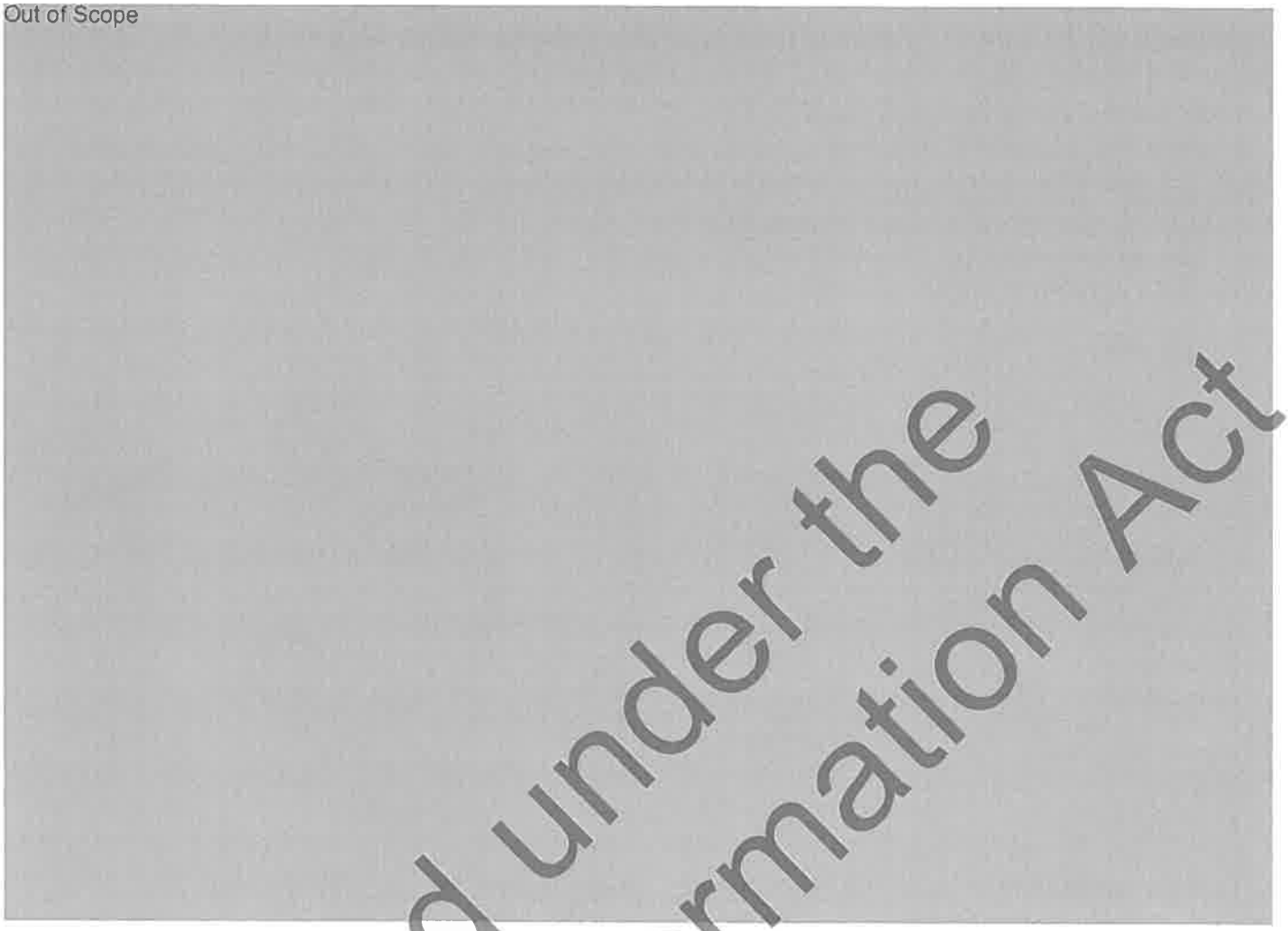
Out of Scope



From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Tuesday, 25 August 2015 12:51 p.m.
To: Jeni Hou; Murray Usmar
Cc: Graham Rundle
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Hi Murray

Please find attached structural calculation to cover B1 of the multiproof application. I believe the calculation addressed all previous queries from the Engineer.

Regards,

Benson Zhang
Design Engineer, MEngSt (Hons) BE

red co
DDI: 07 571 7077
P: 07 571 7070 | **F**: 07 571 7080
470 Otumoetai Road,
TAURANGA 3110.
www.redco.co.nz
Consulting Professional Engineers

Please consider the environment before printing this e-mail

From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Monday, 27 July 2015 12:16 p.m.
To: Murray Usmar
Cc: Benson Zhang; Graham Rundle
Subject: Re: Zirka Circus Marquee [UNCLASSIFIED]

Thanks a lot Murray, will do.....

Kind Regards
Jeni

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: +s 9(2)(a)
http://www.zirkacircus.com

Please Note:
New Address:

P. O. Box 28093
Rototuna
Hamilton 3256

On Mon, Jul 27, 2015 at 12:10 PM, Murray Usmar <Murray.Usmar@mbie.govt.nz> wrote:

Hi Jeni

Send the information to me and I will forward it to the appropriate people.

Regards

Murray Usmar
ASSESSOR - NATIONAL MULTIPLE-USE APPROVALS

Determinations and Assurance Team.
Building System Performance Branch | Building, Resources and Markets Group.
Ministry of Business, Innovation & Employment

murray.usmar@mbie.govt.nz | Telephone +64 (4) 901 8365
15 Stout Street Wellington | PO Box 1473, Wellington 6140

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Monday, 27 July 2015 11:33 a.m.
To: Murray Usmar
Subject: Zirka Circus Marquee [UNCLASSIFIED]

Hi Murray,

Finally my engineer on the process of finishing the documents for Multiple Approval. They should be able to submit the documents by the end of this month as promised. Please let me know who should they email it to, as we are not sure who's in charge of our project now.

Kindest Regards

Jeni

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: s 9(2)(a)
http://www.zirkacircus.com

Please Note:

New Address:

P. O. Box 28093

Rototuna

Hamilton 3256

Duplicate as per document 34

MBIE - MULTI PROOF APPLICATION

35M CIRCUS MARQUEE

for

ZIRKA CIRCUS

STRUCTURAL CALCULATIONS

August 2015 **Project No. 15180**

Prepared by: Benson Zhang
BE MEngSt

CPEng. sign off: Franswa Jooste
BE (Hons), M.IPENZ CPEng Int PE

Reviewed by: Graham Rundle
BE M.IPENZ

Approved by: Graham Rundle
BE M.IPENZ

CONTENTS:

redco

adding 'enginuity' to building projects

Consulting Professional Engineers

Redco NZ Ltd
Redco House
470 Otumoetai Road
TAURANGA 3110
Telephone: 07 571 7070
Facsimile: 07 571 7080
Email: red@redco.co.nz
www.redco.co.nz

Building Code Clause(s) B1

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on page 2)

ISSUED BY: Redco NZ Ltd
(Design Firm)

TO: .....
(Owner/Developer)

TO BE SUPPLIED TO: .....
(Building Consent Authority)

IN RESPECT OF: MBIE - Multi Proof Application (Redco Project No. 15180)
(Description of Building Work)

AT: Refer recommendations in PS1
(Address)

..... **LOT** ..... **DP** ..... **SO** .....

We have been engaged by the owner/developer referred to above to provide Structural Engineering ..... services in respect of the requirements of
(Extent of Engagement)

Clause(s) B1 .....of the Building Code for
All ☐ or Part only ☑ (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☑ Compliance Documents issued by the Ministry of Business, Innovation & Employment. B1/VM1 & AS1 .....or
(verification method / acceptable solution)

☐ Alternative solution as per the attached schedule.....

The proposed building work covered by this producer statement is described on the drawings titled MBIE - Multi Proof Application .....and numbered 1 .....;
together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:

(i) Site verification of the following design assumptions Pegs hold down tests and site wind speed of 30m/s .....

(ii) All proprietary products meeting their performance specification requirements;

I **believe on reasonable grounds** that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:

☐CM1 ☐CM2 ☑CM3 ☐CM4 ☐CM5 (Engineering Categories) or ☐ as per agreement with owner/developer (Architectural)

I, Franswa Jooste .....am:
(Name of Design Professional)

☑CPEng 232746 .....#

☐Reg Arch ..... #

I am a Member of : ☑ IPENZ ☐NZIA and hold the following qualifications: BE (Hons) M.IPENZ CPEng IntPE .....

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Design Firm is a member of ACENZ: ☐

SIGNED BY Franswa Jooste ..... ON BEHALF OF Redco NZ Ltd .....
(Design Firm)

Date 18/08/2015 ..... (signature).....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional engineers New Zealand, Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suit of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 Design Review Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 Construction Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 Construction Review Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as the Institution of Professional Engineers New Zealand (IPENZ) or the New Zealand Institute of Architects (NZIA), provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*Professional Indemnity Insurance

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to $500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5 for Engineers[3]). The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013

2 NZIA Standard Conditions of Contract SCC 2011

3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)

4 PN Guidelines on Producer Statements

www.acenz.org.nz
www.ipenz.org.nz
www.nzia.co.nz

red co adding 'enginuity' to building projects

Consulting Professional Engineers

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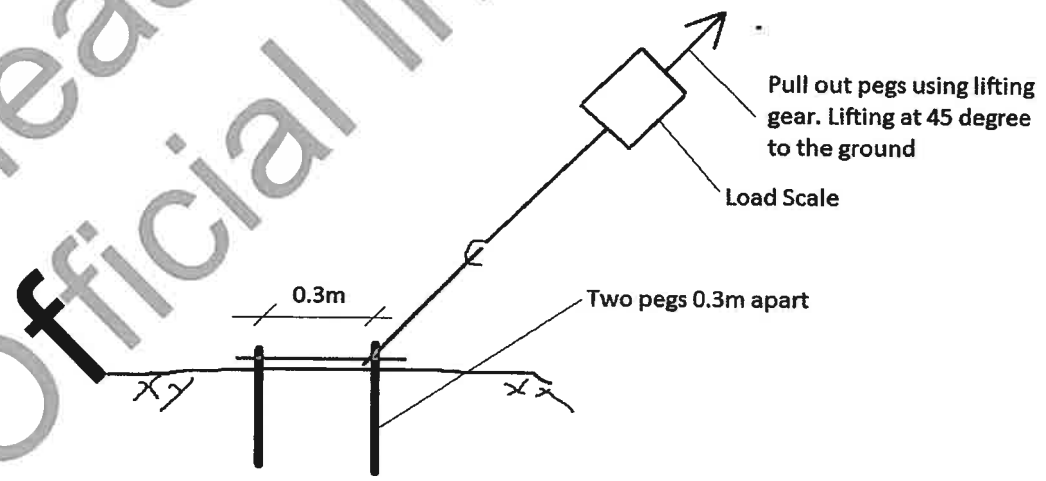
Recommendations

Project No. 15180

Based on our assessment, the 35m circus marquee is structurally capable to withstand a maximum design wind speeds of 108 kph (30m/s). This is considered acceptable for a temporary structure subject to the following limitations.

- For site wind speeds exceeding 108 kph, the structure shall be dismantled.
- For site wind speeds exceeding 50 kph, all openings in the marquee must be zipped shut and excessive movements are to be expected.
- A wind anemometer shall be used onsite and monitored by the event manager or a local authority to ensure the actual site wind speeds don't exceed the limitations above.
- The marquee is not designed to support any snow loads. It shall not be used in areas above 400m altitude in the North Island and during the snowing season in the South Island.
- To avoid ponding, the fabric must be stretched tightly after erection.
- Peg pull-out tests shall be carried out at any sites before erection of the marquee. Pull-out tests shall be followed the procedure below.

    1. Install two pegs into the ground. Connect the pegs to the lifting gear with a load scale in between using steel chains.



2. Record the reading from the scale when the first peg began to move and continue lifting.

3. Record the reading from the scale when the first peg is totally uplift from the ground.

4. Repeat the above steps at a different location. Minimum 2 tests shall be carried out at each site. The lower readings shall be used to compare the requirements.

   Minimum Required Load for peg to move = 300kg
   Minimum Required Load for peg to be lift from the ground = 790kg

   If the pull-out loads are found to be less than the above minimum requirements, additional pegs or weights may be required. Please report to Redco for additional hold down design.

We trust you find these points in order, but should you have any queries on any aspect please do not hesitate to call.

Yours sincerely
Redco NZ Ltd

Benson Zhang
Design Engineer, MEngSt (Hons) BE

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Consulting Professional Engineers

DESIGN FEATURE REPORT

1. Structure Description

The 35m circus marquee is a lightweight PVC fabric structure. The marquee is circular in shape with a diameter of 35m. It was designed and manufactured in Italy. The PVC fabric was manufactured in New Zealand by Baytex Manufacturing Co Ltd.

The marquee is used by Zirca Circus for events around the cities and towns of New Zealand. It is easy to dismantle and will not be used under extreme weather conditions.

The marquee is supported by four 15.5m height king posts at the centre. The king posts also support a cupola at the roof level. The king posts are stabilized by guy and spacer ropes at the top of the king posts. Each king post has two set of guy ropes which are directly anchored to the ground. The structure is a tensile fabric structure. The PVC fabric spans from the cupola to the king posts at the top and spans from the king posts to the perimeter posts around the circumference. The top of each perimeter posts is tie down to ground with a tension strap. Equal amount of pre-stress tension forces around the building are used to tighten the fabric. The tension in the fabric supports the vertical loads and stabilized lateral loads on the structure. The induced compression forces are resisted by the 4 king posts at the centre.

2. Scope

To assess the marquee to relevant New Zealand design standards to show compliance to the New Zealand Building Code (NZBC) section B1 by means of an Alternative Solution.

3. Means of Compliance

The following standards have been used:

- AS/NZS1170:2011
- NZS3404:1997

4. Alternative Solution

The NZ Building Code is primarily intended for permanent structures and the design loadings are based on the probability of occurrence.
Tents and marquees are temporary demountable structures that by their nature are not expected or required to withstand the most adverse weather loadings as the structures can be readily demounted before an adverse weather event occurs.
The tents and marquees are usually occupied by specific events (in this case for a circus performance) that can be postponed or cancelled in the event of adverse weather.
For more than ten years Redco have been establishing the maximum safe wind loadings for tents and marquees and providing erection/dismantling recommendations based on the relevant wind speeds.
These recommendations have been accepted by Councils and Building Consent Authorities as part of the Building Consent applications for short term events.
This design format and these recommendations have also been accepted in Australia and in the Pacific Islands.
The Australian Building Codes Board has prepared a Draft Standard for Temporary Structures which recognises this design format.

The Draft Standard provides for the use of a minimum ultimate strength limit state design wind speed of 30m/s (108kph). This is similar to the minimum design wind speed in New Caledonia of 100kph.
AS/NZS 1170.0:2011 also now has a minimum ultimate strength limit state design wind speed of 30m/s.

For this design a minimum ultimate design wind speed of 30 m/s has been adopted.

The ABCB Standard also references the British Institution of Structural Engineers publication ICE 2007 "Temporary demountable structures guidance." This Guidance provides two design options:

a) Design for maximum likely wind forces to be experienced. (As for a permanent structure)
b) Design for a maximum operational wind speed, above which an action plan for demounting would be triggered. (As for our design approach)

So this method of design for a maximum operational wind speed is put forward as an Alternative Solution based on the more than 10 years of history of use in New Zealand and the endorsement of the Australian Draft Standard and the British ISE publication.

The following alternative solutions have been referenced in the design of the structure:

- Australia Building Code Board: Temporary Structure
- Institution of Structural Engineering Guidance – ICE 2007

5. Structural Members

The following structural members have been checked:

- Fabric
- King Post
- Perimeter Post
- Cupola
- Cable/Strap
- Peg/Soil Nails loads

6. Design Loads

For the purposes of consideration of loading, this structure Importance Level 3 in accordance with AS/NZS 1170.0:2011.

The following loads have been used in the calculation.

Roof Dead Load	= 0.008kPa
Roof Live Load	= 0.0kPa
Imposed Load	= 1.0kN/m (around Cupola to account for lightings)
Snow Load	= 0.0kPa
Seismic Load	= insignificant (lightweight fabric structure)
Maximum Design Wind Speed	=30m/s

Pressure coefficients are used in accordance with NZS1170.2 Appendix C5 "Circular Bins, Silos and Tanks" for circular wall and cone roof geometry.

Internal, $C_{p,i}$	0.0,	-0.3
Wall Cp, b(□)	0.9	
Wall C_{fig}	0.63	
Roof Zone A C_{fig}	-0.8	
Roof Zone B C_{fig}	-0.5	

6. Deflections

The structure is a tensile fabric structure. The design tension actions from the fabric are dependent on the fabric deformation. To control the deformation to an acceptable level, the followings deformation limits have been used in calculation to derive design actions.

Over 15m of fabric span,
Ultimate Limit State deflection = 1.0m
Serviceability Limit State deflection = 0.5m

7. Material Specifications

The followings material specifications are from Studio D' Ingeneria Ardolino's Calculation report provided by Farming Phoenix Ent. Ltd. The material properties have been used in the calculation.

STEEL:

Class	S 235 (Fe360)
E-Modulus	E = 210000 MPa
Yield strength t<=40mm	Fyk = 235MPa
Yield strength t>40mm	Fyk = 215MPa
Ultimate strength	Fuk = 360MPa

ROPE AZN 636 AC:

Ultimate strength	Fptk = 1770 MPa
Diameter	Ø = 12mm
Self weight	s.w. = 0.6kg/m
Ultimate Force	N = 95kN
Diameter	Ø = 14mm
Self weight	s.w. = 0.82kg/m
Ultimate Force	N = 129kN
Diameter	Ø = 16mm
Self weight	s.w. = 1.07kg/m
Ultimate Force	N = 165kN
Diameter	Ø = 18mm
Self weight	s.w. = 1.35kg/m
Ultimate Force	N = 95kN
Diameter	Ø = 20mm
Self weight	s.w. = 1.68kg/m
Ultimate Force	N = 265kN

TENT NAIZIL SPORT COVER:

PVC-beschichtetes Polyestergewebe	
Ultimate strength	N = 3kN/5cm
Self weight	s.w. = 0.8kg/m^2

SOIL NAIL:

Diameter	Ø = 45mm
Length	L = 1400mm

LOADINGS:

Dead Load:

Fabric SW	=	0.008	kPa
Cupola SW	=	0.1	kPa

Live Load:

Lightings on Cupola	=	1.0	kN/m

Wind Load:

Site wind speed is to be monitored using a wind anemometer onsite and the marquee is to be mismantled when the actual site wind speed exceed the limitation.

Assess marquee to a minimum ultimate limit state design wind speed of 30m/s

Ultimate Design Site Wind Speed of, Vdes =		**108**	**kPh**
	=	**30**	**m/s**
therefore Design Wind Pressure, pz = 0.5 x 1.2kg/m3 x Vdes	=	**0.54**	**kPa**

Snow Load:

Roof Su	=	0.0	kPa

Seismic Load:

Less critical than wind load

WIND PRESSURE COEFFICIENTS:

From NZS1170.2:2011

Internal Pressure Coefficient:

All openings must be zipped shut for wind exceeding serviceability wind speed, therefore all walls are equally permeable during Ultimate Limit State

Cp,i = **-0.3** or **0.0** (0.0 is more critical)

External Pressure Coefficient:

Structure has a circular base and a cone shape roof with four circular king posts protruding the cone shape. Pressure Coefficients from NZS1170.2:2011 Section Appendix C5 "Circular Bins, Silos and Tanks" are considered to be the most appropriate to the nature of the structure's geometry

Dimensions:

Diameter, b	=	35	m
Reference Height, h	=	9.8	m
Roof Pitch, α	=	37	degree

Wall:

Cp, b(Θb), wall	=	**0.9**	(Θb = 0 most critical, Cpl=0.9, kb=1)
Cfig, wall	=	**0.63**	(for overall drag force)

Roof:

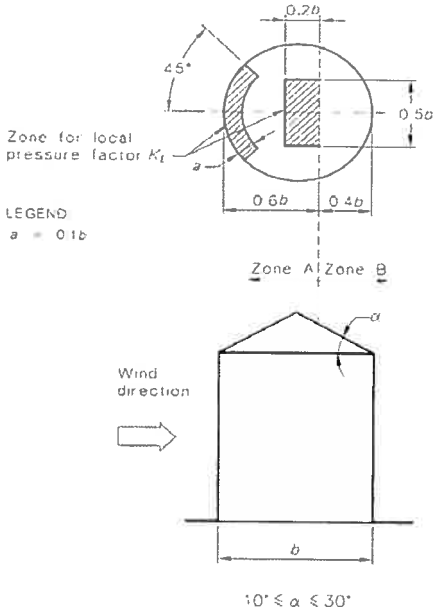
Cp,e, Zone A	=	-0.8
Cp,e, Zone B	=	-0.5
Local Pressure Factor, Kl	=	1.5
Area Factor, Ka	=	0.8

Cfig = Cp,e x Ka x Kl	=	**-0.64** for Zone A
	=	**-0.4** for Zone B
	=	**-0.96** for Zone A Local

Local Zone Area: 0.1b	=	3.5 m
0.2b	=	7.0 m
0.5b	=	17.5 m

King Post:

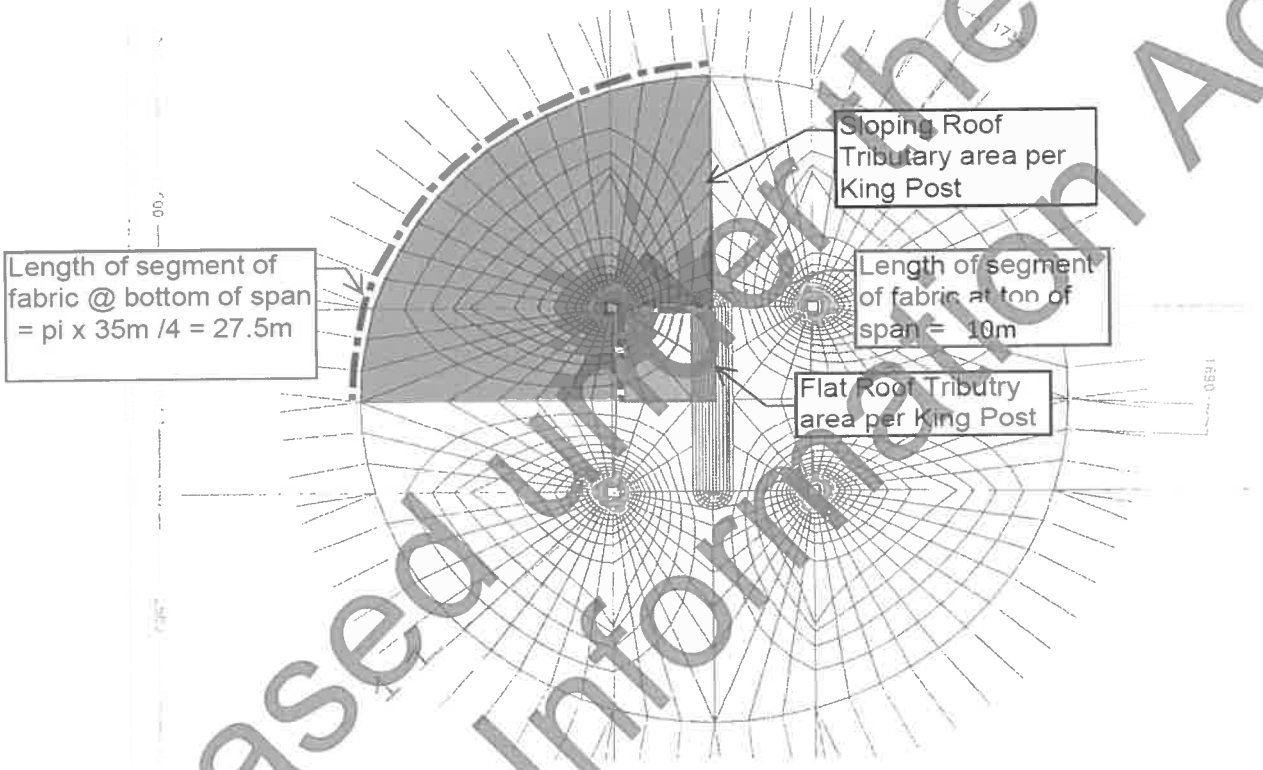
Cfig = 1.2 (Table E3, conservative)



DESIGN ACTIONS:

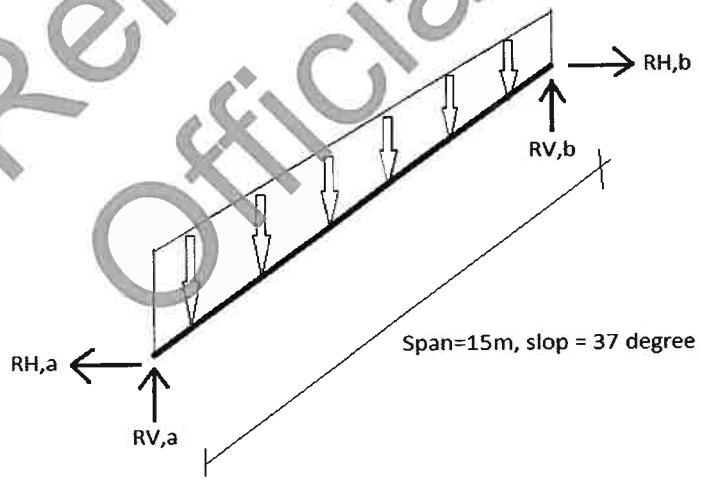
Mqequee is a tensile fabric structure. Tension forces from fabric and cables' catenary action are depending on deformation Determind required tension force to control deflection under Serviceability Limit State. Design actions from fabirc under Ultimate Limite State will be governed by fabric ultimate strength or supporting structural member's capacities.

Fabric span from Cupola to King Posts and from King Posts to perimeter walls. Tributriy area of each King Post is illustraded below



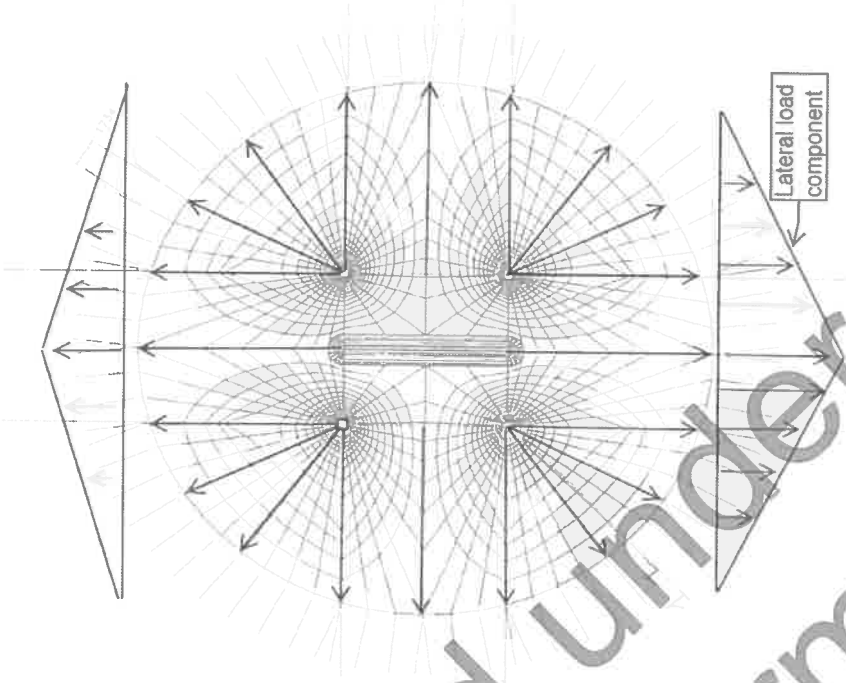
Dead Load:

To determind design actions required to control Fabric Deformation, d = **0.3 m**



Horizontal Reaction RH:

Because the marquee is circular in shape, the horizontal component of the reactions are only half of the reactions from this 2D analysis. Actual RH will be 1/2 show the analysis as illustraded below.



Fabric span	=	15 m
Length of segment of fabric at top of span	=	10 m
Length of segment of fabric at bottom of span	=	27.5 m
Dead load at top of span = Fabric SW x Length	=	0.08 kN/m
Dead load at bottom of span = Fabric SW x Length	=	0.22 kN/m
Equivalent UDL = (DL top + DL bottom)/2	=	0.15 kN/m
Load Paralle to fabric = UDL x sin(slop)	=	0.09 kN/m
Load Perpendicular to fabric = UDL x cos(slop)	=	0.12 kN/m

Direct Tension:

@RV,b = Load Paralle x Span x sin(slop)	=	0.81 kN
@RH,b = Load Paralle x Span x cos(slop)	=	1.08 kN
Catenary Tension:		
Horizontal Reaction, H = WL^2/(8d) = Load Perp x Span^2/(8d)	=	11.23 kN
@RV,a&b = H x sin(slop)	=	6.76 kN
@RH,a&b = H x cos(slop)	=	8.97 kN
Vertical Reaction, V = WL/2 = Load Perp x Span / 2	=	0.90 kN
@RV,a&b = H x cos(slop)	=	0.72 kN
@RH,a&b = H x sin(slop)	=	0.54 kN

Dead loads on King Post from Cupola:

Cupola SW = SW x Area (12m x 2m)/4	=	0.05 kN
Fabric SW = SW x Area(12m x 2m)/4	=	0.60 kN
Angle of cable connecting Cupola to King Post	≈	45 degree
@RV,b = DL (Cupola + Fabric)	=	0.65 kN
@RH,b = RV,b/tan(45 degree)	=	0.65 kN

Total	RV,b =	**8.94 kN**
	0.5RH,b =	**6.48 kN**
	RV,a =	**3.74 kN**
	0.5RH,a =	**4.76 kN**

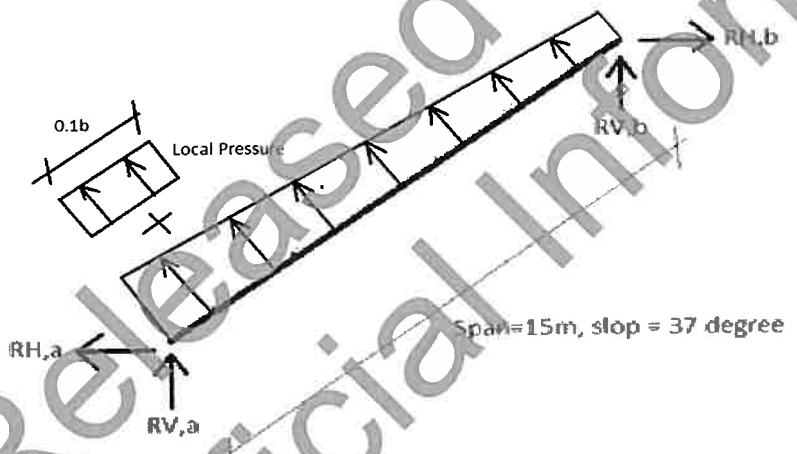
Live Load:

Live loads on King Post from Cupola:

Cupola LL = LL x (12m + 2m)*2/4	=	7.00 kN
Angle of cable connecting Cupola to King Post	≈	45 degree
@RV,b = DL (Cupola + Fabric)	=	**7.00 kN**
@RH,b = RV,b/tan(45 degree)	=	**7.00 kN**

Wind Load:

To control fabric deformation under ULS to d	=	1.0 m
To control fabric deformation under SLS to d	=	0.5 m



Serviceability Limit State:

Movements of marquee should be acceptable and not be affecting functions of the structure under SLS loads

Assess marquee to a SLS Design Wind Speed of, SLS V,des	=	**50 kPh**
	=	**13.89 m/s**
therefore Design Wind Pressure, pz = 0.5 x 1.2kg/m3 x Vdes	=	**0.116 kPa**
Fabric span	=	15 m
Length of segment of fabric at top of span	=	10 m
Length of segment of fabric at bottom of span	=	27.5 m

Windward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone A)	=	-0.74 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone A)	=	-2.04 kN/m
Additional Wind load at local area = pz x Length x 0.1b x C,fig(Local-ZoneA)	=	-3.56 kN
Equivalent UDL = (WL,top + WL,bottom)/2 + WL,Local/span	=	-1.63 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-91 kN
@RV,a&b = H x sin(slop)	=	-55 kN
@RH,a&b = H x cos(slop)	=	-73 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-12 kN
@RV,a&b = H x cos(slop)	=	-10 kN
@RH,a&b = H x sin(slop)	=	-7 kN

Total	RV,b =	**-45 kN**
	0.5RH,b =	**-40 kN**
	RV,a =	**-45 kN**
	0.5RH,a =	**-40 kN**

Leeward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone B)	=	-0.46 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone B)	=	-1.27 kN/m
Equivalent UDL = (WL,top + WL,bottom)/2	=	-0.87 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-49 kN
@RV,a&b = H x sin(slop)	=	-29 kN
@RH,a&b = H x cos(slop)	=	-39 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-7 kN
@RV,a&b = H x cos(slop)	=	-5 kN
@RH,a&b = H x sin(slop)	=	-4 kN

Total	RV,b =	**-24 kN**
	0.5RH,b =	**-21 kN**
	RV,a =	**-24 kN**
	0.5RH,a =	**-21 kN**

Ultimate Limit State:

Assess marquee to a SLS Design Wind Speed of, SLS V,des	=	**108**	**kPh**
	=	**30**	**m/s**
therefore Design Wind Pressure, pz = 0.5 x 1.2kg/m3 x Vdes	=	**0.54**	**kPa**
Fabric span	=	15	m
Length of segment of fabric at top of span	=	10	m
Length of segment of fabric at bottom of span	=	27.5	m

Windward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone A)	=	-3.46 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone A)	=	-9.5 kN/m
Additional Wind load at local area = pz x Length x 0.1b x C,fig(Local-ZoneA)	=	-16.6 kN
Equivalent UDL = (WL,top + WL,bottom)/2 + WL,Local/span	=	-7.59 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-213 kN	
@RV,a&b = H x sin(slop)	=	-128 kN	
@RH,a&b = H x cos(slop)	=	-170 kN	
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-57 kN	
@RV,a&b = H x cos(slop)	=	-45 kN	
@RH,a&b = H x sin(slop)	=	-34 kN	
Total	RV,b =	**-83 kN**	
	0.5RH,b =	**-102 kN**	
	RV,a =	**-83 kN**	
	0.5RH,a =	**-102 kN**	

Leeward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone B)	=	-2.16 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone B)	=	-5.94 kN/m
Equivalent UDL = (WL,top + WL,bottom)/2	=	-4.05 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-114 kN	
@RV,a&b = H x sin(slop)	=	-69 kN	
@RH,a&b = H x cos(slop)	=	-91 kN	
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-30 kN	
@RV,a&b = H x cos(slop)	=	-24 kN	
@RH,a&b = H x sin(slop)	=	-18 kN	
Total	RV,b =	**-44 kN**	
	0.5RH,b =	**-55 kN**	
	RV,a =	**-44 kN**	
	0.5RH,a =	**-55 kN**	

Wind Load On King Post Above Roof Line:

Average King Post Diameter, d	=	1.0 m
SLS Wind load = pz x d x Cfig	=	**0.1 kN/m**
ULS Wind load = pz x d x Cfig	=	**0.6 kN/m**

Wind Load On External Walls:

SLS Wind load = pz x b x Cfig/2(half curcumference)	=	**1.3 kN/m**
ULS Wind load = pz x b x Cfig/2(half curcumference)	=	**6.0 kN/m**

Load Combinations:

1. 1.2G + 1.5Q
2. 0.9G + 0.4Q + Wu
3. 1.2G + 0.4Q + Wu

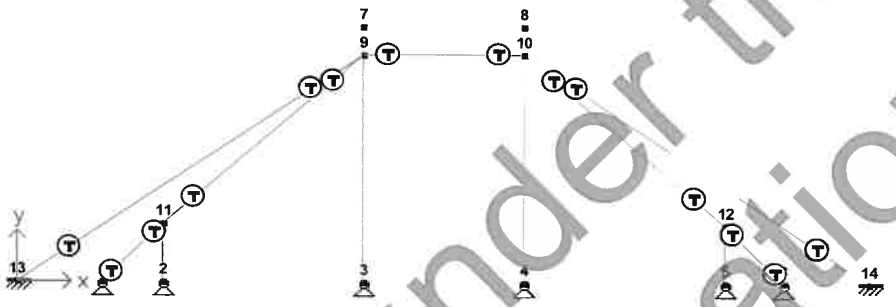
Ultimate Limit State

4. G + Q
5. Ws (50kph)

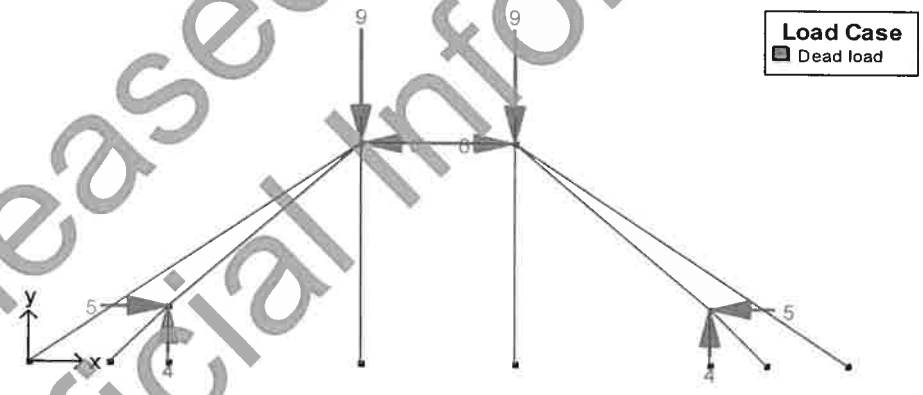
Serviceability Limit State

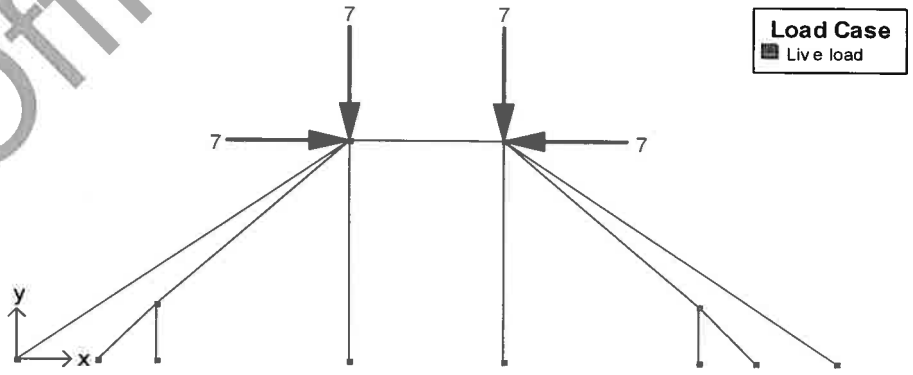
Multiframe Model:

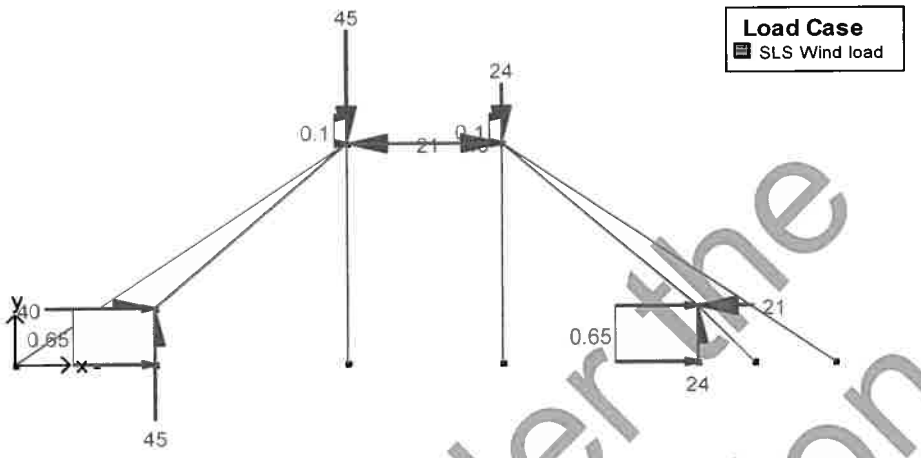
All cables are model as tension members

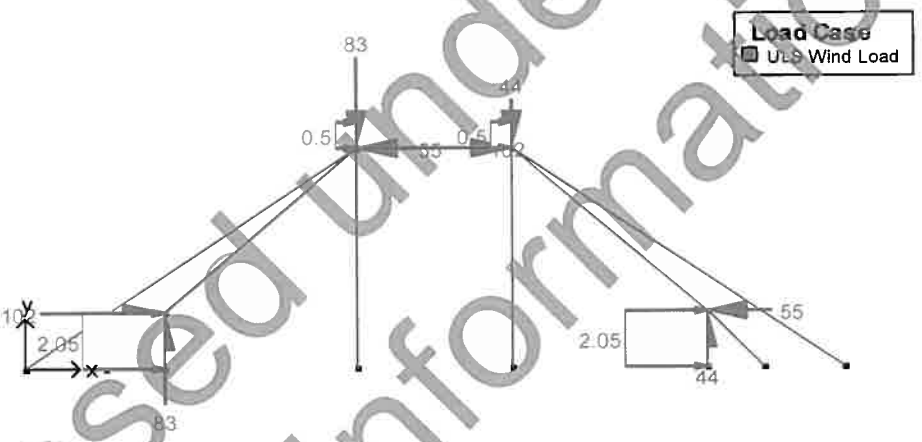


Loadings:



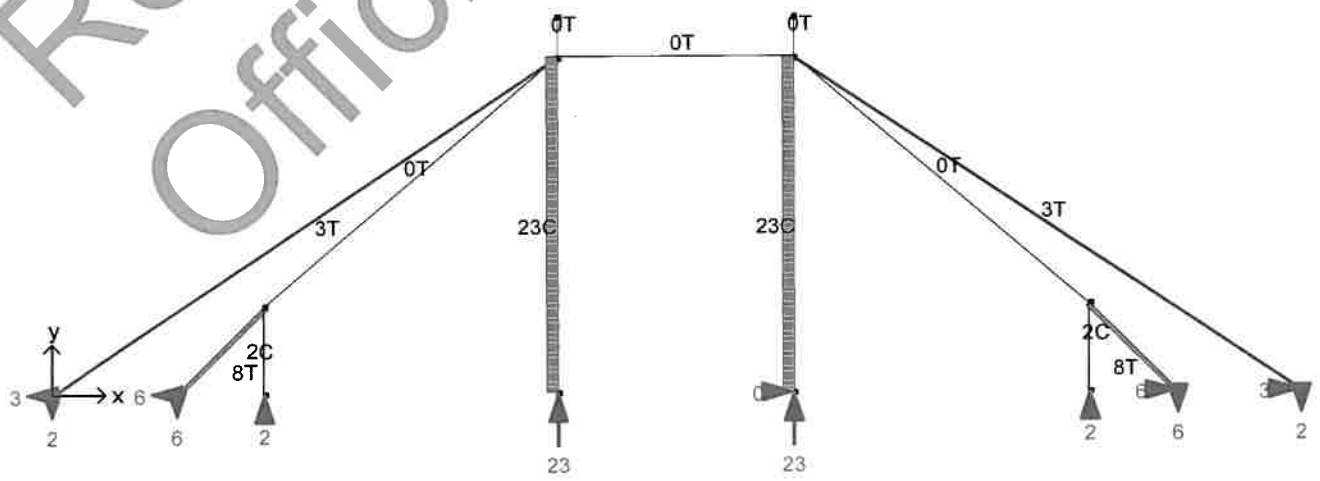




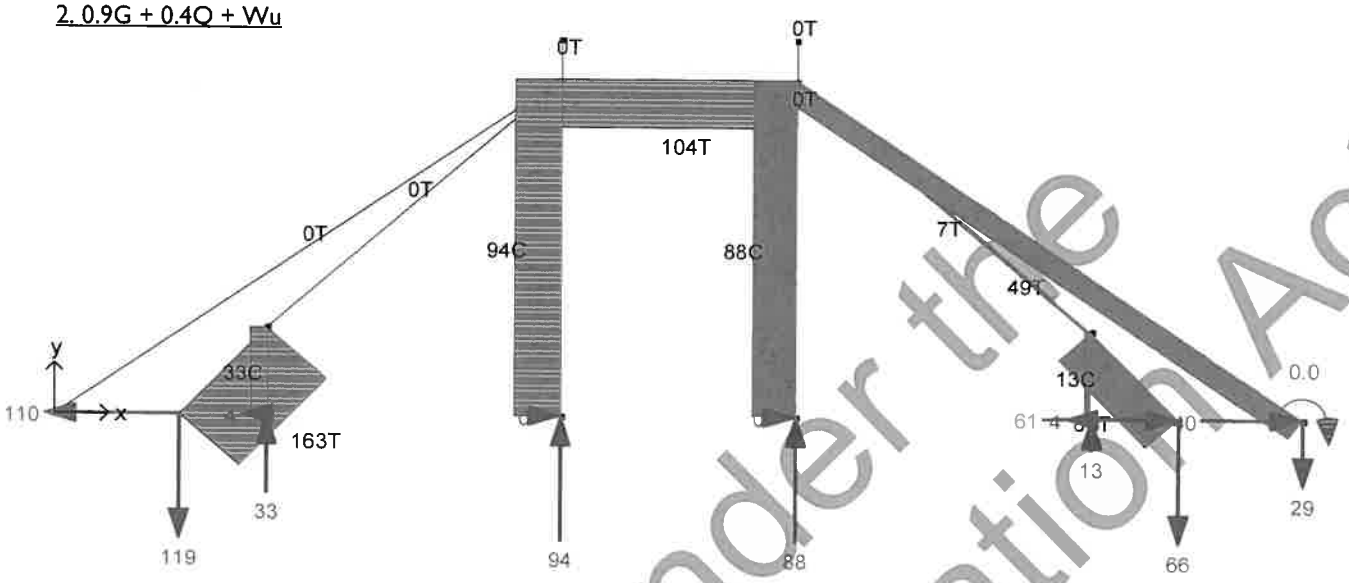


Design Actions:

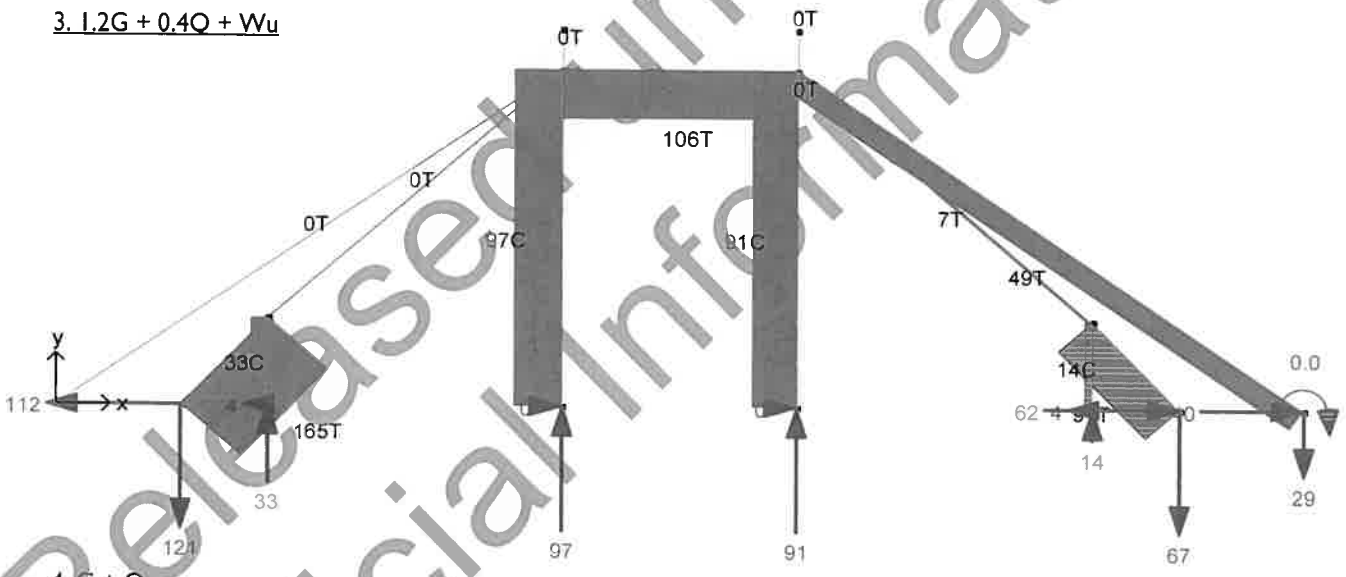
1. 1.2G + 1.5Q



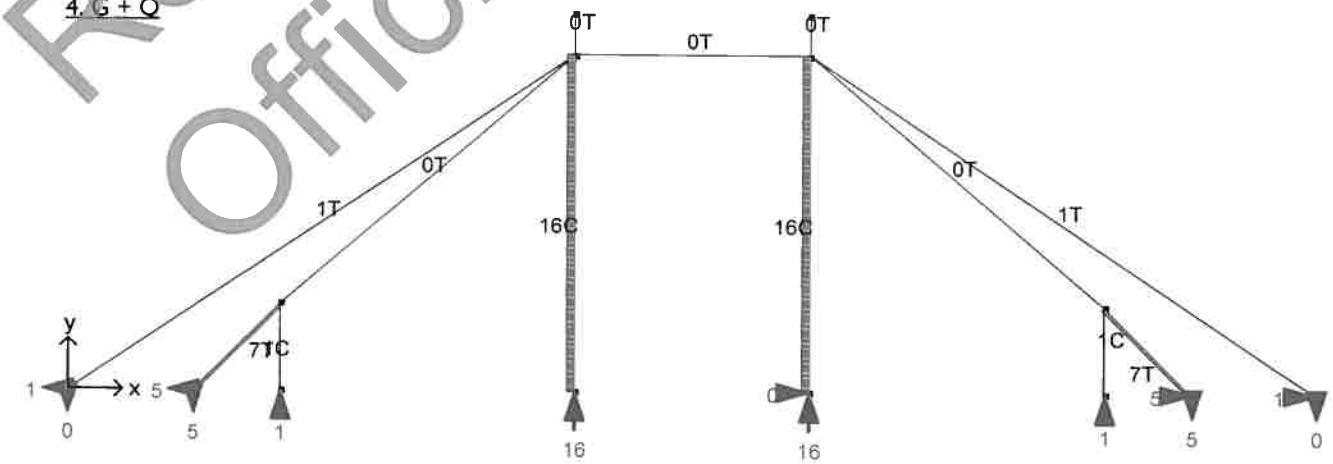
2. 0.9G + 0.4Q + Wu



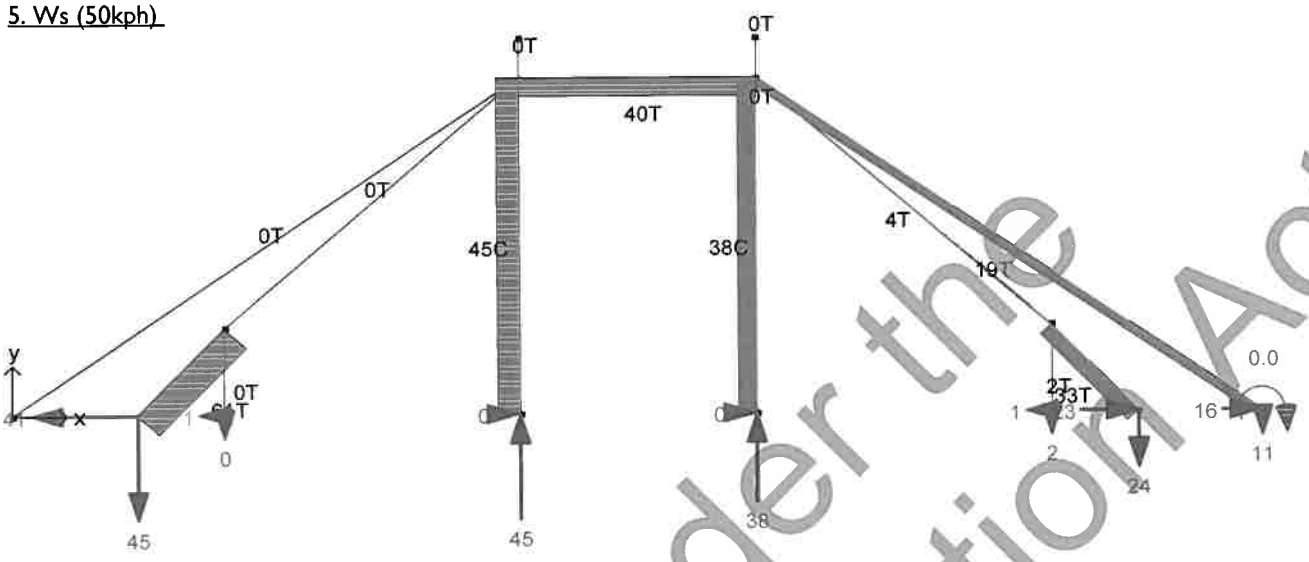
3. 1.2G + 0.4Q + Wu



4. G + Q



5. Ws (50kph)



SUMMARY:

	Case	King Post, Nc*	Ø16 Cable,Nt*	2xØ12 Cable,Nt*	16xWall Posts, Nc*
1.	1.2G + 1.5Q	23 kN	3 kN	3 kN	2 kN
2.	0.9G + 0.4Q + Wu	94 kN	104 kN	49 kN	33 kN
3.	1.2G + 0.4Q + Wu	**97 kN**	**106 kN**	**49 kN**	**33 kN**
4.	G + Q	16 kN	0 kN	0 kN	1 kN
5.	Ws (50kph)	45 kN	40 kN	19 kN	-2 kN

KING POST:

King Post is a laced 351x351 column consisted with 4xØ48.3x2.9 Tube chord with Ø26.9x2.5 Tube diagonals@45 degree
Assess King Post design capacity to NZS3404:1997

Axial Loadings:

Dead load S.W = 3.3 kN

From Multiframe Analysis:

1.2G+0.4Q +Wu = 97 kN For ULS V,des = 108 kPh

Nc* = 101 kN

Nominal Section Capacity: (*Section 6.2*)

For Ø48.3x2.9 Tube

Element slenderness, λe = (do/t)(Fy/250) = 15.66

do = 48.3 mm

t = 2.9 mm

fy = 235 Mpa

λey = 82 > 15.66 , therefore be=b, form factor kf = 1

An = 1652 mm^2 (4 x Ø48.3x2.9 Tubes)

Ns = 388.2 kN

Nominal Member Capacity: (*Section 6.3*)

Slenderness ratio of a main component (6.4.2.1)

Effective Length Le,m= KeL = 0.8 m

Ke = 1

L = 0.8 m

rx or y = 16 mm

(Le/r)c = 50

Slenderness ratio of a laced compresion member (6.4.2.2)

Effective Length Le,m= KeL = 15.5 m

Ke = 1

L = 15.5 m

rx or y = 176.2 mm

Le/r = 87.97

1.4x(Le/r)c = 70

(Le/r)m = 87.97

Modified member slenderness (6.4.3.2)

(Le/r)bn = √(Le/r)m^2 + (Le/r)c^2 = 101.2

Take αb = 1

αc = 0.52 (From Table 6.3.3(2)

Nc = αc x Ns = 201.9 kN

Ø = 0.9

ØNc = **181.7 kN** > 101 therefore, Okay

Transvers shear force (6.4.1)

V* = ∏ (Ns/Nc - 1) * N*/ λn >= 0.01N*

0.01N*	=	1.01 kN	
V*	=	3.56 kN	
Nc* = V*/cos(45 degree)	=	5.04 kN	

Provided 2xØ26.9x2.5 Tube diagonals, okay by inspection

Provided 4M20 Grade 8.8 Bolts at King Post joint, okay by inspection

CABLES:

From Multiframe Analysis			ØNt	
Ø16 Cable,Nt* (1.2G+0.4Q+Wu)	=	106 kN	148.5 kN	Okay
2xØ12 Cable,Nt* (1.2G+0.4Q+Wu)	=	49 kN		
	=	24.5 kN/cable	85.5 kN	Okay

PERIMETER POSTS:

Critical actions is when wind at Θ=0, Cfig = 0.9. Cfig = 0.63 is used in Multiframe analysis for overall drag force.

Therefore conservatively factor the load from analysis for 1.5 to account for critical scenario

From Multiframe Analysis:

16xWall Posts, Nc* (1.2G+0.4Q+Wu)	=	33.0 kN				
	=	2.1 kN/Post	x	1.5 =	3.094 kN/Post	
16xTie Down Strap, Nt* (1.2G+0.4Q+Wu) x 1.5	=	165.0 kN				
	=	10.3 kN/strap	x	1.5 =	15.47 kN/strap	

Provided Ø60x3 Grade S235 Post, Okay by inspection

Provided Tie Down Strap with 2500kg working load, therefore Okay

Tie down strap is fixed back to 2xSoil Nails, therefore

Minimum pull out per nail @45 degree = **7.7 kN/Nail**

FABRIC:

Maximum tension force in fabric from ultimate wind load:

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-213 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	57 kN
T* = √(H^2 + V^2)	=	221 kN
Ultimate fabric strength	=	3 kN/5cm
Length of fabric at top	=	10 m
Total strength = 3kN/5cm x (5m/0.05m)	=	600 kN
F.O.S = Total Strength/T*	=	2.72 acceptable, therefore okay

CUPOLA:

Cupola is a truss frame consisted of two parallel chord trusses spanning 12m each side supported by 4xØ14 Cables
The parallel chord truss consisted of Ø48.3x2.9 Tube as chord member with Ø26.9x2.5 Tube diagonals at 45 degress

Loadings:

Roof tributry width per truss = 2.5 m

Dead Load	Fabric	0.008 kPa	x	2.5 m	=	0.01 kN/m
	SW	0.1 kPa	x	1 m	=	0.1 kN/m
Live Load	Lighting				=	1.0 kN/m

As the cupola's supporting cables will be slack under wind uplift. Roof wind load will be resisted by tension in the fabric around the cupola

Span	=	12 m
UDL, 1.2G+1.5Q	=	1.63 kN/m
M* = UDL x Span^2 / 8	=	29.38 kNm
V* = UDL x span / 2	=	9.792 kN

Ø48.3x2.9 Tube Chord:

Truss depth	=	0.5 m
Effective depth	=	0.45 m
Axial couple = M*/ Edepth	=	65.28 kN

Top chord is restrainted by transvers member at 2.0m spacing
For Ø48.3x2.9 Tube

Element slenderness, λe = (do/t)(Fy/250) = 15.66

do	=	48.3 mm	
t	=	2.9 mm	
fy	=	235 Mpa	
λey	=	82 >	15.66 , therefore be=b, form factor kf = 1
An	=	1652 mm^2	(4 x Ø48.3x2.9 Tubes)
Ns	=	388.2 kN	

Effective Length Le,m= KeL = 2 m

Ke	=	1	
L	=	2 m	
rx or y	=	16 mm	
(Le/r)c	=	125	
Take αb	=	-1	
αc	=	0.476	(From Table 6.3.3(2)
Nc = αc x Ns		=	184.8 kN
Ø		=	0.9
ØNc		=	**166.3 kN** > 65.28 ,therefore okay

Ø26.9x2.5 Tube Diagonal:

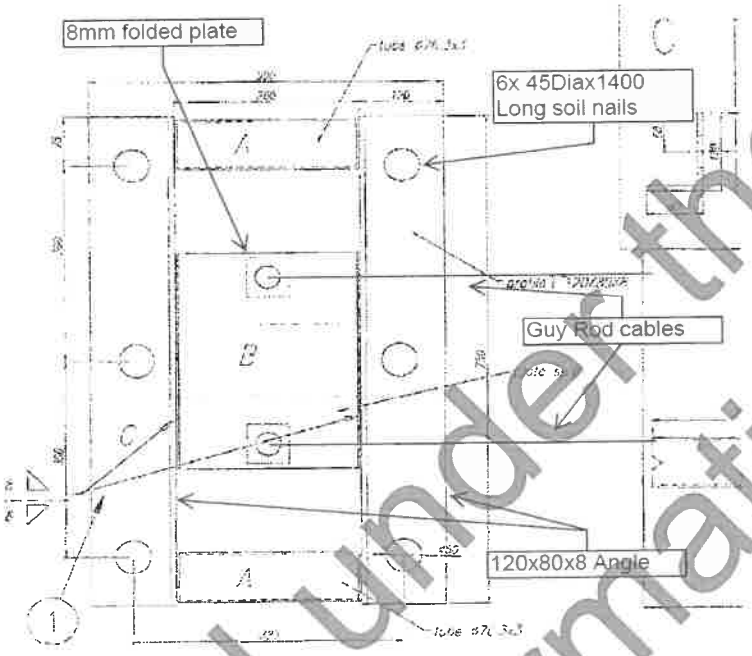
Nc* = V*/cos(45 degree) = 13.85 kN

Le = 0.6 m

Ø26.9x2.5 Tube Diagonal okay by inspection

GUY PEGS:

The marquee is stabilized by 8 Guy rods and each rob consisted with one Ø12 cable and one Ø16 cable. Both cable fixed dwon to the hold down bracket with 6xØ45mmx1400mm soil nails into the ground



Loadings:

From Multiframe Analysis:

Ultimate Limit State:

For 2xGuys	H*,(1.2G+0.4Q+Wu)	=	-40	=	20 kN/Guy
	V*,(1.2G+0.4Q+Wu)	=	-29	=	-14.5 kN/Guy

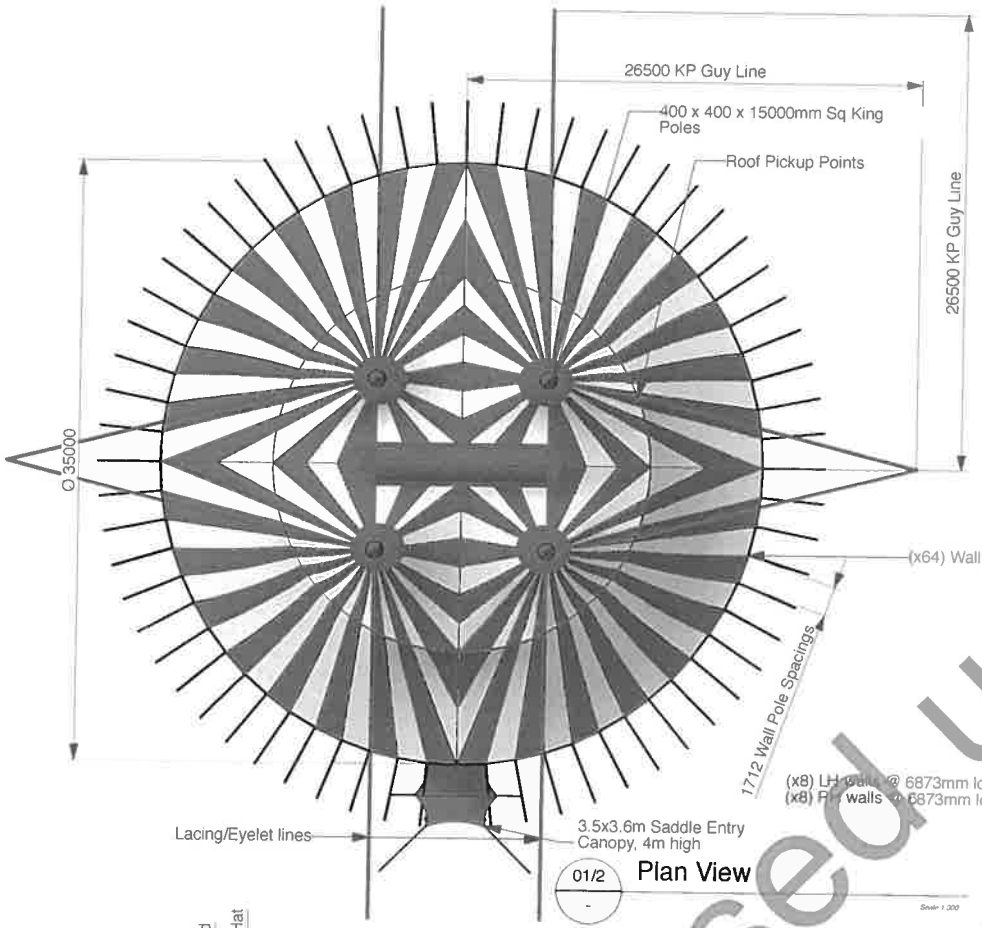
T*@45 degree = √(H^2 + V^2)	=	24.7 kN	(Resisted by 6 soil nails)	
T*@45degree for each Nail	=	**4.1 kN/Nail**	<	7.7 (perimeter hold down governs)

Base on previous peg pull out tests, the nail can sustain significant portion of loads before the soil start to yield. And the load continous to increase until the nail is fully lift off the ground.

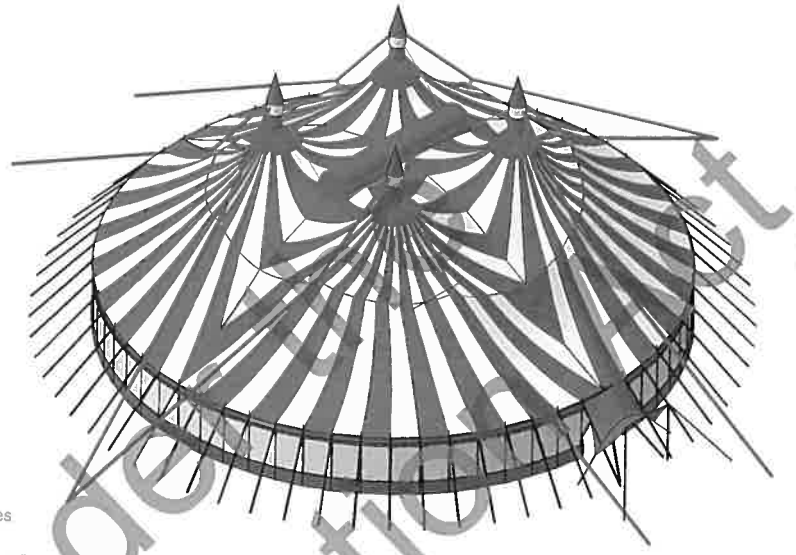
Peg need to be remain steady under serviceability loads.

Perimeter Post Hold Down Case Governs:

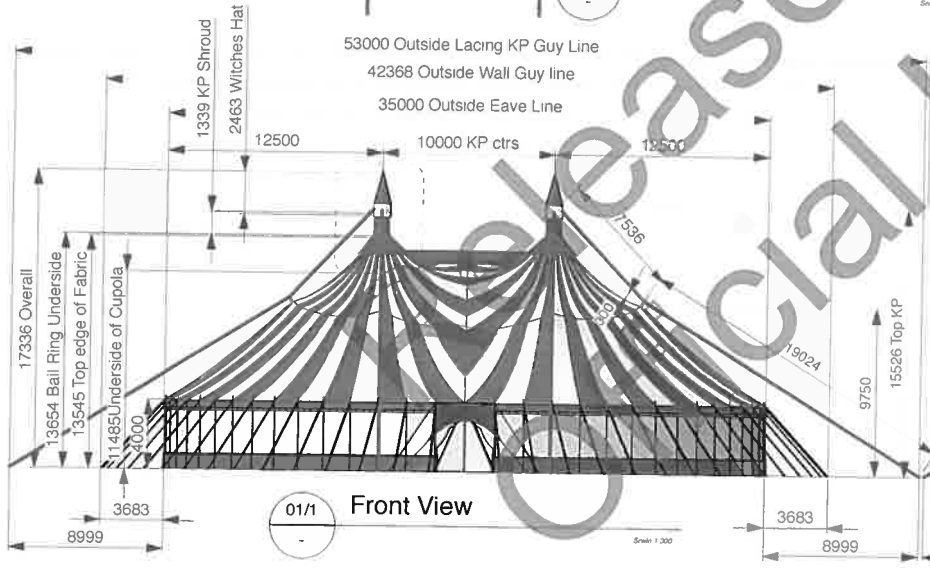
ULS pull out required per nail @45 degree	=	**7.7 kN/Nail**
SLS pull out required per nail @45 degree	=	**2.9 kN/Nail**



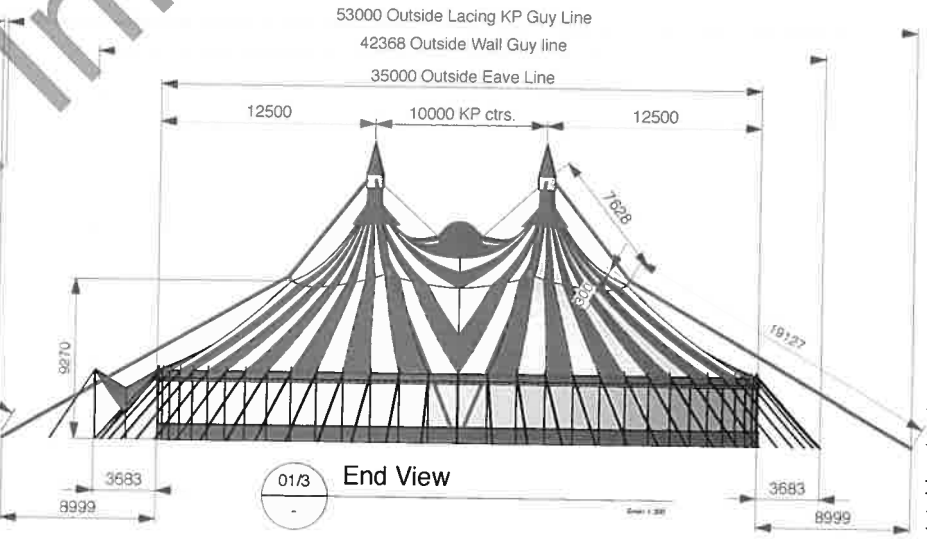
01/2 Plan View



01/4 Perspective View



01/1 Front View



01/3 End View

Baytex Big Top Performance Tent

Zirka Circus

Note:
All dimensions in mm.
All dimensions have tolerances of ± 0.5mm unless otherwise stated.
Break all sharp edges

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Issued	
Date	

Original Copy Red

No.	By	Date	Amendment

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A3 Drg | 3rd Angle Proj

Scale: 1:100 | Drawing Type: Preliminary

Job Title: **Baytex Big Top Performance Ten**
Zirka Circus

Drawing Title: **35mØ 4 Pole Circus Tent**
Plan & Elevations
Preliminary Design

Sheet No.

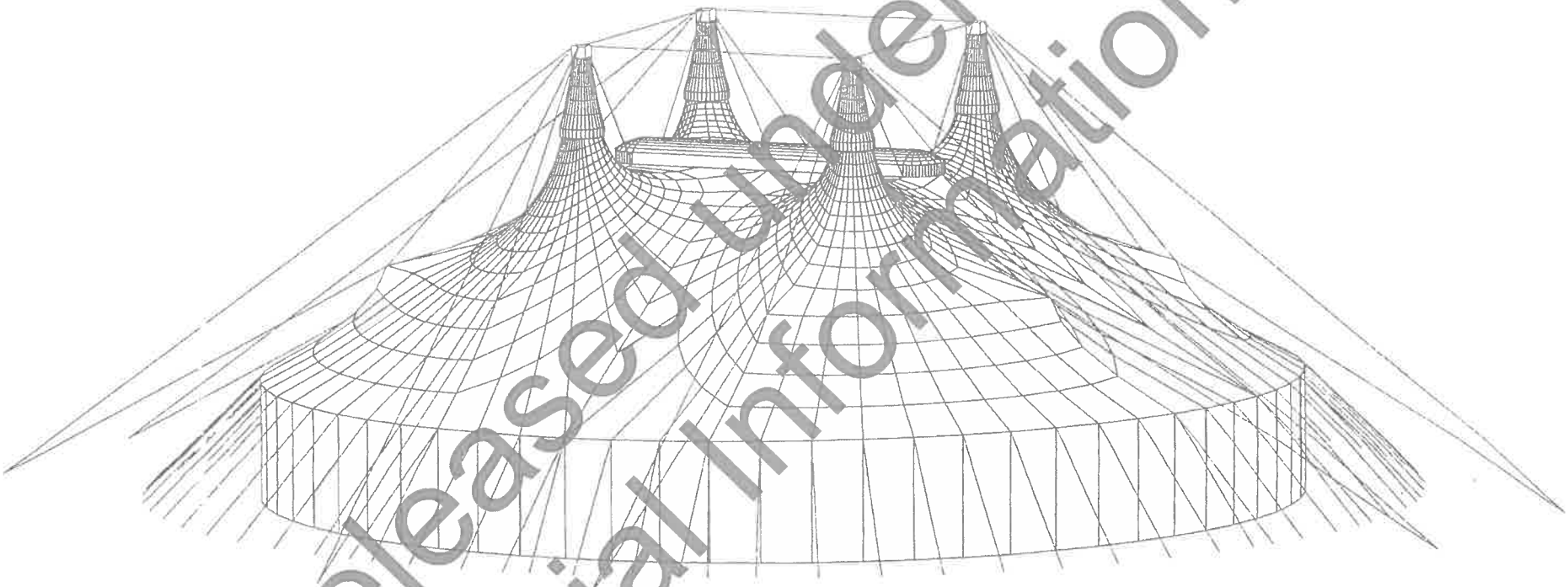
Part No.

Drawing No.: **15.057.01** | Revision No.

