MARQUEE INSTALLATION HANDBOOK

Basic Structure
Operation & Safe Use

Revision
2023

Table of Contents

For instructions relating to our wider range of products please ask your sales representative for any the following manuals:

Cone Structures	Pagoda, Cone & Tri-cone
Cruciform Structures	6m-6m, 9-9m & 9-12m Cruciform
Curved Structures	3m & 4m Curved beam structures
Gable End Extensions	Bell and Hip frameworks
Linings	Starlight, Dividing curtains, Insulated, Balloon linings and Stretch linings
Porches & Extensions	Solent Canopy and Porch structures
Hard walls & Doors	Solid walling & Door
Flooring	Standard and Sub-frame Flooring
Radial Structures	Radial Ends and 90deg turns
Hayling Structure	Hayling frame
Pole & Drape	Pole & Drape linings

Introduction

The purpose of this document is to provide a source of information for the operators of Coverspan marquees and their associated products, explaining their safe and effective methods of use.

The Coverspan marquee system comprises of an aluminium frame with steel knuckles, covered by PVC Covers and internal decorative linings. The frames range from 3m to 15m span and use a 3m bay to give an unlimited length.

The design of the marquee makes the longitudinal items interchangeable throughout the range and the main structural beams are formed from a 4-channel aluminium extrusion. This gives the advantage of an internal kader channel to partition marquees, hang equipment and removes the need for special gable walls.

The maximum use of interchangeable parts has made this modular system extremely popular in the hire trade.

The Custom Covers website compliments this manual. The website contains product descriptions, technical reference information and YouTube videos showing the installation of a standard frame and flooring. Please refer to www.customcovers.co.uk

Simon Bell
Production and Technical Director

General Product Statement

Custom Covers' Marquee Structures have been supplied since 1984 and have a proven history in the UK

All the structures are fabricated from a combination of aluminium extrusions and galvanised steel fabrications. These will give a good service life if cared for and maintained

This manual covers the safe use and operation of the structures and provides general advice on maintenance.

Custom Covers have an ISO 9001 Quality management system certified by LRQA. This standard is applied from design until delivery and is complimented by other technical standards as applicable to the structures.

Part One

Components (See drawings of components at Appendix B)

This is a list of the components needed to put up a 3/6/9/12 or 15 metre Custom Covers marquee. A full bill of materials can be supplied if requested.

- 12m Leg Insert
- Aluminium Base plate (for 3/6/9m)
- Corner plate
- Cross-bracing (also known as Scissors)
- Curtain Rail
- Eave Knuckle
- Eave Rail - Bar Tension or Symmetrical
- Foot Bolt
- Gable End Legs Assembly
- Ground Rail
- Keystone insert
- Leg
- Purlin
- R Clip
- Ridge Knuckle
- Roof Beam
- Roof Wire
- Steel Base plate (for 12/15m)
- Ground anchor stake
- Assorted nuts and bolts

Safety Considerations

The importance of personal safety on site cannot be over emphasized. All marquee installers should be aware of the hazards involved with:

- Manual Handling
- Site Vehicles
- Working at Height
- Underground Services
- Use of PPE
    - Hard Hats
    - Toe-capped shoes
    - High Visibility Wear
    - Gloves

And should ensure appropriate precautions are taken by adhering to risk assessments and method statements. The industry trade body (MUTA) has various training schemes aimed at the hire industry.

Site Survey

Before installation can begin it is important that a competent person completes a site survey. This is the first step in any safe marquee function or event.

The main aims of the site survey are to:

- Gather all information relevant to the proposed function/event.
- Be certain that the correct equipment is used and is suitable for the location/function
- Organise this information to give an effective means of clear communication for all involved.
- Serve as a permanent record of the entire function/event.
- Identify any hazards that may exist for the installation crew and/or the users

Site Safety

On site, care is needed. Consideration should be given to:

- Obstructions: check that there is nothing over head (e.g. power cables) or underground (e.g. gas mains)
- Location
- Expected weather throughout the build, the event & dismantle stages.
- Wind Exposure and likely effect of any change in wind direction
- Access
- Emergency exit requirements.
- Anchoring Stability

All marquee installers must be aware of and adhere to applicable building codes, fire regulations, event industry guidance documents and personal safety outlines as given above.

Finally, a complete checklist could assist in completing a safe installation and should be developed by the individual company.

An example is shown overleaf.

SITE SURVEY RECORD

Customer …… VO/EST No. ……..

Date required on site ……..……..

CUSTOM COVERS (1984) LTD
Quayside Road
Bitterne Manor
Southampton
SO18 1AD

Phone: 023 8033 5744
Fax: 023 8022 5581
Email: sales@custom covers.co.uk

Function

……
……
……

Surface

- ❑ Grass
- ❑ Asphalt
- ❑ Gravel
- ❑ Concrete
- ❑ Wood

Level Yes/No
Clear Yes/No

Brief description
……
……
……

Job Profile

- ❑ Straight-forward job
- ❑ Technically difficult
- ❑ Easy site access
- ❑ Difficult site access
- ❑ Trees in way
- ❑ Attached to house/building
- ❑ Difficult anchorage
- ❑ Multiple levels
- ❑ Over pool
- ❑ Other

Describe
……
……

Person responsible for marking out ……
Contact person at site ……..
General description of site;
……
……
……

Underground

- ❑ Electrical Cabling
- ❑ Gas pipes
- ❑ Telephone cables
- ❑ Septic tank
- ❑ Sprinklers
- ❑ Water main
- ❑ Pool liners
- ❑ None of the above

Any other problems
……
……

Overhead

- ❑ Electrical
- ❑ Telephone
- ❑ Trees/branches
- ❑ Other
- ❑ None of the above

Any other overhead problems
……
……
……..

Special equipment considerations;
……
……
……

Form completed by ……..……..……..

sitesurvey.pub 12/02

Part Two (Assembly)

Recommended Tools Required

- Sledge Hammer
- 17 & 19mm Spanner
- Fiddle for tightening rigging screws
- 30m Measuring Tape
- 3 Throw-over Ropes (with carbine hooks) sized to marquee
- Stake Puller
- 6 step step ladder
- Mega ladder
- Purlin Prop

An animation of the installation method is available on our website and YouTube by following the link - https://youtu.be/75olifvwnzA

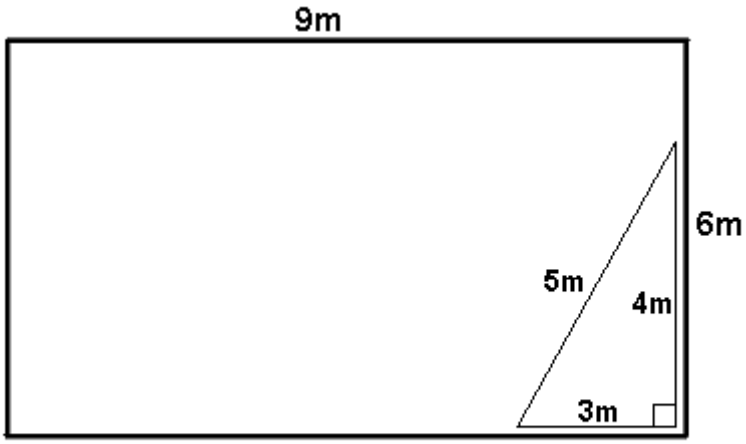
Layout, Anchoring and Staking

The installer needs to ensure that the holding for the structure is sufficient to resist the design wind loads. The IFAI guidance and our detailed recommendations are attached as an appendix to this manual.

After establishing the desired location of the marquee, locate the first corner. Temporarily secure the first corner base plate and run a measuring tape or string down the length of one side. Using a spacing bar or a tape measure, place the remaining base plates along one side and temporarily secure them by half-staking. (The single stake hole in the base plates should face inwards for 12m marquees)

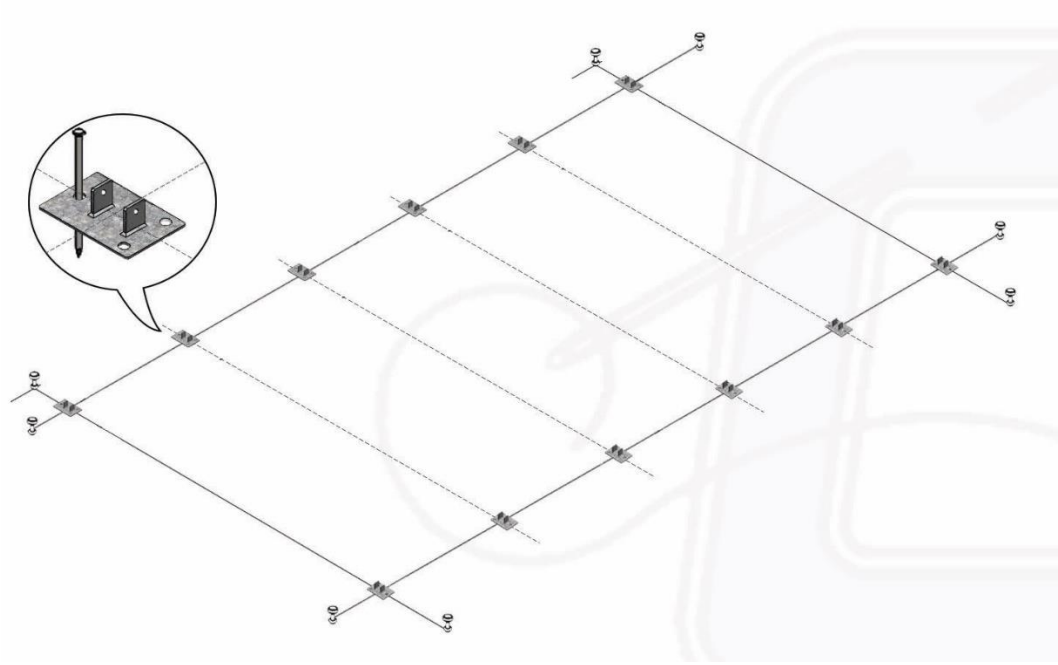
Next, determine the positions of the other corners by careful measurement. There are two recommended methods for ensuring the plates are square:

- Use measurements from layout plan, (see Appendix C) or:
- Use the 3-4-5 Method:



