University of
Stavanger

Faculty of Science and Technology

MASTER'S THESIS

Study program/ Specialization: **Byggkonstruksjoner**	Spring semester, 2014 Open
Writer: **Nadina Memic**	………………………………………… (Writer's signature)

Faculty supervisor:
Siriwardane, S.A. Sudath C
External supervisor(s):

Ole Gabrielsen, DNV GL

Thesis title:

Conceptual design of a topside structure

Credits (ECTS): 30

Key words: Topside Code check Sesam Genie	Pages: ………57………… + enclosure: …61… Stavanger, …14.07.2014…………….. Date/year

ACKNOWLEDGEMENT

This thesis is a requirement for achieving the Master’s degree in structural engineering, (Byggkonstruksjoner), at the University of Stavanger.

From January 2013, beside studies, I`ve been lucky to work part time at DNV Stavanger, Offshore structures; where I also got the opportunity to do my master thesis.
For that, I would like to express my gratitude to my supervisor, Ole Gabrielsen and for his help and input during this work.

I would like to thank my supervisor at the University of Stavanger, professor S.A Sudath C for his interest and follow-up.

Last, but most, I would like to thank my two best friends; my sister, Amila and my mother, Sevleta.

SUMMARY

Today's platform design builds on years of experience.
Previous platform designs for similar environmental and operational conditions usually form the basis.
The design and analysis is done in accordance to established rules and guidelines, namely *standards*, to secure that an offshore structure is able to withstand the loads it is exposed to during its lifetime.

Based on literature study, Eurocode 3 and NORSOK standards, a conceptual design of topside has been performed.
The topside is modelled, analyzed and optimized in SESAM GeniE.

The structure is optimized for the inplace condition, with the Ultimate Limit State (ULS-1a) as the governing condition.

Further, a local analysis is performed, by the use of shell elements. The shell model was connected with the beam model and the gained Von Mises stress was 632.98 MPa.
The gained stress concentration factor, SCF, was 9.85.

Considering the results gained for the global beam model, and for the shell-beam model, the importance of simulating the joint stiffness is seen.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATION

Abbreviation	Definition
CHS	Circular Hollow Section
NCS	Norwegian Continental Shelf
SLS	Serviceability Limit State
PSA	Petroleum Safety Authority Norway (Petroleumstilsynet)
ULS	Ultimate Limit State
VIV	Vortex-induced vibrations
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
CEN	Comité européen de normalisation
ETSI	European Telecommunications Standards Institute
CENELEC	Comité Européen de Normalisation Électrotechnique
NORSOK	Norsk sokkels konkurranseposisjon
DNV	Det Norske Veritas

1. Introduction

1.1 Background

Today’s platform design builds on years of experience.
Previous platform designs for similar environmental and operational conditions usually form the basis.
The design and analysis is done in accordance to established rules and guidelines, namely *standards*, to secure that an offshore structure is able to withstand the loads it is exposed to during its lifetime.

The *deck*, which is one of the major structural components, supports the drilling equipment, production equipment and life support systems of the platform.
Depending on its weight, it is either installed as an integrated deck or a modularized deck, with the crane lifting capacity as the main limitation. [8]

As the deck is fabricated onshore and transported to its final destination, the temporary phases as transport and lift need to be considered, along with the operational requirements.

In this thesis, the operational (the in-place) condition is considered.

1.2 Objective and Scope

The aim of the project is to perform a conceptual global design of a topside structure.
Further, the structure should be analysed and optimized for the Ultimate Limit State (ULS) load condition.
Local design of the main support joint should be modelled in shell elements and evaluated.

This thesis shall look into the following:

- Perform a literature study on current knowledge for topside design.
- Review equipment list and arrange topside layout.
- Establish interface to jacket structure.
- Design and model global and primary structural members in a complete Finite Element (FE) model of the topside structure (see NORSOK N-003).
- Perform conceptual design of flare tower.
- Implement suitable boundary conditions.
- Apply load cases representing self-weight and wind loads for the Ultimate Limit State (ULS).
- Run code checks according to NORSOK and Eurocode 3.
- Perform re-design of members as appropriate.
- Perform local design of main support joint using shell elements.

1.3 Limitations

- All temporary phases
- Accidental Limit State (ALS)
- Fatigue Limit State (FLS)
- Snow ,wave and earthquake loads
- Accidental loads

2 Literature Study

2.1 General

The principal Norwegian legislation governing petroleum activities in Norway and on the Norwegian Continental Shelf, NCS, is the Norwegian Petroleum Act of 29 November 1996, along with regulations issued thereunder. [22]

It states that the Norwegian State has the proprietary right to subsea petroleum deposits and the exclusive right to resource management.

Only the State can award licenses for petroleum activities.

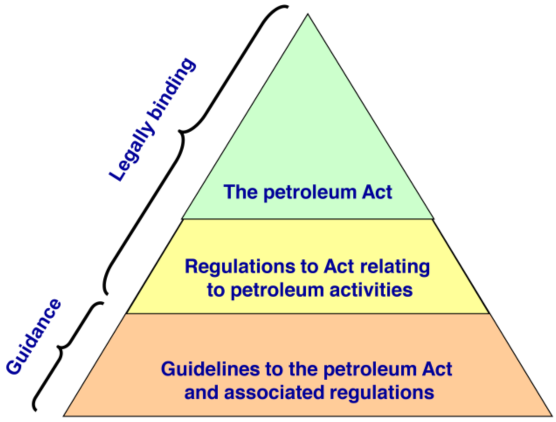


Figure 2-A Hierarchy of legislation in Norway [24]

The national organization of the Norwegian petroleum sector is shown in Figure 2.

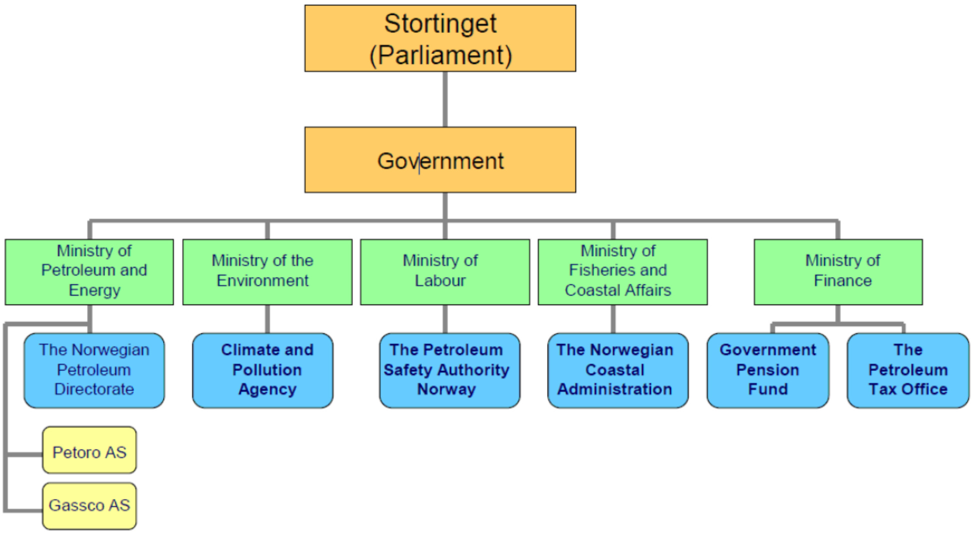


Figure 2-B National organization of the petroleum sector in Norway [24]

The Norwegian Parliament, Stortinget, establishes the framework for Norwegian petroleum activities. The government has the executive power over petroleum policy, whereas the Ministry of Petroleum and Energy hold the overall responsibility for management of petroleum resources on the NCS. The Norwegian Petroleum Directorate, NPD, is an advisory body for the Ministry.

2.2 Design Standards

"A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose." [23]

Figure 2-C shows the four main levels the standards within the petroleum industry are divided in, namely [24]:

1. Internation*al*

"An International Standard is a standard adopted by an international standards organization and made available to the public."
The given definition given states that an International Standard is*:*
"A normative document, developed according to consensus procedures, which has been approved by the IEC National Committee members of the responsible committee in accordance with Part 1 of the ISO/IEC Directives." [15]

Adoption of the International Electrotechnical Commission **(**IEC) standards is voluntary, regardless whether a state is a member of the Commission or not. [15]

2. Regional

Comité européen de normalization,CEN, is one of three European Standardization Organizations that have been officially recognized by the European Union and the European Free Trade Association as being responsible for developing and defining voluntary standards at European level; the other two being Comité Européen de Normalisation Électrotechnique (CENELEC)and European Telecommunications Standards Institute(ETSI) .
CEN develops and publishes the European Standard, EN. [16]

3. National

Norway, being an International Organization for Standardization (ISO) and CEN, National Member has the responsibility to implement the European Standards as national standards. [17]
An annex is issued by each country.

4. Industry/Associations

Standards developed by the petroleum industry.
"The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations." [18]

Today, the NORSOK standards are based on recognized international standards. If a National Standard is available on the subject, the relevant NORSOK will be withdrawn. NORSOK standards are administered and published by Standards Norway.

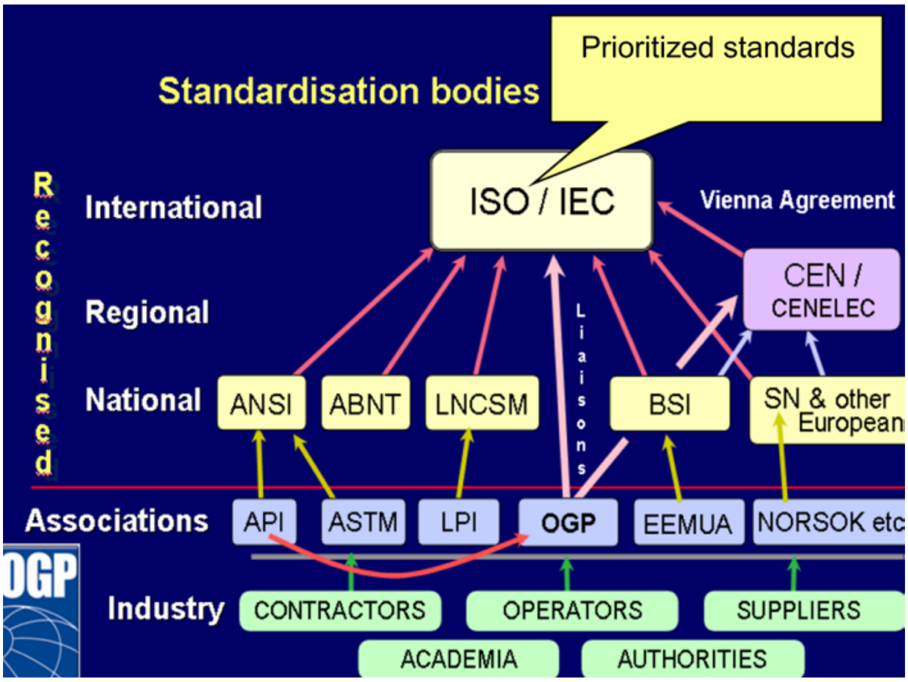


Figure 2-C Standardization Bodies [24]

Along with recognized standards, such as ISO and EC, there are available DNV standards.

DNV service documents consist of [19]:

- *Service Specifications*. Procedural requirements
- *Standards*. Technical requirements
- Recommended Practices. Guidance

2.2.1 Limit State Design

During the structural analysis, it is evaluated whether the structure is designed to withstand the loads it is – and the loads it most probably will be exposed to. The design constraints are defined as *limit states* and are stated in EN 1990. Limit state design is also defined as the load and *resistance factors design (LRFD)* – where the resistance factors are applied. [32]

The four limit states are:

1. SLS- Serviceability Limit State; normal use, operations.
2. ULS- Ultimate Limit State; max capacity, loss of structural stiffness and strength.
3. ALS- Accidental Limit State; accidents; collision, explosions
4. FLS- Fatigue Limit State; due to cyclic loading, ex. ViV

2.2.2 Relevant Standards

The relevant standards for this thesis will mainly be:

a. *Eurocode 3 (EN 1993-1-1,2005): Design of Steel Structures*, which covers the general rules for steel structures with material thickness t≥ 3mm. Incorporated in the standard: National annex, NA from 2008
b. *NORSOK N-001: Integrity of offshore structures*, which covers the general principles and guidelines for the design of offshore facilities and verification of load bearing structures.
c. *NORSOK N-003: Actions an actions effect*, which covers general principles and guidelines for the determination of actions and action effects for the structural design.
d. *NORSOK N-004: Design of steel structures*, which covers guidelines and requirements for design and documentation of offshore steel structures.

In addition:

e. *NORSOK S-001: Technical Safety*, which covers the principles and requirements for the development of the safety design of offshore installations.

2.3 Text Books

2.3.1 Field Development

Offshore platform design consists of a sequence of activities.
Whether an offshore location has the potential for hydrocarbon reserves is evaluated by geologists and geophysicist through the study of geological formations.

Thereby, the economic viability of the field is evaluated through estimated costs and production schemes. During this period, it is necessary to rely on earlier, relevant experience and knowledge, due to the lack of accurate data. [25]

If the studies carried out are positive, the NPD map the potential petroleum resources in the subsurface, whereas the oil and seismic companies preform data acquisition. [33] Here, important information is gained, such as an approximate estimate for recoverable reserves of hydrocarbons and it is thereafter decided whether exploratory drilling activities will start. After completing this phase, more accurate reservoir information is gained. The outcome of this process impacts the field development concept selection highly. [25]

The Offshore field development design spiral is shown in figure 2-4, where each spiral indicates one design cycle, and figure 2-5 showing figure 2-4 in a flow diagram format.

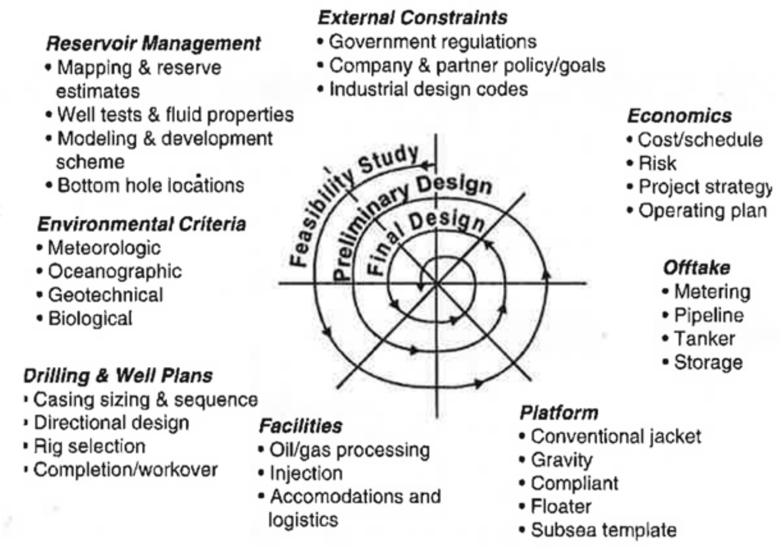


Figure 6.2 Offshore field development design spiral

Figure 2-D Offshore Field development design [25]

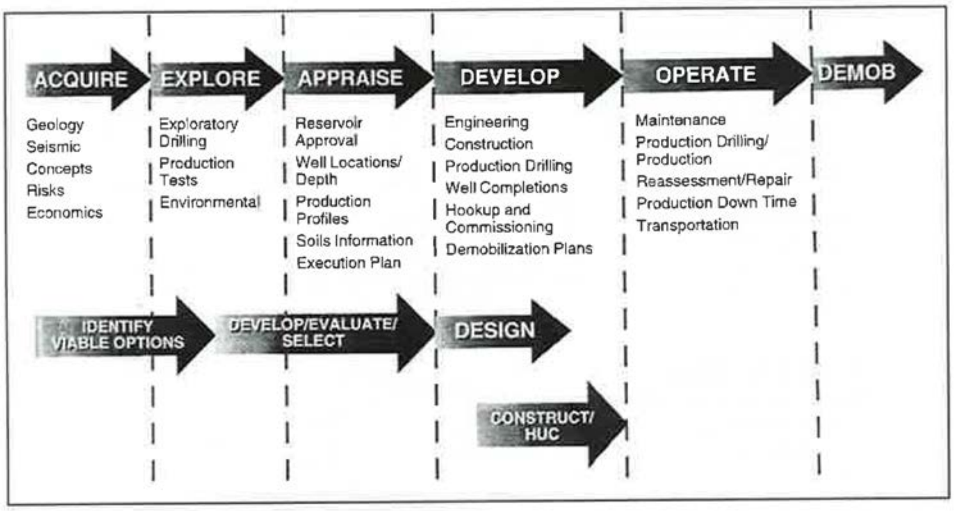


Figure 2-E Field development timeline [25]

The Front- End Loading activity, FEL activity, is the most important phase of a field development timeline and all projects which precede the start of the basic design phase are defined as FEL.

The FEL phase, which consists of identifying viable options, development/evaluation/ selection of concept and conceptual design, only consumes about 2-3% of TIC (total installed cost) of the field development, but has the highest impact on cost overruns when a full FEL is not executed. The ability of influencing the costs decreases as the work progress and making the right choices at the concept development stage is important. [25]

Conceptual design, being one of the phases in FEL, is where general definition of each system component (well systems, platforms topside facilities and transportation along with their subcomponents , namely; hull, mooring system, tethers, living quarter, process, utility systems, pipelines, etc. are made and a cost and schedule estimate prepared.
During the conceptual phase, the accuracy of the TIC estimates is at ±25-40% range.

The FEL process ends when the conceptual design phase is completed. At the end of this phase following information is available [25]:

- A field development plan
- Basis of conceptual design (field characteristics, operational and environmental parameters, foundation conditions, platform configurations, global materials selection and additional assumptions used for the concept development)
- Conceptual drawings showing major component configurations (platforms, topsides facilities layout, well locations, well systems, reservoir maps
- Platform structure configuration; conceptual drawings that show side elevations and plan for legs and major bracings
- Cost estimate

The information gained in the conceptual design phase is then used as an input to the Basic Design Phase.

2.3.2 Topside layout

The fixed steel platform (jacket) is the most common offshore structure used for drilling and operation. [8] Most of the fixed platforms are installed in shallow water. In 1988 the Bullwinkle jacket in the Gulf of Mexico set the world record, being installed at a water depth of 412 m, whereas in the North Sea, the installation is limited to a water depth of 150-180m, due to its harsh environment. [8]

Fixed jacket offshore platforms consist of three main structural components:

f. Deck / Topside; supporting the drilling and production equipment
g. Jacket / Tower; supporting the deck and other substructure (j-tubes, walkways and risers).
h. Foundation; piles transferring the loads to the soil

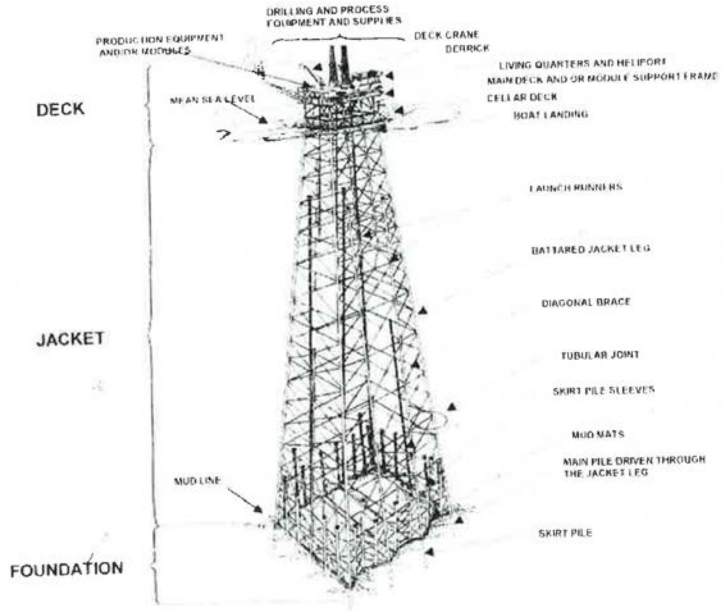


Figure 2-F Structural components of a steel jacket [2]

The topside is installed offshore after the installation and piling of the jacket structure. [24] There are several ways of installing decks, with the most common and most preferable method being is to lift it in place with a heavy lift crane vessel. The lifting capacity of the crane vessel is the main limitation. The second common method is the float-over method, which is preferable when the lifting capacity is exceeded, or when the deck in question is a *modular deck*, which require expensive offshore hook-up work. This method is more weather sensitive and is restricted to more calm seas.[10]

There are three main factors governing the size, configuration and layout of the deck; its operational requirements, installation constraints and whether it will be manned or unmanned. Manned topside needs to fulfill additional safety requirements, and it also requires accommodation and landing and evacuation facilities. [8]

In general, there are four different topside designs that are used [24]:

i. *Modularized deck* - large modules on a support frame, equipment installed in modules.
j. *Hybrid deck* -modules on top of an integrated deck
k. *Integrated deck* -one-piece structure including all equipment and equipment packages, the equipment is pre-installed on the deck at an onshore yard
l. *Flat lay-out* - small modules or equipment packages distributed over a large area

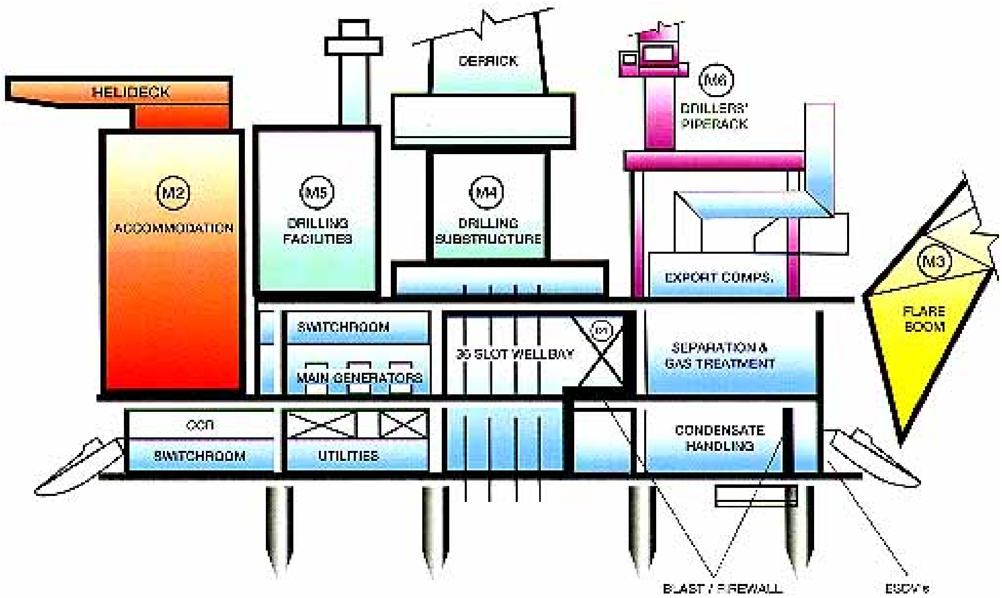


Figure 2-G Topside Layout [9]

An integrated deck has in principle three levels, where they are supported by a grid work of girders, trusses and columns [7], the three decks are namely:

- m. *Main (upper) deck;* drilling/production systems and several other modules, such as process, utilities and LQ.
- n. *Cellar deck*; pumps, wellheads utility systems, etc.
- o. *Additional deck levels;* oil and gas separation, processing, etc.

A modular deck system consists of a certain number of modules. The Module Support Frame (MSF) provides the space frame for supporting the modules and transferring their load to the jacket. The modules are [8]:

- p. *Living quarters* (usually supporting a helideck, hotel, office, etc.)
- q. *Utilities* (power generation, electrical and production control systems)
- r. *Wellhead* (supporting the wellheads, well test and control equipment)
- s. *Drill Rig* (drill tower, drill pipe, drillers, control room)
- t. *Production* (oil/gas/water separation, treatment systems and transfer of the produced liquids and gas to the offloading system)
- u. *Compression Module* (may be installed at a later stage, if needed for gas re-injection. Other modules, such as water injection and pumping modules may also be added)

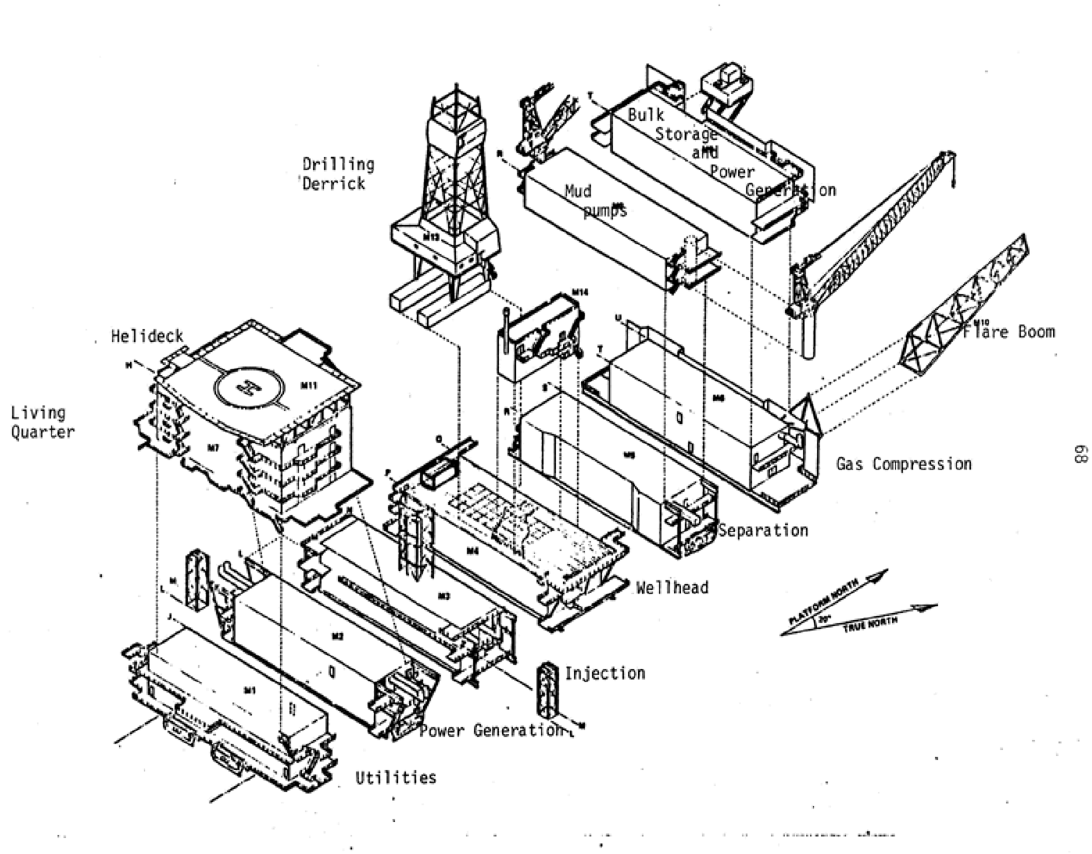


Figure 2-H Topside components [2]

The most important concern is to separate the fuel sources (wellhead-, Unfired Process-, Hydrocarbon Storage-, Pipeline area) from ignition sources (LQ-, utilities-, building-, machinery area) where the utility area serves as a barrier between hazardous areas and LQ. A manned platform also requires two independent escape routes from each location. Heavy equipment should be placed near truss supports and as low as possible in order to lower the vertical C.O.G , thus minimalizing the dynamic response. Rotating equipment should be oriented that way that its long axis is along the transverse to the platform floor beams in order to increase the stiffness. [8]

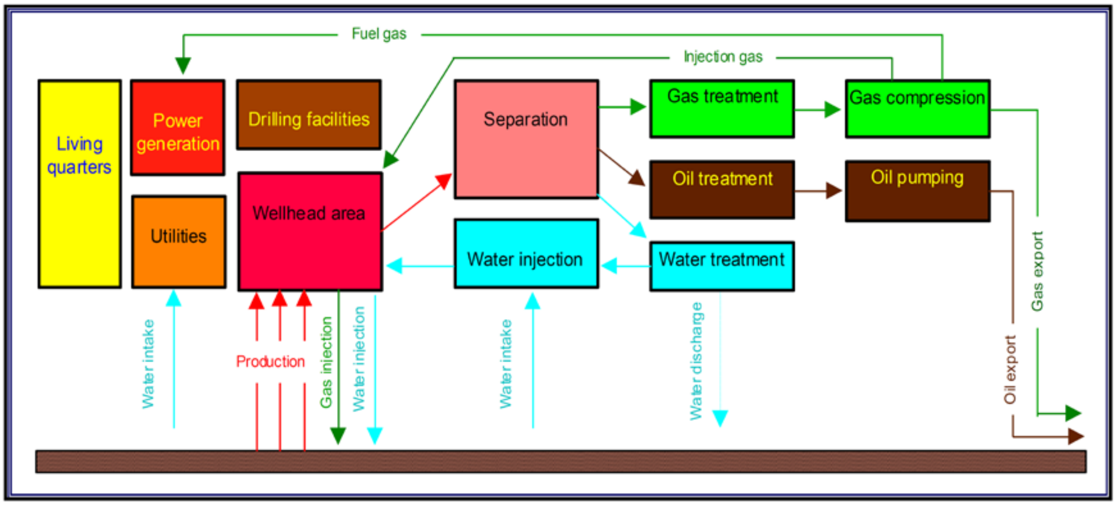


Figure 2-I Main functional areas [24]

3 Basis of Design

3.1 General

The topside analysis is based on the loads a structure is exposed to.
Permanent, variable and environmental loads are factorized with different load action factors, as the aim is to check the structure for worst case scenario.
Relevant standards are used for this purpose.
The provided weight report, containing the equipment loads for the in-place condition, is the main limitation of the design.
It gives a total operating weight of 14 626.5 tons. The structural steel is limited to 6050 tons.

The topside is to be checked for ULS-1 a/b and ULS-3 a/b and SLS.
Snow-, wave- and earthquake loads are not covered.
The inplace condition id dominated by the permanent and variable loads.

A sketch, showing the main platform areas to be included has been provided along with the weight report, ref Figure 3-A.
No other drawings have been available. The topside layout is based on the literature study in chapter 2.

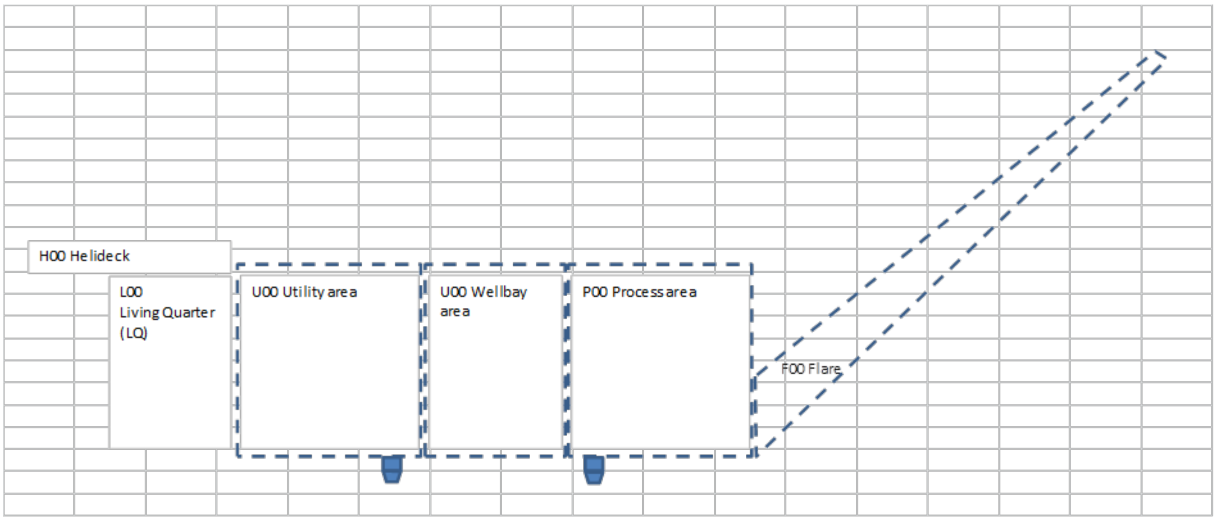


Figure 3-A Topside sketch [Appendix 1]

The factors for the load combinations for the different limit states, are found in Table 3-1.

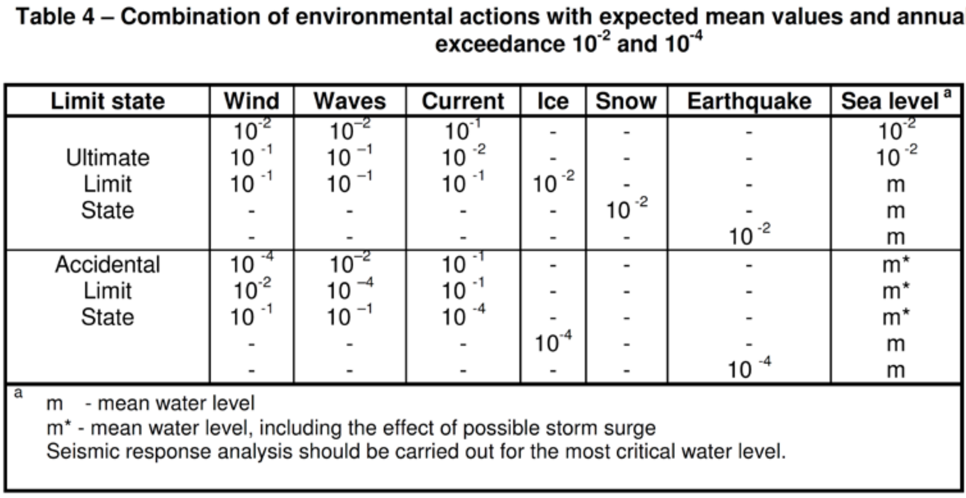


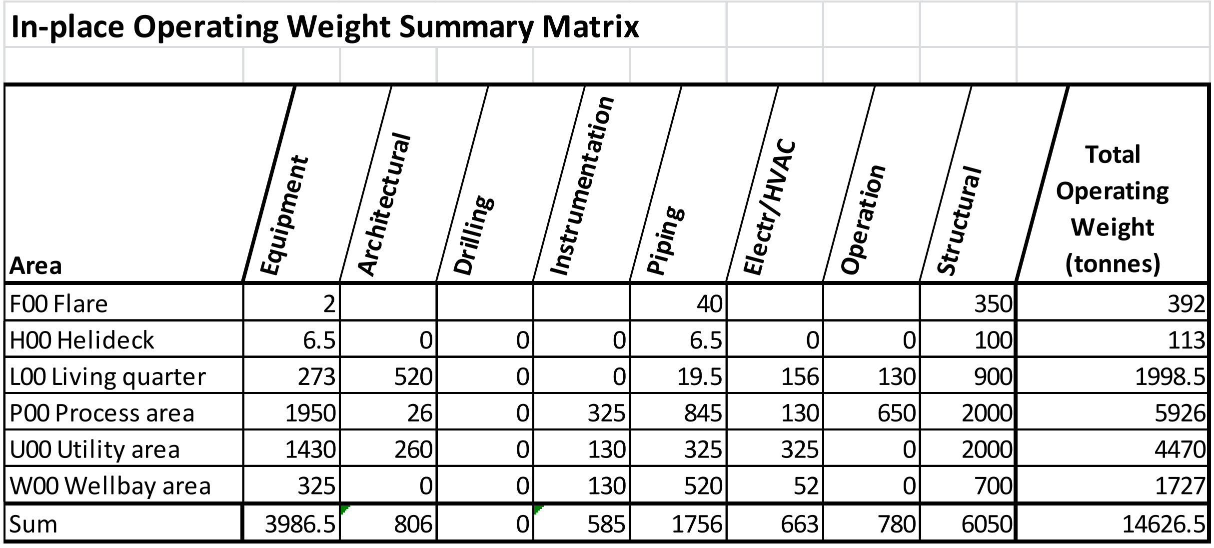
Table 4 – Combination of environmental actions with expected mean values and annual probability of exceedance 10^{-2} and 10^{-4}

Limit state	Wind	Waves	Current	Ice	Snow	Earthquake	Sea level [a]
Ultimate Limit State	10^{-2}	10^{-2}	10^{-1}	-	-	-	10^{-2}
	10^{-1}	10^{-1}	10^{-2}	-	-	-	10^{-2}
	10^{-1}	10^{-1}	10^{-1}	10^{-2}	-	-	m
	-	-	-	-	10^{-2}	-	m
	-	-	-	-	-	10^{-2}	m
Accidental Limit State	10^{-4}	10^{-2}	10^{-1}	-	-	-	m*
	10^{-2}	10^{-4}	10^{-1}	-	-	-	m*
	10^{-1}	10^{-1}	10^{-4}	-	-	-	m*
	-	-	-	10^{-4}	-	-	m
	-	-	-	-	-	10^{-4}	m

[a] m - mean water level
m* - mean water level, including the effect of possible storm surge
Seismic response analysis should be carried out for the most critical water level.

Table 3-1 Load combinations [4]

3.2 Weight Budget



In-place Operating Weight Summary Matrix

Area	Equipment	Architectural	Drilling	Instrumentation	Piping	Electr/HVAC	Operation	Structural	Total Operating Weight (tonnes)
F00 Flare	2				40			350	392
H00 Helideck	6.5	0	0	0	6.5	0	0	100	113
L00 Living quarter	273	520	0	0	19.5	156	130	900	1998.5
P00 Process area	1950	26	0	325	845	130	650	2000	5926
U00 Utility area	1430	260	0	130	325	325	0	2000	4470
W00 Wellbay area	325	0	0	130	520	52	0	700	1727
Sum	3986.5	806	0	585	1756	663	780	6050	14626.5

Table 3-B Weight report for the Topside [Appendix1]

The weight-report does not give a detailed distribution of the permanent loads, only a summation of the loads imposed on the different deck areas. For that reason, it has been chosen to uniformly distribute the load as equipment among the decks.
The *operational* load has also been uniformly distributed among the decks.
The load distribution table is found in Appendix A and is based on [24].

3.3 Permanent loads

Permanent actions (dead loads) include self-weight, equipment-weight and other permanent structure, such as stiffeners, brackets, weldings, etc.
It is assumed that all necessary factors have been included in the report.

A weight report includes all primary, secondary and outfitting steel, whereas not everything is included in the conceptual model. If a lower weight is gained in the model, the mass density needs to be scaled in order to achieve the desired weight.

Live loads which are applied are the loads defined under *Operational* in the weight report. Live loads relevant for a topside structure could be everything from people, content in the tanks and pipes, laydown area, etc.

3.4 Environmental Loads

The environmental loads are covered in NORSOK N-003 and DNV-RP-C205.
Metocean Reports for the specific area is usually used in order to achieve high accuracy. In this thesis, calculations are carried out only according to the standards.

3.4.1 Wind ULS-1

The static wind loads are calculated according to NORSOK N-003, 6.3.3:
The mean wind action is calculated by:

$$F = \frac{1}{2} * p * Cs * A * Um^2 * sin\alpha$$

p = air density
Cs = shape coefficient (DNV RP-205, table 5.5)
A = area of the member or surface normal to the direction of the force
Um = wind speed
α = angle between the direction of the wind and the axis of the exposed member or surface

According to NORSOK N-003, 6.3.2:

The characteristic wind velocity u(z,t) at a height z(m) above sea level and corresponding averaging time period *t* less than or equal to t_0=3600s may be calculated as:

$$U(z,t) = U(z)\ \left(1 - 0.41Iu(z)\ln\left(\frac{t}{t0}\right)\right)$$

Where the 1 h mean wind speed U (z) is given by:

$$U(z) = U0\ \left[1 + C\ ln\left(\frac{z}{10}\right)\right]$$

$C = 5{,}73*10^{-2}\ (1+0.15U_0\ )^{0.5}$

The turbulence intensity factor $I_u(z)$ is given by:

$I_u(z) = 0.06[1+0.043\ U_0](z/10)^{-0.22}$

U_0 = 1 h mean wind speed at 10m (m/s)

Assumptions made are as following:

- 1 hour average wind is set to 38 m/s.
- p=1, 27 according to table F-1 DNV-RP 205, assumption: 5°C.

- The topside is treated as a box, with an L> 50 m. The shape coefficient is set to C_s= 1.0 Gust period is set to 15s.
- Shape coefficient used on helideck is not in accordance to DNV RP-205.
- The wind load calculations are done for 0°, 90°, 180° and 270°. Values for 45°, 135°, 225° and 315° are gained by using a factor of ± 0.7071. The force is applied as line load on the beams.

The calculations are performed for all topside elevations. It is sufficient to use app. ¾ of the height, but conservatively, the highest point has been used, as the wave and earthquake loads are not included.

The wind calculations are found in Appendix E.

3.4.2 Wind ULS-3

As there is no available Metocean Report, following data for the wind speed have been used [27] :

Platform	10 year	100 year	Factor
X	31 m/s	34m/s	0.824
Thesis	*34.5m/s*	38m/s	0.824

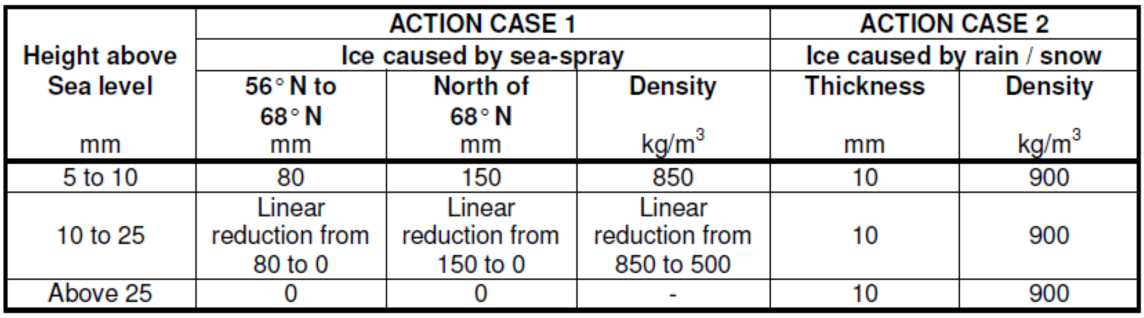
Table 3-2 Wind scaling factor

10 year wind is found by using the equation for basic wind pressure in DNV RP-205, 5.2.1:
$q=\frac{1}{2}p_a U^2_{T,z}$

where:
q= wind pressure
p_a=mass density of air
$U_{T,z}$= wind velocity averaged over a time interval *T* at height *z* meter above the mean water level

This gives a 10-year wind of 34.5 m/s and a factor of 0.824 which is used to scale the 100-yearwind load.
The wind calculations for ULS-3 a/b are found in Appendix E.

According to N-003 6.4.2.1, ice load due to sea spray or rain needs to be accounted for.
As the topside is positioned above 25m from the sea level, according to Table 2, the density 900kg/m^3 and thickness 10mm should be used. Equipment load of 9 kg/m^2 has been modelled and uniformly distributed along the exposed area.



