Building Act 1993

Building Regulations 2006

REGULATION 1507: CERTIFICATE OF COMPLIANCE—DESIGN

To

Relevant building surveyor: Victorian Building Authority

Postal address: 733 Bourke Street, Docklands VIC 3008

From

Building practitioner: Ronald Bell

Category and class: Civil Engineer Registration No: EC27967

Postal address: PO Box 1671, Browns Plains BC, Queensland, 4118.

Site Design Conditions

Location: State of Victoria, $V_{sit,25}$=41m/s

Compliance

I did not prepare the design and I certify that the part of the design described as 22m diameter Circus Tent complies with the following provisions of the regulations

AS/NZS 1170.0:2002	Structural Design Actions Part 0—General Principles
AS/NZS 1170.1:2002	Structural Design Actions Part 1—Permanent, Imposed & Other Actions
AS/NZS 1170.2:2011	Structural Design Actions Part 2—Wind Actions
AS4100:1998	Steel Structures Code.

Design documents

Calculations- for 22m-TENT RevA-Exec271015 (69 Sheets)
Declaration of Conformity-reduced (24 Sheets)
Declaration of Performance (2 Sheets)
Australian Journal of Structural Engineering Vol 12, No 2 pp. 173—176.

Additional Requirements

Tie Down and Bearing Requirements

- Minimum Sole Plate Size to be 275x275x35 Hardwood for 100kPa Bearing soil.
- Tie Down 22m Diameter tent
- Main Guys = PUNTA-GRL32
- Guys to Wall Poles = 2.5 Tonne capacity webbing with Turfer Ratchet Winch to 38ø x 1200 long pegs
- Guy Stakes to be 150TFB.
- Pegged Tie Down Points to be PROOF TESTED TO 3200kg UNDER SUPERVISION.
- Minimum Peg Depth 600mm

Signed:

Ronald A. Bell
Registered Professional Engineer
Grad Cert (Tech Mgt), BEng Civil (Hons), BEng, MIEAust (891940), MIPENZ (1027605)
31MAR2016
Signed .....
RPEQ (6715), RBP(NT) (60596ES), RBP(Vic) (EC27967), RBP(Tas)(CC5556),MAIB (9225), JP(Qual).
STRUCTURAL DETAILS CONCURRED

Date: Thursday, 31 March 2016

REGISTERED Building Practitioner plus CPD

SUMMERMORE Pty Ltd ABN 42 108 898 433
PO Box 1671
Browns Plains BC
Queensland, 4118
Tel: 07 3800 0973 Fax: 07 3800 1860 Mob:0438288116
E: ron@summermore.com.au
W: www.summermore.com.au

Thursday, 31 March 2016

Maryann Schulz
Moscow Circus
PO Box 501,
Ormeau,
QLD, 4208.

Dear Maryann,

STRUCTURAL DESIGN CERTIFICATION (16-10670)
22M DIAMETER CIRCUS TENT

We, Summermore Pty Ltd, being Registered Structural and Civil Engineers, hereby confirm that we are in receipt of the following documents –

Calculations- for 22m-TENT RevA-Exec271015	(69 Sheets)
Declaration of Conformity-reduced	(24 Sheets)
Declaration of Performance	(2 Sheets)
Australian Journal of Structural Engineering Vol 12, No 2 pp. 173–176.	

We further certify that we have checked the design of the abovementioned project as detailed in the referenced documents have been designed in accordance with widely accepted engineering principles and the referenced codes of practice.

AS/NZS 1170.0:2002	Structural Design Actions Part 0–General Principles
AS/NZS 1170.1:2002	Structural Design Actions Part 1–Permanent, Imposed & Other Actions
AS/NZS 1170.2:2011	Structural Design Actions Part 2–Wind Actions
AS4100:1998	Steel Structures Code.

The design parameters for the abovementioned project are:
Wind Classification: Region A, IL3, TC2, h=15, $V_{sit,1000}$, 1 month = $41^{m}/_{s}$

Tie Down and Bearing Requirements

Minimum Sole Plate Size to be 275x275x35 Hardwood for 100kPa Bearing soil.
Tie Down 22m Diameter tent

- Main Guys = PUNTA-GRL32
- Guys to Wall Poles = 2.5 Tonne capacity webbing with Turfer Ratchet Winch to 38ø x 1200 long pegs
- Guy Stakes to be 150TFB.
- Pegged Tie Down Points to be PROOF TESTED TO 3200kg UNDER SUPERVISION.
- Minimum Peg Depth 600mm

This certification is limited to the documentation supplied and compliance with the requirements of the published codes of practice listed and should not be used for any other purpose. Summermore Pty Ltd accepts no responsibility for information that has not been expressly identified as part of this assessment. This assessment can only be relied upon by the addressee and cannot be relied upon by any third party. Summermore Pty Ltd accepts no responsibility for any third party that seeks to rely upon this assessment.

If we can be of any further assistance in this matter, please do not hesitate to contact this office.

Yours Faithfully

Ronald Bell
Grad Cert (Tech Mgt), BEng Civil (Hons), PEng, MIEAust (891940), RPEQ (6715), RBP(Vic)(EC27967), RBP(NT)(60596ES), RBP(Tas)(CC5556C), MAIB (9225), JP(Qual).
Director
Summermore Pty Ltd

ENGINEERS AUSTRALIA Professional Engineers MEMBER

BUILDING COMMISSION VICTORIA REGISTERED Building Practitioner

Proud Member of: CONSULT AUSTRALIA Representing Engineering Excellence

STRUCTURAL CALCULATIONS
FOR THE STRUCTURAL STEELWORK

CLIENT: A-TRE ALBAN srl
Via dell'industria 11/13
Mussolente (VI)- ITALY

OBJECT: Tent 22m x H15m
(ref. LORITZ CIRCUS-Australia)

Structural Steelwork Fabricator :

Anceschi Carlo SRL
via Marconi, 17 - 42010 Rio Saliceto - Italy
Tel: +39 0522 738071
Email: info@anceschicarlo.it

Rev A– Executive 27/10/15

Nigel Voak ***(I.eng AMIStructE)***

Structural Engineer

Via Socrate Gambetti 2
42123Reggio Emilia
Tel 0522 322528
Tel cell 335 – 59 14 866
Email: nigel.voak@alice.it

Ordine Ingegneri Reggio Emilia N° 2142
Institution of Structural Engineers (UK) Membership No: *064219684*

Introduction

Codes of Practice and Standards used for this project

For this set of structural calculations the following standards and codes of practice have been used:

EN 1090-2 Execution of steel structures and aluminium structures — Part 2: Technical requirements for steel structures
EN 1090-3 Execution of steel structures and aluminium structures — Part 3: Technical requirements for aluminium structures
EN 1990:2002 Eurocode: Basis of structural design
EN 1991 (all parts) Eurocode 1: Actions on structures
EN 1993 (all parts) Eurocode 3: Design of steel structures
EN 1998 (all parts) Eurocode 8: Design of structures for earthquake resistance
EN 10045-1 Metallic materials — Charpy impact test — Part 1: Test method
EN 10164 Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions
EN ISO 9001 Quality management systems — Requirements (ISO 9001:2000)
EN ISO 14731 Welding coordination — Tasks and responsibilities (ISO 14731:2006)
ISO 7976-1 Tolerances for building — Methods of measurement of buildings and building products — Part 1: Methods and instruments
EN 10025-1:2002 Hot-rolled products of structural steels - Part 1: General delivery conditions.
EN 10025-2:2002 Hot-rolled products of structural steels - Part 2: Technical delivery conditions for non alloystructural steels.
EN 10025-3:2002 Hot-rolled products of structural steels - Part 3: Technical delivery conditions for normalized / normalized rolled weldable fine grain structural steels.
EN 10025-4:2002 Hot-rolled products of structural steels - Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.
EN 10025-5:2002 Hot-rolled products of structural steels - Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance.
EN 10025-6:2002 Hot-rolled products of structural steels - Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition.
EN 10164:1993 Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions.
EN 10210-1:2002 Hot finished structural hollow sections of non-alloy and fine grain structural steels – Part 1: Technical delivery requirements.
EN 10219-1:2002 Cold formed hollow sections of structural steel - Part 1: Technical delivery requirements.

EN 13782:2006 Temporary structures. Tents. Safety
UNI EN 13782:2006 **:** Strutture temporanee - Tende - Sicurezza

For undated references, the latest edition of the referenced document (including any amendments) applies.

Calculation note

For this set of calculations, the structure is considered to be perfectly erected without alignment errors and other erection errors that are significant enough to cause second order effects.

Finite Element Pe and Post Processor

This set of calculations has been carried out with the SAP2000 Finite element program

Bibliography

Together with the codes of practice and standards listed above, the following have been used.

Roark's Formulas for Stresses and Strains 6h Ed Mc Graw Hill

Beta factors

Guide to Stability Design Critera for Metal Structures 5th Ed. Wiley

(Structural Stability Research Council – USA)

Problems regarding the stability of the structure

Design of SHS Welded Joints. British Steel / Corus

Nodes for Tubes

Limit States

Fundamental combinations

The design values of the actions shall be combined in the following way:

$$\gamma_G G_k + \gamma_F Q_{k,1}$$

$$\gamma_G G_k + \sum \gamma_F Q_{k,i}$$

All cases shall be checked, where

$\gamma_G = 1{,}35$	partial safety factor for unfavourable permanent actions;
$\gamma_G = 1{,}0$	partial safety factor for favourable permanent actions;
$\gamma_F = 1{,}5$	partial safety factor for only one variable action;
$\gamma_F = 1{,}35$	partial safety factor for more variable actions;
G_k	characteristic value of permanent action;
$Q_{k,i}$	characteristic value of one of the variable actions.

Design values

The material coefficients to be adopted in calculations for the structural steels covered by this Eurocode Part should be taken as follows:

- modulus of elasticity $E = 210\,000\,N/mm^2$
- shear modulus $G = \frac{E}{2(1+\nu)} \approx 81\,000\,N/mm^2$
- Poisson's ratio in elastic stage $\nu = 0{,}3$
- coefficient of linear thermal expansion $\alpha = 12 \times 10^{-6}$ per°C (for $T \leq 100$ °C)

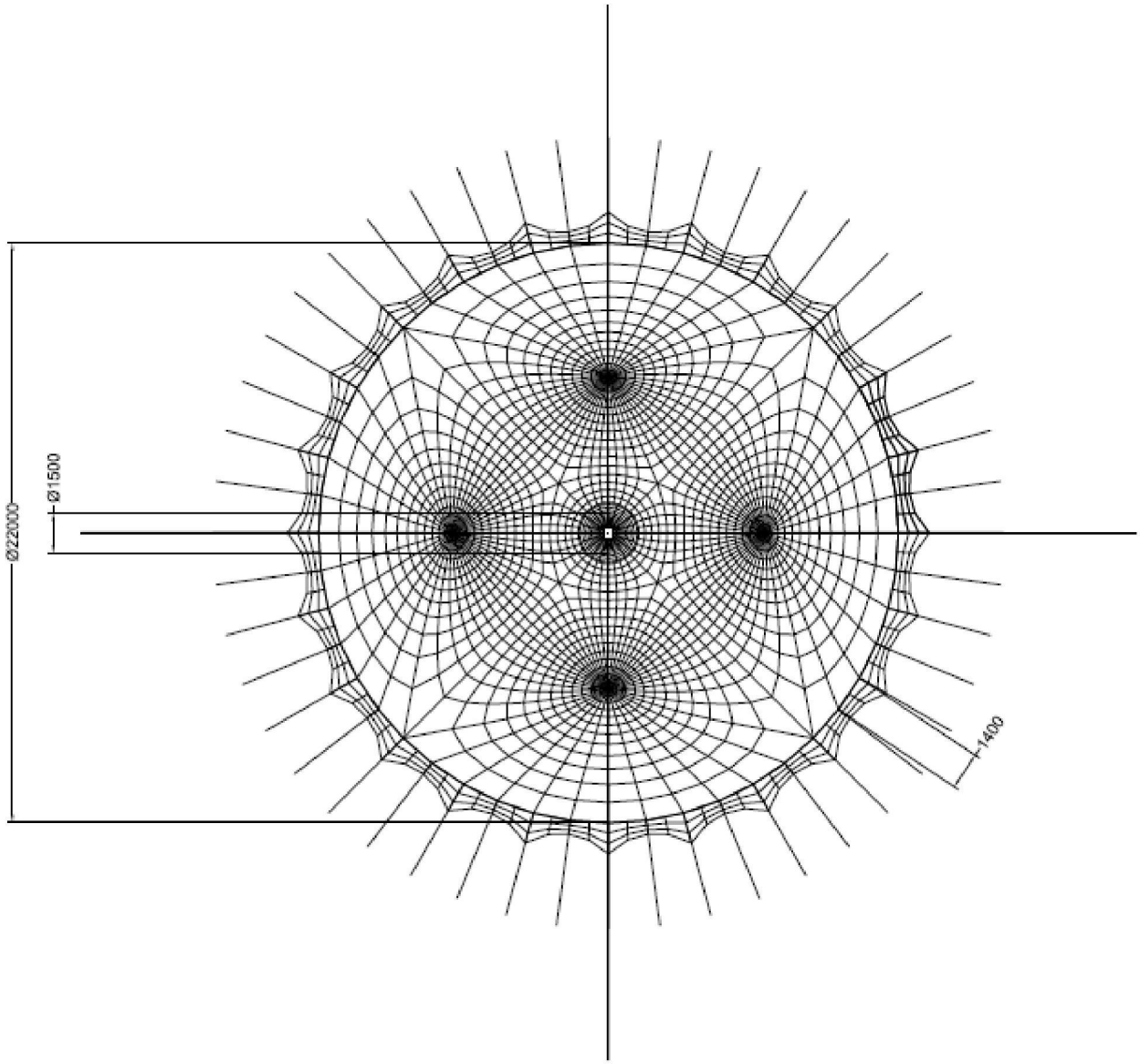
Nominal values of yield strength f_y and ultimate tensile strength f_u for hot rolled structural steel

Standard and steel grade	Nominal thickness of the element t [mm]			
	t ≤ 40 mm		40 mm < t ≤ 80 mm	
	f_y [N/mm²]	f_u [N/mm²]	f_y [N/mm²]	f_u [N/mm²]
EN 10025-2				
S 235	235	360	215	360
S 275	275	430	255	410
S 355	355	510	335	470
S 450	440	550	410	550
EN 10025-3				
S 275 N/NL	275	390	255	370
S 355 N/NL	355	490	335	470
S 420 N/NL	420	520	390	520
S 460 N/NL	460	540	430	540
EN 10025-4				
S 275 M/ML	275	370	255	360
S 355 M/ML	355	470	335	450
S 420 M/ML	420	520	390	500
S 460 M/ML	460	540	430	530
EN 10025-5				
S 235 W	235	360	215	340
S 355 W	355	510	335	490
EN 10025-6				
S 460 Q/QL/QL1	460	570	440	550

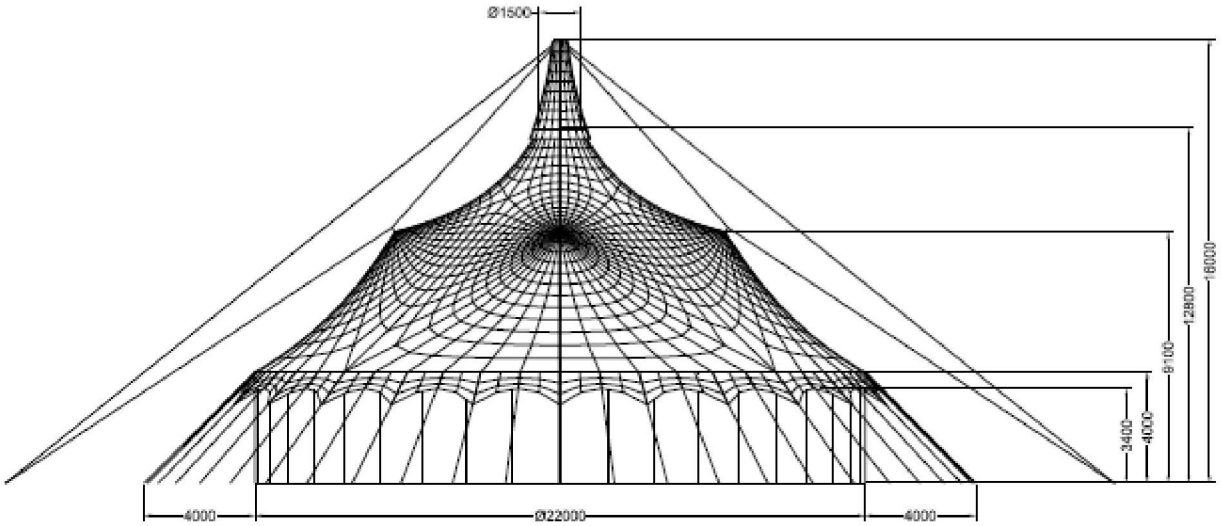
Nominal values of yield strength f_y and ultimate tensile strength f_u for structural hollow sections

Standard and steel grade	Nominal thickness of the element t [mm]			
	t ≤ 40 mm		40 mm < t ≤ 65 mm	
	f_y [N/mm²]	f_u [N/mm²]	f_y [N/mm²]	f_u [N/mm²]
EN 10210-1				
S 235 H	235	360	215	340
S 275 H	275	430	255	410
S 355 H	355	510	335	490
S 275 NH/NLH	275	390	255	370
S 355 NH/NLH	355	490	335	470
S 420 NH/NHL	420	540	390	520
S 460 NH/NLH	460	560	430	550
EN 10219-1				
S 235 H	235	360		
S 275 H	275	430		
S 355 H	355	510		
S 275 NH/NLH	275	370		
S 355 NH/NLH	355	470		
S 460 NH/NLH	460	550		
S 275 MH/MLH	275	360		
S 355 MH/MLH	355	470		
S 420 MH/MLH	420	500		
S 460 MH/MLH	460	530		

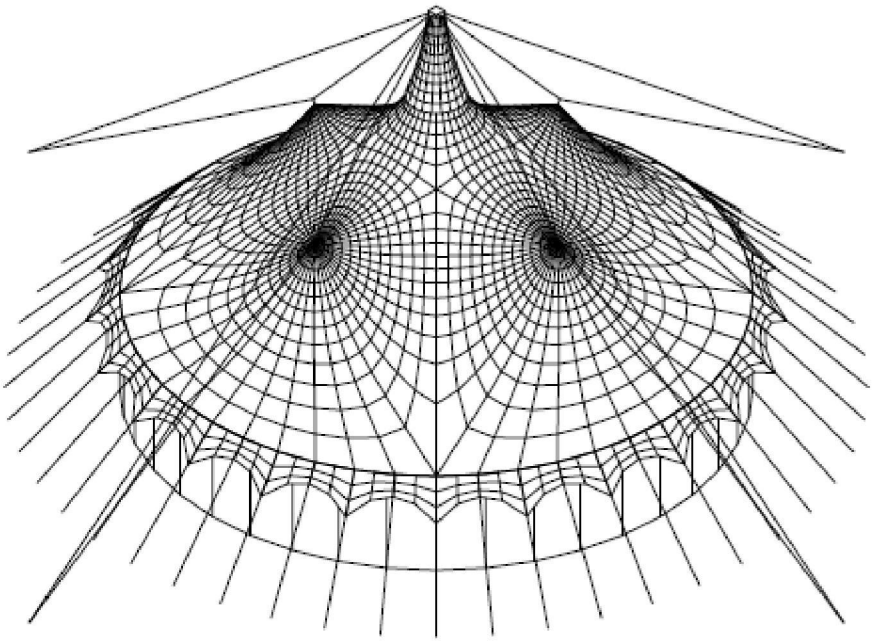
General View of the Structure



Plan View



Front View



3D View

Scope of these calculations

The scope of this set of calculations is to examine the structure in structural steel to support a tent 22m in diameter and 15m high circular tent structure.

These calculations only concern and certify the structural steelwork structure.

Analysis of Elementary Loads

Self weight of the structure:

Self weight of the tent covering = 5N/m2
Structure in steel = 78 kN/m^3

Snow loads:

The tent is not designed to carry a snow load and this is achieved by:

- sufficient heating equipment is installed and is ready for use and;
- heating is started prior to snow fall and;
- tent is heated in such a way, that the whole roof cladding has an outside air temperature of more than + 2 °C;
- cladding is made and tensioned in such a way, that pounding of water or any other deformations of the cladding cannot take place.

The user must use the above method to ensure that the structure is not subjected to snow loads.

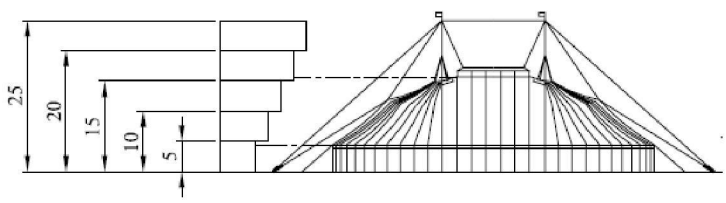
Equipment Loads

Allowable equipment load = 10.0kN (1Tonne) for the antenna

Wind Load

height: h m	pressure: q N/m^2
$h \leq 5$	500
$5 < h \leq 10$	600
$10 < h \leq 15$	660
$15 < h < 20$	710
$20 < h \leq 25$	760

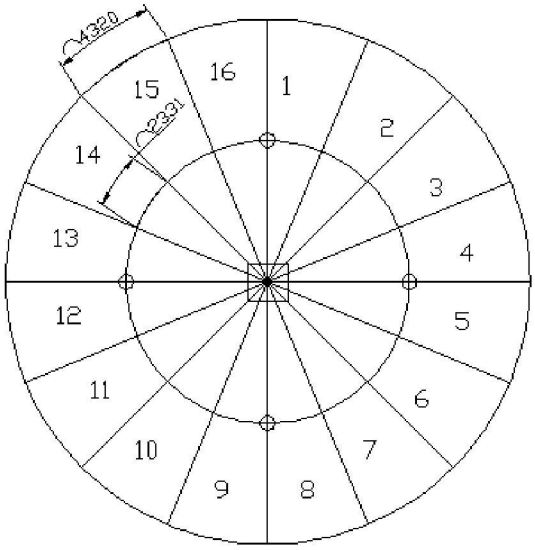
(EN 13782 6.4.2.2)



For simplicity we use a wind load of 660N/m2 for the roof load

Loads applied to the Structure

Loading scheme with the tent sectors divided into 16 load sectors for simplicity



Load Condition 1 – Vertical self weight loads

The tent is divided into 16 sectors

Tent self weight = 5N/m2 /cos45 = 7.0N/m2

For sectors 1-16 Antenna H15m divided into 4 zones corresponding to the intermediate supports.

