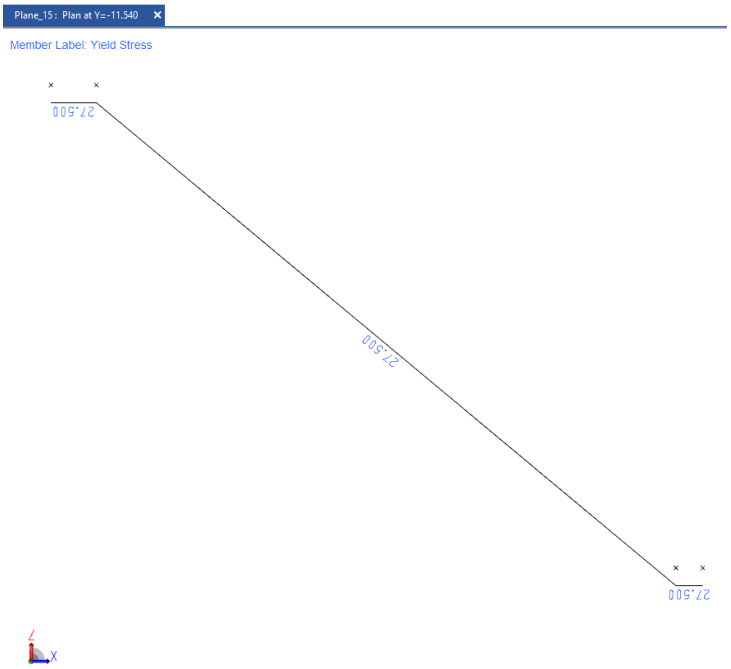

Plane_14 : Plan at Y=-9.700
Member Label: Yield Stress
27.500
27.500
27.500
Z
X

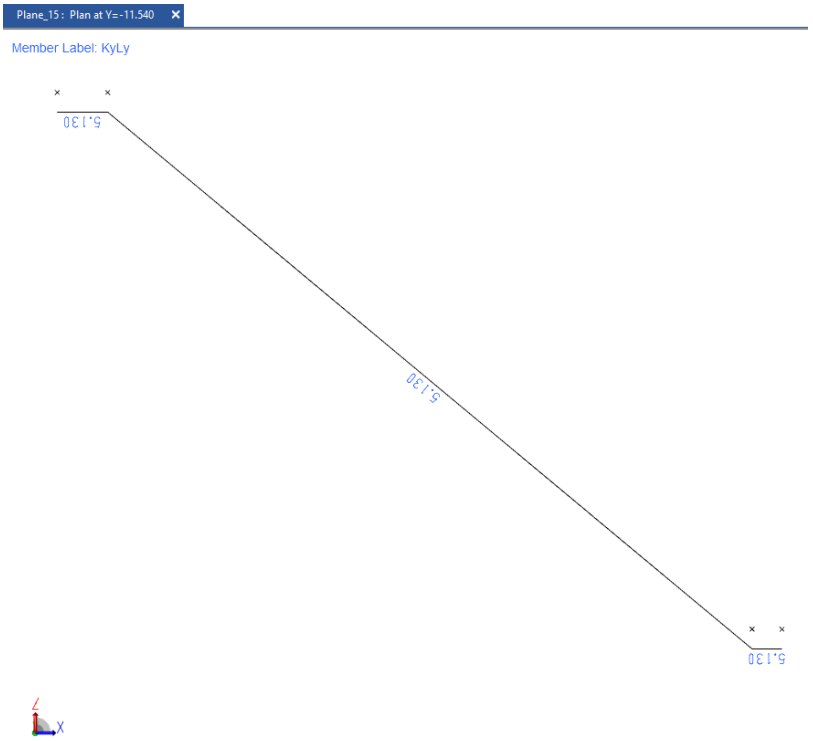

Plane_14 : Plan at Y=-9.700
Member Label: KyLy
4.950
4.950
4.950
Z
X

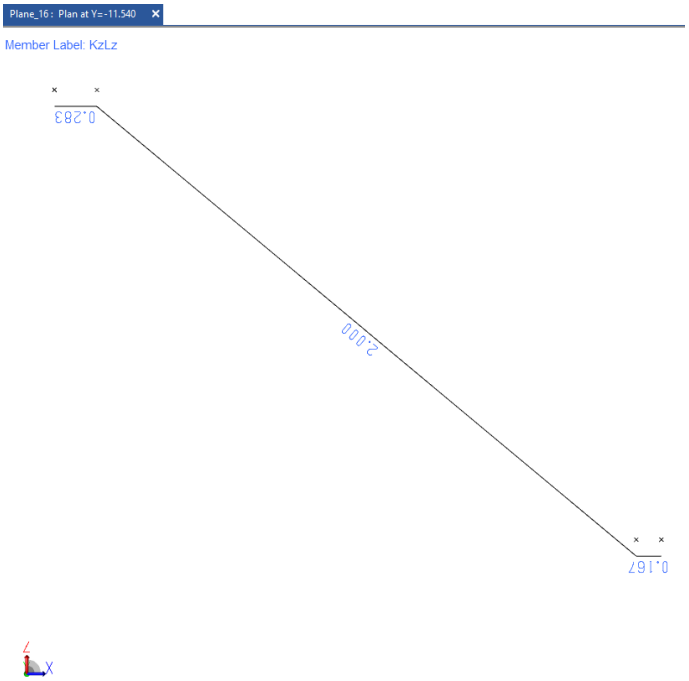

Plane_15 : Plan at Y=-9.700
Member Label: KzLz
0.284
2.000
0.268
Z
X

