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MASTER'S THESIS

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ABSTRACT

During 2012 Aker Solutions will build new buildings in Stavanger.
The buildings will be placed in Jåttåvågen and be completed towards the end of 2012. Two of the buildings will be linked together by a skywalk at the second floor.
The alternatives have been to design a skywalk made of steel or use aluminium to utilize the positive characteristics of aluminium. Aluminium has been used.

The main focus of this thesis is to design and analyze a skywalk between two buildings and get an understanding of aluminium as a structural material.

The skywalk is modelled and analyzed using STAAD Pro v8i and the maximum utilization ratios for the ultimate limit state are listed below:

Beam members:	0.707
Local check joints:	0.956

The skywalk has sufficient capacity in the ultimate limit state.

Aluminium has a low modulus of elasticity and instability and the feeling of instability may be a problem. The skywalk is checked for displacement in serviceability limit state.

Maximum deflection:	20.320 mm

Neither the horizontal nor the vertical displacement will make the skywalk feel instable. However, the displacement of the glass facades may be too high and should be further checked.

Aluminium has a great future as a structural material, especially when weight or corrosion is a problem.
For this skywalk neither weight nor corrosion is a problem and the method of jointing the structure with casted joints will be expensive.
It is fully possible to design the skywalk in aluminium but steel would be a more natural choice and probably less expensive.

ACKNOWLEDGEMENT

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This report has been carried out under the supervision of Rolf A. Jakobsen and S. A. Sudath C. Siriwardane at the University at Stavanger.

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Stavanger, 13. June 2012

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Atle Aasgaard

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ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
AC	Cast aluminium
ALS	Accidental limit state
AW	Wrought aluminium
BY	Buckling length coefficient for weak axis buckling
BZ	Buckling length coefficient for strong axis buckling
CY, CZ	Buckling curve coefficients
DMIN	Minimum allowable depth of section
DMAX	Maximum allowable depth of section
ET	Extruded tube
FEM	Finite element method
FYLD	Allowable yield strength/0.2% proof strength
HAZ	Heat affected zone
HT	Heat-treatable
LC	Load case/load combination
MF	Material factor
NHT	Non heat-treatable
RATIO	Permissible ratio of the actual stresses
SLS	Serviceability limit state
STAB	Critical condition in stability
ULS	Ultimate limit state
UF	Utilization

SYMBOLS

Symbol	Definition
A	Min. elongation
A	Cross section area
A_{net}	Net section area
A_{nt}	Net area subjected to tension
A_{nv}	Net area subjected to shear
d	Diameter for bolt
d_0	Hole diameter
E	Modulus of elasticity
f_o	Characteristic value of 0.2% proof strength
$f_{o,haz}$	0.2% proof strength in heat affected zone, HAZ
f_u	Ultimate tensile strength
$f_{u,haz}$	Ultimate tensile strength in heat affected zone, HAZ
$F_{b,Rd}$	Design bearing resistance per bolt
$F_{v,Ed}$	Design shear force per bolt (ULS)
$F_{v,Rd}$	Design shear resistance per bolt
G	Shear modulus
$N_{net,Rd}$	Design resistance of section at bolt holes
$V_{eff,1,Rd}$	Design block tearing resistance for concentric loading
γ_{M1}, γ_{M2}	Partial safety factor/material factor
ν	Poisson's ratio
α	Coefficient of thermal expansion
ρ	Density
e_1, e_2	Edge distances
p_1	Spacing between bolt holes

1. INTRODUCTION

1.1 REPORT OVERVIEW

This report is divided into seven chapters. The first part is a theoretical part giving an introduction to aluminium as a structural material. The second part contains a design part and consists of design and geometry of the skywalk. The third part is an analytical part where the STAAD Pro v8i analysis and its input are presented. The results of the STAAD Pro v8i analysis are presented in chapter 6 and conclusion in chapter 7.

1.2 SCOPE OF REPORT

The scope of this master's thesis is to model and analyse a skywalk, using STAAD Pro v8i, for the new buildings to Aker Solutions in Jåttåvågen. The buildings will be completed towards the end of 2012. The skywalk should be analysed using aluminium and a big part of this thesis is to look at the positive and negative characteristics of aluminium as a structural material. The skywalk should be modelled without welds.

1.3 LIMITATIONS

Due to the very small likelihood of an earthquake in Stavanger actions caused by earthquakes have been disregarded in this thesis.

Fatigue has been disregarded in this thesis.

The skywalk is not designed to withstand hazards due to fire.

The structure is depending on static loads only.

2. ALUMINIUM

2.1 INTRODUCTION

Aluminium is a metallic element having the chemical symbol Al, with the atomic number 13 and atomic weight 27. The nucleus of the atom contains 13 protons and 14 neutrons. Aluminium is found primarily as bauxite ore and is the third most common element in the earth's crust, after oxygen and silicon. It makes up 8% of the crust's total mass and is the most abundant metal, see Figure 2-1.

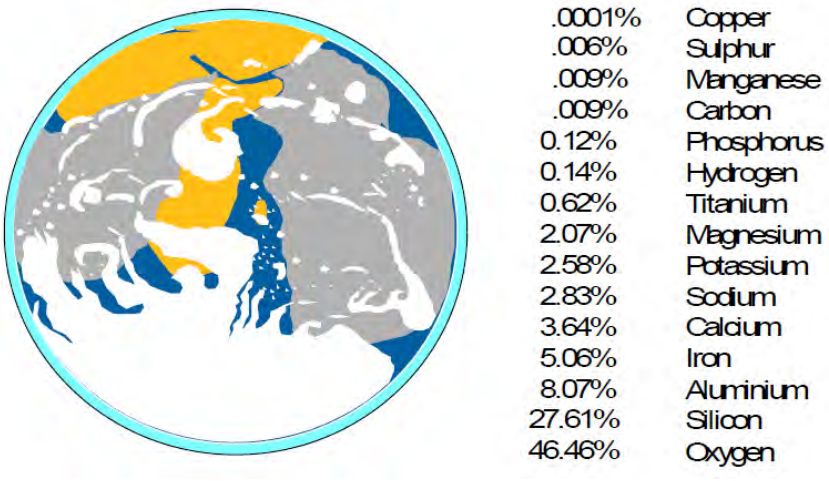


Figure 2-1: Analysis of earth's crust (Budd, 1999)

Norway is among the world's largest producers of aluminium. Norway's unique position as a producer of aluminium is due to the supply of electrical energy. Under normal circumstances 90% of the production is exported.

The fact that Norwegian aluminium is produced using environmentally friendly hydropower makes the CO_2 emissions per tonne of Al only one tenth of the emissions from a smelter operated with electricity from a coal power plant, which is common in for example China.

2.2 WHEN TO CHOOSE ALUMINIUM

Lightweight: aluminium is light. It weights about one third of steel. This is an important factor if the self-weight is a concern.

Corrosion resistance: Aluminium forms its own protective layer against corrosion when exposed to air. Aluminium has ability for self-healing if the protective layer is damaged. Aluminium can be used unpainted.

Fabrication: Aluminium is soft, and it can easily be fabricated into various forms and shapes.

Heat conductivity: Aluminium is approximately three times as thermally conductive as steel.

Low temperature performance: Aluminium does not become brittle at low temperatures as steel do. The mechanical properties of aluminium improve as the temperature goes down.

Recyclability: Aluminium can easily be recycled and reprocessed.

Reflectivity: Aluminium is highly reflective of light, heat and electric waves.

Non-toxic: Aluminium is non-toxic and odourless.

Non-magnetic: Aluminium is non-magnetic

2.3 MANUFACTURE

2.3.1 Primary production

The production of aluminium ingot involves three steps: mining the bauxite ore, refining of bauxite to gain alumina, and melting of alumina to gain aluminium. See Figure 2-2.

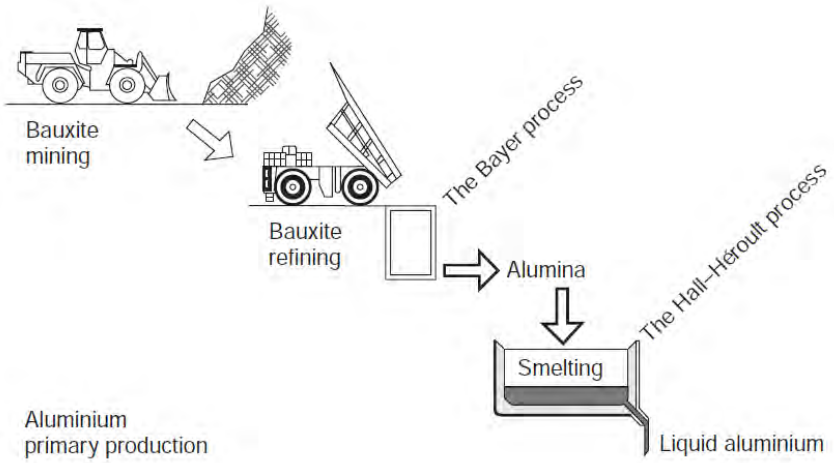


Figure 2-2: Aluminium production (Müller, 2011)

In order to refine bauxite one must use the Bayer process, see Figure 2-3. The bauxite is washed, milled and dissolved in sodium hydroxide at high temperature. A solution of sodium aluminate and undissolved bauxite deposits are contained in the accrued fluid. The undissolved bauxite, called red mud, sinks to the bottom of the digester tank where it is filtered and removed. The remaining sodium aluminate is pumped into the following tank, called the precipitator. During the process of cooling fine particles of pure alumina sink down to the bottom of the precipitator. To free and remove chemically bound water one must remove the pure alumina particles and pass them through a rotary kiln at very high temperature. The final product is a white powder, pure alumina also called aluminium oxide (Müller, 2011).

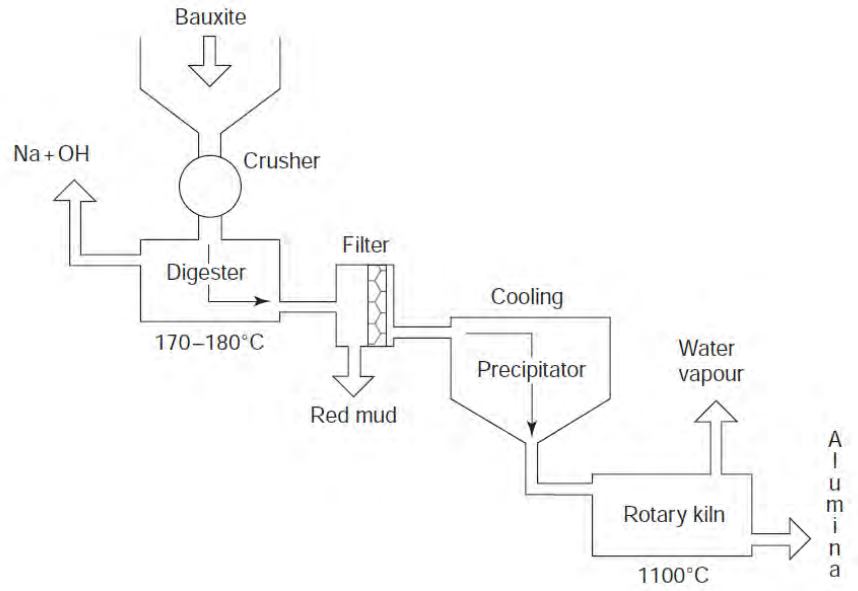


Figure 2-3: The Bayer process (Müller, 2011)

In order to extract metallic aluminium from alumina powder an electrolytic procedure, called the Hall-Héroult process, is used, see Figure 2-4. The alumina is placed in a carbon-lined container where it dissolves in molten cryolite and aluminium fluoride. The resulting mixture is electrolysed using high electrical current and low voltage. The cathode draws the liquid aluminium, where it is deposited. At a temperature of 900°C the metal forms. It has a very high purity of 99.5%. The liquid aluminium is denser than molten cryolite, causing it to sink to the bottom of the container, where it is removed at regular intervals (Müller, 2011).

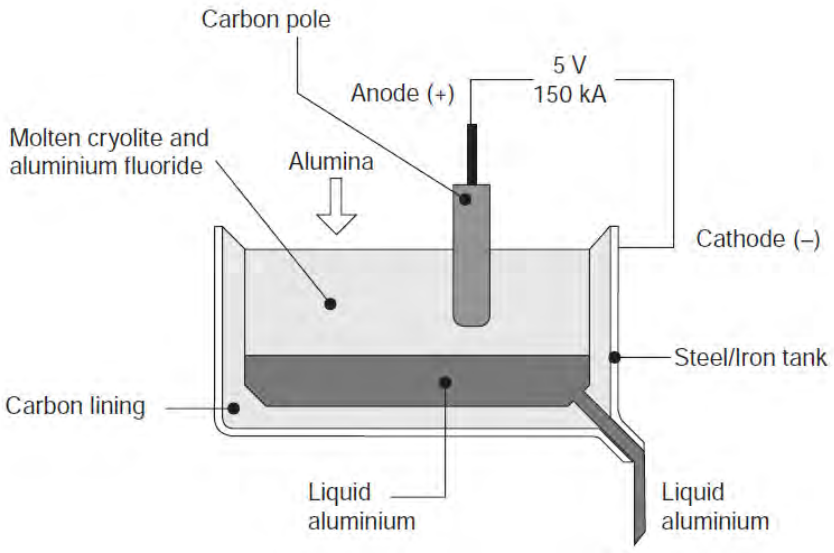


Figure 2-4: The Hall-Héroult process (Müller, 2011)

2.3.2 Secondary production, recycling

Aluminium can be recycled repeatedly, as the reprocessing does no harm to the metal or its structure. When it has arrived at the recycling plant, the scrap aluminium will be checked and sorted to determine its composition and value. Some of the scrap aluminium must be processed further to remove coatings and other contaminations. The "clean" scrap aluminium is melted in furnaces. Processing of the molten aluminium is the same method as for primary processing.

The energy required to recycle scrap aluminium to aluminium metal is only 5% of the energy used to produce the metal in primary production (Müller, 2011).

2.4 ALUMINIUM PRODUCTS

Processing of aluminium and its alloys is done in various ways to produce aluminium products for private, commercial and industrial use. The manufacturing process for products of aluminium includes both modern methods and traditional processes, such as milling and extruding in the former case, and forging and casting in the latter. Forging and castings products are still seeing wide use, especially for architectural and office or home use, whilst milling products and extruded sections are more often used for structural applications. Milled and extruded, but also drawn products used for structural application are subdivided into flat products, extruded products and tube products. Their main characteristics are the process of manufacture and heating used for the manufacture of specific products (Müller, 2011).

2.5 ELEMENT FABRICATION

Aluminium goods are usually delivered as semi-finished products, most of them as sheet, plate, extrusions and tube products. These products are subsequently further shaped and fabricated to create the desired shapes or elements utilising a broad range of fabrication processes. All fabrication processes used in steel fabrication can, as a general rule, be used with aluminium goods. The main difference lies in that the softer aluminium allows for a quicker and cheaper fabrication as compared to the fabrication of steel. The processes that are typically used are cutting, sawing, drilling, punching, bending, machining and welding (Müller, 2011).

2.6 PROPERTIES

2.6.1 Physical properties

Aluminium is a weak metal in its pure form with tensile strength ranging from 90 to 140 N/mm^2. Pure aluminium is used for domestic products such as cans and packaging, but also for electrical conductors. Aluminium can be strengthen and used for structural applications. This is done by alloying and tensile strength in the region of 500 N/mm^2 has been reached (Müller, 2011).

Table 2-1 summaries the main physical properties of pure aluminium.

Table 2-1: Properties of pure aluminium (Müller, 2011)

Property	Value
Atomic number	13
Atomic value	10 cm^3/g-atom
Atomic weight	26.68
Coeff. of thermal expansion	α = 23.5 x 10^{-6} /°C
Density	P = 2.7 g/cm^3
Electrical resistivity	R = 2.69 – 2.824 μΩcm
Elongation	~ 50 %
Hardness	BHN = 15 Brinell
Modulus of elasticity	E = 69 kN/mm^2
Modulus of rigidity	G = 26 kN/mm^2
Point of melting	~ 660 °C
Point of boiling	~ 1800 – 2480 °C
Poisson's ratio	ν = 0.33
Proof/yield stress	f_y = < 25 N/mm^2
Thermal conductivity	K = 240 W/m°C
Ultimate tensile strength	$f_{y,ult}$ = < 58 N/mm^2
Specific heat	c = 22 cal/g°C
Valency	3

2.6.2 Stress-strain curves

Aluminium and structural steel have a big difference when it comes to the stress-strain behaviour. Structural steel exhibits a yield strength, a subsequent yield plateau and finally strain hardening to arrive at the maximum strength f_u, see Figure 2-5.

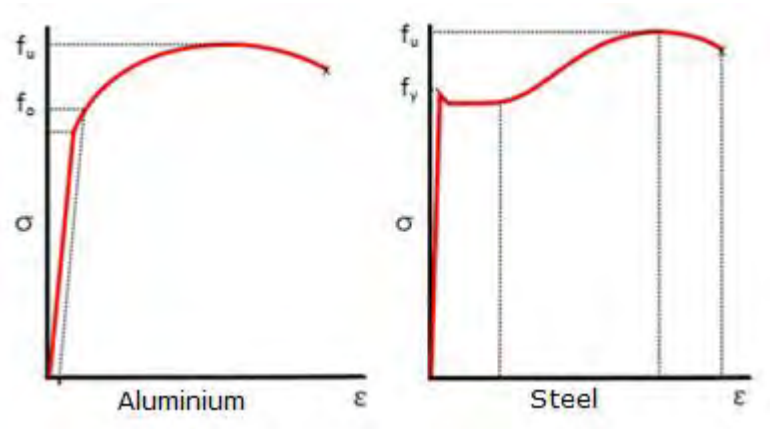


Figure 2-5: Stress-strain curves for aluminium and steel

Aluminium alloys show a highly non-linear stress-strain relationship up to the maximum strength. For design purposes instead of the yield strength conventionally the 0.2% strain limit or proof stress f_o is used, see Figure 2-5. As compared to steel this limit has no physical meaning; it is just defined for design purposes.

The mechanical properties of aluminium alloys vary from low strength for pure aluminium (1050-O), medium strength for 5xxx and 6xxx series alloys, to high strength 7xxx alloys, see Figure 2-6 (European aluminium assosiation, Matter, 2001-2010).

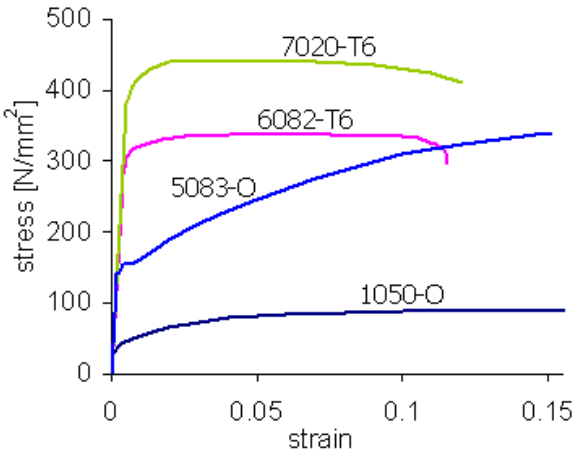


Figure 2-6: Stress-strain curves for various aluminium alloys (European aluminium assosiation, Matter, 2001-2010)

2.7 COMPARISON WITH STEEL

Below is a comparison between aluminium (AlMgSi1) and steel (St 52) for some chosen properties, see Table 2-2. Stress-strain curves are compared above.

Table 2-2: Comparison between aluminium and steel (Jakobsen, n.d.)

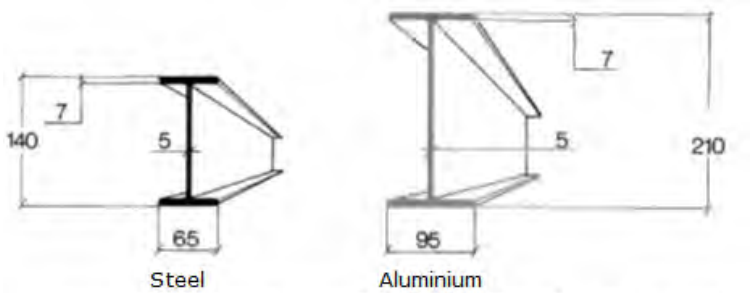
Property	AlMgSi1	St 52	AlMgSi1/St 52
Density	2.7 g/cm^3	7.8 g/cm^3	~ 1:3
Modulus of elasticity	70 kN/mm^2	208 kN/mm^2	
Ultimate stress	310 N/mm^2	520 N/mm^2	~ 1:1.7
Yield stress	270 N/mm^2	340 N/mm^2	~ 1:1.3
Melting point	660°C	1510°C	
Boiling point	1800-2480°C	2750°C	
Thermal expansion coeff.	23.5*10^{-6}/°C	12*10^{-6}/°C	~ 1:1.05
Thermal conductivity	225 W/m°C	50 W/m°C	~ 1:1.02
Heat capacity	0.92 kJ/kg°C	0.52 kJ/kg°C	~ 1:1.17

"For cases where yield stresses are dimensioning the weight ratio steel/aluminium is 2/1.
For unloaded components the weight ratio steel/aluminium is 3/1" (Jakobsen, n.d.).
Table 2-3 shows the comparison between steel and aluminium for equal beam geometry.

Table 2-3: Comparison for equal geometry (Jakobsen, n.d.)

	Steel	Aluminium
Weight	1	1/3
Deformation	1	3
Beam height	1	1

Figure 2-7 shows an example of beam stiffness with different geometry between steel and aluminium.



	Steel	Aluminium
2. Mom of area	483 cm^4	1438 cm^4
Weight	12 kg/m	6 kg/m

Figure 2-7: Example for different geometry (Jakobsen, n.d.)

Table 2-4: Comparison for different geometry (Jakobsen, n.d.)

	Steel	Aluminium
Weight	1	0.5
Deformation	1	1
Beam height	1	1.5

Table 2-4 shows the comparison between steel and aluminium for the different beam geometry in the example above.
Aluminium is poorer in fatigue than steel, Figure 2-8 shows comparison between Steel and aluminium (Jakobsen, n.d.).

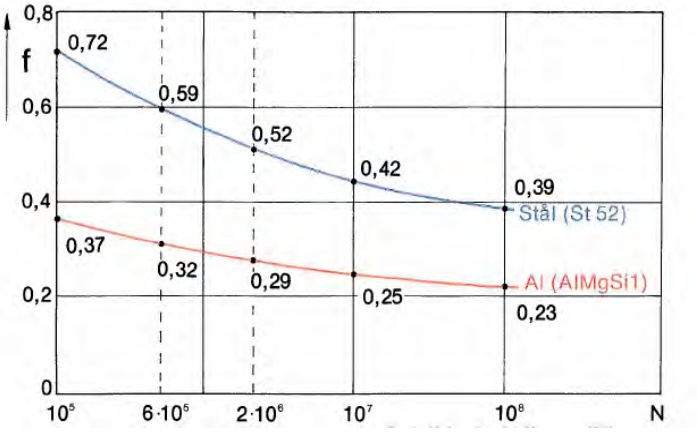


Figure 2-8: Comparison for fatigue (Jakobsen, n.d.)

The low elastic modulus of aluminium alloys is an asset when a structure is subjected to shock-loading conditions. An aluminium alloy member will absorb almost three times as much energy before permanent damage occurs than a steel member of equal moment of inertia and strength. Figure 2-9 shows a comparison of shock absorbance between steel and aluminium (Cobden, 1994).

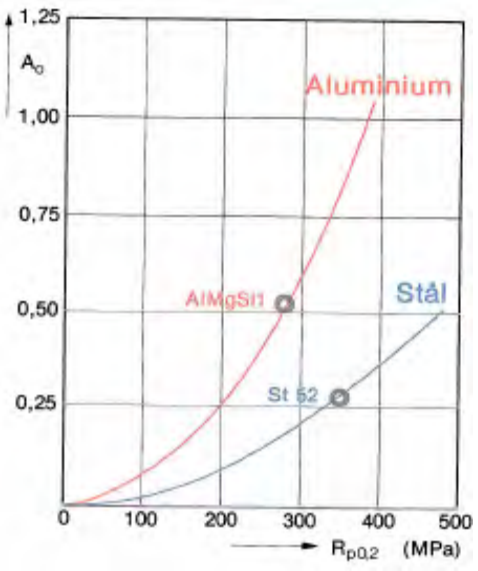


Figure 2-9: Comparison for shock absorbance (Jakobsen, n.d.)

Aluminium has good resistance against corrosion. Figure 2-10 shows comparison between steel and aluminium. The upper graph shows general rate of corrosion in a maritime environment. The lower graph shows average rate of corrosion after 20 years in sea water (Jakobsen, n.d.).

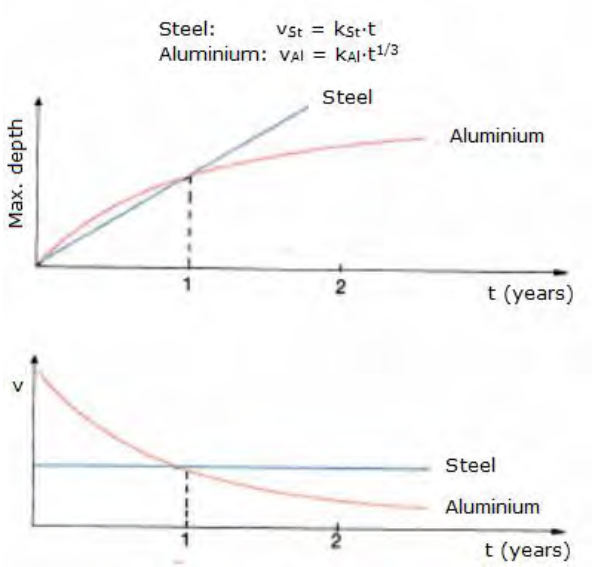


Figure 2-10: Comparison for corrosion (Jakobsen, n.d.)

2.8 ALUMINIUM ALLOYS

2.8.1 Numbering and designation

Pure aluminium must be strengthened to be used for structural applications. There are many different alloy series. Aluminium alloys are grouped into wrought aluminium alloys and cast aluminium alloys. Wrought alloys are divided into eight alloy series 1xxx-8xxx. They are further subdivided into heat-treatable (HT) and non-heat-treatable (NHT). See Table 2-5.

Table 2-5: Numerical wrought alloy designation system

Series	Alloy elements	Type
1xxx	None	NHT
2xxx	Copper (Cu)	HT
3xxx	Manganese (Mn)	NHT
4xxx	Silicon (Si)	NHT
5xxx	Magnesium (Mg)	NHT
6xxx	Magnesium and silicon (MgSi)	HT
7xxx	Zinc (Zn)	HT
8xxx	Other elements	

Cast alloys are divided into nine alloy series 1xxxx-9xxxx, see Table 2-6.

Table 2-6: Numerical cast alloy designation system

Series	Alloy elements
1xxxx	None
2xxxx	Copper (Cu)
3xxxx	n/a
4xxxx	Silicon (Si)
5xxxx	Magnesium (Mg)
6xxxx	n/a
7xxxx	Zinc (Zn)
8xxxx	Tin (Sn)
9xxxx	Master alloys

Wrought alloy series:

1xxx series: This series is for commercially pure aluminium, defined as being at least 99% aluminium. This alloy series has very good electrical conductivity and corrosion resistance, and are often used in plants. It is also used in the food and packaging industry.

2xxx series: The primary alloying element for this group is copper. It produces high strength but also reduced corrosion resistance, reduced ductility and poor extrudability. This series is mainly used by the aerospace industry.

3xxx series: In this series manganese is the primary alloying element. This series has a tensile strength of approximately 200 N/mm^2 and are not much stronger than pure aluminium. It has very high corrosion resistance and good workability, and are used in cladding of buildings and car panelling.

4xxx series: In this series silicon is added to reduce the melting point and it is used for castings and weld filler wire.

5xxx series: By adding magnesium this series gets a combination of high strength and excellent resistance to corrosion. It is used for vessels, vehicles, ships and chemical plants.

6xxx series: This alloy series contains magnesium and silicon. They have high strength, excellent extrudability, and good corrosion resistance. It has a tensile strength around 300 N/mm^2 and proof stress of 250 N/mm^2. This series include the 6082 alloy which is widely used for building structures.

7xxx series: The primary alloying element in this series is zinc. These alloys display the highest strength of aluminium alloys, and can reach a tensile strength of 580 N/mm^2. It has poorer corrosion resistance and extrudability than the 6xxx series, and is mainly used for aircrafts and military.

8xxx series: This series is reserved for alloying elements other than those used for the 1xxx-7xxx series.

(Müller, 2011)

2.8.2 Temper designation

Aluminium alloys are available in different tempers. By heat treatment the mechanical properties of the heat-treatable alloys can be changed. Heat is therefore used to strengthen or soften the material. There are five basic temper designations used for aluminium alloy temper designation. These groupings are represented by the letters F, O, H, W and T. See Table 2-7.

Table 2-7: Basic temper designation

Letter	Description	Meaning
F	As fabricated	Forming process with no special control over thermal or strain hardening
O	Annealed	Heat treated to give min. strength improving ductility and dimensionality
H	Strain hardened	Strengthened by cold working
W	Heat treated	Solution heat treated but produces an unstable temper
T	Heat treated	Thermally heat treated with or without additional strain hardening

The groups for strain-hardened alloys (H) and thermally heat treated alloys (T) are further subdivided indicating the applied treatment or treatment combinations. Subdivisions of the strain-hardened and HT aluminium alloys are done by adding numerical indicators to the preceding letters. The range of the strain-hardened alloys is H1−H4 and HX2−HX8. The subgroups for the heat treated alloys are T1−T9. See Table 2-8. (Müller, 2011).

Table 2-8: Temper designation system to current standards

Temper destination (xxxx)		
-F	As fabricated	
-O	Fully annealed	
-H1	Strain-hardened only	NHT
-H2	Strain-hardened and partially annealed	NHT
-H3	Strain-hardened and stabilised	NHT
-H4	Strain-hardened and lacquered or painted	NHT
-HX2	Quarter-hard	NHT
-HX4	Half-hard	NHT
-HX6	Three-quarter-hard	NHT
-HX8	Fully-hard	NHT
-T1	Cooled from an elevated termperature shaping process	HT
-T2	Cooled from an elevated termperature shaping process, cold worked and naturally aged	HT
-T3	Solution heat-treated, cold worked and naturally aged	HT
-T4	Solution heat-treated and naturally aged	HT
-T5	Cooled from an elevated termperature shaping process and artificially aged	HT
-T6	Solution heat-treated and artificially aged	HT
-T7	Solution heat-treated and over-aged	HT
-T8	Solution heat-treated, cold worked, and then artificially aged	HT
-T9	Solution heat-treated, artificially aged and then cold worked	HT

To explain the numbering and designation system the commonly used aluminium alloy 6082-T6 is used:

6=group 6xxx (magnesium and silicon)
0=original alloy (not modified)
82=group specific allocator
T6=heat treated and artificially aged

2.9 JOINTING ALUMINIUM

2.9.1 General

There are many ways of jointing aluminium members. But for primary structures the joints normally are welded connections, bolted connections, riveted connections or adhesive joints.

2.9.2 Mechanical joints

Mechanical joints formed by bolting, screwing, riveting and pinning are frequently used as methods when jointing aluminium. Compared to welded joints they have the advantage that there is no softening due to the influence of heat. Fasteners for use in aluminium and aluminium alloy structures can be made of:

- aluminium/aluminium alloy
- steel (mild steel)
- stainless steel.

Fasteners made of aluminium/aluminium alloy have the advantage of avoiding galvanic corrosion and also thermal expansion problems.

Fasteners made of mild steel need to be isolated from the aluminium in order to avoid galvanic corrosion.

Fasteners made of austenitic stainless steel do not suffer from galvanic corrosion when in contact with aluminium. It also has higher strength then fasteners made of aluminium/aluminium alloy.

2.9.3 Welded joints

Aluminium structural elements are often jointed by welding. There are a lot of advantages of welded connections, such as simplicity of connections and design, less material required compared to bolted connections. However there is one big disadvantage of welded connections which is softening of the heat-affected zone.

2.9.4 Bonded joints

"Adhesive bonding is defined as the process of joining parts using a non-metallic substance which undergoes a physical or chemical hardening reaction causing the parts to join together through surface adherence and internal strength of the adhesive" (European aluminium association, Matter, 2001-2010)

It is not widely used in structural applications, but is an alternative to welding and mechanical jointing.

2.10 STRENGTH VARIATION WITH TEMPERATURE

Aluminium has a weakness when it comes to elevated temperatures. The strength of the metal decreases pretty quick as the temperature increases. But when the temperature decreases the strength of the metal increases and it does not become brittle like steel. The tensile strength of 6082-T6 goes down by 70% at 200°C, compared to room temperature, but increases by 40% at -200°C.

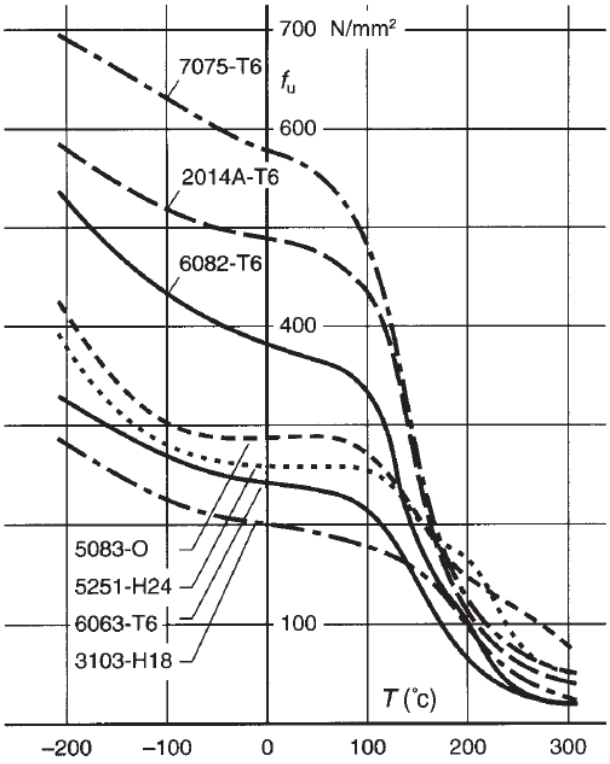


Figure 2-11: Variation of tensile stress (f_u) with temperature T for various alloys (Dwight, 1999)

Figure 2-11 shows how tensile strength varies with temperature for a range of alloys. The specimens are tested at temperature T after long-term exposure at that temperature. Figure 2-12 gives a more comprehensive data for the 6082-T6 alloy (Dwight, 1999).

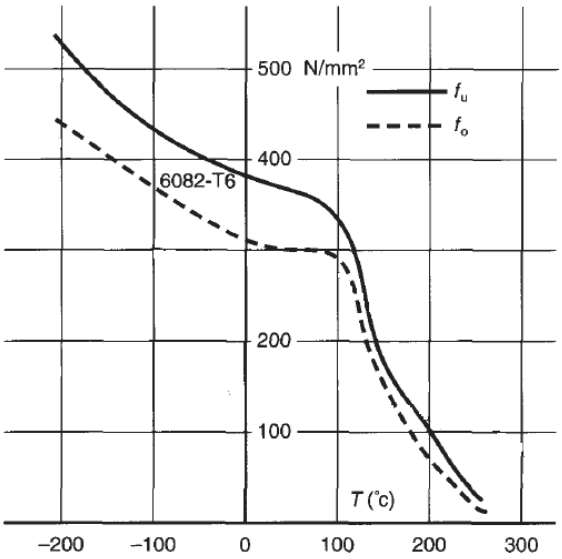


Figure 2-12: Variation of proof stress (f_o) and tensile strength (f_u) with temperature, for the 6082-T6 alloy (Dwight, 1999)

2.11 HEAT AFFECTED ZONE

An annoying feature in aluminium construction is the weakening of the metal around welds, known as heat affected zone (HAZ) softening, see Figure 2-13. Most aluminium alloys used in structural applications have mechanical properties based or improved by cold-working or heat treatment. When welding these aluminium alloy members, heat generated by the welding process reduces material properties in the HAZ.

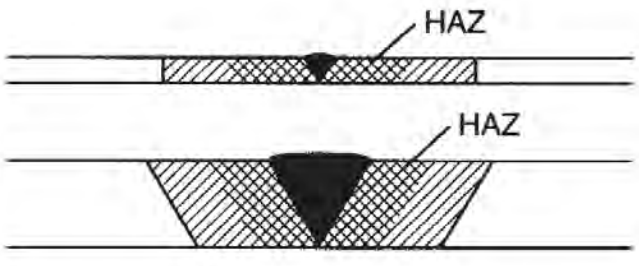


Figure 2-13: HAZ softening at aluminium welds (Dwight, 1999)

The reduction in strength can be locally reduced in the parent metal strength by nearly one half. Table 2-9 shows an extract from Eurocode 9, table 3.2b, (NS-EN 1999-1-1).

Table 2-9: Characteristic values of 0.2% proof strength f_0 and ultimate tensile strength f_u for unwelded and for HAZ for alloy EN-AW 6082

Alloy EN-AW	Product form	Temper	Thick-ness t mm 1) 3)	f_o 1)	f_u 1)	A 5) 2)	$f_{o,haz}$ 4),	$f_{u,haz}$ 4)	HAZ-factor 4)		BC 6)	n_p 7)
				N/mm²		%	N/mm²		$\rho_{o,haz}$	$\rho_{u,haz}$		
6082	EP,ET,ER/B	T4	$t \le 25$	110	205	14	100	160	0,91	0,78	B	8
	EP/O, EP/H	T5	$t \le 5$	230	270	8	125	185	0,54	0,69	B	28
	EP/O,EP/H ET	T6	$t \le 5$	250	290	8	125	185	0,50	0,64	A	32
			$5 < t \le 15$	260	310	10			0,48	0,60	A	25
	ER/B	T6	$t \le 20$	250	295	8			0,50	0,63	A	27
			$20 < t \le 150$	260	310	8			0,48	0,60	A	25
	DT	T6	$t \le 5$	255	310	8			0,49	0,60	A	22
			$5 < t \le 20$	240	310	10			0,52	0,60	A	17

2.12 CORROSION

Aluminium has good resistance to corrosion in most environments and many chemical agents. Any aluminium surface exposed to air develops a thin oxide film. Although very thin this layer prevents further oxidation. As long as oxygen is available this oxide film will reform if damaged. This gives aluminium a good durability. In most aluminium installations, no protection against surface corrosion is necessary, except for the sake of appearance.

Unfortunately, aluminium is a base metal, and is less noble than most of the other metals used in construction. See Table 2-10.

Table 2-10: Electrochemical series of metals

	Metal
Most noble	Gold
Cathodic	Platinum
	Silver
	Nickel
	Copper
	Brasses
	Lead
	Tin
	Cast iron, high strength steel
	Mild steel
	Cadmium
	Titanium
	Aluminium
	Beryllium
	Zinc
Anodic	Magnesium
Less noble	Lithium

When two different metals are electrically connected and immersed in an electrolyte an electric cell is formed. Ions are moving from the lesser noble metal (anode) to the more noble metal (cathode). Loss of metal occurs at the anode, known as galvanic corrosion or bimetallic corrosion. So when aluminium is in contact with most other metals and moisture is present, accelerated corrosion is likely to occur. Therefore aluminium must be isolated from other metals in order to avoid galvanic corrosion.

3. DESIGN AND GEOMETRY

3.1 GENERAL

The skywalk is designed to fit the surrounding buildings, which mainly consists of white and black rectangular buildings. The figures below are meant as illustrations and are not accurate.

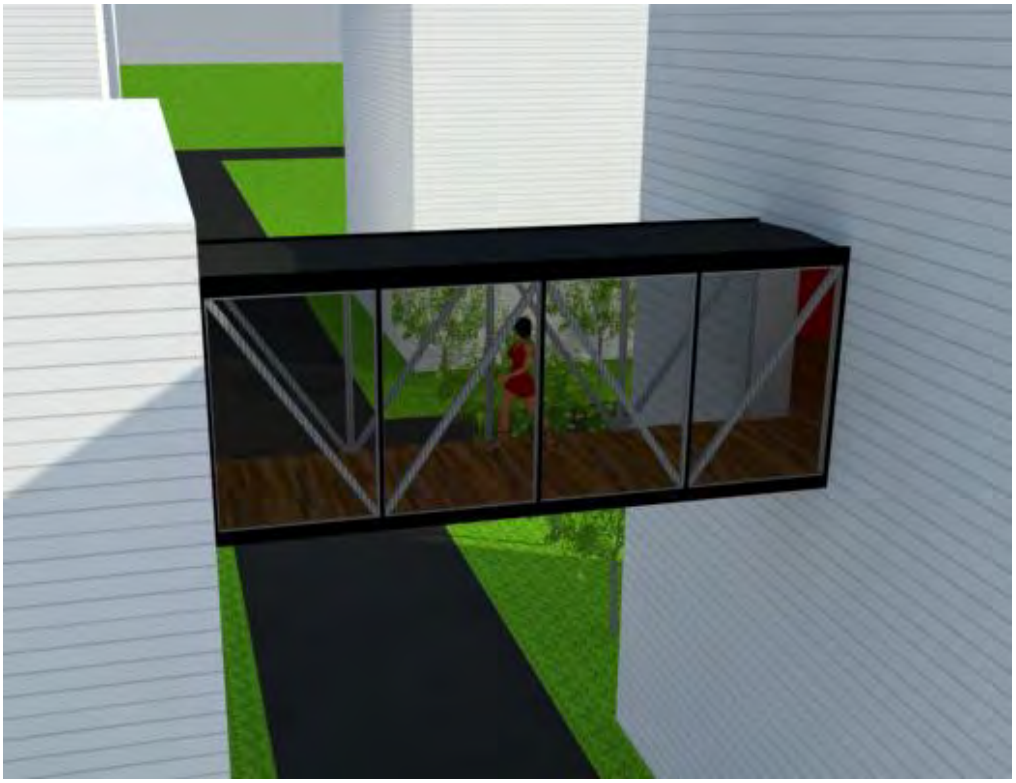


Figure 3-1: Design of skywalk

Figure 3-1 shows an overview of the design of the skywalk, and how it interacts with surrounding buildings. The figure is an illustration and the size and shape of the surrounding buildings are arbitrarily.
Figure 3-2 shows the skywalk without surroundings, and one can see how the skywalk enters the buildings on each side of the clearance between them.

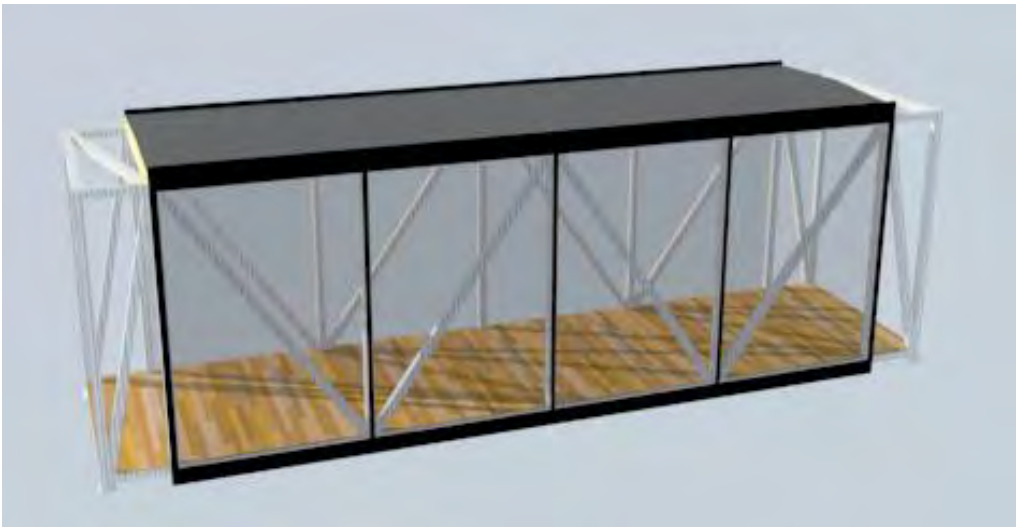


Figure 3-2: Design of skywalk 2

Figure 3-3 illustrates how the skywalk may look like inside. Floor and ceiling is not set and will depend on the two buildings which are connected by the skywalk.

Figure 3-3: Illustration of the inside of the skywalk

3.2 GEOMETRY AND PROPERTIES

3.2.1 Geometry

The skywalk spans between two buildings. The clearance between the two buildings is 7.25 metres. The length of the skywalk is 8.4 metres, the width is 2.0 metres and the height is 2.6 metres. See Figure 3-4.

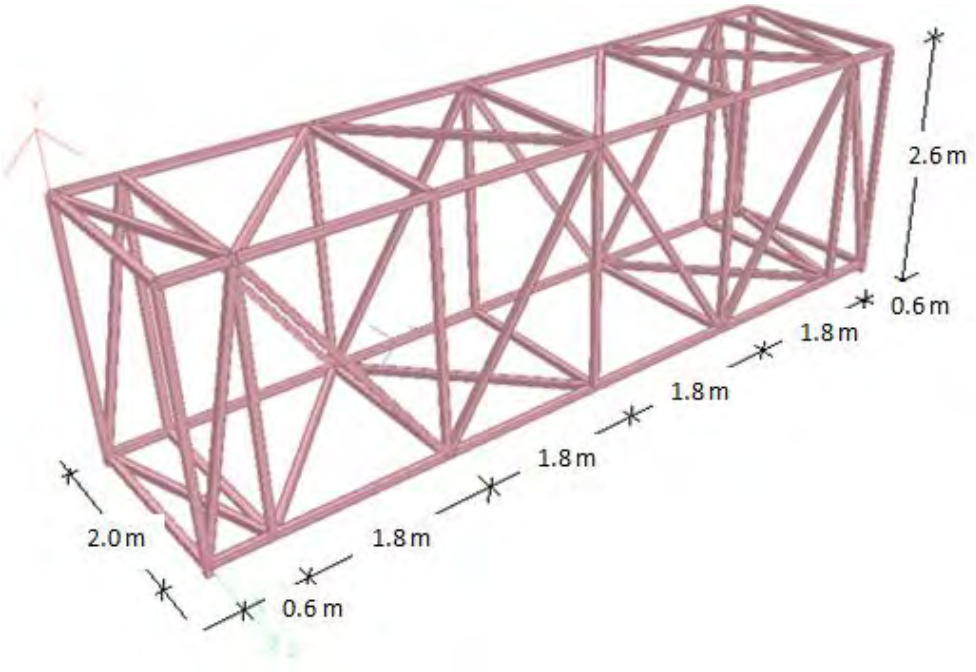


Figure 3-4: Model of bearing structure

3.3 SUPPORT POINTS

The structure will be landing on four support points, one in each corner. See Figure 3-5.

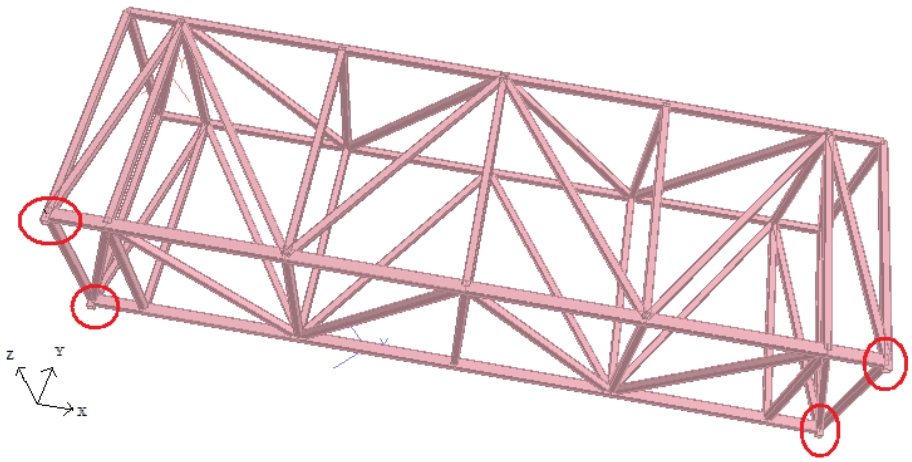


Figure 3-5: Support points

The support points needs to able to comprehend movements of the structure. The aluminium structure also needs to be isolated at the support points in order to prevent galvanic corrosion. The foot plate on the aluminium structure will be resting on an anchored steel plate, with a layer of neoprene between them. See Figure 3-6 for an illustration.

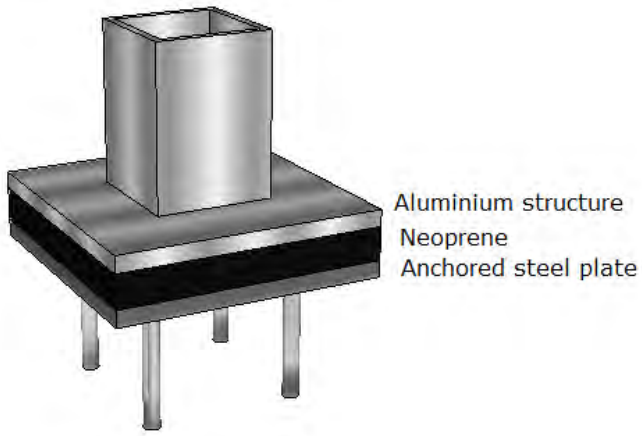


Figure 3-6: Illustration of Support point

The neoprene will isolate the aluminium from the steel, and it will allow the structure to move.

3.4 LOCAL JOINT DESIGN

3.4.1 General

The structure is to be bolted together in order to avoid weakening of the metal due to softening of the heat affected zone. Each joint consists of a hub made of cast aluminium. Wrought extruded aluminium tubes are threaded over and bolted together. See Figure 3-7 for an illustration of a typical joint. Appendix VII shows drawings of two typical joints.