Date: **12.12.14**

Drawn By: **A.P.Lingman**

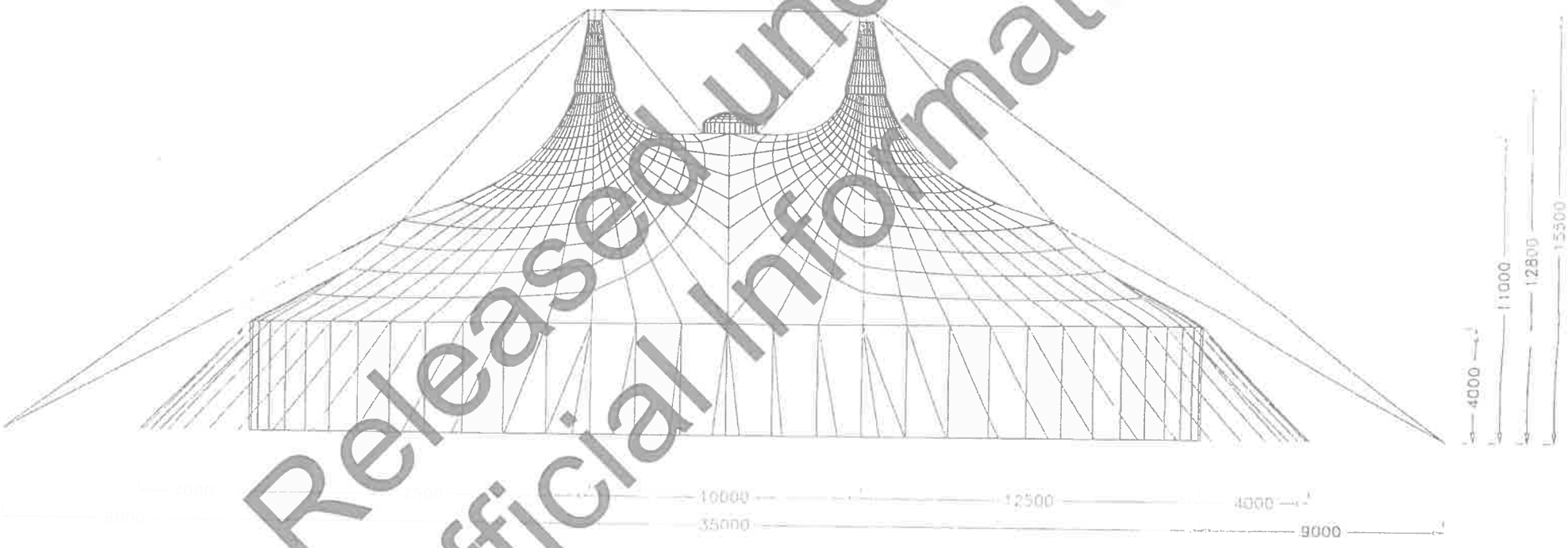
Thu, 26 Mar, 2015
11:50:10 am
15.057.05-7 Ø35m ZirkaCircus.vw



35m Circus Tenet Translated set of drawings
15180

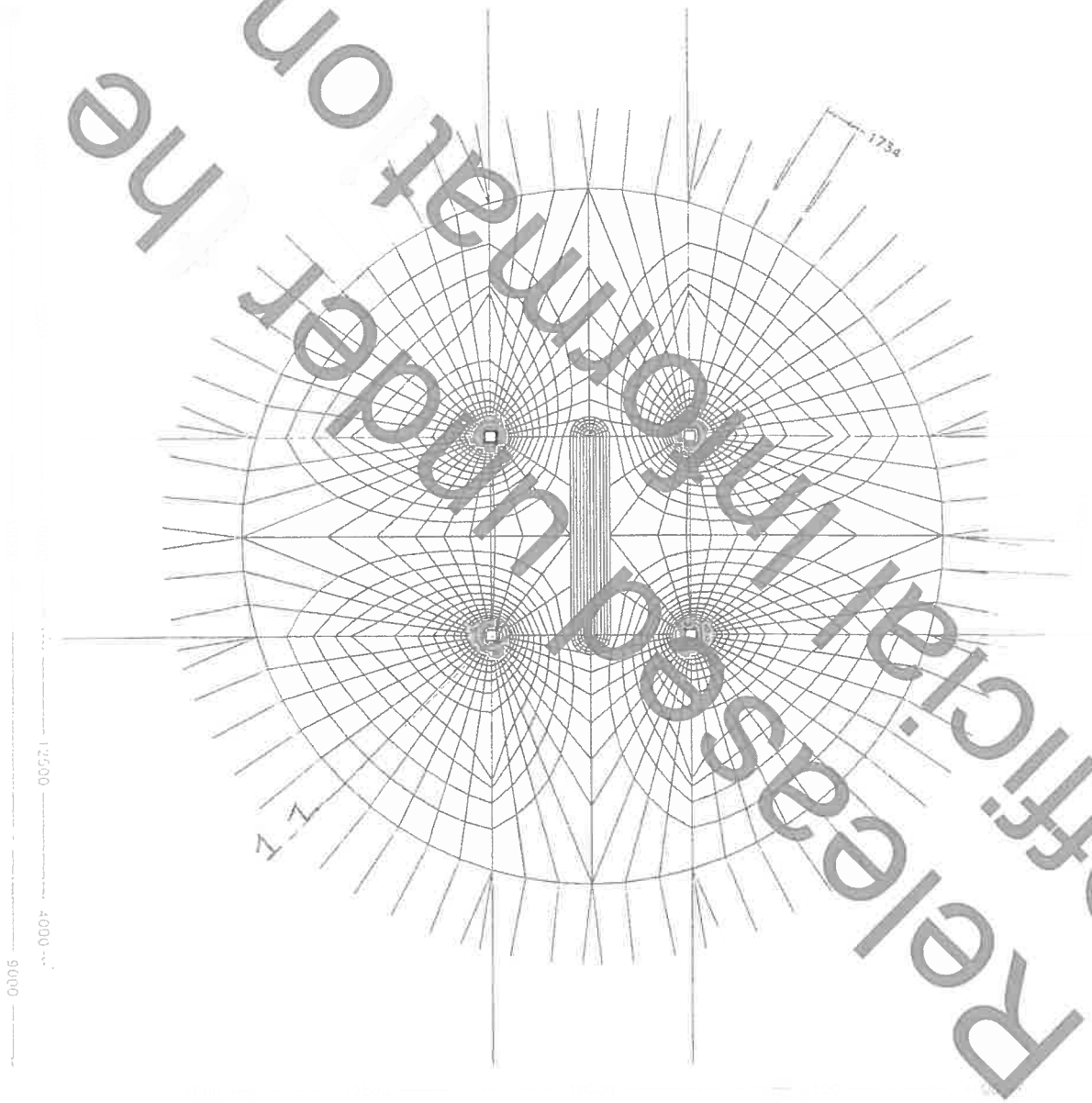
Tent Diameter 35m - Antennas 10x10 - Ring Diameter 120cm - Cupola (1+10+1) x2.0 - H 11.00 - H 12.8 - h. 4.00

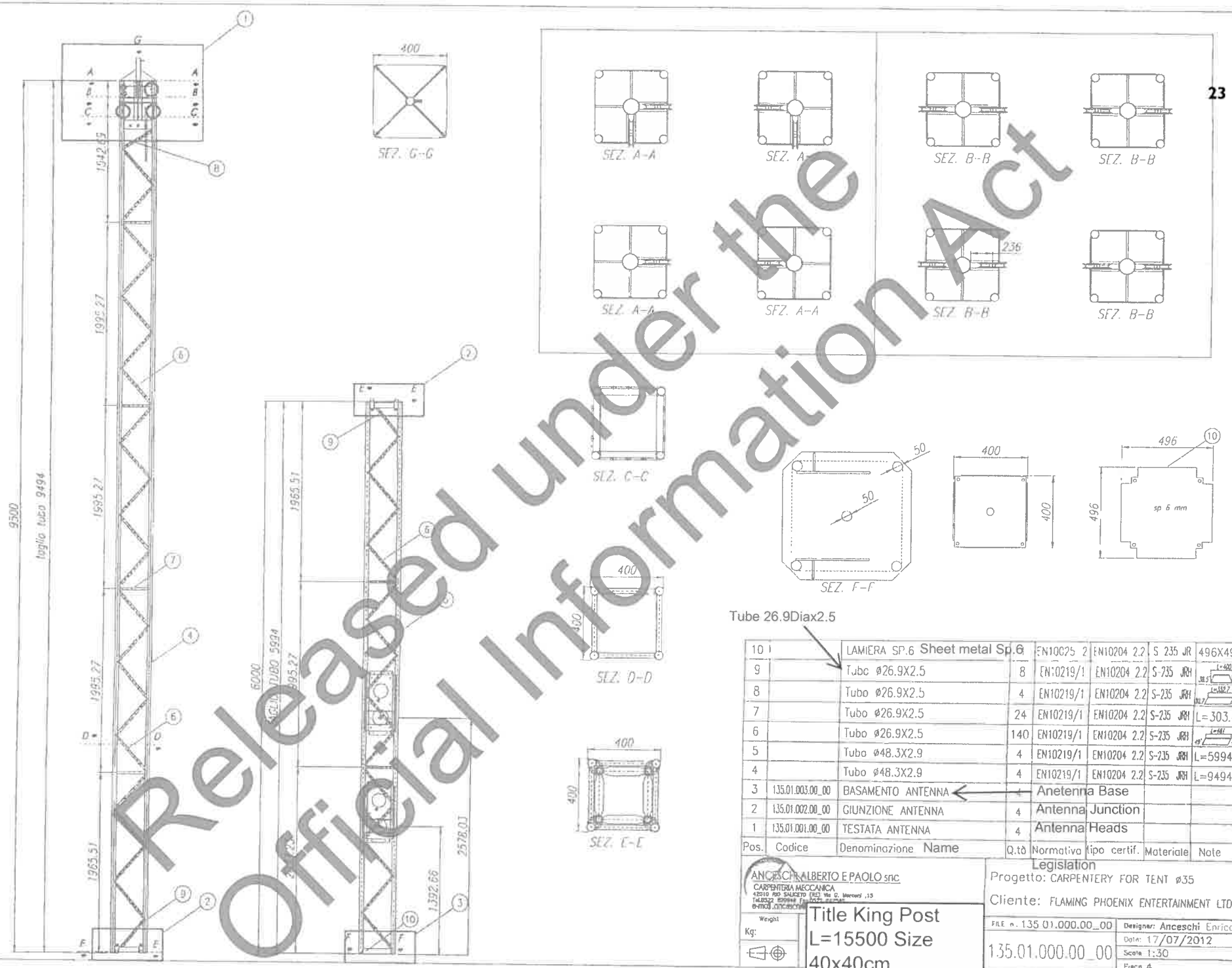
Tensodenda diametro mt. 35.00 – Antenne a mt. 10.00 x 10.00 – Ring diametro cm 120
Cupola mt. (1.00 + 10.00 + 1.00) x 2.00 – H. 11.00 – H. 12.80 – h. 4.00



Tent Diameter 35m - Antennas 10x10 - Ring Diameter 120cm - Cupola (1+10+1)

Tensodenda diametro mt. 35.00 – Antenne a mt. 10.00 x 10.00 – Ring diametro cm 120
Cupola mt. (1.00 + 10.00 + 1.00) x 2.00 – H. 11.00 – H. 12.80 – h. 4.00





Tube 26.9Diax2.5

Pos.	Codice	Denominazione Name	Q.tà	Normativa	tipo certif.	Materiale	Note
10		LAMIERA SP.6 Sheet metal Sp.6		EN10025 2	EN10204 2.2	S 235 JR	496X496
9		Tubo ø26.9X2.5	8	EN10219/1	EN10204 2.2	S-235 JRH	
8		Tubo ø26.9X2.5	4	EN10219/1	EN10204 2.2	S-235 JRH	
7		Tubo ø26.9X2.5	24	EN10219/1	EN10204 2.2	S-235 JRH	L=303.4
6		Tubo ø26.9X2.5	140	EN10219/1	EN10204 2.2	S-235 JRH	
5		Tubo ø48.3X2.9	4	EN10219/1	EN10204 2.2	S-235 JRH	L=5994
4		Tubo ø48.3X2.9	4	EN10219/1	EN10204 2.2	S-235 JRH	L=9494
3	135.01.003.00_00	BASAMENTO ANTENNA	4	Anetenna Base			
2	135.01.002.00_00	GIUNZIONE ANTENNA	4	Antenna Junction			
1	135.01.001.00_00	TESTATA ANTENNA	4	Antenna Heads			

ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA
42010 RIO SALICETO (RE) Via G. Marconi ,15
Tel.0522 [illegible]

Weight Kg:

Title King Post
L=15500 Size
40x40cm

Legislation

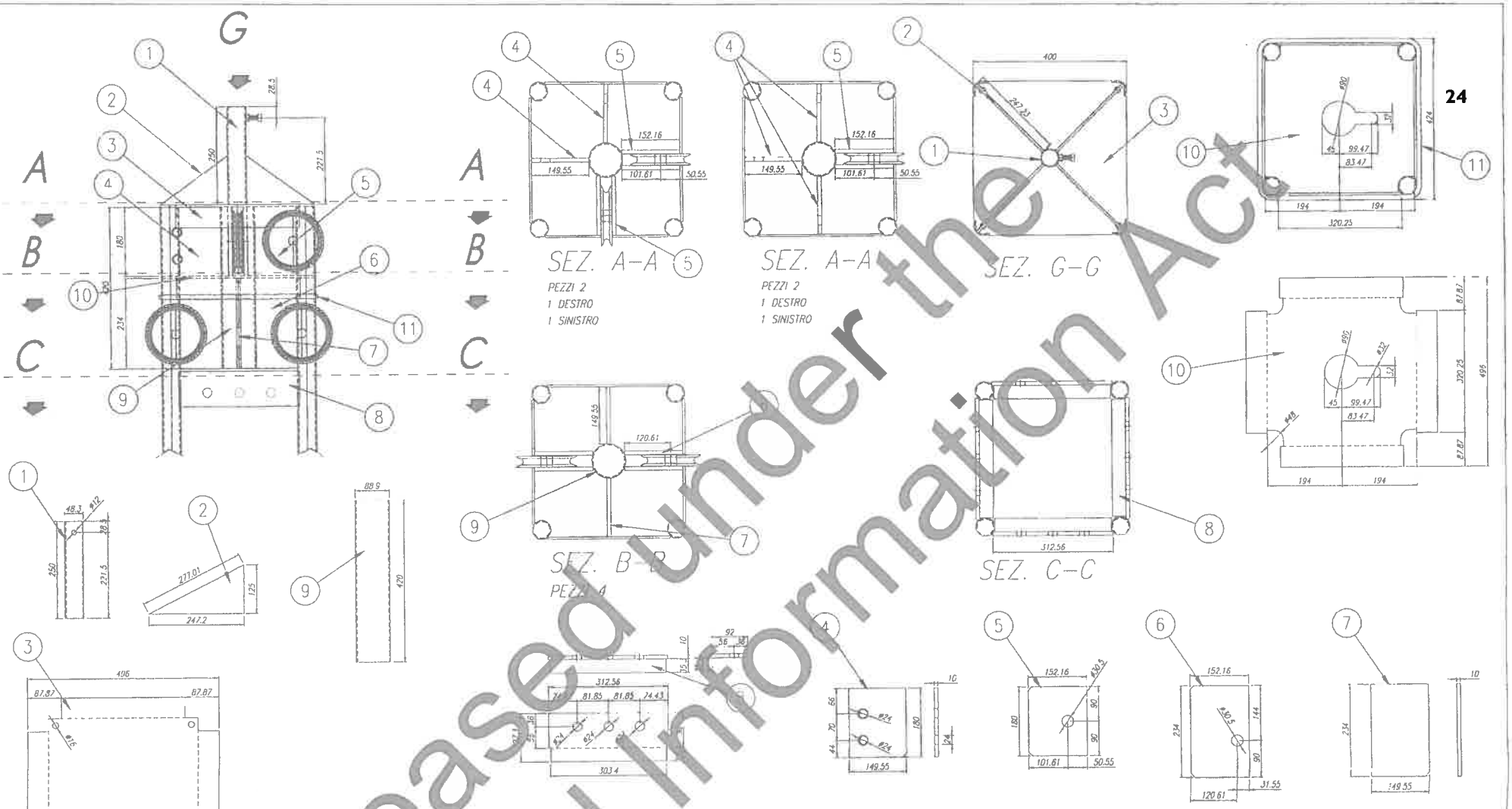
Progetto: CARPENTERY FOR TENT ø35

Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

FILE n. 135 01.000.00_00

135.01.000.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scala 1:30
Fresa 4



3		LAMIERA SP.6	1	EN10025-2	EN10204 2.2	S-235 JR	L=496X496
2		LAMIERA SP.6	4	EN10025-2	EN10204 2.2	S-235 JR	L=247.2X125
1		Tubo ø48.3X2.9	1	EN10219/1	EN10204 3.1	S-355 JRH	L=250
Pos.	Codice	Denominazione	Q.tà	Normativa	Tipo certif.	Materiale	Note

11		Round 12Dia	1	EN10025-2	EN10204 2.2	S-235 JR	L=1558.4
10		LAMIERA SP.6 Sheet Metal Sp6		EN10025-2	EN10204 2.2	S-235 JR	L=496X496
9		Tube 88.9Dia x3		EN10219/1	EN10204 3.1	S-355 JRH	L=420
8		LAMIERA SP.10 Sheet Metal Sp10	4	EN10025-2	EN10204 2.2	S-235 JR	L=312.5X127.5
7		LAMIERA SP.10		EN10025-2	EN10204 2.2	S-235 JR	L=149.5X231
6		LAMIERA SP.10	4	EN10025-2	EN10204 2.2	S-235 JR	L=152.1X234
5		LAMIERA SP.10	4	EN10025-2	EN10204 2.2	S-235 JR	L=152.1X180
4		LAMIERA SP.10	2	EN10025-2	EN10204 2.2	S-235 JR	L=149.5X180

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e-mail.anceschi@anceschi.it www.anceschi.it

Weight
Kg:

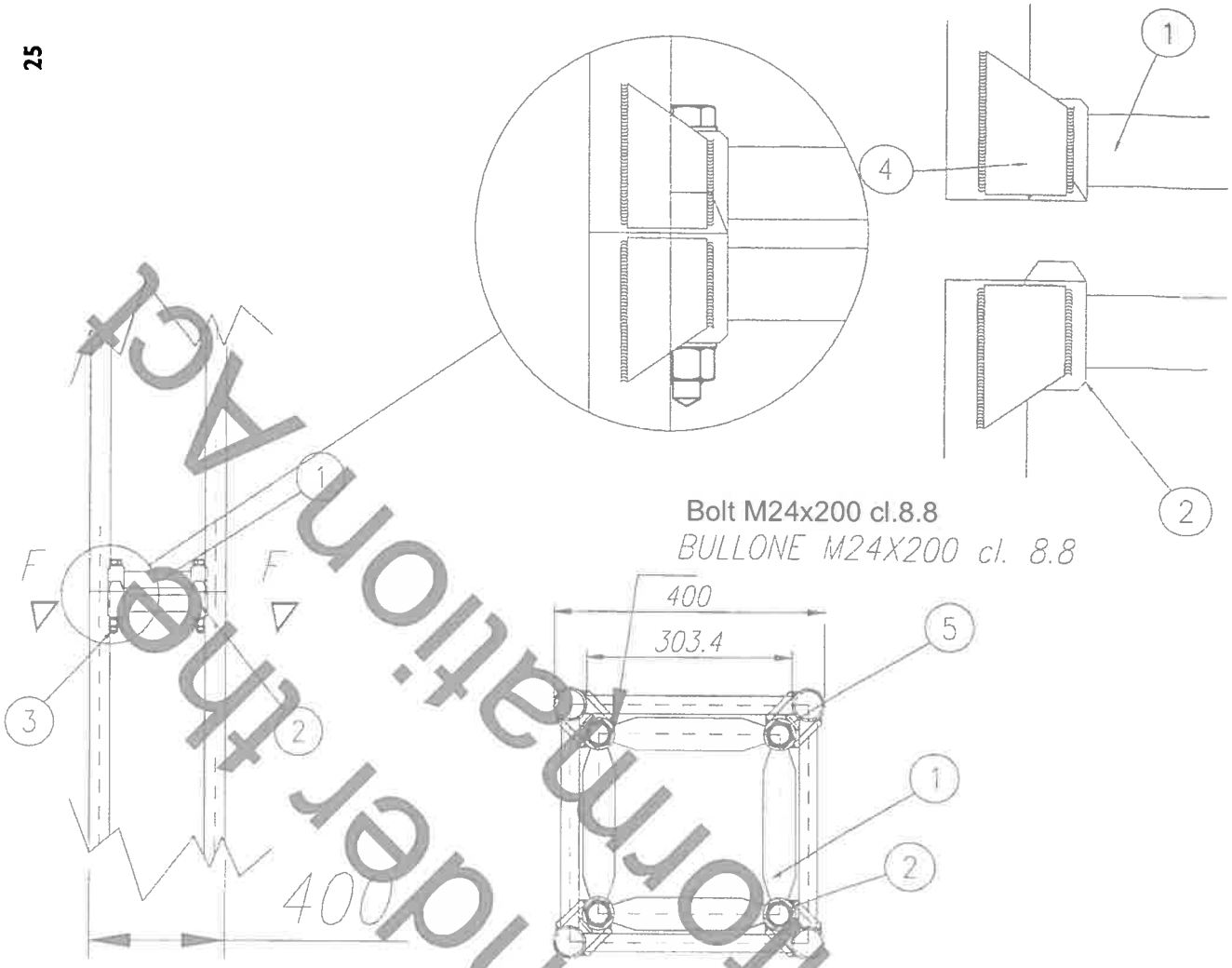
Title King Post
L=15500 Size 40x40cm

Progetto: CARPENTERY FOR TENT ø35
Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

FILE n°: 135.01.001.00_00
135.01.001.00_00

Designer: Anceschi Enrico
Date: 17/07/2012
Scale: 1:30
Piece: 4

25



Pos.	Codice	Denominazione Name	Q.tà	Materiale	Note
5		Piatto 40x4 Dish 40x4	8	Fe 360 C EN 10025	L=60
4		Piatto 60x5 Dish 60x5	16	Fe 360-C EN 10025	L=45
3		Bullone m24x200 Bolt M24x200	4	cl. 8.8	L=200
2		Tubo ø48x10 Tube 48Diax10	16	Fe 360-C EN 10025	L=90
1		Tubo ø48x3	4	Fe 360-C EN 10025	L=218

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Material

Progetto: CARPENTERY FOR TENT ø35

Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

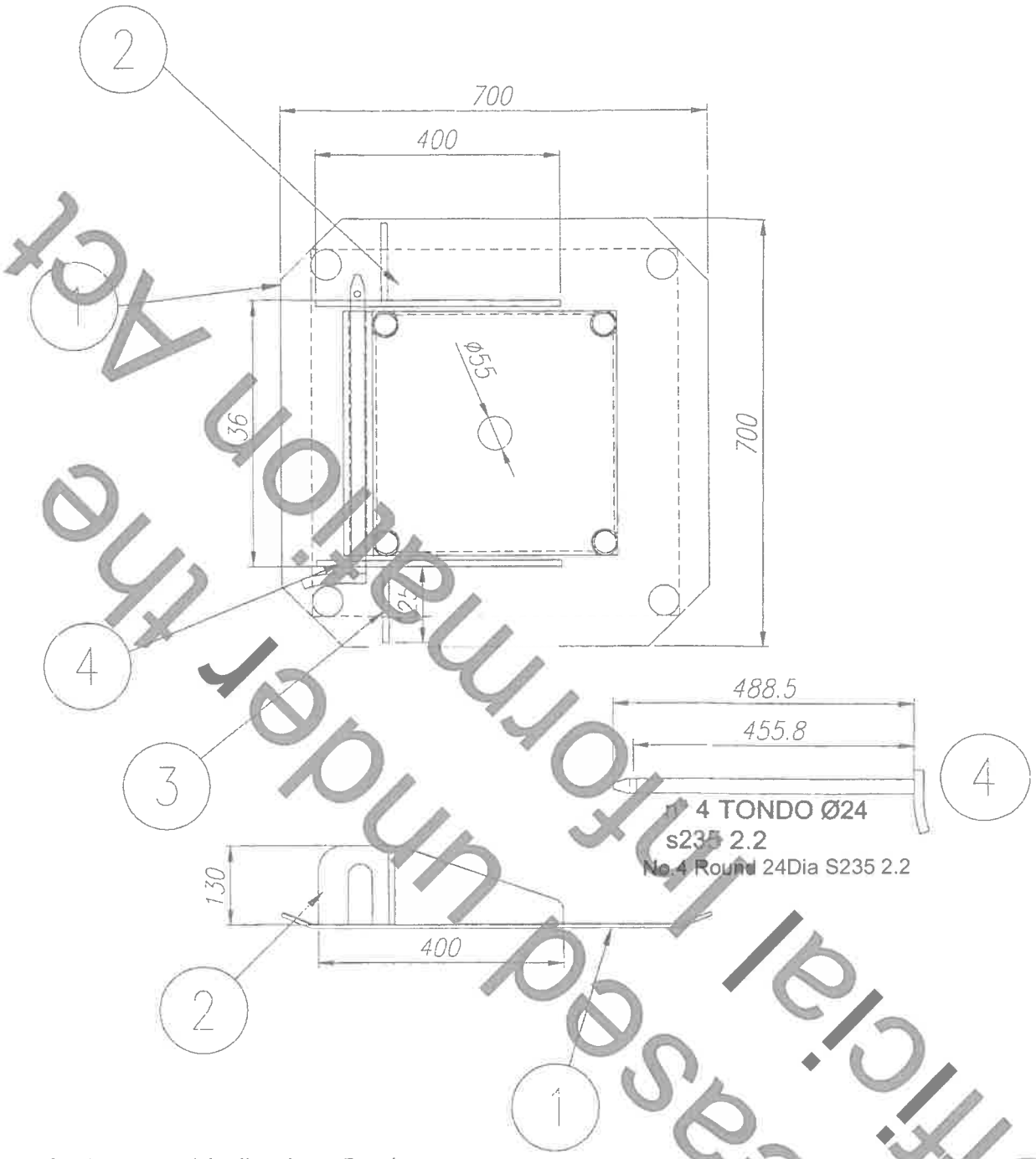
Weight
Kg:

Title: King Post Joint

FILE n°: 135.01.002.00_00

135.01.002.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scale: 1:30
Piece: 4



Pos.	Codice	Denominazione Name	Q.tà	Materia e	Note
4		Tubo tondo ø24 Round Tube 24Dia	1	Fe 360-C EN10025	L=500
3		Piatto 130x10 Dish 130x10	1	Fe 360-C EN10025	L=125
2		Piatto 130x10	1	Fe 360-C EN10025	L=400
1		Piastra sp.6 Plate sp.6	1	Fe 360-C EN10025	L=700X700

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Progetto: CARPENTERY FOR TENT ø35

Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

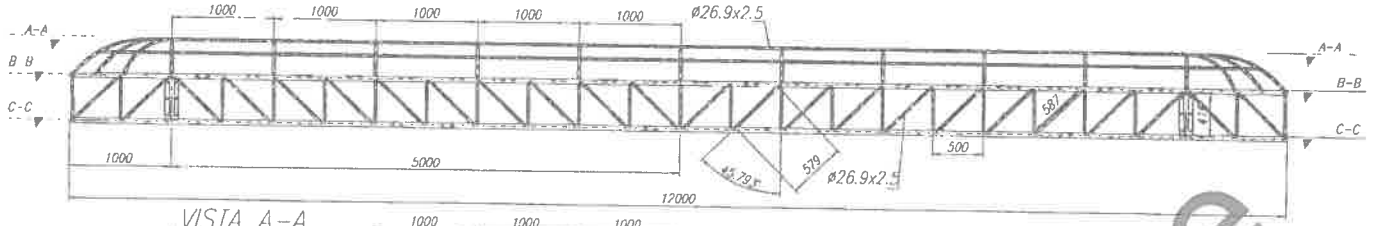
Weight
Kg:

Title: Base Plate

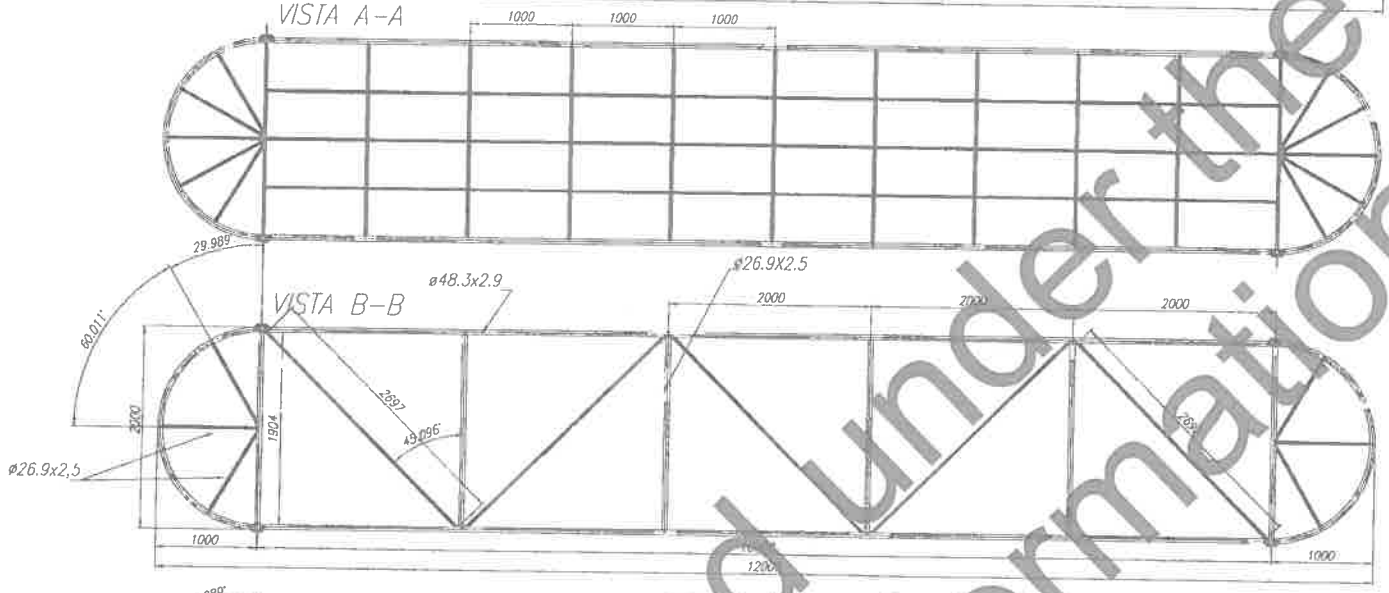
FILE n°: 135.01.003.00_00

135.01.003.00_00

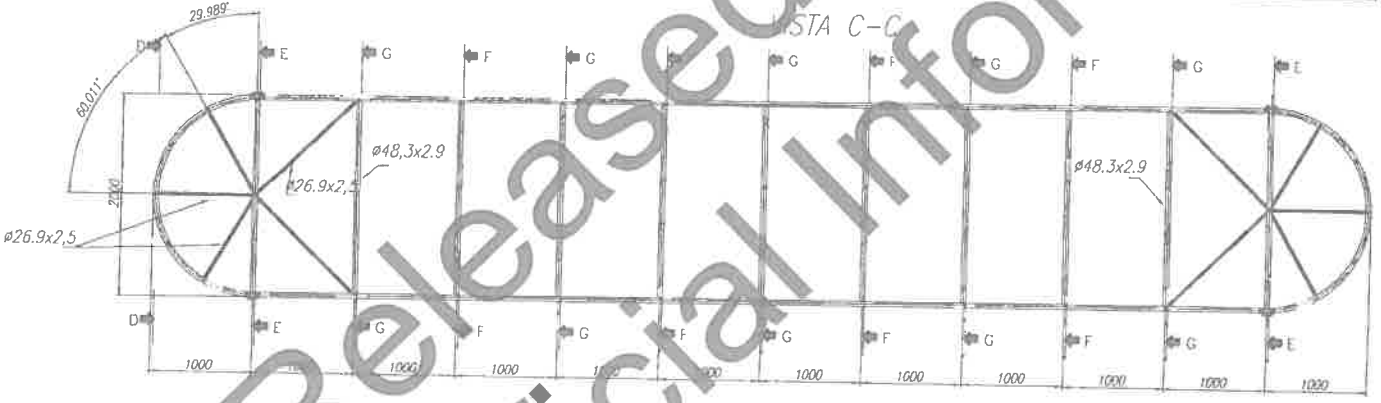
Designer: Anceschi Enrica
Date: 17/07/2012
Scale: 1:30
Piece: 4



VISTA A-A



VISTA B-B



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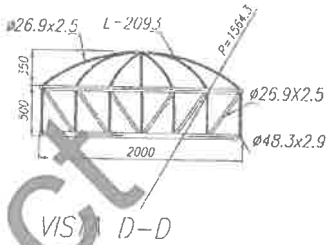
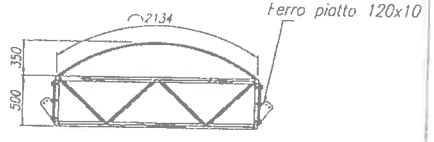
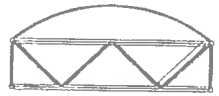


VISTA D-D

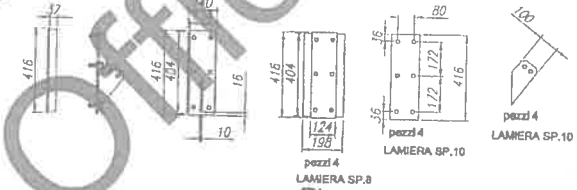


VISTA E-E



VISTA F-F

VISTA G-G



Piece

Plate sp.8

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e-mail :anceschi@anceschi.it www.anceschi.it

Progetto: CARPENTERY FOR CIRCUS ø35

Cliente: F PHOENIX . ENT.

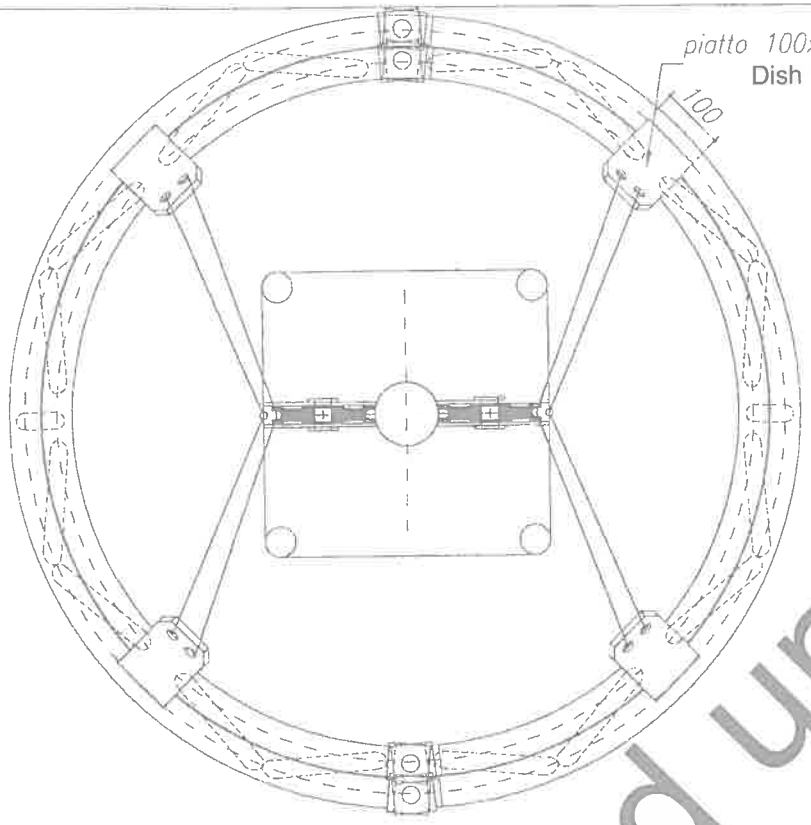
Weight
Kg:

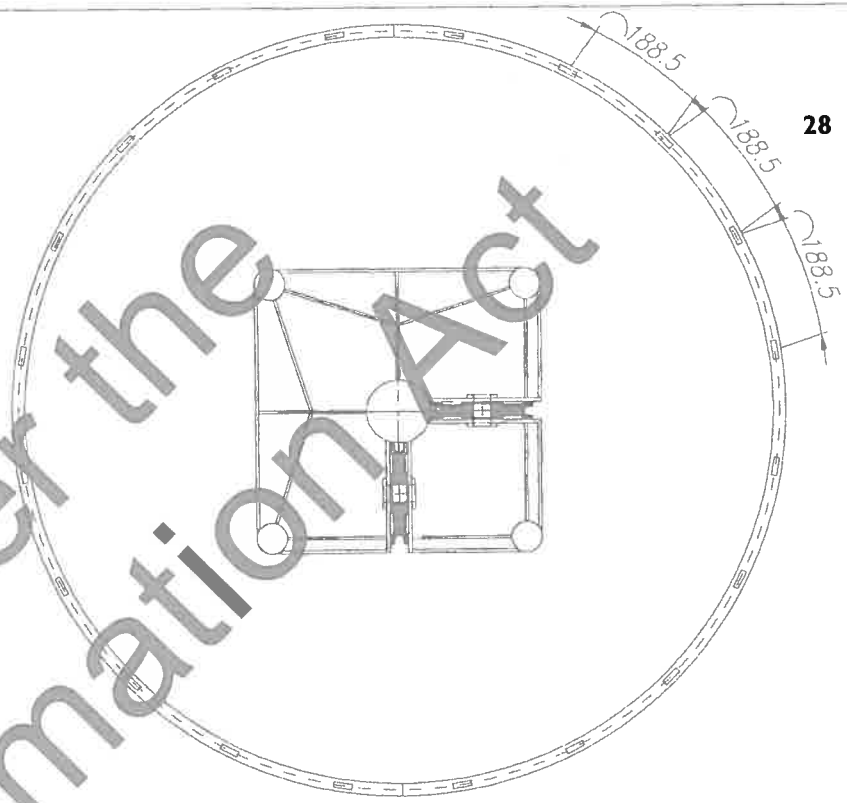
Title: Cupola 12x2

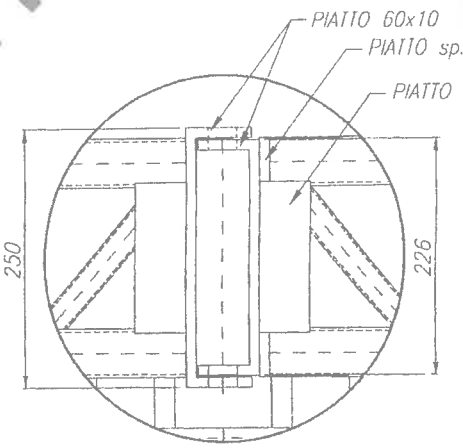
FILE n°: 135.02.000.00_00.dwg

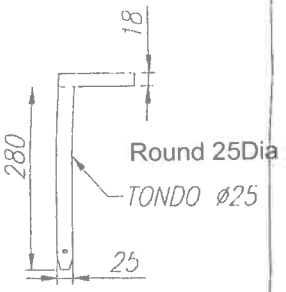
135.02.000.00_00

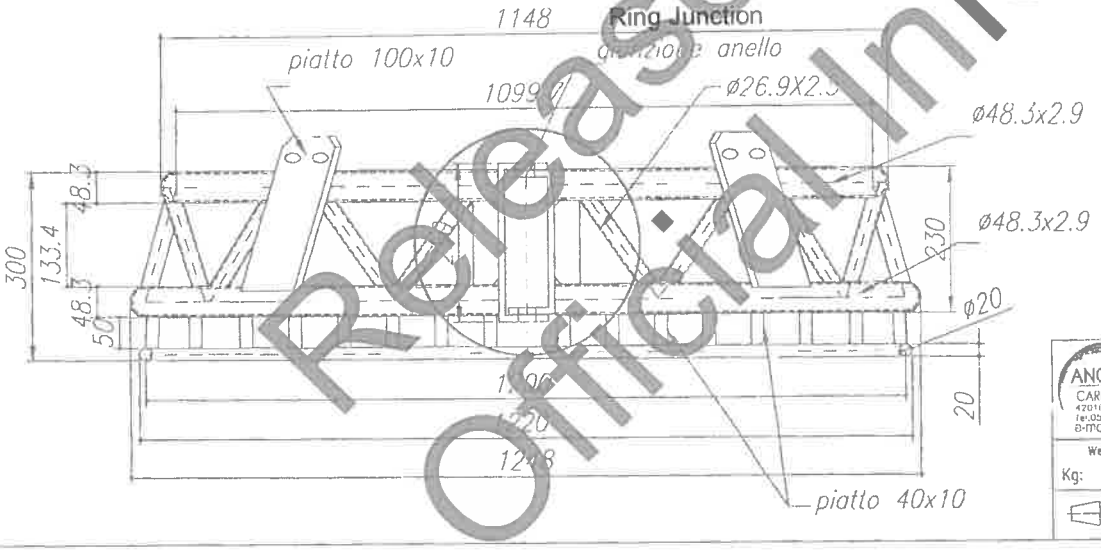
Designer: Anceschi Enrico
Date: 09/07/2012
Scale: 1:40
Piece: 1











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e-mail .anceschi@anceschi.it www.anceschi.it

Progetto: carpentery for circus diam.35
Cliente: F . PHOENIX . ENT .

Weight
Kg:

Title: Openable Basket 1200dia

FILE n°: 135.03.000.00_00.dwg
135.03.000.00_00

Designer: Anceschi Enrica
Date: 09/07/2012
Scale: 1:8
Piece: 4

29

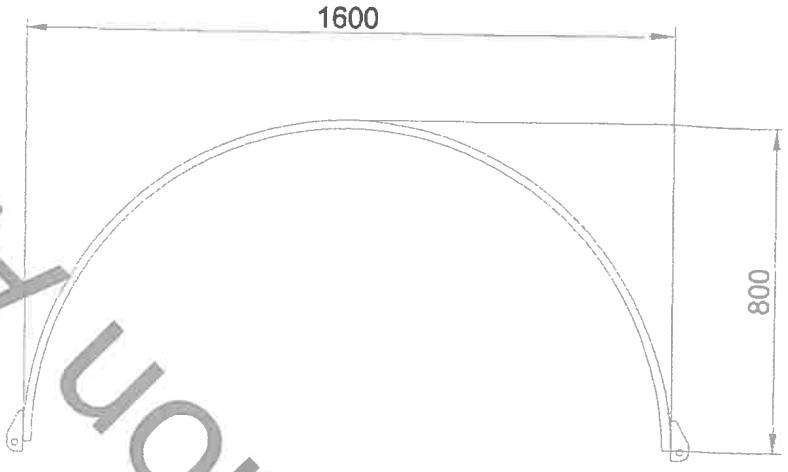
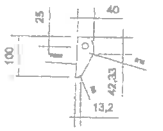
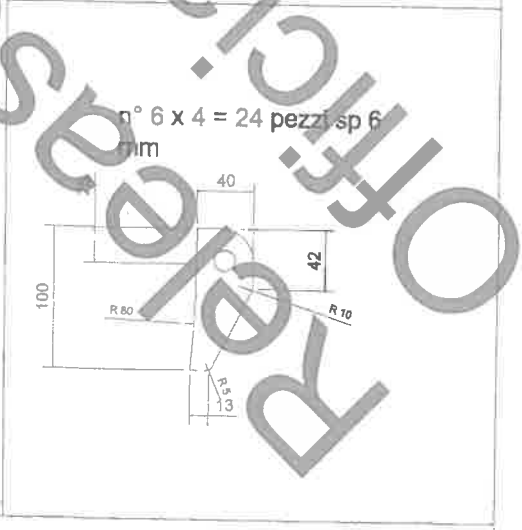


plate sp.6
PIATTO SP.6



n° 6 x 4 = 24 pezzi sp 6 mm

20dia Round Grade fe360
TONDO ø20
fe360



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Progetto: CARPENTERY FOR CIRCUS ø35
Cliente: F . PHOENIX . ENT

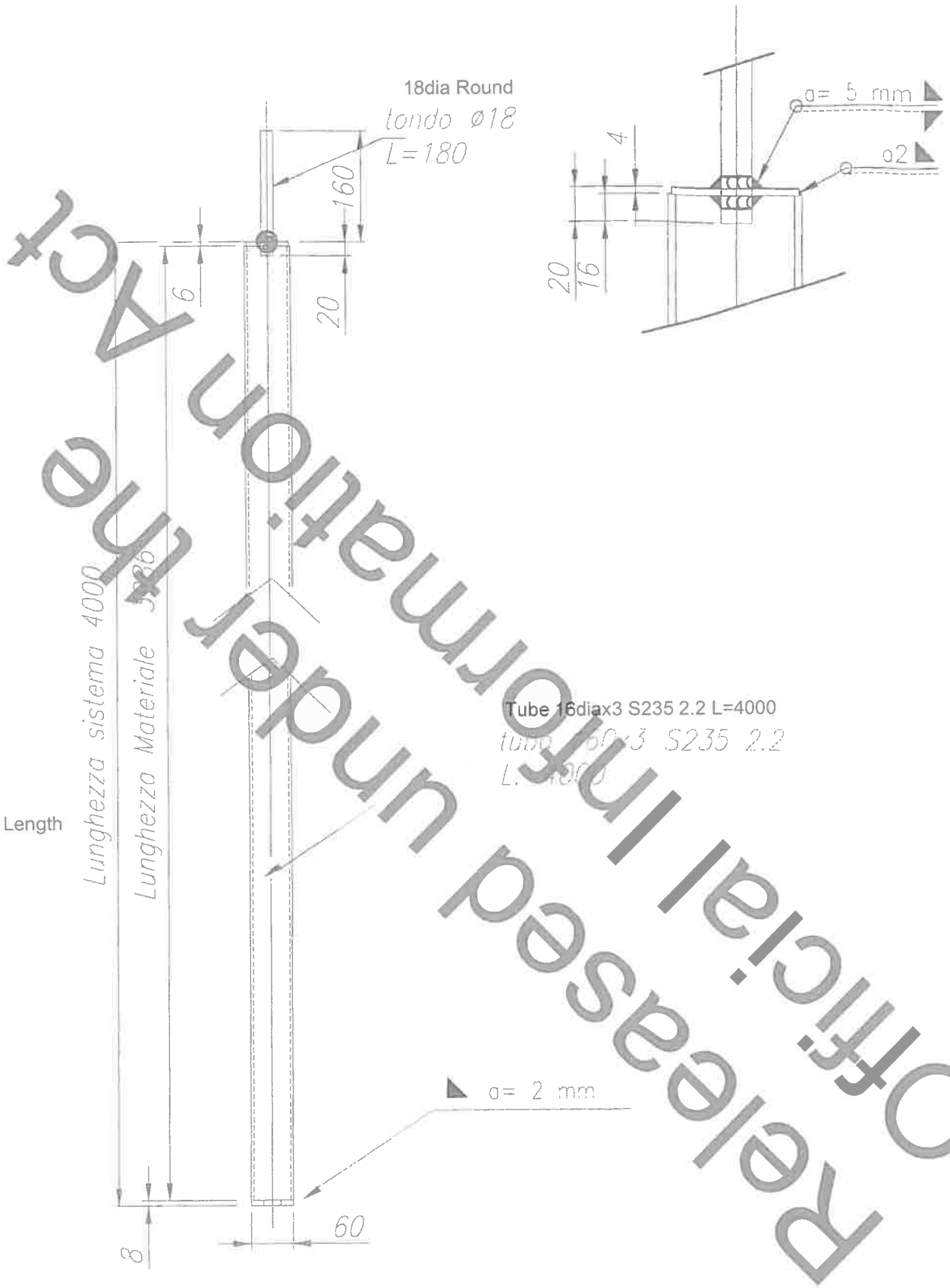
Weight
Kg:

Titolo: RINGS
Title: Rings

FILE n°: 135.04.000.00_00.dwg
135.04.000.00_00

Designer: Anceschi Enrico
Date: 09/07/2012
Scale: 1:18
Piece: 4

30



ANCESCHI ALBERTO E PAOLO snc
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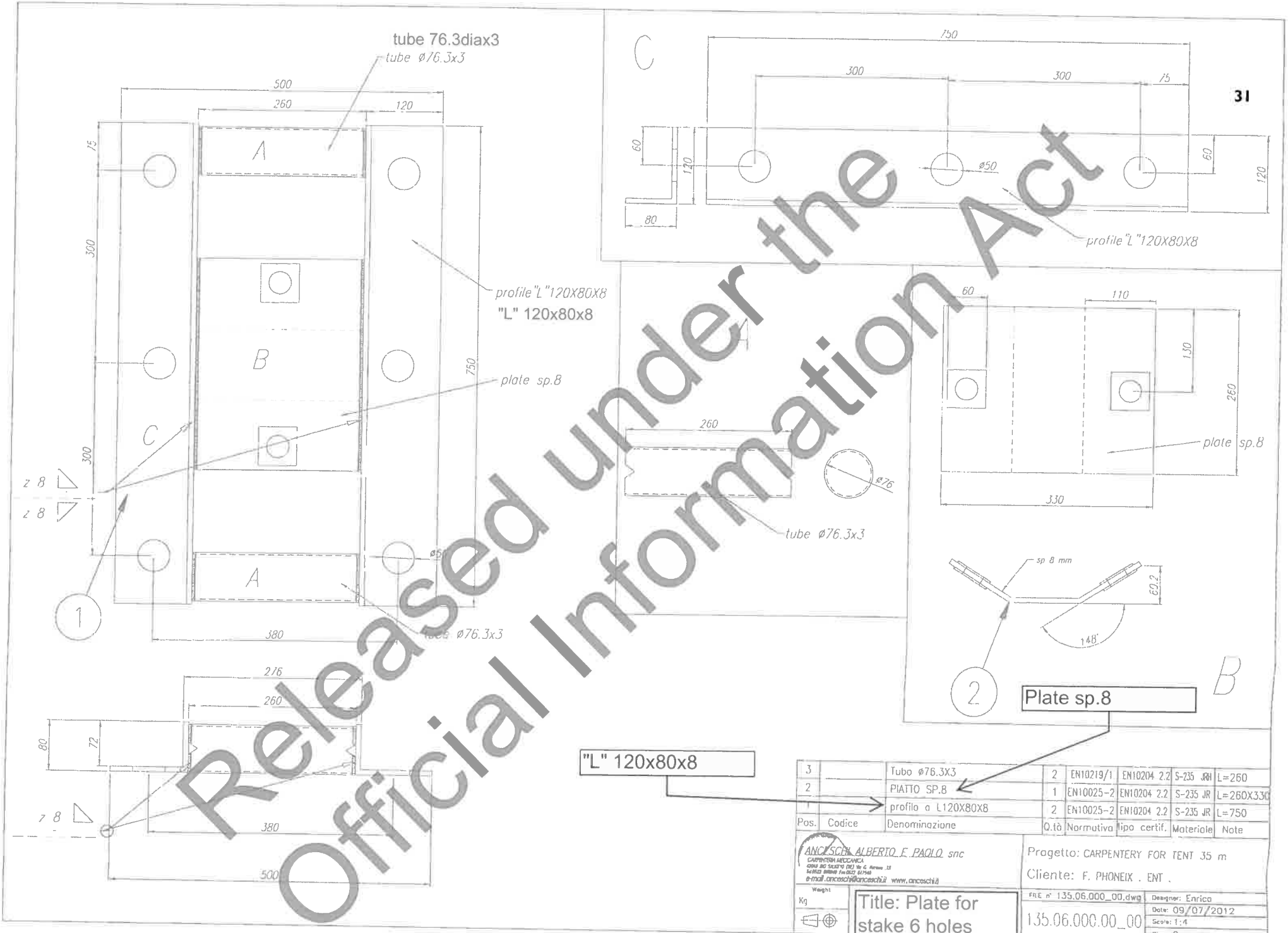
Progetto: CARPENTERY FOR TENT 35 m

Cliente: F. PHOENIX . ENT

Weight Kg:	Title:Pole 4m Pipe 60diax3	FILE n°: 135.05.000.00_00.dwg	Designer: Enrica
		135.05.000.00_00	Date: 09/07/2012
			Scale: 1:8
			Piece: 66



Pos.	Codice	Denominazione	Q.tà	Normativa	Tipo certif.	Materiale	Note
3		Tubo ø76.3X3	2	EN10219/1	EN10204 2.2	S-235 JRH	L=260
2		PIATTO SP.8	1	EN10025-2	EN10204 2.2	S-235 JR	L=260X330
1		profilo a L120X80X8	2	EN10025-2	EN10204 2.2	S-235 JR	L=750

ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA
e-mail.anceschi@anceschi.it www.anceschi.it

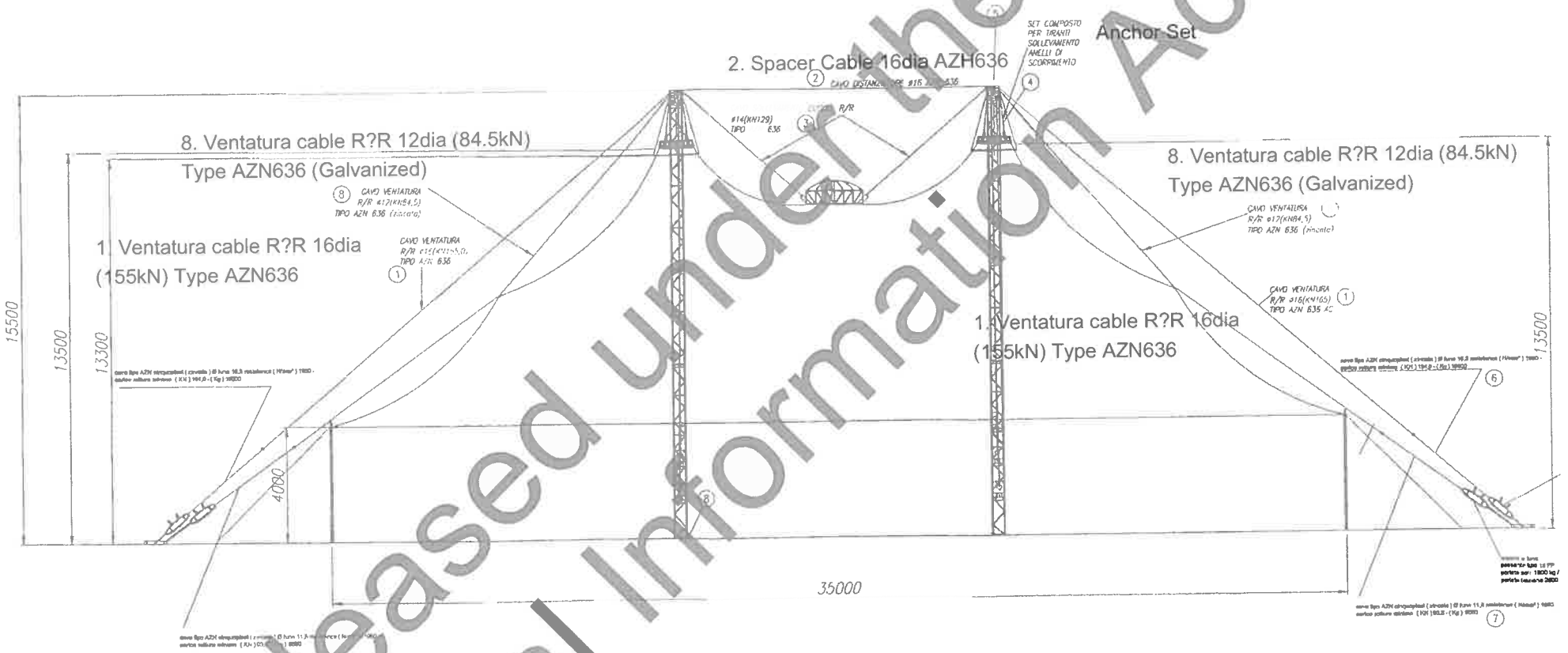
Progetto: CARPENTERY FOR TENT 35 m
Cliente: F. PHONEIX . ENT .

Weight Kg

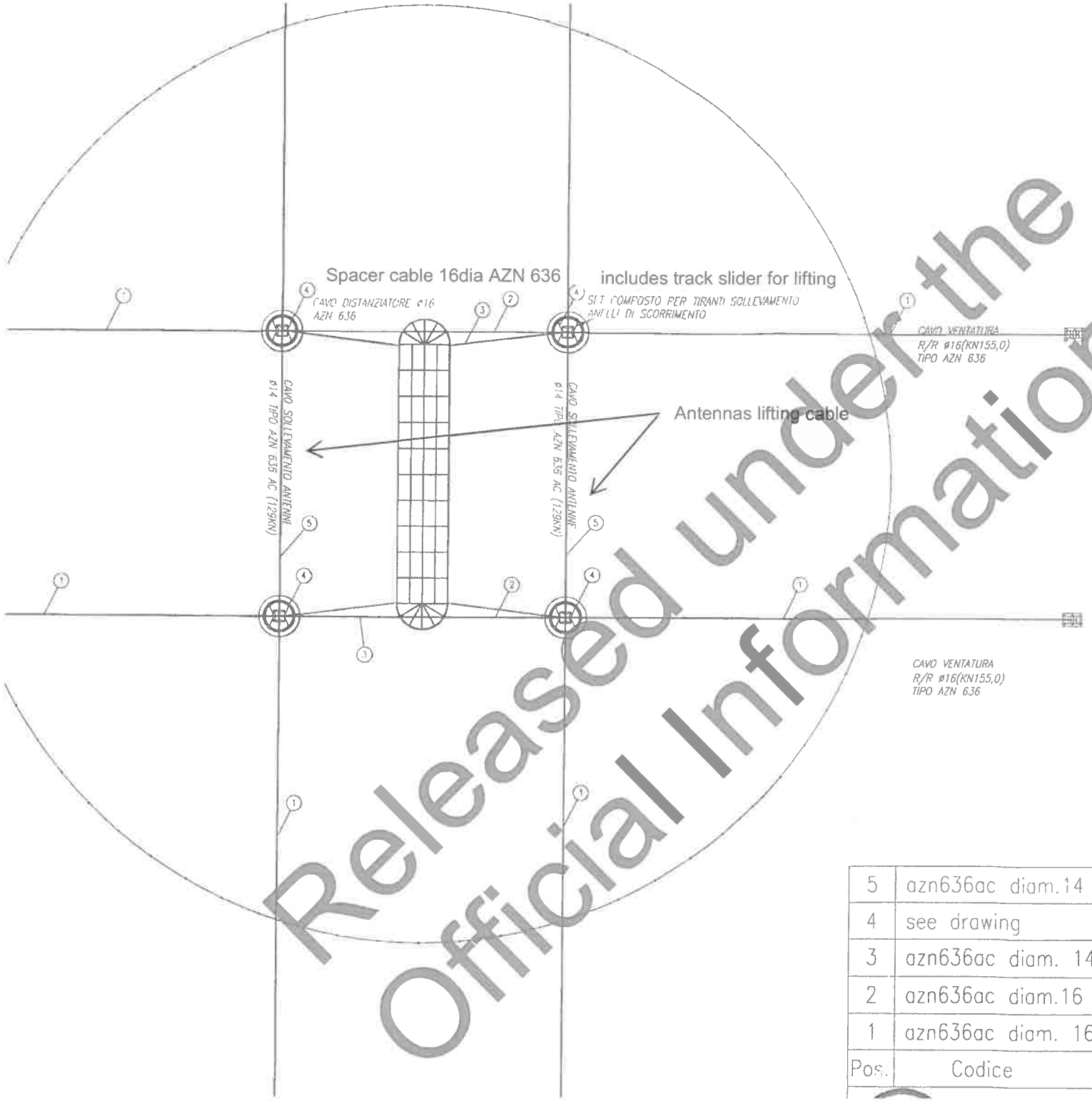
Title: Plate for stake 6 holes

FILE n° 135.06.000_00.dwg
135.06.000.00_00

Designer: Enrica
Date: 09/07/2012
Scale: 1:4
Piece: 8



Pos.	Codice	Denominazione Name	Q.tà
5	azn636ac diam.14	cables for lifting king poles	2
4	see drawing	cables for lifting basket	4
3	azn636ac diam. 14	Cables for lifting dome	4
2	azn636 diam.16	Cables Distance	2
1	azn636 diam. 16	cables fixing king poles	8



Pos.	Codice	Denominazione **Name**	Q.tà	
5	azn636ac diam.14	cables for lifting king poles	2	
4	see drawing	cables for lifting basket	4	
3	azn636ac diam. 14	Cables for lifting dome	4	
2	azn636ac diam.16	Cables Distance	2	
1	azn636ac diam. 16	cables fixing king poles	8	

SET COMPOSTO PER TIRANTI
SOLLEVAMENTO ANELLI DI SCORRIMENTO

For Lifting Rods with Rings

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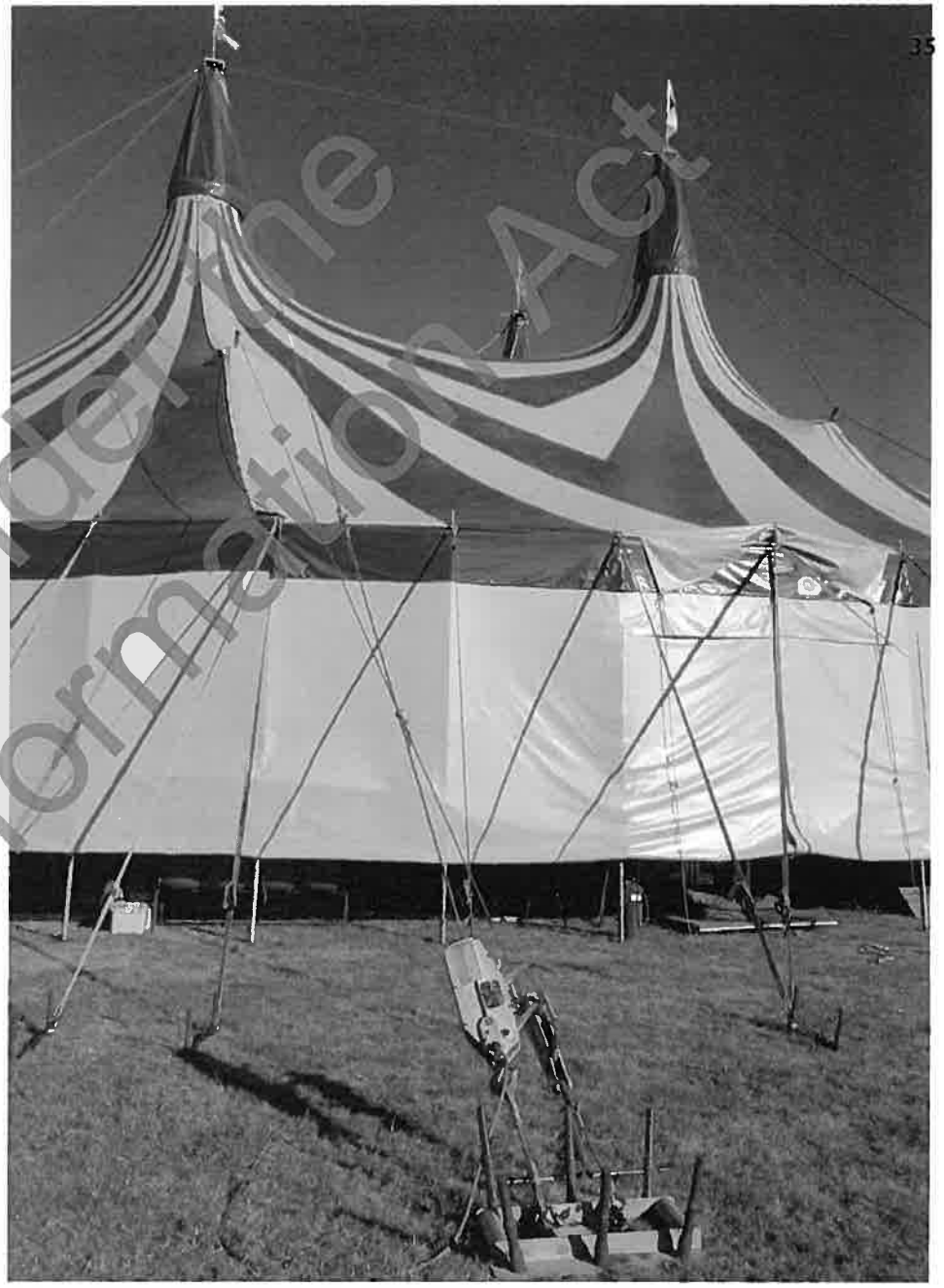
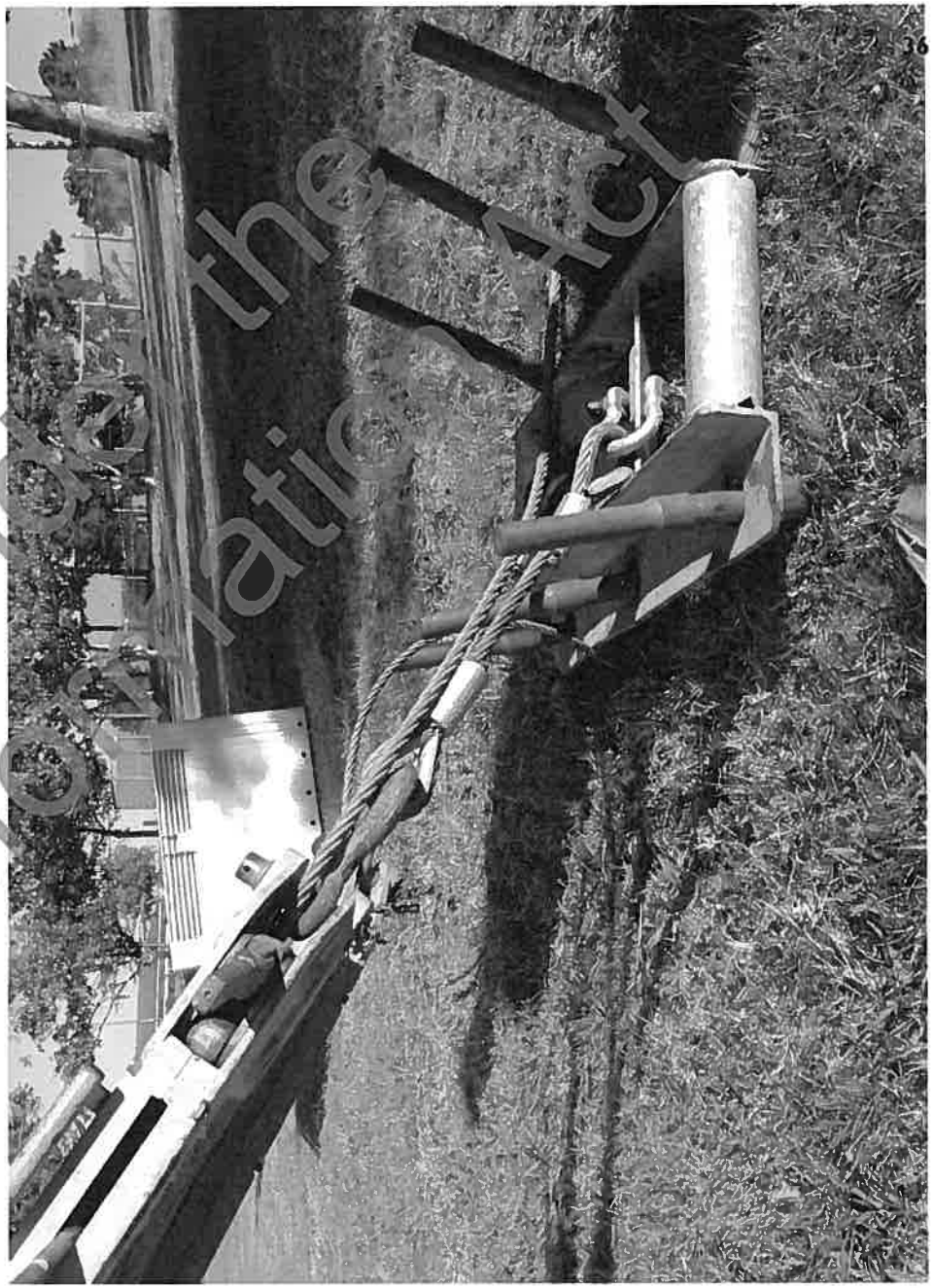
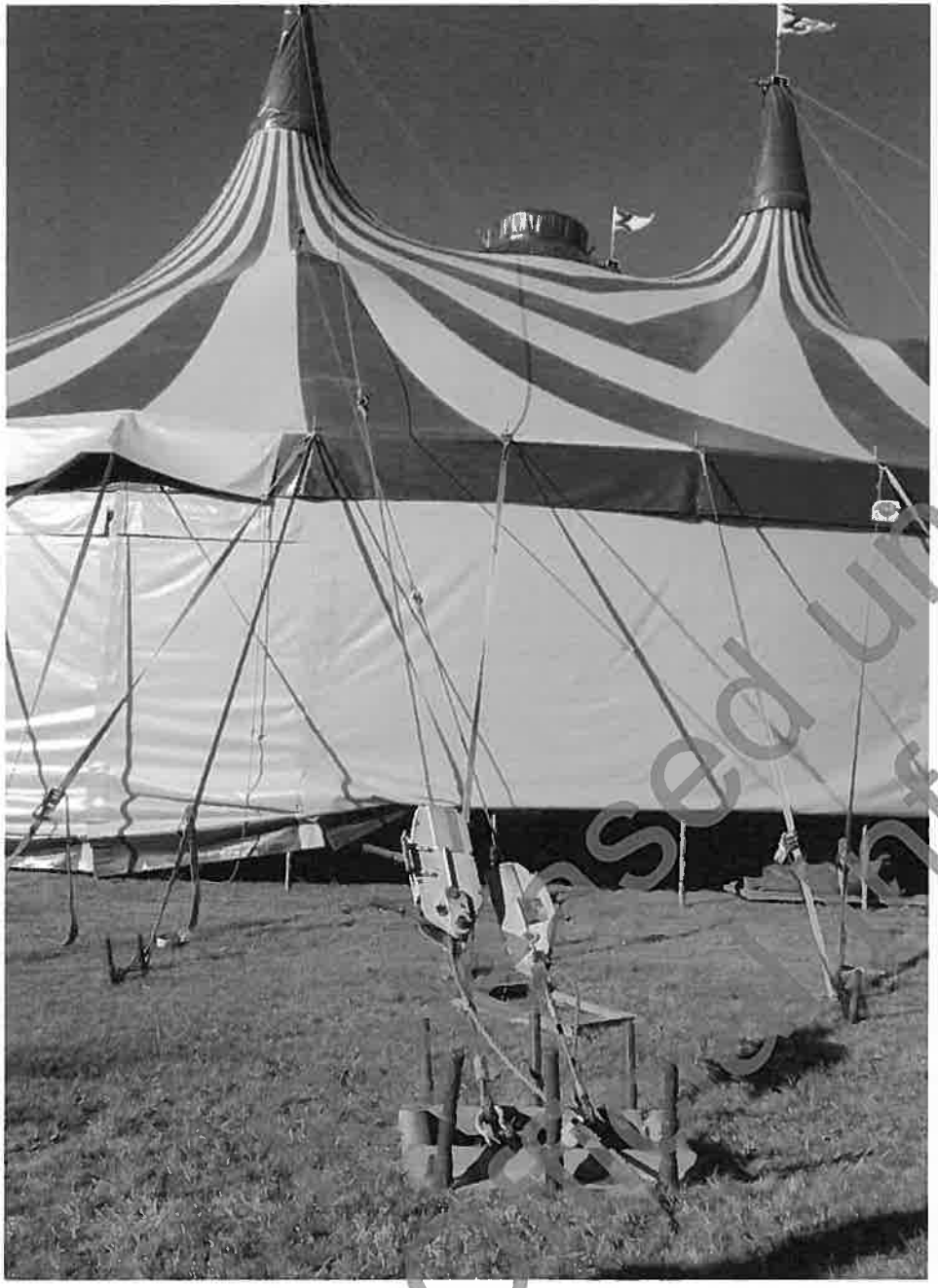
Progetto: SET COMPOSTO PER TIRANTI

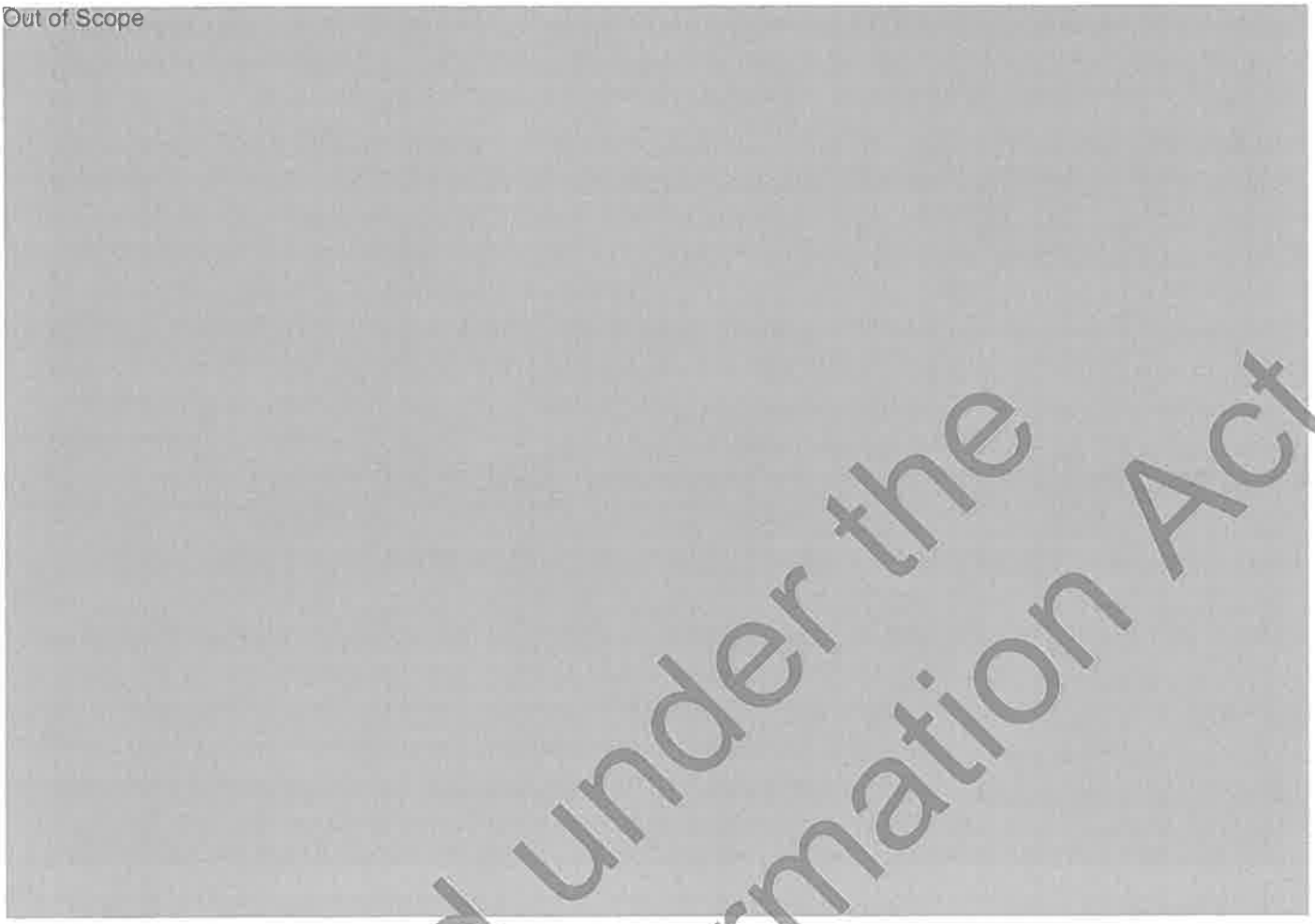
Cliente: Flaming Phoenix entrateniment

Weight Kg:	Title: Lifting Rings	FILE n°: 135.00.000.00	Designer: Enrica
		135.00.000	Date:
			Scale: 1:30
			Piece:









From: Darrel Cheong
Sent: Monday, 28 September 2015 10:38 a.m.
To: Murray Usmar
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Morning Murray

Dave McG passed on the Zirka Circus file to me last Friday. I'm wondering when you'll need it? It's been a month since your email below.