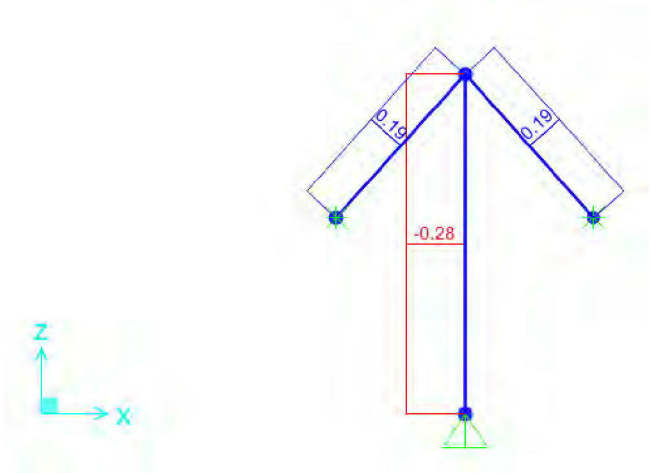
q1=7kN/m2 x 17.28m =23.24N/m
q2=7kN/m2 x 3.52m =9.32N/m
q3=7kN/m2 x 2.64m =0N/m

Reactions Tent 13m Antenna

	VkN	**HkN**	**VkN**	**HkN**	**VkN**	**HkN**
1	-0.02	0.08	0.14	0.05	0.04	0.03
2	-0.02	0.08	0.14	0.05	0.04	0.03
3	-0.02	0.08	0.14	0.05	0.04	0.03
4	-0.02	0.08	0.14	0.05	0.04	0.03
Total	0.08*	0.32*	0.56	0.2	0.16	0.12

*edge loads

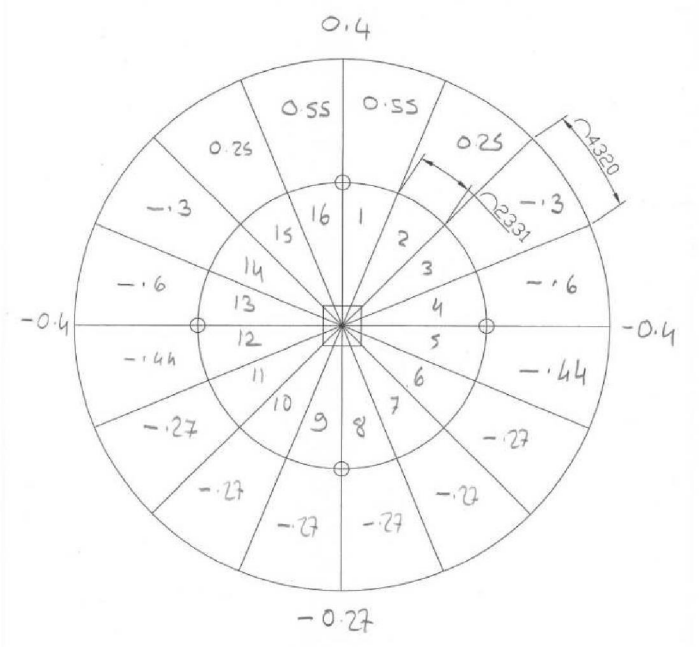
Distribution of the intermediate point load after an iteration to have ropes only in traction



Vertical load transmitted to the tower = 2 x 0.28kN + 0.16kN = 0.72kN

Load condition 2 – Wind load

Tent divided into 16 sectors as shown above on page 9 to simplify the non uniform wind loading
An average wind coefficient of 4 sectors is used to find the load at the mid support points:



The tent is analysed by sector considering the tent covering as a series of “wires”

For Antenna H15m

Basic wind load :

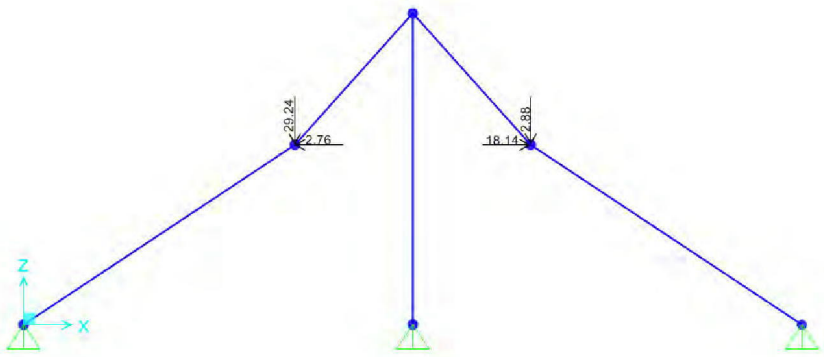
q1=0.66kN/m2 x 17.25m =11.37kN/m
q2=0.66kN/m2 x 9.32m =6.15kN/m
q3=0.66kN/m2 x 0m =0kN/m

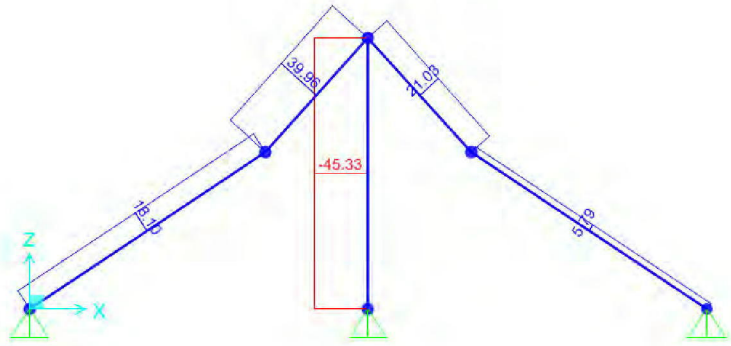
Wind

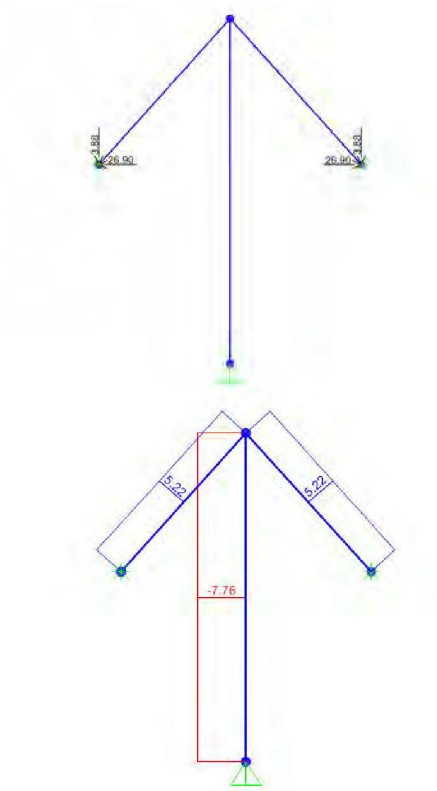
Form coefficients

Quadrant		**VkN**	**HkN**	**VkN**	**HkN**	**VkN**	**HkN**
1	0.4	-13.54	32.0	29.24	2.76	10.74	7.94
2	-0.4	-32.96	13.63	3.88	26.9	5.86	12.0
3	-0.27	-22.2	9.2	2.88	18.14	3.96	8.1
4	-0.4	-32.96	13.63	3.88	26.9	5.86	12.0
Total		-101.66	69.19	39.88	74.7	26.42	40.04

Distribution of the intermediate point load after an iteration to have ropes only in traction







Vertical load transmitted to tower by tent support rope = 53.06kN

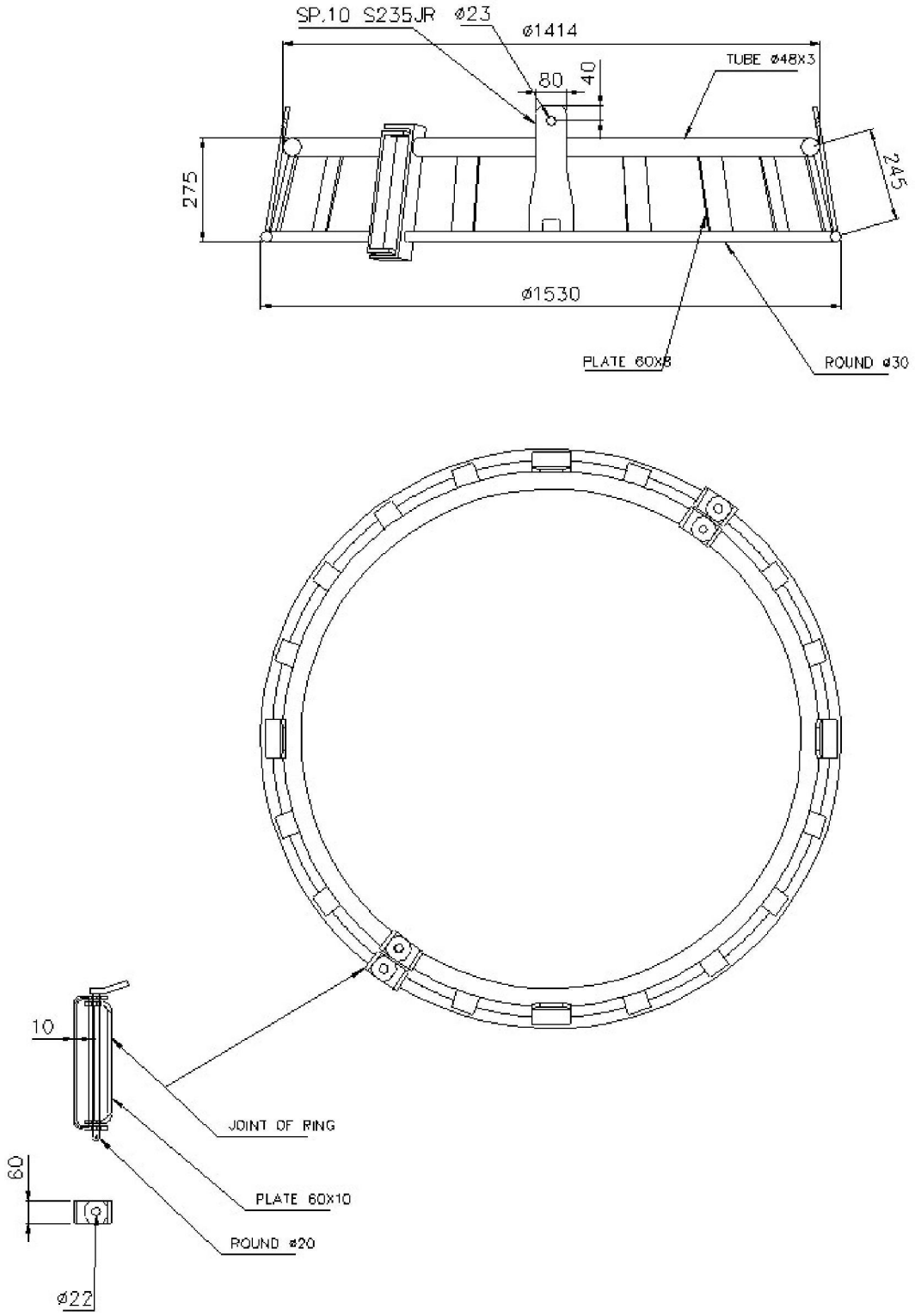
Verical wind load at centre = 26.42kN

Load Condition 3 Equipment

Equipment load on antenna = 20kN

Calculation Ring Structure

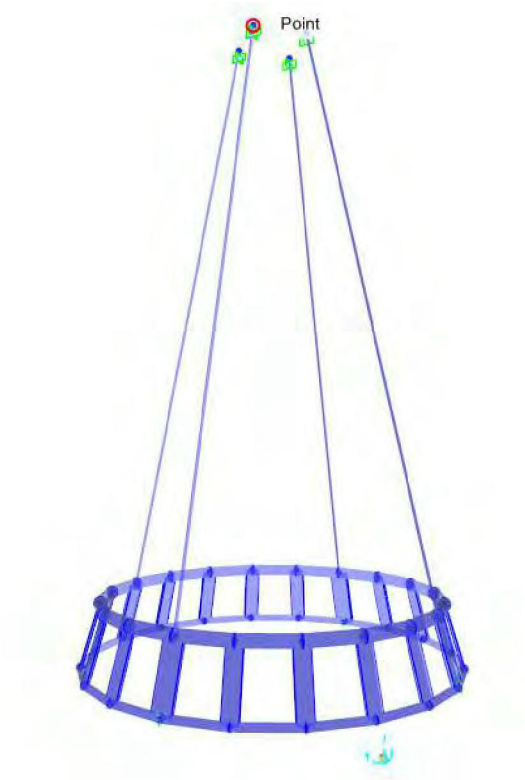
Dimensions and Details



View of the ring structure

Static scheme

Finite element model



Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
1	GLOBAL	Cartesian	750.00	0.00	0.00
2	GLOBAL	Cartesian	750.00	1500.00	0.00
3	GLOBAL	Cartesian	981.76	36.71	0.00
4	GLOBAL	Cartesian	518.24	1463.29	0.00
5	GLOBAL	Cartesian	1190.84	143.24	0.00
6	GLOBAL	Cartesian	309.16	1356.76	0.00
7	GLOBAL	Cartesian	1356.76	309.16	0.00
8	GLOBAL	Cartesian	143.24	1190.84	0.00
9	GLOBAL	Cartesian	1463.29	518.24	0.00
10	GLOBAL	Cartesian	36.71	981.76	0.00
11	GLOBAL	Cartesian	1500.00	750.00	0.00
12	GLOBAL	Cartesian	0.00	750.00	0.00
13	GLOBAL	Cartesian	1463.29	981.76	0.00
14	GLOBAL	Cartesian	36.71	518.24	0.00
15	GLOBAL	Cartesian	1356.76	1190.84	0.00
16	GLOBAL	Cartesian	143.24	309.16	0.00
17	GLOBAL	Cartesian	1190.84	1356.76	0.00
18	GLOBAL	Cartesian	309.16	143.24	0.00
19	GLOBAL	Cartesian	981.76	1463.29	0.00
20	GLOBAL	Cartesian	518.24	36.71	0.00
21	GLOBAL	Cartesian	750.00	67.00	236.00
22	GLOBAL	Cartesian	750.00	1433.00	236.00
41	GLOBAL	Cartesian	961.06	100.43	236.00
42	GLOBAL	Cartesian	538.94	1399.57	236.00
43	GLOBAL	Cartesian	1151.46	197.44	236.00

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
44	GLOBAL	Cartesian	348.54	1302.56	236.00
45	GLOBAL	Cartesian	1302.56	348.54	236.00
46	GLOBAL	Cartesian	197.44	1151.46	236.00
47	GLOBAL	Cartesian	1399.57	538.94	236.00
48	GLOBAL	Cartesian	100.43	961.06	236.00
49	GLOBAL	Cartesian	1433.00	750.00	236.00
50	GLOBAL	Cartesian	67.00	750.00	236.00
51	GLOBAL	Cartesian	1399.57	961.06	236.00
52	GLOBAL	Cartesian	100.43	538.94	236.00
53	GLOBAL	Cartesian	1302.56	1151.46	236.00
54	GLOBAL	Cartesian	197.44	348.54	236.00
55	GLOBAL	Cartesian	1151.46	1302.56	236.00
56	GLOBAL	Cartesian	348.54	197.44	236.00
57	GLOBAL	Cartesian	961.06	1399.57	236.00
58	GLOBAL	Cartesian	538.94	100.43	236.00
78	GLOBAL	Cartesian	750.00	582.00	2561.00
85	GLOBAL	Cartesian	918.00	750.00	2561.00
86	GLOBAL	Cartesian	750.00	918.00	2561.00
87	GLOBAL	Cartesian	582.00	750.00	2561.00

Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
1	Yes	No	No	No	No	No
2	Yes	No	No	No	No	No
11	No	Yes	No	No	No	No
12	No	Yes	No	No	No	No
78	Yes	Yes	Yes	Yes	Yes	Yes
85	Yes	Yes	Yes	Yes	Yes	Yes
86	Yes	Yes	Yes	Yes	Yes	Yes
87	Yes	Yes	Yes	Yes	Yes	Yes

Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length
			mm
12	2	19	234.65
13	19	17	234.65
14	17	15	234.65
15	15	13	234.65
16	13	11	234.65
17	11	9	234.65
18	9	7	234.65
19	7	5	234.65
20	5	3	234.65
21	3	1	234.65
22	1	20	234.65

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length
			mm
23	20	18	234.65
24	18	16	234.65
25	16	14	234.65
26	14	12	234.65
27	12	10	234.65
28	10	8	234.65
29	8	6	234.65
30	6	4	234.65
31	4	2	234.65
52	57	55	213.69
53	55	53	213.69
54	53	51	213.69
55	51	49	213.69
56	49	47	213.69
57	47	45	213.69
58	45	43	213.69
59	43	41	213.69
60	41	21	213.69
61	21	58	213.69
62	58	56	213.69
63	56	54	213.69
64	54	52	213.69
65	52	50	213.69
66	50	48	213.69
67	48	46	213.69
68	46	44	213.69
69	44	42	213.69
70	42	22	213.69
71	22	57	213.69
72	2	22	245.33
73	4	42	245.33
74	6	44	245.33
75	8	46	245.33
76	10	48	245.33
77	12	50	245.33
78	14	52	245.33
79	16	54	245.33
80	18	56	245.33
81	20	58	245.33
82	1	21	245.33
83	3	41	245.33
84	5	43	245.33
85	7	45	245.33
86	9	47	245.33
87	11	49	245.33
88	13	51	245.33
89	15	53	245.33
90	17	55	245.33
91	19	57	245.33
92	21	78	2381.35
96	49	85	2381.35
97	22	86	2381.35
98	50	87	2381.35

Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
12	Round 30	Round 30	Default
13	Round 30	Round 30	Default
14	Round 30	Round 30	Default
15	Round 30	Round 30	Default
16	Round 30	Round 30	Default
17	Round 30	Round 30	Default
18	Round 30	Round 30	Default
19	Round 30	Round 30	Default
20	Round 30	Round 30	Default
21	Round 30	Round 30	Default
22	Round 30	Round 30	Default
23	Round 30	Round 30	Default
24	Round 30	Round 30	Default
25	Round 30	Round 30	Default
26	Round 30	Round 30	Default
27	Round 30	Round 30	Default
28	Round 30	Round 30	Default
29	Round 30	Round 30	Default
30	Round 30	Round 30	Default
31	Round 30	Round 30	Default
52	Tube 48*3	Tube 48*3	Default
53	Tube 48*3	Tube 48*3	Default
54	Tube 48*3	Tube 48*3	Default
55	Tube 48*3	Tube 48*3	Default
56	Tube 48*3	Tube 48*3	Default
57	Tube 48*3	Tube 48*3	Default
58	Tube 48*3	Tube 48*3	Default
59	Tube 48*3	Tube 48*3	Default
60	Tube 48*3	Tube 48*3	Default
61	Tube 48*3	Tube 48*3	Default
62	Tube 48*3	Tube 48*3	Default
63	Tube 48*3	Tube 48*3	Default
64	Tube 48*3	Tube 48*3	Default
65	Tube 48*3	Tube 48*3	Default
66	Tube 48*3	Tube 48*3	Default
67	Tube 48*3	Tube 48*3	Default
68	Tube 48*3	Tube 48*3	Default
69	Tube 48*3	Tube 48*3	Default
70	Tube 48*3	Tube 48*3	Default
71	Tube 48*3	Tube 48*3	Default
72	Plate 80*10	Plate 80*10	Default
73	Plate 60*8	Plate 60*8	Default
74	Plate 60*8	Plate 60*8	Default
75	Plate 60*8	Plate 60*8	Default
76	Plate 60*8	Plate 60*8	Default
77	Plate 80*10	Plate 80*10	Default
78	Plate 60*8	Plate 60*8	Default
79	Plate 60*8	Plate 60*8	Default
80	Plate 60*8	Plate 60*8	Default
81	Plate 60*8	Plate 60*8	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
82	Plate 80*10	Plate 80*10	Default
83	Plate 60*8	Plate 60*8	Default
84	Plate 60*8	Plate 60*8	Default
85	Plate 60*8	Plate 60*8	Default
86	Plate 60*8	Plate 60*8	Default
87	Plate 80*10	Plate 80*10	Default
88	Plate 60*8	Plate 60*8	Default
89	Plate 60*8	Plate 60*8	Default
90	Plate 60*8	Plate 60*8	Default
91	Plate 60*8	Plate 60*8	Default
92	Rope	N.A.	Default
96	Rope	N.A.	Default
97	Rope	N.A.	Default
98	Rope	N.A.	Default

Frame Release Assignments 1 - General, Part 1 of 2

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
92	No	No	No	Yes	Yes	Yes
96	No	No	No	Yes	Yes	Yes
97	No	No	No	Yes	Yes	Yes
98	No	No	No	Yes	Yes	Yes

Frame Release Assignments 1 - General, Part 2 of 2

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
92	No	No	No	No	No	Yes
96	No	No	No	No	No	Yes
97	No	No	No	No	No	Yes
98	No	No	No	No	No	Yes

Basic Mechanical Properties

Table 6: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight	UnitMass	E1	G12	U12	A1
	KN/mm3	KN-s2/mm4	KN/mm2	KN/mm2		1/C
Rope	7.6973E-08	7.8490E-12	100.00000	38.46154	0.300000	1.1700E-05
S235	7.6973E-08	7.8490E-12	210.00000	80.76923	0.300000	1.1700E-05

Material Properties 03a - Steel Data

Table 7: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope
	N/mm2	N/mm2	
S235	235	360	-0.100000

Loads on the structure

Load condition 1 – Self weight of tent covering

From previous tent load calculation on page 11:

Qv = 160N divided by 4.71m = 0.34N/m
Qh = 120N divided by 4.71m = 0.26N/m

Load Condition 2 – Wind Load

From previous basic wind load calculation on page 14:

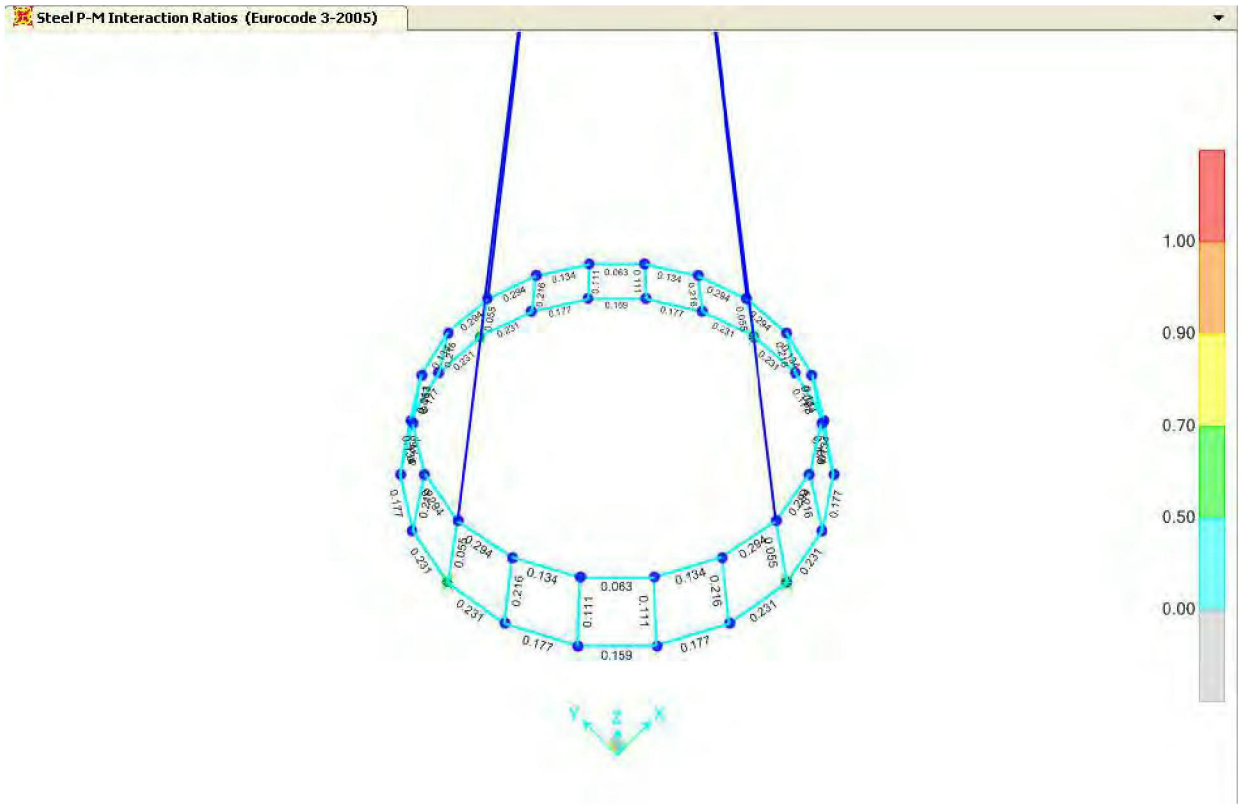
Qv = 26.42kN divided by 4.71m = 5.61kN/m
Qh = 40.04kN divided by 4.71m = 22.41kN/m

Load Combinations

Table 16: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
SLE	Linear Add	Cover	1.000000
SLE		DEAD	1.000000
SLE		Wind	1.000000
SLU1	Linear Add	Cover	1.350000
SLU1		DEAD	1.350000
SLU1		Wind	1.500000

Verification of the structure for stability and resistence



Summary Data - Eurocode 3-2005, Part 1 of 2

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
12	Round 30	Beam	No Messages	0.230543	PMM
13	Round 30	Beam	No Messages	0.17701	PMM
14	Round 30	Beam	No Messages	0.159415	PMM
15	Round 30	Beam	No Messages	0.17701	PMM
16	Round 30	Beam	No Messages	0.230543	PMM
17	Round 30	Beam	No Messages	0.230543	PMM
18	Round 30	Beam	No Messages	0.17701	PMM
19	Round 30	Beam	No Messages	0.159415	PMM
20	Round 30	Beam	No Messages	0.17701	PMM
21	Round 30	Beam	No Messages	0.230543	PMM
22	Round 30	Beam	No Messages	0.230543	PMM
23	Round 30	Beam	No Messages	0.17701	PMM
24	Round 30	Beam	No Messages	0.159415	PMM
25	Round 30	Beam	No Messages	0.17701	PMM
26	Round 30	Beam	No Messages	0.230543	PMM
27	Round 30	Beam	No Messages	0.230543	PMM
28	Round 30	Beam	No Messages	0.17701	PMM
29	Round 30	Beam	No Messages	0.159415	PMM
30	Round 30	Beam	No Messages	0.17701	PMM
31	Round 30	Beam	No Messages	0.230543	PMM
52	Tube 48*3	Beam	No Messages	0.133785	PMM
53	Tube 48*3	Beam	No Messages	0.063488	PMM
54	Tube 48*3	Beam	No Messages	0.133785	PMM
55	Tube 48*3	Beam	No Messages	0.293762	PMM
56	Tube 48*3	Beam	No Messages	0.293762	PMM
57	Tube 48*3	Beam	No Messages	0.133785	PMM
58	Tube 48*3	Beam	No Messages	0.063488	PMM
59	Tube 48*3	Beam	No Messages	0.133785	PMM
60	Tube 48*3	Beam	No Messages	0.293762	PMM
61	Tube 48*3	Beam	No Messages	0.293762	PMM
62	Tube 48*3	Beam	No Messages	0.133785	PMM
63	Tube 48*3	Beam	No Messages	0.063488	PMM
64	Tube 48*3	Beam	No Messages	0.133785	PMM
65	Tube 48*3	Beam	No Messages	0.293762	PMM
66	Tube 48*3	Beam	No Messages	0.293762	PMM
67	Tube 48*3	Beam	No Messages	0.133785	PMM
68	Tube 48*3	Beam	No Messages	0.063488	PMM
69	Tube 48*3	Beam	No Messages	0.133785	PMM
70	Tube 48*3	Beam	No Messages	0.293762	PMM
71	Tube 48*3	Beam	No Messages	0.293762	PMM
72	Plate 80*10	Brace	No Messages	0.055155	PMM
73	Plate 60*8	Brace	No Messages	0.216477	PMM
74	Plate 60*8	Brace	No Messages	0.111319	PMM
75	Plate 60*8	Brace	No Messages	0.111319	PMM
76	Plate 60*8	Brace	No Messages	0.216477	PMM
77	Plate 80*10	Brace	No Messages	0.055155	PMM
78	Plate 60*8	Brace	No Messages	0.216477	PMM
79	Plate 60*8	Brace	No Messages	0.111319	PMM
80	Plate 60*8	Brace	No Messages	0.111319	PMM
81	Plate 60*8	Brace	No Messages	0.216477	PMM
82	Plate 80*10	Brace	No Messages	0.055155	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
83	Plate 60*8	Brace	No Messages	0.216477	PMM
84	Plate 60*8	Brace	No Messages	0.111319	PMM
85	Plate 60*8	Brace	No Messages	0.111319	PMM
86	Plate 60*8	Brace	No Messages	0.216477	PMM
87	Plate 80*10	Brace	No Messages	0.055155	PMM
88	Plate 60*8	Brace	No Messages	0.216477	PMM
89	Plate 60*8	Brace	No Messages	0.111319	PMM
90	Plate 60*8	Brace	No Messages	0.111319	PMM
91	Plate 60*8	Brace	No Messages	0.216477	PMM