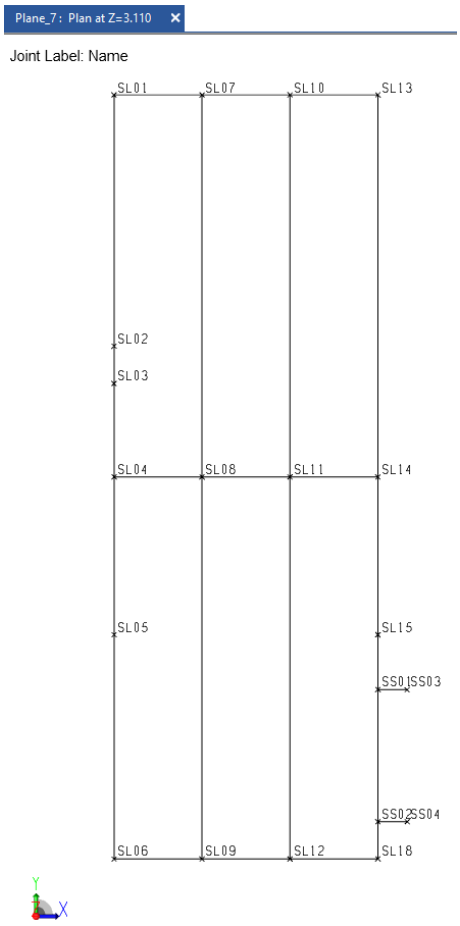

Plane_15 : Plan at Y=-11.540
Joint Label: Name
SS06
SS08
SM15
SM28
Z
X

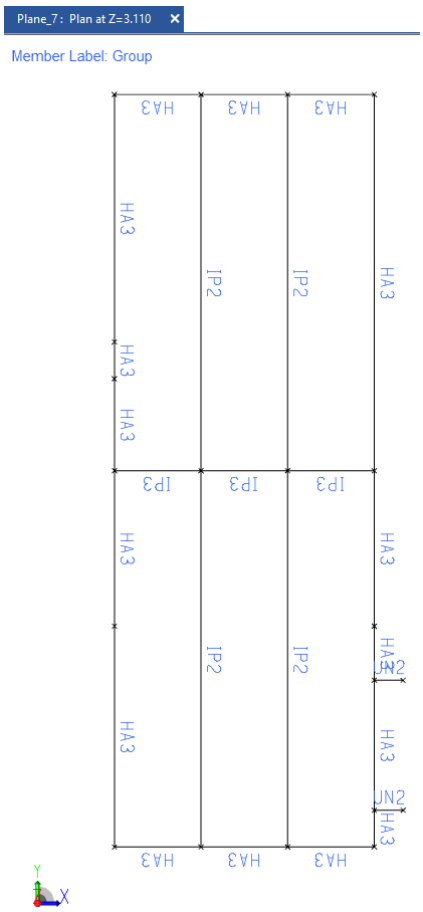

Plane_15 : Plan at Y=-11.540
Member Label: Group
UNS
UNS
UNS
Z
X

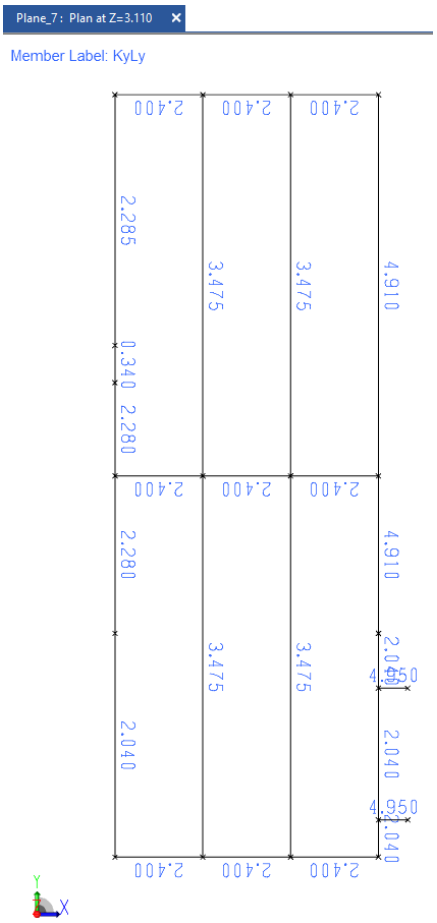

Plane_15 : Plan at Y=-11.540
Member Label: Yield Stress
27.500
27.500
27.500
Z
X

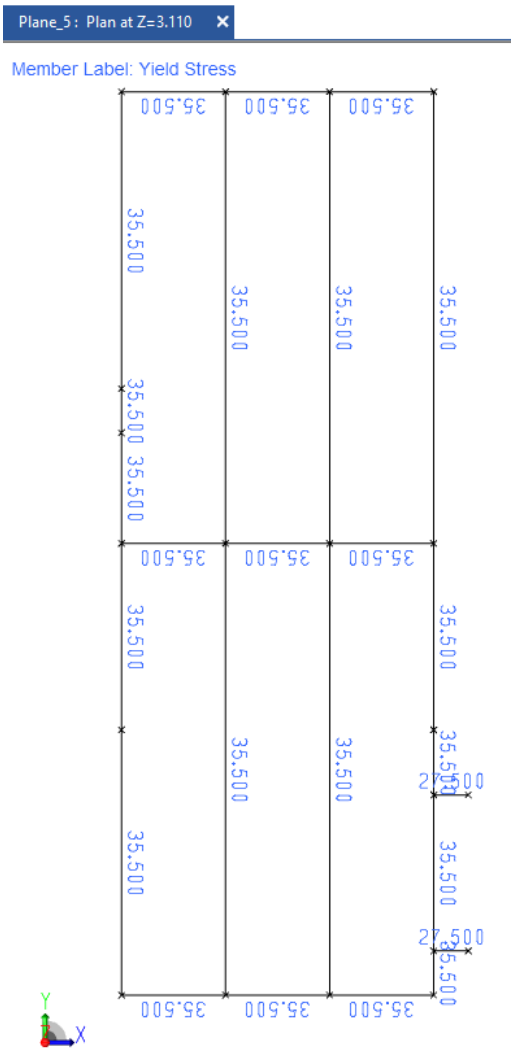