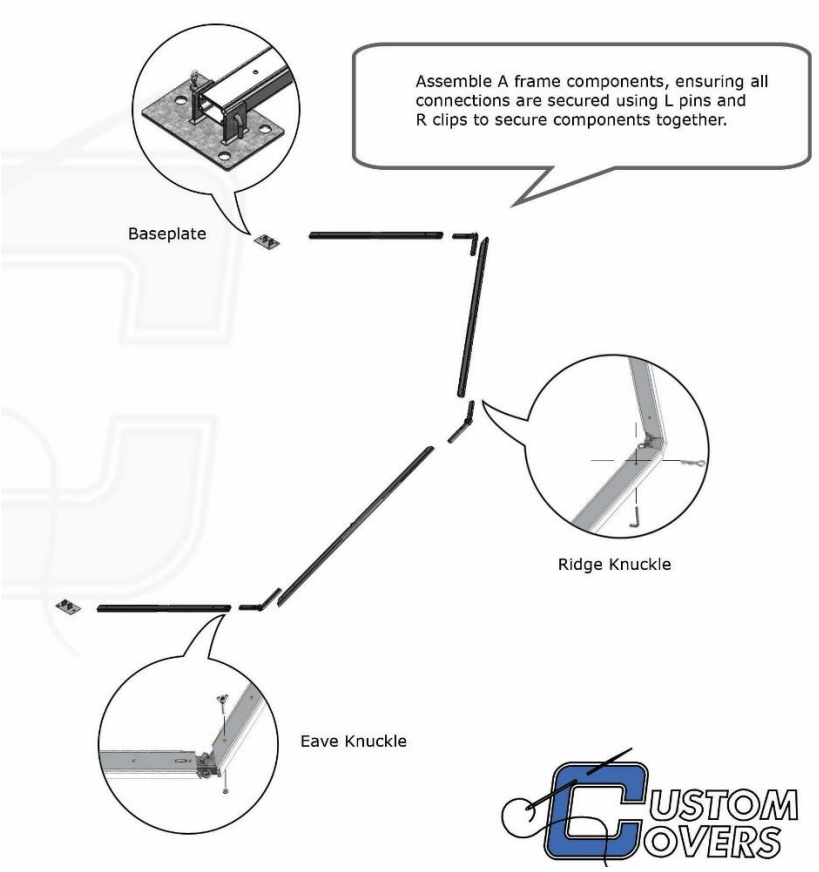
The 3-4-5 Method can easily be adjusted for large marquees, 3-4-5 becoming 6-8-10 and so on. It would be advisable, once the entire marquee is marked out, to check that the other corners are square. Once the remaining plates are arranged, secure them by half-staking.

Frame Assembly

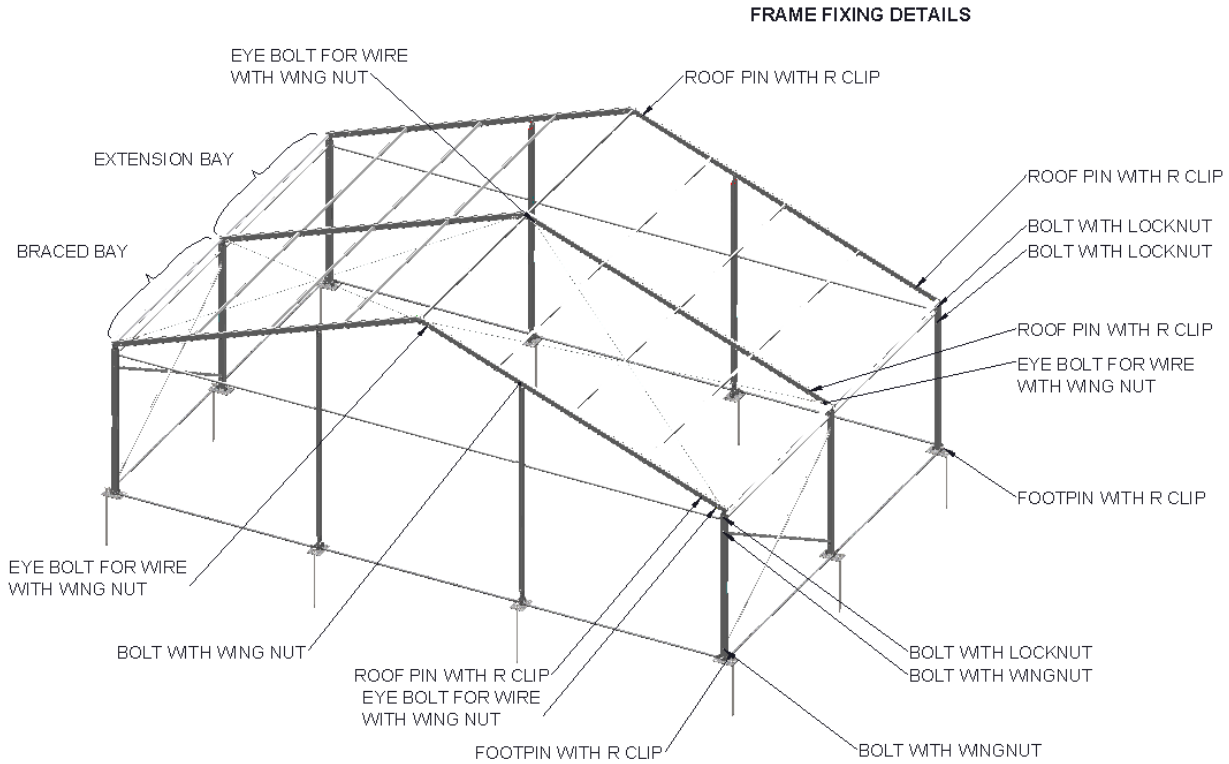


- Lay out all the components as shown, and assemble each A-Frame starting at the base plate one side and working across to the other. The pin that goes through the leg and base plate should be facing outside the marquee and secured with an R-clip. The eave knuckle should then be attached to the leg using a wing nut and bolt through the top hole, making sure that the end of the eave knuckle with the cut-out for the curtain rail is inserted into the leg. It is possible to keep these as a pre-assembled unit.

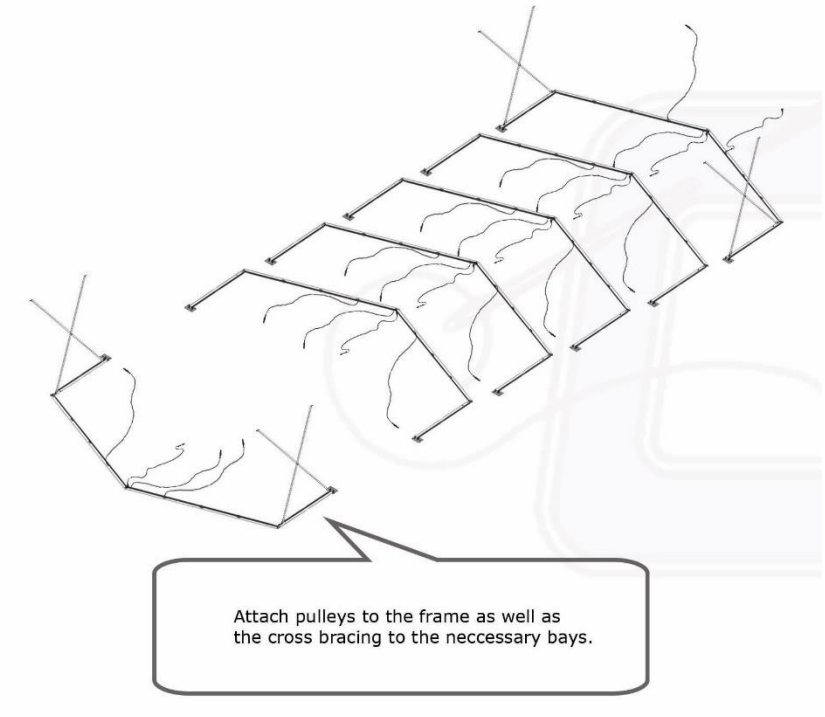
- The end of the roof beam with 2 holes in it is then attached to the eave knuckle, and secured using a drop nose pin through the second hole up the beam.



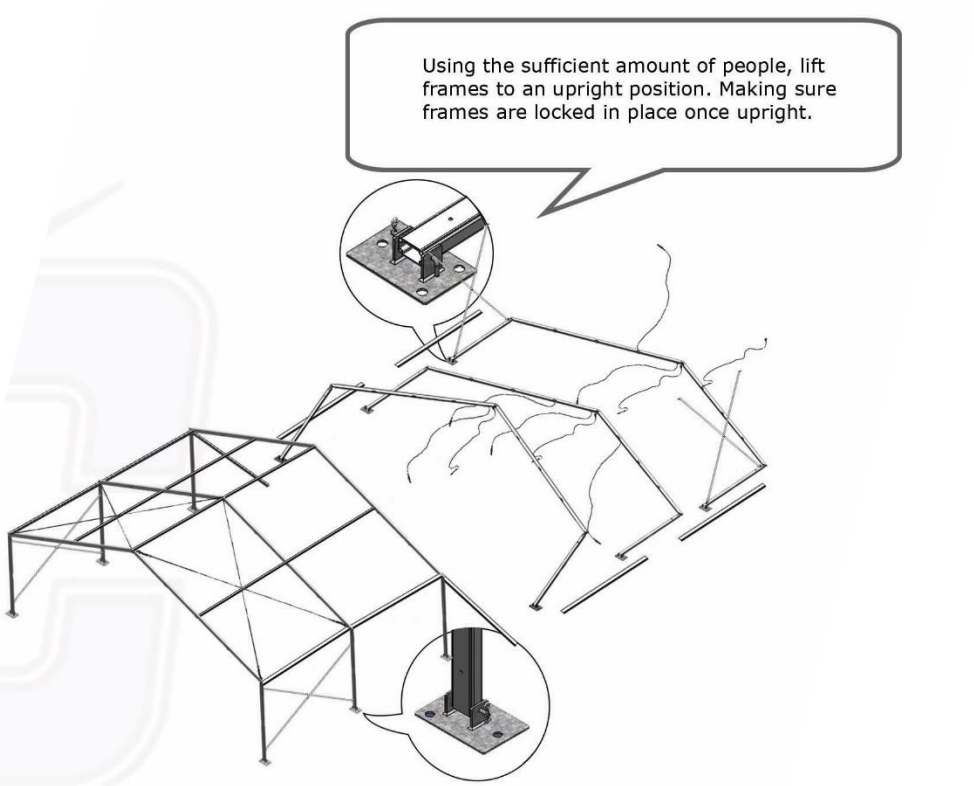
- The ridge knuckle is then fitted to the first roof beam and in turn, the second roof beam is fitted to that. The ridge knuckles on the first 2 A-frames will be secured using the roof wires. Uncoil the roof wires completely and pass the eyebolt on the end of the wire **without** the bottle screw through the holes in the ridge. Make sure that on these first two bays, the wires will be facing each other when the A-frames are upright.
  Note: If installing linings later, it is worth attaching the pulleys to the ridge knuckles before hoisting the frame.