Summary Data - Eurocode 3-2005, Part 2 of 2

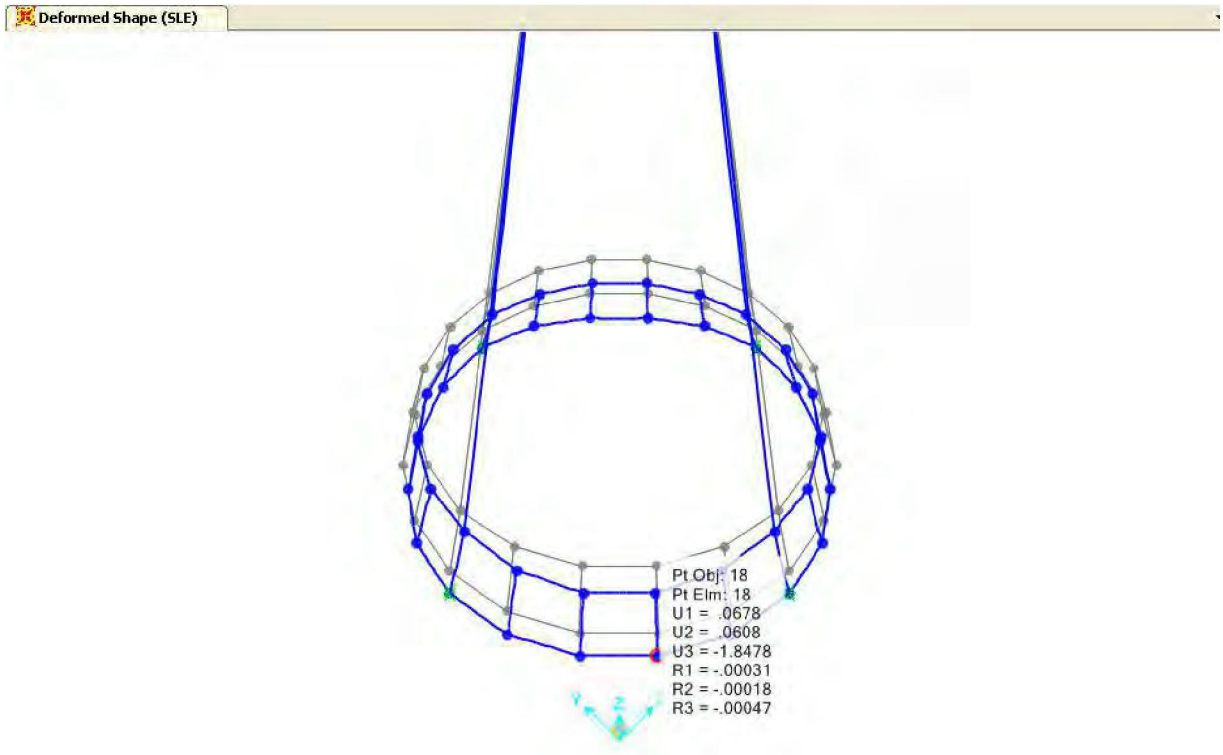
Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
12	SLU	0	No Messages	No Messages
13	SLU	0	No Messages	No Messages
14	SLU	234.65	No Messages	No Messages
15	SLU	234.65	No Messages	No Messages
16	SLU	234.65	No Messages	No Messages
17	SLU	0	No Messages	No Messages
18	SLU	0	No Messages	No Messages
19	SLU	234.65	No Messages	No Messages
20	SLU	234.65	No Messages	No Messages
21	SLU	234.65	No Messages	No Messages
22	SLU	0	No Messages	No Messages
23	SLU	0	No Messages	No Messages
24	SLU	234.65	No Messages	No Messages
25	SLU	234.65	No Messages	No Messages
26	SLU	234.65	No Messages	No Messages
27	SLU	0	No Messages	No Messages
28	SLU	0	No Messages	No Messages
29	SLU	0	No Messages	No Messages
30	SLU	234.65	No Messages	No Messages
31	SLU	234.65	No Messages	No Messages
52	SLU	213.69	No Messages	No Messages
53	SLU	0	No Messages	No Messages
54	SLU	0	No Messages	No Messages
55	SLU	213.69	No Messages	No Messages
56	SLU	0	No Messages	No Messages
57	SLU	213.69	No Messages	No Messages
58	SLU	0	No Messages	No Messages
59	SLU	0	No Messages	No Messages
60	SLU	213.69	No Messages	No Messages
61	SLU	0	No Messages	No Messages
62	SLU	213.69	No Messages	No Messages
63	SLU	213.69	No Messages	No Messages
64	SLU	0	No Messages	No Messages
65	SLU	213.69	No Messages	No Messages
66	SLU	0	No Messages	No Messages
67	SLU	213.69	No Messages	No Messages
68	SLU	213.69	No Messages	No Messages
69	SLU	0	No Messages	No Messages

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

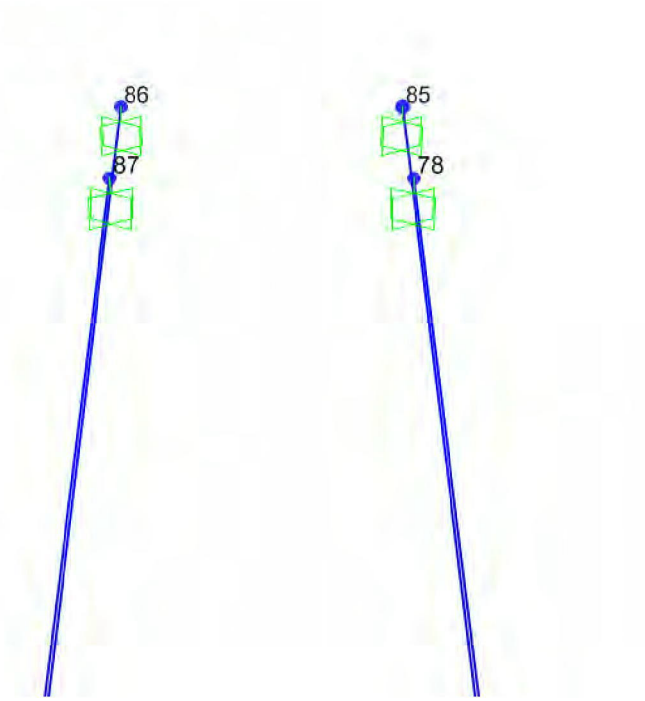
Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
70	SLU	213.69	No Messages	No Messages
71	SLU	0	No Messages	No Messages
72	SLU	0	No Messages	No Messages
73	SLU	245.33	No Messages	No Messages
74	SLU	245.33	No Messages	No Messages
75	SLU	245.33	No Messages	No Messages
76	SLU	245.33	No Messages	No Messages
77	SLU	0	No Messages	No Messages
78	SLU	245.33	No Messages	No Messages
79	SLU	245.33	No Messages	No Messages
80	SLU	245.33	No Messages	No Messages
81	SLU	245.33	No Messages	No Messages
82	SLU	0	No Messages	No Messages
83	SLU	245.33	No Messages	No Messages
84	SLU	245.33	No Messages	No Messages
85	SLU	245.33	No Messages	No Messages
86	SLU	245.33	No Messages	No Messages
87	SLU	0	No Messages	No Messages
88	SLU	245.33	No Messages	No Messages
89	SLU	245.33	No Messages	No Messages
90	SLU	245.33	No Messages	No Messages
91	SLU	245.33	No Messages	No Messages

Displacement of the structure



No damage will occure to the structure

Reactions

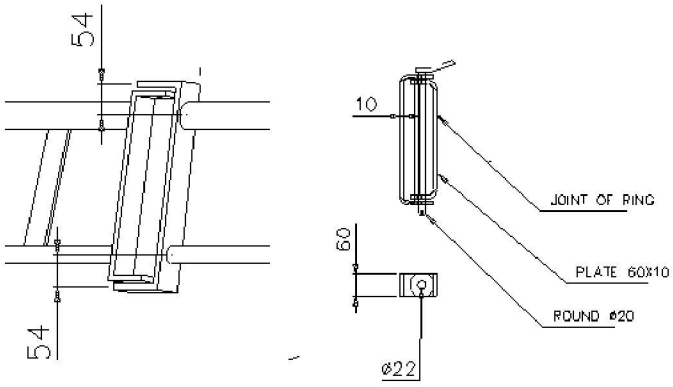


Joint	OutputCase	CaseType	F1	F2	F3
			KN	KN	KN
78	DEAD	LinStatic	0	0.036	0.171
78	Tent	LinStatic	0	0.008836	0.04
78	Wind	LinStatic	-2.12E-19	1.458	6.582
78	SLE	Combination	-2.184E-19	1.502	6.793
78	SLU	Combination	-3.266E-19	2.247	10.157
85	DEAD	LinStatic	-0.036	1.641E-20	0.171
85	Tent	LinStatic	-0.008836	0	0.04
85	Wind	LinStatic	-1.458	6.867E-19	6.582
85	SLE	Combination	-1.502	7.072E-19	6.793
85	SLU	Combination	-2.247	1.058E-18	10.157
86	DEAD	LinStatic	1.514E-20	-0.036	0.171
86	Tent	LinStatic	0	-0.008836	0.04
86	Wind	LinStatic	6.348E-19	-1.458	6.582
86	SLE	Combination	6.538E-19	-1.502	6.793
86	SLU	Combination	9.778E-19	-2.247	10.157
87	DEAD	LinStatic	0.036	0	0.171
87	Tent	LinStatic	0.008836	0	0.04
87	Wind	LinStatic	1.458	-1.056E-19	6.582
87	SLE	Combination	1.502	-1.085E-19	6.793
87	SLU	Combination	2.247	-1.624E-19	10.157

Base Reactions

OutputCase	CaseType	GlobalFX	GlobalFY	GlobalFZ
		KN	KN	KN
DEAD	LinStatic	-5.669E-15	-6.384E-15	0.683
Tent	LinStatic	-1.61E-15	-1.535E-15	0.16
Wind	LinStatic	-2.631E-13	-2.567E-13	26.328
SLE	Combination	-2.704E-13	-2.646E-13	27.171
SLU	Combination	-4.045E-13	-3.957E-13	40.63

Verification of joint



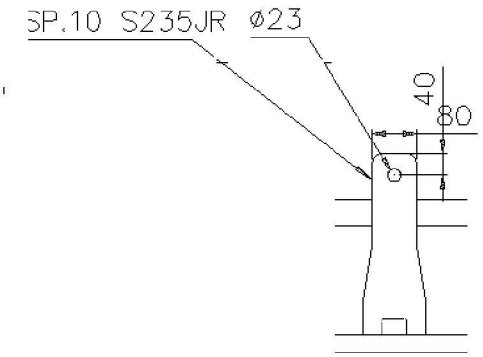
N = 9.22kN

Me = 9.22kN x 54mm = 498Nm

Wx plate 60 x 10 = 6cm3

fy = $\frac{498Nm}{6.0cm3}$ = 82N/mm2 < fyr 213N/mm2 OK

Verifation of support point



N = 10.38kN

Shackels

Grilli omega — **Anchor shackle (screw collar pin)**

Portata WLL t (**)	Codice Code n°	A mm	C mm	D mm	F mm	B mm	Peso Weight kg
0,50	77.431.005	12	6	8	28	20	0,05
0,75	77.431.007	13	8	10	31	21	0,08
1,00	77.431.010	16	10	11	36	26	0,14
1,50	77.431.015	18	11	13	43	29	0,19
2,00	77.431.020	22	13	16	51	32	0,34
3,25	77.431.033	26	16	19	64	43	0,63
4,75	77.431.048	31	19	22	76	51	0,95
6,50	77.431.065	36	22	25	83	58	1,55
8,50	77.431.085	43	25	28	95	68	2,30
9,50	77.431.095	47	28	32	108	75	3,24
12,00	77.431.120	51	32	35	115	83	4,40
13,50	77.431.135	57	35	38	133	92	6,00
17,00	77.431.170	60	38	42	146	99	7,50
25,00	77.431.250	74	45	50	178	126	14,00
35,00	77.431.350	83	50	57	197	146	18,90
55,00	77.431.550	105	65	70	254	185	37,15
85,00	77.431.850	127	75	80	330	190	62,24
120,00	77.431.998	146	90	95	381	238	110,00

** Coefficiente di sicurezza 5:1
I grilli sono forniti con superfici zincate.

** Safety factor 5:1
All shackles are supplied galvanised

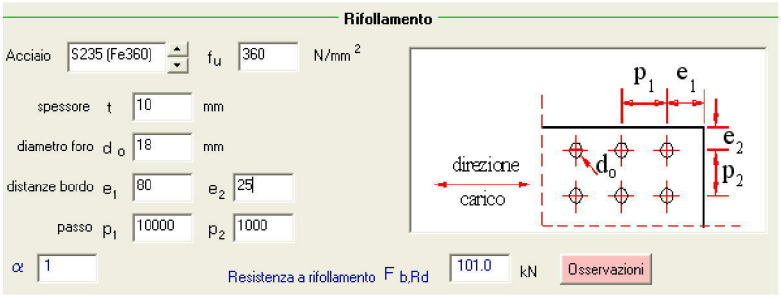
The ultimate load capacity of a 3.5Ton shackle = 35kN x 5 = 175kN

EN 13782:2005 Point 9 requires a safty factor of 2

The maximum load that can be applied to a 3.5T shackle = 175kN/2 = 87.5kN

The maximum central ring rope load (ultimate) = 11kN < 87.5kN OK

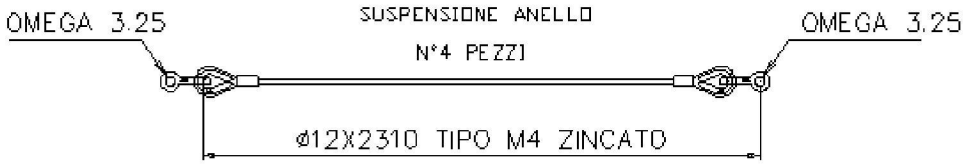
Bearing stress



The maximum antenna rope load (ultimate) = 10.4kN < 101kN

The 10mm plate is verified.

Ropes



The maximum central ring rope load (ultimate) = 10.4kN

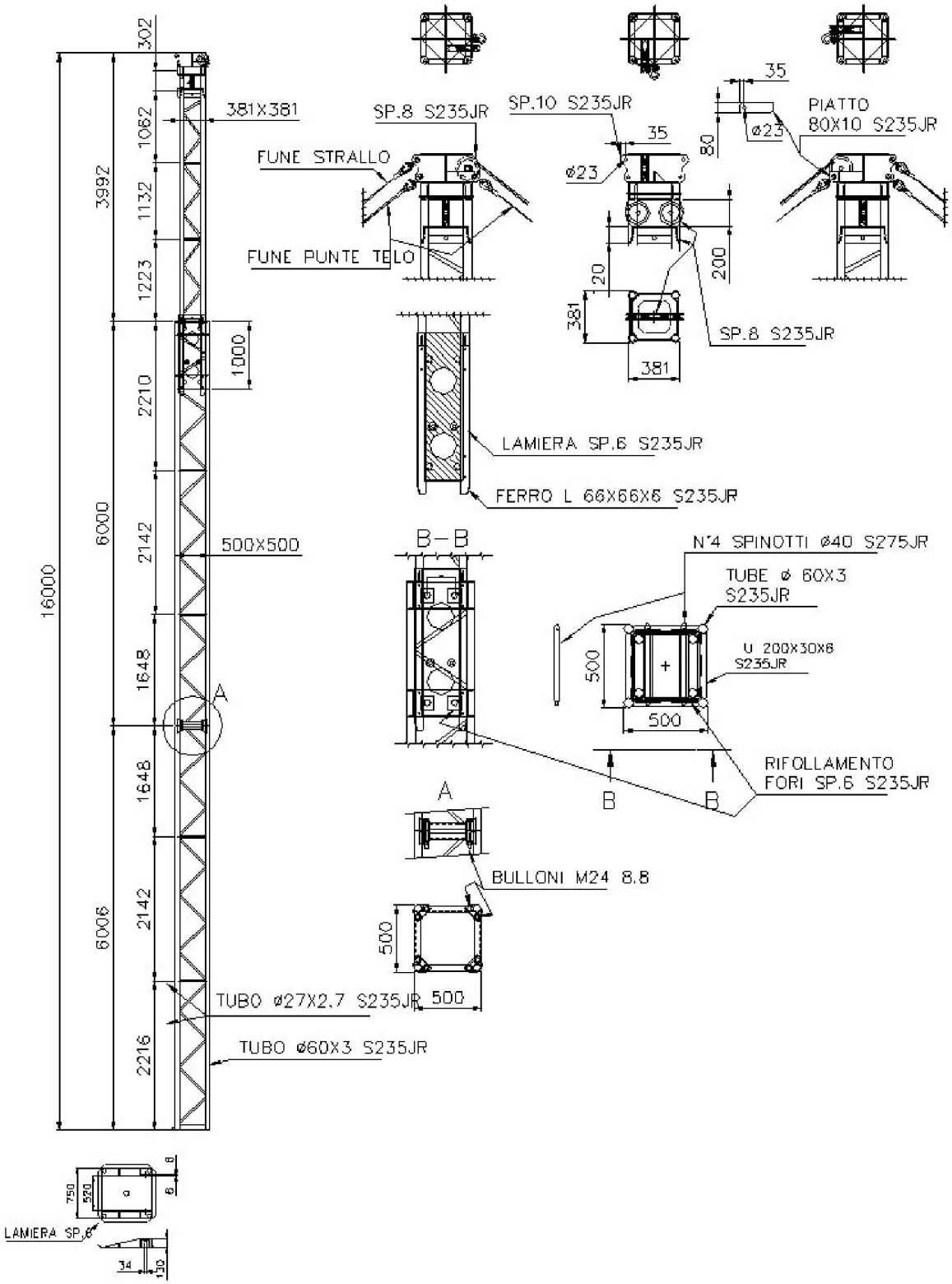
With Teci M4 Dia 12mm: Maximum load = 0.5 x 80.4kN = 40.2kN

The maximum rope load (ultimate) = 10.4kN < 10.4kN

The Teci M4 12mm rope e is verified.

Antenna

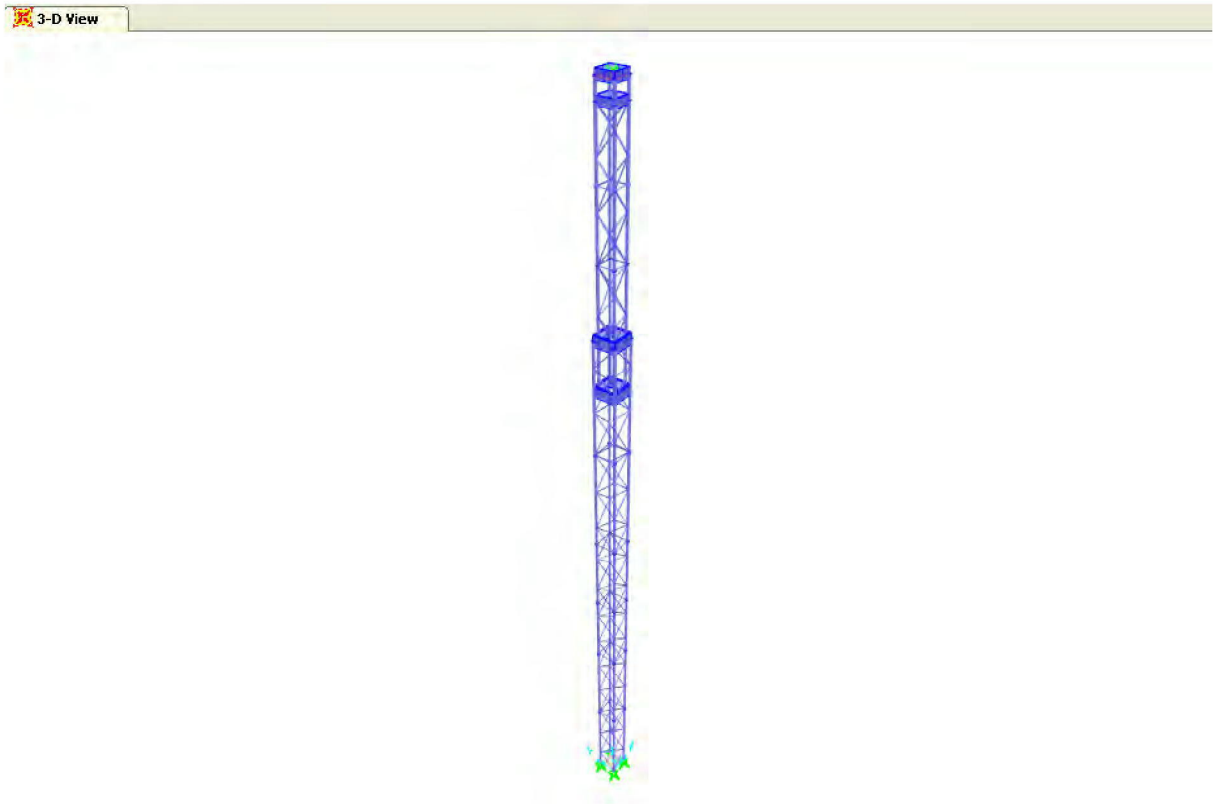
Dimensions and Details



View of the antenna structure

Static scheme

Finite element model



Description of model

Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
1	GLOBAL	Cartesian	440.00	0.00	0.00
2	GLOBAL	Cartesian	440.00	0.00	2142.00
3	GLOBAL	Cartesian	380.00	220.00	15649.00
4	GLOBAL	Cartesian	220.00	380.00	15649.00
5	GLOBAL	Cartesian	440.00	440.00	0.00
6	GLOBAL	Cartesian	440.00	440.00	2142.00
7	GLOBAL	Cartesian	0.00	0.00	0.00
8	GLOBAL	Cartesian	0.00	0.00	2142.00
9	GLOBAL	Cartesian	0.00	440.00	0.00
10	GLOBAL	Cartesian	0.00	440.00	2142.00
11	GLOBAL	Cartesian	440.00	0.00	428.40
12	GLOBAL	Cartesian	60.00	220.00	15649.00
13	GLOBAL	Cartesian	220.00	60.00	15649.00
14	GLOBAL	Cartesian	0.00	440.00	428.40
15	GLOBAL	Cartesian	220.00	220.00	15649.00
16	GLOBAL	Cartesian	440.00	440.00	856.80
17	GLOBAL	Cartesian	0.00	0.00	856.80
19	GLOBAL	Cartesian	440.00	0.00	1285.20
22	GLOBAL	Cartesian	0.00	440.00	1285.20
24	GLOBAL	Cartesian	440.00	440.00	1713.60
25	GLOBAL	Cartesian	0.00	0.00	1713.60
27	GLOBAL	Cartesian	440.00	0.00	4284.00
28	GLOBAL	Cartesian	440.00	440.00	4284.00

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
29	GLOBAL	Cartesian	0.00	0.00	4284.00
30	GLOBAL	Cartesian	0.00	440.00	4284.00
32	GLOBAL	Cartesian	440.00	440.00	2570.40
33	GLOBAL	Cartesian	0.00	0.00	2570.40
35	GLOBAL	Cartesian	440.00	0.00	2998.80
38	GLOBAL	Cartesian	0.00	440.00	2998.80
40	GLOBAL	Cartesian	440.00	440.00	3427.20
41	GLOBAL	Cartesian	0.00	0.00	3427.20
43	GLOBAL	Cartesian	440.00	0.00	3855.60
46	GLOBAL	Cartesian	0.00	440.00	3855.60
49	GLOBAL	Cartesian	440.00	0.00	5932.00
50	GLOBAL	Cartesian	440.00	440.00	5932.00
51	GLOBAL	Cartesian	0.00	0.00	5932.00
52	GLOBAL	Cartesian	0.00	440.00	5932.00
53	GLOBAL	Cartesian	440.00	0.00	4696.00
56	GLOBAL	Cartesian	0.00	440.00	4696.00
58	GLOBAL	Cartesian	440.00	440.00	5108.00
59	GLOBAL	Cartesian	0.00	0.00	5108.00
61	GLOBAL	Cartesian	440.00	0.00	5520.00
64	GLOBAL	Cartesian	0.00	440.00	5520.00
99	GLOBAL	Cartesian	440.00	0.00	7580.00
100	GLOBAL	Cartesian	440.00	440.00	7580.00
101	GLOBAL	Cartesian	0.00	0.00	7580.00
102	GLOBAL	Cartesian	0.00	440.00	7580.00
103	GLOBAL	Cartesian	440.00	0.00	6344.00
104	GLOBAL	Cartesian	0.00	440.00	6344.00
105	GLOBAL	Cartesian	440.00	440.00	6756.00
106	GLOBAL	Cartesian	0.00	0.00	6756.00
107	GLOBAL	Cartesian	440.00	0.00	7168.00
108	GLOBAL	Cartesian	0.00	440.00	7168.00
109	GLOBAL	Cartesian	440.00	0.00	9722.00
110	GLOBAL	Cartesian	440.00	440.00	9722.00
111	GLOBAL	Cartesian	0.00	0.00	9722.00
112	GLOBAL	Cartesian	0.00	440.00	9722.00
113	GLOBAL	Cartesian	440.00	0.00	8008.40
114	GLOBAL	Cartesian	440.00	440.00	8008.40
115	GLOBAL	Cartesian	0.00	0.00	8008.40
116	GLOBAL	Cartesian	0.00	440.00	8008.40
117	GLOBAL	Cartesian	440.00	0.00	8436.80
118	GLOBAL	Cartesian	440.00	440.00	8436.80
119	GLOBAL	Cartesian	0.00	0.00	8436.80
120	GLOBAL	Cartesian	0.00	440.00	8436.80
121	GLOBAL	Cartesian	440.00	0.00	8865.20
122	GLOBAL	Cartesian	440.00	440.00	8865.20
123	GLOBAL	Cartesian	0.00	0.00	8865.20
124	GLOBAL	Cartesian	0.00	440.00	8865.20
125	GLOBAL	Cartesian	440.00	0.00	9293.60
126	GLOBAL	Cartesian	440.00	440.00	9293.60
127	GLOBAL	Cartesian	0.00	0.00	9293.60
128	GLOBAL	Cartesian	0.00	440.00	9293.60
129	GLOBAL	Cartesian	440.00	0.00	11932.00
130	GLOBAL	Cartesian	440.00	440.00	11932.00
131	GLOBAL	Cartesian	0.00	0.00	11932.00
132	GLOBAL	Cartesian	0.00	440.00	11932.00
133	GLOBAL	Cartesian	440.00	0.00	10150.40
134	GLOBAL	Cartesian	440.00	440.00	10150.40
135	GLOBAL	Cartesian	0.00	0.00	10150.40
136	GLOBAL	Cartesian	0.00	440.00	10150.40
137	GLOBAL	Cartesian	440.00	0.00	10578.80
138	GLOBAL	Cartesian	440.00	440.00	10578.80