Plane_15 : Plan at Y=-11.540
Member Label: KyLy
5.130
5.130
5.130

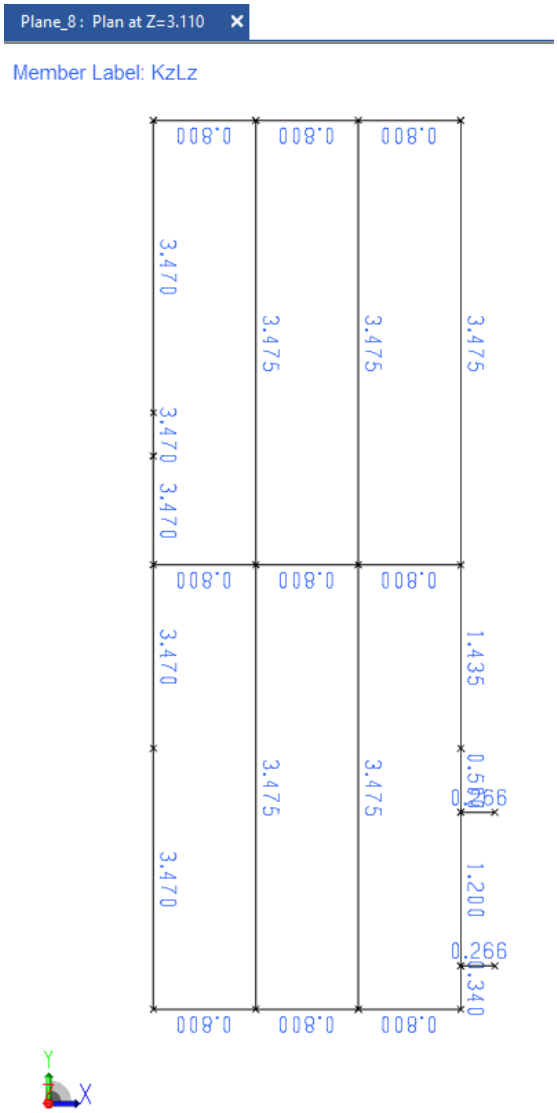

Plane_16 : Plan at Y=-11.540
Member Label: KzLz
0.283
2.000
0.167

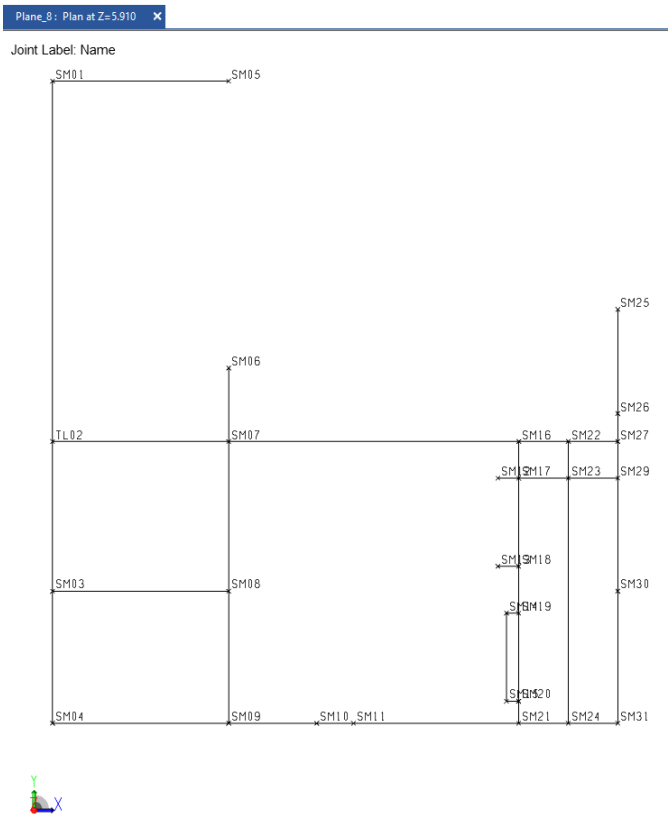

Plane_7 : Plan at Z=3.110
Joint Label: Name
SL01
SL07
SL10
SL13
SL02
SL03
SL04
SL08
SL11
SL14
SL05
SL15
SS01
SS03
SS02
SS04
SL06
SL09
SL12
SL18
Y
X