Height above Sea level	ACTION CASE 1			ACTION CASE 2	
	Ice caused by sea-spray			Ice caused by rain / snow	
mm	56° N to 68° N mm	North of 68° N mm	Density kg/m^3	Thickness mm	Density kg/m^3
5 to 10	80	150	850	10	900
10 to 25	Linear reduction from 80 to 0	Linear reduction from 150 to 0	Linear reduction from 850 to 500	10	900
Above 25	0	0	-	10	900

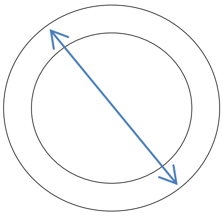
Table 3-3 Ice load [4]

3.4.3 Flare Tower wind and ice

Wind calculations for the flare are performed according to N-003 and DNV RP-205.
According to N-003, 6.3.3, for smooth, circular, tubular structures, following shape coefficients may be used:
C_s= 0.65 for Reynolds number > $5x10^5$
C_s= 1.2 for Reynolds number < $5x10^5$
Where the Reynolds number is defined as:
$R_e=U_w*D/\nu$

Marine growth is applied on the Flare tower, representing ice loads, giving an increased weight and diameter.

The ice load is applied according to Table 3-2.
According to N-003: For tubular structures it may be assumed that the ice covers half the circumference.



The ice load applied is:
Ice_{Flare}= [(900kg/m^3 / air density) / 2

3.5 Loads and load combinations

The basic loadcases and load combinations, are facotirezd according to Table 3-1, and are presented below.
Safety factors in chapter 3.6, Table 3-6 are applied.
The Loadcases are numbered from 1-25 for ULS-1 and from 1-26 for ULS-3.

Wind directions		
From 0°	West	W
45°	South-West	SW
From 90°	South	S
135°	South-East	SE
From 180°	East	E
225°	North-East	NE
From 270°	North	N
315°	North-West	NW

Table 3-4 Wind directions

ULS 1 a/b

Loadcase	Description
1	Self weight, equipment and variable loads
2	Wind from West (0°)
3	Wind from East (180°)
4	Wind from North (270°)
5	Wind from South (90°)
6	Flare wind from West (0°)
7	Flare wind from South (90°)
8	Flare wind from East (180°)
9	Flare wind from North (270°)
10	ULS_1_a_000
11	ULS_1_a_045
12	ULS_1_a_090
13	ULS_1_a_135
14	ULS_1_a_180
15	ULS_1_a_225
16	ULS_1_a_270
17	ULS_1_a_315
18	ULS_1_b_000
19	ULS_1_a_045
20	ULS_1_b_090
21	ULS_1_b_135
22	ULS_1_b_180
23	ULS_1_b_225
24	ULS_1_b_270
25	ULS_1_b_315

ULS 3 a/b

Loadcase	Description
1	Self weight, equipment and variable loads
2	Ice
3	Wind from West (0°)
4	Wind from East (180°)
5	Wind from North (270°)
6	Wind from South (90°)
7	Flare wind from West (0°)
8	Flare wind from South (90°)
9	Flare wind from East (180°)
10	Flare wind from North (270°)
11	ULS_3_a_000
12	ULS_1_a_045
13	ULS_3_a_090
14	ULS_3_a_135
15	ULS_3_a_180
16	ULS_3_a_225
17	ULS_3_a_270
18	ULS_3_a_315
19	ULS_3_b_000
20	ULS_3_a_045
21	ULS_3_b_090
22	ULS_3_b_135
23	ULS_3_b_180
24	ULS_3_b_225
25	ULS_3_b_270
26	ULS_3_b_315

Table 3-5 Loadcases ULS-1 and ULS-3

ULS 1-a combination

Basic Loadcase	Primary Loads	W	SW	S	SE	E	NE	N	NW
	ULS-combination	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	LC1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
2	W	0.7	0.4949						0.4949
3	E				0.4949	0.7	0.4949		
4	N						0.4949	0.7	0.4949
5	S		0.4949	0.7	0.4949				
6	Flare wind from W	0.7	0.4949						0.4949
7	Flare wind from S		0.4949	0.7	0.4949				
8	Flare wind from E				0.4949	0.7	0.4949		
9	Flare wind from N						0.4949	0.7	0.4949

UL1-b combination

Basic Loadcase	Primary Loads	W	SW	S	SE	E	NE	N	NW
	ULS-combination	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
1	LC1	1	1	1	1	1	1	1	1
2	W	1.3	0.9191						0.9191
3	E				0.9191	1.3	0.9191		
4	N						0.9191	1.3	0.9191
5	S		0.9191	1.3	0.9191				
6	Flare wind from W	1.3	0.9191						0.9191
7	Flare wind from S		0.9191	1.3	0.9191				
8	Flare wind from E				0.9191	1.3	0.9191		
9	Flare wind from N						0.9191	1.3	0.9191

Table 3-6 Load combinations ULS1

ULS 3-a combination

Basic Loadcase	Primary Loads	W	SW	S	SE	E	NE	N	NW
	ULS-combination	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1	LC1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
2	Ice	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3	W	0.7	0.4949						0.4949
4	E				0.4949	0.7	0.4949		
5	N						0.4949	0.7	0.4949
6	S		0.4949	0.7	0.4949				
7	Flare wind from W	0.7	0.4949						0.4949
8	Flare wind from S		0.4949	0.7	0.4949				
9	Flare wind from E				0.4949	0.7	0.4949		
10	Flare wind from N						0.4949	0.7	0.4949

UL3-b combination

Basic Loadcase	Primary Loads	W	SW	S	SE	E	NE	N	NW
	ULS-combination	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
1	LC1	1	1	1	1	1	1	1	1
2	Ice	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
3	W	1.3	0.9191						0.9191
4	E				0.9191	1.3	0.9191		
5	N						0.9191	1.3	0.9191
6	S		0.9191	1.3	0.9191				
7	Flare wind from W	1.3	0.9191						0.9191
8	Flare wind from S		0.9191	1.3	0.9191				
9	Flare wind from E				0.9191	1.3	0.9191		
10	Flare wind from N						0.9191	1.3	0.9191

Table 3-7 Load combinations ULS1

3.6 Safety Factors

In this thesis, the ULS –1 a/-b and ULS-3a/b is covered.

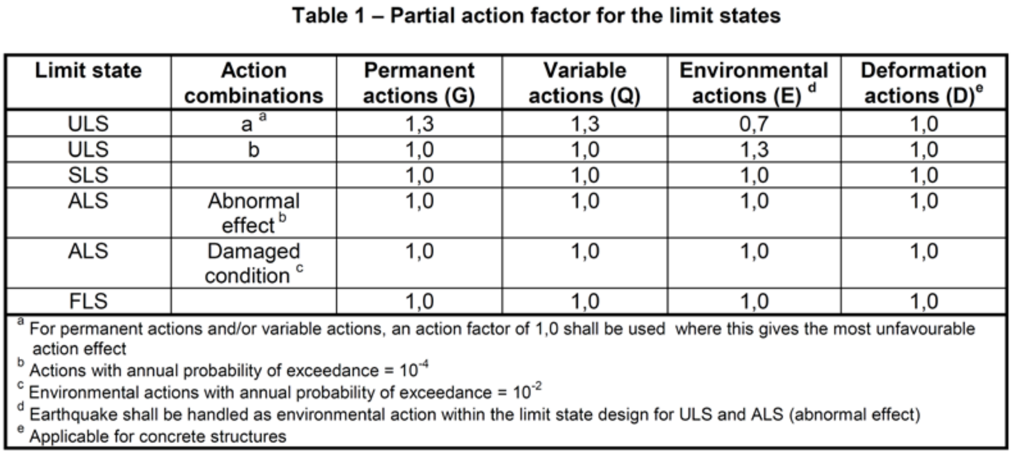


Table 1 – Partial action factor for the limit states

Limit state	Action combinations	Permanent actions (G)	Variable actions (Q)	Environmental actions (E) [d]	Deformation actions (D)[e]
ULS	a [a]	1,3	1,3	0,7	1,0
ULS	b	1,0	1,0	1,3	1,0
SLS		1,0	1,0	1,0	1,0
ALS	Abnormal effect [b]	1,0	1,0	1,0	1,0
ALS	Damaged condition [c]	1,0	1,0	1,0	1,0
FLS		1,0	1,0	1,0	1,0

[a] For permanent actions and/or variable actions, an action factor of 1,0 shall be used where this gives the most unfavourable action effect

[b] Actions with annual probability of exceedance = 10^{-4}

[c] Environmental actions with annual probability of exceedance = 10^{-2}

[d] Earthquake shall be handled as environmental action within the limit state design for ULS and ALS (abnormal effect)

[e] Applicable for concrete structures

Table 3-8 Partial factors [6]

3.7 Material Data

The material properties according to *EC3 1- 1, 3.2.6*, are:

Modulus of elasticity	$E = 210000 N/mm^2$
Density	$\rho = 7850 kg/m^3$
Poisson`s ratio	$\nu = 0.3$
Shear modulus	$G = 81\,000\ N/mm^2$

Yield strength for both plates and sections (which all are custom made/welded profiles) is according to EC3 1-1, table 3.1:

Yield strength $f_y = 420$ MPa

The material factor for ULS condition is according to *N-004, 6.1*.

Material factor $\gamma_m = 1.15$

According to [14] a buckling factor of 0.75 can be used for RHS. A more conservative approach is made, where the used factor is 0.8.

Material	Description	Yields strength [MPa]	Density [kg/m^3]	Young`s Modulus [MPa]	Poisson`s ratio	Thermal expansion Coefficient	Axial reduction
Mat1	Linear isotropic	420	7850	2.1	0.3	1.2e-005	-
Mat_shear*	Shear isotropic	-	10	2.1	0.3	0	100

Table 3-9 Material selection

Mat1 is used for all beams, whereas Mat_shear has been used for the plates in the global model. Further explanations for the plates is found in chapter 4.5.

3.8 Acceptance Criteria

The performed code check is based on [14].
Stress is calculated according to eq. 6.1 in [14].

General Von Mises [21] :

$$\sigma_j = \sqrt{\frac{1}{2}\left[\left(\sigma_{xx} - \sigma_{yy}\right)^2 + \left(\sigma_{yy} - \sigma_{zz}\right)^2 + (\sigma_{zz} - \sigma_{xx})^2\right]} + \sqrt{3\left[\left(\tau_{xy}\right)^2 + \left(\tau_{yz}\right)^2 + (\tau_{xz})^2\right]}$$

The design resistance becomes:

$$\sigma_j \leq f_y/\gamma_m$$

4 Methodology

4.1 General

The structural integrity of the topside needs to be checked for the inplace condition.
A finite element model is created in SESAM GeniE where the different loads are applied.
The topside needs to have sufficient capacity and to be able to withstand the loads it is exposed to.
The structure is to be analyzed and optimized for the ULS condition.
Several stiffening arrangements were tested.

4.2 Finite Element Method

Finite element analysis, FEA, is a method for numerical solution of field problems. Individual finite elements are visualized as small pieces of a structure, where they are connected at points called *nodes*. The arrangement of these elements is called a *mesh*. Although other numerical methods are available, FEA is still preferred due to its unique attributes, such as [20]:

- Not being geometric restricted
- Different components can be combined (i.e. a single FE model consisting of bar, beam, plate)
- Applicable to any field problem; from stress analysis to magnetic fields.
- Boundary conditions and loading are not restricted (i.e. in a stress analysis, any portion of a body may be supported, while distributed or concentrated forces may be applied to any other portion

4.2.1 SESAM GenieE

The code checking in Sesam Genie is based on finite element results, by the use of a two-noded 3D-beam, meaning that six d.o.f. are allowed per node: three translations and three rotations. The motions define the axial displacement, twisting and lateral deflection.

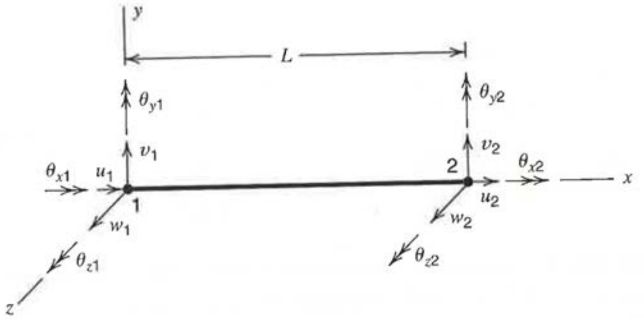


Figure 4-A Two- noded beam [20]

SESAM (*Super Element Structural Analysis Modules*) is a package consisting of several different modules for structural analysis, developed by DNV Software.
Sesam GeniE, which is used in this thesis, is a pre-processor for beam-/shell-/plate structures. It is a tool for designing and analyzing, where the concept model is independent of the analysis model. The loads applied are also applied independently of the analysis model, so GeniE allows changes in both design and loading conditions along the work process.
Using Sestra, GeniE runs a linear static analysis. Prior to the analysis, a finite element model needs to be generated. Beam forces, displacements, principal stresses, general plate stresses and diagrams are gained and presented per object. [35]
Wajac computes hydrostatic and hydrodynamic forces on fixed offshore frame structures due to wave and current, together with static or gust wind loads. It uses the Morison equation for computing the hydrodynamic loads on tubular members. [13]

The codechecking positions are determined by GeniE , so the positions vary from load case to load case, as the thre positions are:

- Beam ends, quarter and middle positions
- Positions where the section changes, ex. Material
- Positions where maximum in-plane and out- of –plane moments occur [36]

4.2.2 SESAM input

- Sesam Genie automatically uses the section capacity (depending on cross section class), this needs to be changed as the aim is to perform the code check only for the members in the elastic range only.

- The interaction factors, given in Annex A/B in EC3 depend on whether method 1 or 2 has been chosen and are applied to eq. 6.61 in EC3.

- The conservative approach in Eq. 6.2 is excluded, as EC3 states that a linear summation of the utilization ratios for each stress resultant *may be used.*

4.2.3 SESAM Units

The units used in Sesam Genie are as follows:

- Newton, N
- Metres,m
- Kilos,kg
- Celsius, C
- Stresses are given in MPa.

4.3 Conceptual Design

All data provided for the thesis is found in Appendix A. It is stated that there is no derrick and that all drilling operations are performed from a jack-up rig.
As it is necessary for further assumptions, it is assumed that the topside will be placed on a jacket.

Further search for similar topsides, led to the Gudrun topside, which was installed in 2013. [28] The dimensions have been used as guidance to some extent.

Figure 4-B Gudrun Topside [28]

Figure 4-C Gudrun Topside lift [28]

The Gudrun Topside, weighing 10.6 tons, was lifted by the world's largest crane vessel, Saipem 7000. [28]
In 2004, Saipem 7000 lifted the 72x66 m large and 12 150 tons heavy integrated deck, Sabratha, in the Mediterranean Sea. [29]

It has therefore been chosen to assume that the weight and the geometry of the topside are within the crane capacity, and the *integrated deck configuration* can be used.

An example of a cellar deck layout is presented in Figure 4-D.

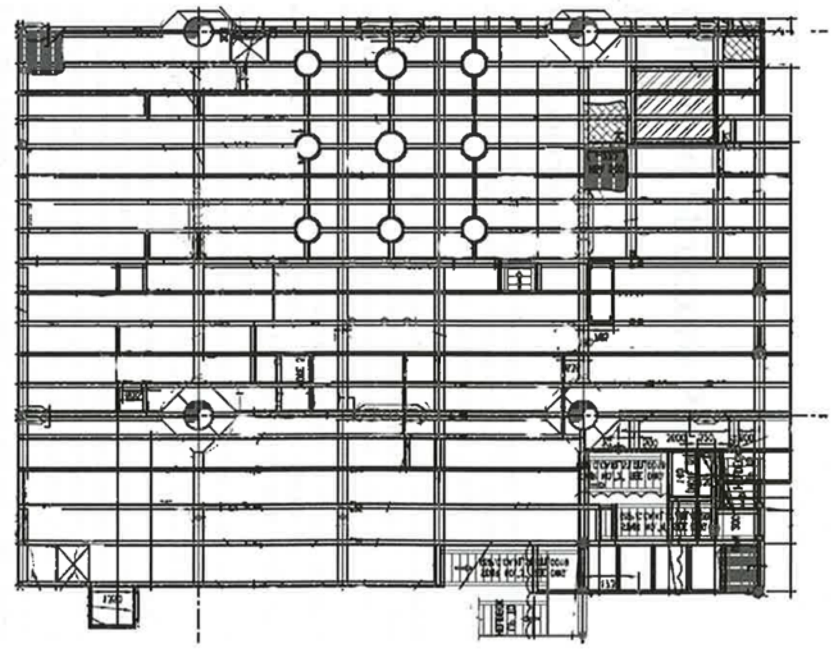


Figure 4-D Cellar deck layout [7]

The chosen dimensions are somewhat close to the Gudrun Topside and as there is no derrick, the *wellbay area* is lowered.

Further, the drawings for Statfjord B, available on [24] are used.
After several models, the final model is presented in Figure 4-E.

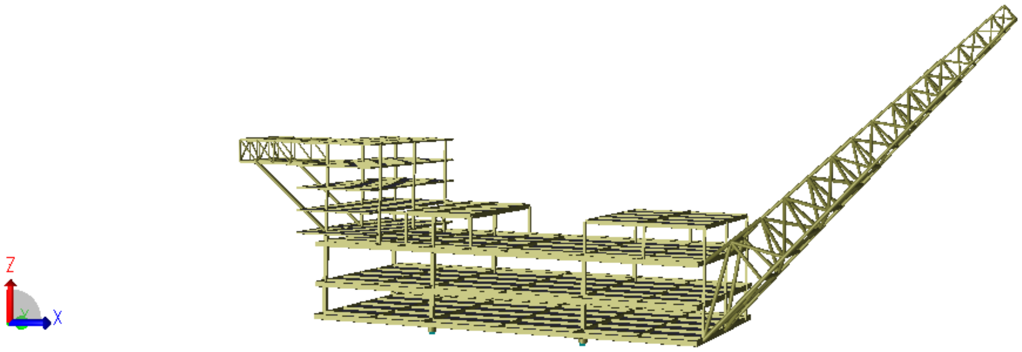


Figure 4-E Topside with no bracings

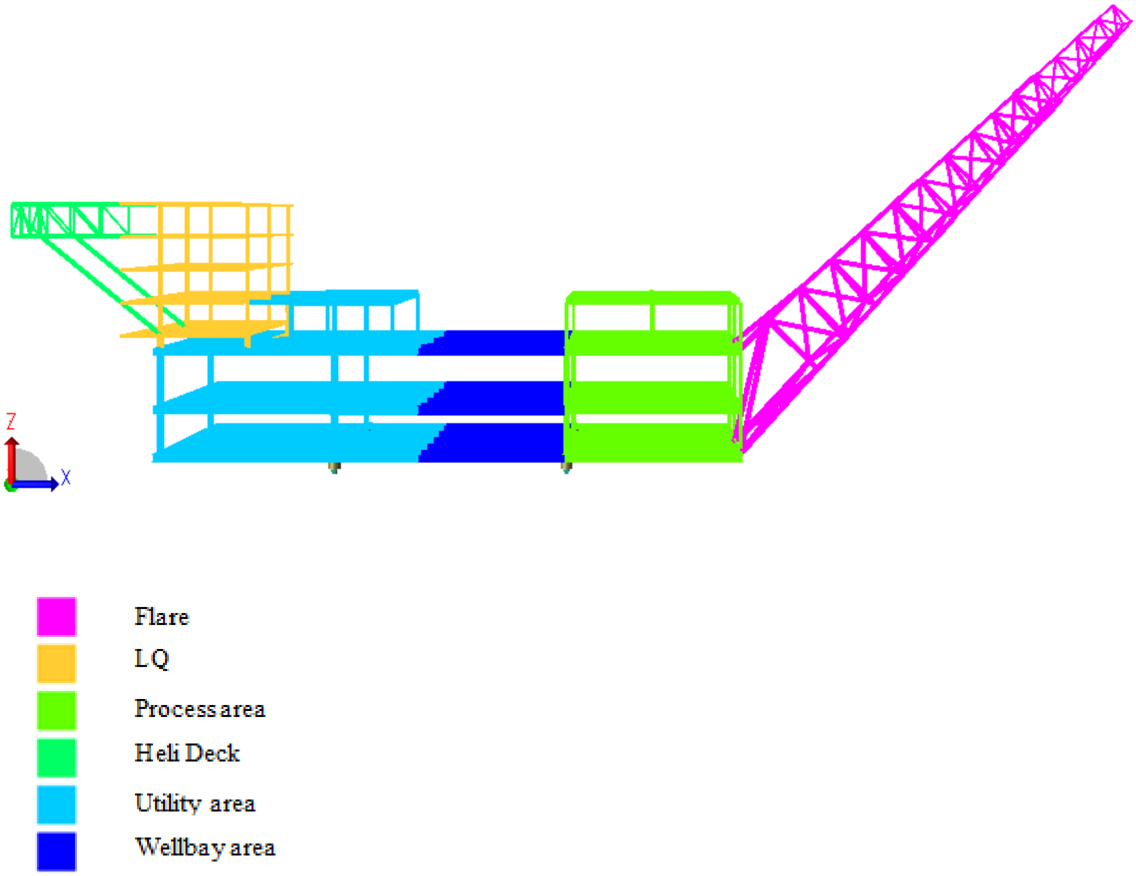


Figure 4-F Topside areas

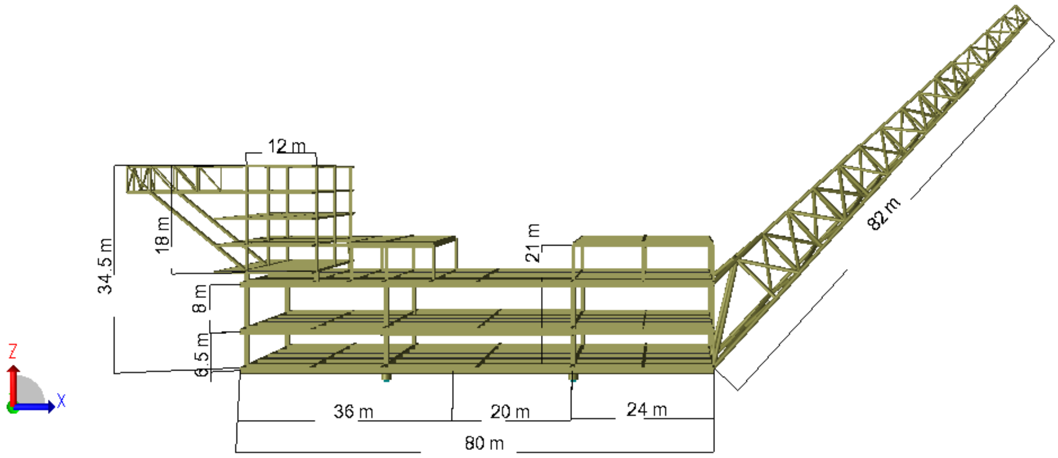


Figure 4-G Topside dimension

The topside dimensions are 80x36 m with the highest point of 34.5m, the other elevations are shown in Figure 4-5.
It consists of 4 decks:

- Cellar deck
- Lower main deck

- Upper main deck
- Weather deck

LQ is placed on the upper main deck. The interface with the jacket structure is 36x28m.

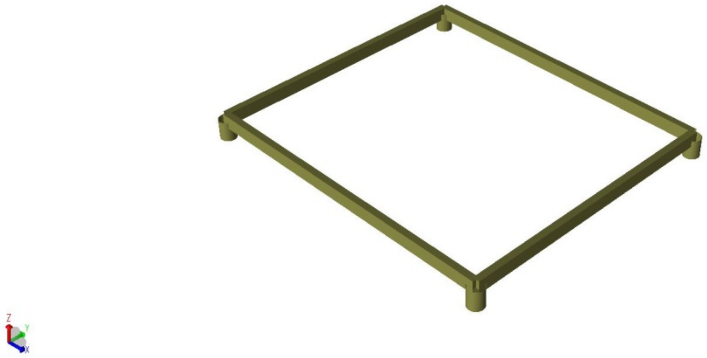


Table 4-1 Support points

4.3.1 Boundary conditions

The supports are fixed for translation in all directions.

4.3.2 Choice of cross sections

Considering the in-place condition only, the main loads are from the equipment and the self-weight.
It has therefore been chosen to use three types of profiles, namely HEB and RHS and SHS.

SHS/RHS are efficient in both axial compression and torsion, whereas the HEB are used as floor beams, as they are efficient in transverse loading. [32]

It has been chosen to use SHS for the bracings, although CHS is also widely used, especially for floaters, due to fatigue.
There are several structural advantages of RHS relative to CHS. Compared to CHS, RHS are used for columns and trusses, mainly for members loaded in compression or torsion. As they are rectangular (RHS) or square (SHS), they are also be easily welded to the flat face and to each other.
Erecting costs are also less for hollow section trusses, due to their great stiffness and lateral strength. A square hollow section has also about 2/3 of the surface are of the same I section, and if closed at ends, it only has four surfaces to be painted.

There are increased costs of using multiple sizes for the brace members, due to the material handling, so it is rather preferred to use the same size for a group of members, while varying the thickness. [32]

Using RHS/SHS is beneficial as it gives greater torsional rigidity to resist twist in the lift phase.
Hollow section have also two webs, so they have a greater resistance to bearing failure at point of high concentrated load/ or at supports. [31]

4.3.3 Stiffening Arrangements

Different truss systems have been tested, where it is chosen to present the four main types:

Warren, Howe, Pratt and X-bracing.

Type	Steel (kg)	Max Deflection LC1 (m)	Max Deflection ULS_1_a_090 (m)
Warren	$5.82185*10^6$	0.161392	0.209369
Pratt	$5.89499*10^6$	0.158883	0.206139
Howe	$5.89499*10^6$	0.17084	0.221272
X-bracing	$5.92967*10^6$	0.134692	0.173667

Table 4-2 Stiffening arrangements and deflections

There are no apparent differences between the four types of bracings. Both the amount of steel used and the deflections gained are somewhat equal.
It has been prioritized to choose a bracing system which would `focus`the weight transfer to the four supports and one that also would require minimum of weldings.

The Warren truss provides the most economical solution – the long compression brace members can take advantage of the RHS efficiency in compression. [32]
Warren arrangement has about half the number of brace members and the half the number of joints, compared to Pratt, resulting in cost and labor savings.

Warren trusses provide also the opportunity to use gap joints, and it also gives a more `open` truss, which is an important practical consideration when mechanical , electrical and other services need to be placed.

The different stiffening arrangements are shown in Appendix H.

4.3.4 Flare Tower

The relevant guidelines for the Flare Tower design are found in NORSOK N-001, chapter 8; *Design of various types of structures*. NORSOK N-003 along with DNV-RP-205 covers the environmental conditions and loads, whereas NORSOK N-004, with reference to DNV-OS-C101, covers the steel structure design.

A truss work of CHS is the most common flare tower design today.

This design contributes to a relatively light, but strong structure. However, it consists of a number of welded joints, which require a high welding quality. [7]

It is assumed that flare tower is welded to the deck.

Several truss systems have been tested, along with different CHS-profile, where the two main are:

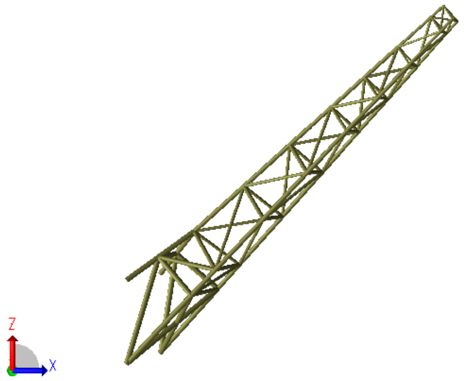


Figure 4-I Flare design A

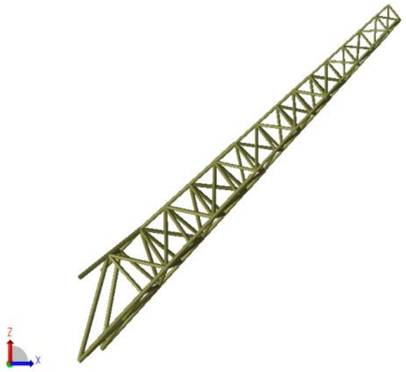


Figure 4-H Flare design B

One of the most important considerations to take into account when designing a flare tower is stated in N-001, that it should be designed with the objective to avoid ViV.

ViVs correspond to a *non-linear, amplitude dependent aerodynamic damping*, which do not cause immediate collapse of a structure, but cause fatigue. [30]

Fatigue due to ViVs and fatigue due to the large number of welds (where the largest stress concentrations occur) require a FLS- check. This has not been covered in this thesis.

The flare, which can be regarded as a cantilever beam, and should also be checked for deflections in the SLS- condition.

4.3.5 Limitations

Helicopter decks are designed according to NORSOK C-004, *Helicopter deck on offshore installations*.
It has not been performed a conceptual design of the helideck, although a simplified structure has been created.

4.4 Global and local coordinate system

The global coordinate system is as following: X is pointing to the east, Y is pointing to the north and Z is pointing upwards.

The y-axis is the strong axis and z is the weak axis for both the I-beam and the RHS. The bracings, which all are SHS are symmetric about both x-x and y-y axes.

4.5 Design of Global Members

The model includes all members contributing to structural strength.
Secondary steel is important in the load transfer to the main steel.
A weight report includes all primary, secondary and outfitting steel, whereas not everything is included in the conceptual model. This resulted in a lower weight than given in the report.
In order to achieve the wanted weight, the mass density has been scaled.
As it was difficult to distribute the load along the Flare-members, the mass have been scaled to include the equipment load. The weight of the shear plates has not been scaled.

Plates are modelled at the neutral axis. The elevations are placed in the centerline of the largest beam. Doing so, the beam eccentrities are neglected and the plates do not contribute to the bending stiffness of the beams, they only function as *shear plates* .

The plate material is shear material, where the density is 10 kg/m^3 and are applied a axial components reduced by a factor of 100 (the stiffness is 1/100 ; the plates are meant not to take any axial stress or bending)

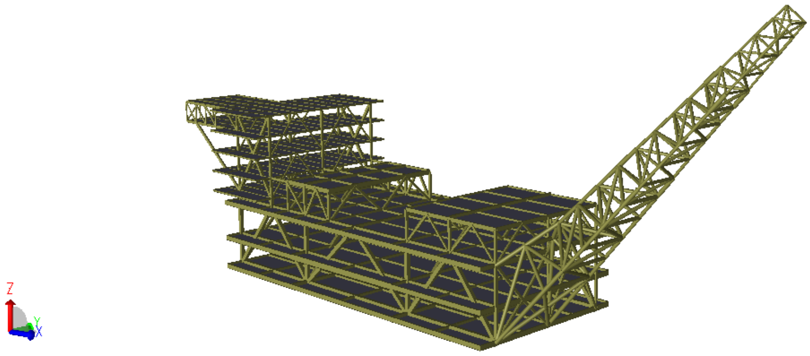


Figure 4-J Global beam model

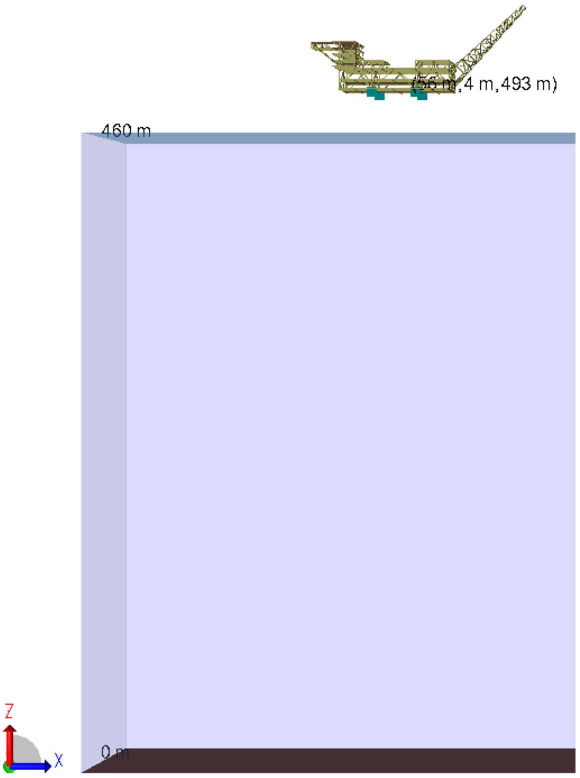


Figure 4-K Position in the global coordinate system

The chosen sections are based on some simple Colbeam-calculations, on input from and advice, but mostly trying and failing, as some workings of a truss system was unpredictable. The sections are presented in Table 4-3.

Member	Fabrication	Description	Height	Width	flange t.	web t.	d	t
B_1300_700	Welded	Box Section	1.3	0.7	0.05	0.05		
B_400_03	Welded	Box Section	0.4	0.4	0.03	0.03		
B_500_030	Welded	Box Section	0.5	0.5	0.03	0.03		
B_500_035	Welded	Box Section	0.5	0.5	0.035	0.035		
B_500_040	Welded	Box Section	0.5	0.5	0.04	0.04		
B_600_025	Welded	Box Section	0.6	0.6	0.025	0.025		
B_600_040	Welded	Box Section	0.6	0.6	0.04	0.04		
B_800_040	Welded	Box Section	0.8	0.8	0.04	0.04		
B_700_045	Welded	Box Section	0.7	0.7	0.045	0.045		
I_700_300	Hot rolled	I Section	0.7	0.3	0.017	0.032		
I_800_300	Hot rolled	I Section	0.8	0.3	0.0175	0.03		
I_1000_300	Welded	I Section	1	0.3	0.019	0.036		
I_1000_400	Welded	I Section	1	0.4	0.03	0.045		
I_1200_400	Welded	I Section	1.2	0.4	0.02	0.04		
I_1200_600	Welded	I Section	1.2	0.6	0.03	0.04		
I_1300_600	Welded	I Section	1.3	0.6	0.03	0.05		
P_1600_75	Welded	Pipe Section	1.6	1.6			1.6	0.075

Table 4-3 Sections used for the main structure

4.6 Joint Design

4.6.1 Ease of Fabrication

The global beam model with the plate placed in the neutral axis and with the incoming beams intersecting each other at the support points is a non- realistic version.

To create a more realistic model of the joint, the beams were moved to top of steel, the beam ends of the bracings were moved and the length of the CHS support changed, so a transition between SHS and CHS is possible.

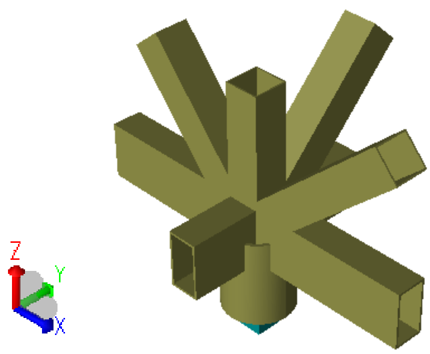


Figure 4-M Joint from the global beam model

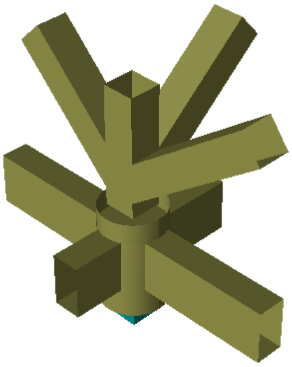


Figure 4-L Redesigned joint

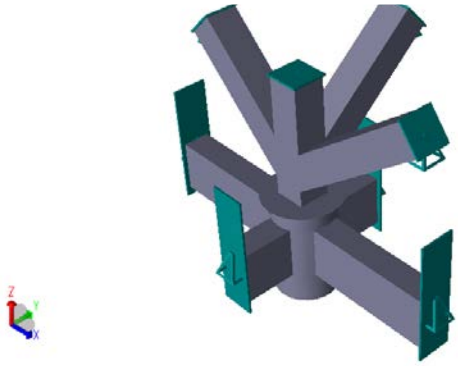


Figure 4-N Shell model of the joint

4.6.2 Sub-modelling Technique

The joint is reattached to the global model by using *rigid link support.* Rigid link is a connection between an independent point (master node) and dependent points (slave points). Rigid link is used in to make sure that there is a correct transition between a beam and a shell model. [34]

The rigid body behavior (flat planes remain flat planes) require that all the finite element nodes in the plane are dependent on the translation degrees of freedom of a dependent point. [34]

The boundaries need to be set for the master node. In order to achieve a correct behavior, the boundary conditions are set to free for all degrees of freedom. Volume needs to be specified for the independent points, making them `slaves`of the master node.

First order shell elements are used.

The local coordinate system is used of each beam to create a link.

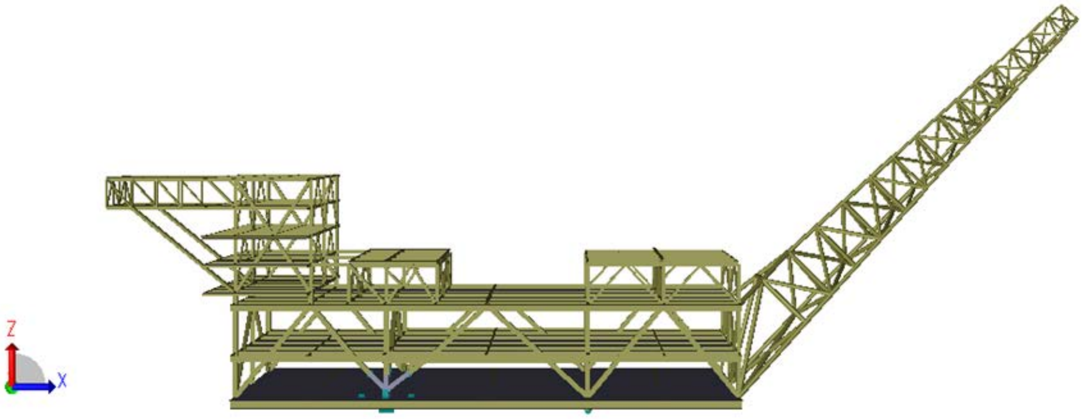


Figure 4-O Combined global beam model an shell joint

4.6.3 Estimation of Stress Concentration

The stress concentration factor, SCF, is highly dependent on the geometry of the joint. The factor is the applied to the nominal stress to reach the maximum stress at the hot spot and it primarily used in fatigue analysis, as the increase of local stresses can result in failure. Stress concentration is caused by geometric discontinuities. [7]
DNV-RP-C203 Fatigue Design of Offshore structures cover the fatigue analysis. The S-N curves should be used with the SCF gained when the mesh equal to t * t has been used.

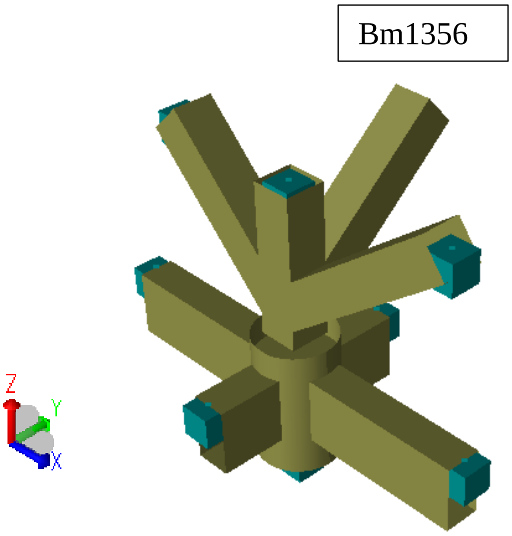


Figure 4-P Redesigned beam joint for SCF estimation

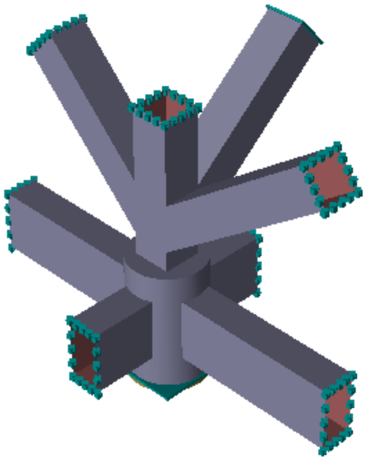


Figure 4-Q Shell model of the modified beam joint for SCF estimation

5 Results

5.1 General

All member checks have been done according to EC3. Flare members are checked according to NORSOK (tubular members).

All members were included in the code check (where some ~ 0.90 utilization factors are found in LQ), but it is chosen only to present the utilized members of the main structure.

All UFs below 1.00 are accepted and the five elements with the highest UF are presented.
LQ- utilization factors are presented in Appendix L.

5.2 Global Beam Model

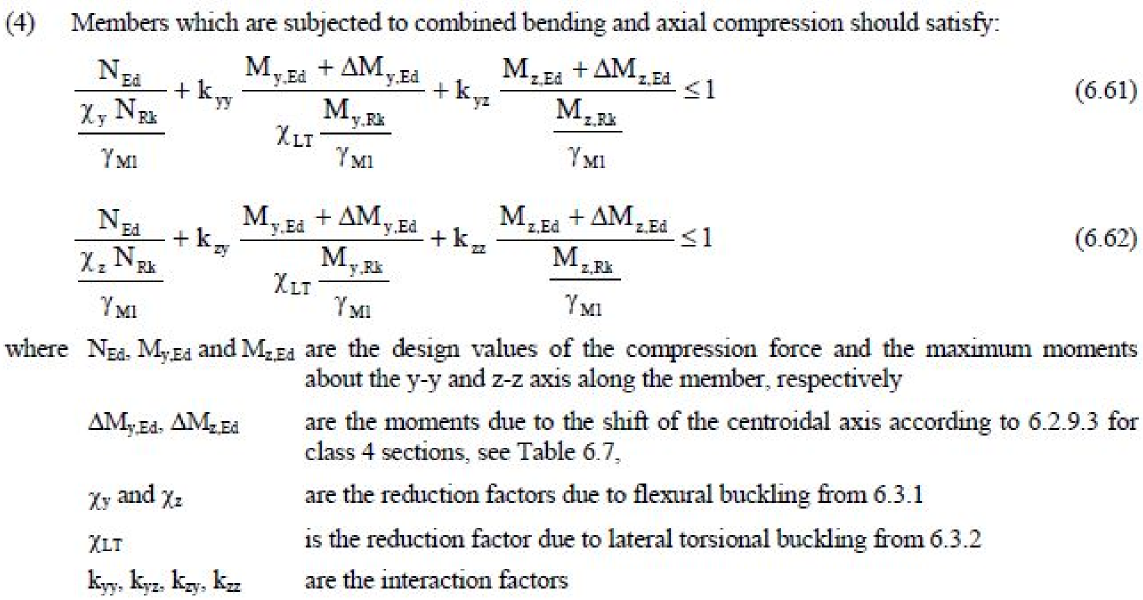
5.2.1 ULS-1

The maximum utilization factors are gained for these members:

Member	Loadcase	UfTot	Formula
Bm 1407	ULS_1_a_270	0.96	uf661
Bm 1403	ULS_1_a_090	0.93	uf661
Bm 1697	ULS_1_a_270	0.91	ufXSection
Bm 1633	ULS_1_a_135	0.88	uf662
Bm 1629	ULS_1_a_225	0.87	uf662

Table 5-1Max utilized Topside members due to ULS-1

It is to be noticed that the `opposite` load combination yields +/- 2% for the members.
For ex. for Bm 1407, which has an UfTot of 0.96 for 270°-wind, the ULS_1_a_090 combination gives an UfTot of 0.94.
The utilization factors for all members, except from Bm 1697, are found according to eq 6.61 and 6.62 in [14].