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
139	GLOBAL	Cartesian	0.00	0.00	10578.80
140	GLOBAL	Cartesian	0.00	440.00	10578.80
141	GLOBAL	Cartesian	440.00	0.00	11007.20
142	GLOBAL	Cartesian	440.00	440.00	11007.20
143	GLOBAL	Cartesian	0.00	0.00	11007.20
144	GLOBAL	Cartesian	0.00	440.00	11007.20
145	GLOBAL	Cartesian	440.00	0.00	11435.60
146	GLOBAL	Cartesian	440.00	440.00	11435.60
147	GLOBAL	Cartesian	0.00	0.00	11435.60
148	GLOBAL	Cartesian	0.00	440.00	11435.60
149	GLOBAL	Cartesian	440.00	60.00	11932.00
150	GLOBAL	Cartesian	0.00	60.00	11932.00
151	GLOBAL	Cartesian	440.00	60.00	11007.20
152	GLOBAL	Cartesian	0.00	60.00	11007.20
153	GLOBAL	Cartesian	440.00	380.00	11932.00
154	GLOBAL	Cartesian	0.00	380.00	11932.00
155	GLOBAL	Cartesian	440.00	380.00	11007.20
156	GLOBAL	Cartesian	0.00	380.00	11007.20
165	GLOBAL	Cartesian	60.00	60.00	11932.00
166	GLOBAL	Cartesian	60.00	60.00	11007.20
167	GLOBAL	Cartesian	60.00	380.00	11932.00
168	GLOBAL	Cartesian	60.00	380.00	11007.20
169	GLOBAL	Cartesian	380.00	60.00	11932.00
170	GLOBAL	Cartesian	380.00	60.00	11007.20
171	GLOBAL	Cartesian	380.00	380.00	11932.00
172	GLOBAL	Cartesian	380.00	380.00	11007.20
173	GLOBAL	Cartesian	60.00	60.00	13155.00
174	GLOBAL	Cartesian	60.00	380.00	13155.00
175	GLOBAL	Cartesian	380.00	60.00	13155.00
176	GLOBAL	Cartesian	380.00	380.00	13155.00
177	GLOBAL	Cartesian	60.00	60.00	12339.67
178	GLOBAL	Cartesian	60.00	380.00	12339.67
179	GLOBAL	Cartesian	380.00	60.00	12339.67
180	GLOBAL	Cartesian	380.00	380.00	12339.67
181	GLOBAL	Cartesian	60.00	60.00	12747.33
182	GLOBAL	Cartesian	60.00	380.00	12747.33
183	GLOBAL	Cartesian	380.00	60.00	12747.33
184	GLOBAL	Cartesian	380.00	380.00	12747.33
185	GLOBAL	Cartesian	60.00	60.00	14287.00
186	GLOBAL	Cartesian	60.00	380.00	14287.00
187	GLOBAL	Cartesian	380.00	60.00	14287.00
188	GLOBAL	Cartesian	380.00	380.00	14287.00
189	GLOBAL	Cartesian	60.00	60.00	13532.33
190	GLOBAL	Cartesian	60.00	380.00	13532.33
191	GLOBAL	Cartesian	380.00	60.00	13532.33
192	GLOBAL	Cartesian	380.00	380.00	13532.33
193	GLOBAL	Cartesian	60.00	60.00	13909.67
194	GLOBAL	Cartesian	60.00	380.00	13909.67
195	GLOBAL	Cartesian	380.00	60.00	13909.67
196	GLOBAL	Cartesian	380.00	380.00	13909.67
197	GLOBAL	Cartesian	60.00	60.00	15349.00
198	GLOBAL	Cartesian	60.00	380.00	15349.00
199	GLOBAL	Cartesian	380.00	60.00	15349.00
200	GLOBAL	Cartesian	380.00	380.00	15349.00
201	GLOBAL	Cartesian	60.00	60.00	14664.33
202	GLOBAL	Cartesian	60.00	380.00	14664.33
203	GLOBAL	Cartesian	380.00	60.00	14664.33
204	GLOBAL	Cartesian	380.00	380.00	14664.33
205	GLOBAL	Cartesian	60.00	60.00	15041.67
206	GLOBAL	Cartesian	60.00	380.00	15041.67

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
207	GLOBAL	Cartesian	380.00	60.00	15041.67
208	GLOBAL	Cartesian	380.00	380.00	15041.67
209	GLOBAL	Cartesian	60.00	60.00	15649.00
210	GLOBAL	Cartesian	60.00	380.00	15649.00
211	GLOBAL	Cartesian	380.00	60.00	15649.00
212	GLOBAL	Cartesian	380.00	380.00	15649.00

Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
1	Yes	Yes	Yes	No	No	No
5	Yes	Yes	Yes	No	No	No
7	Yes	Yes	Yes	No	No	No
9	Yes	Yes	Yes	No	No	No
15	Yes	Yes	No	No	No	No

Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length
			mm
1	1	2	2142.00
2	211	3	160.00
3	5	6	2142.00
4	7	8	2142.00
5	9	10	2142.00
6	10	8	440.00
7	8	2	440.00
8	2	6	440.00
9	6	10	440.00
10	3	212	160.00
11	7	11	614.11
12	11	17	614.11
13	17	19	614.11
14	19	25	614.11
15	25	2	614.11
16	7	14	614.11
17	14	17	614.11
18	17	22	614.11
19	22	25	614.11
20	25	10	614.11
21	5	14	614.11
22	14	16	614.11
23	16	19	614.11
24	212	4	160.00
25	19	24	614.11
26	24	2	614.11
27	5	11	614.11
28	11	16	614.11
29	16	22	614.11
30	22	24	614.11
31	24	10	614.11
32	2	27	2142.00
33	6	28	2142.00
34	8	29	2142.00
35	10	30	2142.00
36	30	29	440.00

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length mm
37	29	27	440.00
38	27	28	440.00
39	28	30	440.00
40	4	210	160.00
41	210	12	160.00
42	12	209	160.00
43	209	13	160.00
44	13	211	160.00
116	2	32	614.11
117	32	35	614.11
118	35	40	614.11
119	40	43	614.11
120	43	28	614.11
121	2	33	614.11
122	33	35	614.11
123	35	41	614.11
124	41	43	614.11
125	43	29	614.11
126	33	38	614.11
127	38	40	614.11
128	40	46	614.11
129	46	28	614.11
130	10	32	614.11
131	32	38	614.11
132	38	41	614.11
133	41	46	614.11
134	46	29	614.11
135	10	33	614.11
136	30	52	1648.00
137	28	50	1648.00
138	29	51	1648.00
139	27	49	1648.00
140	52	51	440.00
141	51	49	440.00
142	49	50	440.00
143	50	52	440.00
144	29	53	602.78
145	53	59	602.78
146	59	61	602.78
147	61	51	602.78
148	28	53	602.78
149	53	58	602.78
150	58	61	602.78
151	61	50	602.78
152	50	64	602.78
153	64	58	602.78
154	58	56	602.78
155	56	28	602.78
156	29	56	602.78
157	56	59	602.78
158	59	64	602.78
159	64	51	602.78
208	52	102	1648.00
209	50	100	1648.00
210	51	101	1648.00
211	49	99	1648.00
212	102	101	440.00
213	101	99	440.00
214	99	100	440.00
215	100	102	440.00

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length mm
216	51	103	602.78
217	103	106	602.78
218	106	107	602.78
219	107	101	602.78
220	50	103	602.78
221	103	105	602.78
222	105	107	602.78
223	107	100	602.78
224	100	108	602.78
225	108	105	602.78
226	105	104	602.78
227	104	50	602.78
228	51	104	602.78
229	104	106	602.78
230	106	108	602.78
231	108	101	602.78
232	100	110	2142.00
233	99	109	2142.00
234	101	111	2142.00
235	102	112	2142.00
236	112	111	440.00
237	111	109	440.00
238	109	110	440.00
239	110	112	440.00
240	101	113	614.11
241	113	119	614.11
242	119	121	614.11
243	121	127	614.11
244	127	109	614.11
245	109	126	614.11
246	126	121	614.11
247	121	118	614.11
248	118	113	614.11
249	113	100	614.11
250	100	116	614.11
251	116	118	614.11
252	118	124	614.11
253	124	126	614.11
254	126	112	614.11
255	112	127	614.11
256	127	124	614.11
257	124	119	614.11
258	119	116	614.11
259	116	101	614.11
260	132	131	440.00
261	131	129	440.00
262	129	130	440.00
263	130	132	440.00
264	112	132	2210.00
265	111	131	2210.00
266	110	130	2210.00
267	109	129	2210.00
268	109	135	614.11
269	135	137	614.11
270	137	143	614.11
271	143	145	614.11
272	145	131	663.33
273	131	148	663.33
274	148	143	614.11
275	143	140	614.11

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length mm
276	140	135	614.11
277	135	112	614.11
278	109	134	614.11
279	134	137	614.11
280	137	142	614.11
281	142	145	614.11
282	145	130	663.33
283	112	134	614.11
284	134	140	614.11
285	140	142	614.11
286	142	148	614.11
287	148	130	663.33
288	142	144	440.00
289	144	143	440.00
290	143	141	440.00
291	141	142	440.00
292	150	149	440.00
293	154	153	440.00
294	152	151	440.00
295	156	155	440.00
296	170	169	924.80
297	166	165	924.80
298	172	171	924.80
299	168	167	924.80
300	169	175	1223.00
301	165	173	1223.00
302	171	176	1223.00
303	167	174	1223.00
304	175	176	320.00
305	176	174	320.00
306	174	173	320.00
307	173	175	320.00
308	171	178	518.26
309	178	184	518.26
310	184	174	518.26
311	171	179	518.26
312	179	184	518.26
313	184	175	518.26
314	175	181	518.26
315	181	179	518.26
316	179	165	518.26
317	165	178	518.26
318	178	181	518.26
319	181	174	518.26
320	173	185	1132.00
321	174	186	1132.00
322	176	188	1132.00
323	175	187	1132.00
324	187	188	320.00
325	188	186	320.00
326	186	185	320.00
327	185	187	320.00
328	175	192	494.75
329	192	195	494.75
330	195	188	494.75
331	188	194	494.75
332	194	192	494.75
333	192	174	494.75
334	185	194	494.75
335	194	189	494.75

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length mm
336	189	174	494.75
337	185	195	494.75
338	195	189	494.75
339	189	175	494.75
340	185	197	1062.00
341	186	198	1062.00
342	188	200	1062.00
343	187	199	1062.00
344	199	200	320.00
345	200	198	320.00
346	198	197	320.00
347	197	199	320.00
360	188	202	494.75
361	202	208	494.75
362	208	198	443.68
363	198	205	443.68
364	205	202	494.75
365	202	185	494.75
366	199	205	443.68
367	205	203	494.75
368	203	185	494.75
369	199	208	443.68
370	208	203	494.75
371	203	188	494.75
372	199	211	300.00
373	200	212	300.00
374	197	209	300.00
375	198	210	300.00

Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
1	Tube 60*3	Tube 60*3	Default
2	L130*44*6	L130*44*6	Default
3	Tube 60*3	Tube 60*3	Default
4	Tube 60*3	Tube 60*3	Default
5	Tube 60*3	Tube 60*3	Default
6	Tube 27*2.7	Tube 27*2.7	Default
7	Tube 27*2.7	Tube 27*2.7	Default
8	Tube 27*2.7	Tube 27*2.7	Default
9	Tube 27*2.7	Tube 27*2.7	Default
10	L130*44*6	L130*44*6	Default
11	Tube 27*2.7	Tube 27*2.7	Default
12	Tube 27*2.7	Tube 27*2.7	Default
13	Tube 27*2.7	Tube 27*2.7	Default
14	Tube 27*2.7	Tube 27*2.7	Default
15	Tube 27*2.7	Tube 27*2.7	Default
16	Tube 27*2.7	Tube 27*2.7	Default
17	Tube 27*2.7	Tube 27*2.7	Default
18	Tube 27*2.7	Tube 27*2.7	Default
19	Tube 27*2.7	Tube 27*2.7	Default
20	Tube 27*2.7	Tube 27*2.7	Default
21	Tube 27*2.7	Tube 27*2.7	Default
22	Tube 27*2.7	Tube 27*2.7	Default
23	Tube 27*2.7	Tube 27*2.7	Default
24	L130*44*6	L130*44*6	Default
25	Tube 27*2.7	Tube 27*2.7	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
26	Tube 27*2.7	Tube 27*2.7	Default
27	Tube 27*2.7	Tube 27*2.7	Default
28	Tube 27*2.7	Tube 27*2.7	Default
29	Tube 27*2.7	Tube 27*2.7	Default
30	Tube 27*2.7	Tube 27*2.7	Default
31	Tube 27*2.7	Tube 27*2.7	Default
32	Tube 60*3	Tube 60*3	Default
33	Tube 60*3	Tube 60*3	Default
34	Tube 60*3	Tube 60*3	Default
35	Tube 60*3	Tube 60*3	Default
36	Tube 27*2.7	Tube 27*2.7	Default
37	Tube 27*2.7	Tube 27*2.7	Default
38	Tube 27*2.7	Tube 27*2.7	Default
39	Tube 27*2.7	Tube 27*2.7	Default
40	L130*44*6	L130*44*6	Default
41	L130*44*6	L130*44*6	Default
42	L130*44*6	L130*44*6	Default
43	L130*44*6	L130*44*6	Default
44	L130*44*6	L130*44*6	Default
116	Tube 27*2.7	Tube 27*2.7	Default
117	Tube 27*2.7	Tube 27*2.7	Default
118	Tube 27*2.7	Tube 27*2.7	Default
119	Tube 27*2.7	Tube 27*2.7	Default
120	Tube 27*2.7	Tube 27*2.7	Default
121	Tube 27*2.7	Tube 27*2.7	Default
122	Tube 27*2.7	Tube 27*2.7	Default
123	Tube 27*2.7	Tube 27*2.7	Default
124	Tube 27*2.7	Tube 27*2.7	Default
125	Tube 27*2.7	Tube 27*2.7	Default
126	Tube 27*2.7	Tube 27*2.7	Default
127	Tube 27*2.7	Tube 27*2.7	Default
128	Tube 27*2.7	Tube 27*2.7	Default
129	Tube 27*2.7	Tube 27*2.7	Default
130	Tube 27*2.7	Tube 27*2.7	Default
131	Tube 27*2.7	Tube 27*2.7	Default
132	Tube 27*2.7	Tube 27*2.7	Default
133	Tube 27*2.7	Tube 27*2.7	Default
134	Tube 27*2.7	Tube 27*2.7	Default
135	Tube 27*2.7	Tube 27*2.7	Default
136	Tube 60*3	Tube 60*3	Default
137	Tube 60*3	Tube 60*3	Default
138	Tube 60*3	Tube 60*3	Default
139	Tube 60*3	Tube 60*3	Default
140	Tube 27*2.7	Tube 27*2.7	Default
141	Tube 27*2.7	Tube 27*2.7	Default
142	Tube 27*2.7	Tube 27*2.7	Default
143	Tube 27*2.7	Tube 27*2.7	Default
144	Tube 27*2.7	Tube 27*2.7	Default
145	Tube 27*2.7	Tube 27*2.7	Default
146	Tube 27*2.7	Tube 27*2.7	Default
147	Tube 27*2.7	Tube 27*2.7	Default
148	Tube 27*2.7	Tube 27*2.7	Default
149	Tube 27*2.7	Tube 27*2.7	Default
150	Tube 27*2.7	Tube 27*2.7	Default
151	Tube 27*2.7	Tube 27*2.7	Default
152	Tube 27*2.7	Tube 27*2.7	Default
153	Tube 27*2.7	Tube 27*2.7	Default
154	Tube 27*2.7	Tube 27*2.7	Default
155	Tube 27*2.7	Tube 27*2.7	Default
156	Tube 27*2.7	Tube 27*2.7	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
157	Tube 27*2.7	Tube 27*2.7	Default
158	Tube 27*2.7	Tube 27*2.7	Default
159	Tube 27*2.7	Tube 27*2.7	Default
208	Tube 60*3	Tube 60*3	Default
209	Tube 60*3	Tube 60*3	Default
210	Tube 60*3	Tube 60*3	Default
211	Tube 60*3	Tube 60*3	Default
212	Tube 27*2.7	Tube 27*2.7	Default
213	Tube 27*2.7	Tube 27*2.7	Default
214	Tube 27*2.7	Tube 27*2.7	Default
215	Tube 27*2.7	Tube 27*2.7	Default
216	Tube 27*2.7	Tube 27*2.7	Default
217	Tube 27*2.7	Tube 27*2.7	Default
218	Tube 27*2.7	Tube 27*2.7	Default
219	Tube 27*2.7	Tube 27*2.7	Default
220	Tube 27*2.7	Tube 27*2.7	Default
221	Tube 27*2.7	Tube 27*2.7	Default
222	Tube 27*2.7	Tube 27*2.7	Default
223	Tube 27*2.7	Tube 27*2.7	Default
224	Tube 27*2.7	Tube 27*2.7	Default
225	Tube 27*2.7	Tube 27*2.7	Default
226	Tube 27*2.7	Tube 27*2.7	Default
227	Tube 27*2.7	Tube 27*2.7	Default
228	Tube 27*2.7	Tube 27*2.7	Default
229	Tube 27*2.7	Tube 27*2.7	Default
230	Tube 27*2.7	Tube 27*2.7	Default
231	Tube 27*2.7	Tube 27*2.7	Default
232	Tube 60*3	Tube 60*3	Default
233	Tube 60*3	Tube 60*3	Default
234	Tube 60*3	Tube 60*3	Default
235	Tube 60*3	Tube 60*3	Default
236	Tube 27*2.7	Tube 27*2.7	Default
237	Tube 27*2.7	Tube 27*2.7	Default
238	Tube 27*2.7	Tube 27*2.7	Default
239	Tube 27*2.7	Tube 27*2.7	Default
240	Tube 27*2.7	Tube 27*2.7	Default
241	Tube 27*2.7	Tube 27*2.7	Default
242	Tube 27*2.7	Tube 27*2.7	Default
243	Tube 27*2.7	Tube 27*2.7	Default
244	Tube 27*2.7	Tube 27*2.7	Default
245	Tube 27*2.7	Tube 27*2.7	Default
246	Tube 27*2.7	Tube 27*2.7	Default
247	Tube 27*2.7	Tube 27*2.7	Default
248	Tube 27*2.7	Tube 27*2.7	Default
249	Tube 27*2.7	Tube 27*2.7	Default
250	Tube 27*2.7	Tube 27*2.7	Default
251	Tube 27*2.7	Tube 27*2.7	Default
252	Tube 27*2.7	Tube 27*2.7	Default
253	Tube 27*2.7	Tube 27*2.7	Default
254	Tube 27*2.7	Tube 27*2.7	Default
255	Tube 27*2.7	Tube 27*2.7	Default
256	Tube 27*2.7	Tube 27*2.7	Default
257	Tube 27*2.7	Tube 27*2.7	Default
258	Tube 27*2.7	Tube 27*2.7	Default
259	Tube 27*2.7	Tube 27*2.7	Default
260	C 200*30*6	C 200*30*6	Default
261	C 200*30*6	C 200*30*6	Default
262	C 200*30*6	C 200*30*6	Default
263	C 200*30*6	C 200*30*6	Default
264	Tube 60*3	Tube 60*3	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
265	Tube 60*3	Tube 60*3	Default
266	Tube 60*3	Tube 60*3	Default
267	Tube 60*3	Tube 60*3	Default
268	Tube 27*2.7	Tube 27*2.7	Default
269	Tube 27*2.7	Tube 27*2.7	Default
270	Tube 27*2.7	Tube 27*2.7	Default
271	Tube 27*2.7	Tube 27*2.7	Default
272	Tube 27*2.7	Tube 27*2.7	Default
273	Tube 27*2.7	Tube 27*2.7	Default
274	Tube 27*2.7	Tube 27*2.7	Default
275	Tube 27*2.7	Tube 27*2.7	Default
276	Tube 27*2.7	Tube 27*2.7	Default
277	Tube 27*2.7	Tube 27*2.7	Default
278	Tube 27*2.7	Tube 27*2.7	Default
279	Tube 27*2.7	Tube 27*2.7	Default
280	Tube 27*2.7	Tube 27*2.7	Default
281	Tube 27*2.7	Tube 27*2.7	Default
282	Tube 27*2.7	Tube 27*2.7	Default
283	Tube 27*2.7	Tube 27*2.7	Default
284	Tube 27*2.7	Tube 27*2.7	Default
285	Tube 27*2.7	Tube 27*2.7	Default
286	Tube 27*2.7	Tube 27*2.7	Default
287	Tube 27*2.7	Tube 27*2.7	Default
288	C 200*30*6	C 200*30*6	Default
289	C 200*30*6	C 200*30*6	Default
290	C 200*30*6	C 200*30*6	Default
291	C 200*30*6	C 200*30*6	Default
292	Spine 40	Spine 40	Default
293	Spine 40	Spine 40	Default
294	Spine 40	Spine 40	Default
295	Spine 40	Spine 40	Default
296	Tube 60*3	Tube 60*3	Default
297	Tube 60*3	Tube 60*3	Default
298	Tube 60*3	Tube 60*3	Default
299	Tube 60*3	Tube 60*3	Default
300	Tube 60*3	Tube 60*3	Default
301	Tube 60*3	Tube 60*3	Default
302	Tube 60*3	Tube 60*3	Default
303	Tube 60*3	Tube 60*3	Default
304	Tube 27*2.7	Tube 27*2.7	Default
305	Tube 27*2.7	Tube 27*2.7	Default
306	Tube 27*2.7	Tube 27*2.7	Default
307	Tube 27*2.7	Tube 27*2.7	Default
308	Tube 27*2.7	Tube 27*2.7	Default
309	Tube 27*2.7	Tube 27*2.7	Default
310	Tube 27*2.7	Tube 27*2.7	Default
311	Tube 27*2.7	Tube 27*2.7	Default
312	Tube 27*2.7	Tube 27*2.7	Default
313	Tube 27*2.7	Tube 27*2.7	Default
314	Tube 27*2.7	Tube 27*2.7	Default
315	Tube 27*2.7	Tube 27*2.7	Default
316	Tube 27*2.7	Tube 27*2.7	Default
317	Tube 27*2.7	Tube 27*2.7	Default
318	Tube 27*2.7	Tube 27*2.7	Default
319	Tube 27*2.7	Tube 27*2.7	Default
320	Tube 60*3	Tube 60*3	Default
321	Tube 60*3	Tube 60*3	Default
322	Tube 60*3	Tube 60*3	Default
323	Tube 60*3	Tube 60*3	Default
324	Tube 27*2.7	Tube 27*2.7	Default

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
325	Tube 27*2.7	Tube 27*2.7	Default
326	Tube 27*2.7	Tube 27*2.7	Default
327	Tube 27*2.7	Tube 27*2.7	Default
328	Tube 27*2.7	Tube 27*2.7	Default
329	Tube 27*2.7	Tube 27*2.7	Default
330	Tube 27*2.7	Tube 27*2.7	Default
331	Tube 27*2.7	Tube 27*2.7	Default
332	Tube 27*2.7	Tube 27*2.7	Default
333	Tube 27*2.7	Tube 27*2.7	Default
334	Tube 27*2.7	Tube 27*2.7	Default
335	Tube 27*2.7	Tube 27*2.7	Default
336	Tube 27*2.7	Tube 27*2.7	Default
337	Tube 27*2.7	Tube 27*2.7	Default
338	Tube 27*2.7	Tube 27*2.7	Default
339	Tube 27*2.7	Tube 27*2.7	Default
340	Tube 60*3	Tube 60*3	Default
341	Tube 60*3	Tube 60*3	Default
342	Tube 60*3	Tube 60*3	Default
343	Tube 60*3	Tube 60*3	Default
344	L120*84*8	L120*84*8	Default
345	L120*84*8	L120*84*8	Default
346	L120*84*8	L120*84*8	Default
347	L120*84*8	L120*84*8	Default
360	Tube 27*2.7	Tube 27*2.7	Default
361	Tube 27*2.7	Tube 27*2.7	Default
362	Tube 27*2.7	Tube 27*2.7	Default
363	Tube 27*2.7	Tube 27*2.7	Default
364	Tube 27*2.7	Tube 27*2.7	Default
365	Tube 27*2.7	Tube 27*2.7	Default
366	Tube 27*2.7	Tube 27*2.7	Default
367	Tube 27*2.7	Tube 27*2.7	Default
368	Tube 27*2.7	Tube 27*2.7	Default
369	Tube 27*2.7	Tube 27*2.7	Default
370	Tube 27*2.7	Tube 27*2.7	Default
371	Tube 27*2.7	Tube 27*2.7	Default
372	Tube 60*3	Tube 60*3	Default
373	Tube 60*3	Tube 60*3	Default
374	Tube 60*3	Tube 60*3	Default
375	Tube 60*3	Tube 60*3	Default