Thanks
Darrel

From: Murray Usmar
Sent: Wednesday, 26 August 2015 5:06 p.m.
To: David McGuigan
Cc: Graeme Lawrance; Darrel Cheong
Subject: FW: Zirka Circus Marquee [UNCLASSIFIED]

David

As discussed attached is the latest information from Redco to show compliance with B1 for the Zirka Circus Marquee MultiProof application. Graeme and Theo have been involved with the assessment. Please assess this latest information for compliance with B1.

I will forward a link to the files in Mako and also copies of the most recent correspondence (that I could find in Mako) to & Darrel.

Murray Usmar
ASSESSOR NATIONAL MULTIPLE-USE APPROVALS

Determinations and Assurance Team.
Building System Performance Branch | Building, Resources and Markets Group.
Ministry of Business, Innovation & Employment

murray.usmar@mbie.govt.nz | Telephone +64 (4) 901 8365
15 Stout Street Wellington | PO Box 1473, Wellington 6140

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New Zealand Government

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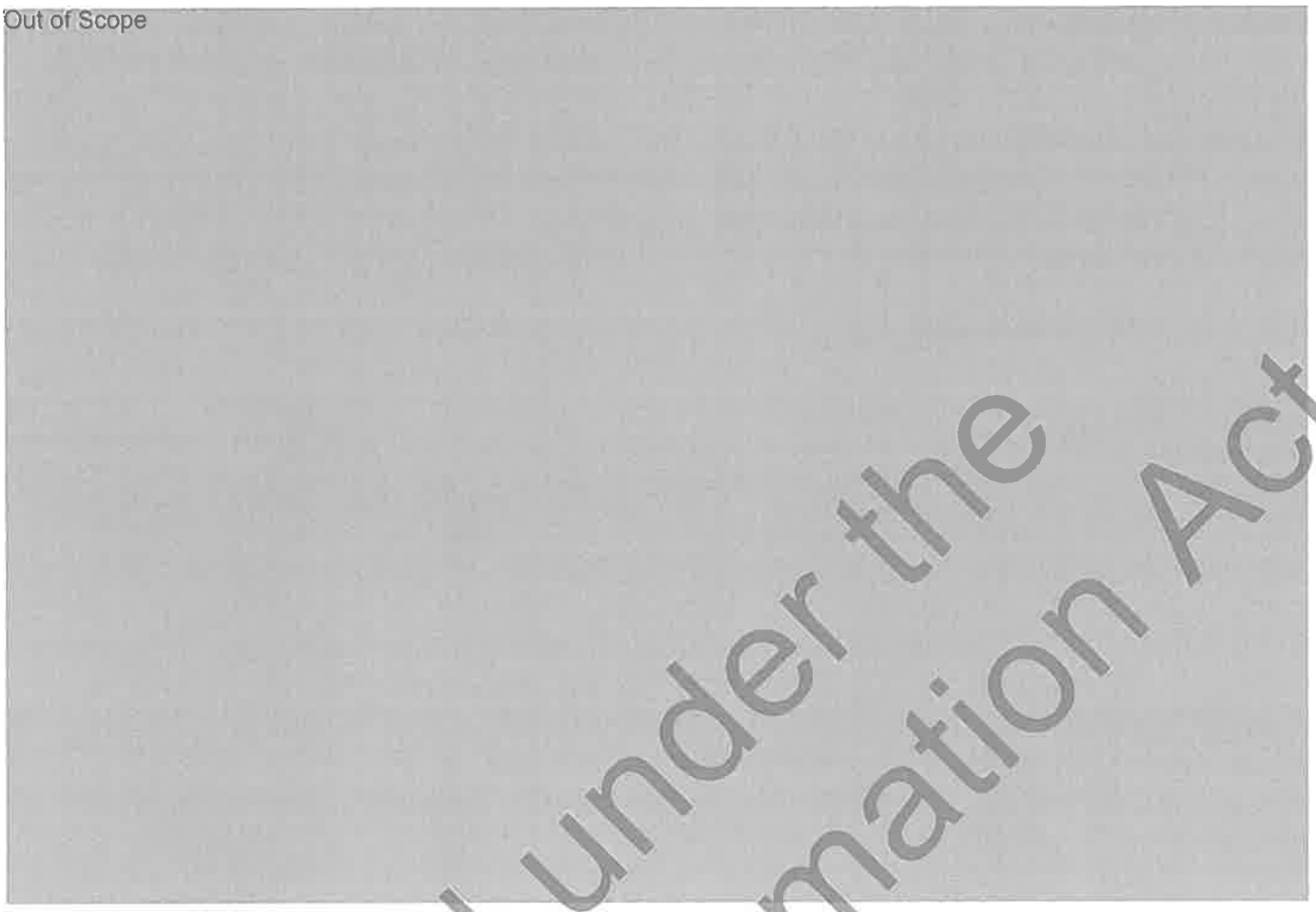

From: Theofanis Kostas
Sent: Monday, 5 October 2015 10:56 a.m.
To: Darrel Cheong
Cc: Murray Usmar; David McGuigan
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Hi Darrel,

As discussed, the elasticity modulus of the tent material would be useful.

Kind regards,

Theo Kostas
STRUCTURAL ENGINEER
Building System Performance Branch; Building, Resources and Markets Group
Ministry of Business, Innovation & Employment

Theofanis.kostas@mbie.govt.nz | Ph: (+64) +4 896 5741
Level 5, 15 Stout Street, PO Box 1473, Wellington 6140

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Friday, 2 October 2015 6:01 p.m.
To: Darrel Cheong
Cc: Murray Usmar; Theofanis Kostas; David McGuigan; Graham Rundle; Jeni Hou
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Hi Darrel

Thank you for your reply and we will address your queries below accordingly. Can you confirm these are the only queries outstanding regarding the structural B1 aspect of this application? We would like to address all the queries at once if possible.

I have some quick comments regarding queries number 3 and 6 below.

3.On page 18 of your calculations, it is mentioned that 'previous peg pull out tests' indicate that each peg can sustain significant portion of loads before the soil start to yield. Can you also please provide evidence of these tests and their results? I note that the results of the pull-out tests vary depending on the type(s) of site-specific soil. Therefore, the results from one site may not always be suitable for other sites.

An onsite peg-pull out testing procedure was recommended in the Recommendations to ensure pegs meet the expected performance for varies site conditions. Minimum loads for yielding and complete pull-out were given for the current peg arrange.

4. Repeat the above steps at a different location. Minimum 2 tests shall be carried out at each site. The lower readings shall be used to compare the requirements.

Minimum Required Load for peg to move = 300kg
Minimum Required Load for peg to be lift from the ground = 790kg

If the pull-out loads are found to be less than the above minimum requirements, additional pegs or weights may be required. Please report to Redco for additional hold down design.

4. No material specifications are given for the membrane material

TENT NAIZIL SPORT COVER:
PVC-beschichtetes Polyestergewebe
Ultimate strength **N = 3kN/5cm**
Self weight **s.w. = 0.8kg/m^2**

Regards,
Benson

From: Darrel Cheong [mailto:Darrel.Cheong@mbie.govt.nz]
Sent: Friday, 2 October 2015 4:33 p.m.
To: BensonZ@redco.co.nz
Cc: Murray Usmar; Theofanis Kostas; David McGuigan
Subject: FW: Zirka Circus Marquee [UNCLASSIFIED]

Benson

Thanks for the documents that you submitted. MBIE have the following points of queries below:

1. We note that you have chosen to comply with Clause B of the Building Code via the Alternative Solution path. However, your PS1 does not indicate the Alternative path choice. Additionally, you mentioned (on page 2) that the Australian Building Codes Board has a Draft Temporary Structures Standard which specifies ULS design wind speed of 30m/s. I have read the document and could not find any reference to 30m/s. Can you please submit a copy of that 30m/s reference?

2. For **ULS**, based on Table 3.3 of AS/NZS 1170.0, an IL3 of 6 months or less (chosen here for comparison purposes only) would have to be designed for 1/250 intensity wind – which translates to a 43m/s regional wind speed (Region A, Table 3.1 of AS/NZS 1170.2). Your choice of 30m/s is only about 70% of the 43m/s requirement. Furthermore, for **SLS**, based on Table 3.3 of AS/NZS 1170.0, an IL3 of 6 months or less would have to be designed for 1/25 intensity wind – which translates to a 37m/s regional wind speed (Region A, Table 3.1 of AS/NZS 1170.2). Your choice of 13.89m/s is only about 38% of the 37m/s requirement. Table 3.3.3 of the Draft Temporary Structures Standard specifies a reduction factor of 0.95 for temporary structures of 6 months and your reduction choices far exceed this. Can you please justify your choices of the ULS & SLS wind speeds? Also, it is not clear how long the circus will be held for in total? The total intended duration will be its design working life.

   It should be noted that a structure designed for temporary use does not change its overall expectation for life-safety.

3. On page 18 of your calculations, it is mentioned that 'previous peg pull out tests' indicate that each peg can sustain significant portion of loads before the soil start to yield. Can you also please provide evidence of these tests and their results? I note that the results of the pull-out tests vary depending on the type(s) of site-specific soil. Therefore, the results from one site may not always be suitable for other sites.

4. Wind forces are a critical consideration in the design, construction, erection and dismantling of temporary structures. Therefore, on-site risk management is a critical consideration in the use of temporary structures. We would like to know what evaluation/emergency/evacuation procedures Zirka has in place to respond to excessive wind speeds. Mention is given in the 'Recommendations' page that a wind anemometer will be used and monitored by the event manager but there is no further information on the accuracy/reliability of this equipment, operating personnel and procedures, etc.

5. As Zirka Circus is mobile and travels around the country, we would also like to see maintenance procedures in making sure any components that are damaged or worn out are identified and replaced.

6. No material specifications are given for the membrane material

7. The displacement limits given in the design are completely arbitrary and seem to refer to the sagging of the material, and not the stretching of the material under design loads. There is no check for tearing of the membrane material at the positions of the cables either, which would probably be the critical check for the structure.

Kind regards

Darrel Cheong
GRADUATE ENGINEER
Building System Performance Branch, Building, Resources & Markets
Ministry of Business, Innovation & Employment
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Level 5, 15 Stout St, Wellington 6011 | PO Box 1473, Wellington 6140

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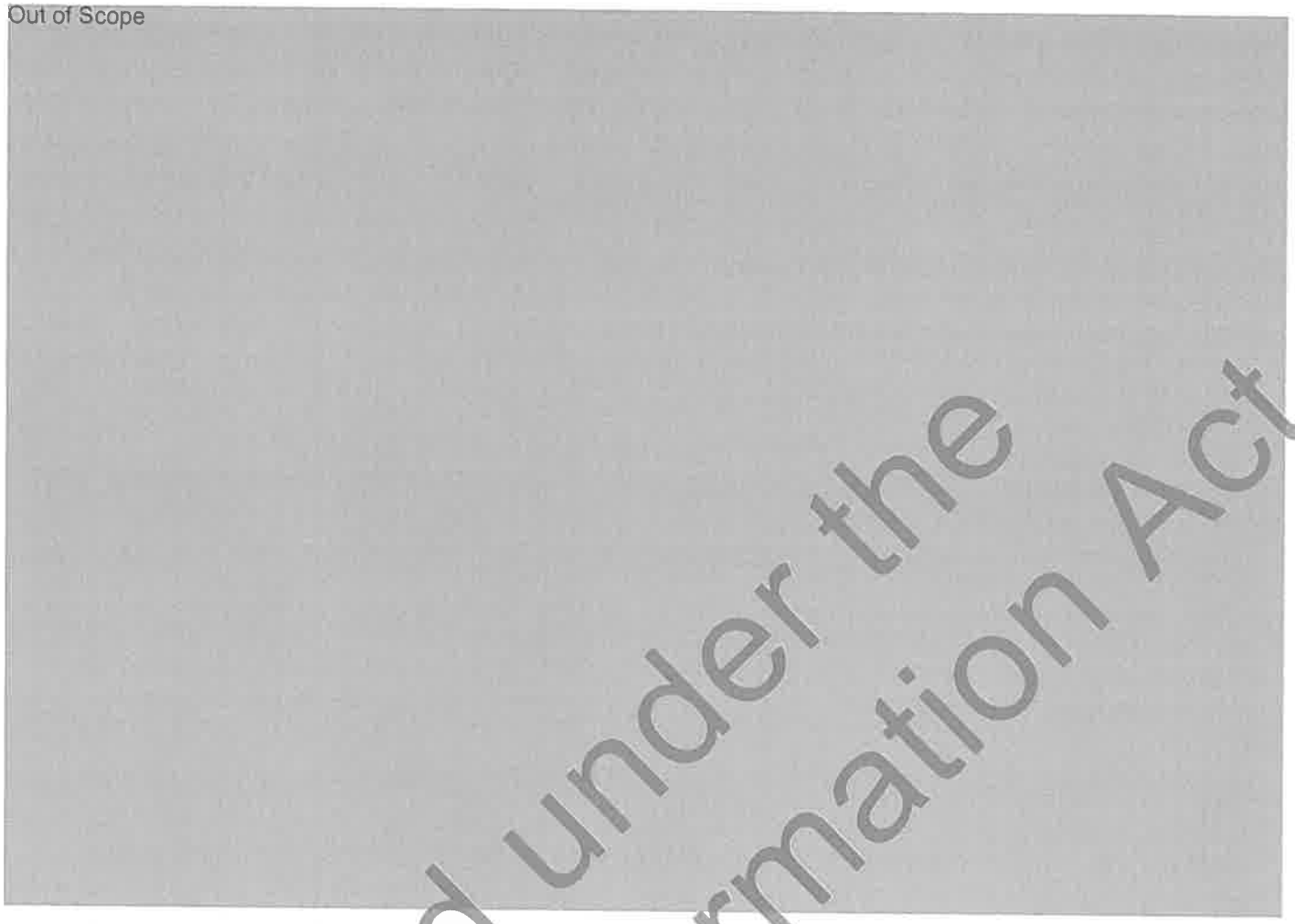

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Wednesday, 7 October 2015 4:49 p.m.
To: Darrel Cheong
Cc: Murray Usmar; David McGuigan; Theofanis Kostas; Gilles Seve; Graham Rundle; Jeni Hou
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Hi Darrel

Thank you for your comments. You mentioned these are the comments for now, are we expecting more comments from you later on?

We understand the final review will be dependent on our response, but can you confirm these 10 quires which listed below and in your earlier email 02/10/15 are a completed list of review comments in regard to B1 aspect of this application? And once all 10 of the quires are resolved, MBIE will be in a position to grant the application?

We would like to get a handle of the amount of works still outstanding so to advise the client regarding timelines.

Regards,
Benson
15180

From: Darrel Cheong [mailto:Darrel.Cheong@mbie.govt.nz]
Sent: Wednesday, 7 October 2015 3:18 p.m.
To: BensonZ@redco.co.nz
Cc: Murray Usmar; David McGuigan; Theofanis Kostas; Gilles Seve
Subject: FW: Zirka Circus Marquee [UNCLASSIFIED]

Benson

Thanks for the direct pull-out results from the site. Some other queries from us below:

6. (from previous numbering) On the material specifications query, can you please provide the elasticity modulus for the fabric material? This will help us get a handle on deflection limits.

8. i) On geotechnical matters, from my observation, the test results were for Circus Aotearoa for 1m-long and 50mm-diameter pegs whereas you are designing for Zirka Circus using 1.4m-long and 45mm-diameter pegs. We would like to see test results on the actual pegs used in design.

ii) Your ULS calculations for each nail on page 18 may need to be revised as tension of 24.7kN is for one guy and each guy is resisted by 3 soil nails as opposed to 6. Therefore, each nail would have to resist twice of **4.1kN** i.e. 24.7/3 = **8.2kN**.

iii) How did you obtain SLS pull-out requirement of 2.9kN/nail at the last line of page 18?

iv) Are the soil nails installed at 90 degrees to the ground like shown in your 'recommendations' page? If not, what angles to the ground are they installed at?

v) To satisfy geotechnical aspects, MBIE recommends that a geotechnical professional is engaged to perform on-site tests (scala penetrometer tests or equivalent). These test results should be correlated to the type of soil(s) that the nails anchor to and would provide us with more confidence that the soil nails will work properly.

9. Can you please provide further details (thickness, dimensions, etc) on the antenna base of the king posts? I am referring to section F-F on page 23.

10. Finally, there is a high degree of inconsistency in the calculations. Please clarify:
i) On page 16 of the calculations, in the 'Cables' section, it gives a force of 106kN for the d16 cable, and 49kN for the 2x d12 cables. Then, in the check for the guy peg (on page18) there is a distribution of a tension force (Horizontal component 20kN, vertical component -29kN) between one d12 and one d16 guy which we can't determine where it has been derived from.
ii) Again on page 16, in the 'Cables' section, we are not sure how the tension capacity of cables (148.5kN for d16; 85.5kN for 2xd12) have been obtained.

That's all we have for now and let me know if any of these queries is unclear.

I will be away tomorrow and Friday and will be back on Monday 12 October.

Kind regards

Darrel Cheong
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BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Monday, 5 October 2015 10:48 a.m.
To: Darrel Cheong
Cc: Murray Usmar; Theofanis Kostas; David McGuigan
Subject: RE: Zirka Circus Marquee [UNCLASSIFIED]

Hi Darrel

As discussed in our phone conservation, please find attached ground peg pull out test results at one of the circus's venue in Napier. We actually recommended a onsite pull-out test to be carried out before erecting the tent in our Recommendations.

We will be expecting all your structural comments in the next one or two days.

Regards,
Benson
15180

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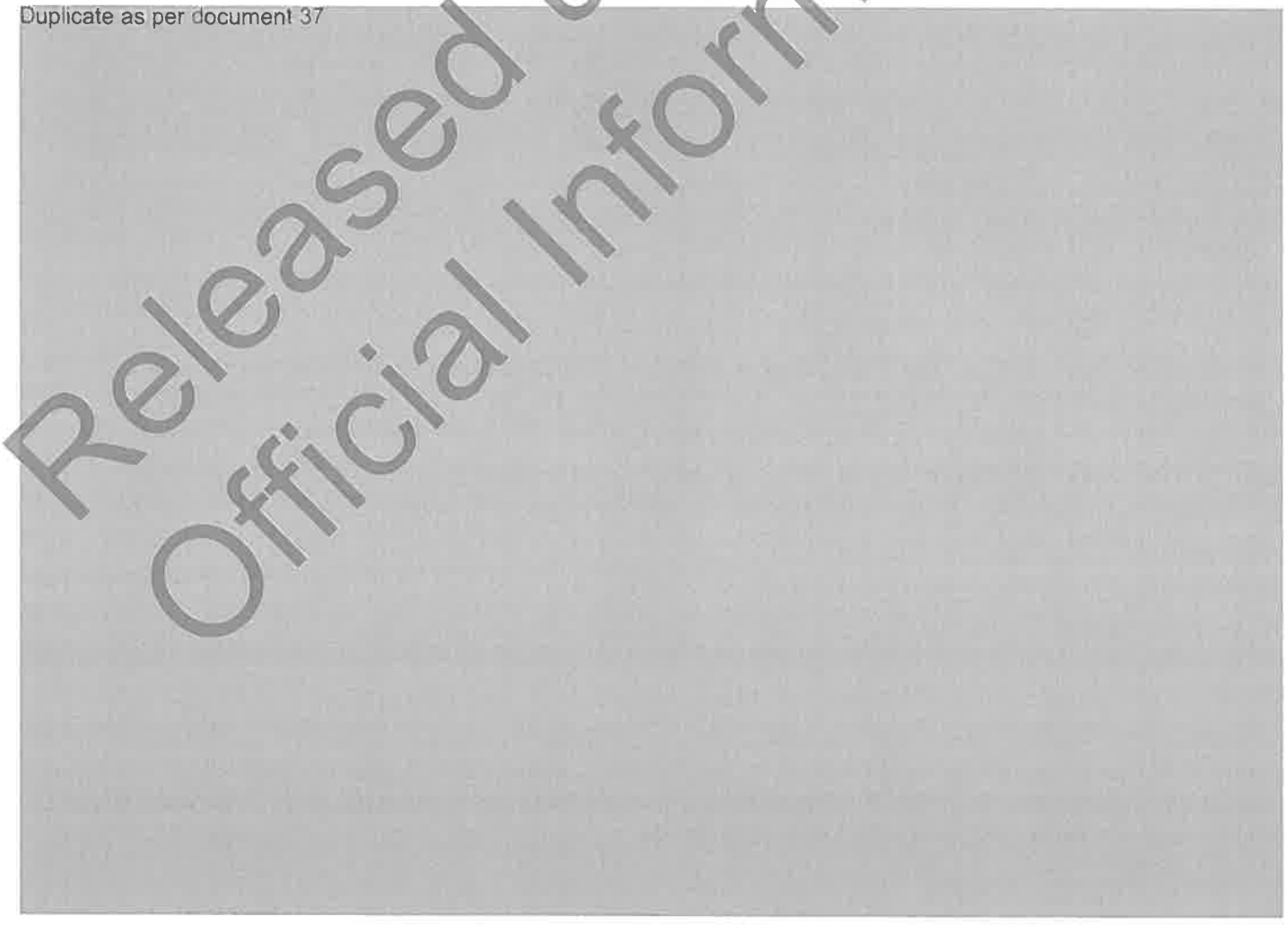

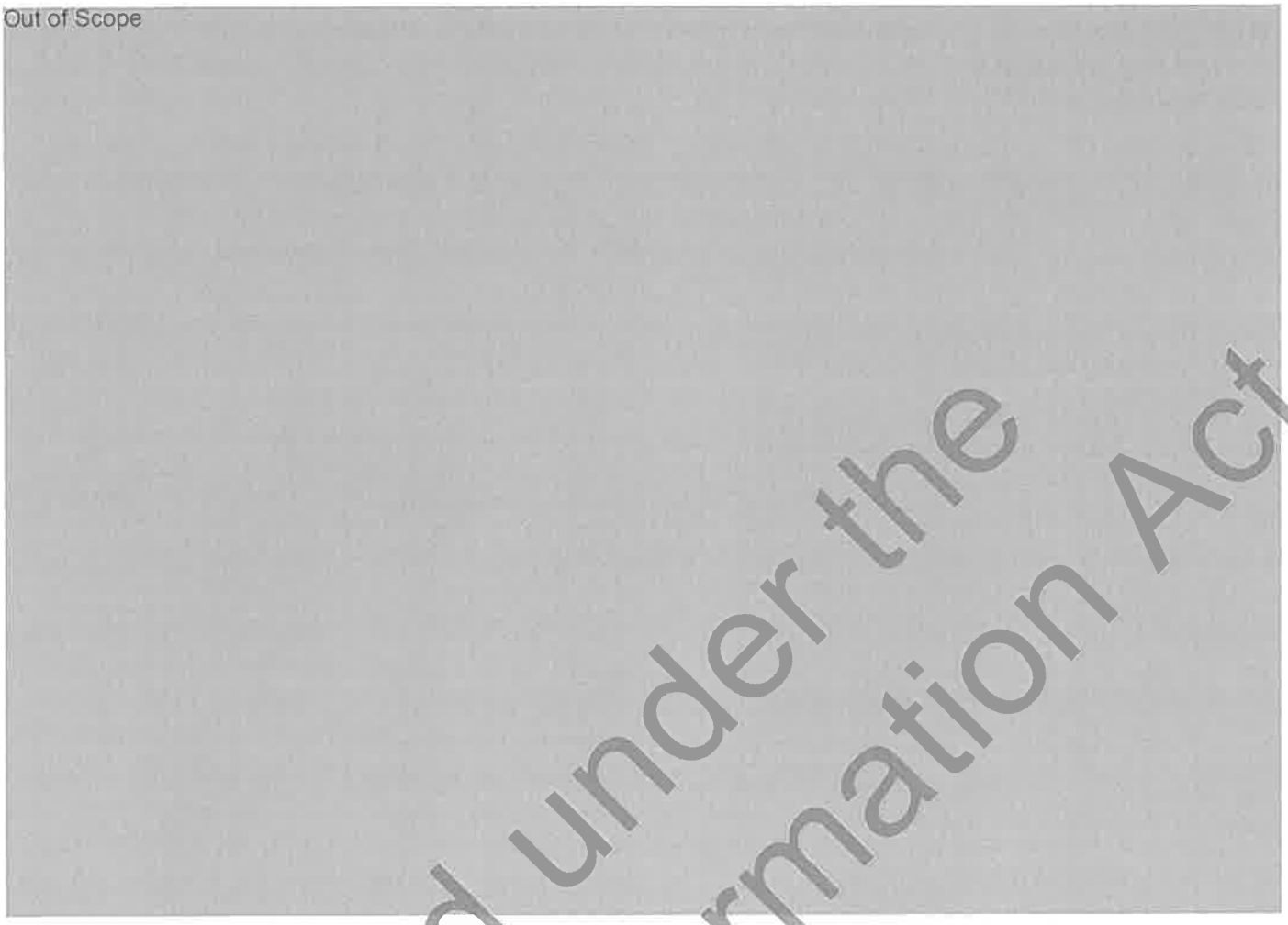

From: Darrel Cheong
Sent: Thursday, 10 December 2015 10:28 a.m.
To: John Gardiner; Murray Usmar
Cc: David McGuigan; Theofanis Kostas
Subject: RE: MBIE queries

John and Murray

Below is a draft reply to Redco prior to our telephone conference call. I have tried summarising our points of discussion yesterday into this email.

Let me know what you think.

Thanks
Darrel

Hi Benson

The team has discussed your design philosophy and we have decided to endorse that approach – focussing more on the site safety management as opposed to the design details.

We gather that the marquee structure has been designed to European standards (Eurocode 3) and was brought into New Zealand without much modification. It has been used for a few years and there have not been any serious structural problems with it. What Redco has done to date is back-analysing the structure to a ULS wind speed of 30m/s & to an SLS wind speed of about 14m/s. The pegs are then designed to these wind actions. However, you mentioned that there is a constant pull-out resistance which all pegs have to achieve and this will be done via on-site testing (on any ground conditions).

To help us progress this MultiProof application, can you then please provide more information on:

a) Full capacity of the marquee

b) Emergency evacuation procedures

c) Risk register and mitigation procedures

d) To be confirmed (anything else relevant from the attached Code of Practice)

Once you have provided us with the information above and if there are still gaps in your application, our team would like to have a telephone conference call with Jenny and Redco to further clarify these queries.

Thanks for your time.

Kind regards

Darrel Cheong
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BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Tuesday, 8 December 2015 10:13 a.m.
To: Darrel Cheong
Cc: Jeni Hou; Graham Rundle; Murray Usmar; David Barnard
Subject: RE: MBIE queries

Thanks Darrel. We will provide the information you required, but as discussed yesterday the intention of Multiproof is not be site specific.

Further to our discussion yesterday, I have consulted Metservice regarding their weather forecast so to better understand the probabilities and risks associated with our alternative design approach. And the following is what I understand from the conservation,

- Metservice will issue the "Strong Wind Warning" for inland when the forecasted gust wind speed exceed 110km/hour (30.6m/s) 24 hours in advance on their website or 48 hours on some special type watches.

- The confidence interval of the "Strong Wind Warning" is more than 95% which includes faults alarm events. The probability of the forcast actually missed an event is very low.

Please note that the forecast is based on data normally recorded in airports or open field area which the tent is very unlikely to be. And there is on site wind anemometer as a "back-up" measure if a "Strong Wind" event is missed by the weatherforcast.

Please consider the probabilities and risks of the proposed alternative approach in your meeting on Wednesday and we are look forward to your reply.

Regards,
Benson

From: Darrel Cheong [mailto:Darrel.Cheong@mbie.govt.nz]
Sent: Monday, 7 December 2015 6:38 p.m.
To: BensonZ@redco.co.nz
Cc: Jeni Hou (jeni@zirkacircus.com); Graham Rundle; Murray Usmar
Subject: FW: MBIE queries

Benson

As discussed earlier today, please indicate total intended working period of the marquee structure and the intended set-up locations. This information will assist us with the MultiProof's certificate conditions.

Also, my team and I will be discussing about your alternative design approach on Wednesday and we will get back to you in due course.

Thanks for your time.

Kind regards

Darrel Cheong
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BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

From: Darrel Cheong
Sent: Monday, 7 December 2015 3:45 p.m.
To: BensonZ@redco.co.nz
Subject: RE: MBIE queries

Benson

I rang you last week but I did not get hold of you. I wanted to clarify some of my queries relating to questions #8, #9 and #10 of our correspondence.

It will be good if you can ring me back. Hope to speak soon.

Kind regards
Darrel

From: Darrel Cheong
Sent: Wednesday, 2 December 2015 5:31 p.m.
To: 'Benson Zhang'
Cc: Jeni Hou; Graham Rundle; Murray Usmar
Subject: RE: MBIE queries

Hi Benson, Graham and Jeni

Thanks for your response and thanks for your patience with this application.

Having understood your design intent better, I have had a discussion with my colleagues on your design philosophy and we still have some reservations at this stage. We will keep you informed of how to progress this.

On another note, in regard to the ten queries below, having read your response carefully, I would need some clarification with your answers to questions #8, #9, and #10. I think these questions are still largely unanswered. I will ring you tomorrow morning to clarify these questions.

Will speak tomorrow.

Thanks.

Kind regards

Darrel Cheong
GRADUATE ENGINEER
Building System Performance Branch, Building, Resources & Markets
Ministry of Business, Innovation & Employment
Darrel.Cheong@mbie.govt.nz | Telephone: +64 (4) 901 8527
Level 5, 15 Stout St, Wellington 6011 | PO Box 1473, Wellington 6140

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT HIKINA WHAKATUTUKI

New Zealand Government

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Tuesday, 17 November 2015 5:38 p.m.
To: Darrel Cheong

Cc: Jeni Hou; Graham Rundle
Subject: FW: MBIE queries

Hi Darrel

Please find attached calculation and our responses in red below regarding the ten queries you had of this application. If anything is unclear or you have further concerns, please feel to give me a call to discuss.

1. We note that you have chosen to comply with Clause B of the Building Code via the Alternative Solution path. However, your PS1 does not indicate the Alternative path choice. Additionally, you mentioned (on page 2) that the Australian Building Codes Board has a Draft Temporary Structures Standard which specifies ULS design wind speed of 30m/s. I have read the document and could not find any reference to 30m/s. Can you please submit a copy of that 30m/s reference?

The alternative path we have chosen is to comply with the ABCB (Australian Building Codes Board) Temporary Structures 2015 which is more appropriate for temporary structures.
The 30m/s was in Section 3.3 of the 2014 Draft ABCB Standard but is not included in the 2015 version. But the code dose give an alternative method example in Section 2.1 which recognises the format of the design method we have adopted.

2. For **ULS**, based on Table 3.3 of AS/NZS 1170.0, an IL3 of 6 months or less (chosen here for comparison purposes only) would have to be designed for 1/250 intensity wind – which translates to a 43m/s regional wind speed (Region A, Table 3.1 of AS/NZS 1170.2). Your choice of 30m/s is only about 70% of the 43m/s requirement. Furthermore, for **SLS**, based on Table 3.3 of AS/NZS 1170.0, an IL3 of 6 months or less would have to be designed for 1/25 intensity wind – which translates to a 37m/s regional wind speed (Region A, Table 3.1 of AS/NZS 1170.2). Your choice of 13.89m/s is only about 38% of the 37m/s requirement. Table 3.3.3 of the Draft Temporary Structures Standard specifies a reduction factor of 0.95 for temporary structures of 6 months and your reduction choices far exceed this. Can you please justify your choices of the ULS & SLS wind speeds? Also, it is not clear how long the circus will be held for in total? The total intended duration will be its design working life.

It should be noted that a structure designed for temporary use does not change its overall expectation for life-safety.

The design theories from NZS1170 are based on probability and risk. Therefore any comparisons should also be based on probability and risk rather than just the physical magnitude of the loading.
Yes, the structure has been assessed to a lower magnitude of wind speed compared to NZS1170 but there is onsite monitoring strategy to mitigate risk which NZS1170 does not take into account for demountable structures.
The maximum design wind speed is governed by the hold down pegs pull-out capacity based on our previous test results. But we have recommended the pegs be verified onsite every time before erecting the structure.
The risk of the structure experiencing loadings exceeding its capability is mitigated by:

Weather forecasts.

Anemometer onsite readings for constant monitoring

Early warning and evacuation for occupants before reaching structural limits (evacuation at wind speed exceeding 90kph)

Considering the factors above, the marquee should have lower probability of structural failure than if it was designed from NZS1170 without monitoring strategy.
Please refer recommendations in structural report.

3. On page 18 of your calculations, it is mentioned that 'previous peg pull out tests' indicate that each peg can sustain significant portion of loads before the soil start to yield. Can you also please provide evidence of these tests and their results? I note that the results of the pull-out tests vary depending on the type(s) of site-specific soil. Therefore, the results from one site may not always be suitable for other sites.

The previous peg pull out tests are only for understanding the behaviour of the pegs. Site testing is recommended in our Recommendations to ensure pegs meet the expected performances at every site. Please refer Recommendations in structural report.

4. Wind forces are a critical consideration in the design, construction, erection and dismantling of temporary structures. Therefore, on-site risk management is a critical consideration in the use of temporary structures. We would like to know what evaluation/emergency/evacuation procedures Zirka has in place to respond to excessive wind speeds. Mention is given in the 'Recommendations' page that a wind anemometer will be used and monitored by the event manager but there is no further information on the accuracy/reliability of this equipment, operating personnel and procedures, etc.

Please refer updated Recommendations. We recommend an appointed site manager to carry out an "assembled structure" inspection every time after the marquee is erected. It is recommended in the inspection checklist that the anemometer instrument is to be checked to be in good working order by the appointed site manager, and all inspection report need to be filed to MBIE annually in a similar manner to that in which Building WOF documentation is filed with the Territorial Authority. It is however up to Zirka Circus and MBIE to decide the final assurance regime which forms part of the Multiproof conditions.

5. As Zirka Circus is mobile and travels around the country, we would also like to see maintenance procedures in making sure any components that are damaged or worn out are identified and replaced.

Please refer updated Recommendations. We recommend that the materials checked by an independent qualified personnel and the inspection report be field with MBIE annually.
Similar to item 4, this is to be confirmed by Zirka Circus and MBIE which forms part of the Multiproof conditions.

6. No material specifications are given for the membrane material (from previous numbering) On the material specifications query, can you please provide the elasticity modulus for the fabric material? This will help us get a handle on deflection limits.
Please refer testing certificates provided by the manufacturer in Appendix.

7. The displacement limits given in the design are completely arbitrary and seem to refer to the sagging of the material, and not the stretching of the material under design loads. There is no check for tearing of the membrane material at the positions of the cables either, which would probably be the critical check for the structure.
Please refer updated calculations. The displacements have been assessed based on the elastic modulus from the manufacturer's test certificates. The displacement of the fabric under ultimate limit state is found to be around 1.3m rather 1.0m initially assumed. The larger displacement actually reduce the fabric reactions to the marquee.

8. i) On geotechnical matters, from my observation, the test results were for Circus Aotearoa for 1m-long and 50mm-diameter pegs whereas you are designing for Zirka Circus using 1.4m-long and 45mm-diameter pegs. We would like to see test results on the actual pegs used in design.
ii) Your ULS calculations for each nail on page 18 may need to be revised as tension of 24.7kN is for one guy and each guy is resisted by 3 soil nails as opposed to 6. Therefore, each nail would have to resist twice of 4.1kN i.e. 24.7/3 = 8.2kN.
iii) How did you obtain SLS pull-out requirement of 2.9kN/nail at the last line of page 18?
iv) Are the soil nails installed at 90 degrees to the ground like shown in your 'recommendations' page? If not, what angles to the ground are they installed at?
v) To satisfy geotechnical aspects, MBIE recommends that a geotechnical professional is engaged to perform on-site tests (scala penetrometer tests or equivalent). These test results should be correlated to the type of soil(s) that the nails anchor to and would provide us with more confidence that the soil nails will work properly.

Please refer updated calculation. And similar to item 3, we recommended onsite peg pull-out tests to be carried out on each site. The proposed pull-out test is a more realistic representation of the actual load conditions than scale penetrometer tests or equivalent.

We recommended such test is supervised and documented by an appointed site manager and the test results to be filed with MBIE.

9. Can you please provide further details (thickness, dimensions, etc) on the antenna base of the king posts? I am referring to section F-F on page 23.
The base plate detail is on page 26. The base plate itself is 700x700x6mm thick steel plate.

10. Finally, there is a high degree of inconsistency in the calculations. Please clarify:
i) On page 16 of the calculations, in the 'Cables' section, it gives a force of 106kN for the d16 cable, and 49kN for the 2x d12 cables. Then, in the check for the guy peg (on page18) there is a distribution of a tension force (Horizontal component 20kN, vertical component -29kN) between one d12 and one d16 guy which we can't determine where it has been derived from.
ii) Again on page 16, in the 'Cables' section, we are not sure how the tension capacity of cables (148.5kN for d16; 85.5kN for 2xd12) have been obtained.
Please refer to updated calculation. Each guy peg is supporting two guys (1x12dia + 1x 16dia). The tension capacity is the ultimate capacity from the material specification x 0.9 strength reduction factor from NZS3404.

Regards

Benson Zhang
Design Engineer, MEngSt (Hons) BE

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P: 07 571 7070 | **F**: 07 571 7080
470 Otumoetai Road,
TAURANGA 3110.
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Consulting Professional Engineers

Safe Use and Operation of Marquees and Temporary Structures

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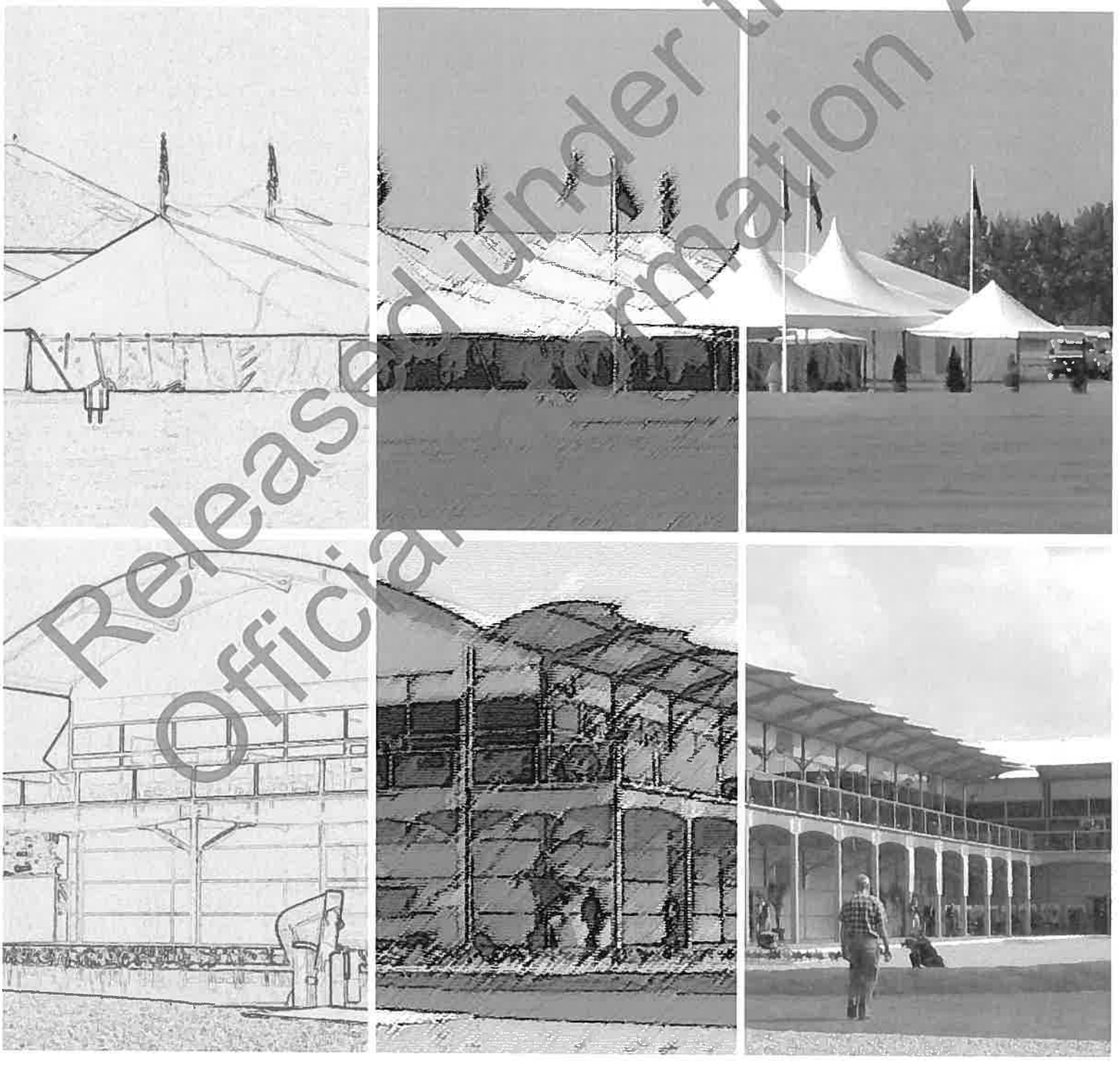


MUTAmarq

Accreditation Scheme
&
Best Practice Guide

This guide is designed for use by all involved in the procurement and provision of temporary structures for events; safety professionals and enforcement authorities; event organisers; occupiers and contractors.

It is a definitive guide published by the UK's foremost authority on the marquee industry.

This guide was last updated in June 2009.

MUTAmarq
is administered by

MUTA
Supporting Technical Fabrics since 1919

36 Broadway
London
SW1H 0BH
Tel: 0207 340 6265

Further copies of this guide can be obtained from the address above or by download from:
www.muta.org.uk
or
www.mutamarq.org.uk

"The Health and Safety Executive (HSE) commends the Performance Textiles Association in producing the MUTAmarq "Best Practice Guide for the Safe Use and Operation of Marquees and Temporary Structures". It is encouraging to see that those who manage and operate marquees and other textile covered framed structures are taking practical steps to identify and manage the real risks in this industry.

"This guide will be of benefit to any contractor or operator in this Industry and also to many event organisers and others involved in the procurement of temporary structures.

"The HSE commends these Guidelines and hopes that they will assist the Industry achieve their aims of continual improvement in standards of safety based on sensible assessment and management of risk. This is an important step for the Industry in ensuring that the safety standards they set are maintained and improved."

HSE Glasgow March 2008

Contents

1. STATEMENT BY THE HSE, STSU ENTERTAINMENT SECTION

"The Health and Safety executive (HSE) commends the Performance Textiles Association in producing the MUTAmarq "Best Practice Guide for the Safe Use and Operation of Marquees and Temporary Structures". It is encouraging to see that those who manage and operate marquees and other textile covered framed structures are taking practical steps to identify and manage the real risks in this industry. This guide will be of benefit to any contractor or operator in this Industry and also to many event organisers and others involved in the procurement of temporary structures. The HSE commends these Guidelines and hopes that they will assist the Industry achieve their aims of continual improvement in standards of safety based on sensible assessment and management of risk. This is an important step for the Industry in ensuring that the safety standards they set are maintained and improved." *March 2008*

2. WHO SHOULD USE THIS GUIDE?

Local Authorities, event organisers and venue owners should welcome this guide as a benchmark for the procurement of temporary structures. Selecting contractors that demonstrate competence by adherence to these guidelines will greatly improve safety before, during and after the event.

Contractors seeking a practical way to demonstrate their professionalism and competence should register under this scheme.

3. INTRODUCTION

MUTAmarq is an accreditation scheme run by MUTA, long recognised as the representative body of the industry

MUTAmarq recognises the duty that marquee contractors have to ensure that members of the public can have complete confidence in the safety of the products and services supplied by them. Those contractors accredited under MUTAmarq are subject to periodic inspections to ensure, not only the safety of finished installation, but also that of the crews during erection and dismantling thus helping clients to fulfil their obligations under health and safety legislation.

MUTAmarq provides guidelines for best practice in the use and operation of tents, marquees and ancillary equipment for the benefit of contractors and their customers.

MUTAmarq is the assessment centre for NVQ Events (Temporary Structures).

4. SCOPE

MUTAmarq covers all marquees and all textile-covered framed structures, whether of steel or aluminium, which are intended for public assembly, a place of work or like purposes. It does not cover camping tents, air-supported structures or grandstands.

Multi-storey structures are also within the scope of this code and are also subject to some special provisions detailed in Annex D.

MUTAmarq also deals with ancillary equipment supplied with a marquee or structure including flooring, furniture, interior linings, heating and lighting.

In general, the products and services supplied by contractors are provided on a short-term or temporary hire basis. Long-term (over 28 days) or semi-permanent installation may become subject to other codes or regulations outside the scope of this document.

MUTAmarq **does not** seek to establish the aesthetic standards of any installation. Cleanliness and appearance of fabrics, suitability of colours and quality of furnishings etc. are subject to commercial contract.

MUTAmarq **does not** accredit the business standards of contractors approved under the scheme.

Approved contractors may however also be members of MUTA which has a separate code of practice that covers this area.

5. RESPONSIBILITY

All parties have a duty of care to both the public and the crews working on site. This includes the venue owner/operator, the event organiser, the marquee contractor and other contractors working on the same site.

Prior to any event, the tent contractor shall ensure that areas of responsibility for health and safety are clearly defined: those of all parties in the contract chain including the tent contractor, sub-contractors and those of the client and organisers. These will normally be set out in the contract and should preferably be standardised. Sales staff should make clients aware of their safety responsibilities.

It is vital that all structures used by the public are so far as is reasonably practicable, safe, particularly in case of fire or adverse weather, and that procedures are in place to protect the public and staff in these circumstances.

6. PUBLIC SAFETY

6.1 Structural

6.1.1 Design

The design and suitability of a tented structure shall be proven either by long established use or, particularly for larger tents* and structures, by calculation verified by a qualified structural engineer. As a minimum, such calculations shall include the maximum wind loading for which the structure is approved and the maximum imposed load permissible.
* *Larger tents and marquees are pole marquees greater than 40ft in span and framed tents greater than 9m in span.*

Guidance contained in "Temporary demountable structures – Guidance on design, procurement and use", published by the Institute of Structural Engineers should be followed at all times. (Chapters 8.3 and 12).

6.1.2 Anchorage

6.1.2.1 Anchors are critical to the stability and safety of tents. The pull out force that an anchorage stake can withstand depends on the type of soil, the inclination of the anchor and the depth of the anchor.

6.1.2.2 Loose, non-cohesive soils provide the least resistance and may require special anchors. Where there is doubt as to the holding capacity of stakes sample pull tests should be carried out.

6.1.2.3 Where ground penetration is not possible, heavy weights can be used to withstand uplift forces.

Note: The weight requirement is often underestimated and can be several tonnes per anchorage point.
Integral wooden flooring will contribute to the anchorage by virtue of its weight, but it is very unlikely to meet the full load requirements as only the outer edge has any effect.

6.1.2.4 Anchorage should always be in accordance with the manufacturer's manual and be sufficient to resist the maximum uplift force expected.
Note: Every upright should be anchored. As an absolute minimum for an upright, is one stake not less than 450 mm long, 12 mm diameter (18"lg, 1/2" dia.).

6.1.2.5 Intermediate uprights must also be anchored, even if uplift forces are countered at the main anchor points, as lateral movement can destabilise the structure or cause injury.

6.1.2.6 All uprights should have a means to spread the load at the base to prevent sinking when erected on soft ground.

6.1.2.7 Stakes and ropes near exits or other walking routes should be fenced off or clearly marked to prevent members of the public from walking into or tripping over them. Responsibility for designating walking routes and erection of fencing will normally lie with the event organiser, but the marquee contractor should ensure that the organiser is aware of these safety issues. Purpose-designed stakes with defined heads and/or eyes for rope attachment are generally preferred since they do not need to project significantly above the surface. This provides superior anchorage as well as reducing the risk of tripping. Where necessary, consideration should be given to protecting the heads of any projecting stakes with a suitable padding. This clause generally applies to tents and structures that rely on guys for support.

6.1.3 Thorough Examination and Inspection

There shall be a two-part inspection. Firstly, a thorough annual inspection of all the component parts of the tented structure and, secondly, an inspection with report/checklist upon completion of EACH assembly by a competent person prior to handing over.

6.1.3.1 Thorough examination
It is generally accepted that the tent and marquee hire contracting industry is of a seasonal nature and that the off season is spent refurbishing, repairing, checking and renewing as necessary the hire stock. Particular attention is to be paid to the components that are critical to the structure of the tent. It is strongly recommended that records be kept of such inspections and of any repairs or maintenance carried out to critical components. See annex A.I.

6.1.3.2 Inspection
On initial erection and before the tented structure is signed off by the contractor and handed over to the client, it should be subjected to a thorough inspection prior to issue of a report which will incorporate a checklist carried out by the charge hand or foreman whose responsibility it was to erect the structure in the first place.

The charge hand or foreman or person acting in a supervisory capacity should have training in or be thoroughly familiar with the particular structure type and/or size. This competency should be evidenced by a MUTAmarq skills card or equivalent.
The initial erection checklist should be a document provided by the contractor and should have particular reference to the points tabled in Annex A.II
The checklist should be returned by the charge hand or foreman to his office and kept by the contractor for a period of not less than twelve months.

6.1.4 Stability

6.1.4.1 Roof and wall bracing are an integral part of most frame structures and must be fitted to any installation in accordance with the manufacturers instructions (normally at each end and, on larger structures, every 6th bay).

6.1.4.2 Marquee installations should be supplied so as to allow complete closure when not in use and when extreme weather conditions are expected.

6.1.4.3 Clients should be informed of the design wind load of the structure and given instructions to evacuate should this be in danger of being reached.

6.1.4.4 Roof panels should be sufficiently tensioned to avoid ponding.

6.1.4.5 In winter, where there is a danger of snow, clients should be advised of the need to heat the structure to prevent snow build-up endangering the structure's stability. This is a particular danger where adjacent structures form a valley.

6.1.4.6 On uneven ground the excessive use of packing is to be discouraged. Specialist platforms or scaffolding should be considered for variations in height of more than 0.75 metres.

6.1.4.7 Where tentage is erected on a scaffold grid or similar platform, the contractor shall ensure that as a minimum standard the grid or platform complies with BS EN 12811-1:2003 and BS 5975:1996. and that upon completion the supplier certifies in writing accordingly. It is for the marquee contractor to ensure the supplier of such structures receives all relevant design information in respect of the tentage to be so erected, e.g. design wind load, anchorage load, point load, occupancy level etc.

6.1.4.8 Continual reference should be made to weather forecasting services, particularly with regard to tents erected during the winter months and those erected on exposed sites. If tents cannot be protected or strengthened to withstand forecast wind speeds they should, wherever possible, be made safe by lowering or removing covers, to be reinstated when the danger has passed. In carrying out these measures, no member of the public or work crew should be put at risk, in particular it should be noted that once frame structure roofs are removed, purlins can become dislodged in high winds.

6.1.4.9 It is for the contractor to agree with the client at the outset what surveillance/maintenance (if any) will be necessary after the tented

structure has been handed over to the client. This determination shall be made on the basis of a risk assessment which takes into account all relevant factors including the use to which the structure is put, the weather conditions, time of year etc.

6.1.4.10 As a general rule the contractor shall provide the client with an out of hours emergency telephone number(s).

6.2 Fire & Emergency Exits

Note: This section is offered for guidance but does not absolve the client of the obligation to carry out a risk assessment as required by the Regulatory Reform (Fire Safety) Order 2005. (4.8 for relevant documents).

6.2.1 Fire retardancy of fabrics

6.2.1.1 New manufactured membranes and fabrics should be of inherently flame retarded fabric or durably flame retarded fabric when tested to BS 7837. Fabrics tested to BS 5438, tests 2A and 2B, with a 10 second flame application time in each case continue to be acceptable. (The method of test described in BS 7157 is also acceptable). Other sheet materials should be Class I surface spread of flame in accordance with BS 476: Part 7. Materials should be free of flaming molten droplet characteristics and should not readily support combustion. All membranes and fabric should be so labelled.

6.2.1.2 Further guidance on flammability of materials is given in Temporary Demountable Structures Chapter 12.

6.2.2 Exits

6.2.2.1 Exit calculations - relevant factors - see Annex C.

6.2.2.2 Tents intended to hold more than fifty persons should not have less than two exits.

6.2.2.3 Exits should be distributed as evenly as possible around the tent to provide genuine alternative routes from all parts of the tent.

6.2.2.4 The maximum distance of travel from any part of a tent to a final exit should not normally be more than 24 metres.

6.2.2.5 If the distance of travel includes a ramp or stairway, an additional 0.25 metres should be added to the distance of travel for every 1 metre of ramp or stairway.

6.2.2.6 All doors on an exit route should open outwards and, where exit doors have to be secured against intruders, they should be fitted with panic bolts or panic latches to comply with BS EN 1125 and BS EN 179. (Please note that BS 5725 is now obsolete but doors complying with this standard can still be used).

6.2.2.7 Where there are no doors, flap exits should be provided of a quick release design to comply with the appropriate rate of discharge, e.g. forty people in two minutes.

6.2.2.8 Any exits that are not intended for public use must be screened with baffles. Any such exit will not be taken into account in determining the number of exits as defined in Annex C.

6.2.2.9 Both emergency exit doors and flap exits should be provided with exit signs, conforming with BS 5499, *Fire Safety Signs, notices and Graphic Symbols*. Responsibility for provision of such signs is a matter for agreement between contractor and client.

6.2.2.10 It is recommended that all stages or platforms higher than 60cm and accessible to the general public shall be fitted with a handrail at least 1 metre high.

6.2.2.11 Entrance and exit ramps for the general public shall not have a gradient of more than 1 in 12 and shall be surfaced with a suitable non-slip material.

6.2.3 Fire Fighting Equipment

6.2.3.1 Responsibility for provision of fire fighting equipment is a matter for agreement between contractor and client. All places of entertainment should be equipped with means for fighting fire for use by tent occupants.

6.2.3.2 The advice of the local fire brigade should be sought in cases of doubt. Generally, however, the tented structure should be provided with water-based extinguishers of a minimum capacity of six litres. These should be visible, easily accessible and should be easily operated. One fire extinguisher should be positioned at each emergency exit. CO_2 extinguishers should also be provided where necessary to deal with electrical fires.

6.2.3.3 Where more than 250 occupants are anticipated, sufficient persons should be available who are trained and experienced in the duties of a fire warden. This should normally be the responsibility of the client.

6.3 Capacity & Public Access

6.3.1 Capacity

6.3.1.1 Generally, the internal layout (seating, gangways etc) is not within the remit of the tent suppliers. The contractor shall nevertheless advise clients or licensees to adopt the Guide to Fire Precautions in Existing Places of Entertainment and Like Premises, Chapter 13, clauses 6.8 to 7.7 as a guideline*. Where catering premises are involved, the client should be advised to consider the provisions of the Food Hygiene (General) Regulations 1970, as amended in 1990 and 1991, and the Food Safety Act 1990.
**Regulatory Reform Orders now place the onus on venue operators to carry out a fire risk assessment. Guides to fire risk assessment are available from the Department for Communities and Local Government. This guidance to some extent supersedes the previous document, however in many cases its guidance still provides for good practice.*

6.3.1.2 The occupant capacity is the permissible number of people occupying a tent or part of a tent and is an important factor in assessing the means of escape.

6.3.1.3 In areas where fixed seating is provided, the major part of occupant capacity is determined by amount of seating available. In other cases, however, the contractor should ensure that an assessment is made of the probable density of people within the occupant capacity. For technical requirements and calculations see Annex B.

6.4 Furniture

Where the contractor provides furniture, it shall comply with the following:

6.4.1 Upholstered seating should be capable of meeting ignition sources 0 and 1 of BS 5852: Part I and ignition source 5 of BS 5852: Part II.

6.4.2 Tables provided for food preparation should have hard and easily washable surfaces.

6.5 Lighting

Where the contractor provides lighting, it shall conform with the following:

6.5.1 All parts of the structure and approaches thereto which the public have access and all external exit ways should, if intended for use in the absence of daylight, be provided with normal lighting capable of providing sufficient illumination of those parts for the public to leave the structure safely.

6.5.2 Electrical installations should be installed, tested and maintained in accordance with the provisions of the IEE Regulations for Electrical Installations. Work on electrical installations and appliances, should only be carried out by competent personnel.

6.5.3 Where lighting is necessary, emergency lighting shall be provided on all main fire exit doors and such signs should be capable of operating independently of the central source of power.

6.5.4 For larger events, the emergency lighting must be extended to illuminate the escape routes. Again, this additional lighting must be capable of being powered independently of the central source of power (see BS 5266 *Emergency Lighting*).

6.6 Heating

Where the contractor provides heating, it shall conform to the following:

6.6.1 All means of heating other than electrical should be indirect type heaters, sited externally and ducted in by means of flame retardant hosing. Care must be taken to ensure that exhaust fumes from heaters are not allowed to enter the structure and are dispersed safely.

6.6.2 All heaters should conform to relevant national standards such as BS 799 for oil burning equipment.

6.6.3 Spare containers of LPG should be stored at least 6 metres from any structure, protected against unauthorised interference and accidental leakage and, where grouped, should be locked together.

6.7 Client Awareness

The contractor shall make the client aware of the following recommended safety factors to be considered by the client when choosing a site and operating a tented structure:

6.7.1 No dangerous or combustible or toxic gases or other allied product such as aerosols, explosives or pyrotechnics should be stored within a tented structure.

6.7.2 Very few tented structures have snow-load capacity and if snow is a possibility the structure must be heated in order to maintain a minimum temperature of 12ºC to prevent build-up of snow on the roof.

Valleys between tents and buildings or adjacent tents, can be a particular problem when snow builds up and clients should be made aware of the danger and the need to remove excess weight from these areas.

6.7.3 Persons other than the contractor's staff or those under his supervision shall not be admitted to a tented structure during erection or dismantle operations until it is deemed structurally complete and safe.

6.7.4 The area underneath stages, platforms etc. should not be used for storage.

6.7.5 Rubbish should not be allowed to accumulate underneath stages etc. Such areas should be inspected daily to ensure conformity.

6.7.6 Exit routes should be kept free from obstruction at all times.

6.7.7 When any person is in the tent, the exit doors should not be locked.

6.7.8 The client should be informed of maximum in service wind speed.

6.7.9 Continual reference should be made to weather forecasting services, particularly with regard to tents erected during the winter months and/or those erected on exposed sites. Contingency plans should be in place to evacuate tents when wind speeds approaching the maximum service gust speed are forecast.

6.7.10 The client is to be made aware that, once the structure has been handed over, it is essential that he/she make no modifications to the structure, in particular structural components (such as cross bracing) or the number and positioning of exits.

See Annex A.III for checklist for sales staff.

6.8 Regulations & Guidance

More comprehensive guidance can be found in the following publications:

6.8.1 Temporary Demountable Structures – Guidance on design, procurement and use, available from the Institute of Structural Engineers.

6.8.2 Fire Safety Risk Assessment – Small and Medium Places of Assembly, available from the Department for Communities and Local Government.

6.8.3 Fire Safety Risk Assessment – Outdoor Events, available from the Department for Communities and Local Government.

7. SITE SAFETY

7.1 Competency/Licences

7.1.1 Crew foremen and/or gang leaders and those responsible for the supervision on site will have demonstrated their competency for the job in hand, either by long service and experience, or by having achieved a relevant qualification. Such competency should be evidenced with a MUTAmarq skills card. (See annex E).

7.1.2 As a minimum, all members of the crew shall have undergone basic induction in on-site health and safety, detailing their duty of care to themselves and others.

7.1.3 Operation of any mechanical equipment, including road vehicles, forklift trucks and access equipment, must only be carried out by those who are able to show appropriate licenses or evidence of training, usually by means of their MUTAmarq skills card.

7.1.4 At least one member of each crew will have undergone suitable first aid training and carry documentation as proof of qualification (can be noted on MUTAmarq skills card).

7.2 Personal Protection Equipment

7.2.1 All crews shall have sufficient and appropriate personal protection equipment available for use when necessary.

7.2.1.1 Protective footwear should be worn at all times.

7.2.1.2 Hard hats should be worn when:

7.2.1.2.1 Overhead work is being carried out (includes adjacent sites).

7.2.1.2.2 Wind could dislodge overhead components prior to them being secured (eg: purlins before roof sheets are fitted).

7.2.1.3 High visibility Jackets should be worn when:

7.2.1.3.1 There is a risk of vehicle movement on site.

7.2.1.3.2 There is mechanical or manual handling of large components in progress on the site or adjacent sites (includes work inside the structure).

7.2.1.4 Gloves when appropriate.

7.2.1.5 Goggles when appropriate.

7.2.1.6 Ear defenders when appropriate.

7.2.1.7 Sun screen when appropriate.

7.3 Services

7.3.1 The location of any underground services must be identified and clearly marked before any ground penetration operation.
If any doubt exists then the advice of the appropriate service company must be sought.

It may be necessary to perform an underground scan of the site area where penetration is planned. If the contractor carries out this scan then he should be permitted to charge an appropriate fee.

7.3.2 Overhead power lines provide a particular threat. When carrying out work on site it should be remembered that electricity is capable of arcing from high voltage power lines. **Wherever possible working within 6 metres of such cables should be avoided.**

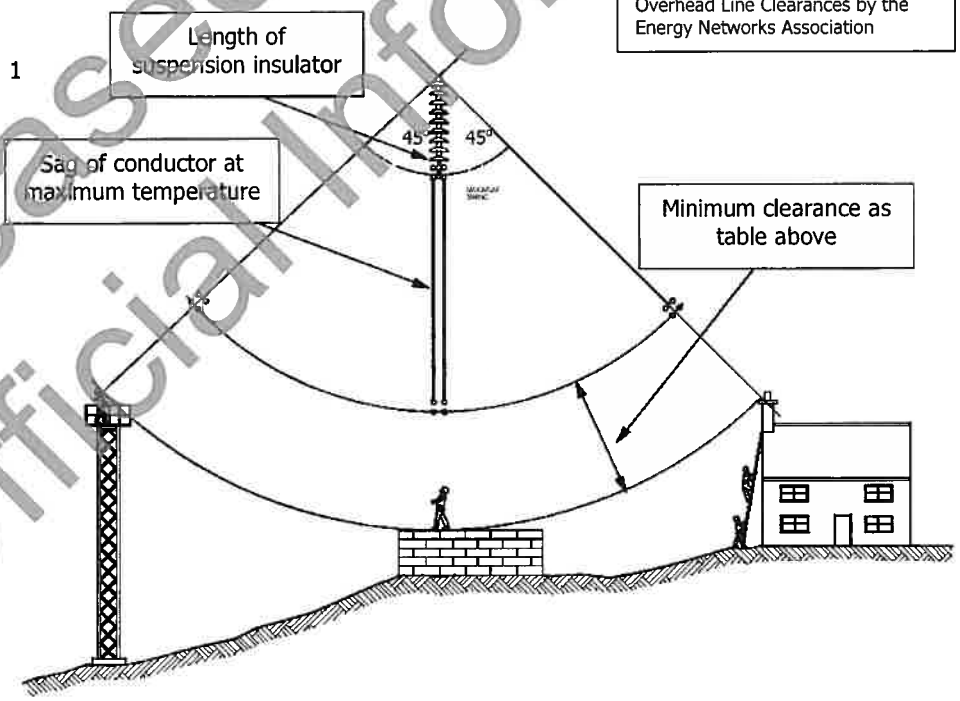
7.3.3 If for operational purposes it is not possible to comply with 7.3.2 then:

7.3.3.1 The absolute minimum clearances that shall be maintained between an overhead line conductor and any part of the tent installation are shown in the table below (see also fig. 1). They allow for a person to stand on or against the structure **but only allow for the free movement of short hand held objects or tools**

Normal System Voltage (kV)	**Up to 33**	**66**	**132**	**275**	**400**
Minimum Clearance (metres)	3.0	3.2	3.6	4.6	5.3

Table and sketch reproduced from Technical specification 43-8 Issue3 Overhead Line Clearances by the Energy Networks Association

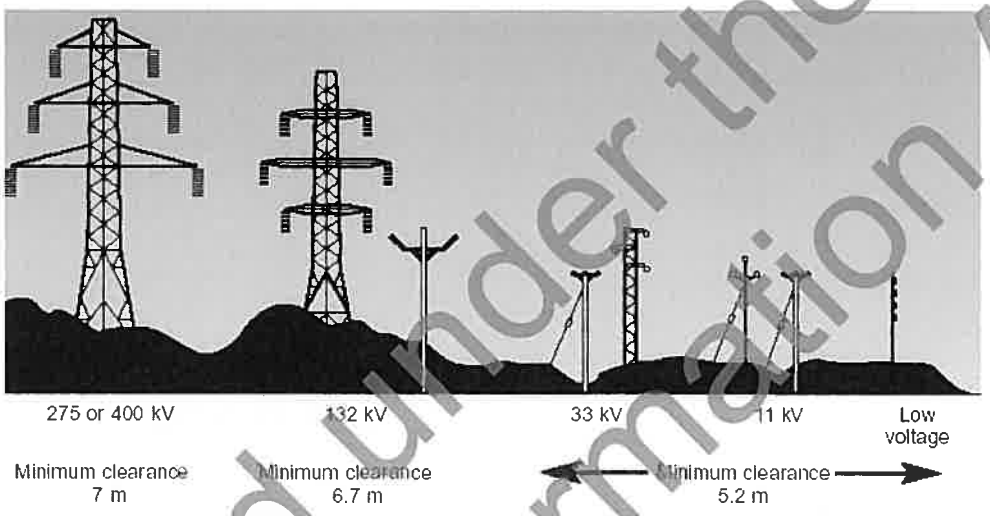
Fig 1



To help determine the height of power lines the publication "Shock Horror" (see below) contains the following information:

"There is a minimum distance (clearance) between the power line (or cable) and the ground. The height of the cable varies according to the voltage carried – generally, the higher the voltage, the higher the power line. Figure 2 shows the types of support, voltage and clearance."

Fig 2.



7.3.3.2 Utmost care must be taken particularly with the use of power plant (forklifts, platforms etc.) and other access equipment.

7.3.3.3 In some cases it will be necessary to contact the power line owner to request shrouding of the line.

Guidance contained in the following publications is helpful:

- HSE Guidance Note GS 6 (Third edition).
- "Shock Horror – Safe working near overhead power lines in agriculture" (available as a download from the HSE web site).
- Technical specification 43-8 Issue3 Overhead Line Clearances – Published by the Energy Networks Association.

7.4 Welfare

7.4.1 As a minimum, crews must have access to toilet and hand washing facilities. Responsibility for such welfare provision will be determined in the contract. (Normally provided by the client or venue owner).

7.5 Documentation

7.5.1 Crews should have available for inspection copies of:

7.5.1.1 Site supervisor's skills card.

7.5.1.2 The contractors health and safety policy.

7.5.1.3 Method statements for all work planned on the site.

7.5.1.4 Generic risk assessment(s).

7.5.1.5 Any necessary site specific risk assessment.

7.5.2 In addition, when required to do so by the client or site authorities, contractors must be able to produce evidence of:

7.5.2.1 Public liability insurance.

7.5.2.2 MUTAmarq accreditation.

7.6 Client Awareness

7.6.1 Contractors should ensure that clients are aware of their responsibility to provide a safe working environment for contractors and their crews. This includes:

7.6.1.1 Warning of known overhead/underground services.

7.6.1.2 Warning of any other risk or hazard identified by the client's own risk assessment.

7.6.1.3 Ensuring that any other contractors working on the same or adjacent sites are competent and working safely.

8. REPORTING OF INCIDENTS

8.1 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)

8.1.1 Contractors and clients are reminded of their responsibilities to report injuries and dangerous occurrences. The Regulations define even minor injuries as reportable when they result in more than three days incapacity for their normal work; dangerous occurrences are listed in a schedule to the Regulations.

8.2 Requirement to report incidents to MUTAmarq administration

8.2.1 Accredited contractors shall report to MUTAmarq, on the prescribed form, any incident involving:

- a tent operated or supplied by them;
- components of such a tent or accessories (such as flooring, lighting, furniture etc) supplied by them;
- a member of their crew or any bystanders during erection or dismantling of such a tent;

where such an incident gives rise to a duty to report under RIDDOR. This requirement is in addition to the requirements of RIDDOR and applies whether or not the duty to report under RIDDOR falls to the member concerned. (For example, a tripping incident involving a marquee contractor's flooring would be reportable to MUTA notwithstanding that the employer of the injured party had separately made a formal report as required by RIDDOR).

8.2.2 In addition, any incident involving the unintentional collapse of a tent or a component thereof shall be reported to MUTAmarq by the accredited contractor wherever they sit in the supply chain.

Note: It is accepted that any such report to MUTAmarq is made without prejudice to the contractor's position in any proceedings. The purpose of the report is not to assign blame, but to alert MUTAmarq to the fact that an incident has occurred so that information on how to prevent similar incidents can be shared with all contractors.

9. COMPLIANCE

9.1 Inspection

In advance of the season commencing, accredited contractors shall furnish MUTA with six venues and dates where their completed work can be viewed to enable verification of compliance to this code. This is a minimum requirement. The administration may require additional venues and dates for scheduling purposes.

9.1.1 Inspection
There are two types of inspection to be carried out by experienced inspectors, appointed by the MUTAmarq administration at randomly selected installations/sites.

9.1.1.1 Public safety inspection will generally follow the completed structure checklist (see annex A II). Action and reporting as 9.1.1.3 below:

For each applicable item:

A - Pass – No action.

B - Pass with comment – Written comment, via report, to the contractor requesting future improvement.

C - Marginal fail – Written comment to contractor demanding future improvement – May occasion further inspection.

D - Fail – Urgent contact with the contractor to request immediate remedy – Occasions second inspection paid for by the contractor.

In addition the inspector has the discretion to add/deduct percentage points for overall presentation, items not covered by the checklist and co-operation of site staff if applicable.

9.1.1.2 Site Health & Safety inspection will generally cover the following aspects. Action and reporting as 9.1.1.3:

Personal Protection Equipment
First Aid
Supervision
Manual handling
Licences and competencies
Tools
Services
Working at height
Housekeeping
Welfare
Documentation

In addition the inspector has the discretion to add/deduct percentage points for overall conduct, items not covered by the checklist and co-operation of site staff if applicable.

9.1.1.3 Actions and Reporting by Inspectorate

	Public Safety	Site Safety HSE Equivalent	Action	Deduct per Item/Group
A	Pass	Compliance	None	
B	Pass with Comment	Bad Practice	Written comment, via report, to the contractor requesting future improvement	5%
C	Fail with Comment	Improvement Notice	Written comment to contractor demanding future improvement – May occasion further inspection.	10%
D	Fail	Prohibition Order	Urgent contact with the contractor to request immediate remedy – Occasions second inspection paid for by the contractor	50%

9.2 Non compliance – actions

9.2.1 A points system will operate as follows:

9.2.1.1 An overall score for any one inspection visit of 80% or less – 1 point.

9.2.1.2 An overall score for any one inspection visit of 60% or less – 2 points.

9.2.1.3 Failure to comply with the inspector's instructions in regard to immediate remedial action will attract a further 2 points.

9.2.1.4 Points expire after six further inspection visits, or two years, whichever is the sooner.

9.2.2 Accumulation of 4 points will result in withdrawal of accreditation.

9.2.3 Once accreditation is withdrawn, a contractor may only reapply once it has satisfied the administration that the issues causing loss of accreditation have been addressed and cured. This may require further inspection(s) at the contractor's expense.

9.2.4 Appeals

9.2.4.1 Appeals against the decisions of inspectors can be made to the Executive Committee of the Marquee Section of MUTA whose ruling will be final and binding.

9.2.4.2 Any member of the executive with a conflicting interest will be excluded from the panel hearing appeals.

10. EVIDENCE OF ACCREDITATION

10.1 Accredited contractors will be given an annual certificate, valid for 12 months beginning in March each year.

10.2 Accredited contractors will be listed on the MUTAmarq web site.

10.3 Accredited contractors will be updated regularly as regards their accumulated points status.

10.4 Accredited contractors will be encouraged to display the MUTAmarq logo.

11. ADMINISTRATION

11.1 The scheme will be administered by the management of MUTA, answerable to the executive committee of the marquee section of the association.

12. ELIGIBILITY

Mutamarq accreditation is available to any bona fide company whose main activity is the hire of marquees or temporary structures as defined in the scope (Section 4)

12.1 Accredited Contractors shall:

12.1.1 Sign an annual declaration to carry out all work in accordance with this code, issued regulations and guidelines

12.1.2 Satisfy the administration that they are a bona fide organisation;

12.1.3 Submit to an initial inspection (to be charged at the published rate).

12.1.4 Agree to periodic and random inspections of premises and systems

12.1.5 Agree to periodic and random inspections of finished installations

12.1.6 Agree to periodic and random inspections of the conduct of crews on site in respect of health and safety.

12.1.7 Maintain adequate Public Liability insurance and to provide evidence of same to the administration if requested.

12.1.8 Agree to the disciplinary procedures detailed in section 9.2.

12.1.9 Pay the appropriate annual fee.

12.2 Membership of the Marquee Section of MUTA has similar criteria as listed in 12.1 and therefore automatically confers accreditation.

12.1.1 PTA members failing to maintain accreditation will automatically forfeit membership of the association.

ANNEX A

A.I. **Annual check on equipment**

Note: These checks should be undertaken as a minimum. Additional checks may be required by the equipment manufacturer's recommendation. The results should be recorded in a permanent form.