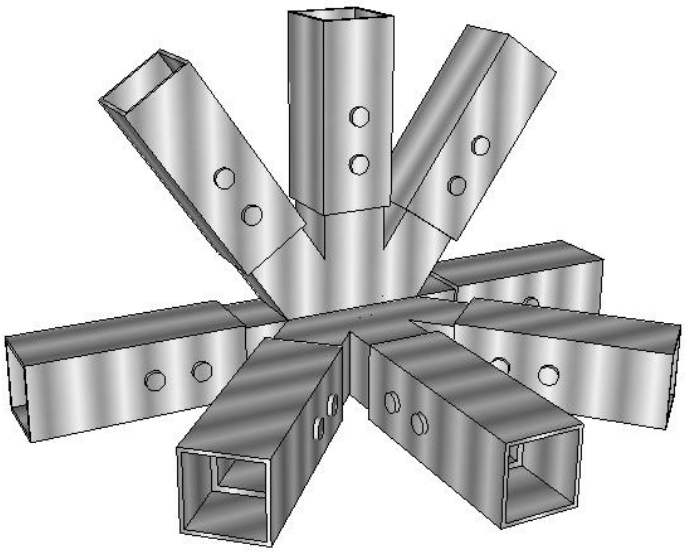


Figure 3-7: Illustration of a typical joint

3.5 LIFTING ARRANGEMENT

The aluminium structure will be lifted into place by a mobile or fixed crane. The aluminium structure has low self weight, about 600 kg (5.8 kN) (Appendix III or chapter 6), and can easily be lifted using straps.

3.6 FACADES

3.6.1 Glass facade

The glass facade system will be of type "Sapa Facade 4150 SSG Structural Glazing" from Sapa building system. See Figure 3-8.

Figure 3-8: Glass facade system (Sapa building system AB, 2012)

"The 4150 SSG Structural Glazing facade system consists of 50 mm wide insulated aluminium mullions and transoms. The system is based on double glazing units with a warm edge and a specially developed mounting profile for installation fittings. The glass panes are anchored in the mullions and transoms with the help of installation fittings. The weather seal between the glass panes is done with the use of an approved sealing compound, usually black. The design of the inside gasket and the insulating strip optimises the insulation of the profiles.
The mullions are designed so as to ensure stability under the dimensioning loads and are joined together with hidden joints.
Classified According to applicable EN standards"
(Sapa building system AB, 2012)

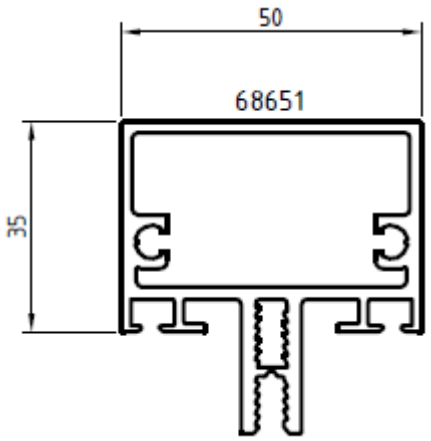


Figure 3-9: Vertical profiles (Sapa Building system AB, 2012)

3.6.2 Roof

The roof of the skywalk will be made of corrugated aluminium plates and approximately flat. It will be built up enough to let water drain.

3.6.3 Floor

The floor inside the skywalk has not yet been determined but the bottom of the skywalk will be covered with aluminium plates.

4. LOADS AND LOADING CONDITIONS

4.1 LOAD CASES

The skywalk is subjected to various permanent and variable loads. The characteristic values are defined in Table 4-1 below:

Table 4-1: Load cases

Load case	Type of load	Load
LC1	Self-weight aluminium	27.0 kN/m^3
LC2	Self-weight glass facade	0.4 kN/m^2
LC3	Self-weight roof	1.0 kN/m^2
LC4	Self-weight floor	1.0 kN/m^2
LC5	Live load C3	5.0 kN/m^2
LC6	Snow load	1.5 kN/m^2
LC7	Wind load	1.0 kN/m^2
LC8	2 falling persons	1.7 kN

LC1, self-weight of aluminium, and are calculated by STAAD Pro v8i in the analysis.

LC2, Self-weight glass facade, is defined through conversation with FasadeConsult Aluminium AS, see Appendix I. The load is distributed as two concentrated loads per window on the bottom gurts, see Figure 4-1.

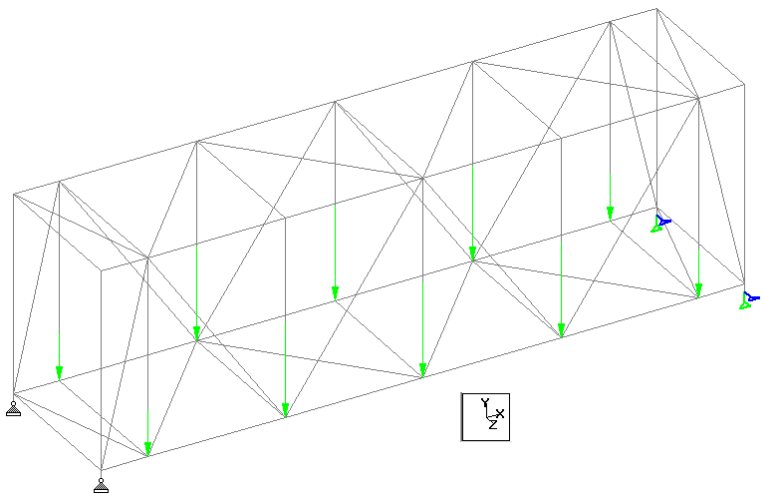


Figure 4-1: Load distribution of LC2

LC3, self-weight roof, and LC4, self-weight floor, are assumptions and shall be to the safe side, see Figure 4-2 for load distribution.

LC5, Live load C3, are defined by NS-EN 1991-1-1. See Figure 4-2 for load distribution.

LC6, Snow load, is defined by NS-EN 1991-1-3, see Appendix I for calculations. See Figure 4-2 for load distribution.

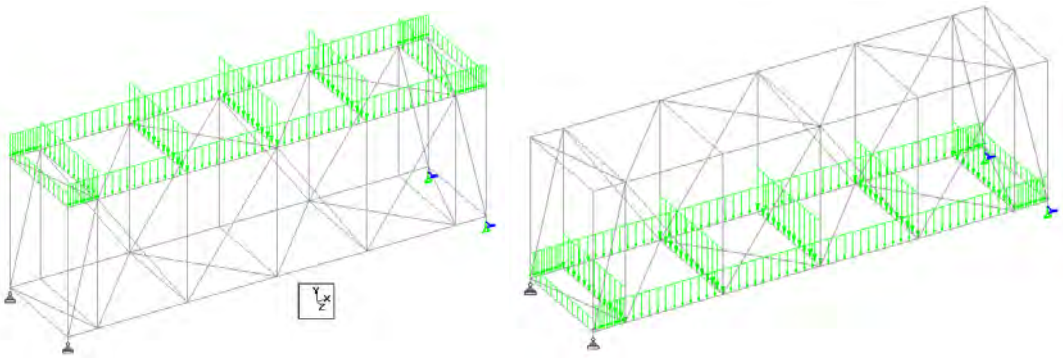


Figure 4-2: Load distribution of LC3-LC6

LC7, Wind load, is defined by NS-EN 1991-1-4 and calculated in Appendix I. Wind load is applied in both Z-direction and −Z-direction. Figure 4-3 shows the distribution of wind load in −Z-direction.

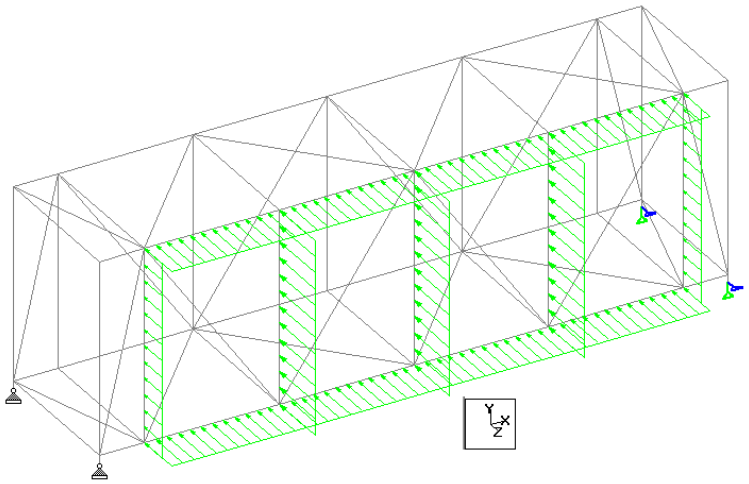


Figure 4-3: Load distribution of LC7

Due to the instability of aluminium an additional load representing 2 drunken persons (2x85 kg) falling into the wall of the skywalk has been included. This load is represented as a static horizontal concentrated load of 1.7 kN at the middle of the skywalk. See Figure 4-4 for load distribution.

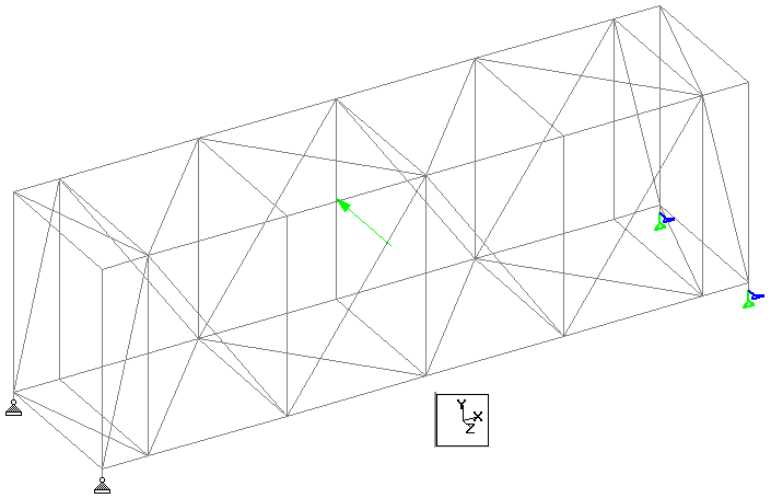


Figure 4-4: Load distribution LC8

4.2 LIMIT STATES

According to NS-EN 1990 the structure is analyzed for ultimate limit state and serviceability limit state. Table 4-2 shows the limit states used in this thesis.

Table 4-2: Limit states

	Permanent load	Dominant variable load	Non-dominant variable load
SLS	1.0	1.0	1.0
ULS-a	1.35	1.05	1.05
ULS-b	1.2	1.5	1.05

5. DESIGN INPUT FOR MODEL

5.1 GENERAL

The skywalk has been modelled as a space frame model and analyzed using STAAD Pro v8i. In addition to loads and limit states given in chapter 4 input for the STAAD Pro v8i analyze is given below.

5.2 UNITS

Following SI units are used as analysis database units:

- Length - metres (m)
- Force - kilo Newton (kN)

5.3 GLOBAL COORDINATE SYSTEM

Conventional Cartesian coordinate system: This coordinate system Figure 5-1 is a rectangular coordinate system (X, Y, Z) which follows the orthogonal right hand rule. This coordinate system may be used to define the joint locations and loading directions. The translational degrees of freedom are denoted by u1, u2, u3 and the rotational degrees of freedom are denoted by u_4, u_5 & u_6.

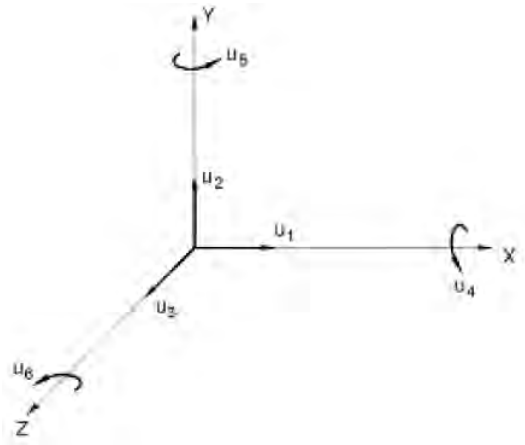


Figure 5-1: Cartesian (rectangular) coordinate system

5.4 LOCAL COORDINATE SYSTEM

A local coordinate system is associated with each member. Each axis of the local orthogonal coordinate system is also based on the right hand rule. Figure 5-2 shows a beam member with start joint 'i' and end joint 'j'. The positive direction of the local x-axis is determined by joining 'i' to 'j' and projecting it in the same direction. The right hand rule may be applied to obtain the positive directions of the local y and z axes. The local y and z-axes coincide with the axes of the two principal moments of inertia. Note that the local coordinate system is always rectangular.

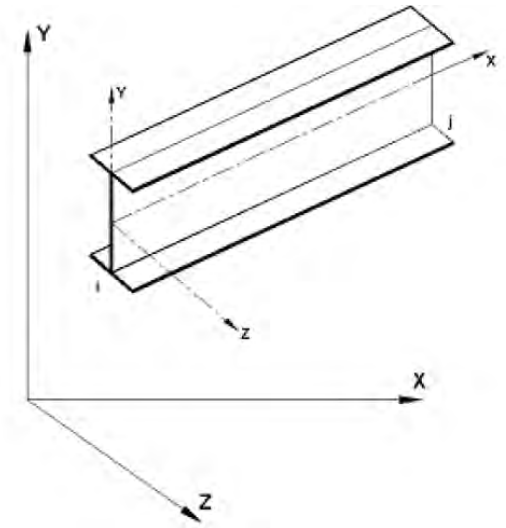


Figure 5-2: Local coordinate system

5.5 THE MODEL

The skywalk is modelled in STAAD Pro v8i as a three dimensional space structure as shown in Figure 5-3. The structure is assumed to have six degree of freedom at each joint.

The outer dimensions are (between nodes):

Length (x-axis): 8.4 metres

Width (z-axis) 2.0 metres

Height (y-axis) 2.6 metres

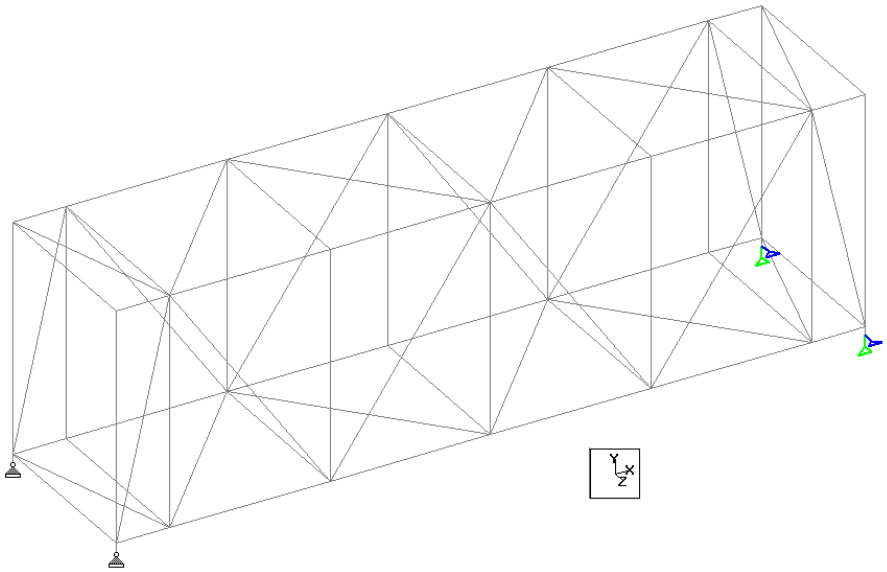


Figure 5-3: Analytical model of the skywalk

5.6 BOUNDARY CONDITIONS

The analytical boundary conditions are defined applied on the STAAD Pro v8i modelling. Figure 5-4 illustrates a 2-dimensional simply supported structure.

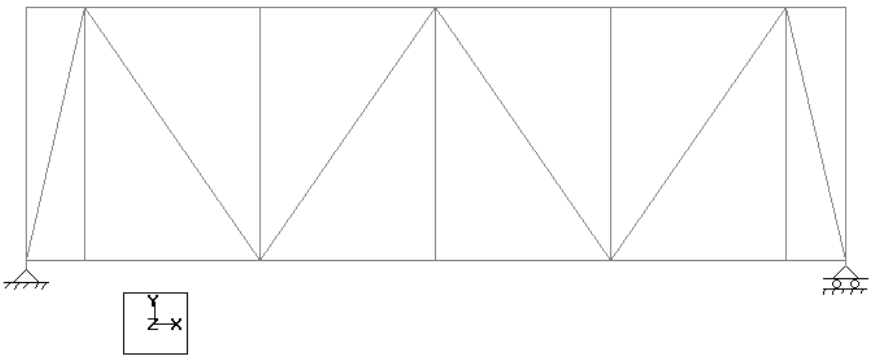


Figure 5-4: Geometry of boundary condition

Following boundary conditions are used:

- On the left-hand support the structure is pinned to its support and cannot experience any deflections
- On the right-hand support the structure is pinned, but free to move in x-direction.

5.7 CODE CHECK

The design philosophy and procedural logistics are based on the principles of elastic analysis and ultimate limit state design. Design parameters are defined according to Eurocodes/NS 3472 for structural steel design with aluminium check, and basis of code checking is listed below:

CY and CZ:	Buckling curve coefficient, α, is set to 0.159 for heat-treated alloys.
BY:	Buckling length coefficient, β, is equal to 1.0 for weak axis buckling (y-y).
BZ:	Buckling length coefficient, β, is equal to 1.0 for strong axis buckling (z-z)
FYLD:	0.2% proof strength of aluminium, f_o, has value of 250 N/mm^2 for EN-AW 6082 T6 (ET).
MF:	Material factor, $\gamma_{M1}=1.1$
SSY and SSZ:	Value of 0.0. No side sway, β, is calculated.
RATIO:	Value of 1.0. Permissible ratio of the actual to allowable stresses.

CMZ: Value of 0.21 α_{LT} for sections in connection with lateral buckling.

DMAX: 1.0 m, maximum allowable depth of section.

DMIN: 0.0 m, minimum allowable depth of section

5.8 MATERIAL

5.8.1 Material properties

The following material properties applied for the structure:

- Modulus of elasticity: $E=70\ 000\ N/mm^2$
- Shear modulus: $G=27\ 000\ N/mm^2$
- Poisson's ratio: $\nu=0.3$
- Coefficient of linear thermal expansion: $\alpha=23x10^{-6}$ per °C
- Unit mass: $\rho=2\ 700\ kg/m^3$

5.8.2 Profiles

The profiles used in this structure are extruded tubes of wrought aluminium alloy EN-AW 6082 T6. Table 5-1 shows the characteristic values for the profiles.

Table 5-1: Characteristic values for profiles

Profile	Alloy designation		Temper	f_o	f_u	A
	Numerical	Chemical		N/mm^2		%
TUB80804	EN-AW 6082	EN-AW AlSi1MgMn	T6	250	290	8

Where f_o is the 0.2% proof strength, f_u is the ultimate tensile strength and A is the min elongation.

5.8.3 Joints

The joints are chill cast aluminium hubs joining tubes of size 70x70x5 mm. NS-EN 1706:2010 specifies alloy EN-AC 42200-T6 and are only valid for separately cast test specimens. Table 5-2 shows the characteristic values for the cast joints.

Table 5-2: Characteristic values for joints

Profile	Alloy designation		Temper	f_o	f_u	A
	Numerical	Chemical		N/mm^2		%
TUB70705	EN-AC 42200	EN-AC AlSi7Mg0.6	T6	240	320	3

Where f_o is the 0.2% proof strength, f_u is the ultimate tensile strength and A is the min elongation.

5.8.4 Bolts

For the bolted connections aluminium bolts M16 shall be used. Table 5-3 shows the characteristic values for the aluminium bolts.

Table 5-3: Characteristic values for bolts

Bolt	Alloy designation		f_o	f_u
	Numerical	Chemical	N/mm^2	
M16	EN-AW 6082	EN-AW AlSi1MgMn	260	310

Where f_o is the 0.2% proof strength, f_u is the ultimate tensile strength.

5.8.5 Partial safety factors/material factors

According to NS-EN 1999-1-1 the partial safety factors to be used are set as follows:

$\gamma_{M1} = 1.10$

$\gamma_{M2} = 1.25$

5.9 CALCULATION OF FORCES AND BENDING MOMENTS

Elastic analysis method is used to obtain the forces and moments for design. Analysis is done for the primary loading conditions and combinations.

5.9.1 Member with only axial forces

For tension only members, axial tension capacity is checked for ultimate limit stress. For compression members, axial compression capacity is checked in addition to lateral buckling and ultimate limit stress. The coefficient α is specified in both directions through the parameters CY and CZ (see 5.9.4 Aluminium check)

5.9.2 Members with axial force and bending moment

For compression members with bending, interaction formulae of NS 3472 table 12.3.4.2 are used for checking member capacity.

The equivalent moment factor β is calculated using the procedure of NS 3472 table 12. Two different approaches are used depending upon whether the members can sway or not. Conditions for side sway and transverse loading are specified through the use of parameters SSY and SSZ. For member that cannot sway, without transverse loading, coefficients β should be calculated and proper dimensioning moments are used in the interaction formulae.

5.9.3 Von Mises yield criterion

Combined effect of axial, bending, horizontal/vertical shear and torsional shear stress is calculated at 13 sections on a member and up to 5 critical points at a section for tube profile, see Figure 5-5 and Table 5-4. The worst stress value is checked against yield stress divided by appropriate material factor.

The general von Mises stress calculates as:

$$\sigma_j = \sqrt{(\sigma_x \sigma_{by} \sigma_{bz})^2 + 3(\tau_x + \tau_y + \tau_z)^2} \leq \frac{f_y}{\gamma_m}$$

The design resistance are obtained by dividing the characteristic material strength by the material factor and the nominal stresses should satisfy

$$\sigma_j \leq \frac{f_y}{\gamma_m} = f_d$$

Note! For aluminium the 0.2% proof strength f_o is used instead of f_y.

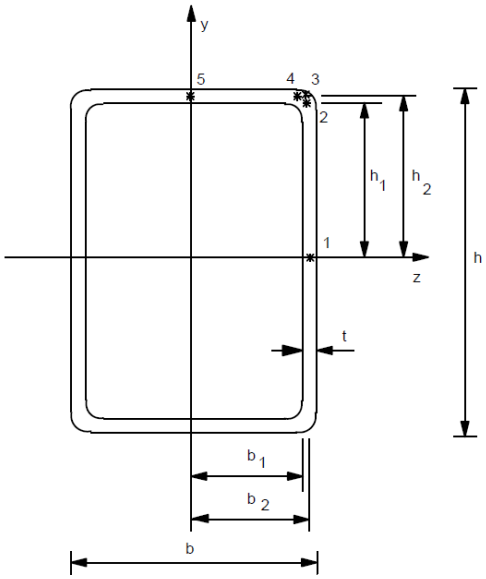


Figure 5-5: Geometry of tube section

A_x, I_x, I_y, I_z and $C_w = \frac{b^2h^2t}{24}\frac{(h-b)^2}{(h+b)}$ are taken from STAAD Pro v8i database.

$A_y = 2ht$ and $A_z = 2\frac{2}{3}bt$

Table 5-4: Stress calculation at selected points

Point no.	σ_x	σ_{by}	σ_{bz}	τ_x	τ_y	τ_z
1	$\frac{F_x}{A_x}$	$\frac{M_y}{I_y}b_2$	0	$\frac{M_x(h-t)(b-t)}{I_x(h+b-2t)}$	$\frac{F_y}{I_z}\frac{bth_2+th_1^2}{2t}$	0
2	$\frac{F_x}{A_x}$	$\frac{M_y}{I_y}b_2$	$\frac{M_z}{I_z}h_1$	$\frac{M_x(h-t)(b-t)}{I_x(h+b-2t)}$	$\frac{F_y}{I_z}\frac{bth_2}{2t}$	$\frac{F_z}{I_y}\frac{2h_1tb_2}{2t}$
3	$\frac{F_x}{A_x}$	$\frac{M_y}{I_y}b_2$	$\frac{M_z}{I_z}h_2$	$\frac{M_x(h-t)(b-t)}{I_x(h+b-2t)}$	$\frac{F_y}{I_z}\frac{2b_2th_2}{2t}$	$\frac{F_z}{I_y}\frac{2h_2tb_2}{2t}$
4	$\frac{F_x}{A_x}$	$\frac{M_y}{I_y}b_1$	$\frac{M_z}{I_z}h_2$	$\frac{M_x(h-t)(b-t)}{I_x(h+b-2t)}$	$\frac{F_y}{I_z}\frac{2b_1th_2}{2t}$	$\frac{F_z}{I_y}\frac{htb_2}{2t}$
5	$\frac{F_x}{A_x}$	0	$\frac{M_z}{I_z}h_2$	$\frac{M_x(h-t)(b-t)}{I_x(h+b-2t)}$	0	$\frac{F_z}{I_y}\frac{htb_2+tb_1^2}{2t}$

5.9.4 Aluminium check

STAAD Pro v8i performs stability check on aluminium alloys according to buckling curve in ECCS (European recommendation for aluminium alloy structures 1978). It is possible to select heat-treated or non heat treated alloy from the parameter list in the STAAD Pro v8i input file.

For heat-treated use CY=CZ=0.159, and for non heat-treated use CY=CZ=0.242.

Tracks 1.0 and 9.0 print buckling curve H for heat-treated, and buckling curve N for non heat-treated. The yield check is the same as for steel.

5.10 LOCAL JOINT CHECK

5.10.1 Cast joints

For the local check of the cast joints a similar model is analyzed in STAAD Pro v8i but with profiles TUB70705 which is the size and shape of the cast joints (Appendix IV). The 0.2% proof strength, f_o, is 240 N/mm^2 for the cast alloy EN-AC 42200 T6.

Three joints are checked, see Figure 5-6.

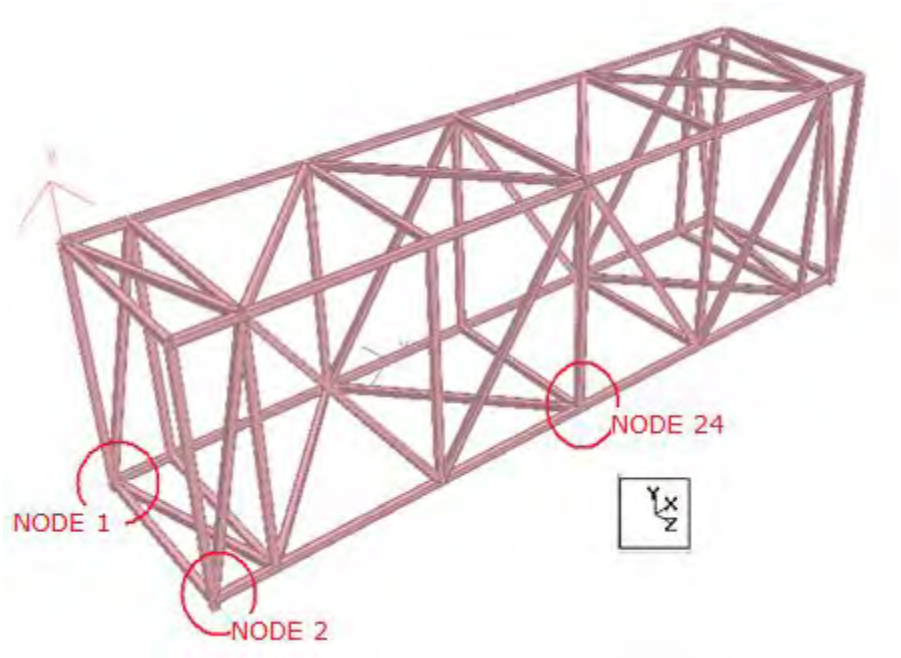


Figure 5-6: Joints to be checked

The general 3D Von Mises stress calculation formula as given below is used in order to find the equivalent stress:

$$\sigma_j = \sqrt{\frac{1}{2}[(\sigma_x - \sigma_y)^2 + (\sigma_y - \sigma_z)^2 + (\sigma_z - \sigma_x)^2] + 3{\tau_{xy}}^2 + 3{\tau_{yz}}^2 + 3{\tau_{xz}}^2}$$

For simplicity reason the indexing used for shear stresses deviates some from the normal definition, as e.g. τ_{xy} denotes shear stress acting in the xy-plane.

The screening discussed above, was done by picking the worst UF from transverse beams (z-direction), the longitudinal beams (x-direction incl. horizontal braces) and vertical beams (y-direction incl. vertical braces). Then it was assumed that each UF

represent the maximum normal stress from x-, y- and z-direction respectively ($\sigma_i = f_f \cdot UF_i$), i.e. not dimensioned by shear stress. Hence, the above formula can be written as follows:

$$f_d \cdot UF = \sqrt{\frac{1}{2}[(f_d \cdot UF_z - f_d \cdot UF_x)^2 + \left(f_d \cdot UF_x - f_d \cdot UF_y\right)^2 + \left(f_d \cdot UF_y - f_d \cdot UF_z\right)^2]}$$

Then, eliminating f_d, the expression is reduced to only include UF's. It is obvious the sign of stresses is significant in order to find the maximum possible combined UF. A study of this effect, resulted in a rewritten formula, where the utilisation in each direction is sorted such that $UF_{max} \geq UF_{med} \geq UF_{min}$. It was then found that worst situation is found if the maximum stress is of opposite sign than the two other components. Hence, the final formula for an equivalent maximum Von Mises utilisation in a node could then be written as follows:

$$UF_{screening} = \sqrt{\frac{1}{2}[(-UF_{max} - UF_{med})^2 + (UF_{med} - UF_{min})^2 + (UF_{min} - (-UF_{max}))^2]}$$

which leads to:

$$UF_{screening} = \sqrt{\frac{1}{2}[(UF_{max} + UF_{med})^2 + (UF_{med} - UF_{min})^2 + (UF_{min} + UF_{max})^2]}$$

For calculations, see Appendix V.

5.10.2 **Bolted connections**

The bolted connections are checked against the largest beam end force of the beams that are bolted. The forces are taken from the STAAD Pro v8i analysis (TUB80804). The connections are checked according to NS-EN 1999-1-1.

6. ANALYSIS RESULTS

6.1 BEAM CHECK

The skywalk has been modelled and analyzed using STAAD Pro v8i and the maximum utilization for the beam members are given in Table 6-1.

Table 6-1: Most utilized beams

Most utilized members (>0.5)				
Beam	**Section**	**Load case**	**UF**	**Limiting criteria**
3	TUB80804	16	0.702	STAB
5	TUB80804	13	0.707	STAB
7	TUB80804	13	0.693	STAB
13	TUB80804	16	0.683	STAB
45	TUB80804	16	0.505	STAB

6.2 LOCAL CHECK JOINTS

Three of the cast joints are checked for beam end stresses found in STAAD Pro v8i analysis (TUB70705). Table 6-2 shows the utilization of the $UF_{screening}$ performed on the three joints.

Table 6-2: Utilization of $UF_{creening}$ for checked joints

Utilization of $UF_{sreening}$ for checked joints		
Node	**Section**	**UF**
1	TUB70705	0.699
2	TUB70705	0.717
24	TUB70705	0.956

The bolted connections are checked against the largest beam end force of the beams that are bolted. The forces are taken from the STAAD Pro v8i analysis (TUB80804). The largest tension beam end force is found in beam 5 and is 53.517 kN. The largest compression beam end force is found in beam 31 and is 53.718 kN. A force of 54 kN is used for the calculations. Table 6-3 shows the utilization of the different checks for the bolted connections.

Table 6-3: Utilization for bolted joints

Utilization for bolted joints (max F = 54 kN)		
Criteria	**Section**	**UF**
Shear resistance	M16	0.578
Bearing resistance	TUB80804	0.624
Parent material	TUB80804	0.241
Block tearing resistance	TUB80804	0.300

6.3 DEFLECTION

Table 6-4 shows a summary of maximum node deflection in the two different serviceability limit states (SLS), one with horizontal loads in Z-direction and one with horizontal loads in −Z-direction.

Table 6-4: Summary node displacement (STAAD Pro v8i)

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	32	8:SLS1 (Z-DIR	**2.808**	0.000	0.000	2.808	0.004	0.001	0.003
Min X	36	9:SLS2 (-Z-DIF	**-0.043**	-0.063	-18.937	18.937	-0.003	0.000	0.002
Max Y	29	8:SLS1 (Z-DIR	0.000	**0.000**	0.000	0.000	0.006	-0.000	-0.003
Min Y	27	9:SLS2 (-Z-DIF	1.179	**-6.501**	-2.501	7.064	0.003	0.000	-0.000
Max Z	33	8:SLS1 (Z-DIR	2.220	-0.060	**20.320**	20.441	0.002	0.000	-0.002
Min Z	22	9:SLS2 (-Z-DIF	1.621	-3.972	**-19.974**	20.430	-0.003	-0.000	-0.001
Max rX	27	8:SLS1 (Z-DIR	1.148	-4.934	1.787	5.372	**0.013**	-0.000	0.000
Min rX	23	9:SLS2 (-Z-DIF	0.562	-3.869	-1.569	4.213	**-0.011**	0.000	-0.000
Max rY	4	8:SLS1 (Z-DIR	2.553	-0.056	0.456	2.594	0.004	**0.001**	0.003
Min rY	2	8:SLS1 (Z-DIR	0.076	-0.057	0.494	0.503	0.004	**-0.001**	-0.001
Max rZ	8	8:SLS1 (Z-DIR	2.484	-2.244	0.998	3.493	-0.002	0.001	**0.004**
Min rZ	6	8:SLS1 (Z-DIR	0.094	-2.185	1.006	2.408	-0.002	-0.001	**-0.004**
Max Rst	21	8:SLS1 (Z-DIR	1.259	-6.057	20.212	**21.138**	0.003	0.000	-0.000

Maximum deflections of the four middle nodes of the skywalk are listed in Table 6-5 below. Figure 6-1 shows the node number of the four middle nodes.

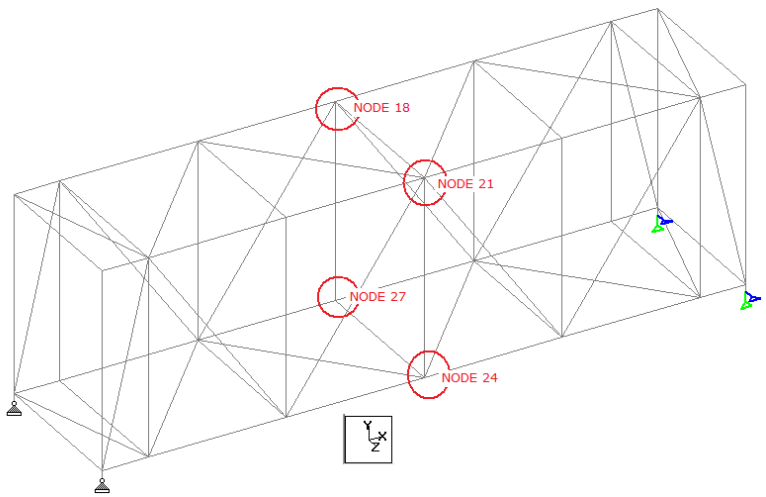


Figure 6-1: Four middle nodes

Table 6-5: Max. node displacement for selected nodes (SLS)

Node	LC	Displacement [mm]		
		X	Y	Z
18	8	1.138	-4.569	20.266
	9	1.189	-6.087	-19.337
21	8	1.259	-6.057	20.212
	9	1.066	-4.622	-19.354
24	8	1.222	-6.499	1.730
	9	1.103	-4.979	-2.465
27	8	1.148	-4.934	1.787
	9	1.179	-6.501	-2.501

6.4 SUPPORT REACTION

Figure 6-2 shows the number of the support nodes.

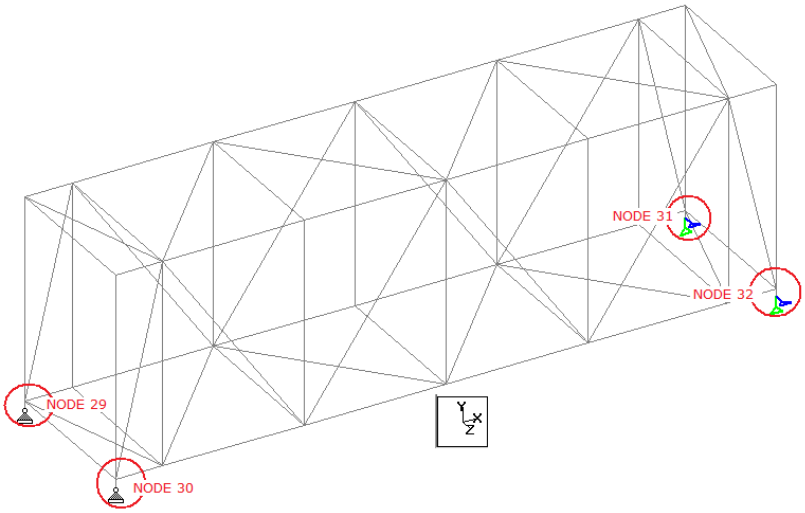


Figure 6-2: Support nodes

Table 6-6 gives a summary of reaction forces. Load case 1 (Self-weight of aluminium), the worst serviceability limit state and the worst ultimate limit state are included.

Table 6-6: Summary reaction forces

Summary reaction forces				
Node	**LC**	**FX [kN]**	**FY [kN]**	**FZ [kN]**
29	1 (Self-weight alu.)	-0.002	1.454	0.091
	9 (Max SLS)	7.103	47.228	14.134
	16 (Max ULS)	7.480	61.596	16.859
30	1 (Self-weight alu.)	0.002	1.454	0.091
	8 (Max SLS)	6.988	47.225	-8.250
	13 (Max ULS)	7.315	61.591	-10.676
31	1 (Self-weight alu.)	0.000	1.454	0.091
	9 (Max SLS)	0.000	46.796	11.832
	16 (Max ULS)	0.000	61.140	14.435
32	1 (Self-weight alu.)	0.000	1.454	-0.091
	8 (Max SLS)	0.000	46.799	-7.187
	13 (Max ULS)	0.000	61.145	-9.563

7. CONCLUSION

The main focus of this Master's thesis has been to model and analyze a skywalk in aluminium between two buildings at the new Aker Solutions office in Jåttåvågen, Stavanger.

A central part of the work has been to understand the positive and negative characteristics of aluminium as a structural material.

The STAAD Pro v8i analysis shows that the skywalk has sufficient capacity in the ultimate limit state, with a maximum utilization, UF, of 0.707 for the beams and 0.956 for the local joint check.

Aluminium has a low modulus of elasticity and it is often a problem that the structure feels instable. Neither the vertical displacement nor the horizontal displacement of the skywalk is enough to make it feel instable.
Both the floor plane and the roof plane are stiff frames.
However, the roof plane has a maximum horizontal displacement of 20.320 mm and that is also the largest displacement between the roof plane and the floor plane. Figure 7-1 illustrates a cross-section of the skywalk and the horizontal displacement (Z-direction). It is not a problem for the safety of the structure but may be problematic for the glass facades. The joints may be more moment stiff in reality than in the analysis and reduce the displacement, but this is subject for further calculations.

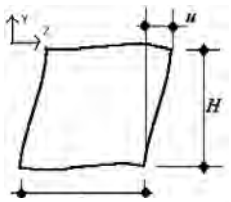


Figure 7-1: Deflection

Accidental limit states such as earthquake and fire are disregarded in this thesis. All though the likelihood of an earthquake in the Stavanger region is very small it should be included in the calculations. High temperature or fire is a severe problem for aluminium structures and the strength decreases rapidly when the temperature increases. Fire is disregarded in this thesis but may be a problem for the skywalk.

Fatigue is disregarded in this thesis. Factors such as the structure being bolted and most of the structure having a low utilization may contribute positive against fatigue. However aluminium is poorer in fatigue than steel and it should be considered.

In order to avoid reduced strength due to softening of the heat-affected zone no welds have been used and the structure is bolted. The joints are casted and all profiles have been set the same cross-section due to practical reasons. This leads to many of the profiles being oversized with a low utilization. The casted joints are an expensive solution.

It would have been nice to produce joints with a completely flat surface. The biggest obstacle is to immerse the bolt heads due to the thin wall thickness of the tubes. The main beam tubes have a wall thickness of 4 mm. In order to immerse the bolt heads the cross-section may be reinforced by a stronger material which does not create a galvanic cell. This is subject for future work.

The conclusion is that the skywalk, with limitations, has sufficient capacity. All though, there may be a problem with the deflection of the glass facades and stiffness of the joints should be further investigated.
This is no long skywalk and neither weight problems nor corrosion problems are an issue. Aluminium has a great future as a structural material but in this case a steel structure would be preferred and probably less expensive.

REFERENCES

Budd, G., 1999. *TALAT Lecture 1101: Resources and Production of Aluminium,* s.l.: European aluminium association.

Cobden, R., 1994. *TALAT Lecture 1501: Aluminium: Physical properties, characteristics and alloys,* s.l.: European aluminium assosiation.

Dwight, J., 1999. *Aluminium design and construction [E-book].* 2002 ed. London: Taylor & Francis e-Library.

European aluminium association, Matter, 2001-2010. *AluMATTER: Mechanical Fastening and Adhesive Bonding.* [Online]
Available at:
http://aluminium.matter.org.uk/content/html/eng/default.asp?catid=217&pageid=2144417137
[Accessed 10 4 2012].

European aluminium assosiation, Matter, 2001-2010. *AluMATTER: Aluminium v steel: Stress-strain behavior.* [Online]
Available at:
http://aluminium.matter.org.uk/content/html/eng/default.asp?catid=217&pageid=2144417131
[Accessed 2 6 2012].

European committee for standardization, 2002. *NS-EN 1990:2002+NA:2008 Eurocode 0: Basis of structural design.* Brusels: European committee of standardization.

European committee for standardization, 2002. *NS-EN 1991-1-1:2002+NA:2008 Eurocode 1: Actions on structures, Part 1-1: General actions: Densities, self-weight, imposed loads for buildings.* Brussels: European committee for standardization.

European committee for standardization, 2003. *NS-EN 1991-1-3:2003+NA:2008 Eurocode 1: Actions on structures, Part 1-3: General actions: Snow loads.* Brussels: European committee for standardization.

European committee for standardization, 2005. *NS-EN 1991-1-4:2005+NA:2009 Eurocode 1: Actions on structures, Part 1-4: General actions: Wind actions.* Brussels: European committee for standardization.

European committee for standardization, 2009. *NS-EN 1999-1-1:2007+A1:2009+NA:2009 Eurocode 9: Design of aluminium structures, Part 1-1: General structural rules,* Brussels: European committee for standardization.

European committee for standardization, 2010. *NS-EN 1706:2010 Aluminium and aluminium alloys, castings, chemical composition and machanical properties.* Brussels: European committee for standardization.

Jakobsen, R. A., n.d. *Offshore projecting, Aluminium after input from "Norsk Hydro",* Stavanger: Universirty of Stavanger.

Kissell, J. R. & Ferry, R. L., 2002. *Aluminium structures: a guide to their specifications and design.* 2nd red. New York: John Wiley & sons, inc..

Müller, U., 2011. *Introduction to structural aluminium design.* s.l.:Whittles Publishing.

Sapa building system AB, 2012. [Online]
Available at: http://www.sapagroup.com/en/company-sites/sapa-building-system-ab/sapa_building_system_ab_gb/products/facades/sapa-4150-ssg-facade-structural-glazing/
[Accessed 5 May 2012].

Sapa building system AB, 2012. [Online]
Available at: http://www.sapagroup.com/Buildingsystem_import/Dimensions/A4150-4008_en.pdf
[Accessed 5 May 2012].

Sapa building system AB, 2012. [Online]
Available at: http://www.sapagroup.com/Buildingsystem_import/DescriptionTexts/A4150-4002_en.pdf
[Accessed 5 May 2012].

Sapa Building system AB, 2012. [Online]
Available at: http://www.sapagroup.com/Buildingsystem_import/DescriptionTexts/A4150-3007_.pdf
[Accessed 5 May 2012].

APPENDIX I – LOADS

(6 Pages to follow)

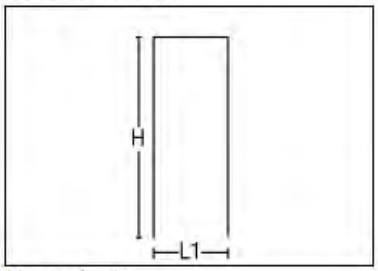
WIND LOAD

Note! The output files from the program used to calculate the windloads are only available in norwegian, so the wind loads in this appendix are therefore presented in norwegian. The main results which are used in the report are marked with a red circle.

Tittel: Skywalk			Side: 0
Prosjekt	Ordre	Sign: AA	Dato: 21-04-2012

Dataprogram: LastBeregning versjon 6.1.6 Laget av sivilingeniør Ove Sletten
Standard NS-EN 1991-1-4: Vindlaster
Data er lagret på fil:

1. Geometri



Vertikalsnitt

H	3000	mm
L1	2200	mm

Byggets lengde, L2: 7500 mm
Takvinkel : 0,00 (grader)

2. Vindhastighet

Fylke: Rogaland Kommune: Stavanger Referansevindhastighet: 26 m/s
Byggested, høyde over havet (m): 20 Calt: 1
Returperiode (år):50 Cprob: 1
Årstidsfaktoren, Cseason: 1 hele året
Vindretning (region):Bruker retningsfaktoren C-ret: 1
Basisvindhastighet: 26 m/s
Høyde Z over grunnivået: 10 m

BYGGESTEDETS TERRENGDATA
Terrengruhetskategori III: Sammenhengende småhusbebyggelse industriområder eller skogsområder.
Terrengruhetsfaktoren Kt: 0,22 Ruhetslengden Zo (m): 0,3 Zmin (m): 8 Vm (m/s): 20,06 Cr: 0,77

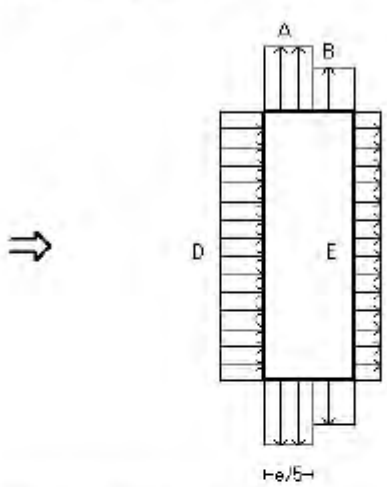
TOPOGRAFI: Ingen topografisk påvirkning.
Terrengformfaktor Co(z): 1 Turbulensfaktor Ki: 1

Vkast: 34,72 m/s
Qkast: 0,753 kN/m2

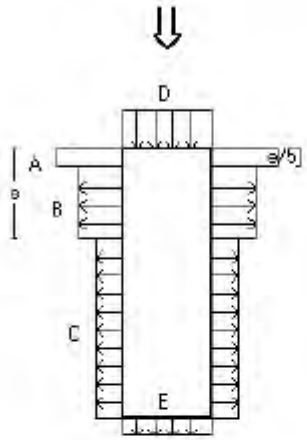
Tittel: Skywalk			Side: 1
Prosjekt:	Ordre:	Sign: AA	Dato: 21-04-2012

3. Yttervegger

3.1 Utvendig vindlast



Vindretning 0 grader. e=6000 mm



Vindretning 90 grader. e=2200 mm

Vindinnfallsretning på 0 grader.

	A	B	C	D	E
Formfaktor Cpe,10	-1,20	-0,80		0,80	-0,52
Utvendig last (kN/m2)	-0,90	-0,60		0,60	-0,39
Formfaktor Cpe,1	-1,40	-1,10		1,00	-0,52
Utvendig last (kN/m2)	-1,05	-0,83		0,75	-0,39
Utstrekning (mm)	1200	1000		7500	7500

Vindinnfallsretning på 90 grader.

	A	B	C	D	E
Formfaktor Cpe,10	-1,20	-0,80	-0,50	0,72	-0,34
Utvendig last (kN/m2)	-0,90	-0,60	-0,38	0,54	-0,26
Formfaktor Cpe,1	-1,40	-1,10	-0,50	1,00	-0,34
Utvendig last (kN/m2)	-1,05	-0,83	-0,38	0,75	-0,26
Utstrekning (mm)	440	1760	5300	2200	2200

Positiv verdi for last gir trykk. Negativ verdi hvis last er sug.

3.2 Innvendig vindlast

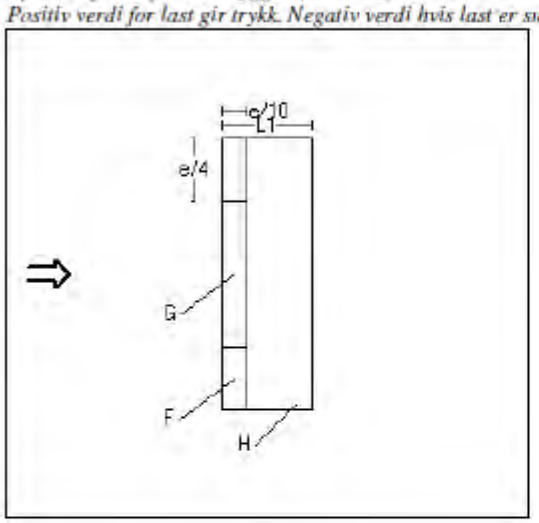
Bygning uten dominerende vindfasade
Beregn innvendig vindlast for u=0.2 overtrykk og u=-0.3 (undertrykk)

	Undertrykk	Overtrykk
Formfaktor	-0,30	0,20
Innvendig last (kN/m2)	-0,23	0,15

Tittel: Skywalk			Side: 2
Prosjekt:	Ordre:	Sign: AA	Dato: 21-04-2012

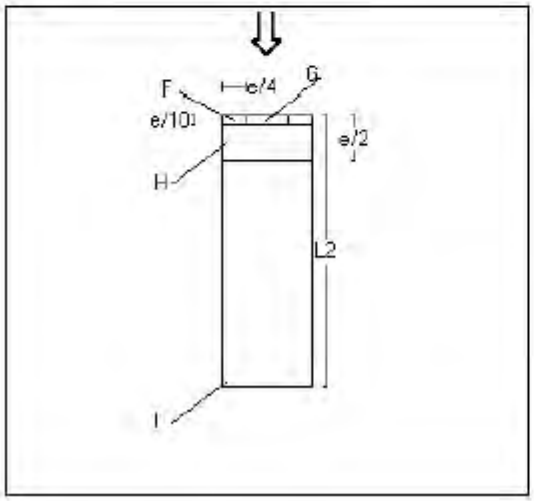
4 Overside av tak

Taktype: Flatt tak
L1=2200 mm L2=7500 mm
Cpe,10 Gjelder for hele bygget, (>=10m2)
Positiv verdi for last gir trykk. Negativ verdi hvis last er sug.