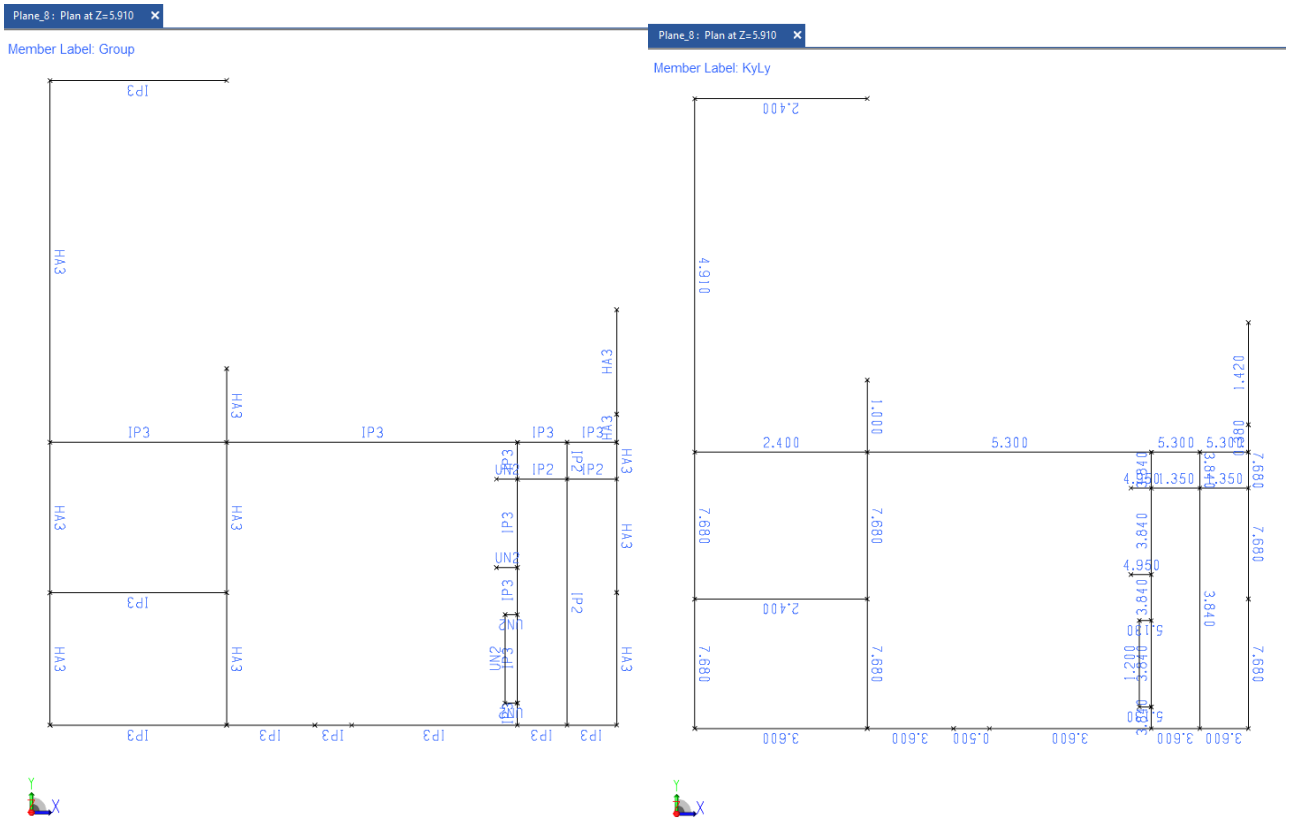

Plane_7 : Plan at Z=3.110
Member Label: Group
HA3
IP2
IP3
UN2
Y
X

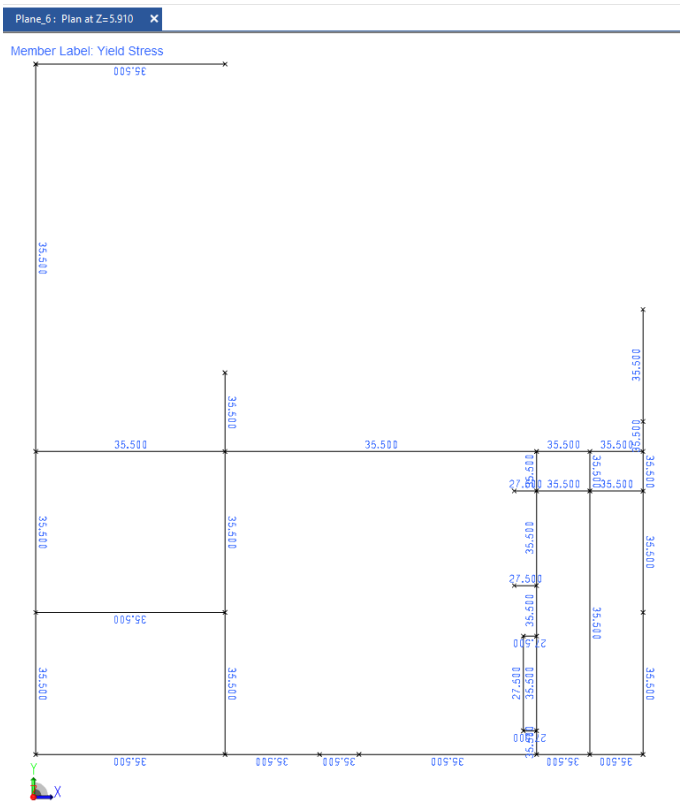

Plane_7 : Plan at Z=3.110
Member Label: KyLy
2.400
2.400
2.400
2.285
3.475
3.475
4.910
0.340
2.280
2.400
2.400
2.400
2.280
4.910
3.475
3.475
2.040
2.040
2.040
Y
X