Frame Release Assignments 1 - General, Part 1 of 2

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
11	No	No	No	Yes	Yes	Yes
12	No	No	No	Yes	Yes	Yes
13	No	No	No	Yes	Yes	Yes
14	No	No	No	Yes	Yes	Yes
15	No	No	No	Yes	Yes	Yes
16	No	No	No	Yes	Yes	Yes
17	No	No	No	Yes	Yes	Yes
18	No	No	No	Yes	Yes	Yes
19	No	No	No	Yes	Yes	Yes
20	No	No	No	Yes	Yes	Yes
21	No	No	No	Yes	Yes	Yes
22	No	No	No	Yes	Yes	Yes
23	No	No	No	Yes	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
25	No	No	No	Yes	Yes	Yes
26	No	No	No	Yes	Yes	Yes
27	No	No	No	Yes	Yes	Yes
28	No	No	No	Yes	Yes	Yes
29	No	No	No	Yes	Yes	Yes
30	No	No	No	Yes	Yes	Yes
31	No	No	No	Yes	Yes	Yes
116	No	No	No	Yes	Yes	Yes
117	No	No	No	Yes	Yes	Yes
118	No	No	No	Yes	Yes	Yes
119	No	No	No	Yes	Yes	Yes
120	No	No	No	Yes	Yes	Yes
121	No	No	No	Yes	Yes	Yes
122	No	No	No	Yes	Yes	Yes
123	No	No	No	Yes	Yes	Yes
124	No	No	No	Yes	Yes	Yes
125	No	No	No	Yes	Yes	Yes
126	No	No	No	Yes	Yes	Yes
127	No	No	No	Yes	Yes	Yes
128	No	No	No	Yes	Yes	Yes
129	No	No	No	Yes	Yes	Yes
130	No	No	No	Yes	Yes	Yes
131	No	No	No	Yes	Yes	Yes
132	No	No	No	Yes	Yes	Yes
133	No	No	No	Yes	Yes	Yes
134	No	No	No	Yes	Yes	Yes
135	No	No	No	Yes	Yes	Yes
144	No	No	No	Yes	Yes	Yes
145	No	No	No	Yes	Yes	Yes
146	No	No	No	Yes	Yes	Yes
147	No	No	No	Yes	Yes	Yes
148	No	No	No	Yes	Yes	Yes
149	No	No	No	Yes	Yes	Yes
150	No	No	No	Yes	Yes	Yes
151	No	No	No	Yes	Yes	Yes
152	No	No	No	Yes	Yes	Yes
153	No	No	No	Yes	Yes	Yes
154	No	No	No	Yes	Yes	Yes
155	No	No	No	Yes	Yes	Yes
156	No	No	No	Yes	Yes	Yes
157	No	No	No	Yes	Yes	Yes
158	No	No	No	Yes	Yes	Yes
159	No	No	No	Yes	Yes	Yes
216	No	No	No	Yes	Yes	Yes
217	No	No	No	Yes	Yes	Yes
218	No	No	No	Yes	Yes	Yes
219	No	No	No	Yes	Yes	Yes
220	No	No	No	Yes	Yes	Yes
221	No	No	No	Yes	Yes	Yes
222	No	No	No	Yes	Yes	Yes
223	No	No	No	Yes	Yes	Yes
224	No	No	No	Yes	Yes	Yes
225	No	No	No	Yes	Yes	Yes
226	No	No	No	Yes	Yes	Yes
227	No	No	No	Yes	Yes	Yes
228	No	No	No	Yes	Yes	Yes
229	No	No	No	Yes	Yes	Yes
230	No	No	No	Yes	Yes	Yes
231	No	No	No	Yes	Yes	Yes
240	No	No	No	Yes	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
241	No	No	No	Yes	Yes	Yes
242	No	No	No	Yes	Yes	Yes
243	No	No	No	Yes	Yes	Yes
244	No	No	No	Yes	Yes	Yes
245	No	No	No	Yes	Yes	Yes
246	No	No	No	Yes	Yes	Yes
247	No	No	No	Yes	Yes	Yes
248	No	No	No	Yes	Yes	Yes
249	No	No	No	Yes	Yes	Yes
250	No	No	No	Yes	Yes	Yes
251	No	No	No	Yes	Yes	Yes
252	No	No	No	Yes	Yes	Yes
253	No	No	No	Yes	Yes	Yes
254	No	No	No	Yes	Yes	Yes
255	No	No	No	Yes	Yes	Yes
256	No	No	No	Yes	Yes	Yes
257	No	No	No	Yes	Yes	Yes
258	No	No	No	Yes	Yes	Yes
259	No	No	No	Yes	Yes	Yes
260	No	No	No	Yes	Yes	Yes
261	No	No	No	Yes	Yes	Yes
262	No	No	No	Yes	Yes	Yes
263	No	No	No	Yes	Yes	Yes
268	No	No	No	Yes	Yes	Yes
269	No	No	No	Yes	Yes	Yes
270	No	No	No	Yes	Yes	Yes
271	No	No	No	Yes	Yes	Yes
272	No	No	No	Yes	Yes	Yes
273	No	No	No	Yes	Yes	Yes
274	No	No	No	Yes	Yes	Yes
275	No	No	No	Yes	Yes	Yes
276	No	No	No	Yes	Yes	Yes
277	No	No	No	Yes	Yes	Yes
278	No	No	No	Yes	Yes	Yes
279	No	No	No	Yes	Yes	Yes
280	No	No	No	Yes	Yes	Yes
281	No	No	No	Yes	Yes	Yes
282	No	No	No	Yes	Yes	Yes
283	No	No	No	Yes	Yes	Yes
284	No	No	No	Yes	Yes	Yes
285	No	No	No	Yes	Yes	Yes
286	No	No	No	Yes	Yes	Yes
287	No	No	No	Yes	Yes	Yes
288	No	No	No	Yes	Yes	Yes
289	No	No	No	Yes	Yes	Yes
290	No	No	No	Yes	Yes	Yes
291	No	No	No	Yes	Yes	Yes
292	No	No	No	Yes	Yes	Yes
293	No	No	No	Yes	Yes	Yes
294	No	No	No	Yes	Yes	Yes
295	No	No	No	Yes	Yes	Yes
296	No	No	No	Yes	Yes	Yes
297	No	No	No	Yes	Yes	Yes
298	No	No	No	Yes	Yes	Yes
299	No	No	No	Yes	Yes	Yes
300	No	No	No	No	Yes	Yes
301	No	No	No	No	Yes	Yes
302	No	No	No	No	Yes	Yes
303	No	No	No	No	Yes	Yes
308	No	No	No	Yes	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
309	No	No	No	Yes	Yes	Yes
310	No	No	No	Yes	Yes	Yes
311	No	No	No	Yes	Yes	Yes
312	No	No	No	Yes	Yes	Yes
313	No	No	No	Yes	Yes	Yes
314	No	No	No	Yes	Yes	Yes
315	No	No	No	Yes	Yes	Yes
316	No	No	No	Yes	Yes	Yes
317	No	No	No	Yes	Yes	Yes
318	No	No	No	Yes	Yes	Yes
319	No	No	No	Yes	Yes	Yes
328	No	No	No	Yes	Yes	Yes
329	No	No	No	Yes	Yes	Yes
330	No	No	No	Yes	Yes	Yes
331	No	No	No	Yes	Yes	Yes
332	No	No	No	Yes	Yes	Yes
333	No	No	No	Yes	Yes	Yes
334	No	No	No	Yes	Yes	Yes
335	No	No	No	Yes	Yes	Yes
336	No	No	No	Yes	Yes	Yes
337	No	No	No	Yes	Yes	Yes
338	No	No	No	Yes	Yes	Yes
339	No	No	No	Yes	Yes	Yes
360	No	No	No	Yes	Yes	Yes
361	No	No	No	Yes	Yes	Yes
362	No	No	No	Yes	Yes	Yes
363	No	No	No	Yes	Yes	Yes
364	No	No	No	Yes	Yes	Yes
365	No	No	No	Yes	Yes	Yes
366	No	No	No	Yes	Yes	Yes
367	No	No	No	Yes	Yes	Yes
368	No	No	No	Yes	Yes	Yes
369	No	No	No	Yes	Yes	Yes
370	No	No	No	Yes	Yes	Yes
371	No	No	No	Yes	Yes	Yes

Frame Release Assignments 1 - General, Part 2 of 2

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
11	No	No	No	No	Yes	Yes
12	No	No	No	No	Yes	Yes
13	No	No	No	No	Yes	Yes
14	No	No	No	No	Yes	Yes
15	No	No	No	No	Yes	Yes
16	No	No	No	No	Yes	Yes
17	No	No	No	No	Yes	Yes
18	No	No	No	No	Yes	Yes
19	No	No	No	No	Yes	Yes
20	No	No	No	No	Yes	Yes
21	No	No	No	No	Yes	Yes
22	No	No	No	No	Yes	Yes
23	No	No	No	No	Yes	Yes
25	No	No	No	No	Yes	Yes
26	No	No	No	No	Yes	Yes
27	No	No	No	No	Yes	Yes
28	No	No	No	No	Yes	Yes
29	No	No	No	No	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
30	No	No	No	No	Yes	Yes
31	No	No	No	No	Yes	Yes
116	No	No	No	No	Yes	Yes
117	No	No	No	No	Yes	Yes
118	No	No	No	No	Yes	Yes
119	No	No	No	No	Yes	Yes
120	No	No	No	No	Yes	Yes
121	No	No	No	No	Yes	Yes
122	No	No	No	No	Yes	Yes
123	No	No	No	No	Yes	Yes
124	No	No	No	No	Yes	Yes
125	No	No	No	No	Yes	Yes
126	No	No	No	No	Yes	Yes
127	No	No	No	No	Yes	Yes
128	No	No	No	No	Yes	Yes
129	No	No	No	No	Yes	Yes
130	No	No	No	No	Yes	Yes
131	No	No	No	No	Yes	Yes
132	No	No	No	No	Yes	Yes
133	No	No	No	No	Yes	Yes
134	No	No	No	No	Yes	Yes
135	No	No	No	No	Yes	Yes
144	No	No	No	No	Yes	Yes
145	No	No	No	No	Yes	Yes
146	No	No	No	No	Yes	Yes
147	No	No	No	No	Yes	Yes
148	No	No	No	No	Yes	Yes
149	No	No	No	No	Yes	Yes
150	No	No	No	No	Yes	Yes
151	No	No	No	No	Yes	Yes
152	No	No	No	No	Yes	Yes
153	No	No	No	No	Yes	Yes
154	No	No	No	No	Yes	Yes
155	No	No	No	No	Yes	Yes
156	No	No	No	No	Yes	Yes
157	No	No	No	No	Yes	Yes
158	No	No	No	No	Yes	Yes
159	No	No	No	No	Yes	Yes
216	No	No	No	No	Yes	Yes
217	No	No	No	No	Yes	Yes
218	No	No	No	No	Yes	Yes
219	No	No	No	No	Yes	Yes
220	No	No	No	No	Yes	Yes
221	No	No	No	No	Yes	Yes
222	No	No	No	No	Yes	Yes
223	No	No	No	No	Yes	Yes
224	No	No	No	No	Yes	Yes
225	No	No	No	No	Yes	Yes
226	No	No	No	No	Yes	Yes
227	No	No	No	No	Yes	Yes
228	No	No	No	No	Yes	Yes
229	No	No	No	No	Yes	Yes
230	No	No	No	No	Yes	Yes
231	No	No	No	No	Yes	Yes
240	No	No	No	No	Yes	Yes
241	No	No	No	No	Yes	Yes
242	No	No	No	No	Yes	Yes
243	No	No	No	No	Yes	Yes
244	No	No	No	No	Yes	Yes
245	No	No	No	No	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
246	No	No	No	No	Yes	Yes
247	No	No	No	No	Yes	Yes
248	No	No	No	No	Yes	Yes
249	No	No	No	No	Yes	Yes
250	No	No	No	No	Yes	Yes
251	No	No	No	No	Yes	Yes
252	No	No	No	No	Yes	Yes
253	No	No	No	No	Yes	Yes
254	No	No	No	No	Yes	Yes
255	No	No	No	No	Yes	Yes
256	No	No	No	No	Yes	Yes
257	No	No	No	No	Yes	Yes
258	No	No	No	No	Yes	Yes
259	No	No	No	No	Yes	Yes
260	No	No	No	No	No	Yes
261	No	No	No	No	No	Yes
262	No	No	No	No	No	Yes
263	No	No	No	No	No	Yes
268	No	No	No	No	Yes	Yes
269	No	No	No	No	Yes	Yes
270	No	No	No	No	Yes	Yes
271	No	No	No	No	Yes	Yes
272	No	No	No	No	Yes	Yes
273	No	No	No	No	Yes	Yes
274	No	No	No	No	Yes	Yes
275	No	No	No	No	Yes	Yes
276	No	No	No	No	Yes	Yes
277	No	No	No	No	Yes	Yes
278	No	No	No	No	Yes	Yes
279	No	No	No	No	Yes	Yes
280	No	No	No	No	Yes	Yes
281	No	No	No	No	Yes	Yes
282	No	No	No	No	Yes	Yes
283	No	No	No	No	Yes	Yes
284	No	No	No	No	Yes	Yes
285	No	No	No	No	Yes	Yes
286	No	No	No	No	Yes	Yes
287	No	No	No	No	Yes	Yes
288	No	No	No	No	No	Yes
289	No	No	No	No	No	Yes
290	No	No	No	No	No	Yes
291	No	No	No	No	No	Yes
292	No	No	No	No	Yes	Yes
293	No	No	No	No	Yes	Yes
294	No	No	No	No	Yes	Yes
295	No	No	No	No	Yes	Yes
296	No	No	No	No	Yes	Yes
297	No	No	No	No	Yes	Yes
298	No	No	No	No	Yes	Yes
299	No	No	No	No	Yes	Yes
300	No	No	No	No	No	No
301	No	No	No	No	No	No
302	No	No	No	No	No	No
303	No	No	No	No	No	No
308	No	No	No	No	Yes	Yes
309	No	No	No	No	Yes	Yes
310	No	No	No	No	Yes	Yes
311	No	No	No	No	Yes	Yes
312	No	No	No	No	Yes	Yes
313	No	No	No	No	Yes	Yes

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
314	No	No	No	No	Yes	Yes
315	No	No	No	No	Yes	Yes
316	No	No	No	No	Yes	Yes
317	No	No	No	No	Yes	Yes
318	No	No	No	No	Yes	Yes
319	No	No	No	No	Yes	Yes
328	No	No	No	No	Yes	Yes
329	No	No	No	No	Yes	Yes
330	No	No	No	No	Yes	Yes
331	No	No	No	No	Yes	Yes
332	No	No	No	No	Yes	Yes
333	No	No	No	No	Yes	Yes
334	No	No	No	No	Yes	Yes
335	No	No	No	No	Yes	Yes
336	No	No	No	No	Yes	Yes
337	No	No	No	No	Yes	Yes
338	No	No	No	No	Yes	Yes
339	No	No	No	No	Yes	Yes
360	No	No	No	No	Yes	Yes
361	No	No	No	No	Yes	Yes
362	No	No	No	No	Yes	Yes
363	No	No	No	No	Yes	Yes
364	No	No	No	No	Yes	Yes
365	No	No	No	No	Yes	Yes
366	No	No	No	No	Yes	Yes
367	No	No	No	No	Yes	Yes
368	No	No	No	No	Yes	Yes
369	No	No	No	No	Yes	Yes
370	No	No	No	No	Yes	Yes
371	No	No	No	No	Yes	Yes

Connectivity - Area

Table 6: Connectivity - Area

Area	Joint1	Joint2	Joint3	Joint4
2	211	3	15	13
3	13	15	12	209
4	3	212	4	15
5	15	4	210	12

Area Section Assignments

Table 7: Area Section Assignments

Area	Section	MatProp
2	Plate 6	Default
3	Plate 6	Default
4	Plate 6	Default
5	Plate 6	Default

Material Properties

Table 9: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope
	N/mm2	N/mm2	
S235	235	360	-0.100000

Loads on the structure

Load condition 1 – Self weight of tent covering

From previous tent load calculation on page 10:

P1 = 0.72kN divided by 4 points = 0.18kN

Load condition 2 – Self weight of ring

Self weight of ring from ring calculation = 0.68kN divided by 4 points = 0.17kN On each point

Load Condition 3 – Wind Load

From previous basic wind load calculation on page 14:

P1 = 26.42kN + 53.06kN = 79.48kN divided by 4 points = 19.87kN

Load Condition 4 Plant

P1 = 20kN on 4 suspension points = 5.0kN

Load Combinations

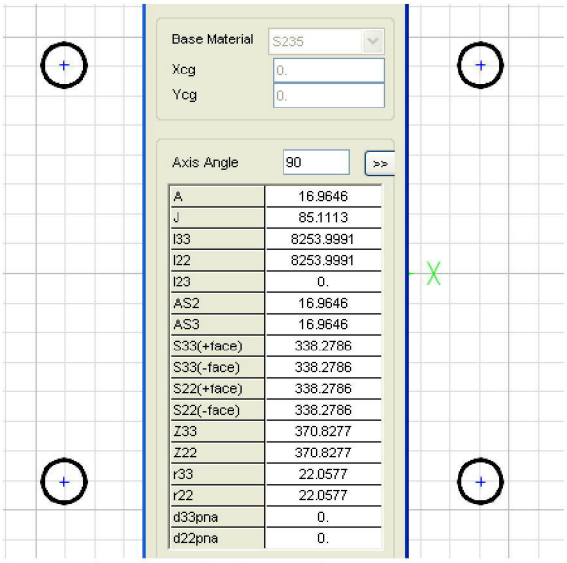
Table 16: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
SLE	Linear Add	Cover	1.000000
SLE		DEAD	1.000000
SLE		Plant	1.000000
SLE		Wind	1.000000
SLU1	Linear Add	Cover	1.350000
SLU1		DEAD	1.350000
SLU1		Plant	1.350000
SLU1		Wind	1.500000
SLU2	Linear Add	Cover	1.350000
SLU2		DEAD	1.350000
SLU2		Plant	1.500000
SLU2		Wind	1.350000

Verification of the structure according to EC3

Determination of effective slenderness:

To take into account the actual slenderness of the antenna, the global effective length of the truss cords and the local effective length of the truss cords are integrated to determine the effective length for the stability calculations.



Properties for whole section

For whole section ß = 1600/20.05 = 79.8

For local section ß = 85.6/2.01 = 42.58

$$\lambda_b = \sqrt{\lambda_f^2 + \lambda^2} \qquad (7)$$

where,

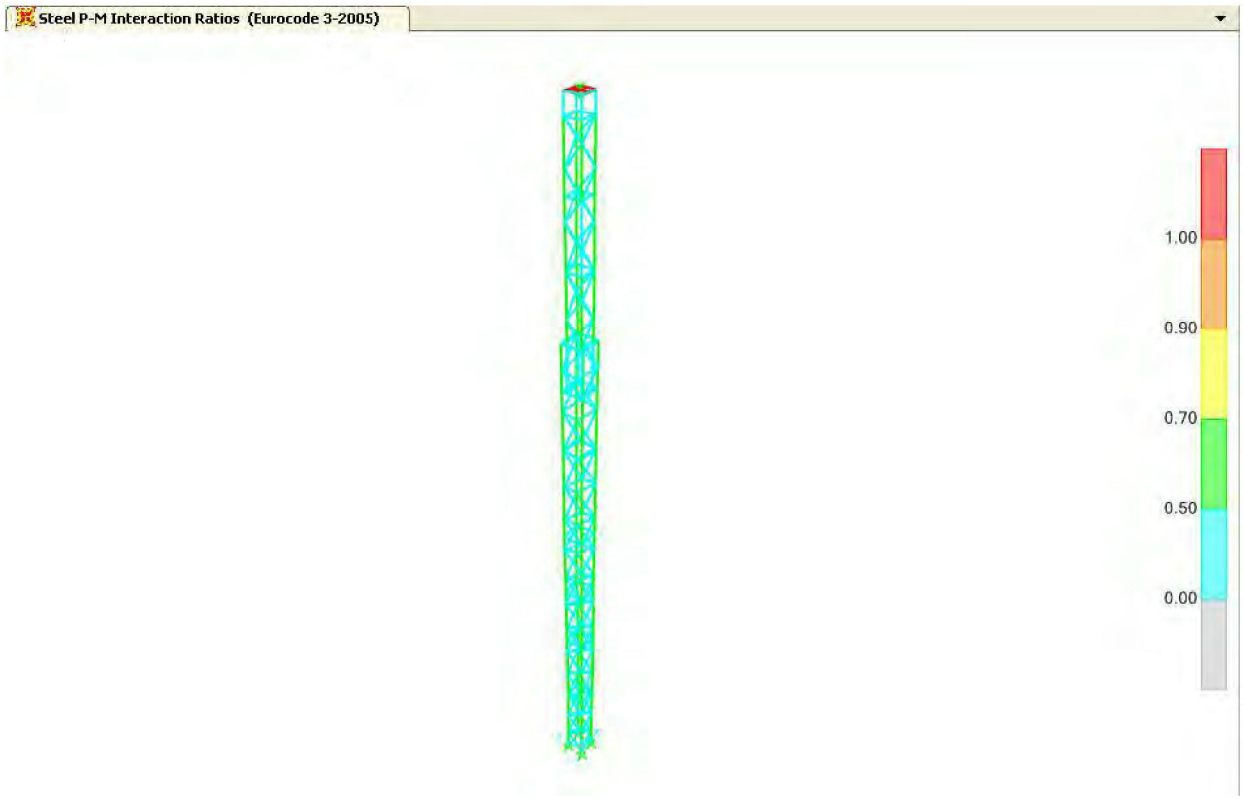
λ_f = lower value of slenderness of the individual vertical members between batten intervals and

λ = slenderness of the overall column, using the radius of gyration of the whole built up section.