Utstrekning (mm)
e=6000
e/4=1500
e/10=600

	Cpe,10	Last (kN/m2)	Hor.projeksjon (mm)
F	-1,80	-1,36	1500x600
G	-1,20	-0,90	4500x600
H	-0,70	-0,53	7500x1600

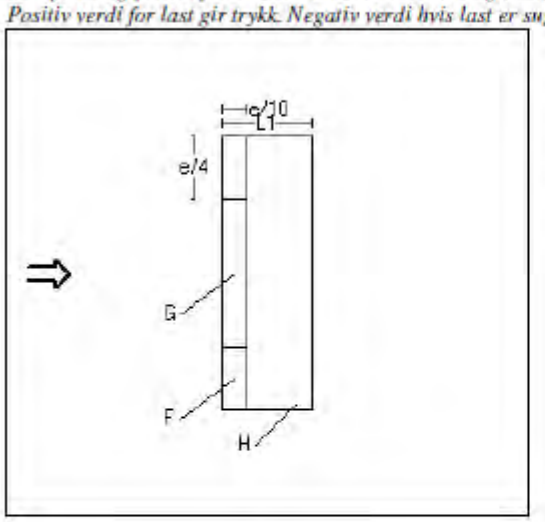


Utstrekning (mm)
e=2200
e/4=550
e/10=220

	Cpe,10	Last (kN/m2)	Hor.projeksjon (mm)
F	-1,80	-1,36	550x220
G	-1,20	-0,90	1100x220
H	-0,70	-0,53	2200x880
I	+/-0,20	+/-0,15	2200x6400

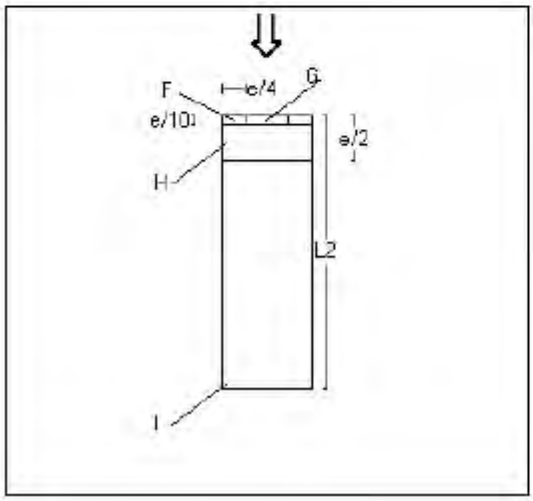
Titel Skywalk			Side 3
Projekt	Ordre	Sign AA	Dato 21-04-2012

Taktype: Flatt tak
L1=2200 mm L2=7500 mm
Cpe,1 Gjelder for en lokal flate på 1m2. Benyttes ved dimensjonering av limfuger, spikring, båndstål o.l.
*Interpoleringsformel for belastet areal A mellom 1 og 10 m2 : Cpe = Cpe,1 + (Cpe,10 - Cpe,1) * $\log_{10}$A*
Positiv verdi for last gir trykk. Negativ verdi hvis last er sug.



Utstrekning (mm)
e=6000
e/4=1500
e/10=600

	Cpe,1	Last (kN/m2)	Hor.projeksjon(mm)
F	-2,50	-1,88	1500x600
G	-2,00	-1,51	4500x600
H	-1,20	-0,90	7500x1600



Utstrekning (mm)
e=2200
e/4=550
e/10=220

	Cpe,1	Last (kN/m2)	Hor.projeksjon(mm)
F	-2,50	-1,88	550x220
G	-2,00	-1,51	1100x220
H	-1,20	-0,90	2200x880
I	+/-0,20	+/-0,15	2200x6400

SNOW LOAD

Place: Stavanger, Rogaland, Norway

Characteristic snow load on ground:

$s_{k,0} = 1.5\ kN/m^2$

Disign value snow load:

$s = \mu_i \cdot C_e \cdot C_t \cdot s_k$

$\mu_1 = 0.8$

$C_e = 0.8$

$C_t = 1.0$

$S_k = 1.5\ kN/m^2$

$s = 0.8 \cdot 0.8 \cdot 1.0 \cdot 1.5\ kN/m^2$

$\underline{s = 0.96\ kN/m^2 \approx 1.0\ kN/m^2}$

GLASS FACADE

The dead load of the glass facade is set to 0.4 kN/m^2 after conversation with fasadeconsult. Below is an extract from the conversation shown for documentation. Its in norwegian but the value used is marked with a red circle.

Subject: SV: Vekt på fasade/takløsning
Date: Tue, 21 Feb 2012 14:52:52 +0100
From: jardar.nordeng@sapagroup.com
To: Thomas.Akselvoll@fasadeconsult.no; a_aasgaard@hotmail.com

Hei Atle!

Det er veldig avhengig av glasstykkelser som du skal ha i taket eller fasaden.

Tidligere med to-lags isolerglass regnet vi med at egenlasten til en fasade eller tak kunne være 350 – 400N /m2

Nå blir det mer og mer vanlig med tre-lags isolerglass og dette øker også egenvekten slik at nå regner man oftere og oftere med ca 0,5kN/m2 i egenvekt.

Glass har en egenvekt på 2,5kg/mm tykkelse x m2.

MVH

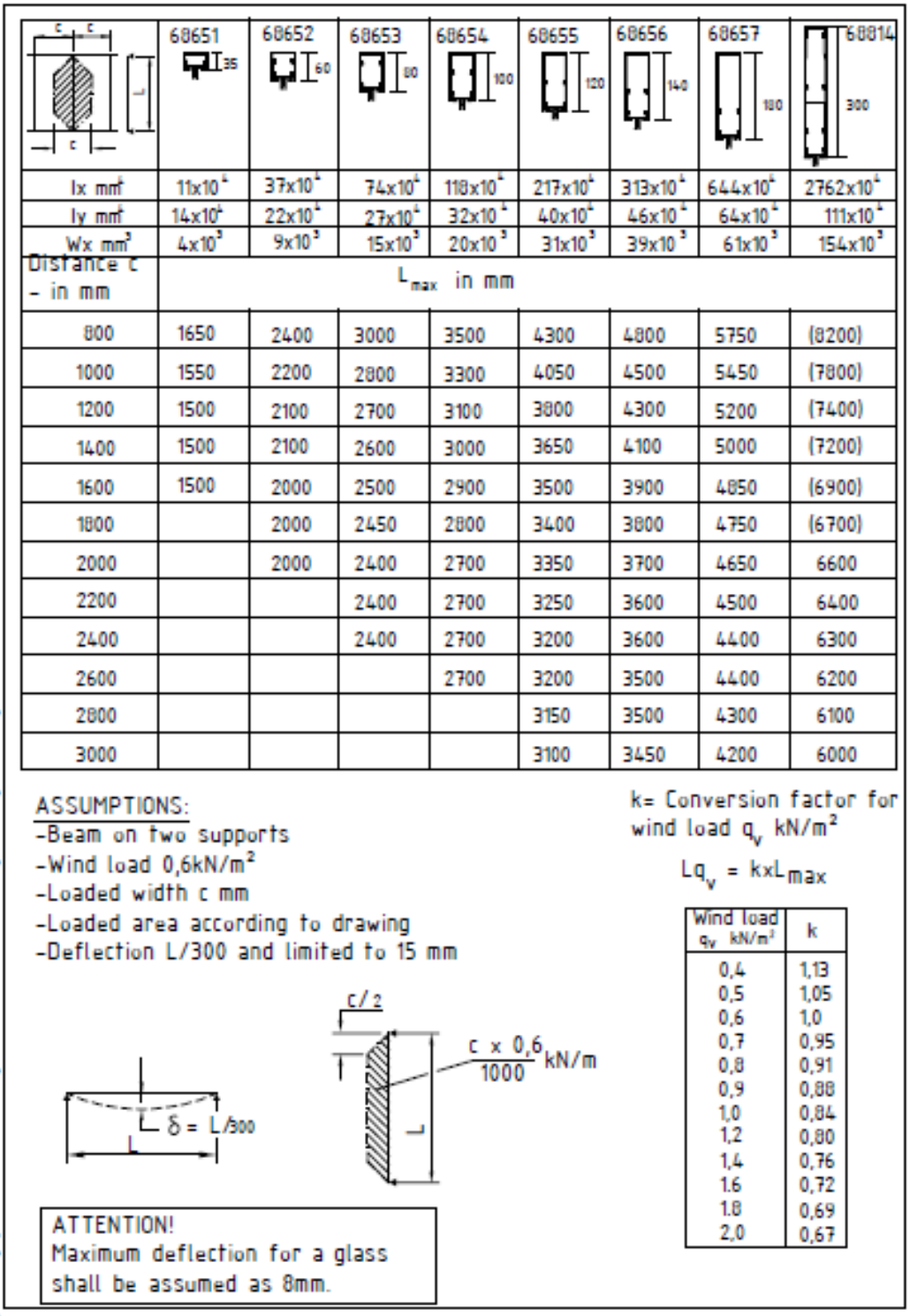
Jardar Kilsti Nordeng

APPENDIX II – GLASS FACADE

(1 Page to follow)

Title	Pages
Glass facade dimensioning	1

GLASS FACADE DIMENSIONING



	68651	68652	68653	68654	68655	68656	68657	68814
Ix mm⁴	11x10⁴	37x10⁴	74x10⁴	118x10⁴	217x10⁴	313x10⁴	644x10⁴	2762x10⁴
Iy mm⁴	14x10⁴	22x10⁴	27x10⁴	32x10⁴	40x10⁴	46x10⁴	64x10⁴	111x10⁴
Wx mm³	4x10³	9x10³	15x10³	20x10³	31x10³	39x10³	61x10³	154x10³
Distance c - in mm	L_{max} in mm							
800	1650	2400	3000	3500	4300	4800	5750	(8200)
1000	1550	2200	2800	3300	4050	4500	5450	(7800)
1200	1500	2100	2700	3100	3800	4300	5200	(7400)
1400	1500	2100	2600	3000	3650	4100	5000	(7200)
1600	1500	2000	2500	2900	3500	3900	4850	(6900)
1800		2000	2450	2800	3400	3800	4750	(6700)
2000		2000	2400	2700	3350	3700	4650	6600
2200			2400	2700	3250	3600	4500	6400
2400			2400	2700	3200	3600	4400	6300
2600				2700	3200	3500	4400	6200
2800					3150	3500	4300	6100
3000					3100	3450	4200	6000

ASSUMPTIONS:
-Beam on two supports
-Wind load 0,6kN/m²
-Loaded width c mm
-Loaded area according to drawing
-Deflection L/300 and limited to 15 mm

k= Conversion factor for wind load q_v kN/m²

$Lq_v = kxL_{max}$

Wind load q_v kN/m²	k
0,4	1,13
0,5	1,05
0,6	1,0
0,7	0,95
0,8	0,91
0,9	0,88
1,0	0,84
1,2	0,80
1,4	0,76
1.6	0,72
1.8	0,69
2,0	0,67

ATTENTION!
Maximum deflection for a glass shall be assumed as 8mm.

sapa: buildingsystem	Data for estimated calculations of facade sections on two supports	FACADE 4150		
		–	09-03	P4150-401

APPENDIX III – STAAD PRO V8I ANALYSIS BEAMS

(42 Pages to follow)

Title	Pages
STAAD pro v8i analysis TUB80804	42

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	Part		
Job Title Skywalk TUB80804	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Job Information

	Engineer	Checked	Approved
Name:	a.aasgaard		
Date:	03-May-12		

Structure Type	SPACE FRAME

Number of Nodes	32	Highest Node	36
Number of Elements	80	Highest Beam	81

Number of Basic Load Cases	10
Number of Combination Load Cases	8

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SELFWEIGHT ALUMINIUM
Primary	2	SELFWEIGHT GLASS FACADE
Primary	3	SELFWEIGHT ROOF
Primary	4	SELFWEIGHT FLOOR
Primary	5	LIVE LOAD C3
Primary	6	WIND (Z-DIRECTION)
Primary	7	SNOW
Primary	11	2 DRUNKEN PERSONS (Z-DIRECTION)
Primary	14	WIND (-Z-DIRECTION)
Primary	15	2 DRUNKEN PERSONS (-Z-DIRECTION)
Combination	8	SLS1 (Z-DIRECTION)
Combination	9	SLS2 (-Z-DIRECTION)
Combination	10	ULS-A1 (Z-DIRECTION)
Combination	12	ULS-A2 (-Z-DIRECTION)
Combination	13	ULS-B1 (Z-DIRECTION)
Combination	16	ULS-B2 (-Z-DIRECTION)
Combination	17	ULS-B3 (Z-DIRECTION)
Combination	18	ULS-B4 (-Z-DIRECTION)

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Nodes

Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000
2	0.000	0.000	2.000
3	8.400	0.000	0.000
4	8.400	0.000	2.000
5	0.600	0.000	0.000
6	0.600	0.000	2.000
7	7.800	0.000	0.000
8	7.800	0.000	2.000
12	0.600	2.600	0.000
13	0.600	2.600	2.000
14	7.800	2.600	0.000
16	7.800	2.600	2.000
17	2.400	2.600	0.000
18	4.200	2.600	0.000
19	6.000	2.600	0.000
20	6.000	2.600	2.000
21	4.200	2.600	2.000
22	2.400	2.600	2.000
23	2.400	0.000	2.000
24	4.200	0.000	2.000
25	6.000	0.000	2.000
26	2.400	0.000	0.000
27	4.200	0.000	0.000
28	6.000	0.000	0.000
29	0.000	-0.100	0.000
30	0.000	-0.100	2.000
31	8.400	-0.100	0.000
32	8.400	-0.100	2.000
33	0.000	2.600	0.000
34	0.000	2.600	2.000
35	8.400	2.600	0.000
36	8.400	2.600	2.000

Beams

Beam	Node A	Node B	Length (m)	Property	β (degrees)
2	12	17	1.800	1	0
3	14	3	2.668	1	0
4	3	4	2.000	1	0
5	4	16	2.668	1	0
6	16	20	1.800	1	0
7	13	2	2.668	1	0
8	2	6	0.600	1	0
9	6	13	2.600	1	0
10	6	23	1.800	1	0
11	8	4	0.600	1	0
12	14	16	2.000	1	0
13	12	1	2.668	1	0
14	1	2	2.000	1	0

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Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
15	1	5	0.600	1	0
16	5	12	2.600	1	0
17	12	13	2.000	1	0
18	5	6	2.000	1	0
19	5	26	1.800	1	0
20	7	14	2.600	1	0
21	7	3	0.600	1	0
22	7	8	2.000	1	0
23	8	16	2.600	1	0
24	17	18	1.800	1	0
25	18	19	1.800	1	0
26	19	14	1.800	1	0
27	20	21	1.800	1	0
28	21	22	1.800	1	0
29	22	13	1.800	1	0
30	23	24	1.800	1	0
31	24	25	1.800	1	0
32	25	8	1.800	1	0
33	26	27	1.800	1	0
34	27	28	1.800	1	0
35	28	7	1.800	1	0
36	26	17	2.600	1	0
37	23	22	2.600	1	0
38	27	18	2.600	1	0
39	28	19	2.600	1	0
40	24	21	2.600	1	0
41	25	20	2.600	1	0
42	19	20	2.000	1	0
43	18	21	2.000	1	0
44	17	22	2.000	1	0
45	26	23	2.000	1	0
46	27	24	2.000	1	0
47	28	25	2.000	1	0
48	6	26	2.691	1	0
49	26	24	2.691	1	0
50	24	28	2.691	1	0
51	28	8	2.691	1	0
52	19	16	2.691	1	0
53	19	21	2.691	1	0
54	21	17	2.691	1	0
55	17	13	2.691	1	0
56	1	6	2.088	1	0
57	8	3	2.088	1	0
58	12	26	3.162	1	0
59	26	18	3.162	1	0
60	18	28	3.162	1	0
61	28	14	3.162	1	0
62	16	25	3.162	1	0
63	25	21	3.162	1	0
64	21	23	3.162	1	0

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Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
65	23	13	3.162	1	0
66	1	29	0.100	1	0
67	2	30	0.100	1	0
68	4	32	0.100	1	0
69	31	3	0.100	1	0
70	1	33	2.600	1	0
71	33	12	0.600	1	0
72	33	34	2.000	1	0
73	34	13	0.600	1	0
74	34	2	2.600	1	0
75	3	35	2.600	1	0
76	14	35	0.600	1	0
77	35	36	2.000	1	0
78	36	4	2.600	1	0
79	36	16	0.600	1	0
80	35	16	2.088	1	0
81	13	33	2.088	1	0

Section Properties

Prop	Section	Area (cm^2)	I_{yy} (cm^4)	I_{zz} (cm^4)	J (cm^4)	Material
1	TUB80804	12.100	116.000	116.000	175.590	ALUMINUM

Materials

Mat	Name	E (kN/mm^2)	ν	Density (kg/m^3)	α (1/°K)
1	STEEL	205.000	0.300	7.83E+3	12E -6
2	STAINLESSSTEEL	197.930	0.300	7.83E+3	18E -6
3	ALUMINUM	68.948	0.330	2.71E+3	23E -6
4	CONCRETE	21.718	0.170	2.4E+3	10E -6

Supports

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN-m/deg)	rY (kN-m/deg)	rZ (kN-m/deg)
29	Fixed	Fixed	Fixed	-	-	-
30	Fixed	Fixed	Fixed	-	-	-
31	-	Fixed	Fixed	-	-	-
32	-	Fixed	Fixed	-	-	-

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Basic Load Cases

Number	Name
1	SELFWEIGHT ALUMINIUM
2	SELFWEIGHT GLASS FACADE
3	SELFWEIGHT ROOF
4	SELFWEIGHT FLOOR
5	LIVE LOAD C3
6	WIND (Z-DIRECTION)
7	SNOW
11	2 DRUNKEN PERSONS (Z-DIRECTION)
14	WIND (-Z-DIRECTION)
15	2 DRUNKEN PERSONS (-Z-DIRECTION)

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
8	SLS1 (Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.00
		2	SELFWEIGHT GLASS FACADE	1.00
		3	SELFWEIGHT ROOF	1.00
		4	SELFWEIGHT FLOOR	1.00
		5	LIVE LOAD C3	1.00
		6	WIND (Z-DIRECTION)	1.00
		7	SNOW	1.00
		11	2 DRUNKEN PERSONS (Z-DIRECTION)	1.00
9	SLS2 (-Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.00
		2	SELFWEIGHT GLASS FACADE	1.00
		3	SELFWEIGHT ROOF	1.00
		4	SELFWEIGHT FLOOR	1.00
		5	LIVE LOAD C3	1.00
		7	SNOW	1.00
		14	WIND (-Z-DIRECTION)	1.00
		15	2 DRUNKEN PERSONS (-Z-DIRECTION)	1.00
10	ULS-A1 (Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.35
		2	SELFWEIGHT GLASS FACADE	1.35
		3	SELFWEIGHT ROOF	1.35
		4	SELFWEIGHT FLOOR	1.35
		5	LIVE LOAD C3	1.05
		6	WIND (Z-DIRECTION)	1.05
		7	SNOW	1.05
		11	2 DRUNKEN PERSONS (Z-DIRECTION)	1.05
12	ULS-A2 (-Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.35
		2	SELFWEIGHT GLASS FACADE	1.35
		3	SELFWEIGHT ROOF	1.35
		4	SELFWEIGHT FLOOR	1.35
		5	LIVE LOAD C3	1.05
		7	SNOW	1.05
		14	WIND (-Z-DIRECTION)	1.05
		15	2 DRUNKEN PERSONS (-Z-DIRECTION)	1.05
13	ULS-B1 (Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.20
		2	SELFWEIGHT GLASS FACADE	1.20
		3	SELFWEIGHT ROOF	1.20

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Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		4	SELFWEIGHT FLOOR	1.20
		5	LIVE LOAD C3	1.50
		6	WIND (Z-DIRECTION)	1.05
		7	SNOW	1.05
		11	2 DRUNKEN PERSONS (Z-DIRECTION)	1.05
16	ULS-B2 (-Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.20
		2	SELFWEIGHT GLASS FACADE	1.20
		3	SELFWEIGHT ROOF	1.20
		4	SELFWEIGHT FLOOR	1.20
		5	LIVE LOAD C3	1.50
		7	SNOW	1.05
		14	WIND (-Z-DIRECTION)	1.05
		15	2 DRUNKEN PERSONS (-Z-DIRECTION)	1.05
17	ULS-B3 (Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.20
		2	SELFWEIGHT GLASS FACADE	1.20
		3	SELFWEIGHT ROOF	1.20
		4	SELFWEIGHT FLOOR	1.20
		5	LIVE LOAD C3	1.05
		7	SNOW	1.05
		11	2 DRUNKEN PERSONS (Z-DIRECTION)	1.05
		6	WIND (Z-DIRECTION)	1.50
18	ULS-B4 (-Z-DIRECTION)	1	SELFWEIGHT ALUMINIUM	1.20
		2	SELFWEIGHT GLASS FACADE	1.20
		3	SELFWEIGHT ROOF	1.20
		4	SELFWEIGHT FLOOR	1.20
		5	LIVE LOAD C3	1.05
		7	SNOW	1.05
		15	2 DRUNKEN PERSONS (-Z-DIRECTION)	1.05
		14	WIND (-Z-DIRECTION)	1.50

Node Displacement Summary

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	32	13:ULS-B1 (Z-I	**3.640**	0.000	0.000	3.640	0.004	0.001	0.003
Min X	32	14:WIND (-Z-D	**-0.443**	0.000	0.000	0.443	-0.004	-0.001	-0.000
Max Y	27	6:WIND (Z-DIF	-0.012	**0.710**	1.959	2.084	0.005	-0.000	0.000
Min Y	24	13:ULS-B1 (Z-I	1.630	**-8.545**	1.716	8.867	-0.005	0.000	-0.000
Max Z	33	17:ULS-B3 (Z-I	2.420	-0.053	**29.596**	29.695	0.003	0.000	-0.002
Min Z	22	18:ULS-B4 (-Z-	1.749	-4.196	**-29.232**	29.584	-0.003	-0.000	-0.001
Max rX	27	13:ULS-B1 (Z-I	1.552	-6.896	1.773	7.287	**0.017**	-0.000	0.000
Min rX	23	18:ULS-B4 (-Z-	0.652	-4.083	-2.385	4.773	**-0.014**	0.000	-0.001
Max rY	4	17:ULS-B3 (Z-I	2.978	-0.065	0.679	3.055	0.006	**0.001**	0.003
Min rY	2	17:ULS-B3 (Z-I	0.032	-0.066	0.734	0.738	0.006	**-0.001**	-0.001
Max rZ	8	13:ULS-B1 (Z-I	3.215	-2.957	1.076	4.499	-0.003	0.001	**0.005**
Min rZ	6	13:ULS-B1 (Z-I	0.184	-2.896	1.084	3.098	-0.003	-0.001	**-0.005**
Max Rst	21	17:ULS-B3 (Z-I	1.425	-6.943	29.425	**30.267**	0.005	0.000	-0.000

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Node Displacements

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
1	1:SELFWEIGH	0.008	-0.002	0.002	0.009	0.000	0.000	-0.000
	2:SELFWEIGH	0.025	-0.005	0.001	0.026	0.000	0.000	-0.000
	3:SELFWEIGH	0.021	-0.005	-0.004	0.022	-0.000	0.000	-0.000
	4:SELFWEIGH	0.025	-0.005	0.014	0.029	0.000	0.000	-0.000
	5:LIVE LOAD (	0.130	-0.026	0.071	0.150	0.001	0.000	-0.001
	6:WIND (Z-DIF	0.109	0.008	0.532	0.543	0.005	-0.000	-0.000
	7:SNOW	0.019	-0.004	-0.002	0.020	-0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.349	-0.039	0.660	0.747	0.006	-0.000	-0.003
	9:SLS2 (-Z-DIF	0.108	-0.057	-0.482	0.498	-0.003	0.001	-0.002
	10:ULS-A1 (Z-I	0.390	-0.046	0.697	0.800	0.007	-0.000	-0.003
	11:2 DRUNKEI	0.012	0.001	0.045	0.047	0.000	-0.000	-0.000
	12:ULS-A2 (-Z-	0.137	-0.065	-0.502	0.525	-0.003	0.001	-0.002
	13:ULS-B1 (Z-I	0.437	-0.055	0.726	0.849	0.007	-0.000	-0.004
	14:WIND (-Z-D	-0.107	-0.008	-0.519	0.530	-0.004	0.000	0.000
	15:2 DRUNKEI	-0.012	-0.001	-0.046	0.047	-0.000	0.000	0.000
	16:ULS-B2 (-Z-	0.184	-0.074	-0.473	0.513	-0.003	0.001	-0.003
	17:ULS-B3 (Z-I	0.428	-0.039	0.934	1.028	0.009	-0.001	-0.003
	18:ULS-B4 (-Z-	0.077	-0.066	-0.738	0.745	-0.005	0.001	-0.002
2	1:SELFWEIGH	0.007	-0.002	0.000	0.008	-0.000	-0.000	-0.000
	2:SELFWEIGH	0.025	-0.005	0.001	0.026	0.000	0.000	-0.000
	3:SELFWEIGH	0.021	-0.005	0.005	0.022	0.000	0.000	-0.000
	4:SELFWEIGH	0.024	-0.005	-0.007	0.026	-0.000	-0.000	-0.000
	5:LIVE LOAD (	0.124	-0.026	-0.028	0.130	-0.001	-0.000	-0.001
	6:WIND (Z-DIF	-0.131	-0.008	0.479	0.497	0.004	-0.001	0.001
	7:SNOW	0.019	-0.004	0.003	0.020	0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.076	-0.057	0.494	0.503	0.004	-0.001	-0.001
	9:SLS2 (-Z-DIF	0.365	-0.039	-0.550	0.661	-0.006	0.001	-0.003
	10:ULS-A1 (Z-I	0.103	-0.065	0.518	0.532	0.004	-0.001	-0.002
	11:2 DRUNKEI	-0.014	-0.001	0.041	0.044	0.000	-0.000	0.000
	12:ULS-A2 (-Z-	0.406	-0.046	-0.578	0.708	-0.006	0.001	-0.003
	13:ULS-B1 (Z-I	0.147	-0.074	0.506	0.532	0.004	-0.001	-0.002
	14:WIND (-Z-D	0.130	0.008	-0.482	0.500	-0.005	0.001	-0.001
	15:2 DRUNKEI	0.014	0.001	-0.041	0.043	-0.000	0.000	-0.000
	16:ULS-B2 (-Z-	0.450	-0.055	-0.590	0.745	-0.006	0.000	-0.004
	17:ULS-B3 (Z-I	0.032	-0.066	0.734	0.738	0.006	-0.001	-0.001
	18:ULS-B4 (-Z-	0.453	-0.039	-0.795	0.916	-0.008	0.001	-0.003
3	1:SELFWEIGH	0.065	-0.002	0.002	0.066	0.000	-0.000	0.000
	2:SELFWEIGH	0.236	-0.005	0.001	0.236	0.000	-0.000	0.000
	3:SELFWEIGH	0.222	-0.005	-0.004	0.222	-0.000	-0.000	0.000
	4:SELFWEIGH	0.225	-0.005	0.014	0.225	0.000	-0.000	0.000
	5:LIVE LOAD (	1.138	-0.026	0.071	1.141	0.001	-0.000	0.001
	6:WIND (Z-DIF	-0.294	0.008	0.477	0.561	0.004	0.001	-0.000
	7:SNOW	0.213	-0.004	-0.002	0.213	-0.000	-0.000	0.000
	8:SLS1 (Z-DIR	1.769	-0.039	0.599	1.868	0.006	0.001	0.002
	9:SLS2 (-Z-DIF	2.430	-0.056	-0.421	2.467	-0.003	-0.001	0.003
	10:ULS-A1 (Z-I	2.082	-0.046	0.633	2.176	0.006	0.001	0.002
	11:2 DRUNKEI	-0.036	0.001	0.039	0.053	0.000	0.000	-0.000
	12:ULS-A2 (-Z-	2.776	-0.064	-0.438	2.811	-0.003	-0.001	0.003
	13:ULS-B1 (Z-I	2.482	-0.055	0.663	2.569	0.007	0.001	0.003
	14:WIND (-Z-D	0.295	-0.008	-0.464	0.550	-0.004	-0.001	0.001

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	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	15:2 DRUNKEI	0.036	-0.001	-0.040	0.054	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	3.176	-0.073	-0.408	3.203	-0.003	-0.001	0.004
	17:ULS-B3 (Z-I	1.837	-0.040	0.846	2.023	0.008	0.001	0.002
	18:ULS-B4 (-Z·	2.797	-0.065	-0.649	2.872	-0.005	-0.001	0.003
4	1:SELFWEIGH	0.066	-0.002	0.000	0.066	-0.000	0.000	0.000
	2:SELFWEIGH	0.236	-0.005	0.001	0.236	0.000	-0.000	0.000
	3:SELFWEIGH	0.222	-0.005	0.005	0.222	0.000	-0.000	0.000
	4:SELFWEIGH	0.225	-0.005	-0.007	0.226	-0.000	0.000	0.000
	5:LIVE LOAD (	1.141	-0.026	-0.028	1.141	-0.001	0.000	0.001
	6:WIND (Z-DIF	0.411	-0.008	0.445	0.606	0.004	0.001	0.000
	7:SNOW	0.213	-0.004	0.003	0.213	0.000	-0.000	0.000
	8:SLS1 (Z-DIR	2.553	-0.056	0.456	2.594	0.004	0.001	0.003
	9:SLS2 (-Z-DIF	1.655	-0.039	-0.512	1.732	-0.005	-0.001	0.002
	10:ULS-A1 (Z-I	2.905	-0.064	0.479	2.945	0.004	0.001	0.003
	11:2 DRUNKEI	0.039	-0.001	0.038	0.054	0.000	0.000	0.000
	12:ULS-A2 (-Z·	1.962	-0.046	-0.537	2.035	-0.006	-0.001	0.002
	13:ULS-B1 (Z-I	3.306	-0.073	0.466	3.340	0.004	0.001	0.003
	14:WIND (-Z-D	-0.409	0.008	-0.448	0.607	-0.004	-0.001	-0.000
	15:2 DRUNKEI	-0.039	0.001	-0.037	0.054	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	2.363	-0.055	-0.550	2.427	-0.006	-0.001	0.003
	17:ULS-B3 (Z-I	2.978	-0.065	0.679	3.055	0.006	0.001	0.003
	18:ULS-B4 (-Z·	1.666	-0.040	-0.739	1.823	-0.008	-0.001	0.002
5	1:SELFWEIGH	0.010	-0.057	0.002	0.058	0.000	-0.000	-0.000
	2:SELFWEIGH	0.032	-0.209	-0.001	0.211	0.000	-0.000	-0.000
	3:SELFWEIGH	0.027	-0.178	-0.005	0.181	-0.000	-0.000	-0.000
	4:SELFWEIGH	0.031	-0.217	0.011	0.219	0.001	-0.000	-0.000
	5:LIVE LOAD (	0.162	-1.113	0.055	1.126	0.004	-0.000	-0.002
	6:WIND (Z-DIF	0.128	0.172	0.899	0.925	0.004	-0.001	0.000
	7:SNOW	0.025	-0.166	-0.003	0.168	-0.000	-0.000	-0.000
	8:SLS1 (Z-DIR	0.431	-1.754	1.036	2.082	0.010	-0.001	-0.003
	9:SLS2 (-Z-DIF	0.146	-2.125	-0.873	2.302	0.001	0.000	-0.004
	10:ULS-A1 (Z-I	0.482	-2.040	1.089	2.362	0.010	-0.001	-0.004
	11:2 DRUNKEI	0.015	0.014	0.077	0.080	0.000	-0.000	0.000
	12:ULS-A2 (-Z·	0.184	-2.430	-0.914	2.603	0.002	0.000	-0.004
	13:ULS-B1 (Z-I	0.540	-2.442	1.113	2.737	0.012	-0.001	-0.004
	14:WIND (-Z-D	-0.127	-0.171	-0.854	0.880	-0.003	0.000	-0.000
	15:2 DRUNKEI	-0.015	-0.015	-0.077	0.080	-0.000	0.000	-0.000
	16:ULS-B2 (-Z·	0.242	-2.832	-0.890	2.978	0.004	0.000	-0.005
	17:ULS-B3 (Z-I	0.525	-1.863	1.493	2.445	0.012	-0.001	-0.003
	18:ULS-B4 (-Z·	0.112	-2.408	-1.300	2.738	0.000	0.001	-0.004
6	1:SELFWEIGH	0.009	-0.061	0.002	0.062	-0.000	-0.000	-0.000
	2:SELFWEIGH	0.032	-0.209	-0.001	0.211	0.000	-0.000	-0.000
	3:SELFWEIGH	0.027	-0.178	-0.005	0.180	0.000	0.000	-0.000
	4:SELFWEIGH	0.031	-0.217	0.011	0.220	-0.001	-0.000	-0.000
	5:LIVE LOAD (	0.157	-1.115	0.060	1.127	-0.003	-0.000	-0.002
	6:WIND (Z-DIF	-0.169	-0.222	0.864	0.908	0.001	-0.000	-0.001
	7:SNOW	0.025	-0.166	-0.003	0.168	0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.094	-2.185	1.006	2.408	-0.002	-0.001	-0.004
	9:SLS2 (-Z-DIF	0.469	-1.706	-0.863	1.969	-0.006	0.000	-0.003
	10:ULS-A1 (Z-I	0.128	-2.494	1.059	2.713	-0.002	-0.001	-0.005

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	11:2 DRUNKEI	-0.018	-0.018	0.077	0.081	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	0.522	-1.991	-0.903	2.248	-0.006	0.001	-0.003
	13:ULS-B1 (Z-I	0.184	-2.896	1.084	3.098	-0.003	-0.001	-0.005
	14:WIND (-Z-C	0.169	0.220	-0.851	0.895	-0.002	0.001	0.000
	15:2 DRUNKEI	0.018	0.019	-0.077	0.082	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	0.578	-2.393	-0.877	2.613	-0.007	0.000	-0.004
	17:ULS-B3 (Z-I	0.037	-2.494	1.446	2.883	-0.001	-0.001	-0.005
	18:ULS-B4 (-Z·	0.583	-1.793	-1.287	2.283	-0.007	0.001	-0.003
7	1:SELFWEIGH	0.064	-0.057	0.002	0.085	0.000	0.000	0.000
	2:SELFWEIGH	0.229	-0.209	-0.001	0.310	0.000	0.000	0.000
	3:SELFWEIGH	0.215	-0.178	-0.005	0.280	-0.000	0.000	0.000
	4:SELFWEIGH	0.219	-0.217	0.011	0.308	0.001	0.000	0.000
	5:LIVE LOAD (	1.105	-1.113	0.055	1.569	0.004	0.000	0.002
	6:WIND (Z-DIF	-0.273	0.236	0.894	0.964	0.004	0.001	-0.000
	7:SNOW	0.207	-0.166	-0.003	0.266	-0.000	0.000	0.000
	8:SLS1 (Z-DIR	1.732	-1.684	1.029	2.626	0.009	0.001	0.003
	9:SLS2 (-Z-DIF	2.347	-2.197	-0.866	3.329	0.002	-0.001	0.004
	10:ULS-A1 (Z-I	2.036	-1.967	1.083	3.031	0.010	0.001	0.004
	11:2 DRUNKEI	-0.034	0.020	0.077	0.086	0.000	0.000	-0.000
	12:ULS-A2 (-Z·	2.682	-2.505	-0.908	3.780	0.002	-0.001	0.004
	13:ULS-B1 (Z-I	2.425	-2.368	1.107	3.565	0.012	0.001	0.005
	14:WIND (-Z-C	0.274	-0.235	-0.849	0.922	-0.003	-0.001	0.000
	15:2 DRUNKEI	0.034	-0.021	-0.077	0.086	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	3.070	-2.906	-0.884	4.319	0.004	-0.001	0.005
	17:ULS-B3 (Z-I	1.804	-1.761	1.484	2.926	0.012	0.001	0.003
	18:ULS-B4 (-Z·	2.697	-2.511	-1.290	3.904	0.000	-0.001	0.004
8	1:SELFWEIGH	0.064	-0.061	0.002	0.089	-0.000	0.000	0.000
	2:SELFWEIGH	0.229	-0.209	-0.001	0.310	0.000	0.000	0.000
	3:SELFWEIGH	0.215	-0.178	-0.005	0.279	0.000	-0.000	0.000
	4:SELFWEIGH	0.219	-0.217	0.011	0.308	-0.001	0.000	0.000
	5:LIVE LOAD (	1.108	-1.114	0.060	1.572	-0.003	0.000	0.002
	6:WIND (Z-DIF	0.403	-0.275	0.857	0.986	0.001	0.000	0.000
	7:SNOW	0.207	-0.166	-0.003	0.266	0.000	-0.000	0.000
	8:SLS1 (Z-DIR	2.484	-2.244	0.998	3.493	-0.002	0.001	0.004
	9:SLS2 (-Z-DIF	1.603	-1.647	-0.854	2.452	-0.006	-0.001	0.003
	10:ULS-A1 (Z-I	2.826	-2.555	1.050	3.952	-0.002	0.001	0.004
	11:2 DRUNKEI	0.038	-0.024	0.076	0.088	0.000	0.000	0.000
	12:ULS-A2 (-Z·	1.902	-1.929	-0.895	2.853	-0.006	-0.001	0.004
	13:ULS-B1 (Z-I	3.215	-2.957	1.076	4.499	-0.003	0.001	0.005
	14:WIND (-Z-C	-0.401	0.273	-0.843	0.973	-0.002	-0.001	-0.000
	15:2 DRUNKEI	-0.038	0.025	-0.076	0.089	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	2.291	-2.331	-0.869	3.382	-0.008	-0.001	0.004
	17:ULS-B3 (Z-I	2.898	-2.580	1.434	4.136	-0.001	0.001	0.004
	18:ULS-B4 (-Z·	1.612	-1.706	-1.275	2.671	-0.007	-0.001	0.003
12	1:SELFWEIGH	0.072	-0.054	0.011	0.091	0.000	-0.000	-0.000
	2:SELFWEIGH	0.260	-0.183	0.023	0.319	0.000	0.000	-0.000
	3:SELFWEIGH	0.243	-0.183	0.016	0.304	0.001	0.000	-0.000
	4:SELFWEIGH	0.246	-0.182	0.050	0.310	-0.000	-0.000	-0.000
	5:LIVE LOAD (	1.244	-0.923	0.315	1.581	-0.001	-0.000	-0.001
	6:WIND (Z-DIF	-0.080	0.175	18.303	18.304	0.004	-0.000	0.000

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	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	7:SNOW	0.234	-0.170	0.026	0.291	0.000	0.000	-0.000
	8:SLS1 (Z-DIR	2.216	-1.506	20.307	20.483	0.004	-0.000	-0.002
	9:SLS2 (-Z-DIF	2.382	-1.885	-19.391	19.627	-0.005	-0.000	-0.002
	10:ULS-A1 (Z-I	2.574	-1.762	21.352	21.579	0.004	-0.000	-0.002
	11:2 DRUNKEI	-0.003	0.015	1.562	1.562	0.000	0.000	0.000
	12:ULS-A2 (-Z·	2.747	-2.159	-20.330	20.628	-0.005	-0.000	-0.003
	13:ULS-B1 (Z-I	3.010	-2.087	21.479	21.789	0.004	-0.000	-0.002
	14:WIND (-Z-C	0.080	-0.174	-18.275	18.276	-0.005	-0.000	-0.000
	15:2 DRUNKEI	0.003	-0.015	-1.557	1.558	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	3.184	-2.485	-20.203	20.603	-0.006	-0.000	-0.003
	17:ULS-B3 (Z-I	2.415	-1.593	29.574	29.715	0.006	-0.000	-0.002
	18:ULS-B4 (-Z·	2.660	-2.147	-28.569	28.772	-0.007	-0.000	-0.002
13	1:SELFWEIGH	0.071	-0.056	0.010	0.091	-0.000	0.000	-0.000
	2:SELFWEIGH	0.259	-0.183	0.023	0.318	0.000	0.000	-0.000
	3:SELFWEIGH	0.242	-0.183	0.015	0.304	-0.000	0.000	-0.000
	4:SELFWEIGH	0.246	-0.182	0.049	0.310	0.000	0.000	-0.000
	5:LIVE LOAD (	1.243	-0.925	0.306	1.579	0.001	0.000	-0.001
	6:WIND (Z-DIF	0.114	-0.207	18.294	18.295	0.003	0.000	-0.000
	7:SNOW	0.234	-0.170	0.026	0.291	-0.000	0.000	-0.000
	8:SLS1 (Z-DIR	2.416	-1.924	20.287	20.521	0.004	0.000	-0.002
	9:SLS2 (-Z-DIF	2.175	-1.474	-19.428	19.605	-0.003	0.000	-0.002
	10:ULS-A1 (Z-I	2.783	-2.201	21.331	21.624	0.004	0.000	-0.003
	11:2 DRUNKEI	0.007	-0.018	1.564	1.565	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	2.530	-1.729	-20.370	20.599	-0.003	0.000	-0.002
	13:ULS-B1 (Z-I	3.219	-2.527	21.454	21.841	0.004	0.000	-0.003
	14:WIND (-Z-C	-0.113	0.207	-18.298	18.299	-0.003	0.000	0.000
	15:2 DRUNKEI	-0.007	0.018	-1.559	1.559	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	2.966	-2.054	-20.247	20.566	-0.003	0.000	-0.002
	17:ULS-B3 (Z-I	2.711	-2.204	29.549	29.754	0.005	0.000	-0.003
	18:ULS-B4 (-Z·	2.356	-1.545	-28.619	28.757	-0.004	0.000	-0.002
14	1:SELFWEIGH	0.001	-0.054	0.011	0.055	0.000	0.000	0.000
	2:SELFWEIGH	0.001	-0.183	0.023	0.185	0.000	-0.000	0.000
	3:SELFWEIGH	-0.000	-0.183	0.016	0.184	0.001	-0.000	0.000
	4:SELFWEIGH	0.003	-0.182	0.051	0.189	-0.000	0.000	0.000
	5:LIVE LOAD (	0.023	-0.924	0.318	0.977	-0.001	0.000	0.001
	6:WIND (Z-DIF	0.041	0.218	17.917	17.918	0.004	0.000	-0.000
	7:SNOW	-0.002	-0.170	0.026	0.172	0.000	-0.000	0.000
	8:SLS1 (Z-DIR	0.062	-1.459	19.883	19.937	0.004	0.000	0.002
	9:SLS2 (-Z-DIF	-0.007	-1.933	-18.960	19.058	-0.005	0.000	0.002
	10:ULS-A1 (Z-I	0.067	-1.712	20.908	20.978	0.004	0.000	0.002
	11:2 DRUNKEI	-0.006	0.020	1.522	1.522	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	-0.005	-2.210	-19.878	20.000	-0.005	0.000	0.003
	13:ULS-B1 (Z-I	0.077	-2.037	21.036	21.134	0.004	0.000	0.002
	14:WIND (-Z-C	-0.039	-0.217	-17.887	17.889	-0.004	0.000	0.000
	15:2 DRUNKEI	0.005	-0.020	-1.517	1.517	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	0.004	-2.536	-19.750	19.912	-0.005	0.000	0.003
	17:ULS-B3 (Z-I	0.085	-1.524	28.955	28.995	0.006	0.000	0.002
	18:ULS-B4 (-Z·	-0.024	-2.218	-27.942	28.030	-0.007	0.000	0.002
16	1:SELFWEIGH	0.003	-0.056	0.010	0.057	-0.000	-0.000	0.000
	2:SELFWEIGH	0.002	-0.183	0.023	0.185	0.000	-0.000	0.000

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	3:SELFWEIGH	0.000	-0.183	0.015	0.184	-0.000	-0.000	0.000
	4:SELFWEIGH	0.003	-0.182	0.049	0.188	0.000	-0.000	0.000
	5:LIVE LOAD (	0.022	-0.924	0.309	0.975	0.001	-0.000	0.001
	6:WIND (Z-DIF	0.063	-0.240	17.907	17.909	0.003	-0.000	0.000
	7:SNOW	-0.002	-0.170	0.025	0.172	-0.000	-0.000	0.000
	8:SLS1 (Z-DIR	0.099	-1.960	19.864	19.960	0.004	-0.000	0.002
	9:SLS2 (-Z-DIF	-0.041	-1.437	-18.997	19.051	-0.003	-0.000	0.002
	10:ULS-A1 (Z-I	0.107	-2.239	20.886	21.006	0.004	-0.000	0.003
	11:2 DRUNKEI	0.008	-0.021	1.524	1.524	0.000	0.000	0.000
	12:ULS-A2 (-Z·	-0.041	-1.690	-19.918	19.989	-0.003	-0.001	0.002
	13:ULS-B1 (Z-I	0.116	-2.564	21.010	21.167	0.004	-0.000	0.003
	14:WIND (-Z-D	-0.062	0.240	-17.910	17.912	-0.003	-0.000	-0.000
	15:2 DRUNKEI	-0.008	0.022	-1.519	1.519	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	-0.032	-2.016	-19.793	19.895	-0.003	-0.001	0.002
	17:ULS-B3 (Z-I	0.134	-2.257	28.930	29.018	0.005	-0.000	0.003
	18:ULS-B4 (-Z·	-0.070	-1.492	-27.992	28.032	-0.004	-0.001	0.002
17	1:SELFWEIGH	0.055	-0.145	-0.004	0.155	0.000	-0.000	-0.000
	2:SELFWEIGH	0.195	-0.496	-0.033	0.534	-0.000	-0.000	-0.000
	3:SELFWEIGH	0.182	-0.526	-0.039	0.558	0.001	-0.000	-0.000
	4:SELFWEIGH	0.186	-0.469	-0.005	0.505	-0.000	-0.000	-0.000
	5:LIVE LOAD (	0.938	-2.365	0.036	2.544	-0.001	-0.000	-0.000
	6:WIND (Z-DIF	-0.028	0.533	18.276	18.284	0.001	0.000	0.000
	7:SNOW	0.175	-0.510	-0.027	0.540	0.001	-0.000	-0.000
	8:SLS1 (Z-DIR	1.705	-3.930	19.780	20.239	0.002	0.000	-0.001
	9:SLS2 (-Z-DIF	1.757	-5.091	-19.921	20.636	-0.002	-0.000	-0.001
	10:ULS-A1 (Z-I	1.975	-4.618	20.745	21.344	0.002	0.000	-0.001
	11:2 DRUNKEI	0.002	0.048	1.576	1.576	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	2.030	-5.836	-20.941	21.834	-0.002	-0.000	-0.001
	13:ULS-B1 (Z-I	2.305	-5.436	20.773	21.596	0.002	0.000	-0.001
	14:WIND (-Z-D	0.029	-0.531	-18.279	18.287	-0.003	-0.000	-0.000
	15:2 DRUNKEI	-0.002	-0.049	-1.570	1.571	-0.000	0.000	-0.000
	16:ULS-B2 (-Z·	2.360	-6.655	-20.913	22.072	-0.002	-0.000	-0.001
	17:ULS-B3 (Z-I	1.870	-4.133	28.981	29.334	0.002	0.000	-0.001
	18:ULS-B4 (-Z·	1.951	-5.830	-29.155	29.796	-0.003	-0.000	-0.001
18	1:SELFWEIGH	0.037	-0.163	0.012	0.168	0.000	0.000	0.000
	2:SELFWEIGH	0.131	-0.606	0.023	0.620	0.000	-0.000	-0.000
	3:SELFWEIGH	0.121	-0.571	0.017	0.584	0.001	0.000	0.000
	4:SELFWEIGH	0.125	-0.569	0.050	0.585	-0.000	-0.000	-0.000
	5:LIVE LOAD (	0.633	-2.865	0.315	2.951	-0.002	-0.000	-0.000
	6:WIND (Z-DIF	-0.021	0.691	18.232	18.246	0.003	0.000	0.000
	7:SNOW	0.116	-0.554	0.027	0.567	0.001	0.000	0.000
	8:SLS1 (Z-DIR	1.138	-4.569	20.266	20.806	0.003	0.000	0.000
	9:SLS2 (-Z-DIF	1.189	-6.087	-19.337	20.307	-0.004	-0.000	-0.000
	10:ULS-A1 (Z-I	1.319	-5.371	21.310	22.016	0.004	0.000	0.000
	11:2 DRUNKEI	-0.004	0.068	1.589	1.590	0.001	0.000	0.000
	12:ULS-A2 (-Z·	1.373	-6.964	-20.273	21.480	-0.004	-0.000	-0.000
	13:ULS-B1 (Z-I	1.542	-6.374	21.436	22.417	0.003	0.000	0.000
	14:WIND (-Z-D	0.022	-0.689	-18.180	18.193	-0.005	-0.000	-0.000
	15:2 DRUNKEI	0.004	-0.069	-1.601	1.603	0.001	-0.000	-0.000
	16:ULS-B2 (-Z·	1.596	-7.967	-20.147	21.723	-0.004	-0.000	-0.000