- Complete the A-frame by attaching the eave knuckle, leg, and base plates, using the same holes and bolts as the other side. Assemble the remaining A-frames the same way as the first two, but using drop nose pins at the ridge instead of the roof wires.
  Note: To extend the 12m frame to 15m, keystone segments can be inserted and bolted to the upper sections of the roof beams. These are then fitted to the ridge knuckles as standard.



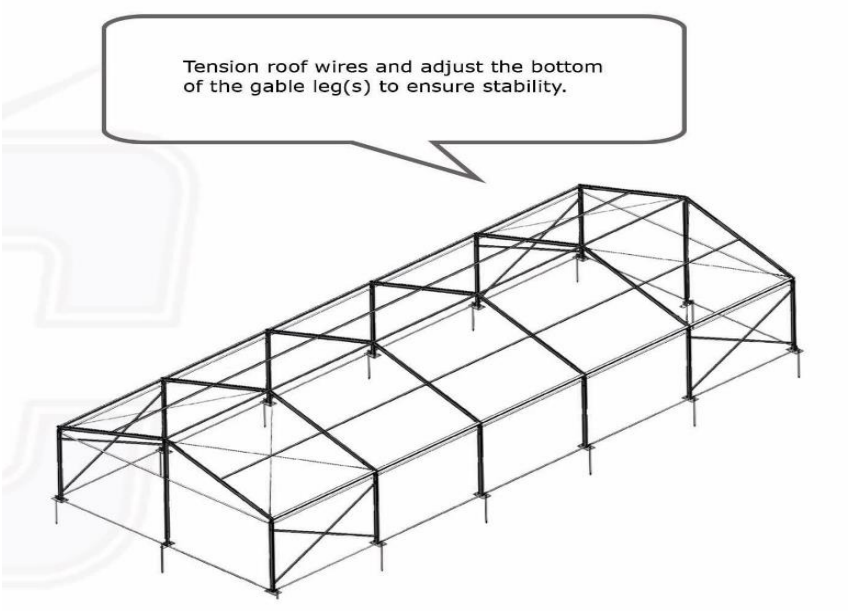
- Once all the bays are assembled, lay the cross bracing out by the side of the first two bays with the roof wires attached. Lift the first bay with sufficient people and attach the scissors with bolts through the remaining two holes in the leg. Rest the frame on the ends of the cross braces. Then lift the second A-frame and bolt the legs into the cross braces.



- Take an eave rail, and insert the curved hook into the bracket on the side of the eave knuckle, lift the rail and drop the straight hook into the opposite eave knuckle bracket (make sure if using bar tension eave rails, the channel is facing inwards). Repeat this process with the purlins using the purlin prop and fitting them into the brackets on the sides of the roof beams.
  Note: It is efficient to ensure that all the curved purlin hooks are fitted to the same A frame.

- Attach a base plate to the bottom of the gable leg(s) and bolt the top end through the holes in the roof beams. Adjust the bottom of the gable leg(s) to ensure stability. For a gable fitted in the centre of a bay, adjust the bottom of the leg and pass it through the bracket on the ridge knuckle, and secure with an R-clip.

- To assemble the remaining bays take two eave rails and insert the curved end into the eave knuckles on the bay that is standing, resting the straight hook on the floor. Rotate up the next A-frame and drop the eave rail into the other eave knuckle bracket. Insert the purlins as before. Assemble the remaining bays in the same way.

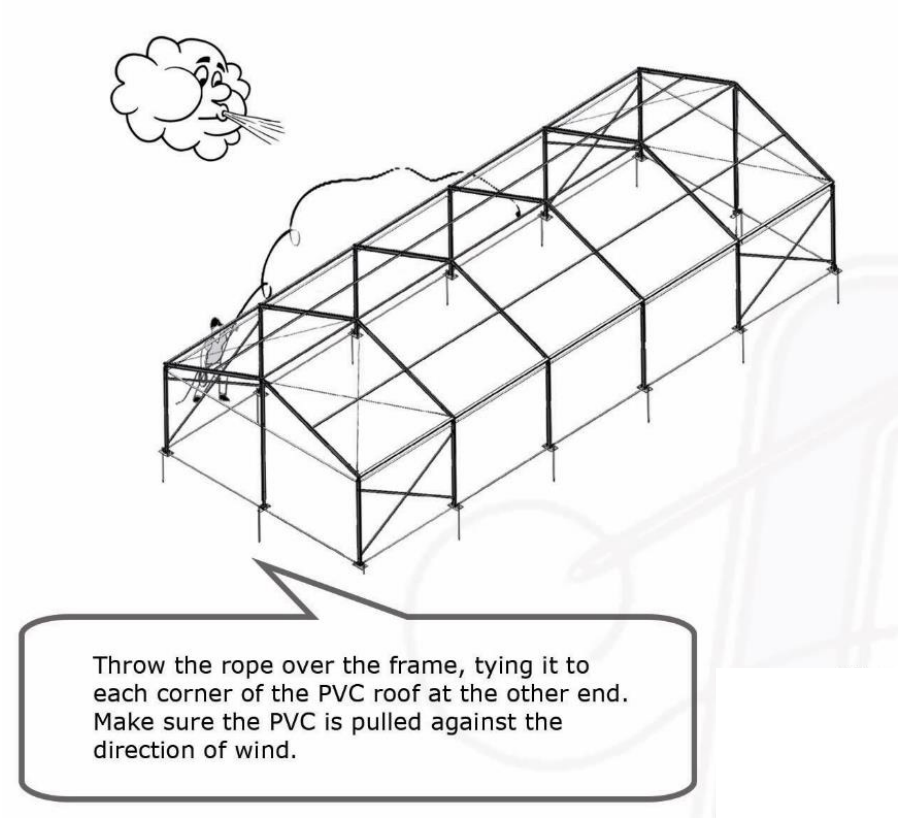


- If the PVC Roof is *NOT* Bar Tensioned (i.e. Standard), it is recommended to fit the roof wires after the PVC Roofs have been fitted. This is to prevent the bungee hooks on the roof valance catching and tangling with the roof wires. Take the roof wires and loosen the bottle screws off all the way. Take the wire and attach it to the opposite roof beam on the same side of the marquee, to the hole nearest to the end of the beam. Make sure all wires are installed, then tighten the bottle screws. If the wires do not fit in, check that the marquee is square and not dipping due to uneven ground uneven ground.

- If the PVC Roof is Bar Tensioned, the roofs wires may be attached prior to PVC Roof fitting.

PVC

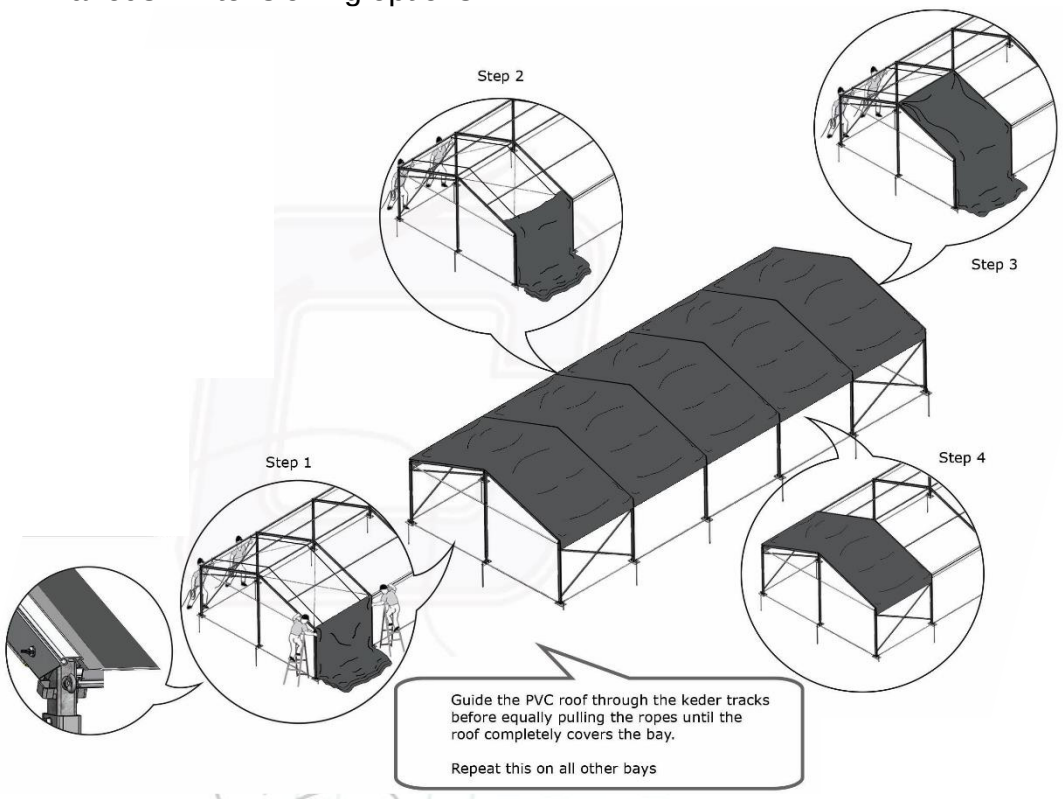
- PVC roofs: Once the frame is assembled, throw one rope with carbine hook over the frame (up wind). Use this rope to pull back two other ropes. (The single rope is then attached to the roof and is pulled over with the roof allowing the pull over roes to be pulled back for the second roof). One person should then attach the hooks to the D-rings on the edge of the roofs, making sure the hook opening is facing upwards, and the bungee flange is on the inside of the roof. Feed the kader into the channel on either side of the roof and pull evenly and together until the roof is all the way over and there is an equal amount of valance hanging down on either side. Repeat this process for all roofs. It is most efficient to pull into the wind as this lifts the roofs away from the purlins



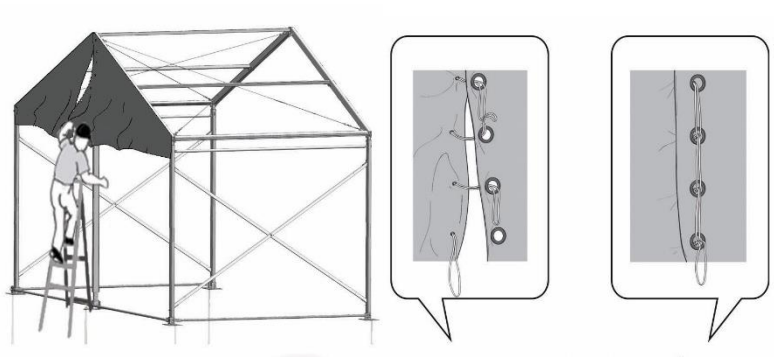
- For Bungee tension tents, tensioning the roofs is a two person task. Remember to tension the roof wires before tensioning the roof sheets. Take one end of the bungee cord, pass it over the eave rail, around the leg and hook it back onto itself. Mirror this on the other side of the structure. Then attach the bungee at the other two opposite legs. For an even tension install the bungee on either side of the roof at the same time with two people, working from outwards from the centre of the eave rail to the eave knuckle.