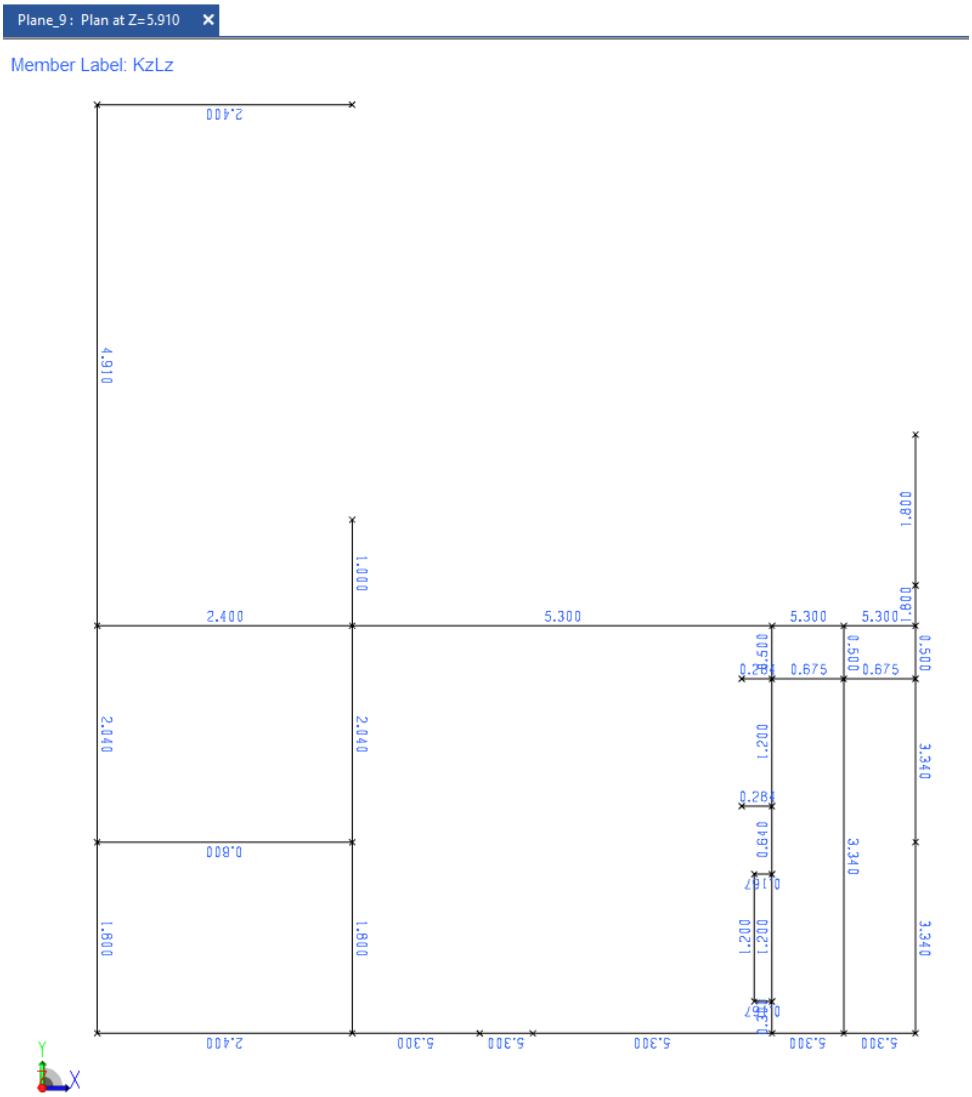

Plane_5 : Plan at Z=3.110
Member Label: Yield Stress
35.500
27.500

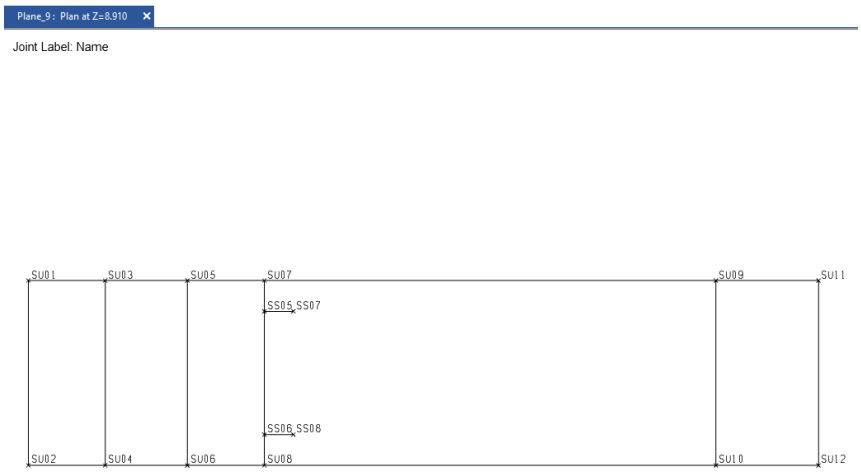

Plane_8 : Plan at Z=3.110
Member Label: KzLz
0.800
3.470
3.475
1.435
0.566
1.200