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	17:ULS-B3 (Z-I	1.247	-4.774	29.499	29.909	0.005	0.000	0.000
	18:ULS-B4 (-Z·	1.320	-6.987	-28.470	29.344	-0.006	-0.000	-0.000
19	1:SELFWEIGH	0.019	-0.145	-0.004	0.146	0.000	0.000	0.000
	2:SELFWEIGH	0.066	-0.496	-0.033	0.502	-0.000	0.000	0.000
	3:SELFWEIGH	0.061	-0.526	-0.039	0.531	0.001	0.000	0.000
	4:SELFWEIGH	0.064	-0.469	-0.005	0.474	-0.000	0.000	0.000
	5:LIVE LOAD (	0.328	-2.365	0.037	2.388	-0.001	0.000	0.000
	6:WIND (Z-DIF	-0.011	0.554	18.082	18.091	0.001	0.000	-0.000
	7:SNOW	0.057	-0.510	-0.027	0.514	0.001	0.000	0.000
	8:SLS1 (Z-DIR	0.573	-3.907	19.568	19.962	0.002	0.000	0.001
	9:SLS2 (-Z-DIF	0.618	-5.114	-19.705	20.367	-0.002	-0.000	0.001
	10:ULS-A1 (Z-I	0.665	-4.593	20.522	21.040	0.002	0.000	0.001
	11:2 DRUNKEI	-0.011	0.050	1.555	1.556	0.000	0.000	0.000
	12:ULS-A2 (-Z·	0.712	-5.861	-20.714	21.539	-0.002	-0.000	0.001
	13:ULS-B1 (Z-I	0.781	-5.412	20.551	21.266	0.002	0.000	0.001
	14:WIND (-Z-D	0.013	-0.552	-18.085	18.094	-0.003	-0.000	0.000
	15:2 DRUNKEI	0.010	-0.051	-1.550	1.551	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	0.828	-6.680	-20.685	21.753	-0.002	-0.000	0.001
	17:ULS-B3 (Z-I	0.628	-4.099	28.671	28.970	0.002	0.000	0.001
	18:ULS-B4 (-Z·	0.687	-5.864	-28.840	29.439	-0.003	-0.000	0.001
20	1:SELFWEIGH	0.020	-0.139	-0.004	0.140	-0.000	0.000	0.000
	2:SELFWEIGH	0.066	-0.495	-0.033	0.501	-0.000	0.000	0.000
	3:SELFWEIGH	0.061	-0.524	-0.040	0.529	-0.001	0.000	0.000
	4:SELFWEIGH	0.064	-0.470	-0.006	0.474	0.000	0.000	0.000
	5:LIVE LOAD (	0.327	-2.367	0.034	2.390	0.001	0.000	0.000
	6:WIND (Z-DIF	0.077	-0.507	18.073	18.081	0.004	0.000	0.000
	7:SNOW	0.057	-0.509	-0.028	0.513	-0.001	0.000	0.000
	8:SLS1 (Z-DIR	0.679	-5.056	19.551	20.206	0.002	0.000	0.001
	9:SLS2 (-Z-DIF	0.512	-3.955	-19.759	20.157	-0.003	-0.000	0.001
	10:ULS-A1 (Z-I	0.776	-5.797	20.504	21.322	0.002	0.000	0.001
	11:2 DRUNKEI	0.007	-0.045	1.555	1.555	0.000	0.000	0.000
	12:ULS-A2 (-Z·	0.601	-4.641	-20.771	21.292	-0.003	-0.000	0.001
	13:ULS-B1 (Z-I	0.892	-6.618	20.532	21.590	0.003	0.000	0.001
	14:WIND (-Z-D	-0.076	0.503	-18.133	18.140	-0.001	-0.000	-0.000
	15:2 DRUNKEI	-0.007	0.045	-1.549	1.550	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	0.716	-5.462	-20.744	21.463	-0.002	-0.000	0.001
	17:ULS-B3 (Z-I	0.779	-5.781	28.649	29.237	0.004	0.000	0.001
	18:ULS-B4 (-Z·	0.535	-4.170	-28.919	29.223	-0.003	-0.000	0.001
21	1:SELFWEIGH	0.037	-0.165	0.012	0.169	-0.000	0.000	-0.000
	2:SELFWEIGH	0.131	-0.605	0.024	0.620	0.000	-0.000	0.000
	3:SELFWEIGH	0.121	-0.571	0.015	0.584	-0.001	0.000	-0.000
	4:SELFWEIGH	0.125	-0.571	0.048	0.586	0.000	-0.000	0.000
	5:LIVE LOAD (	0.633	-2.873	0.305	2.957	0.001	-0.000	0.000
	6:WIND (Z-DIF	0.090	-0.658	18.193	18.205	0.004	0.000	-0.000
	7:SNOW	0.116	-0.555	0.025	0.567	-0.001	0.000	-0.000
	8:SLS1 (Z-DIR	1.259	-6.057	20.212	21.138	0.003	0.000	-0.000
	9:SLS2 (-Z-DIF	1.066	-4.622	-19.354	19.926	-0.002	-0.000	0.000
	10:ULS-A1 (Z-I	1.446	-6.934	21.253	22.402	0.003	0.000	-0.000
	11:2 DRUNKEI	0.007	-0.061	1.590	1.591	-0.001	0.000	-0.000
	12:ULS-A2 (-Z·	1.243	-5.426	-20.292	21.042	-0.003	-0.000	0.000

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Job Title: Skywalk TUB80804	Job No: 1	Sheet No:	Rev:
	Part:		
	Ref:		
	By: a.aasgaard	Date: 03-May-12	Chd:
Client:	File: Skywalk TUB80804.std	Date/Time: 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	13:ULS-B1 (Z-I	1.669	-7.939	21.375	22.863	0.004	0.000	-0.000
	14:WIND (-Z-D	-0.089	0.656	-18.198	18.210	-0.002	-0.000	0.000
	15:2 DRUNKEI	-0.007	0.061	-1.584	1.585	-0.001	-0.000	0.000
	16:ULS-B2 (-Z·	1.466	-6.432	-20.170	21.221	-0.002	-0.000	0.000
	17:ULS-B3 (Z-I	1.425	-6.943	29.425	30.267	0.005	0.000	-0.000
	18:ULS-B4 (-Z·	1.141	-4.844	-28.496	28.927	-0.004	-0.000	0.000
22	1:SELFWEIGH	0.054	-0.139	-0.004	0.149	-0.000	-0.000	-0.000
	2:SELFWEIGH	0.195	-0.495	-0.033	0.533	-0.000	-0.000	-0.000
	3:SELFWEIGH	0.182	-0.524	-0.040	0.556	-0.001	-0.000	-0.000
	4:SELFWEIGH	0.185	-0.470	-0.006	0.505	0.000	-0.000	-0.000
	5:LIVE LOAD (	0.938	-2.368	0.032	2.547	0.001	-0.000	-0.000
	6:WIND (Z-DIF	0.102	-0.491	18.267	18.274	0.004	0.000	-0.000
	7:SNOW	0.175	-0.509	-0.028	0.539	-0.001	-0.000	-0.000
	8:SLS1 (Z-DIR	1.838	-5.038	19.763	20.478	0.002	-0.000	-0.001
	9:SLS2 (-Z-DIF	1.621	-3.972	-19.974	20.430	-0.003	-0.000	-0.001
	10:ULS-A1 (Z-I	2.115	-5.778	20.727	21.621	0.002	-0.000	-0.001
	11:2 DRUNKEI	0.007	-0.044	1.575	1.575	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	1.887	-4.659	-20.998	21.591	-0.003	-0.000	-0.001
	13:ULS-B1 (Z-I	2.444	-6.600	20.754	21.914	0.003	-0.000	-0.001
	14:WIND (-Z-D	-0.101	0.487	-18.327	18.334	-0.001	-0.000	0.000
	15:2 DRUNKEI	-0.007	0.044	-1.569	1.570	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	2.216	-5.480	-20.971	21.788	-0.002	-0.000	-0.001
	17:ULS-B3 (Z-I	2.068	-5.755	28.959	29.598	0.004	-0.000	-0.001
	18:ULS-B4 (-Z·	1.749	-4.196	-29.232	29.584	-0.003	-0.000	-0.001
23	1:SELFWEIGH	0.016	-0.134	0.008	0.135	-0.000	0.000	-0.000
	2:SELFWEIGH	0.051	-0.495	0.016	0.498	-0.000	0.000	-0.000
	3:SELFWEIGH	0.047	-0.469	0.015	0.471	0.000	-0.000	-0.000
	4:SELFWEIGH	0.051	-0.470	0.032	0.474	-0.001	0.000	-0.000
	5:LIVE LOAD (	0.260	-2.367	0.166	2.388	-0.005	0.000	-0.000
	6:WIND (Z-DIF	-0.083	-0.479	1.620	1.692	0.004	-0.000	-0.000
	7:SNOW	0.044	-0.453	0.015	0.456	0.000	-0.000	-0.000
	8:SLS1 (Z-DIR	0.376	-4.910	2.033	5.328	-0.000	-0.000	-0.001
	9:SLS2 (-Z-DIF	0.562	-3.869	-1.569	4.213	-0.011	0.000	-0.000
	10:ULS-A1 (Z-I	0.445	-5.626	2.156	6.041	-0.001	-0.000	-0.001
	11:2 DRUNKEI	-0.010	-0.042	0.160	0.166	0.001	-0.000	-0.000
	12:ULS-A2 (-Z·	0.639	-4.532	-1.627	4.858	-0.012	0.000	-0.001
	13:ULS-B1 (Z-I	0.537	-6.456	2.220	6.848	-0.003	-0.000	-0.001
	14:WIND (-Z-D	0.083	0.477	-1.661	1.730	-0.006	0.000	0.000
	15:2 DRUNKEI	0.010	0.043	-0.160	0.166	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	0.732	-5.363	-1.562	5.633	-0.014	0.000	-0.001
	17:ULS-B3 (Z-I	0.383	-5.606	2.875	6.312	0.001	-0.000	-0.001
	18:ULS-B4 (-Z·	0.652	-4.083	-2.385	4.773	-0.014	0.000	-0.001
24	1:SELFWEIGH	0.037	-0.172	-0.011	0.176	-0.000	0.000	-0.000
	2:SELFWEIGH	0.131	-0.667	-0.054	0.681	0.000	-0.000	0.000
	3:SELFWEIGH	0.121	-0.570	-0.053	0.586	0.000	0.000	-0.000
	4:SELFWEIGH	0.125	-0.626	-0.035	0.639	-0.001	-0.000	0.000
	5:LIVE LOAD (	0.633	-3.148	-0.172	3.216	-0.005	-0.000	0.000
	6:WIND (Z-DIF	0.056	-0.692	1.895	2.018	0.002	0.000	-0.000
	7:SNOW	0.116	-0.554	-0.050	0.568	0.000	0.000	-0.000
	8:SLS1 (Z-DIR	1.222	-6.499	1.730	6.835	-0.003	0.000	-0.000

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	9:SLS2 (-Z-DIF	1.103	-4.979	-2.465	5.664	-0.009	-0.000	0.000
	10:ULS-A1 (Z-I	1.408	-7.434	1.771	7.770	-0.003	0.000	-0.000
	11:2 DRUNKEI	0.004	-0.070	0.210	0.221	0.002	0.000	-0.000
	12:ULS-A2 (-Z·	1.282	-5.838	-2.634	6.532	-0.010	-0.000	0.000
	13:ULS-B1 (Z-I	1.630	-8.545	1.716	8.867	-0.005	0.000	-0.000
	14:WIND (-Z-D	-0.055	0.689	-1.880	2.003	-0.004	-0.000	0.000
	15:2 DRUNKEI	-0.004	0.068	-0.210	0.221	0.000	-0.000	0.000
	16:ULS-B2 (-Z·	1.505	-6.950	-2.688	7.602	-0.012	-0.000	0.000
	17:ULS-B3 (Z-I	1.371	-7.440	2.647	8.015	-0.002	0.000	-0.000
	18:ULS-B4 (-Z·	1.195	-5.223	-3.457	6.376	-0.012	-0.000	0.000
25	1:SELFWEIGH	0.058	-0.134	0.008	0.146	-0.000	-0.000	0.000
	2:SELFWEIGH	0.210	-0.495	0.016	0.538	-0.000	-0.000	0.000
	3:SELFWEIGH	0.195	-0.469	0.015	0.508	0.000	0.000	0.000
	4:SELFWEIGH	0.199	-0.470	0.032	0.511	-0.001	-0.000	0.000
	5:LIVE LOAD (	1.005	-2.367	0.166	2.577	-0.005	-0.000	0.000
	6:WIND (Z-DIF	0.253	-0.495	1.669	1.759	0.004	0.000	0.000
	7:SNOW	0.189	-0.453	0.015	0.491	0.000	0.000	0.000
	8:SLS1 (Z-DIR	2.131	-4.928	2.087	5.760	-0.000	0.000	0.001
	9:SLS2 (-Z-DIF	1.580	-3.851	-1.624	4.468	-0.011	-0.000	0.000
	10:ULS-A1 (Z-I	2.436	-5.644	2.212	6.534	-0.001	0.000	0.001
	11:2 DRUNKEI	0.023	-0.044	0.166	0.173	0.001	0.000	0.000
	12:ULS-A2 (-Z·	1.858	-4.514	-1.684	5.164	-0.012	-0.000	0.001
	13:ULS-B1 (Z-I	2.789	-6.474	2.276	7.408	-0.003	0.000	0.001
	14:WIND (-Z-D	-0.251	0.493	-1.710	1.798	-0.006	-0.000	-0.000
	15:2 DRUNKEI	-0.023	0.044	-0.166	0.173	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	2.211	-5.344	-1.620	6.006	-0.014	-0.000	0.001
	17:ULS-B3 (Z-I	2.451	-5.632	2.953	6.815	0.001	0.000	0.001
	18:ULS-B4 (-Z·	1.646	-4.057	-2.464	5.024	-0.014	-0.001	0.001
26	1:SELFWEIGH	0.016	-0.137	0.008	0.139	0.000	0.000	-0.000
	2:SELFWEIGH	0.051	-0.496	0.016	0.499	0.000	0.000	-0.000
	3:SELFWEIGH	0.047	-0.470	0.013	0.472	-0.000	0.000	-0.000
	4:SELFWEIGH	0.051	-0.470	0.030	0.474	0.001	0.000	-0.000
	5:LIVE LOAD (	0.264	-2.366	0.156	2.386	0.004	0.000	-0.000
	6:WIND (Z-DIF	0.184	0.511	1.602	1.692	0.005	-0.000	0.000
	7:SNOW	0.044	-0.454	0.014	0.456	-0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.679	-3.835	1.996	4.377	0.009	-0.000	-0.001
	9:SLS2 (-Z-DIF	0.269	-4.951	-1.509	5.182	0.001	0.000	-0.001
	10:ULS-A1 (Z-I	0.763	-4.499	2.116	5.030	0.010	-0.000	-0.001
	11:2 DRUNKEI	0.022	0.047	0.158	0.166	0.000	-0.000	0.000
	12:ULS-A2 (-Z·	0.333	-5.670	-1.564	5.891	0.001	0.000	-0.001
	13:ULS-B1 (Z-I	0.857	-5.328	2.176	5.818	0.012	-0.000	-0.001
	14:WIND (-Z-D	-0.182	-0.510	-1.586	1.676	-0.003	0.000	-0.000
	15:2 DRUNKEI	-0.022	-0.047	-0.159	0.167	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	0.427	-6.499	-1.504	6.684	0.003	0.000	-0.001
	17:ULS-B3 (Z-I	0.820	-4.033	2.827	4.993	0.012	-0.000	-0.001
	18:ULS-B4 (-Z·	0.226	-5.664	-2.288	6.112	-0.000	0.001	-0.001
27	1:SELFWEIGH	0.037	-0.168	-0.011	0.172	0.000	-0.000	0.000
	2:SELFWEIGH	0.131	-0.667	-0.053	0.682	0.000	0.000	-0.000
	3:SELFWEIGH	0.121	-0.571	-0.053	0.586	-0.000	-0.000	0.000
	4:SELFWEIGH	0.125	-0.624	-0.036	0.637	0.001	0.000	-0.000

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	5:LIVE LOAD (	0.633	-3.135	-0.178	3.203	0.007	0.000	-0.000
	6:WIND (Z-DIF	-0.012	0.710	1.959	2.084	0.005	-0.000	0.000
	7:SNOW	0.116	-0.554	-0.051	0.568	-0.000	-0.000	0.000
	8:SLS1 (Z-DIR	1.148	-4.934	1.787	5.372	0.013	-0.000	0.000
	9:SLS2 (-Z-DIF	1.179	-6.501	-2.501	7.064	0.003	0.000	-0.000
	10:ULS-A1 (Z-I	1.329	-5.789	1.830	6.216	0.014	-0.000	0.000
	11:2 DRUNKEI	-0.003	0.074	0.210	0.223	-0.000	-0.000	0.000
	12:ULS-A2 (-Z·	1.362	-7.434	-2.672	8.017	0.003	0.000	-0.000
	13:ULS-B1 (Z-I	1.552	-6.896	1.773	7.287	0.017	-0.000	0.000
	14:WIND (-Z-C	0.013	-0.707	-1.888	2.016	-0.003	0.000	-0.000
	15:2 DRUNKEI	0.003	-0.076	-0.230	0.243	-0.002	0.000	-0.000
	16:ULS-B2 (-Z·	1.585	-8.541	-2.729	9.105	0.006	0.000	-0.000
	17:ULS-B3 (Z-I	1.262	-5.165	2.735	5.980	0.016	-0.000	0.000
	18:ULS-B4 (-Z·	1.306	-7.448	-3.499	8.332	0.002	0.000	-0.000
28	1:SELFWEIGH	0.058	-0.137	0.008	0.149	0.000	-0.000	0.000
	2:SELFWEIGH	0.210	-0.496	0.016	0.539	0.000	-0.000	0.000
	3:SELFWEIGH	0.195	-0.470	0.013	0.509	-0.000	-0.000	0.000
	4:SELFWEIGH	0.198	-0.470	0.030	0.511	0.001	-0.000	0.000
	5:LIVE LOAD (	1.003	-2.367	0.156	2.575	0.004	-0.000	0.000
	6:WIND (Z-DIF	-0.207	0.533	1.652	1.748	0.005	0.000	-0.000
	7:SNOW	0.189	-0.454	0.014	0.492	-0.000	-0.000	0.000
	8:SLS1 (Z-DIR	1.616	-3.812	2.050	4.620	0.009	0.000	0.001
	9:SLS2 (-Z-DIF	2.089	-4.974	-1.564	5.617	0.001	-0.000	0.001
	10:ULS-A1 (Z-I	1.896	-4.474	2.173	5.323	0.010	0.000	0.001
	11:2 DRUNKEI	-0.028	0.049	0.163	0.173	0.000	0.000	-0.000
	12:ULS-A2 (-Z·	2.392	-5.695	-1.622	6.386	0.001	-0.000	0.001
	13:ULS-B1 (Z-I	2.248	-5.303	2.233	6.177	0.012	0.000	0.001
	14:WIND (-Z-C	0.208	-0.532	-1.635	1.732	-0.003	-0.000	0.000
	15:2 DRUNKEI	0.028	-0.049	-0.164	0.174	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	2.744	-6.524	-1.562	7.248	0.003	-0.001	0.001
	17:ULS-B3 (Z-I	1.703	-3.998	2.906	5.228	0.012	0.000	0.001
	18:ULS-B4 (-Z·	2.386	-5.698	-2.368	6.616	0.000	-0.001	0.001
29	1:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	2:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	3:SELFWEIGH	0.000	0.000	0.000	0.000	-0.000	0.000	-0.000
	4:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	5:LIVE LOAD (	0.000	0.000	0.000	0.000	0.001	0.000	-0.001
	6:WIND (Z-DIF	0.000	0.000	0.000	0.000	0.005	-0.000	-0.001
	7:SNOW	0.000	0.000	0.000	0.000	-0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.000	0.000	0.000	0.000	0.006	-0.000	-0.003
	9:SLS2 (-Z-DIF	0.000	0.000	0.000	0.000	-0.004	0.001	-0.001
	10:ULS-A1 (Z-I	0.000	0.000	0.000	0.000	0.007	-0.000	-0.004
	11:2 DRUNKEI	0.000	0.000	0.000	0.000	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	0.000	0.000	0.000	0.000	-0.004	0.001	-0.002
	13:ULS-B1 (Z-I	0.000	0.000	0.000	0.000	0.007	-0.000	-0.004
	14:WIND (-Z-C	0.000	0.000	0.000	0.000	-0.005	0.000	0.001
	15:2 DRUNKEI	0.000	0.000	0.000	0.000	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	0.000	0.000	0.000	0.000	-0.004	0.001	-0.002
	17:ULS-B3 (Z-I	0.000	0.000	0.000	0.000	0.009	-0.001	-0.004
	18:ULS-B4 (-Z·	0.000	0.000	0.000	0.000	-0.007	0.001	-0.001

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
30	1:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	-0.000	-0.000
	2:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	3:SELFWEIGH	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	4:SELFWEIGH	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000
	5:LIVE LOAD (	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.001
	6:WIND (Z-DIF	0.000	0.000	0.000	0.000	0.005	-0.001	0.001
	7:SNOW	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	8:SLS1 (Z-DIR	0.000	0.000	0.000	0.000	0.005	-0.001	-0.001
	9:SLS2 (-Z-DIF	0.000	0.000	0.000	0.000	-0.006	0.001	-0.003
	10:ULS-A1 (Z-I	0.000	0.000	0.000	0.000	0.005	-0.001	-0.001
	11:2 DRUNKEI	0.000	0.000	0.000	0.000	0.000	-0.000	0.000
	12:ULS-A2 (-Z-	0.000	0.000	0.000	0.000	-0.006	0.001	-0.004
	13:ULS-B1 (Z-I	0.000	0.000	0.000	0.000	0.005	-0.001	-0.002
	14:WIND (-Z-D	0.000	0.000	0.000	0.000	-0.005	0.001	-0.001
	15:2 DRUNKEI	0.000	0.000	0.000	0.000	-0.000	0.000	-0.000
	16:ULS-B2 (-Z-	0.000	0.000	0.000	0.000	-0.006	0.000	-0.004
	17:ULS-B3 (Z-I	0.000	0.000	0.000	0.000	0.007	-0.001	-0.001
	18:ULS-B4 (-Z-	0.000	0.000	0.000	0.000	-0.008	0.001	-0.004
31	1:SELFWEIGH	0.073	0.000	0.000	0.073	0.000	-0.000	0.000
	2:SELFWEIGH	0.261	0.000	0.000	0.261	0.000	-0.000	0.000
	3:SELFWEIGH	0.242	0.000	0.000	0.242	-0.000	-0.000	0.000
	4:SELFWEIGH	0.250	0.000	0.000	0.250	0.000	-0.000	0.000
	5:LIVE LOAD (	1.269	0.000	0.000	1.269	0.001	-0.000	0.001
	6:WIND (Z-DIF	-0.344	0.000	0.000	0.344	0.005	0.001	-0.000
	7:SNOW	0.232	0.000	0.000	0.232	-0.000	-0.000	0.000
	8:SLS1 (Z-DIR	1.943	0.000	0.000	1.943	0.006	0.001	0.002
	9:SLS2 (-Z-DIF	2.716	0.000	0.000	2.716	-0.004	-0.001	0.003
	10:ULS-A1 (Z-I	2.289	0.000	0.000	2.289	0.006	0.001	0.002
	11:2 DRUNKEI	-0.040	0.000	0.000	0.040	0.000	0.000	-0.000
	12:ULS-A2 (-Z-	3.100	0.000	0.000	3.100	-0.004	-0.001	0.003
	13:ULS-B1 (Z-I	2.736	0.000	0.000	2.736	0.007	0.001	0.003
	14:WIND (-Z-D	0.348	0.000	0.000	0.348	-0.004	-0.001	0.001
	15:2 DRUNKEI	0.040	0.000	0.000	0.040	-0.000	-0.000	0.000
	16:ULS-B2 (-Z-	3.547	0.000	0.000	3.547	-0.004	-0.001	0.004
	17:ULS-B3 (Z-I	2.010	0.000	0.000	2.010	0.008	0.001	0.002
	18:ULS-B4 (-Z-	3.132	0.000	0.000	3.132	-0.006	-0.001	0.003
32	1:SELFWEIGH	0.074	0.000	0.000	0.074	0.000	0.000	0.000
	2:SELFWEIGH	0.261	0.000	0.000	0.261	0.000	-0.000	0.000
	3:SELFWEIGH	0.243	0.000	0.000	0.243	0.000	-0.000	0.000
	4:SELFWEIGH	0.249	0.000	0.000	0.249	-0.000	0.000	0.000
	5:LIVE LOAD (	1.263	0.000	0.000	1.263	-0.000	0.000	0.001
	6:WIND (Z-DIF	0.443	0.000	0.000	0.443	0.004	0.001	0.000
	7:SNOW	0.233	0.000	0.000	0.233	0.000	-0.000	0.000
	8:SLS1 (Z-DIR	2.808	0.000	0.000	2.808	0.004	0.001	0.003
	9:SLS2 (-Z-DIF	1.838	0.000	0.000	1.838	-0.005	-0.001	0.002
	10:ULS-A1 (Z-I	3.196	0.000	0.000	3.196	0.004	0.001	0.003
	11:2 DRUNKEI	0.042	0.000	0.000	0.042	0.000	0.000	0.000
	12:ULS-A2 (-Z-	2.177	0.000	0.000	2.177	-0.006	-0.001	0.002
	13:ULS-B1 (Z-I	3.640	0.000	0.000	3.640	0.004	0.001	0.003
	14:WIND (-Z-D	-0.443	0.000	0.000	0.443	-0.004	-0.001	-0.000

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	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	15:2 DRUNKEI	-0.042	0.000	0.000	0.042	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	2.622	0.000	0.000	2.622	-0.006	-0.001	0.003
	17:ULS-B3 (Z-I	3.271	0.000	0.000	3.271	0.006	0.001	0.003
	18:ULS-B4 (-Z·	1.854	0.000	0.000	1.854	-0.007	-0.001	0.002
33	1:SELFWEIGH	0.072	-0.006	0.010	0.073	0.000	-0.000	-0.000
	2:SELFWEIGH	0.260	-0.009	0.024	0.261	0.000	-0.000	-0.000
	3:SELFWEIGH	0.243	-0.019	0.015	0.244	0.000	-0.000	-0.000
	4:SELFWEIGH	0.246	-0.010	0.049	0.251	-0.000	0.000	-0.000
	5:LIVE LOAD (	1.244	-0.050	0.308	1.283	-0.000	0.000	-0.001
	6:WIND (Z-DIF	-0.077	0.036	18.323	18.324	0.002	0.000	0.000
	7:SNOW	0.234	-0.005	0.026	0.236	0.000	-0.000	-0.000
	8:SLS1 (Z-DIR	2.220	-0.060	20.320	20.441	0.002	0.000	-0.002
	9:SLS2 (-Z-DIF	2.381	-0.137	-19.456	19.602	-0.002	-0.000	-0.003
	10:ULS-A1 (Z-I	2.578	-0.076	21.365	21.520	0.002	0.000	-0.002
	11:2 DRUNKEI	-0.003	0.003	1.565	1.565	0.000	0.000	0.000
	12:ULS-A2 (-Z·	2.746	-0.157	-20.400	20.585	-0.002	-0.000	-0.003
	13:ULS-B1 (Z-I	3.014	-0.092	21.489	21.699	0.002	0.000	-0.003
	14:WIND (-Z-D	0.078	-0.035	-18.328	18.328	-0.002	-0.000	-0.000
	15:2 DRUNKEI	0.003	-0.003	-1.560	1.560	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	3.183	-0.173	-20.276	20.525	-0.002	-0.000	-0.004
	17:ULS-B3 (Z-I	2.420	-0.053	29.596	29.695	0.003	0.000	-0.002
	18:ULS-B4 (-Z·	2.658	-0.167	-28.662	28.786	-0.003	-0.000	-0.003
34	1:SELFWEIGH	0.071	-0.005	0.010	0.072	-0.000	-0.000	-0.000
	2:SELFWEIGH	0.259	-0.009	0.024	0.261	0.000	-0.000	-0.000
	3:SELFWEIGH	0.242	-0.019	0.015	0.243	-0.000	-0.000	-0.000
	4:SELFWEIGH	0.246	-0.010	0.049	0.251	0.000	-0.000	-0.000
	5:LIVE LOAD (	1.244	-0.050	0.310	1.283	0.000	-0.000	-0.001
	6:WIND (Z-DIF	0.114	-0.028	18.314	18.315	0.003	0.000	-0.000
	7:SNOW	0.234	-0.004	0.026	0.236	-0.000	-0.000	-0.000
	8:SLS1 (Z-DIR	2.417	-0.127	20.312	20.456	0.003	-0.000	-0.003
	9:SLS2 (-Z-DIF	2.177	-0.067	-19.440	19.562	-0.003	-0.000	-0.002
	10:ULS-A1 (Z-I	2.784	-0.146	21.357	21.538	0.003	-0.000	-0.003
	11:2 DRUNKEI	0.006	-0.002	1.564	1.564	0.000	-0.000	-0.000
	12:ULS-A2 (-Z·	2.532	-0.083	-20.383	20.540	-0.004	-0.000	-0.002
	13:ULS-B1 (Z-I	3.221	-0.162	21.482	21.722	0.004	-0.000	-0.004
	14:WIND (-Z-D	-0.113	0.027	-18.315	18.315	-0.003	-0.000	0.000
	15:2 DRUNKEI	-0.007	0.002	-1.559	1.559	-0.000	0.000	0.000
	16:ULS-B2 (-Z·	2.969	-0.099	-20.258	20.475	-0.003	-0.000	-0.003
	17:ULS-B3 (Z-I	2.712	-0.152	29.584	29.708	0.005	-0.000	-0.003
	18:ULS-B4 (-Z·	2.358	-0.065	-28.639	28.736	-0.005	-0.000	-0.002
35	1:SELFWEIGH	0.001	-0.006	0.010	0.012	0.000	0.000	0.000
	2:SELFWEIGH	0.001	-0.009	0.024	0.025	0.000	0.000	0.000
	3:SELFWEIGH	-0.000	-0.019	0.015	0.024	0.000	0.000	0.000
	4:SELFWEIGH	0.003	-0.010	0.049	0.050	-0.000	-0.000	0.000
	5:LIVE LOAD (	0.022	-0.050	0.311	0.316	-0.000	-0.000	0.001
	6:WIND (Z-DIF	0.039	0.040	17.872	17.872	0.002	0.000	-0.000
	7:SNOW	-0.002	-0.005	0.026	0.026	0.000	0.000	0.000
	8:SLS1 (Z-DIR	0.059	-0.056	19.825	19.825	0.002	0.000	0.002
	9:SLS2 (-Z-DIF	-0.006	-0.141	-18.953	18.954	-0.002	-0.000	0.003
	10:ULS-A1 (Z-I	0.064	-0.072	20.845	20.846	0.002	0.000	0.002

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	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Node Displacements Cont...

Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
	11:2 DRUNKEI	-0.006	0.003	1.518	1.518	0.000	0.000	-0.000
	12:ULS-A2 (-Z·	-0.005	-0.162	-19.871	19.872	-0.002	-0.000	0.003
	13:ULS-B1 (Z-I	0.073	-0.088	20.971	20.971	0.002	0.000	0.003
	14:WIND (-Z-C	-0.037	-0.039	-17.875	17.875	-0.002	-0.000	0.000
	15:2 DRUNKEI	0.006	-0.003	-1.513	1.513	-0.000	-0.000	0.000
	16:ULS-B2 (-Z·	0.005	-0.177	-19.746	19.747	-0.002	-0.000	0.004
	17:ULS-B3 (Z-I	0.081	-0.048	28.873	28.873	0.003	0.000	0.002
	18:ULS-B4 (-Z·	-0.022	-0.172	-27.930	27.931	-0.003	-0.000	0.003
36	1:SELFWEIGH	0.003	-0.005	0.010	0.012	-0.000	0.000	0.000
	2:SELFWEIGH	0.002	-0.009	0.024	0.026	0.000	0.000	0.000
	3:SELFWEIGH	0.000	-0.019	0.015	0.024	-0.000	0.000	0.000
	4:SELFWEIGH	0.003	-0.010	0.050	0.051	0.000	0.000	0.000
	5:LIVE LOAD (	0.021	-0.050	0.313	0.318	0.000	0.000	0.001
	6:WIND (Z-DIF	0.063	-0.032	17.863	17.863	0.003	0.000	0.000
	7:SNOW	-0.002	-0.004	0.026	0.026	-0.000	0.000	0.000
	8:SLS1 (Z-DIR	0.098	-0.131	19.817	19.818	0.003	0.000	0.003
	9:SLS2 (-Z-DIF	-0.043	-0.063	-18.937	18.937	-0.003	0.000	0.002
	10:ULS-A1 (Z-I	0.105	-0.150	20.837	20.838	0.003	0.000	0.003
	11:2 DRUNKEI	0.008	-0.003	1.517	1.517	0.000	0.000	0.000
	12:ULS-A2 (-Z·	-0.042	-0.079	-19.854	19.855	-0.004	0.000	0.002
	13:ULS-B1 (Z-I	0.114	-0.166	20.964	20.965	0.003	0.000	0.004
	14:WIND (-Z-C	-0.062	0.031	-17.862	17.862	-0.003	-0.000	-0.000
	15:2 DRUNKEI	-0.008	0.003	-1.512	1.512	-0.000	-0.000	-0.000
	16:ULS-B2 (-Z·	-0.034	-0.095	-19.728	19.729	-0.003	0.000	0.003
	17:ULS-B3 (Z-I	0.132	-0.158	28.861	28.862	0.005	0.000	0.003
	18:ULS-B4 (-Z·	-0.072	-0.059	-27.907	27.907	-0.005	0.000	0.002

Beam Displacement Detail Summary

Displacements shown in italic indicate the presence of an offset

	Beam	L/C	d (m)	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	68	13:ULS-B1 (Z-I	0.100	**3.640**	0.000	0.000	3.640
Min X	68	14:WIND (-Z-C	0.100	**-0.443**	0.000	0.000	0.443
Max Y	56	14:WIND (-Z-C	0.626	0.000	**1.026**	-0.626	1.202
Min Y	46	13:ULS-B1 (Z-I	1.000	1.590	**-17.166**	1.745	17.328
Max Z	2	17:ULS-B3 (Z-I	0.540	2.251	-2.837	**29.759**	29.979
Min Z	29	18:ULS-B4 (-Z·	0.720	1.992	-3.739	**-29.431**	29.735
Max Rst	43	17:ULS-B3 (Z-I	0.800	1.316	-6.943	29.469	**30.305**

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	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Displacement Summary

Displacements shown in italic indicate the presence of an offset

	Beam	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	68	32	13:ULS-B1 (Z-I	**3.640**	0.000	0.000	3.640
Min X	68	32	14:WIND (-Z-D	**-0.443**	0.000	0.000	0.443
Max Y	33	27	6:WIND (Z-DIF	-0.012	**0.710**	1.959	2.084
Min Y	30	24	13:ULS-B1 (Z-I	1.630	**-8.545**	1.716	8.867
Max Z	70	33	17:ULS-B3 (Z-I	2.420	-0.053	**29.596**	29.695
Min Z	28	22	18:ULS-B4 (-Z-	1.749	-4.196	**-29.232**	29.584
Max Rst	27	21	17:ULS-B3 (Z-I	1.425	-6.943	29.425	**30.266**

Beam End Force Summary

The signs of the forces at end B of each beam have been reversed. For example: this means that the Min Fx entry gives the largest tension value for an beam.

				Axial	Shear		Torsion	Bending	
	Beam	Node	L/C	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
Max Fx	66	29	16:ULS-B2 (-Z-	**61.596**	-7.480	-16.859	-0.000	-0.000	-0.000
Min Fx	31	24	13:ULS-B1 (Z-I	**-53.718**	3.739	-0.118	-0.066	0.098	0.956
Max Fy	67	2	18:ULS-B4 (-Z-	32.824	**10.334**	1.117	0.000	-0.112	1.033
Min Fy	66	1	18:ULS-B4 (-Z-	54.813	**-10.334**	-18.834	0.000	1.883	-1.033
Max Fz	69	31	18:ULS-B4 (-Z-	54.187	0.000	**15.484**	0.000	0.000	0.000
Min Fz	66	1	18:ULS-B4 (-Z-	54.813	-10.334	**-18.834**	0.000	1.883	-1.033
Max Mx	8	2	17:ULS-B3 (Z-I	-0.666	3.356	-0.430	**0.605**	0.054	1.251
Min Mx	11	8	17:ULS-B3 (Z-I	-11.123	-0.231	0.264	**-0.567**	-0.153	-0.071
Max My	40	24	17:ULS-B3 (Z-I	-15.896	0.002	-2.167	-0.001	**2.444**	0.003
Min My	38	27	16:ULS-B2 (-Z-	-18.365	-0.000	1.955	0.001	**-2.279**	-0.001
Max Mz	45	26	16:ULS-B2 (-Z-	2.438	8.977	-0.063	-0.010	0.065	**3.074**
Min Mz	56	6	18:ULS-B4 (-Z-	15.207	1.289	-0.103	0.037	-0.106	**-1.423**

Beam End Forces Envelope

Sign convention is as the action of the joint on the beam.

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
2	12	+ve	38.194	1.194	0.161	0.089	0.159	0.337
			16:ULS-B	12:ULS-A	16:ULS-B	17:ULS-B	6:WIND (;	12:ULS-A
			-2.397	-0.021	-0.790	-0.109	-0.157	-0.017
			6:WIND (;	6:WIND (;	17:ULS-B	18:ULS-B	16:ULS-B	6:WIND (;
	17	-ve	38.194	0.035	1.046	0.089	0.376	0.280
			16:ULS-B	5:LIVE LC	17:ULS-B	17:ULS-B	17:ULS-B	10:ULS-A
			-2.397	-1.119	-0.003	-0.109	-0.002	-0.051
			6:WIND (;	10:ULS-A	11:2 DRU	18:ULS-B	11:2 DRU	5:LIVE LC
3	14	+ve	52.653	0.266	0.491	0.003	0.708	0.318
			16:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B	16:ULS-B
			-4.041	-0.025	-0.573	-0.029	-0.725	-0.024
			6:WIND (;	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	3	-ve	52.764	0.241	0.491	0.003	0.586	0.044
			16:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	17:ULS-B	6:WIND (;
			-4.041	-0.025	-0.573	-0.029	-0.819	-0.359
			6:WIND (;	6:WIND (;	18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B

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Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
3	14	+ve	52.653	0.266	0.491	0.003	0.708	0.318
			16:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B	16:ULS-B
			-4.041	-0.025	-0.573	-0.029	-0.725	-0.024
			6:WIND (;	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	3	-ve	52.764	0.241	0.491	0.003	0.586	0.044
			16:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	17:ULS-B	6:WIND (;
			-4.041	-0.025	-0.573	-0.029	-0.819	-0.359
			6:WIND (;	6:WIND (;	18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B
4	3	+ve	8.213	3.298	0.105	0.034	0.109	1.945
			13:ULS-B	16:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B
			-0.674	-0.991	-0.133	-0.028	-0.109	-1.159
			14:WIND	6:WIND (;	17:ULS-B	17:ULS-B	18:ULS-B	17:ULS-B
	4	-ve	8.213	0.979	0.105	0.034	0.101	2.132
			13:ULS-B	14:WIND	18:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B
			-0.674	-3.500	-0.133	-0.028	-0.156	-1.022
			14:WIND	13:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B
5	4	+ve	53.517	0.020	0.677	0.026	0.658	0.029
			13:ULS-B	14:WIND	17:ULS-B	13:ULS-B	18:ULS-B	14:WIND
			-4.624	-0.222	-0.571	-0.002	-0.870	-0.320
			14:WIND	13:ULS-B	18:ULS-B	3:SELFW	17:ULS-B	13:ULS-B
	16	-ve	53.406	0.020	0.677	0.026	0.936	0.307
			13:ULS-B	14:WIND	17:ULS-B	13:ULS-B	17:ULS-B	13:ULS-B
			-4.624	-0.248	-0.571	-0.002	-0.867	-0.024
			14:WIND	13:ULS-B	18:ULS-B	3:SELFW	18:ULS-B	14:WIND
6	16	+ve	35.979	1.163	0.016	0.041	0.297	0.317
			13:ULS-B	12:ULS-A	6:WIND (;	14:WIND	18:ULS-B	12:ULS-A
			-0.619	-0.001	-0.970	-0.037	-0.019	-0.004
			14:WIND	11:2 DRU	18:ULS-B	10:ULS-A	6:WIND (;	6:WIND (;
	20	-ve	35.979	0.029	0.866	0.041	0.204	0.246
			13:ULS-B	5:LIVE LC	18:ULS-B	14:WIND	18:ULS-B	12:ULS-A
			-0.619	-1.093	-0.052	-0.037	-0.069	-0.044
			14:WIND	10:ULS-A	13:ULS-B	10:ULS-A	13:ULS-B	5:LIVE LC
7	13	+ve	53.075	0.278	0.573	0.002	0.948	0.320
			13:ULS-B	16:ULS-B	18:ULS-B	3:SELFW	17:ULS-B	16:ULS-B
			-4.334	-0.045	-0.679	-0.026	-0.879	-0.034
			14:WIND	6:WIND (;	17:ULS-B	13:ULS-B	18:ULS-B	6:WIND (;
	2	-ve	53.185	0.253	0.573	0.002	0.651	0.086
			13:ULS-B	16:ULS-B	18:ULS-B	3:SELFW	18:ULS-B	6:WIND (;
			-4.334	-0.045	-0.679	-0.026	-0.864	-0.389
			14:WIND	6:WIND (;	17:ULS-B	13:ULS-B	17:ULS-B	16:ULS-B
8	2	+ve	5.371	3.356	0.065	0.605	0.054	1.251
			6:WIND (;	17:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
			-18.027	-1.021	-0.430	-0.185	-0.012	-0.455
			18:ULS-B	14:WIND	17:ULS-B	14:WIND	18:ULS-B	14:WIND
	6	-ve	5.371	1.396	0.065	0.605	0.027	0.290
			6:WIND (;	17:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B
			-18.027	-1.798	-0.430	-0.185	-0.204	-0.174
			18:ULS-B	18:ULS-B	17:ULS-B	14:WIND	17:ULS-B	17:ULS-B

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Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
9	6	+ve	0.419	0.035	1.559	0.008	1.840	0.053
			14:WIND	14:WIND	18:ULS-B	14:WIND	17:ULS-B	14:WIND
			-11.788	-0.424	-1.256	-0.021	-1.178	-0.629
			13:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	13:ULS-B
	13	-ve	0.419	0.035	0.052	0.008	0.593	0.474
			14:WIND	14:WIND	15:2 DRU	14:WIND	18:ULS-B	13:ULS-B
			-11.898	-0.424	-1.256	-0.021	-1.426	-0.040
			13:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	14:WIND
10	6	+ve	3.991	3.710	0.919	0.190	0.058	0.806
			14:WIND	16:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	16:ULS-B
			-16.377	-0.044	-0.086	-0.071	-0.262	-0.060
			13:ULS-B	6:WIND (;	17:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;
	23	-ve	3.991	0.036	0.007	0.190	0.007	1.283
			14:WIND	14:WIND	15:2 DRU	18:ULS-B	15:2 DRU	13:ULS-B
			-16.377	-4.288	-0.917	-0.071	-0.260	-0.014
			13:ULS-B	13:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	14:WIND
11	8	+ve	1.154	0.742	0.264	0.161	0.008	0.213
			14:WIND	16:ULS-B	17:ULS-B	14:WIND	3:SELFW	16:ULS-B
			-12.667	-0.242	-0.027	-0.567	-0.153	-0.071
			13:ULS-B	6:WIND (;	3:SELFW	17:ULS-B	17:ULS-B	17:ULS-B
	4	-ve	1.154	0.291	0.264	0.161	0.037	0.741
			14:WIND	14:WIND	17:ULS-B	14:WIND	18:ULS-B	13:ULS-B
			-12.667	-2.503	-0.027	-0.567	-0.008	-0.083
			13:ULS-B	13:ULS-B	3:SELFW	17:ULS-B	3:SELFW	14:WIND
12	14	+ve	2.068	2.480	0.050	0.014	0.046	1.773
			18:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B
			-0.083	-0.759	-0.026	-0.015	-0.019	-0.816
			11:2 DRU	6:WIND (;	6:WIND (;	17:ULS-B	18:ULS-B	17:ULS-B
	16	-ve	2.068	0.777	0.050	0.014	0.081	1.593
			18:ULS-B	14:WIND	18:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B
			-0.083	-2.439	-0.026	-0.015	-0.015	-0.717
			11:2 DRU	17:ULS-B	6:WIND (;	17:ULS-B	6:WIND (;	18:ULS-B
13	12	+ve	52.298	0.271	0.566	0.026	0.729	0.316
			16:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B
			-3.738	-0.029	-0.485	-0.002	-0.713	-0.022
			6:WIND (;	14:WIND	17:ULS-B	3:SELFW	18:ULS-B	14:WIND
	1	-ve	52.409	0.246	0.566	0.026	0.797	0.056
			16:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	14:WIND
			-3.738	-0.029	-0.485	-0.002	-0.564	-0.374
			6:WIND (;	14:WIND	17:ULS-B	3:SELFW	17:ULS-B	13:ULS-B
14	1	+ve	9.203	3.379	0.174	0.039	0.146	2.064
			13:ULS-B	16:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B
			-1.539	-1.060	-0.147	-0.044	-0.146	-1.276
			14:WIND	6:WIND (;	18:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
	2	-ve	9.203	1.048	0.174	0.039	0.202	2.237
			13:ULS-B	14:WIND	17:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B
			-1.539	-3.579	-0.147	-0.044	-0.148	-1.128
			14:WIND	13:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B

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Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
15	1	+ve	2.692	2.784	0.448	0.014	0.113	0.970
			14:WIND	16:ULS-B	18:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B
			-14.426	-0.680	-0.113	-0.508	-0.119	-0.316
			13:ULS-B	6:WIND (;	17:ULS-B	16:ULS-B	18:ULS-B	6:WIND (;
	5	-ve	2.692	0.748	0.448	0.014	0.150	0.269
			14:WIND	18:ULS-B	18:ULS-B	6:WIND (;	18:ULS-B	13:ULS-B
			-14.426	-1.426	-0.113	-0.508	-0.005	-0.092
			13:ULS-B	17:ULS-B	17:ULS-B	16:ULS-B	11:2 DRU	14:WIND
16	5	+ve	0.143	0.027	0.981	0.018	0.727	0.043
			3:SELFW	6:WIND (;	18:ULS-B	18:ULS-B	6:WIND (;	6:WIND (;
			-11.313	-0.412	-1.138	-0.016	-1.500	-0.613
			13:ULS-B	16:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	16:ULS-B
	12	-ve	0.143	0.027	0.981	0.018	1.052	0.458
			3:SELFW	6:WIND (;	18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B
			-11.424	-0.412	-0.034	-0.016	-0.265	-0.027
			13:ULS-B	16:ULS-B	11:2 DRU	17:ULS-B	6:WIND (;	6:WIND (;
17	12	+ve	2.091	2.513	0.025	0.014	0.018	1.806
			18:ULS-B	18:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B
			-0.084	-0.779	-0.049	-0.013	-0.044	-0.847
			11:2 DRU	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B
	13	-ve	2.091	0.797	0.025	0.014	0.015	1.626
			18:ULS-B	14:WIND	6:WIND (;	17:ULS-B	6:WIND (;	17:ULS-B
			-0.084	-2.471	-0.049	-0.013	-0.080	-0.750
			11:2 DRU	17:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B
18	5	+ve	1.959	6.413	0.167	0.033	0.112	1.974
			17:ULS-B	16:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	16:ULS-B
			-0.541	-0.628	-0.115	-0.033	-0.185	-0.748
			16:ULS-B	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	6	-ve	1.959	0.594	0.167	0.033	0.148	2.344
			17:ULS-B	14:WIND	17:ULS-B	17:ULS-B	17:ULS-B	13:ULS-B
			-0.541	-6.964	-0.115	-0.033	-0.119	-0.554
			16:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	14:WIND
19	5	+ve	2.581	3.662	0.027	0.012	0.246	0.762
			14:WIND	13:ULS-B	14:WIND	16:ULS-B	17:ULS-B	13:ULS-B
			-14.648	-0.023	-0.935	-0.008	-0.012	-0.031
			13:ULS-B	14:WIND	17:ULS-B	14:WIND	14:WIND	14:WIND
	26	-ve	2.581	0.016	0.901	0.012	0.216	1.308
			14:WIND	6:WIND (;	17:ULS-B	16:ULS-B	17:ULS-B	16:ULS-B
			-14.648	-4.296	-0.035	-0.008	-0.031	-0.012
			13:ULS-B	16:ULS-B	16:ULS-B	14:WIND	16:ULS-B	11:2 DRU
20	7	+ve	0.590	0.394	0.966	0.015	0.717	0.584
			6:WIND (;	16:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;	16:ULS-B
			-11.847	-0.012	-1.122	-0.017	-1.483	-0.018
			16:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	6:WIND (;
	14	-ve	0.590	0.394	0.966	0.015	1.028	0.012
			6:WIND (;	16:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;
			-11.957	-0.012	-0.033	-0.017	-0.250	-0.441
			16:ULS-B	6:WIND (;	11:2 DRU	18:ULS-B	6:WIND (;	16:ULS-B