- For Bar tension tents the tension is achieved by passing a tension bar through the pocket at the end of the roof. Once the roof is pulled over install the bar tension bar and fix to the tensioning system. This may be by means of a webbing strap and ratchet or by a metal push down unit.

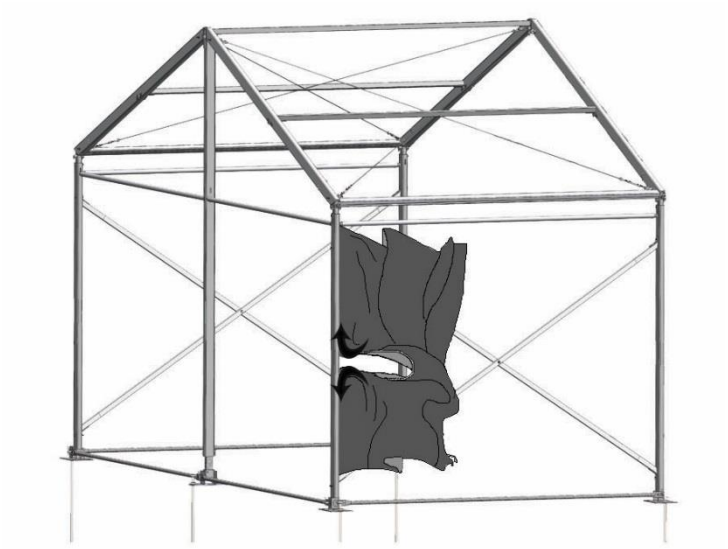
Set one side of the roof to the approximate valance overlap desired and then tension the roof from the other side. See Appendix B for the various BT tensioning options



- The Gable Triangles slides into the top channel of the roof beams, making sure the lacing is facing inwards. Then lace up the two sides of the gable and attach to the gable legs with straps. Hook & loop flaps can then cover the edges of the roofs and gables.
  Note: A curtain pole can be used to push the gable up the track via the D-ring fitted to the gable.



- The walls are fitted by sliding the bottom half of the kedered side into the outside leg channel using the cut out in the centre of the leg this is followed by the top half of the wall. The walls should have rings at the top, and a pocket on the outside at the bottom. Repeat this for the other half of the wall.



- Take the curtain rail and slide it through the rings at the top of one half of the wall and hook it into the slot in the leg profile, take the other end of the curtain rail and slide the rings of the other half of the wall and using the adjustable hook locate the curtain rail in the leg.

- Lace the walls up, and then slide the ground rail into the pocket at the bottom of the wall, securing it at either end using the base plate pins and R-clips. On the gable ends, corner plates should be fitted to the foot pin at each corner to locate the ground rail on the gable side.

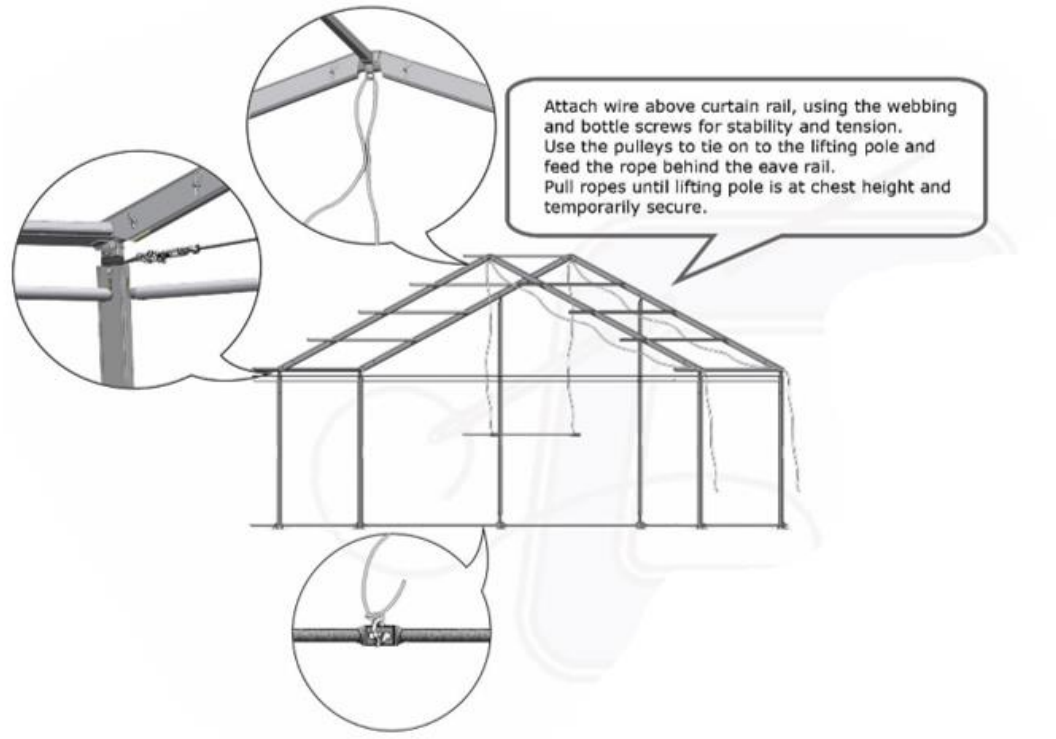
- When bar tension walls are to be fitted no curtain rail is used. In this instance the top of the wall is designed to slide into the eave rail of the structure. The installation method is as above with the exception of the curtain rail.

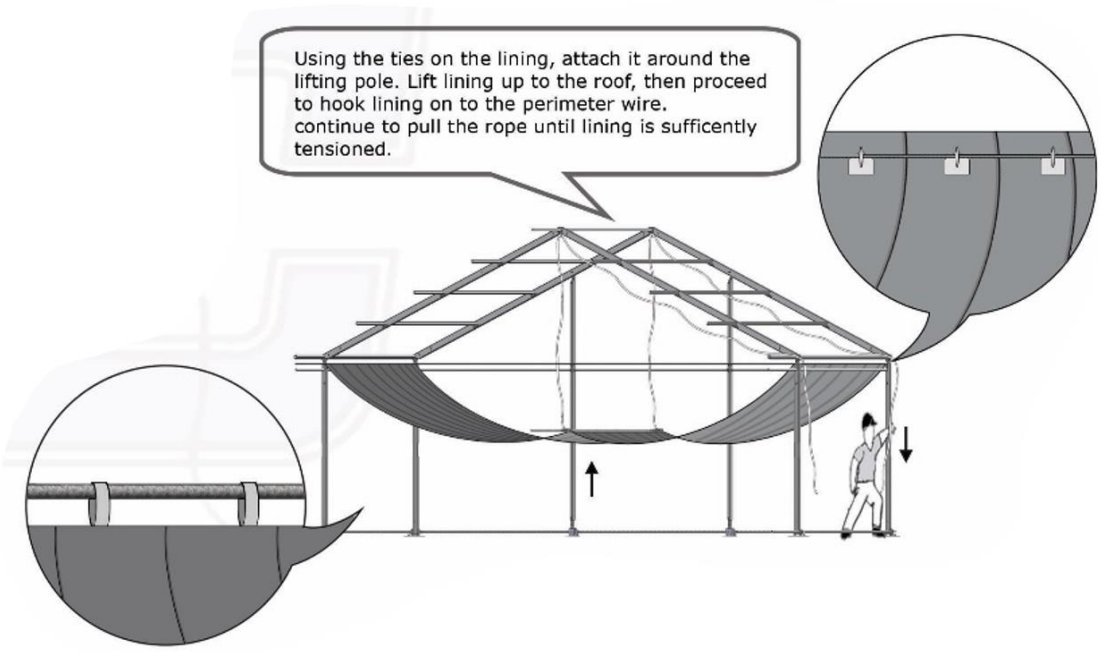
- Once the walls have been fitted and you are happy with the position of the marquee, drive the stakes fully in to the ground

Note: For installation instructions for other supporting structures, see Appendices.

Linings

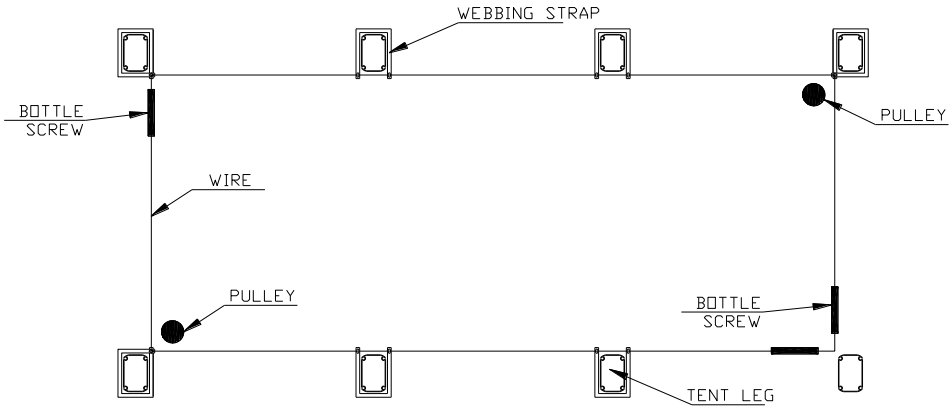
- Tie the pulleys supplied to ridge knuckles with the long ropes put through each pulley to hang down each side. Repeat this on every bay. If fitting hip ends, do not put pulleys on each end of the marquee, if fitting gables put pulleys right up to each end.