0.266
1.340

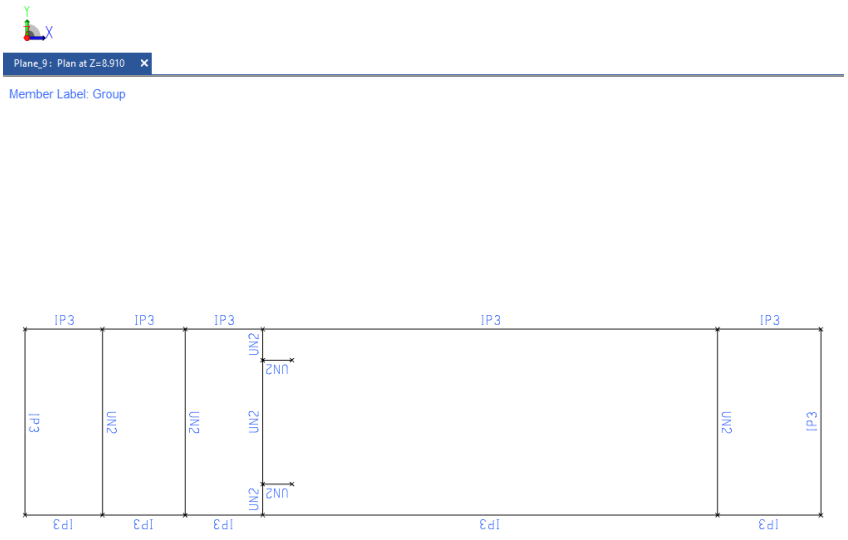

Plane_8 : Plan at Z=5.910
Joint Label: Name
SM01
SM05
SM25
SM06
SM26
TL02
SM07
SM16
SM22
SM27
SM17
SM23
SM29
SM18
SM03
SM08
SM30
SM19
SM20
SM04
SM09
SM10
SM11
SM21
SM24
SM31
Y
X