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Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
21	7	+ve	2.968	0.671	0.011	0.487	0.125	0.209
			6:WIND (;	5:LIVE LC	11:2 DRU	16:ULS-B	18:ULS-B	13:ULS-B
			-14.714	-0.166	-0.307	-0.006	-0.004	-0.046
			16:ULS-B	2:SELFW	18:ULS-B	11:2 DRU	11:2 DRU	2:SELFW
	3	-ve	2.968	0.018	0.011	0.487	0.054	0.603
			6:WIND (;	6:WIND (;	11:2 DRU	16:ULS-B	17:ULS-B	13:ULS-B
			-14.714	-2.006	-0.307	-0.006	-0.059	-0.038
			16:ULS-B	16:ULS-B	18:ULS-B	11:2 DRU	18:ULS-B	14:WIND
22	7	+ve	2.068	6.389	0.076	0.021	0.146	1.943
			17:ULS-B	16:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	16:ULS-B
			-0.630	-0.608	-0.128	-0.021	-0.072	-0.721
			18:ULS-B	6:WIND (;	17:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;
	8	-ve	2.068	0.574	0.076	0.021	0.080	2.329
			17:ULS-B	14:WIND	18:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B
			-0.630	-6.941	-0.128	-0.021	-0.111	-0.540
			18:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	14:WIND
23	8	+ve	1.080	0.407	1.524	0.021	1.791	0.600
			14:WIND	13:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	13:ULS-B
			-12.545	-0.020	-1.222	-0.008	-1.128	-0.028
			13:ULS-B	14:WIND	17:ULS-B	14:WIND	18:ULS-B	14:WIND
	16	-ve	1.080	0.407	0.050	0.021	0.554	0.025
			14:WIND	13:ULS-B	15:2 DRU	17:ULS-B	18:ULS-B	14:WIND
			-12.655	-0.020	-1.222	-0.008	-1.387	-0.458
			13:ULS-B	14:WIND	17:ULS-B	14:WIND	17:ULS-B	13:ULS-B
24	17	+ve	35.425	1.146	0.004	0.072	0.367	0.310
			16:ULS-B	12:ULS-A	15:2 DRU	18:ULS-B	17:ULS-B	12:ULS-A
			-0.333	-0.013	-1.021	-0.060	-0.003	-0.014
			6:WIND (;	11:2 DRU	17:ULS-B	17:ULS-B	15:2 DRU	11:2 DRU
	18	-ve	35.425	0.019	0.815	0.072	0.182	0.311
			16:ULS-B	14:WIND	17:ULS-B	18:ULS-B	17:ULS-B	10:ULS-A
			-0.333	-1.142	-0.112	-0.060	-0.100	-0.033
			6:WIND (;	10:ULS-A	16:ULS-B	17:ULS-B	16:ULS-B	5:LIVE LC
25	18	+ve	35.553	1.141	0.109	0.060	0.178	0.310
			16:ULS-B	10:ULS-A	16:ULS-B	17:ULS-B	17:ULS-B	10:ULS-A
			-0.442	-0.019	-0.812	-0.072	-0.096	-0.033
			6:WIND (;	14:WIND	17:ULS-B	18:ULS-B	16:ULS-B	5:LIVE LC
	19	-ve	35.553	0.013	1.024	0.060	0.369	0.309
			16:ULS-B	11:2 DRU	17:ULS-B	17:ULS-B	17:ULS-B	12:ULS-A
			-0.442	-1.145	-0.004	-0.072	-0.003	-0.014
			6:WIND (;	12:ULS-A	15:2 DRU	18:ULS-B	15:2 DRU	11:2 DRU
26	19	+ve	38.220	1.114	0.003	0.107	0.377	0.276
			16:ULS-B	10:ULS-A	11:2 DRU	18:ULS-B	17:ULS-B	10:ULS-A
			-2.419	-0.035	-1.048	-0.088	-0.002	-0.051
			6:WIND (;	5:LIVE LC	17:ULS-B	17:ULS-B	11:2 DRU	5:LIVE LC
	14	-ve	38.220	0.016	0.788	0.107	0.157	0.331
			16:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	6:WIND (;	12:ULS-A
			-2.419	-1.188	-0.160	-0.088	-0.155	-0.012
			6:WIND (;	12:ULS-A	16:ULS-B	17:ULS-B	16:ULS-B	6:WIND (;

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
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	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
27	20	+ve	36.009	1.146	0.104	0.017	0.197	0.308
			13:ULS-B	10:ULS-A	13:ULS-B	17:ULS-B	18:ULS-B	10:ULS-A
			-0.616	-0.012	-0.830	-0.024	-0.089	-0.014
			14:WIND	14:WIND	18:ULS-B	11:2 DRU	13:ULS-B	5:LIVE LC
	21	-ve	36.009	0.010	1.006	0.017	0.356	0.300
			13:ULS-B	6:WIND (;	18:ULS-B	17:ULS-B	18:ULS-B	12:ULS-A
			-0.616	-1.125	-0.002	-0.024	-0.003	-0.030
			14:WIND	12:ULS-A	15:2 DRU	11:2 DRU	15:2 DRU	5:LIVE LC
28	21	+ve	35.944	1.125	0.003	0.024	0.359	0.300
			13:ULS-B	12:ULS-A	6:WIND (;	11:2 DRU	18:ULS-B	12:ULS-A
			-0.559	-0.010	-1.009	-0.016	-0.003	-0.030
			14:WIND	6:WIND (;	18:ULS-B	13:ULS-B	15:2 DRU	5:LIVE LC
	22	-ve	35.944	0.012	0.827	0.024	0.196	0.308
			13:ULS-B	14:WIND	18:ULS-B	11:2 DRU	18:ULS-B	10:ULS-A
			-0.559	-1.146	-0.102	-0.016	-0.088	-0.014
			14:WIND	10:ULS-A	13:ULS-B	13:ULS-B	13:ULS-B	5:LIVE LC
29	22	+ve	35.915	1.091	0.051	0.038	0.204	0.247
			13:ULS-B	10:ULS-A	13:ULS-B	10:ULS-A	18:ULS-B	12:ULS-A
			-0.562	-0.029	-0.866	-0.041	-0.069	-0.044
			14:WIND	5:LIVE LC	18:ULS-B	14:WIND	13:ULS-B	5:LIVE LC
	13	-ve	35.915	0.001	0.970	0.038	0.298	0.316
			13:ULS-B	11:2 DRU	18:ULS-B	10:ULS-A	18:ULS-B	12:ULS-A
			-0.562	-1.162	-0.016	-0.041	-0.019	-0.003
			14:WIND	12:ULS-A	6:WIND (;	14:WIND	6:WIND (;	6:WIND (;
30	23	+ve	6.414	4.171	1.026	0.088	0.006	1.345
			14:WIND	13:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;	13:ULS-B
			-50.665	-0.025	-0.016	-0.073	-0.353	-0.019
			13:ULS-B	14:WIND	6:WIND (;	18:ULS-B	18:ULS-B	14:WIND
	24	-ve	6.414	0.025	0.103	0.088	0.086	1.013
			14:WIND	6:WIND (;	13:ULS-B	17:ULS-B	13:ULS-B	16:ULS-B
			-50.665	-3.795	-0.810	-0.073	-0.171	-0.025
			13:ULS-B	16:ULS-B	18:ULS-B	18:ULS-B	14:WIND	6:WIND (;
31	24	+ve	9.081	3.791	0.831	0.071	0.098	1.011
			14:WIND	16:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B	16:ULS-B
			-53.718	-0.022	-0.118	-0.086	-0.181	-0.023
			13:ULS-B	6:WIND (;	13:ULS-B	17:ULS-B	14:WIND	6:WIND (;
	25	-ve	9.081	0.022	0.003	0.071	0.000	1.341
			14:WIND	14:WIND	6:WIND (;	18:ULS-B	-	13:ULS-B
			-53.718	-4.167	-1.005	-0.086	-0.331	-0.016
			13:ULS-B	13:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	14:WIND
32	25	+ve	6.929	4.269	0.933	0.067	0.007	1.274
			14:WIND	13:ULS-B	18:ULS-B	17:ULS-B	11:2 DRU	13:ULS-B
			-20.724	-0.018	-0.006	-0.186	-0.270	-0.011
			17:ULS-B	14:WIND	15:2 DRU	18:ULS-B	18:ULS-B	7:SNOW
	8	-ve	6.929	0.027	0.071	0.067	0.040	0.779
			14:WIND	6:WIND (;	17:ULS-B	17:ULS-B	17:ULS-B	16:ULS-B
			-20.724	-3.690	-0.903	-0.186	-0.244	-0.037
			17:ULS-B	16:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	6:WIND (;

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
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	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
33	26	+ve	9.058	4.120	0.132	0.048	0.228	1.287
			6:WIND (;	16:ULS-B	16:ULS-B	15:2 DRU	17:ULS-B	16:ULS-B
			-53.690	-0.018	-0.875	-0.132	-0.099	-0.013
			16:ULS-B	6:WIND (;	17:ULS-B	13:ULS-B	16:ULS-B	6:WIND (;
	27	-ve	9.058	0.014	0.961	0.048	0.306	1.024
			6:WIND (;	2:SELFW	17:ULS-B	15:2 DRU	17:ULS-B	13:ULS-B
			-53.690	-3.813	-0.006	-0.132	-0.006	-0.017
			16:ULS-B	13:ULS-B	11:2 DRU	13:ULS-B	11:2 DRU	2:SELFW
34	27	+ve	9.067	3.811	0.005	0.134	0.322	1.024
			6:WIND (;	13:ULS-B	11:2 DRU	13:ULS-B	17:ULS-B	13:ULS-B
			-53.700	-0.014	-0.983	-0.048	-0.005	-0.017
			16:ULS-B	2:SELFW	17:ULS-B	15:2 DRU	11:2 DRU	2:SELFW
	28	-ve	9.067	0.017	0.853	0.134	0.205	1.285
			6:WIND (;	6:WIND (;	17:ULS-B	13:ULS-B	17:ULS-B	16:ULS-B
			-53.700	-4.118	-0.116	-0.048	-0.082	-0.011
			16:ULS-B	16:ULS-B	16:ULS-B	15:2 DRU	16:ULS-B	6:WIND (;
35	28	+ve	3.051	4.278	0.046	0.008	0.227	1.299
			6:WIND (;	16:ULS-B	16:ULS-B	6:WIND (;	17:ULS-B	16:ULS-B
			-15.151	-0.009	-0.916	-0.014	-0.039	-0.011
			16:ULS-B	11:2 DRU	17:ULS-B	16:ULS-B	16:ULS-B	11:2 DRU
	7	-ve	3.051	0.008	0.920	0.008	0.230	0.739
			6:WIND (;	2:SELFW	17:ULS-B	6:WIND (;	17:ULS-B	13:ULS-B
			-15.151	-3.645	-0.017	-0.014	-0.002	-0.016
			16:ULS-B	13:ULS-B	14:WIND	16:ULS-B	14:WIND	2:SELFW
36	26	+ve	5.396	0.002	1.241	0.010	1.078	0.005
			12:ULS-A	6:WIND (;	18:ULS-B	18:ULS-B	6:WIND (;	11:2 DRU
			-0.676	-0.062	-2.168	-0.005	-1.702	-0.076
			6:WIND (;	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B	16:ULS-B
	17	-ve	5.280	0.002	1.342	0.010	1.524	0.084
			18:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B
			-0.676	-0.062	-0.044	-0.005	-0.306	-0.004
			6:WIND (;	16:ULS-B	11:2 DRU	6:WIND (;	6:WIND (;	6:WIND (;
37	23	+ve	4.958	0.002	1.959	0.010	1.438	0.001
			10:ULS-A	14:WIND	18:ULS-B	18:ULS-B	17:ULS-B	14:WIND
			-0.331	-0.046	-1.041	-0.004	-0.893	-0.045
			14:WIND	13:ULS-B	17:ULS-B	17:ULS-B	14:WIND	13:ULS-B
	22	-ve	4.833	0.002	0.033	0.010	0.182	0.075
			10:ULS-A	14:WIND	15:2 DRU	18:ULS-B	14:WIND	13:ULS-B
			-0.331	-0.046	-1.551	-0.004	-1.269	-0.004
			14:WIND	13:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	14:WIND
38	27	+ve	0.620	0.001	1.967	0.001	0.843	0.001
			6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	6:WIND (;	17:ULS-B
			-18.365	-0.001	-1.741	-0.001	-2.279	-0.001
			16:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	16:ULS-B	18:ULS-B
	18	-ve	0.620	0.001	1.769	0.001	0.585	0.001
			6:WIND (;	17:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B
			-18.475	-0.001	-0.860	-0.001	-0.459	-0.001
			16:ULS-B	18:ULS-B	15:2 DRU	17:ULS-B	15:2 DRU	17:ULS-B

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
39	28	+ve	5.381	0.062	1.226	0.004	1.067	0.076
			12:ULS-A	16:ULS-B	18:ULS-B	6:WIND (;	6:WIND (;	16:ULS-B
			-0.664	-0.003	-2.154	-0.008	-1.685	-0.005
			6:WIND (;	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	11:2 DRU
	19	-ve	5.260	0.062	1.356	0.004	1.502	0.004
			18:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B	6:WIND (;
			-0.664	-0.003	-0.044	-0.008	-0.293	-0.084
			6:WIND (;	6:WIND (;	11:2 DRU	18:ULS-B	6:WIND (;	16:ULS-B
40	24	+ve	1.062	0.002	2.044	0.001	2.444	0.003
			14:WIND	17:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B
			-19.388	-0.002	-2.167	-0.001	-1.083	-0.003
			13:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	14:WIND	18:ULS-B
	21	-ve	1.062	0.002	0.830	0.001	0.452	0.003
			14:WIND	17:ULS-B	11:2 DRU	18:ULS-B	11:2 DRU	18:ULS-B
			-19.498	-0.002	-1.466	-0.001	-0.868	-0.003
			13:ULS-B	18:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
41	25	+ve	4.949	0.047	1.947	0.002	1.426	0.047
			10:ULS-A	13:ULS-B	18:ULS-B	6:WIND (;	13:ULS-B	13:ULS-B
			-0.323	-0.002	-1.029	-0.008	-0.884	-0.002
			14:WIND	14:WIND	17:ULS-B	18:ULS-B	14:WIND	14:WIND
	20	-ve	4.824	0.047	0.032	0.002	0.172	0.004
			10:ULS-A	13:ULS-B	15:2 DRU	6:WIND (;	14:WIND	14:WIND
			-0.323	-0.002	-1.563	-0.008	-1.253	-0.075
			14:WIND	14:WIND	18:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B
42	19	+ve	3.260	2.612	0.005	0.006	0.016	1.213
			18:ULS-B	12:ULS-A	18:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B
			-0.031	-0.370	-0.019	-0.005	-0.008	-0.255
			15:2 DRU	6:WIND (;	17:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;
	20	-ve	3.260	0.304	0.005	0.006	0.004	1.301
			18:ULS-B	14:WIND	18:ULS-B	18:ULS-B	14:WIND	17:ULS-B
			-0.031	-2.616	-0.019	-0.005	-0.022	-0.237
			15:2 DRU	17:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	14:WIND
43	18	+ve	3.096	2.911	0.003	0.000	0.003	1.621
			17:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B
			-0.718	-0.590	-0.003	-0.000	-0.003	-0.543
			15:2 DRU	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	21	-ve	3.096	0.622	0.003	0.000	0.003	1.531
			17:ULS-B	14:WIND	17:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
			-0.718	-2.911	-0.003	-0.000	-0.003	-0.509
			15:2 DRU	17:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	14:WIND
44	17	+ve	3.244	2.622	0.020	0.006	0.008	1.226
			18:ULS-B	12:ULS-A	17:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B
			-0.032	-0.379	-0.005	-0.006	-0.016	-0.263
			15:2 DRU	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	22	-ve	3.244	0.313	0.020	0.006	0.023	1.317
			18:ULS-B	14:WIND	17:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
			-0.032	-2.630	-0.005	-0.006	-0.004	-0.247
			15:2 DRU	17:ULS-B	18:ULS-B	18:ULS-B	14:WIND	14:WIND

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
45	26	+ve	4.058	8.977	0.017	0.004	0.065	3.074
			18:ULS-B	16:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	16:ULS-B
			-1.988	-0.893	-0.063	-0.011	-0.018	-0.920
			17:ULS-B	6:WIND (;	16:ULS-B	18:ULS-B	6:WIND (;	6:WIND (;
	23	-ve	4.058	0.929	0.017	0.004	0.016	2.988
			18:ULS-B	14:WIND	6:WIND (;	17:ULS-B	6:WIND (;	13:ULS-B
			-1.988	-8.783	-0.063	-0.011	-0.061	-1.050
			17:ULS-B	13:ULS-B	16:ULS-B	18:ULS-B	16:ULS-B	14:WIND
46	27	+ve	3.685	8.390	0.013	0.000	0.014	2.431
			17:ULS-B	16:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	16:ULS-B
			-1.748	-0.655	-0.014	-0.000	-0.014	-0.804
			18:ULS-B	6:WIND (;	18:ULS-B	18:ULS-B	17:ULS-B	6:WIND (;
	24	-ve	3.685	0.592	0.013	0.000	0.013	2.912
			17:ULS-B	14:WIND	17:ULS-B	17:ULS-B	17:ULS-B	13:ULS-B
			-1.748	-9.016	-0.014	-0.000	-0.013	-0.635
			18:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B	18:ULS-B	14:WIND
47	28	+ve	4.026	8.958	0.047	0.012	0.005	3.055
			18:ULS-B	16:ULS-B	16:ULS-B	18:ULS-B	6:WIND (;	16:ULS-B
			-1.956	-0.877	-0.007	-0.004	-0.050	-0.904
			17:ULS-B	6:WIND (;	11:2 DRU	17:ULS-B	16:ULS-B	6:WIND (;
	25	-ve	4.026	0.913	0.047	0.012	0.045	2.970
			18:ULS-B	14:WIND	16:ULS-B	18:ULS-B	16:ULS-B	13:ULS-B
			-1.956	-8.765	-0.007	-0.004	-0.010	-1.034
			17:ULS-B	13:ULS-B	11:2 DRU	17:ULS-B	11:2 DRU	14:WIND
48	6	+ve	15.571	0.410	0.002	0.006	0.059	0.234
			17:ULS-B	17:ULS-B	6:WIND (;	3:SELFW	18:ULS-B	6:WIND (;
			-15.645	-0.284	-0.038	-0.115	-0.007	-0.629
			18:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B	6:WIND (;	18:ULS-B
	26	-ve	15.571	0.296	0.002	0.006	0.000	0.297
			17:ULS-B	17:ULS-B	6:WIND (;	3:SELFW	-	14:WIND
			-15.645	-0.398	-0.038	-0.115	-0.045	-0.826
			18:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B	16:ULS-B	17:ULS-B
49	26	+ve	6.833	0.563	0.048	0.185	0.007	0.430
			18:ULS-B	18:ULS-B	16:ULS-B	13:ULS-B	15:2 DRU	18:ULS-B
			-7.262	-0.278	-0.003	-0.016	-0.067	-0.746
			17:ULS-B	17:ULS-B	15:2 DRU	11:2 DRU	13:ULS-B	17:ULS-B
	24	-ve	6.833	0.448	0.048	0.185	0.079	0.260
			18:ULS-B	18:ULS-B	16:ULS-B	13:ULS-B	16:ULS-B	6:WIND (;
			-7.262	-0.393	-0.003	-0.016	-0.007	-0.930
			17:ULS-B	17:ULS-B	15:2 DRU	11:2 DRU	6:WIND (;	18:ULS-B
50	24	+ve	0.403	0.387	0.003	0.016	0.080	0.256
			18:ULS-B	17:ULS-B	15:2 DRU	11:2 DRU	16:ULS-B	6:WIND (;
			-0.915	-0.442	-0.049	-0.184	-0.008	-0.923
			17:ULS-B	18:ULS-B	16:ULS-B	13:ULS-B	6:WIND (;	18:ULS-B
	28	-ve	0.403	0.272	0.003	0.016	0.007	0.421
			18:ULS-B	17:ULS-B	15:2 DRU	11:2 DRU	15:2 DRU	18:ULS-B
			-0.915	-0.557	-0.049	-0.184	-0.068	-0.737
			17:ULS-B	18:ULS-B	16:ULS-B	13:ULS-B	13:ULS-B	17:ULS-B

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
51	28	+ve	9.131	0.405	0.035	0.116	0.000	0.297
			17:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B	-	14:WIND
			-9.123	-0.302	0.000	-0.006	-0.042	-0.825
			18:ULS-B	17:ULS-B	-	3:SELFW	13:ULS-B	17:ULS-B
	8	-ve	9.131	0.290	0.035	0.116	0.057	0.245
			17:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B	18:ULS-B	6:WIND (;
			-9.123	-0.417	0.000	-0.006	-0.006	-0.648
			18:ULS-B	17:ULS-B	-	3:SELFW	6:WIND (;	18:ULS-B
52	19	+ve	4.297	0.321	0.012	0.014	0.043	0.337
			17:ULS-B	18:ULS-B	14:WIND	3:SELFW	13:ULS-B	18:ULS-B
			-3.859	-0.247	-0.022	-0.055	-0.011	-0.356
			18:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B	14:WIND	17:ULS-B
	16	-ve	4.297	0.207	0.012	0.014	0.021	0.463
			17:ULS-B	18:ULS-B	14:WIND	3:SELFW	14:WIND	17:ULS-B
			-3.859	-0.362	-0.022	-0.055	-0.017	-0.373
			18:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B	13:ULS-B	18:ULS-B
53	19	+ve	1.485	0.279	0.050	0.038	0.000	0.290
			18:ULS-B	18:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B
			-0.857	-0.184	0.000	-0.020	-0.069	-0.266
			17:ULS-B	17:ULS-B	-	3:SELFW	16:ULS-B	17:ULS-B
	21	-ve	1.485	0.164	0.050	0.038	0.068	0.382
			18:ULS-B	18:ULS-B	16:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B
			-0.857	-0.298	0.000	-0.020	-0.000	-0.306
			17:ULS-B	17:ULS-B	-	3:SELFW	15:2 DRU	18:ULS-B
54	21	+ve	1.614	0.301	0.001	0.020	0.068	0.386
			18:ULS-B	17:ULS-B	6:WIND (;	3:SELFW	16:ULS-B	17:ULS-B
			-0.983	-0.167	-0.051	-0.037	-0.001	-0.309
			17:ULS-B	18:ULS-B	16:ULS-B	17:ULS-B	6:WIND (;	18:ULS-B
	17	-ve	1.614	0.186	0.001	0.020	0.001	0.293
			18:ULS-B	17:ULS-B	6:WIND (;	3:SELFW	6:WIND (;	18:ULS-B
			-0.983	-0.281	-0.051	-0.037	-0.070	-0.269
			17:ULS-B	18:ULS-B	16:ULS-B	17:ULS-B	16:ULS-B	17:ULS-B
55	17	+ve	4.375	0.330	0.022	0.056	0.011	0.348
			17:ULS-B	18:ULS-B	13:ULS-B	17:ULS-B	14:WIND	18:ULS-B
			-3.938	-0.256	-0.012	-0.014	-0.043	-0.367
			18:ULS-B	17:ULS-B	14:WIND	3:SELFW	13:ULS-B	17:ULS-B
	13	-ve	4.375	0.216	0.022	0.056	0.017	0.477
			17:ULS-B	18:ULS-B	13:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B
			-3.938	-0.371	-0.012	-0.014	-0.020	-0.386
			18:ULS-B	17:ULS-B	14:WIND	3:SELFW	14:WIND	18:ULS-B
56	1	+ve	15.207	1.378	0.087	0.106	0.109	1.361
			18:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B
			-15.117	-0.685	-0.103	-0.015	-0.086	-1.100
			17:ULS-B	17:ULS-B	18:ULS-B	14:WIND	17:ULS-B	17:ULS-B
	6	-ve	15.207	1.289	0.087	0.106	0.096	0.530
			18:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B	6:WIND (;
			-15.117	-0.774	-0.103	-0.015	-0.106	-1.423
			17:ULS-B	17:ULS-B	18:ULS-B	14:WIND	18:ULS-B	18:ULS-B

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
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	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
57	8	+ve	10.378	0.663	0.078	0.029	0.066	0.481
			18:ULS-B	17:ULS-B	18:ULS-B	14:WIND	17:ULS-B	6:WIND (;
			-10.349	-1.176	-0.063	-0.122	-0.076	-1.342
			17:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B	18:ULS-B	18:ULS-B
	3	-ve	10.378	0.574	0.078	0.029	0.087	1.206
			18:ULS-B	17:ULS-B	18:ULS-B	14:WIND	18:ULS-B	18:ULS-B
			-10.349	-1.265	-0.063	-0.122	-0.064	-0.946
			17:ULS-B	18:ULS-B	17:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B
58	12	+ve	3.353	0.030	0.191	0.007	0.654	0.013
			6:WIND (;	1:SELFW	6:WIND (;	3:SELFW	18:ULS-B	1:SELFW
			-45.719	-0.012	-0.514	-0.064	-0.326	-0.101
			16:ULS-B	5:LIVE LC	18:ULS-B	13:ULS-B	17:ULS-B	16:ULS-B
	26	-ve	3.353	0.004	0.191	0.007	0.283	0.057
			6:WIND (;	11:2 DRU	6:WIND (;	3:SELFW	6:WIND (;	12:ULS-A
			-45.609	-0.089	-0.514	-0.064	-0.973	-0.007
			16:ULS-B	12:ULS-A	18:ULS-B	13:ULS-B	18:ULS-B	11:2 DRU
59	26	+ve	14.334	0.044	0.550	0.073	0.295	0.016
			16:ULS-B	12:ULS-A	18:ULS-B	13:ULS-B	6:WIND (;	1:SELFW
			-0.820	-0.004	-0.215	-0.012	-0.979	-0.011
			6:WIND (;	6:WIND (;	6:WIND (;	15:2 DRU	18:ULS-B	5:LIVE LC
	18	-ve	14.224	0.003	0.550	0.073	0.761	0.016
			16:ULS-B	11:2 DRU	18:ULS-B	13:ULS-B	18:ULS-B	1:SELFW
			-0.820	-0.045	-0.215	-0.012	-0.394	-0.009
			6:WIND (;	10:ULS-A	6:WIND (;	15:2 DRU	17:ULS-B	16:ULS-B
60	18	+ve	13.995	0.045	0.212	0.012	0.750	0.016
			16:ULS-B	10:ULS-A	6:WIND (;	15:2 DRU	18:ULS-B	1:SELFW
			-0.625	-0.003	-0.545	-0.073	-0.383	-0.009
			6:WIND (;	11:2 DRU	18:ULS-B	13:ULS-B	17:ULS-B	16:ULS-B
	28	-ve	14.106	0.003	0.212	0.012	0.291	0.016
			16:ULS-B	6:WIND (;	6:WIND (;	15:2 DRU	6:WIND (;	1:SELFW
			-0.625	-0.044	-0.545	-0.073	-0.974	-0.011
			6:WIND (;	12:ULS-A	18:ULS-B	13:ULS-B	18:ULS-B	5:LIVE LC
61	28	+ve	3.105	0.091	0.506	0.064	0.274	0.059
			6:WIND (;	12:ULS-A	18:ULS-B	16:ULS-B	6:WIND (;	12:ULS-A
			-45.318	-0.004	-0.186	-0.007	-0.958	-0.007
			16:ULS-B	11:2 DRU	6:WIND (;	3:SELFW	18:ULS-B	11:2 DRU
	14	-ve	3.105	0.013	0.506	0.064	0.642	0.013
			6:WIND (;	16:ULS-B	18:ULS-B	16:ULS-B	18:ULS-B	1:SELFW
			-45.428	-0.030	-0.186	-0.007	-0.315	-0.104
			16:ULS-B	1:SELFW	6:WIND (;	3:SELFW	17:ULS-B	16:ULS-B
62	16	+ve	2.664	0.030	0.171	0.008	0.756	0.015
			14:WIND	1:SELFW	14:WIND	6:WIND (;	17:ULS-B	14:WIND
			-44.715	-0.011	-0.536	-0.091	-0.339	-0.105
			13:ULS-B	7:SNOW	17:ULS-B	16:ULS-B	14:WIND	13:ULS-B
	25	-ve	2.664	0.006	0.171	0.008	0.201	0.046
			14:WIND	14:WIND	14:WIND	6:WIND (;	14:WIND	10:ULS-A
			-44.605	-0.088	-0.536	-0.091	-0.944	-0.006
			13:ULS-B	10:ULS-A	17:ULS-B	16:ULS-B	13:ULS-B	14:WIND

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
63	25	+ve	15.008	0.054	0.560	0.094	0.205	0.022
			13:ULS-B	10:ULS-A	17:ULS-B	16:ULS-B	14:WIND	10:ULS-A
			-1.104	-0.004	-0.184	-0.010	-0.967	-0.004
			14:WIND	14:WIND	14:WIND	11:2 DRU	13:ULS-B	14:WIND
	21	-ve	14.897	0.005	0.560	0.094	0.817	0.016
			13:ULS-B	5:LIVE LC	17:ULS-B	16:ULS-B	17:ULS-B	1:SELFW
			-1.104	-0.040	-0.184	-0.010	-0.377	-0.022
			14:WIND	12:ULS-A	14:WIND	11:2 DRU	14:WIND	13:ULS-B
64	21	+ve	15.127	0.041	0.187	0.010	0.828	0.016
			13:ULS-B	12:ULS-A	14:WIND	11:2 DRU	17:ULS-B	1:SELFW
			-1.305	-0.005	-0.565	-0.093	-0.384	-0.023
			14:WIND	5:LIVE LC	17:ULS-B	16:ULS-B	14:WIND	13:ULS-B
	23	-ve	15.238	0.004	0.187	0.010	0.208	0.024
			13:ULS-B	14:WIND	14:WIND	11:2 DRU	14:WIND	17:ULS-B
			-1.305	-0.055	-0.565	-0.093	-0.971	-0.005
			14:WIND	10:ULS-A	17:ULS-B	16:ULS-B	13:ULS-B	14:WIND
65	23	+ve	2.918	0.087	0.545	0.092	0.211	0.044
			14:WIND	10:ULS-A	17:ULS-B	16:ULS-B	14:WIND	10:ULS-A
			-44.896	-0.006	-0.176	-0.009	-0.955	-0.005
			13:ULS-B	14:WIND	14:WIND	6:WIND (;	13:ULS-B	5:LIVE LC
	13	-ve	2.918	0.011	0.545	0.092	0.768	0.014
			14:WIND	7:SNOW	17:ULS-B	16:ULS-B	17:ULS-B	14:WIND
			-45.006	-0.030	-0.176	-0.009	-0.347	-0.104
			13:ULS-B	1:SELFW	14:WIND	6:WIND (;	14:WIND	13:ULS-B
66	1	+ve	61.591	10.203	7.834	0.000	1.883	1.020
			16:ULS-B	17:ULS-B	6:WIND (;	-	18:ULS-B	17:ULS-B
			-6.897	-10.334	-18.834	0.000	-0.783	-1.033
			6:WIND (;	18:ULS-B	18:ULS-B	-	6:WIND (;	18:ULS-B
	29	-ve	61.596	10.203	7.834	0.000	0.000	0.000
			16:ULS-B	17:ULS-B	6:WIND (;	-	17:ULS-B	3:SELFW
			-6.897	-10.334	-18.834	0.000	-0.000	-0.000
			6:WIND (;	18:ULS-B	18:ULS-B	-	18:ULS-B	16:ULS-B
67	2	+ve	61.586	10.334	10.676	0.000	0.244	1.033
			13:ULS-B	18:ULS-B	13:ULS-B	-	14:WIND	18:ULS-B
			-6.898	-10.203	-2.441	0.000	-1.068	-1.020
			14:WIND	17:ULS-B	14:WIND	-	13:ULS-B	17:ULS-B
	30	-ve	61.591	10.334	10.676	0.000	0.000	0.000
			13:ULS-B	18:ULS-B	13:ULS-B	-	17:ULS-B	6:WIND (;
			-6.898	-10.203	-2.441	0.000	-0.000	-0.000
			14:WIND	17:ULS-B	14:WIND	-	18:ULS-B	16:ULS-B
68	4	+ve	61.141	0.000	9.563	0.000	0.147	0.000
			13:ULS-B	16:ULS-B	13:ULS-B	-	14:WIND	14:WIND
			-6.509	-0.000	-1.469	0.000	-0.956	-0.000
			14:WIND	7:SNOW	14:WIND	-	13:ULS-B	13:ULS-B
	32	-ve	61.145	0.000	9.563	0.000	0.000	0.000
			13:ULS-B	16:ULS-B	13:ULS-B	-	11:2 DRU	14:WIND
			-6.509	-0.000	-1.469	0.000	-0.000	-0.000
			14:WIND	7:SNOW	14:WIND	-	12:ULS-A	17:ULS-B

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
69	31	+ve	61.140	0.000	15.484	0.000	0.000	0.000
			16:ULS-B	5:LIVE LC	18:ULS-B	-	17:ULS-B	16:ULS-B
			-6.509	-0.000	-5.769	0.000	-0.000	-0.000
			6:WIND (;	3:SELFW	6:WIND (;	-	3:SELFW	6:WIND (;
	3	-ve	61.136	0.000	15.484	0.000	1.548	0.000
			16:ULS-B	5:LIVE LC	18:ULS-B	-	18:ULS-B	18:ULS-B
			-6.509	-0.000	-5.769	0.000	-0.577	-0.000
			6:WIND (;	3:SELFW	6:WIND (;	-	6:WIND (;	11:2 DRU
70	1	+ve	3.294	0.009	0.928	0.017	0.790	0.038
			18:ULS-B	14:WIND	18:ULS-B	18:ULS-B	17:ULS-B	14:WIND
			-0.889	-0.306	-0.741	-0.013	-1.125	-0.426
			6:WIND (;	13:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	13:ULS-B
	33	-ve	3.184	0.009	0.928	0.017	1.287	0.403
			18:ULS-B	14:WIND	18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B
			-0.889	-0.306	-0.741	-0.013	-1.136	-0.016
			6:WIND (;	13:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	6:WIND (;
71	33	+ve	0.692	1.893	0.246	0.336	0.001	0.497
			17:ULS-B	13:ULS-B	17:ULS-B	18:ULS-B	11:2 DRU	13:ULS-B
			-0.355	-0.145	-0.006	-0.223	-0.027	-0.082
			18:ULS-B	14:WIND	11:2 DRU	17:ULS-B	18:ULS-B	14:WIND
	12	-ve	0.692	1.507	0.246	0.336	0.130	0.029
			17:ULS-B	13:ULS-B	17:ULS-B	18:ULS-B	17:ULS-B	3:SELFW
			-0.355	-0.155	-0.006	-0.223	-0.003	-0.523
			18:ULS-B	3:SELFW	11:2 DRU	17:ULS-B	2:SELFW	13:ULS-B
72	33	+ve	0.498	1.295	0.028	0.030	0.004	0.948
			17:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	14:WIND	18:ULS-B
			-0.963	-0.560	-0.004	-0.028	-0.019	-0.692
			18:ULS-B	6:WIND (;	14:WIND	18:ULS-B	17:ULS-B	17:ULS-B
	34	-ve	0.498	0.567	0.028	0.030	0.037	1.105
			17:ULS-B	14:WIND	17:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B
			-0.963	-1.301	-0.004	-0.028	-0.004	-0.838
			18:ULS-B	17:ULS-B	14:WIND	18:ULS-B	14:WIND	18:ULS-B
73	34	+ve	0.321	1.718	0.005	0.018	0.024	0.383
			16:ULS-B	13:ULS-B	15:2 DRU	7:SNOW	18:ULS-B	13:ULS-B
			-0.047	-0.030	-0.363	-0.045	-0.000	-0.001
			6:WIND (;	14:WIND	16:ULS-B	16:ULS-B	15:2 DRU	11:2 DRU
	13	-ve	0.321	1.332	0.005	0.018	0.003	0.033
			16:ULS-B	13:ULS-B	15:2 DRU	7:SNOW	15:2 DRU	3:SELFW
			-0.047	-0.164	-0.363	-0.045	-0.195	-0.532
			6:WIND (;	3:SELFW	16:ULS-B	16:ULS-B	16:ULS-B	13:ULS-B
74	34	+ve	2.770	0.036	0.784	0.018	0.882	0.016
			13:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	6:WIND (;
			-0.596	-0.329	-0.601	-0.022	-1.067	-0.401
			14:WIND	16:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	16:ULS-B
	2	-ve	2.881	0.036	0.784	0.018	0.972	0.455
			13:ULS-B	6:WIND (;	17:ULS-B	18:ULS-B	17:ULS-B	16:ULS-B
			-0.596	-0.329	-0.601	-0.022	-0.682	-0.077
			14:WIND	16:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;

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Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
75	3	+ve	3.506	0.351	0.932	0.015	0.811	0.456
			18:ULS-B	16:ULS-B	18:ULS-B	17:ULS-B	17:ULS-B	16:ULS-B
			-1.020	-0.049	-0.744	-0.018	-1.148	-0.065
			6:WIND (;	6:WIND (;	17:ULS-B	18:ULS-B	18:ULS-B	6:WIND (;
	35	-ve	3.396	0.351	0.932	0.015	1.275	0.062
			18:ULS-B	16:ULS-B	18:ULS-B	17:ULS-B	18:ULS-B	6:WIND (;
			-1.020	-0.049	-0.744	-0.018	-1.124	-0.457
			6:WIND (;	6:WIND (;	17:ULS-B	18:ULS-B	17:ULS-B	16:ULS-B
76	14	+ve	0.602	0.156	0.006	0.217	0.133	0.034
			17:ULS-B	3:SELFW	7:SNOW	17:ULS-B	17:ULS-B	6:WIND (;
			-0.282	-1.340	-0.254	-0.330	-0.003	-0.556
			14:WIND	13:ULS-B	17:ULS-B	18:ULS-B	2:SELFW	16:ULS-B
	35	-ve	0.602	0.004	0.006	0.217	0.001	0.443
			17:ULS-B	7:SNOW	7:SNOW	17:ULS-B	7:SNOW	13:ULS-B
			-0.282	-1.725	-0.254	-0.330	-0.026	-0.035
			14:WIND	13:ULS-B	17:ULS-B	18:ULS-B	18:ULS-B	14:WIND
77	35	+ve	0.495	1.285	0.004	0.027	0.019	0.941
			17:ULS-B	18:ULS-B	14:WIND	18:ULS-B	17:ULS-B	18:ULS-B
			-0.960	-0.554	-0.028	-0.028	-0.004	-0.685
			18:ULS-B	6:WIND (;	17:ULS-B	17:ULS-B	14:WIND	17:ULS-B
	36	-ve	0.495	0.560	0.004	0.027	0.004	1.092
			17:ULS-B	14:WIND	14:WIND	18:ULS-B	14:WIND	17:ULS-B
			-0.960	-1.291	-0.028	-0.028	-0.036	-0.824
			18:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B
78	36	+ve	2.941	0.315	0.781	0.021	0.868	0.418
			17:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B	18:ULS-B	13:ULS-B
			-0.737	-0.025	-0.598	-0.018	-1.053	-0.031
			14:WIND	14:WIND	18:ULS-B	18:ULS-B	17:ULS-B	14:WIND
	4	-ve	3.052	0.315	0.781	0.021	0.978	0.034
			17:ULS-B	13:ULS-B	17:ULS-B	17:ULS-B	17:ULS-B	14:WIND
			-0.737	-0.025	-0.598	-0.018	-0.688	-0.402
			14:WIND	14:WIND	18:ULS-B	18:ULS-B	18:ULS-B	13:ULS-B
79	36	+ve	0.290	1.887	0.363	0.046	0.000	0.438
			13:ULS-B	13:ULS-B	16:ULS-B	16:ULS-B	15:2 DRU	13:ULS-B
			-0.021	-0.177	-0.005	-0.018	-0.023	-0.048
			14:WIND	14:WIND	15:2 DRU	7:SNOW	18:ULS-B	14:WIND
	16	-ve	0.290	1.501	0.363	0.046	0.195	0.058
			13:ULS-B	13:ULS-B	16:ULS-B	16:ULS-B	16:ULS-B	14:WIND
			-0.021	-0.177	-0.005	-0.018	-0.003	-0.578
			14:WIND	14:WIND	15:2 DRU	7:SNOW	15:2 DRU	13:ULS-B
80	35	+ve	1.816	0.749	0.065	0.024	0.001	0.686
			18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B	11:2 DRU	18:ULS-B
			-1.549	-0.712	-0.001	-0.008	-0.046	-0.685
			17:ULS-B	17:ULS-B	11:2 DRU	3:SELFW	18:ULS-B	17:ULS-B
	16	-ve	1.816	0.660	0.065	0.024	0.090	0.894
			18:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B	18:ULS-B	17:ULS-B
			-1.549	-0.800	-0.001	-0.008	-0.001	-0.784
			17:ULS-B	17:ULS-B	11:2 DRU	3:SELFW	11:2 DRU	18:ULS-B

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Beam End Forces Envelope Cont...

Beam	Node	Envelope	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
81	13	+ve	1.806	0.814	0.001	0.008	0.089	0.912
			18:ULS-B	17:ULS-B	11:2 DRU	3:SELFW	18:ULS-B	17:ULS-B
			-1.540	-0.674	-0.064	-0.024	-0.001	-0.802
			17:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B	11:2 DRU	18:ULS-B
	33	-ve	1.806	0.726	0.001	0.008	0.001	0.698
			18:ULS-B	17:ULS-B	11:2 DRU	3:SELFW	11:2 DRU	18:ULS-B
			-1.540	-0.763	-0.064	-0.024	-0.045	-0.696
			17:ULS-B	18:ULS-B	18:ULS-B	16:ULS-B	18:ULS-B	17:ULS-B

Reactions

		Horizontal	Vertical	Horizontal	Moment		
Node	L/C	FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)
29	1:SELFWEIGH	-0.002	1.454	0.091	0.000	0.000	0.000
	2:SELFWEIGH	0.002	4.000	0.002	0.000	0.000	0.000
	3:SELFWEIGH	-0.001	4.350	-0.334	0.000	0.000	0.000
	4:SELFWEIGH	0.008	4.350	0.894	0.000	0.000	0.000
	5:LIVE LOAD (	0.045	21.961	4.268	0.000	0.000	0.000
	6:WIND (Z-DIF	-6.371	-6.897	-7.834	0.000	0.000	0.000
	7:SNOW	-0.004	3.600	-0.174	0.000	0.000	0.000
	8:SLS1 (Z-DIR	-6.988	32.203	-3.840	0.000	0.000	0.000
	9:SLS2 (-Z-DIF	7.103	47.228	14.134	0.000	0.000	0.000
	10:ULS-A1 (Z-I	-7.335	38.059	-3.836	0.000	0.000	0.000
	11:2 DRUNKEI	-0.666	-0.615	-0.753	0.000	0.000	0.000
	12:ULS-A2 (-Z-	7.460	53.836	15.036	0.000	0.000	0.000
	13:ULS-B1 (Z-I	-7.315	45.819	-2.013	0.000	0.000	0.000
	14:WIND (-Z-D	6.389	6.898	8.657	0.000	0.000	0.000
	15:2 DRUNKEI	0.664	0.615	0.729	0.000	0.000	0.000
	16:ULS-B2 (-Z-	7.480	61.596	16.859	0.000	0.000	0.000
	17:ULS-B3 (Z-I	-10.203	32.832	-7.459	0.000	0.000	0.000
	18:ULS-B4 (-Z-	10.334	54.817	18.834	0.000	0.000	0.000
30	1:SELFWEIGH	0.002	1.454	-0.091	0.000	0.000	0.000
	2:SELFWEIGH	-0.002	4.000	-0.002	0.000	0.000	0.000
	3:SELFWEIGH	0.001	4.350	0.334	0.000	0.000	0.000
	4:SELFWEIGH	-0.008	4.350	-0.892	0.000	0.000	0.000
	5:LIVE LOAD (	-0.045	21.959	-4.258	0.000	0.000	0.000
	6:WIND (Z-DIF	6.371	6.897	-3.259	0.000	0.000	0.000
	7:SNOW	0.004	3.600	0.173	0.000	0.000	0.000
	8:SLS1 (Z-DIR	6.988	47.225	-8.250	0.000	0.000	0.000
	9:SLS2 (-Z-DIF	-7.103	32.199	-2.017	0.000	0.000	0.000
	10:ULS-A1 (Z-I	7.335	53.832	-8.858	0.000	0.000	0.000
	11:2 DRUNKEI	0.666	0.615	-0.255	0.000	0.000	0.000
	12:ULS-A2 (-Z-	-7.460	38.055	-2.313	0.000	0.000	0.000
	13:ULS-B1 (Z-I	7.315	61.591	-10.676	0.000	0.000	0.000
	14:WIND (-Z-D	-6.389	-6.898	2.441	0.000	0.000	0.000
	15:2 DRUNKEI	-0.664	-0.615	0.279	0.000	0.000	0.000
	16:ULS-B2 (-Z-	-7.480	45.814	-4.131	0.000	0.000	0.000
	17:ULS-B3 (Z-I	10.203	54.813	-10.226	0.000	0.000	0.000
	18:ULS-B4 (-Z-	-10.334	32.828	-1.117	0.000	0.000	0.000

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Reactions Cont...