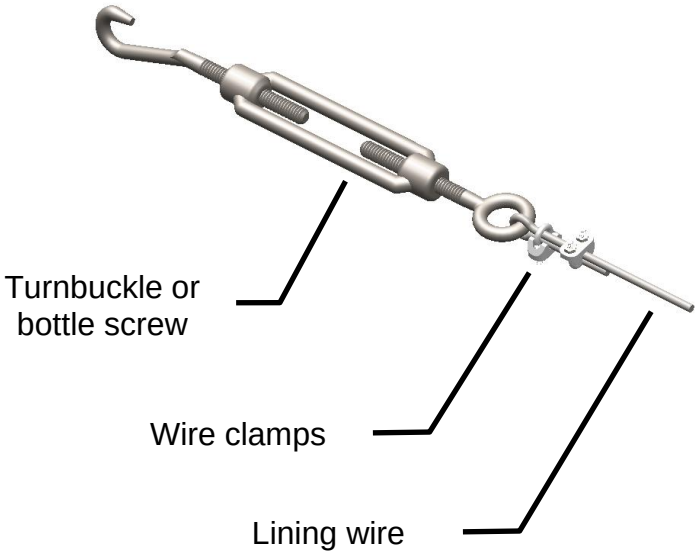


- Clamp the lifting poles together using the shackles supplied. Tie one end of the rope to the lifting pole. The other end must be fed behind the wire between the eave and the wire (see next step).

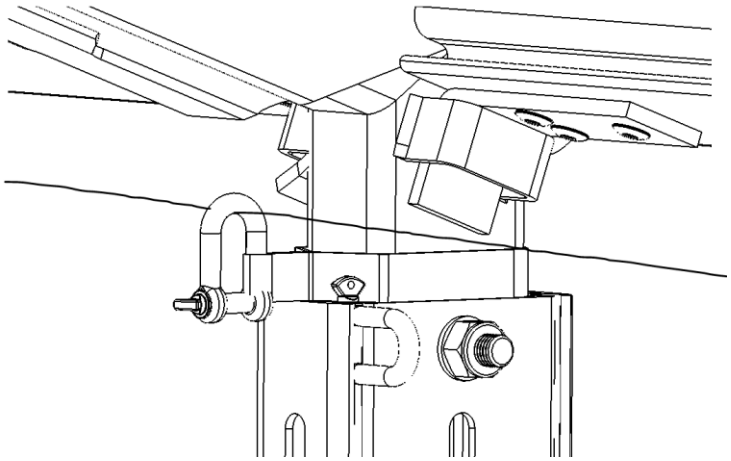
- **To fit wires**. Measure lining wall height. Wrap a webbing strop around each corner leg at lining wall height and attach small pulleys at opposite corners of the marquee. Feed a wire through the pulleys and once fitted, attach a bottlescrew and 2 clamps on each end.



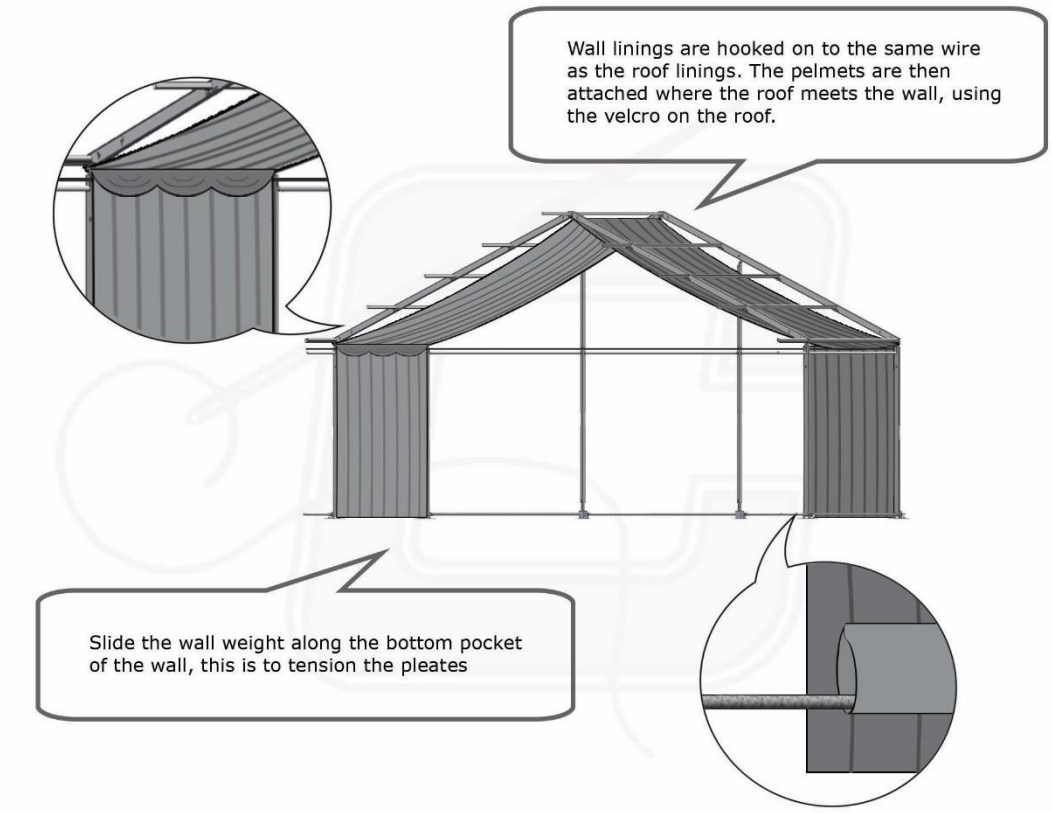
Make sure bottlescrew is fully opened and hook on to wires at opposite corners. Pull wire tight through bottlescrew then tighten clamps. Close bottlescrew as tight as possible to tension the wire.



There are three ways to stop the wire from pulling out when you attach the roof lining. (i) Attach a shackle in the kader track and clamp around wire. (ii) Use webbing strops with a shackle. (iii) Attach a lining clamp into the kader track.



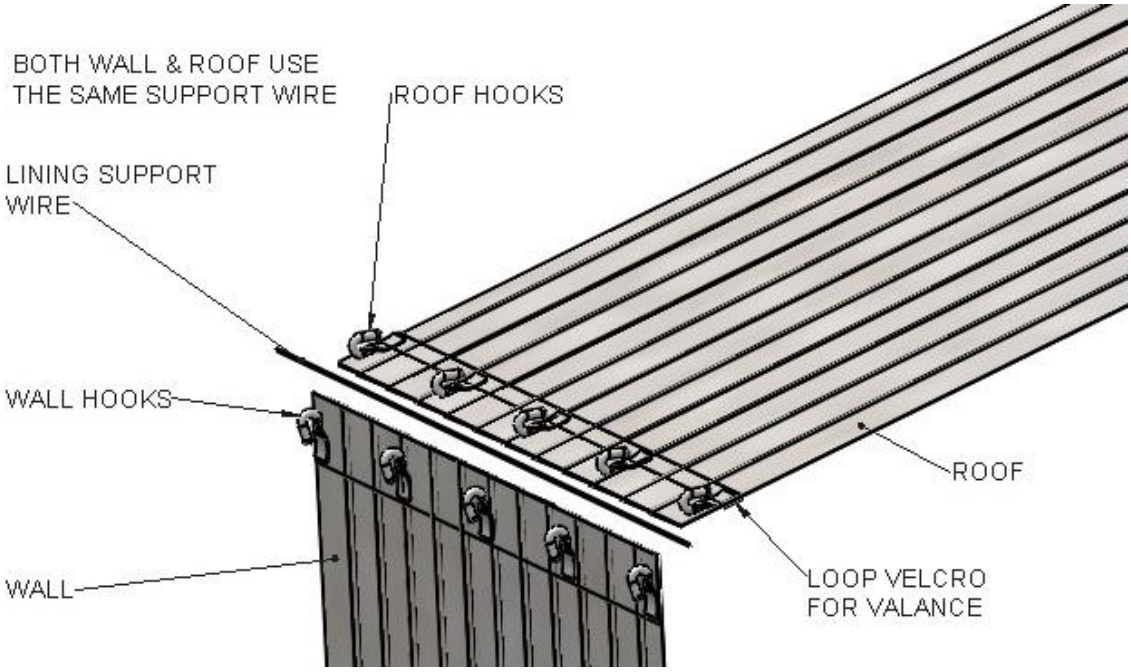
- Pull up the lifting poles to shoulder height, and then attach the roof extensions by tying the webbing straps in a bow like a shoelace. Repeat on every bay. Attach each roof to its neighbour and pull down the length of the ridge to get a taut straight line. Attach the gable to the roofs at each end ensuring that the webbing is secured to the lifting bar. To attach a hip end there is a webbing strap with an eyelet through. Tie this around the end of the lifting pole.



- Lift poles to above eave height, then hook the linings up on the wire all the way round. Tie the corners with the webbing straps supplied, and then fasten all the hook & loop fastenings together. Pull the poles up as high as you can to tension the roof. (Some people prefer to fit the hook & loop fastenings once the roofs are lifted into the ridge, safe access at height is required for this)

- To hang the walls or above door walls, hook on to the main wire. Window drapes attach to the hook & loop fastenings sewn on the edge of the roof linings. Swagged or pleated pelmets hook & loop fasten on to the roof linings also.

- On the walls there is a pocket at the bottom for the wall weight to slide in to weight down the walls.



STARLIGHT LININGS

NB: When fitting starlight linings ensure all master looms are on the same side of the marquee.