A.I.i. Woodwork shall be structurally sound - splits or major cracks to be bound, clamped or filled and a suitable stress graded test should be initiated and failures discarded accordingly.

A.I.ii. All ropes shall be checked for fraying and anything with over 20% fraying shall be discarded.

A.I.iii. All roof and wall covers shall be checked for tears and repaired in accordance with the manufacturer's recommendations.

A.I.iv. All repairs to load bearing structural members shall be according to manufacturer's instructions or certified by a qualified structural engineer.

A.I.v. All wire rope shall be checked for fraying and thimble loop integrity.

A.I.vi. All purlins shall be checked to ensure that they are straight.

A.I.vii. All brackets shall be checked to ensure that they are sound and secure.

A.I.viii. All riveted connections shall be checked for soundness.

A.I.ix. All non-galvanised steel shall be checked for sign of corrosion.

A.I.x. All welds shall be checked for cracks.

A.I.xi. All extruded sections shall be checked for kinking or bowing.

A.I.xii. Safety wires on all ridge poles shall be checked for soundness and secure fixing.

A.II. **Recommended minimum checklist for assembled structures**

A.II.i. Anchorages are suitable for the purpose and are holding fast.

A.II.ii. Bracing wires on roof and walls are in place and adequately tensioned.

A.II.iii. All ropes, including wire ropes, are sound.

A.II.iv. Fabric is tensioned and not prone to ponding.

A.II.v. Emergency exits are in place, operating correctly and are without obstruction.

A.II.vi. Escape routes are clear of obstruction.

A.II.vii. Exposed ropes and stakes adjacent to exits and entrances are marked or roped off.

A.II.viii. All locking pins and bolts are in place and secure.

A.II.ix. All structural supports are sound.

A.II.x. Eaves connection joints are securely locked home.

A.II.xi. No unrepaired tears in fabric are present.

A.II.xii. Flooring is evenly laid and there are no tripping points.

A.II.xiii. Carpet and other floor covering is securely fixed so as to minimise the risk of tripping.

A.II.xiv. Roof lining does not drop significantly below eaves.

A.II.xv. All timber uprights and ridges are free from splits that are likely to cause failure

A.II.xvi. Walls are securely pegged and/or secured

A.II.xvii. Any pole tent has its full complement of side uprights, anchor stakes, pulley blocks and guy ropes.

A.II.xviii. The main upright is independently guyed.

A.II.xix. Finally, an all-round visual check to satisfy that the tented structure is erected securely.

A.II.xx. Any other observations.

A.III. **Recommended minimum checklist for sales staff (client awareness)**

A.III.i. Access and egress for the public including disabled, emergency vehicles and equipment. Stakes and ropes can present a tripping hazard and members of the public and staff should as far as possible be kept away from areas where such dangers are present; the use of fences or other barriers is recommended. Where this cannot be achieved, the contractor can protect stake heads with padding (see below).

A.III.ii. The proximity of surrounding buildings and vegetation and other fire risks in relation to the spread of fire.

A.III.iii. The need for a telephone (to call emergency services).

A.III.iv. Availability of mains services.

A.III.v. The slope or unevenness of the ground.

A.III.vi. Client must notify contractor of the position of underground services or overhead cables, which may present hazards during the build-up or use of the tent.

A.III.vii. If underground services or overhead cables cross sites where tents are to be erected, the client shall first obtain appropriate advice from the service company concerned.

A.III.viii. For larger events, it is recommended that an outline site plan of all structures should be prepared by the client showing the position of all entrances and exits, generator equipment, vehicles etc. It should be kept up to date on the site and be readily available for inspection. The plan should be agreed by the licensing authority, following consultation with the fire authority, having regard to occupancy, use, position and other factors relevant to safety. It should not be altered without reference to the licensing authority. The tent supplier should be furnished with the latest copies of such a plan.

A.III.ix. The site should be arranged so as to allow for adequate means of access by fire fighting appliances to within 50 metres of any part of the structure. Access routes should be not less than 4 metres wide, should have no overhead structure or cable less than 4.5 metres above the ground and should be capable of taking the weight (about 12.5 tonnes) of fire fighting appliances in all weathers. Emergency vehicle routes within the site should be kept clear of obstruction at all times.

A.III.x. Access to hydrants and other water supplies should not be obstructed or obscured.

A.III.xi. There must be at least 6 metres between tent establishments.

Note: Parts of this annex are reproduced, with minor amendments, from the Home Office "Guide to Fire Precautions in Places of Entertainment and Like Premises" with the permission of the Controller of Her Majesty's Stationery Office.

ANNEX B

Occupancy

If the maximum use is to be made of a building, the available exits should be of sufficient number and width to permit safe evacuation of the calculated occupant capacity. Where existing exits are not sufficient, there are two courses of action open to occupiers or to the enforcing authorities. The most satisfactory arrangement is the provision of additional exit capacity by means of either more or wider exits. The other course is to limit the number of people admitted to the tented structure to that which the exits can serve, provided that the number of persons can be controlled to prevent overcrowding. Regard should also be given to the needs of disabled persons.

The calculated occupant capacity of the premises, or any part thereof, should be determined:

a. in areas where fixed seating is provided

i) if individual seats, by the number of such seats, and
ii) if bench seats or similar continuous seating, by dividing the total width of such seating by 450 mm;

and

b. in other areas (including standing areas occupied together with fixed seating) by dividing the floor area in metres squared by the relevant occupant load factor given in the table below. Toilets, stairways enclosures and similar areas are excluded; and

c. in the case of other room or floor not covered in the table below, by the number of persons the room or floor is designed to hold.

The occupant load factor should not normally exceed the factors set in the table below:

Occupant load factors -

Use of room or floor	**Occupant load factor** (m^2 per person)
Area for standing	0.3
Amusement arcade, assembly hall, bingo hall, club concourse, crush hall, dance hall, venue for pop concert and like occasion, queuing area.	0.5
Bar	*0.3 to 0.5
Bowling alley, billiard room	9.3
Conference room, dining room, restaurant	*1.0 to 1.5
Studio (radio, film, television, recording)	1.4
Common room i.e. a lounge, reading room, staff room, waiting room	1.0

* depending upon the amount of seating and tables provided

Where premises have a multi-purpose use then the occupant load factor should be the one for the most onerous of the uses.

ANNEX C

Exits

Note: This annex is reproduced, with minor amendments, from the Home Office "Guide to Fire Precautions in Places of Entertainment and Like Premises" with the permission of the Controller of Her Majesty's Stationery Office.

Annex C.1 Occupancy calculations - relevant factors

One unit of exit width	525 mm
Rate of discharge per minute through one unit	40 persons
Maximum permissible calculated evacuation time - Class C buildings	2 minutes
Occupant load factor	see table in annex B
Floor area in metres^2	
Number of persons = floor area in metres^2 ÷ occupant load factor	

With these factors it is possible to calculate the number of units of exit width and subsequently the number and width of exits required for a given number of persons:-

Number of units of exit width	Number of exits
U = N ÷(40 x T) Where: N = Number of persons T = Time factor in minutes (2 for marquees) U = Number of units required	E = (U ÷ 4) + 1 Where: E = Number of exits or stairs required
Where a decimal of 0.3 or over results, the next whole number is used.	Where a decimal of 0.75 or over results, the next whole number is used

Note: It is assumed that one exit will not be available for an evacuation.

Annex C.2 Occupancy calculation - example

Note: This example demonstrates the use of rounding up (or down) as the case may be; it also brings into use the variable occupant load factors for bar areas where seating is provided.

Question: What are the exit requirements for a tent (class C building) used as a dance hall?

The dance floor area is 420m^2
The bar area is 60m^2 of which 30m^2 has tables and chairs

To arrive at the answer you need to complete the following three calculations:

1. Work out the number of people that the floor area will accommodate:

a) The dance floor will accommodate 420 ÷ 0.5 = 840 persons
b) The bar will accommodate: 60 ÷ 0.4 = 150 persons

Total occupancy = 990 persons

II. Work out number of units (U) of exit width required

The number of units (U) of exit width is calculated as follows:

U = N ÷ (40 x T) = 990 ÷ (40 x 2) = 12.375 units

Note: As 0.375 units attracts the rounding up rule, the total is rounded up

Total units of exit width = 13

III. Work out number of exits required

The number of exits (E) required is calculated as follows:

E = (U ÷ 4) + 1 = (13 ÷ 4) + 1 = 4.25 exits

Note: As 0.25 is less than 0.75, it does not attract the rounding up rule

Total number of exits required therefore = 4

Answer: A minimum of 4 exits comprising not less than 13 units of exit width

Note: This may be achieved by having 3 exits of 3 units each and 1 exit of 4 units OR 2 exits of 4 units each plus 1 exit of 3 units and 1 exit of 2 units

ANNEX D

Special Provisions for Multi-Storey Structures

Working at Height: guidance on the safe erection, fitting out and dismantling of double deck structures.

Legislation

The UK's Work at Height Regulations 2005 implement the European Temporary Work at Height Directive. They require those with responsibility for work at height to ensure that:

The Regulations Hierarchy

1. **Work at height is avoided where possible;**

2. **Where work at height cannot be avoided, work equipment or other measures are used to prevent falls;**

3. **Where the risk of a fall cannot be eliminated, work equipment or other measures are used to minimise the distance or consequences of a fall.**

(The actual regulations are available as a free download from http://www.opsi.gov.uk - follow the links to "statutory instruments" 2005 no. 735)

The responsibilities of duty holders include ensuring that:

a) All work at height is properly planned and organised;

b) All work at height takes account of weather conditions that could endanger safety;

c) Those involved in work at height are trained and competent;

d) The place where work at height is done is safe;

e) Equipment for work at height is appropriately inspected;

f) The risks from fragile surfaces are properly controlled; and

g) The risks from falling objects are properly controlled.

Solutions

Planning

(Regulations 4, 6 (1) & 6(2))

Design and selection of equipment

You must avoid work at height whenever possible; is it safe and reasonably practicable to carry out some of the work in other ways? It may be considered reasonable for you to make some modifications to the equipment or to the method of work in order to achieve this. This should include looking at future designs to see whether the need to work at height can be designed out but also reviewing existing equipment to see where design modifications can be made to reduce the need to work at height.

Project planning

For every project a risk assessment needs to be conducted. A site survey is an integral part of this process. The survey must include site-specific conditions such as vehicle access, ground conditions (including underground features) and overhead hazards such as power lines, trees etc. Specific method statements are generally produced by adapting a standard template.

The correct selection of equipment for the specific site conditions is a vital part of project planning.

Where a structure is erected on a scaffold, where practicable, the scaffold should be boarded out by the scaffold contractor before work on the structure itself begins; where this is not reasonably practicable collective fall arrest measures such as safety nets may be employed.

Liaison with client and other contractors requiring access to the structure should be established to ensure that responsibilities for safety are understood and acted upon.

Emergency planning

The Regulations require you to have a plan for emergencies and rescue. Effort should be in proportion to the risk and should cover reasonably foreseeable situations such as a user stranded in equipment (eg MEWPS and deployed fall arrest equipment). You need a plan in place to deal with these situations and workers should be trained in the procedures together with any rescue equipment which may need to be used. It will not generally be sufficient to rely on the Fire and Rescue Service.

Weather

(Regulation 4(3))

It is an absolute duty to ensure that work is postponed if weather conditions endanger safety. If weather conditions pose a threat to health and safety, stop work (eg risk of being blown off or slipping due to ice). On the other hand, exposure to rain and cold can be dealt with by personal protection equipment.

Training

(Regulations 5 & 6(5)(b))

You must ensure that everyone involved in the work is competent; or, if they are undergoing training, are supervised by a competent person. Although a competent person is not defined in these regulations, it is generally accepted that a competent person is a person who can demonstrate that they have sufficient professional or technical training, knowledge, actual experience and authority to enable them to carry out their assigned duties at the level of responsibility allocated to them. In the case of foremen and site supervisors this may be evidenced by a MUTAmarq skill card.

Where other precautions do not entirely eliminate the risk of a fall, you must (as far as is reasonably practicable) train staff how to avoid falling and how to minimise injury in the event of a fall.

The place where work is done

(Regulations 6 (4), 6(5), 7, 8 and 12)

Where it is essential for work to be carried out at height, both the access to the work position and the position itself must, so far as is reasonably practicable, be safe and have features to prevent a fall.

If the position in which work at height is done lacks inherent safety features to prevent falls (see above), it will be necessary to provide sufficient suitable equipment to prevent a fall, or, to the extent that this is not reasonably practicable, to minimise the distance and consequences of a fall. You are required to use the most suitable equipment and to give priority to collective measures (such as safety nets) over personal protection (such as fall arrest harnesses) – but note that this priority is only where the measures being compared are in the same level of the Regulations Hierarchy.

There are specific requirements in the Regulations for particular types of equipment:

Schedule	Part	Equipment
1		Existing places of work and means of access
2		Guard rails, barriers etc.
3	1	Working platforms
3	2	Additional requirements for scaffolding
4		Collective fall arresting equipment, eg: nets and airbags
5	1	Personal fall protection equipment
5	2	Additional requirements for work positioning systems
5	3	Additional requirements for rope access and positioning techniques
5	4	Additional requirements for fall arrest systems
5	5	Additional requirements for work restraint systems
6		Requirements for ladders

You should consider whether it is reasonably practicable to provide equipment such as guard rails or barriers to prevent falls at each stage of the work, if necessary by modifying the structure itself or the method of work.

Equipment which has been successfully used in the industry to minimise the distance and consequences of a fall includes fall arrest harnesses and fall bags. Fall arrest harnesses, of course, require suitable attachment points (see also schedule 5 part 4 of the regulations) and providing for these may not be reasonably practicable in every case; in others, there may be a requirement for modification of the structure or of the method of work.

Whatever methods are adopted, it is important to take all reasonably practicable measures so that the necessary equipment is not removed or dismantled (for example to allow access by other contractors) until it is safe to do so. At the point of hand-over, you should communicate effectively with the client the importance of not tampering with the structure. A handover pack has been found to be a practicable method of achieving this.

Inspection

(Regulations 12 & 13)

You must ensure that both the place where work is done (see schedule 1) and any safety equipment provided (covered by schedules 2-6) is inspected at suitable intervals. You should additionally inspect the structure in the event of adverse weather conditions.

You must ensure, before using any equipment which has come from another business, and before any equipment leaves your business, that it is accompanied by a visible indication that the last inspection has been carried out.

Fragile surfaces

(Regulation 9)

You must ensure that no one working under your control goes onto or near a fragile surface (such as asbestos cement or plastic skylights) unless this is the only reasonably practicable way for the work to be carried out safely. If anyone does work on or near a fragile surface you must, so far as is reasonably practicable, provide suitable equipment to minimise the risk of a fall, and, if any risk remains, to minimise the distance and consequences of a fall.

Roof panels of PVC coated polyester in good condition are not generally considered to be fragile within the meaning of this clause.

Falling objects

(Regulations 10 & 11)

Where it is necessary to prevent injury, you must do all that is reasonably practicable to prevent anything falling. You must prevent anything being thrown or tipped from height if it is likely to cause injury and you must prevent anything being stored in such a way that its movement is likely to injure anyone.

Any areas of the site where there is a danger of injury from falling objects or persons must be clearly marked and, so far as is reasonably practicable, unauthorised access must be prevented.

ANNEX E

MUTAmarq Skills Card

MUTAmarq makes a distinction between "Supervisors" and "Foremen" in that a Supervisor would be someone who not only can run a crew and oversee the erection of tents, but can also have input into the planning of jobs and can train junior staff.

- Supervisors with NVQ Events (Temporary Structures) Level 3 automatically qualify. (Colour Code: Gold)
  This card is valid for 5 years and can be renewed at that time on evidence of a current H & S qualification taken in the previous 2 years.

- Those with experience only can qualify through accreditation by their employer, but this option will only be available until the end of 2009, after that time the only route will be by a formal qualification. This includes those currently registered as candidates for the NVQ.

Employers can accredit staff as either supervisors or foremen as appropriate. Those accredited as supervisors will receive a gold card, foremen a silver card.

This card is valid for 5 years and can be renewed at that time on evidence of a current H & S qualification taken in the previous 2 years.

On passing their NVQ, candidates can upgrade their card on payment of the appropriate fee.

Card Details

The front of the card carries:

- Photo ID
- Foreman's Name
- Employer Company Name
- Colour Coded strip
- Code for Competencies:
  - Up to 16m Frame
  - Up to 26m Frame
  - Over 26m Frame
  - Multi-storey
  - Up to 50ft Pole
  - Over 50ft Pole
- Code for Licenses
  - Fork Lift
  - Telescopic
  - Three Wheel Fork
  - Cherry Picker
  - Scissor Lift
  - Etc.
- Expiry date
- MUTAmarq Logo
- ID Number

The rear of the card carries:

- Return address (the association)
- Criteria for renewal
- Key to Competencies
- Key to Licenses

Note:

The holder of a MUTAmarq skills card, gained via the Level 3 Events (Temporary Structures) NVQ or via 'grandfather rights' will be deemed to be competent within the meaning of section 12.4.1 of the Institute of Structural Engineers' publication 'Temporary Demountable Structures - Guidance on procurement, design and use'.

ANNEX F

Reference

Annex F.1 Reference documents of particular interest to marquee hirers

MUTA Marquee Fire Safety Certification Scheme
(The above publication is available from MUTA)

MUTA Marquee Study (Buro Happold Report No 2611/01)
(The above publication is available to MUTA members from the association administration)

"A Guide to the Basics of Risk Assessment", prepared for MUTA by the Symonds Group Ltd
(The above publication is available to MUTA members from the association web site)

"Temporary demountable structures – Guidance on design, procurement and use" published by the Institute of Structural Engineers (Chapters 8.3 and 12 are of particular interest)

The Home Office "Guide to Fire Precautions in places of Entertainment and Like Premises" (ISBN 0-11-340907-9) as amended by circular DCOL 14/1995

Guide to Health Safety and welfare at Pop Concerts and Other Similar Events (ISBN 0-11-341072-7)

(The above publications are available from HMSO bookshops and Accredited Agents)

Memorandum of guidance on the Electricity at Work Regulations 1989 (ISBN 0-11-883963-2)

Guidance Note GS 50 from the Health & Safety Executive - Electrical Safety at Places of Entertainment (ISBN 0-11-885598-0)

(The above publications are available from HSE Books. PO Box 1999, Sudbury, Suffolk, CO10 6FS)

The current Institute of Electrical Engineers Regulations for Electrical Installations

(Obtainable from the Institute of Electrical Engineers, PO Box 26, Hitchin, Herts, SG5 1SA)

Annex F.2 British Standards of particular interest to marquee hirers

BS 1006: 1990 Methods of test for colour fastness of textiles and leather

BS 2052: 1989 Ropes made from manila, sisal, hemp, cotton and coir

BS 2087: Preservative treatments for textiles

BS 2087: Part 1: 1992 Specification for treatment
BS 2087: 2: 1992 Methods of test

BS 2576: 1986 Method for determination of breaking strength and elongation (strip method) of woven fabrics

BS 3084: 1992 Specification for slide fasteners

BS 3102: 1959 (1991) Specification for brass eyelets and washers for general purposes

BS 3424: Testing coated fabrics

BS 4344: 1968 Pulley blocks for use with natural and synthetic fibre ropes

BS 4736: 1985 (1991) Method for determination of dimensional changes of fabric induced by cold water immersion.

BS 4790: 1987 Specification for determination of the effects of a small source of ignition on textile floor coverings (hot metal nut method)

BS 4881: 1993 Specification for polypropylene film cords, lines and wires

BS 5053: 1985 Methods of test for cordage and webbing slings and for fibre cores for wire ropes

BS 5266: Part 1: 1988 Code of Practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment

BS 5287: 1988 Specification for assessment and labelling of textile floor coverings tested to BS 4790

BS 5438: 1976 Methods of test for flammability of vertically oriented textile fabrics and fabric assemblies subjected to a small igniting flame *Replaced by BS 5438: 1989 but remains current pending changes in legislation*

BS 5438: 1989 Methods of test for flammability textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens *Replaced by BS 5438: 1976 which remains current while legislation referring to it is revised*

BS 5651: 1978 Cleansing and wetting procedures for use in the assessment of the effect of cleansing and wetting on the flammability of textile fabrics and fabric assemblies *Replaced by BS 5651: 1989 but remains current while legislation referring to it is revised*

BS 5651: 1989 Method for cleansing and wetting procedures for use in the assessment of the effect of cleansing and wetting on the flammability of textile fabrics and fabric assemblies *Will replace BS 5651: 1978 when the Nightwear (Safety) Regulations (1985) and the Furniture and Furnishings (Fire Safety) Regulations 1988 are revised.*

BS 5867: - Specification for curtains and drapes

BS 5867: Part 1: 1980 General requirements+
BS 5867: Part 2: 1980 Flammability requirements

BS 6085: 1982 (1992) Methods of test for determination of the effects of a small source of ignition on textile floor coverings (methenamine tablet test)

BS 6399: Part 2 1995 Code of practice for wind loads

BS 7157: 1989 (1994) Method of test for ignitability of fabrics used in the construction of large tented structures

BS 7837: 1996 Performance levels of fabrics used in the construction of marquees and large tents when subjected to the test procedures in BS 5438

Copies of British Standards may be obtained from the Sales Department, British Standards Institution, Linford Wood, Milton Keynes, MK14 6LE

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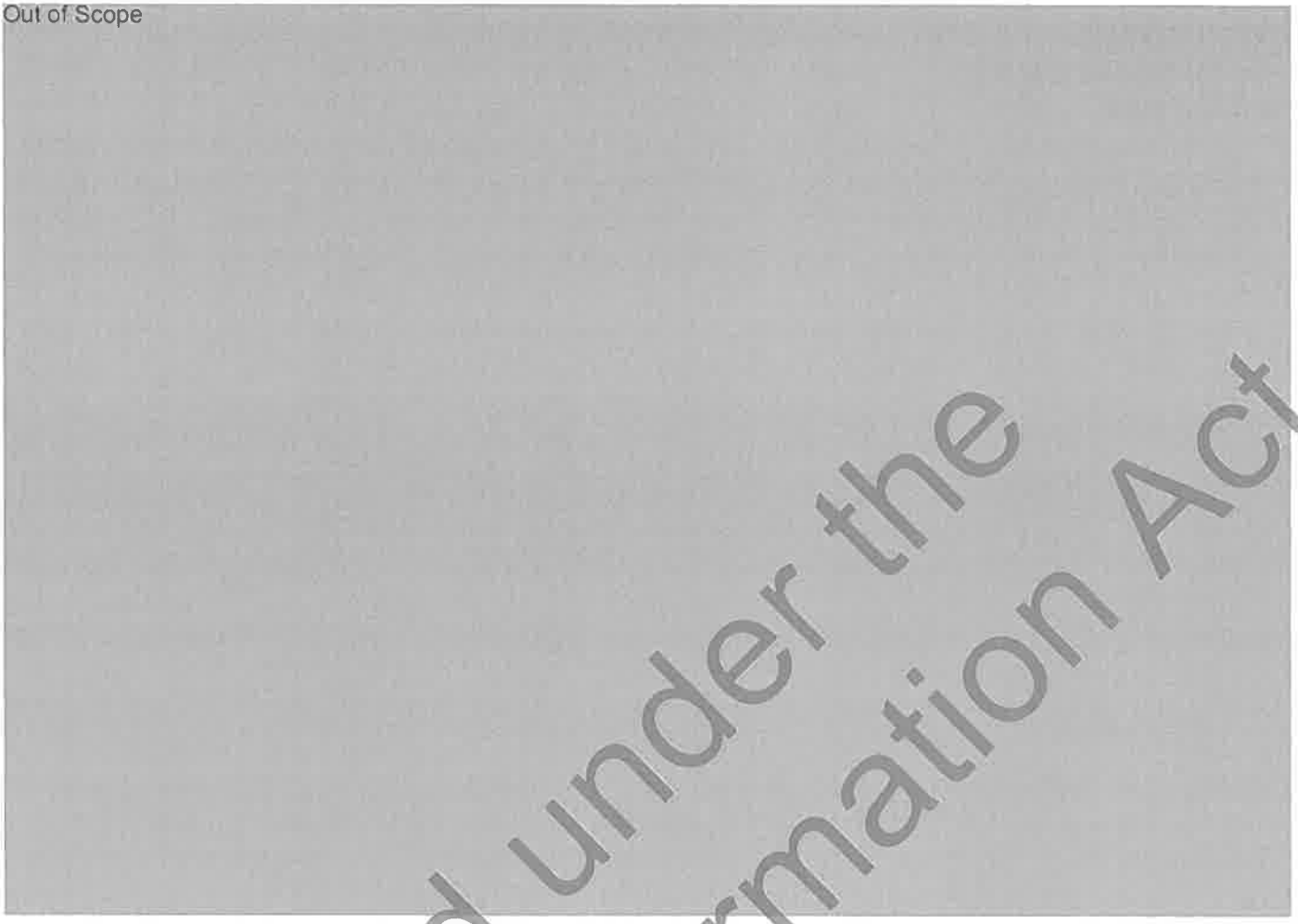

From: Theofanis Kostas
Sent: Thursday, 10 December 2015 11:24 a.m.
To: Darrel Cheong
Cc: David McGuigan; John Gardiner; Murray Usman
Subject: RE: MBIE queries [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Darrel,

Suggesting for the opening statement we say that we are prepared to endorse the approach if we're satisfied that it meets the requirements of the building code, in to avoid commitment on our behalf on a method which may be insufficient.

Cheers,

Theo Kostas
STRUCTURAL ENGINEER
Building System Performance Branch; Building, Resources and Markets Group
Ministry of Business, Innovation & Employment

Theofanis.kostas@mbie.govt.nz | Ph: (+64) +4 896 5741
Level 5, 15 Stout Street, PO Box 1473, Wellington 6140

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

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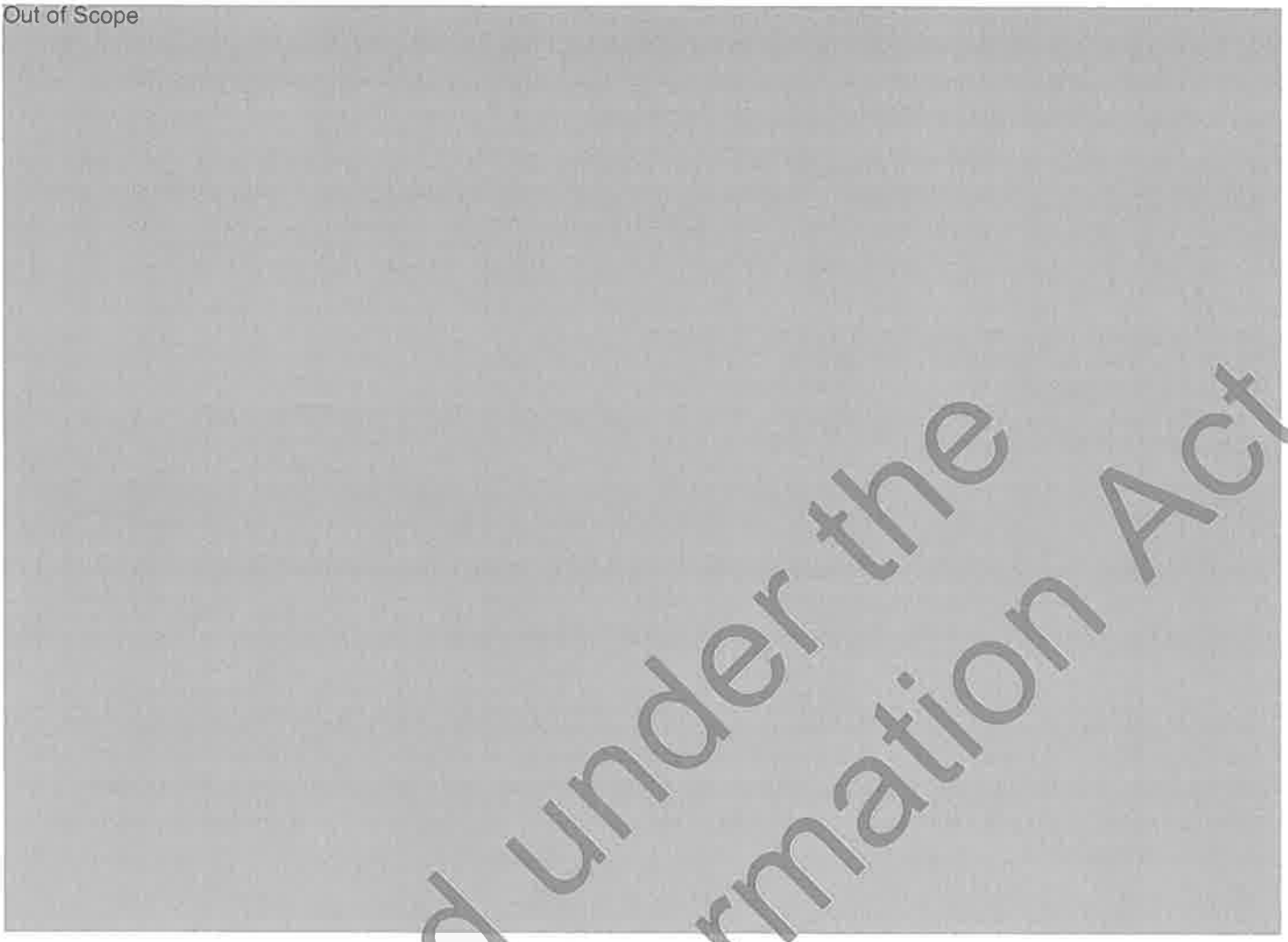

From: Benson Zhang [mailto:BensonZ@redco.co.nz]
Sent: Thursday, 10 December 2015 5:37 p.m.
To: Darrel Cheong
Cc: Jeni Hou; Graham Rundle; Murray Usmar; David McGuigan; Theofanis Kostas
Subject: RE: MBIE queries

Thanks Darrel.

I believe the latest calculation has covered the four items listed below to a certain degree. And recommended checklist in the calculation Appendix are developed based from the UK Code of Practice. Can you review the attached calculations and let me know your thoughts?

a) Anchorage of the ground pegs (in different ground conditions) and their test procedures

   The ground testing procedure was given in the "Summary and Recommendations", page 2-3 of pdf.

b) Procedures of the wind monitoring/forecasting and the equipment/personnel for this purpose

   Wind monitoring procedure was given in the "Summary and Recommendations", page 3 of pdf.

c) Emergency evacuation procedures when the weather/wind increases in intensity enough to put the public at risk

   The evacuation procedure will be similar to the emergency evacuation during an fire event.

d) Examination and inspection procedures for the routine assembling/disassembling

The inspection and assembling procedure and checklists were given in "Summary and Recommendations", page 2 -3 of pdf, and in "Appendix" page 23 – 24 of pdf.

Regards,
Benson
15180

From: Darrel Cheong [mailto:Darrel.Cheong@mbie.govt.nz]
Sent: Thursday, 10 December 2015 5:18 p.m.
To: BensonZ@redco.co.nz
Cc: Jeni Hou (jeni@zirkacircus.com); Graham Rundle; Murray Usmar; David McGuigan; Theofanis Kostas
Subject: FW: MBIE queries

Hi Benson

The team has discussed your design philosophy and we have decided to endorse the approach of focussing more on the site safety management as opposed to the design details- provided that we are satisfied on reasonable grounds that the objectives of Clause B1 (of the New Zealand Building Code) can be met.

We gather that the marquee structure has been designed to European standards (Eurocode 3) and was brought into New Zealand without modification. It has been used for a few years and there have not been any structural problems with it. What Redco has done to date is back-analysing the structure to a ULS wind speed of 30m/s & to an SLS wind speed of about 14m/s. The pegs are then designed to these wind actions. However, you mentioned that there is a constant pull-out resistance which all pegs have to achieve and this will be done via on-site testing (on any ground conditions).

To help us progress this MultiProof application, can you then please provide more information on:

e) Anchorage of the ground pegs (in different ground conditions) and their test procedures

f) Procedures of the wind monitoring/forecasting and the equipment/personnel for this purpose

g) Emergency evacuation procedures when the weather/wind increases in intensity enough to put the public at risk

h) Examination and inspection procedures for the routine assembling/disassembling

Once you have documented and provided us with the information above, and if there are still gaps in your application, our team would like to have a telephone conference call with Jenny and Redco to further clarify these queries.

I have also attached a UK-based Code of Practice for temporary structures which has useful contents in Section 6.1 – Structural.

Thanks for your time and attention.

Kind regards

Darrel Cheong
GRADUATE ENGINEER

Building System Performance Branch, Building, Resources & Markets
Ministry of Business, Innovation & Employment
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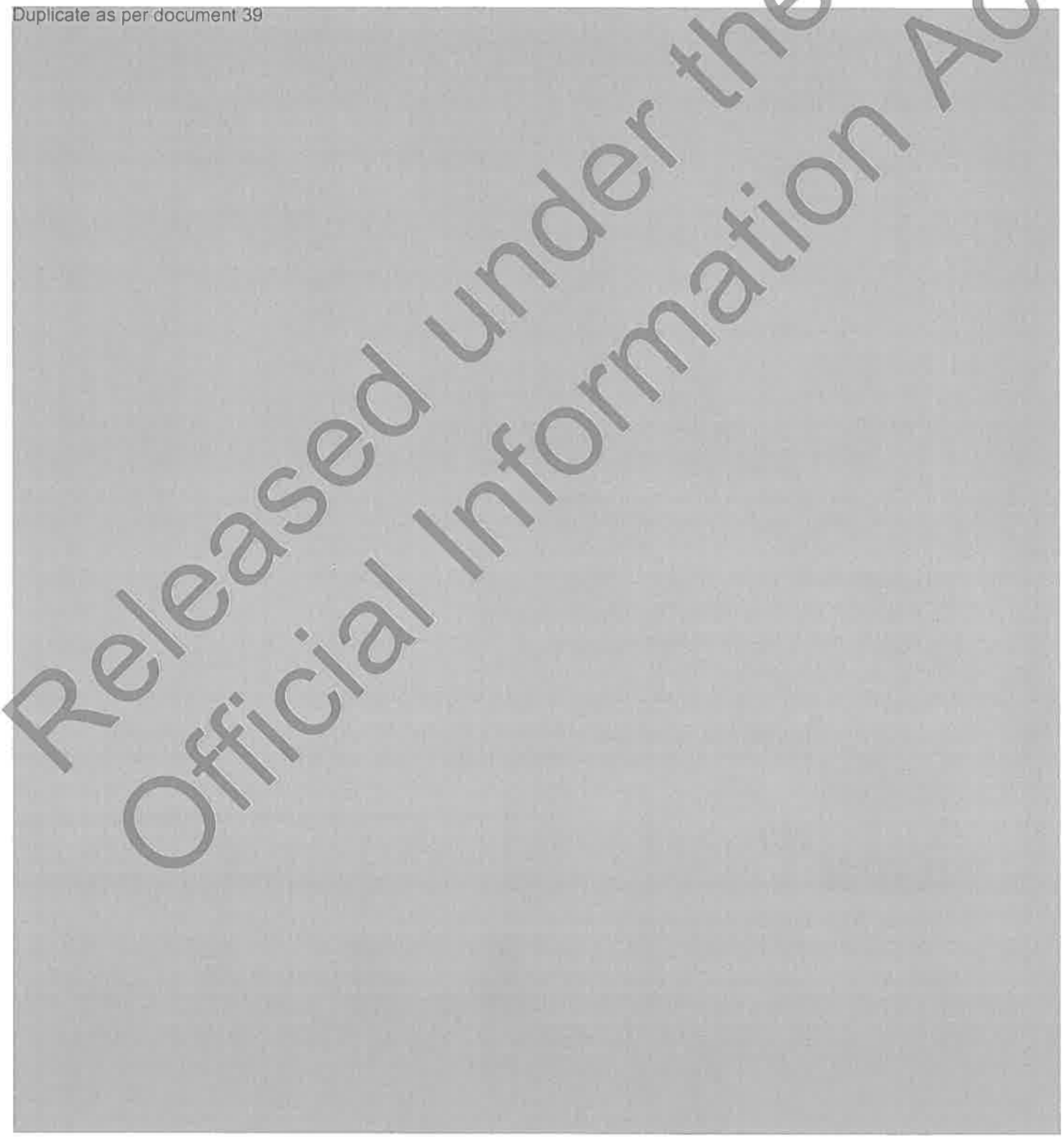

MBIE - MULTI PROOF APPLICATION

35M CIRCUS MARQUEE

for

ZIRKA CIRCUS

STRUCTURAL CALCULATIONS

November 2015 **Project No. 15180**

Prepared by:	Benson Zhang BE MEngSt	CPEng. sign off:	Franswa Jooste BE (Hons) M.IPENZ CPEng Int PE
Reviewed by:	Graham Rundle BE M.IPENZ	Approved by:	Graham Rundle BE M.IPENZ

CONTENTS: Revision A

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Summary and Recommendations

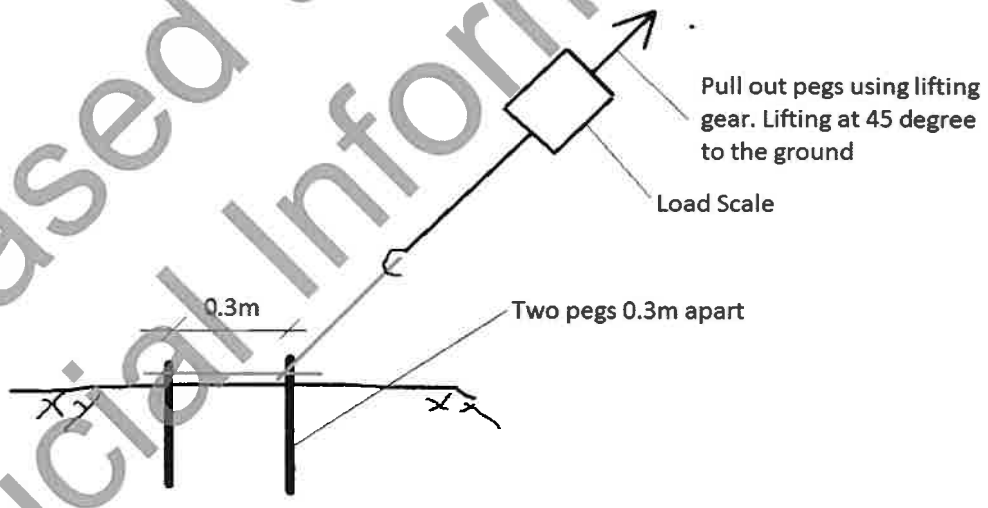
Project No. 15180

Based on our assessment, the 35m circus marquee is structurally capable to withstand a minimum design wind speeds of 108 kph (30m/s). This is considered acceptable for a temporary structure subject to the following limitations and procedures for the safe use of the structure.

- Before erecting the marquee, weather forecast shall be checked for any adverse weather conditions to ensure the forecasted Gust Wind Speed is unlikely to exceed the design wind speeds of 108 kph during the upcoming event.

- Peg pull-out tests shall be carried out at any sites before erection of the marquee. Tests shall be supervised by an appointed event/site manager. Pull-out tests shall be followed the procedure below.

    1. Install two pegs into the ground. Connect the pegs to the lifting gear with a load scale in between using steel chains.



    2. Record the reading from the scale when the first peg began to move and continue lifting.

    3. Record the reading from the scale when the first peg is totally uplift from the ground.

4. Repeat the above steps at a different location. Minimum 2 tests shall be carried out at each site. The lower readings shall be used to compare the requirements.

   Minimum Required Load for peg to move = 300kg
   Minimum Required Load for peg to be lift from the ground = 760kg

   If the pull-out loads are found to be less than the above minimum requirements, additional pegs or weights may be required. Please report to Redco for additional hold down design.

5. Document test results and file all test results to the ministry for record annually.

- A wind anemometer shall be used onsite and be monitored continuously by the appointed event/site manager every hour. Actions shall be taken accordingly when the Gust Wind Speed reading exceed the follow limits:

  i. For gust wind speeds exceeding 50 kph, all openings in the marquee must be zipped shut and excessive movements are to be expected. Check all ground anchors every hour and secure any loosen anchors if found.

  ii. For gust wind speed exceeding 90 kph, the marquee shall be evacuated according to the emergency procedure.

  iii. For gust wind speeds exceeding 108 kph, the structure shall be dismantled.

- The marquee is not designed to support any snow loads. It shall not be used in areas above 400m altitude in the North Island and during the snowing season in the South Island.

- To avoid ponding, the fabric must be stretched tightly after erection.

- After each erection, the appointed event/site manager shall inspection the assembly of marquee to ensure all structural assemblies have been correctly installed. A recommended minimum checklist for assembled structure is provided in Appendix. Each inspection shall be documented with a completed checklist and all assembly inspection shall be filed to the ministry annually for record.

- All structural components shall be checked annually by independent qualified personnel. Any damaged structural components shall be repaired and replaced according to the marquee's manufacturer's recommendations. All inspections shall be documented and file to the ministry annually for record. A recommended minimum checklist is provided in Appendix.

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Consulting Professional Engineers

DESIGN FEATURE REPORT

1. Structure Description

The 35m circus marquee is a lightweight PVC fabric structure. The marquee is circular in shape with a diameter of 35m. It was designed and manufactured in Italy. The PVC fabric was manufactured in New Zealand by Baytex Manufacturing Co Ltd.

The marquee is used by Zirca Circus for events around the cities and towns of New Zealand. It is easy to dismantle and will not be used under extreme weather conditions.

The marquee is supported by four 15.5m height king posts at the centre. The king posts also support a cupola at the roof level. The king posts are stabilized by guy and spacer ropes at the top of the king posts. Each king post has two set of guy ropes which are directly anchored to the ground. The structure is a tensile fabric structure. The PVC fabric spans from the cupola to the king posts at the top and spans from the king posts to the perimeter posts around the circumference. The top of each perimeter posts is tie down to ground with a tension strap. Equal amount of pre-stress tension forces around the building are used to tighten the fabric. The tension in the fabric supports the vertical loads and stabilized lateral loads on the structure. The induced compression forces are resisted by the 4 king posts at the centre.

2. Scope

To assess the marquee to relevant New Zealand design standards to show compliance to the New Zealand Building Code (NZBC) section B1 by means of an Alternative Solution.

3. Means of Compliance

The following standards have been used:

- AS/NZS1170:2011
- NZS3404:1997

4. Alternative Solution

The NZ Building Code is primarily intended for permanent structures and the design loadings are based on the probability of occurrence.
Tents and marquees are temporary demountable structures that by their nature are not expected or required to withstand the most adverse weather loadings as the structures can be readily demounted before an adverse weather event occurs.
The tents and marquees are usually occupied by specific events (in this case for a circus performance) that can be postponed or cancelled in the event of adverse weather.
For more than ten years Redco have been establishing the maximum safe wind loadings for tents and marquees and providing erection/dismantling recommendations based on the relevant wind speeds.
These recommendations have been accepted by Councils and Building Consent Authorities as part of the Building Consent applications for short term events.
This design format and these recommendations have also been accepted in Australia and in the Pacific Islands.
The Australian Building Codes Board has prepared a Standard for Temporary Structures. An alternative method example is given in Section 2.1 of this standard which recognises this design format with the use of an enhanced on-site monitoring strategy to accompany the use of the structure.

For this design, a minimum ultimate design wind speed of 30 m/s has been adopted. The actual site wind speed will be monitored by an anemometer onsite with safety procedures to ensure the structure will only be operating within the design limits. The safety procedures are summarised in the Recommendations to show compliance of the ABCB Standard.

The ABCB Standard also references the British Institution of Structural Engineers publication ICE 2007 "Temporary demountable structures guidance." This Guidance provides two design options:

a) Design for maximum likely wind forces to be experienced. (As for a permanent structure)
b) Design for a maximum operational wind speed, above which an action plan for demounting would be triggered. (As for our design approach)

So this method of design for a maximum operational wind speed is put forward as an Alternative Solution based on the more than 10 years of history of use in New Zealand and the endorsement of the Australian Standard and the British ISE publication.

The following alternative solutions have been referenced in the design of the structure:

- Australia Building Code Board: Temporary Structure
- Institution of Structural Engineering Guidance – ICE 2007

5. Structural Members

The following structural members have been checked:

- Fabric
- King Post
- Perimeter Post
- Cupola
- Cable/Strap
- Peg/Soil Nails loads

6. Design Loads

For the purposes of consideration of loading, this structure Importance Level 3 in accordance with AS/NZS 1170.0:2011.

The following loads have been used in the calculation:

Roof Dead Load	= 0.008kPa
Roof Live Load	= 0.0kPa
Imposed Load	= 1.0kN/m (around Cupola to account for lightings)
Snow Load	= 0.0kPa
Seismic Load	= insignificant (lightweight fabric structure)
Maximum Design Wind Speed	=30m/s

Pressure coefficients are used in accordance with NZS1170.2 Appendix C5 "Circular Bins, Silos and Tanks" for circular wall and cone roof geometry.

Internal, Cpi	0.0,	-0.3
Wall Cp, b(□)	0.9	
Wall C_{fig}	0.63	
Roof Zone A C_{fig}	-0.8	
Roof Zone B C_{fig}	-0.5	

7. Material Specifications

The followings material specifications are from Studio D' Ingeneria Ardolino's Calculation report provided by Faming Phoenix Ent. Ltd. The material properties have been used in the calculation.

STEEL:

Class	S 235 (Fe360)
E-Modulus	E = 210000 MPa
Yield strength t<=40mm	Fyk = 235MPa
Yield strength t>40mm	Fyk = 215MPa
Ultimate strength	Fuk = 360MPa

ROPE AZN 636 AC:

Ultimate strength	Fptk = 1770 MPa
Diameter	Ø = 12mm
Self weight	s.w. = 0.6kg/m
Ultimate Force	N = 95kN
Diameter	Ø = 14mm
Self weight	s.w. = 0.82kg/m
Ultimate Force	N = 129kN
Diameter	Ø = 16mm
Self weight	s.w. = 1.07kg/m
Ultimate Force	N = 165kN
Diameter	Ø = 18mm
Self weight	s.w. = 1.35kg/m
Ultimate Force	N = 95kN
Diameter	Ø = 20mm
Self weight	s.w. = 1.68kg/m
Ultimate Force	N = 265kN

TENT NAIZIL SPORT COVER:

PVC-beschichtetes Polyestergewebe	
Ultimate strength	N = 3kN/5cm
Self weight	s.w. = 0.8kg/m^2

(refer manufacturer's testing certificates for fabrics' elastic modulus)

SOIL NAIL:

Diameter	Ø = 45mm
Length	L = 1400mm

LOADINGS:

Dead Load:

Fabric SW	=	0.008	kPa
Cupola SW	=	0.1	kPa

Live Load:

Lightings on Cupola	=	1.0	kN/m

Wind Load:

Site wind speed is to be monitored using a wind anemometer onsite and the marquee is to be mismantled when the actual site wind speed exceed the limitation.

Assess marquee to a minimum ultimate limit state design wind speed of 30m/s

Ultimate Design Site Wind Speed of, Vdes =	=	108	**kPh**
	=	30	**m/s**
therefore Design Wind Pressure, pz = 0.5 x 1.2kg/m3 x Vdes	=	**0.54**	**kPa**

Marquee is to be evacuated when design wind speed is over 50kPh

Serviceability Desgin Site Wind Speed	=	50	**kPh**
	=	13.9	**m/s**
Serviceability Desgin Site Wind Pressure, pz	=	0.12	**kPa**

Snow Load:

Roof Su	=	0.0	kPa

Seismic Load:

Less critical than wind load

WIND PRESSURE COEFFICIENTS:

From NZS1170.2:2011

Internal Pressure Coefficient:

All openings must be zipped shut for wind exceeding serviceability wind speed, therefore all walls are equally permeable during Ultimate Limit State

Cp,i = **-0.3** or **0.0** (0.0 is more critical)

External Pressure Coefficient:

Structure has a circular base and a cone shape roof with four circular king posts protruding the cone shape. Pressure Coefficients from NZS1170.2:2011 Section Appendix C5 "Circular Bins, Silos and Tanks" are considered to be the most appropriate to the nature of the structure's geometry

Dimensions:

Diameter, b	=	35	m
Reference Height, h	=	9.8	m
Roof Pitch, α	=	37	degree

Wall:

Cp, b(Θb), wall	=	**0.9**	(Θb = 0 most critical, Cpl=0.9, kb=1)
Cfig, wall	=	**0.63**	(for overall drag force)

Roof:

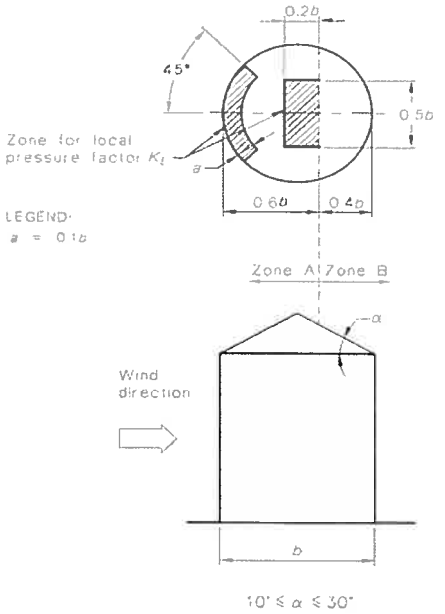
Cp,e, Zone A	=	-0.8
Cp,e, Zone B	=	-0.5
Local Pressure Factor, Kl	=	1.5
Area Factor, Ka	=	0.8

Cfig = Cp,e x Ka x Kl	=	**-0.64** for Zone A
	=	**-0.4** for Zone B
	=	**-0.96** for Zone A Local

Local Zone Area:	0.1b =	3.5 m
	0.2b =	7.0 m
	0.5b =	17.5 m

King Post:

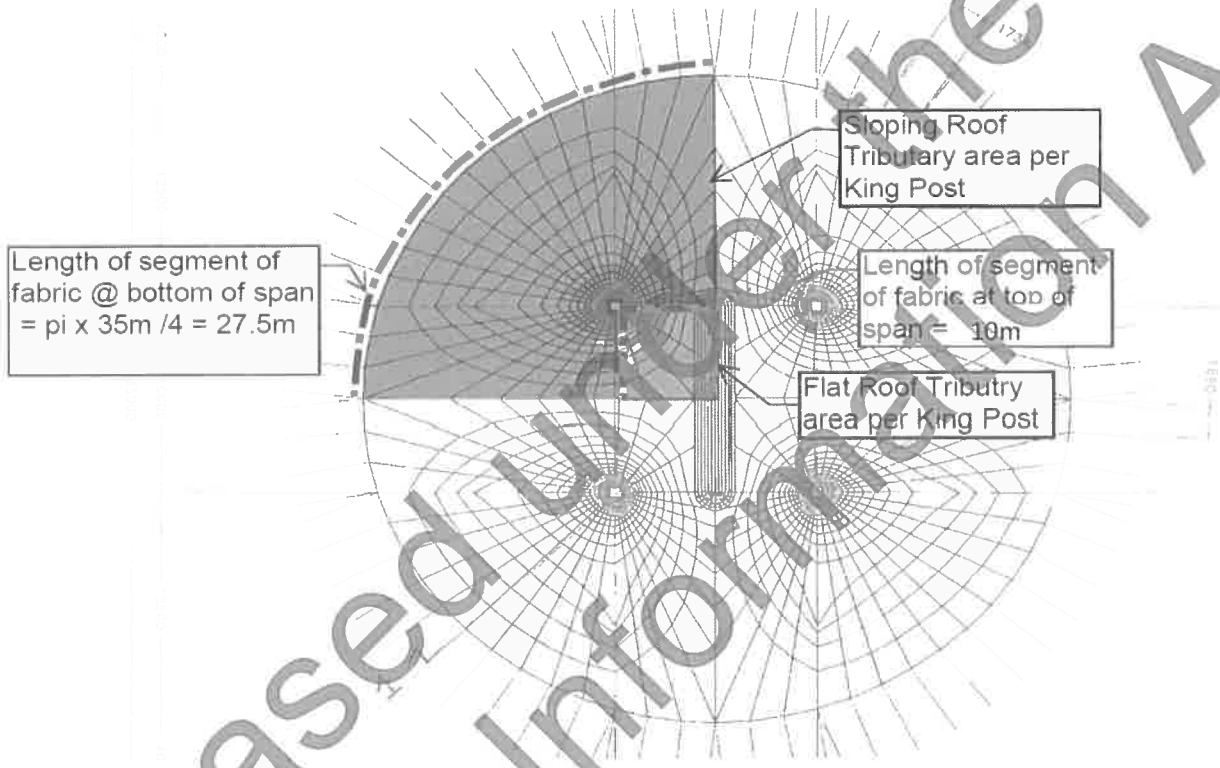
Cfig = 1.2 (Table E3, conservative)



DESIGN ACTIONS:

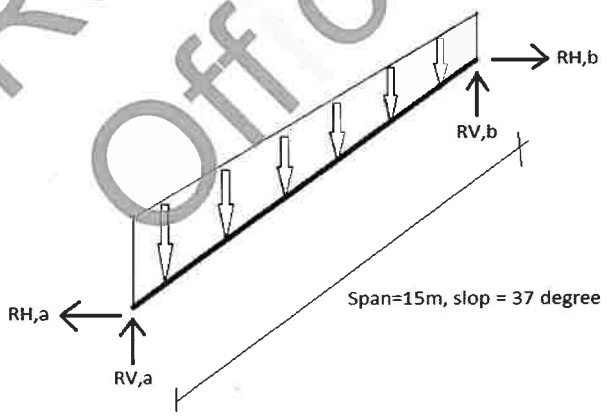
Mqequee is a tensile fabric structure. Tension forces from fabric and cables' catenary action are depending on deformation Determind required tension force to control deflection under Serviceability Limit State. Design actions from fabirc under Ultimate Limite State will be governed by fabric ultimate strength or supporting structural member's capacities.

Fabric span from Cupola to King Posts and from King Posts to perimeter walls. Tributriy area of each King Post is illustraded below



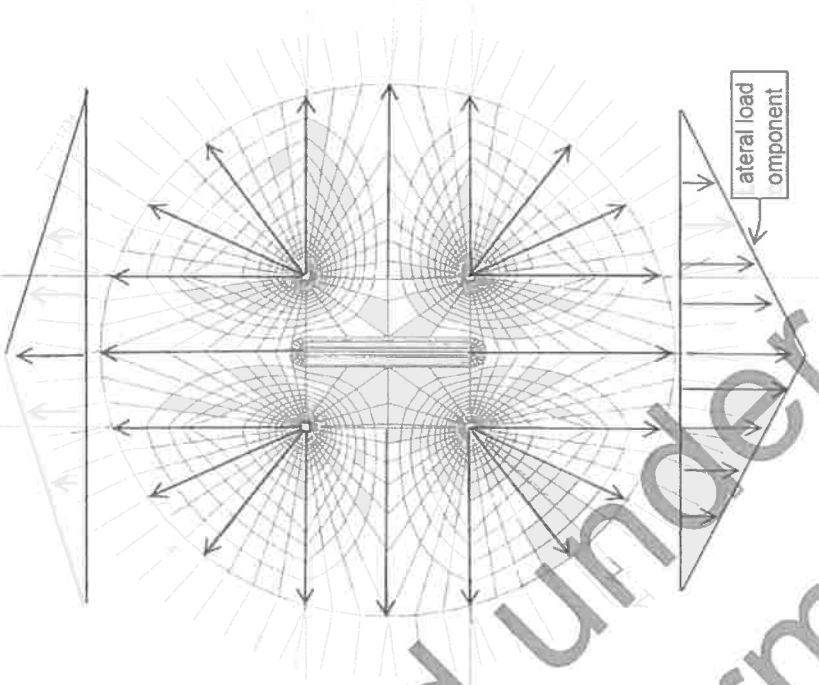
Dead Load:

Initial Guess of febric deformation	=	0.30 m	
Calculated febric deformation based on tension in fabric	=	0.29 m	
Difference	=	0.01 ≈	0, therefore Okay



Horizontal Reaction RH:

Because the marquee is circular in shape, the horizontal component of the reactions are only half of the reactions from this 2D analysis. Actual RH will be 1/2 show the analysis as illustraded below.



Fabric span	=	15 m
Length of segment of fabric at top of span	=	10 m
Length of segment of fabric at bottom of span	=	27.5 m
Dead load at top of span = Fabric SW x Length	=	0.08 kN/m
Dead load at bottom of span = Fabric SW x Length	=	0.22 kN/m
Equivalent UDL = (DL top + DL bottom)/2	=	0.15 kN/m
Load Paralle to fabric = UDL x sin(slop)	=	0.09 kN/m
Load Perpendicular to fabric = UDL x cos(slop)	=	0.12 kN/m

Direct Tenston:		
@RV,b = Load Paralle x Span x sin(slop)	=	0.81 kN
@RH,b = Load Paralle x Span x cos(slop)	=	1.08 kN
Catenary Tension:		
Horizontal Reaction, H = WL^2/(8d) = Load Perp x Span^2/(8d)	=	11.23 kN
@RV,a&b = H x sin(slop)	=	6.76 kN
@RH,a&b = H x cos(slop)	=	8.97 kN
Vertical Reaction, V = WL/2 = Load Perp x Span / 2	=	0.90 kN
@RV,a&b = H x cos(slop)	=	0.72 kN
@RH,a&b = H x sin(slop)	=	0.54 kN

Dead loads on King Post from Cupola:

Cupola SW = SW x Area (12m x 2m)/4	=	0.05 kN	
Fabric SW = SW x Area(12m x 2m)/4	=	0.60 kN	
Angle of cable connecting Cupola to King Post	≈	45 degree	
@RV,b = DL (Cupola + Fabric)	=	0.65 kN	
@RH,b = RV,b/tan(45 degree)	=	0.65 kN	
Total	RV,b =	**8.94 kN**	
	0.5RH,b =	**6.48 kN**	
	RV,a =	**3.74 kN**	
	0.5RH,a =	**4.76 kN**	

Check fabric deformation:

Catenary Tension = Total Catenary Tension / 27.5m	=	0.41 kN/m
Adopt Fabric Elastic Modulus, E	=	540 kN/m
Fabric stretch = Catenary Tension / Elastic modulus x fabric length	=	11 mm
Fabric sag angle = cos^-1((Fabric + stretch)/2 / (Fabric/2))	=	2.2 degree
Deformation = Span/2 x sin(sag angle)	=	292 mm

Live Load:

Live loads on King Post from Cupola:

Cupola LL = LL x (12m + 2m)*2/4	=	7.00 kN
Angle of cable connecting Cupola to King Post	≈	45 degree
@RV,b = DL (Cupola + Fabric)	=	**7.00 kN**
@RH,b = RV,b/tan(45 degree)	=	**7.00 kN**

Wind Load:

Ultimate Wind Load Fabric Deformation:

Windward Face:

Initial Guess of febric deformation	=	1.17 m	
Calculated febric deformation based on tension in fabric	=	1.16 m	
Difference	=	0.01 ≈	0, therefore Okay

Leeward Face:

Initial Guess of febric deformation	=	0.95 m	
Calculated febric deformation based on tension in fabric	=	0.95 m	
Difference	=	0.00 ≈	0, therefore Okay

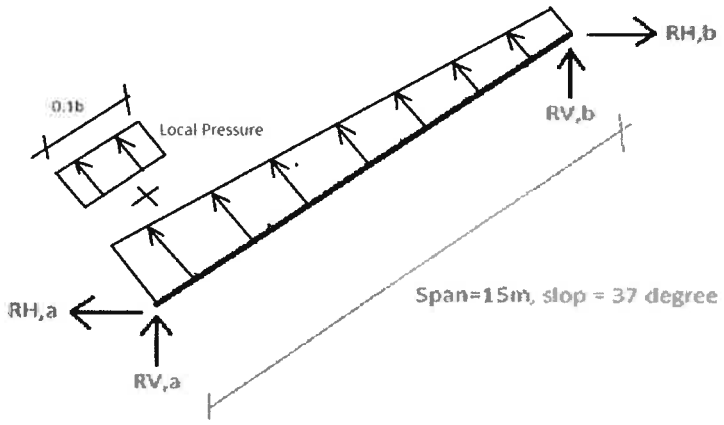
Serviceability Wind Load Fabric Deformation:

Windward Face:

To control fabric deformation under SLS to d	=	0.70 m	
Calculated febric deformation based on tension in fabric	=	0.70	
Difference	=	0.00 ≈	0, therefore Okay

Leeward Face:

Initial Guess of febric deformation	=	0.57 m	
Calculated febric deformation based on tension in fabric	=	0.57 m	
Difference	=	0.00 ≈	0, therefore Okay



Serviceability Limit State:

Movements of marquee should be acceptable and not be affecting functions of the structure under SLS loads

SLS Design Wind Pressure, pz	=	**0.12 kPa**
Fabric span	=	15 m
Length of segment of fabric at top of span	=	10 m
Length of segment of fabric at bottom of span	=	27.5 m

Windward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone A)	=	-0.74 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone A)	=	-2.04 kN/m
Additional Wind load at local area = pz x Length x 0.1b x C,fig(Local-ZoneA)	=	-3.57 kN
Equivalent UDL = (WL,top + WL,bottom)/2 + WL,Local/span	=	-1.63 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-65 kN
@RV,a&b = H x sin(slop)	=	-39 kN
@RH,a&b = H x cos(slop)	=	-52 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-12 kN
@RV,a&b = H x cos(slop)	=	-10 kN
@RH,a&b = H x sin(slop)	=	-7 kN

Total	RV,b =	**-30 kN**
	0.5RH,b =	**-30 kN**
	RV,a =	**-30 kN**
	0.5RH,a =	**-30 kN**

Check fabric deformation:

Catenary Tension = Total Catenary Tension / 27.5m	=	-2.38 kN/m
Adopt Fabric Elastic Modulus, E	=	540 kN/m
Fabric stretch = Catenary Tension / Elastic modulus x fabric length	=	66 mm
Fabric sag angle = cos^-1((Fabric + stretch)/2 / (Fabric/2))	=	5.4 degree
Deformation = Span/2 x sin(sag angle)	=	702 mm

Leeward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone B)		=	-0.46 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone B)		=	-1.28 kN/m
Equivalent UDL = (WL,top + WL,bottom)/2		=	-0.87 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)		=	-43 kN
@RV,a&b = H x sin(slop)		=	-26 kN
@RH,a&b = H x cos(slop)		=	-34 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2		=	-7 kN
@RV,a&b = H x cos(slop)		=	-5 kN
@RH,a&b = H x sin(slop)		=	-4 kN
Total	RV,b	=	**-21 kN**
	0.5RH,b	=	**-19 kN**
	RV,a	=	**-21 kN**
	0.5RH,a	=	**-19 kN**

Check fabric deformation:

Catenary Tension = Total Catenary Tension / 27.5m	=	-1.56 kN/m
Adopt Fabric Elastic Modulus, E	=	540 kN/m
Fabric stretch = Catenary Tension / Elastic modulus x fabric length	=	43 mm
Fabric sag angle = cos^-1((Fabric + stretch)/2 / (Fabric/2))	=	4.4 degree
Deformation = Span/2 x sin(sag angle)	=	569 mm

Ultimate Limit State:

ULS Design Wind Pressure, pz	=	**0.54 kPa**
Fabric span	=	15 m
Length of segment of fabric at top of span	=	10 m
Length of segment of fabric at bottom of span	=	27.5 m

Windward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone A)	=	-3.46 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone A)	=	-9.5 kN/m
Additional Wind load at local area = pz x Length x 0.1b x C,fig(Local-ZoneA)	=	-16.6 kN
Equivalent UDL = (WL,top + WL,bottom)/2 + WL,Local/span	=	-7.59 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-182 kN
@RV,a&b = H x sin(slop)	=	-110 kN
@RH,a&b = H x cos(slop)	=	-146 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-57 kN
@RV,a&b = H x cos(slop)	=	-45 kN
@RH,a&b = H x sin(slop)	=	-34 kN

Total	RV,b =	**-64 kN**	
	0.5RH,b =	**-90 kN**	
	RV,a =	**-64 kN**	
	0.5RH,a =	**-90 kN**	

Check fabric deformation:

Catenary Tension = Total Catenary Tension / 27.5m	=	-6.6 kN/m	
Adopt Fabric Elastic Modulus, E	=	540 kN/m	
Fabric stretch = Catenary Tension / Elastic modulus x fabric length	=	184 mm	
Fabric sag angle = cos^-1((Fabric + stretch)/2 / (Fabric/2))	=	8.9 degree	
Deformation = Span/2 x sin(sag angle)	=	1165 mm	

Leeward Face:

Wind load at top of span = pz x Length x Cp,fig (Zone B)	=	-2.16 kN/m
Wind load at bottom of span = pz x Length x Cp,fig (Zone B)	=	-5.94 kN/m
Equivalent UDL = (WL,top + WL,bottom)/2	=	-4.05 kN/m

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-120 kN
@RV,a&b = H x sin(slop)	=	-72 kN
@RH,a&b = H x cos(slop)	=	-96 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	-30 kN
@RV,a&b = H x cos(slop)	=	-24 kN
@RH,a&b = H x sin(slop)	=	-18 kN

Total	RV,b =	**-48 kN**
	0.5RH,b =	**-57 kN**
	RV,a =	**-48 kN**
	0.5RH,a =	**-57 kN**

Check fabric deformation:

Catenary Tension = Total Catenary Tension / 27.5m	=	-4.4 kN/m
Adopt Fabric Elastic Modulus, E	=	540 kN/m
Fabric stretch = Catenary Tension / Elastic modulus x fabric length	=	121 mm
Fabric sag angle = cos^-1((Fabric + stretch)/2 / (Fabric/2))	=	7.3 degree
Deformation = Span/2 x sin(sag angle)	=	947 mm

Wind Load On King Post Above Roof Line:

Average King Post Diameter, d	=	1.0 m
SLS Wind load = pz x d x Cfig	=	**0.1 kN/m**
ULS Wind load = pz x d x Cfig	=	**0.6 kN/m**

Wind Load On External Walls:

SLS Wind load = pz x b x Cfig/2(half curcumference)	=	**1.3 kN/m**
ULS Wind load = pz x b x Cfig/2(half curcumference)	=	**6.0 kN/m**

Load Combinations:

1. 1.2G + 1.5Q
2. 0.9G + 0.4Q + Wu
3. 1.2G + 0.4Q + Wu

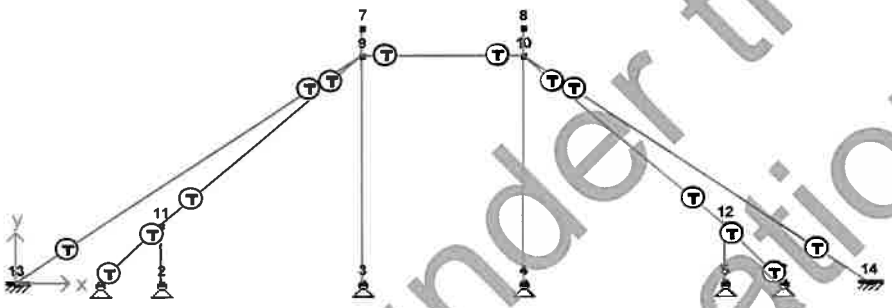
Ultimate Limit State

4. G + Q
5. Ws (50kph)

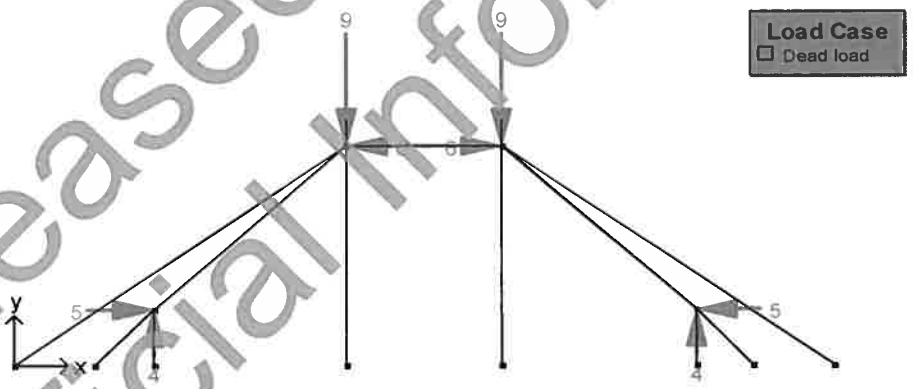
Serviceability Limit State

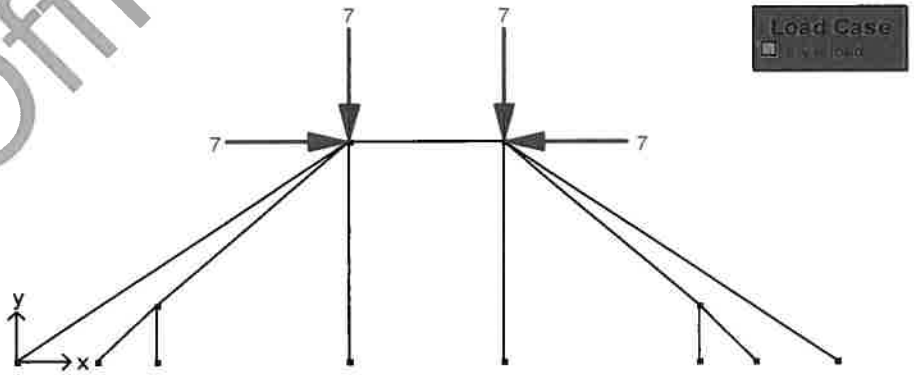
Multiframe Model:

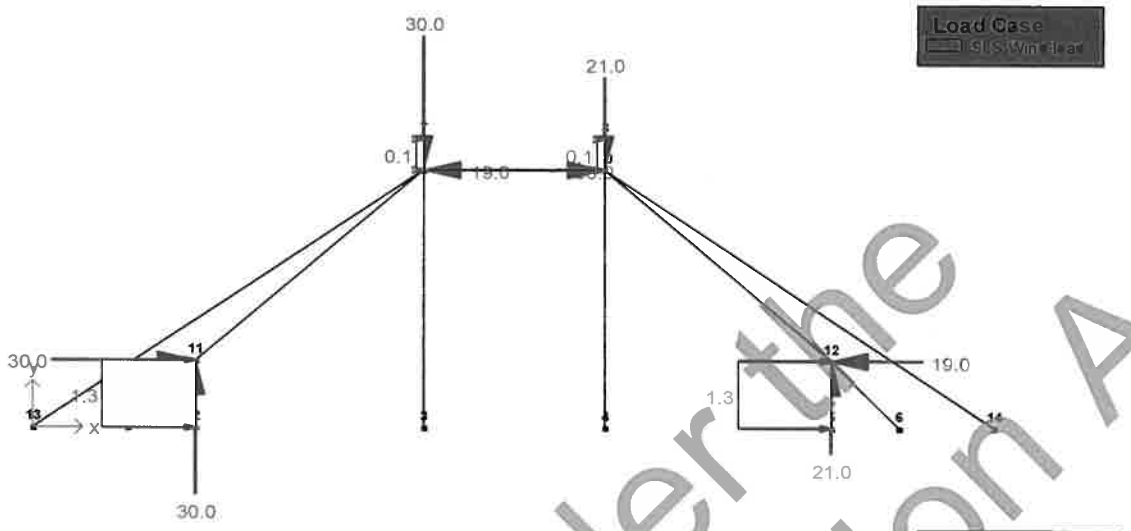
All cables are model as tension members

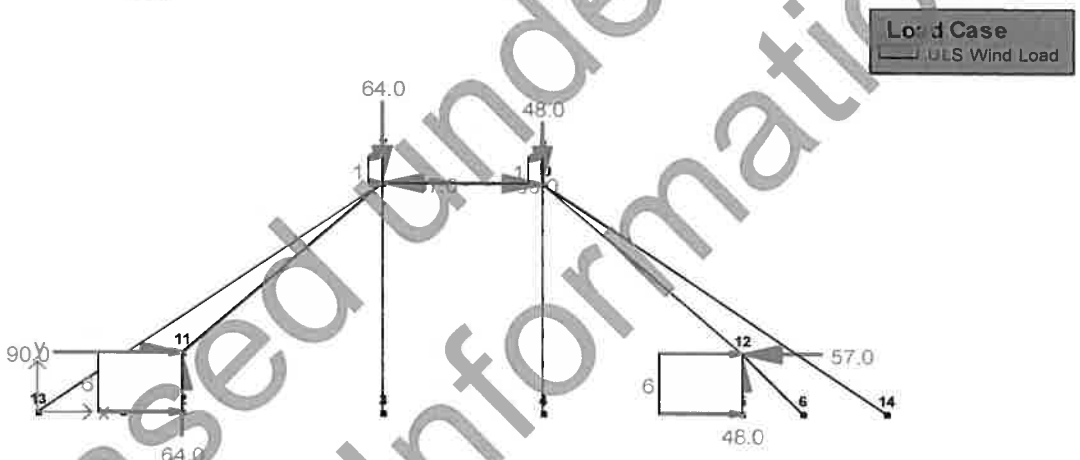


Loadings:



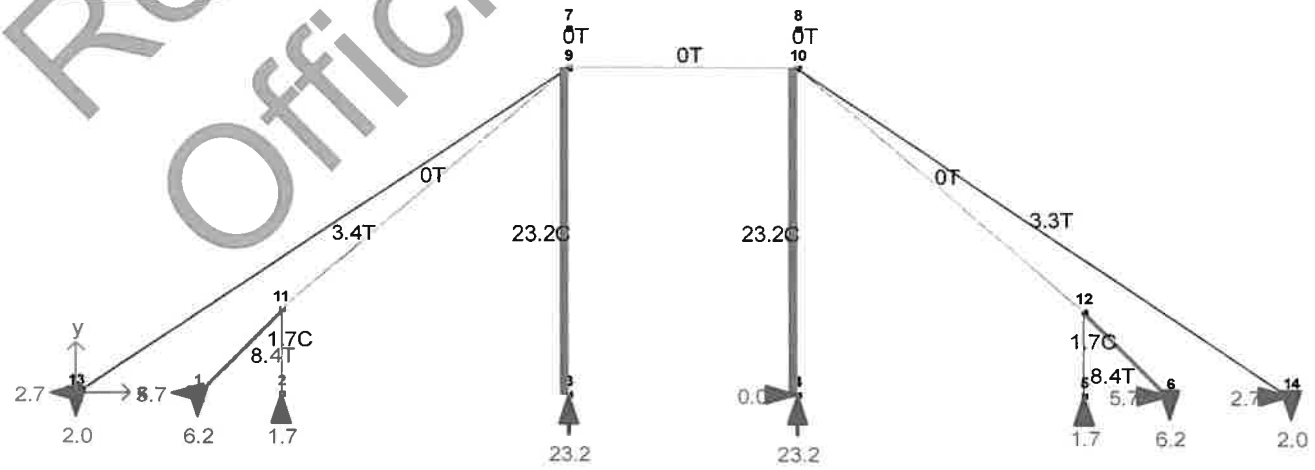




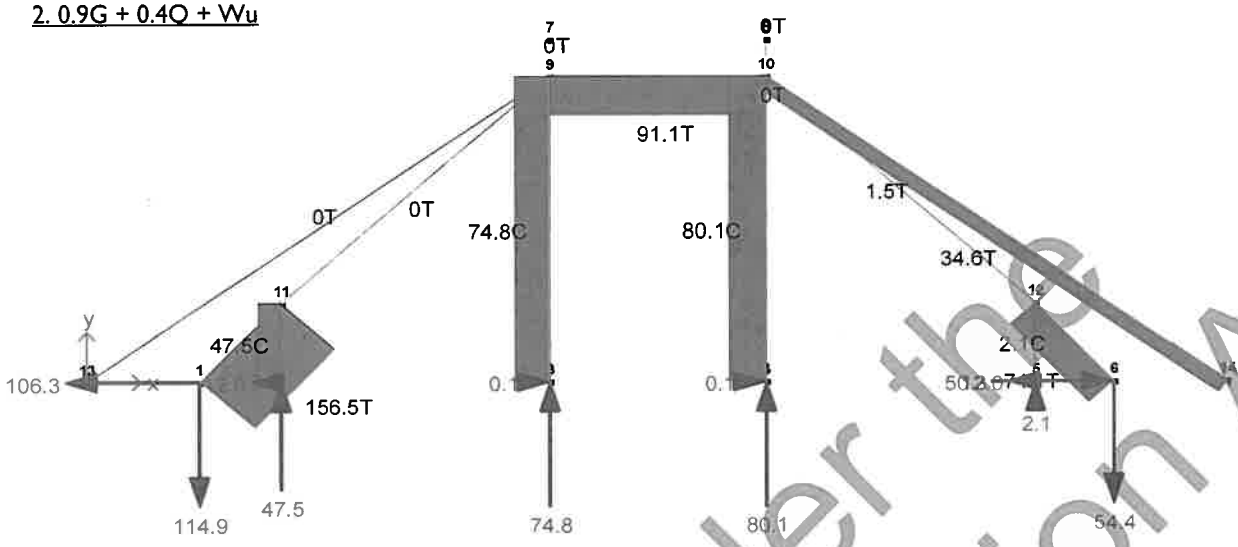


Design Actions:

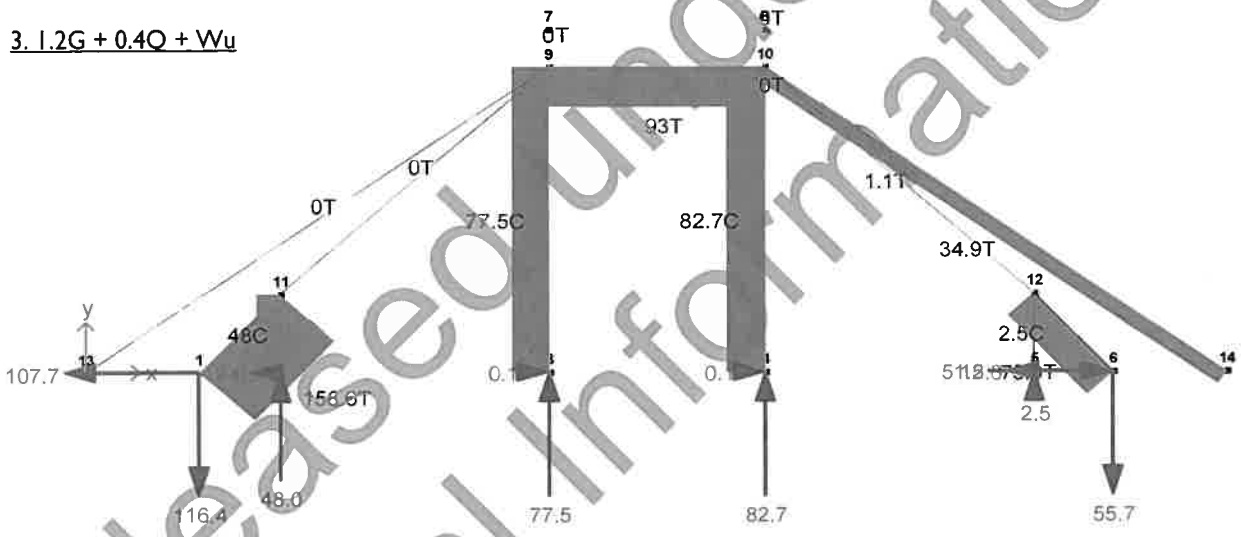
1. 1.2G + 1.5Q



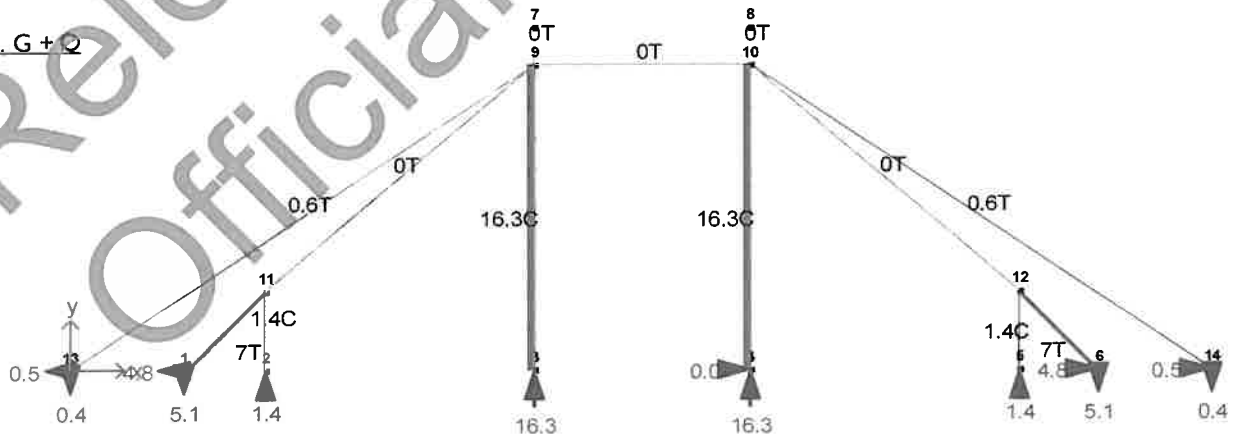
2. 0.9G + 0.4Q + Wu



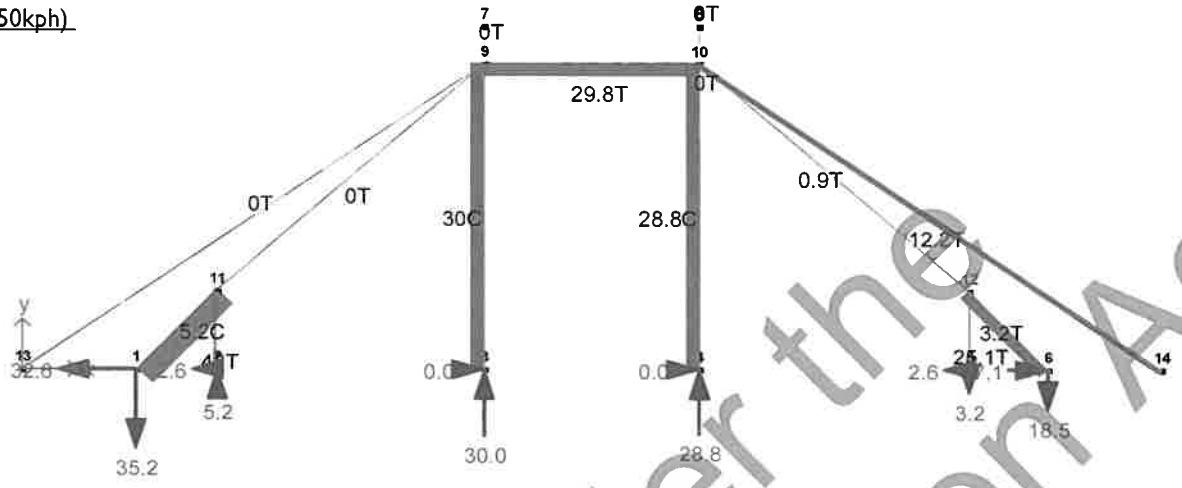
3. 1.2G + 0.4Q + Wu



4. G + Q



5. Ws (50kph)



SUMMARY:

	Case	King Post, Nc*	Ø16 Cable,Nt*	Ø12+Ø16 Cables,Nt*	16xWall Posts, Nc*
1.	1.2G + 1.5Q	23 kN	3 kN	3 kN	2 kN
2.	0.9G + 0.4Q + Wu	80.1 kN	91.1 kN	34.6 kN	47.5 kN
3.	1.2G + 0.4Q + Wu	**82.7 kN**	**93 kN**	**34.9 kN**	**48 kN**
4.	G + Q	16 kN	0 kN	0 kN	1 kN
5.	Ws (50kph)	45 kN	40 kN	19 kN	-2 kN

KING POST:

King Post is a laced 351x351 column consisted with 4xØ48.3x2.9 Tube chord with Ø26.9x2.5 Tube diagonals@45 degree

Assess King Post design capacity to NZS3404:1997

Axial Loadings:

Dead load S.W = 3.3 kN

From Multiframe Analysis:

1.2G+0.4Q +Wu = 82.7 kN

Nc* = 86.66 kN

Nominal Section Capacity: (*Section 6.2*)

For Ø48.3x2.9 Tube

Element slenderness, λe = (do/t)(Fy/250) = 15.66

do = 48.3 mm

t = 2.9 mm

fy = 235 Mpa

λey = 82 > 15.66 , therefore be=b, form factor kf = 1

An = 1652 mm^2 (4 x Ø48.3x2.9 Tubes)

Ns = 388.2 kN

Nominal Member Capacity: (*Section 6.3*)

Slenderness ratio of a main component (6.4.2.1)

Effective Length Le,m= KeL = 0.8 m

Ke = 1

L = 0.8 m

rx or y = 16 mm

(Le/r)c = 50

Slenderness ratio of a laced compresion member (6.4.2.2)

Effective Length Le,m= KeL = 15.5 m

Ke = 1

L = 15.5 m

rx or y = 176.2 mm

Le/r = 87.97

1.4x(Le/r)c = 70

(Le/r)m = 87.97

Modified member slenderness (6.4.3.2)

(Le/r)bn = √(Le/r)m^2 + (Le/r)c^2 = 101.2

Take αb = 1

αc = 0.52 (From Table 6.3.3(2)

Nc = αc x Ns = 201.9 kN

Ø = 0.9

ØNc = **181.7 kN** > 104.2 therefore, Okay

Transvers shear force (6.4.1)

V* = ∏ (Ns/Nc - 1) * N*/ λn >= 0.01N*

0.01N*	=	0.87 kN
V*	=	3.06 kN
Nc* = V*/cos(45 degree)	=	4.33 kN

Provided 2xØ26.9x2.5 Tube diagonals, okay by inspection

Provided 4M20 Grade 8.8 Bolts at King Post joint, okay by inspection

CABLES:

From Multiframe Analysis			ØNt (Ø=0.9)	
Ø16 Cable,Nt* (1.2G+0.4Q+Wu)	=	93 kN	148.5 kN	Okay
Ø12 + Ø16 Cables,Nt* (1.2G+0.4Q+Wu)	=	34.9 kN		
	=	17.45 kN/cable	85.5 kN	Okay

PERIMETER POSTS:

Critical actions is when wind at Θ=0, Cfig = 0.9. Cfig = 0.63 is used in Multiframe analysis for overall drag force.
Therefore conservatively factor the load from analysis for 1.5 to account for critical scenario.

From Multiframe Analysis:

16xWall Posts, Nc* (1.2G+0.4Q+Wu)	=	48.0 kN			
	=	3.0 kN/Post	x	1.5 =	4.5 kN/Post
16xTie Down Strap, Nt* (1.2G+0.4Q+Wu) x 1.5	=	158.6 kN			
	=	9.9 kN/strap	x	1.5 =	14.87 kN/strap

Provided Ø60x3 Grade S235 Post, Okay by inspection

Provided Tie Down Strap with 2500kg working load, therefore Okay

Tie down strap is fixed back to 2xSoil Nails, therefore

Minimum pull out per nail @45 degree = **7.4 kN/Nail**

FABRIC:

Maximum tension force in fabric from ultimate wind load:

Catenary Tension:

Horizontal Reaction, H = WL^2/(8d) = UDL x Span^2/(8d)	=	-182 kN
Vertical Reaction, V = WL/2 = UDL x Span / 2	=	57 kN
T* = √(H^2 + V^2)	=	191 kN

Ultimate fabric strength	=	3 kN/5cm
Length of fabric at top	=	10 m
Total strength = 3kN/5cm x (5m/0.05m)	=	600 kN
F.O.S = Total Strength/T*	=	3.14 acceptable, therefore okay

CUPOLA:

Cupola is a truss frame consisted of two parallel chord trusses spanning 12m each side supported by 4xØ14 Cables
The parallel chord truss consisted of Ø48.3x2.9 Tube as chord member with Ø26.9x2.5 Tube diagonals at 45 degress

Loadings:

Roof tributry width per truss = 2.5 m

Dead Load	Fabric	0.008 kPa	x	2.5 m	=	0.01 kN/m
	SW	0.1 kPa	x	1 m	=	0.1 kN/m
Live Load	Lighting				=	1.0 kN/m

As the cupola's supporting cables will be slack under wind uplift. Roof wind load will be resisted by tension in the fabric around the cupola

Span	=	12 m
UDL, 1.2G+1.5Q	=	1.63 kN/m
M* = UDL x Span^2 / 8	=	29.38 kNm
V* = UDL x span / 2	=	9.792 kN

Ø48.3x2.9 Tube Chord:

Truss depth	=	0.5 m
Effective depth	=	0.45 m
Axial couple = M*/ Edepth	=	65.28 kN

Top chord is restrainted by transvers member at 2.0m spacing
For Ø48.3x2.9 Tube
Element slenderness, λe = (do/t)(Fy/250) = 15.66

do	=	48.3 mm	
t	=	2.9 mm	
fy	=	235 Mpa	
λey	=	82 >	15.66 , therefore be=b, form factor kf = 1
An	=	1652 mm^2	(4 x Ø48.3x2.9 Tubes)
Ns	=	388.2 kN	

Effective Length Le,m= KeL = 2 m

Ke	=	1	
L	=	2 m	
rx or y	=	16 mm	
(Le/r)c	=	125	
Take αb	=	-1	
αc	=	0.476	(From Table 6.3.3(2)
Nc = αc x Ns		=	184.8 kN
Ø		=	0.9
ØNc		=	**166.3 kN** > 65.28 ,therefore okay

Ø26.9x2.5 Tube Diagonal:

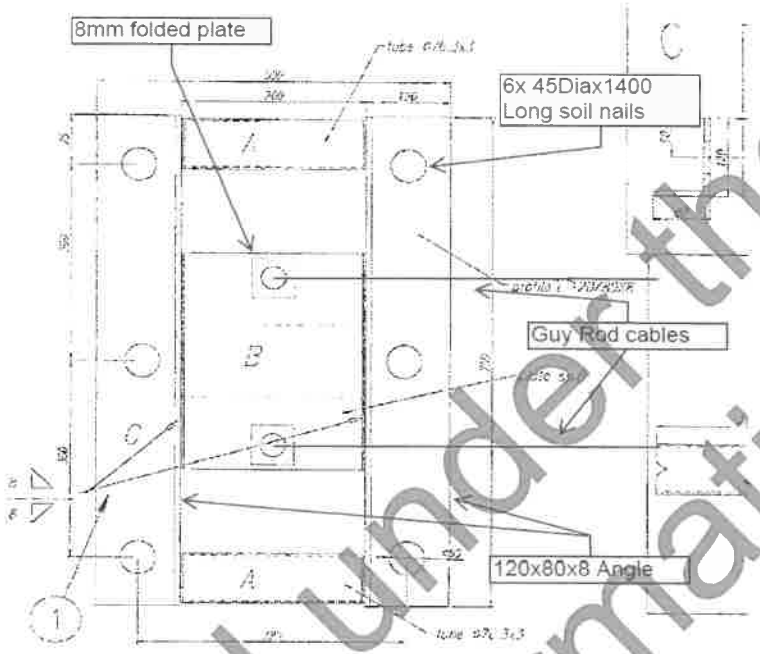
Nc* = V*/cos(45 degree) = 13.85 kN

Le = 0.6 m

Ø26.9x2.5 Tube Diagonal okay by inspection

GUY PEGS:

The marquee is stabilized by 8 Guy rods and each rob consisted with one Ø12 cable and one Ø16 cable. Both cable fixed dwon to the hold down bracket with 6xØ45mmx1400mm soil nails into the ground



Loadings:

From Multiframe Analysis:

Ø12+Ø16 Cables Nt* = 34.9 kN

T*@45 degree = 34.9 kN (Resisted by 6 soil nails)

T*@45degree for each Nail = **5.8 kN/Nail** < 7.4 (perimeter hold down governs)

Soil Nail:

Base on previous peg pull out tests, the nail can sustain significant portion of loads before the soil start to yield. And the load continous to increase until the nail is fully lift off the ground.

Peg need to be remain steady under serviceability loads.

Perimeter Post Hold Down Case Governs:

ULS pull out required per nail @45 degree = **7.4 kN/Nail**

SLS pull out required per nail @45 degree = **2.9 kN/Nail**

RECOMMENDED MINIMUM CHECKLIST FOR ASSEMBLED STRUCTURES

This list is not exhaustive and is meant as guidance only.

Inspection Date: _____

Site: _____

Inspected By: _____

	OK	NG
1. All aspects of the final structure are at a safe distance from power lines & other hazzards		
2. Ground pegs' pull-out testing results meet the minimum requirements		
3. Hold down straps on walls are in place and adequately tensioned		
4. All ropes, and guy wires are sound		
5. Fabric is tensioned and not prone to ponding		
6. Emergency exits are in place, operating correctly and are without obstruction		
7. Escape routes are clear of obstruction		
8. Exposed ropes and stakes adjacent to exits and entrances are marked and/or roped off		
9. All locking pins and bolts are in place and secure		
10. All structural supports are sound without cracks or significant dents and not overstressed		
11. Eaves connection joints are securely locked home		
12. No unrepaired tears in fabric are present		
13. Walls are securely pegged and/or secured		
14. The king posts are independently guyed where appropriate		
15. Suspended weights are evently distributed and do not overload the structure, no excessive weights suspended from roof beams etcs.		
16. Wind anemometer is installed and the instructments are in good working orders		
17. Final all-round visual check to satisfy that tent is erected securely		

Comments:

RECOMMENDED MINIMUM CHECKLIST FOR EQUIPMENTS

This list is not exhaustive and is meant as guidance only.

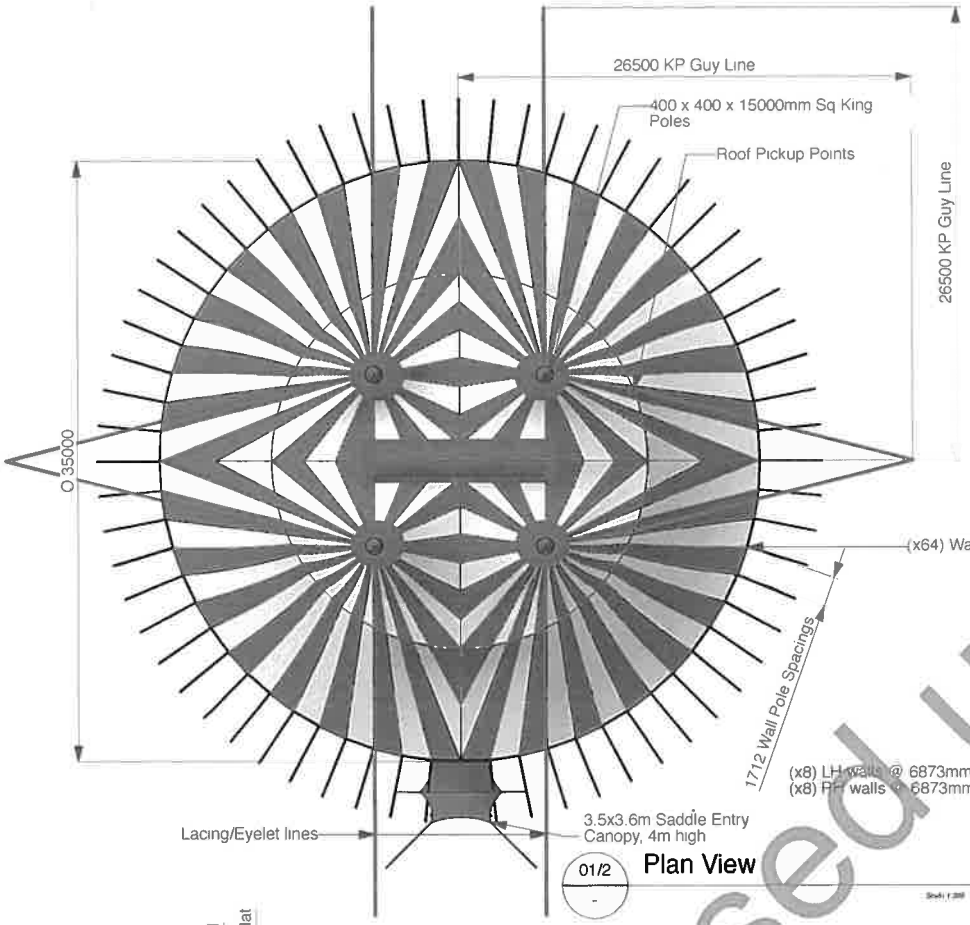
Inspection Date: _____

Location: _____

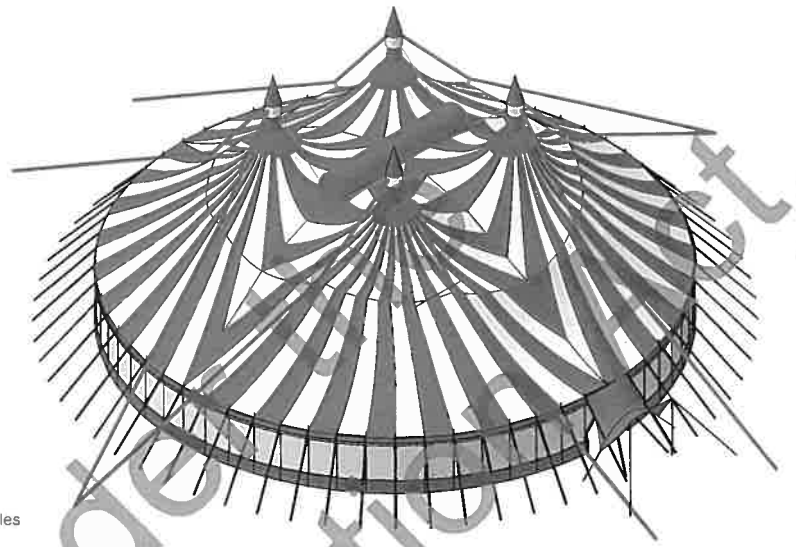
Inspected By: _____

	OK	NG
1. All ropes are checked for fraying and anything with over 20% fraying shall be discarded		
2. All roof and wall covers are checked for tears and repaired in accordance with the manufacturer's recommendations.		
3. All repairs to load bearing structural members are according to manufacturer's instructions or certified by a qualified structural engineer.		
4. All wire rope are checked for fraying and thimble loop integrity.		
5. All brackets are checked to ensure they are sound and secure.		
6. All non-galvanised steel are checked for sign of corrosion.		
7. All welds are checked for cracks.		
8. All steel sections are checked for kinking or bowing.		
9. Safety wires on all ridge poles are checked for soundness and secure fixing.		

Comments:



01/2 Plan View



01/4 Perspective View

Baytex Big Top Performance Tent

Zirka Circus

Note:
All dimensions in mm.
All dimensions have tolerances of ± 0.5mm unless otherwise stated.
Break all sharp edges

Copyright:
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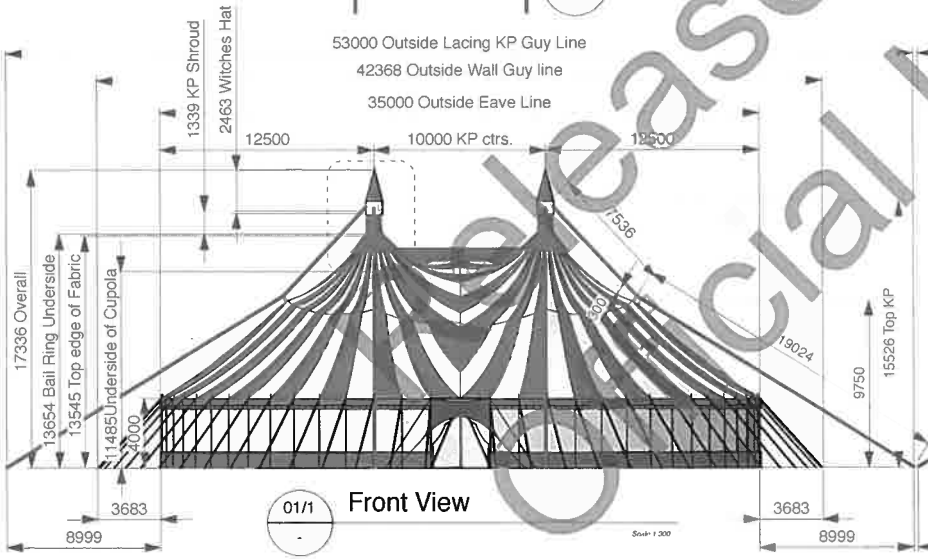
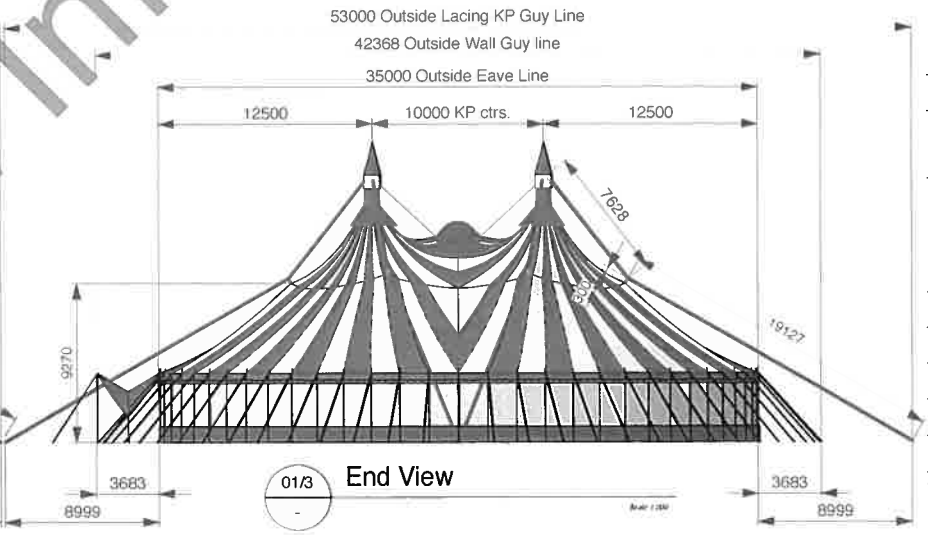
Approved	
Checked	
Issued	
Date	

Original Copy Red



01/1 Front View



01/3 End View

No.	By	Date	Amendment

Baytex Manufacturing Company Ltd
52 Newton Street
P.O. Box 4370
Mt Maunganui
New Zealand

Phone: 64 7 579 0190
Fax: 64 7 579 0194
email: sales@baytex.co.nz

A3 Drg 3rd Angle Proj

Scale	Drawing Type
1:100	Preliminary

Job Title
Baytex Big Top Performance Ten
Zirka Circus

Drawing Title
35mØ 4 Pole Circus Tent
Plan & Elevations
Preliminary Design

Sheet No.

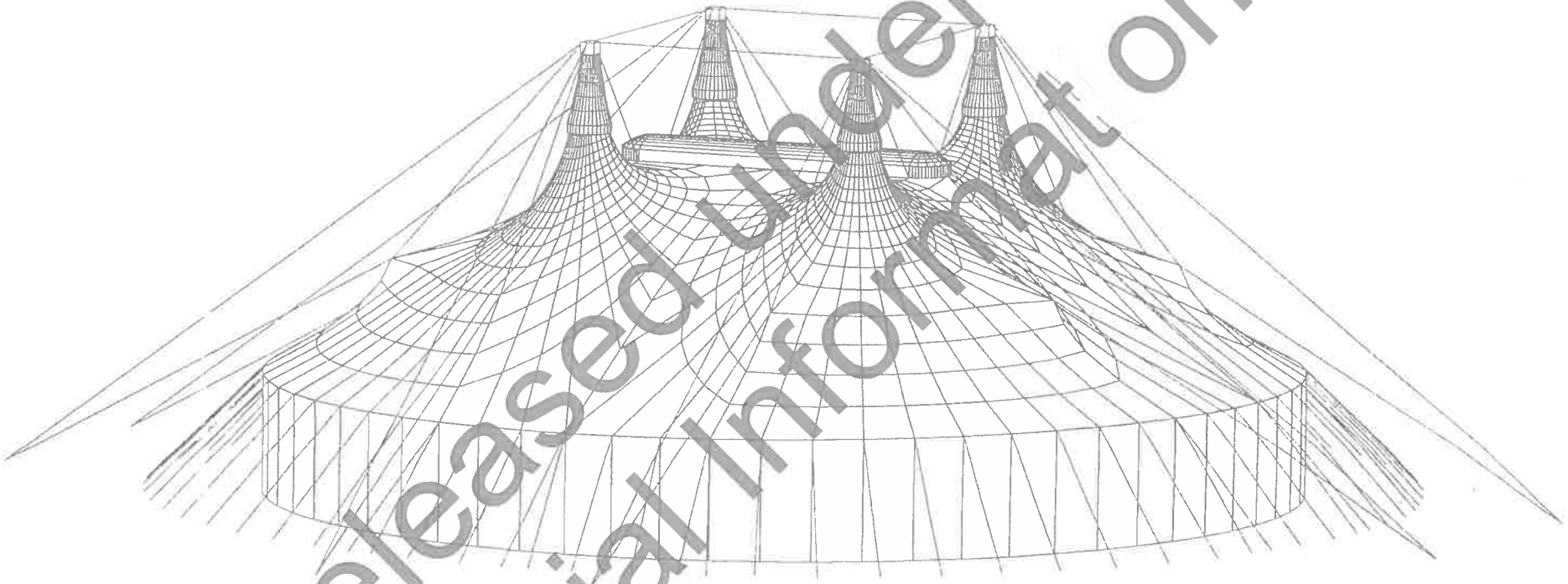
Part No.

Drawing No.	Revision No.
15.057.01	

Date
12.12.14

Drawn By
A.P.Lingman

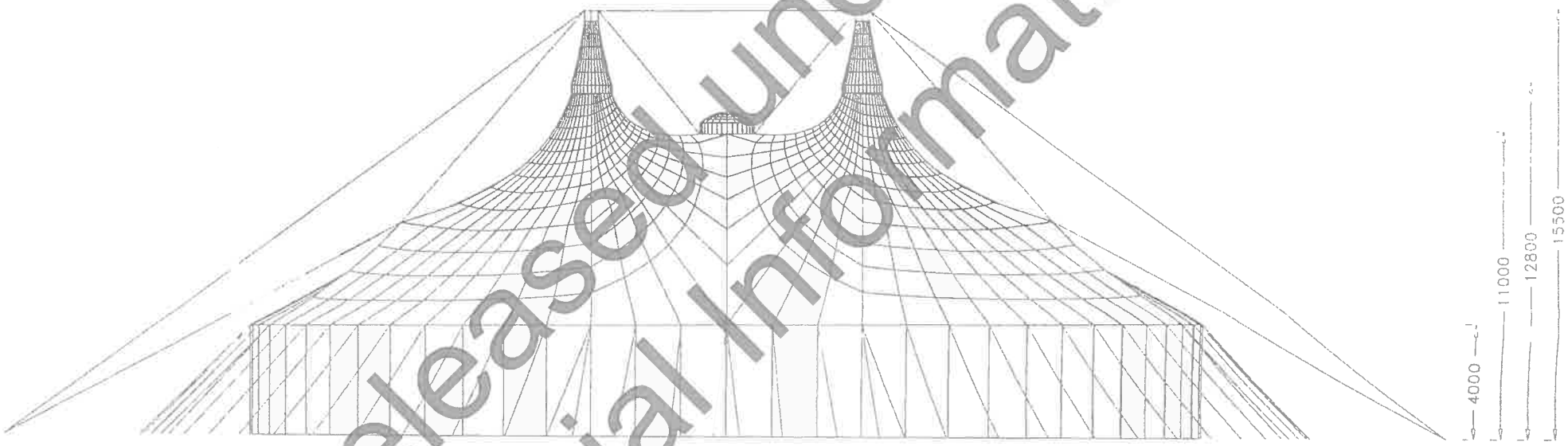
Thu, 26 Mar, 2015
11:50:10 am
15.057.05-7 Ø35m ZirkaCircus.vw



35m Circus Tenet Translated set of drawings
15180

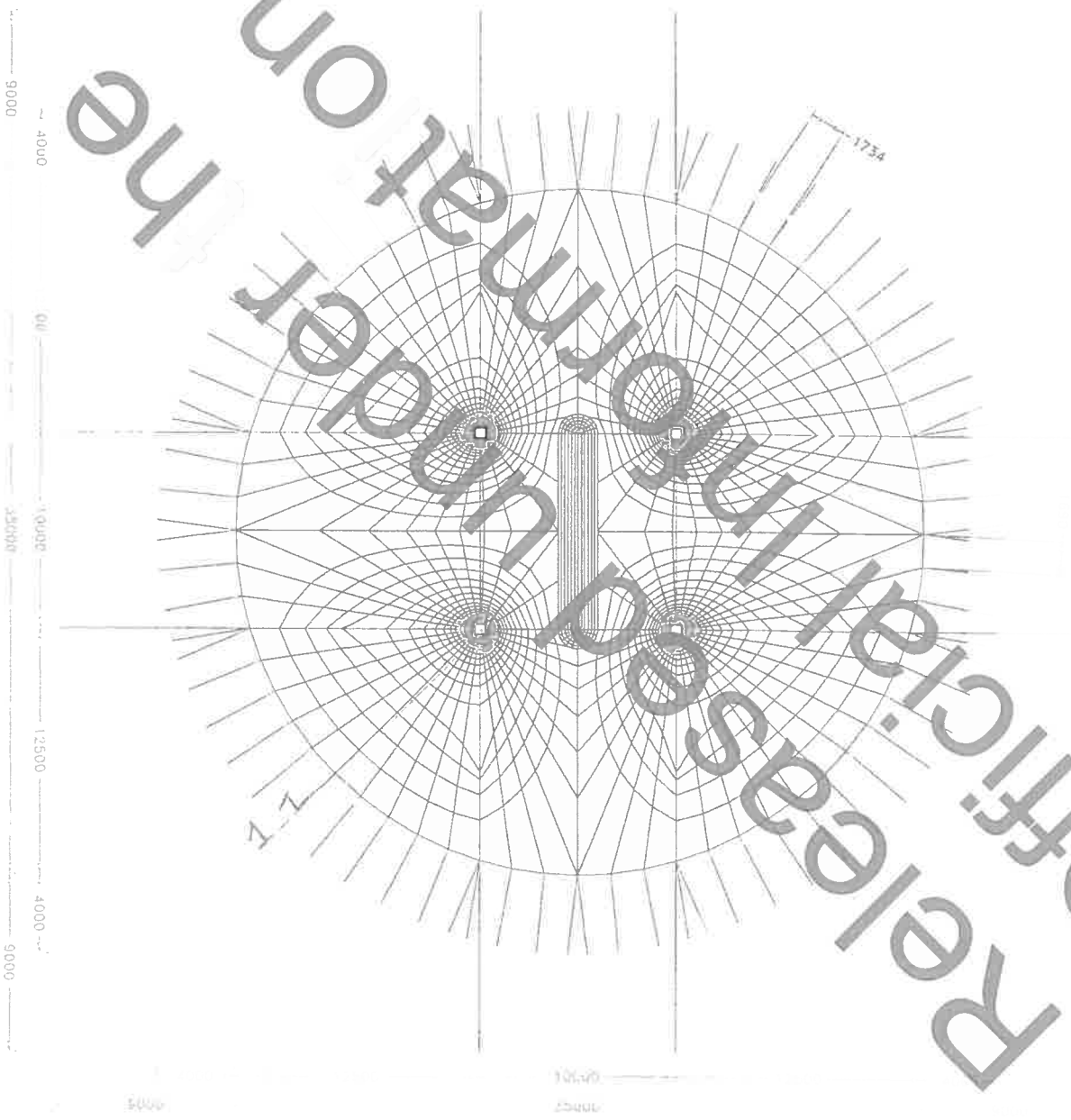
Tent Diameter 35m - Antennas 10x10 - Ring Diameter 120cm - Cupola (1+10+1) x2.0 - H 11.00 - H 12.8 - h. 4.00

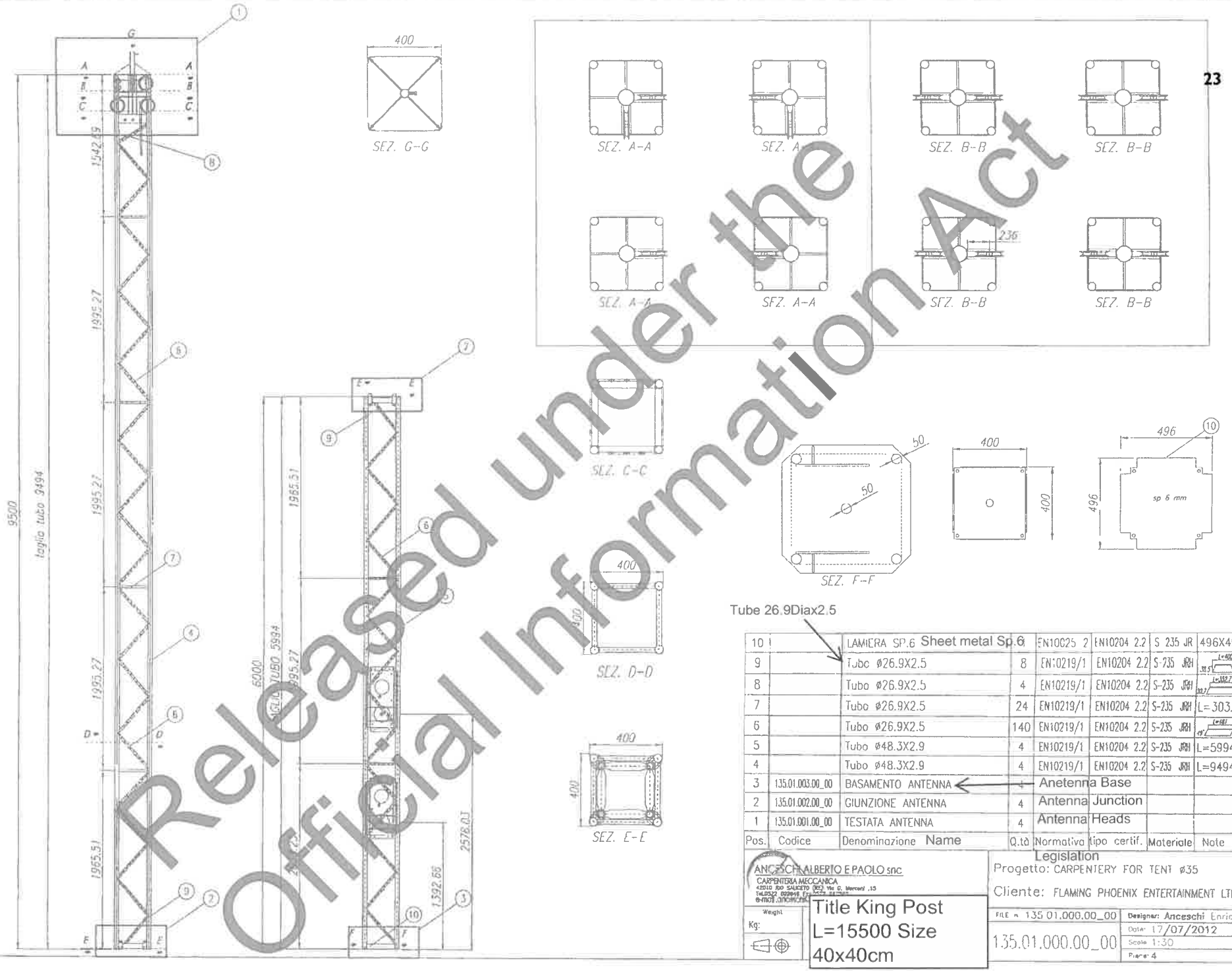
Tensodenda diametro mt. 35.00 – Antenne a mt. 10.00 x 10.00 – Ring diametro cm. 120
Cupola mt. (1.00 + 10.00 + 1.00) x 2.00 – H. 11.00 – H. 12.80 – h. 4.00



Tent Diameter 35m - Antennas 10x10 - Ring Diameter 120cm - Cupola (1+10+1)

Tensodenda diametro mt. 35.00 – Antenne a mt. 10.00 x 10.00 – Ring diametro cm 120
Cupola mt. (1.00 + 10.00 + 1.00) x 2.00 – H. 11.00 – H. 12.80 – h. 4.00





Tube 26.9Diax2.5

Pos.	Codice	Denominazione Name	Q.tà	Normativa	tipo certif.	Materiale	Note
10		LAMIERA SP.6 Sheet metal Sp.6	6	EN10025 2	EN10204 2.2	S 235 JR	496X496
9		Tubo ø26.9X2.5	8	EN10219/1	EN10204 2.2	S-235 JRH	
8		Tubo ø26.9X2.5	4	EN10219/1	EN10204 2.2	S-235 JRH	
7		Tubo ø26.9X2.5	24	EN10219/1	EN10204 2.2	S-235 JRH	L=303.4
6		Tubo ø26.9X2.5	140	EN10219/1	EN10204 2.2	S-235 JRH	
5		Tubo ø48.3X2.9	4	EN10219/1	EN10204 2.2	S-235 JRH	L=5994
4		Tubo ø48.3X2.9	4	EN10219/1	EN10204 2.2	S-235 JRH	L=9494
3	135.01.003.00_00	BASAMENTO ANTENNA	4	Anetenna Base			
2	135.01.002.00_00	GIUNZIONE ANTENNA	4	Antenna Junction			
1	135.01.001.00_00	TESTATA ANTENNA	4	Antenna Heads			

ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA

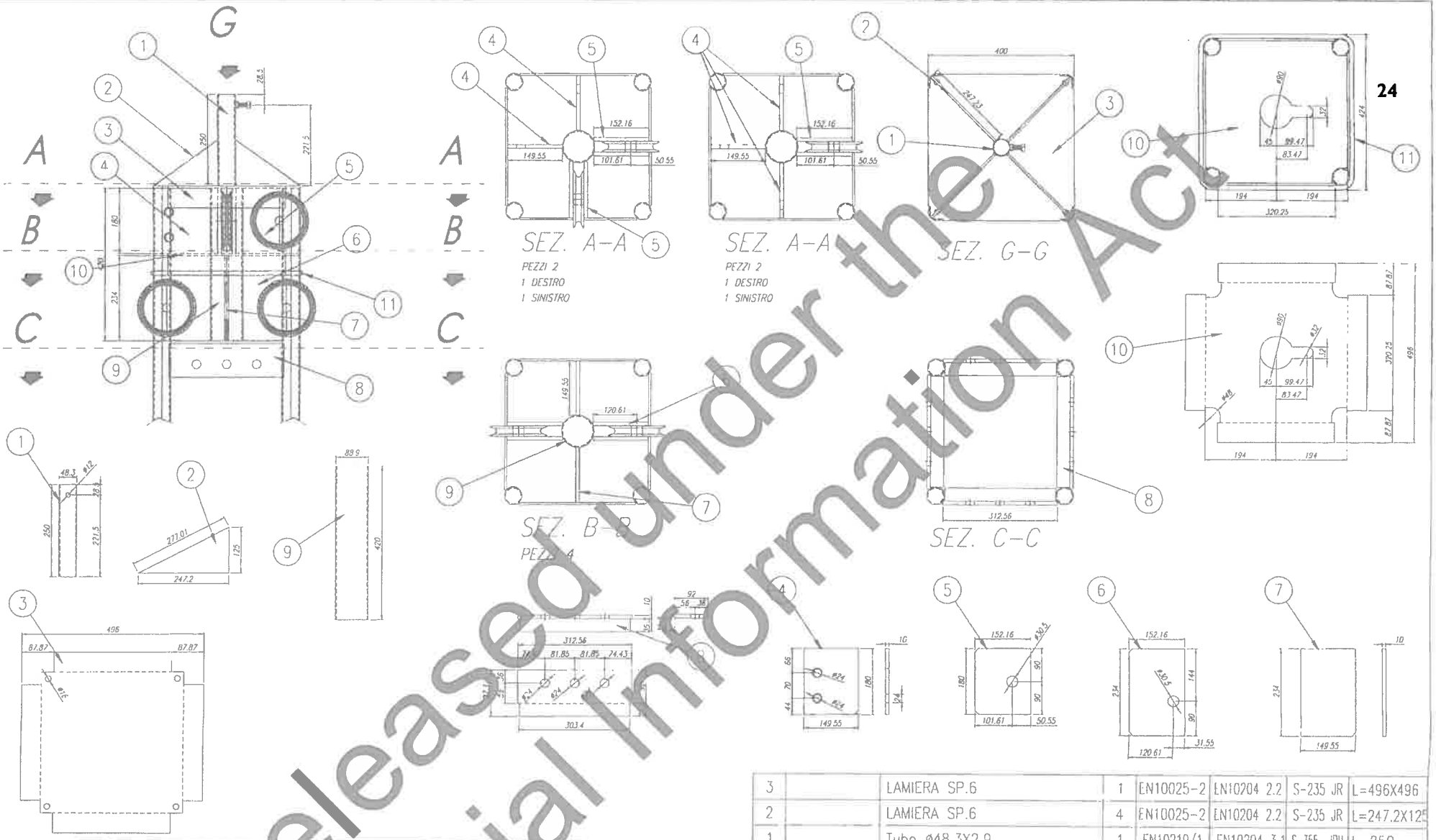
Weight
Kg:

Legislation
Progetto: CARPENTERY FOR TENT ø35
Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

Title King Post
L=15500 Size
40x40cm

FILE n. 135.01.000.00_00
135.01.000.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scale 1:30
Page: 4



Pos.	Codice	Denominazione	Q.tà	Normativa	Tipo certif.	Materiale	Note
11		Tubo ø Round 12Dia	1	EN10025-2	EN10204 2.2	S-235 JR	L=1558.4
10		LAMIERA SP.6 Sheet Metal Sp6	1	EN100 -2	EN10204 2.2	S-235 JR	L=496X496
9		Tubo ø88.9X3 Tube 88.9Diax3		EN10219/1	EN10204 3.1	S-355 JRH	L=420
8		LAMIERA SP.10 Sheet Metal Sp10	4	EN10025-2	EN10204 2.2	S-235 JR	L=312.5X127.3
7		LAMIERA SP.10		EN10025-2	EN10204 2.2	S-235 JR	L=149.5X23
6		LAMIERA SP.1	4	EN10025-2	EN10204 2.2	S-235 JR	L=152.1X23
5		LAMIERA SP.1	4	EN10025-2	EN10204 2.2	S-235 JR	L=152.1X18
4		LAMIERA SP.10	2	EN10025-2	EN10204 2.2	S-235 JR	L=149.5X18
3		LAMIERA SP.6	1	EN10025-2	EN10204 2.2	S-235 JR	L=496X496
2		LAMIERA SP.6	4	EN10025-2	EN10204 2.2	S-235 JR	L=247.2X125
1		Tubo ø48.3X2.9	1	EN10219/1	EN10204 3.1	S-355 JRH	L=250

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e-mail.onceschi@anceschi.it www.onceschi.it

Weight
Kg:

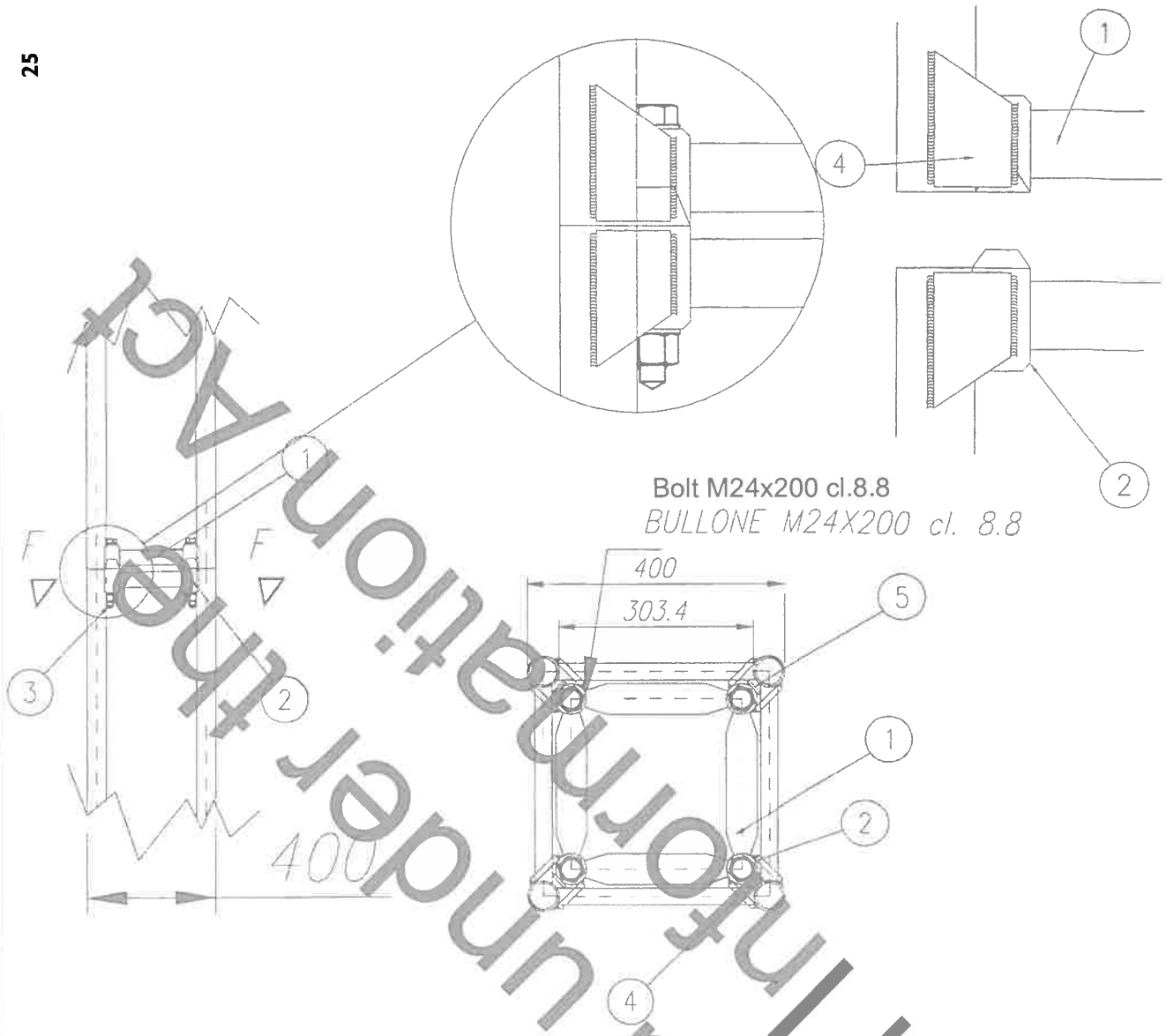
Title King Post
L=15500 Size 40x40cm

Progetto: CARPENTERY FOR TENT ø35
Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

FILE n°: 135.01.001.00_00
135.01.001.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scale: 1:30
Piece: 4

25



Pos.	Codice	Denominazione Name	Q.tà	Materiale	Note
5		Piatto 40x4 Dish 40x4	8	Fe 360-C EN 10025	L=60
4		Piatto 60x5 Dish 60x5	16	Fe 360-C EN 10025	L=45
3		Bullone m24x200 Bolt M24x200	4	cl. 8.8	L=200
2		Tubo ø48x10 Tube 48Diax10	16	Fe 360-C EN 10025	L=290
1		Tubo ø48x3	4	Fe 360-C EN 10025	L=218

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Material

Progetto: CARPENTERY FOR TENT ø35

Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

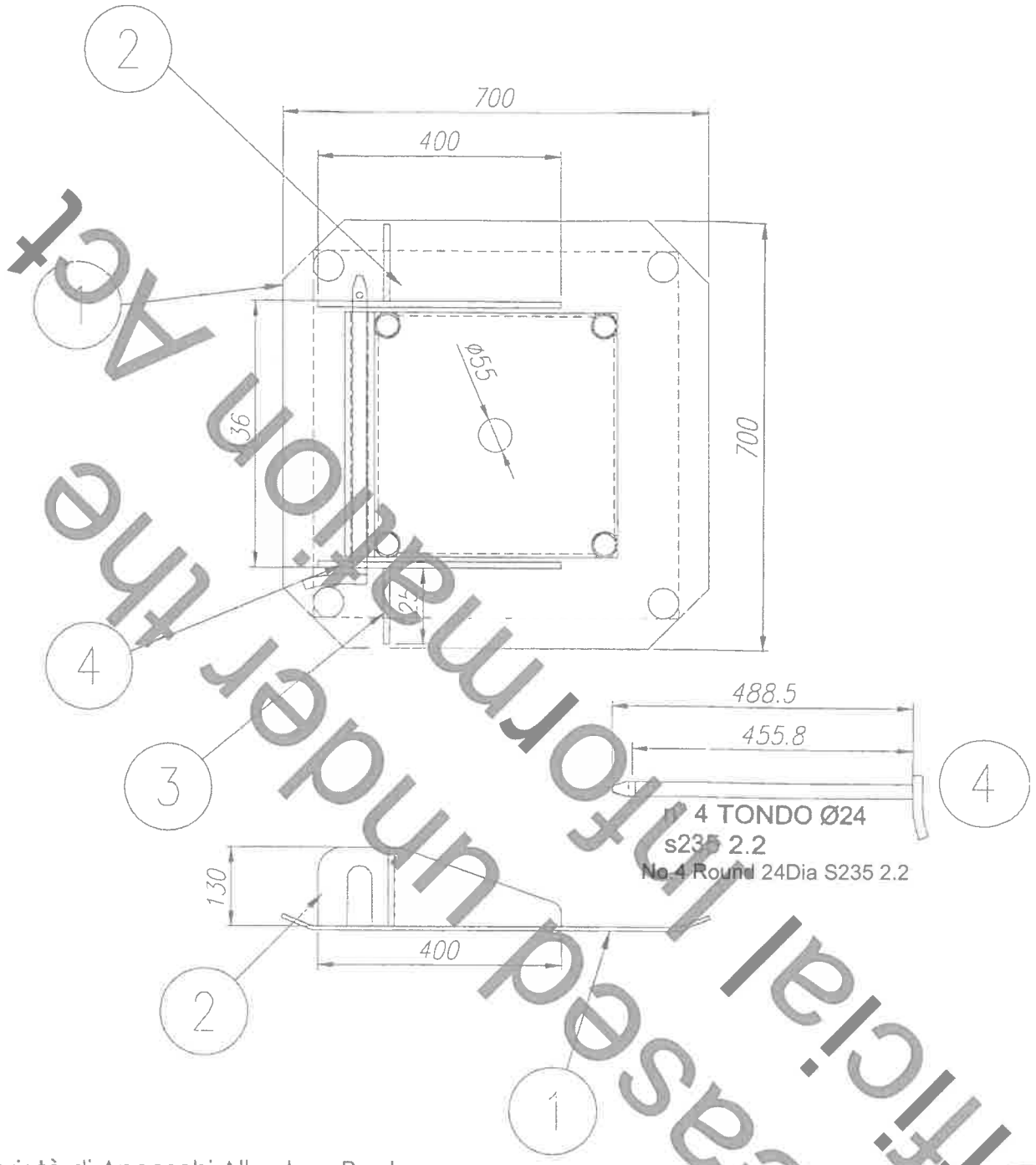
Weight
Kg:

Title: King Post Joint

FILE n°: 135.01.002.00_00

135.01.002.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scale: 1:30
Piece: 4



Pos.	Codice	Denominazione Name	Q.tà	Materia e	Note
4		Tubo tondo ø24 Round Tube 24Dia	1	Fe 360-C EN10025	L=500
3		Piatto 130x10 Dish 130x10	1	Fe 360-C EN10025	L=125
2		Piatto 130x10	1	Fe 360-C EN10025	L=400
1		Piastra sp.6 Plate sp.6	1	Fe 360-C EN10025	L=700X700

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e-mail.anceschi@anceschi.it www.anceschi.it

Progetto: CARPENTERY FOR TENT ø35

Cliente: FLAMING PHOENIX ENTERTAINMENT LTD.

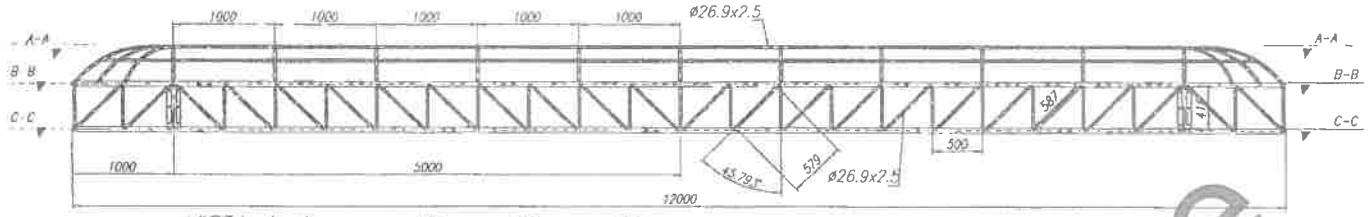
Weight
Kg:

Title: Base Plate

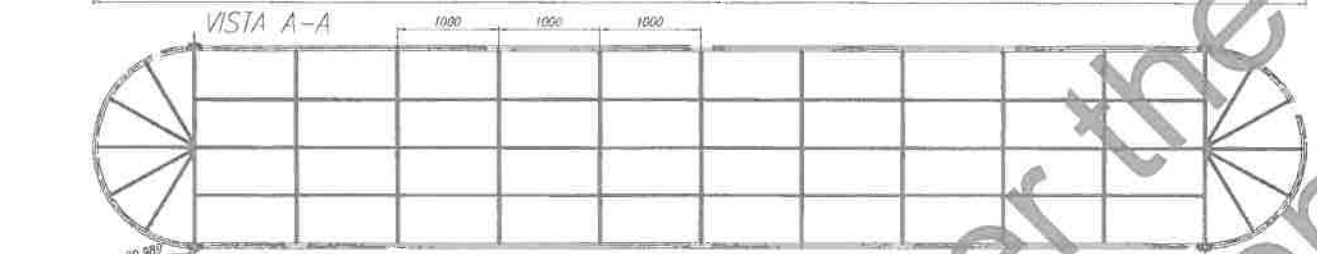
FILE n°: 135.01.003.00_00

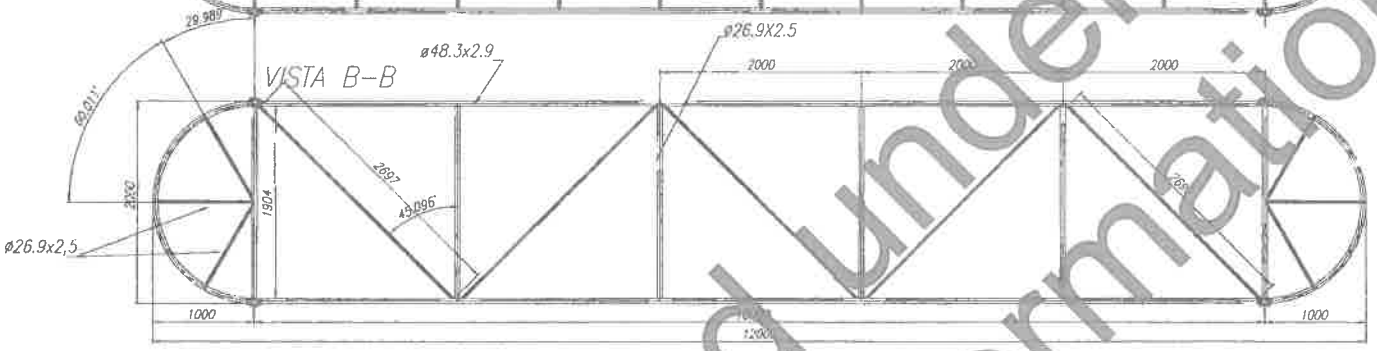
135.01.003.00_00

Designer: Anceschi Enrica
Date: 17/07/2012
Scale: 1:30
Piece: 4



VISTA A-A





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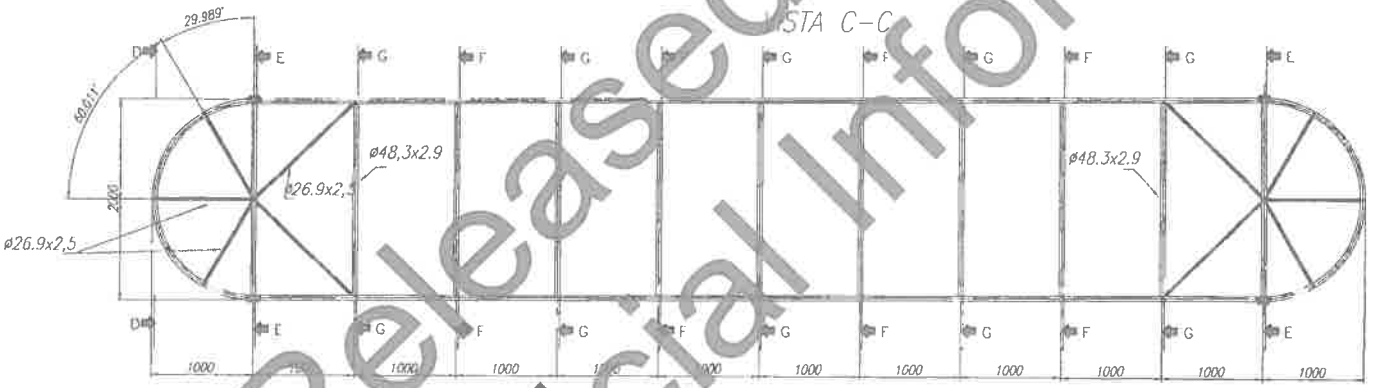
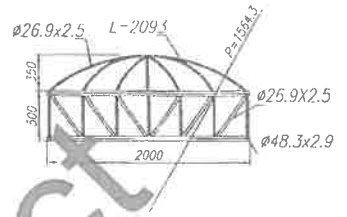
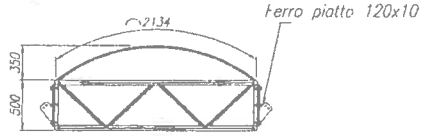


VISTA C-C



VISTA D-D



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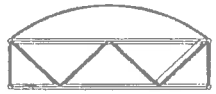
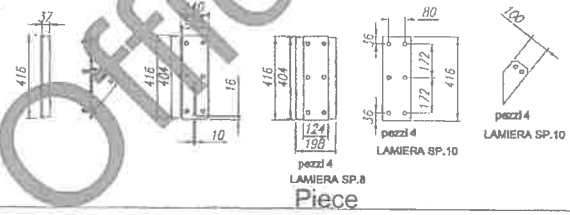


VISTA F-F

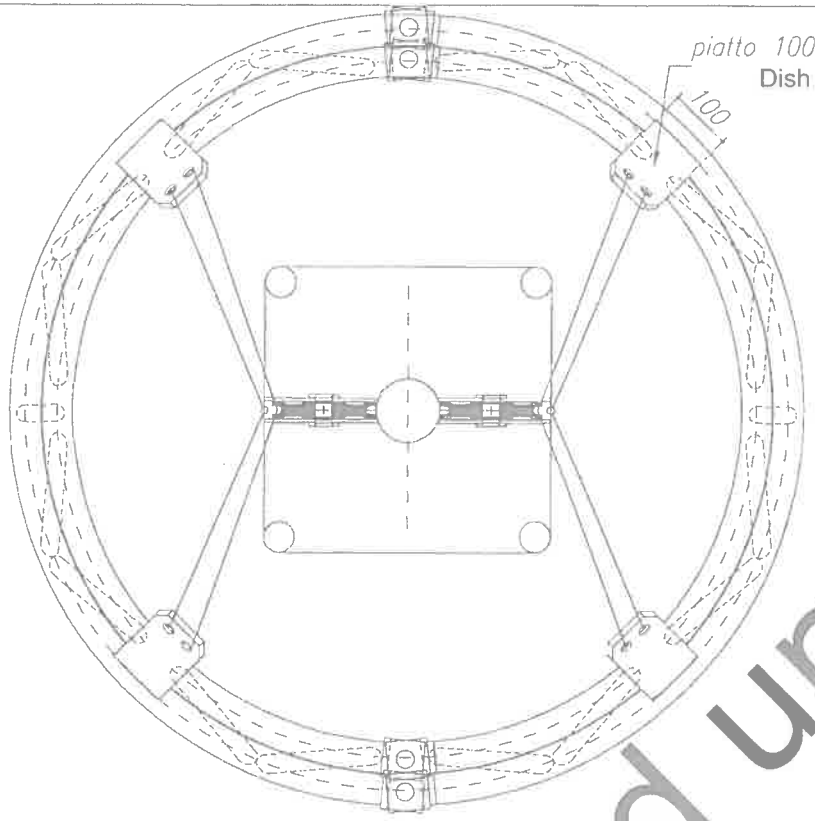
VISTA G-G

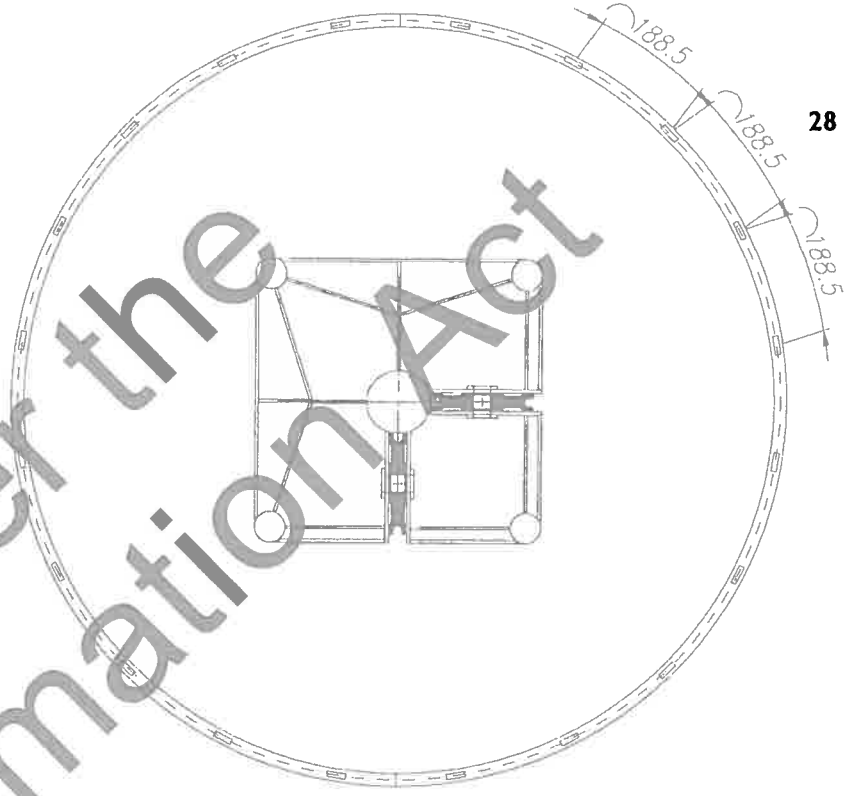


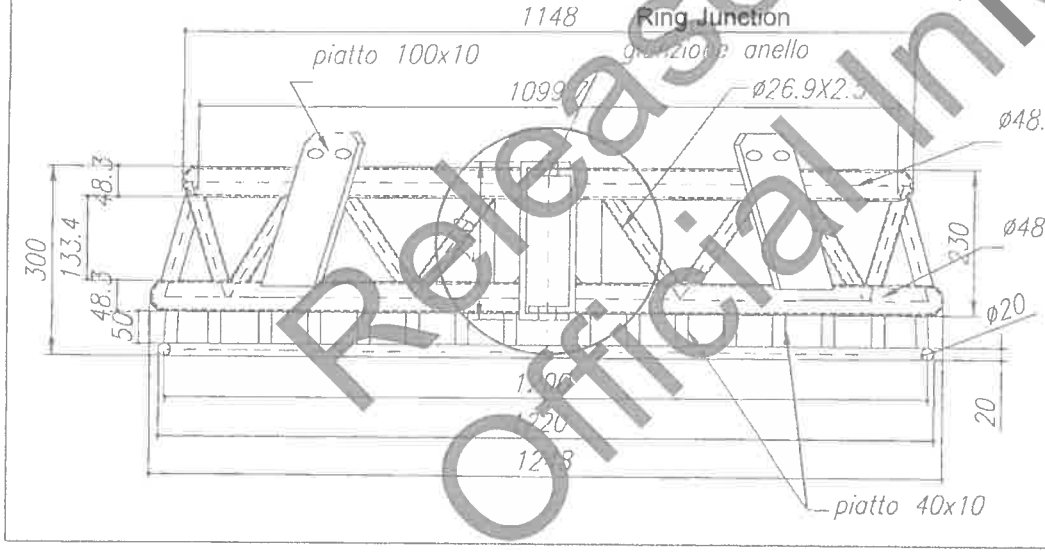
Piece

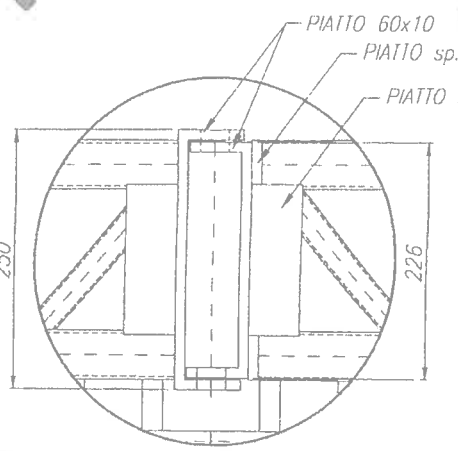
Plate sp.8

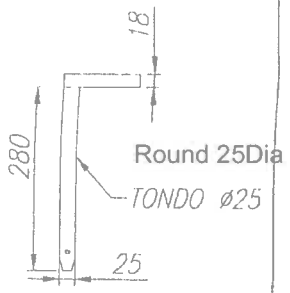
ANCESCHI ALBERTO E PAOLO snc CARPENTERIA MECCANICA 42010 RIO SALICETO (RE) Via G. Marconi ,15 Tel.0522 699849 Fax.0522 647540 e-mail.anceschi@anceschi.it www.anceschi.it	Progetto: CARPENTERY FOR CIRCUS ø35 Cliente: F PHOENIX . ENT.	
Weight Kg:	Title: Cupola 12x2	FILE n°. 135.02.000.00_00.dwg 135.02.000.00_00
		Designer: Anceschi Enrica Date: 09/07/2012 Scale: 1:40 Piece: 1











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tel.0522 699349 fax.0522 647340
e-mail..anceschi@anceschi.it www.anceschi.it

Weight
Kg:

Title: Openable Basket 1200dia

Progetto: carpentery for circus diam.35
Cliente: F . PHOENIX . ENT .