λb = √ 79.8^2 + 42.6^2 = 90.45

L = 90.45 x 2.01 x 10 = 1818mm

Verification with EC3



Summary Data - Eurocode 3-2005, Part 1 of 2

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
1	Tube 60*3	Column	No Messages	0.601128	PMM
3	Tube 60*3	Column	No Messages	0.609092	PMM
4	Tube 60*3	Column	No Messages	0.609092	PMM
5	Tube 60*3	Column	No Messages	0.601128	PMM
6	Tube 27*2.7	Beam	No Messages	0.090936	PMM
7	Tube 27*2.7	Beam	No Messages	0.090913	PMM
8	Tube 27*2.7	Beam	No Messages	0.090936	PMM
9	Tube 27*2.7	Beam	No Messages	0.090913	PMM
11	Tube 27*2.7	Brace	No Messages	0.012742	PMM
12	Tube 27*2.7	Brace	No Messages	0.005295	PMM
13	Tube 27*2.7	Brace	No Messages	0.003375	PMM
14	Tube 27*2.7	Brace	No Messages	0.004534	PMM
15	Tube 27*2.7	Brace	No Messages	0.025528	PMM
16	Tube 27*2.7	Brace	No Messages	0.012742	PMM
17	Tube 27*2.7	Brace	No Messages	0.005295	PMM
18	Tube 27*2.7	Brace	No Messages	0.003375	PMM
19	Tube 27*2.7	Brace	No Messages	0.004534	PMM
20	Tube 27*2.7	Brace	No Messages	0.025528	PMM
21	Tube 27*2.7	Brace	No Messages	0.012742	PMM
22	Tube 27*2.7	Brace	No Messages	0.005295	PMM
23	Tube 27*2.7	Brace	No Messages	0.003375	PMM
25	Tube 27*2.7	Brace	No Messages	0.004534	PMM
26	Tube 27*2.7	Brace	No Messages	0.025528	PMM
27	Tube 27*2.7	Brace	No Messages	0.012742	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
28	Tube 27*2.7	Brace	No Messages	0.005295	PMM
29	Tube 27*2.7	Brace	No Messages	0.003375	PMM
30	Tube 27*2.7	Brace	No Messages	0.004534	PMM
31	Tube 27*2.7	Brace	No Messages	0.025528	PMM
32	Tube 60*3	Column	No Messages	0.604218	PMM
33	Tube 60*3	Column	No Messages	0.599404	PMM
34	Tube 60*3	Column	No Messages	0.599404	PMM
35	Tube 60*3	Column	No Messages	0.604218	PMM
36	Tube 27*2.7	Beam	No Messages	0.030824	PMM
37	Tube 27*2.7	Beam	No Messages	0.031199	PMM
38	Tube 27*2.7	Beam	No Messages	0.030824	PMM
39	Tube 27*2.7	Beam	No Messages	0.031199	PMM
116	Tube 27*2.7	Brace	No Messages	0.022853	PMM
117	Tube 27*2.7	Brace	No Messages	0.003318	PMM
118	Tube 27*2.7	Brace	No Messages	0.005877	PMM
119	Tube 27*2.7	Brace	No Messages	0.003433	PMM
120	Tube 27*2.7	Brace	No Messages	0.022543	PMM
121	Tube 27*2.7	Brace	No Messages	0.022853	PMM
122	Tube 27*2.7	Brace	No Messages	0.003318	PMM
123	Tube 27*2.7	Brace	No Messages	0.005877	PMM
124	Tube 27*2.7	Brace	No Messages	0.003433	PMM
125	Tube 27*2.7	Brace	No Messages	0.022543	PMM
126	Tube 27*2.7	Brace	No Messages	0.003318	PMM
127	Tube 27*2.7	Brace	No Messages	0.005877	PMM
128	Tube 27*2.7	Brace	No Messages	0.003433	PMM
129	Tube 27*2.7	Brace	No Messages	0.022543	PMM
130	Tube 27*2.7	Brace	No Messages	0.022853	PMM
131	Tube 27*2.7	Brace	No Messages	0.003318	PMM
132	Tube 27*2.7	Brace	No Messages	0.005877	PMM
133	Tube 27*2.7	Brace	No Messages	0.003433	PMM
134	Tube 27*2.7	Brace	No Messages	0.022543	PMM
135	Tube 27*2.7	Brace	No Messages	0.022853	PMM
136	Tube 60*3	Column	No Messages	0.59975	PMM
137	Tube 60*3	Column	No Messages	0.573755	PMM
138	Tube 60*3	Column	No Messages	0.573755	PMM
139	Tube 60*3	Column	No Messages	0.59975	PMM
140	Tube 27*2.7	Beam	No Messages	0.027699	PMM
141	Tube 27*2.7	Beam	No Messages	0.02769	PMM
142	Tube 27*2.7	Beam	No Messages	0.027699	PMM
143	Tube 27*2.7	Beam	No Messages	0.02769	PMM
144	Tube 27*2.7	Brace	No Messages	0.017349	PMM
145	Tube 27*2.7	Brace	No Messages	0.003938	PMM
146	Tube 27*2.7	Brace	No Messages	0.00321	PMM
147	Tube 27*2.7	Brace	No Messages	0.018299	PMM
148	Tube 27*2.7	Brace	No Messages	0.017349	PMM
149	Tube 27*2.7	Brace	No Messages	0.003938	PMM
150	Tube 27*2.7	Brace	No Messages	0.003209	PMM
151	Tube 27*2.7	Brace	No Messages	0.018299	PMM
152	Tube 27*2.7	Brace	No Messages	0.018299	PMM
153	Tube 27*2.7	Brace	No Messages	0.00321	PMM
154	Tube 27*2.7	Brace	No Messages	0.003938	PMM
155	Tube 27*2.7	Brace	No Messages	0.017349	PMM
156	Tube 27*2.7	Brace	No Messages	0.017349	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
157	Tube 27*2.7	Brace	No Messages	0.003938	PMM
158	Tube 27*2.7	Brace	No Messages	0.003209	PMM
159	Tube 27*2.7	Brace	No Messages	0.018299	PMM
208	Tube 60*3	Column	No Messages	0.596778	PMM
209	Tube 60*3	Column	No Messages	0.572056	PMM
210	Tube 60*3	Column	No Messages	0.572056	PMM
211	Tube 60*3	Column	No Messages	0.596778	PMM
212	Tube 27*2.7	Beam	No Messages	0.043535	PMM
213	Tube 27*2.7	Beam	No Messages	0.043471	PMM
214	Tube 27*2.7	Beam	No Messages	0.043535	PMM
215	Tube 27*2.7	Beam	No Messages	0.043471	PMM
216	Tube 27*2.7	Brace	No Messages	0.017926	PMM
217	Tube 27*2.7	Brace	No Messages	0.002956	PMM
218	Tube 27*2.7	Brace	No Messages	0.003478	PMM
219	Tube 27*2.7	Brace	No Messages	0.017528	PMM
220	Tube 27*2.7	Brace	No Messages	0.017928	PMM
221	Tube 27*2.7	Brace	No Messages	0.002954	PMM
222	Tube 27*2.7	Brace	No Messages	0.003481	PMM
223	Tube 27*2.7	Brace	No Messages	0.017526	PMM
224	Tube 27*2.7	Brace	No Messages	0.017528	PMM
225	Tube 27*2.7	Brace	No Messages	0.003478	PMM
226	Tube 27*2.7	Brace	No Messages	0.002956	PMM
227	Tube 27*2.7	Brace	No Messages	0.017926	PMM
228	Tube 27*2.7	Brace	No Messages	0.017928	PMM
229	Tube 27*2.7	Brace	No Messages	0.002954	PMM
230	Tube 27*2.7	Brace	No Messages	0.003481	PMM
231	Tube 27*2.7	Brace	No Messages	0.017526	PMM
232	Tube 60*3	Column	No Messages	0.593577	PMM
233	Tube 60*3	Column	No Messages	0.60047	PMM
234	Tube 60*3	Column	No Messages	0.593577	PMM
235	Tube 60*3	Column	No Messages	0.60047	PMM
236	Tube 27*2.7	Beam	No Messages	0.062954	PMM
237	Tube 27*2.7	Beam	No Messages	0.063293	PMM
238	Tube 27*2.7	Beam	No Messages	0.062954	PMM
239	Tube 27*2.7	Beam	No Messages	0.063293	PMM
240	Tube 27*2.7	Brace	No Messages	0.022915	PMM
241	Tube 27*2.7	Brace	No Messages	0.003274	PMM
242	Tube 27*2.7	Brace	No Messages	0.005195	PMM
243	Tube 27*2.7	Brace	No Messages	0.003455	PMM
244	Tube 27*2.7	Brace	No Messages	0.022727	PMM
245	Tube 27*2.7	Brace	No Messages	0.022743	PMM
246	Tube 27*2.7	Brace	No Messages	0.003442	PMM
247	Tube 27*2.7	Brace	No Messages	0.005186	PMM
248	Tube 27*2.7	Brace	No Messages	0.003283	PMM
249	Tube 27*2.7	Brace	No Messages	0.022927	PMM
250	Tube 27*2.7	Brace	No Messages	0.022915	PMM
251	Tube 27*2.7	Brace	No Messages	0.003274	PMM
252	Tube 27*2.7	Brace	No Messages	0.005195	PMM
253	Tube 27*2.7	Brace	No Messages	0.003455	PMM
254	Tube 27*2.7	Brace	No Messages	0.022727	PMM
255	Tube 27*2.7	Brace	No Messages	0.022743	PMM
256	Tube 27*2.7	Brace	No Messages	0.003442	PMM
257	Tube 27*2.7	Brace	No Messages	0.005186	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
258	Tube 27*2.7	Brace	No Messages	0.003283	PMM
259	Tube 27*2.7	Brace	No Messages	0.022927	PMM
260	C 200*30*6	Beam	No Messages	0.113829	Major Shear
261	C 200*30*6	Beam	No Messages	0.001526	PMM
262	C 200*30*6	Beam	No Messages	0.113829	Major Shear
263	C 200*30*6	Beam	No Messages	0.001526	PMM
264	Tube 60*3	Column	No Messages	0.628576	PMM
265	Tube 60*3	Column	No Messages	0.634081	PMM
266	Tube 60*3	Column	No Messages	0.634081	PMM
267	Tube 60*3	Column	No Messages	0.628576	PMM
268	Tube 27*2.7	Brace	No Messages	0.017801	PMM
269	Tube 27*2.7	Brace	No Messages	0.009102	PMM
270	Tube 27*2.7	Brace	No Messages	0.016016	PMM
271	Tube 27*2.7	Brace	No Messages	0.018978	PMM
272	Tube 27*2.7	Brace	No Messages	0.011244	PMM
273	Tube 27*2.7	Brace	No Messages	0.01132	PMM
274	Tube 27*2.7	Brace	No Messages	0.018895	PMM
275	Tube 27*2.7	Brace	No Messages	0.015921	PMM
276	Tube 27*2.7	Brace	No Messages	0.009192	PMM
277	Tube 27*2.7	Brace	No Messages	0.017713	PMM
278	Tube 27*2.7	Brace	No Messages	0.017713	PMM
279	Tube 27*2.7	Brace	No Messages	0.009192	PMM
280	Tube 27*2.7	Brace	No Messages	0.015921	PMM
281	Tube 27*2.7	Brace	No Messages	0.018895	PMM
282	Tube 27*2.7	Brace	No Messages	0.01132	PMM
283	Tube 27*2.7	Brace	No Messages	0.017801	PMM
284	Tube 27*2.7	Brace	No Messages	0.009102	PMM
285	Tube 27*2.7	Brace	No Messages	0.016016	PMM
286	Tube 27*2.7	Brace	No Messages	0.018978	PMM
287	Tube 27*2.7	Brace	No Messages	0.011244	PMM
288	C 200*30*6	Beam	No Messages	0.004085	PMM
289	C 200*30*6	Beam	No Messages	0.113331	Major Shear
290	C 200*30*6	Beam	No Messages	0.004085	PMM
291	C 200*30*6	Beam	No Messages	0.113331	Major Shear
292	Spine 40	Beam	No Messages	0.428827	PMM
293	Spine 40	Beam	No Messages	0.428827	PMM
294	Spine 40	Beam	No Messages	0.426099	PMM
295	Spine 40	Beam	No Messages	0.426099	PMM
296	Tube 60*3	Column	No Messages	0.19458	PMM
297	Tube 60*3	Column	No Messages	0.189512	PMM
298	Tube 60*3	Column	No Messages	0.189512	PMM
299	Tube 60*3	Column	No Messages	0.19458	PMM
300	Tube 60*3	Column	No Messages	0.59102	PMM
301	Tube 60*3	Column	No Messages	0.579986	PMM
302	Tube 60*3	Column	No Messages	0.579986	PMM
303	Tube 60*3	Column	No Messages	0.59102	PMM
304	Tube 27*2.7	Beam	No Messages	0.089884	PMM
305	Tube 27*2.7	Beam	No Messages	0.1099	PMM
306	Tube 27*2.7	Beam	No Messages	0.089884	PMM
307	Tube 27*2.7	Beam	No Messages	0.1099	PMM
308	Tube 27*2.7	Brace	No Messages	0.004545	PMM
309	Tube 27*2.7	Brace	No Messages	0.01125	PMM
310	Tube 27*2.7	Brace	No Messages	0.020621	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
311	Tube 27*2.7	Brace	No Messages	0.007935	PMM
312	Tube 27*2.7	Brace	No Messages	0.007482	PMM
313	Tube 27*2.7	Brace	No Messages	0.024219	PMM
314	Tube 27*2.7	Brace	No Messages	0.020621	PMM
315	Tube 27*2.7	Brace	No Messages	0.01125	PMM
316	Tube 27*2.7	Brace	No Messages	0.004545	PMM
317	Tube 27*2.7	Brace	No Messages	0.007935	PMM
318	Tube 27*2.7	Brace	No Messages	0.007482	PMM
319	Tube 27*2.7	Brace	No Messages	0.024219	PMM
320	Tube 60*3	Column	No Messages	0.407548	PMM
321	Tube 60*3	Column	No Messages	0.552869	PMM
322	Tube 60*3	Column	No Messages	0.547794	PMM
323	Tube 60*3	Column	No Messages	0.552869	PMM
324	Tube 27*2.7	Beam	No Messages	0.11755	PMM
325	Tube 27*2.7	Beam	No Messages	0.114269	PMM
326	Tube 27*2.7	Beam	No Messages	0.11755	PMM
327	Tube 27*2.7	Beam	No Messages	0.114269	PMM
328	Tube 27*2.7	Brace	No Messages	0.028852	PMM
329	Tube 27*2.7	Brace	No Messages	0.006999	PMM
330	Tube 27*2.7	Brace	No Messages	0.028779	PMM
331	Tube 27*2.7	Brace	No Messages	0.029319	PMM
332	Tube 27*2.7	Brace	No Messages	0.006455	PMM
333	Tube 27*2.7	Brace	No Messages	0.029556	PMM
334	Tube 27*2.7	Brace	No Messages	0.028779	PMM
335	Tube 27*2.7	Brace	No Messages	0.006999	PMM
336	Tube 27*2.7	Brace	No Messages	0.028852	PMM
337	Tube 27*2.7	Brace	No Messages	0.029319	PMM
338	Tube 27*2.7	Brace	No Messages	0.006455	PMM
339	Tube 27*2.7	Brace	No Messages	0.029556	PMM
340	Tube 60*3	Column	No Messages	0.539493	PMM
341	Tube 60*3	Column	No Messages	0.515499	PMM
342	Tube 60*3	Column	No Messages	0.539493	PMM
343	Tube 60*3	Column	No Messages	0.515499	PMM
344	L120*84*8	Beam	No Messages	0.045151	PMM
345	L120*84*8	Beam	No Messages	0.045212	PMM
346	L120*84*8	Beam	No Messages	0.045151	PMM
347	L120*84*8	Beam	No Messages	0.045212	PMM
360	Tube 27*2.7	Brace	No Messages	0.026953	PMM
361	Tube 27*2.7	Brace	No Messages	0.013822	PMM
362	Tube 27*2.7	Brace	No Messages	0.020419	PMM
363	Tube 27*2.7	Brace	No Messages	0.020502	PMM
364	Tube 27*2.7	Brace	No Messages	0.013705	PMM
365	Tube 27*2.7	Brace	No Messages	0.027098	PMM
366	Tube 27*2.7	Brace	No Messages	0.020419	PMM
367	Tube 27*2.7	Brace	No Messages	0.013822	PMM
368	Tube 27*2.7	Brace	No Messages	0.026953	PMM
369	Tube 27*2.7	Brace	No Messages	0.020502	PMM
370	Tube 27*2.7	Brace	No Messages	0.013705	PMM
371	Tube 27*2.7	Brace	No Messages	0.027098	PMM
372	Tube 60*3	Column	No Messages	0.351881	PMM
373	Tube 60*3	Column	No Messages	0.351019	PMM
374	Tube 60*3	Column	No Messages	0.351019	PMM
375	Tube 60*3	Column	No Messages	0.351881	PMM

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
2	L130*44*6	Beam	No Messages	0.006661	PMM
10	L130*44*6	Beam	No Messages	0.002208	PMM
24	L130*44*6	Beam	No Messages	0.002198	PMM
40	L130*44*6	Beam	No Messages	0.006745	PMM
41	L130*44*6	Beam	No Messages	0.006661	PMM
42	L130*44*6	Beam	No Messages	0.002208	PMM
43	L130*44*6	Beam	No Messages	0.002198	PMM
44	L130*44*6	Beam	No Messages	0.006745	PMM

Summary Data - Eurocode 3-2005, Part 2 of 2

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
1	SLU1	1285.2	No Messages	No Messages
3	SLU1	0	No Messages	No Messages
4	SLU1	0	No Messages	No Messages
5	SLU1	1285.2	No Messages	No Messages
6	SLU1	440	No Messages	No Messages
7	SLU1	440	No Messages	No Messages
8	SLU1	440	No Messages	No Messages
9	SLU1	440	No Messages	No Messages
11	SLU1	0	No Messages	No Messages
12	SLU1	307.05	No Messages	No Messages
13	SLU1	307.05	No Messages	No Messages
14	SLU1	307.05	No Messages	No Messages
15	SLU1	0	No Messages	No Messages
16	SLU1	0	No Messages	No Messages
17	SLU1	307.05	No Messages	No Messages
18	SLU1	307.05	No Messages	No Messages
19	SLU1	307.05	No Messages	No Messages
20	SLU1	0	No Messages	No Messages
21	SLU1	0	No Messages	No Messages
22	SLU1	307.05	No Messages	No Messages
23	SLU1	307.05	No Messages	No Messages
25	SLU1	307.05	No Messages	No Messages
26	SLU1	0	No Messages	No Messages
27	SLU1	0	No Messages	No Messages
28	SLU1	307.05	No Messages	No Messages
29	SLU1	307.05	No Messages	No Messages
30	SLU1	307.05	No Messages	No Messages
31	SLU1	0	No Messages	No Messages
32	SLU1	856.8	No Messages	No Messages
33	SLU1	1285.2	No Messages	No Messages
34	SLU1	1285.2	No Messages	No Messages
35	SLU1	856.8	No Messages	No Messages
36	SLU1	440	No Messages	No Messages
37	SLU1	0	No Messages	No Messages
38	SLU1	440	No Messages	No Messages
39	SLU1	0	No Messages	No Messages
116	SLU1	0	No Messages	No Messages
117	SLU1	0	No Messages	No Messages
118	SLU1	307.05	No Messages	No Messages

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
119	SLU1	0	No Messages	No Messages
120	SLU1	0	No Messages	No Messages
121	SLU1	0	No Messages	No Messages
122	SLU1	0	No Messages	No Messages
123	SLU1	307.05	No Messages	No Messages
124	SLU1	0	No Messages	No Messages
125	SLU1	0	No Messages	No Messages
126	SLU1	0	No Messages	No Messages
127	SLU1	307.05	No Messages	No Messages
128	SLU1	0	No Messages	No Messages
129	SLU1	0	No Messages	No Messages
130	SLU1	0	No Messages	No Messages
131	SLU1	0	No Messages	No Messages
132	SLU1	307.05	No Messages	No Messages
133	SLU1	0	No Messages	No Messages
134	SLU1	0	No Messages	No Messages
135	SLU1	0	No Messages	No Messages
136	SLU1	412	No Messages	No Messages
137	SLU1	824	No Messages	No Messages
138	SLU1	824	No Messages	No Messages
139	SLU1	412	No Messages	No Messages
140	SLU1	0	No Messages	No Messages
141	SLU1	0	No Messages	No Messages
142	SLU1	0	No Messages	No Messages
143	SLU1	0	No Messages	No Messages
144	SLU1	0	No Messages	No Messages
145	SLU1	0	No Messages	No Messages
146	SLU1	301.39	No Messages	No Messages
147	SLU1	0	No Messages	No Messages
148	SLU1	0	No Messages	No Messages
149	SLU1	0	No Messages	No Messages
150	SLU1	301.39	No Messages	No Messages
151	SLU1	0	No Messages	No Messages
152	SLU1	602.78	No Messages	No Messages
153	SLU1	301.39	No Messages	No Messages
154	SLU1	602.78	No Messages	No Messages
155	SLU1	602.78	No Messages	No Messages
156	SLU1	0	No Messages	No Messages
157	SLU1	0	No Messages	No Messages
158	SLU1	301.39	No Messages	No Messages
159	SLU1	0	No Messages	No Messages
208	SLU1	412	No Messages	No Messages
209	SLU1	824	No Messages	No Messages
210	SLU1	824	No Messages	No Messages
211	SLU1	412	No Messages	No Messages
212	SLU1	0	No Messages	No Messages
213	SLU1	0	No Messages	No Messages
214	SLU1	0	No Messages	No Messages
215	SLU1	0	No Messages	No Messages
216	SLU1	0	No Messages	No Messages
217	SLU1	0	No Messages	No Messages
218	SLU1	0	No Messages	No Messages
219	SLU1	0	No Messages	No Messages

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
220	SLU1	0	No Messages	No Messages
221	SLU1	0	No Messages	No Messages
222	SLU1	0	No Messages	No Messages
223	SLU1	0	No Messages	No Messages
224	SLU1	602.78	No Messages	No Messages
225	SLU1	602.78	No Messages	No Messages
226	SLU1	602.78	No Messages	No Messages
227	SLU1	602.78	No Messages	No Messages
228	SLU1	0	No Messages	No Messages
229	SLU1	0	No Messages	No Messages
230	SLU1	0	No Messages	No Messages
231	SLU1	0	No Messages	No Messages
232	SLU1	1071	No Messages	No Messages
233	SLU1	428.4	No Messages	No Messages
234	SLU1	1071	No Messages	No Messages
235	SLU1	428.4	No Messages	No Messages
236	SLU1	440	No Messages	No Messages
237	SLU1	440	No Messages	No Messages
238	SLU1	440	No Messages	No Messages
239	SLU1	440	No Messages	No Messages
240	SLU1	0	No Messages	No Messages
241	SLU1	307.05	No Messages	No Messages
242	SLU1	307.05	No Messages	No Messages
243	SLU1	0	No Messages	No Messages
244	SLU1	0	No Messages	No Messages
245	SLU1	614.11	No Messages	No Messages
246	SLU1	614.11	No Messages	No Messages
247	SLU1	307.05	No Messages	No Messages
248	SLU1	307.05	No Messages	No Messages
249	SLU1	614.11	No Messages	No Messages
250	SLU1	0	No Messages	No Messages
251	SLU1	307.05	No Messages	No Messages
252	SLU1	307.05	No Messages	No Messages
253	SLU1	0	No Messages	No Messages
254	SLU1	0	No Messages	No Messages
255	SLU1	614.11	No Messages	No Messages
256	SLU1	614.11	No Messages	No Messages
257	SLU1	307.05	No Messages	No Messages
258	SLU1	307.05	No Messages	No Messages
259	SLU1	614.11	No Messages	No Messages
260	SLU1	0	No Messages	No Messages
261	SLU1	440	No Messages	No Messages
262	SLU1	0	No Messages	No Messages
263	SLU1	440	No Messages	No Messages
264	SLU1	0	No Messages	No Messages
265	SLU1	428.4	No Messages	No Messages
266	SLU1	428.4	No Messages	No Messages
267	SLU1	0	No Messages	No Messages
268	SLU1	0	No Messages	No Messages
269	SLU1	0	No Messages	No Messages
270	SLU1	0	No Messages	No Messages
271	SLU1	0	No Messages	No Messages
272	SLU1	0	No Messages	No Messages

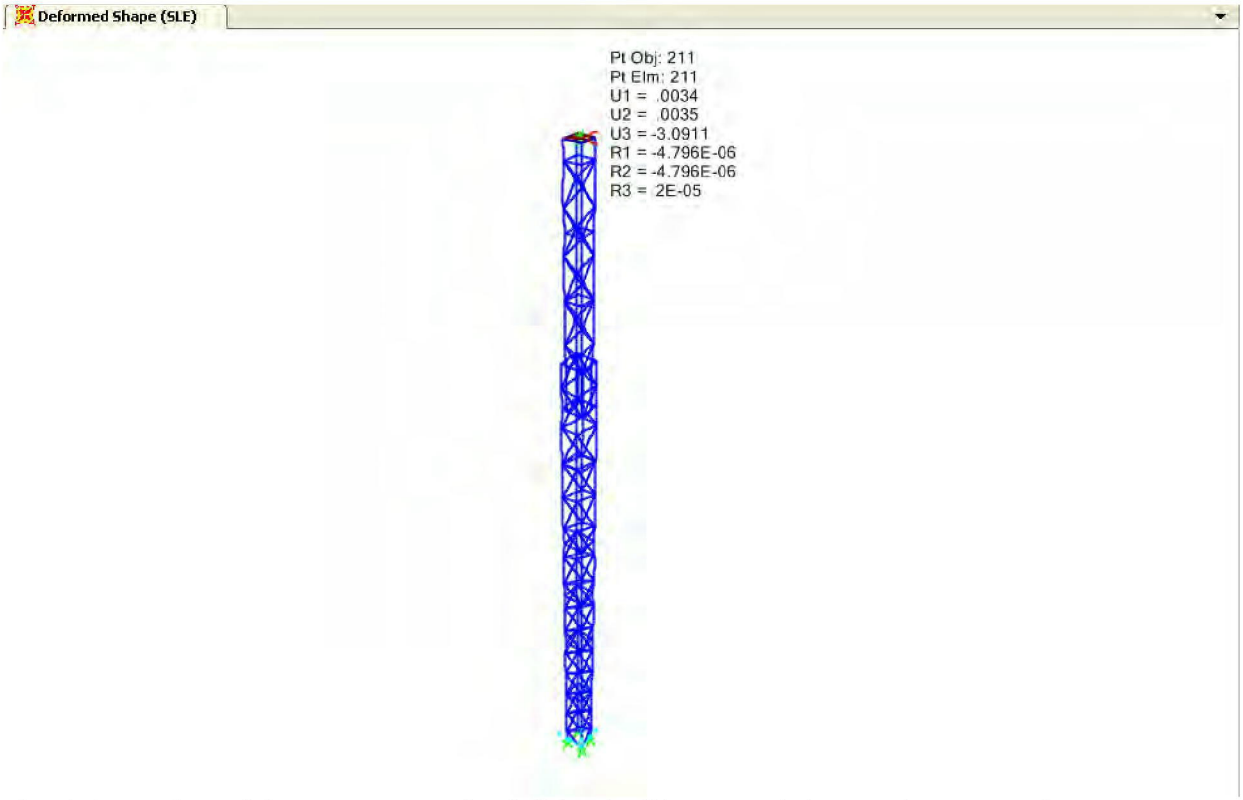
Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
273	SLU1	663.33	No Messages	No Messages
274	SLU1	614.11	No Messages	No Messages
275	SLU1	614.11	No Messages	No Messages
276	SLU1	614.11	No Messages	No Messages
277	SLU1	614.11	No Messages	No Messages
278	SLU1	0	No Messages	No Messages
279	SLU1	0	No Messages	No Messages
280	SLU1	0	No Messages	No Messages
281	SLU1	0	No Messages	No Messages
282	SLU1	0	No Messages	No Messages
283	SLU1	0	No Messages	No Messages
284	SLU1	0	No Messages	No Messages
285	SLU1	0	No Messages	No Messages
286	SLU1	0	No Messages	No Messages
287	SLU1	0	No Messages	No Messages
288	SLU1	440	No Messages	No Messages
289	SLU1	0	No Messages	No Messages
290	SLU1	440	No Messages	No Messages
291	SLU1	0	No Messages	No Messages
292	SLU1	380	No Messages	No Messages
293	SLU1	60	No Messages	No Messages
294	SLU1	380	No Messages	No Messages
295	SLU1	60	No Messages	No Messages
296	SLU1	0	No Messages	No Messages
297	SLU1	0	No Messages	No Messages
298	SLU1	0	No Messages	No Messages
299	SLU1	0	No Messages	No Messages
300	SLU1	0	No Messages	No Messages
301	SLU1	0	No Messages	No Messages
302	SLU1	0	No Messages	No Messages
303	SLU1	0	No Messages	No Messages
304	SLU1	320	No Messages	No Messages
305	SLU1	320	No Messages	No Messages
306	SLU1	320	No Messages	No Messages
307	SLU1	320	No Messages	No Messages
308	SLU1	0	No Messages	No Messages
309	SLU1	0	No Messages	No Messages
310	SLU1	0	No Messages	No Messages
311	SLU1	0	No Messages	No Messages
312	SLU1	0	No Messages	No Messages
313	SLU1	0	No Messages	No Messages
314	SLU1	518.26	No Messages	No Messages
315	SLU1	518.26	No Messages	No Messages
316	SLU1	518.26	No Messages	No Messages
317	SLU1	0	No Messages	No Messages
318	SLU1	0	No Messages	No Messages
319	SLU1	0	No Messages	No Messages
320	SLU1	0	No Messages	No Messages
321	SLU1	377.33	No Messages	No Messages
322	SLU1	377.33	No Messages	No Messages
323	SLU1	377.33	No Messages	No Messages
324	SLU1	0	No Messages	No Messages
325	SLU1	0	No Messages	No Messages

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
326	SLU1	0	No Messages	No Messages
327	SLU1	0	No Messages	No Messages
328	SLU1	0	No Messages	No Messages
329	SLU1	0	No Messages	No Messages
330	SLU1	0	No Messages	No Messages
331	SLU1	494.75	No Messages	No Messages
332	SLU1	494.75	No Messages	No Messages
333	SLU1	494.75	No Messages	No Messages
334	SLU1	494.75	No Messages	No Messages
335	SLU1	494.75	No Messages	No Messages
336	SLU1	494.75	No Messages	No Messages
337	SLU1	494.75	No Messages	No Messages
338	SLU1	494.75	No Messages	No Messages
339	SLU1	494.75	No Messages	No Messages
340	SLU1	377.33	No Messages	No Messages
341	SLU1	377.33	No Messages	No Messages
342	SLU1	377.33	No Messages	No Messages
343	SLU1	377.33	No Messages	No Messages
344	SLU1	320	No Messages	No Messages
345	SLU1	0	No Messages	No Messages
346	SLU1	320	No Messages	No Messages
347	SLU1	0	No Messages	No Messages
360	SLU1	0	No Messages	No Messages
361	SLU1	0	No Messages	No Messages
362	SLU1	0	No Messages	No Messages
363	SLU1	443.68	No Messages	No Messages
364	SLU1	494.75	No Messages	No Messages
365	SLU1	494.75	No Messages	No Messages
366	SLU1	443.68	No Messages	No Messages
367	SLU1	494.75	No Messages	No Messages
368	SLU1	494.75	No Messages	No Messages
369	SLU1	443.68	No Messages	No Messages
370	SLU1	494.75	No Messages	No Messages
371	SLU1	494.75	No Messages	No Messages
372	SLU1	0	No Messages	No Messages
373	SLU1	0	No Messages	No Messages
374	SLU1	0	No Messages	No Messages
375	SLU1	0	No Messages	No Messages
2	SLU1	0	No Messages	No Messages
10	SLU1	0	No Messages	No Messages
24	SLU1	160	No Messages	No Messages
40	SLU1	0	No Messages	No Messages
41	SLU1	0	No Messages	No Messages
42	SLU1	0	No Messages	No Messages
43	SLU1	160	No Messages	No Messages
44	SLU1	0	No Messages	No Messages

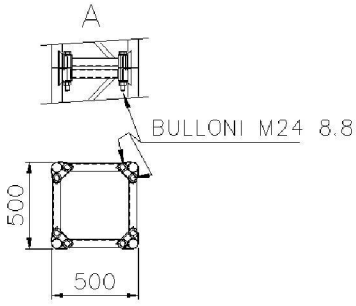
Deflection



The deformation of the structure under full load will not result in any damage to the structure and fittings.