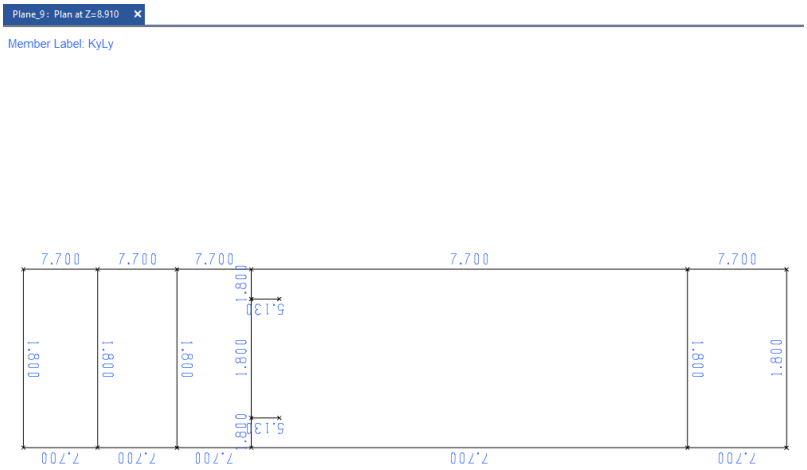

Plane_8 : Plan at Z=5.910
Member Label: Group
Plane_8 : Plan at Z=5.910
Member Label: KyLy

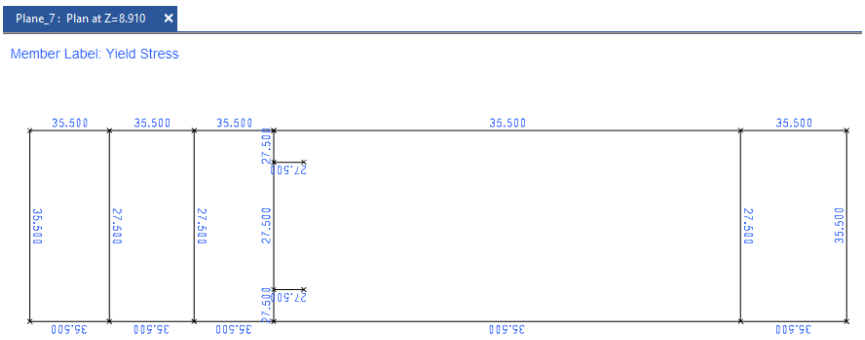

Plane_6 : Plan at Z=5.910
Member Label: Yield Stress
35.500
27.500

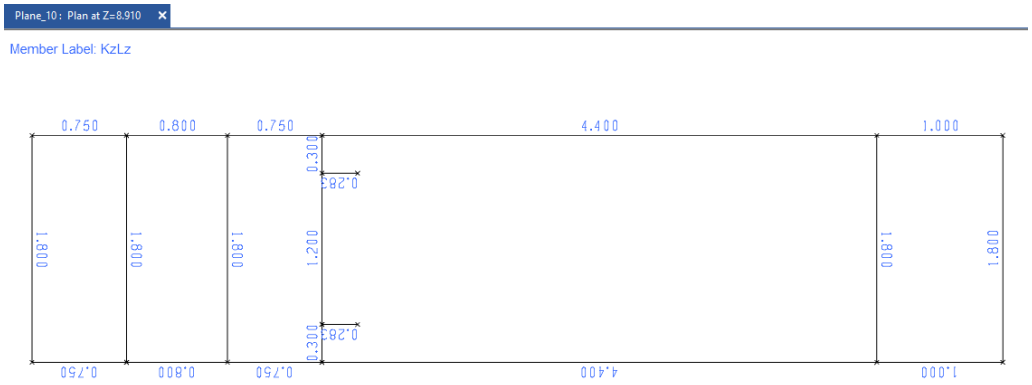

Plane_9 : Plan at Z=5.910
Member Label: KzLz
2.400
4.910
1.000
1.800
2.400
5.300
5.300
5.300
0.500
0.675
0.675
2.040
2.040
1.200
3.340
0.284
0.640
0.600
1.800
1.800
1.200
1.200
3.340
2.400
5.300
5.300
5.300
5.300
5.300
Y
X


Plane_9 : Plan at Z=8.910
Joint Label: Name
SU01
SU03
SU05
SU07
SU09
SU11
SS05
SS07
SS06
SS08
SU02
SU04
SU06
SU08
SU10
SU12