Checks

Post-Assembly

Before leaving site, marquees should be subjected to thorough inspection taking into account where applicable the following:

- Anchorage's should be suitable for purpose and hold fast
- Bracing wires or rails should be in place and properly fastened and tensioned
- All ropes including wire ropes should be sound
- The fabric should be properly tensioned and not prone to ponding
- Exposed ropes and stakes adjacent to the entrances and exits should be marked and roped off
- All locking pins and bolts should be in place and secure
- Eave connection joints should be securely locked home
- The fabric should not have unrepaired tears
- Flooring should be evenly laid, securely fixed with no tripping points
- Walls should be securely fastened
- Clear responsibility should be documented showing who is responsible for the structure during the event.

Regular Checks during Extended Usage

Checks should be made both daily and weekly for marquees during extended usage. These should include:

- Daily:
  - No fabric damage
  - Stakes are in and secure
  - Walls are laced
- Weekly (as above, plus):
  - Bracing wires are tight
  - Wing nuts are tight
  - Flooring is sound
  - Leg pins are secure with all R-Clips in place
  - Fabric is laced and fabric is taut

Part Three (Dismantling)

The basic process is the reverse of the assembly.

Linings

- When removing linings, care should be taken that they are dropped onto a clean surface or bag. They should then be packed securely. If dirty, it is recommended that they be cleaned before storage, to prevent growth of mildew.

PVC

- PVC should be folded away and packed dry. Do NOT pack when damp as this promotes mould growth.

Frame

- Care should be taken when dismantling the frame as when assembling. Purlins and Eaves should be brought down carefully and A-frames should be walked down and not dropped. Be aware that roof wires need to be detached before lowering the end sections. NOTE: Work towards the starter bay and leave the bracing scissors assembled until their bay is the last standing.

Part Four

Safety and Maintenance

- Where the possibility of strong winds exists, extra anchorage should be added as necessary to ensure the structure is firmly secured. (See Appendix D: Structural Specifications)
- Consideration also needs to be taken for the anchoring stability of the site. The softer the ground or soil type, the more anchorage is needed.
- Custom Covers Marquees are not snow loaded. This follows common practice amongst European manufacturers which typically do not include snow loading in design calculations. (See Appendix D: Structural Specifications for what to do in the event of heavy snow on page 34)
- A competent person should carry out periodic inspections annually. These inspections are to ensure the marquee components are not unduly worn and that there is no damage to the structure, to the PVC or to the linings.
- Escape Routs and entrances must be clearly marked and unobstructed. The UK requirements for safe occupancy figures and exits are stated below in the MUTA Recommendations.
- All PVC and linings are flame retardant. However, caution should still be taken when using flammable substances and/or open flames near or inside the marquee structure. Details of Fire Certifications can be found in Part 5 Appendix A.

MUTA Recommendations

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

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 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 continuous seating, by dividing the total width of such seating by 450mm; and

b. in other areas (including standing areas occupied together with fixed seating) by dividing the floor area in meters squared by the relevant occupant load factor given in the table below. Toilets, stairway 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.

Occupancy Calculations Relevant factors:

One unit of exit width	525mm
Rate of discharge per unit (persons per minute)	40 p/min
Maximum permissible calculated evacuation time - Class C buildings	2 minutes
Occupant load factor	see above
Floor area (m^2)	(of marquee)

Number of Persons = floor area (m^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)	E = (U ÷ 4) + 1

Where:	Where:
N = Number of persons	E = Number of exits or stairs required
T = Time factor in minutes (2 for marquees)	
U = Number of units 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.

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 marquee (class C building) used as a dance hall?

The dance floor area is 420m2
The bar area is 60m2 of which 30m2 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

2. 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

3. 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 I exit of 4 units OR 2 exits of 4 units each plus I exit of 3 units and 1 exit of 2 units

Part Five (Appendices)

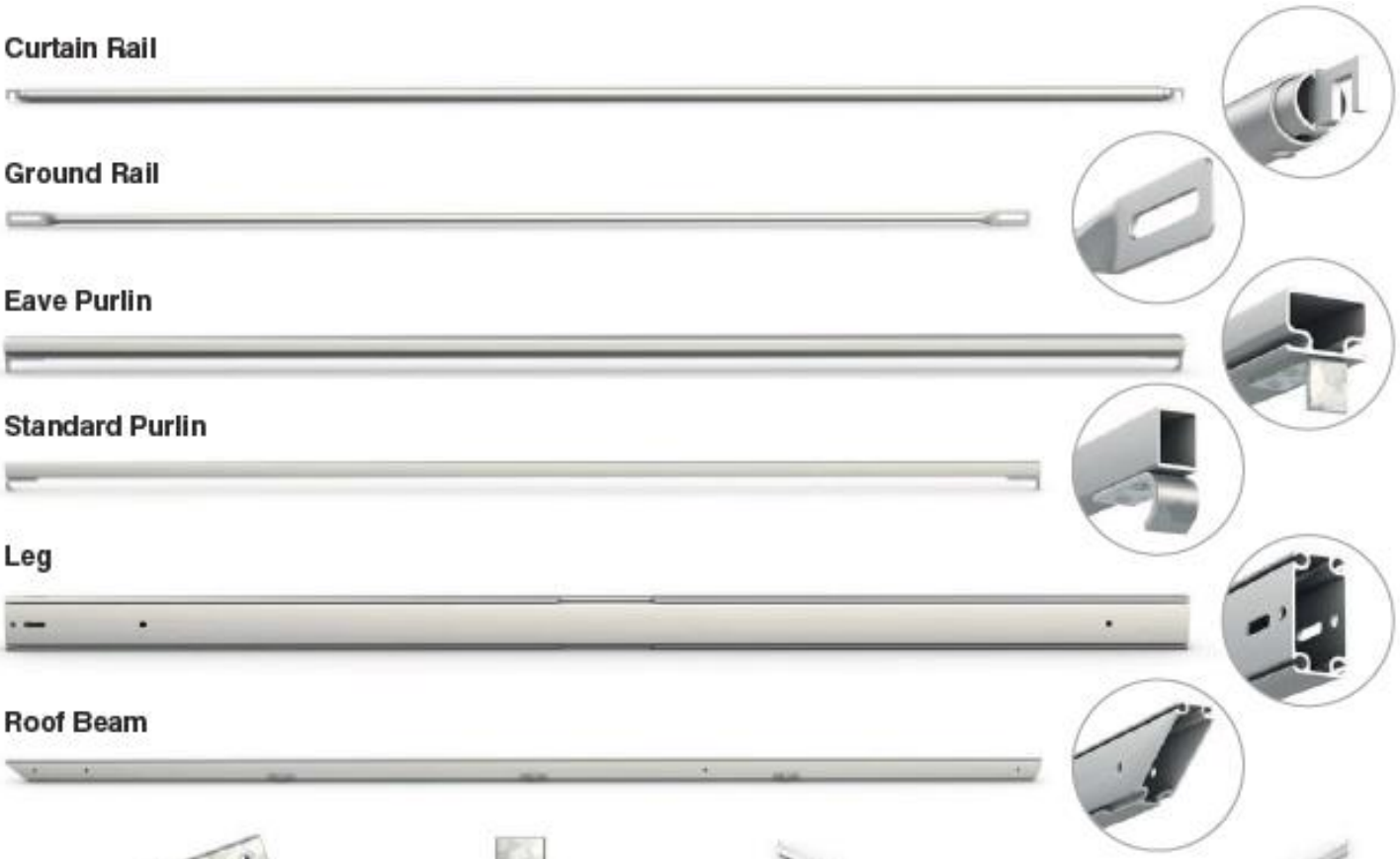
Appendix A: Fire Retardancy Specifications

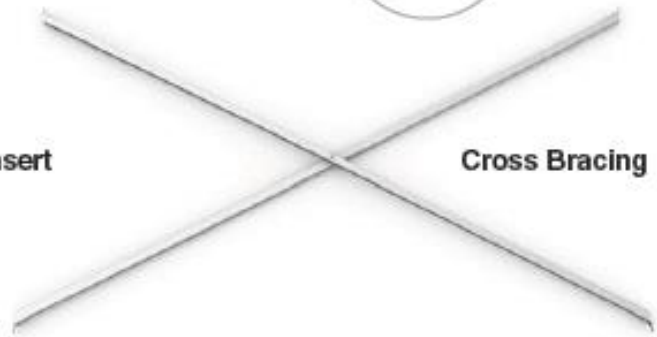
Individual certificates are available for each textile element. These can be downloaded from our web site: www.customcovers.co.uk or can be requested by phone.

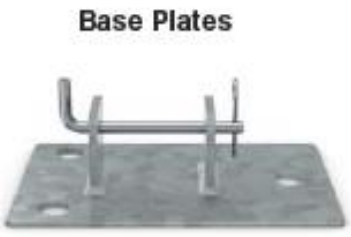
All current materials are tested to ensure compliance with the following standards:

PVC	Linings
Flame retardant to BS7837 tested to BS5438 Lowick UV Resistant	Flame retardant to BS5867 tested to BS5438