Connections

Connection Between column sections



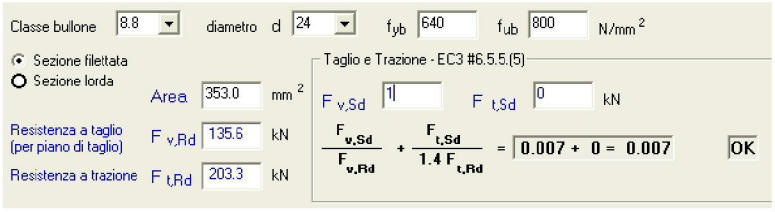
Bolts M24 Class 8.8

Bolts carry instability loading of 39kN x 0.01. Take as 1kN in shear for each bolt

From Table 3.4 EC1993-1-8

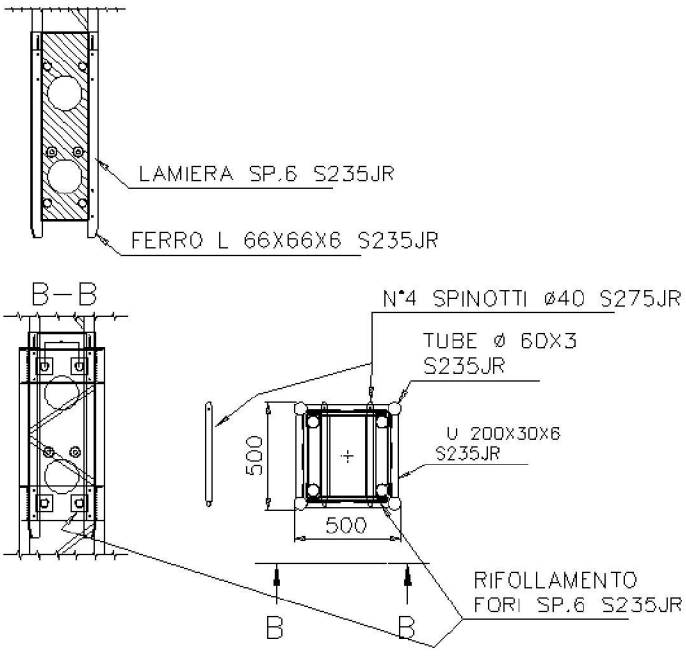
Failure mode	Bolts
Shear resistance per shear plane	$F_{v,Rd} = \frac{\alpha_v \, f_{nb} \, A}{\gamma_{M2}}$ - where the shear plane passes through the threaded portion of the bolt (A is the tensile stress area of the bolt A_s): - for classes 4.6, 5.6 and 8.8: $\alpha_v = 0,6$ - for classes 4.8, 5.8, 6.8 and 10.9: $\alpha_v = 0,5$ - where the shear plane passes through the unthreaded portion of the bolt (A is the gross cross section of the bolt): $\alpha_v = 0,6$

Using an Automatic calculation the bolts are verified (Sd = the Actual ultimate loading in the program)



Bolts OK because they are largely over dimensioned.

Upper Joint



Shear on Spine = 38kN

With Spine 40mm in S275

fv = 38000N . = 30N/mm2 vplzst resistance in shear; 144N/mm2 > 30N/mm2 OK
1256mm2

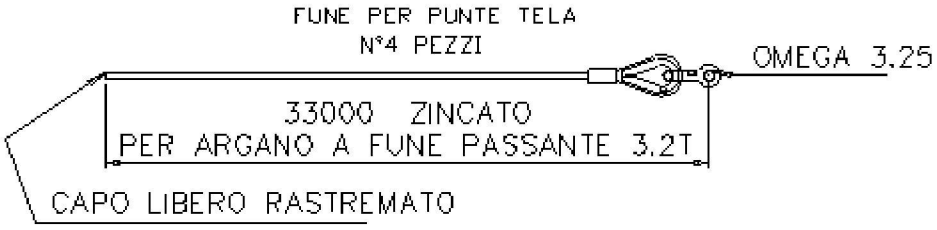
Bearing on C6mm = fv = 38000N . = 158N/mm2 < 213N/mm2 OK>
6mm x 40mm

Joint verified

Ropes

From the structure loading calculations we obtain a maximum ultimate rope load of:

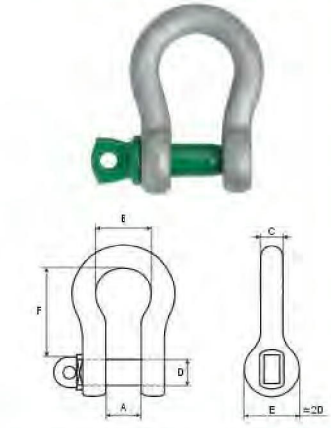
0.2kN x 1.35 + 39.96kN x 1.5 = 60.2kN



Rope Teci Dia 16mm S10

Shackels

Grilli omega — **Anchor shackle (screw collar pin)**



Portata WLL t (**)	Codice Code n°	A mm	C mm	D mm	F mm	B mm	Peso Weight kg
0,50	77.431.005	12	6	8	28	20	0,05
0,75	77.431.007	13	8	10	31	21	0,08
1,00	77.431.010	16	10	11	36	26	0,14
1,50	77.431.015	18	11	13	43	29	0,19
2,00	77.431.020	22	13	16	51	32	0,34
3,25	77.431.033	26	16	19	64	43	0,83
4,75	77.431.048	31	19	22	76	51	0,95
6,50	77.431.065	36	22	25	83	58	1,55
8,50	77.431.085	43	25	28	95	68	2,30
9,50	77.431.095	47	28	32	108	75	3,24
12,00	77.431.120	51	32	35	115	83	4,40
13,50	77.431.135	57	35	38	133	92	6,00
17,00	77.431.170	60	38	42	146	99	7,50
25,00	77.431.250	74	45	50	178	126	14,00
35,00	77.431.350	83	50	57	197	146	18,90
55,00	77.431.550	105	65	70	254	185	37,15
85,00	77.431.850	127	75	80	330	190	62,24
120,00	77.431.998	146	90	95	381	238	110,00

** Coefficiente di sicurezza 5:1
I grilli sono forniti con superfici zincate.

** Safety factor 5:1
All shackles are supplied galvanised

The ultimate load capacity of a 3.5Ton shackle = 35kN x 5 = 175kN

EN 13782:2005 Point 9 requires a safty factor of 2

The maximum load that can be applied to a 3.5T shackle = 175kN/2 = 87.5kN

The maximum rope load (ultimate) = 60.2kN < 87.5kN OK

Ropes

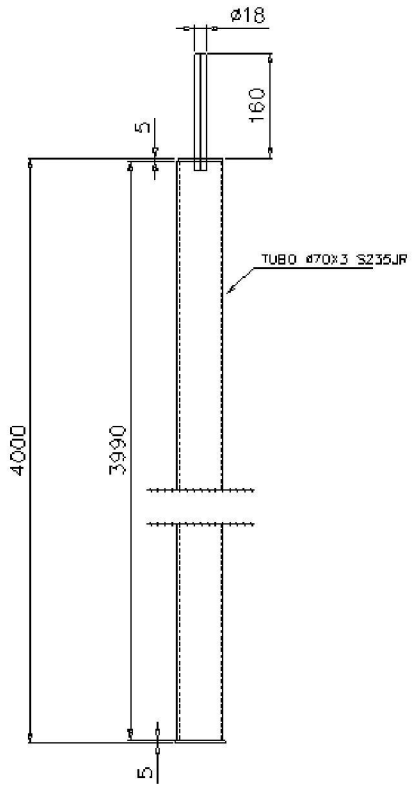
The maximum rope load (ultimate) = 60.2kN

The maximum load that can be carried by the 16mm S10 rope = 177kN/2 = 88.5kN

The maximum rope load (ultimate) = 60.2kN < 88.5kN OK

External Pole

Dimensions



Poles at 1400mm centres. Bracing at 45°

Wind Loads on Poles per Sector

Using data from previous calculation with poles spaced at 1.4m:

Horizzontal wind load = 69.19kN = 1.0kN/ml
Veritical wind load for -0.6 = 2.86kN/m

Horizontal wind derived from H bottom in kN page 10= 1.0kN/m x 1.4= 1.4kN

Vertical wind derived from V bottom in kN page 10= 2.86kN/m x 1.4= 4.0kN

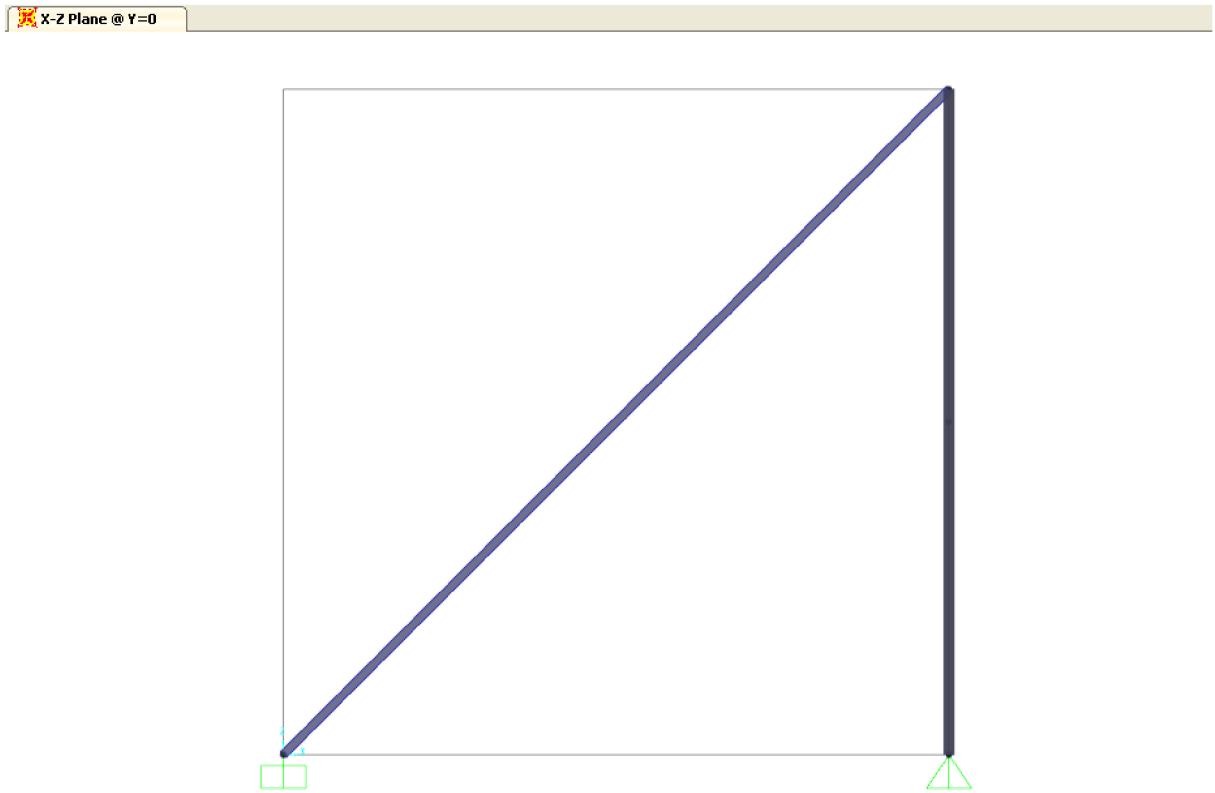
Ce taken from page 8 but increased to the local value 0.62

Local wind horizontal 500N/m2 x Ce 0.62 x 1.4m = 434N/m

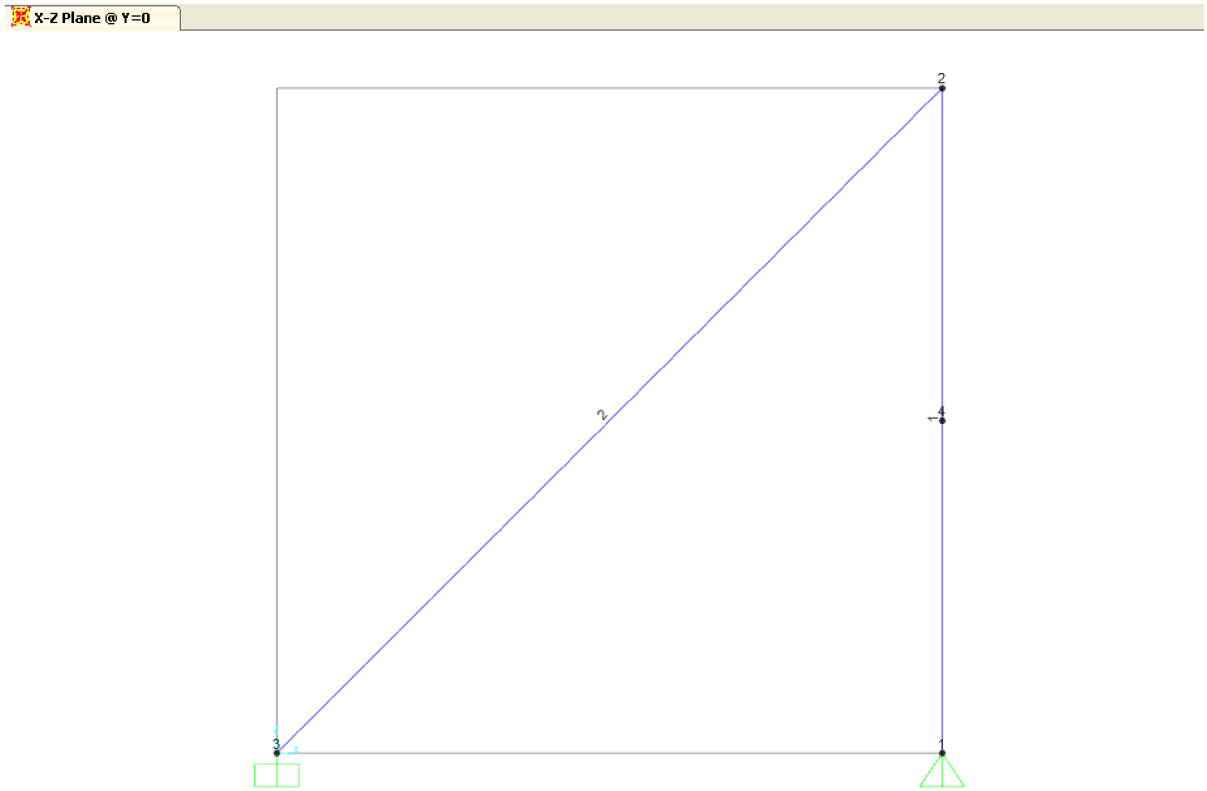
Self weight of tent

Can be ignored

Finite Element Model



Description of the model



Frame and Node numbers

Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			mm	mm	mm
1	GLOBAL	Cartesian	4000.00	0.00	0.00
2	GLOBAL	Cartesian	4000.00	0.00	4000.00
3	GLOBAL	Cartesian	0.00	0.00	0.00
4	GLOBAL	Cartesian	4000.00	0.00	2000.00

Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
1	Yes	Yes	Yes	No	No	No
3	Yes	Yes	Yes	Yes	Yes	Yes

Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length
			mm
1	1	2	4000.00
2	2	3	5656.85

Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
1	Tube 70*3	Tube 70*3	Default
2	Strap	N.A.	Default

Frame Release Assignments 1 - General, Part 1 of 2

Table 5: Frame Release Assignments 1 - General, Part 1 of 2

Frame	PI	V2I	V3I	TI	M2I	M3I
2	No	No	No	Yes	Yes	Yes

Frame Release Assignments 1 - General, Part 2 of 2

Table 5: Frame Release Assignments 1 - General, Part 2 of 2

Frame	PJ	V2J	V3J	TJ	M2J	M3J
2	No	No	No	No	Yes	Yes

.

Material Properties - Basic Mechanical Properties

Table 6: Material Properties 02 - Basic Mechanical Properties

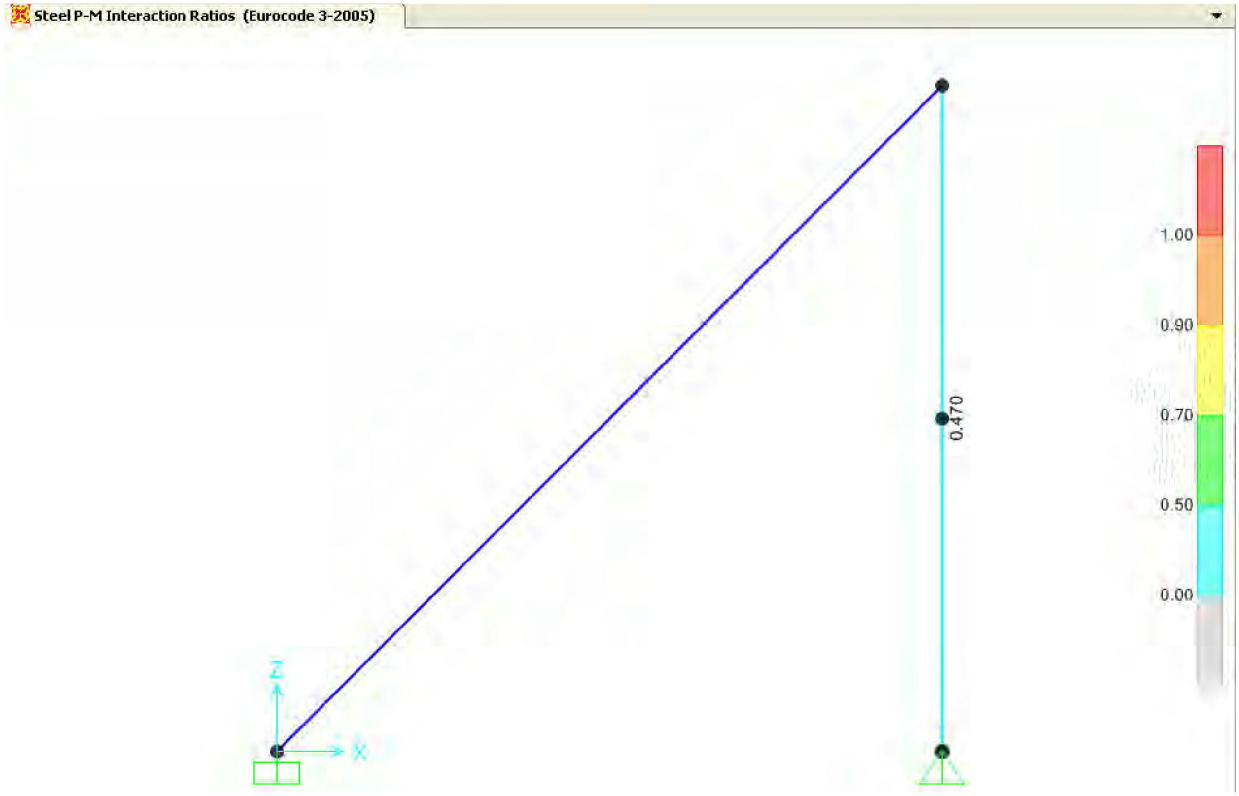
Material	UnitWeight	UnitMass	E1	G12	U12	A1
	KN/mm3	KN-s2/mm4	KN/mm2	KN/mm2		1/C
S235	7.6973E-08	7.8490E-12	210.00000	80.76923	0.300000	1.1700E-05

Table 7: Material Properties 03a - Steel Data

Table 7: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope
	N/mm2	N/mm2	
S235	235	360	-0.100000

Verification of Pole for resistance and stability



Summary Data - Eurocode 3-2005, Part 1 of 2

Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
1	Tube 70*3	Column	No Messages	0.469878	PMM

Summary Data - Eurocode 3-2005, Part 2 of 2

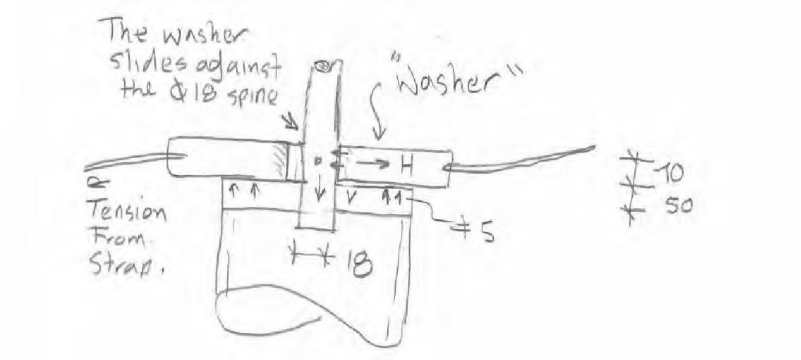
Table: Steel Design 1 - Summary Data - Eurocode 3-2005, Part 2 of 2

Frame	Combo	Location	ErrMsg	WarnMsg
		mm		
1	SLU1	2000	No Messages	No Messages

Verified

Verification Top Plate

H = 1.4kN Hult = 2.1kN



Da Roark – Formulas for Circular Plates

M = 2100N x 7.5mm = 15750Nmm

Y = 3.301 per b/a 0.38

Fy = $\frac{3.301 \times 15750\text{Nmm}}{35\text{mm} \times 5\text{mm}^2}$ = 59N/mm2 < 235N/mm2/1.1 = 213N/mm2

Reactions

Ground anchors

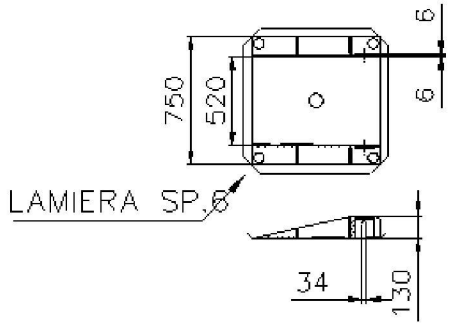
In accordance with EN13782:2005 chapter 8:

The anchor calculation is to be carried out by the Client taking into account the local ground conditions. Alternatively the anchors must be tested on site with a safety factor of 1.6

For our case the outer pole anchors must be able to carry 2.3kN x 1.6 = 4kN in both the horizontal and vertical direction. At 45° the ground anchors must carry 5.0kN (CL 8.4)

For our case the outer antenna anchors must be able to carry 18kN x 1.6 = 29kN in the horizontal direction and 7kN x 1.6 = 11kN in the vertical direction. At 45° the ground anchors must carry 31kN (CL 8.4)

Pressure under the Antenna Base



Antenna Baseplate

From the finite element model we obtain the baseplate loading

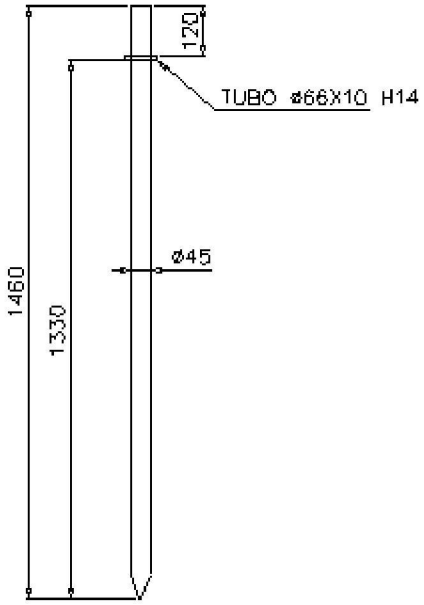
At the Service state (SLE) N = 118kN $= \frac{86\text{kN}}{0.75\text{m} \times 0.75\text{m}} = 152\text{kN/m2}$

At the Ultimate state (SLU) N = 172kN $= \frac{155\text{kN}}{0.75\text{m} \times 0.75\text{m}} = 275\text{kN/m2}$

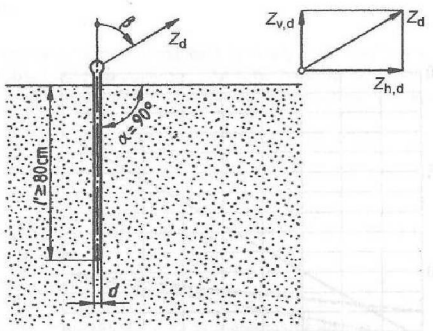
The ground bearing capacity calculation is to be carried out by the Client taking into account the local ground conditions.

Anchor Calculation

The number of anchors required needs to be checked by the Clients Engineer for each site where the tent is erected as we have no means of knowing the soil conditions on each site. We cannot be held resposible for certifying the number of anchors to be used.



Details of ground anchor



Key

Z_d is the anchor service load (service load), in N;

$Z_{h,d}$ is the horizontal anchor service load, in N;

$Z_{v,d}$ is the vertical anchor service load, in N;

d is the anchor diameter, in cm;

l' is the depth of penetration in cm;

α is the angle of penetration;

$ß$ is the angle of acting tensile force to the vertical.

Antenna:

For informative uses only below is a calculation for ground anchors in dense cohesionless soil.

Consider ß 45°

Maximum Service load for each anchor = 17 x 4.5cm x 130cm = 9945N = 9.95kN

The maximum service load on the antenna ropes = 20kN. Minimum 3 anchors are required

For informative uses only below is a calculation for ground anchors in medium/stiff cohesive soil.

Consider ß 45°

Maximum Service load for each anchor = 10 x 4.5cm x 130cm = 5850N = 5.85kN

The maximum service load on the antenna ropes = 20kN. Minimum 4 anchors are required

Outer Poles:

For informative uses only below is a calculation for ground anchors in dense cohesionless soil.

Consider ß 45°

Maximum Service load for each anchor = 17 x 4.5cm x 130cm = 9945N = 9.95kN

The maximum service load on the pole straps = 5kN. Minimum 1 anchor is required

For informative uses only below is a calculation for ground anchors in medium/stiff cohesive soil.

Consider ß 45°

Maximum Service load for each anchor = 10 x 4.5cm x 130cm = 5850N = 5.85kN

The maximum service load on the pole straps = 5kN. Minimum 2 anchors are required

610-1

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Fax 02.66040192
Funi Attrezzature per sollevamento S.p.A.

DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☐ FP 16 1600 kg ☑ FP32 3200 kg

N° di matricola / *Serial number:* 285 Anno / *Year:* 2014

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

610-2

Fas S.p.A.
Via dei Lavoratori 118/120 Tel. 02.6124951
20092 - Cinisello B. (MI) Fax 02.66040192
Funi Attrezzature per sollevamento S.p.A.

DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☐ FP 16 1600 kg ☑ FP32 3200 kg

N° di matricola / *Serial number*: 2899 Anno / *Year*: 2014

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

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Funi Attrezzature per sollevamento S.p.A.

DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model* ☐ FP 8 ☐ FP 16 ☑ FP32
Portata / *Capacity* 800 kg 1600 kg 3200 kg

N° di matricola / *Serial number*: 3072 Anno / *Year*: 2015

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

610-4

Fas S.p.A.
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20092 - Cinisello B. (MI) Fax 02.66040192
Funi Attrezzature per sollevamento S.p.A.

DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☐ FP 16 1600 kg ☑ FP32 3200 kg

N° di matricola / *Serial number*: 3115 Anno / *Year*: 2015

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

611-1

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DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☑ FP 16 1600 kg ☐ FP32 3200 kg

N° di matricola / *Serial number:* 2835 Anno / *Year:* 2015

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
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DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☒ FP 16 1600 kg ☐ FP32 3200 kg

N° di matricola / *Serial number*: 2386 Anno / *Year*: 2015

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

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Funi Attrezzature per sollevamento S.p.A.

DICHIARAZIONE CE DI CONFORMITA'
Declaration Of Conformity

In accordo alla Direttiva Macchine 2006/42/CE – Allegato II parte A
According to Machinery Directive 2006/42/CE – Annex II part A

La FAS S.p.A. dichiara che le macchine nuove denominate:
FAS SpA declare that the new products:

Argani manuali a fune passante serie FP / *FP type manual wire rope winches*

Modello / *Type*	**FP 8**	**FP 16**	**FP 32**
Portata in sollevamento / *Lifting capacity*	800 kg	1600 kg	3200 kg
Portata in trazione / *Pulling capacity*	1200 kg	2500 kg	5000 kg
Diametro fune / *Wire rope diameter*	8,4 mm	11,5 mm	16,3 mm

Sono conformi alle seguenti Direttive e norme:
Comply with the following Directive and standard:

- Direttiva Macchine 2006/42/CE / *Machinery directive 2006/42/EC*
- EN-ISO 12100 - 1 (Sicurezza del Macchinario / *Safety of Machinery*)
- EN-ISO 12100 - 2 (Sicurezza del Macchinario / *Safety of Machinery*)

Si dichiara inoltre che, come indicato nella Direttiva Macchine 2006/42/CE:
Moreover we declare, according to Machinery Directive 2006/42/EC, that:

- La marcatura CE è apposta sulla macchina
  CE mark has been fixed to the winch
- Il fascicolo tecnico è a disposizione presso la sede del Fabbricante
  We will keep the technical documents available at our head office

La presente dichiarazione è rilasciata per il prodotto specificato nel seguito:
This declaration is issued for the product specified below:

Modello / *Model*
Portata / *Capacity*

☐ FP 8 800 kg ☒ FP 16 1600 kg ☐ FP32 3200 kg

N° di matricola / *Serial number* 2893 Anno / *Year* 2015

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Fare riferimento al nostro manuale per la manutenzione dell'argano.
This declaration must be kept for 10 years or for the entire operating time. Please refer to our instruction manual for the maintenance of the winch.

F.A.S. S.p.A.
RESPONSABILE PRODOTTO
GIOVANNI ROVERA

CAVI x TIRFORD 1,6T

612-1

Funi Attrezzature
per Sollevamento SpA

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Milano - Italia
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REA N. 1042062
P.I. / C.F. 05854380150
info@fasitaly.com
www.fasitaly.com

Rifer.Cliente 14115 del 29/10/15
Customer Ref.

Ns. Riferimento N° 502964 - 04/11/2015
Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE

(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)

EC Conformity Declaration

(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Attestato n. / *Certificate n.*		**6LS1045**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		11,5 mm
Lunghezza / *Lenght*		29500 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	1600 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Il Fascicolo Tecnico è a disposizione presso il costruttore. Fare riferimento al nostro catalogo ed alle normative vigenti per il corretto utilizzo e la manutenzione.

This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
Giovanni Rovera

c-tirfu

6L-21

Funi Attrezzature
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Rifer.Cliente 14I15 del 29/10/15
Customer Ref.

Ns. Riferimento N° 502964 - 04/11/2015
Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE
(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)
EC Conformity Declaration
(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Attestato n. / *Certificate n.*		**6LS1046**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		11,5 mm
Lunghezza / *Lenght*		29500 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	1600 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Il Fascicolo Tecnico è a disposizione presso il costruttore. Fare riferimento al nostro catalogo ed alle normative vigenti per il corretto utilizzo e la manutenzione.

This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
Giovanni Rovera

c-tirfu

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Funi Attrezzature
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Rifer.Cliente 14115 del 29/10/15
Customer Ref.

Ns. Riferimento N° 502964 - 04/11/2015
Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE
(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)
EC Conformity Declaration
(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Attestato n. / *Certificate n.*		**6LS1047**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		11,5 mm
Lunghezza / *Lenght*		29500 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	1600 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Il Fascicolo Tecnico è a disposizione presso il costruttore. Fare riferimento al nostro catalogo ed alle normative vigenti per il corretto utilizzo e la manutenzione.

This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
Giovanni Rovera

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CAVI x TIRFON 3,2T

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Funi Attrezzature
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Rifer.Cliente 14115 del 29/10/15
Customer Ref.

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Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE
(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)

EC Conformity Declaration
(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Attestato n. / *Certificate n.*		**6LS1048**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		16,3 mm
Lunghezza / *Lenght*		33000 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	3200 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Il Fascicolo Tecnico è a disposizione presso il costruttore. Fare riferimento al nostro catalogo ed alle normative vigenti per il corretto utilizzo e la manutenzione.

This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
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Rifer.Cliente 14115 del 29/10/15
Customer Ref.

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Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE
(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)
EC Conformity Declaration
(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Attestato n. / *Certificate n.*		**6LS1049**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		16,3 mm
Lunghezza / *Lenght*		33000 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	3200 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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ANCESCHI CARLO S.R.L.

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Attestato n. / *Certificate n.*		**6LS1050**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		16,3 mm
Lunghezza / *Lenght*		33000 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	3200 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1051**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		16,3 mm
Lunghezza / *Lenght*		33000 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	3200 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1044**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		16 mm
Lunghezza / *Lenght*		56000 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	3400 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1052**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL-GRL3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		2310 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	1500 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1053**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL-GRL3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		2310 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	1500 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1054**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL-GRL3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		2310 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	1500 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1055**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL-GRL3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		2310 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	1500 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1056**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		PUNTA-GRL3,2
Diametro nominale / Nominal diameter		14 mm
Lunghezza / *Lenght*		13600 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	2600 kg
	Canestro / Basket	--
	$\beta < 45°$	--
	$45° < \beta < 60°$	--
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1057**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL3,2-2 RED
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		13900 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	--
	Canestro / Basket	--
	$\beta < 45°$	2200 kg
	$45° < \beta < 60°$	1800 kg
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1058**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL3,2-2GR3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		900 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL:*	Tiro Singolo / Single Leg:	--
	Canestro / Basket	--
	$\beta < 45°$	2000 kg
	$45° < \beta < 60°$	1000 kg
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

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Attestato n. / *Certificate n.*		**6LS1059**
Quantità n. / *Quantity n.*		1
Tipo / *Type*		GRL3,2-2GR3,2
Diametro nominale / Nominal diameter		12 mm
Lunghezza / *Lenght*		900 mm
Sviluppo / Circumference		--
Coefficiente di sicurezza / *Safety factor*		5
Portata / *WLL*:	Tiro Singolo / Single Leg:	--
	Canestro / Basket	--
	$\beta < 45°$	2000 kg
	$45° < \beta < 60°$	1000 kg
Norme Armonizzate Applicate *Harmonized Standard Applied*		UNI EN 12100 parts 1-2

Note --

Questa dichiarazione deve essere conservata per 10 anni o per tutta la durata di utilizzo. Il Fascicolo Tecnico è a disposizione presso il costruttore. Fare riferimento al nostro catalogo ed alle normative vigenti per il corretto utilizzo e la manutenzione.

This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
Giovanni Rovera

c-tirfu

614-10

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www.fasitaly.com

Rifer.Cliente 14115 del 29/10/15
Customer Ref.

Ns. Riferimento N° 502964 - 04/11/2015
Our Ref.

Cinisello Balsamo, 04/11/2015

Cliente / Customer

ANCESCHI CARLO S.R.L.

VIA G. MARCONI N. 17
42010 RIO SALICETO (RE)

Dichiarazione di Conformità CE
(Direttiva Macchine 2006/42/CE All. IIA – D.L 17/2010)
EC Conformity Declaration
(Machine Directive 2006/42/EC Annex IIA – D.L 17/2010)

Dichiariamo che gli articoli oggetto della presente dichiarazione sono conformi e soddisfano tutti i requisiti essenziali di sicurezza previsti dalla Direttiva Macchine
We declare that the articles related to this declaration comply and fullfill all the essential safety requirements of the Machine Directive

Quantità n. / *Quantity n.*	20
Codice / *Code*	AGRLOM03,2
Denominazione *Description*	Grillo a omega perno filettato GRL-OM Bow shackle with screw collar pin GRL-OM
Misura / *Size*	20 mm
Portata / *WLL:*	3,25 t
Carico di Prova / *Proof Load:*	6,5 t
Carico di rottura minimo garantito / *M.B.L.:*	19,5 t
Coefficiente di Sicurezza / *Safety factor:*	6
Materiale / *Material*	Acciaio alta resistenza gr 6 / High tensile steel gr 6
Norme Armonizzate Applicate *Harmonized Standard Applied:*	--

Note --

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This declaration of conformity must be kept for 10 years or during the entire service life. Technical Documents are available at manufacturer's head office. Refer to our catalogue and national laws for the proper use.

RESPONSABILE PRODOTTO
Giovanni Rovera

c-acc-ace

DICHIARAZIONE DI PRESTAZIONE
(Declaration of Performance)

n. 14L15/2015

PRODOTTO e USO PREVISTO: *(Product and Intended use)*	**Componenti in acciaio per uso strutturale per tenda Ø22m** (Rif. A TRE ALBAN COVERINGS srl)) **(Manufacture of welded metallic structures for modular Tent Ø22m)**
CODICE IDENTIFICATIVO: *(Serial number)*	**14L15**
Classe di esecuzione *(Execution Class)*	**EXC2**
FABBRICANTE: *(Manufacturer)*	**Anceschi Carlo s.r.l. Via Marconi, 17 42010 – Rio Saliceto (RE)**
Certificat n° / Certificate n°	**0948-CPR-0217**
VERIFICA DELLA COSTANZA: *(Verification of Costancy)*	**2+**
ORGANISMO NOTIFICATO: (Notified Body)	**TÜV Italia s.r.l. - TÜV SÜD Group, Via Carducci 125 Pal.23, 20099 Sesto San Giovanni (MI) - Organismo notificato n° 0948**

CARATTERISTICHE ESSENZIALI	PRESTAZIONE	NORMA ARMONIZZATA DI RIFERIMENTO
Tolleranza sulle dimensioni e di forma	Classe A	EN1090-2, EN10029
Saldabilità	S235, S275, S355	EN10025-1/2, EN10210-1, EN10219-1/2
Resistenza alla rottura Resistenza all'urto	27 J a 20°C	EN 1090-2
Capacità di supporto al carico	NPD	
Deformazione allo stato limite di esercizio	NPD	
Resistenza a fatica	NPD	
Resistenza al fuoco	NPD	
Reazione al fuoco	Classe A1	
Rilascio di cadmio e dei suoi composti	NPD	
Emissione di radioattività	NPD	
Durabilità	Preparazione della superficie secondo la ISO8501-3, grado di preparazione P1 Zincatura: EN ISO 1461	

Si rilascia la presente dichiarazione di prestazione sotto la responsabilità esclusiva del fabbricante, firmato a nome e per conto di Anceschi Carlo s.r.l. da:

Umberto Anceschi, Direzione

Rio Saliceto (RE), Italia – 24/11/2015

Anceschi Carlo s.r.l.
Via Marconi, 17
42010 – Rio Saliceto (RE) – Italy
Tel. +39 0522 738071 – Fax. +39 0522 649920
c.f. e p.iva: 01517290357

CE

0948-CPR-0217

Anceschi Carlo s.r.l.

Via Marconi, 17 – 42010 Rio Saliceto – Italy

15

DOP N° 14L15/2015

EN 1090-1:2009 + A1:2011

Componenti in acciaio per uso strutturale per tenda Ø22m (Rif. A TRE ALBAN COVERINGS srl)

Tolleranze sui dati geometrici: UNI EN 1090-2.

Saldabilità: Acciaio S235JR,S275JR,S355J2 secondo la EN 10025-1/2, EN10210-1, EN10219-1/2

Resistenza alla rottura: 27 J a 20 °C.

Reazione al fuoco: Materiale classificato: Classe A1.

Rilascio di cadmio: NPD.

Emissione di radioattività: NPD.

Durabilità: grado di preparazione della superficie P1 Zincatura EN ISO 1461

Caratteristiche strutturali:
Capacità di supporto del carico: Progetto secondo la EN 1993-1-8,UNI EN 13782:2006- vedere le direttive di progettazione e i calcoli di progetto in accompagnamento.
Deformazione allo stato limite di esercizio: NPD.
Resistenza a fatica: NPD.
Resistenza al fuoco: NPD.
Fabbricazione: Secondo la specifica dei componenti di riferimento come da Calcolo Strutturale tenda 22m H15m Ing. Voak , EN1090-2, EXC2.

Design wind speeds for temporary structures*

C-H Wang† and L Pham
Ecosystem Sciences, CSIRO, Melbourne

ABSTRACT: *This note discusses various approaches to determine design wind speeds for temporary structures for Australian conditions and provides recommendations that are consistent with the regulatory approach of the Building Code of Australia (BCA). Temporary structures are defined as structures with a total period of use to perform its intended purpose less than one year. The design wind speeds for these temporary structures could be reduced up to 50% of those recommended in the BCA depending on the Importance Level.*

1 INTRODUCTION

The Building Code of Australia (BCA) (Australian Building Codes Board, 2010), adopted by all States and Territories, covers new buildings and alterations/additions to existing buildings. However, the BCA does not elaborate on the issues of temporary structures and leaves it to the State and Territory authorities to decide what to do in specific circumstances. There is a need to provide a rationale for the derivation of design wind speeds for temporary structures that has consistent annual exceedance probability to the regulatory principles of the BCA.

The BCA does not define "design life" or state how long structures should last for; however, it specifies "design events" for which structures must be designed on the basis of annual probabilities of exceedance of these events. These annual probabilities depend on the importance level of structures. In this note, the term "design life" is used to denote the total periods of use of a structure to perform for its intended purpose. The design life of structures with repeated use should be the sum of all durations of anticipated use rather than the duration of one single use. Typically, designers operate on the assumption that the design life for "permanent" structures is of the order of 50 years.

The wind action standard AS/NZS 1170.2:2011 (Standards Australia, 2011) refers in Clause 2.3 to structures with design life greater than 5 years as 'permanent' and structures with design life less than or equal to 5 years as 'temporary'. In an earlier version, AS 1170.2:1989 (Standards Australia, 1989), temporary structures, however, are defined as structures with design life less than 6 months. Appendix F of AS/NZS 1170.0:2002 contains some recommendations for design wind speeds for structures with varying design life but not referenced by the BCA, presumably because of the awareness that these recommendations are not consistent with the BCA approach. We define in this note 'temporary structures' as structures with a total period of use to perform its intended purpose less than one year. Temporary structures embrace a number of types of structures such as formwork (6 months but with repeated use), circus tents (1 month but with repeated use), and special occasion entertainment shelter (1 day). Similar to permanent structures, the consequence of failure of temporary structures is addressed by designation of importance levels as specified by the BCA. The risk to structures under consideration is the risk during use, during which the consequence of failure is much higher than that during erection.

There are three possible approaches for the determination of design wind speeds for temporary structures:

(a) Design all structures to the same annual probabilities of exceedance as required by the BCA. This means that all temporary and permanent structures of the same importance level are designed to have the same annual notional reliability. This approach is consistent with the BCA without introducing any new criterion.

(b) Keep the *design-life* probabilities of exceedance of temporary structures the same as that of permanent structures. With this criterion, the

* Paper S11-109 submitted 9/06/11; accepted for publication after review and revision 11/10/11.

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Table 1: Regional wind speeds for reference periods not exceeding one year.

Region	Probability of exceedance	Regional wind speed (in m/s) for a reference period of			
		1 year	6 months	1 Month	1 Week
A	1:100	41	39	34	30
	1:500	45	43	39	34
	1:1000	46	45	41	37
B	1:100	48	44	32	22
	1:500	57	53	43	33
	1:1000	60	57	47	38
C	1:100	56	52	38	27
	1:500	66	62	50	39
	1:1000	70	66	55	45
D	1:100	66	60	42	26
	1:500	80	74	58	43
	1:1000	85	80	65	51

Table 2: Ratios of sub-annual wind speed to annual wind speed.

Region	Probability of exceedance	6-monthly/Annual	Monthly/Annual	Weekly/Annual
A	1:100	0.96	0.83	0.72
	1:500	0.96	0.86	0.77
	1:1000	0.97	0.88	0.79
B	1:100	0.91	0.67	0.46
	1:500	0.94	0.75	0.58
	1:1000	0.94	0.78	0.63
C	1:100	0.92	0.68	0.48
	1:500	0.94	0.76	0.60
	1:1000	0.95	0.79	0.64
D	1:100	0.9	0.63	0.39
	1:500	0.93	0.73	0.54
	1:1000	0.94	0.76	0.60

design wind speeds for temporary structures will have a higher annual probability of exceedance than permanent structures, as demonstrated in Section 2. This approach is not consistent with the BCA.

(c) Keep the *design-life* probabilities of exceedance of temporary structures the same as the *annual* probabilities of exceedance required by the BCA. This approach is consistent with the BCA, but it requires temporary structures to be regarded as structures with the intended period of use less than one year only.

Approach (c) is used in this note and a proposed method is developed in the next Section.

2 DESIGN WIND SPEED FOR TEMPORARY STRUCTURES

The Australian design standard for wind action AS/NZS 1170.2:2011 (Standards Australia, 2011) specifies the regional design wind speeds in terms of the annual probabilities of exceedance, ie. *the probability of exceedance for a reference period* of one year. Reference period is defined herein as the time duration to which the probabilities of exceedance of design wind speeds are referred. If the design life is less than one year, as with the temporary structures defined herein, then it could be argued that the use of one year reference period is excessive and a reference period equal to the design life may be more appropriate. One way to do this is to examine the maximum weekly or monthly gust speed records and carry out the appropriate statistical analysis. This note, however, proposes an alternative probabilistic method which gives the same results as that derived from the gust records, as shown later in this section.

The equations for regional wind speed specified in the design standard are expressed in the following form:

$$V_R = a - bR^{-k} \quad (1)$$

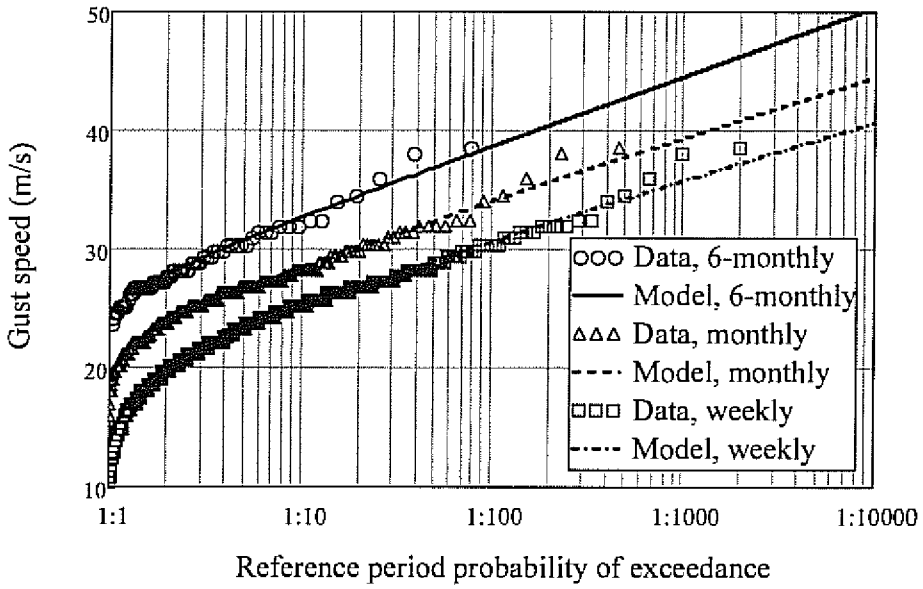

Figure 1: Sub-annual gust hazard derived from daily maximum gust data (Melbourne Airport).

where V_R (m/s) is the regional wind speed with *the annual probability of exceedance* 1 in R, and a, b, and k are the coefficients dependent on the hazard region; for example, for region A, $a = 67$, $b = 41$ and $k = 0.1$.

We assume that the extreme wind events occurring in consecutive reference periods are independent. In such cases, the annual probability of nonexceedance, P_a, can be expressed by the probability of nonexceedance for the reference period s, P_s, as follows (Ang & Tang, 2007):

$$P_a = P_s^T \tag{2}$$

where T is the number of reference periods per year; eg $T = 12$ if monthly extreme events are considered.

Substituting equation (2) into equation (1), we obtain the regional wind speed $V_{R,s}$ for a probability of exceedance of 1 in R_s for the reference period s:

$$V_{R,s} = a - b\left[1 - \left(1 - \frac{1}{R_s}\right)^T\right]^k \tag{3}$$

Equation (3) is used to compute the regional wind speed for annual, 6-monthly, monthly, and weekly wind hazard. Table 1 shows the wind speed values for probabilities of exceedance of 1:100, 1:500, and 1:1000 for the reference period of weekly, monthly, 6 monthly, and yearly, for the four hazard regions. To see the relative magnitude between the sub-annual wind speed and the annual wind speed, the wind speed ratios, defined as $V_{R,s}/V_R$, for the probability of exceedance of 1:100, 1:500, and 1:1000 are given also in table 2.

The probability distributions implied in AS/NZS 1170.2:2011 are only approximate fits to historical data. Thus for practical design purposes, the lines in figure 1 may be regarded as parallel. In this case, the reduction factors given in Table 2 can be simplified to a single table, as shown in the next section, by averaging the ratios across the three probabilities of exceedance.

Alternatively, records of daily gust speeds can be used to determine the weekly, monthly and six-monthly wind speeds. This was carried out as an example using the daily maximum gust data recorded at Melbourne Airport, as shown in figure 1. Comparison of the wind speeds derived from the proposed method and that derived from the recorded data shows that both methods give the same results (table 3).

3 DISCUSSION

There are good reasons why the BCA does not define design life and the reliability assessment is based on a reference period of one year rather than design life. One of the reasons is that it is practically impossible to impose any regulatory action at the end of the design life for structures with design life of more than one year.

Even if design life is defined, a criterion such as Option (b) in Section 1 (ie. keeping the design-life probability of exceedance constant) produces very low ultimate design wind speeds for temporary structures of one week or one month as shown in table 4. For design life of 50 years and annual exceedance probabilities of 1:100, 1:500, and 1:1000, the corresponding design-life exceedance probabilities are approximately 1:2.5, 1:10, and 1:20.

For temporary structures that are constructed and deconstructed within a year, the regional design wind speed may be reduced by the factor given in

Table 3: Comparison of wind speed derived from the proposed method and that derived from recorded data. Figures in ( ) are from the proposed method.

Region	Reference period exceed. prob.	Regional wind speed (in m/s) for a reference period of		
		6 months	1 Month	1 Week
A	1:100	39 (39)	34 (34)	31 (30)
	1:500	43 (43)	38 (39)	34 (34)
	1:1000	45 (45)	39 (41)	36 (37)

Table 4: Comparison of wind speed derived from the proposed method and that derived by keeping the design-life probability of exceedance constant. Figures in ( ) are from the proposed method.

Region	Design-life exceed. prob.	Regional wind speed (in m/s) for a design life of				
		50 years	1 year	6 months	1 Month	1 Week
A	1:2.5	41 (41)	31 (41)	29 (39)	25 (34)	21 (30)
	1:10	45 (45)	34 (45)	33 (43)	29 (39)	25 (34)
	1:20	46 (46)	37 (46)	35 (45)	30 (41)	27 (37)

Table 5: Reduction factors on regional wind speeds.

Wind region	Reduction factor on regional wind speed for structures of		
	6-month duration	1 month duration	1 week duration
A	0.95	0.85	0.75
B	0.95	0.75	0.55
C	0.95	0.75	0.55
D	0.90	0.70	0.50

Note: This table represents the average values (table 2) rounded off to the nearest 0.05.

table 5 as appropriate for the level of importance of the structure and its location (Standards Australia, 2002). Interpolation is permitted for other reference periods not less than one week.

4 CONCLUDING REMARKS

A probabilistic method consistent with the BCA specification to determine the regional gust speed for design of temporary structures has been proposed. The definition of temporary structures as structures with intended period of use less than a year means that items such as construction equipment, construction accommodation, and communication towers may no longer be considered as temporary. This does not mean that they cannot be designed for a lower design load (and hence a lower level of annual reliability). It only means that if consistency with the BCA is deemed necessary, the rationale for adopting a lower reliability level (or load) should be given.

Other criteria such as keeping the design-life probability of exceedance of temporary structures the same as that of permanent structures may be applied for design load reduction. However, if applied without exceptional clauses, such criteria may produce low design wind speed for some short-term structures, as shown in table 4, while alterations introduced by exceptional clauses undermine the rationale of the criteria.

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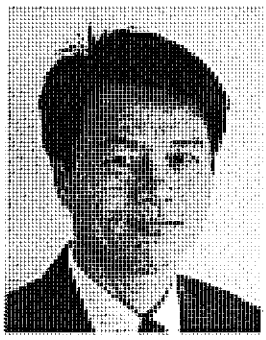

CHI-HSIANG WANG

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LAM PHAM

Dr Lam Pham is currently an Honorary Research Fellow at Commonwealth Scientific and Industrial Research Organisation – Ecosystem Sciences. He retired from the position of Chief Research Scientist at CSIRO at the end of 2005 and is now working part time for Australian Building Codes Board. His activities included the development of regulations and standards, promoting international collaboration, performance-based criteria, steel frame construction and ecologically sustainable construction. He has specialist skills in risk and reliability analysis, structural engineering, steel frame construction and building regulation. He had a leading role in the conversion of structural engineering standards to limit states format and participated in the preparation of many structural design standards currently in use in Australia such as the Loading Standards, the Steel and Cold-formed Steel Structures, Timber Structures and NASH Low Rise Steel Framing. He has authored over 300 technical papers on the above topics.