(4) Members which are subjected to combined bending and axial compression should satisfy:

$$\frac{N_{Ed}}{\frac{\chi_y N_{Rk}}{\gamma_{M1}}} + k_{yy}\frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT}\frac{M_{y,Rk}}{\gamma_{M1}}} + k_{yz}\frac{M_{z,Ed} + \Delta M_{z,Ed}}{\frac{M_{z,Rk}}{\gamma_{M1}}} \leq 1 \qquad (6.61)$$

$$\frac{N_{Ed}}{\frac{\chi_z N_{Rk}}{\gamma_{M1}}} + k_{zy}\frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT}\frac{M_{y,Rk}}{\gamma_{M1}}} + k_{zz}\frac{M_{z,Ed} + \Delta M_{z,Ed}}{\frac{M_{z,Rk}}{\gamma_{M1}}} \leq 1 \qquad (6.62)$$

where N_{Ed}, $M_{y,Ed}$ and $M_{z,Ed}$	are the design values of the compression force and the maximum moments about the y-y and z-z axis along the member, respectively
$\Delta M_{y,Ed}$, $\Delta M_{z,Ed}$	are the moments due to the shift of the centroidal axis according to 6.2.9.3 for class 4 sections, see Table 6.7,
χ_y and χ_z	are the reduction factors due to flexural buckling from 6.3.1
χ_{LT}	is the reduction factor due to lateral torsional buckling from 6.3.2
k_{yy}, k_{yz}, k_{zy}, k_{zz}	are the interaction factors

Figure 5-A Formulas used in the codecheck [14]

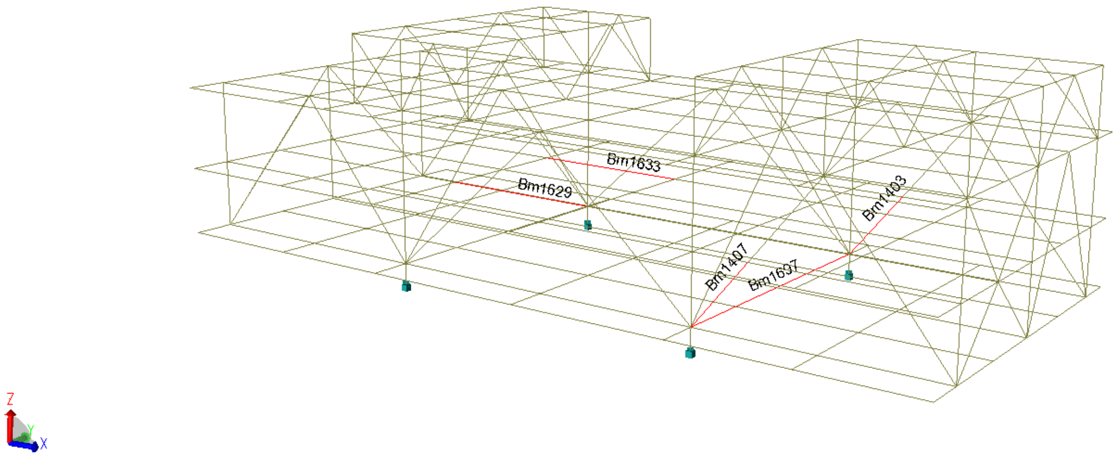


Figure 5-B Utilized members for ULS-1

The UfTot for Bm 1697 is found according to section 6.2.9 and 6.2.10 in [14].

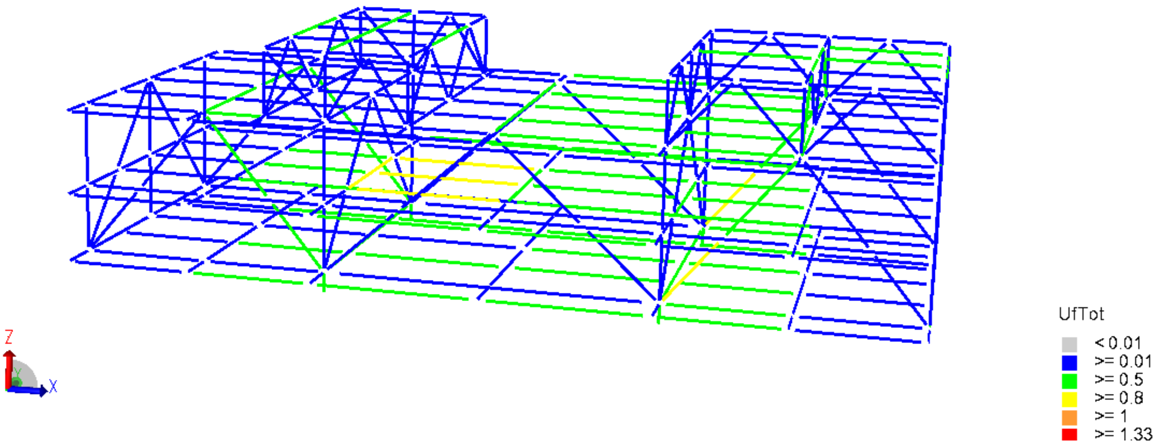


Figure 5-C Utilization factors for the main structure

Bm 1021,1058 and 1020 are checked according to eq. 6.28 in N-004, for tubular members subjected to combined axial compression and bending. Bm 1050 is checked according to 6.1, for tubular members subjected to axial tensile loads.

Member	Loadcase	UfTot	Formula
Bm1021	ULS_1_a_045	0.26	Uf6_28
Bm1058	ULS_1_a_045	0.25	Uf6_28
Bm1050	ULS_1_a_000	0.24	Uf6_1
Bm1059	ULS_1_a_090	0.24	Uf6_27
Bm1020	ULS_1_a_315	0.23	Uf6_28

Table 5-2 Max utilized Flare members due to ULS-1

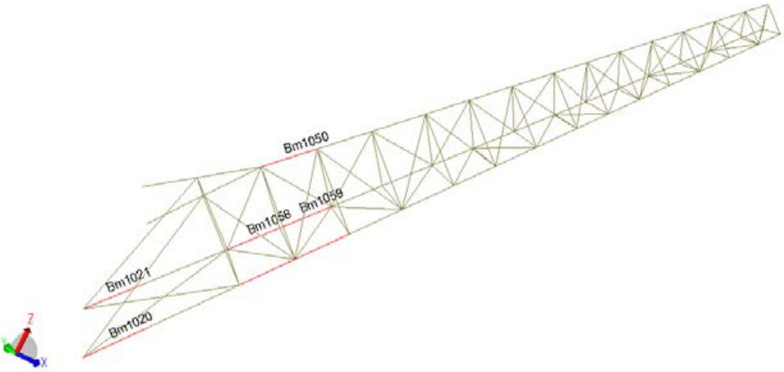


Figure 5-D Utilized Flare membersfor ULS-1

The two unnamed members (opposite of Bm1058 and Bm 1059) have an UF of 0.21 and 0.20, and are marked to show consistency in the UF for the flare (variation +/- 1%).

5.2.2 ULS-3

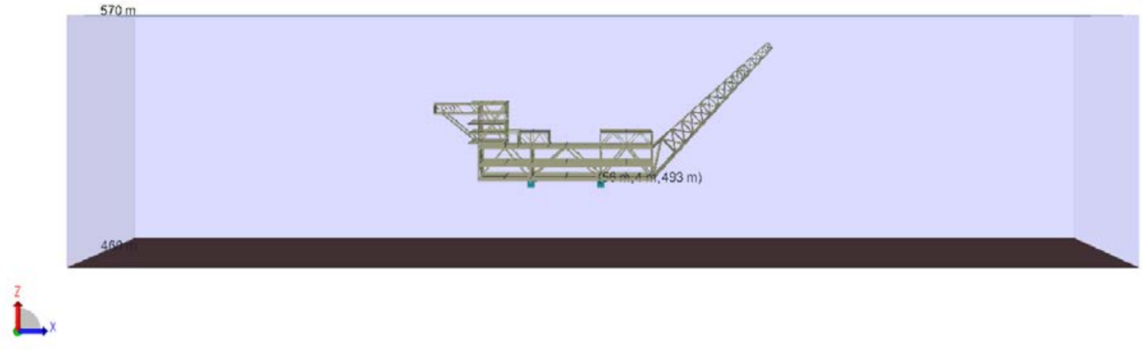


Figure 5-E Ice loads modelled as marine growth

Member	Loadcase	UfTot	Formula
Bm 1407	ULS_3_a_045	0.95	uf661
Bm 1403	ULS_3_a_045	0.93	uf661
Bm 1697	ULS_3_a_045	0.90	ufXSection
Bm 1633	ULS_3_a_045	0.87	uf662
Bm 1629	ULS_3_a_045	0.86	uf662

Table 5-3 Max utilized Topside members for ULS-3

Here, as in ULS-1, the variation is +/- for members of `opposite` combinations, but what can be noticed is that worst-case scenario in ULS-3 shifts 45° , compared to ULS-1. Bm 1407 with its max utilization for 90° and 270° in ULS-1, has a max utilization for 45° and 225° in ULS-3. This `shift` is assumed to be a result of the ice- load the flare is exposed to.

Member	Loadcase	UfTot	Formula
Bm1051	ULS_3_a_135	0.29	Uf6_42
Bm1050	ULS_3_a_045	0.25	Uf6_42
Bm1052	ULS_3_a_135	0.25	Uf6_42
Bm1021	ULS_3_a_135	0.24	Uf6_51
Bm1058	ULS_3_a_045	0.22	Uf6_51

Table 5-4 Max utilized Flare members for ULS-3

The flare members in the ULS- 3 condition are checked according to 6.42 for axial tension. Bending and *hydrostatic pressure*. The *hydro* conditions is due to the ice-loads which are applied as marine growth in GeniE. The option increases the diameter, which again increases the projected area , resulting in larger wind loads and higher utilization factors.

Ice load give a higher weight/ rougher surface, and as can be seen from the increase in UfTot.

The two unnamed members (opposite of Bm1021 and Bm 1058) have an UF of 0.21 and 0.20, and are marked to show consistency in the UF for the flare (variation +/- 1%).

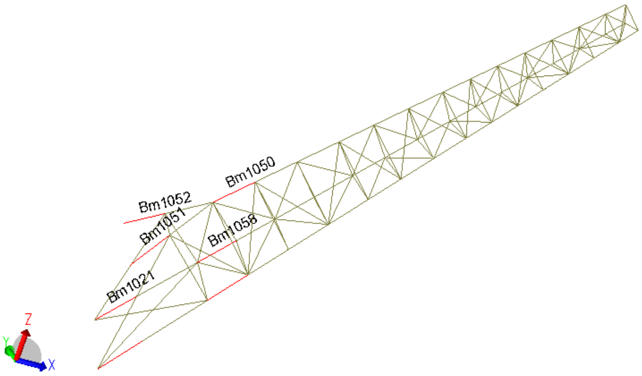


Figure 5-F Max utilized Flare members for ULS-3

The utilization factors for Flare members are shown in Figure 5-G.

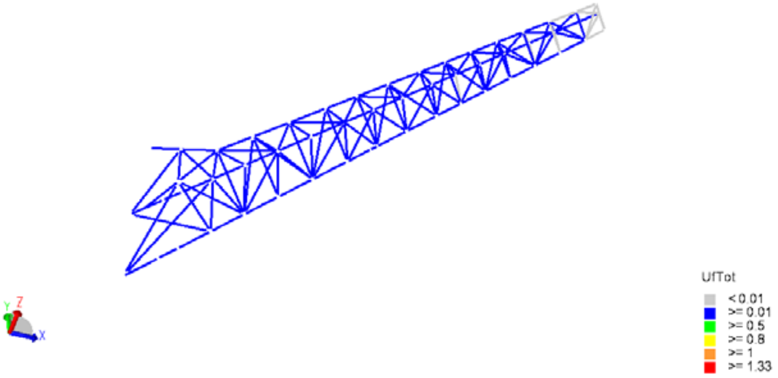


Figure 5-G Utilization factors for the Flare

5.2.3 SLS

The SLS check is précised in NORSOK N-001, 7.2.4. The material factor should be 1.0 for self-weight and equipment, whereas the environmental loads are not included.

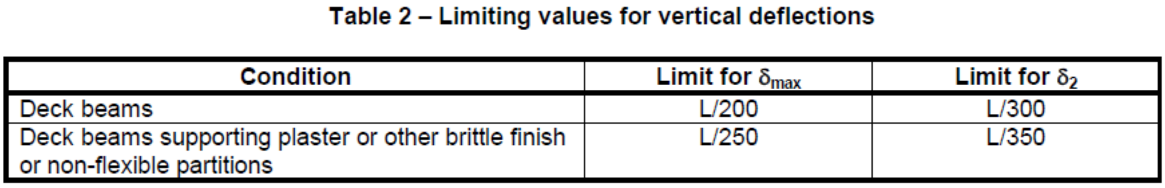


Table 2 – Limiting values for vertical deflections

Condition	Limit for δ_{max}	Limit for δ_2
Deck beams	L/200	L/300
Deck beams supporting plaster or other brittle finish or non-flexible partitions	L/250	L/350

Figure 5-H SLS-requirements [6]

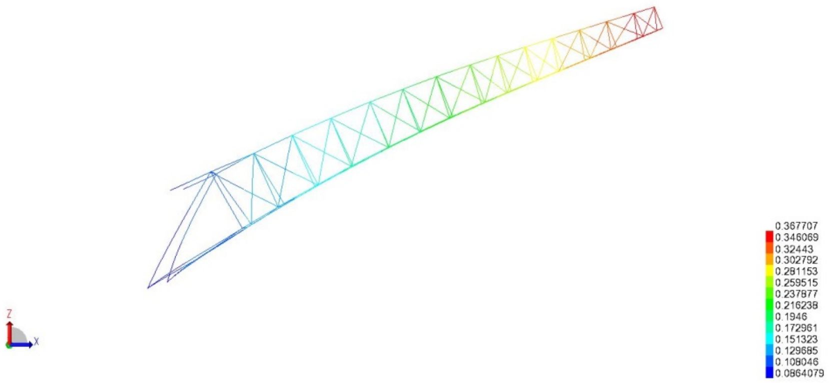


Figure 5-I SLS- check for the Flare

The Flare-tower can be considered as a cantilever beam, so the length, L, is taken as L= (84m*2)= 160m. This gives a deflection limit of : δ= L/250 = 0.672m > 0.331147m.

Utilizations are low for the ULS-check, but the Flare cross sections are based on the SLS-check, as the Flare Tower passed the first ULS-check, but failed for SLS.

All other topside members passed the SLS check.

All other topside members passed the SLS check., although the placement of the deck plate affects the results.

5.3 Joint Model

5.3.1 General

SESAM GeniE is able to do a joint check according to NORSOK N-004 (tubular to tubular joint). As SHS and RHS are used in this model, it was not possible to perform a joint check.

The joint check for the flare tower resulted in acceptable utilization factors, but several joints failed due to the geometry.

Chapter 6.4 in NORSOK N-004 gives the detail of a simple joint.
Several joint types are described in N-004, but for illustration, the simple K-joint is used, where the gap should be larger than 50mm and less than D. It is preferred that overlap of the welds at the toes of the joint is avoided.

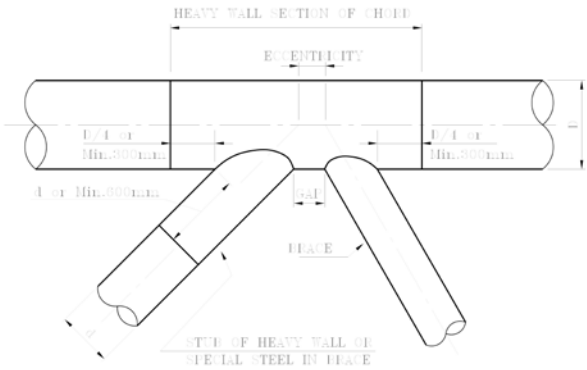


Figure 5-J Joint design according to NORSOK [5]

The joint resistance does not satisfy the equation for interaction for axial force and/or bending moment in the brace, the joints fail for the strength check according to N-004, eq. 6.57.

The joint design is not included in the conceptual phase, but as the joint configuration according to N-004 will require additional welding, the additional weight needs to be included in the weight report.

5.3.2 Local Joint Model

The remodeling resulted in, as expected, in a code check fail, as the load path has been changed. In the original model the beams were modelled with no accounting for local eccentricities. After applying the eccentricities – brace beam ends moved above the top of pipe column, (Ø1600).

The column failed in shear caused by brace axial loading (red marked beam in Figure 5-L). This beam was upsized from RHS 800x40 to RHS 800x85 and UF reduced to acceptable 0.73. Additionally local effects were marked (local stiffness) like bending of shell members, which could not be seen in the beam model, where beam-to-beam connection is defined. For that the local reinforcements were provided in order to better transfer forces (stresses) from beam to beam.

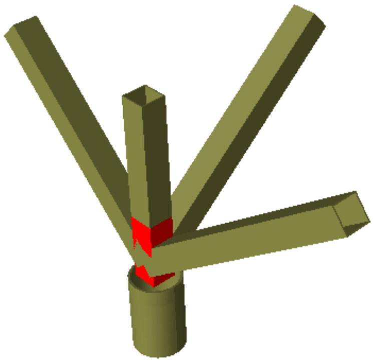
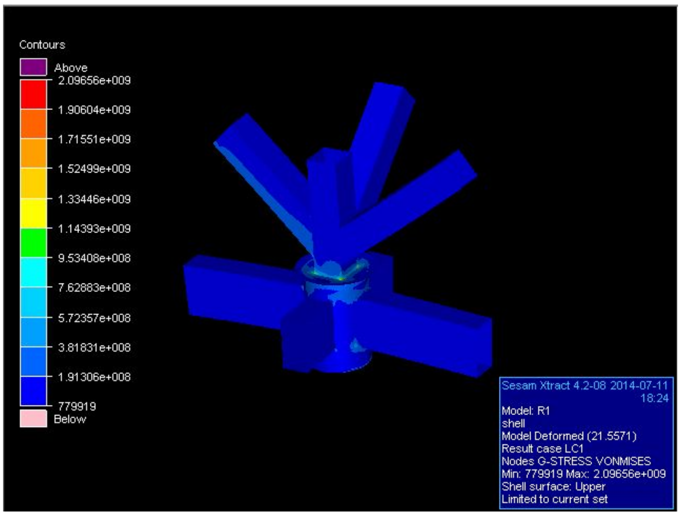


Figure 5-L Redesigned beam joint



Sesam Xtract 4.2-08 2014-07-11 18:24
Model: R1
shell
Model Deformed (21.5571)
Result case LC1
Nodes G-STRESS VONMISES
Min: 779919 Max: 2.09656e+009
Shell surface: Upper
Limited to current set

Figure 5-K Occuring stresses in the joint for loadcombination LC1

In between the box column (red member in Fig 5-L) and jacket interface pipe (Ø1600) the top plate (100mm) was modelled. Since no reinforcements were made in first approach – this plate was subjected to local bending and therefore high stress noted. That may be seen in figure 5-K. The highest VonMises stress is 2096.56 MPa.

In order to decrease the occurring stresses, the joint geometry has been changed, by adding plate reinforcements as shown in figure 5-M. These reinforcements are welded in the pipe section (Ø1600). They are designed to be in line with adjusted structural members.

The thickness equals the thickness used for the column.

The stress decreases to 632.98 MPa.

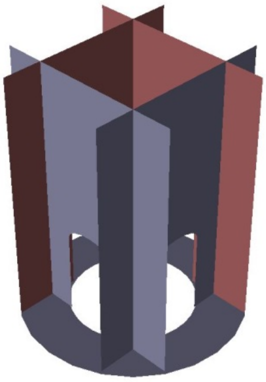


Figure 5-M Reinforced shellmodel with manholes

- Plates in line with hollow section above (red member in Fig. 5-L)
- Plates in line with deck beam webs.
- Lower ring in line with deck beam bottom flanges

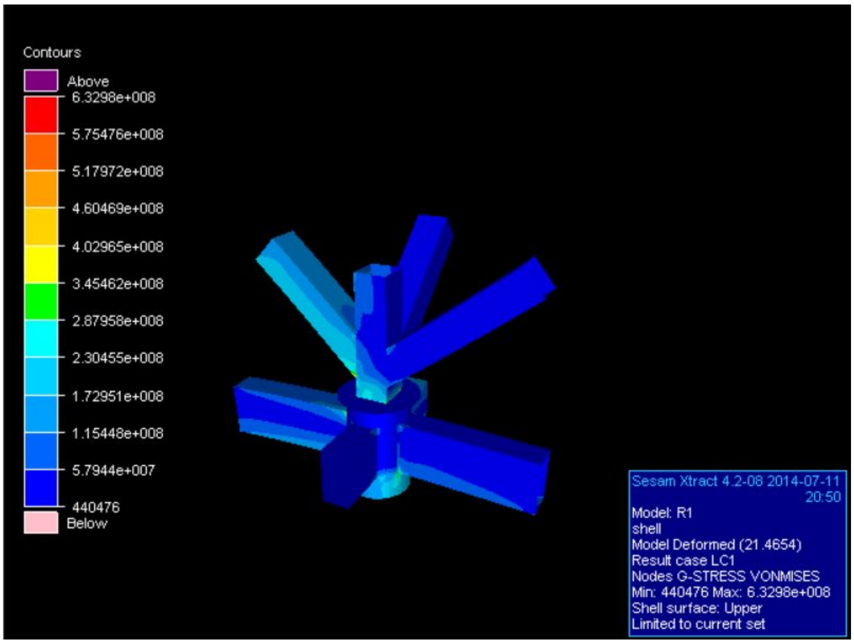


Figure 5-N Deformed shape of reinforced shell joint

5.3.3 SCF calculation

The simplified SCF`s gained from the two analysis are as follows:

a) SCF= Sigxx(Plate model)/ (Sigxx Beam model) = (737414/121011)= 6.1
b) SCF= Sigxx(Plate model)/ (Sigxx Beam model) = ($1.192*10^6$/121011)= 9.85

The results from the analysis and the meshing properties are found in Appendix M.

The displacements are more or less similar for the two models, but the occurring normal stresses are remarkably higher.

5.4 Combined Global Beam Model and Local Joint Model

Sum of loads in the *global* X,Y and Z-direction , along with sum of the local moments about the three axis and the sum of moments about the global X,Y and Z- axis from given loads and moments, is identical for all four models :

1. Global beam model (Model A)
2. Modified beam model (Model B)
3. Shell model (Model C)
4. Modified shell model (Model D)

Model A differs remarkably in the design, so in order to have comparable results; the Model B, Model C and Model D have been used. Figure 5-O shows the four supports for the topside where a comparison of reaction forces is done.

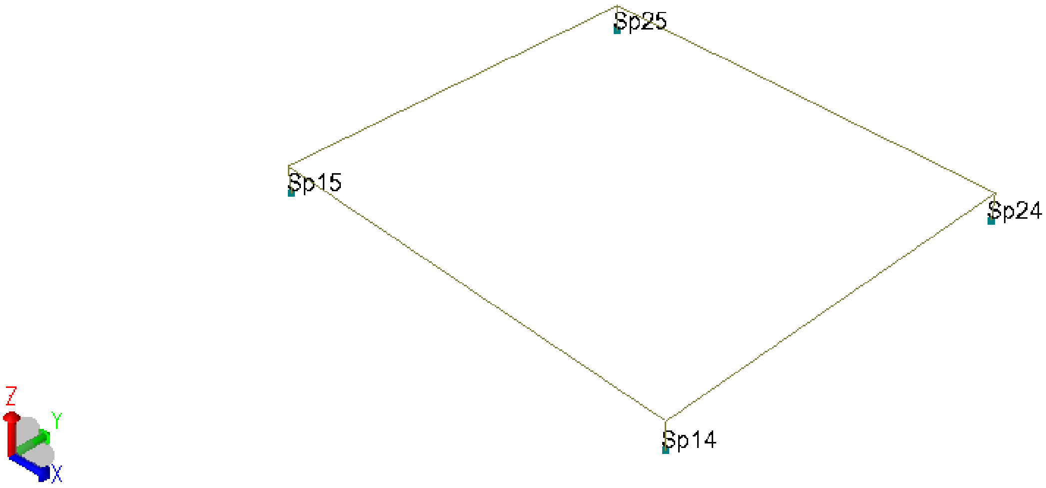


Figure 5-O The four support points for the topside

Selfweight and equipment loads (LC1) has the highest load value and is also the easiest loadcase to be used when reaction forces are compared, as F_Z is the major component.

Model	Sum of forces F_z[N]
Model B	-1.4344E+08
Model C	-1.4344E+08
Model D	-1.4344E+08

Table 5-5 Sum of forces in the vertical direction (Fz)

Model	Loadcase	Sp14 [N]	Sp15 [N]	Sp24 [N]	Sp25 [N]
Model B	**LC1**	$3.96113*10^7$	$3.33069*10^7$	$3.83246*10^7$	$3.21941*10^7$
Model C	**LC1**	$4.02321*10^7$	$3.24697*10^7$	$3.7818*10^7$	$3.29173*10^7$
Model D	**LC1**	$3.95889*10^7$	$3.3434*10^7$	$3.81991*10^7$	$3.22156*10^7$

Table 5-6 Vertical reaction forces (Fz)in the four supports

The vertical load for the global model is equal for all three models.
The local joint shellmodel is placed at Sp15 in Model C and D.
The reaction is smallest in Model C, as it modelled with shell elements, with no stiffening plates, which gives a flexible joint. The forces are transferred to other, stiffer supports. Modelling the joint with shell elements, and stiffening the joint (Model D), the reaction forces are approaching the values gained in Model B.

The results are outlined and can be found in Appendix O-Q Table 5-6 shows the node number for the different support points.

Model	Sp14 [N]	Sp15 [N]	Sp24 [N]	Sp25 [N]
	Node no. in Sestra	Node no. in Sestra	Node no. in Sestra	Node no. in Sestra
Model B	15328	15120	15425	15180
Model C	33409	33210	33506	33264
Model D	34442	34243	34539	34297

Table 5-7 Node no. for the four supports

In order to compare the 3 models additional check was made. The axial force in the beam (neg. value for compression) between Sp14 and Sp15 was compared. In Figure 5-Q the force for models B, C and D is shown.
Shell elements show the local deformations and stresses, which are not possible to detect in the beam model.

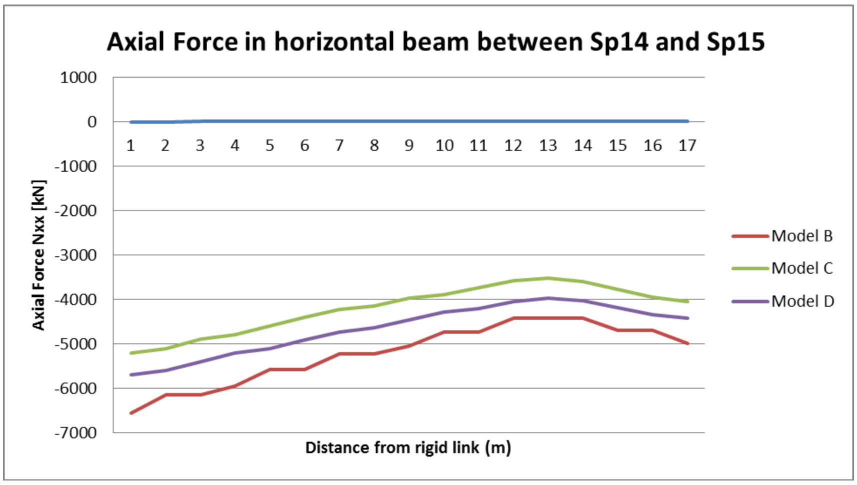


Figure 5-P Axial force in the horizontal beam between Sp14 and Sp15

As may be seen in figure 5-Q the smallest axial load in the beam is for model C. Again – this is a result of local flexibility of the joint model. In model C the joint was modelled with no local reinforcements, hence joint is flexible and not resisting local deflections. Hence lower response load is generated in this beam. After reinforcing the joint (Model D) the load value generated in the beam is increased.

5.5 Results Summary

Model A represents beam concept modelling. In such model the general overall beam system is examined. However when updating this model with local joint offsets, eccentricities – one may identify local problems – that is covered by Model B. In this model by simple moving the braces above the deck plate, local shear effects appear in vertical column (Box 800x40) between brace connection point and the deck beams. The beam needed to be reinforced to Box 800x85 in order to accommodate shear stress caused by loads from braces above the deck.
Still – Model B is built on beam members. In such model no local effects like local bending of the shell plate may be seen. So when Model C was built, based on similar to Model B geometry local effects were included. This model intentionally was built as simple as possible, with no local reinforcements and therefore very high peak stress was gotten (Von Mises stress of 2096.56 MPa). In order to reduce the high peak stress in the joint, the new model was made (Model D) where in line with incoming beams local reinforcements were provided. In this model stress was reduced to 632.98 MPa (very local peak stress) . In the above sequence typical design approach is presented. In early concept stage the beam concept model is built with higher contingency factors for the weight. When design development progresses – the more refined models (local) are built while weight contingency factors are reduced.
In ULS, local plastic deformation occurs; which can be acceptable; this is to be evaluated further, ref. DNV-OS-C101 A 400 Yield check; 402.

Additional remark is also made on the impact of local stiffness of joints onto results. As per NS-EN 1993-1-1, section 5.2.1 Joint modelling: "(1) The effects of the behaviour of the joints on the distribution of internal forces and moments within a structure, and on the overall deformations of the structure, may generally be neglected, but where such effects are significant (such as in the case of semi-continuous joints) they should be taken into account, see EN 1993-1-8." As this thesis has shown the flexibility may impact the load distribution, where for flexible joints the impact is higher. Where the joint (Model D) was reinforced with additional reinforcements the load distribution was in general close to the beam model (Model B).

6 Conclusions

6.1 Summary

The aim of this thesis is to perform a conceptual design of a topside structure, which has the capacity to resist the loads it is exposed to, given in the weight report and the selected environmental loads.
Further, the topside is optimized for the governing condition.

The results from ULS-1 a/b and ULS-3 show that the topside has sufficient capacity for ULS-1 a/b and ULS-3 a/b.In both cases, the condition *a* is governing. This can also be easily assumed as the permanent loads are much larger than the wind loads.
In appendix J, it is seen that the utilization factor for the most utilized beam, Bm1407 is 0.73 for LC1 and 0.96 for the load combination ULS-a.
Due to the action factors, the ULS-a condition will govern for conditions with large permanent loads and the ULS-b for more extreme environmental conditions.
Worst-case combinations for the members shifted in ULS-3a, compared to ULS-1a, as the conditions for the flare tower changed (increment of the projected area)

The remodeling of the local joint resulted in a sharp angle, which could have been avoided if the local joint design was taken into account from the beginning.
Bm2 in Figure 6-A shows the angle the brace would have had if this was done.

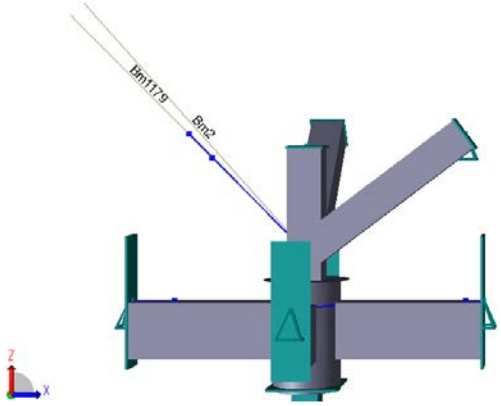


Figure 6-A Suggested modification for the beam model

The Warren truss, which consists of equilateral triangles, creates equal angles at each joint. In this case, the angles differed by 8° at its most (between well bay and utility area), which causes an uneven force distribution.
This affected also the redefined joint at Sp15, and the shear in the plate, thereafter in the column, after stiffening the joint.

The stiffness affects the force transmission, and redesign of one joint does not necessarily give the realistic picture, as that support joint becomes more flexible than the 3 other.
All joints should be redesigned and the deck plate should be moved from the centerline to the top of steel .This would give a more realistic picture of the stiffness.

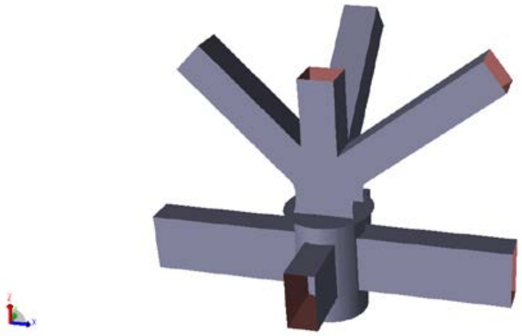


Figure 6-B Shell model with brackets

Adding brackets would increase the area and the sharp transmission would be avoided. This would decrease the local stresses, and lower the SCF to more acceptable values. Ring stiffener may be added to the top flange.

It should be stated that one should be careful with redefining the mesh size as the results gained will vary in magnitude and careful observation needs to be done, through convergence/ singularity tests.
As the mesh is more refined near the sharp corners, the stresses occurring are non-convergent, due to the singularity in the model. [20]

6.2 Topside Design Process

As seen in the Sestra-files, there are several warnings of warped elements and bad element shape. This reduces the accuracy significantly.
Weeks have been spent making the combination-model work and the meshing has been sensitive to any change. It resulted in errors in elements placed far from the shell element, although, no obvious element discontinuity was observed.
It was also tried with controlling the mesh by the use of control lines, the mesh transition zone and element types.
From the advice of my supervisor, DNV Software was contacted. Per 12.07.14, no answer was received.

The results gained, are by the use of the *Sesam quad mesher* (which divides the surfaces into patches an creates a mesh based on these)
0.1m mesh density and quadrilateral shell with 1st order elements have been used.
1st order triangular elements are stiffer and gave lower stress sharp areas.
As there are sharp edges in the model, a 2nd order element would result in higher stresses around these areas and a more refined mesh around some areas.

This considered, it can be assumed that the real stresses are higher than the ones gained.

6.3 Further Work

Depending on whether it would be a prolongation of the thesis or a complete analysis of a topside, different check are to be included.

For accurate results in this thesis, it would be necessary with:

- Redesign all joints and do a joint check
    - Although no detail calculation is necessary, joint modification should be done, by adding gaps for example, as it is highly important to predict the joint behavior for further analysis
- Design and analysis of the LQ lower support point/ node.
- Redundancy: Loss of critical members
- ULS
    - The conceptual design of the global beam model was made and optimized for the ULS 1 a/b and ULS3, however, not all actions were included. Horizontal accelerations, due to wave loads need to be added, along with accelerations due to earthquake loads.
    - Snow Loads (although almost neglectable compared to other loads)

Otherwise:

- ALS
    - Accidental loads
    - Fires and explosions
    - Impact loads
        - Vessels in service to/from installation
        - Dropped Objects

- FLS
    - Fatigue analysis needs to be performed for the flare
    - Main supports

7 References

1. http://www.ptil.no/role-and-area-of-responsibility/category916.html

2. Jacket Handbook part1 Det Norske Veritas (1984)

3. DNV-RP-205 “Environmental conditions and environmental loads”

4. NORSOK N-003 Actions and action effects (2007). Standards Norway.

5. NORSOK N-004 Design of steel structures (2014). Standards Norway.

6. NORSOK N-001 Integrity of offshore structures (2012). Standards Norway.

7. El-Reedy, A. Mohamed (2012) Offshore Structures: Design, Construction and Maintenance. Elsevier (Gulf Professional Publishing). ISBN 978-0-12-385475-9

8. Chakrabarti, K. Subrata (2005) Handbook of Offshore Engineering Volume II .Elsevier. ISBN 0 08 044569 1

9. **http://www.offshore-technology.com/projects/britannia/britannia3.html**

10. Gerwick, C. Ben, Jr. (2007) Construction of marine and offshore structures. Taylor& Francis Group (CRC Press). 3rd edition. ISBN 978-0-8493-3052-0
11. Chakrabarti, K. Subrata (2005) Handbook of Offshore Engineering Volume II

12. http://www.lundin-petroleum.com/eng/Development_EdvardGrieg.php

    (verifisert 12.06.14)
13. Wajac use manual
14. EN 1993-1-1 Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings
15. http://www.iec.ch/standardsdev/publications/is.htm (verified 06.07.14 00:19)
16. https://www.cen.eu/about/Pages/default.aspx (verified 06.07.14 00:19)
17. http://standards.cen.eu/dyn/www/f?p=CENWEB:5 (verified 06.07.14 00:19)
18. *https://www.standard.no/en/sectors/energi-og-klima/petroleum/norsok-standards/#.U7gcmfl_s-I* (verified 06.07.14 00:19)
19. http://exchange.dnv.com/servicedocuments/dnv/ (verified 06.07.14 00:19)

20. Cook, D. Robert; Malkus, S. David; Plesha, E. Michael; Witt, J. Robert (2002) Concepts and applications of finite element analysis. John Wiley & Sons.Inc. 4th edition. ISBN 978-0-471-35605-9.