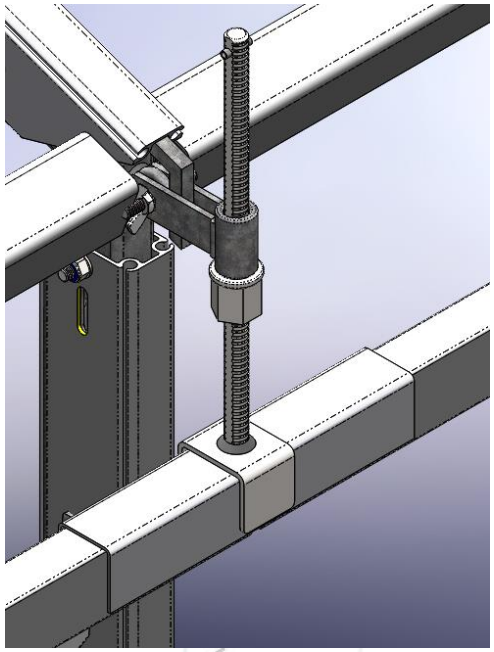
Appendix B: Components



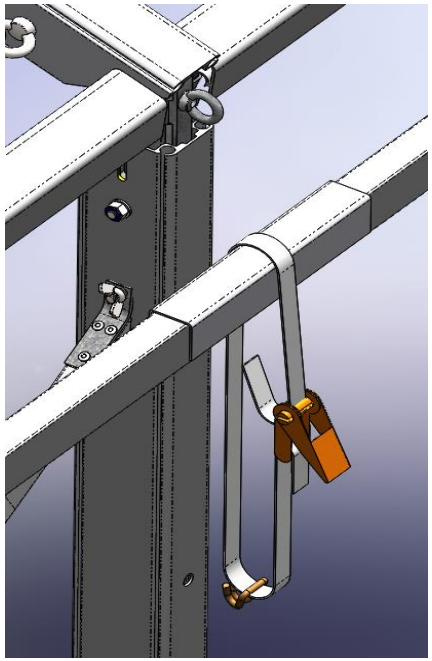




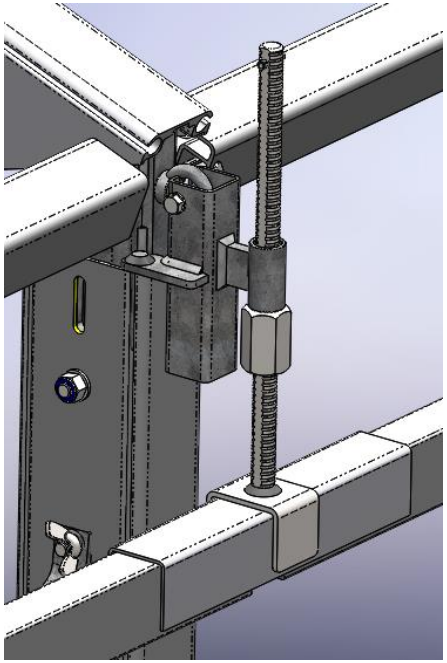
Bar Tension Components



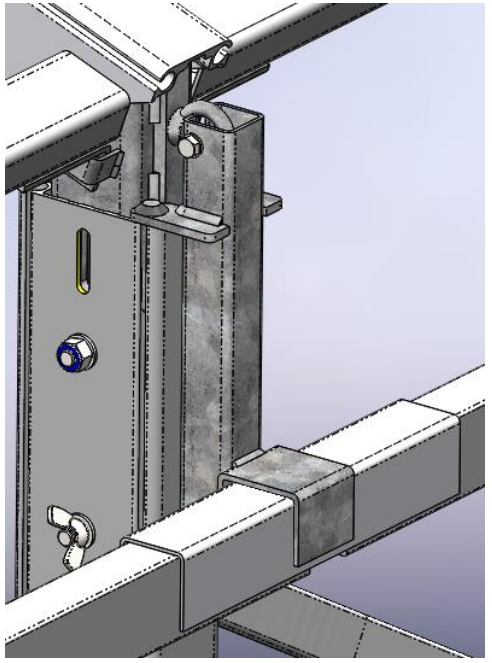
3-9m Push down unit



Ratchet assembly

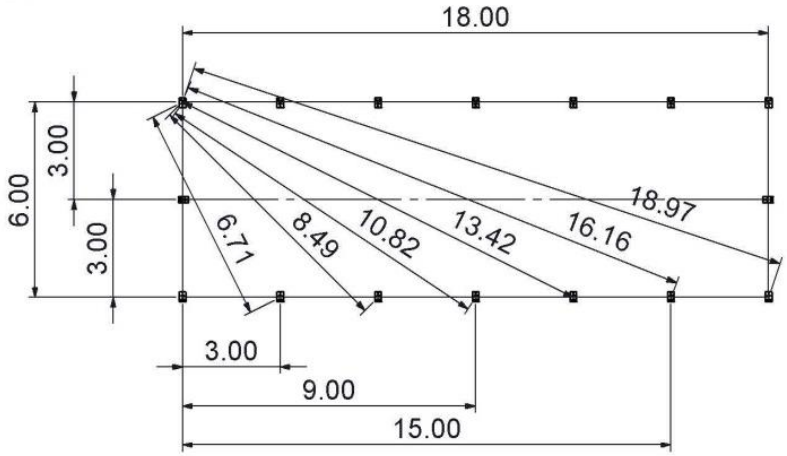


12 & 15m Push down unit

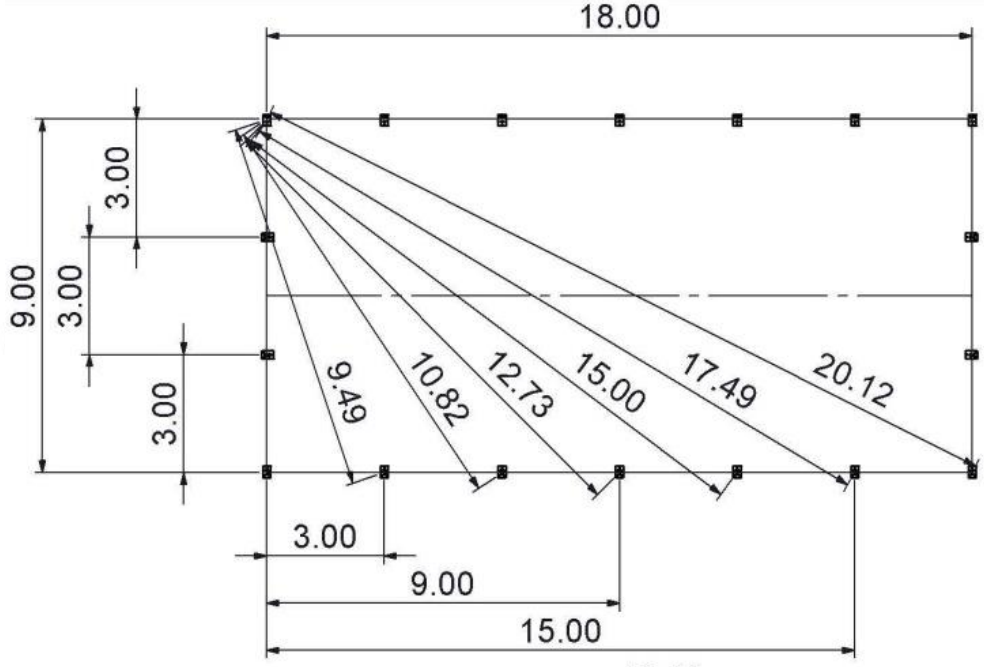


12 & 15m fixed unit

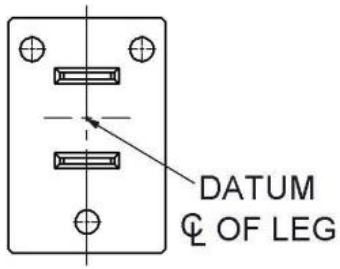
Appendix C: Drawings - Base Plate Layout Dimension in Metres