Node	L/C	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
	7:SNOW	0.000	3.600	-0.172	0.000	0.000	0.000
	8:SLS1 (Z-DIR	0.000	32.629	-1.575	0.000	0.000	0.000
	9:SLS2 (-Z-DIF	0.000	46.796	11.832	0.000	0.000	0.000
	10:ULS-A1 (Z-I	0.000	38.506	-1.459	0.000	0.000	0.000
	11:2 DRUNKEI	0.000	-0.575	-0.538	0.000	0.000	0.000
	12:ULS-A2 (-Z-	0.000	53.382	12.618	0.000	0.000	0.000
	13:ULS-B1 (Z-I	0.000	46.264	0.358	0.000	0.000	0.000
	14:WIND (-Z-C	0.000	6.509	6.586	0.000	0.000	0.000
	15:2 DRUNKEI	0.000	0.575	0.514	0.000	0.000	0.000
	16:ULS-B2 (-Z-	0.000	61.140	14.435	0.000	0.000	0.000
	17:ULS-B3 (Z-I	0.000	33.454	-4.152	0.000	0.000	0.000
	18:ULS-B4 (-Z-	0.000	54.187	15.484	0.000	0.000	0.000
32	1:SELFWEIGH	0.000	1.454	-0.091	0.000	0.000	0.000
	2:SELFWEIGH	0.000	4.000	-0.002	0.000	0.000	0.000
	3:SELFWEIGH	0.000	4.350	0.334	0.000	0.000	0.000
	4:SELFWEIGH	0.000	4.350	-0.893	0.000	0.000	0.000
	5:LIVE LOAD (	0.000	21.961	-4.264	0.000	0.000	0.000
	6:WIND (Z-DIF	0.000	6.509	-2.290	0.000	0.000	0.000
	7:SNOW	0.000	3.600	0.173	0.000	0.000	0.000
	8:SLS1 (Z-DIR	0.000	46.799	-7.187	0.000	0.000	0.000
	9:SLS2 (-Z-DIF	0.000	32.632	-3.097	0.000	0.000	0.000
	10:ULS-A1 (Z-I	0.000	53.385	-7.742	0.000	0.000	0.000
	11:2 DRUNKEI	0.000	0.575	-0.154	0.000	0.000	0.000
	12:ULS-A2 (-Z-	0.000	38.510	-3.447	0.000	0.000	0.000
	13:ULS-B1 (Z-I	0.000	61.145	-9.563	0.000	0.000	0.000
	14:WIND (-Z-C	0.000	-6.509	1.469	0.000	0.000	0.000
	15:2 DRUNKEI	0.000	-0.575	0.178	0.000	0.000	0.000
	16:ULS-B2 (-Z-	0.000	46.269	-5.268	0.000	0.000	0.000
	17:ULS-B3 (Z-I	0.000	54.191	-8.675	0.000	0.000	0.000
	18:ULS-B4 (-Z-	0.000	33.458	-2.688	0.000	0.000	0.000

Reaction Summary

	Node	L/C	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
Max FX	29	18:ULS-B4 (-Z-	**10.334**	54.817	18.834	0.000	0.000	0.000
Min FX	30	18:ULS-B4 (-Z-	**-10.334**	32.828	-1.117	0.000	0.000	0.000
Max FY	29	16:ULS-B2 (-Z-	7.480	**61.596**	16.859	0.000	0.000	0.000
Min FY	30	14:WIND (-Z-C	-6.389	**-6.898**	2.441	0.000	0.000	0.000
Max FZ	29	18:ULS-B4 (-Z-	10.334	54.817	**18.834**	0.000	0.000	0.000
Min FZ	30	13:ULS-B1 (Z-I	7.315	61.591	**-10.676**	0.000	0.000	0.000
Max MX	29	1:SELFWEIGH	-0.002	1.454	0.091	**0.000**	0.000	0.000
Min MX	29	1:SELFWEIGH	-0.002	1.454	0.091	**0.000**	0.000	0.000
Max MY	29	1:SELFWEIGH	-0.002	1.454	0.091	0.000	**0.000**	0.000
Min MY	29	1:SELFWEIGH	-0.002	1.454	0.091	0.000	**0.000**	0.000
Max MZ	29	1:SELFWEIGH	-0.002	1.454	0.091	0.000	0.000	**0.000**
Min MZ	29	1:SELFWEIGH	-0.002	1.454	0.091	0.000	0.000	**0.000**

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Reaction Envelope

Node	Env	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
29	+ve	10.334	61.596	18.834	0.000	0.000	0.000
29	+ve	Load: 18	Load: 16	Load: 18	-	-	-
29	-ve	-10.203	-6.897	-7.834	0.000	0.000	0.000
29	-ve	Load: 17	Load: 6	Load: 6	-	-	-
30	+ve	10.203	61.591	2.441	0.000	0.000	0.000
30	+ve	Load: 17	Load: 13	Load: 14	-	-	-
30	-ve	-10.334	-6.898	-10.676	0.000	0.000	0.000
30	-ve	Load: 18	Load: 14	Load: 13	-	-	-
31	+ve	0.000	61.140	15.484	0.000	0.000	0.000
31	+ve	-	Load: 16	Load: 18	-	-	-
31	-ve	0.000	-6.509	-5.769	0.000	0.000	0.000
31	-ve	-	Load: 6	Load: 6	-	-	-
32	+ve	0.000	61.145	1.469	0.000	0.000	0.000
32	+ve	-	Load: 13	Load: 14	-	-	-
32	-ve	0.000	-6.509	-9.563	0.000	0.000	0.000
32	-ve	-	Load: 14	Load: 13	-	-	-

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (cm^2)	Iz (cm^4)	Iy (cm^4)	Ix (cm^4)
2	TUB80804	TUB80804	0.316	1.000	0.316	STAB	16	12.100	116.000	116.000	180.000
3	TUB80804	TUB80804	0.702	1.000	0.702	STAB	16	12.100	116.000	116.000	180.000
4	TUB80804	TUB80804	0.397	1.000	0.397	STAB	17	12.100	116.000	116.000	180.000
5	TUB80804	TUB80804	0.707	1.000	0.707	STAB	13	12.100	116.000	116.000	180.000
6	TUB80804	TUB80804	0.315	1.000	0.315	STAB	16	12.100	116.000	116.000	180.000
7	TUB80804	TUB80804	0.693	1.000	0.693	STAB	13	12.100	116.000	116.000	180.000
8	TUB80804	TUB80804	0.232	1.000	0.232	VMIS	17	12.100	116.000	116.000	180.000
9	TUB80804	TUB80804	0.378	1.000	0.378	VMIS	17	12.100	116.000	116.000	180.000
10	TUB80804	TUB80804	0.261	1.000	0.261	VMIS	13	12.100	116.000	116.000	180.000
11	TUB80804	TUB80804	0.192	1.000	0.192	VMIS	13	12.100	116.000	116.000	180.000
12	TUB80804	TUB80804	0.297	1.000	0.297	STAB	18	12.100	116.000	116.000	180.000
13	TUB80804	TUB80804	0.683	1.000	0.683	STAB	16	12.100	116.000	116.000	180.000
14	TUB80804	TUB80804	0.428	1.000	0.428	STAB	17	12.100	116.000	116.000	180.000
15	TUB80804	TUB80804	0.207	1.000	0.207	VMIS	16	12.100	116.000	116.000	180.000
16	TUB80804	TUB80804	0.339	1.000	0.339	VMIS	16	12.100	116.000	116.000	180.000
17	TUB80804	TUB80804	0.302	1.000	0.302	STAB	18	12.100	116.000	116.000	180.000
18	TUB80804	TUB80804	0.389	1.000	0.389	STAB	13	12.100	116.000	116.000	180.000
19	TUB80804	TUB80804	0.261	1.000	0.261	VMIS	13	12.100	116.000	116.000	180.000
20	TUB80804	TUB80804	0.336	1.000	0.336	VMIS	16	12.100	116.000	116.000	180.000
21	TUB80804	TUB80804	0.168	1.000	0.168	VMIS	16	12.100	116.000	116.000	180.000
22	TUB80804	TUB80804	0.383	1.000	0.383	STAB	13	12.100	116.000	116.000	180.000
23	TUB80804	TUB80804	0.369	1.000	0.369	VMIS	17	12.100	116.000	116.000	180.000
24	TUB80804	TUB80804	0.328	1.000	0.328	STAB	13	12.100	116.000	116.000	180.000
25	TUB80804	TUB80804	0.327	1.000	0.327	STAB	13	12.100	116.000	116.000	180.000
26	TUB80804	TUB80804	0.315	1.000	0.315	STAB	16	12.100	116.000	116.000	180.000
27	TUB80804	TUB80804	0.320	1.000	0.320	STAB	16	12.100	116.000	116.000	180.000
28	TUB80804	TUB80804	0.321	1.000	0.321	STAB	16	12.100	116.000	116.000	180.000
29	TUB80804	TUB80804	0.315	1.000	0.315	STAB	16	12.100	116.000	116.000	180.000

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Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (cm^2)	Iz (cm^4)	Iy (cm^4)	Ix (cm^4)
30	TUB80804	TUB80804	0.396	1.000	0.396	VMIS	13	12.100	116.000	116.000	180.000
31	TUB80804	TUB80804	0.408	1.000	0.408	VMIS	13	12.100	116.000	116.000	180.000
32	TUB80804	TUB80804	0.271	1.000	0.271	VMIS	13	12.100	116.000	116.000	180.000
33	TUB80804	TUB80804	0.399	1.000	0.399	VMIS	16	12.100	116.000	116.000	180.000
34	TUB80804	TUB80804	0.396	1.000	0.396	VMIS	16	12.100	116.000	116.000	180.000
35	TUB80804	TUB80804	0.252	1.000	0.252	VMIS	16	12.100	116.000	116.000	180.000
36	TUB80804	TUB80804	0.315	1.000	0.315	STAB	18	12.100	116.000	116.000	180.000
37	TUB80804	TUB80804	0.271	1.000	0.271	STAB	13	12.100	116.000	116.000	180.000
38	TUB80804	TUB80804	0.396	1.000	0.396	VMIS	16	12.100	116.000	116.000	180.000
39	TUB80804	TUB80804	0.312	1.000	0.312	STAB	18	12.100	116.000	116.000	180.000
40	TUB80804	TUB80804	0.414	1.000	0.414	VMIS	13	12.100	116.000	116.000	180.000
41	TUB80804	TUB80804	0.269	1.000	0.269	STAB	13	12.100	116.000	116.000	180.000
42	TUB80804	TUB80804	0.213	1.000	0.213	STAB	18	12.100	116.000	116.000	180.000
43	TUB80804	TUB80804	0.259	1.000	0.259	STAB	17	12.100	116.000	116.000	180.000
44	TUB80804	TUB80804	0.215	1.000	0.215	STAB	18	12.100	116.000	116.000	180.000
45	TUB80804	TUB80804	0.505	1.000	0.505	STAB	16	12.100	116.000	116.000	180.000
46	TUB80804	TUB80804	0.470	1.000	0.470	STAB	13	12.100	116.000	116.000	180.000
47	TUB80804	TUB80804	0.499	1.000	0.499	STAB	16	12.100	116.000	116.000	180.000
48	TUB80804	TUB80804	0.318	1.000	0.318	STAB	17	12.100	116.000	116.000	180.000
49	TUB80804	TUB80804	0.230	1.000	0.230	STAB	18	12.100	116.000	116.000	180.000
50	TUB80804	TUB80804	0.156	1.000	0.156	STAB	18	12.100	116.000	116.000	180.000
51	TUB80804	TUB80804	0.241	1.000	0.241	STAB	17	12.100	116.000	116.000	180.000
52	TUB80804	TUB80804	0.125	1.000	0.125	STAB	17	12.100	116.000	116.000	180.000
53	TUB80804	TUB80804	0.072	1.000	0.072	STAB	18	12.100	116.000	116.000	180.000
54	TUB80804	TUB80804	0.074	1.000	0.074	STAB	18	12.100	116.000	116.000	180.000
55	TUB80804	TUB80804	0.128	1.000	0.128	STAB	17	12.100	116.000	116.000	180.000
56	TUB80804	TUB80804	0.345	1.000	0.345	STAB	18	12.100	116.000	116.000	180.000
57	TUB80804	TUB80804	0.294	1.000	0.294	STAB	18	12.100	116.000	116.000	180.000
58	TUB80804	TUB80804	0.310	1.000	0.310	VMIS	16	12.100	116.000	116.000	180.000
59	TUB80804	TUB80804	0.346	1.000	0.346	STAB	16	12.100	116.000	116.000	180.000
60	TUB80804	TUB80804	0.343	1.000	0.343	STAB	16	12.100	116.000	116.000	180.000
61	TUB80804	TUB80804	0.307	1.000	0.307	VMIS	16	12.100	116.000	116.000	180.000
62	TUB80804	TUB80804	0.305	1.000	0.305	VMIS	13	12.100	116.000	116.000	180.000
63	TUB80804	TUB80804	0.356	1.000	0.356	STAB	13	12.100	116.000	116.000	180.000
64	TUB80804	TUB80804	0.360	1.000	0.360	STAB	13	12.100	116.000	116.000	180.000
65	TUB80804	TUB80804	0.307	1.000	0.307	VMIS	13	12.100	116.000	116.000	180.000
66	TUB80804	TUB80804	0.679	1.000	0.679	VMIS	18	12.100	116.000	116.000	180.000
67	TUB80804	TUB80804	0.530	1.000	0.530	VMIS	17	12.100	116.000	116.000	180.000
68	TUB80804	TUB80804	0.371	1.000	0.371	VMIS	13	12.100	116.000	116.000	180.000
69	TUB80804	TUB80804	0.452	1.000	0.452	VMIS	16	12.100	116.000	116.000	180.000
70	TUB80804	TUB80804	0.276	1.000	0.276	STAB	18	12.100	116.000	116.000	180.000
71	TUB80804	TUB80804	0.101	1.000	0.101	VMIS	16	12.100	116.000	116.000	180.000
72	TUB80804	TUB80804	0.177	1.000	0.177	STAB	17	12.100	116.000	116.000	180.000
73	TUB80804	TUB80804	0.107	1.000	0.107	STAB	13	12.100	116.000	116.000	180.000
74	TUB80804	TUB80804	0.231	1.000	0.231	STAB	17	12.100	116.000	116.000	180.000
75	TUB80804	TUB80804	0.288	1.000	0.288	STAB	18	12.100	116.000	116.000	180.000
76	TUB80804	TUB80804	0.107	1.000	0.107	VMIS	16	12.100	116.000	116.000	180.000
77	TUB80804	TUB80804	0.175	1.000	0.175	STAB	17	12.100	116.000	116.000	180.000
78	TUB80804	TUB80804	0.243	1.000	0.243	STAB	17	12.100	116.000	116.000	180.000
79	TUB80804	TUB80804	0.115	1.000	0.115	STAB	13	12.100	116.000	116.000	180.000

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Job Title Skywalk TUB80804	Job No 1	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
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Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (cm^2)	Iz (cm^4)	Iy (cm^4)	Ix (cm^4)
80	TUB80804	TUB80804	0.146	1.000	0.146	STAB	18	12.100	116.000	116.000	180.000
81	TUB80804	TUB80804	0.149	1.000	0.149	STAB	18	12.100	116.000	116.000	180.000

Statics Check Results

L/C		FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)
1:SELFWEIGHT	Loads	0.000	-5.816	0.000	5.816	0.000	-24.425
1:SELFWEIGHT	Reactions	-0.000	5.816	-0.000	-5.816	-0.000	24.425
	Difference	0.000	0.000	-0.000	-0.000	0.000	0.000
2:SELFWEIGHT	Loads	0.000	-16.000	0.000	16.000	0.000	-67.200
2:SELFWEIGHT	Reactions	0.000	16.000	-0.000	-16.000	0.000	67.200
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
3:SELFWEIGHT	Loads	0.000	-17.400	0.000	17.400	0.000	-73.080
3:SELFWEIGHT	Reactions	0.000	17.400	-0.000	-17.400	0.000	73.080
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
4:SELFWEIGHT	Loads	0.000	-17.400	0.000	17.400	0.000	-73.080
4:SELFWEIGHT	Reactions	0.000	17.400	-0.000	-17.400	0.000	73.080
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
5:LIVE LOAD C3	Loads	0.000	-87.840	0.000	87.840	0.000	-368.928
5:LIVE LOAD C3	Reactions	0.000	87.840	0.000	-87.840	-0.000	368.928
	Difference	0.000	0.000	0.000	0.000	-0.000	0.000
6:WIND (Z-DIRE	Loads	0.000	0.000	19.152	24.898	-80.438	0.000
6:WIND (Z-DIRE	Reactions	0.000	0.000	-19.152	-24.898	80.438	0.000
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
7:SNOW	Loads	0.000	-14.400	0.000	14.400	0.000	-60.480
7:SNOW	Reactions	0.000	14.400	-0.000	-14.400	0.000	60.480
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
11:2 DRUNKEN F	Loads	0.000	0.000	1.700	2.210	-7.140	0.000
11:2 DRUNKEN F	Reactions	0.000	0.000	-1.700	-2.210	7.140	0.000
	Difference	0.000	0.000	-0.000	0.000	0.000	0.000
14:WIND (-Z-DIR	Loads	0.000	0.000	-19.152	-24.898	80.438	0.000
14:WIND (-Z-DIR	Reactions	-0.000	0.000	19.152	24.898	-80.438	-0.000
	Difference	-0.000	0.000	0.000	-0.000	-0.000	-0.000
15:2 DRUNKEN I	Loads	0.000	0.000	-1.700	-2.210	7.140	0.000
15:2 DRUNKEN I	Reactions	-0.000	0.000	1.700	2.210	-7.140	-0.000
	Difference	-0.000	0.000	0.000	-0.000	-0.000	-0.000

University of Stavanger Universitetet i Stavanger Software licensed to TOSHIBA	Job No 1	Sheet No	Rev
	Part		
Job Title Skywalk TUB80804	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Steel Design (Track 2) Beam 3 Check 1

```
DETAILS FOR CHECKING ACCORDING TO NS3472
                (VERSION 06002)
MEMBER NO          :       3
MEMBER TYPE        : TUBE
SECTION : TUB80804                  (EUROPEAN SECTIONS)
GOVERNING LOADCASE  :   16

  MEMBER PROPERTY            UNITS CM
  ---------------
  Ax    :        12.1     iy    :         3.1
  Ay    :         6.4     iz    :         3.1
  Az    :         6.4     Sy    :        29.0
  Ix    :  1.8000E+02     Sz    :        29.0
  Iy    :       116.0     Iw    :  0.0000E+00
  Iz    :       116.0     Lw    :       266.8

  MATERIAL DATA              UNITS NEWTON MMS
  ---------------
  E     :       68948.     Gamma   :     1.100
  Fy    :   250.000        Fd      :   227.272
  lamfy :    52.172        Gamma mk:     1.000
  BUCKLING PARAMETERS        UNITS KNEWTON METERS
  -------------------
  STRONG AXIS                WEAK AXIS              LATERAL BUCKLING
  L     :         2.668      L     :         2.668    L     :         2.668
  beta  :         1.000      beta  :         1.000    ny    :         1.000
  lambda:        86.179      lambda:        86.179    alfaLT:         0.490
  lambb :         1.652      lambb :         1.652    Mvd   :         6.591
  curve :       H            curve :       H
  ksi   :         0.321      ksi   :         0.321
  n/ksi :         0.518      n/ksi :         0.518
  betaM :         2.405      betaM :         2.334
  k     :         0.511      k     :         0.511
  m     :  5.451839E-02      m     :  9.922352E-02

  FORCES                     UNITS KNEWTON METERS
  ---------------
  STRONG AXIS                WEAK AXIS/BUCKLING
  Fx    :        52.764 C    Fx    :        52.764 C
  Ms    :         0.318      Ms    :         0.499
  Mm    :        -0.029      Mm    :        -0.077
  Me    :         0.359      Me    :         0.654
  psi   : -8.837862E-01      psi   : -7.632887E-01
  Mmax  :         0.359      Mmax  :         0.654
  IRx   :         0.597      IRx   :         0.597
  IRm   :         0.079      IRm   :         0.105
  IRtot :         0.676      IRtot :         0.702

  YIELD CHECK
  -----------
  STRESS : NEW MMS           FORCES: KNEW METERS
  STRESS AT POINT :   3      FORCES AT SECTION         2.668
  sigax :        43.606          Fx    :        52.764 C
  sigb  :        33.194          Fy    :        -0.241
  tau   :         0.838          Fz    :         0.432
  tors  :         0.590          Mx    :        -0.028
  sige  :        76.840          My    :         0.654
  IR    :         0.338          Mz    :         0.359

  Governing interaction ratio            0.702
3      52.76 C         0.5      -0.1       0.7
```

University of Stavanger Universitetet i Stavanger Software licensed to TOSHIBA	Job No 1	Sheet No	Rev
	Part		
Job Title Skywalk TUB80804	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Steel Design (Track 2) Beam 5 Check 1

```
DETAILS FOR CHECKING ACCORDING TO NS3472
                (VERSION 06002)
MEMBER NO          :      5
MEMBER TYPE        : TUBE
SECTION : TUB80804                (EUROPEAN SECTIONS)
GOVERNING LOADCASE  :   13

  MEMBER PROPERTY            UNITS CM
  ---------------
  Ax    :        12.1     iy    :         3.1
  Ay    :         6.4     iz    :         3.1
  Az    :         6.4     Sy    :        29.0
  Ix    : 1.8000E+02      Sz    :        29.0
  Iy    :       116.0     Iw    : 0.0000E+00
  Iz    :       116.0     Lw    :       266.8

  MATERIAL DATA              UNITS NEWTON MMS
  ---------------
  E     :       68948.     Gamma   :     1.100
  Fy    :   250.000        Fd      :   227.272
  lamfy :    52.172        Gamma mk:     1.000
  BUCKLING PARAMETERS        UNITS KNEWTON METERS
  -------------------
  STRONG AXIS                WEAK AXIS              LATERAL BUCKLING
  L     :         2.668      L     :         2.668    L     :         2.668
  beta  :         1.000      beta  :         1.000    ny    :         1.000
  lambda:        86.179      lambda:        86.179    alfaLT:         0.490
  lambb :         1.652      lambb :         1.652    Mvd   :         6.591
  curve :       H            curve :       H
  ksi   :         0.321      ksi   :         0.321
  n/ksi :         0.363      n/ksi :         0.363
  betaM :         2.454      betaM :         2.500
  k     :         0.504      k     :         0.504
  m     : 4.857510E-02       m     : 1.042973E-01

  FORCES                     UNITS KNEWTON METERS
  ---------------
  STRONG AXIS                WEAK AXIS/BUCKLING
  Fx    :        53.517 C    Fx    :        53.517 C
  Ms    :        -0.320      Ms    :        -0.687
  Mm    :        -0.015      Mm    :         0.000
  Me    :        -0.307      Me    :        -0.687
  psi   : -9.575208E-01      psi   : -9.999400E-01
  Mmax  :         0.320      Mmax  :         0.687
  IRx   :         0.606      IRx   :         0.606
  IRm   :         0.077      IRm   :         0.101
  IRtot :         0.683      IRtot :         0.707

  YIELD CHECK
  -----------
  STRESS : NEW MMS           FORCES: KNEW METERS
  STRESS AT POINT :   3      FORCES AT SECTION         0.000
  sigax :        44.229          Fx    :        53.517 C
  sigb  :        33.007          Fy    :        -0.222
  tau   :         0.918          Fz    :         0.515
  tors  :         0.558          Mx    :         0.026
  sige  :        77.277          My    :        -0.687
  IR    :         0.340          Mz    :        -0.320

  Governing interaction ratio              0.707
5      53.52 C        -0.7       0.0       -0.7
```

University of Stavanger Universitetet i Stavanger Software licensed to TOSHIBA	Job No 1	Sheet No	Rev
	Part		
Job Title Skywalk TUB80804	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Steel Design (Track 2) Beam 7 Check 1

```
DETAILS FOR CHECKING ACCORDING TO NS3472
                (VERSION 06002)
MEMBER NO          :       7
MEMBER TYPE        : TUBE
SECTION : TUB80804                  (EUROPEAN SECTIONS)
GOVERNING LOADCASE  :   13

  MEMBER PROPERTY            UNITS CM
  ---------------
  Ax    :         12.1     iy    :          3.1
  Ay    :          6.4     iz    :          3.1
  Az    :          6.4     Sy    :         29.0
  Ix    :  1.8000E+02     Sz    :         29.0
  Iy    :        116.0     Iw    :  0.0000E+00
  Iz    :        116.0     Lw    :        266.8

  MATERIAL DATA              UNITS NEWTON MMS
  ---------------
  E     :        68948.     Gamma   :      1.100
  Fy    :   250.000         Fd      :    227.272
  lamfy :    52.172         Gamma mk:      1.000
  BUCKLING PARAMETERS        UNITS KNEWTON METERS
  -------------------
  STRONG AXIS                WEAK AXIS              LATERAL BUCKLING
  L     :          2.668     L     :          2.668     L     :          2.668
  beta  :          1.000     beta  :          1.000     ny    :          1.000
  lambda:         86.179     lambda:         86.179     alfaLT:          0.490
  lambb :          1.652     lambb :          1.652     Mvd   :          6.591
  curve :       H            curve :       H
  ksi   :          0.321     ksi   :          0.321
  n/ksi :          0.368     n/ksi :          0.368
  betaM :          2.327     betaM :          2.486
  k     :          0.508     k     :          0.508
  m     :  3.768931E-02     m     :  1.056122E-01

  FORCES                     UNITS KNEWTON METERS
  ---------------
  STRONG AXIS                WEAK AXIS/BUCKLING
  Fx    :         53.185 C   Fx    :         53.185 C
  Ms    :          0.248     Ms    :          0.696
  Mm    :          0.019     Mm    :          0.007
  Me    :          0.194     Me    :          0.683
  psi   : -7.820115E-01     psi   : -9.807065E-01
  Mmax  :          0.248     Mmax  :          0.696
  IRx   :          0.602     IRx   :          0.602
  IRm   :          0.073     IRm   :          0.091
  IRtot :          0.675     IRtot :          0.693

  YIELD CHECK
  -----------
  STRESS : NEW MMS           FORCES: KNEW METERS
  STRESS AT POINT :    3     FORCES AT SECTION          0.000
  sigax :         43.955        Fx    :         53.185 C
  sigb  :         30.940        Fy    :          0.179
  tau   :          0.866        Fz    :         -0.517
  tors  :          0.550        Mx    :         -0.026
  sige  :         74.935        My    :          0.696
  IR    :          0.330        Mz    :          0.248

  Governing interaction ratio              0.693
7      53.19 C          0.7       0.0       0.7
```

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	Part		
Job Title Skywalk TUB80804	Ref		
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Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Steel Design (Track 2) Beam 13 Check 1

```
DETAILS FOR CHECKING ACCORDING TO NS3472
                (VERSION 06002)
MEMBER NO          :     13
MEMBER TYPE        : TUBE
SECTION : TUB80804                (EUROPEAN SECTIONS)
GOVERNING LOADCASE  :   16

  MEMBER PROPERTY            UNITS CM
  ---------------
  Ax    :        12.1     iy    :         3.1
  Ay    :         6.4     iz    :         3.1
  Az    :         6.4     Sy    :        29.0
  Ix    :  1.8000E+02     Sz    :        29.0
  Iy    :       116.0     Iw    :  0.0000E+00
  Iz    :       116.0     Lw    :       266.8

  MATERIAL DATA              UNITS NEWTON MMS
  ---------------
  E     :       68948.     Gamma   :     1.100
  Fy    :   250.000        Fd      :   227.272
  lamfy :    52.172        Gamma mk:     1.000
  BUCKLING PARAMETERS        UNITS KNEWTON METERS
  -------------------
  STRONG AXIS                WEAK AXIS              LATERAL BUCKLING
  L     :         2.668      L     :         2.668    L     :         2.668
  beta  :         1.000      beta  :         1.000    ny    :         1.000
  lambda:        86.179      lambda:        86.179    alfaLT:         0.490
  lambb :         1.652      lambb :         1.652    Mvd   :         6.591
  curve :       H            curve :       H
  ksi   :         0.321      ksi   :         0.321
  n/ksi :         0.513      n/ksi :         0.513
  betaM :         2.418      betaM :         2.352
  k     :         0.515      k     :         0.515
  m     :  3.975794E-02      m     :  9.670737E-02

  FORCES                     UNITS KNEWTON METERS
  ---------------
  STRONG AXIS                WEAK AXIS/BUCKLING
  Fx    :        52.409 C    Fx    :        52.409 C
  Ms    :         0.262      Ms    :        -0.502
  Mm    :         0.003      Mm    :         0.068
  Me    :         0.239      Me    :        -0.637
  psi   : -9.103959E-01      psi   : -7.879567E-01
  Mmax  :         0.262      Mmax  :         0.637
  IRx   :         0.593      IRx   :         0.593
  IRm   :         0.070      IRm   :         0.090
  IRtot :         0.663      IRtot :         0.683

  YIELD CHECK
  -----------
  STRESS : NEW MMS           FORCES: KNEW METERS
  STRESS AT POINT :   3      FORCES AT SECTION         2.668
  sigax :        43.313          Fx    :       52.409 C
  sigb  :        28.695          Fy    :       -0.175
  tau   :         0.749          Fz    :       -0.427
  tors  :         0.541          Mx    :        0.026
  sige  :        72.042          My    :       -0.637
  IR    :         0.317          Mz    :        0.239

  Governing interaction ratio            0.683
13      52.41 C       -0.5       0.1      -0.6
```

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	Part		
Job Title Skywalk TUB80804	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB80804.std	Date/Time 04-Jun-2012 20:56	

Steel Design (Track 2) Beam 45 Check 1

```
DETAILS FOR CHECKING ACCORDING TO NS3472
                (VERSION 06002)
MEMBER NO          :     45
MEMBER TYPE        : TUBE
SECTION : TUB80804                (EUROPEAN SECTIONS)
GOVERNING LOADCASE  :   16

     MEMBER PROPERTY            UNITS CM
     ---------------
     Ax    :        12.1     iy    :         3.1
     Ay    :         6.4     iz    :         3.1
     Az    :         6.4     Sy    :        29.0
     Ix    : 1.8000E+02      Sz    :        29.0
     Iy    :       116.0     Iw    : 0.0000E+00
     Iz    :       116.0     Lw    :       200.0

     MATERIAL DATA              UNITS NEWTON MMS
     ---------------
     E     :       68948.     Gamma   :     1.100
     Fy    :   250.000        Fd      :   227.272
     lamfy :    52.172        Gamma mk:     1.000
     BUCKLING PARAMETERS       UNITS KNEWTON METERS
     -------------------
     STRONG AXIS               WEAK AXIS              LATERAL BUCKLING
     L     :         2.000     L     :         2.000    L     :         2.000
     beta  :         1.000     beta  :         1.000    ny    :         1.000
     lambda:        64.594     lambda:        64.594    alfaLT:         0.490
     lambb :         1.238     lambb :         1.238    Mvd   :         6.591
     curve :      H            curve :      H
     ksi   :         0.517     ksi   :         0.517
     n/ksi :         0.029     n/ksi :         0.029
     betaM :         1.375     betaM :         2.449
     k     :         1.024     k     :         0.986
     m     : 4.664287E-01      m     : 9.920619E-03

     FORCES                    UNITS KNEWTON METERS
     ---------------
     STRONG AXIS               WEAK AXIS/BUCKLING
     Fx    :         2.438 C   Fx    :         2.438 C
     Ms    :         3.074     Ms    :         0.065
     Mm    :        -1.981     Mm    :         0.002
     Me    :        -0.805     Me    :         0.061
     psi   : 2.619999E-01      psi   : -9.277995E-01
     Mmax  :         3.074     Mmax  :         0.065
     IRx   :         0.017     IRx   :         0.017
     IRm   :         0.487     IRm   :         0.476
     IRtot :         0.505     IRtot :         0.493

     YIELD CHECK
     -----------
     STRESS : NEW MMS          FORCES: KNEW METERS
     STRESS AT POINT :   3     FORCES AT SECTION         0.000
     sigax :         2.015        Fx    :         2.438 C
     sigb  :       102.848        Fy    :         8.977
     tau   :        11.253        Fz    :        -0.063
     tors  :         0.215        Mx    :        -0.010
     sige  :       106.728        My    :         0.065
     IR    :         0.470        Mz    :         3.074

     Governing interaction ratio            0.505
45   2.44 C          0.1       0.0       0.1
```

APPENDIX IV – STAAD PRO V8I ANALYSIS JOINTS

(26 Pages to follow)

Title	Pages
STAAD Pro v8i analysis TUB70705	26

University of Stavanger Software licensed to TOSHIBA	Job No 2	Sheet No	Rev
	Part		
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Job Information

	Engineer	Checked	Approved
Name:	a.aasgaard		
Date:	03-May-12		

Structure Type	SPACE FRAME

Number of Nodes	32	Highest Node	36
Number of Elements	80	Highest Beam	81

Number of Basic Load Cases	10
Number of Combination Load Cases	8

Included in this printout are data for:

Beams	7,8,13,14,15,30,31,40,46,49,50,5

Included in this printout are results for load cases:

Type	L/C	Name
Combination	8	SLS1 (Z)
Combination	9	SLS2 (-Z)
Combination	10	ULS-A1 (Z)
Combination	12	ULS-A2 (-Z)
Combination	13	ULS-B1 (Z)
Combination	16	ULS-B2 (-Z)
Combination	17	ULS-B3 (Z)
Combination	18	ULS-B4 (-Z)

Beams

Beam	Node A	Node B	Length (m)	Property	β (degrees)
7	13	2	2.668	1	0
8	2	6	0.600	1	0
13	12	1	2.668	1	0
14	1	2	2.000	1	0
15	1	5	0.600	1	0
30	23	24	1.800	1	0
31	24	25	1.800	1	0
40	24	21	2.600	1	0
46	27	24	2.000	1	0
49	26	24	2.691	1	0
50	24	28	2.691	1	0
56	1	6	2.088	1	0
70	1	33	2.600	1	0
74	34	2	2.600	1	0

Section Properties

Prop	Section	Area (cm^2)	I_{yy} (cm^4)	I_{zz} (cm^4)	J (cm^4)	Material
1	TUBE	13.000	92.083	92.083	137.312	ALUMINUM

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Materials

Mat	Name	E (kN/mm²)	ν	Density (kg/m³)	α (1/°K)
1	STEEL	205.000	0.300	7.83E+3	12E -6
2	STAINLESSSTEEL	197.930	0.300	7.83E+3	18E -6
3	ALUMINUM	68.948	0.330	2.71E+3	23E -6
4	CONCRETE	21.718	0.170	2.4E+3	10E -6

Beam Combined Axial and Bending Stresses

Beam	L/C	d	Corner 1 (N/mm²)	Corner 2 (N/mm²)	Corner 3 (N/mm²)	Corner 4 (N/mm²)	Max Tens (N/mm²)	Max Comp (N/mm²)
7	8:SLS1 (Z)	0.000	2.101	50.956	61.453	12.599	0.000	61.453
		0.267	7.704	47.187	55.866	16.383	0.000	55.866
		0.534	13.284	43.395	50.301	20.190	0.000	50.301
		0.800	18.841	39.581	44.759	24.019	0.000	44.759
		1.067	24.376	35.745	39.239	27.871	0.000	39.239
		1.334	29.889	31.886	33.742	31.745	0.000	33.742
		1.601	35.375	28.001	28.271	35.645	0.000	35.645
		1.868	40.839	24.093	22.822	39.568	0.000	40.839
		2.135	46.281	20.163	17.395	43.513	0.000	46.281
		2.401	51.700	16.211	11.991	47.480	0.000	51.700
		2.668	57.097	12.236	6.610	51.471	0.000	57.097
	9:SLS2 (-Z)	0.000	38.485	-5.596	10.134	54.214	-5.596	54.214
		0.267	36.532	0.076	12.102	48.558	0.000	48.558
		0.534	34.556	5.725	14.093	42.924	0.000	42.924
		0.800	32.559	11.352	16.106	37.313	0.000	37.313
		1.067	30.538	16.956	18.142	31.724	0.000	31.724
		1.334	28.495	22.538	20.200	26.157	0.000	28.495
		1.601	26.427	28.094	22.283	20.616	0.000	28.094
		1.868	24.336	33.627	24.390	15.098	0.000	33.627
		2.135	22.222	39.138	26.519	9.603	0.000	39.138
		2.401	20.086	44.627	28.670	4.129	0.000	44.627
		2.668	17.927	50.092	30.844	-1.321	-1.321	50.092
	10:ULS-A1 (Z)	0.000	3.694	56.320	69.015	16.389	0.000	69.015
		0.267	9.870	52.439	62.860	20.290	0.000	62.860
		0.534	16.015	48.528	56.735	24.222	0.000	56.735
		0.800	22.129	44.586	50.641	28.184	0.000	50.641
		1.067	28.214	40.614	44.577	32.177	0.000	44.577
		1.334	34.268	36.612	38.544	36.200	0.000	38.544
		1.601	40.287	32.575	32.546	40.257	0.000	40.287
		1.868	46.275	28.507	26.577	44.345	0.000	46.275
		2.135	52.234	24.410	20.640	48.464	0.000	52.234
		2.401	58.162	20.281	14.732	52.613	0.000	58.162
		2.668	64.059	16.123	8.855	56.792	0.000	64.059
	12:ULS-A2 (-Z	0.000	41.897	-3.059	15.130	60.085	-3.059	60.085
		0.267	40.139	2.973	16.908	54.074	0.000	54.074
		0.534	38.351	8.975	18.716	48.093	0.000	48.093
		0.800	36.533	14.946	20.555	42.142	0.000	42.142
		1.067	34.684	20.887	22.425	36.222	0.000	36.222
		1.334	32.805	26.797	24.324	30.332	0.000	32.805
		1.601	30.891	32.673	26.259	24.477	0.000	32.673
		1.868	28.947	38.518	28.224	18.652	0.000	38.518

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		2.135	26.972	44.333	30.219	12.858	0.000	44.333
		2.401	24.967	50.117	32.244	7.094	0.000	50.117
		2.668	22.931	55.872	34.300	1.360	0.000	55.872
	13:ULS-B1 (Z)	0.000	9.157	60.135	74.342	23.363	0.000	74.342
		0.267	15.473	56.445	68.044	27.071	0.000	68.044
		0.534	21.761	52.729	61.774	30.806	0.000	61.774
		0.800	28.023	48.985	55.530	34.568	0.000	55.530
		1.067	34.258	45.214	49.314	38.357	0.000	49.314
		1.334	40.466	41.416	43.124	42.173	0.000	43.124
		1.601	46.642	37.588	36.966	46.020	0.000	46.642
		1.868	52.792	33.732	30.834	49.894	0.000	52.792
		2.135	58.915	29.850	24.730	53.795	0.000	58.915
		2.401	65.011	25.940	18.652	57.723	0.000	65.011
		2.668	71.080	22.003	12.601	61.678	0.000	71.080
	16:ULS-B2 (-Z	0.000	47.359	0.756	20.457	67.060	0.000	67.060
		0.267	45.742	6.979	22.092	60.855	0.000	60.855
		0.534	44.098	13.175	23.755	54.677	0.000	54.677
		0.800	42.426	19.344	25.444	48.527	0.000	48.527
		1.067	40.728	25.486	27.161	42.403	0.000	42.403
		1.334	39.003	31.601	28.905	36.306	0.000	39.003
		1.601	37.247	37.685	30.679	30.240	0.000	37.685
		1.868	35.463	43.743	32.480	24.201	0.000	43.743
		2.135	33.653	49.773	34.309	18.189	0.000	49.773
		2.401	31.816	55.776	36.164	12.204	0.000	55.776
		2.668	29.952	61.752	38.047	6.246	0.000	61.752
	17:ULS-B3 (Z)	0.000	-3.926	66.062	76.736	6.747	-3.926	76.736
		0.267	3.576	60.267	69.251	12.560	0.000	69.251
		0.534	11.051	54.445	61.794	18.401	0.000	61.794
		0.800	18.499	48.596	54.365	24.268	0.000	54.365
		1.067	25.921	42.720	46.962	30.163	0.000	46.962
		1.334	33.315	36.817	39.586	36.084	0.000	39.586
		1.601	40.678	30.883	32.240	42.036	0.000	42.036
		1.868	48.015	24.922	24.922	48.015	0.000	48.015
		2.135	55.324	18.934	17.631	54.022	0.000	55.324
		2.401	62.606	12.919	10.367	60.055	0.000	62.606
		2.668	69.862	6.877	3.130	66.115	0.000	69.862
	18:ULS-B4 (-Z	0.000	49.451	-16.787	1.501	67.740	-16.787	67.740
		0.267	45.871	-8.754	5.100	59.725	-8.754	59.725
		0.534	42.264	-0.749	8.725	51.738	-0.749	51.738
		0.800	38.629	7.230	12.378	43.777	0.000	43.777
		1.067	34.968	15.182	16.058	35.844	0.000	35.844
		1.334	31.280	23.106	19.764	27.937	0.000	31.280
		1.601	27.560	31.000	23.502	20.062	0.000	31.000
		1.868	23.814	38.867	27.266	12.213	0.000	38.867
		2.135	20.041	46.707	31.058	4.392	0.000	46.707
		2.401	16.240	54.520	34.876	-3.403	-3.403	54.520
		2.668	12.413	62.306	38.722	-11.170	-11.170	62.306
8	8:SLS1 (Z)	0.000	-33.674	-32.733	28.922	27.981	-33.674	28.922
		0.060	-28.399	-28.402	23.647	23.650	-28.402	23.650
		0.120	-23.528	-24.476	18.776	19.724	-24.476	19.724

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Job Title: Skywalk TUB70705	Job No: 2	Sheet No:	Rev:
	Part:		
	Ref:		
	By: a.aasgaard	Date: 03-May-12	Chd:
Client:	File: Skywalk TUB70705.std	Date/Time: 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.180	-19.061	-20.954	14.309	16.202	-20.954	16.202
		0.240	-14.998	-17.836	10.246	13.084	-17.836	13.084
		0.300	-11.340	-15.122	6.588	10.370	-15.122	10.370
		0.360	-8.143	-12.870	3.391	8.118	-12.870	8.118
		0.420	-5.351	-11.022	0.599	6.270	-11.022	6.270
		0.480	-2.962	-9.579	-1.790	4.827	-9.579	4.827
		0.540	-0.978	-8.539	-3.774	3.787	-8.539	3.787
		0.600	0.602	-7.904	-5.354	3.152	-7.904	3.152
	9:SLS2 (-Z)	0.000	-7.503	-6.253	-14.131	-15.382	-15.382	0.000
		0.060	-7.115	-6.091	-14.520	-15.543	-15.543	0.000
		0.120	-7.130	-6.334	-14.504	-15.300	-15.300	0.000
		0.180	-7.550	-6.981	-14.084	-14.654	-14.654	0.000
		0.240	-8.374	-8.032	-13.260	-13.603	-13.603	0.000
		0.300	-9.602	-9.487	-12.032	-12.148	-12.148	0.000
		0.360	-11.292	-11.404	-10.343	-10.231	-11.404	0.000
		0.420	-13.386	-13.725	-8.248	-7.910	-13.725	0.000
		0.480	-15.884	-16.450	-5.750	-5.184	-16.450	0.000
		0.540	-18.787	-19.580	-2.848	-2.055	-19.580	0.000
		0.600	-22.093	-23.113	0.459	1.479	-23.113	1.479
	10:ULS-A1 (Z)	0.000	-37.449	-36.611	31.058	30.220	-37.449	31.058
		0.060	-31.646	-31.775	25.255	25.384	-31.775	25.384
		0.120	-26.289	-27.385	19.897	20.994	-27.385	20.994
		0.180	-21.377	-23.441	14.986	17.050	-23.441	17.050
		0.240	-16.912	-19.943	10.520	13.552	-19.943	13.552
		0.300	-12.892	-16.891	6.500	10.499	-16.891	10.499
		0.360	-9.381	-14.348	2.990	7.957	-14.348	7.957
		0.420	-6.317	-12.251	-0.074	5.860	-12.251	5.860
		0.480	-3.698	-10.600	-2.693	4.208	-10.600	4.208
		0.540	-1.526	-9.394	-4.866	3.003	-9.394	3.003
		0.600	0.201	-8.635	-6.593	2.244	-8.635	2.244
	12:ULS-A2 (-Z	0.000	-9.970	-8.807	-14.148	-15.311	-15.311	0.000
		0.060	-9.297	-8.348	-14.820	-15.769	-15.769	0.000
		0.120	-9.071	-8.336	-15.047	-15.782	-15.782	0.000
		0.180	-9.290	-8.769	-14.827	-15.348	-15.348	0.000
		0.240	-9.956	-9.649	-14.162	-14.469	-14.469	0.000
		0.300	-11.067	-10.974	-13.051	-13.144	-13.144	0.000
		0.360	-12.688	-12.808	-11.430	-11.310	-12.808	0.000
		0.420	-14.754	-15.089	-9.364	-9.029	-15.089	0.000
		0.480	-17.266	-17.815	-6.851	-6.303	-17.815	0.000
		0.540	-20.225	-20.987	-3.893	-3.131	-20.987	0.000
		0.600	-23.629	-24.605	-0.489	0.487	-24.605	0.487
	13:ULS-B1 (Z)	0.000	-41.517	-40.114	32.580	31.178	-41.517	32.580
		0.060	-35.156	-34.863	26.220	25.927	-35.156	26.220
		0.120	-29.380	-30.197	20.444	21.261	-30.197	21.261
		0.180	-24.189	-26.116	15.253	17.180	-26.116	17.180
		0.240	-19.583	-22.620	10.647	13.683	-22.620	13.683
		0.300	-15.562	-19.708	6.626	10.772	-19.708	10.772
		0.360	-12.209	-17.464	3.272	8.528	-17.464	8.528
		0.420	-9.440	-15.806	0.504	6.870	-15.806	6.870
		0.480	-7.257	-14.732	-1.680	5.796	-14.732	5.796

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.540	-5.658	-14.243	-3.278	5.307	-14.243	5.307
		0.600	-4.644	-14.338	-4.293	5.402	-14.338	5.402
	16:ULS-B2 (-Z	0.000	-14.037	-12.310	-12.626	-14.352	-14.352	0.000
		0.060	-12.808	-11.437	-13.855	-15.226	-15.226	0.000
		0.120	-12.163	-11.148	-14.500	-15.514	-15.514	0.000
		0.180	-12.103	-11.444	-14.560	-15.218	-15.218	0.000
		0.240	-12.627	-12.325	-14.035	-14.337	-14.337	0.000
		0.300	-13.737	-13.791	-12.926	-12.872	-13.791	0.000
		0.360	-15.515	-15.925	-11.148	-10.738	-15.925	0.000
		0.420	-17.877	-18.644	-8.785	-8.019	-18.644	0.000
		0.480	-20.825	-21.947	-5.838	-4.716	-21.947	0.000
		0.540	-24.357	-25.835	-2.306	-0.827	-25.835	0.000
		0.600	-28.474	-30.308	1.811	3.646	-30.308	3.646
	17:ULS-B3 (Z)	0.000	-41.892	-40.658	39.622	38.387	-41.892	39.622
		0.060	-35.155	-35.236	32.885	32.965	-35.236	32.965
		0.120	-28.854	-30.249	26.583	27.978	-30.249	27.978
		0.180	-22.987	-25.697	20.717	23.426	-25.697	23.426
		0.240	-17.556	-21.580	15.285	19.309	-21.580	19.309
		0.300	-12.559	-17.898	10.289	15.627	-17.898	15.627
		0.360	-8.060	-14.713	5.790	12.443	-14.713	12.443
		0.420	-3.996	-11.964	1.726	9.693	-11.964	9.693
		0.480	-0.367	-9.649	-1.903	7.379	-9.649	7.379
		0.540	2.827	-7.770	-5.097	5.500	-7.770	5.500
		0.600	5.585	-6.326	-7.856	4.055	-7.856	5.585
	18:ULS-B4 (-Z	0.000	-3.746	-1.976	-23.112	-24.882	-24.882	0.000
		0.060	-4.123	-2.652	-22.735	-24.206	-24.206	0.000
		0.120	-4.934	-3.763	-21.924	-23.095	-23.095	0.000
		0.180	-6.181	-5.310	-20.677	-21.548	-21.548	0.000
		0.240	-7.863	-7.292	-18.995	-19.566	-19.566	0.000
		0.300	-9.980	-9.708	-16.878	-17.150	-17.150	0.000
		0.360	-12.594	-12.622	-14.264	-14.236	-14.264	0.000
		0.420	-15.643	-15.971	-11.215	-10.886	-15.971	0.000
		0.480	-19.128	-19.756	-7.730	-7.102	-19.756	0.000
		0.540	-23.047	-23.975	-3.811	-2.883	-23.975	0.000
		0.600	-27.402	-28.629	0.544	1.772	-28.629	1.772
13	8:SLS1 (Z)	0.000	-1.258	35.368	50.761	14.135	-1.258	50.761
		0.267	3.704	33.953	45.814	15.565	0.000	45.814
		0.534	8.644	32.515	40.890	17.018	0.000	40.890
		0.800	13.561	31.056	35.988	18.493	0.000	35.988
		1.067	18.455	29.573	31.109	19.991	0.000	31.109
		1.334	23.327	28.068	26.252	21.511	0.000	28.068
		1.601	28.173	26.538	21.421	23.057	0.000	28.173
		1.868	32.997	24.985	16.613	24.625	0.000	32.997
		2.135	37.798	23.409	11.827	26.216	0.000	37.798
		2.401	42.576	21.811	7.064	27.829	0.000	42.576
		2.668	47.333	20.190	2.323	29.465	0.000	47.333
	9:SLS2 (-Z)	0.000	43.639	7.336	18.717	55.021	0.000	55.021
		0.267	40.843	12.353	21.528	50.019	0.000	50.019
		0.534	38.024	17.347	24.363	45.040	0.000	45.040
		0.800	35.183	22.319	27.219	40.083	0.000	40.083

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.067	32.319	27.268	30.098	35.149	0.000	35.149
		1.334	29.432	32.195	33.000	30.238	0.000	33.000
		1.601	26.520	37.096	35.927	25.352	0.000	37.096
		1.868	23.586	41.974	38.877	20.488	0.000	41.974
		2.135	20.628	46.831	41.850	15.647	0.000	46.831
		2.401	17.649	51.664	44.844	10.829	0.000	51.664
		2.668	14.647	56.475	47.862	6.033	0.000	56.475
	10:ULS-A1 (Z)	0.000	1.462	38.664	56.454	19.253	0.000	56.454
		0.267	6.747	37.470	51.190	20.467	0.000	51.190
		0.534	12.001	36.246	45.956	21.712	0.000	45.956
		0.800	17.226	34.991	40.753	22.987	0.000	40.753
		1.067	22.419	33.706	35.580	24.293	0.000	35.580
		1.334	27.582	32.390	30.437	25.629	0.000	32.390
		1.601	32.711	31.040	25.329	27.000	0.000	32.711
		1.868	37.809	29.660	20.251	28.401	0.000	37.809
		2.135	42.877	28.249	15.204	29.832	0.000	42.877
		2.401	47.915	26.807	10.187	31.294	0.000	47.915
		2.668	52.922	25.336	5.200	32.786	0.000	52.922
	12:ULS-A2 (-Z	0.000	48.604	9.230	22.808	62.182	0.000	62.182
		0.267	45.743	14.790	25.690	56.643	0.000	56.643
		0.534	42.851	20.319	28.603	51.135	0.000	51.135
		0.800	39.929	25.817	31.545	45.657	0.000	45.657
		1.067	36.976	31.285	34.518	40.209	0.000	40.209
		1.334	33.993	36.723	37.522	34.792	0.000	37.522
		1.601	30.976	42.126	40.560	29.409	0.000	42.126
		1.868	27.928	47.499	43.629	24.057	0.000	47.499
		2.135	24.849	52.841	46.728	18.735	0.000	52.841
		2.401	21.740	58.153	49.857	13.444	0.000	58.153
		2.668	18.601	63.435	53.017	8.183	0.000	63.435
	13:ULS-B1 (Z)	0.000	4.696	44.542	64.021	24.175	0.000	64.021
		0.267	10.236	43.470	58.499	25.266	0.000	58.499
		0.534	15.750	42.371	53.004	26.383	0.000	53.004
		0.800	21.236	41.245	47.536	27.527	0.000	47.536
		1.067	26.695	40.092	42.095	28.698	0.000	42.095
		1.334	32.127	38.912	36.681	29.897	0.000	38.912
		1.601	37.529	37.701	31.298	31.126	0.000	37.701
		1.868	42.903	36.463	25.942	32.382	0.000	42.903
		2.135	48.250	35.198	20.613	33.665	0.000	48.250
		2.401	53.571	33.906	15.311	34.975	0.000	53.571
		2.668	58.864	32.587	10.036	36.313	0.000	58.864
	16:ULS-B2 (-Z	0.000	51.838	15.108	30.375	67.105	0.000	67.105
		0.267	49.232	20.790	32.999	61.442	0.000	61.442
		0.534	46.599	26.444	35.651	55.806	0.000	55.806
		0.800	43.939	32.071	38.329	50.197	0.000	50.197
		1.067	41.252	37.671	41.034	44.615	0.000	44.615
		1.334	38.538	43.245	43.766	39.060	0.000	43.766
		1.601	35.793	48.787	46.530	33.536	0.000	48.787
		1.868	33.021	54.302	49.320	28.039	0.000	54.302
		2.135	30.222	59.791	52.137	22.568	0.000	59.791
		2.401	27.396	65.252	54.981	17.125	0.000	65.252

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Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		2.668	24.544	70.687	57.852	11.709	0.000	70.687
	17:ULS-B3 (Z)	0.000	-10.011	44.478	62.297	7.808	-10.011	62.297
		0.267	-3.053	41.703	55.357	10.601	-3.053	55.357
		0.534	3.877	38.901	48.445	13.421	0.000	48.445
		0.800	10.781	36.072	41.559	16.268	0.000	41.559
		1.067	17.658	33.217	34.701	19.142	0.000	34.701
		1.334	24.508	30.334	27.869	22.043	0.000	30.334
		1.601	31.327	27.420	21.069	24.975	0.000	31.327
		1.868	38.119	24.479	14.295	27.934	0.000	38.119
		2.135	44.883	21.512	7.548	30.920	0.000	44.883
		2.401	51.621	18.517	0.829	33.933	0.000	51.621
		2.668	58.332	15.495	-5.864	36.973	-5.864	58.332
	18:ULS-B4 (-Z	0.000	55.798	3.311	15.296	67.782	0.000	67.782
		0.267	51.387	9.977	19.725	61.135	0.000	61.135
		0.534	46.949	16.616	24.181	54.514	0.000	54.514
		0.800	42.484	23.228	28.664	47.921	0.000	47.921
		1.067	37.993	29.812	33.174	41.355	0.000	41.355
		1.334	33.474	36.370	37.711	34.815	0.000	37.711
		1.601	28.924	42.897	42.279	28.307	0.000	42.897
		1.868	24.347	49.397	46.874	21.825	0.000	49.397
		2.135	19.744	55.870	51.496	15.370	0.000	55.870
		2.401	15.113	62.315	56.145	8.943	0.000	62.315
		2.668	10.455	68.734	60.821	2.542	0.000	68.734
14	8:SLS1 (Z)	0.000	37.075	30.930	-25.459	-19.314	-25.459	37.075
		0.200	37.938	33.303	-26.322	-21.687	-26.322	37.938
		0.400	36.453	33.330	-24.837	-21.713	-24.837	36.453
		0.600	32.621	31.009	-21.005	-19.392	-21.005	32.621
		0.800	26.441	26.340	-14.825	-14.724	-14.825	26.441
		1.000	17.915	19.324	-6.298	-7.708	-7.708	19.324
		1.200	6.705	9.626	4.911	1.990	0.000	9.626
		1.400	-6.852	-2.420	18.468	14.036	-6.852	18.468
		1.600	-22.756	-16.813	34.372	28.429	-22.756	34.372
		1.800	-41.007	-33.553	52.623	45.169	-41.007	52.623
		2.000	-61.606	-52.641	73.222	64.257	-61.606	73.222
	9:SLS2 (-Z)	0.000	-57.753	-51.505	62.764	56.516	-57.753	62.764
		0.200	-38.394	-33.358	43.405	38.369	-38.394	43.405
		0.400	-21.381	-17.559	26.392	22.570	-21.381	26.392
		0.600	-6.716	-4.108	11.727	9.119	-6.716	11.727
		0.800	5.601	6.996	-0.590	-1.985	-1.985	6.996
		1.000	15.572	15.753	-10.561	-10.742	-10.742	15.753
		1.200	22.859	21.828	-17.848	-16.817	-17.848	22.859
		1.400	27.800	25.555	-22.788	-20.543	-22.788	27.800
		1.600	30.393	26.934	-25.381	-21.923	-25.381	30.393
		1.800	30.638	25.966	-25.627	-20.955	-25.627	30.638
		2.000	28.537	22.651	-23.525	-17.640	-23.525	28.537
	10:ULS-A1 (Z)	0.000	38.037	31.644	-25.537	-19.143	-25.537	38.037
		0.200	39.597	34.788	-27.096	-22.287	-27.096	39.597
		0.400	38.542	35.317	-26.041	-22.817	-26.041	38.542
		0.600	34.873	33.232	-22.372	-20.731	-22.372	34.873
		0.800	28.589	28.532	-16.088	-16.032	-16.088	28.589