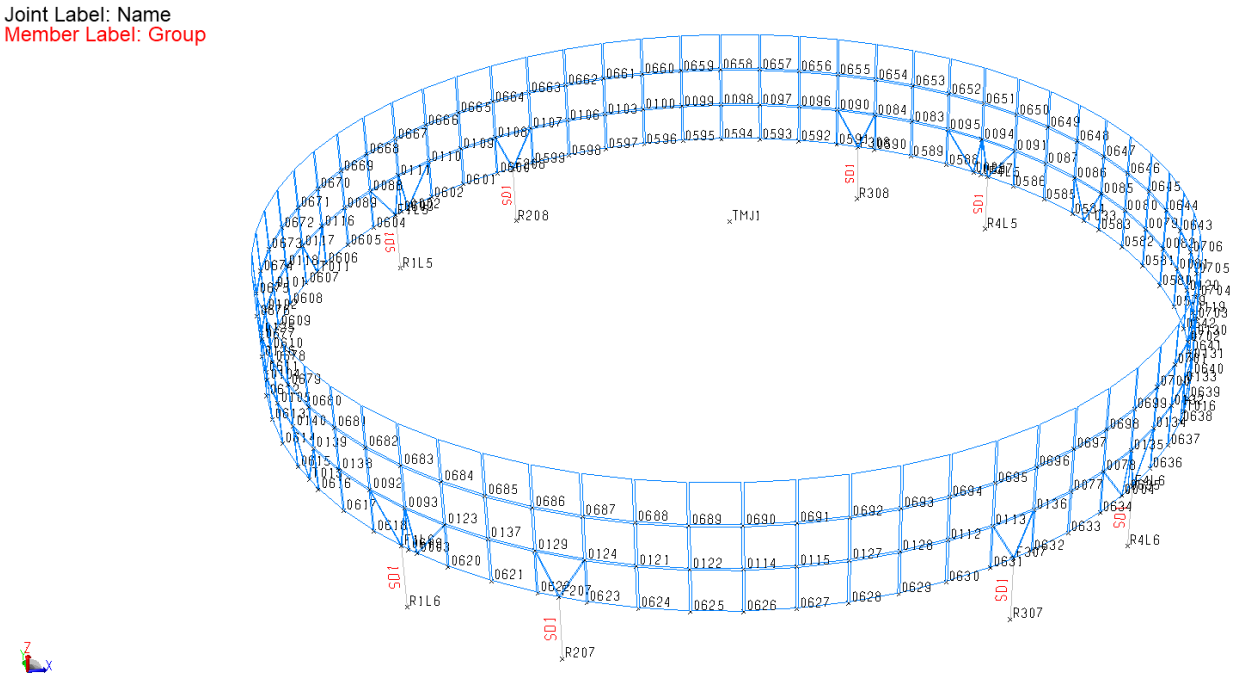

Plane_9 : Plan at Z=8.910
Member Label: Group
IP3
UN2

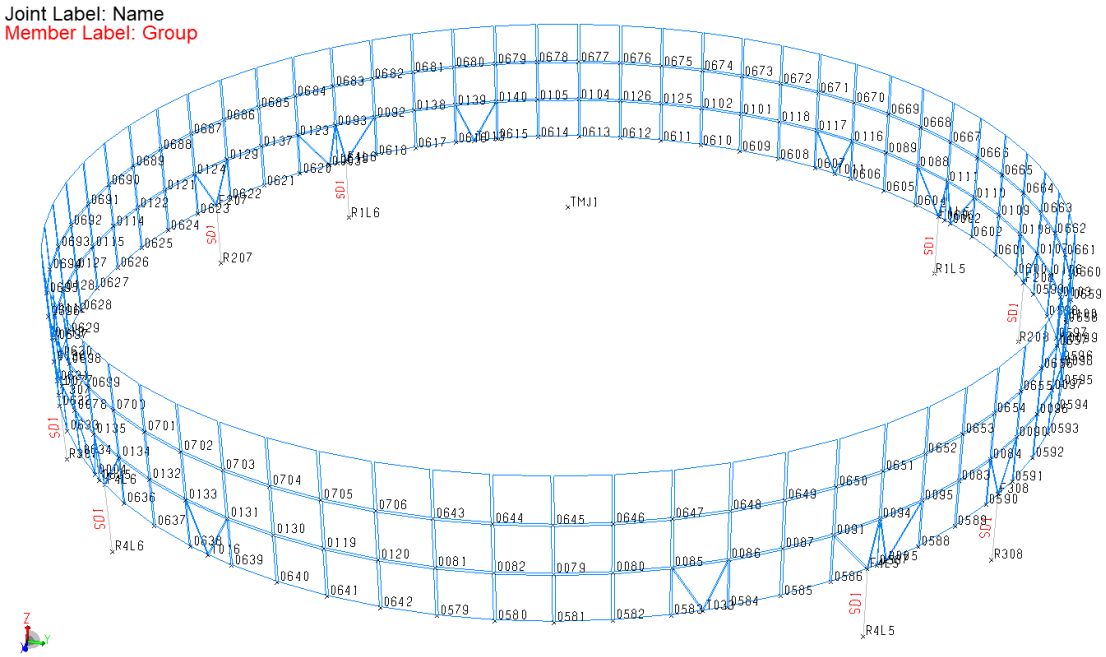

Plane_9 : Plan at Z=8.910
Member Label: KyLy
7.700
1.800
5.132


Plane_7 : Plan at Z=8.910
Member Label: Yield Stress
35.500
27.500


Plane_10 : Plan at Z=8.910
Member Label: KzLz
0.750
0.800
0.750
4.400
1.000
0.300
0.283
1.800
1.800
1.800
1.200
1.800
1.800
0.283
0.300
0.750
0.800
0.750
4.400
1.000


Y
X





All Plates / shells are Group M65