FILE n°: 135.03.000.00_00.dwg	Designer: Anceschi Enrico
135.03.000.00_00	Date: 09/07/2012
	Scale: 1:8
	Piece: 4

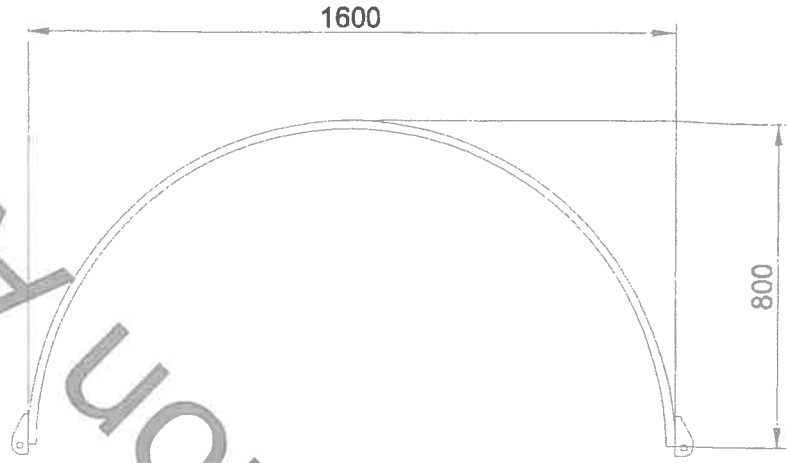
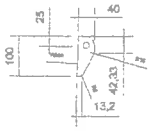


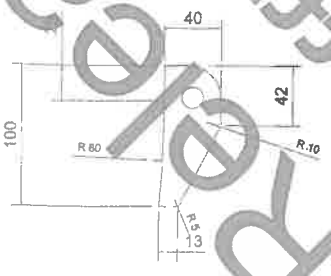
plate sp.6
PIATTO SP.6



n° 6 x 4 = 24 pezzi sp 6 mm

20dia Round Grade fe360
TONDO ø20
fe360

n° 6 x 4 = 24 pezzi sp 6 mm



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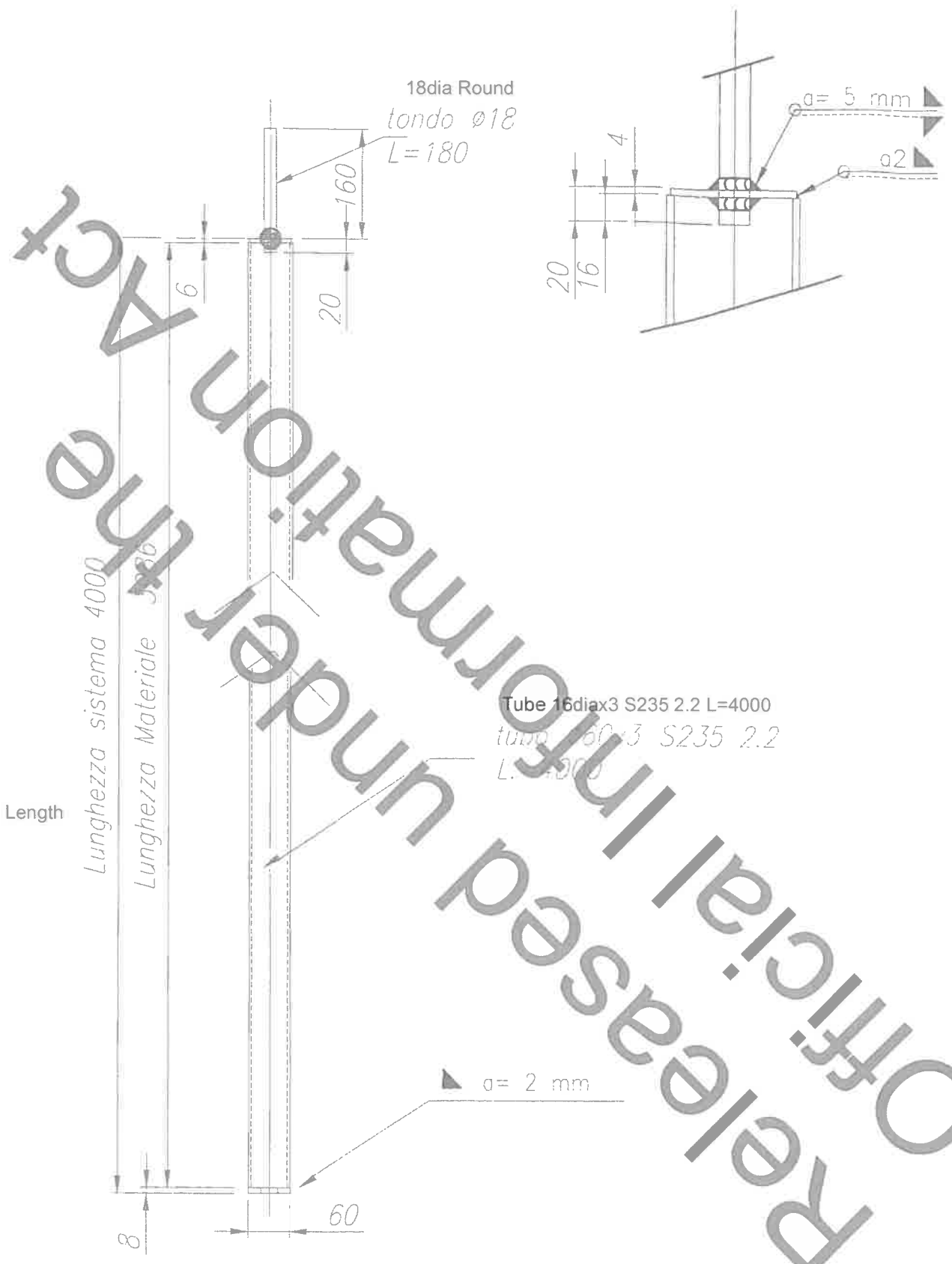
e-mail .anceschi@anceschi.it www. anceschi.it

Progetto: CARPENTERY FOR CIRCUS ø35

Cliente: F . PHOENIX . ENT

Weight Kg:	Titolo: RiNGS	FILE n°: 135.04.000.00_00.dwg	Designer: Anceschi Enrico
	Title: Rings	135.04.000.00_00	Date: 09/07/2012
			Scale: 1:18
			Piece: 4

30



ANCESCHI ALBERTO E PAOLO snc
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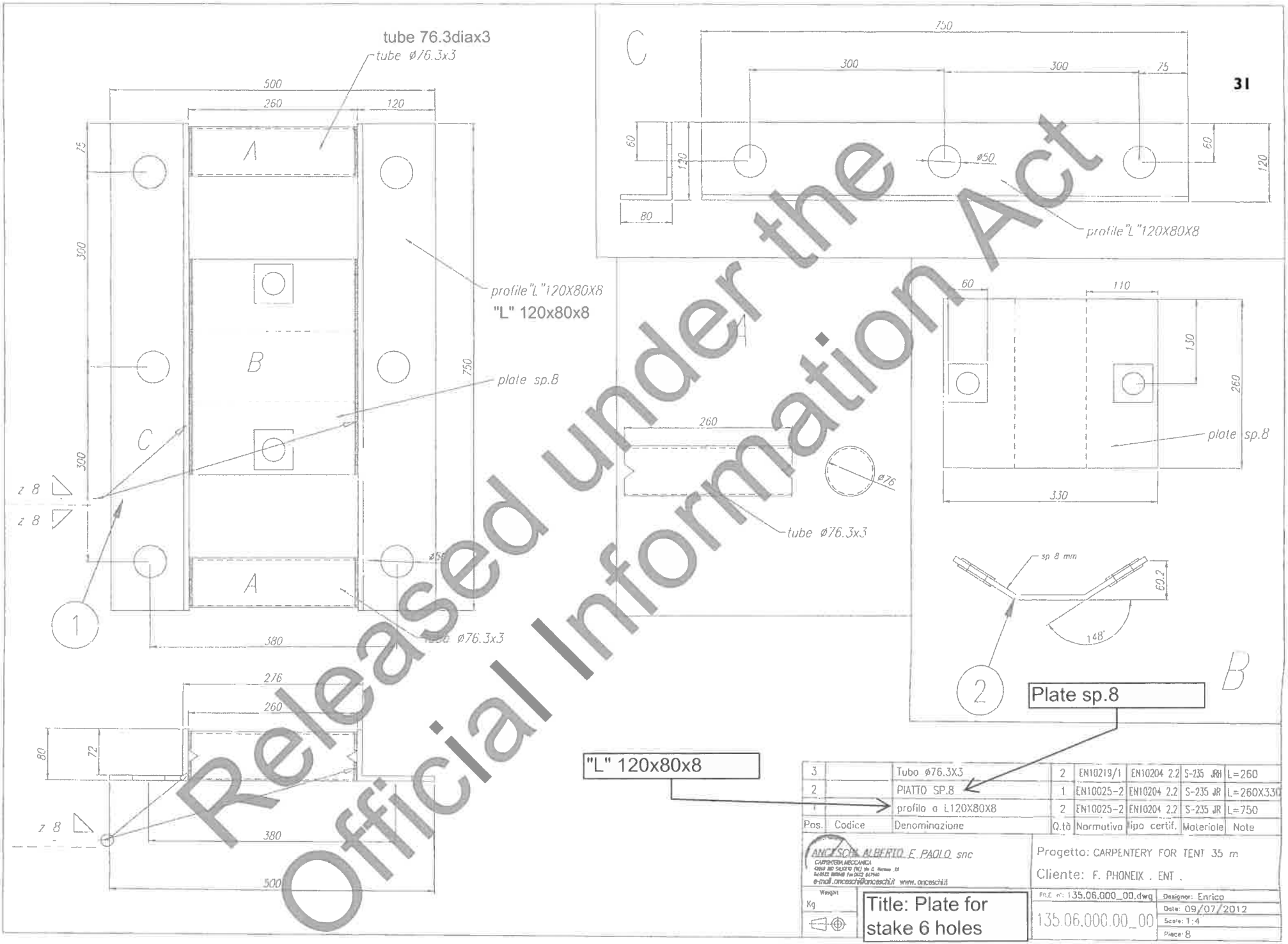
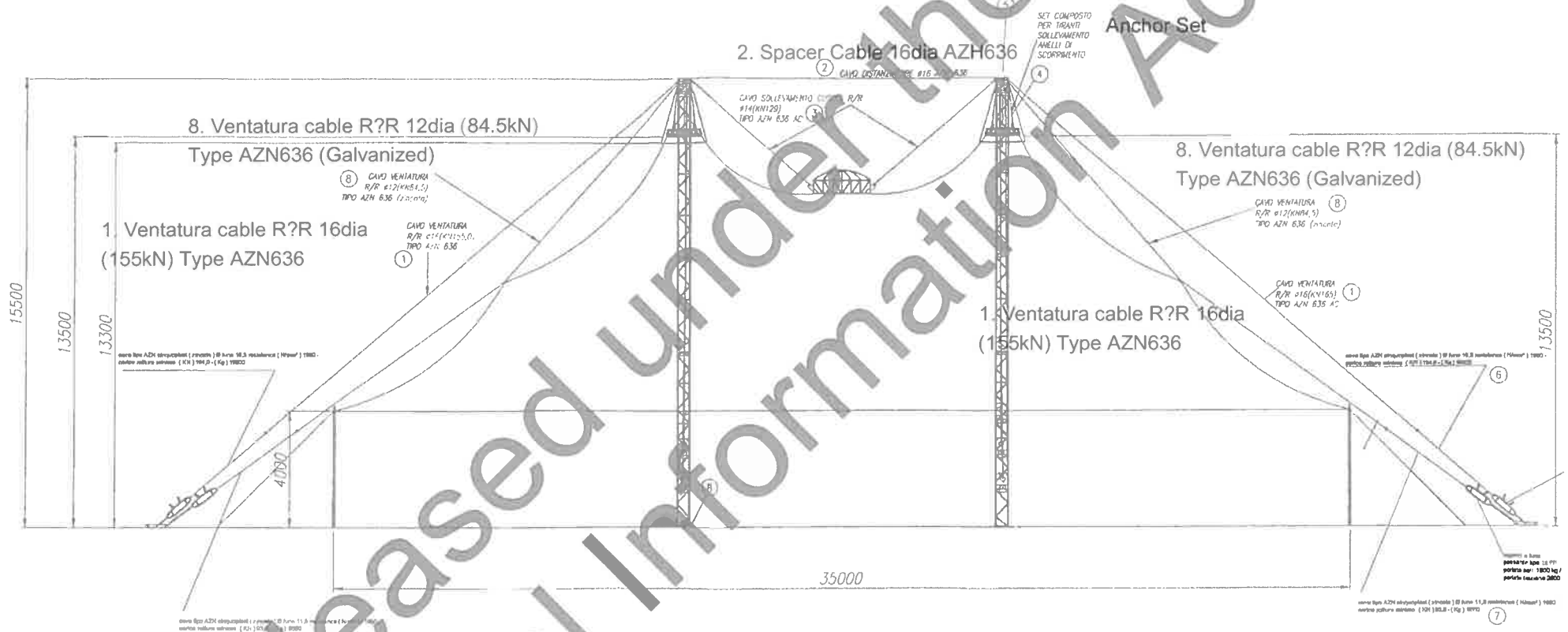
Progetto: CARPENTERY FOR TENT 35 m

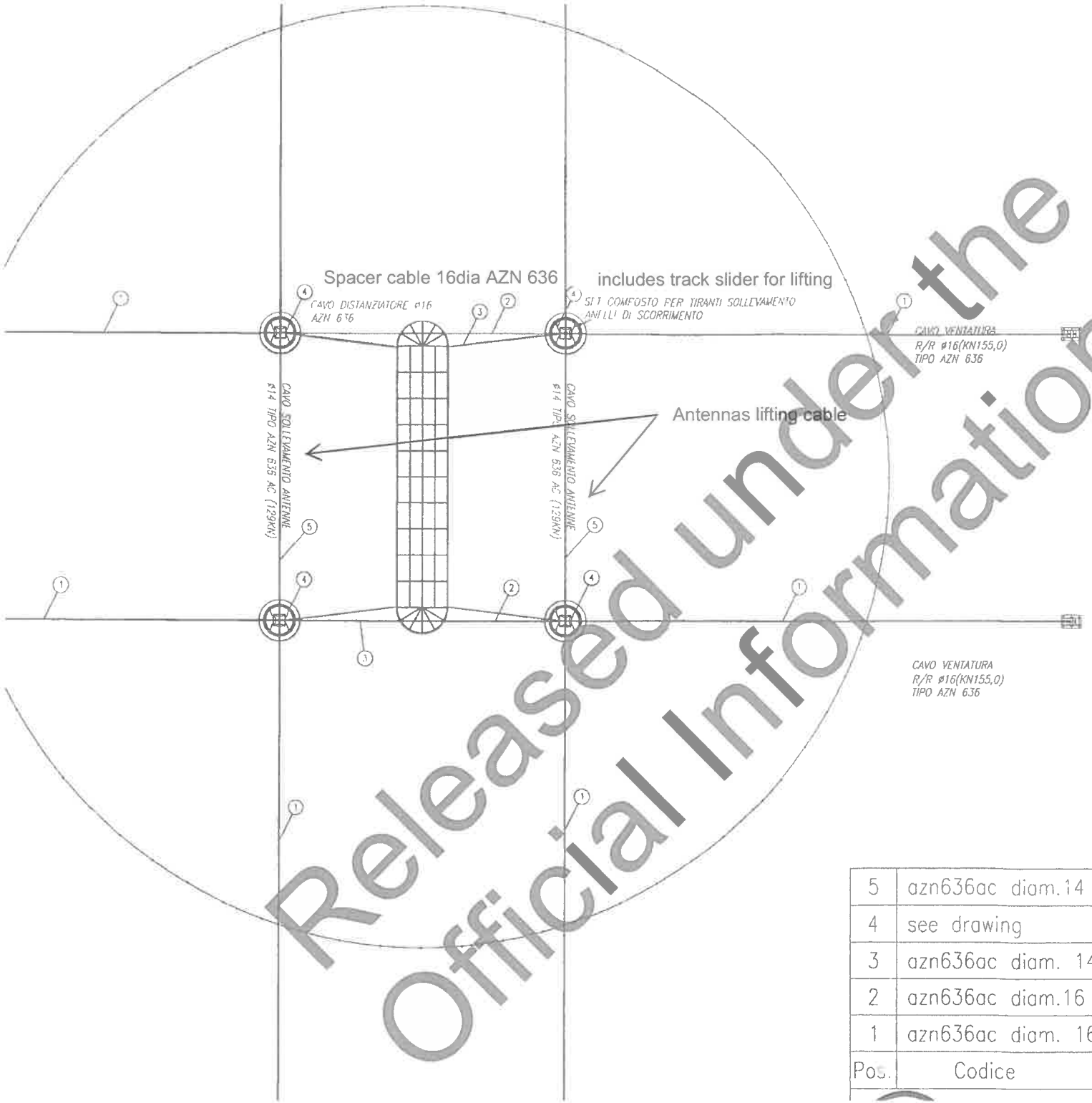
Cliente: F. PHOENIX . ENT

Weight Kg:	Title:Pole 4m Pipe 60diax3	FILE n°: 135.05.000.00_00.dwg	Designer: Enrico
		135.05.000.00_00	Date: 09/07/2012
			Scale: 1:8
			Piece: 66





Pos.	Codice	Denominazione Name	Q.tà
5	azn636ac diam.14	cables for lifting king poles	2
4	see drawing	cables for lifting basket	4
3	azn636ac diam. 14	Cables for lifting dome	4
2	azn636 diam.16	Cables Distance	2
1	azn636 diam. 16	cables fixing king poles	8



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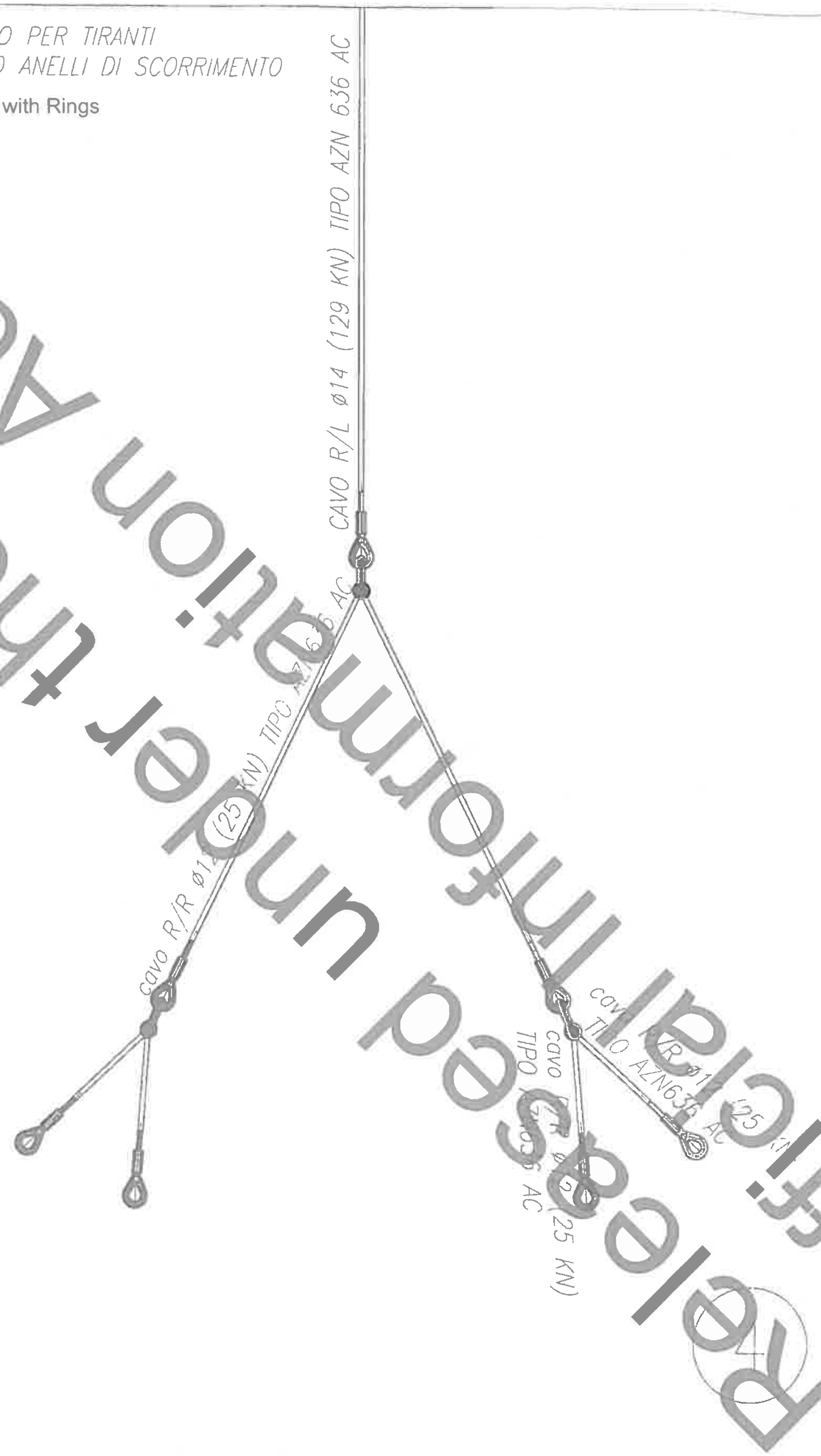
3	azn636ac diam. 14	Cables for lifting dome	4	
2	azn636ac diam.16	Cables Distance	2	
1	azn636ac diam. 16	cables fixing king poles	8	

SET COMPOSTO PER TIRANTI
SOLLEVAMENTO ANELLI DI SCORRIMENTO

For Lifting Rods with Rings



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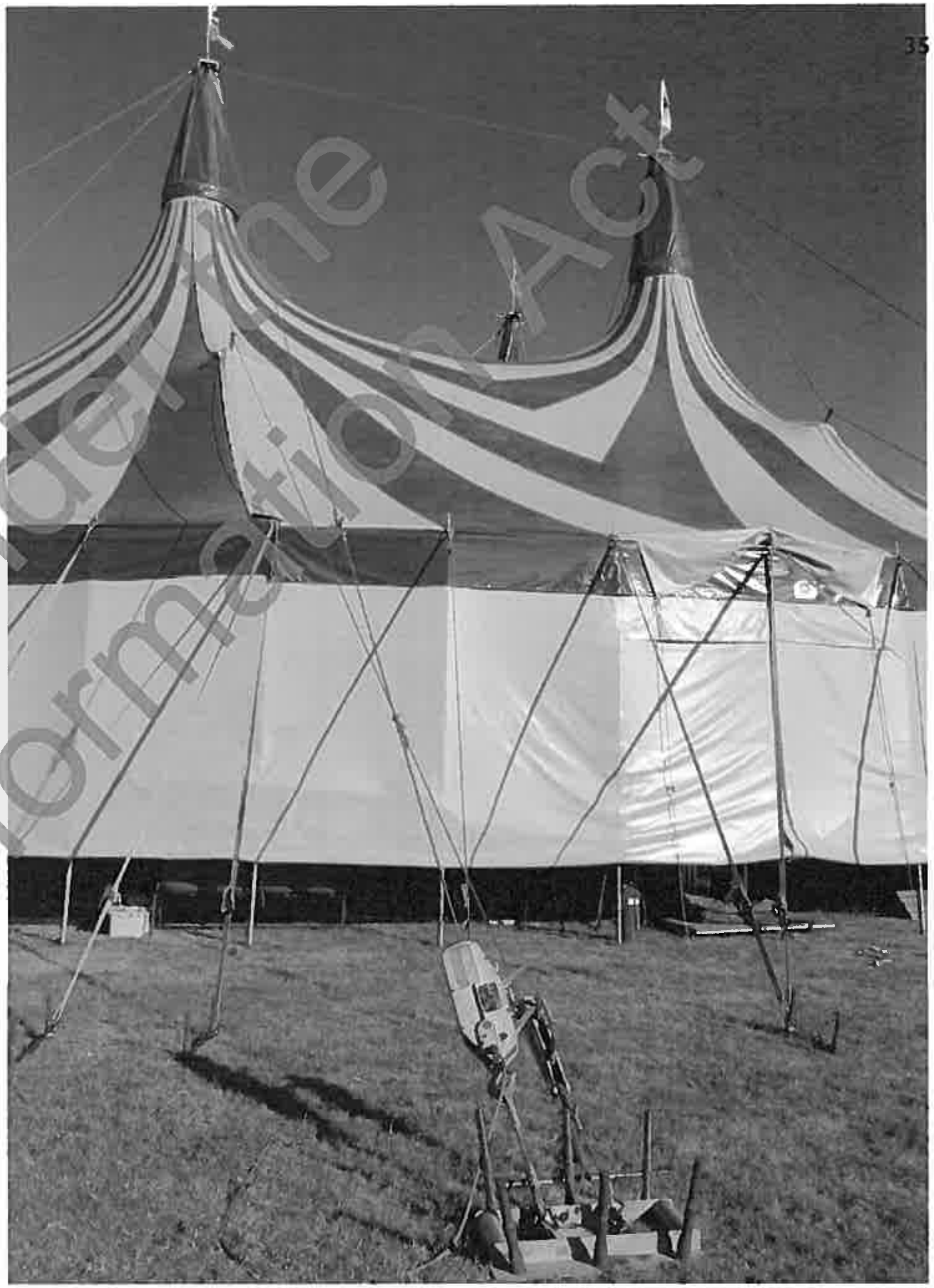
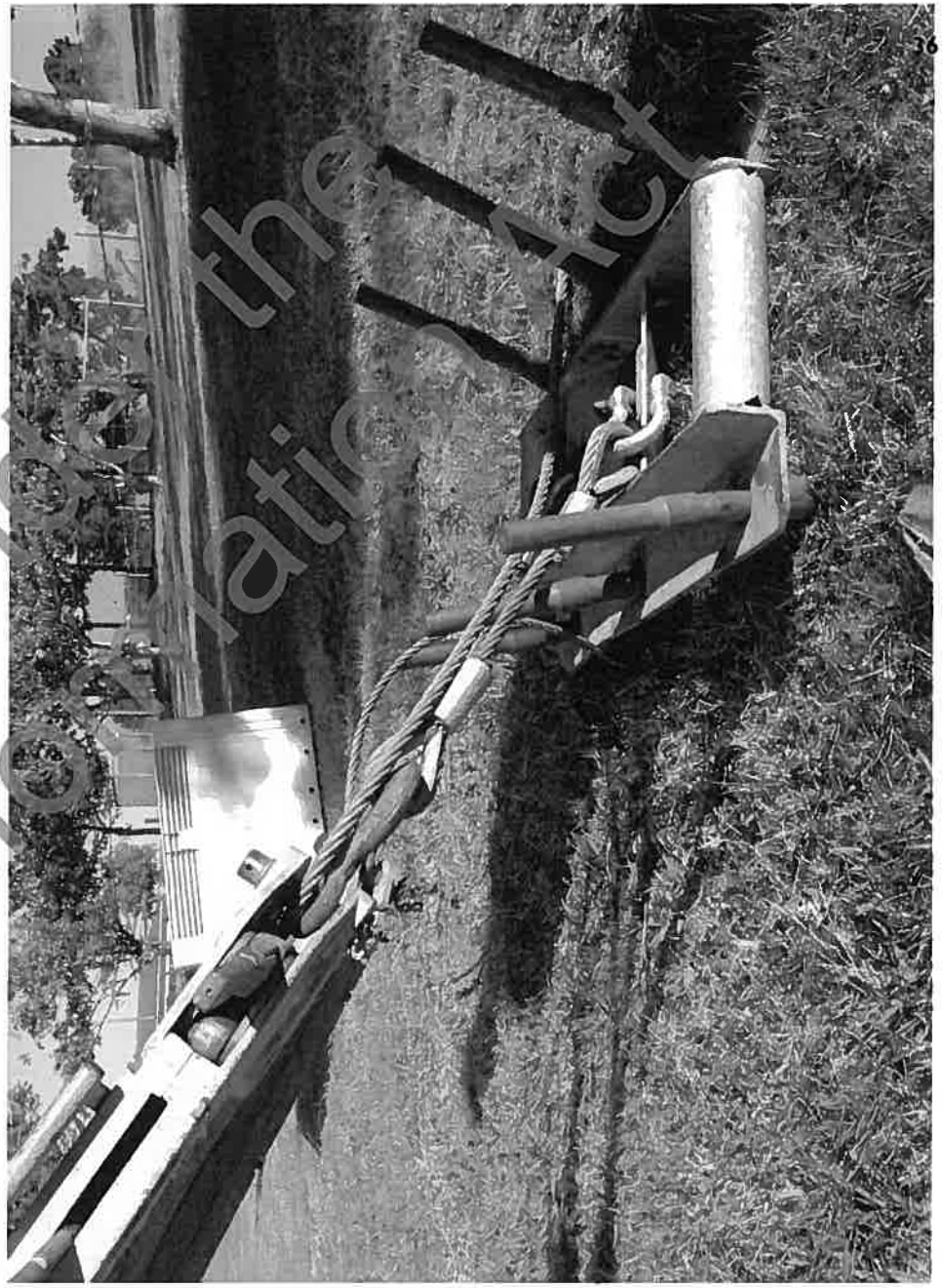
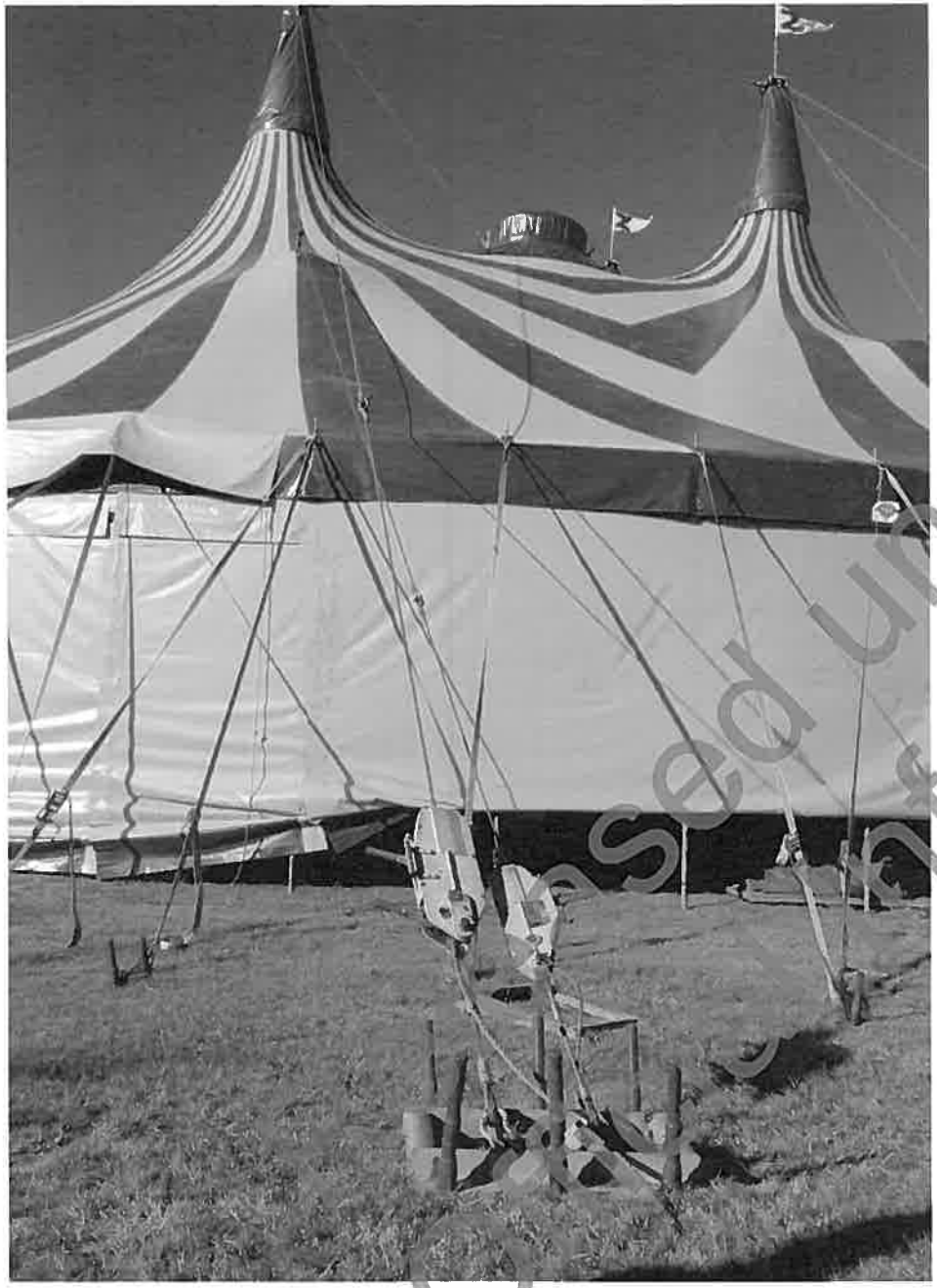
Progetto: SET COMPOSTO PER TIRANTI

Cliente: Flaming Pnoenix entrateniment

Weight Kg:	Title: Lifting Rings	FILE n°: 135.00.000.00	Designer: Enrico
		135.00.000	Date:
			Scale: 1:30
			Piece:







MAS Measurement & Analysis Systems

Newcastle University

School of Civil Engineering and Geosciences

Newcastle University
Drummond Building
Newcastle upon Tyne
NE1 7RU

CERTIFICATE OF TESTING

Job title:	**Biaxial Testing**	Job number:	**FERR-001**
Client:	**Ferrari**	Certificate number:	**FERR-001/17**
Sample ID:	**702T2 2 of 3**	Sheet:	**1 of 8**
Batch No:	**1000003453**	UTS:	**60 kN/m (warp)** **56 kN/m (fill)**
Test type:	**B5: Biaxial test based on "MSAJ/M-02-1995. Testing Method for Elastic Constants of Membrane Materials", amended to suit Client requirements.**		
Number of tests:	**17 of 32**		
Particular client requirements:	**See FERR-001 Testing Protocol**		

Notes:

(i) Temperature maintained at 23 degrees centigrade
(ii) Load and strain recorded at 2 second intervals
(iii) Best fit elastic constants calculated to minimise strain difference using increasing load curves with residual strain removed, from cycles 6, 12, 18, 24, 30 (1:1, 2:1, 1:2, 1:0, 0:1 respectively). Reciprocal constraint has not been applied (i.e. 4 independent elastic constants have been calculated).

Results:

Warp modulus, E_w = 528 kN/m
Fill modulus, E_f = 532 kN/m
Poisson's ratio warp-fill, $v_{w\text{-}f}$ = 0.34
Poisson's ratio fill-warp, $v_{f\text{-}w}$ = 0.50

DATE OF TEST:	24/11/2010	**TEST BY:**	Robert Grisdale
DATE OF ISSUE:	07/01/2011	**APPROVED BY:**	Dr Ben Bridgens
		SIGNED:	Ben Bridgens.

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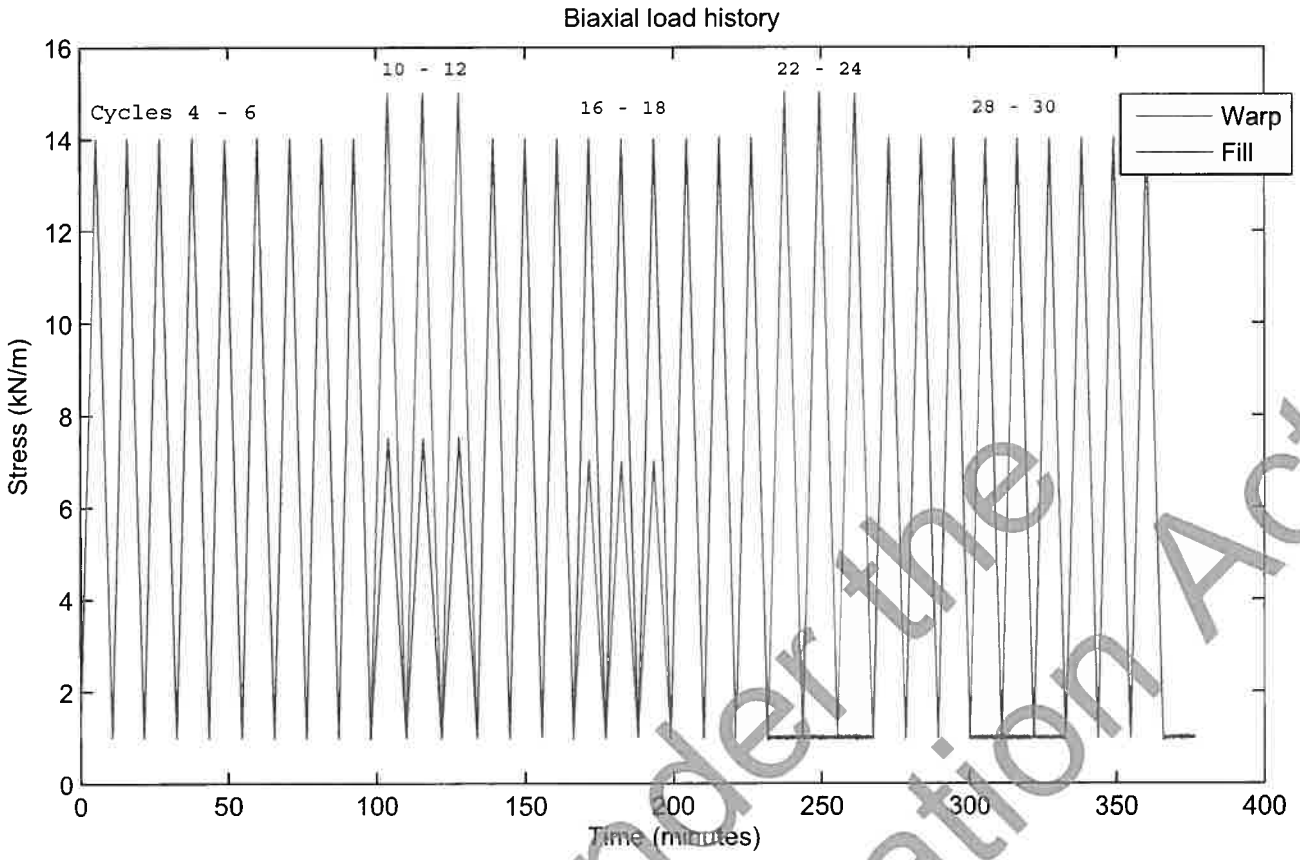

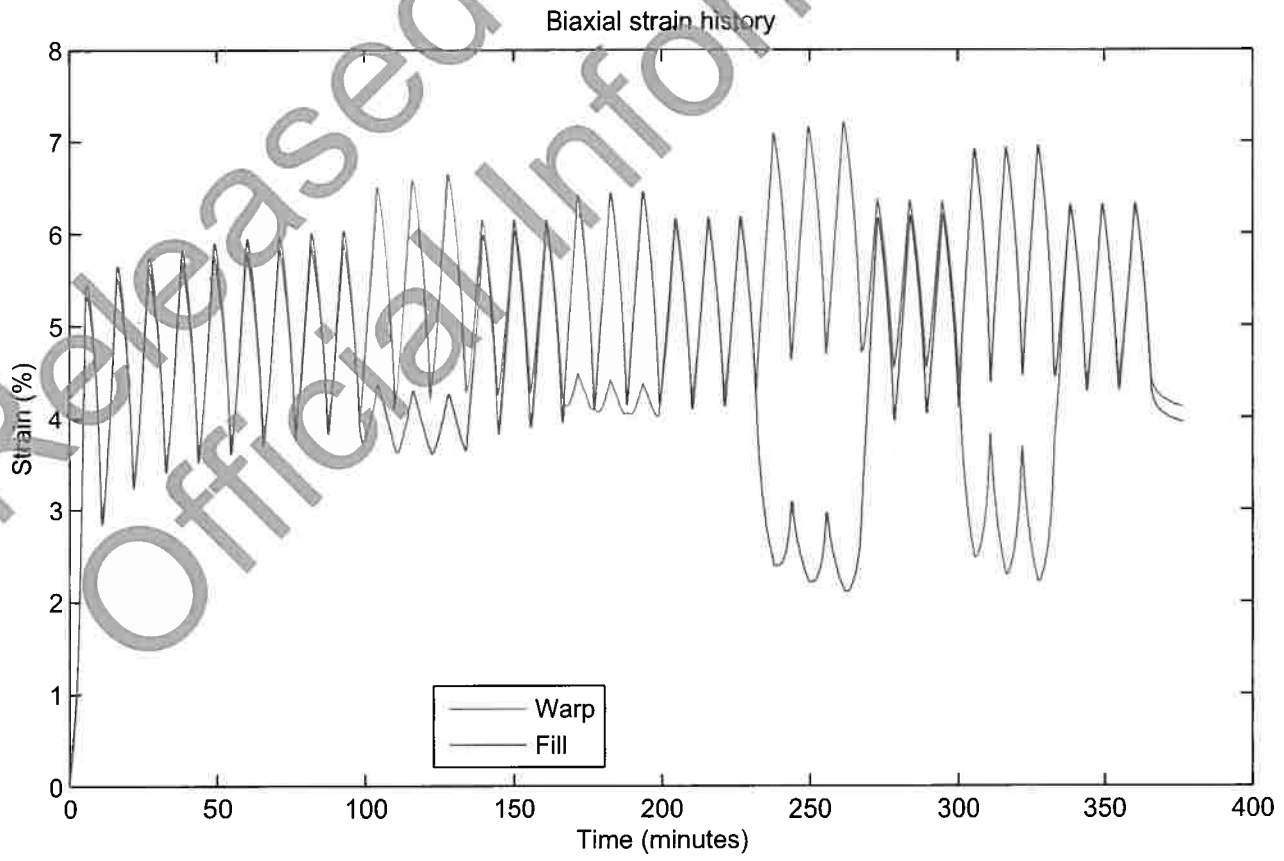

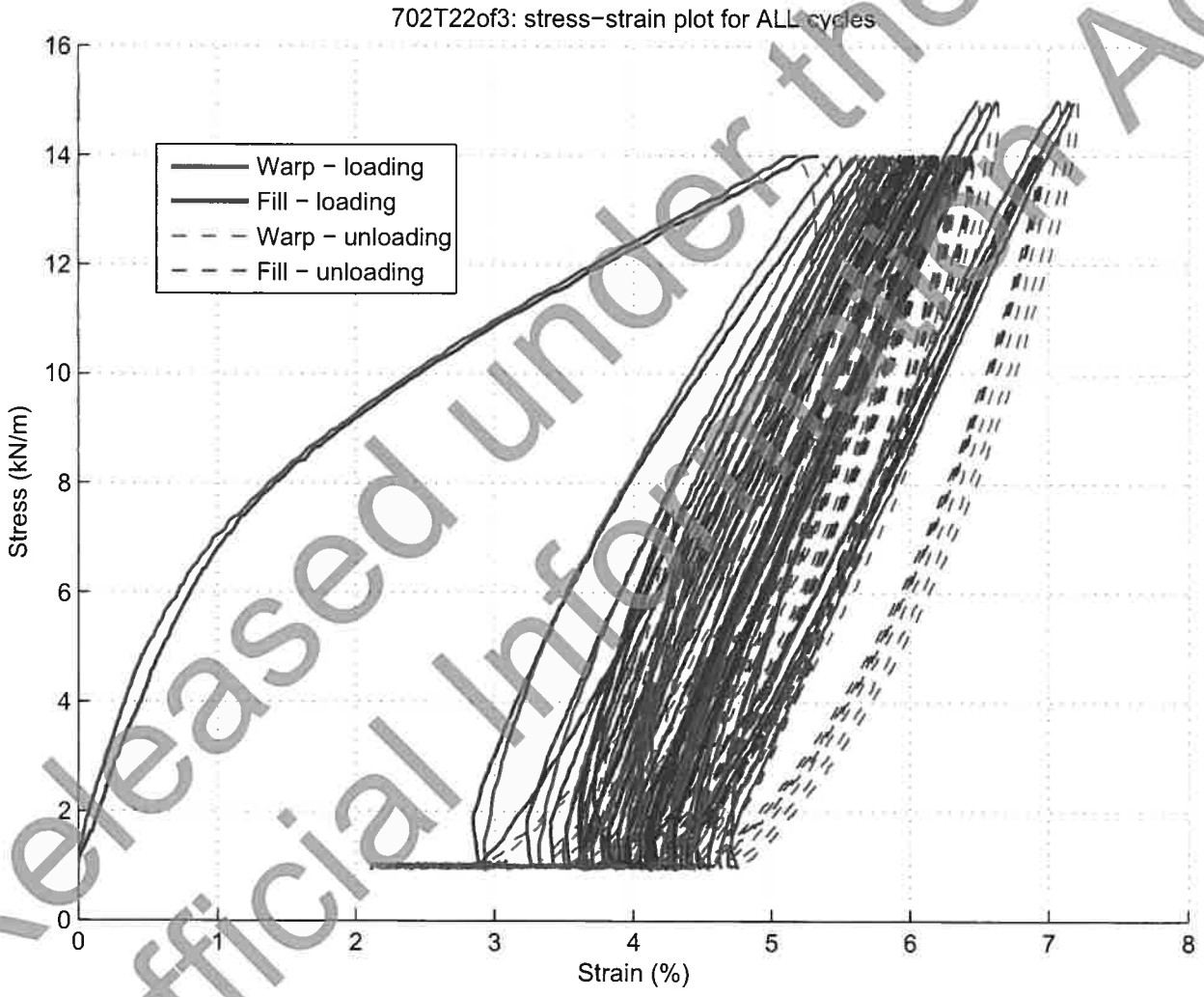

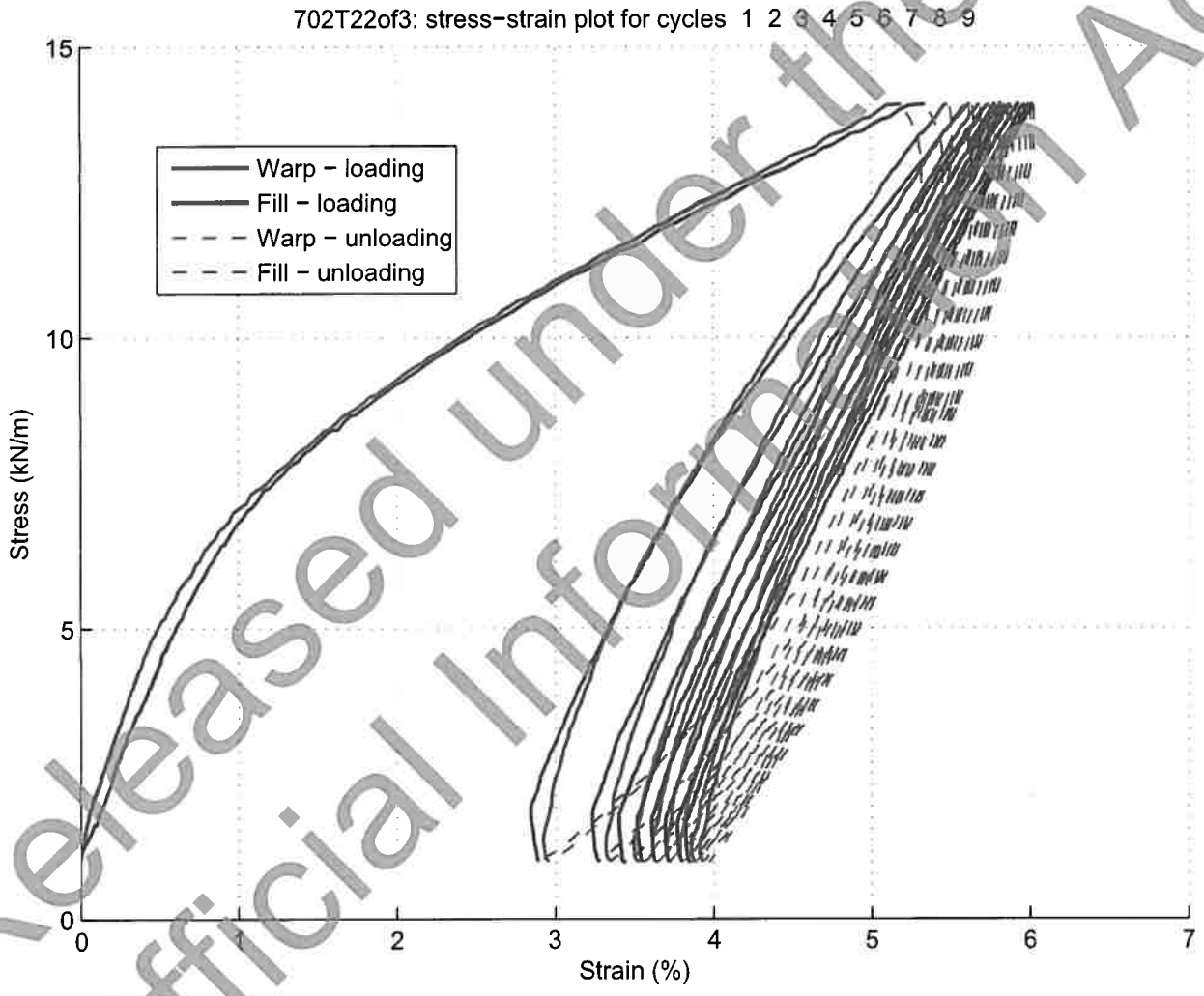

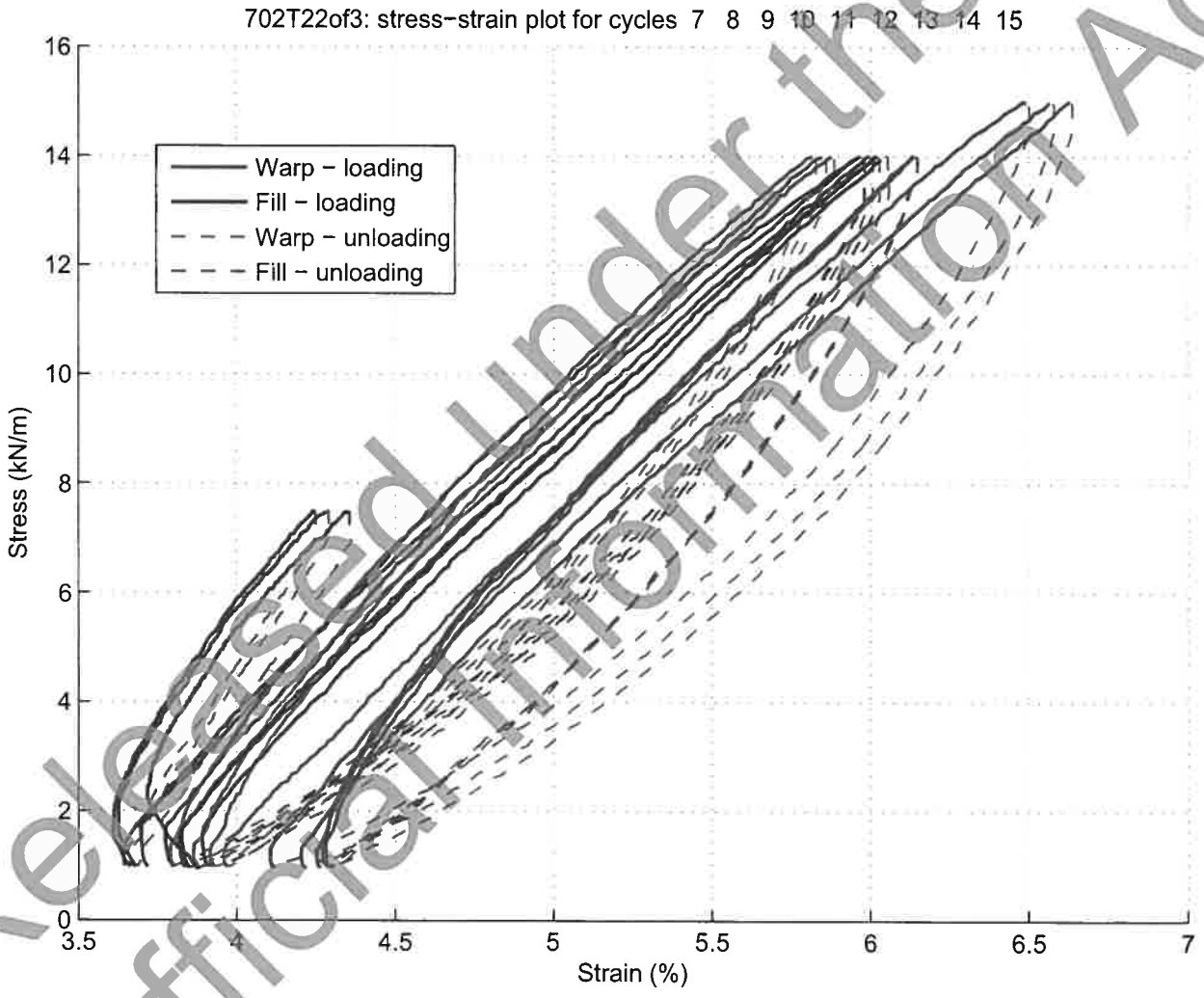

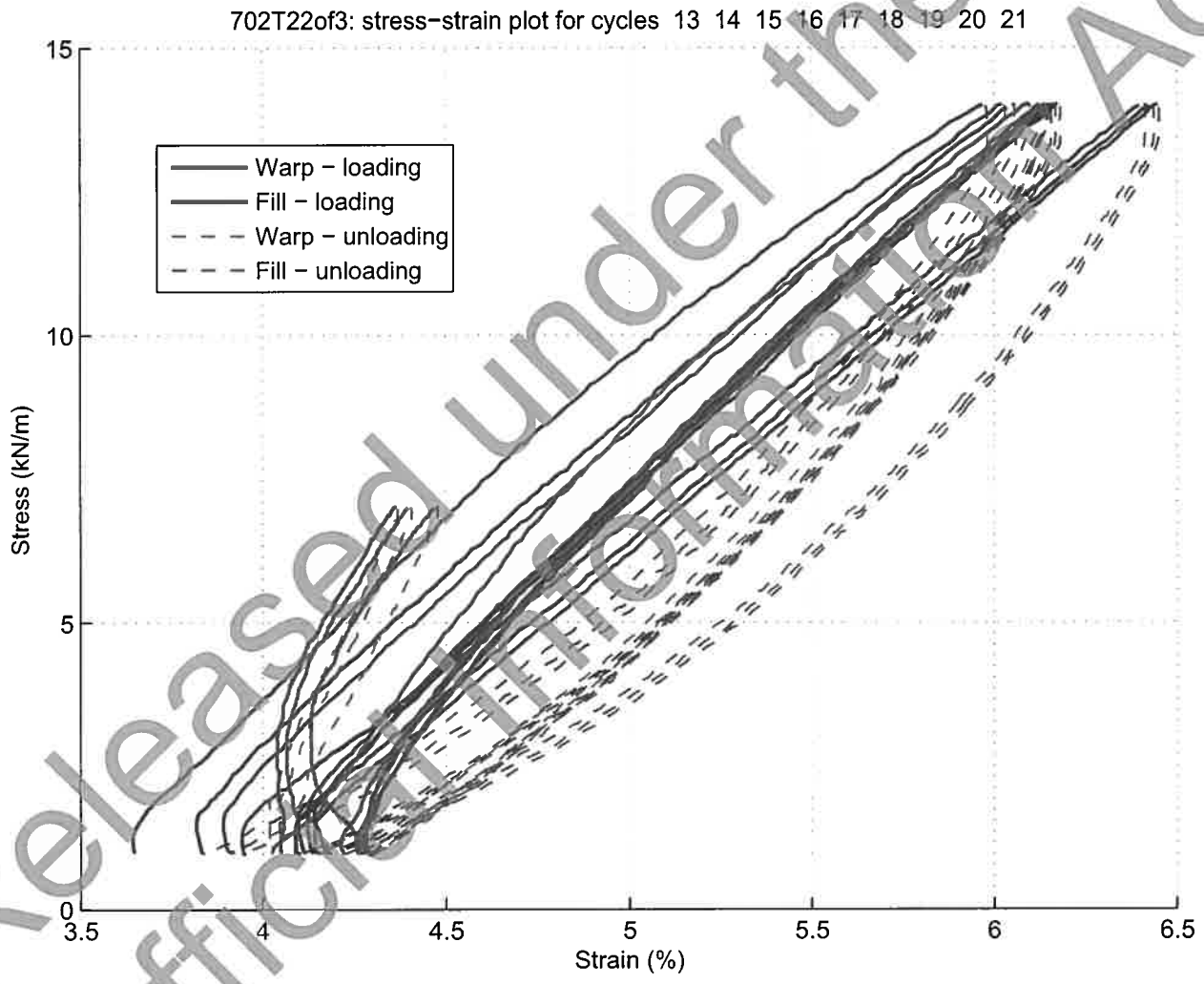

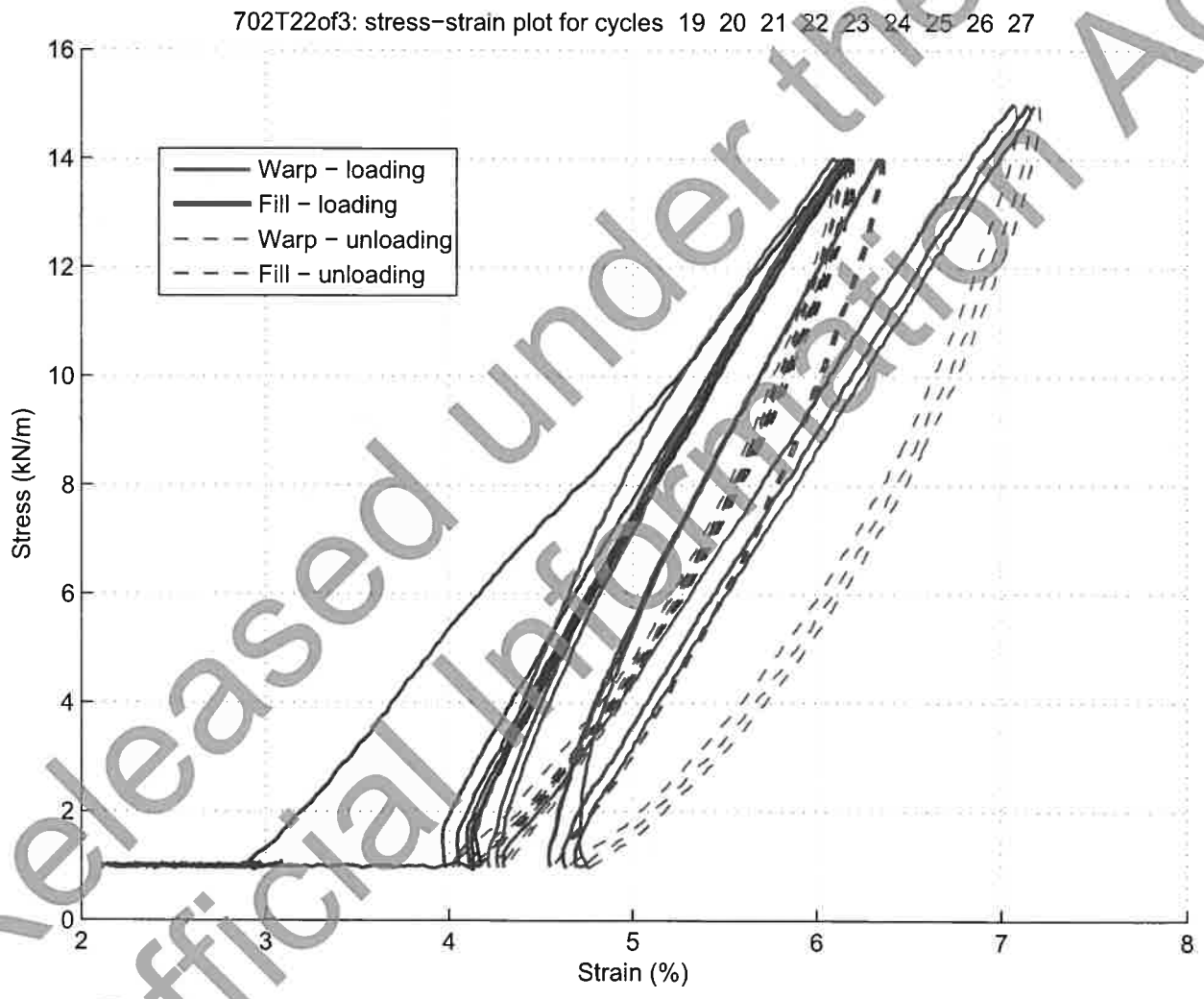

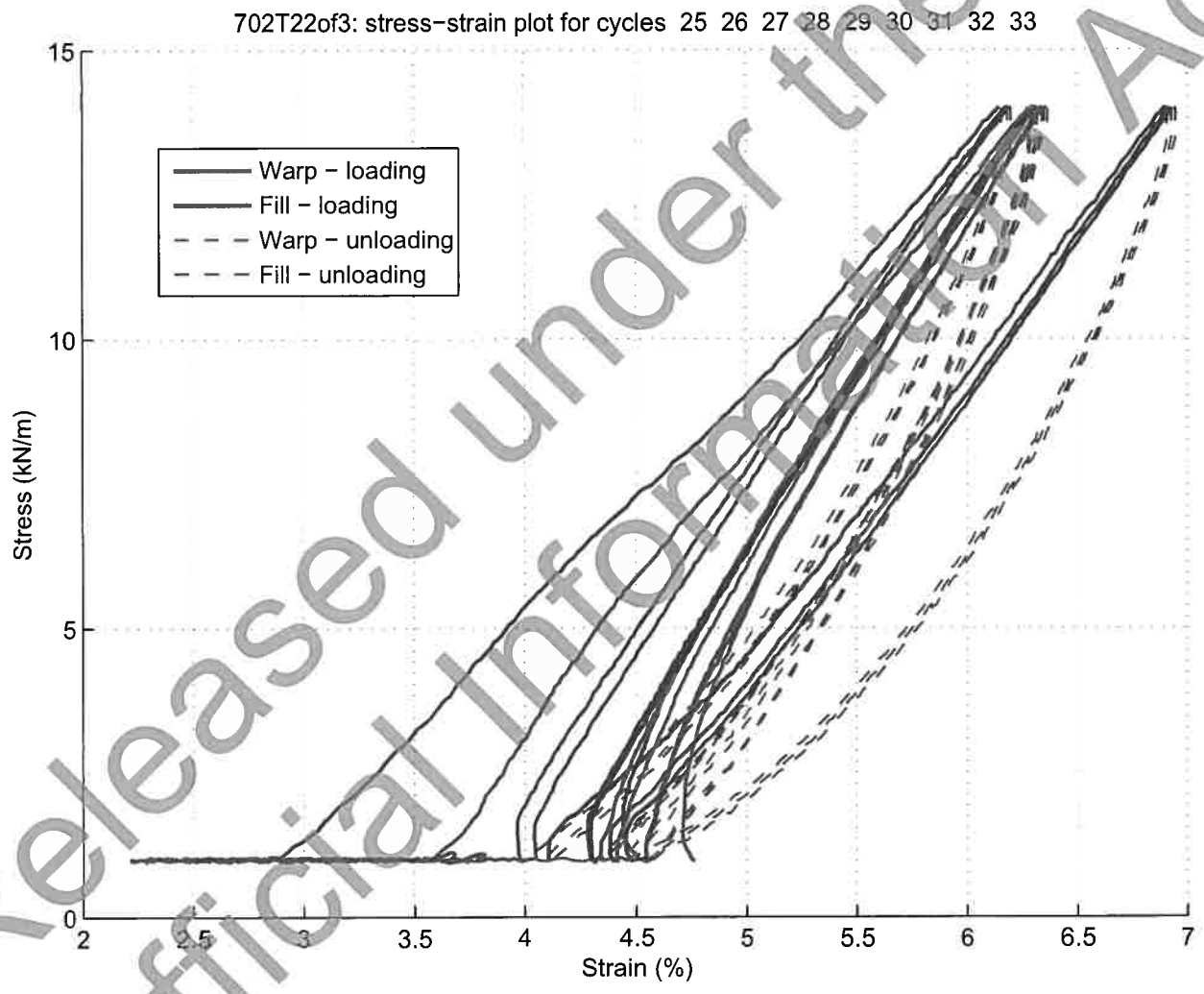

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NE1 7RU

CERTIFICATE OF TESTING

Job title:	**Biaxial Testing**	Job number:	**FERR-001**
Client:	**Ferrari**	Certificate number:	**FERR-001/16**
Sample ID:	**702T2 1 of 3**	Sheet:	**1 of 8**
Batch No:	**1000002973**	UTS:	**60 kN/m (warp)** **56 kN/m (fill)**
Test type:	**B5: Biaxial test based on "MSAJ/M-02-1995. Testing Method for Elastic Constants of Membrane Materials", amended to suit Client requirements.**		
Number of tests:	**16 of 32**		
Particular client requirements:	**See FERR-001 Testing Protocol**		

Notes:

(i) Temperature maintained at 23 degrees centigrade
(ii) Load and strain recorded at 2 second intervals
(iii) Best fit elastic constants calculated to minimise strain difference using increasing load curves with residual strain removed, from cycles 6, 12, 18, 24, 30 (1:1, 2:1, 1:2, 1:0, 0:1 respectively). Reciprocal constraint has not been applied (i.e. 4 independent elastic constants have been calculated).

Results:

Warp modulus, E_w = 540 kN/m
Fill modulus, E_f = 528 kN/m
Poisson's ratio warp-fill, $v_{w\text{-}f}$ = 0.34
Poisson's ratio fill-warp, $v_{f\text{-}w}$ = 0.46

DATE OF TEST:	23/11/2010	**TEST BY:**	Robert Grisdale
DATE OF ISSUE:	25/11/2010	**APPROVED BY:**	Dr Ben Bridgens
		SIGNED:	Ben Bridgens.