21. Boresi, Arthur; Schimdt, Richard (2002) Advanced Mechanics of Materials. . John Wiley & Sons.Inc. 6th edition.ISBN 978-0-471-43881-6

22. http://www.npd.no/en/Regulations/Acts/Petroleum-activities-act/

23. http://www.iso.org/iso/home/standards.htm

24. Odland, Jonas (2012) Lecture notes in Offshore Field Development

25. Chakrabarti, K. Subrata (2005) Handbook of Offshore Engineering Volume II

26. http://nom.nb.no/eng/The-Field/

27. Provided at DNV

28. http://www.statoil.com/no/NewsAndMedia/News/2013/Pages/19Jul_Gudrun.aspx

29. http://www.saipem-india.com/ProjectOffshore.asp

30. Jakobsen, B. Jasna (2011) Lecture notes in Enviromental Loads

31. Offshore Topside Modules- The Benefits of Using Structural Hollow Sections, The Steel Institute

32. Packer,J.A; Wardenier, J; Zhao, X.-L; van der Vegte, G.J; Kurobane, Y. (2009) Design Guide for rectangular hollow sections (RHS) joints under predominantly static loading. LSS Verlag. 2nd edition. ISBN 978-3-938817-04-9

33. http://www.npd.no/en/Topics/Seismic/

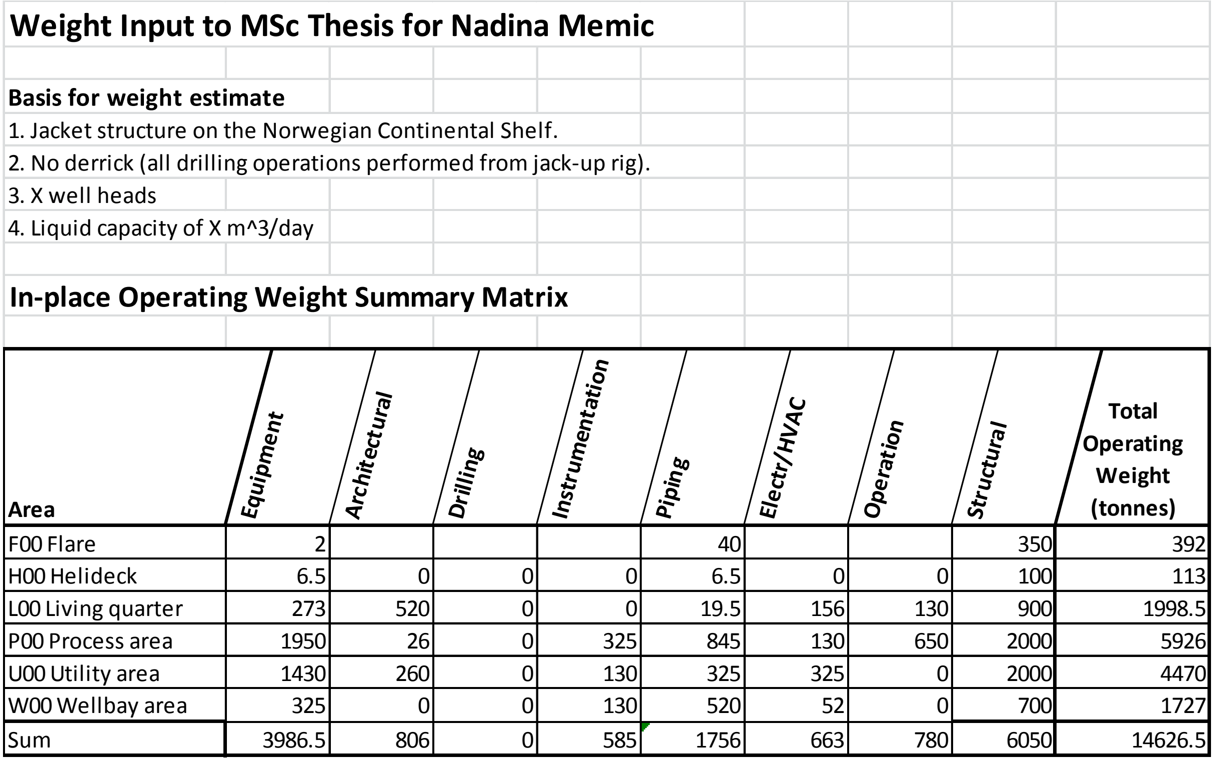
34. Sesam GeniE user manual. Vol III; Modelling of plate/shell structures

35. Sesam GeniE user manual Vol1; Concept engineering

36. Sesam GeniE user manual Vol4 Beam code checking

8 APPENDIX

A. *Weight Report*



Weight Input to MSc Thesis for Nadina Memic

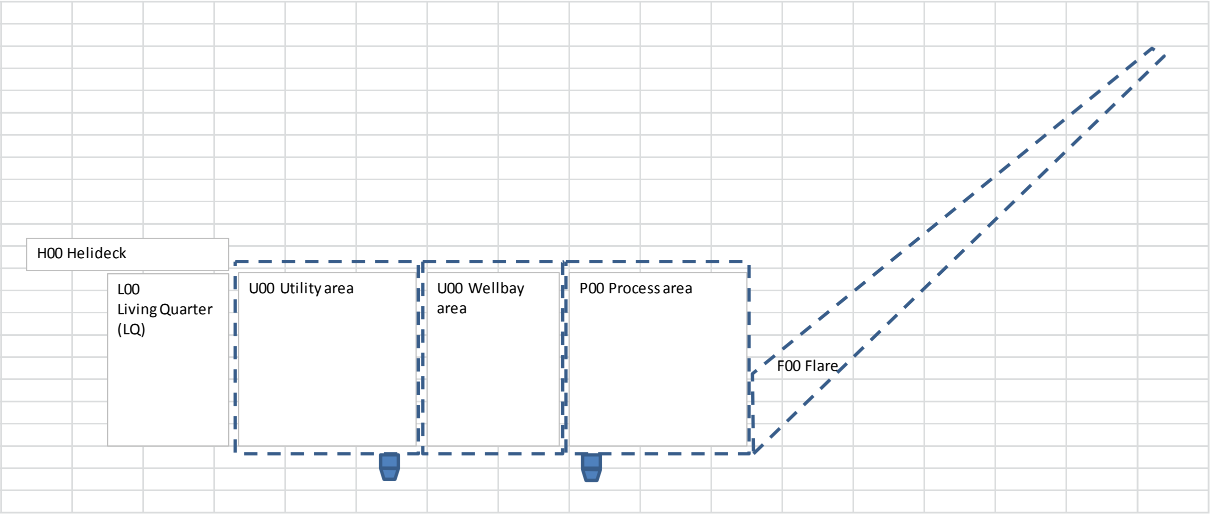
Basis for weight estimate

1. Jacket structure on the Norwegian Continental Shelf.
2. No derrick (all drilling operations performed from jack-up rig).
3. X well heads
4. Liquid capacity of X m^3/day

In-place Operating Weight Summary Matrix

Area	***Equipment***	***Architectural***	***Drilling***	***Instrumentation***	***Piping***	***Electr/HVAC***	***Operation***	***Structural***	**Total Operating Weight (tonnes)**
F00 Flare	2				40			350	392
H00 Helideck	6.5	0	0	0	6.5	0	0	100	113
L00 Living quarter	273	520	0	0	19.5	156	130	900	1998.5
P00 Process area	1950	26	0	325	845	130	650	2000	5926
U00 Utility area	1430	260	0	130	325	325	0	2000	4470
W00 Wellbay area	325	0	0	130	520	52	0	700	1727
Sum	3986.5	806	0	585	1756	663	780	6050	14626.5

Appendix A-1 Weight Report

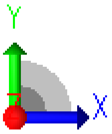


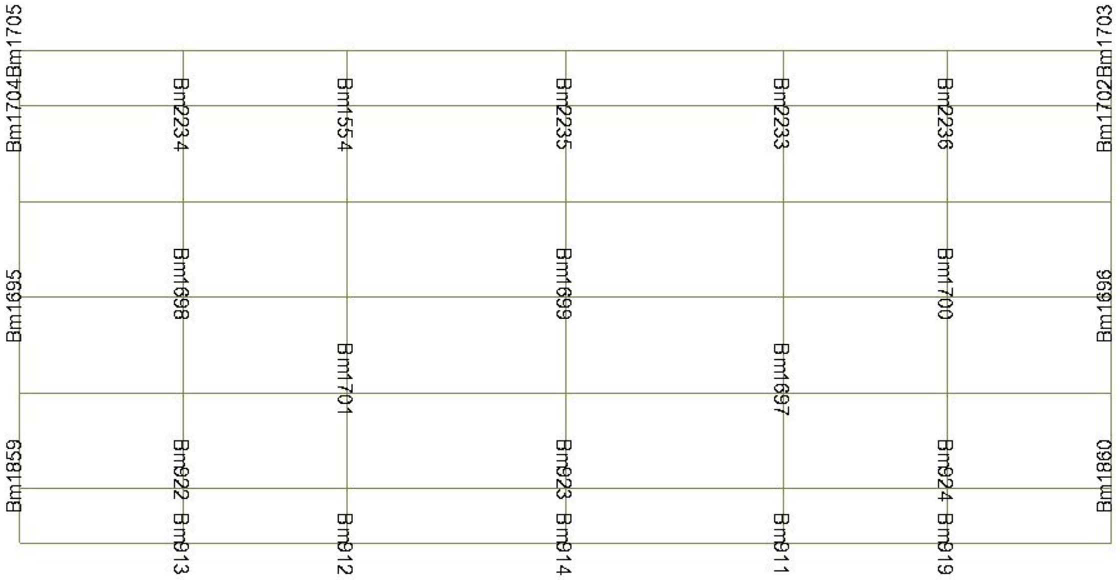
Appendix A-2 Sketch of a topside

B. Weight distribution

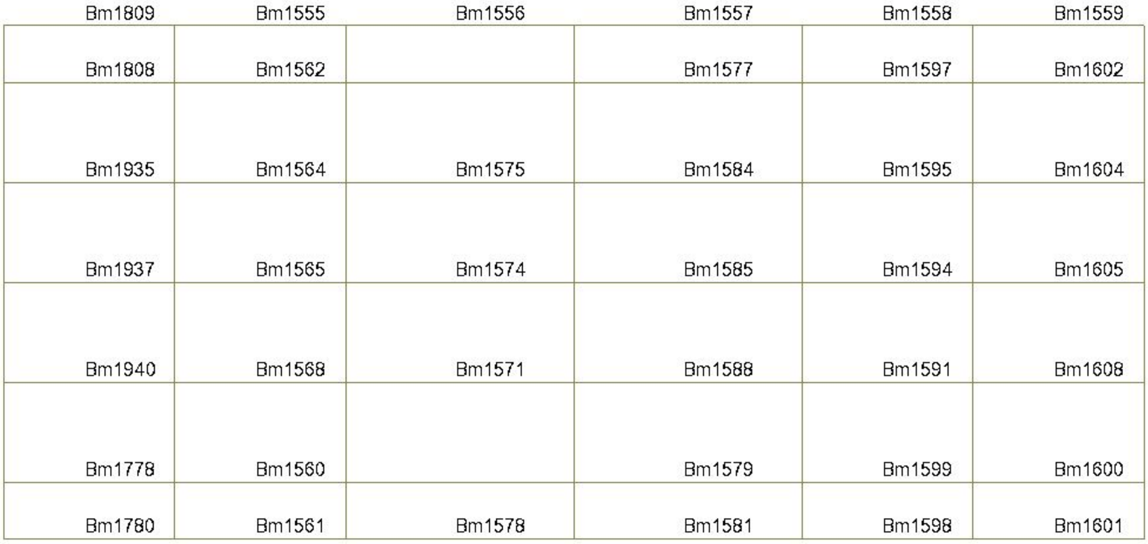
Area	**Cellar Deck**	**Lower Main Deck**	**Upper Main Deck**	**Weather Deck**	
P00 Process area					
Equipment	30	15	15	40	
Architectural	60	40	-	-	
Drilling	-	-	-	-	
Instrumentation	70	30	-	-	
Piping	70	30	-	-	
Elec/HVAC	40	30	30		
Operation	-	30	30	40	
Structural	-	-	-	-	
U00 Utility area					
Equipment	5	45	25	25	
Architectural	60	40	-	-	
Drilling	-	-	-	-	
Instrumentation	70	30	-	-	
Piping	70	30	-	-	
Elec/HVAC	40	30	30	-	
Operation	-	-	-	-	
Structural	-	-	-	-	
W00 Wellbay area					
Equipment	-	-	100	-	
Architectural	-	-	-	-	
Drilling	-	-	-	-	
Instrumentation	70	30	-	-	
Piping	70	30	-	-	
Elec/HVAC	50	50	-	-	
Operation	-	-	-	-	
Structural	-	-	-	-	
L00 LQ	**1st deck**	**2nd deck**	**3rd deck**	**4th deck**	**5th deck**
Equipment	25	25	25	25	-
Architectural	25	25	25	25	-
Drilling	-	-	-	-	-
Instrumentation	-	-	-	-	-
Piping	100	-	-	-	-
Elec/HVAC	25	25	25	25	-
Operation	25	25	25	25	0
Structural	-	-	-	-	-

C. Geometry

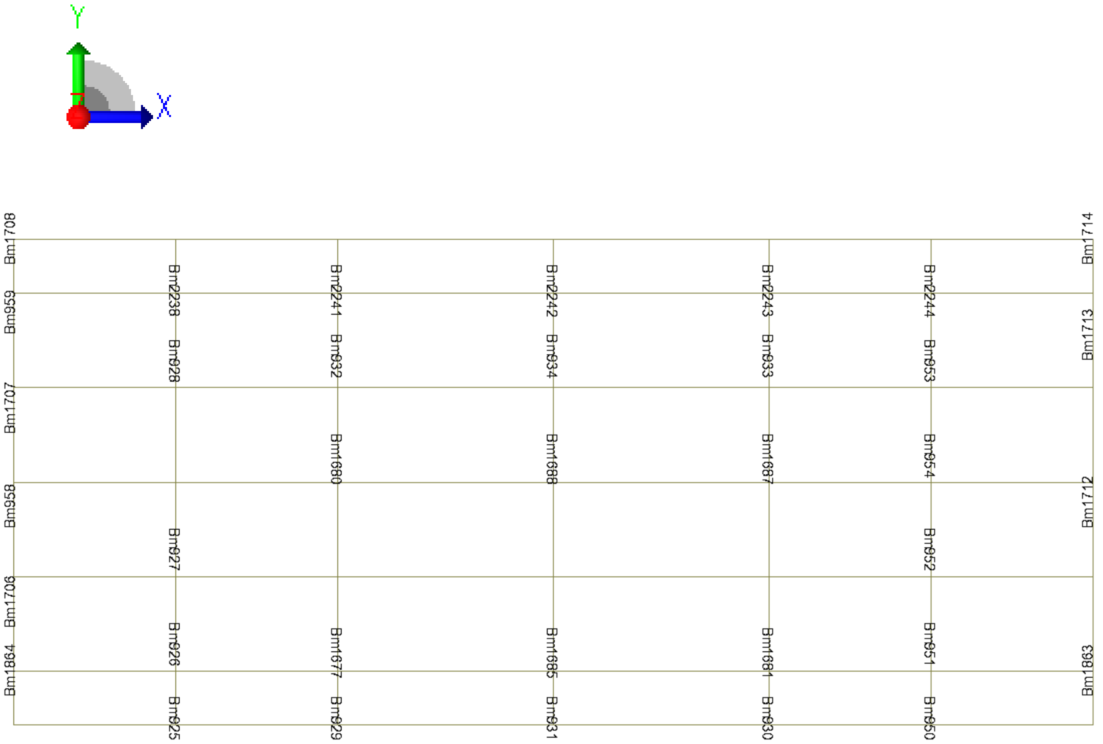




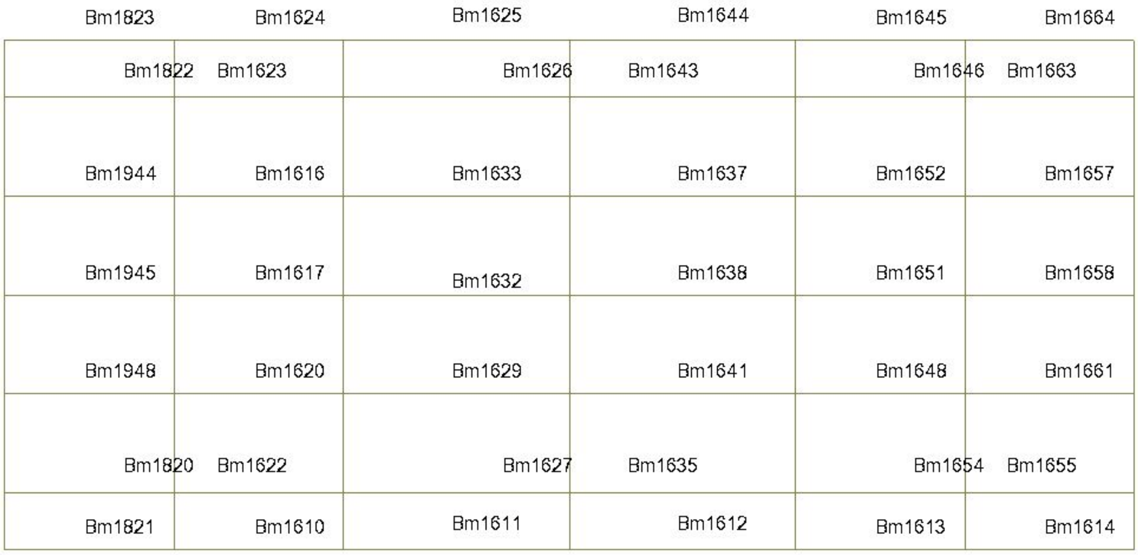
Appendix C-1 Member names Cellar Deck



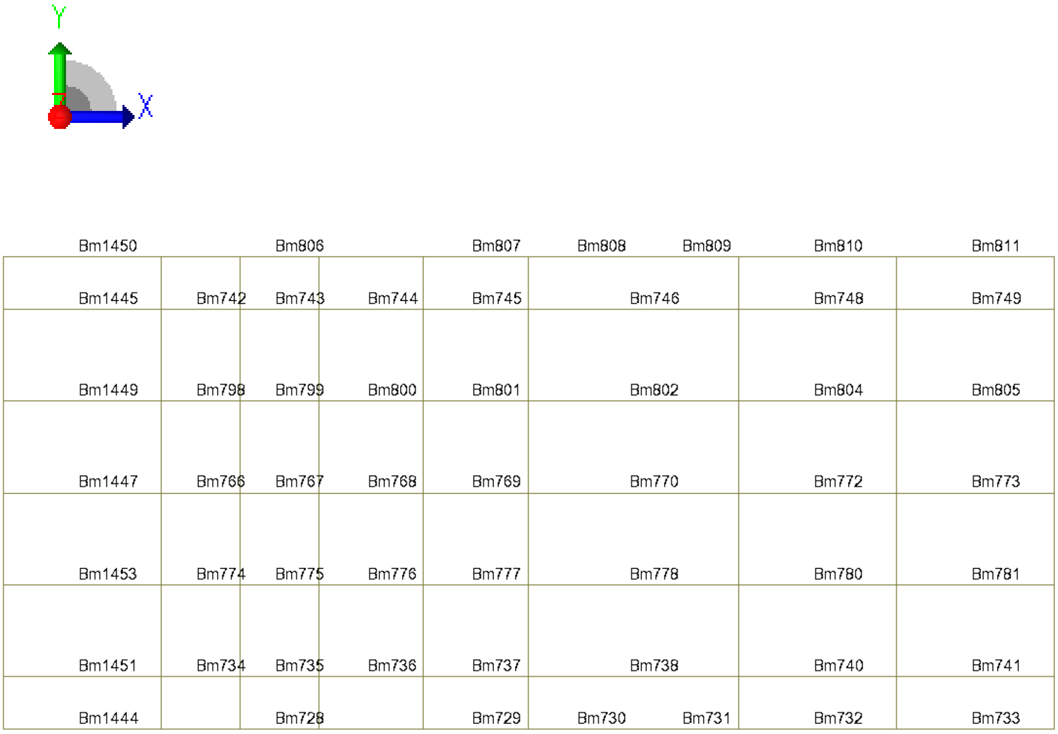
Appendix C-2 Member names Cellar Deck



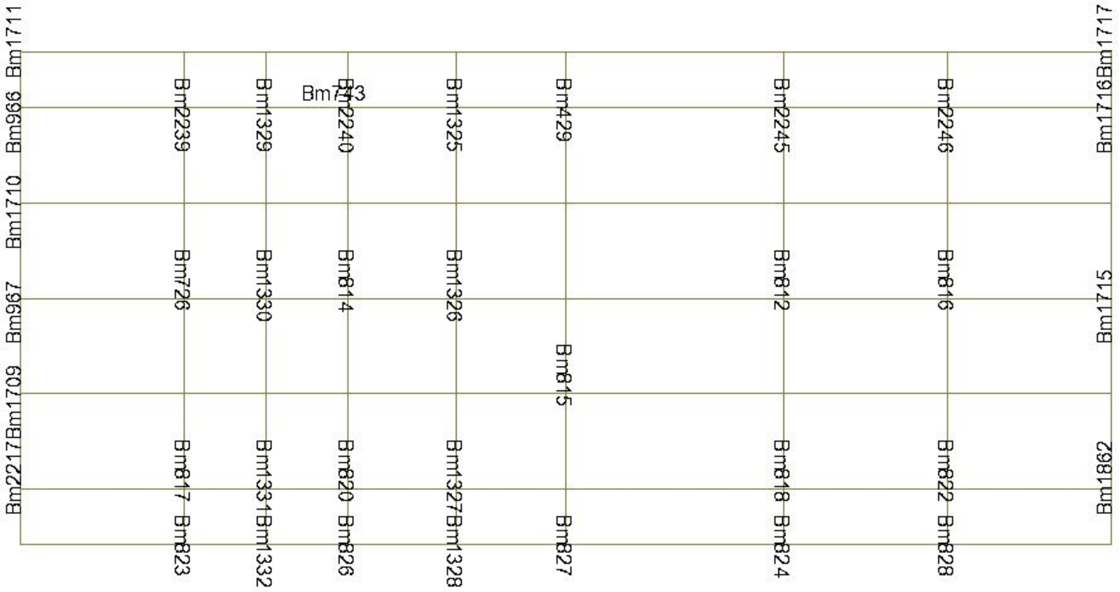
Appendix C-3 Memeber names Lower Main Deck



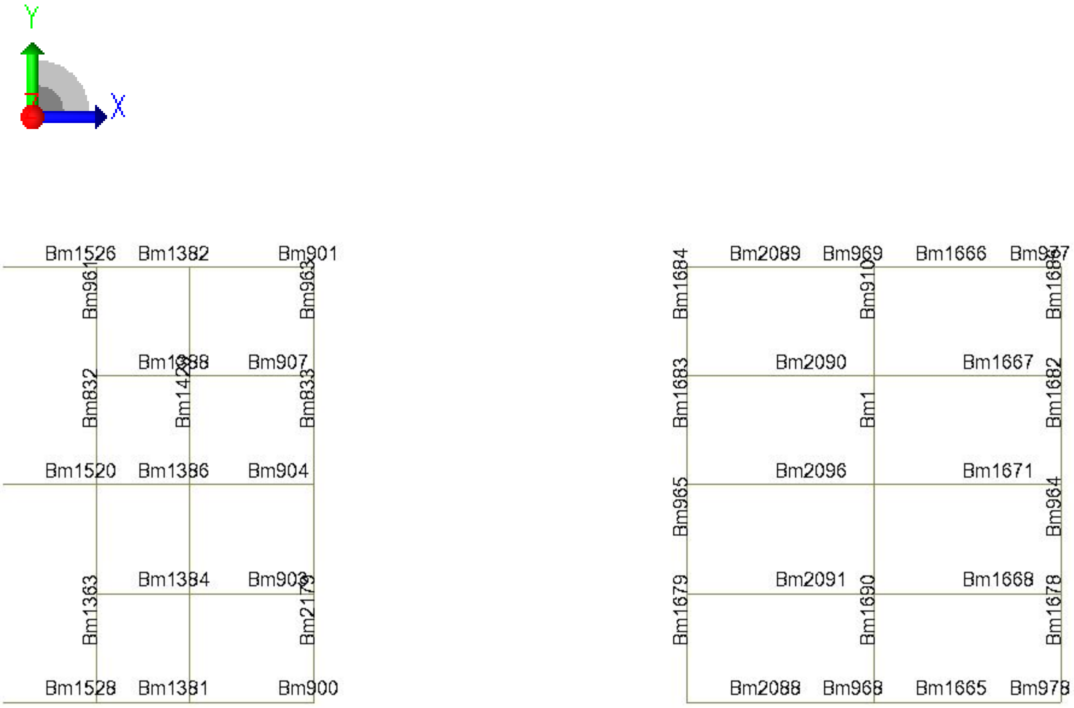
Appendix C-4 Member names Lower Main Deck



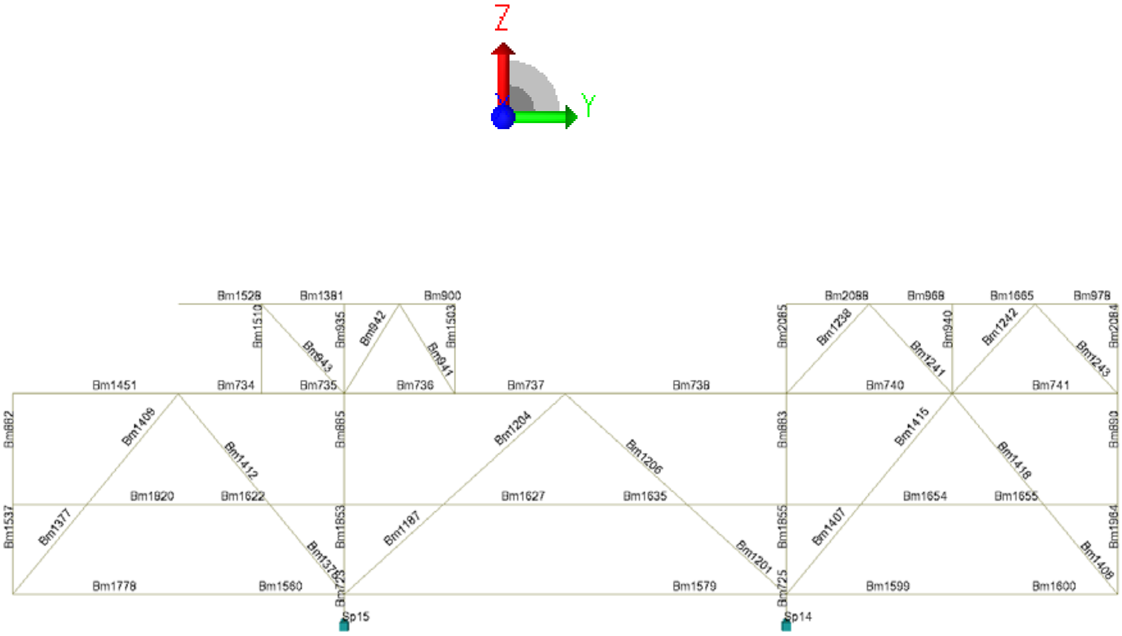
Appendix C-5 Member names Upper Main Deck



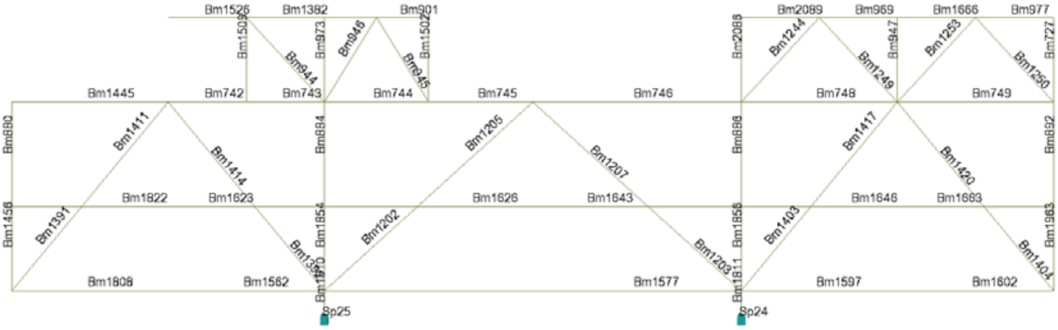
Appendix C-6 Member names Upper Main Deck



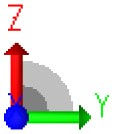
Appendix C-7 Member names Weather Deck

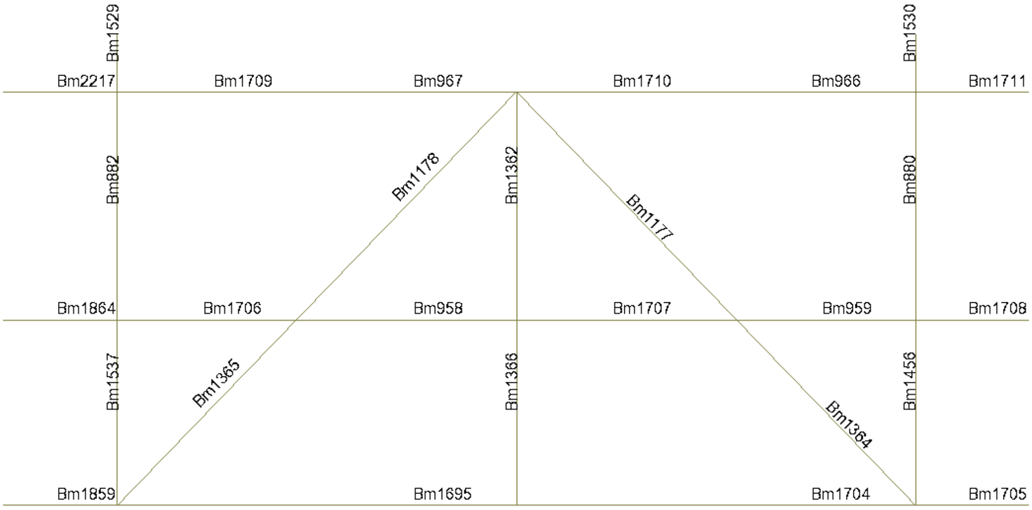


Appendix C-8 Member names South

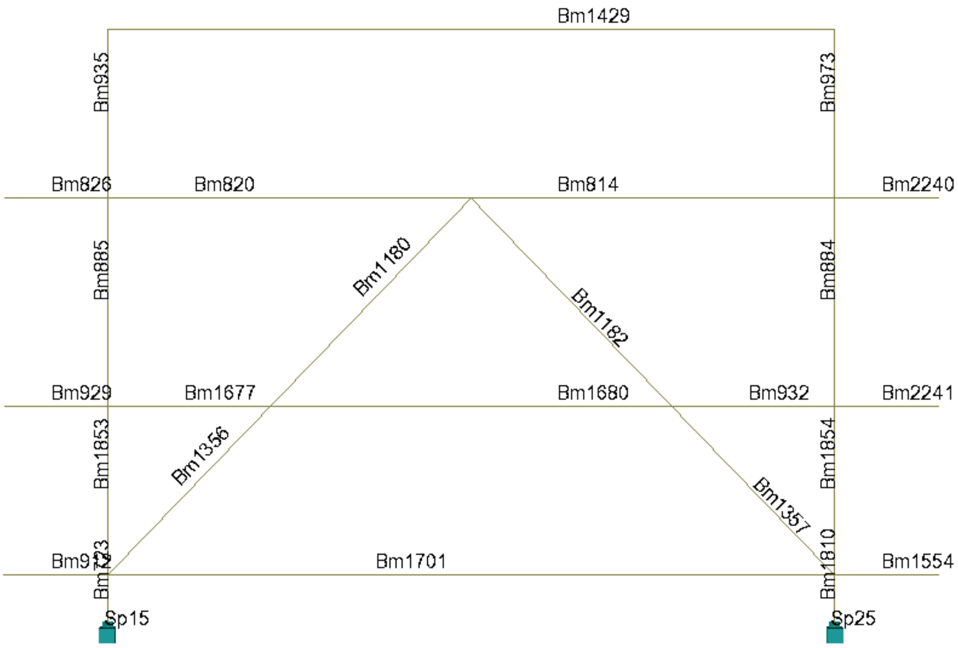


Appendix C-9 Member names North

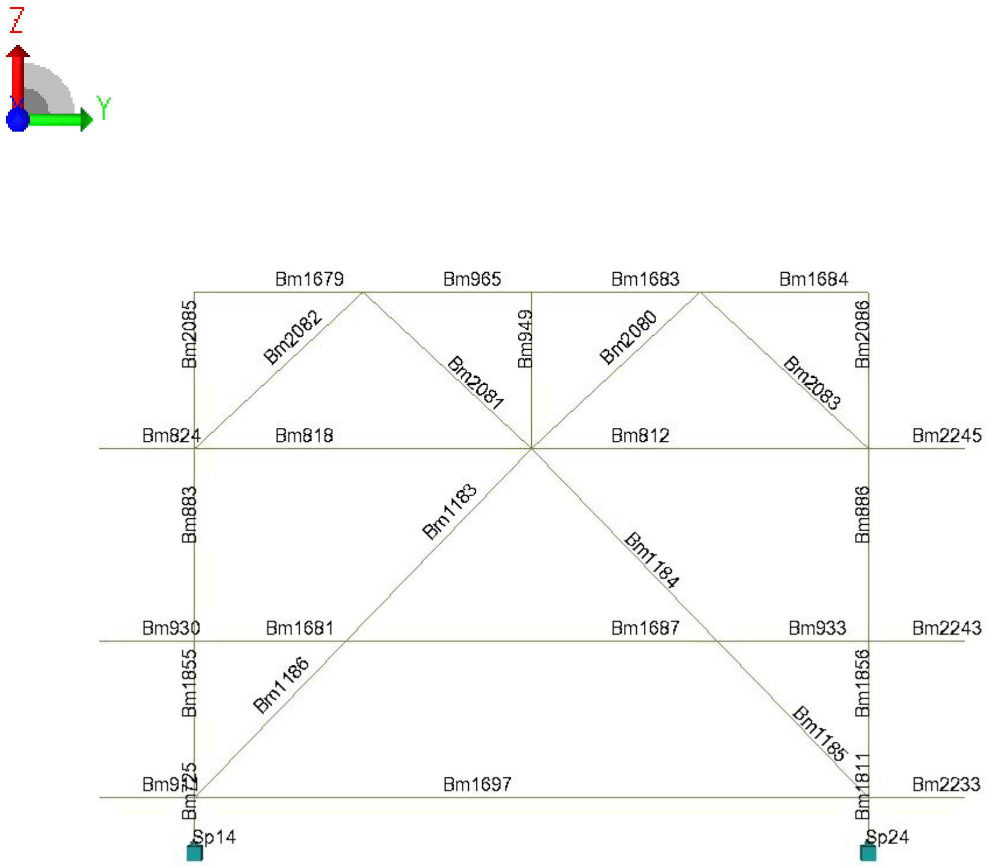




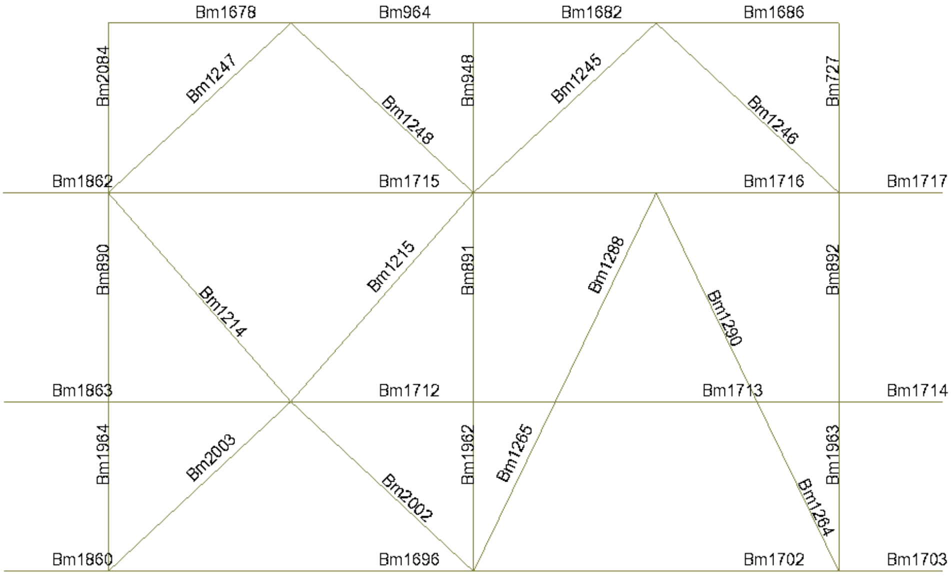
Appendix C-10 Member names West (T1)



Appendix C-11 Member names (T2)

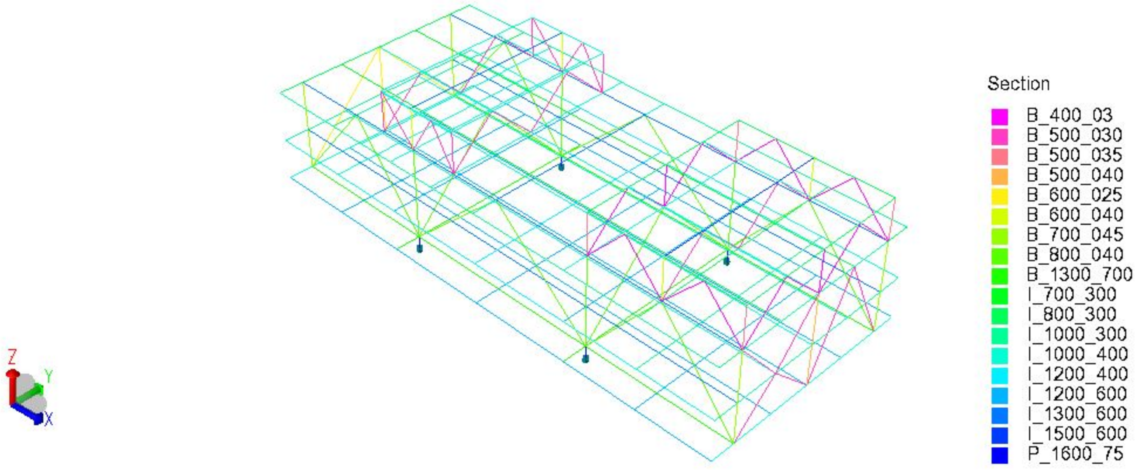


Appendix C-12 Member names (T3)



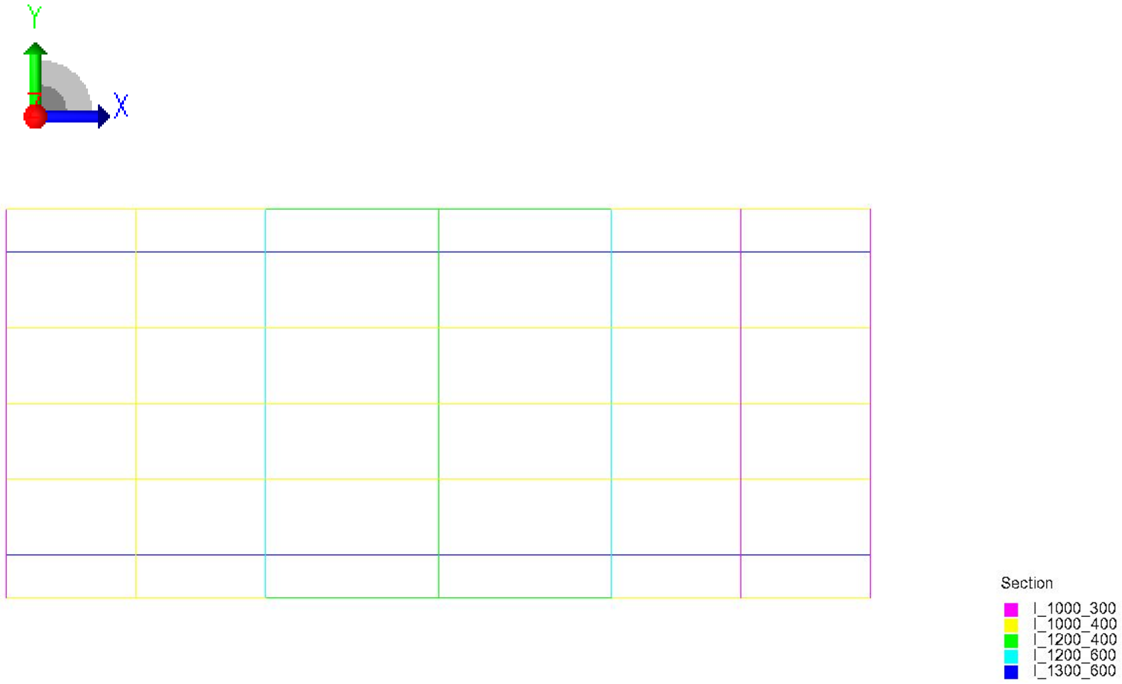
Appendix C-13 Member names East (T4)