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Job No 2	Sheet No	Rev	
Part			
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	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.000	19.690	21.218	-7.189	-8.717	-8.717	21.218
		1.200	7.803	10.916	4.697	1.585	0.000	10.916
		1.400	-6.698	-2.002	19.199	14.502	-6.698	19.199
		1.600	-23.814	-17.533	36.315	30.034	-23.814	36.315
		1.800	-43.545	-35.679	56.045	48.180	-43.545	56.045
		2.000	-65.890	-56.440	78.391	68.941	-65.890	78.391
	12:ULS-A2 (-Z	0.000	-61.533	-54.912	67.098	60.478	-61.533	67.098
		0.200	-40.551	-35.207	46.116	40.772	-40.551	46.116
		0.400	-22.184	-18.116	27.749	23.682	-22.184	27.749
		0.600	-6.431	-3.640	11.997	9.205	-6.431	11.997
		0.800	6.707	8.221	-1.141	-2.656	-2.656	8.221
		1.000	17.230	17.468	-11.664	-11.903	-11.903	17.468
		1.200	24.765	23.727	-19.200	-18.162	-19.200	24.765
		1.400	29.686	27.371	-24.120	-21.806	-24.120	29.686
		1.600	31.992	28.401	-26.426	-22.836	-26.426	31.992
		1.800	31.683	26.816	-26.118	-21.251	-26.118	31.683
		2.000	28.760	22.616	-23.195	-17.051	-23.195	28.760
	13:ULS-B1 (Z)	0.000	34.951	28.467	-19.423	-12.939	-19.423	34.951
		0.200	39.784	34.939	-24.256	-19.411	-24.256	39.784
		0.400	41.245	38.041	-25.717	-22.513	-25.717	41.245
		0.600	39.335	37.771	-23.807	-22.244	-23.807	39.335
		0.800	34.054	34.131	-18.526	-18.603	-18.603	34.131
		1.000	25.402	27.119	-9.874	-11.591	-11.591	27.119
		1.200	12.897	16.255	2.631	-0.727	-0.727	16.255
		1.400	-2.979	2.019	18.506	13.509	-2.979	18.506
		1.600	-22.225	-15.587	37.753	31.115	-22.225	37.753
		1.800	-44.843	-36.565	60.371	52.093	-44.843	60.371
		2.000	-70.833	-60.914	86.361	76.442	-70.833	86.361
	16:ULS-B2 (-Z	0.000	-64.619	-58.089	73.211	66.682	-64.619	73.211
		0.200	-40.364	-35.055	48.957	43.648	-40.364	48.957
		0.400	-19.481	-15.392	28.074	23.985	-19.481	28.074
		0.600	-1.969	0.899	10.562	7.693	-1.969	10.562
		0.800	12.172	13.820	-3.579	-5.227	-5.227	13.820
		1.000	22.942	23.370	-14.349	-14.777	-14.777	23.370
		1.200	29.859	29.066	-21.267	-20.474	-21.267	29.859
		1.400	33.405	31.392	-24.813	-22.800	-24.813	33.405
		1.600	33.580	30.347	-24.988	-21.754	-24.988	33.580
		1.800	30.384	25.931	-21.792	-17.338	-21.792	30.384
		2.000	23.817	18.143	-15.225	-9.550	-15.225	23.817
	17:ULS-B3 (Z)	0.000	58.489	49.456	-44.525	-35.492	-44.525	58.489
		0.200	55.856	48.992	-41.892	-35.028	-41.892	55.856
		0.400	50.684	45.989	-36.719	-32.024	-36.719	50.684
		0.600	42.972	40.445	-29.007	-26.481	-29.007	42.972
		0.800	32.720	32.363	-18.755	-18.398	-18.755	32.720
		1.000	19.928	21.740	-5.964	-7.776	-7.776	21.740
		1.200	4.234	8.215	9.730	5.749	0.000	9.730
		1.400	-13.999	-7.850	27.963	21.814	-13.999	27.963
		1.600	-34.772	-26.454	48.737	40.418	-34.772	48.737
		1.800	-58.085	-47.598	72.050	61.562	-58.085	72.050
		2.000	-83.938	-71.281	97.902	85.246	-83.938	97.902

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Job Title: Skywalk TUB70705	Job No: 2	Sheet No	Rev
	Part		
	Ref		
	By: a.aasgaard	Date: 03-May-12	Chd
Client	File: Skywalk TUB70705.std	Date/Time: 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
	18:ULS-B4 (-Z	0.000	-80.367	-71.292	84.677	75.602	-80.367	84.677
		0.200	-55.913	-48.649	60.223	52.960	-55.913	60.223
		0.400	-33.998	-28.546	38.309	32.857	-33.998	38.309
		0.600	-14.623	-10.983	18.934	15.294	-14.623	18.934
		0.800	2.212	4.040	2.099	0.270	0.000	4.040
		1.000	16.507	16.524	-12.197	-12.213	-12.213	16.524
		1.200	27.900	26.105	-23.590	-21.795	-23.590	27.900
		1.400	36.754	33.147	-32.443	-28.837	-32.443	36.754
		1.600	43.067	37.649	-38.757	-33.339	-38.757	43.067
		1.800	46.842	39.612	-42.531	-35.301	-42.531	46.842
		2.000	48.076	39.035	-43.765	-34.724	-43.765	48.076
15	8:SLS1 (Z)	0.000	-9.946	-6.464	-6.888	-10.371	-10.371	0.000
		0.060	-9.214	-5.682	-7.620	-11.152	-11.152	0.000
		0.120	-8.885	-5.304	-7.949	-11.530	-11.530	0.000
		0.180	-8.961	-5.331	-7.873	-11.504	-11.504	0.000
		0.240	-9.441	-5.761	-7.393	-11.073	-11.073	0.000
		0.300	-10.325	-6.596	-6.509	-10.238	-10.325	0.000
		0.360	-11.671	-7.893	-5.163	-8.941	-11.671	0.000
		0.420	-13.421	-9.594	-3.413	-7.241	-13.421	0.000
		0.480	-15.576	-11.699	-1.259	-5.136	-15.576	0.000
		0.540	-18.134	-14.208	1.300	-2.626	-18.134	1.300
		0.600	-21.097	-17.121	4.262	0.287	-21.097	4.262
	9:SLS2 (-Z)	0.000	-26.064	-29.688	17.026	20.649	-29.688	20.649
		0.060	-22.751	-25.382	13.712	16.343	-25.382	16.343
		0.120	-19.841	-21.480	10.803	12.441	-21.480	12.441
		0.180	-17.336	-17.982	8.298	8.943	-17.982	8.943
		0.240	-15.235	-14.888	6.197	5.849	-15.235	6.197
		0.300	-13.538	-12.198	4.500	3.160	-13.538	4.500
		0.360	-12.303	-9.971	3.265	0.932	-12.303	3.265
		0.420	-11.472	-8.147	2.434	-0.892	-11.472	2.434
		0.480	-11.045	-6.728	2.007	-2.311	-11.045	2.007
		0.540	-11.023	-5.712	1.984	-3.326	-11.023	1.984
		0.600	-11.404	-5.101	2.366	-3.937	-11.404	2.366
	10:ULS-A1 (Z)	0.000	-12.516	-8.750	-6.541	-10.308	-12.516	0.000
		0.060	-11.493	-7.673	-7.565	-11.385	-11.493	0.000
		0.120	-10.915	-7.042	-8.142	-12.016	-12.016	0.000
		0.180	-10.784	-6.857	-8.274	-12.201	-12.201	0.000
		0.240	-11.098	-7.117	-7.960	-11.940	-11.940	0.000
		0.300	-11.858	-7.824	-7.200	-11.234	-11.858	0.000
		0.360	-13.127	-9.040	-5.930	-10.018	-13.127	0.000
		0.420	-14.843	-10.702	-4.215	-8.356	-14.843	0.000
		0.480	-17.004	-12.809	-2.054	-6.248	-17.004	0.000
		0.540	-19.611	-15.363	0.553	-3.695	-19.611	0.553
		0.600	-22.664	-18.362	3.606	-0.696	-22.664	3.606
	12:ULS-A2 (-Z	0.000	-29.440	-33.136	18.568	22.263	-33.136	22.263
		0.060	-25.707	-28.358	14.834	17.486	-28.358	17.486
		0.120	-22.419	-24.026	11.547	13.154	-24.026	13.154
		0.180	-19.577	-20.140	8.705	9.268	-20.140	9.268
		0.240	-17.181	-16.700	6.309	5.828	-17.181	6.309
		0.300	-15.231	-13.706	4.359	2.834	-15.231	4.359

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.360	-13.791	-11.222	2.919	0.349	-13.791	2.919
		0.420	-12.796	-9.183	1.924	-1.690	-12.796	1.924
		0.480	-12.247	-7.590	1.375	-3.283	-12.247	1.375
		0.540	-12.144	-6.443	1.272	-4.430	-12.144	1.272
		0.600	-12.487	-5.741	1.615	-5.131	-12.487	1.615
	13:ULS-B1 (Z)	0.000	-15.821	-11.917	-5.715	-9.620	-15.821	0.000
		0.060	-14.387	-10.425	-7.150	-11.112	-14.387	0.000
		0.120	-13.537	-9.518	-8.000	-12.019	-13.537	0.000
		0.180	-13.271	-9.195	-8.265	-12.341	-13.271	0.000
		0.240	-13.591	-9.458	-7.946	-12.079	-13.591	0.000
		0.300	-14.495	-10.305	-7.041	-11.232	-14.495	0.000
		0.360	-16.068	-11.820	-5.469	-9.716	-16.068	0.000
		0.420	-18.225	-13.921	-3.312	-7.616	-18.225	0.000
		0.480	-20.967	-16.606	-0.570	-4.931	-20.967	0.000
		0.540	-24.294	-19.875	2.757	-1.661	-24.294	2.757
		0.600	-28.205	-23.730	6.669	2.193	-28.205	6.669
	16:ULS-B2 (-Z	0.000	-32.745	-36.302	19.394	22.951	-36.302	22.951
		0.060	-28.600	-31.110	15.249	17.759	-31.110	17.759
		0.120	-25.040	-26.502	11.689	13.151	-26.502	13.151
		0.180	-22.065	-22.479	8.714	9.128	-22.479	9.128
		0.240	-19.674	-19.041	6.323	5.690	-19.674	6.323
		0.300	-17.869	-16.187	4.518	2.836	-17.869	4.518
		0.360	-16.731	-14.002	3.380	0.651	-16.731	3.380
		0.420	-16.178	-12.402	2.827	-0.949	-16.178	2.827
		0.480	-16.210	-11.386	2.859	-1.965	-16.210	2.859
		0.540	-16.827	-10.955	3.476	-2.396	-16.827	3.476
		0.600	-18.029	-11.109	4.677	-2.242	-18.029	4.677
	17:ULS-B3 (Z)	0.000	-7.897	-3.206	-12.019	-16.710	-16.710	0.000
		0.060	-7.647	-2.861	-12.269	-17.055	-17.055	0.000
		0.120	-7.832	-2.950	-12.084	-16.966	-16.966	0.000
		0.180	-8.452	-3.475	-11.464	-16.441	-16.441	0.000
		0.240	-9.507	-4.434	-10.409	-15.482	-15.482	0.000
		0.300	-10.997	-5.829	-8.919	-14.087	-14.087	0.000
		0.360	-12.984	-7.721	-6.931	-12.195	-12.984	0.000
		0.420	-15.407	-10.048	-4.509	-9.868	-15.407	0.000
		0.480	-18.265	-12.810	-1.651	-7.106	-18.265	0.000
		0.540	-21.557	-16.008	1.642	-3.908	-21.557	1.642
		0.600	-25.285	-19.640	5.369	-0.276	-25.285	5.369
	18:ULS-B4 (-Z	0.000	-31.380	-37.030	22.758	28.409	-37.030	28.409
		0.060	-27.362	-31.570	18.740	22.948	-31.570	22.948
		0.120	-23.778	-26.545	15.157	17.923	-26.545	17.923
		0.180	-20.630	-21.955	12.009	13.333	-21.955	13.333
		0.240	-17.917	-17.800	9.296	9.178	-17.917	9.296
		0.300	-15.639	-14.080	7.018	5.458	-15.639	7.018
		0.360	-13.859	-10.857	5.237	2.236	-13.859	5.237
		0.420	-12.513	-8.070	3.892	-0.552	-12.513	3.892
		0.480	-11.603	-5.717	2.981	-2.904	-11.603	2.981
		0.540	-11.127	-3.800	2.506	-4.822	-11.127	2.506
		0.600	-11.087	-2.317	2.466	-6.304	-11.087	2.466
30	8:SLS1 (Z)	0.000	-63.317	-67.831	2.070	6.584	-67.831	6.584

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Job Title: Skywalk TUB70705	Job No: 2	Sheet No:	Rev:
	Part:		
	Ref:		
	By: a.aasgaard	Date: 03-May-12	Chd:
Client:	File: Skywalk TUB70705.std	Date/Time: 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm²)	Corner 2 (N/mm²)	Corner 3 (N/mm²)	Corner 4 (N/mm²)	Max Tens (N/mm²)	Max Comp (N/mm²)
		0.180	-46.193	-49.908	-15.053	-11.339	-49.908	0.000
		0.360	-32.707	-35.623	-28.539	-25.624	-35.623	0.000
		0.540	-22.859	-24.975	-38.388	-36.272	-38.388	0.000
		0.720	-16.648	-17.964	-44.599	-43.282	-44.599	0.000
		0.900	-14.074	-14.591	-47.173	-46.655	-47.173	0.000
		1.080	-15.657	-15.375	-45.589	-45.871	-45.871	0.000
		1.260	-20.878	-19.796	-40.369	-41.450	-41.450	0.000
		1.440	-29.736	-27.855	-31.510	-33.391	-33.391	0.000
		1.620	-42.232	-39.551	-19.015	-21.695	-42.232	0.000
		1.800	-58.364	-54.885	-2.882	-6.362	-58.364	0.000
	9:SLS2 (-Z)	0.000	-43.534	-61.626	5.417	23.510	-61.626	23.510
		0.180	-30.543	-40.196	-7.573	2.080	-40.196	2.080
		0.360	-20.376	-23.218	-17.741	-14.899	-23.218	0.000
		0.540	-13.032	-10.691	-25.085	-27.425	-27.425	0.000
		0.720	-8.511	-2.616	-29.606	-35.500	-35.500	0.000
		0.900	-6.813	1.008	-31.303	-39.124	-39.124	1.008
		1.080	-8.342	-0.456	-29.774	-37.660	-37.660	0.000
		1.260	-12.694	-6.372	-25.422	-31.745	-31.745	0.000
		1.440	-19.870	-16.739	-18.247	-21.378	-21.378	0.000
		1.620	-29.868	-31.557	-8.248	-6.559	-31.557	0.000
		1.800	-42.690	-50.827	4.574	12.711	-50.827	12.711
	10:ULS-A1 (Z)	0.000	-70.827	-76.069	1.161	6.403	-76.069	6.403
		0.180	-51.947	-56.246	-17.719	-13.419	-56.246	0.000
		0.360	-37.080	-40.437	-32.586	-29.229	-40.437	0.000
		0.540	-26.226	-28.640	-43.440	-41.026	-43.440	0.000
		0.720	-19.384	-20.855	-50.282	-48.810	-50.282	0.000
		0.900	-16.554	-17.083	-53.112	-52.582	-53.112	0.000
		1.080	-18.310	-17.897	-51.355	-51.769	-51.769	0.000
		1.260	-24.079	-22.723	-45.587	-46.942	-46.942	0.000
		1.440	-33.860	-31.562	-35.805	-38.103	-38.103	0.000
		1.620	-47.654	-44.414	-22.011	-25.252	-47.654	0.000
		1.800	-65.461	-61.278	-4.205	-8.388	-65.461	0.000
	12:ULS-A2 (-Z	0.000	-50.055	-69.553	4.676	24.174	-69.553	24.174
		0.180	-35.514	-46.049	-9.865	0.670	-46.049	0.670
		0.360	-24.132	-27.412	-21.247	-17.967	-27.412	0.000
		0.540	-15.907	-13.642	-29.472	-31.737	-31.737	0.000
		0.720	-10.840	-4.740	-34.539	-40.639	-40.639	0.000
		0.900	-8.930	-0.705	-36.449	-44.674	-44.674	0.000
		1.080	-10.629	-2.232	-34.750	-43.147	-43.147	0.000
		1.260	-15.486	-8.628	-29.893	-36.751	-36.751	0.000
		1.440	-23.501	-19.890	-21.878	-25.489	-25.489	0.000
		1.620	-34.673	-36.020	-10.706	-9.359	-36.020	0.000
		1.800	-49.003	-57.017	3.624	11.638	-57.017	11.638
	13:ULS-B1 (Z)	0.000	-86.734	-92.508	7.767	13.541	-92.508	13.541
		0.180	-62.025	-66.727	-16.943	-12.241	-66.727	0.000
		0.360	-42.578	-46.208	-36.390	-32.759	-46.208	0.000
		0.540	-28.394	-30.953	-50.574	-48.015	-50.574	0.000
		0.720	-19.473	-20.960	-59.495	-58.008	-59.495	0.000
		0.900	-15.814	-16.230	-63.153	-62.738	-63.153	0.000
		1.080	-18.171	-17.515	-60.797	-61.453	-61.453	0.000

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.260	-25.790	-24.062	-53.178	-54.905	-54.905	0.000
		1.440	-38.672	-35.873	-40.296	-43.095	-43.095	0.000
		1.620	-56.817	-52.946	-22.151	-26.022	-56.817	0.000
		1.800	-80.225	-75.282	1.257	-3.686	-80.225	1.257
	16:ULS-B2 (-Z	0.000	-65.962	-85.993	11.281	31.312	-85.993	31.312
		0.180	-45.592	-56.529	-9.089	1.848	-56.529	1.848
		0.360	-29.630	-33.183	-25.051	-21.498	-33.183	0.000
		0.540	-18.075	-15.955	-36.606	-38.726	-38.726	0.000
		0.720	-10.929	-4.844	-43.752	-49.837	-49.837	0.000
		0.900	-8.190	0.149	-46.491	-54.830	-54.830	0.149
		1.080	-10.490	-1.850	-44.191	-52.831	-52.831	0.000
		1.260	-17.197	-9.966	-37.484	-44.715	-44.715	0.000
		1.440	-28.312	-24.201	-26.369	-30.481	-30.481	0.000
		1.620	-43.835	-44.552	-10.846	-10.129	-44.552	0.000
		1.800	-63.767	-71.022	9.086	16.341	-71.022	16.341
	17:ULS-B3 (Z)	0.000	-71.396	-76.223	-0.340	4.487	-76.223	4.487
		0.180	-52.866	-56.879	-18.870	-14.857	-56.879	0.000
		0.360	-38.251	-41.450	-33.485	-30.286	-41.450	0.000
		0.540	-27.552	-29.938	-44.184	-41.798	-44.184	0.000
		0.720	-20.769	-22.341	-50.967	-49.395	-50.967	0.000
		0.900	-17.902	-18.660	-53.834	-53.076	-53.834	0.000
		1.080	-19.510	-19.455	-52.226	-52.281	-52.281	0.000
		1.260	-25.034	-24.165	-46.702	-47.571	-47.571	0.000
		1.440	-34.474	-32.792	-37.262	-38.944	-38.944	0.000
		1.620	-47.830	-45.334	-23.906	-26.402	-47.830	0.000
		1.800	-65.102	-61.792	-6.634	-9.944	-65.102	0.000
	18:ULS-B4 (-Z	0.000	-42.207	-67.521	4.231	29.546	-67.521	29.546
		0.180	-29.858	-42.900	-8.117	4.925	-42.900	4.925
		0.360	-20.204	-23.416	-17.771	-14.560	-23.416	0.000
		0.540	-13.245	-9.069	-24.731	-28.906	-28.906	0.000
		0.720	-8.980	0.141	-28.995	-38.116	-38.116	0.141
		0.900	-7.411	4.213	-30.565	-42.189	-42.189	4.213
		1.080	-8.920	2.415	-29.055	-40.391	-40.391	2.415
		1.260	-13.125	-4.520	-24.851	-33.455	-33.455	0.000
		1.440	-20.024	-16.593	-17.952	-21.383	-21.383	0.000
		1.620	-29.617	-33.803	-8.358	-4.173	-33.803	0.000
		1.800	-41.906	-56.149	3.930	18.174	-56.149	18.174
31	8:SLS1 (Z)	0.000	-60.856	-56.758	-4.610	-8.708	-60.856	0.000
		0.180	-44.631	-41.474	-20.835	-23.992	-44.631	0.000
		0.360	-32.043	-29.826	-33.423	-35.640	-35.640	0.000
		0.540	-23.092	-21.816	-42.374	-43.650	-43.650	0.000
		0.720	-17.779	-17.444	-47.687	-48.022	-48.022	0.000
		0.900	-16.104	-16.709	-49.362	-48.757	-49.362	0.000
		1.080	-18.585	-20.130	-46.881	-45.336	-46.881	0.000
		1.260	-24.704	-27.190	-40.762	-38.276	-40.762	0.000
		1.440	-34.460	-37.886	-31.006	-27.580	-37.886	0.000
		1.620	-47.854	-52.220	-17.612	-13.246	-52.220	0.000
		1.800	-64.885	-70.192	-0.581	4.726	-70.192	4.726
	9:SLS2 (-Z)	0.000	-40.141	-48.910	6.342	15.112	-48.910	15.112
		0.180	-27.413	-29.590	-6.385	-4.208	-29.590	0.000

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.360	-17.509	-14.722	-16.289	-19.077	-19.077	0.000
		0.540	-10.428	-4.305	-23.370	-29.494	-29.494	0.000
		0.720	-6.170	1.661	-27.628	-35.459	-35.459	1.661
		0.900	-4.736	3.174	-29.062	-36.973	-36.973	3.174
		1.080	-6.528	-0.399	-27.270	-33.399	-33.399	0.000
		1.260	-11.144	-8.424	-22.655	-25.374	-25.374	0.000
		1.440	-18.582	-20.901	-15.216	-12.897	-20.901	0.000
		1.620	-28.844	-37.830	-4.954	4.031	-37.830	4.031
		1.800	-41.929	-59.209	8.131	25.411	-59.209	25.411
	10:ULS-A1 (Z)	0.000	-68.075	-63.244	-6.019	-10.850	-68.075	0.000
		0.180	-50.172	-46.431	-23.922	-27.663	-50.172	0.000
		0.360	-36.281	-33.631	-37.813	-40.463	-40.463	0.000
		0.540	-26.403	-24.843	-47.691	-49.251	-49.251	0.000
		0.720	-20.537	-20.068	-53.557	-54.026	-54.026	0.000
		0.900	-18.684	-19.306	-55.410	-54.789	-55.410	0.000
		1.080	-21.417	-23.129	-52.677	-50.965	-52.677	0.000
		1.260	-28.162	-30.964	-45.932	-43.130	-45.932	0.000
		1.440	-38.919	-42.813	-35.175	-31.281	-42.813	0.000
		1.620	-53.690	-58.673	-20.405	-15.421	-58.673	0.000
		1.800	-72.472	-78.547	-1.622	4.453	-78.547	4.453
	12:ULS-A2 (-Z)	0.000	-46.324	-55.003	5.482	14.160	-55.003	14.160
		0.180	-32.094	-33.953	-8.749	-6.889	-33.953	0.000
		0.360	-21.021	-17.771	-19.822	-23.072	-23.072	0.000
		0.540	-13.106	-6.456	-27.737	-34.387	-34.387	0.000
		0.720	-8.348	-0.009	-32.495	-40.834	-40.834	0.000
		0.900	-6.748	1.572	-34.095	-42.415	-42.415	1.572
		1.080	-8.757	-2.411	-32.086	-38.432	-38.432	0.000
		1.260	-13.924	-11.261	-26.919	-29.582	-29.582	0.000
		1.440	-22.248	-24.978	-18.595	-15.865	-24.978	0.000
		1.620	-33.730	-43.563	-7.113	2.720	-43.563	2.720
		1.800	-48.369	-67.015	7.526	26.172	-67.015	26.172
	13:ULS-B1 (Z)	0.000	-82.830	-77.241	-0.550	-6.139	-82.830	0.000
		0.180	-59.325	-54.956	-24.055	-28.424	-59.325	0.000
		0.360	-41.084	-37.934	-42.296	-45.446	-45.446	0.000
		0.540	-28.105	-26.175	-55.275	-57.206	-57.206	0.000
		0.720	-20.390	-19.678	-62.990	-63.702	-63.702	0.000
		0.900	-17.937	-18.444	-65.443	-64.936	-65.443	0.000
		1.080	-21.498	-23.225	-61.882	-60.155	-61.882	0.000
		1.260	-30.323	-33.269	-53.057	-50.111	-53.057	0.000
		1.440	-44.411	-48.576	-38.970	-34.805	-48.576	0.000
		1.620	-63.761	-69.145	-19.619	-14.235	-69.145	0.000
		1.800	-88.374	-94.977	4.994	11.597	-94.977	11.597
	16:ULS-B2 (-Z)	0.000	-61.079	-69.001	10.950	18.872	-69.001	18.872
		0.180	-41.247	-42.479	-8.882	-7.650	-42.479	0.000
		0.360	-25.824	-22.074	-24.305	-28.055	-28.055	0.000
		0.540	-14.808	-7.787	-35.321	-42.342	-42.342	0.000
		0.720	-8.200	0.382	-41.929	-50.511	-50.511	0.382
		0.900	-6.001	2.433	-44.128	-52.562	-52.562	2.433
		1.080	-8.839	-2.507	-41.290	-47.622	-47.622	0.000
		1.260	-16.085	-13.565	-34.044	-36.564	-36.564	0.000

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.440	-27.739	-30.741	-22.390	-19.388	-30.741	0.000
		1.620	-43.801	-54.035	-6.328	3.906	-54.035	3.906
		1.800	-64.271	-83.446	14.142	33.317	-83.446	33.317
	17:ULS-B3 (Z)	0.000	-68.742	-64.530	-9.159	-13.372	-68.742	0.000
		0.180	-51.336	-48.143	-26.566	-29.759	-51.336	0.000
		0.360	-37.845	-35.672	-40.057	-42.230	-42.230	0.000
		0.540	-28.270	-27.117	-49.632	-50.785	-50.785	0.000
		0.720	-22.611	-22.478	-55.291	-55.424	-55.424	0.000
		0.900	-20.868	-21.754	-57.034	-56.147	-57.034	0.000
		1.080	-23.600	-25.506	-54.302	-52.395	-54.302	0.000
		1.260	-30.248	-33.174	-47.654	-44.728	-47.654	0.000
		1.440	-40.812	-44.758	-37.090	-33.144	-44.758	0.000
		1.620	-55.292	-60.258	-22.610	-17.644	-60.258	0.000
		1.800	-73.687	-79.673	-4.214	1.771	-79.673	1.771
	18:ULS-B4 (-Z)	0.000	-38.198	-53.361	6.502	21.665	-53.361	21.665
		0.180	-26.047	-30.942	-5.649	-0.755	-30.942	0.000
		0.360	-16.591	-13.660	-15.106	-18.037	-18.037	0.000
		0.540	-9.829	-1.515	-21.867	-30.182	-30.182	0.000
		0.720	-5.763	5.493	-25.934	-37.190	-37.190	5.493
		0.900	-4.390	7.364	-27.306	-39.061	-39.061	7.364
		1.080	-6.098	3.364	-25.599	-35.061	-35.061	3.364
		1.260	-10.500	-5.773	-21.197	-25.924	-25.924	0.000
		1.440	-17.596	-20.048	-14.100	-11.649	-20.048	0.000
		1.620	-27.388	-39.459	-4.309	7.762	-39.459	7.762
		1.800	-39.874	-64.008	8.177	32.311	-64.008	32.311
40	8:SLS1 (Z)	0.000	-87.647	65.674	65.765	-87.555	-87.647	65.765
		0.260	-69.420	47.450	47.523	-69.346	-69.420	47.523
		0.520	-51.193	29.226	29.281	-51.137	-51.193	29.281
		0.780	-32.966	11.002	11.039	-32.929	-32.966	11.039
		1.040	-14.739	-7.222	-7.203	-14.720	-14.739	0.000
		1.300	3.488	-25.446	-25.445	3.489	-25.446	3.489
		1.560	4.914	-26.870	-26.887	4.898	-26.887	4.914
		1.820	6.341	-28.294	-28.329	6.307	-28.329	6.341
		2.080	7.768	-29.718	-29.771	7.715	-29.771	7.768
		2.340	9.195	-31.142	-31.213	9.124	-31.213	9.195
		2.600	10.622	-32.566	-32.655	10.533	-32.655	10.622
	9:SLS2 (-Z)	0.000	7.357	-24.888	-24.982	7.264	-24.982	7.357
		0.260	-3.918	-13.646	-13.722	-3.994	-13.722	0.000
		0.520	-12.946	-4.652	-4.709	-13.003	-13.003	0.000
		0.780	-19.725	2.093	2.055	-19.764	-19.764	2.093
		1.040	-24.256	6.591	6.571	-24.276	-24.276	6.591
		1.300	-26.539	8.840	8.838	-26.541	-26.541	8.840
		1.560	-26.252	8.519	8.536	-26.236	-26.252	8.536
		1.820	-23.718	5.951	5.986	-23.682	-23.718	5.986
		2.080	-18.935	1.134	1.188	-18.881	-18.935	1.188
		2.340	-11.903	-5.931	-5.858	-11.831	-11.903	0.000
		2.600	-2.624	-15.244	-15.153	-2.533	-15.244	0.000
	10:ULS-A1 (Z)	0.000	-94.795	69.909	70.005	-94.699	-94.795	70.005
		0.260	-75.307	50.419	50.496	-75.230	-75.307	50.496
		0.520	-55.819	30.929	30.988	-55.760	-55.819	30.988

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
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Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.780	-36.331	11.440	11.479	-36.291	-36.331	11.479
		1.040	-16.843	-8.050	-8.030	-16.822	-16.843	0.000
		1.300	2.646	-27.540	-27.538	2.647	-27.540	2.647
		1.560	4.494	-29.390	-29.407	4.476	-29.407	4.494
		1.820	6.342	-31.239	-31.276	6.305	-31.276	6.342
		2.080	8.190	-33.089	-33.144	8.135	-33.144	8.190
		2.340	10.038	-34.939	-35.013	9.964	-35.013	10.038
		2.600	11.886	-36.788	-36.881	11.793	-36.881	11.886
	12:ULS-A2 (-Z	0.000	4.959	-25.182	-25.280	4.861	-25.280	4.959
		0.260	-6.530	-13.732	-13.811	-6.609	-13.811	0.000
		0.520	-15.659	-4.643	-4.703	-15.719	-15.719	0.000
		0.780	-22.428	2.086	2.045	-22.468	-22.468	2.086
		1.040	-26.835	6.453	6.432	-26.856	-26.856	6.453
		1.300	-28.882	8.461	8.459	-28.884	-28.884	8.461
		1.560	-28.232	7.770	7.788	-28.214	-28.232	7.788
		1.820	-25.220	4.718	4.756	-25.183	-25.220	4.756
		2.080	-19.848	-0.694	-0.637	-19.791	-19.848	0.000
		2.340	-12.115	-8.466	-8.390	-12.039	-12.115	0.000
		2.600	-2.022	-18.600	-18.504	-1.926	-18.600	0.000
	13:ULS-B1 (Z)	0.000	-106.371	76.243	76.338	-106.275	-106.371	76.338
		0.260	-85.775	55.648	55.725	-85.698	-85.775	55.725
		0.520	-65.180	35.053	35.111	-65.122	-65.180	35.111
		0.780	-44.584	14.458	14.497	-44.545	-44.584	14.497
		1.040	-23.989	-6.137	-6.117	-23.968	-23.989	0.000
		1.300	-3.393	-26.732	-26.731	-3.392	-26.732	0.000
		1.560	-0.438	-29.687	-29.704	-0.455	-29.704	0.000
		1.820	2.518	-32.642	-32.678	2.482	-32.678	2.518
		2.080	5.473	-35.597	-35.652	5.418	-35.652	5.473
		2.340	8.429	-38.552	-38.626	8.355	-38.626	8.429
		2.600	11.385	-41.507	-41.600	11.292	-41.600	11.385
	16:ULS-B2 (-Z	0.000	-6.617	-18.848	-18.946	-6.715	-18.946	0.000
		0.260	-16.999	-8.503	-8.583	-17.078	-17.078	0.000
		0.520	-25.020	-0.519	-0.579	-25.080	-25.080	0.000
		0.780	-30.681	5.104	5.063	-30.722	-30.722	5.104
		1.040	-33.981	8.366	8.345	-34.003	-34.003	8.366
		1.300	-34.921	9.268	9.267	-34.923	-34.923	9.268
		1.560	-33.163	7.472	7.490	-33.145	-33.163	7.490
		1.820	-29.044	3.316	3.353	-29.007	-29.044	3.353
		2.080	-22.564	-3.202	-3.145	-22.507	-22.564	0.000
		2.340	-13.724	-12.080	-12.003	-13.648	-13.724	0.000
		2.600	-2.523	-23.318	-23.223	-2.427	-23.318	0.000
	17:ULS-B3 (Z)	0.000	-106.512	81.722	81.856	-106.378	-106.512	81.856
		0.260	-84.887	60.105	60.212	-84.779	-84.887	60.212
		0.520	-63.262	38.488	38.569	-63.181	-63.262	38.569
		0.780	-41.637	16.871	16.926	-41.582	-41.637	16.926
		1.040	-20.012	-4.746	-4.718	-19.983	-20.012	0.000
		1.300	1.614	-26.363	-26.361	1.616	-26.363	1.616
		1.560	5.599	-30.341	-30.365	5.575	-30.365	5.599
		1.820	9.584	-34.318	-34.368	9.533	-34.368	9.584
		2.080	13.569	-38.295	-38.372	13.492	-38.372	13.569

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Part			
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Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		2.340	17.554	-42.272	-42.375	17.451	-42.375	17.554
		2.600	21.540	-46.249	-46.378	21.410	-46.378	21.540
	18:ULS-B4 (-Z	0.000	25.576	-44.097	-44.233	25.439	-44.233	25.576
		0.260	7.058	-25.624	-25.733	6.948	-25.733	7.058
		0.520	-8.088	-10.524	-10.606	-8.170	-10.606	0.000
		0.780	-19.861	1.204	1.149	-19.916	-19.916	1.204
		1.040	-28.261	9.560	9.531	-28.290	-28.290	9.560
		1.300	-33.290	14.543	14.541	-33.292	-33.292	14.543
		1.560	-34.464	15.672	15.697	-34.439	-34.464	15.697
		1.820	-32.266	13.429	13.481	-32.214	-32.266	13.481
		2.080	-26.695	7.814	7.892	-26.617	-26.695	7.892
		2.340	-17.753	-1.174	-1.069	-17.647	-17.753	0.000
		2.600	-5.438	-13.534	-13.402	-5.305	-13.534	0.000
46	8:SLS1 (Z)	0.000	-3.379	-3.885	6.986	7.493	-3.885	7.493
		0.200	25.281	24.873	-21.673	-21.266	-21.673	25.281
		0.400	45.932	45.623	-42.324	-42.015	-42.324	45.932
		0.600	58.574	58.364	-54.967	-54.756	-54.967	58.574
		0.800	63.208	63.097	-59.601	-59.489	-59.601	63.208
		1.000	59.834	59.821	-56.226	-56.213	-56.226	59.834
		1.200	47.306	47.392	-43.699	-43.784	-43.784	47.392
		1.400	26.770	26.955	-23.163	-23.347	-23.347	26.955
		1.600	-1.774	-1.491	5.382	5.099	-1.774	5.382
		1.800	-38.327	-37.945	41.935	41.553	-38.327	41.935
		2.000	-82.889	-82.408	86.496	86.016	-82.889	86.496
	9:SLS2 (-Z)	0.000	-75.731	-75.212	73.299	72.780	-75.731	73.299
		0.200	-34.281	-33.864	31.849	31.432	-34.281	31.849
		0.400	-0.841	-0.524	-1.591	-1.908	-1.908	0.000
		0.600	24.592	24.807	-27.023	-27.239	-27.239	24.807
		0.800	42.015	42.130	-44.447	-44.561	-44.561	42.130
		1.000	51.430	51.444	-53.862	-53.875	-53.875	51.444
		1.200	51.693	51.605	-54.125	-54.037	-54.125	51.693
		1.400	43.947	43.758	-46.378	-46.190	-46.378	43.947
		1.600	28.192	27.902	-30.624	-30.334	-30.624	28.192
		1.800	4.429	4.038	-6.860	-6.470	-6.860	4.429
		2.000	-27.343	-27.835	24.912	25.403	-27.835	25.403
	10:ULS-A1 (Z)	0.000	-5.818	-6.349	9.570	10.101	-6.349	10.101
		0.200	26.104	25.676	-22.352	-21.924	-22.352	26.104
		0.400	49.200	48.876	-45.449	-45.124	-45.449	49.200
		0.600	63.472	63.251	-59.720	-59.499	-59.720	63.472
		0.800	68.919	68.801	-65.167	-65.050	-65.167	68.919
		1.000	65.540	65.527	-61.789	-61.775	-61.789	65.540
		1.200	52.076	52.166	-48.325	-48.415	-48.415	52.166
		1.400	29.787	29.981	-26.036	-26.229	-26.229	29.981
		1.600	-1.326	-1.029	5.078	4.781	-1.326	5.078
		1.800	-41.265	-40.865	45.017	44.616	-41.265	45.017
		2.000	-90.029	-89.525	93.781	93.277	-90.029	93.781
	12:ULS-A2 (-Z	0.000	-81.787	-81.243	79.198	78.653	-81.787	79.198
		0.200	-36.437	-35.998	33.847	33.409	-36.437	33.847
		0.400	0.089	0.422	-2.679	-3.011	-3.011	0.422
		0.600	27.790	28.016	-30.380	-30.606	-30.606	28.016

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.800	46.666	46.786	-49.256	-49.376	-49.376	46.786
		1.000	56.717	56.731	-59.306	-59.321	-59.321	56.731
		1.200	56.682	56.590	-59.272	-59.180	-59.272	56.682
		1.400	47.822	47.624	-50.412	-50.214	-50.412	47.822
		1.600	30.138	29.833	-32.727	-32.423	-32.727	30.138
		1.800	3.628	3.218	-6.218	-5.807	-6.218	3.628
		2.000	-31.707	-32.223	29.117	29.633	-32.223	29.633
	13:ULS-B1 (Z)	0.000	-19.018	-19.548	22.604	23.133	-19.548	23.133
		0.200	24.984	24.558	-21.399	-20.973	-21.399	24.984
		0.400	57.390	57.067	-53.805	-53.482	-53.805	57.390
		0.600	78.199	77.979	-74.614	-74.394	-74.614	78.199
		0.800	87.411	87.294	-83.826	-83.709	-83.826	87.411
		1.000	85.027	85.013	-81.441	-81.428	-81.441	85.027
		1.200	69.388	69.478	-65.803	-65.892	-65.892	69.478
		1.400	42.153	42.346	-38.568	-38.760	-38.760	42.346
		1.600	3.321	3.617	0.265	-0.031	-0.031	3.617
		1.800	-47.108	-46.709	50.694	50.294	-47.108	50.694
		2.000	-109.134	-108.632	112.720	112.217	-109.134	112.720
	16:ULS-B2 (-Z	0.000	-94.988	-94.441	92.232	91.685	-94.988	92.232
		0.200	-37.556	-37.116	34.800	34.360	-37.556	34.800
		0.400	8.279	8.613	-11.035	-11.369	-11.369	8.613
		0.600	42.517	42.744	-45.273	-45.500	-45.500	42.744
		0.800	65.159	65.279	-67.915	-68.035	-68.035	65.279
		1.000	76.203	76.217	-78.959	-78.973	-78.973	76.217
		1.200	73.994	73.902	-76.750	-76.658	-76.750	73.994
		1.400	60.188	59.989	-62.944	-62.745	-62.944	60.188
		1.600	34.785	34.480	-37.541	-37.236	-37.541	34.785
		1.800	-2.215	-2.627	-0.541	-0.129	-2.627	0.000
		2.000	-50.812	-51.330	48.056	48.574	-51.330	48.574
	17:ULS-B3 (Z)	0.000	10.366	9.625	-4.727	-3.987	-4.727	10.366
		0.200	39.066	38.470	-33.428	-32.832	-33.428	39.066
		0.400	59.149	58.697	-53.511	-53.059	-53.511	59.149
		0.600	70.615	70.308	-64.977	-64.670	-64.977	70.615
		0.800	73.465	73.301	-67.826	-67.663	-67.826	73.465
		1.000	67.697	67.678	-62.059	-62.040	-62.059	67.697
		1.200	52.081	52.207	-46.443	-46.568	-46.568	52.207
		1.400	27.849	28.118	-22.210	-22.480	-22.480	28.118
		1.600	-5.001	-4.587	10.639	10.226	-5.001	10.639
		1.800	-46.467	-45.910	52.106	51.548	-46.467	52.106
		2.000	-96.551	-95.849	102.189	101.487	-96.551	102.189
	18:ULS-B4 (-Z	0.000	-90.484	-89.730	87.671	86.917	-90.484	87.671
		0.200	-43.960	-43.353	41.147	40.540	-43.960	41.147
		0.400	-6.053	-5.593	3.240	2.780	-6.053	3.240
		0.600	23.237	23.550	-26.050	-26.363	-26.363	23.550
		0.800	43.910	44.077	-46.723	-46.889	-46.889	44.077
		1.000	55.966	55.986	-58.779	-58.798	-58.798	55.986
		1.200	58.174	58.047	-60.987	-60.860	-60.987	58.174
		1.400	51.765	51.491	-54.578	-54.304	-54.578	51.765
		1.600	36.740	36.318	-39.552	-39.131	-39.552	36.740
		1.800	13.097	12.529	-15.909	-15.341	-15.909	13.097

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		2.000	-19.163	-19.878	16.350	17.065	-19.878	17.065
49	8:SLS1 (Z)	0.000	18.702	15.902	-26.352	-23.552	-26.352	18.702
		0.269	16.571	14.296	-24.221	-21.946	-24.221	16.571
		0.538	14.338	12.589	-21.987	-20.238	-21.987	14.338
		0.807	12.003	10.779	-19.653	-18.429	-19.653	12.003
		1.076	9.566	8.868	-17.216	-16.517	-17.216	9.566
		1.345	7.028	6.855	-14.678	-14.504	-14.678	7.028
		1.614	4.373	4.725	-12.023	-12.375	-12.375	4.725
		1.884	1.617	2.494	-9.267	-10.144	-10.144	2.494
		2.153	-1.241	0.161	-6.408	-7.811	-7.811	0.161
		2.422	-4.201	-2.274	-3.448	-5.376	-5.376	0.000
		2.691	-7.263	-4.810	-0.386	-2.839	-7.263	0.000
	9:SLS2 (-Z)	0.000	-5.752	-7.662	13.013	14.923	-7.662	14.923
		0.269	-1.800	-3.186	9.062	10.448	-3.186	10.448
		0.538	2.049	1.188	5.213	6.074	0.000	6.074
		0.807	5.797	5.459	1.465	1.802	0.000	5.797
		1.076	9.443	9.630	-2.181	-2.368	-2.368	9.630
		1.345	12.987	13.698	-5.725	-6.436	-6.436	13.698
		1.614	16.415	17.650	-9.153	-10.388	-10.388	17.650
		1.884	19.741	21.500	-12.479	-14.239	-14.239	21.500
		2.153	22.965	25.249	-15.704	-17.987	-17.987	25.249
		2.422	26.088	28.896	-18.826	-21.634	-21.634	28.896
		2.691	29.109	32.441	-21.847	-25.179	-25.179	32.441
	10:ULS-A1 (Z)	0.000	19.594	16.402	-27.656	-24.465	-27.656	19.594
		0.269	17.533	14.949	-25.595	-23.011	-25.595	17.533
		0.538	15.334	13.358	-23.396	-21.421	-23.396	15.334
		0.807	12.998	11.630	-21.060	-19.693	-21.060	12.998
		1.076	10.525	9.765	-18.587	-17.827	-18.587	10.525
		1.345	7.914	7.762	-15.976	-15.824	-15.976	7.914
		1.614	5.146	5.602	-13.209	-13.664	-13.664	5.602
		1.884	2.241	3.304	-10.303	-11.367	-11.367	3.304
		2.153	-0.801	0.870	-7.261	-8.932	-8.932	0.870
		2.422	-3.981	-1.702	-4.081	-6.360	-6.360	0.000
		2.691	-7.299	-4.412	-0.764	-3.650	-7.299	0.000
	12:ULS-A2 (-Z	0.000	-6.083	-8.340	13.677	15.934	-8.340	15.934
		0.269	-1.757	-3.408	9.352	11.002	-3.408	11.002
		0.538	2.431	1.387	5.164	6.207	0.000	6.207
		0.807	6.482	6.045	1.113	1.550	0.000	6.482
		1.076	10.395	10.565	-2.801	-2.970	-2.970	10.565
		1.345	14.171	14.947	-6.576	-7.353	-7.353	14.947
		1.614	17.790	19.173	-10.195	-11.578	-11.578	19.173
		1.884	21.271	23.261	-13.677	-15.667	-15.667	23.261
		2.153	24.616	27.212	-17.021	-19.618	-19.618	27.212
		2.422	27.822	31.025	-20.228	-23.431	-23.431	31.025
		2.691	30.892	34.701	-23.297	-27.107	-27.107	34.701
	13:ULS-B1 (Z)	0.000	21.925	18.130	-30.007	-26.212	-30.007	21.925
		0.269	20.027	16.962	-28.109	-25.045	-28.109	20.027
		0.538	18.006	15.672	-26.089	-23.754	-26.089	18.006
		0.807	15.864	14.260	-23.946	-22.342	-23.946	15.864
		1.076	13.599	12.726	-21.682	-20.808	-21.682	13.599

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
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Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.345	11.213	11.069	-19.295	-19.152	-19.295	11.213
		1.614	8.686	9.273	-16.769	-17.356	-17.356	9.273
		1.884	6.038	7.355	-14.120	-15.437	-15.437	7.355
		2.153	3.267	5.315	-11.350	-13.397	-13.397	5.315
		2.422	0.375	3.153	-8.457	-11.235	-11.235	3.153
		2.691	-2.640	0.868	-5.442	-8.950	-8.950	0.868
	16:ULS-B2 (-Z	0.000	-3.752	-6.612	11.326	14.187	-6.612	14.187
		0.269	0.737	-1.394	6.838	8.969	-1.394	8.969
		0.538	5.103	3.701	2.471	3.873	0.000	5.103
		0.807	9.347	8.675	-1.773	-1.100	-1.773	9.347
		1.076	13.470	13.526	-5.895	-5.951	-5.951	13.526
		1.345	17.470	18.255	-9.895	-10.680	-10.680	18.255
		1.614	21.330	22.845	-13.755	-15.270	-15.270	22.845
		1.884	25.068	27.312	-17.494	-19.737	-19.737	27.312
		2.153	28.685	31.657	-21.110	-24.083	-24.083	31.657
		2.422	32.179	35.881	-24.604	-28.306	-28.306	35.881
		2.691	35.550	39.982	-27.976	-32.407	-32.407	39.982
	17:ULS-B3 (Z)	0.000	25.072	21.834	-35.905	-32.668	-35.905	25.072
		0.269	21.795	19.137	-32.628	-29.971	-32.628	21.795
		0.538	18.396	16.318	-29.229	-27.151	-29.229	18.396
		0.807	14.875	13.376	-25.708	-24.210	-25.708	14.875
		1.076	11.231	10.313	-22.065	-21.146	-22.065	11.231
		1.345	7.466	7.127	-18.299	-17.961	-18.299	7.466
		1.614	3.561	3.802	-14.394	-14.636	-14.636	3.802
		1.884	-0.466	0.355	-10.367	-11.188	-11.188	0.355
		2.153	-4.616	-3.215	-6.218	-7.619	-7.619	0.000
		2.422	-8.887	-6.906	-1.946	-3.927	-8.887	0.000
		2.691	-13.281	-10.720	2.447	-0.113	-13.281	2.447
	18:ULS-B4 (-Z	0.000	-10.400	-12.496	20.822	22.918	-12.496	22.918
		0.269	-4.958	-6.455	15.380	16.877	-6.455	16.877
		0.538	0.362	-0.536	10.059	10.958	-0.536	10.958
		0.807	5.560	5.261	4.861	5.161	0.000	5.560
		1.076	10.636	10.936	-0.215	-0.514	-0.514	10.936
		1.345	15.590	16.489	-5.168	-6.067	-6.067	16.489
		1.614	20.404	21.902	-9.983	-11.480	-11.480	21.902
		1.884	25.096	27.193	-14.675	-16.771	-16.771	27.193
		2.153	29.666	32.361	-19.245	-21.940	-21.940	32.361
		2.422	34.114	37.408	-23.692	-26.986	-26.986	37.408
		2.691	38.440	42.333	-28.018	-31.911	-31.911	42.333
50	8:SLS1 (Z)	0.000	-3.929	-1.565	2.574	0.210	-3.929	2.574
		0.269	-0.904	0.937	-0.451	-2.293	-2.293	0.937
		0.538	2.019	3.338	-3.375	-4.693	-4.693	3.338
		0.807	4.841	5.637	-6.196	-6.992	-6.992	5.637
		1.076	7.561	7.834	-8.916	-9.189	-9.189	7.834
		1.345	10.179	9.929	-11.534	-11.284	-11.534	10.179
		1.614	12.681	11.908	-14.036	-13.263	-14.036	12.681
		1.884	15.081	13.785	-16.436	-15.140	-16.436	15.081
		2.153	17.380	15.561	-18.735	-16.916	-18.735	17.380
		2.422	19.576	17.234	-20.931	-18.589	-20.931	19.576
		2.691	21.671	18.806	-23.026	-20.161	-23.026	21.671