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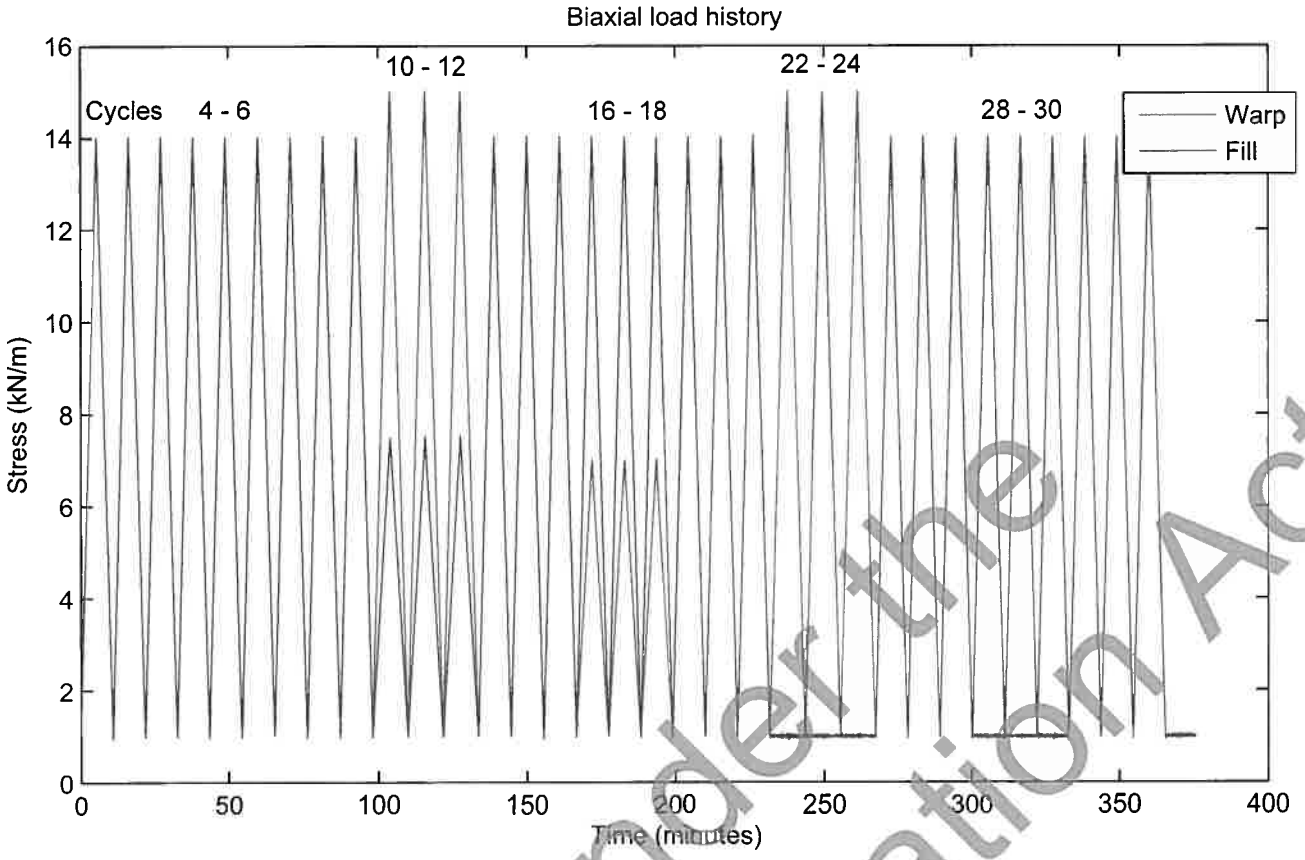

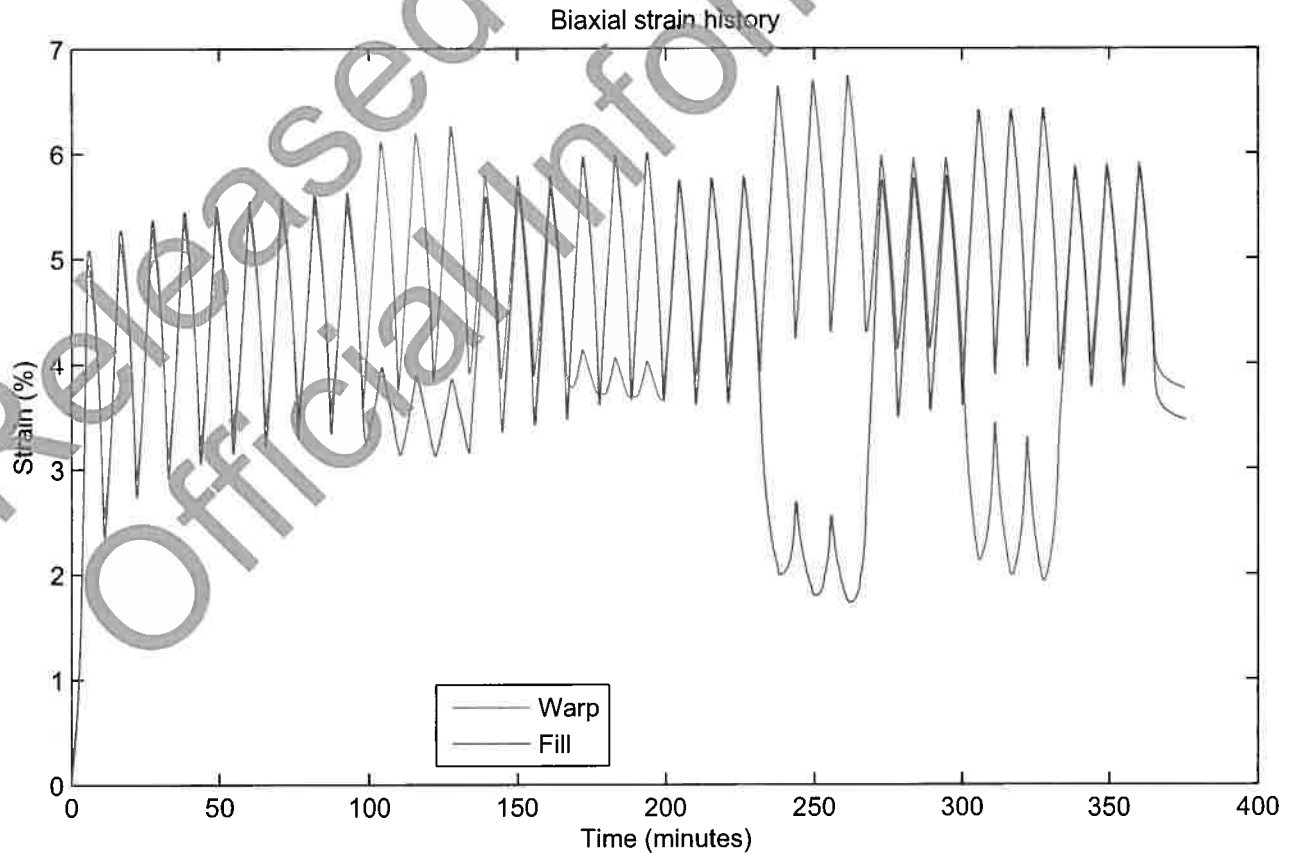

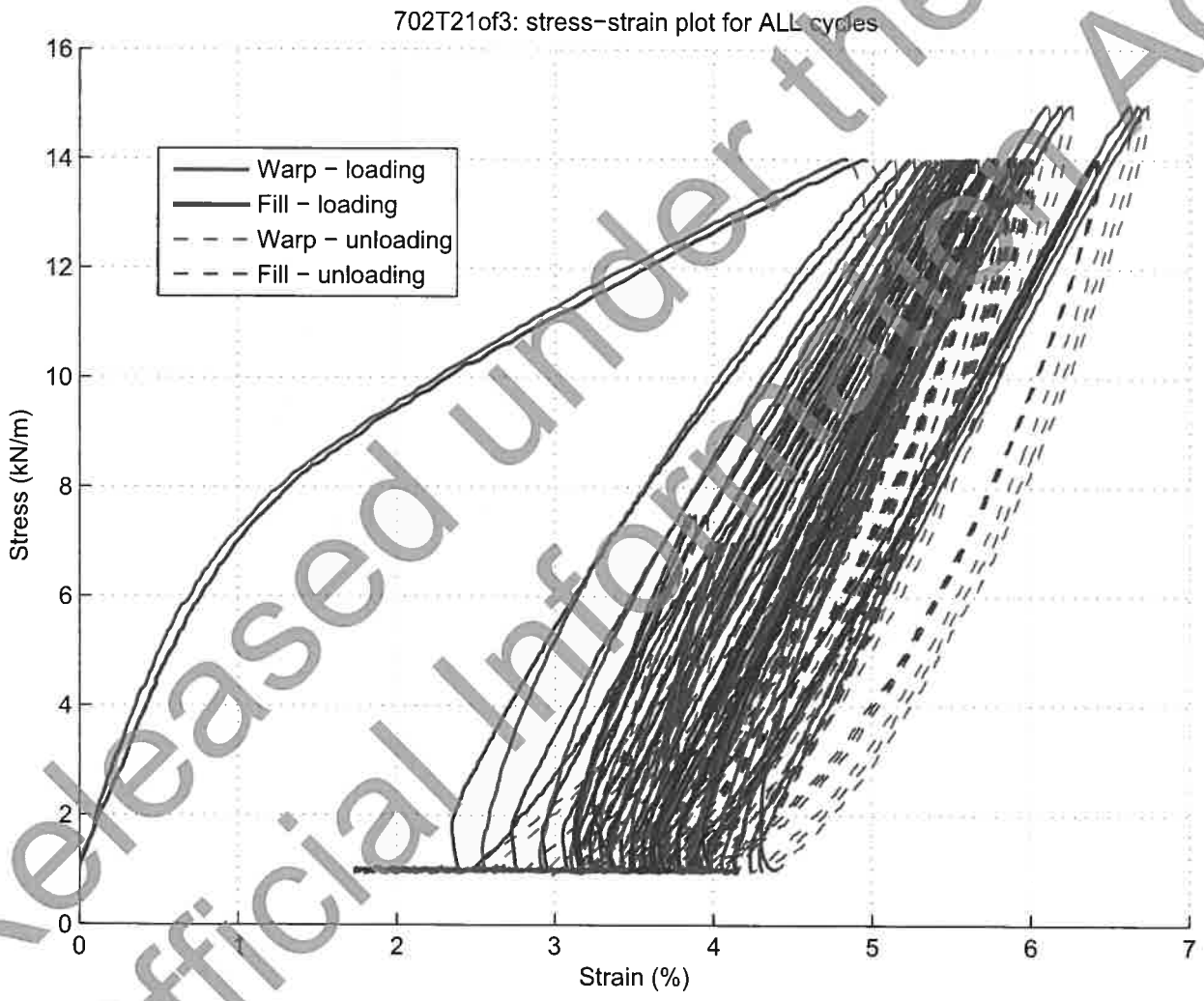

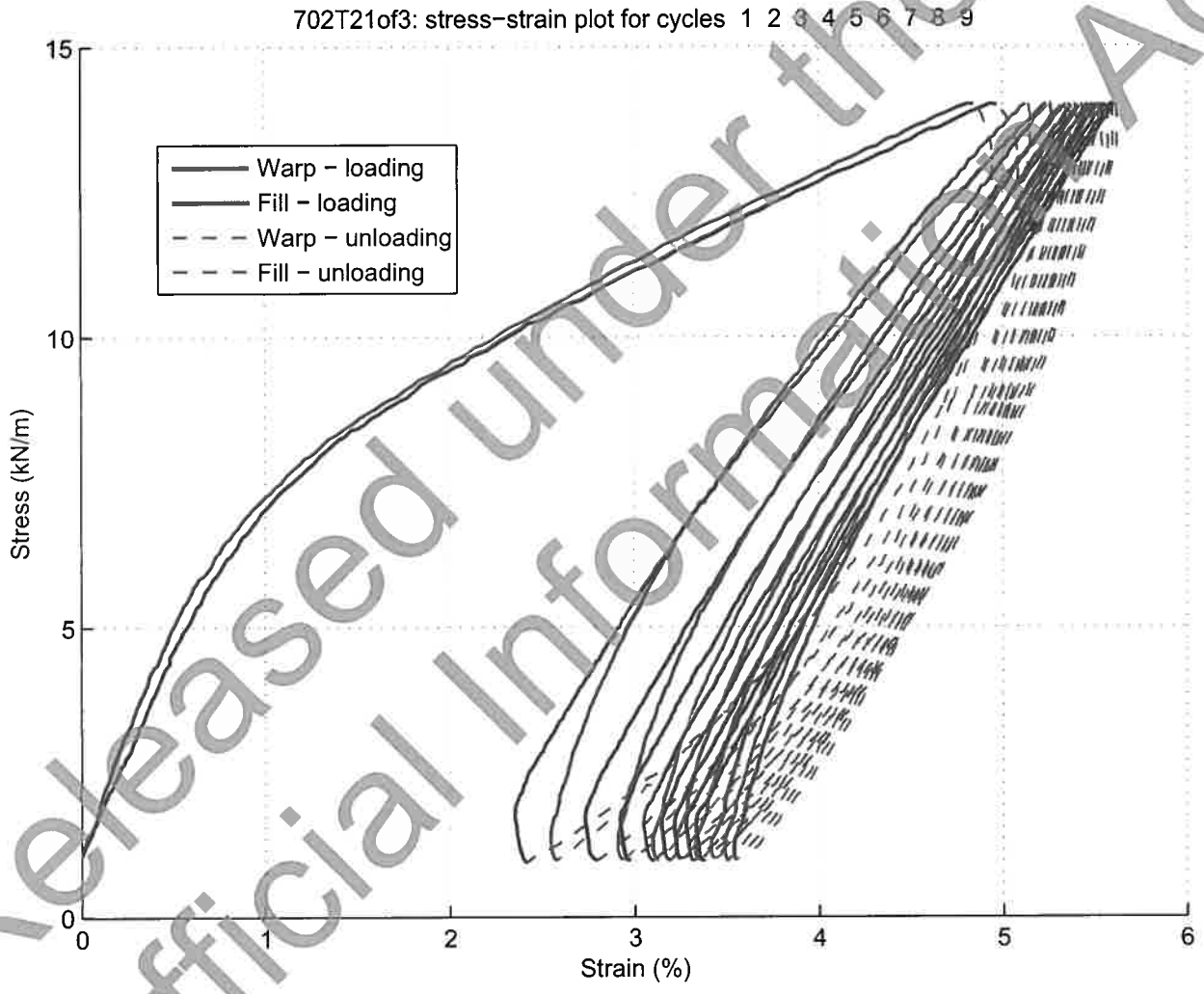

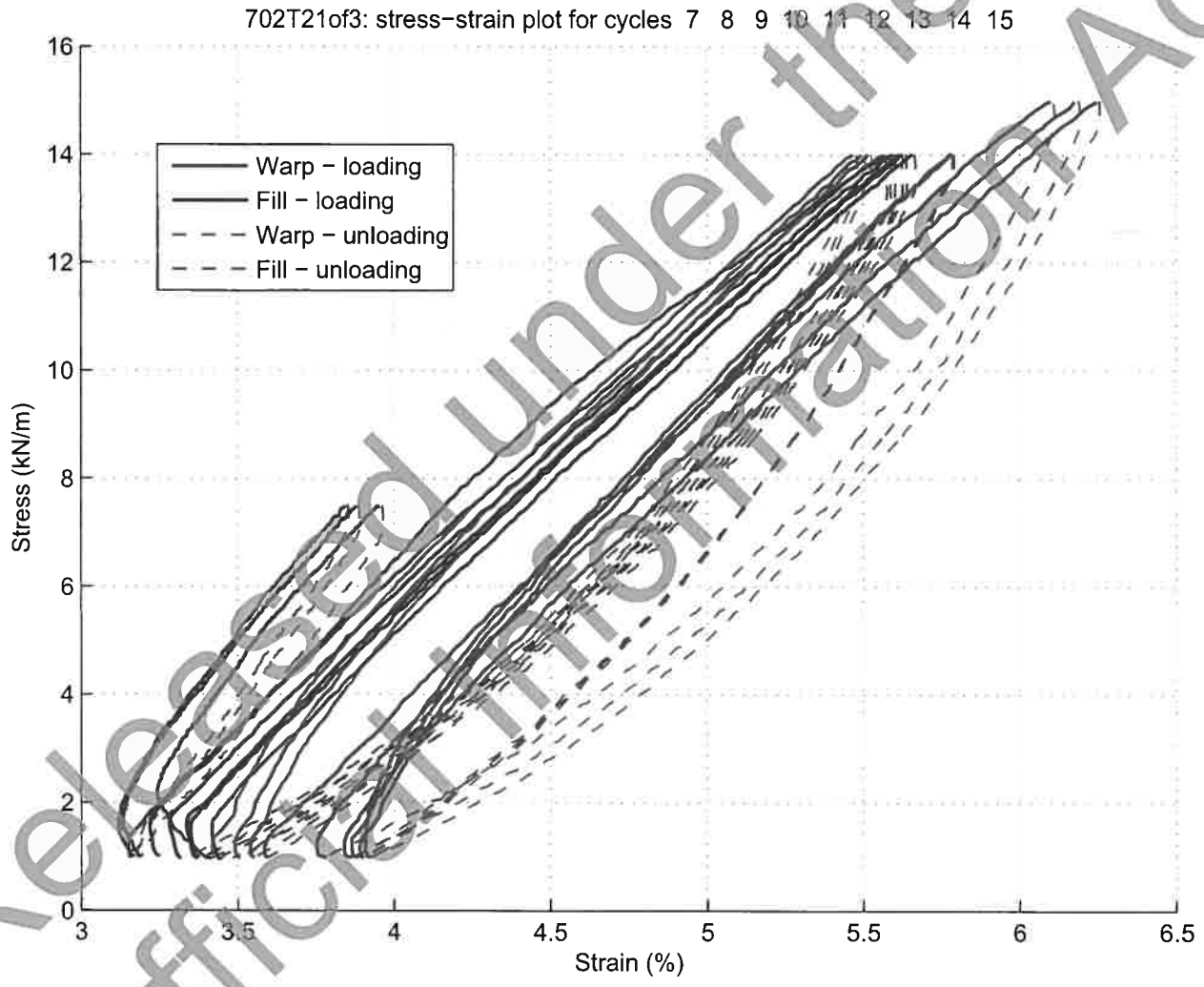

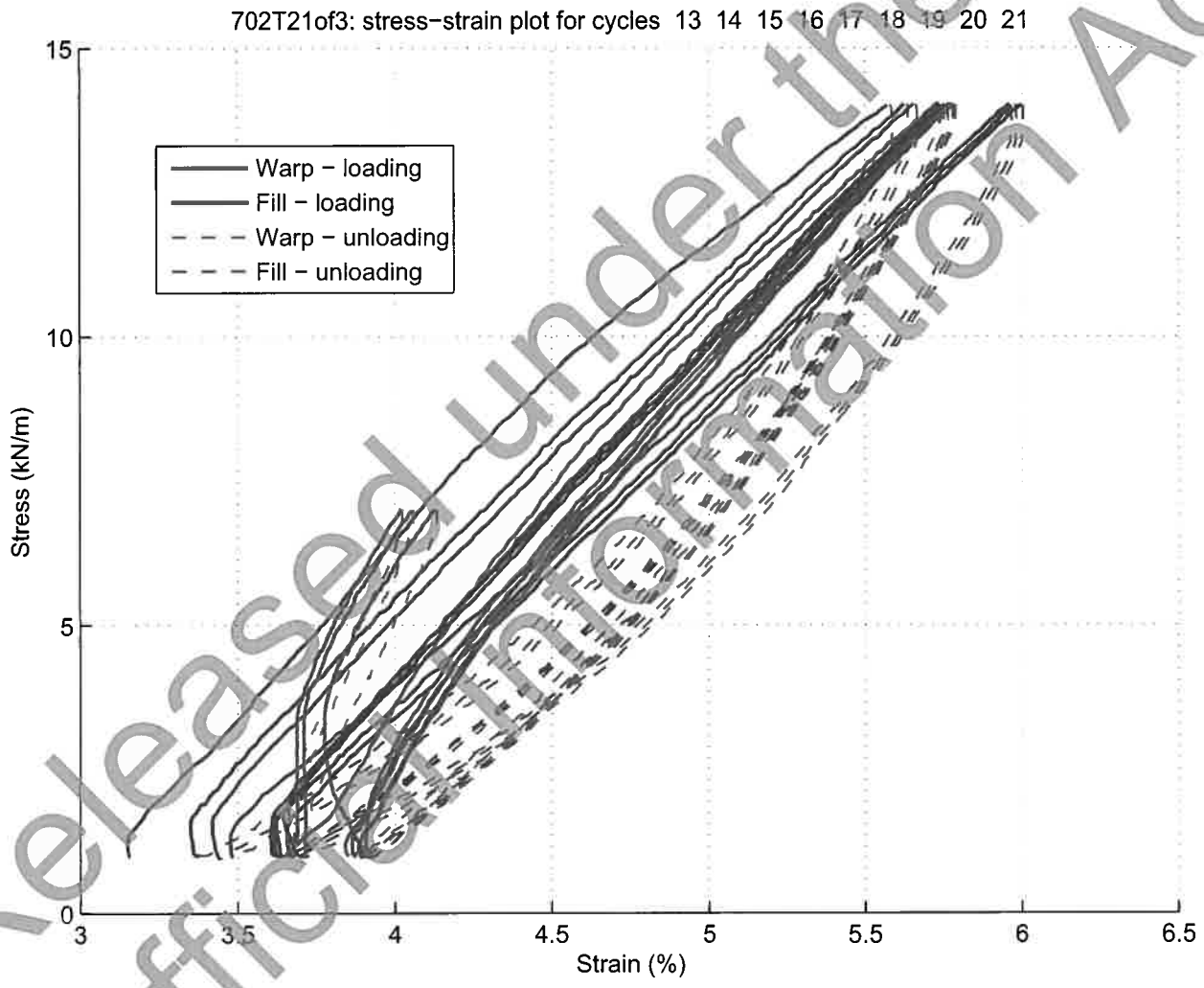

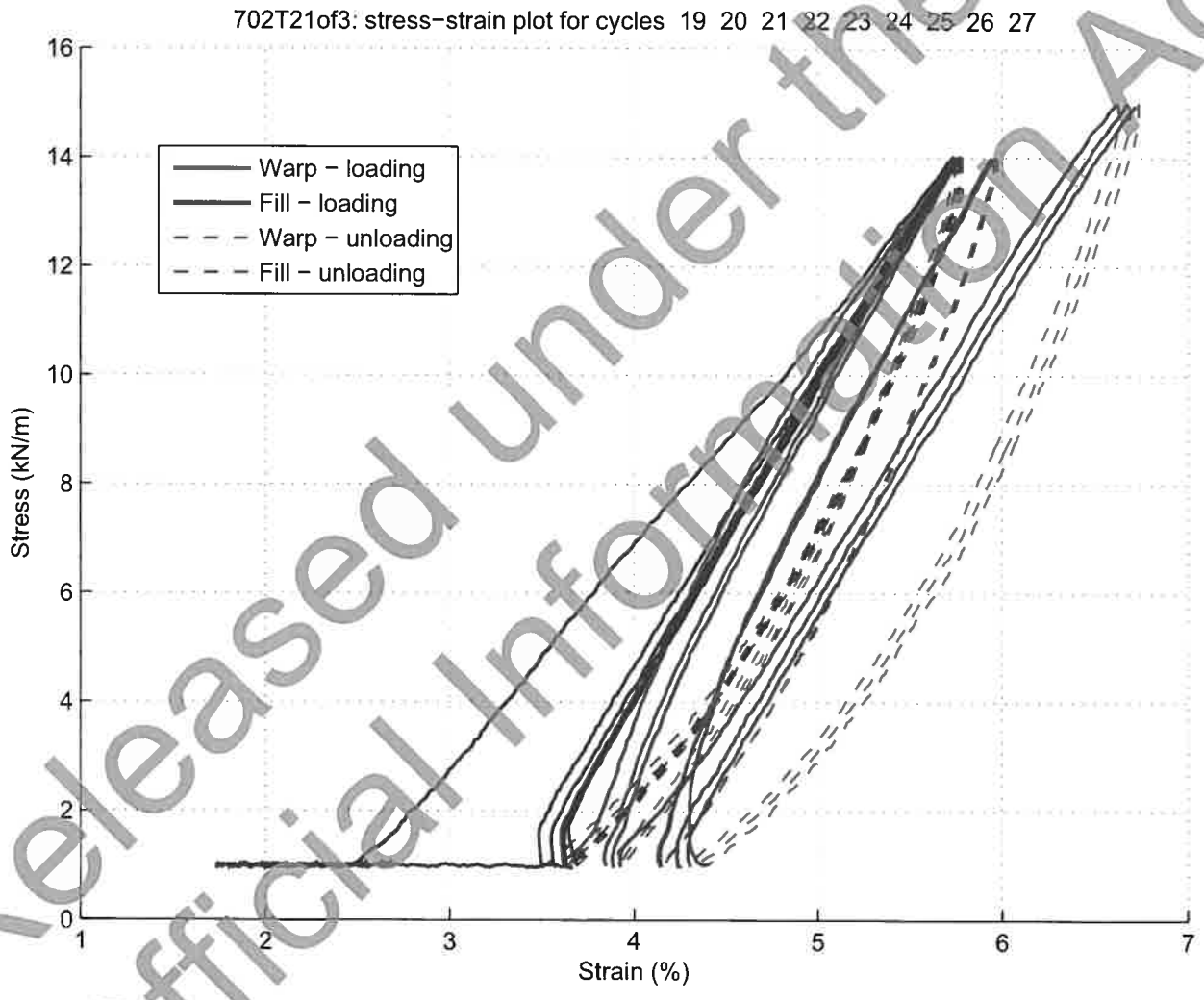

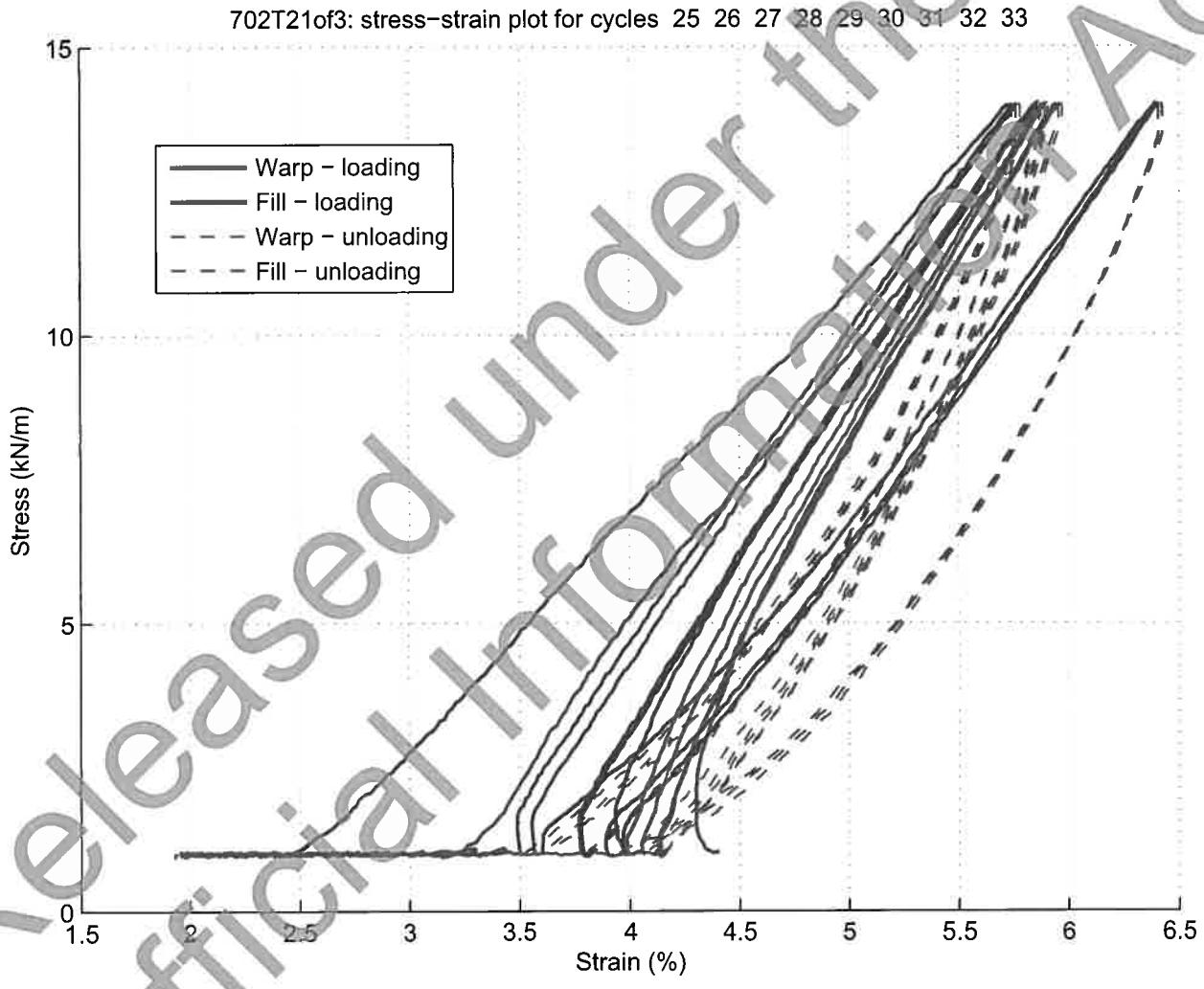

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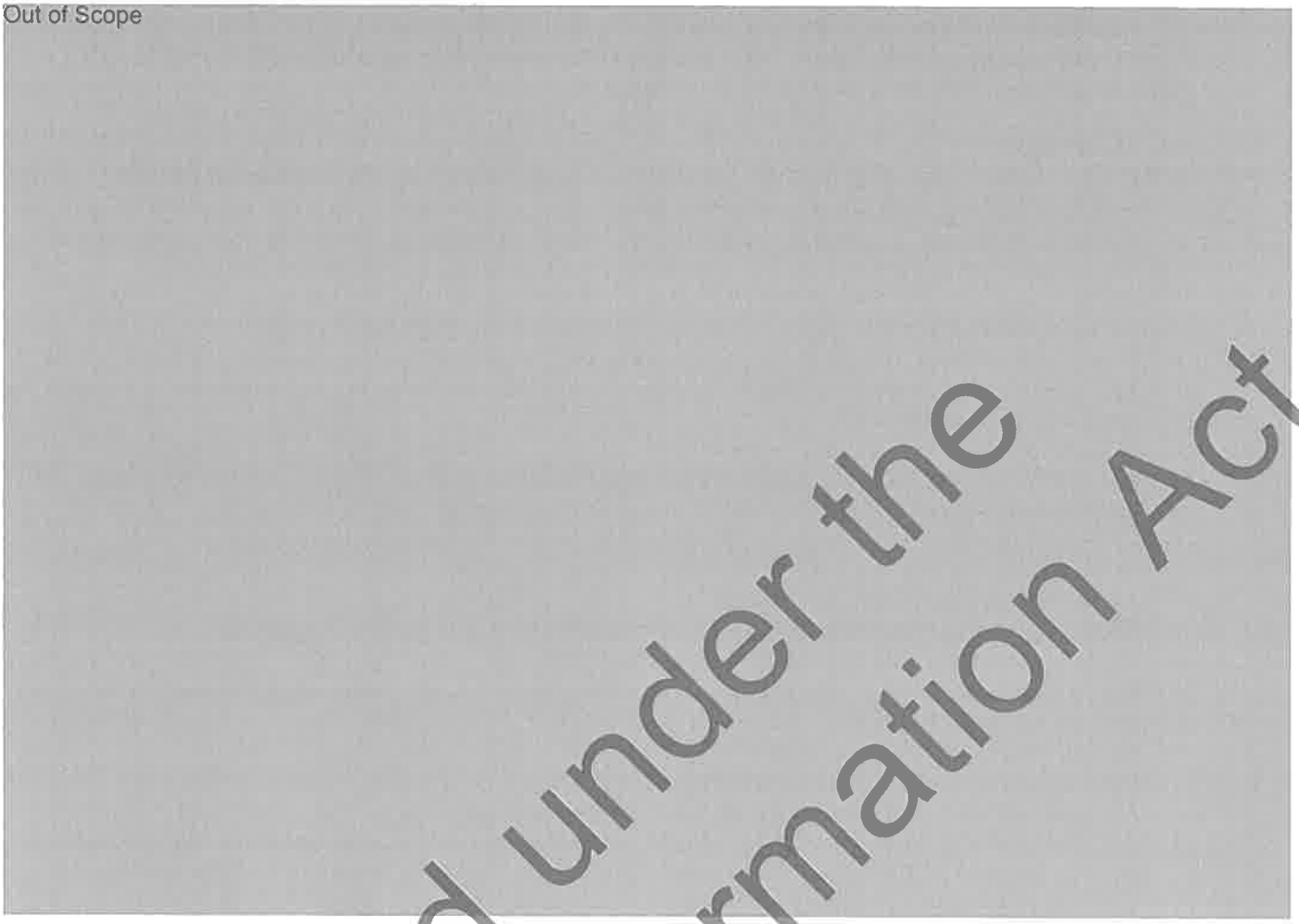


From: John Gardiner
Sent: Tuesday, 15 December 2015 12:39 p.m.
To: Murray Usmar
Subject: FW: Zirka Circus marquee Fire Report initial thoghts from our review

From: Alan Moule [mailto:alanm@natcon.co.nz]
Sent: Friday, 29 May 2015 3:28 p.m.
To: John Gardiner
Cc: alanm@natcon.co.nz; hayleym@natcon.co.nz; natalieh@natcon.co.nz
Subject: FW: Zirka Circus marquee Fire Report initial thoghts from our review

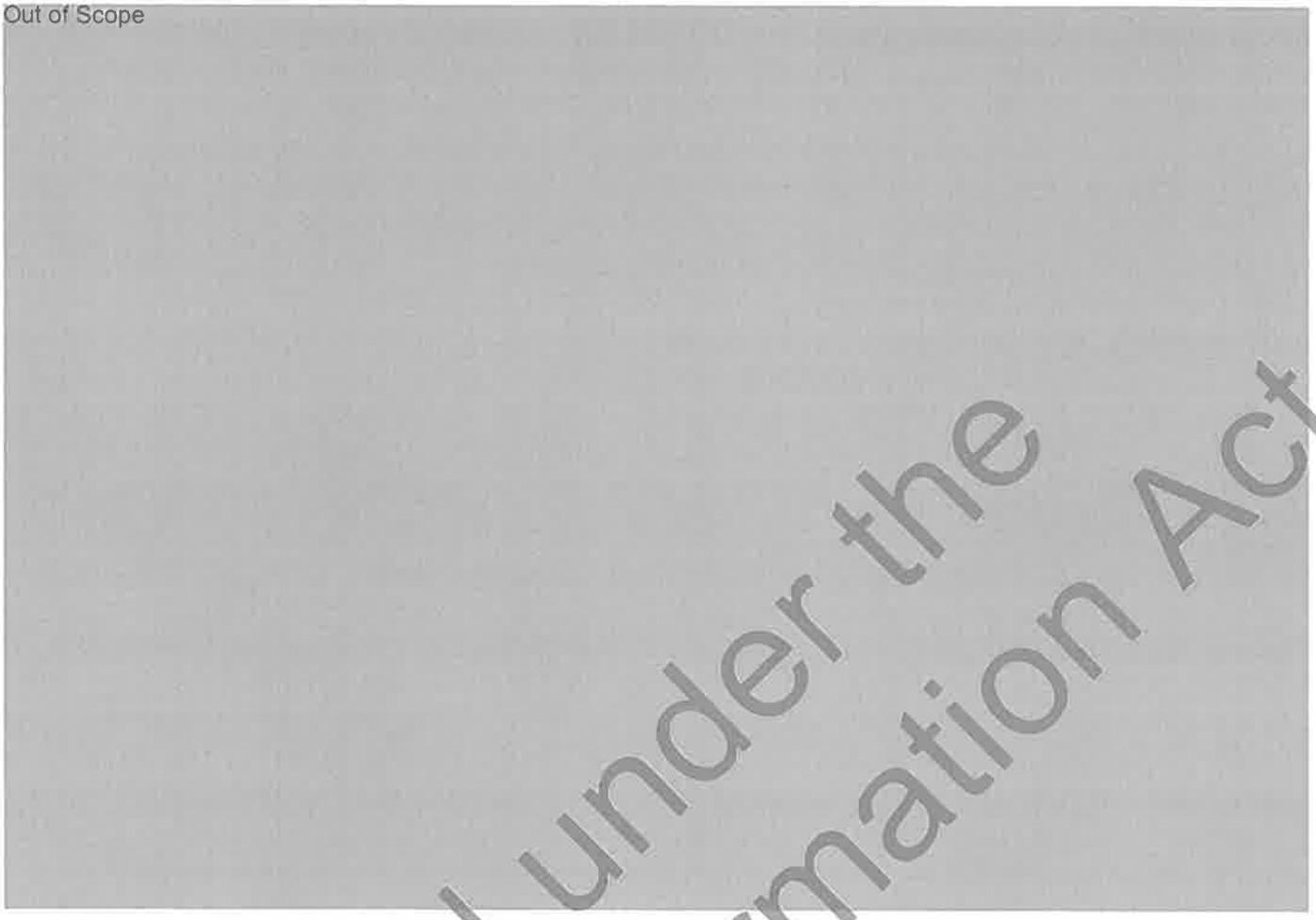
Hi John,

Once again, thank you for the chat yesterday, I do appreciate your time. You asked for some comments on the fire design for the Zirka Circus.

Please be aware that these were never sent out for a reply, these were just what we initially saw and this is from the file note and have been sent in good faith and with the best intentions:

- 5.1 - Fire alarm is non compliant with NZS4512 for installation, inspection, documentation and testing, including test certification. There is no reaon the design cannot be specific. If the sound system is used for warning NZS4512 has requirements for microphone control, wiring and listing and monitoring.
- 5.1 - Fire alarm operation turns lights off – why?
- 5.1 - Para 2 – emergency lighting description doesn't comply with F6 – more than 250 people so 20m doesn't apply.
- Will flood lights comply with NZBC for duration, location and illumination on features and signs? If generator supplied, note start-up requirements.
- Management procedures (manual operation of exit signs, door release) will need to be approved as part of the evacuation scheme and by BCA as part of consent. Management procedures required?
- The seating area is a concealed space as it would not normally be visible to those seating on it? Is the 500kW evacuation starting point then valid (eg Bradford stadium fire for an example).
- Does bleacher seating comply as a mezzanine floor for evac and fire service access as required in VM2?
- 15.3 - Tent volume modelled as 6731m3, not actual 8013m3. Why? Guess it was this done to fit Brisk limits to avoid FDS - maybe?
- B risk model. The min/max dimensions in B risk assume a single sloping roof. The tent slopes in both X and Y dimensions so the area and volume above the knee (4m) is less than that assumed by B-Risk.
- Calculate tent volume based on actual tent shape and B Risk model must be equivalent.
- If the seating area is in the main tent, it needs to be within the volume for the ring fire.
- B-risk printout not included for under seating fire. What vent type and spill plume used – need to be 3d, 2 sided spill plume the width of the seating.
- What is the width of the bleacher walkways and steps used in the evac calc (not stated).
- Calcs do not include stair travel from bleachers to ground.
- Where is tenability criteria measured from, and does it account for the bleachers (for at least the time required until they are clear)
- Bleacher room outside shape factor limits of B risk.
- Materials as noted – steel bleachers, steel tent?
- As noted tent flaps and "hardware" – do these comply with D1?
- From the photos, the tent flaps "hinge" at a 45 deg angle, fixed at the centre above the exit sign and down to the ground. The full width cannot be assumed to be available as it is not a square opening. At best only the section that is 2m clear tall can be used, so say half width. Report S5.5 gives it clear to3.4* 1.8m which is to low.
- No FEB input or information
- No PS1 provided by Debbie S
- No info an modifications or waivers
- Reliance on VM2 (impossible to do), must be a SED
- No record of meetings – minutes etc...
- No first principles approach

Out of Scope



From: Darrel Cheong
Sent: Tuesday, 15 December 2015 1:25 p.m.
To: Jeni Hou
Cc: BensonZ@redco.co.nz; Graham Rundle; Murray Usmar; David McGuigan; Theofanis Kostas
Subject: FW: Meeting with MBIE on 16 December 2015 at 11am [UNCLASSIFIED]

Hi Jeni

Thanks for your call and for your request for a meeting. My colleague, Murray Usmar will be available to meet with you tomorrow at 11am. Please head to MBIE's head office at 15 Stout Street, Wellington tomorrow and register yourself at the reception once you are here.

Further from the correspondence below with Benson, I have read the Fire Engineering Design Report by OnFire Consulting Limited and we are satisfied with the evacuation plan & procedures (Item (c) in the email by Benson below) provided within that report.

As for the other items (a), (b) and (d), can you please provide a similar level of information to the evacuation plan & procedures? What will also help this application is if you have historic records of the ground pegs test, wind monitoring procedures and your Quality Assurance records for the routine assembling/disassembling. These records will provide MBIE with more grounds that the objectives of Clause B1 (of the New Zealand Building Code) can be met.

If you have these information handy, please bring them to tomorrow's meeting.

Otherwise, we look forward to seeing you tomorrow.

Let me know if you have any other queries.

Kind regards

Darrel Cheong
GRADUATE ENGINEER

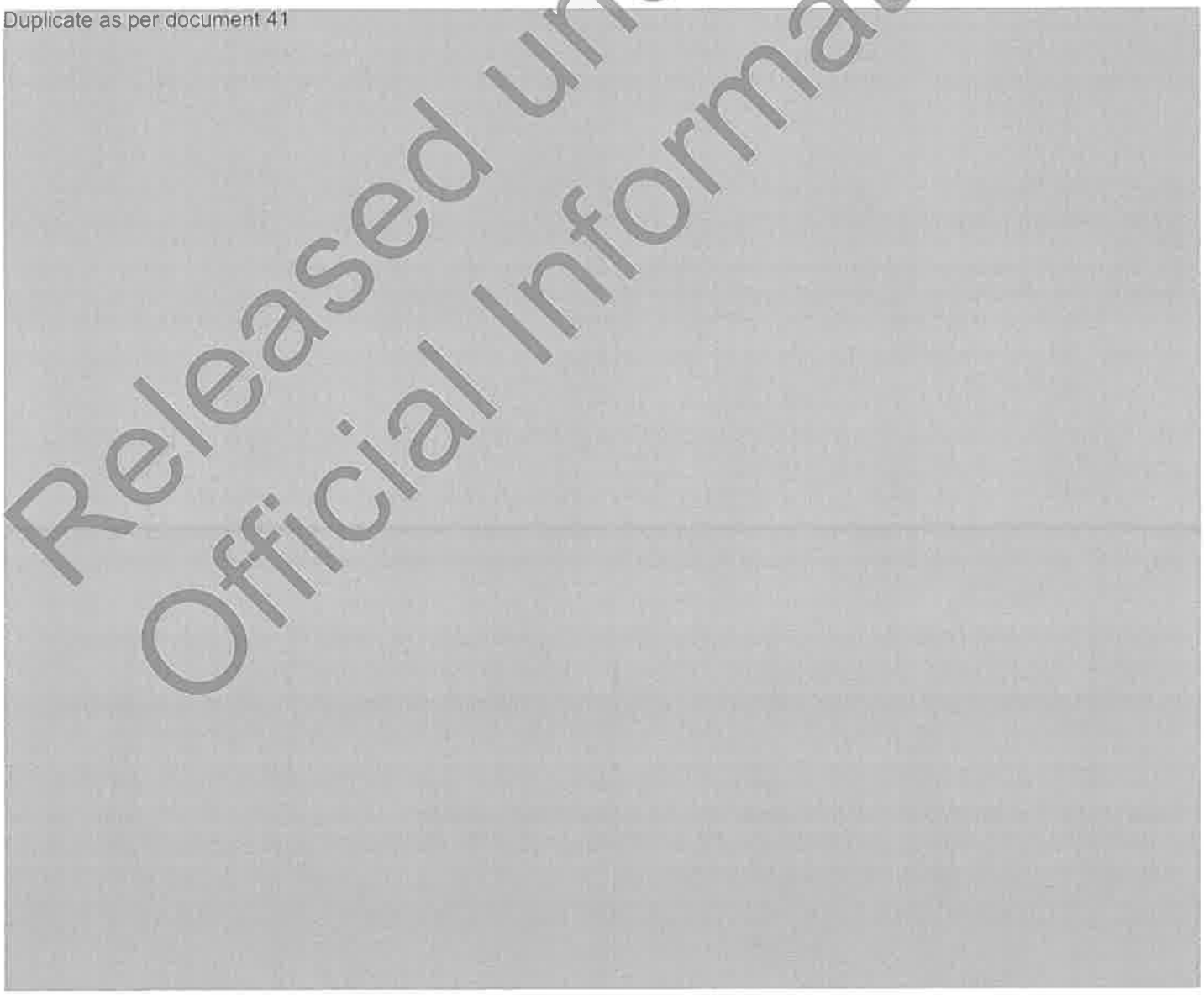
Building System Performance Branch, Building, Resources & Markets
Ministry of Business, Innovation & Employment
Darrel.Cheong@mbie.govt.nz | Telephone: +64 (4) 901 8527
Level 5, 15 Stout St, Wellington 6011 | PO Box 1473, Wellington 6140

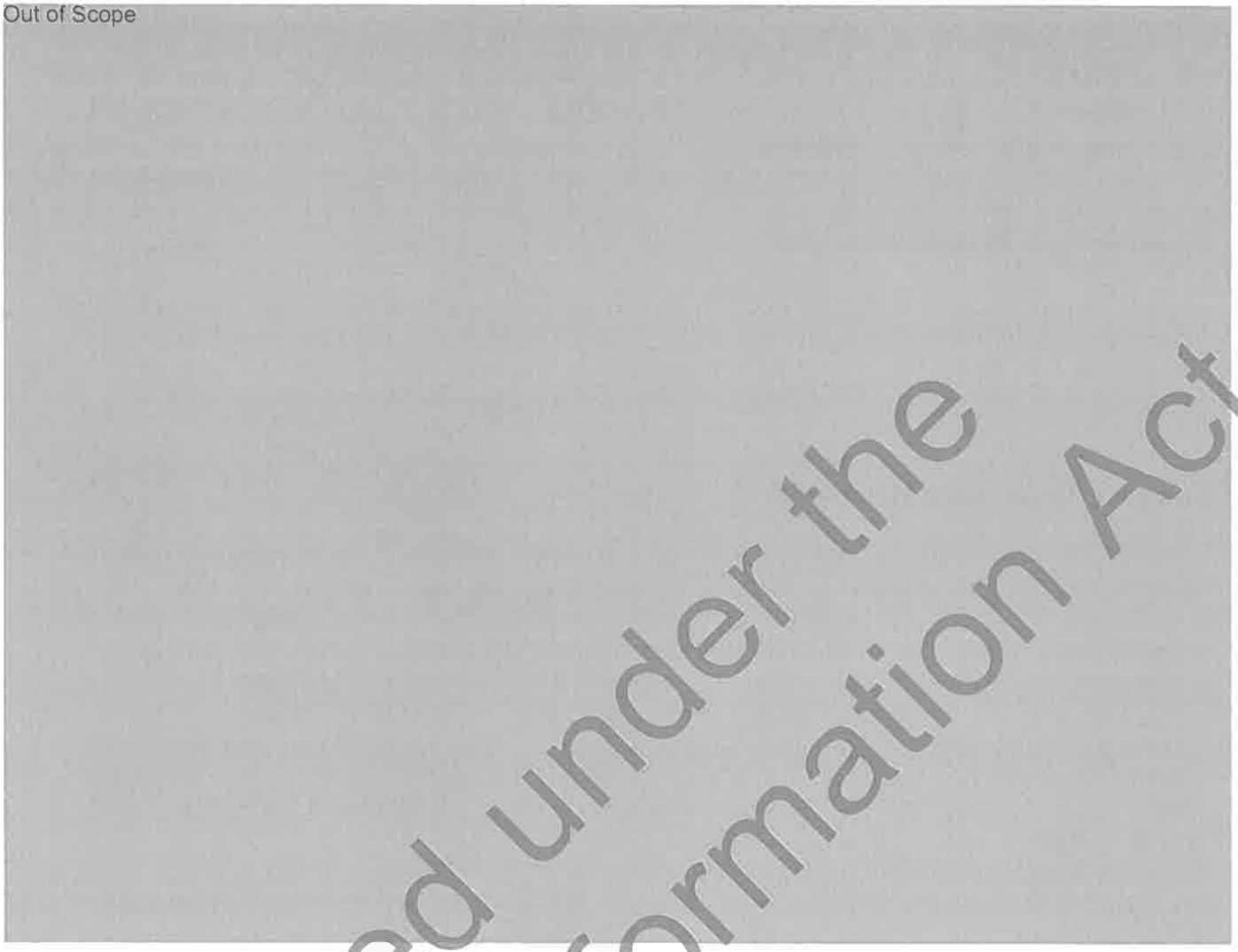
BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government

Duplicate as per document 41





From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Thursday, 14 January 2016 3:25 p.m.
To: Murray Usmar
Cc: Paul Johnson
Subject: Zirka Circus Multi Proof final requirements

Hi Murray,

Hope you had a wonderful Christmas and New Year holiday!

It was nice to have the meeting with you before Christmas, we really appreciated your time and your clarification on our application. It's great to see we are getting to the end of the process after two and half years hard work and we would love to see the final approval soon to get this great start for 2016:-)

Back to the questions you arose in the meeting, please see the answers below as well as the attachments:

Question One: The evidence of testing for the high-tension wires and the replacement of sidewall stripes.

The Zirka Marquee supervisor checks all the components of the marquee carefully before each erection.
The marquee is of standard manufacturers specification.

ALL RIGGING, SHACKLES, PEGS, FITTINGS and FASTENINGS were supplied with the tent, by the manufacturer, to their specifications. In the event of any items requiring replacement, they are replaced to the same specs, by our rigging company, Shaws Wire Ropes of Cambridge. All fittings and shackles are standard, off the shelf and safety rated. Support email has forwarded from Shaws Wire Ropes.

Question Two: Emergency Lights

Copy of specification of emergency light units that explains how they work in the event of power loss they go onto battery backup mode, include layout of where they are positioned in marquee

Spec attached, setting up plan attached as well as the equipment operating procedure.

Question Three: Wind Monitoring

The link to the Metroffice weather reports and how we get notification / warnings as well as real time monitoring, plus real time on site wind speed monitor by Tour Manager

Meanwile, we constantly monitor Met Service through internet and text alerts for weather warnings.

We keep a high quality anemometer on site at all times. The reality is that the tent cannot be erected if the wind is in excess of 30km/h (8m/s). It only meets its wind rating when fully erect, tensioned, and closed. We are therefore very cautious about wind strength, for safety of staff and equipment.
Once the tent is up and secured with sidewalls in place, it is rated for 120km/h.
We have also instituted a company policy that we won't run a show if the wind is in excess of 90km/h.

Specification of the wind anemometer
WS3083 Professional Weather Station (photo attached)
Specifications:

- Outdoor temperature range --- -40.0°C to + 65.0°C (-40°F to +149°F)
- Indoor temperature range --- 0°C to + 50.0°C (32°F to +122°F)
- Humidity range --- 10% to 99% (1% resolution)
- Rain volume display --- 0 to 9999mm, resolution 0.3mm (if rain volume < 1000mm) or 1mm (if rain volume > 1000mm)
- Wind speed --- 0 to 160 km/h
- Barometric pressure --- 300hPa to 1,100hPA (inHg, mmHG or hPa) with 0.1hPa resolution
- Light --- 0 to 400k Lux
- UV Index --- 1 to 12
- Transmission range --- up to 100m (330 feet) line of site
- Power consumption --- receiver 3 x AA batteries, transmitter 2 x AA batteries
- Data storage capacity --- 2 weeks at 5 min intervals up to 3 months at 30min intervals

Question Four: Tent peg pull test on new sites

Zirka Circus will undertake to complete a "Peg Pull" test on all new sites. We will undertake to do sample of two tests on new soil based grounds as and when they arise, and hold log of

results.

Our circus is going to show in Wellington from 23rd February to 6th March. As you mentioned in the meeting, you'd like to set the goal of approving our application by our showing in Wellington, and if this can happen, it would be SO VERY appreciated!

Looking forward to hearing from you.

Kind Regards
Jeni

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: s 9(2)(a)
http://www.zirkacircus.com

Please Note:
New Address:

P. O. Box 28093
Rototuna
Hamilton 3256

AERCUS
Instruments

WS3083 PROFESSIONAL WIRELESS WEATHER STATION WITH USB UPLOAD, UV INDEX & LIGHT METER

WS3083 PROFESSIONAL WIRELESS WEATHER STATION WITH USB UPLOAD, UV INDEX & LIGHT METER

Operation Manual

About This Manual

Thank you and congratulations on selecting this professional weather station. We are positive you will enjoy the benefits of accurate weather readings and information that our weather stations offer. This manual will guide you step-by-step through setting up your device. Use this manual to become familiar with your professional weather station, and save it for future reference.

Important!

Warranty and Support

We warrant our products to be free of defects in components and workmanship, under normal use and service, for one year from the date of original purchase. For product support and warranty claims please contact the following:

- **Purchased in UK/EU:** As many issues can be a result of incorrect setup please contact our local distributor Greenfrog Scientific www.greenfrogscientific.co.uk and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

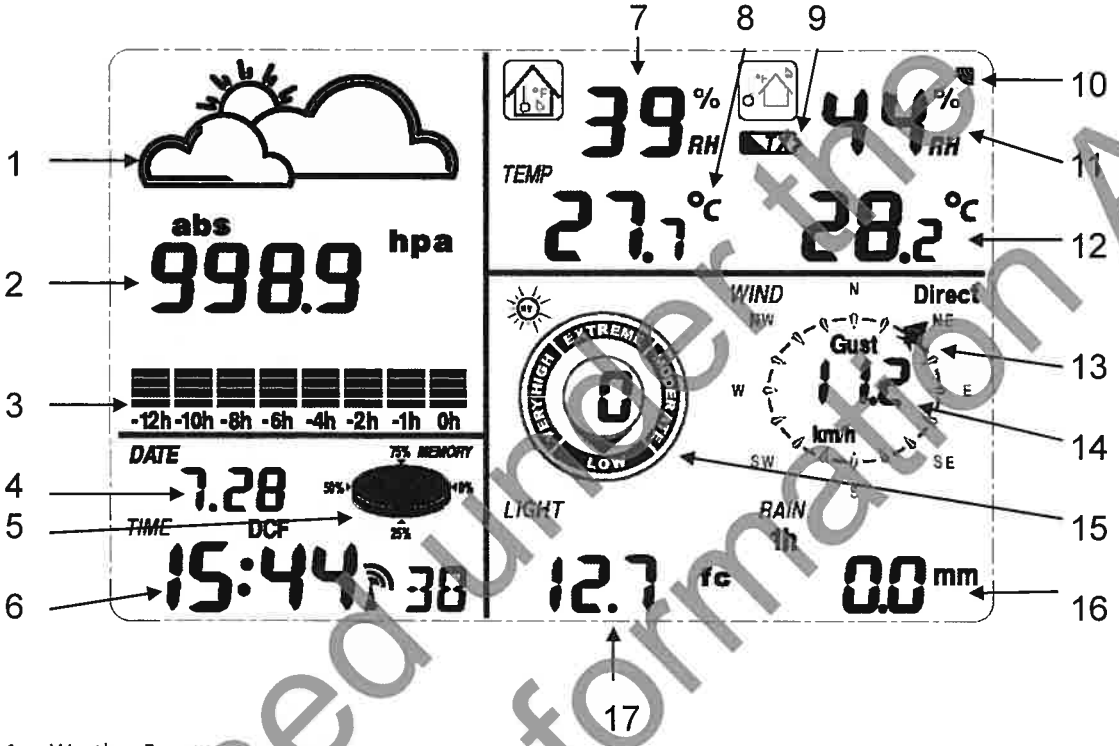
- **Purchased in AUSTRALIA:** As many issues can be a result of incorrect setup please contact our local distributor Monax Test & Weather www.monaxtestandweather.com.au and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

- **Purchased in NEW ZEALAND:** As many issues can be a result of incorrect setup please contact our local distributor Scientific Sales www.scientificsales.co.nz and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

For all others please contact the seller who sold you this item.

Getting Started

The WS3083 Professional Wireless Weather Station includes a base station (receiver), a transmitter unit which includes solar panel and light sensors, one wind direction sensor, one wind speed sensor, one rain gauge, one mounting tree, one USB cable and a downloadable PC software package.



1. Weather Forecast
2. Barometric Pressure
3. Barometric Trend
4. Date
5. Memory
6. Time
7. Indoor Humidity
8. Indoor Temperature
9. Transmitter Low Battery Icon
10. Outdoor Reception Icon
11. Outdoor Humidity
12. Outdoor Temperature
13. Wind Direction
14. Wind Speed
15. UV Index
16. Rainfall
17. Light

Note: The presence of the "Alarm-On icon" means that the particular alarm has been enabled.

Important Notes

System Start
Insert two LR6 (AA) size batteries into the transmitter first. The LED located in the middle on the front of the transmitter will illuminate for 4 seconds, then go off and begin to flash intermittently (approximately every 48 seconds). If the LED does not light up or stays on permanently make sure the batteries are inserted the correct way.

Insert three LR6 (AA size) batteries into the Base Station. The console will illuminate for a few seconds with all the display segments illuminated for checking. After this the Base Station will make an initial measurement and start to register the transmitter (the Outdoor Reception Signal icon will be turned on). Do not touch the Base Station before the outdoor data is received or the outdoor sensor learning mode will be terminated. When the outdoor transmitter has been registered the Base Station will automatically switch to the normal display mode from which all further settings can be adjusted by the user.

Positioning
Once you have verified that all of the components of the weather station are working they can be positioned in their permanent places. Before permanently mounting make sure that all the components work properly together at their chosen mounting or standing locations. If there appear to be problems with the 433 MHz radio transmission they can mostly be overcome by moving the mounting locations.

Note: The radio communication between the receiver and transmitter in an open field can reach a distance of up to 100m providing that there are no interfering obstacles such as buildings, trees, vehicles, high voltage lines, etc. Radio interferences such as PC screens, radios or TV sets, can in bad cases entirely cut off radio communication. Please take this into consideration when choosing standing or mounting locations.

Reconnecting Lost Signal
If no outdoor weather data is displayed as a result of loss of signal during set up, mounting, changing of batteries in the transmitter or plugging or unplugging cables, simply press and hold the **DOWN** key for 4 seconds then release. After this the Base Station will make an initial measurement and start to register the transmitter (the radio reception icon will be turned on). Do not touch the Base Station before the outdoor data is received (this may take several minutes) or the outdoor sensor learning mode will be terminated. When the outdoor transmitter has been registered the Base Station will automatically switch to the normal display mode from which all further settings can be adjusted by the user.

If UV/Light readings are lost press and hold the Reset button on the underside of the solar panel for 4 seconds then release. Then reset the console as above.
Note: When replacing batteries in the transmitter wait two minutes before re-inserting for a proper reset.

Wind Direction
On the edge of the wind direction sensor, there are four letters - "N", "E", "S" and "W" representing the directions North, East, South and West. The wind direction sensor has to be adjusted so that the directions on the sensor are matching your real location. A permanent wind direction error will be introduced when the wind direction sensor is not positioned correctly during installation.

Batteries
Good quality non-rechargeable Alkaline or Lithium batteries are recommended and will receive an appropriate trickle charge from the solar panel.

Note: Many rechargeable batteries are 1.2V and as such are not suitable for this unit which requires 1.5V batteries. Rechargeable batteries also often leak their peak charge quickly which can cause reduced

transmission range. As such we recommend avoiding the use of rechargeable batteries.

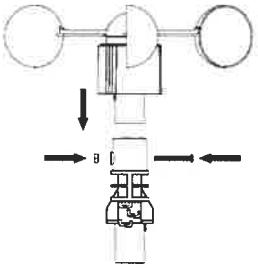
Note: The performance of Alkaline batteries can be significantly reduced in colder environments resulting in loss of signal. In this case we recommend the use of Lithium non-rechargeable batteries in the transmitter.

Note: Incorrectly inserting the batteries may cause a fault and invalidate the warranty so take care to insert them with the correct polarity

Low Battery Indicator

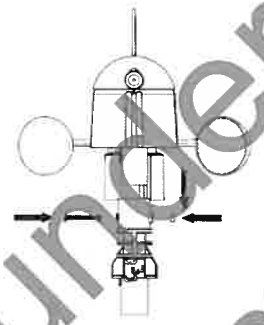
The transmitter low battery indicator TX may illuminate when temperatures are outside the range of 10-35C. This does not necessarily indicate low batteries and will switch off once the temperature returns to this range (also see note above on the use of Alkaline batteries).

Setup – Sensors



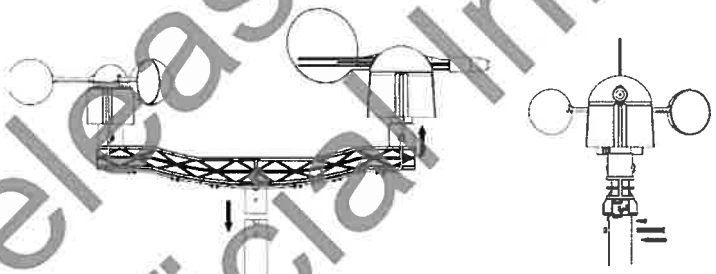
1

Anemometer



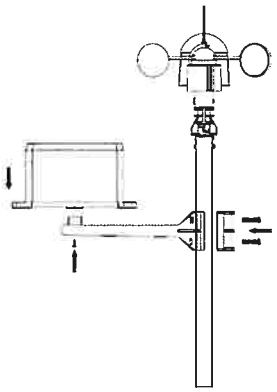
2

Wind direction sensor



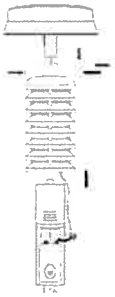
3

Mounting the dual wind sensor holder



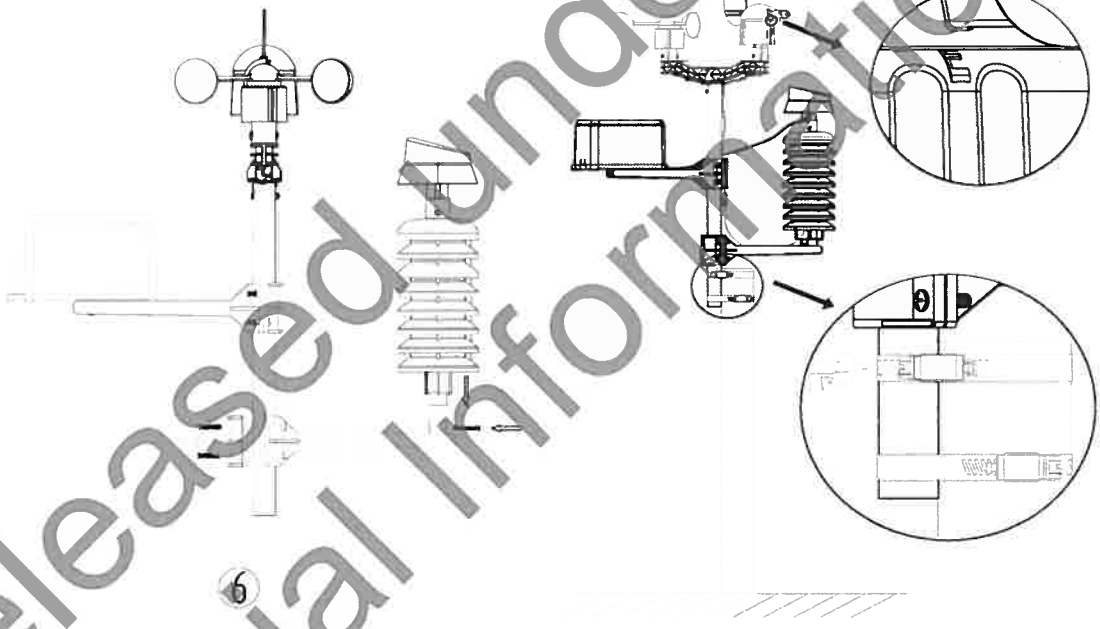
④

Mounting the rain sensor



⑤

Thermo-hygro sensor with solar panel

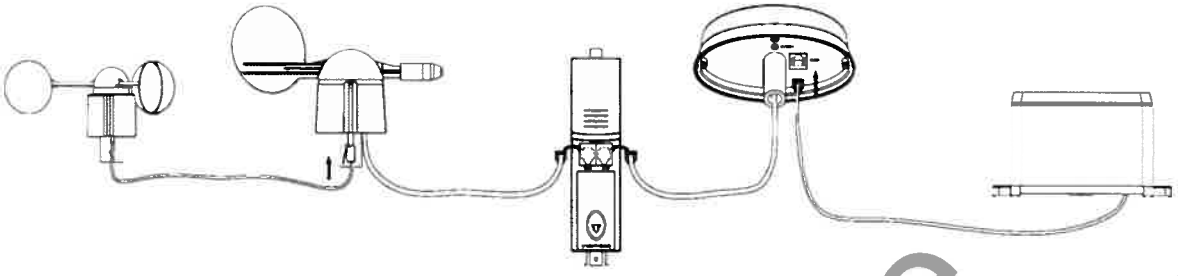


⑥

Mounting the thermo-hygro sensor

⑦

Fix the whole set to a pole
with the two adjustable hoops



- The anemometer's cable is connected to the input on the wind direction sensor.
- The wind direction sensor's cable is connected to the input marked **Wind** on the thermo-hygro sensor.
- The rain sensor's cable is connected to the input marked **Rain** on the solar panel.
- The solar panel's cable is connected to the input marked **Rain** on the thermo-hygro sensor.

The solar transmitter

The solar transmitter makes use of solar energy to power the instruments it is connected to. Note: Use 1.5V LR6 (AA) size batteries. For the solar transmitter to function properly, make sure the solar receptors on the transmitter are exposed to sunlight and the connectors on the connection cable are securely plugged in. For best results face the solar panel north if you reside in the southern hemisphere and south if you reside in the northern hemisphere.

Setting Up

The base station has six keys for easy operation: the **MENU** key, **UP** key, **DOWN** key, **ENTER** key, **HISTORY** key and the **ON/OFF** key.

Note: Keeping the **UP** or **DOWN** key pressed when setting certain units will increase/decrease digits in greater steps.

The setting procedure can be exited at any time by either pressing the **HISTORY** key or waiting for the 30-second time-out to take effect.

The basic settings can now be performed as follows:

Time

Press the **MENU** key to select the TIME section, the TIME section digits will start flashing and you will be in the LCD contrast setting mode (level 1-8, default level 5), press the **UP** or **DOWN** key to set the value. Level 1 will produce the faintest appearance level 8 the darkest.

Press the **ENTER** key to select the following:

- Time zone
- 12/24h time display (default 12h)
- Manual time setting (hours/minutes)

Press the **UP** or **DOWN** key to set each value.

Note: Set your time zone as follows:

Country	Time Zone setting	Country	Time Zone setting
Iceland (-2 for German DST)	-1	Poland	0
Ireland	-1	Slovakia	0
Portugal	-1	Spain	0
United Kingdom	-1	Sweden	0
Albania	0	Switzerland	0
Austria	0	Bulgaria	+1
Belgium	0	Estonia	+1
Croatia	0	Finland	+1
Denmark	0	Greece	+1
France	0	Latvia	+1
Germany	0	Lithuania	+1
Hungary	0	Moldova	+1
Italy	0	Romania	+1
Netherlands	0	Turkey	+1
Norway	0	Ukraine	+1

Date

Press the **MENU** key twice to select the DATE section, the DATE section digits will start flashing. Press the **ENTER** key to shift the display between the following parameters and press the **UP** or **DOWN** key to change the value:

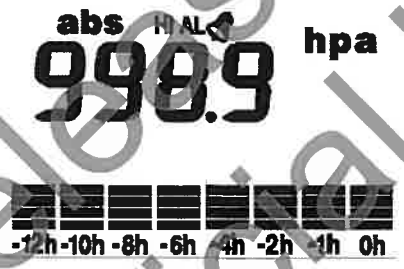
- Date Format
- Year
- Month
- Day
- Time Alarm

After editing the Time Alarm it can be enabled or disabled by pressing **ON/OFF** while the hour or minute of the Time Alarm is flashing. An alarm symbol appears in the Time display section indicating the alarm function has been enabled. **Note:** Press any key to mute the alarm.

Note: Alarms can also be set for most of the weather variables (see below for instructions on setting). When a set weather alarm condition has been triggered that particular alarm will sound for 120 seconds. The corresponding value, 'HI AL" or "LO AL" and the alarm symbol will flash until the weather condition no longer meets the user's set level. When the alarm is sounding press any key to mute the alarm.

Note: Because of the preset default settings it may not be necessary for the majority of users to perform any further basic settings - except for Relative Air Pressure (see below). Changes, however, can be easily made as below.

Pressure



Press the MENU key three times to select the PRESSURE HISTORY section, the PRESSURE HISTORY section digits will start flashing. Press the **UP** or **DOWN** key to select the bar graph time scale (either 12 hrs or 24 hrs).

Press the **MENU** key a fourth time to select the PRESSURE section, the PRESSURE section digits will start flashing. Press the **UP** or **DOWN** key to change between Relative and Absolute air pressure.

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Pressure units of measurement - hPa, mmHg or inHg (default hPa).
- Relative pressure value - if you are significantly above sea level you will need to calibrate the air

pressure reading to allow for your altitude. To do so make sure you have selected Relative as above and change the pressure reading to match with a local benchmark such as the local air pressure provided for your area on the Met Service or Bureau of Meteorology websites. If Absolute pressure is selected, skip this step.

- Pressure high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Pressure low alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum pressure value (since last reset). Resetting the maximum pressure value - when both the pressure value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum pressure value will be reset to the current reading.
- Minimum pressure value (since last reset). Resetting the minimum pressure value - when both the pressure value and MIN icon are flashing, hold the **ENTER** key for 3s, the minimum pressure value will be reset to the current reading.

Weather Forecast

Press the **MENU** key five times to select the TENDENCY section, the TENDENCY section digits will start flashing. Press the **UP** or **DOWN** key to select the tendency (not generally required as this will adjust automatically over a few days as the unit collects data and begins forecasting).

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Set the pressure threshold from 2-4hPa (default 2hPa)
- Set the storm threshold from 3-9hPa (default 4hPa)

Note: The prediction is for the upcoming 12 - 24 hours and does not necessarily reflect the current weather situation. It calculates on the basis of the pressure changes that have occurred during the past 24 hours the most likely weather forecast for the upcoming 12 - 24 hours. The weather forecast predicted has a probability of 70%. This means that observed over a period of several weeks, 7 from 10 forecasts for the upcoming 12 - 24 hours will be correct. Observing the forecast for only a few days is not sufficient to draw any conclusions with respect to accuracy.

Notes on the pressure sensitivity setting for weather forecasting

The pressure threshold can be set to suit the user's requirements for weather forecasting - anywhere from 2-4hPa (default 2hPa). Areas that experience frequent changes in air pressure require a higher setting compared to areas where the air pressure is stagnant. For example if 4hPa is selected, then there must be a fall or rise in air pressure of at least 4hPa before the weather station will register this as a change in weather.

Notes on the storm threshold setting

The storm threshold can be set to suit the user's requirements for storm forecasting - anywhere from 3-9hPa (default 4hPa). When there is a fall below the pressure threshold within any given 3 hour period, the storm forecasting will be activated and the clouds with rain icon as well as the tendency arrows will flash for 3 hours indicating the storm warning feature has been activated.

Weather forecast symbols:

Sunny 

Partly Cloudy 

Cloudy 

Rainy 

Snow 

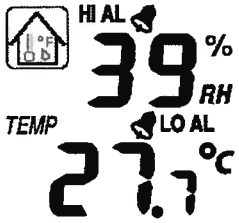
Storm 

Snowstorm 

Clear Night 

Cloudy Night 

Indoor Humidity



Press the **MENU** key six times to select the INDOOR HUMIDITY section, the INDOOR HUMIDITY section digits will start flashing. Press the **UP** or **DOWN** key to change the humidity high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Indoor humidity low alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum humidity (since last reset). Resetting the maximum indoor humidity value - when both the indoor humidity value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum indoor humidity value will be reset to the current reading.
- Minimum humidity (since last reset). Resetting the minimum indoor humidity value - when both the indoor humidity value and **MIN** icon are flashing, hold the **ENTER** key for 3s, the minimum indoor humidity value will be reset to the current reading.

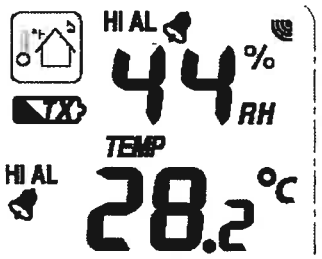
Indoor Temperature

Press the **MENU** key seven times to select the INDOOR TEMPERATURE section, the INDOOR TEMPERATURE section digits will start flashing. Press the **UP** or **DOWN** key to change the temperature unit between C and F.

Press the **ENTER** key to select the following modes:

- Indoor temperature high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Indoor temperature low alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum temperature (since last reset). Resetting the maximum indoor temperature value - when both the indoor temperature value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum indoor temperature value will be reset to the current reading.
- Minimum temperature (since last reset). Resetting the minimum indoor temperature value - when both the indoor temperature value and **MIN** icon are flashing, hold the **ENTER** key for 3s, the minimum indoor temperature value will be reset to current reading.

Outdoor Humidity



Press the **MENU** key eight times to select the OUTDOOR HUMIDITY section. Procedures and settings are similar to Indoor Humidity above.

Outdoor Temperature

Press the **MENU** key nine times to select the OUTDOOR TEMPERATURE section, the OUTDOOR TEMPERATURE section digits will start flashing. Press the **UP** or **DOWN** key to change the temperature display mode between Temperature, Wind Chill and Dew Point.

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Temperature unit display C or F.
- Outdoor temperature high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Outdoor temperature low alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum temperature (since last reset). Resetting the maximum outdoor temperature value - when both the outdoor temperature value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum outdoor temperature value will be reset to the current reading.
- Minimum temperature (since last reset). Resetting the minimum outdoor temperature value - when both the outdoor temperature value and **MIN** icon are flashing, hold the **ENTER** key for 3s, the minimum outdoor temperature value will be reset to the current reading.

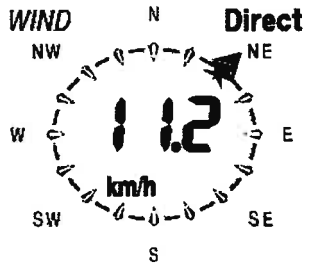
UV Index

Press the **MENU** key ten times to select the UV INDEX section, the UV INDEX section digits will start flashing. Press the **UP** or **DOWN** key to change the UV high alarm (press ON/OFF to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.

The UV Index has a scale of 1-12 as follows:

Extreme:	10, 11, 12
Very High:	7, 8, 9
High	5, 6
Moderate:	3, 4
Low:	0, 1, 2

Wind



Press the **MENU** key eleven times to select the WIND section, the WIND section digits will start flashing. Press the **UP** or **DOWN** key to shift the display between Average wind speed and Gust (default Average wind speed).

Note: Average wind speed is the average speed over the 48 second period between signal transmissions. In gusty conditions this may appear as though wind speed is being under reported as low winds and high winds are averaged across the 48 second interval. Setting wind speed to Gust will display the maximum wind speed during the 48 second period which can often be more meaningful in these conditions.

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Wind speed units - select between km/h, mph, m/s, knots, bft.
- Wind speed high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Wind direction alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum wind speed (since last reset). Resetting the maximum wind speed value - when both the wind speed value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum value will be reset to the current reading.

Light

Press the **MENU** key twelve times to select the LIGHT section, the LIGHT section digits will start flashing. Press the **UP** or **DOWN** key to change the light intensity display mode between W/M², FC and LUX.

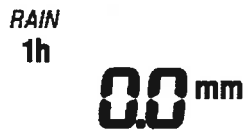
Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Light intensity high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm

symbol appears in the display.

- Maximum light intensity value (since last reset). Resetting the maximum light intensity value - when both the light intensity value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum light intensity value will be reset to the current reading.

Rain



Press the **MENU** key thirteen times to select the RAIN section, the RAIN section digits will start flashing. Press the **UP** or **DOWN** key to change the period over which rain is measured (1h, 24h, Week, Month and Total rain). **Note:** The 24h setting resets at midnight each day.

Press the **ENTER** key to select the following modes, then press the **UP** or **DOWN** key to set the value:

- Rainfall units - select between mm and inch.
- Rain high alarm (press **ON/OFF** to enable/disable). If the alarm is enabled, an alarm symbol appears in the display.
- Maximum rainfall (since this was last reset). Resetting the maximum rainfall value - when both the rain value and MAX icon are flashing, hold the **ENTER** key for 3s, the maximum rain value will be reset to the current reading.
- Clearing Total rainfall - when both the Total rain value and the word CLEAR are flashing, hold the **ENTER** key for 3s, the Total value will be reset to zero (1h, 24h, Week, and Month rain values will be reset to zero automatically).

Memory

Press the HISTORY key to activate the history data display. Press the **DOWN** key to toggle backwards to see earlier weather history data together with its time stamp, press the **UP** key to see more recent weather history. When the history data is displayed, the corresponding time will be displayed in the time section area (the history data saving interval is preset to 30 minutes).

Pressing the ENTER key will trigger the memory clear procedure, the word "CLE" will appear and the memory usage icon will be flashing. Pressing and holding the **ENTER** key for 3 seconds will clear the memory.

Note: Historical values for some variables are only available once downloaded to PC and will appear as dashes on the Base Station.

Reset To Factory Default Settings

While in normal display, press and hold the **UP** key for 20 seconds to reset all settings to the default settings.

PC Connection

An important feature of the WS3083 is the capability for the recorded data to be downloaded, stored and displayed on your PC.

Data Storage
The Base Station allows the internal storage of up to 4,080 complete sets of weather data with time and date. These data sets are stored in non-volatile ring buffer memory (EEPROM) and will not be lost in the event of an interruption of power supply (e. g. change of batteries). When the memory capacity of the weather station is exhausted the oldest data sets stored will be overwritten by the new ones.

Data Recall
Certain weather data or setting values can only be read out, processed, and displayed by means of a PC.

Software Download
Note: No CD is contained with this unit please download the latest Cumulus software and Basic Installation Guide by entering the link below into your browser's address bar:

http://www.aercusinstruments.com/downloads/

This software allows the display, storage, and printing of historical data. In addition the software allows the data to be uploaded and displayed on a website.

Cumulus has a comprehensive Wiki and Support Forum for any software related issues:

http://wiki.sandaysoft.com/a/Main_Page

http://sandaysoft.com/forum/

Note: To get accurate sunrise and sunset data make sure to enter the Latitude and Longitude for your location in the boxes provided in the centre of the Station Settings panel. Latitude and Longitude for your location can be found here:

http://www.findlatitudeandlongitude.com/

Trouble Shooting

Problem	Solution
I am not receiving any outside data.	Check that batteries in both units are fresh and fully charged. Alkaline batteries slow down and freeze in colder temperatures which leads to signal dropouts so we recommend Lithium batteries in colder climates. Also avoid rechargeable batteries as many are 1.2V (standard 1.5V required) and they also leak their peak charge quickly even if they are 1.5V. Put the batteries in the receiver last to force a proper resync. Check that the transmitter is not out of range. Test this by taking the receiver closer to the transmitter, remove and reinsert the batteries and wait for a few minutes to see whether the signal is picked up. Check for sources of interference (cordless phones, baby monitors, PC monitors etc). If this is an issue the console and/or transmitter will need to be relocated. If none of these is causing the problem you may have a faulty transmitter.
My wind speed appears to be under reporting.	When set to Average, wind speed is measured as the average speed recorded over the 48 second period between transmissions. In gusty weather this can appear as though it is under reading. Set this to Gust (see Wind section above) to view the maximum wind speed during each 48 second period.
My rain gauge is under reporting rainfall or not recording it at all.	Remove the cover from the rain gauge and check for spider webs etc that may be impeding the tipper's motion. Tip the tipper back and forth, each tip should register as 0.3mm on the console if it is operating correctly (remember the transmission interval is every 48 seconds so allow sufficient time for the console to register the tips).
My rain gauge is over reporting rainfall.	On rare occasions wind can enter the rain gauge from underneath and cause the rain gauge's tipper mechanism to tip and register false rain readings. In this case mount the rain gauge on a flat surface or mount a plastic plate under the rain gauge to prevent the wind entering. Insecurely mounted sensor trees can also sway in strong winds and cause false rain readings.

Specifications

Outdoor data	
Transmission distance in open field:	Up to 100m (line of site)
Frequency:	433 MHZ
Temperature range:	- 40C to +60C
Resolution:	0.1C
Measuring range rel. humidity:	10% to 99%
Rain volume display:	0 – 9,999mm
Resolution:	0.3mm (if rain volume < 1,000mm) 1mm (if rain volume > 1,000mm)
Wind speed:	0-160kph
Light:	0-400k Lux
Measuring interval thermo-hygro sensor:	48 sec
Measuring interval UV and Light sensors:	60 sec
Water proof level:	IPX3
Indoor data	
Measuring interval pressure / temp:	48 sec
Indoor temperature range:	0C to +60C
Resolution:	0.1C
Measuring range rel. humidity:	10% to 99%
Resolution:	1%
Measuring range air pressure:	300-1,100hPa (8.85-32.5inHg)
Resolution:	0.1hPa
Alarm duration:	120 sec
Power consumption	
Base station	3XAA 1.5V batteries
Remote sensor:	2xAA 1.5V batteries

Contact information

Purchased in UK/EU: Please contact our local distributor Greenfrog Scientific www.greenfrogscientific.co.uk and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

Purchased in AUSTRALIA: Please contact our local distributor Monax Test & Weather www.monaxtestandweather.com.au and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

Purchased in NEW ZEALAND: Please contact our local distributor Scientific Sales www.scientificsales.co.nz and their team will be happy to help. Genuine faults can typically be diagnosed without requiring the unit to be returned and replacement parts sent quickly if needed.

For all others please contact the retailer who sold you this item.

EU DECLARATION OF CONFORMITY

Hereby, Aercus Instruments, declares that this Wireless Weather Station (Model: WS3083) is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. A copy of the signed and dated Declaration of Conformity is available on request from contact@aercusinstruments.com.

COUNTRIES RTTE APPROVAL COMPLIED

All EU countries

This handbook may contain mistakes and printing errors. The information in this handbook is regularly checked and corrections made in the next issue. We accept no liability for technical mistakes or printing errors - or their consequences.