D. Cross sections

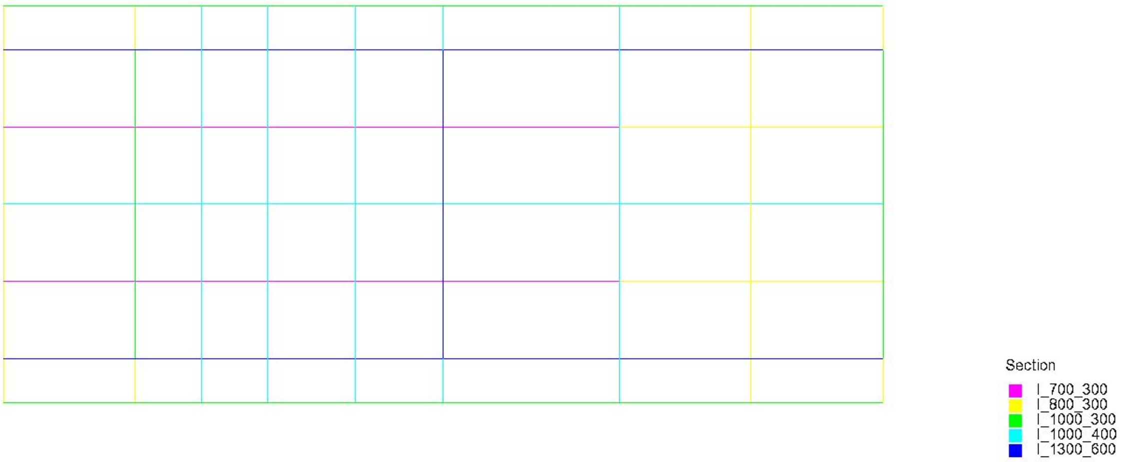


Appendix D-1 Sections Topside

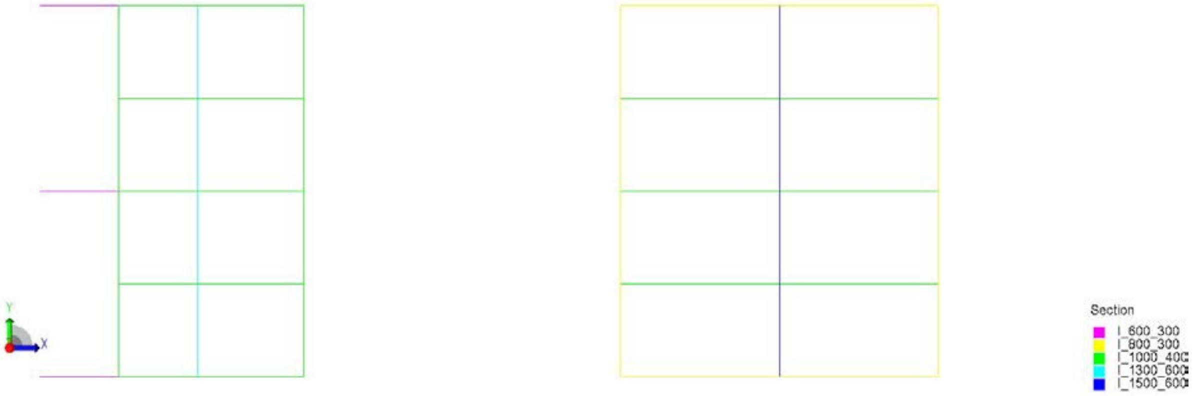
Appendix D-2 Sections Cellar Deck



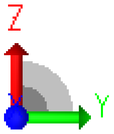
Appendix D-3 Sections Lower Main Deck

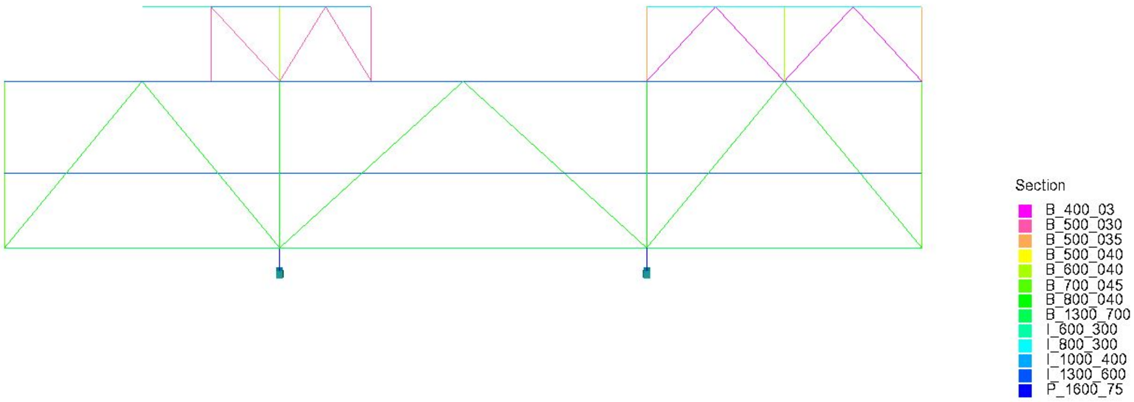


Appendix D-4 Sections Upper Main Deck

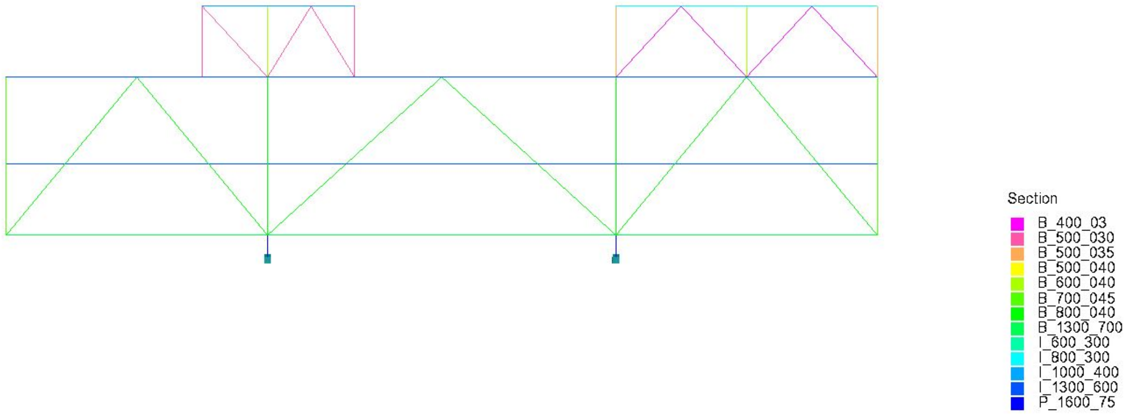


Appendix D-5 Sections Weather Deck

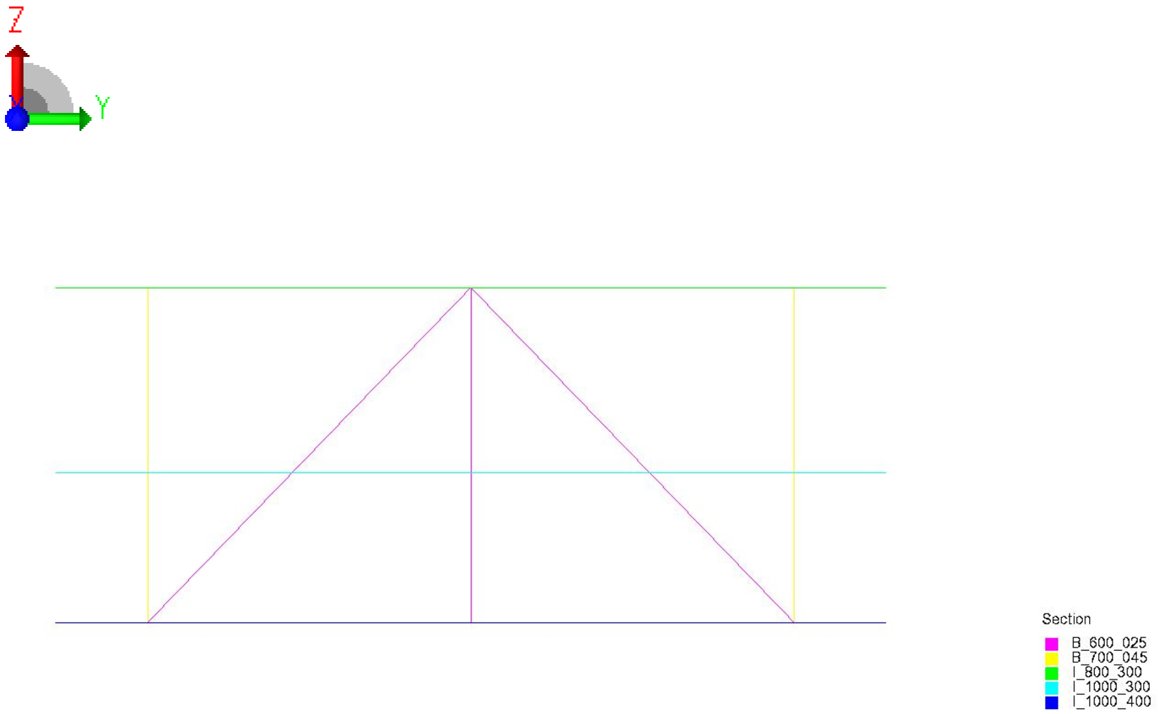




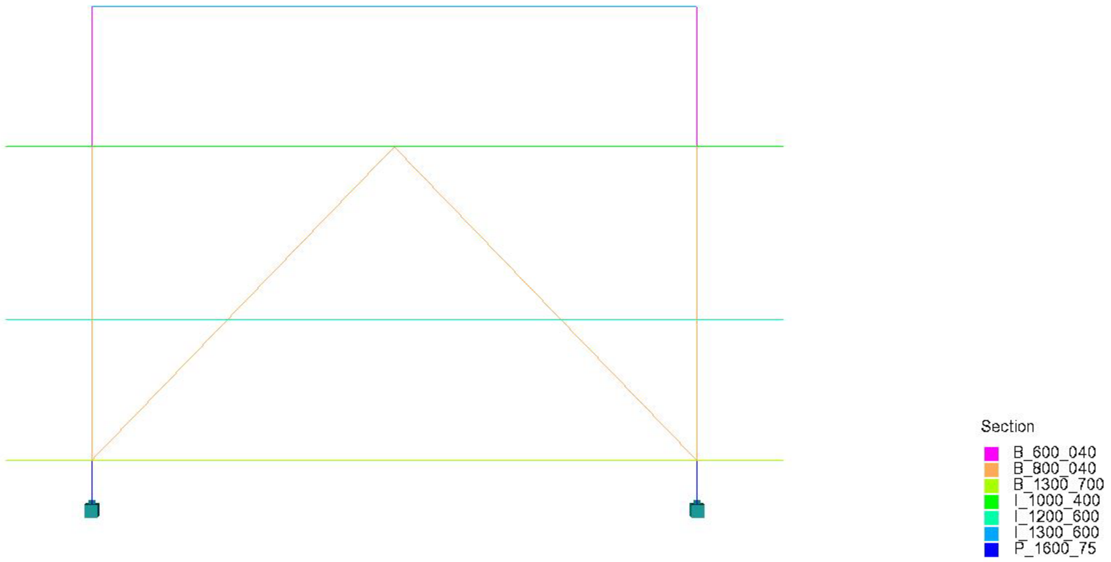
Appendix D-6 Sections South



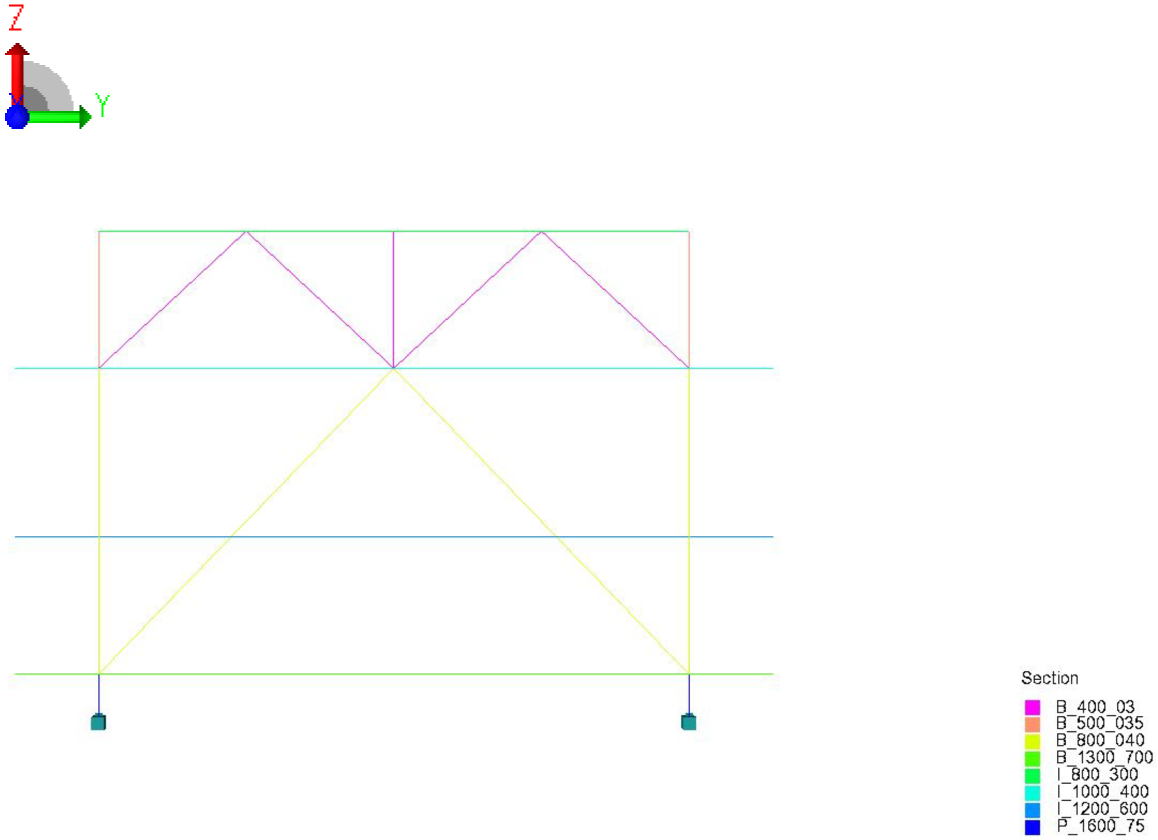
Appendix D-7 Sections North



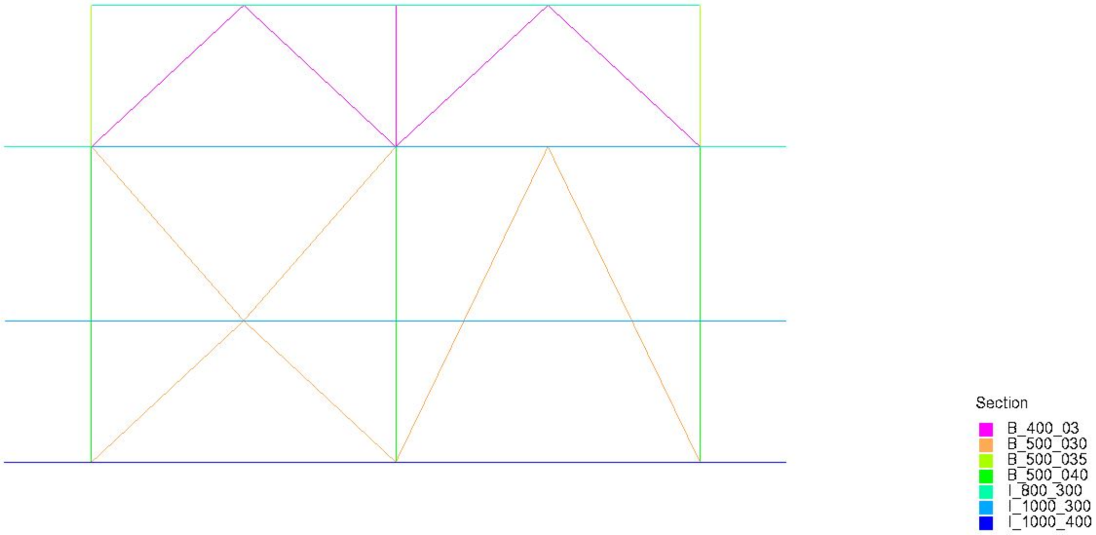
Appendix D-8 Sections West (T1)



Appendix D-9 Sections (T2)

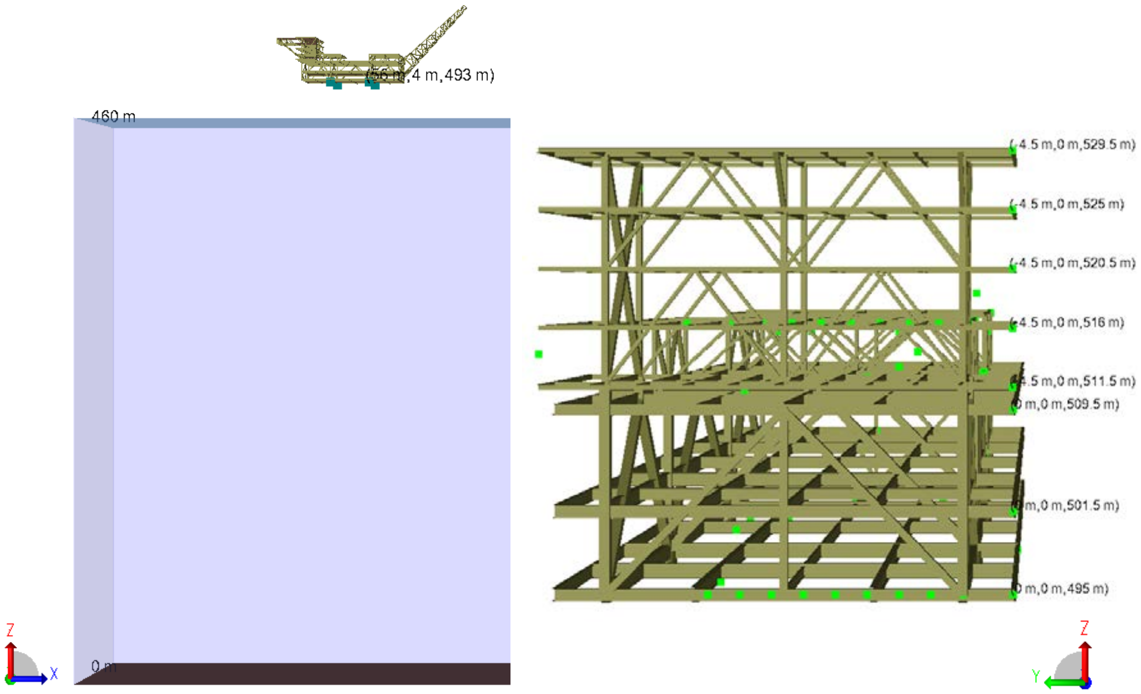


Appendix D-10



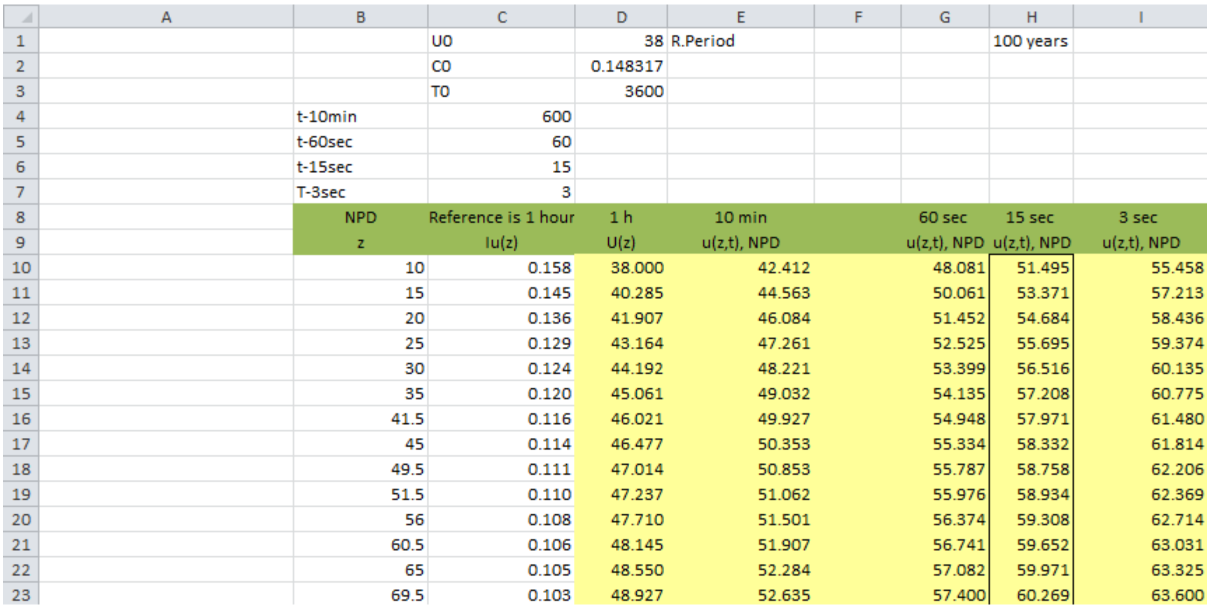
Appendix D-11 Sections East (T4)

E. Wind Calculation



Appendix E-1 Topside elevations

Highest wind speed: 529.5m- 460m <u>= 69.5 m</u> above sea level



	A	B	C	D	E	F	G	H	I
1			U0	38	R.Period			100 years	
2			C0	0.148317					
3			T0	3600					
4		t-10min	600						
5		t-60sec	60						
6		t-15sec	15						
7		T-3sec	3						
8		NPD	Reference is 1 hour	1 h	10 min		60 sec	15 sec	3 sec
9		z	Iu(z)	U(z)	u(z,t), NPD		u(z,t), NPD	u(z,t), NPD	u(z,t), NPD
10		10	0.158	38.000	42.412		48.081	51.495	55.458
11		15	0.145	40.285	44.563		50.061	53.371	57.213
12		20	0.136	41.907	46.084		51.452	54.684	58.436
13		25	0.129	43.164	47.261		52.525	55.695	59.374
14		30	0.124	44.192	48.221		53.399	56.516	60.135
15		35	0.120	45.061	49.032		54.135	57.208	60.775
16		41.5	0.116	46.021	49.927		54.948	57.971	61.480
17		45	0.114	46.477	50.353		55.334	58.332	61.814
18		49.5	0.111	47.014	50.853		55.787	58.758	62.206
19		51.5	0.110	47.237	51.062		55.976	58.934	62.369
20		56	0.108	47.710	51.501		56.374	59.308	62.714
21		60.5	0.106	48.145	51.907		56.741	59.652	63.031
22		65	0.105	48.550	52.284		57.082	59.971	63.325
23		69.5	0.103	48.927	52.635		57.400	60.269	63.600

Where the:

C0 =5.73*0.01*(1+0.15*U0)^0.5
z=69.5 m
Iu(69.5)= 0.06*(1+0.043*U0)*(B23/10)^(-0.22)
1h U(69.5)= 0.06*(1+0.043*U0)*(B23/10)^(-0.22)
1h U(z)= U0*(1+C0*LN(B23/10))
10 min U (z,t)=D23*(1-0.41*C23*LN(C$4/T0))
60 sec U (z,t)=D23*(1-0.41*C23*LN(C$5/T0))
15 sec U (z,t)=D23*(1-0.41*C23*LN(C$6/T0))
3 sec U (z,t)=D23*(1-0.41*C23*LN(C$7/T0))

Direction	**Area $[m^2]$**	**Beam length belonging to A_x [m]**
A_1	1242	288
A_2	1800	392.5
A_3	1242	260
A_4	1800	392.5

Direction	Deck	Each Length (m)	Rho	V,15s,100yrs (m/s)	Total Area (m2)	Cs	Wind force (KN)	Line wind force (N/m)	Wind pressure (KN/m^2)
From West to East (0 degree)	Total	288.000	1.270	60.269	1242.000	1.000	2864.722	9946.952	2.307

Direction	Deck	Each Length (m)	Rho	V,15s,100yrs (m/s)	Total Area (m2)	Cs	Wind force (KN)	Line wind force (N/m)	Wind pressure (KN/m^2)
From South to North (90 degree)	Total_2	392.500	1.270	60.269	1800.000	1.000	4151.771	10577.762	2.307

Direction	Deck	Each Length (m)	Rho	V,15s,100yrs (m/s)	Total Area (m2)	Cs	Wind force (KN)	Line wind force (N/m)	Wind pressure (KN/m^2)
From East to West (180 degree)	Total_2	260.000	1.270	60.269	1242.000	1.000	2864.722	11018.163	2.307

Direction	Deck	Each Length (m)	Rho	V,15s,100yrs (m/s)	Total Area (m2)	Cs	Wind force (KN)	Line wind force (N/m)	Wind pressure (KN/m^2)
From North to South (270 degree)	Total_2	392.500	1.270	60.269	1800.000	1.000	4151.771	10577.762	2.307

Where:

Wind Force [kN] =0.5*Rho*Cs*Total Area*(V, 15s, 100years) ^2/1000
Line wind force [N/m]= Wind Force [kN]/ (Beam length *1000)

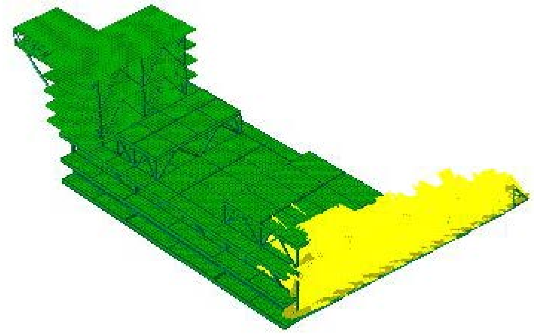
100 years return period:

Direction	Line load100 year wind [N/m]
West to East	9946.952
South to North	10577.762
East to West	11018.163
North to South	10577.762

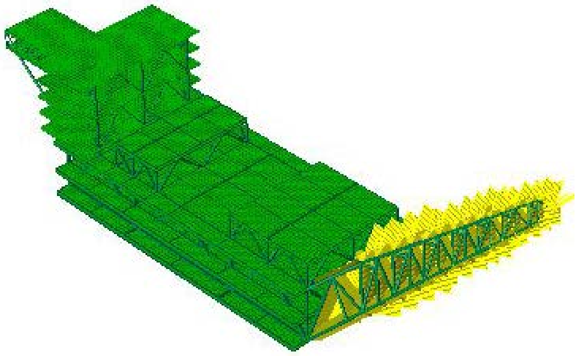
10 years return period:

Direction	Line load 100 year wind [N/m]	Scaling Factor	Line load 10 year wind [N/m]
West to East	9946.952	0.824	8196.288
South to North	10577.762	0.824	8716.076
East to West	11018.163	0.824	9078.966
North to South	10577.762	0.824	8716.076

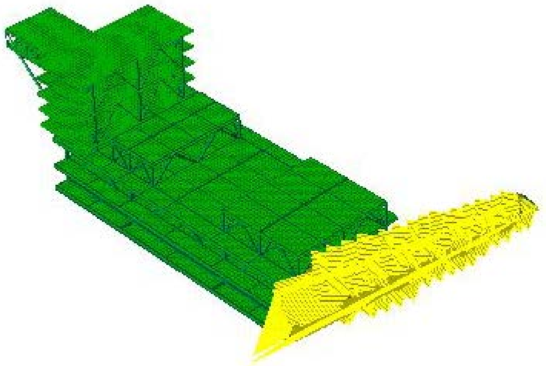
F. Wind Loads on structure



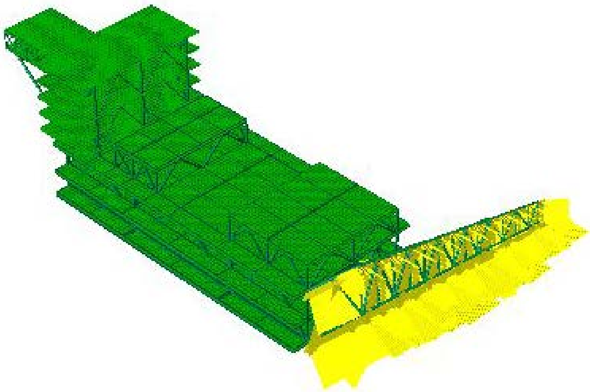
Appendix G-2 Flare Wind from West



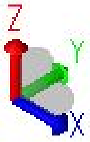
Appendix G-1 Flare wind from North

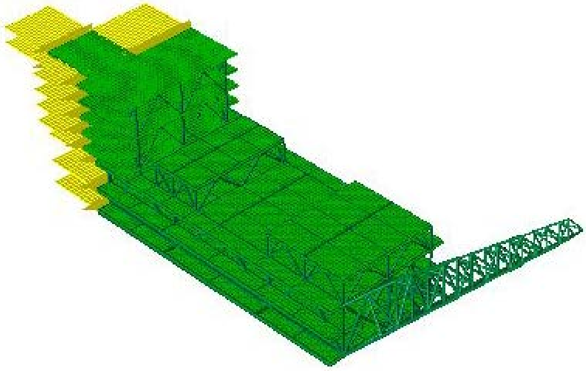


Appendix G-4 Flare Wind from South

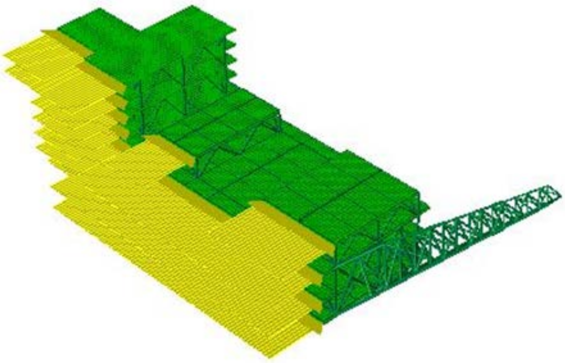


Appendix G-3 Flare Wind from East

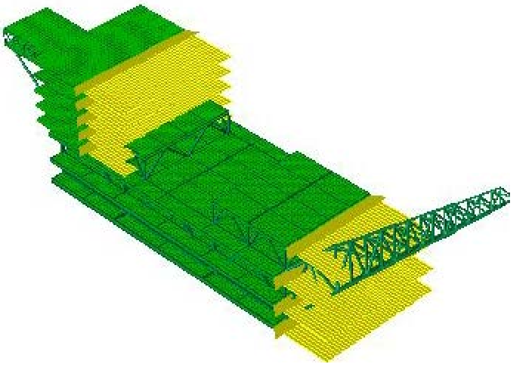




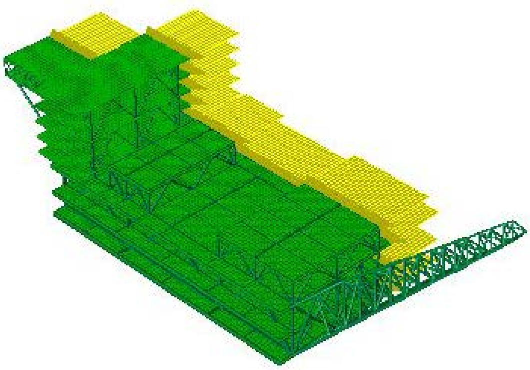
Appendix G-5 Wind from West



Appendix G-6 Wind from South

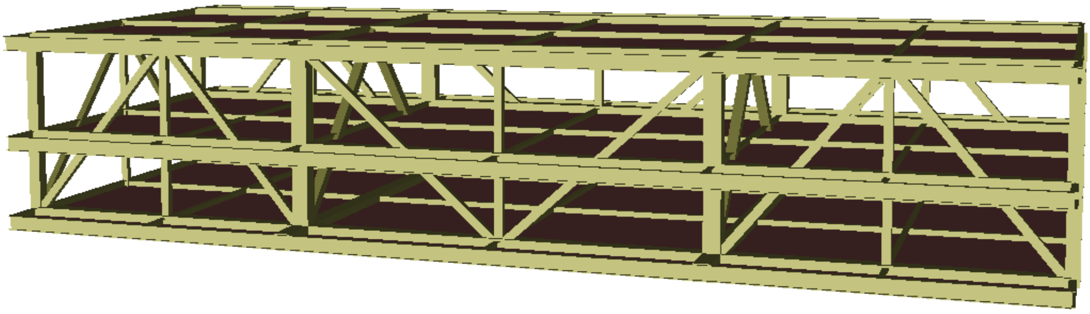


Appendix G-8 Wind from East

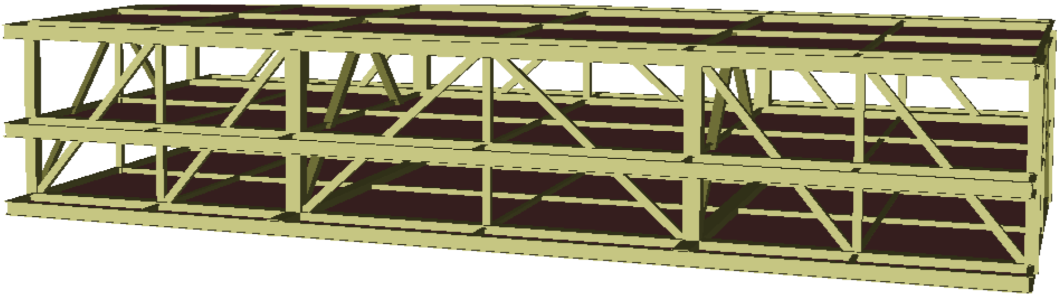


Appendix G-7 Wind from North

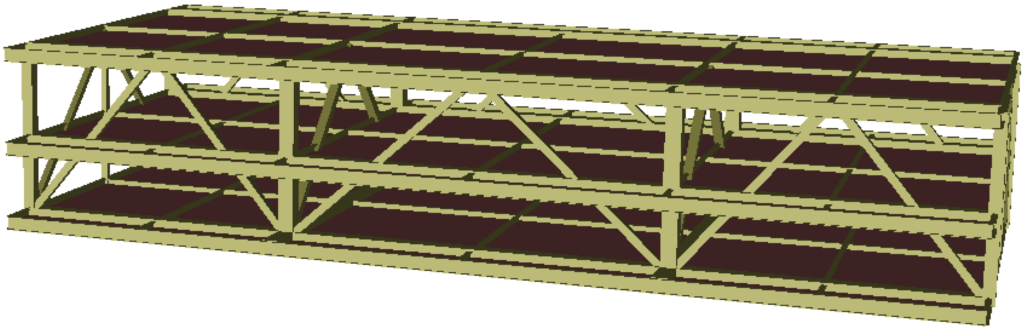
H. Stiffening Arrangements



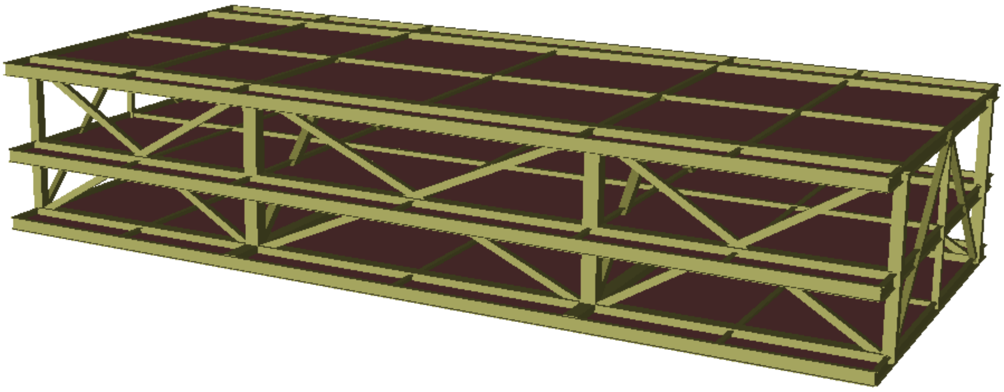
Appendix H-1 Pratt Truss



Appendix H-2 Howe Truss



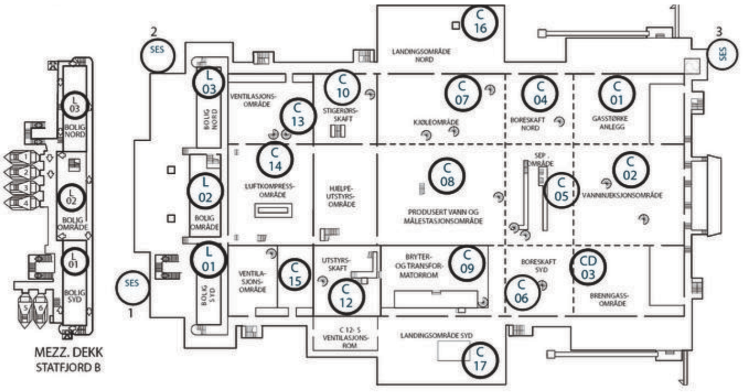
Appendix H-3 Warren Truss

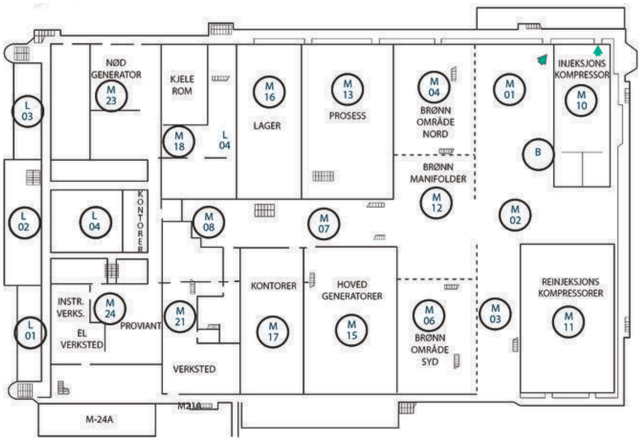


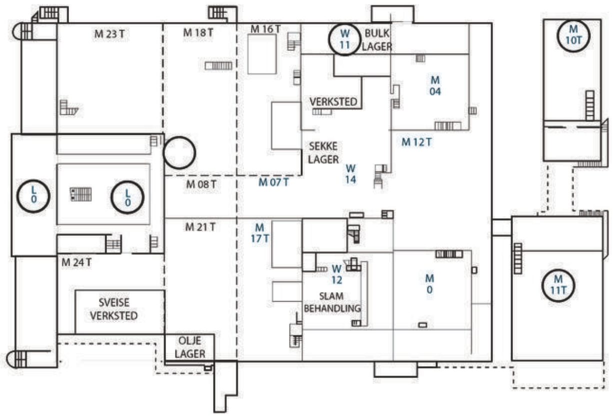
Appendix H-4 X-bracing

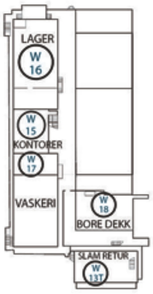
I. Topside Layout

The deck drawings belong to Statfjord B and are taken from [24].
Clicking on the different areas also shows images from the area in question.
The drawings have therefore been used for both the topside layout and the load distribution, as they give an overview over the major deck areas and an image of where different equipment is placed.









J. Codecheck ULS1 a/b

1 Cc1 : Frame Code Check

Description : Capacity Manager

1.1 Cc1.run(1) : Frame Code Check

Description : Norsok N-004 2013

General options

Code	Norsok
CapendIncluded	true
UseCommentary663	true
MaterialFactor	1.15
Azimuthal Tolerance Angle	5
Ind. Brace Can Distance	false

General options

Code	EN 1993-1-1
GammaM0	1.15
GammaM1	1.15
Method1	false
NationalAnnex	Norwegian

Cc1.run(1) : Member Result Brief

- Sorted by UfTot (Descending)
- Then sorted by LoadCase (Ascending)

- Run : Cc1.run(1)
- Worst LoadCase per Member
- All SubChecks per Member
- Worst Position along Member

Member	LoadCase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
Bm1407	ULS_1_a_270	0.00	OK	0.96	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1237	ULS_1_a_270	0.00	OK	0.94	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1217	ULS_1_a_090	1.00	OK	0.94	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1226	ULS_1_a_090	1.00	OK	0.94	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1225	ULS_1_a_270	0.00	OK	0.94	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1403	ULS_1_a_090	0.00	OK	0.93	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1218	ULS_1_a_270	0.00	OK	0.92	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1697	ULS_1_a_270	1.00	OK	0.91	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1633	ULS_1_a_135	1.00	OK	0.88	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1629	ULS_1_a_225	1.00	OK	0.87	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1632	ULS_1_a_180	1.00	OK	0.85	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)

Member	LoadCase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
Bm1407	LC1	0.00	OK	0.73	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1237	LC1	0.00	OK	0.72	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1217	LC1	1.00	OK	0.72	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1226	LC1	1.00	OK	0.72	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1225	LC1	0.00	OK	0.71	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1403	LC1	0.00	OK	0.71	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1218	LC1	0.00	OK	0.71	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1697	LC1	1.00	OK	0.70	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1633	LC1	1.00	OK	0.67	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1629	LC1	1.00	OK	0.67	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1632	LC1	1.00	OK	0.65	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)

K. Codecheck ULS -3a/b

1 Cc1 : Frame Code Check

Description : Capacity Manager

1.1 Cc1.run(1) : Frame Code Check

Description : Norsok N-004 2013

General options

Code	Norsok
CapendIncluded	true
UseCommentary663	true
MaterialFactor	1.15
Azimuthal Tolerance Angle	5
Ind. Brace Can Distance	false

General options

Code	EN 1993-1-1
GammaM0	1.15
GammaM1	1.15
Method1	false
NationalAnnex	Norwegian

Cc1.run(1) : Member Result Brief

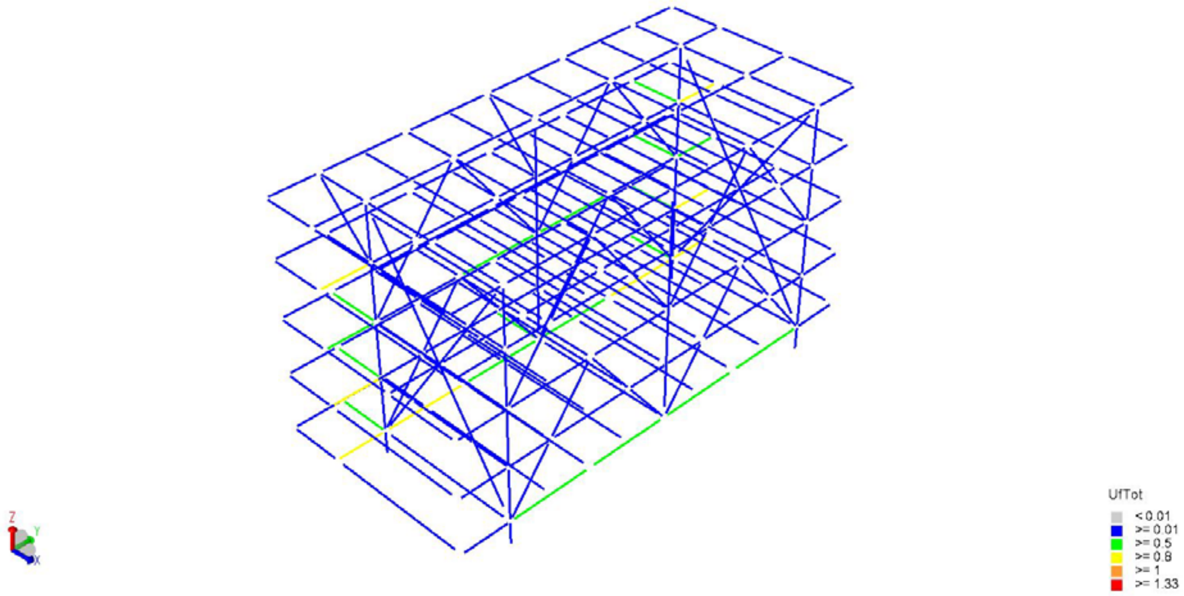
- Sorted by UfTot (Descending)
- Then sorted by LoadCase (Ascending)

- Run : Cc1.run(1)
- Worst LoadCase per Member
- All SubChecks per Member
- Worst Position along Member

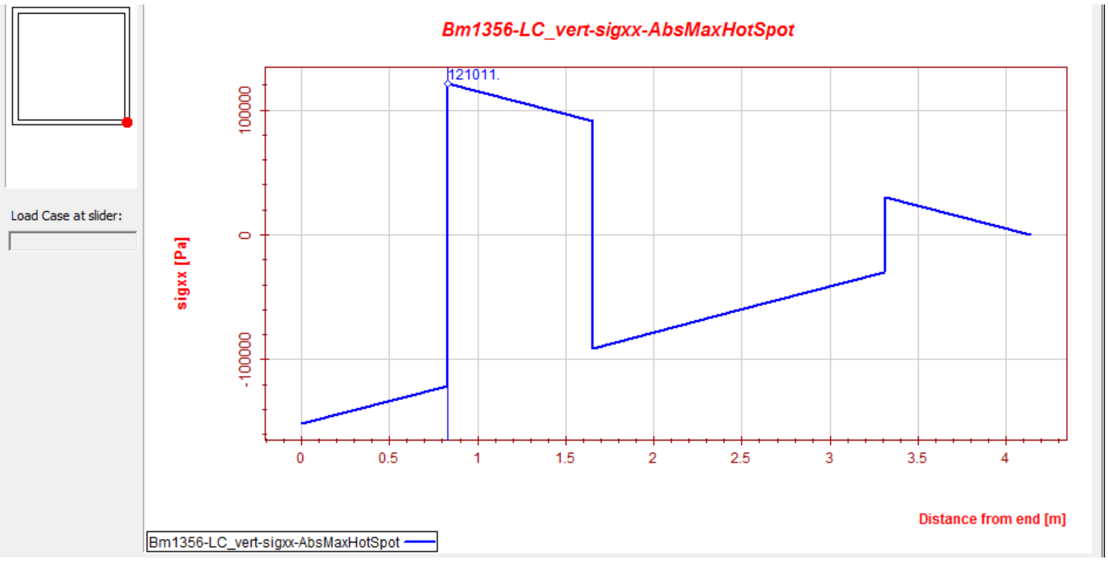
Member	LoadCase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
Bm1407	ULS_3_a_045	0.00	OK	0.95	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1217	ULS_3_a_045	1.00	OK	0.93	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1237	ULS_3_a_045	0.00	OK	0.93	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1226	ULS_3_a_045	1.00	OK	0.93	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1225	ULS_3_a_045	0.00	OK	0.93	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1403	ULS_3_a_045	0.00	OK	0.93	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1218	ULS_3_a_045	0.00	OK	0.92	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1697	ULS_3_a_045	1.00	OK	0.90	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1633	ULS_3_a_045	1.00	OK	0.87	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1629	ULS_3_a_045	1.00	OK	0.86	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1632	ULS_3_a_045	1.00	OK	0.85	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)

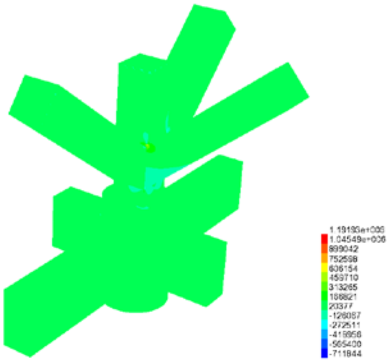
Member	LoadCase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
Bm1407	LC1	0.00	OK	0.73	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1237	LC1	0.00	OK	0.72	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1217	LC1	1.00	OK	0.72	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1226	LC1	1.00	OK	0.72	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1225	LC1	0.00	OK	0.71	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1403	LC1	0.00	OK	0.71	uf661	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1218	LC1	0.00	OK	0.70	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1697	LC1	1.00	OK	0.70	ufXSection	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1633	LC1	1.00	OK	0.67	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1629	LC1	1.00	OK	0.67	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)
Bm1632	LC1	1.00	OK	0.65	uf662	Geom OK	EN 1993-1-1 member	Cc1.run(1)

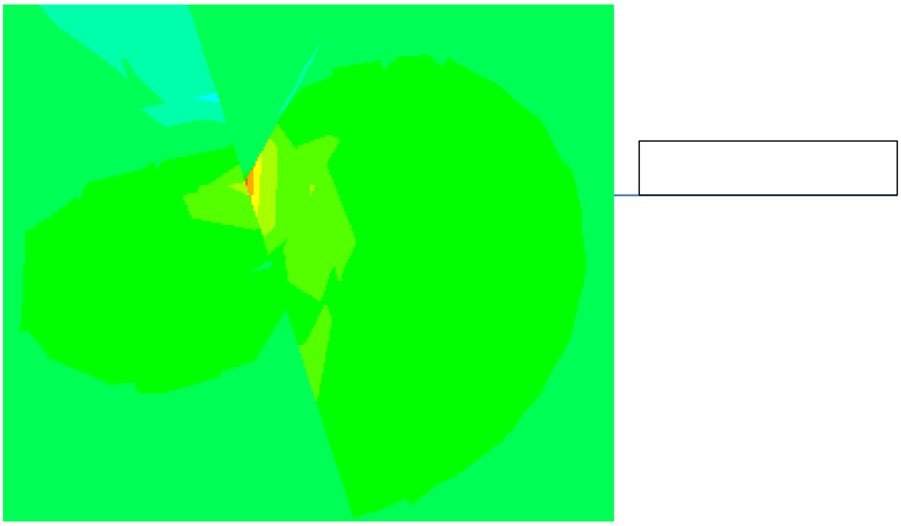
L. LQ utilization

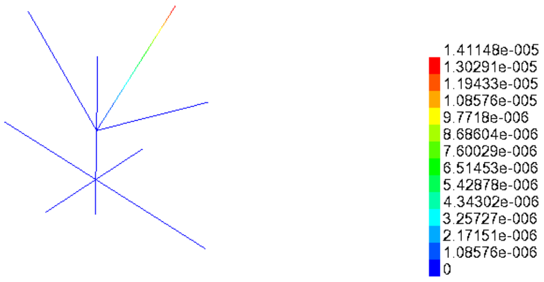


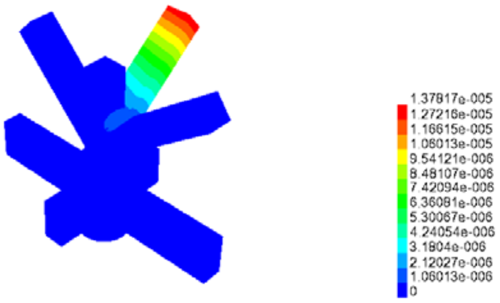
M. Stress Calculation Factor








1.41148e-005
1.30291e-005
1.19433e-005
1.08576e-005
9.7718e-006
8.68604e-006
7.60029e-006
6.51453e-006
5.42878e-006
4.34302e-006
3.25727e-006
2.17151e-006
1.08576e-006
0