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
	9:SLS2 (-Z)	0.000	25.697	29.119	-24.877	-28.299	-28.299	29.119
		0.269	22.714	25.609	-21.894	-24.789	-24.789	25.609
		0.538	19.629	21.998	-18.808	-21.178	-21.178	21.998
		0.807	16.442	18.284	-15.621	-17.464	-17.464	18.284
		1.076	13.153	14.469	-12.333	-13.649	-13.649	14.469
		1.345	9.762	10.552	-8.942	-9.732	-9.732	10.552
		1.614	6.255	6.518	-5.435	-5.698	-5.698	6.518
		1.884	2.647	2.383	-1.827	-1.563	-1.827	2.647
		2.153	-1.064	-1.854	1.884	2.674	-1.854	2.674
		2.422	-4.876	-6.193	5.696	7.013	-6.193	7.013
		2.691	-8.790	-10.633	9.610	11.453	-10.633	11.453
	10:ULS-A1 (Z)	0.000	-3.800	-1.006	2.344	-0.450	-3.800	2.344
		0.269	-0.521	1.668	-0.935	-3.124	-3.124	1.668
		0.538	2.621	4.204	-4.077	-5.660	-5.660	4.204
		0.807	5.625	6.603	-7.081	-8.059	-8.059	6.603
		1.076	8.492	8.864	-9.948	-10.321	-10.321	8.864
		1.345	11.221	10.988	-12.678	-12.445	-12.678	11.221
		1.614	13.794	12.955	-15.250	-14.412	-15.250	13.794
		1.884	16.229	14.785	-17.685	-16.241	-17.685	16.229
		2.153	18.526	16.477	-19.983	-17.934	-19.983	18.526
		2.422	20.686	18.032	-22.143	-19.489	-22.143	20.686
		2.691	22.709	19.450	-24.166	-20.906	-24.166	22.709
	12:ULS-A2 (-Z	0.000	27.308	31.213	-26.480	-30.385	-30.385	31.213
		0.269	24.278	27.573	-23.450	-26.746	-26.746	27.573
		0.538	21.110	23.797	-20.283	-22.969	-22.969	23.797
		0.807	17.805	19.882	-16.978	-19.055	-19.055	19.882
		1.076	14.363	15.831	-13.535	-15.003	-15.003	15.831
		1.345	10.783	11.642	-9.956	-10.814	-10.814	11.642
		1.614	7.047	7.296	-6.219	-6.468	-6.468	7.296
		1.884	3.172	2.813	-2.345	-1.985	-2.345	3.172
		2.153	-0.839	-1.808	1.667	2.636	-1.808	2.636
		2.422	-4.988	-6.566	5.816	7.394	-6.566	7.394
		2.691	-9.274	-11.461	10.102	12.289	-11.461	12.289
	13:ULS-B1 (Z)	0.000	0.846	4.262	-2.346	-5.762	-5.762	4.262
		0.269	3.823	6.511	-5.323	-8.011	-8.011	6.511
		0.538	6.677	8.637	-8.177	-10.137	-10.137	8.637
		0.807	9.410	10.642	-10.910	-12.142	-12.142	10.642
		1.076	12.020	12.524	-13.520	-14.024	-14.024	12.524
		1.345	14.508	14.284	-16.008	-15.784	-16.008	14.508
		1.614	16.856	15.905	-18.356	-17.405	-18.356	16.856
		1.884	19.083	17.404	-20.583	-18.904	-20.583	19.083
		2.153	21.187	18.780	-22.687	-20.280	-22.687	21.187
		2.422	23.169	20.034	-24.669	-21.534	-24.669	23.169
		2.691	25.029	21.167	-26.529	-22.667	-26.529	25.029
	16:ULS-B2 (-Z	0.000	31.954	36.480	-31.170	-35.696	-35.696	36.480
		0.269	28.621	32.416	-27.837	-31.632	-31.632	32.416
		0.538	25.167	28.230	-24.383	-27.446	-27.446	28.230
		0.807	21.590	23.921	-20.806	-23.137	-23.137	23.921
		1.076	17.891	19.491	-17.107	-18.707	-18.707	19.491
		1.345	14.070	14.938	-13.286	-14.154	-14.154	14.938

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.614	10.109	10.246	-9.325	-9.462	-9.462	10.246
		1.884	6.027	5.431	-5.243	-4.647	-5.243	6.027
		2.153	1.822	0.495	-1.038	0.289	-1.038	1.822
		2.422	-2.505	-4.564	3.289	5.348	-4.564	5.348
		2.691	-6.954	-9.745	7.738	10.529	-9.745	10.529
	17:ULS-B3 (Z)	0.000	-8.409	-5.978	6.773	4.342	-8.409	6.773
		0.269	-4.069	-2.214	2.433	0.578	-4.069	2.433
		0.538	0.149	1.428	-1.785	-3.064	-3.064	1.428
		0.807	4.245	4.947	-5.881	-6.583	-6.583	4.947
		1.076	8.219	8.345	-9.855	-9.981	-9.981	8.345
		1.345	12.070	11.620	-13.706	-13.256	-13.706	12.070
		1.614	15.782	14.756	-17.418	-16.391	-17.418	15.782
		1.884	19.372	17.769	-21.008	-19.405	-21.008	19.372
		2.153	22.840	20.660	-24.476	-22.296	-24.476	22.840
		2.422	26.186	23.430	-27.822	-25.066	-27.822	26.186
		2.691	29.410	26.077	-31.046	-27.713	-31.046	29.410
	18:ULS-B4 (-Z	0.000	33.479	37.503	-32.424	-36.448	-36.448	37.503
		0.269	29.208	32.629	-28.153	-31.574	-31.574	32.629
		0.538	24.814	27.634	-23.759	-26.578	-26.578	27.634
		0.807	20.299	22.516	-19.243	-21.461	-21.461	22.516
		1.076	15.661	17.276	-14.606	-16.220	-16.220	17.276
		1.345	10.901	11.913	-9.846	-10.858	-10.858	11.913
		1.614	6.001	6.412	-4.946	-5.357	-5.357	6.412
		1.884	0.980	0.788	0.075	0.267	0.000	0.980
		2.153	-4.164	-4.958	5.219	6.013	-4.958	6.013
		2.422	-9.430	-10.826	10.485	11.882	-10.826	11.882
		2.691	-14.818	-16.817	15.873	17.872	-16.817	17.872
56	8:SLS1 (Z)	0.000	20.237	16.825	-36.298	-32.885	-36.298	20.237
		0.209	16.859	14.182	-32.920	-30.243	-32.920	16.859
		0.418	13.420	11.478	-29.480	-27.538	-29.480	13.420
		0.626	9.919	8.712	-25.980	-24.773	-25.980	9.919
		0.835	6.357	5.886	-22.418	-21.946	-22.418	6.357
		1.044	2.734	2.998	-18.795	-19.058	-19.058	2.998
		1.253	-0.959	0.040	-15.101	-16.100	-16.100	0.040
		1.462	-4.714	-2.980	-11.347	-13.081	-13.081	0.000
		1.670	-8.530	-6.060	-7.531	-10.000	-10.000	0.000
		1.879	-12.407	-9.202	-3.654	-6.858	-12.407	0.000
		2.088	-16.345	-12.405	0.285	-3.655	-16.345	0.285
	9:SLS2 (-Z)	0.000	-30.493	-25.698	46.675	41.881	-30.493	46.675
		0.209	-22.094	-18.217	38.277	34.399	-22.094	38.277
		0.418	-13.756	-10.797	29.939	26.979	-13.756	29.939
		0.626	-5.480	-3.438	21.663	19.620	-5.480	21.663
		0.835	2.735	3.860	13.448	12.323	0.000	13.448
		1.044	10.889	11.096	5.294	5.087	0.000	11.096
		1.253	18.972	18.262	-2.790	-2.080	-2.790	18.972
		1.462	26.995	25.367	-10.812	-9.185	-10.812	26.995
		1.670	34.956	32.411	-18.773	-16.228	-18.773	34.956
		1.879	42.856	39.393	-26.673	-23.210	-26.673	42.856
		2.088	50.694	46.314	-34.512	-30.132	-34.512	50.694
	10:ULS-A1 (Z)	0.000	20.860	17.308	-37.731	-34.179	-37.731	20.860

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
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Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.209	17.489	14.710	-34.360	-31.581	-34.360	17.489
		0.418	14.035	12.030	-30.906	-28.901	-30.906	14.035
		0.626	10.499	9.267	-27.370	-26.138	-27.370	10.499
		0.835	6.880	6.421	-23.751	-23.292	-23.751	6.880
		1.044	3.178	3.493	-20.049	-20.363	-20.363	3.493
		1.253	-0.618	0.470	-16.253	-17.340	-17.340	0.470
		1.462	-4.497	-2.636	-12.373	-14.235	-14.235	0.000
		1.670	-8.459	-5.825	-8.412	-11.046	-11.046	0.000
		1.879	-12.504	-9.096	-4.367	-7.775	-12.504	0.000
		2.088	-16.631	-12.450	-0.240	-4.421	-16.631	0.000
	12:ULS-A2 (-Z	0.000	-32.407	-27.341	49.391	44.326	-32.407	49.391
		0.209	-23.412	-19.309	40.396	36.293	-23.412	40.396
		0.418	-14.500	-11.358	31.484	28.343	-14.500	31.484
		0.626	-5.670	-3.491	22.655	20.475	-5.670	22.655
		0.835	3.077	4.294	13.908	12.691	0.000	13.908
		1.044	11.741	11.996	5.244	4.989	0.000	11.996
		1.253	20.310	19.603	-3.326	-2.619	-3.326	20.310
		1.462	28.797	27.128	-11.812	-10.143	-11.812	28.797
		1.670	37.201	34.570	-20.216	-17.585	-20.216	37.201
		1.879	45.522	41.929	-28.537	-24.945	-28.537	45.522
		2.088	53.760	49.205	-36.776	-32.221	-36.776	53.760
	13:ULS-B1 (Z)	0.000	19.794	16.160	-36.604	-32.970	-36.604	19.794
		0.209	17.052	14.235	-33.862	-31.046	-33.862	17.052
		0.418	14.236	12.237	-31.047	-29.048	-31.047	14.236
		0.626	11.347	10.166	-28.158	-26.976	-28.158	11.347
		0.835	8.385	8.021	-25.195	-24.831	-25.195	8.385
		1.044	5.349	5.802	-22.159	-22.613	-22.613	5.802
		1.253	2.228	3.499	-19.039	-20.310	-20.310	3.499
		1.462	-0.965	1.123	-15.845	-17.934	-17.934	1.123
		1.670	-4.233	-1.327	-12.578	-15.484	-15.484	0.000
		1.879	-7.573	-3.850	-9.237	-12.960	-12.960	0.000
		2.088	-10.988	-6.447	-5.823	-10.364	-10.988	0.000
	16:ULS-B2 (-Z	0.000	-33.473	-28.490	50.518	45.534	-33.473	50.518
		0.209	-23.849	-19.784	40.894	36.828	-23.849	40.894
		0.418	-14.299	-11.151	31.343	28.196	-14.299	31.343
		0.626	-4.822	-2.592	21.867	19.637	-4.822	21.867
		0.835	4.581	5.893	12.463	11.151	0.000	12.463
		1.044	13.911	14.305	3.134	2.740	0.000	14.305
		1.253	23.157	22.633	-6.112	-5.588	-6.112	23.157
		1.462	32.329	30.887	-15.284	-13.842	-15.284	32.329
		1.670	41.427	39.068	-24.383	-22.023	-24.383	41.427
		1.879	50.452	47.175	-33.408	-30.130	-33.408	50.452
		2.088	59.404	55.208	-42.359	-38.164	-42.359	59.404
	17:ULS-B3 (Z)	0.000	31.201	26.199	-54.725	-49.724	-54.725	31.201
		0.209	25.449	21.488	-48.974	-45.013	-48.974	25.449
		0.418	19.624	16.703	-43.148	-40.228	-43.148	19.624
		0.626	13.725	11.845	-37.250	-35.370	-37.250	13.725
		0.835	7.753	6.913	-31.277	-30.438	-31.277	7.753
		1.044	1.707	1.908	-25.231	-25.433	-25.433	1.908
		1.253	-4.423	-3.181	-19.102	-20.343	-20.343	0.000

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Job No 2	Sheet No	Rev	
Part			
Job Title Skywalk TUB70705	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		1.462	-10.627	-8.344	-12.898	-15.181	-15.181	0.000
		1.670	-16.904	-13.581	-6.621	-9.944	-16.904	0.000
		1.879	-23.254	-18.891	-0.271	-4.634	-23.254	0.000
		2.088	-29.678	-24.274	6.154	0.749	-29.678	6.154
	18:ULS-B4 (-Z	0.000	-43.154	-36.118	66.796	59.759	-43.154	66.796
		0.209	-31.644	-25.996	55.286	49.637	-31.644	55.286
		0.418	-20.208	-15.948	43.849	39.589	-20.208	43.849
		0.626	-8.845	-5.974	32.486	29.615	-8.845	32.486
		0.835	2.444	3.927	21.197	19.714	0.000	21.197
		1.044	13.660	13.754	9.981	9.887	0.000	13.754
		1.253	24.792	23.498	-1.151	0.144	-1.151	24.792
		1.462	35.850	33.167	-12.209	-9.526	-12.209	35.850
		1.670	46.835	42.763	-23.194	-19.122	-23.194	46.835
		1.879	57.746	52.286	-34.105	-28.645	-34.105	57.746
		2.088	68.584	61.735	-44.942	-38.094	-44.942	68.584
70	8:SLS1 (Z)	0.000	-9.171	29.065	9.917	-28.319	-28.319	29.065
		0.260	-6.145	22.576	6.875	-21.845	-21.845	22.576
		0.520	-3.118	16.086	3.833	-15.371	-15.371	16.086
		0.780	-0.091	9.597	0.792	-8.897	-8.897	9.597
		1.040	2.935	3.108	-2.250	-2.423	-2.423	3.108
		1.300	5.962	-3.381	-5.292	4.051	-5.292	5.962
		1.560	8.989	-9.871	-8.334	10.525	-9.871	10.525
		1.820	12.015	-16.360	-11.376	16.999	-16.360	16.999
		2.080	15.042	-22.849	-14.418	23.473	-22.849	23.473
		2.340	18.068	-29.339	-17.460	29.947	-29.339	29.947
		2.600	21.095	-35.828	-20.501	36.422	-35.828	36.422
	9:SLS2 (-Z)	0.000	37.742	-21.318	-34.200	24.860	-34.200	37.742
		0.260	29.937	-16.560	-26.410	20.088	-26.410	29.937
		0.520	22.132	-11.803	-18.620	15.315	-18.620	22.132
		0.780	14.327	-7.045	-10.830	10.542	-10.830	14.327
		1.040	6.522	-2.287	-3.041	5.769	-3.041	6.522
		1.300	-1.283	2.470	4.749	0.996	-1.283	4.749
		1.560	-9.088	7.228	12.539	-3.777	-9.088	12.539
		1.820	-16.893	11.986	20.329	-8.550	-16.893	20.329
		2.080	-24.698	16.743	28.118	-13.323	-24.698	28.118
		2.340	-32.503	21.501	35.908	-18.096	-32.503	35.908
		2.600	-40.308	26.259	43.698	-22.868	-40.308	43.698
	10:ULS-A1 (Z)	0.000	-8.104	31.037	9.275	-29.866	-29.866	31.037
		0.260	-5.216	24.172	6.366	-23.022	-23.022	24.172
		0.520	-2.327	17.308	3.457	-16.178	-16.178	17.308
		0.780	0.562	10.444	0.548	-9.335	-9.335	10.444
		1.040	3.450	3.580	-2.362	-2.491	-2.491	3.580
		1.300	6.339	-3.285	-5.271	4.353	-5.271	6.339
		1.560	9.228	-10.149	-8.180	11.197	-10.149	11.197
		1.820	12.116	-17.013	-11.089	18.040	-17.013	18.040
		2.080	15.005	-23.877	-13.998	24.884	-23.877	24.884
		2.340	17.894	-30.742	-16.908	31.728	-30.742	31.728
		2.600	20.782	-37.606	-19.817	38.572	-37.606	38.572
	12:ULS-A2 (-Z	0.000	41.154	-21.865	-37.047	25.973	-37.047	41.154
		0.260	32.670	-16.920	-28.583	21.007	-28.583	32.670

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.520	24.185	-11.975	-20.119	16.042	-20.119	24.185
		0.780	15.701	-7.030	-11.655	11.076	-11.655	15.701
		1.040	7.216	-2.085	-3.191	6.110	-3.191	7.216
		1.300	-1.268	2.860	5.273	1.145	-1.268	5.273
		1.560	-9.753	7.805	13.737	-3.821	-9.753	13.737
		1.820	-18.237	12.750	22.201	-8.786	-18.237	22.201
		2.080	-26.722	17.695	30.664	-13.752	-26.722	30.664
		2.340	-35.206	22.640	39.128	-18.717	-35.206	39.128
		2.600	-43.691	27.585	47.592	-23.683	-43.691	47.592
	13:ULS-B1 (Z)	0.000	-5.086	31.567	6.463	-30.189	-30.189	31.567
		0.260	-2.629	24.458	3.988	-23.099	-23.099	24.458
		0.520	-0.172	17.349	1.513	-16.008	-16.008	17.349
		0.780	2.285	10.241	-0.962	-8.918	-8.918	10.241
		1.040	4.741	3.132	-3.437	-1.827	-3.437	4.741
		1.300	7.198	-3.977	-5.912	5.263	-5.912	7.198
		1.560	9.655	-11.086	-8.387	12.354	-11.086	12.354
		1.820	12.111	-18.195	-10.862	19.444	-18.195	19.444
		2.080	14.568	-25.303	-13.337	26.535	-25.303	26.535
		2.340	17.025	-32.412	-15.812	33.626	-32.412	33.626
		2.600	19.482	-39.521	-18.287	40.716	-39.521	40.716
	16:ULS-B2 (-Z	0.000	44.173	-21.335	-39.859	25.649	-39.859	44.173
		0.260	35.257	-16.635	-30.961	20.930	-30.961	35.257
		0.520	26.340	-11.934	-22.063	16.212	-22.063	26.340
		0.780	17.424	-7.234	-13.165	11.493	-13.165	17.424
		1.040	8.507	-2.533	-4.267	6.774	-4.267	8.507
		1.300	-0.409	2.167	4.632	2.055	-0.409	4.632
		1.560	-9.326	6.868	13.530	-2.663	-9.326	13.530
		1.820	-18.242	11.568	22.428	-7.382	-18.242	22.428
		2.080	-27.158	16.269	31.326	-12.101	-27.158	31.326
		2.340	-36.075	20.969	40.224	-16.820	-36.075	40.224
		2.600	-44.991	25.670	49.122	-21.538	-44.991	49.122
	17:ULS-B3 (Z)	0.000	-18.561	41.150	18.950	-40.761	-40.761	41.150
		0.260	-13.264	31.967	13.634	-31.597	-31.597	31.967
		0.520	-7.966	22.785	8.318	-22.433	-22.433	22.785
		0.780	-2.668	13.603	3.002	-13.269	-13.269	13.603
		1.040	2.629	4.421	-2.314	-4.105	-4.105	4.421
		1.300	7.927	-4.762	-7.629	5.059	-7.629	7.927
		1.560	13.224	-13.944	-12.945	14.223	-13.944	14.223
		1.820	18.522	-23.126	-18.261	23.387	-23.126	23.387
		2.080	23.820	-32.308	-23.577	32.551	-32.308	32.551
		2.340	29.117	-41.491	-28.893	41.715	-41.491	41.715
		2.600	34.415	-50.673	-34.209	50.879	-50.673	50.879
	18:ULS-B4 (-Z	0.000	50.218	-32.598	-45.732	37.084	-45.732	50.218
		0.260	39.642	-25.313	-35.174	29.781	-35.174	39.642
		0.520	29.065	-18.028	-24.615	22.478	-24.615	29.065
		0.780	18.488	-10.744	-14.056	15.175	-14.056	18.488
		1.040	7.911	-3.459	-3.498	7.872	-3.498	7.911
		1.300	-2.666	3.826	7.061	0.569	-2.666	7.061
		1.560	-13.243	11.111	17.620	-6.734	-13.243	17.620
		1.820	-23.820	18.396	28.178	-14.037	-23.820	28.178

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Job Title: Skywalk TUB70705	Job No: 2	Sheet No:	Rev:
	Part:		
	Ref:		
	By: a.aasgaard	Date: 03-May-12	Chd:
Client:	File: Skywalk TUB70705.std	Date/Time: 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

Beam	L/C	d	Corner 1 (N/mm²)	Corner 2 (N/mm²)	Corner 3 (N/mm²)	Corner 4 (N/mm²)	Max Tens (N/mm²)	Max Comp (N/mm²)
		2.080	-34.397	25.681	38.737	-21.341	-34.397	38.737
		2.340	-44.974	32.966	49.296	-28.644	-44.974	49.296
		2.600	-55.551	40.250	59.854	-35.947	-55.551	59.854
74	8:SLS1 (Z)	0.000	36.248	-19.031	-33.383	21.896	-33.383	36.248
		0.260	29.815	-14.891	-26.935	17.772	-26.935	29.815
		0.520	23.382	-10.752	-20.486	13.648	-20.486	23.382
		0.780	16.949	-6.613	-14.038	9.524	-14.038	16.949
		1.040	10.516	-2.474	-7.590	5.400	-7.590	10.516
		1.300	4.083	1.665	-1.142	1.276	-1.142	4.083
		1.560	-2.350	5.804	5.306	-2.848	-2.848	5.804
		1.820	-8.783	9.943	11.754	-6.972	-8.783	11.754
		2.080	-15.216	14.083	18.202	-11.096	-15.216	18.202
		2.340	-21.648	18.222	24.651	-15.220	-21.648	24.651
		2.600	-28.081	22.361	31.099	-19.344	-28.081	31.099
	9:SLS2 (-Z)	0.000	-12.365	31.193	13.344	-30.214	-30.214	31.193
		0.260	-10.496	25.391	11.491	-24.396	-24.396	25.391
		0.520	-8.628	19.588	9.638	-18.578	-18.578	19.588
		0.780	-6.759	13.786	7.785	-12.761	-12.761	13.786
		1.040	-4.891	7.983	5.932	-6.943	-6.943	7.983
		1.300	-3.023	2.181	4.078	-1.125	-3.023	4.078
		1.560	-1.154	-3.622	2.225	4.693	-3.622	4.693
		1.820	0.714	-9.424	0.372	10.510	-9.424	10.510
		2.080	2.583	-15.227	-1.481	16.328	-15.227	16.328
		2.340	4.451	-21.029	-3.334	22.146	-21.029	22.146
		2.600	6.319	-26.832	-5.187	27.964	-26.832	27.964
	10:ULS-A1 (Z)	0.000	39.823	-19.765	-36.501	23.087	-36.501	39.823
		0.260	32.782	-15.455	-29.440	18.797	-29.440	32.782
		0.520	25.741	-11.144	-22.378	14.507	-22.378	25.741
		0.780	18.700	-6.834	-15.316	10.218	-15.316	18.700
		1.040	11.658	-2.524	-8.254	5.928	-8.254	11.658
		1.300	4.617	1.786	-1.192	1.638	-1.192	4.617
		1.560	-2.424	6.097	5.869	-2.651	-2.651	6.097
		1.820	-9.465	10.407	12.931	-6.941	-9.465	12.931
		2.080	-16.507	14.717	19.993	-11.231	-16.507	19.993
		2.340	-23.548	19.027	27.055	-15.520	-23.548	27.055
		2.600	-30.589	23.337	34.117	-19.810	-30.589	34.117
	12:ULS-A2 (-Z	0.000	-11.220	32.971	12.562	-31.628	-31.628	32.971
		0.260	-9.545	26.842	10.907	-25.479	-25.479	26.842
		0.520	-7.869	20.713	9.253	-19.330	-19.330	20.713
		0.780	-6.194	14.585	7.598	-13.181	-13.181	14.585
		1.040	-4.519	8.456	5.944	-7.032	-7.032	8.456
		1.300	-2.844	2.328	4.289	-0.883	-2.844	4.289
		1.560	-1.169	-3.801	2.634	5.266	-3.801	5.266
		1.820	0.506	-9.929	0.980	11.415	-9.929	11.415
		2.080	2.181	-16.058	-0.675	17.564	-16.058	17.564
		2.340	3.856	-22.186	-2.329	23.713	-22.186	23.713
		2.600	5.532	-28.315	-3.984	29.862	-28.315	29.862
	13:ULS-B1 (Z)	0.000	41.420	-17.701	-37.848	21.273	-37.848	41.420
		0.260	33.978	-13.647	-30.389	17.237	-30.389	33.978
		0.520	26.537	-9.592	-22.929	13.200	-22.929	26.537

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Job Title Skywalk TUB70705	Job No 2	Sheet No	Rev
	Part		
	Ref		
	By a.aasgaard	Date 03-May-12	Chd
Client	File Skywalk TUB70705.std	Date/Time 04-Jun-2012 21:55	

Beam Combined Axial and Bending Stresses Cont...

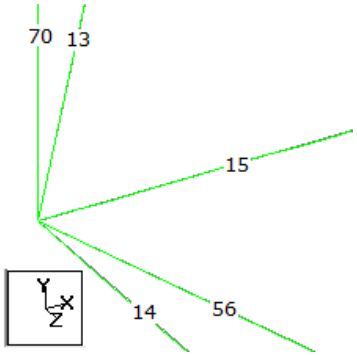
Beam	L/C	d	Corner 1 (N/mm^2)	Corner 2 (N/mm^2)	Corner 3 (N/mm^2)	Corner 4 (N/mm^2)	Max Tens (N/mm^2)	Max Comp (N/mm^2)
		0.780	19.096	-5.538	-15.469	9.164	-15.469	19.096
		1.040	11.654	-1.483	-8.009	5.128	-8.009	11.654
		1.300	4.213	2.571	-0.550	1.092	-0.550	4.213
		1.560	-3.229	6.626	6.910	-2.945	-3.229	6.910
		1.820	-10.670	10.680	14.370	-6.981	-10.670	14.370
		2.080	-18.112	14.735	21.829	-11.017	-18.112	21.829
		2.340	-25.553	18.789	29.289	-15.053	-25.553	29.289
		2.600	-32.995	22.844	36.749	-19.090	-32.995	36.749
	16:ULS-B2 (-Z'	0.000	-9.623	35.034	11.215	-33.442	-33.442	35.034
		0.260	-8.348	28.650	9.958	-27.040	-27.040	28.650
		0.520	-7.073	22.265	8.702	-20.637	-20.637	22.265
		0.780	-5.798	15.881	7.445	-14.235	-14.235	15.881
		1.040	-4.523	9.497	6.188	-7.832	-7.832	9.497
		1.300	-3.248	3.113	4.932	-1.430	-3.248	4.932
		1.560	-1.974	-3.271	3.675	4.973	-3.271	4.973
		1.820	-0.699	-9.656	2.418	11.375	-9.656	11.375
		2.080	0.576	-16.040	1.162	17.778	-16.040	17.778
		2.340	1.851	-22.424	-0.095	24.180	-22.424	24.180
		2.600	3.126	-28.808	-1.352	30.583	-28.808	30.583
	17:ULS-B3 (Z)	0.000	48.862	-30.059	-45.292	33.629	-45.292	48.862
		0.260	40.259	-23.697	-36.671	27.285	-36.671	40.259
		0.520	31.656	-17.335	-28.050	20.942	-28.050	31.656
		0.780	23.053	-10.974	-19.428	14.598	-19.428	23.053
		1.040	14.450	-4.612	-10.807	8.254	-10.807	14.450
		1.300	5.846	1.750	-2.186	1.911	-2.186	5.846
		1.560	-2.757	8.112	6.436	-4.433	-4.433	8.112
		1.820	-11.360	14.474	15.057	-10.776	-11.360	15.057
		2.080	-19.963	20.835	23.679	-17.120	-19.963	23.679
		2.340	-28.566	27.197	32.300	-23.463	-28.566	32.300
		2.600	-37.169	33.559	40.921	-29.807	-37.169	40.921
	18:ULS-B4 (-Z'	0.000	-22.378	43.491	23.184	-42.686	-42.686	43.491
		0.260	-18.812	35.298	19.636	-34.474	-34.474	35.298
		0.520	-15.246	27.105	16.089	-26.262	-26.262	27.105
		0.780	-11.680	18.911	12.541	-18.051	-18.051	18.911
		1.040	-8.114	10.718	8.993	-9.839	-9.839	10.718
		1.300	-4.549	2.525	5.446	-1.628	-4.549	5.446
		1.560	-0.983	-5.669	1.898	6.584	-5.669	6.584
		1.820	2.583	-13.862	-1.650	14.795	-13.862	14.795
		2.080	6.149	-22.055	-5.198	23.007	-22.055	23.007
		2.340	9.715	-30.248	-8.745	31.219	-30.248	31.219
		2.600	13.281	-38.442	-12.293	39.430	-38.442	39.430

APPENDIX V – LOCAL CHECK CAST JOINTS

(3 Pages to follow)

Title	Pages
Local check cast joints	3

NODE 1



Beam	End	LC	Stresses	UF
13	2	18	68.734	0.315
14	1	18	84.677	0.388
15	1	18	-37.030	0.170
56	1	18	66.796	0.306
70	1	18	50.218	0.230

$$UF_{screening} = \sqrt{\frac{1}{2}[(UF_{max} + UF_{med})^2 + (UF_{med} - UF_{min})^2 + (UF_{min} + UF_{max})^2]}$$

$UF_z = 0.388 \Rightarrow UF_{max}$
$UF_y = 0.315 \Rightarrow UF_{med}$
$UF_x = 0.306 \Rightarrow UF_{min}$

$$UF_{screening} = \sqrt{\frac{1}{2}[(0.388 + 0.315)^2 + (0.315 - 0.306)^2 + (0.306 + 0.388)^2]}$$

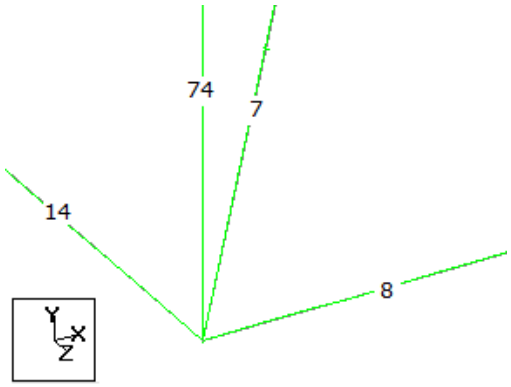
$$UF_{screening} = \sqrt{\frac{1}{2}[(0.703)^2 + (0.009)^2 + (0.694)^2]}$$

$$UF_{screening} = \sqrt{\frac{1}{2}(0.975926)}$$

$$UF_{screening} = \sqrt{0.487963}$$

$$UF_{screening} = 0.6985 \leq 1.0 \Rightarrow OK!$$

NODE 2



Beam	End	LC	Stresses	UF
7	2	13	71.080	0.326
8	1	17	-41.892	0.192
14	2	17	97.902	0.449
74	2	17	40.921	0.188

$$UF_{screening} = \sqrt{\frac{1}{2}[(UF_{max} + UF_{med})^2 + (UF_{med} - UF_{min})^2 + (UF_{min} + UF_{max})^2]}$$

$UF_z = 0.449 \Rightarrow UF_{max}$
$UF_y = 0.326 \Rightarrow UF_{med}$
$UF_x = 0.192 \Rightarrow UF_{min}$

$$UF_{screening} = \sqrt{\frac{1}{2}[(0.449 + 0.326)^2 + (0.326 - 0.192)^2 + (0.192 + 0.449)^2]}$$

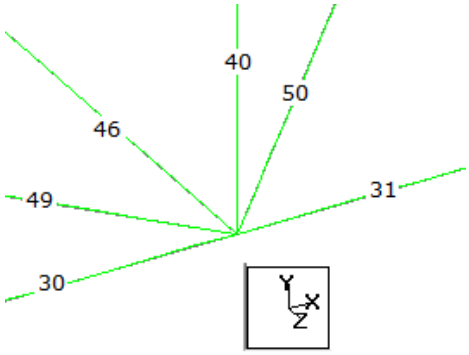
$$UF_{screening} = \sqrt{\frac{1}{2}[(0.775)^2 + (0.134)^2 + (0.641)^2]}$$

$$UF_{screening} = \sqrt{\frac{1}{2}(1.029462)}$$

$$UF_{screening} = \sqrt{0.514731}$$

$$UF_{screening} = 0.7174 \leq 1.0 \Rightarrow OK!$$

NODE 24



Beam	End	LC	Stresses	UF
30	2	13	-80.225	0.368
31	1	13	-82.830	0.380
40	1	17	-106.512	0.488
46	2	13	112.720	0.517
49	2	18	42.333	0.194
50	1	18	37.503	0.172

$$UF_{screening} = \sqrt{\frac{1}{2}[(UF_{max} + UF_{med})^2 + (UF_{med} - UF_{min})^2 + (UF_{min} + UF_{max})^2]}$$

$UF_z = 0.517 \Rightarrow UF_{max}$
$UF_y = 0.488 \Rightarrow UF_{med}$
$UF_x = 0.380 \Rightarrow UF_{min}$

$$UF_{screening} = \sqrt{\frac{1}{2}[(0.517 + 0.488)^2 + (0.488 - 0.380)^2 + (0.380 + 0.517)^2]}$$

$$UF_{screening} = \sqrt{\frac{1}{2}[(1.005)^2 + (0.108)^2 + (0.897)^2]}$$

$$UF_{screening} = \sqrt{\frac{1}{2}(1.826298)}$$

$$UF_{screening} = \sqrt{0.913149}$$

$$UF_{screening} = 0.9556 \leq 1.0 \Rightarrow OK!$$

APPENDIX VI – LOCAL CHECK BOLTED CONNECTIONS

(4 Pages to follow)

Title	Pages
Local check bolted connections	4

BOLTED CONNECTIONS

Bolted connections are checked according to EN-1999-1-1:2007

Bolts:
2xM16 aluminium bolts, EN-AW 6082.

Largest beam end force from STAAD Pro v8i analysis:
F≈54.0 kN

Distances:
d_0 = d + 2 mm = 16 + 2 = 18 mm

Distance and spacing	Min	Regular
End distance, e_1	$1.2d_0$	$2.0d_0$
Edge distance, e_2	$1.2d_0$	$1.5d_0$
Spacing, p_1 (tension and compression)	$2.2d_0$	$2.5d_0$

$e_1 = 2d_0 = 2 \cdot 18 = 36$ mm ≈ 35 mm (> $1.2d_0$ = 21.6 mm)
$p_1 = 2.5d_0 = 2.5 \cdot 18 = 45$ mm
e_2 = 40 mm (> 1.5 d_0 = 27 mm)

Design shear force per bolt (ULS):
$F_{v,Ed}$ = 54/4 = 13.5 kN

Design values for bolts:
Shear resistance:

$$F_{v,Rd} = \frac{\alpha_v \cdot f_{ub} \cdot A}{\gamma_{M2}}$$

$$F_{v,Rd} = \frac{0.6 \cdot 310 \cdot 157}{1.25}$$

$$F_{v,Rd} = 23.36\,kN > F_{v,Ed} = 13.5\,kN \Rightarrow OK!$$

Bearing resistance:

TUB70705:

$$F_{b,Rd} = \frac{k_1 \cdot \alpha_b \cdot f_u \cdot d \cdot t}{\gamma_{M2}}$$

$$k_1 = min\begin{cases} 2.8\frac{e_2}{d_0} - 1.7 = 2.8\frac{35}{18} - 1.7 = 3.744 \\ 2.5 \end{cases} = 2.5$$

$$\alpha_d = min\begin{cases} \frac{e_1}{3d_0} = \frac{35}{3 \cdot 18} = 0.648 \\ \frac{p_1}{3d_0} - \frac{1}{4} = \frac{45}{3 \cdot 18} - \frac{1}{4} = 0.583 \end{cases} = 0.583$$

$$\alpha_b = min\begin{cases} \frac{f_{ub}}{f_u} = \frac{310}{320} = 0.969 \\ 1.0 \\ \alpha_d \end{cases} = 0.583$$

$$F_{b,Rd} = \frac{2.5 \cdot 0.583 \cdot 320 \cdot 16 \cdot 5}{1.25}$$

$$F_{b,Rd} = 29.85\,kN > F_{v,Ed} = 13.5\,kN => OK!$$

TUB80804:

$$F_{b,Rd} = \frac{k_1 \cdot \alpha_b \cdot f_u \cdot d \cdot t}{\gamma_{M2}}$$

$$k_1 = min\begin{cases} 2.8\frac{e_2}{d_0} - 1.7 = 2.8\frac{40}{18} - 1.7 = 4.52 \\ 2.5 \end{cases} = 2.5$$

$$\alpha_d = min\begin{cases} \frac{e_1}{3d_0} = \frac{35}{3 \cdot 18} = 0.648 \\ \frac{p_1}{3d_0} - \frac{1}{4} = \frac{45}{3 \cdot 18} - \frac{1}{4} = 0.583 \end{cases} = 0.583$$

$$\alpha_b = min\begin{cases} \frac{f_{ub}}{f_u} = \frac{310}{290} = 1.07 \\ 1.0 \\ \alpha_d \end{cases} = 0.583$$

$$F_{b,Rd} = \frac{2.5 \cdot 0.583 \cdot 290 \cdot 16 \cdot 4}{1.25}$$

$$F_{b,Rd} = 21.64\,kN > F_{v,Ed} = 13.5\,kN => OK!$$

Control of parent material:

TUB70705:

$$N_{net,Rd} = \frac{0.9 \cdot A_{net} \cdot f_u}{\gamma_{M2}}$$

$$A_{net} = A - 2 \cdot d_0 \cdot t$$

$$A_{net} = 1300 - 2 \cdot 18 \cdot 5 = 1120\, mm^2$$

$$N_{net,Rd} = \frac{0.9 \cdot 1120 \cdot 320}{1.25}$$

$$N_{net,Rd} = 258.0\, kN > \Sigma F_{v,Ed} = 54\, kN => OK!$$

TUB80804:

$$N_{net,Rd} = \frac{0.9 \cdot A_{net} \cdot f_u}{\gamma_{M2}}$$

$$A_{net} = A - 2 \cdot d_0 \cdot t$$

$$A_{net} = 1216 - 2 \cdot 18 \cdot 4 = 1072\, mm^2$$

$$N_{net,Rd} = \frac{0.9 \cdot 1072 \cdot 290}{1.25}$$

$$N_{net,Rd} = 223.8\, kN > \Sigma F_{v,Ed} = 54\, kN => OK!$$

Control for block tearing resistance:

TUB70705

$V_{eff,1,Rd} = \frac{f_u \cdot A_{nt}}{\gamma_{M2}} + \frac{f_o \cdot A_{nv}}{\sqrt{3} \cdot \gamma_{M1}}$

$A_{nt} = (60 + 35 + 35 - 2 \cdot 9) \cdot 5 = 560\ mm^2$ (net area subjected to tension)

$A_{nv} = (45 + 45 + 35 + 35 - 3 \cdot 18) \cdot 5 = 530\ mm^2$ (net area subjected to shear)

$V_{eff,1,Rd} = \frac{320 \cdot 560}{1.25} + \frac{240 \cdot 530}{\sqrt{3} \cdot 1.1}$

$V_{eff,1,Rd} = 210.122\ kN > \Sigma F_{v,Ed} = 54\ kN \Rightarrow OK!$

TUB80804:

$V_{eff,1,Rd} = \frac{f_u \cdot A_{nt}}{\gamma_{M2}} + \frac{f_o \cdot A_{nv}}{\sqrt{3} \cdot \gamma_{M1}}$

$A_{nt} = (72 + 40 + 40 - 2 \cdot 9) \cdot 4 = 536\ mm^2$ (net area subjected to tension)

$A_{nv} = (45 + 45 + 35 + 35 - 3 \cdot 18) \cdot 4 = 424\ mm^2$ (net area subjected to shear)

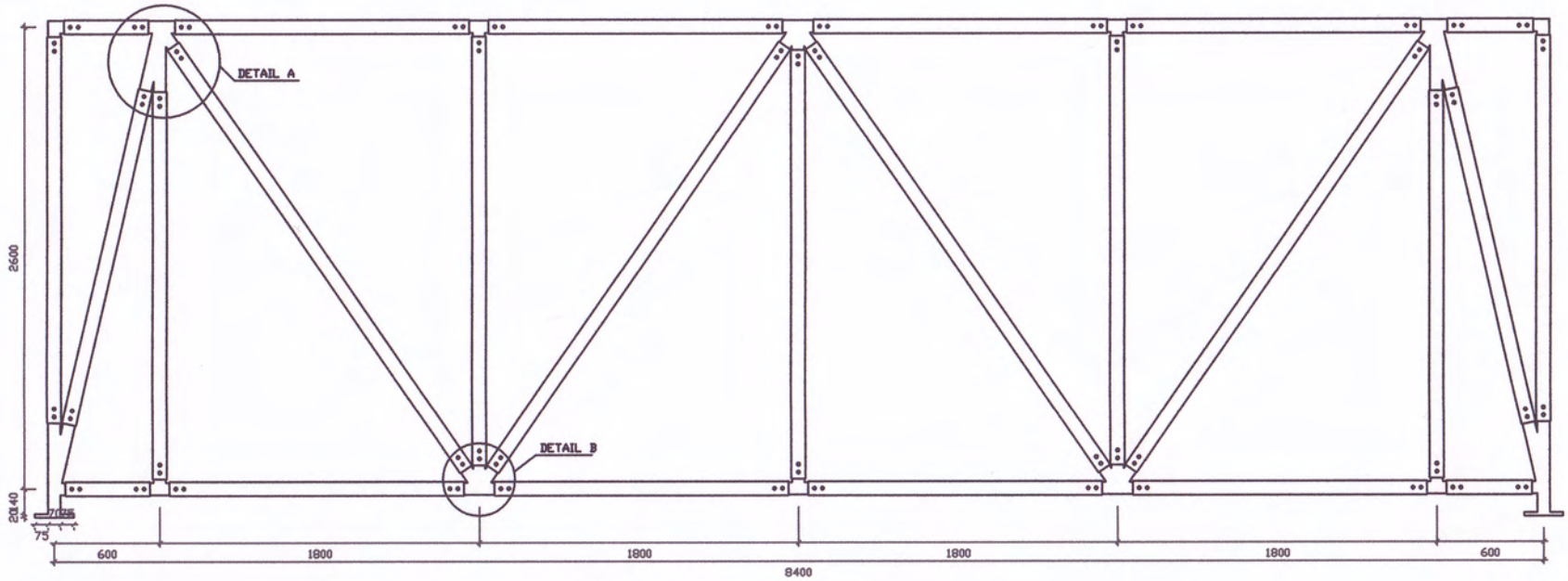
$V_{eff,1,Rd} = \frac{290 \cdot 536}{1.25} + \frac{250 \cdot 424}{\sqrt{3} \cdot 1.1}$

$V_{eff,1,Rd} = 179.987\ kN > \Sigma F_{v,Ed} = 54\ kN \Rightarrow OK!$

APPENDIX VII – DRAWINGS

(2 Pages to follow)

Title	Pages
Skywalk	1
Details	1

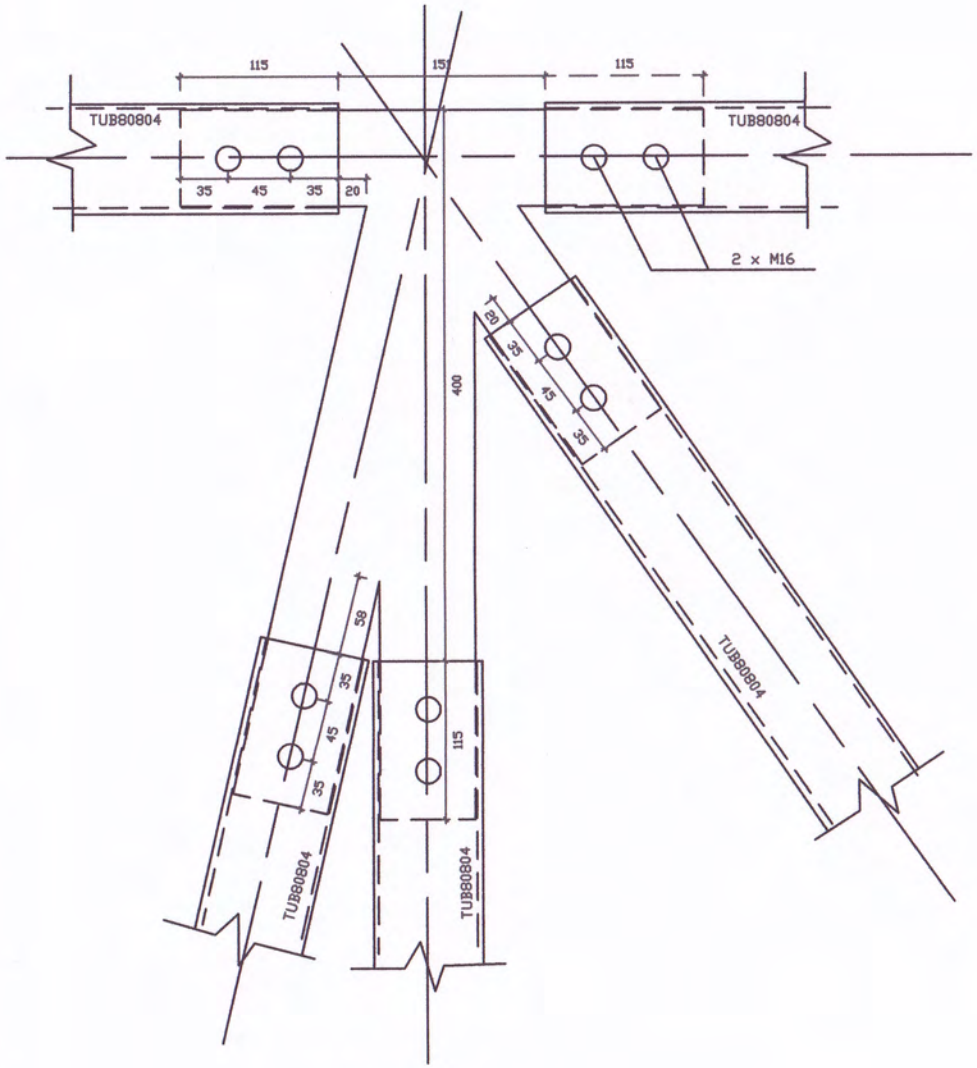


Structural engineering and material science

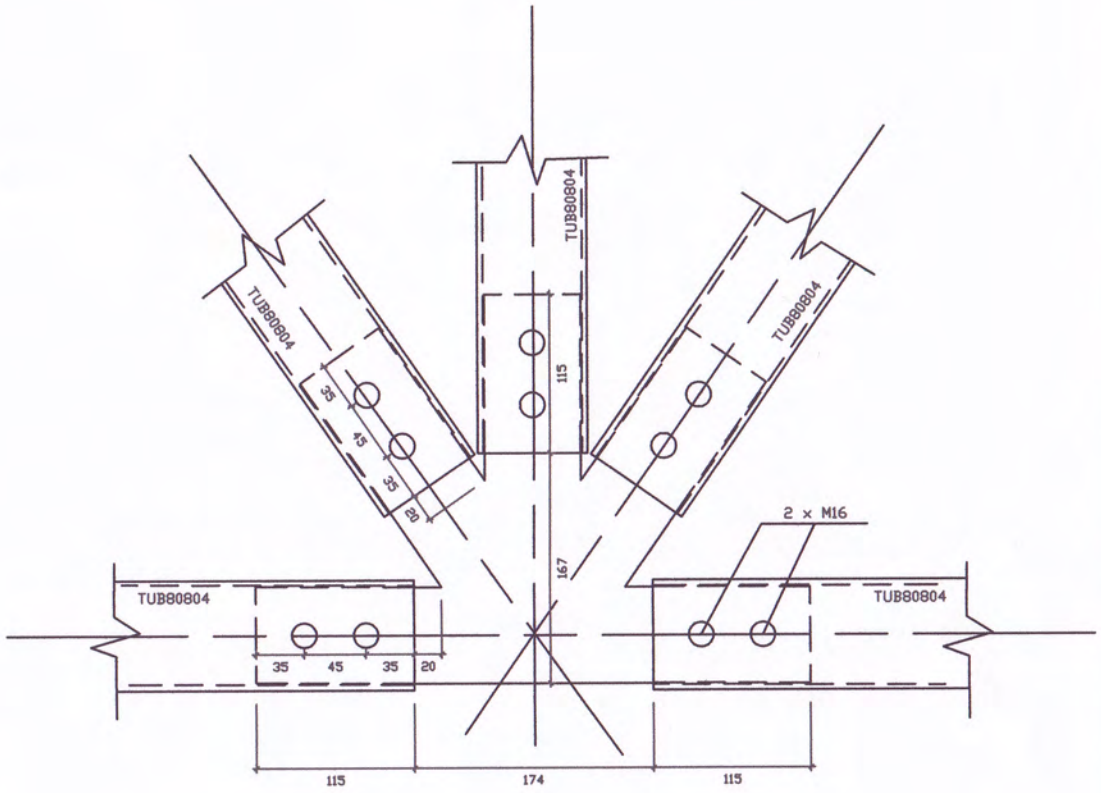
Faculty for Science and Technology

MASTER THESIS SKYWALK

Skywalk



DETAIL A



DETAIL B

CAST JOINTS DIMENSIONS ARE 70X70X5 MM

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MASTER THESIS SKYWALK Skywalk Detail A , B			