NIKKO
EMERGENCY LIGHTING

NEW LED

Twin LED Floodlights

Emergency Lighting

Part Number: GR30LED

- 2 x 3 High-Powered LEDs providing excellent light output of 2 x 235 lumens
- Extremely lightweight and versatile
- Weatherproof IP65-rated
- Provides in excess of 2 hours of emergency lighting
- Automatic overcharge protection and battery low voltage cut-out to prevent full discharge of battery
- Test switch to provide manual autonomous testing of emergency operation under regular conditions
- Designed and tested to comply with AS2293

Applications include:

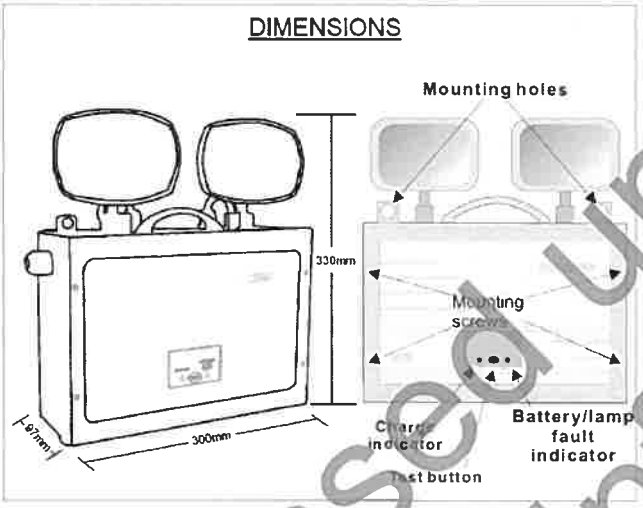
- General interior or exterior emergency
- Offices
- Factories & Warehouses
- Residential buildings

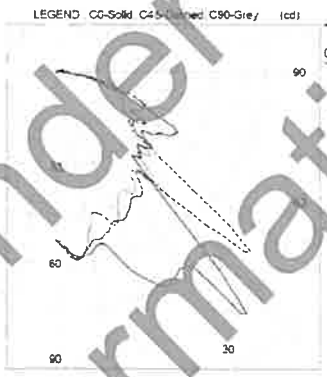
mpower

SPECIFICATIONS

PART NUMBER	GR30LED
LIGHT SOURCE	2 x 3W LED
FUNCTION	Non-Maintained
BATTERY	High-Temperature Nickel Cadmium
BATTERY PROTECTION	From overcharge & full discharge
CHARGER	Dual Rate
EMERGENCY DURATION	Greater than 2 hours
POWER CONSUMPTION (MAX)	10 VA
OPERATING VOLTAGE	240V AC
FREQUENCY	50Hz
INDICATORS / CONTROLS	Battery charging LED / Test Switch / battery fault LED
EMERGENCY ILLUMINATION	2 x 235 lm
IP CLASSIFICATION	IP65
ENVIRONMENT	Outdoor
TEMPERATURE RANGE	0 to 40°C
RELATIVE HUMIDITY	0 to 95%
CONSTRUCTION MATERIALS	Bayblend FR3010. Transparent Polycarbonate
WEIGHT	2040g

DIMENSIONS





INTENSITY SUMMARY (cd)

	C-Plane						Output
Gamma	C0	C22.5	C45	C67.5	C90	Lumens
0.0	52.9	52.9	52.9	52.9	52.9	
5.0	57.5	57.7	58.6	59.3	58.4	5.5
10.0	57.4	55.0	55.3	55.5	52.1	
15.0	55.4	54.0	53.5	52.0	45.8	15.1
20.0	55.9	53.9	49.6	52.9	51.0	
25.0	73.6	60.5	48.9	53.4	42.3	25.4
30.0	71.1	69.0	44.9	49.0	44.3	
35.0	92.5	63.2	41.6	40.1	38.0	30.7
40.0	33.7	35.4	48.7	40.5	42.4	
45.0	32.7	35.5	79.6	47.0	36.5	32.9
50.0	35.9	39.1	30.9	30.9	28.2	
55.0	33.6	27.8	25.6	26.2	27.1	25.6
60.0	38.7	31.8	24.4	22.7	22.3	
65.0	31.3	31.0	27.3	16.9	19.9	24.6
70.0	20.1	19.0	25.4	15.4	20.4	
75.0	14.0	13.0	15.7	13.9	16.9	15.7
80.0	6.5	10.5	11.0	11.0	11.2	
85.0	4.8	5.1	5.8	5.6	5.1	6.4
90.0	2.7	2.9	3.1	2.4	2.2	

ZONAL LUMENS AND PERCENTAGES

Zone	Lumens	% Lamp	% Luminaire
0-30	46.0	N/A	24.3
0-40	76.6	N/A	40.6
0-60	135.2	N/A	71.5
0-90	181.8	N/A	96.2
40-90	105.2	N/A	55.6
60-90	46.7	N/A	24.7
90-180	7.2	N/A	3.8
0-180	189.0	N/A	100.0

AUSTRALIA
Toll Free
Ph: 1300 733 004
info@mpower.com.au
www.mpower.com.au

Head Office - VIC
9 Mosrael Place
ROWVILLE
VIC 3178
Ph: 03 9763 0555
Fax: 03 9763 0577

NSW
10 Williamson Road
INGLEBURN
NSW 2565
Ph: 02 8788 4500
Fax: 02 8605 3702

SA
Units 3, 4 & 5
70-72 Pym Street
DUDLEY PARK
SA 5008
Ph: 08 8269 0674
Fax: 08 8269 1671

QLD
Unit 2 / 14 Hook Street
CAPALABA
QLD 4157
Ph: 07 3823 4933
Fax: 07 3245 1327

North QLD
Unit 5, 59 Pilkington St
TOWNSVILLE
QLD 4810
Ph: 07 3245 1276
Fax: 07 4723 5143

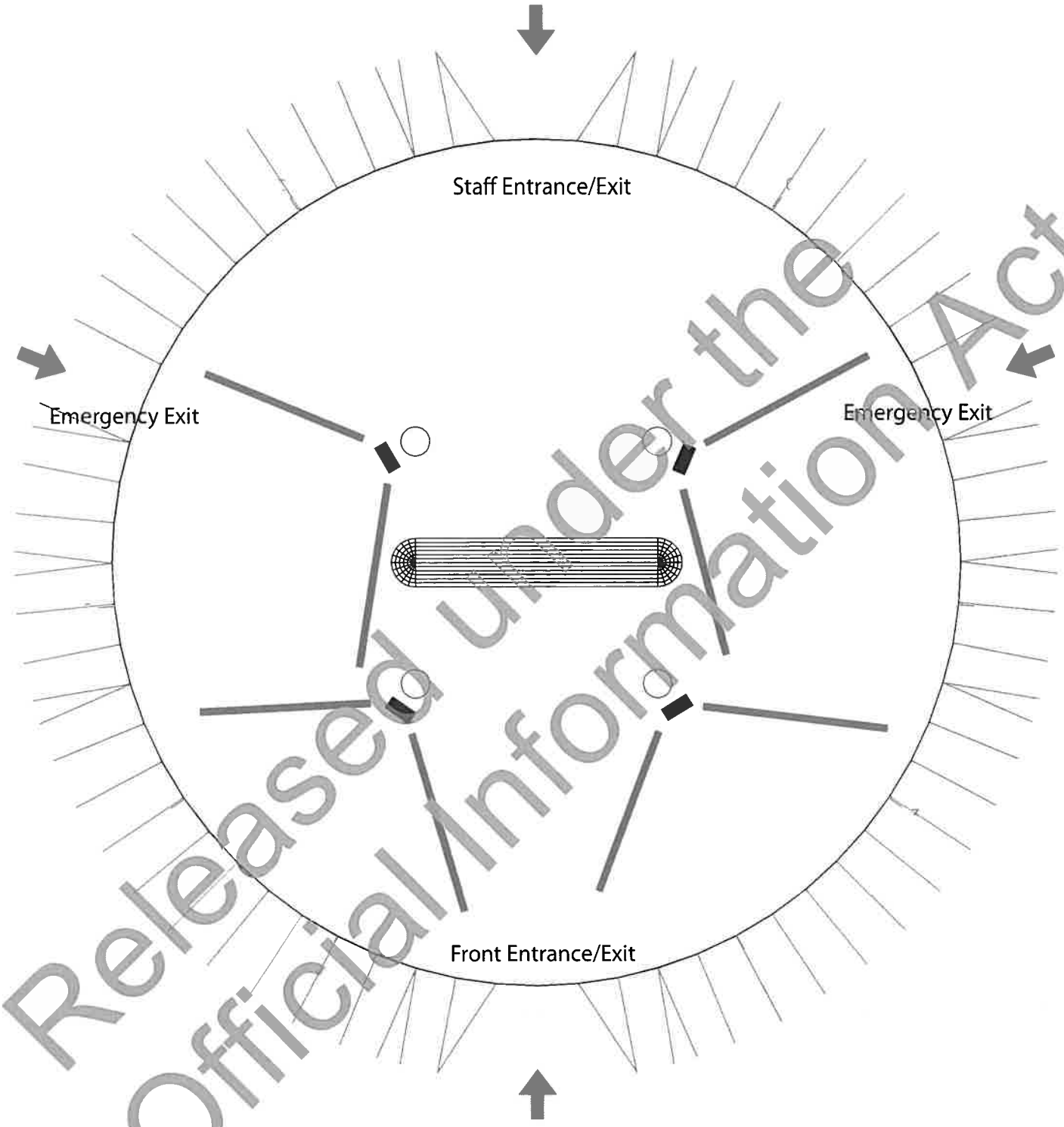
WA
Unit 2 / 10 Mordaunt Circuit
CANNING VALE
WA 6155
Ph: 08 6254 2211
Fax: 08 6254 2299

TAS
Unit 3 / 94 Central Ave
DERWENT PARK
TAS 7009
Ph: 03 6272 4590
Fax: 03 6272 4690

NT- AGENT
Powerhouse
NT Distributors
2/34 Benison Road
WINNELLIE
NT 0820
Ph: 08 8947 0027
Fax: 08 8947 1126

NEW ZEALAND
Auckland
Unit B / 237 Bush Road
ALBANY
Ph: 09 415 6615
Fax: 09 415 8160
Wellington
7 Ward Street
LOWER HUTT
Ph: 04 586 6188
Fax: 04 586 6088
Christchurch
29 Birmingham Drive
MIDDLETON
Ph: 03 335 0639
Fax: 03 335 0641

Emergency Light Positions



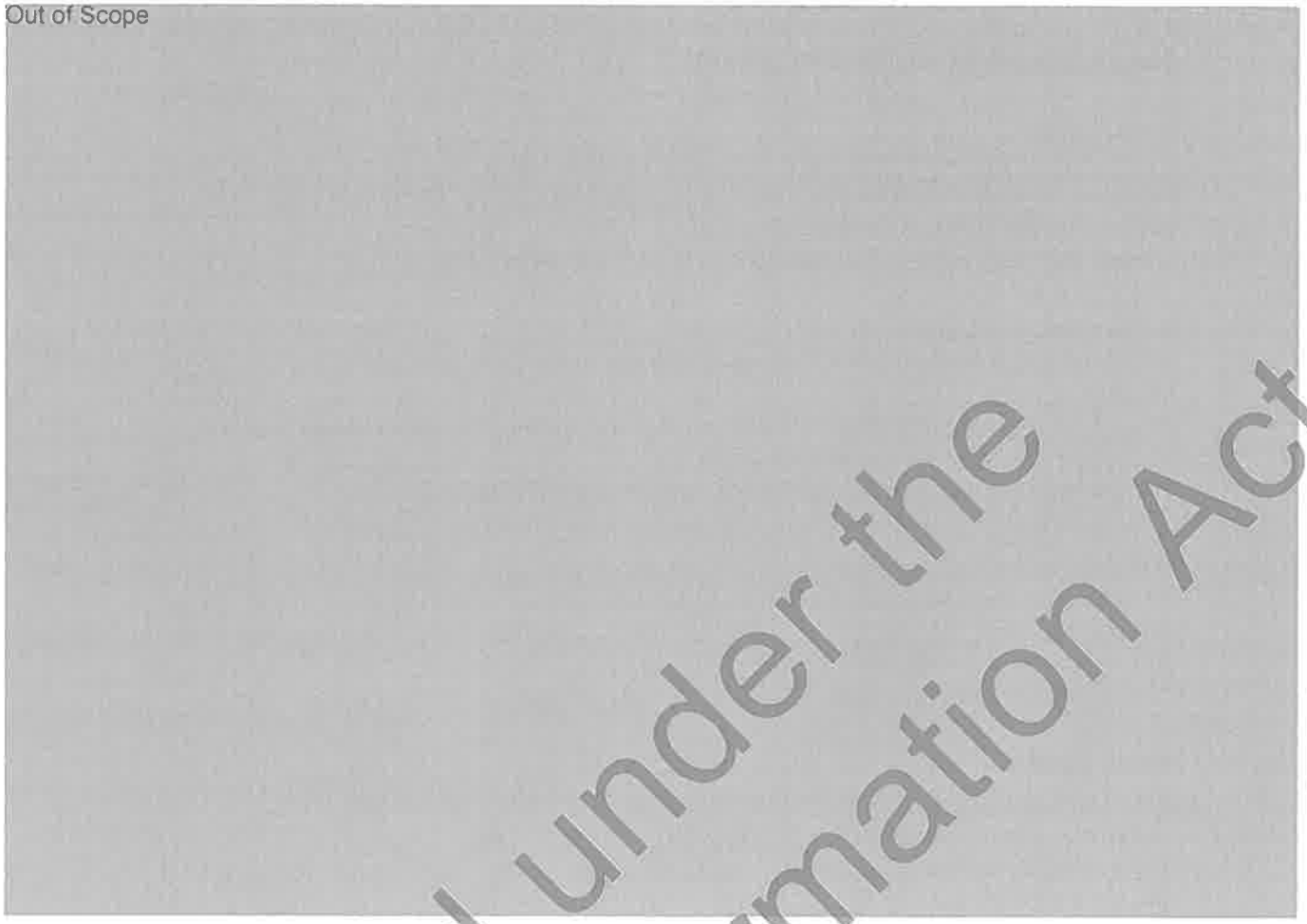
New Emergency Safety Equipment

Exit Signs
Place over each exit as before. Also staff exit at back.
Must be switched ON when power is on (town power or generator). Must be switched OFF before generator is off.
Check that they stay on when power is off, before inspection.

Emergency Lights
Place on each kingpole as in diagram. Make sure they light towards emergency exits.
Must be switched ON when power is on (town power or generator). Must be switched OFF before generator is off.
Check that they stay on when power is off, before inspection.

Alarms
Only need charging once a month. Green light on charger on when fully charged.
Always plug in computer.
Test both before inspection.

Extinguishers
Front exit. Place behind entrance screens, one near sound desk (Dry Powder), one on opposite side (water)
Rear. Place behind side curtains on each side.
Must have signs



From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Thursday, 14 January 2016 3:43 p.m.
To: Murray Usmar
Cc: Paul Johnson
Subject: Fwd: Rigging and inspections

Hi Murray,

Please see the support email below from Shaw's Wire Ropes in Cambridge.

Kind Regards
Jeni

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: +s 9(2)(a)
http://www.zirkacircus.com

Please Note:
New Address:

P. O. Box 28093
Rototuna
Hamilton 3256

---------- Forwarded message ----------
From: **Alan McDonald** <alan@wireropes.co.nz>
Date: Tue, Dec 22, 2015 at 12:01 PM
Subject: Rigging and inspections
To: "jeni@zirkacircus.com" <jeni@zirkacircus.com>

Hello Jeni,

With regards to our conversation this morning, I can say that we have been supplying you lifting, lashing and rigging gear on a regular basis. We have on occasion replaced damaged or worn equipment.

We have had an account set up for Zirka Circus since 2012 and have dealt with you for a number of years prior to this on a cash sale basis.

As discussed we will be happy to do another inspection on your marquee equipment next time you are in Hamilton and look into a formal regular inspection process for the future.

Regards,

Alan

SHAW'S WIRE ROPES

Alan Macdonald SHAW'S WIRE ROPES LTD.
p 0064 (0)7 82[illegible] 4029 m s 9(2)(a)
f 0064 (0)7 823 4059 w www.wireropes.co.nz

PO BOX 962, Cambridge • 9-13 Albert Street, Cambridge, 3434, New Zealand

Building Code Compliance Summary

12 February 2016

Application No: 10057

Applicant: Flaming Phoenix Entertainment Limited (Zirka Circus)

Project: Circus Marquee

Scope:

Snow Loading: Marquee is not to be erected or occupied by the Public during snow conditions.
Wind Loading: Site wind speed is to be monitored using a wind anemometer on-site
Ground Condition: Site to be tested using Peg Pull Test Procedures.

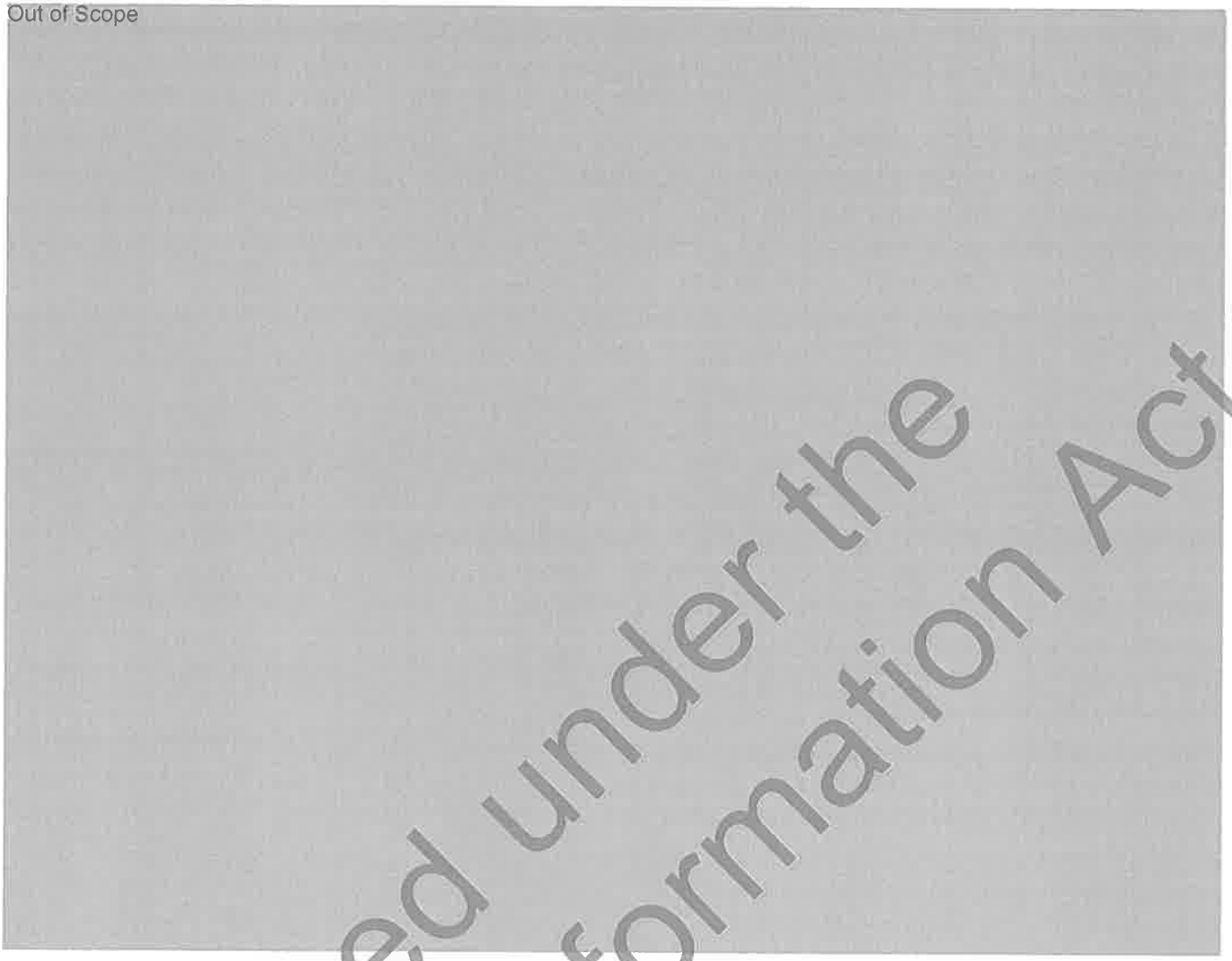
Preamble:

- Given that the floor area of the Marquee is over 100m² (963m²) a Building Consent is required.
- Building Consent is required in-order to show that the Purpose and Principles of BA04 section 3 is achieved.
- Building Work for which the Building Consent is granted is the erection of the marquee.
-

BUILDING CODE CLAUSE :	ELEMENT :	COMPONENT	HOW COMPLIES:	COMMENTS:
B1 Structure	*Roof* *Walls*			
B2 Durability	*Roof*			DURABILITY FOR THE DURATION OF THE BUILDING CONSENT. — MAINTENANCE CHECKS EACH TIME ERECTED
	Walls			
	Walls - internal			DISCUSSIONS WITH OWNER REGARDING REPLACEMENT
	Floor		INFO ON FABRIC SUPPLIED.	FABRIC — DONE BY BAYTEX.
C2 Prevention of Fire Occurring				
C3 Fire Affecting Areas Beyond the Fire Source				
C4 Movement to Place of Safety			REFER TO FIRE REPORT + FEB.	
C5 Access and Safety for Fire-				

fighting Operations				
C6 Structural Stability				
D1 Access Routes				
F6 Visibility in Escape Routes				
F7 Warning systems				
F8 Signs				

Out of Scope



From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Tuesday, 16 February 2016 12:53 p.m.
To: Murray Usmar
Cc: Benson Zhang; Paul Johnson
Subject: Operation and Maintenance Booklet of Zirka Circus

Hi Murray,

Please see the attached Operation and Maintenance Booklet as you required.

Kind Regards
Jeni
Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: s 9(2)(a)
http://www.zirkacircus.com

Please Note:
New Address:

P. O. Box 28093

Rototuna
Hamilton 3256

---------- Forwarded message ----------
From: **James Finlayson** <james@zirkacircus.com>
Date: Tue, Feb 16, 2016 at 12:45 PM
Subject: FW: ZIRKA CIRCUS
To: Jeni Hou <jeni@zirkacircus.com>

------ Forwarded Message
From: Anceschi Alberto e Paolo <info@anceschi.it>
Date: Tue, 3 Jun 2014 10:19:26 +0200
To: <shauns@redco.co.nz>, James Finlayson <james@zirkacircus.com>
Subject: ZIRKA CIRCUS

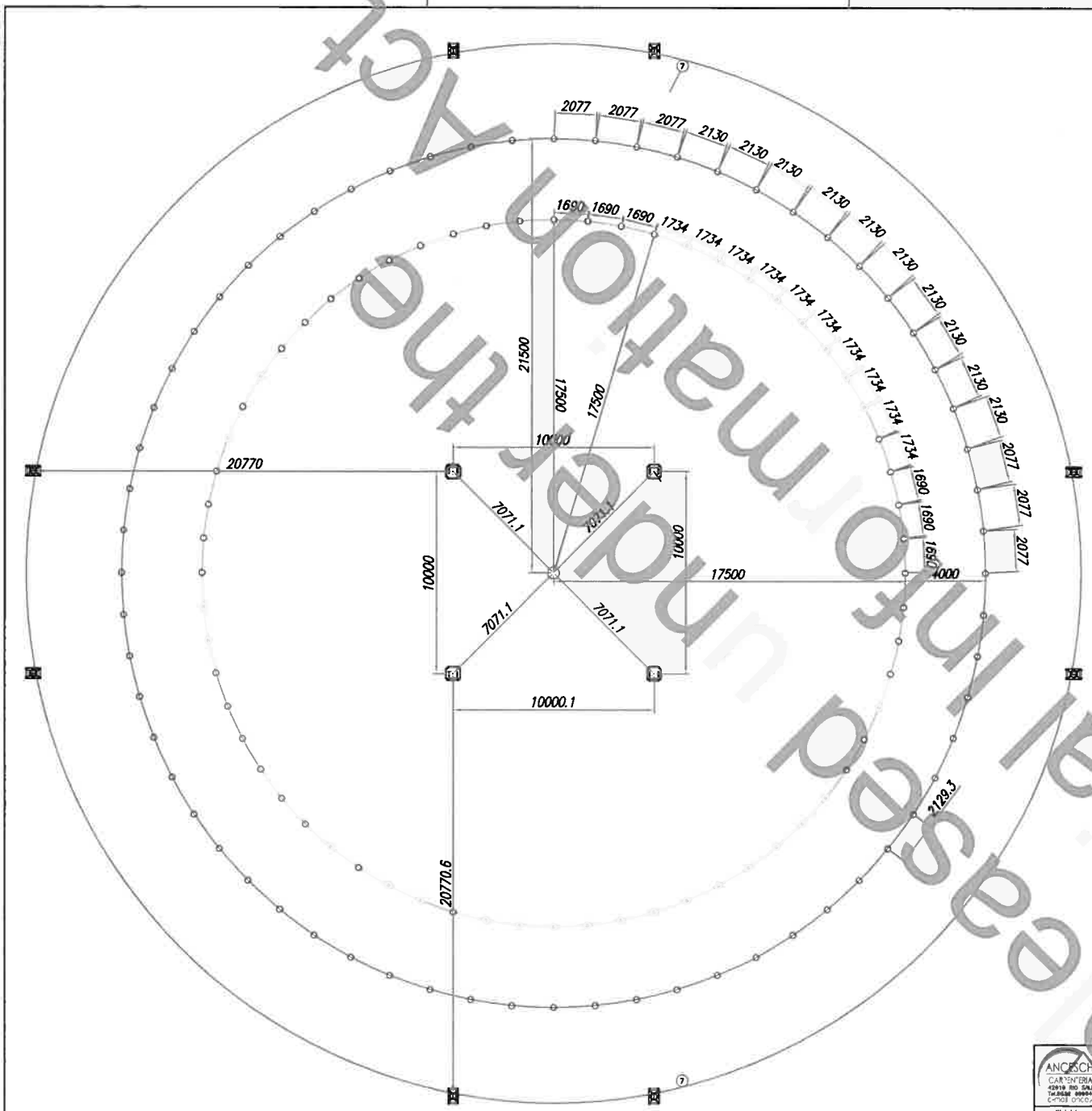
Good morning,
we send you the Operator's and maintenance Booklet of Zirka Circus.

We are your disposition for every other question and demand.
Best regards.

Elisa Anceschi

ANCESCHI ALBERTO E PAOLO
CARPENTERIA MECCANICA
ANCESCHI ALBERTO E PAOLO SNC
Via G Marconi, 15 – 42010 Rio Saliceto (RE)
Tel. 0522 699949 –Fax 0522 647540
E-mail: anceschi@anceschi.it <mailto:anceschi@anceschi.it> - info@anceschi.it <mailto:info@anceschi.it>
WWW.anceschi.it <http://www.anceschi.it/>

------ End of Forwarded Message



PIASTRE ANCORAGGIO ANTENNE N° 8
Plates with 6 holes for anchor King Poles

Picchetti Ancoraggio telo
pickets for anchor tent

Pali del giro
Side poles

Piastre basamenti Antenne
Plate base King poles

ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA

Weight
Kg:

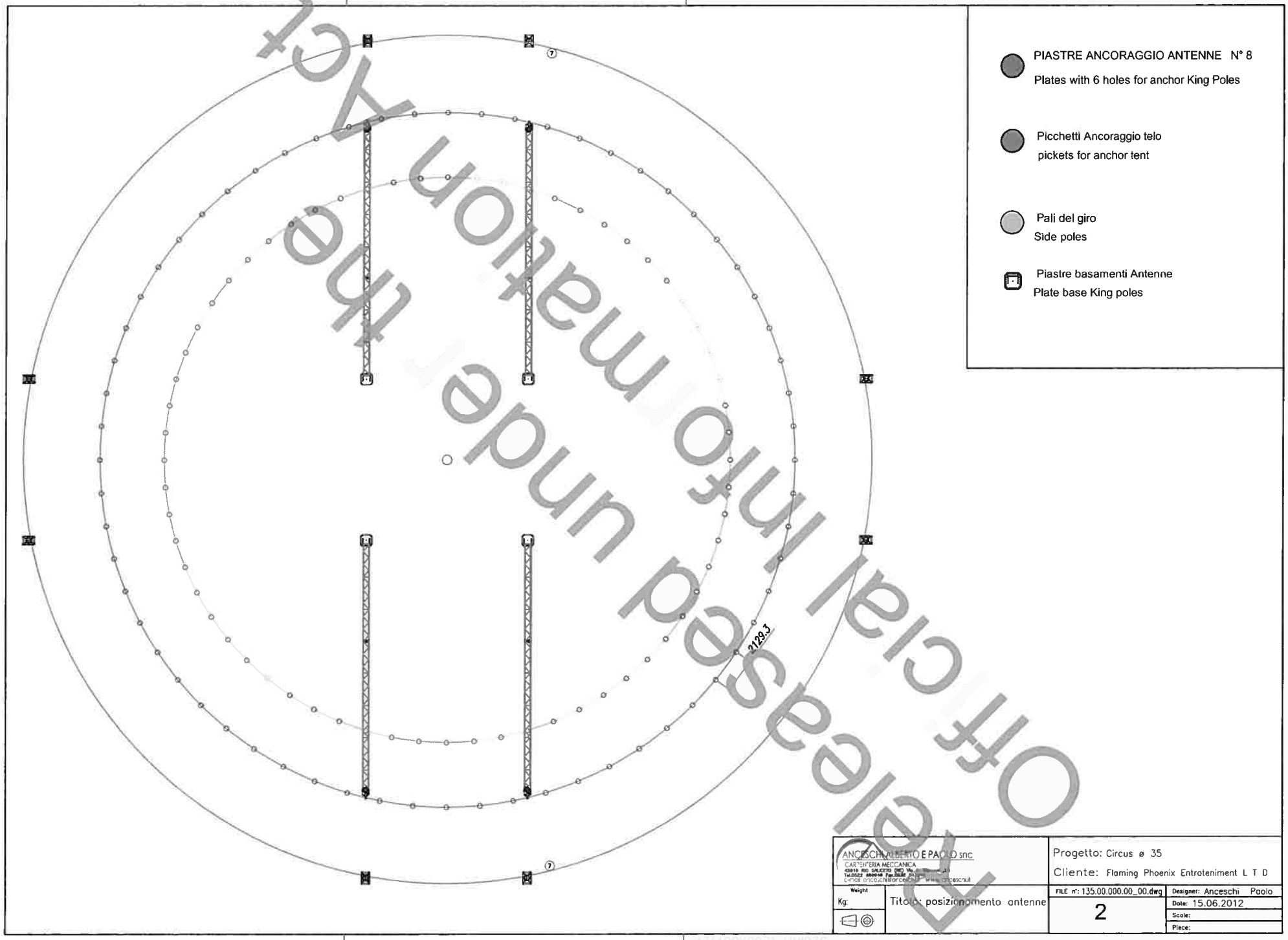
Titolo: Piano di montaggio
Marcatura per montaggio

Progetto: Circus ø 35
Cliente: Flaming Phoenix Entrateniment L T D

FILE n°: 135.00.000.00_00.dwg
1

Designer: Anceschi Paolo
Date: 15.06.2012
Scale:
Piece:

A3(420x297) UNI936



ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA

Weight
Kg:

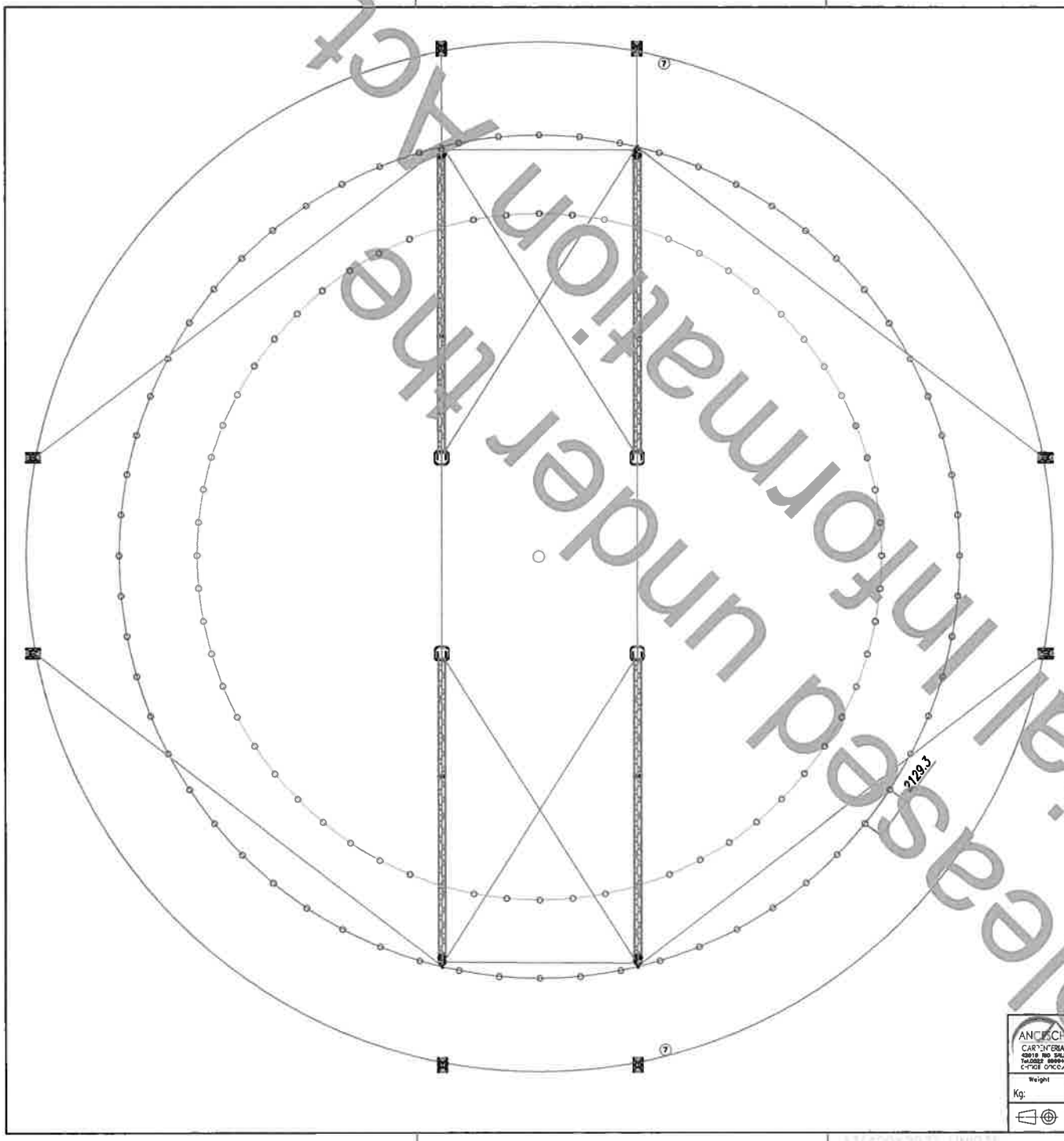
Titolo: posizionamento antenne

Progetto: Circus ø 35
Cliente: Flaming Phoenix Entrateniment L T D

FILE n°: 135.00.000.00_00.dwg
2

Designer: Anceschi Paolo
Date: 15.06.2012
Scale:
Piece:

A3(420x297) UNI836



PIASTRE ANCORAGGIO ANTENNE N° 8
Plates with 6 holes for anchor King Poles

Picchetti Ancoraggio telo
pickets for anchor tent

Pali del giro
Side poles

Cavi
Cables

Piastre basamenti Antenne
Plate base King poles

ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA

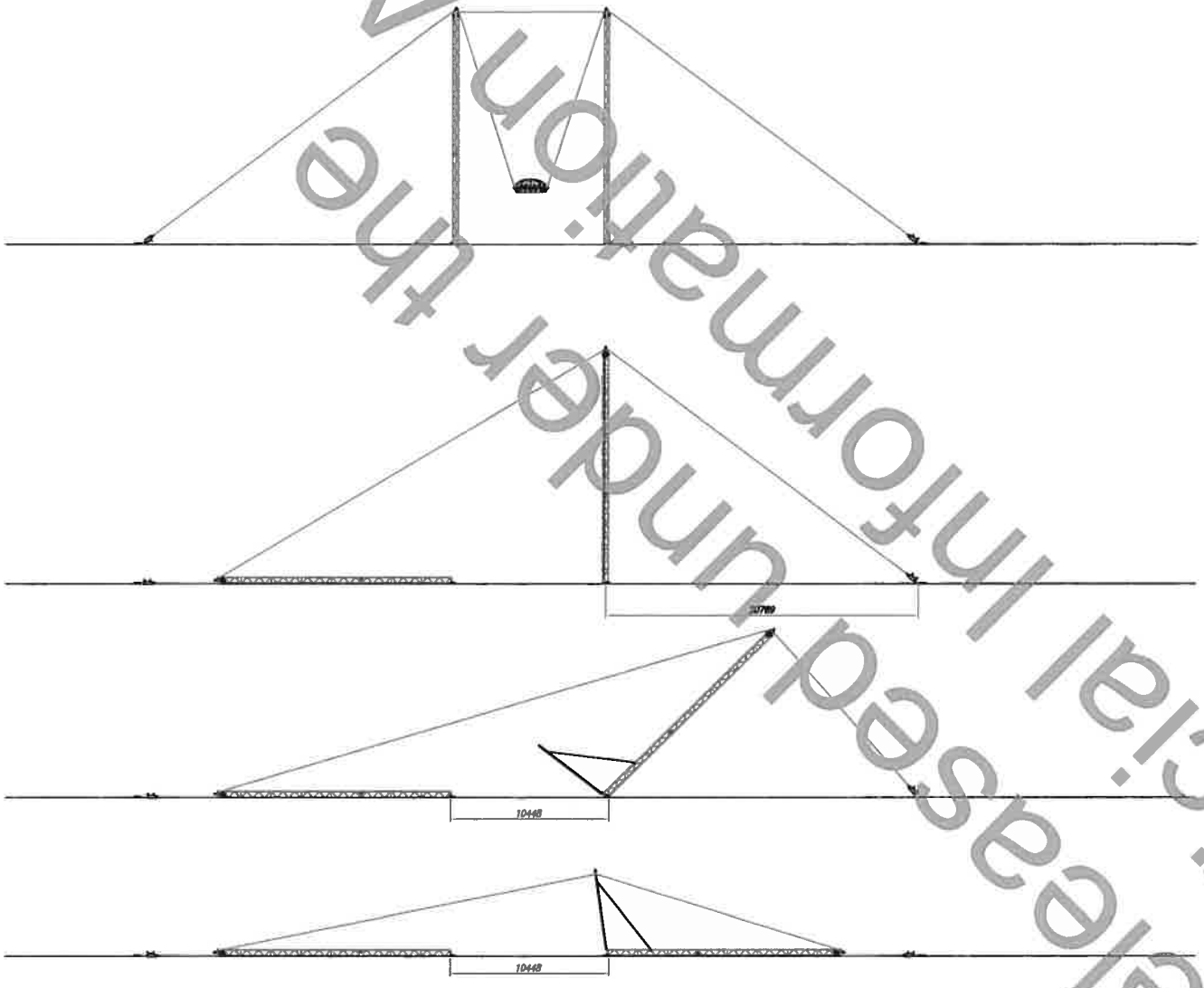
Progetto: Circus ø 35
Cliente: Flaming Phoenix Entrateniment L T D

Weight
Kg:

Titolo: posizionamento antenne

FILE n°: 135.00.000.00_00.dwg
3

Designer: Anceschi Paolo
Date: 15.06.2012
Scale:
Piece:



ANCESCHI ALBERTO E PAOLO snc
CARPENTERIA MECCANICA

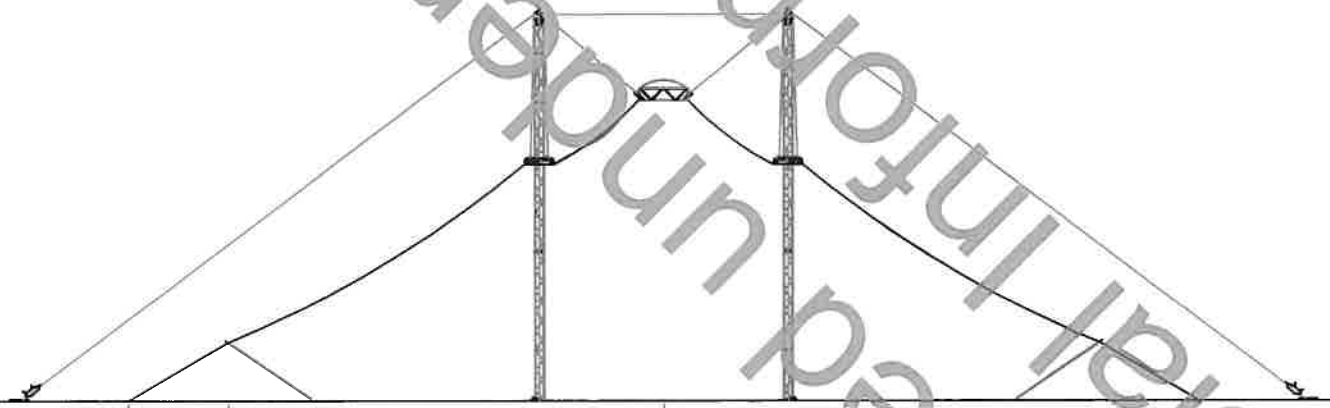
Weight
Kg:

Titolo: Piano di montaggio
Boll. Antenne

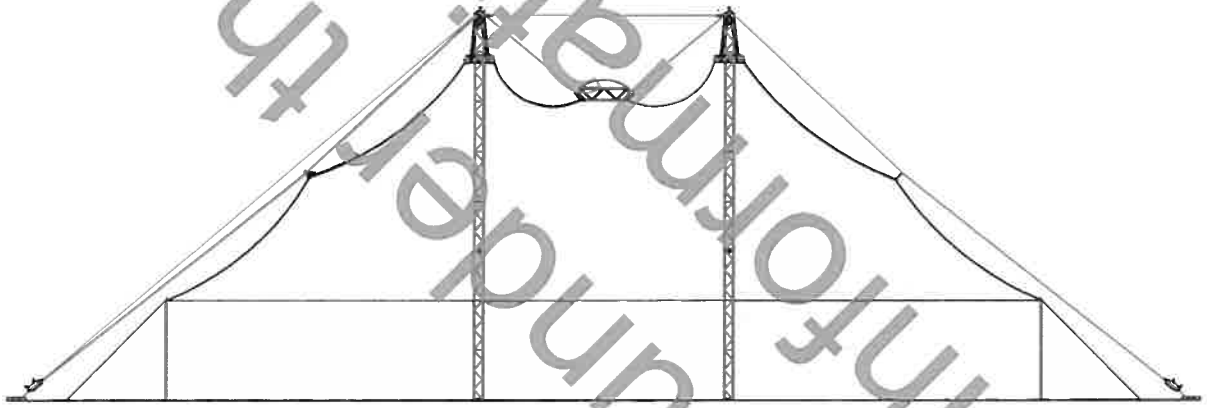
Progetto: Circus ø 35
Cliente: Flaming Phoenix Entrateniment L T D

FILE n°: 135.00.000.00_00.dwg
4

Designer: Anceschi Paolo
Date: 15.06.2012
Scale:
Piece:



ANCESCHI ALBERTO E PAOLO snc CARPENTERIA MECCANICA		Progetto: Circus ø 35 Cliente: Flaming Phoenix Entrateniment L T D
Weight Kg:	Titolo: posizionamento antenne	FILE n°: 135.00.000.00_00 dwg 5
		Designer: Anceschi Paolo Date: 15.06.2012 Scale: Piece:



ANCESCHI ALBERTO E PAOLO snc CARPENTERIA MECCANICA	Progetto: Circus ø 35 Cliente: Flaming Phoenix Entrateniment L T D	
Weight Kg:	Titolo: posizionamento antenne	FILE n°: 135.00.000.00_00.dwg 6
		Designer: Anceschi Paolo Date: 15.06.2012 Scale: Piece:

A3(420X297) UNI936

ANCESCHI ALBERTO E PAOLO S.N.C.
CARPENTERIA MECCANICA

Via G. Marconi,15- I- 42010 Rio Saliceto (RE) –Italia

OPERATOR'S AND MAINTENANCE BOOKLET

FOR THE 35 M DIAMETER CIRCUS STRUCTURE

Owner:

FLAMING PHOENIX ENTERTAINMENT LTD
ZIRKA CIRCUS
P.O BOX 7178
3247 HAMILTON – NEW ZELAND

Rio Saliceto, 30 November 2012

LIST OF CONTENTS

1.1 INTRODUCTION

This booklet contains all the instructions for correct installation, as well as those relating to the purchased product.

In the event of its not being perfectly clear and understandable, please contact the company Anceschi Alberto e Paolo s.n.c.

The company Anceschi Alberto e Paolo s.n.c. reserves the right to make any amendment hereto at any time following the natural evolution of product quality, without having to provide prior notice or update this booklet.

The information and details in this booklet are exact and updated at the time of going to press.

In case of any differences being found, to eliminate any doubt, contact Anceschi Alberto e Paolo s.n.c. directly.

Before starting assembly and using the product, carefully follow the technical instructions in this booklet as well as all indications shown.

This booklet, including all the publications attached thereto, must be kept in an accessible place, known to all operators and the personnel assigned to maintenance, assembly and disassembly operations.

The customer must make sure that:

- The booklet is used in such a way as not to damage it.
- Parts of the booklet are not torn out, removed or rewritten.
- The booklet is kept in protected areas, away from damp and heat.
- In the event of the booklet being amended, that an updated copy be sent to assembly, disassembly and/or maintenance operators, and that the superseded booklet be eliminated.

The safety regulations and the instructions for use and maintenance contained in this booklet do not cancel or replace those required by the applicable legislation of the country where the structure is used and which the user must stringently abide by.

2.1 TECHNICAL AND IDENTIFICATION DETAILS

MANUFACTURER: ANCESCHI ALBERTO E PAOLO S.N.C.
VIA G. MARCONI, 15
42010 RIO SALICETO RE
ITALY
TEL. 0039 0522 699949
FAX. 0039 0522 647540
email: info@anceschi.it

YEAR OF MANUFACTURE:2012

BUYER: FLAMING PHOENIX ENTERTAINMENT LTD
ZIRKA CIRCUS
P.O BOX 7178
3247 HAMILTON – NEW ZELAND
Tel. 07 2117599
Tel. s 9(2)(a)
email: james@zirkacircus.com

The structure features the technical-dimensional characteristics shown on the attached tables:
1-2-3-4-5-6

3. PRECAUTIONS AND RESTRICTIONS DURING USE

3.1PRECAUTIONS DURING USE

1) Prevent transit or standing of unauthorized persons near the structure and/or during assembly or disassembly. In this respect, fencing off and monitoring the area occupied by the tent is mandatory. Only authorized technical personnel wearing legally required personal protection equipment should be allowed to enter this area. The assembly and disassembly area of the structure can be compared to a building site. Consequently, all related safety precautions should be taken in accordance with applicable laws.

2) Carefully assemble all the structural components, checking their structural integrity and correct positioning after assembly.

3) Make sure that when lifting frameworks no excessive stresses, seizing up or anomalous movements occur to the lifting mechanisms.

4) On a daily basis, check correct pre-tensioning and integrity of the cables and other structural parts of the tent.

5) Checking the fastness of the anchor points after fixing to the ground is mandatory. To do this use a certified torque meter and abide by the static calculation.

6) After assembly, no part of the structure must be removed and/or modified. Certifying the correct execution of tent assembly is mandatory with the aid of qualified technicians able to issue to the user suitable documentation at the end of each assembly operation.

7) Before use, check the integrity of all the structural parts, with special attention for those located in the top parts of the tent, as these, in case of accidental movement, could represent a hazard for the user.

8) In case of any doubt, only use the lifting and leveling devices after a careful check has been made by qualified technicians.

9) Do not tamper with any construction part of the structure and abide by the maintenance schedule.

10) In order to always comply with the safety regulations, the user must carry out the tests required by law within the expiry dates.

11) Do not use electrical devices without proper safety markings (CE, IMQ mark or the like). Before each assembly or disassembly operation, make sure that any electrical devices used are in perfect operating condition and that they are correctly supplied.

12) In case of any faults affecting the electrical appliances, call in qualified personnel to operate in accordance with the safety regulations required by applicable legislation.

3.2 RESTRICTIONS DURING USE

1) The technician who performed the structural calculations has imposed restrictions in accordance with specific climatic conditions: **wind and snow. In such circumstances, the user must strictly follow these instructions,** even if not expressly contemplated by the static calculations.

2) **In case of snow** higher than 10 cm., the show, if being performed, must be interrupted and the public must be evacuated. Afterwards, remove the snow using water jets and by increasing the temperature inside the tent. Do not climb on the roof of the tent as injury to operators could ensue.

3) **In case of wind** over 50 Km/h, the show, if being performed, must be interrupted and the public evacuated. In order to prevent hazardous situations, the anchor points must be strengthened and the perimeter of the tent must be opened, removing the sheets from opposite positions. This way, the surface affected by the wind is reduced and the pressure of the wind on the structure will remain below the values indicated on the calculation report.

4) In order to comply with the above, it is best to acquire a wind gauge, widely available on the market; otherwise, contact the weather office on a daily basis.

4. MAINTENANCE

4.1 GENERIC INSTRUCTIONS

1) If the structure has to undergo the applicable regulations regarding public shows, it will necessarily have to undergo **yearly** structural and electrical tests by qualified personnel who will issue suitable documentation and reports.

2) To ensure utmost security, only ever use spare parts supplied by Anceschi Alberto e Paolo Snc; any claims will be invalidated in case of use of non-original spares made by other companies.

3) In case of the structure consisting of electrical parts, make sure these are integral and in good working order: **electrical components which are worn in any way must be immediately replaced.** Using the structure or part of it with faulty or damaged cables and/or sockets and/or plugs is forbidden.

4) At the end of assembly, power MUST be interrupted to all the electrical apparatus of the structure.

5) Using any chemical products to clean the tent fabric is forbidden. In this respect, it is best to use a detergent made specifically for PVC which can be supplied on request directly by Anceschi Alberto e Paolo s.n.c.

6) In case of cleaning machines being used, only use professional brushes of the soft type so as not to damage the fabric. Before washing, make sure the floor on which the fabric rests is flat and even so as not to damage the fabric.

7) During assembly and disassembly, the tent must never be dragged over the floor as this movement would cause irreparable damage to the fabric. After disassembly, the tent must be carefully dried and placed on a flat and even surface. Make sure it is not wet, to prevent the formation of mildew on the fabric.

8) During tent assembly, disassembly, cleaning and transport, always make sure this is not dragged on the floor, does not rub against rough surfaces and does not accidentally come into contact with sharp objects that could damage the waterproof surface or the basic textile structure.

4.2 SPECIAL INSTRUCTIONS REGARDING THE STRUCTURAL ELEMENTS

1) Every time the tent is assembled and disassembled, visually check the condition of the structural elements and connecting devices, with special focus on metal elements.

2) Make sure there is no rust, no corrosion nor any cracks (especially at welded points).

3) Make sure the structural elements have not been deformed by knocks or wrong operations.

4) Every year, check the condition of all the structural pre-tensioning elements: textile belts and cables used to stabilize the antennas. If any such elements are found to be damaged or worn, **they must be immediately replaced**. It is therefore best that the tension of the cables and belts be checked daily, so the structure is always perfectly and safely assembled.

5) Check the condition of any threading, both on the structural elements and nuts and bolts.

4.3 INSTRUCTIONS REGARDING ELECTRIC DEVICES

1) If the power cables are laid on the floor, e.g.: asphalt, concrete, stone floor, etc., they must be equipped with mechanical protection or heavy sheath of suitable width or raised off the ground by at least 4 m. Otherwise, if they are laid on the ground, they must be buried at a depth of at least 10 cm.

2) A general protection must be put in place downstream of the power supply delivery point. Such protection must consist of a residual current circuit breaker coordinated with the power cable and with that of the general switchboard.

3) The switchboard must be positioned so as not to be accessible to the public as specified in art. 752.3.4 of the C.E.I 64-8.7 standard and, on the front of the panel, must have a suitable plate indicating the name of the owner of the structure.

4) The switchboard must be made of insulating material and, to prevent tampering, equipped with lock and key.

5) At the end of each assembly and disassembly operation interrupting power to the switchboard is mandatory. Also disconnect the plugs of all the cables used, putting them away in a safe place, only accessible to authorized operators.

6) Every worn or damaged electrical part must be replaced with an identical or equivalent component. In case of doubt, contact Anceschi Alberto e Paolo s.n.c.

7) The ground connection system must comply stringently with applicable regulations and standards. It is important to only use the yellow/green wire and ensure the connections are safe by using specific terminals.

8) The lightning protection system must always be operative and must be checked daily, making sure that the central antennas of the tent are connected tight to the interconnection cables and to those that put the antennas into contact with the earthing rods in the ground.

4.4 PERIODICAL MAINTENANCE OF STRUCTURE

1) To maintain the high safety standards of the structure, routine daily, weekly, monthly checks must be performed together with extraordinary inspections, to be made in case of faults or particular atmospheric events.

2) The following must be checked daily:
   - The fastness of the stakes in the ground.
   - The integrity and correct tension of the tie rods.
   - The fastness of the structural poles in the ground.

3) The following must be checked weekly:
   - Structure and tent welds.
   - Any stagnating rainwater to prevent rust or damaging the spread fabric.

4) The following must be checked monthly:
   - Integrity of dome (if an integral part of structure).
   - Integrity of all tent fabrics and fastenings.
   - Integrity of tie rods.
   - Integrity of supporting structures, both main ones and secondary ones.

5.1 ASSEMBLING THE STRUCTURE

1) Assembly must be carried out by qualified operators to be selected by the user, or whoever on his behalf, by means of the careful analysis of the operators' technical-professional skills. During assembly, the user, or whoever on his behalf, must be present to check that all applicable safety norms are abided by and that the work done is in compliance with whatever indicated in this booklet. Please also remember that structure assembly cannot begin without being in possession of suitable authorization issued by the competent Bodies.

2) The assembly phase starts with a dimensional inspection of the assigned land area. Subsequently, it is important to make sure the ground on which the structure rests is flat (asphalt, concrete, beaten earth, field) without ups and downs, holes or obstacles, which must be kept at a safe distance. The structure must also be assembled at a minimum distance of 3 meters from overhead and underground power cables above and below the structure itself. The same holds true for any pipes (water, gas, etc.) underneath the area involved. A detailed plan of any such installations should be obtained from the providers of such utility services.

3) In the event of the nature of the ground (subject to landslides, slippery, friable, etc.) being likely to affect the stability of the structure, the user must notify the competent Authority of the risks which could affect the entire assembly operation.

4) If, after the inspections made, it is established that the characteristics of the assigned area correspond to the requirements at para. 2), the worksite area must be fenced off and then the positions of all the columns, poles and anchor points must be determined as described on the attached drawings. Afterwards, the above elements must be positioned as specified on the drawings attached to this booklet and then the anchors must be fastened in the ground. The next step is to position the stay and lifting cables. Afterwards, work can begin erecting the main pillars (antennas) and any framework as shown on the drawings. During this assembly phase, all the operators must remain at a safe distance (out of range of any possible falling pillars and stay cables).

5) Make sure the main pillars are perfectly perpendicular by suitably regulating the stay cables.

6) Position the pieces of the tent as shown on the attached drawings and then fasten them to the metal parts. After completing this operation, lift the tent to the height envisaged by the Project, extend it along the perimeter and insert the perimeter poles which must be kept in vertical position by means of the tension of the tie-rods. Now proceed to assemble the perimeter tarpaulins as shown on the drawings.

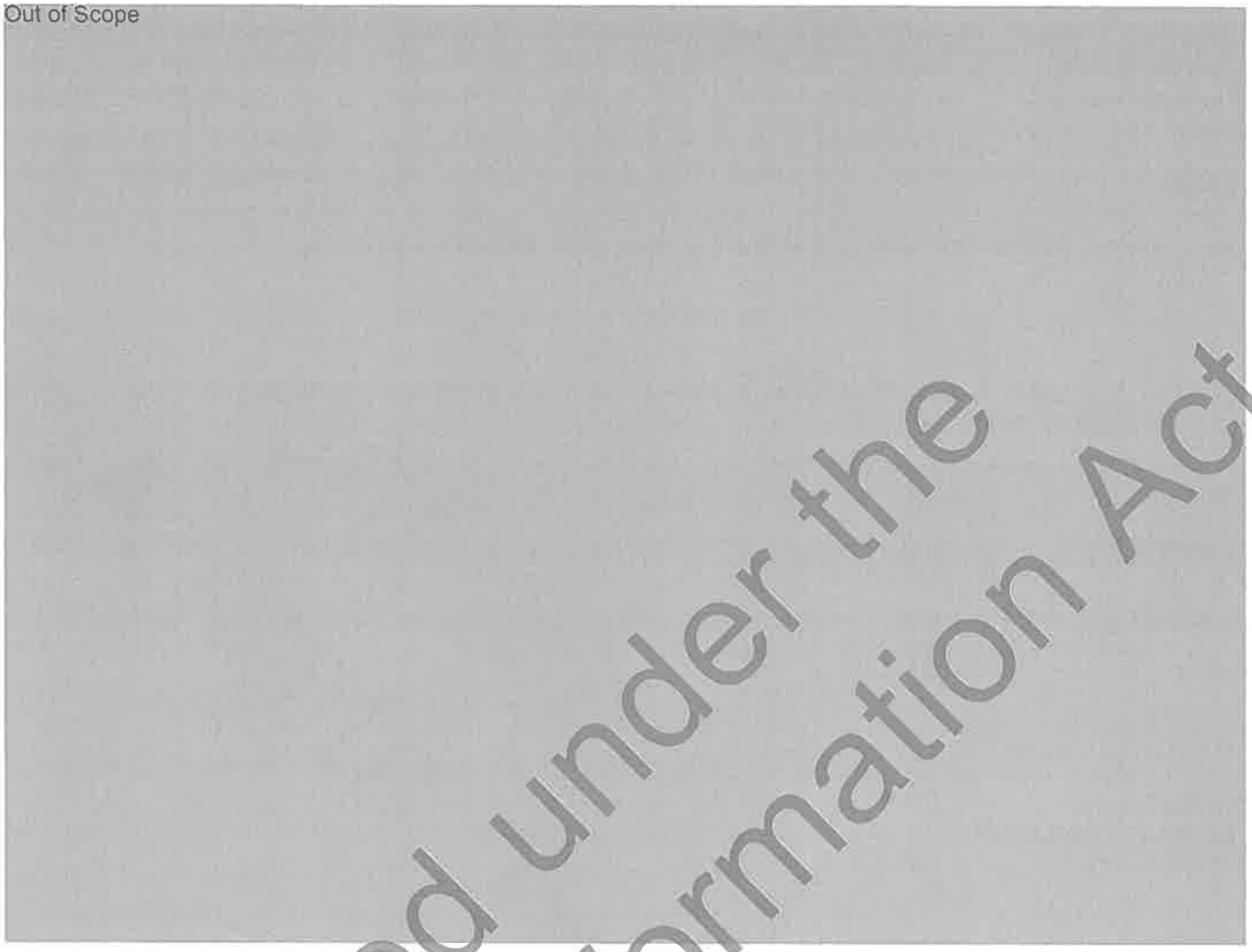
6.1 DISASSEMBLING THE STRUCTURE

To disassemble, repeat all the previously detailed operations in the reverse sequence: Remember to always make sure the structural elements are correctly loaded and secured on the means of transport, to guarantee safety during transport of the tent and metal structural parts.

Abide by all the safety precautions mentioned with regard to assembly

This operator's and maintenance Booklet consists of 11 pages including the cover page and 6 drawings.

Out of Scope



From: pjcircus [mailto:pjcircus@gmail.com]
Sent: Thursday, 18 February 2016 9:17 a.m.
To: Murray Usmar
Cc: jeni@zirkacircus.com
Subject: RE: Benjamin Hemi CFEE Certificate [UNCLASSIFIED]

CFEE Certification

CFEE

CERTIFIED FESTIVAL AND EVENT EXECUTIVE

Professional Certification is an important step in the career track of leaders in all industries. It enhances professional stature among ones peers; recognizes those who have gone beyond expectations to be the best that they can be; makes a statement to those with whom we do business; provides a leveraged position from which to negotiate and build career success; and sets higher standards for our industry. For all of these reasons, it is important that the IFEA offer a certification program.

The IFEA's Certified Festival and Event Executive (CFEE) program was founded in 1983 to provide an opportunity for industry professionals to achieve those goals. The program has evolved significantly over the years and currently has over 200 graduates.

From: Murray Usmar [mailto:Murray.Usmar@mbie.govt.nz]
Sent: Wednesday, 17 February 2016 4:26 PM
To: Paul Johnson
Subject: RE: Benjamin Hemi CFEE Certificate [UNCLASSIFIED]

Hi Paul

We require something a bit more substantial than just a copy of a certificate.

Please provide a letter (on Zirka Letterhead) detailing his role and background (experience in this type of work).

As I said in the phone call the documentation that we have refers to 'the appointed event/site manager' so we did something on file show this.

Regards

Murray Usmar
ASSESSOR NATIONAL MULTIPLE-USE APPROVALS

Determinations and Assurance Team.
Building System Performance Branch | Building, Resources and Markets Group.
Ministry of Business, Innovation & Employment

murray.usmar@mbie.govt.nz | Telephone +64 (4) 901 8365
15 Stout Street Wellington | PO Box 1473, Wellington 6140

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Wednesday, 17 February 2016 2:32 p.m.
To: Murray Usmar
Cc: Paul Johnson; Benjamin Hemi
Subject: Benjamin Hemi CFEE Certificate

Hi Murray,

Please find attached the CFEE certificate of Benjamin Hemi as you required.

Kind Regards
Jeni

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: s 9(2)(a)
http://www.zirkacircus.com

Please Note:

New Address:

P. O. Box 28093
Rototuna
Hamilton 3256

www.govt.nz - your guide to finding and using New Zealand government services

I F E A

International Festivals & Events Association

The IFEA Academy of Event Education Certifies that

Benjamin Hemi

Has Earned the Designation of

C F E E

CERTIFIED FESTIVAL AND EVENT EXECUTIVE

Attesting to successful completion of the required program of study, thereby reflecting a professional knowledge and philosophy of festival and special events management.

Steven Wood Schmader, CFEE, President & CEO, International Festivals & Events Association

Cindy Lenck, Chair, International Festivals & Events Association

July 20, 2015

Date

NZAEP

Professional Certification Program Sponsored by Kaliff Insurance.

International Festival and Events Association
Certified Festival and Events Executive Program

Curriculum Area: Operations/Risk Management

Area Purpose
The most basic element of the industry is operations/risk management for one simple reason – any festival or event is a large gathering of people. The top priority of any organizer is to ensure that gathering is conducted in the safest possible manner. This area of instruction is designed to look at the basic elements of event/festival operations and risk management from both the philosophical and practical approaches, providing a sound foundation of knowledge in the subject area.

Area Objectives
1. Examine the key elements of site plan development.
2. Review the process of soliciting, securing, and managing contracted services.
3. Provide a basic understanding of insurance and risk management procedures.
4. Examine the essential role that interpersonal/relationship building skills play in festival management.
5. Generate an understanding of the critical crowd control, security, and contingency planning issues.
6. Review the leadership role of operations personnel.

Key Instruction Elements (must be covered)

A. Creation of a site plan
Learning Outcomes
- Understand the relationship of site selection to organizational mission
- Understand the need to prioritize site plan elements based upon organizational goals
- Understand the relationship of site planning to security and access control
- Understand the integral relationship between site plan and site selection
- Understand key service and safety issues related to site planning

B. Development of a set-up and tear-down schedule
Learning Outcomes
- Understand the relationship between various operational elements
- Understand the process of creating schedules

C. Bidding and Contracting Services
Learning Outcomes
- Understand which services should be contracted out
- Understand the establishment of a bid list
- Understand the development of a basic format for bid solicitation
- Understand the process for the creation of bid specs

- Understand the process of bid selection
- Understand the basics of a contract and the development of a standard contract format

D. Management of Contracted Services

Learning Outcomes

- Understand the need to be familiar with basic fundamentals of any contracted services business (i.e. electrical contracting terminology, recyclable materials, etc.)
- Understand methods to hold contractors accountable for services to be rendered

E. Key Elements of Insurance

Learning Outcomes

- Understand the system of carrier ratings and carrier selection
- Understand basic insurance terminology
- Understand the various types of coverage and limits available
- Understand the basics of both issuing and receiving additional insured certificates
- Understand the process involved in a claim being made

F. Basics of Risk Management

Learning Outcomes

- Understand the necessity of specific risk management plans, procedures, and personnel
- Understand the process of creating a risk management conscious culture within an organization
- Understand the establishment of positive partnerships with professional/regulatory personnel and agencies

F. Relationship Building Skills

Learning Outcomes

- Understand the wide variety of people involved in any type of event production
- Understanding the need to relate to people at all levels of other organizations (i.e. the police Chief and the individual officer)
- Understand the need to be ethical, professional, fair, and consistent in all dealings
- Understand the relative importance of the event/festival to the people being dealt with (as opposed to the critical nature of issues to the production team)
- Understand specialized skills needed when dealing with event sponsors

H. Security and Crowd Control

Learning Outcomes

- Understand the basic elements of security and crowd control
- Understand the establishment of positive working relationships with regulatory agencies
- Understand the process of securing event perimeters and gating
- Understand standard prohibited items and bag searches
- Understand the creation and implementation of a credentialing system

I. Contingency Planning

Learning Outcomes

- Understand the roles of event organizations and regulatory agencies
- Understand fundamental contingency plan requirements: communication, designated leadership, specialized supplies and equipment.
- Understand basic security related issues (i.e. bomb threat) and potential contingency planning
- Understand basic safety related issues (i.e. fire, propane leak, etc.) and potential contingency planning
- Understand weather related contingency planning
- Understand the creation of a site evacuation plan

J. Traffic Management

Learning Outcomes

- Understand the need to focus on event access and public parking
- Understand key parking requirements and securing necessary capacity
- Understand basic mass transit options

K. Leadership

Learning Outcomes

- Understand the role of the operations director in event leadership
- Understand the distinction between administration/organization and leadership
- Understand the need to develop a conscious, natural, and effective leadership style

L. Volunteer Management

Learning Outcomes

- Understand the basic elements of recruiting and managing volunteers
- Understand volunteer motivation, benefits, and recognition
- Understand the development of quality volunteer committees

International Festival and Events Association
Certified Festival and Events Executive Program

Curriculum Area: Project Management

Area Purpose

Project management is the management of the project to deliver the event. It concerns integrating all the areas of management such as marketing, design and operations so they efficiently use the event resources and satisfy the objectives of the event stakeholders. It produces an accountable system used to report to the event stakeholders, delegate tasks to the event team and establish a control timeline.

In particular it employs the tools of project management to manage the phases of the event from the concept through the planning and preparation to the event close down.

Area Objectives

1. Apply the management science of project management to event delivery
2. Understand and use the tools of scheduling, tasking analysis, milestones, delegation, stakeholder analysis, cost estimating and quality control
3. Undertake an event project feasibility study
4. Apply the theory of risk management to all the management areas of events
5. Develop an accountable management system to deliver the events including the project plan, risk management plan and event management evaluation system
6. Understand the requirements for event management software

Key Instruction Elements and competency outcomes

1. Project Management and Events; Background

Learning Outcomes:

1.1. What makes a project
1.2. History and use of project management to deliver events
1.3. The phases in event management

2. Stakeholder Management

Learning Outcomes:

2.1. Create the templates for stakeholder management
2.2. Identify the stakeholders
2.3. Understand their requirements and objectives

2.4. Manage and communicate with stakeholders
2.5. Evaluate the stakeholder/event relationship

3. Event Feasibility

Learning Outcomes:

3.1. Test the feasibility of the event and the planning
3.2. Understand the return on investment, core objectives and intangible measures
3.3. Scope the work and integrate all the event plans under the project plan

4. Project Tools

Learning Outcomes:

4.1. Create a Work Breakdown Structure
4.2. Undertake task and activity analysis and the critical path
4.3. Set milestones and create the scheduling
4.4. Establish and describe the deliverables

5. Event Team

Learning Outcomes:

5.1. Establish project organization structure
5.2. Create a delegation system based on deliverables
5.3. Establish progress reporting for the event staff
5.4. Develop an event checklist system

6. Risk Management

Learning Outcomes:

6.1. Understand the international risk management standard application to event planning and delivery
6.2. Be able to identify risks – financial, operational, strategic, human error and the 'near miss'
6.3. Create a risk register for the event project
6.4. Embed the risk management process in all areas of event management and the event team

7. Contract Management

Learning Outcomes:

7.1. Establish a resource template
7.2. Undertake a resource analysis and procurement plan
7.3. Integrate the procurement plan with the overall event management schedule
7.4. Understand event supplier contract terminology

8. Events Portfolio

Learning Outcomes:

8.1. Understand the events portfolio - the program of events over the year
8.2. Manage the various event projects and their resources

9. Event Documentation and Reporting

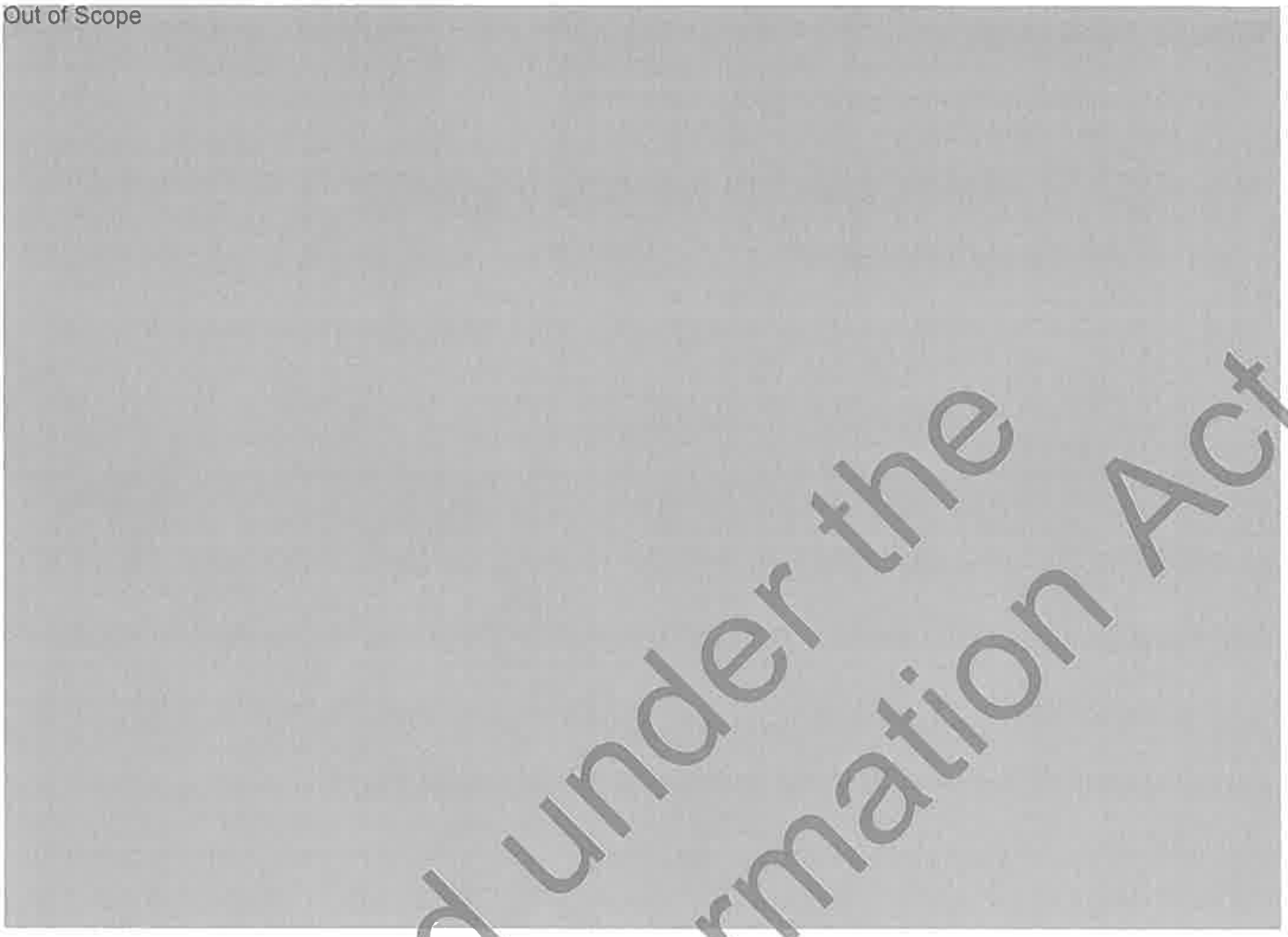
Learning Outcomes:

9.1. Able to create template document management system for the project

9.2. Understand the use of status reports

Project management is the universal tool used to deliver events. From the Olympics to the Gran Prix to festivals such the Sydney Vivid Festival and corporate product launches, the terminology and techniques of project management are employed. It enables event teams to both deliver their event, use an accountable system and communicate with the modern international events industry.

Out of Scope



From: pjcircus [mailto:pjcircus@gmail.com]
Sent: Friday, 19 February 2016 12:38 p.m.
To: Murray Usmar
Cc: jeni@zirkacircus.com
Subject: FW: Benji Hemi background / confirmation of appointment

Hi Murray letter of confirmation re Beni Hemi appointment as requested.

Are you able to confirm the approval will be issued today as discussed, otherwise I will need to employ Engineers for next week if is not in place.
Regards

Pji

From: Jeni Hou [mailto:jeni@zirkacircus.com]
Sent: Friday, 19 February 2016 11:25 AM
To: pjcircus
Subject: Fwd: Benji Hemi background / confirmation of appointment

Sent from my iPhone

Begin forwarded message:

From: Jeni Hou <jeni@zirkacircus.com>
Date: 18 February 2016 11:27:51 am NZDT
To: pjcircus <pjcircus@gmail.com>
Subject: Re: Benji Hemi background / confirmation of appointment

Hi Gm, letter attached, thanks md

Jeni Hou
Managing Director
Flaming Phoenix Entertainment Ltd (Zirka Circus)
Ph: s 9(2)(a)
http://www.zirkacircus.com

Please Note:
New Address:

P. O. Box 28093
Rototuna
Hamilton 3256

On Thu, Feb 18, 2016 at 10:44 AM, pjcircus <pjcircus@gmail.com> wrote:

HI Md

Could you please type out a confirmation of appointment for Benji for the council on Flaming Phoenix header

Benji Hemi – Appointment as Tour Manager

Tour Manager – Responsibility for the day to day operation of the Circus trading as Zirka Circus, including all aspects of the operation from arrival on site, to pull down and exit, Staff Management, Operating procedures in line with specifications of equipment, Work safe environment to all Health and safety standards.

Date appointed – 1 January 2016

Previous History of employment: Events Manager Waipa District Council 2008 -2016, coordinating multi events annually.

Appointed by :

Jeni Hou – Managing Director, Flaming Phoenix Entertainment Ltd, trading as Zirka Circus NZ

Flaming Phoenix Entertainment
Hebei Acrobatic Troupe and Magic Group

18 February 2016

To Whom It May Concern:

Re: Benjamin Hemi – Appointment as Tour Manager

This is to confirm that Flaming Phoenix Entertainment Ltd (T/A Zirka Circus) has appointed Benjamin Hemi as Tour Manager. His responsibility for the day to day operation of Zirka Circus, including all aspects of the operation from arrival on site, to pull down and exit, Staff Management, Operating procedures in line with specifications of equipment, Work safe environment to all Health and safety standards.

Date appointed – 1 January 2016

Previous History of employment: Events Manager Waipa District Council 2008 - 2016, coordinating multi events annually.

Appointed by :

Jeni Hou – Managing Director, Flaming Phoenix Entertainment Ltd, trading as Zirka Circus NZ

Kind regards

Jeni Hou
Managing Director

email: jeni@flamingphoenix.co.nz phone: +64 27 3205881 fax: +64 7 8562236
post: P.O.Box 28093, Hamilton 3256, New Zealand
www.flamingphoenix.co.nz