1.37817e-005
1.27216e-005
1.16615e-005
1.06013e-005
9.54121e-006
8.48107e-006
7.42094e-006
6.36081e-006
5.30067e-006
4.24054e-006
3.1804e-006
2.12027e-006
1.06013e-006
0

N. ULS-1

```
                                 ******       ******       ******       ******      ** ***  ****
                                ********     ********     ********     ********     *************
                               **      **   **      **   **      **   **      **    **    **    **
                               **           **      **   **                   **    **    **    **
                                *******     **********    *******      *********    **    **    **
                                 *******    *********      *******    **********    **    **    **
                                       **   **                   **   **      **    **    **    **
                               **      **   **      **   **      **   **      **    **    **    **
                                ********     ********     ********     *********    **    **    **
                                 ******       ******       ******       ****** **   **    **    **


                               *******************************************************************
                               *******************************************************************
                               **                                                               **
                               **                                                               **
                               **      *****   *******   *****   *******  ******    *****       **
                               **     *     *  *        *     *     *     *     *  *     *      **
                               **     *        *        *           *     *     *  *     *      **
                               **      *****   *****     *****      *     ******   *******      **
                               **           *  *              *     *     *   *    *     *      **
                               **     *     *  *        *     *     *     *    *   *     *      **
                               **      *****   *******   *****      *     *     *  *     *      **
                               **                                                               **
                               **                                                               **
                               **               Superelement Structural Analysis                **
                               **                                                               **
                               **                                                               **
                               *******************************************************************
                               *******************************************************************

                                              Marketing and Support by DNV Software


               Program id   : 8.6-01                                        Computer         : 8664
               Release date : 16-MAY-2013                                   Impl. update     :
               Access time  : 10-JUL-2014 17:51:02                          Operating system : Win NT 6.1 [7601]
               User id      : NADME                                         CPU id           : 0973744164
                                                                            Installation     : , STGLP110135


               Copyright DET NORSKE VERITAS AS, P.O.Box 300, N-1322 Hovik, Norway


               Library     Version    Impl.Upd   Release date
               ELLIBD      1.9-07                16-MAY-2013
               SIFTOOLD    8.3-09                16-MAY-2013
               NORSAMD     8.4-02                16-MAY-2013
               MFR         8.3-05                16-MAY-2013
               PRIMAS      5.3-04                16-MAY-2013
               AUXLIB      8.2-02                16-MAY-2013
               SESTRA_PRLL 8.1-02                16-MAY-2013

               Run identification   :


 DATE: 10-JUL-2014 TIME: 17:51:07   ***************  SESTRA  ***************
PAGE:     1

                                    DATA GENERATION MODULE
                                                                                                                    SUB
PAGE:     1

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   HEAD
   COMM
   COMM    Created by: GeniE  V6.6-08  25-Sep-2013
   COMM
   COMM    Date : 10-Jul-2014   Time : 17:51:02   User : NADME
   COMM
   COMM  CHCK ANTP MSUM MOLO STIF RTOP LBCK      PILE CSING     SIGM
   CMAS    0.   1.   1.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM            ORDR                          CACH MFRWORK
   SOLM    0.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM                 WCOR
   ELOP    0.   0.   0.   1.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  ITYP
   ITOP    1.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  PREFIX
   INAM  20140710_175028_
   COMM
   COMM  PREFIX FORMAT
   LNAM  20140710_175028_ UNFORMATTED
   COMM
   COMM  PREFIX FORMAT
```

```
   RNAM  20140710_175028_ NORSAM
   COMM
   COMM  SEL1 SEL2 SEL3 SEL4 SEL5 SEL6 SEL7 SEL8
   RSEL    1.   0.   0.   0.   0.   0.   1.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  RTRA
   RETR    3.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   Z

  PRINTOUT OF DATA GIVEN IN THE FILE 20140710_175028_S1.FEM

   LOHI    1.   0.  12.   1.   1.   0.   0.   0.   1.  0.10E+01  0.00E+00  0.00E+00
   SEAS    1.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    1.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    1.  0.00E+00  0.10E+01  0.60E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    2.   0.  12.   2.   2.   0.   0.   0.   2.  0.20E+01  0.00E+00  0.00E+00
   SEAS    2.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    2.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    2.  0.00E+00  0.10E+01  0.70E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    3.   0.  12.   3.   3.   0.   0.   0.   3.  0.30E+01  0.00E+00  0.00E+00
   SEAS    3.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    3.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    3.  0.00E+00  0.10E+01  0.80E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
 DATE: 10-JUL-2014 TIME: 17:51:07   ***************  SESTRA  ***************
PAGE:     2

                                   DATA GENERATION MODULE
                                                                                                                         SUB
PAGE:     2

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   LOHI    4.   0.  12.   4.   4.   0.   0.   0.   4.  0.40E+01  0.00E+00  0.00E+00
   SEAS    4.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    4.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    4.  0.00E+00  0.10E+01  0.90E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    1.  0.38E+02  0.00E+00  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    2.  0.38E+02  0.90E+02  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    3.  0.38E+02  0.18E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    4.  0.38E+02  0.27E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 10-JUL-2014 TIME: 17:51:07   ***************  SESTRA  ***************
PAGE:     3

                                   DATA GENERATION MODULE
                                                                                                                         SUB
PAGE:     3
  INTERPRETATION OF ANALYSIS CONTROL DATA


      Type of Analysis :

         Reduction
         Multifront Solver is used
         Retracking


      Input from CMAS Command :

         ANTYP = 1   Static Analysis
         MSUM  > 0   Calculation of Sum of Masses and Centroid

         The singularity constant for membrane and shell elements
         CSING =  1.0000E-08

         Lowest accepted condition number in reduction
         EPSSOL=  1.1102E-14


      Input from RSEL Command :

         Data types selected for storing on Results File :
          - Input Interface File Records,
          - displacements,  sequence:
               all nodes for the first resultcase, all nodes for the second resultcase, etc.
          - forces and moments for beam, spring and layered shell elements,  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.
          - stresses (not for beam or spring elements),  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.

         (Can be redefined by RSEL for selected superelements, see below.)
         Storing is done for superelements specified in RETR command.
```

```
 DATE: 10-JUL-2014 TIME: 17:51:07   ***************  SESTRA  ***************
PAGE:     4

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     4

  INPUT INTERFACE FILES :


     20140710_175028_T1.FEM
     20140710_175028_L1.FEM

         DATE:     10-Jul-2014         TIME:          17:50:30
         PROGRAM:  SESAM GeniE         VERSION:       V6.6-08 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     10-Jul-2014         TIME:          17:50:30
         PROGRAM:  SESAM Gamesha       VERSION:       R5.0-3 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     10-JUL-2014         TIME:         17:50:49
         PROGRAM:  SESAM WAJAC         VERSION:      6.2-01  1-MAR-2011
         COMPUTER: 586 WIN NT 6.1 [7601INSTALLATION: , STGLP110135
         USER:     NADME               ACCOUNT:

 DATE: 10-JUL-2014 TIME: 17:51:07   ***************  SESTRA  ***************
PAGE:     5

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     5

      *** SUMMARY OF DATA FROM INPUT AND LOAD INTERFACE FILES ***
               FOR SUPERELEMENT TYPE       1  ON LEVEL  1

      The superelement has

         21064  subelements
         16725  nodes
            24  specified (fixed) degrees of freedom
        100326  internal (free) degrees of freedom
          totally
        100350  degrees of freedom

             9  loadcases


      The following kinds of loads are given:
            line or point loads for 2 node beams
            gravitational load

      The following basic elements are given:
          7293  2 node beam elements         BEAS
         13753  4 node flat shell elements   FQUS
            18  3 node flat shell elements   FTRS


 DATE: 10-JUL-2014 TIME: 17:51:10   ***************  SESTRA  ***************
PAGE:     6

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     6

      *** SUM OF LOADS AND MOMENTS FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***

     X-LOAD = SUM OF GIVEN LOADS IN GLOBAL X-DIRECTION
     Y-LOAD = SUM OF GIVEN LOADS IN GLOBAL Y-DIRECTION
     Z-LOAD = SUM OF GIVEN LOADS IN GLOBAL Z-DIRECTION
     X-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL X-AXIS
     Y-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Y-AXIS
     Z-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Z-AXIS
     X-RMOM = SUM OF MOMENTS ABOUT GLOBAL X-AXIS FROM GIVEN LOADS AND MOMENTS
     Y-RMOM = SUM OF MOMENTS ABOUT GLOBAL Y-AXIS FROM GIVEN LOADS AND MOMENTS
     Z-RMOM = SUM OF MOMENTS ABOUT GLOBAL Z-AXIS FROM GIVEN LOADS AND MOMENTS

      LOADCASE    X-LOAD      Y-LOAD      Z-LOAD      X-MOM       Y-MOM       Z-MOM      X-RMOM      Y-RMOM      Z-RMOM
           1  7.9820E-11  5.0849E-11 -1.4344E+08  0.0000E+00 -4.5221E+02  0.0000E+00 -2.5462E+09  5.9561E+09  2.4615E-09
           2  2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00  2.9817E-11  0.0000E+00  0.0000E+00  1.4712E+09 -5.1565E+07
           3 -2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00 -7.3396E-12  0.0000E+00  0.0000E+00 -1.4719E+09  5.1565E+07
           4  0.0000E+00 -4.1518E+06  0.0000E+00 -1.4547E-10  0.0000E+00  0.0000E+00  2.1145E+09  0.0000E+00 -1.2155E+08
           5  0.0000E+00  4.1518E+06  0.0000E+00  1.4547E-10  0.0000E+00  0.0000E+00 -2.1145E+09  0.0000E+00  1.2155E+08
           6  5.1836E+05 -4.9794E+03 -4.7266E+04  4.6216E-07 -2.6098E+00 -6.5539E-03  2.1635E+06  2.7646E+08 -6.3016E+06
           7 -3.7374E+03  5.1485E+05 -1.0751E+03  2.7900E+00  1.6730E-06 -6.6219E-01 -2.6991E+08 -1.8048E+06  5.3466E+07
           8 -5.1836E+05  4.9794E+03  4.7266E+04 -2.0734E-06  2.6098E+00  6.5572E-03 -2.1635E+06 -2.7646E+08  6.3016E+06
           9  3.7374E+03 -5.1485E+05  1.0751E+03 -2.7900E+00 -1.0218E-06  6.6220E-01  2.6991E+08  1.8048E+06 -5.3466E+07
```

```
 DATE: 10-JUL-2014 TIME: 17:51:11   ***************  SESTRA  ***************
PAGE:     7

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     7

      *** SUM OF MASSES AND CENTROID FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***


   MASS MATRIX IN GLOBAL COORDINATE SYSTEM (OF THE SUPERELEMENT):
   ---------------------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    3.08653E+09   -1.06111E+08
   0.00000E+00    6.09200E+06    0.00000E+00   -3.08653E+09    0.00000E+00    2.37467E+08
   0.00000E+00    0.00000E+00    6.09200E+06    1.06111E+08   -2.37467E+08    0.00000E+00
   0.00000E+00   -3.08653E+09    1.06111E+08    1.56715E+12   -4.00302E+09   -1.20275E+11
   3.08653E+09    0.00000E+00   -2.37467E+08   -4.00302E+09    1.57931E+12   -5.37098E+10
  -1.06111E+08    2.37467E+08    0.00000E+00   -1.20275E+11   -5.37098E+10    1.75190E+10


   COORDINATES OF CENTROID:
   ------------------------
   3.8980E+01     1.7418E+01     5.0665E+02


   MASS MATRIX AT CENTROID:
   ------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    0.00000E+00    4.12911E-05
   0.00000E+00    6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00   -4.19766E-04
   0.00000E+00    0.00000E+00    6.09200E+06    4.13060E-05   -4.19766E-04    0.00000E+00
   0.00000E+00    0.00000E+00    4.13060E-05    1.51030E+09    1.33184E+08    3.79592E+07
   0.00000E+00    0.00000E+00   -4.19766E-04    1.33184E+08    6.26193E+09    5.14217E+07
   4.12911E-05   -4.19766E-04    0.00000E+00    3.79592E+07    5.14217E+07    6.41430E+09

  *** Estimated size of stiffness matrix for superelement       1:    12415908 variables

 DATE: 10-JUL-2014 TIME: 17:51:11   ***************  SESTRA  ***************
PAGE:     8

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     8

      *** CONNECTION BETWEEN LOADCASE AND RESULTCASE NUMBERS ***

  TOP LEVEL EXT.RESULT  INDEX    TIME       WAVE DIR.   WAVE HEIGHT    WATER
  LOADCASE  IDENT.NO.                         (RAD)                    DEPTH
        1         1
        2         2
        3         3
        4         4
        5         5
        6         6       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        7         7       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        8         8       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        9         9       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02


  *** Estimate of total size of stiffness matrices for new superelements:       12415908 variables
 DATE: 10-JUL-2014 TIME: 17:51:11   ***************  SESTRA  ***************
PAGE:     9

                                    REDUCTION MODULE - SUPERELEMENT TYPE    1
                                                                                                                     SUB
PAGE:     1







                                     - STIFFNESS FACTORIZATION PERFORMED BY MULTIFRONT EQUATION SOLVER -

                                     - LOAD SUBSTITUTION PERFORMED BY  MULTIFRONT EQUATION SOLVER -
 DATE: 10-JUL-2014 TIME: 17:51:15   ***************  SESTRA  ***************
PAGE:    10

                                          STATIC ANALYSIS OF STRUCTURE
                                                                                                                     SUB
PAGE:     1


      Results file name: 20140710_175028_R1.SIN
```

```
 DATE: 10-JUL-2014 TIME: 17:51:19   ***************  SESTRA  ***************
PAGE:    11

                                   RETRACKING MODULE - SUPERELEMENT TYPE    1
                                   THE STRUCTURE                                                                  SUB
PAGE:     2

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z             RX            RY            RZ

        1          15120  -1.15846E+07   2.94073E+06   3.29522E+07   2.02618E+06  -1.82244E+07  -1.53541E+05
                   15181  -1.11134E+07  -2.67080E+06   3.22351E+07  -2.60656E+06  -1.74462E+07   1.21203E+05
                   15330   1.18934E+07   3.74620E+06   4.00426E+07   3.07723E+06   1.37211E+07   2.33013E+05
                   15427   1.08046E+07  -4.01612E+06   3.82072E+07  -2.42239E+06   1.23183E+07  -2.09586E+05

        2          15120  -5.70059E+05   7.49852E+03  -8.21387E+05  -3.48892E+04  -1.43691E+06   1.83975E+04
                   15181  -5.70138E+05  -7.40071E+03  -8.21245E+05   3.48766E+04  -1.43728E+06  -1.83597E+04
                   15330  -8.62191E+05   6.94856E+03   8.21385E+05   1.66045E+03  -1.73420E+06   1.16253E+04
                   15427  -8.62334E+05  -7.04637E+03   8.21248E+05  -1.71316E+03  -1.73321E+06  -1.16496E+04

        3          15120   5.25175E+05  -9.30649E+02   8.30035E+05   2.14923E+04   1.34545E+06  -1.83774E+04
                   15181   5.25572E+05   6.48827E+02   8.30420E+05  -2.09243E+04   1.34584E+06   1.83935E+04
                   15330   9.06852E+05  -2.38749E+03  -8.30063E+05  -1.30278E+04   1.85984E+06  -1.31383E+04
                   15427   9.07123E+05   2.66931E+03  -8.30392E+05   1.16817E+04   1.85644E+06   1.34440E+04

        4          15120  -7.78862E+05   1.24936E+06   1.45212E+06  -2.50119E+06  -1.22440E+06  -7.84061E+04
                   15181   7.85822E+05   1.37272E+06  -1.45204E+06  -2.73824E+06   1.23421E+06  -7.52020E+04
                   15330  -1.80934E+05   7.03815E+05   6.63774E+05  -1.47988E+06  -3.42866E+05  -5.12579E+03
                   15427   1.73974E+05   8.25874E+05  -6.63854E+05  -1.72019E+06   3.30482E+05  -6.49255E+03

        5          15120   7.85901E+05  -1.37262E+06  -1.45199E+06   2.73832E+06   1.23420E+06   7.54110E+04
                   15181  -7.79371E+05  -1.24929E+06   1.45212E+06   2.50048E+06  -1.22610E+06   7.84680E+04
                   15330   1.74072E+05  -8.26684E+05  -6.64045E+05   1.71911E+06   3.31015E+05   7.28277E+03
                   15427  -1.80601E+05  -7.03178E+05   6.63914E+05   1.47766E+06  -3.43335E+05   4.68419E+03

        6    1     15120  -2.42639E+05   3.11420E+04  -2.48137E+05  -6.58743E+04  -5.03655E+05   2.87657E+02
                   15181  -1.75720E+05   3.01980E+04  -2.80195E+05  -5.61738E+04  -3.86828E+05  -8.56430E+03
                   15330  -6.39728E+04  -1.90107E+04   2.91195E+05   3.93244E+04  -2.61058E+05   2.46503E+03
                   15427  -3.60276E+04  -3.73498E+04   2.84404E+05   6.71900E+04  -2.03054E+05  -1.08963E+04

        7    1     15120  -2.25468E+05   4.89436E+04  -5.47617E+04  -7.51209E+04  -3.92879E+05  -2.38866E+04
                   15181   2.44565E+05   4.36294E+04   5.54710E+04  -6.35144E+04   4.22590E+05  -2.53645E+04
                   15330  -5.38835E+05  -2.77988E+05  -4.78836E+05   5.89678E+05  -8.65363E+05  -5.55565E+04
                   15427   5.23475E+05  -3.29438E+05   4.79201E+05   6.57512E+05   8.35457E+05  -4.72100E+04

        8    1     15120   2.42639E+05  -3.11420E+04   2.48137E+05   6.58743E+04   5.03655E+05  -2.87655E+02
                   15181   1.75720E+05  -3.01980E+04   2.80195E+05   5.61738E+04   3.86828E+05   8.56430E+03
                   15330   6.39728E+04   1.90107E+04  -2.91195E+05  -3.93245E+04   2.61058E+05  -2.46503E+03
                   15427   3.60276E+04   3.73498E+04  -2.84404E+05  -6.71900E+04   2.03054E+05   1.08963E+04

        9    1     15120   2.25468E+05  -4.89436E+04   5.47617E+04   7.51209E+04   3.92879E+05   2.38866E+04
                   15181  -2.44565E+05  -4.36294E+04  -5.54710E+04   6.35144E+04  -4.22590E+05   2.53645E+04
                   15330   5.38835E+05   2.77988E+05   4.78836E+05  -5.89678E+05   8.65363E+05   5.55565E+04
                   15427  -5.23475E+05   3.29438E+05  -4.79201E+05  -6.57512E+05  -8.35457E+05   4.72100E+04
 DATE: 10-JUL-2014 TIME: 17:51:19   ***************  SESTRA  ***************
PAGE:    12

                                   RETRACKING MODULE - SUPERELEMENT TYPE    1
                                   THE STRUCTURE                                                                  SUB
PAGE:     3

  SUM OF REACTION FORCES FROM SPECIFIED DEGREES OF FREEDOM.
  THE FORCES AND MOMENTS ARE REFFERED TO THE COORDINATE SYSTEM OF THE ACTUAL SUPERELEMENT.
  ****************************************************************************************

  LOADCASE (INDEX)        X             Y             Z             RX            RY            RZ

        1            6.2492E-06   -1.4901E-07    1.4344E+08    2.5462E+09   -5.9561E+09   -5.9724E-05
        2           -2.8647E+06    7.2574E-08    1.3013E-06   -1.6090E-05   -1.4712E+09    5.1565E+07
        3            2.8647E+06   -5.4862E-08   -1.3404E-06    6.1840E-06    1.4719E+09   -5.1565E+07
        4           -1.2567E-07    4.1518E+06   -4.1444E-08   -2.1145E+09   -6.1825E-05    1.2155E+08
        5            1.3350E-07   -4.1518E+06    3.9930E-08    2.1145E+09    6.6265E-05   -1.2155E+08
        6    1      -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
        7    1       3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
        8    1       5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
        9    1      -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07


 SUPERELEMENT TYPE:     1 ACTUAL ELEMENT:     1
 HAS BEEN STORED ON RESULT FILE
```

```
 DATE: 10-JUL-2014 TIME: 17:51:26   ***************  SESTRA  ***************
PAGE:    13

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     1

  SUM OF GLOBAL LOADS AND MOMENTS
  *******************************


  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1            7.9820E-11    5.0849E-11   -1.4344E+08   -2.5462E+09    5.9561E+09    2.4615E-09
        2            2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00    1.4712E+09   -5.1565E+07
        3           -2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00   -1.4719E+09    5.1565E+07
        4            0.0000E+00   -4.1518E+06    0.0000E+00    2.1145E+09    0.0000E+00   -1.2155E+08
        5            0.0000E+00    4.1518E+06    0.0000E+00   -2.1145E+09    0.0000E+00    1.2155E+08
        6    1       5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
        7    1      -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07
        8    1      -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
        9    1       3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
 DATE: 10-JUL-2014 TIME: 17:51:26   ***************  SESTRA  ***************
PAGE:    14

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     2

  SUM OF REACTION FORCES AND MOMENTS
  **********************************
  GIVEN IN THE GLOBAL COORDINATE SYSTEM OF THE TOP LEVEL SUPERELEMENT

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1            6.2492E-06   -1.4901E-07    1.4344E+08    2.5462E+09   -5.9561E+09   -5.9724E-05
        2           -2.8647E+06    7.2574E-08    1.3013E-06   -1.6090E-05   -1.4712E+09    5.1565E+07
        3            2.8647E+06   -5.4862E-08   -1.3404E-06    6.1840E-06    1.4719E+09   -5.1565E+07
        4           -1.2567E-07    4.1518E+06   -4.1444E-08   -2.1145E+09   -6.1825E-05    1.2155E+08
        5            1.3350E-07   -4.1518E+06    3.9930E-08    2.1145E+09    6.6265E-05   -1.2155E+08
        6    1      -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
        7    1       3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
        8    1       5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
        9    1      -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07
 DATE: 10-JUL-2014 TIME: 17:51:26   ***************  SESTRA  ***************
PAGE:    15

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     3

  DIFFERENCES BETWEEN SUMMED LOADS AND REACTION FORCES
  ****************************************************
  LARGER THAN   0.00E+00 FOR TRANSLATIONAL COMPONENTS AND LARGER THAN   0.00E+00 FOR ROTATIONAL COMPONENTS

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1            6.2493E-06   -1.4896E-07    1.1921E-06    4.7207E-05    2.2516E-03   -5.9721E-05
        2            8.0839E-07    7.2574E-08    1.3013E-06   -1.6090E-05    3.9315E-04   -1.7680E-05
        3           -8.8243E-07   -5.4862E-08   -1.3404E-06    6.1840E-06   -4.2510E-04    2.0050E-05
        4           -1.2567E-07   -3.3900E-07   -4.1444E-08    1.7500E-04   -6.1825E-05   -6.3628E-06
        5            1.3350E-07    3.4599E-07    3.9930E-08   -1.7858E-04    6.6265E-05    6.6459E-06
        6    1       7.1817E-07   -1.6898E-08    3.2574E-07    1.2754E-05    3.6198E-04   -1.2536E-05
        7    1      -1.7003E-07    8.3196E-07   -3.2999E-08   -4.3803E-04   -8.2828E-05    9.3855E-05
        8    1      -7.1671E-07    1.6971E-08   -3.2540E-07   -1.2792E-05   -3.6204E-04    1.2559E-05
        9    1       1.6991E-07   -8.3155E-07    3.3526E-08    4.3714E-04    8.2731E-05   -9.3602E-05

  TOTAL TIME CONSUMED IN SESTRA                    CPU TIME:     20.65  CLOCK TIME:     19.29  CHANNEL TIME:      0.00
```

O. Model B

```
                                 ******       ******       ******       ******      ** ***  ****
                                ********     ********     ********     ********     *************
                               **      **   **      **   **      **   **      **    **    **    **
                               **           **      **   **                    **    **    **    **
                                *******     **********    *******      *********    **    **    **
                                 *******    *********      *******    **********    **    **    **
                                       **   **                   **   **      **    **    **    **
                               **      **   **      **   **      **   **      **    **    **    **
                                ********     ********     ********     *********    **    **    **
                                 ******       ******       ******       ****** **   **    **    **


                               *******************************************************************
                               *******************************************************************
                               **                                                               **
                               **                                                               **
                               **      *****   *******   *****   *******  ******    *****       **
                               **     *     *  *        *     *     *     *     *  *     *      **
                               **     *        *        *           *     *     *  *     *      **
                               **      *****   *****     *****      *     ******   *******      **
                               **           *  *              *     *     *   *    *     *      **
                               **     *     *  *        *     *     *     *    *   *     *      **
                               **      *****   *******   *****      *     *     *  *     *      **
                               **                                                               **
                               **                                                               **
                               **               Superelement Structural Analysis                **
                               **                                                               **
                               **                                                               **
                               *******************************************************************
                               *******************************************************************


                                              Marketing and Support by DNV Software


               Program id   : 8.6-01                                           Computer         : 8664
               Release date : 16-MAY-2013                                      Impl. update     :
               Access time  : 08-JUL-2014 16:08:43                             Operating system : Win NT 6.1 [7601]
               User id      : NADME                                            CPU id           : 0973744164
                                                                               Installation     : , STGLP110135


               Copyright DET NORSKE VERITAS AS, P.O.Box 300, N-1322 Hovik, Norway


               Library     Version    Impl.Upd   Release date
               ELLIBD      1.9-07                16-MAY-2013
               SIFTOOLD    8.3-09                16-MAY-2013
               NORSAMD     8.4-02                16-MAY-2013
               MFR         8.3-05                16-MAY-2013
               PRIMAS      5.3-04                16-MAY-2013
               AUXLIB      8.2-02                16-MAY-2013
               SESTRA_PRLL 8.1-02                16-MAY-2013

               Run identification   :

DATE: 08-JUL-2014 TIME: 16:08:47   ***************  SESTRA  ***************                                             PAGE:
1

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     1

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   HEAD
   COMM
   COMM    Created by: GeniE  V6.6-08  25-Sep-2013
   COMM
   COMM    Date : 08-Jul-2014   Time : 16:08:42   User : NADME
   COMM
   COMM  CHCK ANTP MSUM MOLO STIF RTOP LBCK      PILE CSING     SIGM
   CMAS    0.   1.   1.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM            ORDR                          CACH MFRWORK
   SOLM    0.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM                 WCOR
   ELOP    0.   0.   0.   1.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  ITYP
   ITOP    1.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  PREFIX
   INAM  20140708_160809_
   COMM
   COMM  PREFIX FORMAT
   LNAM  20140708_160809_ UNFORMATTED
   COMM
   COMM  PREFIX FORMAT
   RNAM  20140708_160809_ NORSAM
   COMM
```

```
   COMM  SEL1 SEL2 SEL3 SEL4 SEL5 SEL6 SEL7 SEL8
   RSEL    1.   0.   0.   0.   0.   0.   1.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  RTRA
   RETR    3.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   Z

  PRINTOUT OF DATA GIVEN IN THE FILE 20140708_160809_S1.FEM

   LOHI    1.   0.  12.   1.   1.   0.   0.   0.   1.  0.10E+01  0.00E+00  0.00E+00
   SEAS    1.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    1.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    1.  0.00E+00  0.10E+01  0.60E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    2.   0.  12.   2.   2.   0.   0.   0.   2.  0.20E+01  0.00E+00  0.00E+00
   SEAS    2.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    2.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    2.  0.00E+00  0.10E+01  0.70E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    3.   0.  12.   3.   3.   0.   0.   0.   3.  0.30E+01  0.00E+00  0.00E+00
   SEAS    3.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    3.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    3.  0.00E+00  0.10E+01  0.80E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 08-JUL-2014 TIME: 16:08:47   ***************  SESTRA  ***************
PAGE:     2

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     2

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   LOHI    4.   0.  12.   4.   4.   0.   0.   0.   4.  0.40E+01  0.00E+00  0.00E+00
   SEAS    4.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    4.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    4.  0.00E+00  0.10E+01  0.90E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    1.  0.38E+02  0.00E+00  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    2.  0.38E+02  0.90E+02  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    3.  0.38E+02  0.18E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    4.  0.38E+02  0.27E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 08-JUL-2014 TIME: 16:08:47   ***************  SESTRA  ***************
PAGE:     3

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     3
  INTERPRETATION OF ANALYSIS CONTROL DATA


      Type of Analysis :

         Reduction
         Multifront Solver is used
         Retracking


      Input from CMAS Command :

         ANTYP = 1   Static Analysis
         MSUM  > 0   Calculation of Sum of Masses and Centroid

         The singularity constant for membrane and shell elements
         CSING =  1.0000E-08

         Lowest accepted condition number in reduction
         EPSSOL=  1.1102E-14


      Input from RSEL Command :

         Data types selected for storing on Results File :
          - Input Interface File Records,
          - displacements,  sequence:
               all nodes for the first resultcase, all nodes for the second resultcase, etc.
          - forces and moments for beam, spring and layered shell elements,  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.
          - stresses (not for beam or spring elements),  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.

         (Can be redefined by RSEL for selected superelements, see below.)
         Storing is done for superelements specified in RETR command.
```

```
 DATE: 08-JUL-2014 TIME: 16:08:47   ***************  SESTRA  ***************
PAGE:     4

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     4

  INPUT INTERFACE FILES :


     20140708_160809_T1.FEM
     20140708_160809_L1.FEM

         DATE:     08-Jul-2014         TIME:          16:08:10
         PROGRAM:  SESAM GeniE         VERSION:       V6.6-08 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     08-Jul-2014         TIME:          16:08:10
         PROGRAM:  SESAM Gamesha       VERSION:       R5.0-3 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     08-JUL-2014         TIME:         16:08:29
         PROGRAM:  SESAM WAJAC         VERSION:      6.2-01  1-MAR-2011
         COMPUTER: 586 WIN NT 6.1 [7601INSTALLATION: , STGLP110135
         USER:     NADME               ACCOUNT:


 DATE: 08-JUL-2014 TIME: 16:08:48   ***************  SESTRA  ***************
PAGE:     5

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     5

      *** SUMMARY OF DATA FROM INPUT AND LOAD INTERFACE FILES ***
               FOR SUPERELEMENT TYPE       1  ON LEVEL  1

      The superelement has

         21062  subelements
         16723  nodes
            24  specified (fixed) degrees of freedom
        100314  internal (free) degrees of freedom
          totally
        100338  degrees of freedom

             9  loadcases


      The following kinds of loads are given:
            line or point loads for 2 node beams
            gravitational load

      The following basic elements are given:
          7291  2 node beam elements         BEAS
         13753  4 node flat shell elements   FQUS
            18  3 node flat shell elements   FTRS

        Eccentricities are given

 DATE: 08-JUL-2014 TIME: 16:08:51   ***************  SESTRA  ***************
PAGE:     6

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     6

      *** SUM OF LOADS AND MOMENTS FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***

     X-LOAD = SUM OF GIVEN LOADS IN GLOBAL X-DIRECTION
     Y-LOAD = SUM OF GIVEN LOADS IN GLOBAL Y-DIRECTION
     Z-LOAD = SUM OF GIVEN LOADS IN GLOBAL Z-DIRECTION
     X-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL X-AXIS
     Y-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Y-AXIS
     Z-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Z-AXIS
     X-RMOM = SUM OF MOMENTS ABOUT GLOBAL X-AXIS FROM GIVEN LOADS AND MOMENTS
     Y-RMOM = SUM OF MOMENTS ABOUT GLOBAL Y-AXIS FROM GIVEN LOADS AND MOMENTS
     Z-RMOM = SUM OF MOMENTS ABOUT GLOBAL Z-AXIS FROM GIVEN LOADS AND MOMENTS

      LOADCASE    X-LOAD      Y-LOAD      Z-LOAD      X-MOM       Y-MOM       Z-MOM      X-RMOM      Y-RMOM      Z-RMOM
           1  6.5268E-11 -2.8110E-12 -1.4344E+08  0.0000E+00 -4.5221E+02  0.0000E+00 -2.5459E+09  5.9559E+09 -6.1709E-10
           2  2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00 -1.7905E+05  0.0000E+00  0.0000E+00  1.4710E+09 -5.1565E+07
           3 -2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00  1.9833E+05  0.0000E+00  0.0000E+00 -1.4717E+09  5.1565E+07
           4  0.0000E+00 -4.1518E+06  0.0000E+00 -5.0773E+05  0.0000E+00  0.0000E+00  2.1140E+09  0.0000E+00 -1.2155E+08
           5  0.0000E+00  4.1518E+06  0.0000E+00  5.0773E+05  0.0000E+00  0.0000E+00 -2.1140E+09  0.0000E+00  1.2155E+08
           6  5.1836E+05 -4.9794E+03 -4.7266E+04  4.6216E-07 -2.6098E+00 -6.5539E-03  2.1635E+06  2.7646E+08 -6.3016E+06
           7 -3.7374E+03  5.1485E+05 -1.0751E+03  2.7900E+00  1.6730E-06 -6.6219E-01 -2.6991E+08 -1.8048E+06  5.3466E+07
           8 -5.1836E+05  4.9794E+03  4.7266E+04 -2.0734E-06  2.6098E+00  6.5572E-03 -2.1635E+06 -2.7646E+08  6.3016E+06
           9  3.7374E+03 -5.1485E+05  1.0751E+03 -2.7900E+00 -1.0218E-06  6.6220E-01  2.6991E+08  1.8048E+06 -5.3466E+07
```

```
 DATE: 08-JUL-2014 TIME: 16:08:51   ***************  SESTRA  ***************
PAGE:     7

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     7

      *** SUM OF MASSES AND CENTROID FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***


   MASS MATRIX IN GLOBAL COORDINATE SYSTEM (OF THE SUPERELEMENT):
   ---------------------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    3.08653E+09   -1.06084E+08
   0.00000E+00    6.09200E+06    0.00000E+00   -3.08653E+09    0.00000E+00    2.37448E+08
   0.00000E+00    0.00000E+00    6.09200E+06    1.06084E+08   -2.37448E+08    0.00000E+00
   0.00000E+00   -3.08653E+09    1.06084E+08    1.56716E+12   -4.00203E+09   -1.20266E+11
   3.08653E+09    0.00000E+00   -2.37448E+08   -4.00203E+09    1.57931E+12   -5.36962E+10
  -1.06084E+08    2.37448E+08    0.00000E+00   -1.20266E+11   -5.36962E+10    1.75160E+10


   COORDINATES OF CENTROID:
   ------------------------
   3.8977E+01     1.7414E+01     5.0665E+02


   MASS MATRIX AT CENTROID:
   ------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    0.00000E+00    4.13209E-05
   0.00000E+00    6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00   -4.19766E-04
   0.00000E+00    0.00000E+00    6.09200E+06    4.12911E-05   -4.19766E-04    0.00000E+00
   0.00000E+00    0.00000E+00    4.12911E-05    1.51018E+09    1.32779E+08    3.78572E+07
   0.00000E+00    0.00000E+00   -4.19766E-04    1.32779E+08    6.26091E+09    5.13785E+07
   4.13209E-05   -4.19766E-04    0.00000E+00    3.78572E+07    5.13785E+07    6.41372E+09

  *** Estimated size of stiffness matrix for superelement       1:    12468232 variables

  DATE: 08-JUL-2014 TIME: 16:08:51   ***************  SESTRA  ***************
PAGE:     8

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     8

      *** CONNECTION BETWEEN LOADCASE AND RESULTCASE NUMBERS ***

  TOP LEVEL EXT.RESULT  INDEX    TIME       WAVE DIR.   WAVE HEIGHT    WATER
  LOADCASE  IDENT.NO.                         (RAD)                    DEPTH
        1         1
        2         2
        3         3
        4         4
        5         5
        6         6       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        7         7       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        8         8       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        9         9       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02


  *** Estimate of total size of stiffness matrices for new superelements:       12468232 variables

DATE: 08-JUL-2014 TIME: 16:08:51   ***************  SESTRA  ***************                                        PAGE:
9

                                    REDUCTION MODULE - SUPERELEMENT TYPE    1
                                                                                                                     SUB
PAGE:     1






                                     - STIFFNESS FACTORIZATION PERFORMED BY MULTIFRONT EQUATION SOLVER -

                                     - LOAD SUBSTITUTION PERFORMED BY  MULTIFRONT EQUATION SOLVER -
```

```
DATE: 08-JUL-2014 TIME: 16:09:01   ***************  SESTRA  ***************                                             PAGE:
10

                                          STATIC ANALYSIS OF STRUCTURE
                                                                                                                     SUB
PAGE:     1



      Results file name: 20140708_160809_R1.SIN

DATE: 08-JUL-2014 TIME: 16:09:05   ***************  SESTRA  ***************                                             PAGE:
11

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                                    SUB
PAGE:     2

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z            RX            RY            RZ

        1          15120  -1.18335E+07   2.35777E+06   3.33069E+07   4.98147E+05  -2.63641E+07  -4.15519E+05
                   15180  -1.17754E+07  -1.93934E+06   3.21941E+07  -3.48833E+06  -1.85920E+07   2.26757E+05
                   15328   1.23193E+07   2.95559E+06   3.96113E+07   3.61024E+06   1.32969E+07   2.71398E+05
                   15425   1.12897E+07  -3.37402E+06   3.83246E+07  -2.95264E+06   1.21753E+07  -2.93304E+05

        2          15120  -5.62646E+05   9.49755E+03  -7.88848E+05  -5.18658E+04  -1.86275E+06   5.01353E+02
                   15180  -5.81958E+05   1.94293E+02  -8.31355E+05   3.23576E+04  -1.52270E+06  -1.65279E+04
                   15328  -8.58066E+05   3.38726E+03   7.88607E+05   1.57767E+03  -1.73406E+06   1.05764E+04
                   15425  -8.62054E+05  -1.30791E+04   8.31596E+05   1.11831E+04  -1.76078E+06  -1.06127E+04

        3          15120   5.06398E+05  -3.25503E+03   7.94919E+05   3.13949E+04   1.82770E+06   8.83843E+02
                   15180   5.28541E+05  -7.42412E+03   8.40901E+05  -1.00042E+04   1.46181E+06   1.56654E+04
                   15328   9.13148E+05   1.05562E+03  -7.94698E+05  -2.03091E+04   1.84151E+06  -1.24206E+04
                   15425   9.16636E+05   9.62352E+03  -8.41123E+05   5.12928E+03   1.86655E+06   1.29645E+04

        4          15120  -8.00511E+05   1.23565E+06   1.45240E+06  -2.82736E+06  -1.48171E+06  -7.85655E+04
                   15180   8.12926E+05   1.37319E+06  -1.44249E+06  -2.50917E+06   1.17744E+06  -8.15114E+04
                   15328  -1.74678E+05   7.07078E+05   6.48809E+05  -1.40413E+06  -3.05233E+05  -4.81719E+03
                   15425   1.62264E+05   8.35848E+05  -6.58716E+05  -1.60228E+06   2.92460E+05   7.09880E+03

        5          15120   8.07619E+05  -1.36789E+06  -1.45199E+06   3.04328E+06   1.49153E+06   8.73983E+04
                   15180  -8.06437E+05  -1.24076E+06   1.44224E+06   2.29889E+06  -1.16976E+06   7.34731E+04
                   15328   1.67741E+05  -8.39742E+05  -6.49174E+05   1.61595E+06   2.94474E+05  -4.29708E+03
                   15425  -1.68923E+05  -7.03377E+05   6.58922E+05   1.38610E+06  -3.04319E+05   2.61109E+03

        6    1     15120  -2.40312E+05   3.36301E+04  -2.32881E+05  -8.75595E+04  -6.88058E+05  -5.62261E+03
                   15180  -1.79983E+05   3.28707E+04  -2.82959E+05  -5.40754E+04  -4.26168E+05  -8.20924E+03
                   15328  -6.01712E+04  -2.15456E+04   2.74296E+05   2.05715E+04  -3.61832E+05  -4.80897E+02
                   15425  -3.78939E+04  -3.99757E+04   2.88810E+05   5.95477E+04  -2.78275E+05  -8.85935E+03

        7    1     15120  -2.15084E+05   4.59694E+04  -4.71722E+04  -4.79092E+04  -3.73358E+05  -2.12355E+04
                   15180   2.43470E+05   3.64651E+04   4.93349E+04  -2.82638E+04   3.60467E+05  -2.28442E+04
                   15328  -5.61547E+05  -2.83161E+05  -4.86274E+05   5.60280E+05  -7.50499E+05  -4.91547E+04
                   15425   5.36898E+05  -3.14125E+05   4.85186E+05   6.28691E+05   7.16688E+05  -3.80281E+04

        8    1     15120   2.40312E+05  -3.36301E+04   2.32881E+05   8.75595E+04   6.88058E+05   5.62261E+03
                   15180   1.79983E+05  -3.28707E+04   2.82959E+05   5.40754E+04   4.26168E+05   8.20924E+03
                   15328   6.01712E+04   2.15457E+04  -2.74296E+05  -2.05715E+04   3.61832E+05   4.80901E+02
                   15425   3.78939E+04   3.99757E+04  -2.88811E+05  -5.95477E+04   2.78275E+05   8.85935E+03

        9    1     15120   2.15084E+05  -4.59694E+04   4.71722E+04   4.79092E+04   3.73358E+05   2.12355E+04
                   15180  -2.43470E+05  -3.64651E+04  -4.93349E+04   2.82638E+04  -3.60467E+05   2.28442E+04
                   15328   5.61547E+05   2.83161E+05   4.86274E+05  -5.60280E+05   7.50499E+05   4.91547E+04
                   15425  -5.36898E+05   3.14125E+05  -4.85186E+05  -6.28691E+05  -7.16688E+05   3.80281E+04

  DATE: 08-JUL-2014 TIME: 16:09:05   ***************  SESTRA  ***************
PAGE:    12

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                                    SUB
PAGE:     3

  SUM OF REACTION FORCES FROM SPECIFIED DEGREES OF FREEDOM.
  THE FORCES AND MOMENTS ARE REFFERED TO THE COORDINATE SYSTEM OF THE ACTUAL SUPERELEMENT.
  ****************************************************************************************

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1             4.8988E-06    1.8440E-07    1.4344E+08    2.5459E+09   -5.9559E+09   -4.8876E-05
        2            -2.8647E+06    7.0466E-08    1.2320E-06   -1.8142E-05   -1.4710E+09    5.1565E+07
        3             2.8647E+06   -4.7867E-08   -1.2615E-06    5.9642E-06    1.4717E+09   -5.1565E+07
        4            -5.6229E-08    4.1518E+06   -7.1595E-08   -2.1140E+09   -2.7627E-05    1.2155E+08
        5             5.9023E-08   -4.1518E+06    6.8685E-08    2.1140E+09    2.9534E-05   -1.2155E+08
        6    1       -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
        7    1        3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
        8    1        5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
        9    1       -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07
```

```
 SUPERELEMENT TYPE:     1 ACTUAL ELEMENT:     1
 HAS BEEN STORED ON RESULT FILE

 DATE: 08-JUL-2014 TIME: 16:09:12   ***************  SESTRA  ***************
PAGE:    13

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     1

  SUM OF GLOBAL LOADS AND MOMENTS
  *******************************


  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

       1                6.5268E-11   -2.8110E-12   -1.4344E+08   -2.5459E+09    5.9559E+09   -6.1709E-10
       2                2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00    1.4710E+09   -5.1565E+07
       3               -2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00   -1.4717E+09    5.1565E+07
       4                0.0000E+00   -4.1518E+06    0.0000E+00    2.1140E+09    0.0000E+00   -1.2155E+08
       5                0.0000E+00    4.1518E+06    0.0000E+00   -2.1140E+09    0.0000E+00    1.2155E+08
       6    1           5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
       7    1          -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07
       8    1          -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
       9    1           3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07

 DATE: 08-JUL-2014 TIME: 16:09:12   ***************  SESTRA  ***************
PAGE:    14

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     2

  SUM OF REACTION FORCES AND MOMENTS
  **********************************
  GIVEN IN THE GLOBAL COORDINATE SYSTEM OF THE TOP LEVEL SUPERELEMENT

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

       1                4.8988E-06    1.8440E-07    1.4344E+08    2.5459E+09   -5.9559E+09   -4.8876E-05
       2               -2.8647E+06    7.0466E-08    1.2320E-06   -1.8142E-05   -1.4710E+09    5.1565E+07
       3                2.8647E+06   -4.7867E-08   -1.2615E-06    5.9642E-06    1.4717E+09   -5.1565E+07
       4               -5.6229E-08    4.1518E+06   -7.1595E-08   -2.1140E+09   -2.7627E-05    1.2155E+08
       5                5.9023E-08   -4.1518E+06    6.8685E-08    2.1140E+09    2.9534E-05   -1.2155E+08
       6    1          -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
       7    1           3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
       8    1           5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
       9    1          -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07

DATE: 08-JUL-2014 TIME: 16:09:12   ***************  SESTRA  ***************                                             PAGE:
15

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     3

  DIFFERENCES BETWEEN SUMMED LOADS AND REACTION FORCES
  ****************************************************
  LARGER THAN   0.00E+00 FOR TRANSLATIONAL COMPONENTS AND LARGER THAN   0.00E+00 FOR ROTATIONAL COMPONENTS

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

       1                4.8988E-06    1.8440E-07   -1.6093E-06   -1.4591E-04    1.7738E-03   -4.8876E-05
       2                1.6764E-08    7.0466E-08    1.2320E-06   -1.8142E-05   -1.6928E-05   -7.3016E-07
       3               -8.8476E-08   -4.7867E-08   -1.2615E-06    5.9642E-06   -1.3828E-05    3.0026E-06
       4               -5.6229E-08   -1.2014E-07   -7.1595E-08    5.4121E-05   -2.7627E-05   -8.3447E-06
       5                5.9023E-08    1.1036E-07    6.8685E-08   -4.9353E-05    2.9534E-05    7.7933E-06
       6    1           5.0443E-07   -2.9180E-08    3.0053E-07    1.7921E-05    2.5326E-04   -9.2341E-06
       7    1          -1.3284E-07    8.4145E-07   -4.3476E-08   -4.4441E-04   -6.3606E-05    9.3304E-05
       8    1          -5.0326E-07    2.9326E-08   -3.0101E-07   -1.7992E-05   -2.5344E-04    9.2564E-06
       9    1           1.3260E-07   -8.4122E-07    4.3713E-08    4.4364E-04    6.3568E-05   -9.3065E-05

  TOTAL TIME CONSUMED IN SESTRA                    CPU TIME:     20.73  CLOCK TIME:     24.98  CHANNEL TIME:      0.00
```

P. Model C

```
                                 ******       ******       ******       ******      ** ***  ****
                                ********     ********     ********     ********     *************
                               **      **   **      **   **      **   **      **    **    **    **
                               **           **      **   **                    **    **    **    **
                                *******     **********    *******      *********    **    **    **
                                 *******    *********      *******    **********    **    **    **
                                       **   **                    **   **      **    **    **    **
                               **      **   **      **   **      **   **      **    **    **    **
                                ********     ********     ********     *********    **    **    **
                                 ******       ******       ******       ****** **    **    **    **


                               *******************************************************************
                               *******************************************************************
                               **                                                               **
                               **                                                               **
                               **      *****   *******   *****   *******  ******    *****       **
                               **     *     *  *        *     *     *     *     *  *     *      **
                               **     *        *        *           *     *     *  *     *      **
                               **      *****   *****     *****      *     ******   *******      **
                               **          *  *              *     *     *   *    *     *      **
                               **     *     *  *        *     *     *     *    *   *     *      **
                               **      *****   *******   *****      *     *     *  *     *      **
                               **                                                               **
                               **                                                               **
                               **               Superelement Structural Analysis                **
                               **                                                               **
                               **                                                               **
                               *******************************************************************
                               *******************************************************************


                                              Marketing and Support by DNV Software


               Program id   : 8.6-01                                           Computer         : 8664
               Release date : 16-MAY-2013                                      Impl. update     :
               Access time  : 11-JUL-2014 17:48:04                             Operating system : Win NT 6.1 [7601]
               User id      : NADME                                            CPU id           : 0973744164
                                                                               Installation     : , STGLP110135


               Copyright DET NORSKE VERITAS AS, P.O.Box 300, N-1322 Hovik, Norway


               Library     Version    Impl.Upd   Release date
               ELLIBD      1.9-07                16-MAY-2013
               SIFTOOLD    8.3-09                16-MAY-2013
               NORSAMD     8.4-02                16-MAY-2013
               MFR         8.3-05                16-MAY-2013
               PRIMAS      5.3-04                16-MAY-2013
               AUXLIB      8.2-02                16-MAY-2013
               SESTRA_PRLL 8.1-02                16-MAY-2013

               Run identification   :


 DATE: 11-JUL-2014 TIME: 17:48:08   ***************  SESTRA  ***************
PAGE:     1

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     1

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   HEAD
   COMM
   COMM    Created by: GeniE  V6.6-08  25-Sep-2013
   COMM
   COMM    Date : 11-Jul-2014   Time : 17:48:03   User : NADME
   COMM
   COMM  CHCK ANTP MSUM MOLO STIF RTOP LBCK      PILE CSING     SIGM
   CMAS    0.   1.   1.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM          ORDR                            CACH MFRWORK
   SOLM    0.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM               WCOR
   ELOP    0.   0.   0.   1.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  ITYP
   ITOP    1.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  PREFIX
   INAM  20140711_174724_
   COMM
   COMM  PREFIX FORMAT
   LNAM  20140711_174724_ UNFORMATTED
   COMM
   COMM  PREFIX FORMAT
```

```
   RNAM  20140711_174724_ NORSAM
   COMM
   COMM  SEL1 SEL2 SEL3 SEL4 SEL5 SEL6 SEL7 SEL8
   RSEL    1.   0.   0.   0.   0.   0.   1.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  RTRA
   RETR    3.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   Z

  PRINTOUT OF DATA GIVEN IN THE FILE 20140711_174724_S1.FEM

   LOHI    1.   0.  12.   1.   1.   0.   0.   0.   1.  0.10E+01  0.00E+00  0.00E+00
   SEAS    1.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    1.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    1.  0.00E+00  0.10E+01  0.60E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    2.   0.  12.   2.   2.   0.   0.   0.   2.  0.20E+01  0.00E+00  0.00E+00
   SEAS    2.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    2.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    2.  0.00E+00  0.10E+01  0.70E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    3.   0.  12.   3.   3.   0.   0.   0.   3.  0.30E+01  0.00E+00  0.00E+00
   SEAS    3.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    3.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    3.  0.00E+00  0.10E+01  0.80E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 11-JUL-2014 TIME: 17:48:08   ***************  SESTRA  ***************
PAGE:     2

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     2

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   LOHI    4.   0.  12.   4.   4.   0.   0.   0.   4.  0.40E+01  0.00E+00  0.00E+00
   SEAS    4.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    4.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    4.  0.00E+00  0.10E+01  0.90E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    1.  0.38E+02  0.00E+00  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    2.  0.38E+02  0.90E+02  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    3.  0.38E+02  0.18E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    4.  0.38E+02  0.27E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 11-JUL-2014 TIME: 17:48:08   ***************  SESTRA  ***************
PAGE:     3

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     3
  INTERPRETATION OF ANALYSIS CONTROL DATA


      Type of Analysis :

         Reduction
         Multifront Solver is used
         Retracking


      Input from CMAS Command :

         ANTYP = 1   Static Analysis
         MSUM  > 0   Calculation of Sum of Masses and Centroid

         The singularity constant for membrane and shell elements
         CSING =  1.0000E-08

         Lowest accepted condition number in reduction
         EPSSOL=  1.1102E-14


      Input from RSEL Command :

         Data types selected for storing on Results File :
          - Input Interface File Records,
          - displacements,  sequence:
               all nodes for the first resultcase, all nodes for the second resultcase, etc.
          - forces and moments for beam, spring and layered shell elements,  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.
          - stresses (not for beam or spring elements),  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.

         (Can be redefined by RSEL for selected superelements, see below.)
         Storing is done for superelements specified in RETR command.
```

```
 DATE: 11-JUL-2014 TIME: 17:48:08   ***************  SESTRA  ***************
PAGE:     4

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     4

  INPUT INTERFACE FILES :


     20140711_174724_T1.FEM
     20140711_174724_L1.FEM

         DATE:     11-Jul-2014         TIME:          17:47:24
         PROGRAM:  SESAM GeniE         VERSION:       V6.6-08 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     11-Jul-2014         TIME:          17:47:24
         PROGRAM:  SESAM Gamesha       VERSION:       R5.0-3 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     11-JUL-2014         TIME:         17:47:51
         PROGRAM:  SESAM WAJAC         VERSION:      6.2-01  1-MAR-2011
         COMPUTER: 586 WIN NT 6.1 [7601INSTALLATION: , STGLP110135
         USER:     NADME               ACCOUNT:


 DATE: 11-JUL-2014 TIME: 17:48:09   ***************  SESTRA  ***************
PAGE:     5

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     5




      For a summary of warnings for elements and more information
      see *** SUMMARY OF WARNINGS FROM DATACHECK OF ELEMENTS ***

  *** WARNING Element no.   10077 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   11174 is warped, distance from node 4 to plane =  -1.697E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11178 is warped, distance from node 4 to plane =   1.676E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11181 is warped, distance from node 4 to plane =  -2.213E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11182 is warped, distance from node 4 to plane =   2.131E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11198 is warped, distance from node 4 to plane =  -1.733E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11206 is warped, distance from node 4 to plane =   1.751E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11213 is warped, distance from node 4 to plane =   1.583E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11215 is warped, distance from node 4 to plane =   2.069E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11218 is warped, distance from node 4 to plane =  -2.655E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11219 is warped, distance from node 4 to plane =   1.814E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11230 is warped, distance from node 4 to plane =  -2.143E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11231 is warped, distance from node 4 to plane =   2.549E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11232 is warped, distance from node 4 to plane =  -2.296E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11236 is warped, distance from node 4 to plane =   2.046E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11237 is warped, distance from node 4 to plane =  -2.951E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11238 is warped, distance from node 4 to plane =   3.255E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11239 is warped, distance from node 4 to plane =  -3.387E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11240 is warped, distance from node 4 to plane =   3.087E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11241 is warped, distance from node 4 to plane =  -2.053E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11244 is warped, distance from node 4 to plane =  -1.723E-05
  Print of this warning is turned off after 20 warnings

      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   12118 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   14596 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   16299 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   23441 (3-noded shell or membrane element) has bad element shape.
```

```
 DATE: 11-JUL-2014 TIME: 17:48:14   ***************  SESTRA  ***************
PAGE:     6

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                    SUB
PAGE:     6
      *** SUMMARY OF DATA FROM INPUT AND LOAD INTERFACE FILES ***
               FOR SUPERELEMENT TYPE       1  ON LEVEL  1

      The superelement has

         39750  subelements
         34804  nodes
          1041  specified (fixed) degrees of freedom
        207783  internal (free) degrees of freedom
          totally
        208824  degrees of freedom

             9  loadcases

        Multi Point Constraints are given

      The following kinds of loads are given:
            line or point loads for 2 node beams
            gravitational load

      The following basic elements are given:
          7855  2 node beam elements         BEAS
         31831  4 node flat shell elements   FQUS
            64  3 node flat shell elements   FTRS

        Eccentricities are given

 DATE: 11-JUL-2014 TIME: 17:48:14   ***************  SESTRA  ***************
PAGE:     7

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                    SUB
PAGE:     7

      *** SUM OF LOADS AND MOMENTS FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***

     X-LOAD = SUM OF GIVEN LOADS IN GLOBAL X-DIRECTION
     Y-LOAD = SUM OF GIVEN LOADS IN GLOBAL Y-DIRECTION
     Z-LOAD = SUM OF GIVEN LOADS IN GLOBAL Z-DIRECTION
     X-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL X-AXIS
     Y-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Y-AXIS
     Z-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Z-AXIS
     X-RMOM = SUM OF MOMENTS ABOUT GLOBAL X-AXIS FROM GIVEN LOADS AND MOMENTS
     Y-RMOM = SUM OF MOMENTS ABOUT GLOBAL Y-AXIS FROM GIVEN LOADS AND MOMENTS
     Z-RMOM = SUM OF MOMENTS ABOUT GLOBAL Z-AXIS FROM GIVEN LOADS AND MOMENTS

      LOADCASE    X-LOAD      Y-LOAD      Z-LOAD       X-MOM       Y-MOM       Z-MOM      X-RMOM      Y-RMOM      Z-RMOM
           1  2.9797E-11  7.1935E-12 -1.4344E+08 -8.6275E-01 -4.3380E+02  0.0000E+00 -2.5526E+09  5.9581E+09  7.7443E-10
           2  2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00 -1.7905E+05  0.0000E+00  0.0000E+00  1.4710E+09 -5.1565E+07
           3 -2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00  1.9833E+05  0.0000E+00  0.0000E+00 -1.4717E+09  5.1565E+07
           4  0.0000E+00 -4.1518E+06  0.0000E+00 -5.0773E+05  0.0000E+00  0.0000E+00  2.1140E+09  0.0000E+00 -1.2155E+08
           5  0.0000E+00  4.1518E+06  0.0000E+00  5.0773E+05  0.0000E+00  0.0000E+00 -2.1140E+09  0.0000E+00  1.2155E+08
           6  5.1855E+05 -4.9794E+03 -4.7266E+04  4.6216E-07 -2.6098E+00 -6.5539E-03  2.1635E+06  2.7655E+08 -6.3024E+06
           7 -3.7374E+03  5.1504E+05 -1.0751E+03  2.7900E+00  1.6730E-06 -6.6219E-01 -2.7000E+08 -1.8048E+06  5.3471E+07
           8 -5.1855E+05  4.9794E+03  4.7266E+04 -2.0734E-06  2.6098E+00  6.5572E-03 -2.1635E+06 -2.7655E+08  6.3024E+06
           9  3.7374E+03 -5.1504E+05  1.0751E+03 -2.7900E+00 -1.0218E-06  6.6220E-01  2.7000E+08  1.8048E+06 -5.3471E+07

 DATE: 11-JUL-2014 TIME: 17:48:15   ***************  SESTRA  ***************
PAGE:     8

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                    SUB
PAGE:     8

      *** SUM OF MASSES AND CENTROID FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***


   MASS MATRIX IN GLOBAL COORDINATE SYSTEM (OF THE SUPERELEMENT):
   ---------------------------------------
   6.09202E+06    0.00000E+00    0.00000E+00    0.00000E+00    3.08688E+09   -1.06760E+08
   0.00000E+00    6.09202E+06    0.00000E+00   -3.08688E+09    0.00000E+00    2.37669E+08
   0.00000E+00    0.00000E+00    6.09202E+06    1.06760E+08   -2.37669E+08    0.00000E+00
   0.00000E+00   -3.08688E+09    1.06760E+08    1.56753E+12   -4.02227E+09   -1.20377E+11
   3.08688E+09    0.00000E+00   -2.37669E+08   -4.02227E+09    1.57971E+12   -5.40380E+10
  -1.06760E+08    2.37669E+08    0.00000E+00   -1.20377E+11   -5.40380E+10    1.75758E+10


   COORDINATES OF CENTROID:
   ------------------------
   3.9013E+01     1.7525E+01     5.0671E+02


   MASS MATRIX AT CENTROID:
   ------------------------
   6.09202E+06    0.00000E+00    0.00000E+00    0.00000E+00    9.11379E-03    2.31813E-03
   0.00000E+00    6.09202E+06    0.00000E+00    9.11379E-03    0.00000E+00   -5.25615E-03
   0.00000E+00    0.00000E+00    6.09202E+06    2.31814E-03   -5.25615E-03    0.00000E+00
   0.00000E+00    9.11379E-03    2.31814E-03    1.50811E+09    1.42783E+08    5.23500E+07
   9.11379E-03    0.00000E+00   -5.25615E-03    1.42783E+08    6.27891E+09    5.84887E+07
   2.31813E-03   -5.25615E-03    0.00000E+00    5.23500E+07    5.84887E+07    6.43264E+09
```

```
 DATE: 11-JUL-2014 TIME: 17:48:15   ***************  SESTRA  ***************
PAGE:     9

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     9

  *** SUMMARY OF WARNINGS FROM DATACHECK OF ELEMENTS ***

      There are   1419  warped 4-noded shell or membrane elements in this superelement.
      The distance of the forth node to the element plane exceeds 0.0001 times the
      length of the diagonal connected to the forth node.

      There are      5  3-noded shell or membrane elements with bad element shape.
      The ratio of the largest edge to the smallest height is 4.0 or larger.

          - COMPUTATION IS CONTINUED.


  *** Estimated size of stiffness matrix for superelement       1:    34407999 variables

 DATE: 11-JUL-2014 TIME: 17:48:15   ***************  SESTRA  ***************
PAGE:    10

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:    10

      *** CONNECTION BETWEEN LOADCASE AND RESULTCASE NUMBERS ***

  TOP LEVEL EXT.RESULT  INDEX    TIME       WAVE DIR.   WAVE HEIGHT    WATER
  LOADCASE  IDENT.NO.                         (RAD)                    DEPTH
        1         1
        2         2
        3         3
        4         4
        5         5
        6         6       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        7         7       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        8         8       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        9         9       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02


  *** Estimate of total size of stiffness matrices for new superelements:       34407999 variables

 DATE: 11-JUL-2014 TIME: 17:48:15   ***************  SESTRA  ***************
PAGE:    11

                                    REDUCTION MODULE - SUPERELEMENT TYPE    1
                                                                                                                     SUB
PAGE:     1




                                     - STIFFNESS FACTORIZATION PERFORMED BY MULTIFRONT EQUATION SOLVER -

                                     - LOAD SUBSTITUTION PERFORMED BY  MULTIFRONT EQUATION SOLVER -

 DATE: 11-JUL-2014 TIME: 17:48:25   ***************  SESTRA  ***************
PAGE:    12

                                          STATIC ANALYSIS OF STRUCTURE
                                                                                                                     SUB
PAGE:     1


      Results file name: 20140711_174724_R1.SIN
```

```
 DATE: 11-JUL-2014 TIME: 17:48:34   ***************  SESTRA  ***************
PAGE:    13

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                       SUB
PAGE:     2

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z            RX            RY            RZ

        1          33210  -1.30912E+07   3.19587E+06   3.24697E+07   6.87664E+05  -2.71211E+07  -4.81711E+05
                   33264  -1.15451E+07  -3.15281E+06   3.29173E+07  -2.29928E+06  -1.81003E+07   1.77225E+05
                   33409   1.31417E+07   3.16551E+06   4.02321E+07   3.21835E+06   1.44774E+07   3.32472E+05
                   33506   1.14946E+07  -3.20857E+06   3.78180E+07  -3.36882E+06   1.27483E+07  -6.49681E+04

        2          33210  -5.64478E+05  -4.82443E+03  -7.78981E+05  -4.86645E+04  -1.75607E+06  -5.99269E+03
                   33264  -5.83518E+05   1.76302E+04  -8.43886E+05   1.20115E+04  -1.53263E+06  -1.41511E+04
                   33409  -8.52334E+05   1.86954E+03   7.78572E+05   7.60590E+03  -1.73520E+06   1.03580E+04
                   33506  -8.64392E+05  -1.46753E+04   8.44295E+05   1.75846E+04  -1.77117E+06  -1.57870E+04

        3          33210   4.99701E+05   1.63940E+04   7.84712E+05   2.17999E+04   1.71883E+06   8.82808E+03
                   33264   5.30575E+05  -3.09543E+04   8.53487E+05   1.78000E+04   1.47210E+06   1.37328E+04
                   33409   9.14998E+05   3.07433E+03  -7.84323E+05  -2.71218E+04   1.85279E+06  -1.17070E+04
                   33506   9.19449E+05   1.14859E+04  -8.53877E+05  -1.57492E+03   1.87772E+06   1.77653E+04

        4          33210  -8.69133E+05   1.28020E+06   1.42952E+06  -2.67222E+06  -1.50153E+06  -6.90120E+04
                   33264   8.26117E+05   1.30868E+06  -1.42270E+06  -2.43900E+06   1.20963E+06  -7.06438E+04
                   33409  -1.29811E+05   7.17227E+05   6.77949E+05  -1.42838E+06  -2.44360E+05  -1.81822E+03
                   33506   1.72827E+05   8.45661E+05  -6.84768E+05  -1.62809E+06   3.18043E+05   1.00105E+04

        5          33210   8.83425E+05  -1.42697E+06  -1.42991E+06   2.88733E+06   1.51925E+06   8.56085E+04
                   33264  -8.19691E+05  -1.16294E+06   1.42327E+06   2.21008E+06  -1.20002E+06   6.38252E+04
                   33409   1.14050E+05  -8.49507E+05  -6.78313E+05   1.64000E+06   2.23123E+05  -7.88357E+03
                   33506  -1.77784E+05  -7.12348E+05   6.84953E+05   1.40898E+06  -3.29850E+05  -1.98123E+03

        6    1     33210  -2.51796E+05   3.56719E+04  -2.30211E+05  -8.76224E+04  -6.58579E+05  -8.57013E+03
                   33264  -1.79552E+05   3.07772E+04  -2.86782E+05  -5.12253E+04  -4.27719E+05  -8.85598E+03
                   33409  -4.88591E+04  -2.13656E+04   2.71808E+05   2.13282E+04  -3.50204E+05   3.10277E+01
                   33506  -3.83449E+04  -4.01041E+04   2.92452E+05   6.10816E+04  -2.80937E+05  -8.00236E+03

        7    1     33210  -2.28121E+05   4.29246E+04  -4.74389E+04  -4.63455E+04  -3.54167E+05  -1.98946E+04
                   33264   2.45716E+05   3.66999E+04   4.84813E+04  -2.56758E+04   3.62973E+05  -2.05527E+04
                   33409  -5.51798E+05  -2.81488E+05  -4.85951E+05   5.58101E+05  -7.37431E+05  -4.87482E+04
                   33506   5.37941E+05  -3.13182E+05   4.85984E+05   6.28281E+05   7.17774E+05  -3.37563E+04

        8    1     33210   2.51796E+05  -3.56719E+04   2.30211E+05   8.76224E+04   6.58579E+05   8.57013E+03
                   33264   1.79552E+05  -3.07772E+04   2.86782E+05   5.12253E+04   4.27719E+05   8.85598E+03
                   33409   4.88591E+04   2.13656E+04  -2.71807E+05  -2.13283E+04   3.50204E+05  -3.10236E+01
                   33506   3.83448E+04   4.01041E+04  -2.92453E+05  -6.10816E+04   2.80937E+05   8.00236E+03

        9    1     33210   2.28121E+05  -4.29246E+04   4.74389E+04   4.63455E+04   3.54167E+05   1.98946E+04
                   33264  -2.45716E+05  -3.66999E+04  -4.84813E+04   2.56758E+04  -3.62973E+05   2.05527E+04
                   33409   5.51798E+05   2.81488E+05   4.85951E+05  -5.58101E+05   7.37431E+05   4.87482E+04
                   33506  -5.37941E+05   3.13182E+05  -4.85984E+05  -6.28281E+05  -7.17774E+05   3.37563E+04

 DATE: 11-JUL-2014 TIME: 17:48:34   ***************  SESTRA  ***************
PAGE:    14

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                       SUB
PAGE:     3

  SUM OF REACTION FORCES FROM SPECIFIED DEGREES OF FREEDOM.
  THE FORCES AND MOMENTS ARE REFFERED TO THE COORDINATE SYSTEM OF THE ACTUAL SUPERELEMENT.
  ****************************************************************************************

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1             9.4492E-06   -2.2333E-06    1.4344E+08    2.5526E+09   -5.9581E+09   -6.8768E+01
        2            -2.8647E+06    2.3743E-08    1.0753E-06    2.5805E-01   -1.4710E+09    5.1565E+07
        3             2.8647E+06   -7.1195E-09   -1.1345E-06   -2.7185E-01    1.4717E+09   -5.1565E+07
        4             1.4139E-07    4.1518E+06    5.5064E-08   -2.1140E+09   -9.4944E+00    1.2155E+08
        5            -1.3772E-07   -4.1518E+06   -6.9500E-08    2.1140E+09    9.5464E+00   -1.2155E+08
        6    1       -5.1855E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7655E+08    6.3024E+06
        7    1        3.7374E+03   -5.1504E+05    1.0751E+03    2.7000E+08    1.8048E+06   -5.3471E+07
        8    1        5.1855E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7655E+08   -6.3024E+06
        9    1       -3.7374E+03    5.1504E+05   -1.0751E+03   -2.7000E+08   -1.8048E+06    5.3471E+07


 SUPERELEMENT TYPE:     1 ACTUAL ELEMENT:     1
 HAS BEEN STORED ON RESULT FILE
```

```
 DATE: 11-JUL-2014 TIME: 17:48:48   ***************  SESTRA  ***************
PAGE:    15

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                  SUB
PAGE:     1

  SUM OF GLOBAL LOADS AND MOMENTS
  *******************************


  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           2.9797E-11    7.1935E-12   -1.4344E+08   -2.5526E+09    5.9581E+09    7.7443E-10
        2           2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00    1.4710E+09   -5.1565E+07
        3          -2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00   -1.4717E+09    5.1565E+07
        4           0.0000E+00   -4.1518E+06    0.0000E+00    2.1140E+09    0.0000E+00   -1.2155E+08
        5           0.0000E+00    4.1518E+06    0.0000E+00   -2.1140E+09    0.0000E+00    1.2155E+08
        6    1      5.1855E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7655E+08   -6.3024E+06
        7    1     -3.7374E+03    5.1504E+05   -1.0751E+03   -2.7000E+08   -1.8048E+06    5.3471E+07
        8    1     -5.1855E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7655E+08    6.3024E+06
        9    1      3.7374E+03   -5.1504E+05    1.0751E+03    2.7000E+08    1.8048E+06   -5.3471E+07

 DATE: 11-JUL-2014 TIME: 17:48:48   ***************  SESTRA  ***************
PAGE:    16

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                  SUB
PAGE:     2

  SUM OF REACTION FORCES AND MOMENTS
  **********************************
  GIVEN IN THE GLOBAL COORDINATE SYSTEM OF THE TOP LEVEL SUPERELEMENT

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           9.4492E-06   -2.2333E-06    1.4344E+08    2.5526E+09   -5.9581E+09   -6.8768E+01
        2          -2.8647E+06    2.3743E-08    1.0753E-06    2.5805E-01   -1.4710E+09    5.1565E+07
        3           2.8647E+06   -7.1195E-09   -1.1345E-06   -2.7185E-01    1.4717E+09   -5.1565E+07
        4           1.4139E-07    4.1518E+06    5.5064E-08   -2.1140E+09   -9.4944E+00    1.2155E+08
        5          -1.3772E-07   -4.1518E+06   -6.9500E-08    2.1140E+09    9.5464E+00   -1.2155E+08
        6    1     -5.1855E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7655E+08    6.3024E+06
        7    1      3.7374E+03   -5.1504E+05    1.0751E+03    2.7000E+08    1.8048E+06   -5.3471E+07
        8    1      5.1855E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7655E+08   -6.3024E+06
        9    1     -3.7374E+03    5.1504E+05   -1.0751E+03   -2.7000E+08   -1.8048E+06    5.3471E+07


 DATE: 11-JUL-2014 TIME: 17:48:48   ***************  SESTRA  ***************
PAGE:    17

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                  SUB
PAGE:     3

  DIFFERENCES BETWEEN SUMMED LOADS AND REACTION FORCES
  ****************************************************
  LARGER THAN   0.00E+00 FOR TRANSLATIONAL COMPONENTS AND LARGER THAN   0.00E+00 FOR ROTATIONAL COMPONENTS

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           9.4492E-06   -2.2333E-06    1.5497E-06   -1.1419E+02   -2.2788E+02   -6.8768E+01
        2           4.0792E-07    2.3743E-08    1.0753E-06    2.5805E-01   -9.7656E+00   -7.0096E-01
        3          -4.1723E-07   -7.1195E-09   -1.1345E-06   -2.7185E-01    1.0526E+01    6.5924E-01
        4           1.4139E-07   -1.1236E-06    5.5064E-08   -2.3888E+01   -9.4944E+00   -7.3770E-01
        5          -1.3772E-07    1.1642E-06   -6.9500E-08    2.4263E+01    9.5464E+00    6.7857E-01
        6    1      6.2276E-07   -8.1247E-08    3.5082E-07   -5.3592E-01   -4.7162E+00   -3.0374E-01
        7    1     -1.3849E-07    7.8499E-07   -1.0425E-09    2.9976E-01   -1.5680E+00   -2.4080E-01
        8    1     -6.2218E-07    8.1249E-08   -3.5077E-07    5.3592E-01    4.7162E+00    3.0374E-01
        9    1      1.3735E-07   -7.8499E-07    9.3019E-10   -2.9976E-01    1.5680E+00    2.4080E-01

  TOTAL TIME CONSUMED IN SESTRA                    CPU TIME:     42.03  CLOCK TIME:     40.25  CHANNEL TIME:      0.00
```

Q. Model D

```
                  ******       ******       ******       ******      ** ***  ****
                 ********     ********     ********     ********     *************
                **      **   **      **   **      **   **      **    **    **    **
                **           **      **   **                   **    **    **    **
                 *******     **********    *******      *********    **    **    **
                  *******    *********      *******    **********    **    **    **
                        **   **                   **   **      **    **    **    **
                **      **   **      **   **      **   **      **    **    **    **
                 ********     ********     ********     *********    **    **    **
                  ******       ******       ******       ****** **   **    **    **



                *******************************************************************
                *******************************************************************
                **                                                               **
                **                                                               **
                **      *****   *******   *****   *******  ******    *****       **
                **     *     *  *        *     *     *     *     *  *     *      **
                **     *        *        *           *     *     *  *     *      **
                **      *****   *****     *****      *     ******   *******      **
                **           *  *              *     *     *   *    *     *      **
                **     *     *  *        *     *     *     *    *   *     *      **
                **      *****   *******   *****      *     *     *  *     *      **
                **                                                               **
                **                                                               **
                **               Superelement Structural Analysis                **
                **                                                               **
                **                                                               **
                *******************************************************************
                *******************************************************************


                               Marketing and Support by DNV Software


Program id   : 8.6-01                                           Computer         : 8664
Release date : 16-MAY-2013                                      Impl. update     :
Access time  : 11-JUL-2014 17:51:24                             Operating system : Win NT 6.1 [7601]
User id      : NADME                                            CPU id           : 0973744164
                                                                Installation     : , STGLP110135


Copyright DET NORSKE VERITAS AS, P.O.Box 300, N-1322 Hovik, Norway


Library     Version    Impl.Upd   Release date
ELLIBD      1.9-07                16-MAY-2013
SIFTOOLD    8.3-09                16-MAY-2013
NORSAMD     8.4-02                16-MAY-2013
MFR         8.3-05                16-MAY-2013
PRIMAS      5.3-04                16-MAY-2013
AUXLIB      8.2-02                16-MAY-2013
SESTRA_PRLL 8.1-02                16-MAY-2013

Run identification   :
```

```
 DATE: 11-JUL-2014 TIME: 17:51:28   ***************  SESTRA  ***************
PAGE:     1

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     1

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   HEAD
   COMM
   COMM    Created by: GeniE  V6.6-08  25-Sep-2013
   COMM
   COMM    Date : 11-Jul-2014   Time : 17:51:24   User : NADME
   COMM
   COMM  CHCK ANTP MSUM MOLO STIF RTOP LBCK      PILE CSING     SIGM
   CMAS    0.   1.   1.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM            ORDR                          CACH MFRWORK
   SOLM    0.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM                 WCOR
   ELOP    0.   0.   0.   1.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  ITYP
   ITOP    1.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  PREFIX
   INAM  20140711_175041_
   COMM
   COMM  PREFIX FORMAT
   LNAM  20140711_175041_ UNFORMATTED
   COMM
   COMM  PREFIX FORMAT
   RNAM  20140711_175041_ NORSAM
   COMM
   COMM  SEL1 SEL2 SEL3 SEL4 SEL5 SEL6 SEL7 SEL8
   RSEL    1.   0.   0.   0.   0.   0.   1.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  RTRA
   RETR    3.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   Z

  PRINTOUT OF DATA GIVEN IN THE FILE 20140711_175041_S1.FEM

   LOHI    1.   0.  12.   1.   1.   0.   0.   0.   1.  0.10E+01  0.00E+00  0.00E+00
   SEAS    1.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    1.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    1.  0.00E+00  0.10E+01  0.60E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    2.   0.  12.   2.   2.   0.   0.   0.   2.  0.20E+01  0.00E+00  0.00E+00
   SEAS    2.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    2.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    2.  0.00E+00  0.10E+01  0.70E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    3.   0.  12.   3.   3.   0.   0.   0.   3.  0.30E+01  0.00E+00  0.00E+00
   SEAS    3.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    3.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    3.  0.00E+00  0.10E+01  0.80E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
 DATE: 11-JUL-2014 TIME: 17:51:28   ***************  SESTRA  ***************
PAGE:     2

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     2

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   LOHI    4.   0.  12.   4.   4.   0.   0.   0.   4.  0.40E+01  0.00E+00  0.00E+00
   SEAS    4.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.46E+03  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    4.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    4.  0.00E+00  0.10E+01  0.90E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    1.  0.38E+02  0.00E+00  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    2.  0.38E+02  0.90E+02  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    3.  0.38E+02  0.18E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   WIND    4.  0.38E+02  0.27E+03  0.00E+00  0.10E+02  0.00E+00  0.16E-01  0.10E+01
           2.  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
```

```
 DATE: 11-JUL-2014 TIME: 17:51:28   ***************  SESTRA  ***************
PAGE:     3

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     3
  INTERPRETATION OF ANALYSIS CONTROL DATA


      Type of Analysis :

         Reduction
         Multifront Solver is used
         Retracking


      Input from CMAS Command :

         ANTYP = 1   Static Analysis
         MSUM  > 0   Calculation of Sum of Masses and Centroid

         The singularity constant for membrane and shell elements
         CSING =  1.0000E-08

         Lowest accepted condition number in reduction
         EPSSOL=  1.1102E-14


      Input from RSEL Command :

         Data types selected for storing on Results File :
          - Input Interface File Records,
          - displacements,  sequence:
               all nodes for the first resultcase, all nodes for the second resultcase, etc.
          - forces and moments for beam, spring and layered shell elements,  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.
          - stresses (not for beam or spring elements),  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.

         (Can be redefined by RSEL for selected superelements, see below.)
         Storing is done for superelements specified in RETR command.
 DATE: 11-JUL-2014 TIME: 17:51:28   ***************  SESTRA  ***************
PAGE:     4

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     4

  INPUT INTERFACE FILES :


     20140711_175041_T1.FEM
     20140711_175041_L1.FEM

         DATE:     11-Jul-2014         TIME:          17:50:42
         PROGRAM:  SESAM GeniE         VERSION:       V6.6-08 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     11-Jul-2014         TIME:          17:50:42
         PROGRAM:  SESAM Gamesha       VERSION:       R5.0-3 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     11-JUL-2014         TIME:         17:51:11
         PROGRAM:  SESAM WAJAC         VERSION:      6.2-01  1-MAR-2011
         COMPUTER: 586 WIN NT 6.1 [7601INSTALLATION: , STGLP110135
         USER:     NADME               ACCOUNT:
```

```
 DATE: 11-JUL-2014 TIME: 17:51:30   ***************  SESTRA  ***************
PAGE:     5

                                   DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                SUB
PAGE:     5



      For a summary of warnings for elements and more information
      see *** SUMMARY OF WARNINGS FROM DATACHECK OF ELEMENTS ***

  *** WARNING Element no.   10077 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   11174 is warped, distance from node 4 to plane =  -1.697E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11178 is warped, distance from node 4 to plane =   1.676E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11181 is warped, distance from node 4 to plane =  -2.213E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11182 is warped, distance from node 4 to plane =   2.131E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11198 is warped, distance from node 4 to plane =  -1.733E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11206 is warped, distance from node 4 to plane =   1.751E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11213 is warped, distance from node 4 to plane =   1.583E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11215 is warped, distance from node 4 to plane =   2.069E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11218 is warped, distance from node 4 to plane =  -2.655E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11219 is warped, distance from node 4 to plane =   1.814E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11230 is warped, distance from node 4 to plane =  -2.143E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11231 is warped, distance from node 4 to plane =   2.549E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11232 is warped, distance from node 4 to plane =  -2.296E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11236 is warped, distance from node 4 to plane =   2.046E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11237 is warped, distance from node 4 to plane =  -2.951E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11238 is warped, distance from node 4 to plane =   3.255E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11239 is warped, distance from node 4 to plane =  -3.387E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11240 is warped, distance from node 4 to plane =   3.087E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11241 is warped, distance from node 4 to plane =  -2.053E-05
      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   11244 is warped, distance from node 4 to plane =  -1.723E-05
  Print of this warning is turned off after 20 warnings

      Warp correction is applied to stiffness matrix.
  *** WARNING Element no.   12693 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   15008 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   17010 (3-noded shell or membrane element) has bad element shape.
  *** WARNING Element no.   24621 (3-noded shell or membrane element) has bad element shape.

 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:     6

                                   DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                SUB
PAGE:     6
      *** SUMMARY OF DATA FROM INPUT AND LOAD INTERFACE FILES ***
               FOR SUPERELEMENT TYPE       1  ON LEVEL  1

      The superelement has

         40930  subelements
         35837  nodes
          1041  specified (fixed) degrees of freedom
        213981  internal (free) degrees of freedom
          totally
        215022  degrees of freedom

             9  loadcases

        Multi Point Constraints are given

      The following kinds of loads are given:
            line or point loads for 2 node beams
            gravitational load

      The following basic elements are given:
          7855  2 node beam elements         BEAS
         33017  4 node flat shell elements   FQUS
            58  3 node flat shell elements   FTRS

        Eccentricities are given
```

```
 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:     7

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     7

      *** SUM OF LOADS AND MOMENTS FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***

     X-LOAD = SUM OF GIVEN LOADS IN GLOBAL X-DIRECTION
     Y-LOAD = SUM OF GIVEN LOADS IN GLOBAL Y-DIRECTION
     Z-LOAD = SUM OF GIVEN LOADS IN GLOBAL Z-DIRECTION
     X-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL X-AXIS
     Y-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Y-AXIS
     Z-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Z-AXIS
     X-RMOM = SUM OF MOMENTS ABOUT GLOBAL X-AXIS FROM GIVEN LOADS AND MOMENTS
     Y-RMOM = SUM OF MOMENTS ABOUT GLOBAL Y-AXIS FROM GIVEN LOADS AND MOMENTS
     Z-RMOM = SUM OF MOMENTS ABOUT GLOBAL Z-AXIS FROM GIVEN LOADS AND MOMENTS

      LOADCASE    X-LOAD      Y-LOAD      Z-LOAD      X-MOM       Y-MOM       Z-MOM      X-RMOM      Y-RMOM      Z-RMOM
           1  9.8010E-11  2.6293E-11 -1.4344E+08 -8.6275E-01 -4.3380E+02  0.0000E+00 -2.5456E+09  5.9523E+09  6.2891E-10
           2  2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00 -1.7905E+05  0.0000E+00  0.0000E+00  1.4710E+09 -5.1565E+07
           3 -2.8647E+06  0.0000E+00  0.0000E+00  0.0000E+00  1.9833E+05  0.0000E+00  0.0000E+00 -1.4717E+09  5.1565E+07
           4  0.0000E+00 -4.1518E+06  0.0000E+00 -5.0773E+05  0.0000E+00  0.0000E+00  2.1140E+09  0.0000E+00 -1.2155E+08
           5  0.0000E+00  4.1518E+06  0.0000E+00  5.0773E+05  0.0000E+00  0.0000E+00 -2.1140E+09  0.0000E+00  1.2155E+08
           6  5.1836E+05 -4.9794E+03 -4.7266E+04  4.6216E-07 -2.6098E+00 -6.5539E-03  2.1635E+06  2.7646E+08 -6.3016E+06
           7 -3.7374E+03  5.1485E+05 -1.0751E+03  2.7900E+00  1.6730E-06 -6.6219E-01 -2.6991E+08 -1.8048E+06  5.3466E+07
           8 -5.1836E+05  4.9794E+03  4.7266E+04 -2.0734E-06  2.6098E+00  6.5572E-03 -2.1635E+06 -2.7646E+08  6.3016E+06
           9  3.7374E+03 -5.1485E+05  1.0751E+03 -2.7900E+00 -1.0218E-06  6.6220E-01  2.6991E+08  1.8048E+06 -5.3466E+07

 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:     8

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     8

      *** SUM OF MASSES AND CENTROID FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***


   MASS MATRIX IN GLOBAL COORDINATE SYSTEM (OF THE SUPERELEMENT):
   ---------------------------------------
   6.09206E+06    0.00000E+00    0.00000E+00    0.00000E+00    3.08637E+09   -1.06051E+08
   0.00000E+00    6.09206E+06    0.00000E+00   -3.08637E+09    0.00000E+00    2.37083E+08
   0.00000E+00    0.00000E+00    6.09206E+06    1.06051E+08   -2.37083E+08    0.00000E+00
   0.00000E+00   -3.08637E+09    1.06051E+08    1.56698E+12   -3.99470E+09   -1.20071E+11
   3.08637E+09    0.00000E+00   -2.37083E+08   -3.99470E+09    1.57910E+12   -5.36772E+10
  -1.06051E+08    2.37083E+08    0.00000E+00   -1.20071E+11   -5.36772E+10    1.74845E+10


   COORDINATES OF CENTROID:
   ------------------------
   3.8917E+01     1.7408E+01     5.0662E+02


   MASS MATRIX AT CENTROID:
   ------------------------
   6.09206E+06    0.00000E+00    0.00000E+00    0.00000E+00    2.50101E-02   -2.41338E-02
   0.00000E+00    6.09206E+06    0.00000E+00    2.50101E-02    0.00000E+00   -1.06125E-01
   0.00000E+00    0.00000E+00    6.09206E+06   -2.41339E-02   -1.06125E-01    0.00000E+00
   0.00000E+00    2.50101E-02   -2.41339E-02    1.51298E+09    1.32446E+08    3.99782E+07
   2.50101E-02    0.00000E+00   -1.06125E-01    1.32446E+08    6.25910E+09    5.02476E+07
  -2.41338E-02   -1.06125E-01    0.00000E+00    3.99782E+07    5.02476E+07    6.41184E+09

 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:     9

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     9

  *** SUMMARY OF WARNINGS FROM DATACHECK OF ELEMENTS ***

      There are   1244  warped 4-noded shell or membrane elements in this superelement.
      The distance of the forth node to the element plane exceeds 0.0001 times the
      length of the diagonal connected to the forth node.

      There are      5  3-noded shell or membrane elements with bad element shape.
      The ratio of the largest edge to the smallest height is 4.0 or larger.

          - COMPUTATION IS CONTINUED.


  *** Estimated size of stiffness matrix for superelement       1:    36362117 variables
```

```
 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:    10

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:    10

      *** CONNECTION BETWEEN LOADCASE AND RESULTCASE NUMBERS ***

  TOP LEVEL EXT.RESULT  INDEX    TIME       WAVE DIR.   WAVE HEIGHT    WATER
  LOADCASE  IDENT.NO.                         (RAD)                    DEPTH
        1         1
        2         2
        3         3
        4         4
        5         5
        6         6       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        7         7       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        8         8       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02
        9         9       1    0.000E+00    0.000E+00    0.000E+00    4.600E+02



  *** Estimate of total size of stiffness matrices for new superelements:       36362117 variables

 DATE: 11-JUL-2014 TIME: 17:51:36   ***************  SESTRA  ***************
PAGE:    11

                                    REDUCTION MODULE - SUPERELEMENT TYPE    1
                                                                                                                     SUB
PAGE:     1






                                     - STIFFNESS FACTORIZATION PERFORMED BY MULTIFRONT EQUATION SOLVER -

                                     - LOAD SUBSTITUTION PERFORMED BY  MULTIFRONT EQUATION SOLVER -

 DATE: 11-JUL-2014 TIME: 17:51:52   ***************  SESTRA  ***************
PAGE:    12

                                          STATIC ANALYSIS OF STRUCTURE
                                                                                                                     SUB
PAGE:     1


      Results file name: 20140711_175041_R1.SIN
```

```
 DATE: 11-JUL-2014 TIME: 17:52:04   ***************  SESTRA  ***************
PAGE:    13

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                    SUB
PAGE:     2

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z            RX            RY            RZ

        1          34243  -1.31702E+07   2.60216E+06   3.34340E+07   2.46133E+06  -2.94522E+07  -5.43733E+05
                   34297  -1.15316E+07  -2.42271E+06   3.22156E+07  -2.50734E+06  -1.82489E+07   2.03194E+05
                   34442   1.33787E+07   3.10080E+06   3.95889E+07   3.37306E+06   1.47241E+07   2.99667E+05
                   34539   1.13230E+07  -3.28025E+06   3.81991E+07  -3.07258E+06   1.23456E+07  -5.55511E+04

        2          34243  -6.26641E+05  -4.83803E+03  -8.01454E+05  -4.09541E+04  -2.23328E+06   9.60123E+03
                   34297  -5.66298E+05  -9.66096E+03  -8.10983E+05   4.78152E+04  -1.48800E+06  -1.08785E+04
                   34442  -8.22179E+05   1.53529E+04   8.00718E+05  -1.86924E+04  -1.67878E+06   1.11902E+04
                   34539  -8.49604E+05  -8.53896E+02   8.11720E+05  -8.78216E+03  -1.72876E+06  -1.30414E+04

        3          34243   5.62010E+05   1.09307E+04   8.07651E+05   1.84928E+04   2.19871E+06  -7.90359E+03
                   34297   5.13890E+05   8.65539E+02   8.20091E+05  -2.30764E+04   1.42751E+06   1.07034E+04
                   34442   8.83655E+05  -9.98949E+03  -8.06996E+05  -1.17357E+03   1.79445E+06  -1.27101E+04
                   34539   9.05167E+05  -1.80676E+03  -8.20746E+05   2.40948E+04   1.83543E+06   1.48887E+04

        4          34243  -8.72748E+05   1.36624E+06   1.45875E+06  -3.19152E+06  -1.60033E+06  -1.26005E+05
                   34297   7.98646E+05   1.26497E+06  -1.44828E+06  -2.34198E+06   1.16043E+06  -6.49142E+04
                   34442  -7.62350E+04   6.95504E+05   6.37361E+05  -1.37322E+06  -1.68254E+05   2.44021E+03
                   34539   1.50337E+05   8.25051E+05  -6.47828E+05  -1.57897E+06   2.73180E+05   1.27352E+04

        5          34243   8.80137E+05  -1.51192E+06  -1.45921E+06   3.42947E+06   1.61018E+06   1.43335E+05
                   34297  -7.90884E+05  -1.12239E+06   1.44890E+06   2.11516E+06  -1.14874E+06   5.77575E+04
                   34442   6.50015E+04  -8.26598E+05  -6.36930E+05   1.58189E+06   1.51675E+05  -1.20971E+04
                   34539  -1.54255E+05  -6.90863E+05   6.47238E+05   1.35825E+06  -2.83237E+05  -4.65364E+03

        6    1     34243  -2.68286E+05   3.14219E+04  -2.37824E+05  -8.99033E+04  -8.06494E+05  -5.86161E+03
                   34297  -1.73790E+05   2.61430E+04  -2.75922E+05  -4.27544E+04  -4.12799E+05  -7.59667E+03
                   34442  -4.25046E+04  -1.70221E+04   2.79053E+05   1.32581E+04  -3.34846E+05   6.35911E+01
                   34539  -3.37790E+04  -3.55634E+04   2.81959E+05   5.26659E+04  -2.67217E+05  -7.11563E+03

        7    1     34243  -2.44599E+05   4.75259E+04  -4.93883E+04  -4.26157E+04  -4.19293E+05  -3.43509E+04
                   34297   2.48333E+05   2.78590E+04   5.16196E+04  -1.53842E+04   3.68539E+05  -1.98165E+04
                   34442  -5.39935E+05  -2.79293E+05  -4.83801E+05   5.53970E+05  -7.20992E+05  -4.82125E+04
                   34539   5.39937E+05  -3.10944E+05   4.82645E+05   6.24015E+05   7.22846E+05  -3.32093E+04

        8    1     34243   2.68286E+05  -3.14219E+04   2.37824E+05   8.99033E+04   8.06494E+05   5.86161E+03
                   34297   1.73790E+05  -2.61430E+04   2.75922E+05   4.27544E+04   4.12799E+05   7.59667E+03
                   34442   4.25047E+04   1.70221E+04  -2.79053E+05  -1.32581E+04   3.34846E+05  -6.35870E+01
                   34539   3.37789E+04   3.55634E+04  -2.81959E+05  -5.26660E+04   2.67217E+05   7.11564E+03

        9    1     34243   2.44599E+05  -4.75259E+04   4.93883E+04   4.26157E+04   4.19293E+05   3.43509E+04
                   34297  -2.48333E+05  -2.78590E+04  -5.16196E+04   1.53842E+04  -3.68539E+05   1.98165E+04
                   34442   5.39935E+05   2.79293E+05   4.83801E+05  -5.53970E+05   7.20992E+05   4.82125E+04
                   34539  -5.39937E+05   3.10944E+05  -4.82645E+05  -6.24015E+05  -7.22846E+05   3.32093E+04

 DATE: 11-JUL-2014 TIME: 17:52:04   ***************  SESTRA  ***************
PAGE:    14

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                    SUB
PAGE:     3

  SUM OF REACTION FORCES FROM SPECIFIED DEGREES OF FREEDOM.
  THE FORCES AND MOMENTS ARE REFFERED TO THE COORDINATE SYSTEM OF THE ACTUAL SUPERELEMENT.
  ****************************************************************************************

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1             1.8628E-04    9.6131E-06    1.4344E+08    2.5456E+09   -5.9523E+09   -2.2248E+01
        2            -2.8647E+06   -6.7408E-07    1.0284E-06   -3.3828E-02   -1.4710E+09    5.1565E+07
        3             2.8647E+06    3.3071E-07   -1.1018E-06    5.6311E-02    1.4717E+09   -5.1565E+07
        4             1.0964E-05    4.1518E+06    1.2922E-07   -2.1140E+09   -8.7614E+00    1.2155E+08
        5            -1.1106E-05   -4.1518E+06   -1.4855E-07    2.1140E+09    8.7680E+00   -1.2155E+08
        6    1       -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
        7    1        3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
        8    1        5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
        9    1       -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07


 SUPERELEMENT TYPE:     1 ACTUAL ELEMENT:     1
 HAS BEEN STORED ON RESULT FILE

 DATE: 11-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:    15

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                     SUB
PAGE:     1

  SUM OF GLOBAL LOADS AND MOMENTS
  *******************************


  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1             9.8010E-11    2.6293E-11   -1.4344E+08   -2.5456E+09    5.9523E+09    6.2891E-10
        2             2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00    1.4710E+09   -5.1565E+07
        3            -2.8647E+06    0.0000E+00    0.0000E+00    0.0000E+00   -1.4717E+09    5.1565E+07
        4             0.0000E+00   -4.1518E+06    0.0000E+00    2.1140E+09    0.0000E+00   -1.2155E+08
```

```
       5           0.0000E+00    4.1518E+06    0.0000E+00   -2.1140E+09    0.0000E+00    1.2155E+08
       6    1      5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
       7    1     -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07
       8    1     -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
       9    1      3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07

 DATE: 11-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:    16

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     2

  SUM OF REACTION FORCES AND MOMENTS
  **********************************
  GIVEN IN THE GLOBAL COORDINATE SYSTEM OF THE TOP LEVEL SUPERELEMENT

  LOADCASE (INDEX)        X             Y             Z             RX            RY            RZ

       1           1.8628E-04    9.6131E-06    1.4344E+08    2.5456E+09   -5.9523E+09   -2.2248E+01
       2          -2.8647E+06   -6.7408E-07    1.0284E-06   -3.3828E-02   -1.4710E+09    5.1565E+07
       3           2.8647E+06    3.3071E-07   -1.1018E-06    5.6311E-02    1.4717E+09   -5.1565E+07
       4           1.0964E-05    4.1518E+06    1.2922E-07   -2.1140E+09   -8.7614E+00    1.2155E+08
       5          -1.1106E-05   -4.1518E+06   -1.4855E-07    2.1140E+09    8.7680E+00   -1.2155E+08
       6    1     -5.1836E+05    4.9794E+03    4.7266E+04   -2.1635E+06   -2.7646E+08    6.3016E+06
       7    1      3.7374E+03   -5.1485E+05    1.0751E+03    2.6991E+08    1.8048E+06   -5.3466E+07
       8    1      5.1836E+05   -4.9794E+03   -4.7266E+04    2.1635E+06    2.7646E+08   -6.3016E+06
       9    1     -3.7374E+03    5.1485E+05   -1.0751E+03   -2.6991E+08   -1.8048E+06    5.3466E+07

 DATE: 11-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:    17

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                                     SUB
PAGE:     3

  DIFFERENCES BETWEEN SUMMED LOADS AND REACTION FORCES
  ****************************************************
  LARGER THAN   0.00E+00 FOR TRANSLATIONAL COMPONENTS AND LARGER THAN   0.00E+00 FOR ROTATIONAL COMPONENTS

  LOADCASE (INDEX)        X             Y             Z             RX            RY            RZ

       1           1.8628E-04    9.6131E-06    1.0222E-05   -1.2423E+02   -2.1228E+02   -2.2248E+01
       2           1.3347E-05   -6.7408E-07    1.0284E-06   -3.3828E-02   -8.8354E+00    1.8539E-01
       3          -1.3050E-05    3.3071E-07   -1.1018E-06    5.6311E-02    9.6765E+00   -1.6024E-01
       4           1.0964E-05   -5.6328E-05    1.2922E-07   -2.2284E+01   -8.7614E+00    1.5656E+00
       5          -1.1106E-05    6.0932E-05   -1.4855E-07    2.2640E+01    8.7680E+00   -1.7501E+00
       6    1      5.3913E-06   -1.6616E-06    3.8726E-07   -6.8660E-01   -4.4841E+00    3.8364E-04
       7    1      2.6796E-06   -4.7806E-07    2.4336E-08    4.6160E-01   -1.5172E+00   -5.4005E-03
       8    1     -5.3905E-06    1.6619E-06   -3.8721E-07    6.8660E-01    4.4841E+00   -3.8360E-04
       9    1     -2.6794E-06    4.7812E-07   -2.4798E-08   -4.6160E-01    1.5172E+00    5.4007E-03

  TOTAL TIME CONSUMED IN SESTRA                    CPU TIME:     46.05  CLOCK TIME:     53.74  CHANNEL TIME:      0.00
```

R. ULS-3

```
                                 ******       ******       ******       ******      ** ***  ****
                                ********     ********     ********     ********     *************
                               **      **   **      **   **      **   **      **    **    **    **
                               **           **      **   **                   **    **    **    **
                                *******     **********    *******      *********    **    **    **
                                 *******    *********      *******    **********    **    **    **
                                       **   **                    **   **      **    **    **    **
                               **      **   **      **   **      **   **      **    **    **    **
                                ********     ********     ********     *********    **    **    **
                                 ******       ******       ******       ****** **    **    **    **


                               *******************************************************************
                               *******************************************************************
                               **                                                               **
                               **                                                               **
                               **      *****   *******   *****   *******  ******    *****       **
                               **     *     *  *        *     *     *     *     *  *     *      **
                               **     *        *        *           *     *     *  *     *      **
                               **      *****   *****     *****      *     ******   *******      **
                               **           *  *              *     *     *   *    *     *      **
                               **     *     *  *        *     *     *     *    *   *     *      **
                               **      *****   *******   *****      *     *     *  *     *      **
                               **                                                               **
                               **                                                               **
                               **               Superelement Structural Analysis                **
                               **                                                               **
                               **                                                               **
                               *******************************************************************
                               *******************************************************************

                                              Marketing and Support by DNV Software


               Program id   : 8.6-01                                           Computer         : 8664
               Release date : 16-MAY-2013                                      Impl. update     :
               Access time  : 10-JUL-2014 17:52:15                             Operating system : Win NT 6.1 [7601]
               User id      : NADME                                            CPU id           : 0973744164
                                                                               Installation     : , STGLP110135


               Copyright DET NORSKE VERITAS AS, P.O.Box 300, N-1322 Hovik, Norway


               Library     Version    Impl.Upd   Release date
               ELLIBD      1.9-07                16-MAY-2013
               SIFTOOLD    8.3-09                16-MAY-2013
               NORSAMD     8.4-02                16-MAY-2013
               MFR         8.3-05                16-MAY-2013
               PRIMAS      5.3-04                16-MAY-2013
               AUXLIB      8.2-02                16-MAY-2013
               SESTRA_PRLL 8.1-02                16-MAY-2013

               Run identification   :


 DATE: 10-JUL-2014 TIME: 17:52:19   ***************  SESTRA  ***************
PAGE:     1

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     1

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   HEAD
   COMM
   COMM    Created by: GeniE  V6.6-08  25-Sep-2013
   COMM
   COMM    Date : 10-Jul-2014   Time : 17:52:15   User : NADME
   COMM
   COMM  CHCK ANTP MSUM MOLO STIF RTOP LBCK      PILE CSING     SIGM
   CMAS    0.   1.   1.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM            ORDR                          CACH MFRWORK
   SOLM    0.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM                 WCOR
   ELOP    0.   0.   0.   1.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  ITYP
   ITOP    1.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  PREFIX
   INAM  20140710_175136_
   COMM
   COMM  PREFIX FORMAT
   LNAM  20140710_175136_ UNFORMATTED
   COMM
   COMM  PREFIX FORMAT
   RNAM  20140710_175136_ NORSAM
   COMM
```

```
   COMM  SEL1 SEL2 SEL3 SEL4 SEL5 SEL6 SEL7 SEL8
   RSEL    1.   0.   0.   0.   0.   0.   1.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   COMM
   COMM  RTRA
   RETR    3.   0.   0.   0.   0.   0.   0.   0.   0.  0.00E+00  0.00E+00  0.00E+00
   Z

  PRINTOUT OF DATA GIVEN IN THE FILE 20140710_175136_S1.FEM

   LOHI    1.   0.  12.   1.   1.   0.   0.   0.   1.  0.00E+00  0.00E+00  0.00E+00
   SEAS    1.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.11E+03  0.10E+01  0.46E+03  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    1.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    1.  0.00E+00  0.10E+01  0.70E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    2.   0.  12.   2.   2.   0.   0.   0.   2.  0.00E+00  0.00E+00  0.00E+00
   SEAS    2.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.11E+03  0.10E+01  0.46E+03  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    2.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    2.  0.00E+00  0.10E+01  0.80E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LOHI    3.   0.  12.   3.   3.   0.   0.   0.   3.  0.00E+00  0.00E+00  0.00E+00
   SEAS    3.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.11E+03  0.10E+01  0.46E+03  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    3.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    3.  0.00E+00  0.10E+01  0.90E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 10-JUL-2014 TIME: 17:52:19   ***************  SESTRA  ***************
PAGE:     2

                                    DATA GENERATION MODULE
                                                                                                                      SUB
PAGE:     2

  PRINTOUT OF DATA GIVEN AS DIRECT INPUT TO SESTRA

   LOHI    4.   0.  12.   4.   4.   0.   0.   0.   4.  0.00E+00  0.00E+00  0.00E+00
   SEAS    4.  0.00E+00  0.10E+01  0.70E+01  0.10E+01  0.00E+00  0.00E+00  0.00E+00
           0.  0.11E+03  0.10E+01  0.46E+03  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   TILO    4.  0.00E+00  0.10E+01  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
   LCOM    4.  0.00E+00  0.10E+01  0.10E+02  0.00E+00  0.00E+00  0.00E+00  0.00E+00

 DATE: 10-JUL-2014 TIME: 17:52:19   ***************  SESTRA  ***************
PAGE:     3

                                    DATA GENERATION MODULE
                                                                                                                      SUB
PAGE:     3
  INTERPRETATION OF ANALYSIS CONTROL DATA


      Type of Analysis :

         Reduction
         Multifront Solver is used
         Retracking


      Input from CMAS Command :

         ANTYP = 1   Static Analysis
         MSUM  > 0   Calculation of Sum of Masses and Centroid

         The singularity constant for membrane and shell elements
         CSING =  1.0000E-08

         Lowest accepted condition number in reduction
         EPSSOL=  1.1102E-14


      Input from RSEL Command :

         Data types selected for storing on Results File :
          - Input Interface File Records,
          - displacements,  sequence:
               all nodes for the first resultcase, all nodes for the second resultcase, etc.
          - forces and moments for beam, spring and layered shell elements,  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.
          - stresses (not for beam or spring elements),  sequence:
               all elements for the first resultcase, all elements for the second resultcase, etc.

         (Can be redefined by RSEL for selected superelements, see below.)
         Storing is done for superelements specified in RETR command.
```

```
 DATE: 10-JUL-2014 TIME: 17:52:19   ***************  SESTRA  ***************
PAGE:     4

                                    DATA GENERATION MODULE
                                                                                                                     SUB
PAGE:     4

  INPUT INTERFACE FILES :


     20140710_175136_T1.FEM
     20140710_175136_L1.FEM

         DATE:     10-Jul-2014         TIME:          17:51:37
         PROGRAM:  SESAM GeniE         VERSION:       V6.6-08 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     10-Jul-2014         TIME:          17:51:37
         PROGRAM:  SESAM Gamesha       VERSION:       R5.0-3 25-Sep-2013
         COMPUTER: X86 Windows         INSTALLATION:
         USER:     NADME               ACCOUNT:

         DATE:     10-JUL-2014         TIME:         17:51:59
         PROGRAM:  SESAM WAJAC         VERSION:      6.2-01  1-MAR-2011
         COMPUTER: 586 WIN NT 6.1 [7601INSTALLATION: , STGLP110135
         USER:     NADME               ACCOUNT:


 DATE: 10-JUL-2014 TIME: 17:52:20   ***************  SESTRA  ***************
PAGE:     5

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     5

      *** SUMMARY OF DATA FROM INPUT AND LOAD INTERFACE FILES ***
               FOR SUPERELEMENT TYPE       1  ON LEVEL  1

      The superelement has

         21290  subelements
         16951  nodes
            24  specified (fixed) degrees of freedom
        101682  internal (free) degrees of freedom
          totally
        101706  degrees of freedom

            10  loadcases


      The following kinds of loads are given:
            line or point loads for 2 node beams
            gravitational load

      The following basic elements are given:
          7519  2 node beam elements         BEAS
         13753  4 node flat shell elements   FQUS
            18  3 node flat shell elements   FTRS


 DATE: 10-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:     6

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                     SUB
PAGE:     6

      *** SUM OF LOADS AND MOMENTS FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***

     X-LOAD = SUM OF GIVEN LOADS IN GLOBAL X-DIRECTION
     Y-LOAD = SUM OF GIVEN LOADS IN GLOBAL Y-DIRECTION
     Z-LOAD = SUM OF GIVEN LOADS IN GLOBAL Z-DIRECTION
     X-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL X-AXIS
     Y-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Y-AXIS
     Z-MOM  = SUM OF LOCAL MOMENTS ABOUT GLOBAL Z-AXIS
     X-RMOM = SUM OF MOMENTS ABOUT GLOBAL X-AXIS FROM GIVEN LOADS AND MOMENTS
     Y-RMOM = SUM OF MOMENTS ABOUT GLOBAL Y-AXIS FROM GIVEN LOADS AND MOMENTS
     Z-RMOM = SUM OF MOMENTS ABOUT GLOBAL Z-AXIS FROM GIVEN LOADS AND MOMENTS

      LOADCASE    X-LOAD      Y-LOAD      Z-LOAD       X-MOM       Y-MOM       Z-MOM      X-RMOM      Y-RMOM      Z-RMOM
           1  8.3912E-11  4.6302E-11 -1.4344E+08  0.0000E+00 -4.5221E+02  0.0000E+00 -2.5467E+09  5.9589E+09  1.0859E-09
           2  0.0000E+00  0.0000E+00 -2.8826E+05  0.0000E+00 -1.2175E+00  0.0000E+00 -5.0502E+06  9.8882E+06  0.0000E+00
           3  2.3605E+06  0.0000E+00  0.0000E+00  0.0000E+00  2.4569E-11  0.0000E+00  0.0000E+00  1.2123E+09 -4.2490E+07
           4 -2.3605E+06  0.0000E+00  0.0000E+00  0.0000E+00 -6.0478E-12  0.0000E+00  0.0000E+00 -1.2128E+09  4.2490E+07
           5  0.0000E+00 -3.4211E+06  0.0000E+00 -1.1987E-10  0.0000E+00  0.0000E+00  1.7424E+09  0.0000E+00 -1.0016E+08
           6  0.0000E+00  3.4211E+06  0.0000E+00  1.1987E-10  0.0000E+00  0.0000E+00 -1.7424E+09  0.0000E+00  1.0016E+08
           7  4.4004E+05 -4.0575E+03 -1.3012E+05  3.2036E-07  3.3929E-02 -9.5190E-05  7.5842E+05  2.4376E+08 -5.3308E+06
           8 -3.0413E+03  4.3679E+05 -8.9438E+04 -3.6222E-02  7.7540E-07  7.8953E-03 -2.2969E+08  7.7384E+06  4.5119E+07
           9 -4.4004E+05  4.0575E+03 -4.7329E+04  1.3019E-06 -3.3927E-02  9.7309E-05 -2.7062E+06 -2.2532E+08  5.3308E+06
          10  3.0413E+03 -4.3679E+05 -8.8015E+04  3.6218E-02 -8.5283E-07 -7.8940E-03  2.2774E+08  1.0705E+07 -4.5119E+07
```

```
 DATE: 10-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:     7

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                         SUB
PAGE:     7

      *** SUM OF MASSES AND CENTROID FOR SUPERELEMENT TYPE     1  ON LEVEL  1  ***


   MASS MATRIX IN GLOBAL COORDINATE SYSTEM (OF THE SUPERELEMENT):
   ---------------------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    3.08665E+09   -1.06159E+08
   0.00000E+00    6.09200E+06    0.00000E+00   -3.08665E+09    0.00000E+00    2.37753E+08
   0.00000E+00    0.00000E+00    6.09200E+06    1.06159E+08   -2.37753E+08    0.00000E+00
   0.00000E+00   -3.08665E+09    1.06159E+08    1.56728E+12   -4.01088E+09   -1.20430E+11
   3.08665E+09    0.00000E+00   -2.37753E+08   -4.01088E+09    1.57947E+12   -5.37364E+10
  -1.06159E+08    2.37753E+08    0.00000E+00   -1.20430E+11   -5.37364E+10    1.75432E+10


   COORDINATES OF CENTROID:
   ------------------------
   3.9027E+01     1.7426E+01     5.0667E+02


   MASS MATRIX AT CENTROID:
   ------------------------
   6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00    0.00000E+00    4.13209E-05
   0.00000E+00    6.09200E+06    0.00000E+00    0.00000E+00    0.00000E+00   -4.19766E-04
   0.00000E+00    0.00000E+00    6.09200E+06    4.12911E-05   -4.19766E-04    0.00000E+00
   0.00000E+00    0.00000E+00    4.12911E-05    1.50710E+09    1.32198E+08    3.29825E+07
   0.00000E+00    0.00000E+00   -4.19766E-04    1.32198E+08    6.26141E+09    5.15600E+07
   4.13209E-05   -4.19766E-04    0.00000E+00    3.29825E+07    5.15600E+07    6.41444E+09

  *** Estimated size of stiffness matrix for superelement       1:    12470048 variables

 DATE: 10-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:     8

                                    DATAGENERATION - SUPERELEMENT TYPE     1
                                                                                                                         SUB
PAGE:     8

      *** CONNECTION BETWEEN LOADCASE AND RESULTCASE NUMBERS ***

  TOP LEVEL EXT.RESULT  INDEX    TIME       WAVE DIR.   WAVE HEIGHT    WATER
  LOADCASE  IDENT.NO.                         (RAD)                    DEPTH
        1         1
        2         2
        3         3
        4         4
        5         5
        6         6
        7         7       1    0.000E+00    0.000E+00    0.000E+00    1.100E+02
        8         8       1    0.000E+00    0.000E+00    0.000E+00    1.100E+02
        9         9       1    0.000E+00    0.000E+00    0.000E+00    1.100E+02
       10        10       1    0.000E+00    0.000E+00    0.000E+00    1.100E+02


  *** Estimate of total size of stiffness matrices for new superelements:       12470048 variables

 DATE: 10-JUL-2014 TIME: 17:52:22   ***************  SESTRA  ***************
PAGE:     9

                                    REDUCTION MODULE - SUPERELEMENT TYPE    1
                                                                                                                         SUB
PAGE:     1





                                     - STIFFNESS FACTORIZATION PERFORMED BY MULTIFRONT EQUATION SOLVER -

                                     - LOAD SUBSTITUTION PERFORMED BY  MULTIFRONT EQUATION SOLVER -
```

```
 DATE: 10-JUL-2014 TIME: 17:52:27   ***************  SESTRA  ***************
PAGE:    10

                                          STATIC ANALYSIS OF STRUCTURE
                                                                                                                     SUB
PAGE:     1



      Results file name: 20140710_175136_R1.SIN

 DATE: 10-JUL-2014 TIME: 17:52:31   ***************  SESTRA  ***************
PAGE:    11

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                                    SUB
PAGE:     2

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z            RX            RY            RZ

        1          15258  -1.15906E+07   2.93989E+06   3.29102E+07   2.02219E+06  -1.82482E+07  -1.52932E+05
                   15319  -1.11209E+07  -2.66814E+06   3.21896E+07  -2.60759E+06  -1.74702E+07   1.20365E+05
                   15496   1.19015E+07   3.74446E+06   4.00686E+07   3.11088E+06   1.37668E+07   2.33165E+05
                   15599   1.08100E+07  -4.01621E+06   3.82685E+07  -2.42149E+06   1.23097E+07  -2.10164E+05

        2          15258  -2.13013E+04   1.80444E+02   1.01598E+05   8.60006E+02  -1.76850E+04  -3.49188E+02
                   15319  -1.83372E+04  -1.18499E+03   9.28747E+04   4.41348E+02  -1.42995E+04   6.22811E+02
                   15496   2.01397E+04   5.45398E+03   4.74508E+04  -8.54389E+03   3.18627E+04  -3.23155E+02
                   15599   1.94988E+04  -4.44944E+03   4.63328E+04   6.63364E+03   3.11202E+04   4.28341E+02

        3          15258  -4.69596E+05   6.18411E+03  -6.76855E+05  -2.88315E+04  -1.18411E+06   1.51788E+04
                   15319  -4.69808E+05  -6.08816E+03  -6.76769E+05   2.86480E+04  -1.18446E+06  -1.51469E+04
                   15496  -7.10564E+05   5.76005E+03   6.76848E+05   1.32519E+03  -1.42559E+06   9.69071E+03
                   15599  -7.10564E+05  -5.85600E+03   6.76776E+05  -1.33854E+03  -1.42829E+06  -9.61796E+03

        4          15258   4.32595E+05  -7.58557E+02   6.84000E+05   1.77705E+04   1.10873E+06  -1.51640E+04
                   15319   4.33088E+05   5.38827E+02   6.84317E+05  -1.71735E+04   1.10912E+06   1.51735E+04
                   15496   7.47414E+05  -1.94907E+03  -6.84015E+05  -1.06906E+04   1.52895E+06  -1.09462E+04
                   15599   7.47434E+05   2.16880E+03  -6.84302E+05   9.67947E+03   1.52980E+06   1.10921E+04

        5          15258  -6.41764E+05   1.02962E+06   1.19658E+06  -2.06160E+06  -1.00892E+06  -6.45920E+04
                   15319   6.47479E+05   1.13127E+06  -1.19653E+06  -2.25696E+06   1.01676E+06  -6.19709E+04
                   15496  -1.48785E+05   5.79669E+05   5.47026E+05  -1.21413E+06  -2.81380E+05  -4.04805E+03
                   15599   1.43070E+05   6.80505E+05  -5.47081E+05  -1.41827E+06   2.71805E+05  -5.32158E+03

        6          15258   6.47609E+05  -1.13120E+06  -1.19646E+06   2.25707E+06   1.01705E+06   6.21236E+04
                   15319  -6.42157E+05  -1.02958E+06   1.19658E+06   2.06113E+06  -1.01008E+06   6.46652E+04
                   15496   1.43042E+05  -6.81295E+05  -5.47284E+05   1.41118E+06   2.71495E+05   5.78436E+03
                   15599  -1.48494E+05  -5.78983E+05   5.47162E+05   1.21781E+06  -2.82356E+05   3.85577E+03

        7    1     15258  -2.41335E+05   3.00323E+04  -2.68430E+05  -6.44408E+04  -5.07808E+05   9.09409E+02
                   15319  -1.80514E+05   2.93136E+04  -3.02158E+05  -5.39629E+04  -4.00859E+05  -8.70918E+03
                   15496  -1.09266E+04  -1.74890E+04   3.72268E+05   3.80802E+04  -1.93555E+05   4.28284E+03
                   15599  -7.26381E+03  -3.77993E+04   3.28444E+05   6.57842E+04  -1.73402E+05  -1.17514E+04

        8    1     15258  -2.26733E+05   4.49003E+04  -1.06569E+05  -7.19625E+04  -4.14589E+05  -1.94111E+04
                   15319   1.72608E+05   4.04773E+04  -2.13720E+04  -5.97935E+04   2.79013E+05  -2.28510E+04
                   15496  -4.05401E+05  -2.37407E+05  -2.70428E+05   5.02576E+05  -6.98511E+05  -4.46967E+04
                   15599   4.62568E+05  -2.84760E+05   4.87807E+05   5.64434E+05   6.98930E+05  -4.24812E+04

        9    1     15258   1.66968E+05  -2.22664E+04   1.46576E+05   4.60944E+04   3.39077E+05   4.96193E+02
                   15319   1.14765E+05  -2.15403E+04   1.66594E+05   4.06187E+04   2.48549E+05   5.66308E+03
                   15496   1.03130E+05   1.49938E+04  -1.17312E+05  -2.86610E+04   2.49080E+05   2.51172E+02
                   15599   5.51758E+04   2.47555E+04  -1.48529E+05  -4.73752E+04   1.69871E+05   6.68974E+03

       10    1     15258   1.52366E+05  -3.71344E+04  -1.52845E+04   5.36162E+04   2.45857E+05   2.08168E+04
                   15319  -2.38356E+05  -3.27040E+04  -1.14192E+05   4.64493E+04  -4.31322E+05   1.98049E+04

 DATE: 10-JUL-2014 TIME: 17:52:31   ***************  SESTRA  ***************
PAGE:    12

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                                    SUB
PAGE:     3

  REACTION FORCES IN NODES WITH SPECIFIED (FIXED) DEGREES OF FREEDOM.
  NODES MARKED WITH AN ASTERISK (*) TO THE RIGHT HAVE A LOCAL COORDINATE SYSTEM.
  ******************************************************************************

  LOADCASE (INDEX) NODE NO.      X             Y             Z            RX            RY            RZ
                   15496   4.97605E+05   2.34912E+05   5.25384E+05  -4.93156E+05   7.54037E+05   4.92307E+04
                   15599  -4.14656E+05   2.71716E+05  -3.07892E+05  -5.46025E+05  -7.02462E+05   3.74195E+04
```

```
 DATE: 10-JUL-2014 TIME: 17:52:31   ***************  SESTRA  ***************
PAGE:    13

                                    RETRACKING MODULE - SUPERELEMENT TYPE    1
                                    THE STRUCTURE                                                           SUB
PAGE:     4

  SUM OF REACTION FORCES FROM SPECIFIED DEGREES OF FREEDOM.
  THE FORCES AND MOMENTS ARE REFFERED TO THE COORDINATE SYSTEM OF THE ACTUAL SUPERELEMENT.
  ******************************************************************************************

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           7.9740E-06   -6.0722E-07    1.4344E+08    2.5467E+09   -5.9589E+09   -1.2779E-04
        2           9.6406E-09   -2.3410E-09    2.8826E+05    5.0502E+06   -9.8882E+06   -1.4482E-07
        3          -2.3605E+06    6.5753E-08    1.6751E-06   -6.4895E-06   -1.2123E+09    4.2490E+07
        4           2.3605E+06   -4.8158E-08   -1.6661E-06   -2.5816E-06    1.2128E+09   -4.2490E+07
        5          -8.8476E-08    3.4211E+06   -5.2853E-08   -1.7424E+09   -4.3795E-05    1.0016E+08
        6           9.1939E-08   -3.4211E+06    4.9011E-08    1.7424E+09    4.6089E-05   -1.0016E+08
        7    1     -4.4004E+05    4.0575E+03    1.3012E+05   -7.5842E+05   -2.4376E+08    5.3308E+06
        8    1      3.0413E+03   -4.3679E+05    8.9438E+04    2.2969E+08   -7.7384E+06   -4.5119E+07
        9    1      4.4004E+05   -4.0575E+03    4.7329E+04    2.7062E+06    2.2532E+08   -5.3308E+06
       10    1     -3.0413E+03    4.3679E+05    8.8015E+04   -2.2774E+08   -1.0705E+07    4.5119E+07


 SUPERELEMENT TYPE:     1 ACTUAL ELEMENT:     1
 HAS BEEN STORED ON RESULT FILE

 DATE: 10-JUL-2014 TIME: 17:52:38   ***************  SESTRA  ***************
PAGE:    14

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                            SUB
PAGE:     1

  SUM OF GLOBAL LOADS AND MOMENTS
  *******************************


  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           8.3912E-11    4.6302E-11   -1.4344E+08   -2.5467E+09    5.9589E+09    1.0859E-09
        2           0.0000E+00    0.0000E+00   -2.8826E+05   -5.0502E+06    9.8882E+06    0.0000E+00
        3           2.3605E+06    0.0000E+00    0.0000E+00    0.0000E+00    1.2123E+09   -4.2490E+07
        4          -2.3605E+06    0.0000E+00    0.0000E+00    0.0000E+00   -1.2128E+09    4.2490E+07
        5           0.0000E+00   -3.4211E+06    0.0000E+00    1.7424E+09    0.0000E+00   -1.0016E+08
        6           0.0000E+00    3.4211E+06    0.0000E+00   -1.7424E+09    0.0000E+00    1.0016E+08
        7    1      4.4004E+05   -4.0575E+03   -1.3012E+05    7.5842E+05    2.4376E+08   -5.3308E+06
        8    1     -3.0413E+03    4.3679E+05   -8.9438E+04   -2.2969E+08    7.7384E+06    4.5119E+07
        9    1     -4.4004E+05    4.0575E+03   -4.7329E+04   -2.7062E+06   -2.2532E+08    5.3308E+06
       10    1      3.0413E+03   -4.3679E+05   -8.8015E+04    2.2774E+08    1.0705E+07   -4.5119E+07

 DATE: 10-JUL-2014 TIME: 17:52:38   ***************  SESTRA  ***************
PAGE:    15

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                            SUB
PAGE:     2

  SUM OF REACTION FORCES AND MOMENTS
  **********************************
  GIVEN IN THE GLOBAL COORDINATE SYSTEM OF THE TOP LEVEL SUPERELEMENT

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           7.9740E-06   -6.0722E-07    1.4344E+08    2.5467E+09   -5.9589E+09   -1.2779E-04
        2           9.6406E-09   -2.3410E-09    2.8826E+05    5.0502E+06   -9.8882E+06   -1.4482E-07
        3          -2.3605E+06    6.5753E-08    1.6751E-06   -6.4895E-06   -1.2123E+09    4.2490E+07
        4           2.3605E+06   -4.8158E-08   -1.6661E-06   -2.5816E-06    1.2128E+09   -4.2490E+07
        5          -8.8476E-08    3.4211E+06   -5.2853E-08   -1.7424E+09   -4.3795E-05    1.0016E+08
        6           9.1939E-08   -3.4211E+06    4.9011E-08    1.7424E+09    4.6089E-05   -1.0016E+08
        7    1     -4.4004E+05    4.0575E+03    1.3012E+05   -7.5842E+05   -2.4376E+08    5.3308E+06
        8    1      3.0413E+03   -4.3679E+05    8.9438E+04    2.2969E+08   -7.7384E+06   -4.5119E+07
        9    1      4.4004E+05   -4.0575E+03    4.7329E+04    2.7062E+06    2.2532E+08   -5.3308E+06
       10    1     -3.0413E+03    4.3679E+05    8.8015E+04   -2.2774E+08   -1.0705E+07    4.5119E+07

 DATE: 10-JUL-2014 TIME: 17:52:38   ***************  SESTRA  ***************
PAGE:    16

                                        RETRACKING MODULE - GLOBAL DATA
                                                                                                            SUB
PAGE:     3

  DIFFERENCES BETWEEN SUMMED LOADS AND REACTION FORCES
  ****************************************************
  LARGER THAN   0.00E+00 FOR TRANSLATIONAL COMPONENTS AND LARGER THAN   0.00E+00 FOR ROTATIONAL COMPONENTS

  LOADCASE (INDEX)        X             Y             Z            RX            RY            RZ

        1           7.9741E-06   -6.0718E-07   -8.1956E-06    1.5879E-04    3.2272E-03   -1.2779E-04
        2           9.6406E-09   -2.3410E-09   -7.4797E-08    3.7253E-09    4.4722E-06   -1.4482E-07
        3          -1.7183E-07    6.5753E-08    1.6751E-06   -6.4895E-06   -1.1206E-04    1.2666E-07
        4           1.2526E-07   -4.8158E-08   -1.6661E-06   -2.5816E-06    9.0599E-05    1.8105E-06
        5          -8.8476E-08    8.8010E-08   -5.2853E-08   -4.4346E-05   -4.3795E-05   -2.8908E-06
        6           9.1939E-08   -8.5682E-08    4.9011E-08    4.3631E-05    4.6089E-05    2.9951E-06
        7    1      5.0350E-07   -2.4575E-08    4.9513E-07    2.0330E-05    2.4572E-04   -1.0650E-05
        8    1     -6.2066E-08    6.7957E-07    1.2790E-07   -3.5417E-04   -3.5933E-05    7.3239E-05
        9    1     -3.3324E-07    2.3458E-08   -2.4514E-07   -1.5767E-05   -1.6677E-04    7.6592E-06
       10    1      2.3263E-07   -6.7957E-07    1.2224E-07    3.5876E-04    1.1485E-04   -7.6197E-05

  TOTAL TIME CONSUMED IN SESTRA                    CPU TIME:     19.62  CLOCK TIME:     19.33  CHANNEL TIME:      0.00
```