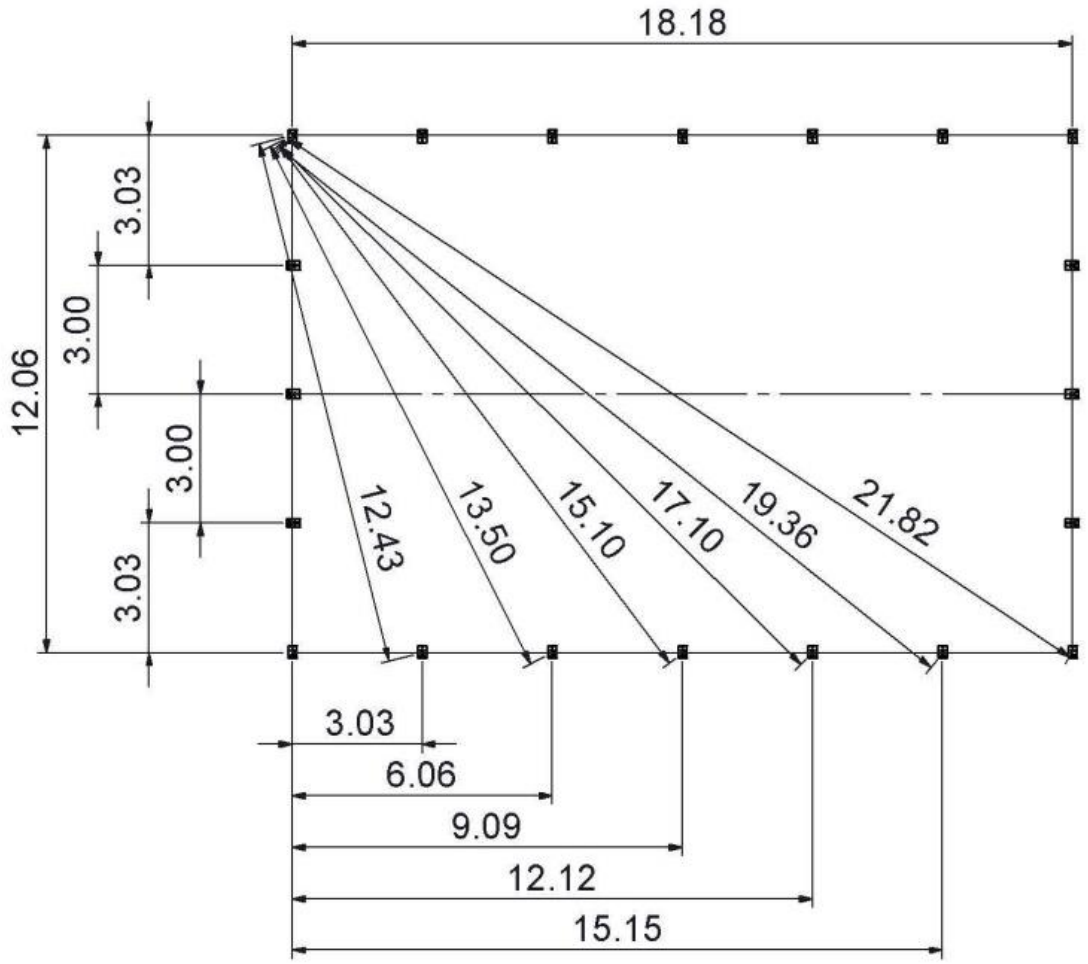


6M STRUCTURE

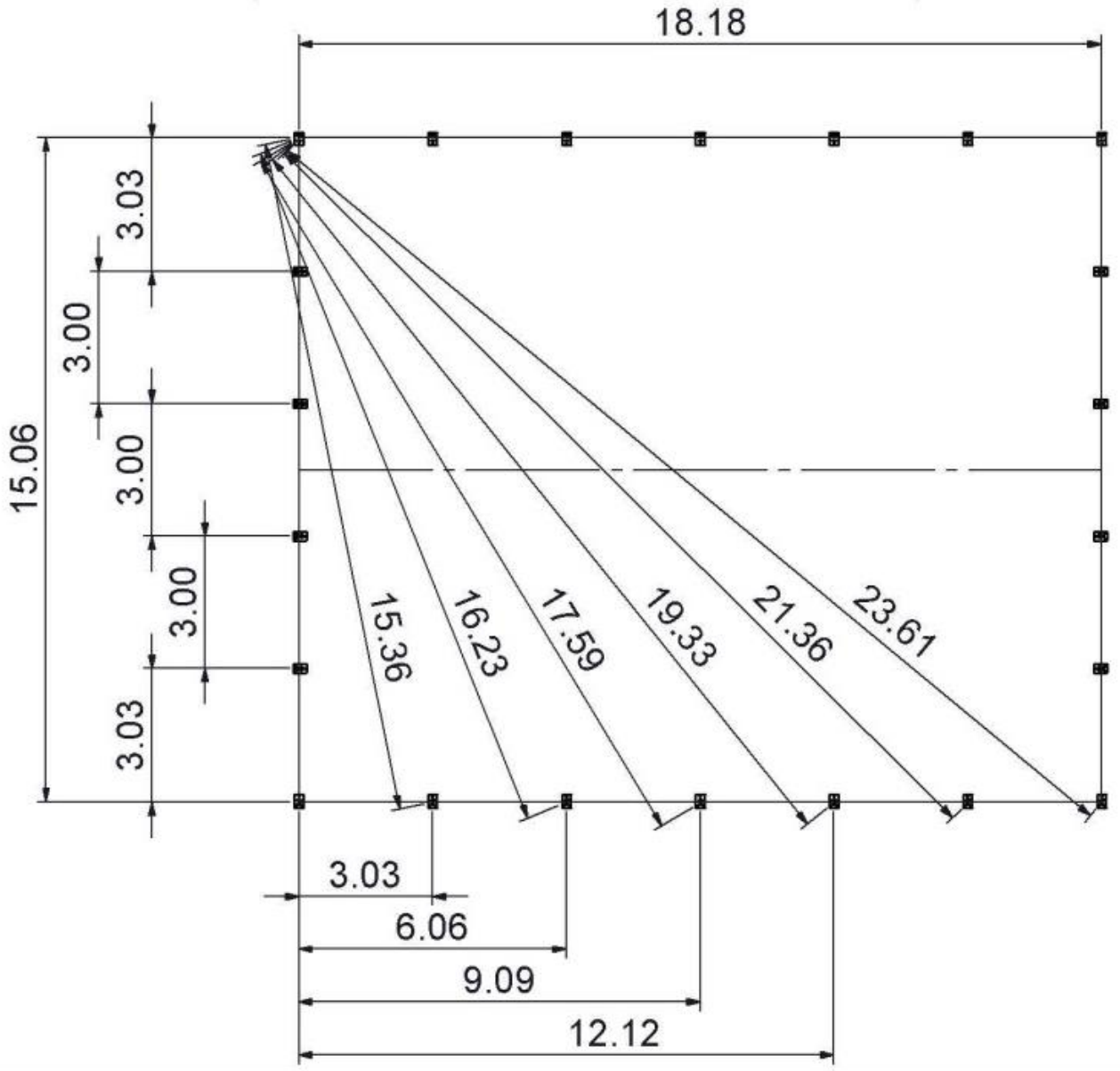


9M STRUCTURE





12M STRUCTURE



15M STRUCTURE

Appendix D: Structural Specifications

Wind Loading Capabilities

(For a quick reference table see page 38)

The following information summarises the design criteria for the Coverspan Marquee and the basic anchoring requirements. There are four main ways of holding a tent down, stakes, ground anchors, weights or bolts. Staking forces are dependant on the cohesiveness of the soil. High clay content soils give a very good holding whereas sandy or rocky soils do no have as much grip. It is important for the installer to assess the soil grip and add stakes as required.

3, 6 & 9 metre Marquee

The design wind loading capability of the 6 & 9m marquee is calculated for 28-Metres per second or 62 mile per hour winds (approx Beaufort force 10). This generates an uplift of approximately 1 tonne per leg, that is resisted by the friction of the stake in the soil. In normal weather condition one 3ft stake should suffice depending upon the condition of the soil. Fitting extra stakes through the baseplate and driving the stakes at a crossing angle can achieve additional holding.

12 metre Marquee

The design wind loading capability of the 12 metre span marquee is 36-meters per second or 80 mile per hour winds (approx Beaufort force 12). This generates an uplift of approximately 1.5 tonne per leg that is resisted by the friction of the stakes in the soil. In normal weather condition two 3ft stakes should suffice depending upon the condition of the soil. Fitting extra stakes through the baseplate and driving the stakes at a crossing angle can achieve additional holding.

15 metre Marquee

The design wind loading capability of the 15 metre marquee is 28-meters per second or 62 mile per hour winds (approx Beaufort force 10). This generates an uplift of approximately 1.5 tonne per leg that is resisted by the friction of the stakes in the soil. In normal weather condition two 3ft stakes should suffice depending upon the condition of the soil. Fitting extra stakes through the baseplate and driving the stakes at a crossing angle can achieve additional holding.

Other Measures

It is also necessary to close all walls during strong winds. This will stop pressure from building up in the marquee during adverse condition (the pressure in a marquee causes lift, this works on the same principle as the air flowing over an aeroplane wing).

Guy ropes, manufactured from 8mm cable, can increase the wind load by up to 16 miles per hour, these cables are attached to the eave knuckle & secured to a base plate with two 3ft stakes The cable need to be set at a 45° angle giving the maximum down force, with a breaking strength of up to three tons

An alternative for extra anchoring support is to use 50mm webbing with a ratchet attached. Once again the webbing will be attached to a base plate & secured with three 3 ft stakes

If faced with the prospect of extreme weather conditions the marquee should be dismantled. If this is not possible, removal of the PVC roof and gable panels will significantly reduce any imposed loads on the frame.

Installation where staking not possible

To remain safe, Marquee structures require to be firmly attached to the ground. When a structure is to be installed on a surface that will not permit tent stakes to be used then other alternatives may be possible. They will not necessarily give the same level of support and the operator must make a suitable risk assessment of the site and predicted weather.

Fixing by bolt. The design calculations demonstrate that provided a good fixing with a rawl bolt is achievable, an M12 x 100 bolt per leg, with an effective depth of 80mm, would provide sufficient anchorage. This should be a minimum of 200mm from any concrete edge. A Large washer should be fitted under the bolt head to spread the load into the baseplate.

Chemical bolts can be used but great care is required to ensure a clean dust free hole that allows a good chemical fix to the supporting structure.

Fixing by weight. It is possible to use weight to anchor the Marquee. The weight per leg should equate to the uplift figures quoted above and be securely fixed to the base of the leg or the eave knuckle. The weight system should also provide some friction against the ground. The weight itself will resist the uplift whilst the friction will stop the structure being pushed sideways. If it is not possible then the weight should be strapped to the eave with a heavy duty strap. See the tables below re minimum weights at below design wind speeds.

The gable end legs are predominantly resisting the lateral forces and will also require weights. Assuming a friction factor of 0.45 then structures 6 & 9m wide will require a weight of 450kg per leg whilst 12 & 15m structures require 600kg per leg.

Note: these are basic guide lines to follow and your discretion will be needed from site to site and the particular prevailing weather conditions for the week of your event. Please refer to the MUTA guidelines regarding risk assessment and site responsibilities.

Min Weight Requirements *per Marquee Upright* for Wind Loading

Holding down forces vary according to the wind speed. The tables below detail a reduction in the design uplift forces for lower wind speeds. The forces refer to each individual upright and the appropriate weight must be secured to each and every one. The tables are produced for guidance only. They are based on idealised conditions and need to be applied with regard to the type of ground and the predicted weather. Operators must continue to monitor the actual conditions and ensure that the weights are positively attached to the frame. It is always preferable to have a positive ground fixing rather than a weight. It must also be noted that the structural calculations for the frame are based on the maximum figure.

Please refer to the MUTA guidelines regarding risk assessment and site responsibilities

Eave Height 2.3m Wind speed (m/s & mph)

Span (m)	13 / 30	20 / 45	28 / 62	36 / 81
3	200	400	800	-
6	150	500	800	-
9	100	600	1010	-
12	100	700	1200	1550
15	100	800	1300	-

Holding down force in kg

- outside design specification

Eave Height 3.0m Wind speed (m/s & mph)

Span (m)	13 / 30	20 / 45	28 / 62	36 / 81
3	200	400	800	-
6	150	500	800	-
9	100	600	1010	-
12	100	700	1300	1550
15	100	800	1400	-

Aluminium & PVC Structures

Technical Specification Coverspan 3 to 9m span
94 x 48mm profile

Design Codes	The structural components have been designed in full accordance with the following Design Codes.	
	Structural steelwork:	BS 5950 Part 1 (1985)
	Structural aluminium:	BS 8118 Part 1 (1991)
	Wind loading:	BS 6399 Part 2 (1997)
Material Specification	Steelwork:	Mild Steel (Grade 43)
	Aluminium:	Alloy (Grade 6005 T6) (0.2% proof stress = 240N/mm^2.) (Tensile stress = 270N/mm^2.)
Design Conditions	The combined structural framework has been designed to safely withstand the imposed factored loading arising from a design wind speed of 28 metres per second. *Note: Owing to the structure's limitation of supporting the full possible snow loading, it is recommended that during wintry weather conditions the area below be heated in order to prevent a large accumulation of snow on the roof.*	

Structural Components — 3/6/9m Coverspan plus

Aluminium roof beam & legs	94mm x 48mm x3mm
Eave Rail	67mm x 45mm x2mm
Purlin Centre & Ridge	40mm x 30mm x5mm
Gable End Legs	94mm x 48mm x 3mm
Eave Knuckle (Steel)	60mm x 40mm x 4mm
Roof Knuckle (Steel)	60mm x 40mm x 3mm
Bracing (vertical)	35mm x 40mm x 2.5mm
Bracing (roof)	6mm dia. wire rope

Technical Specification Coverspan plus 12m span
114mm x 80mm profile

Design Codes — The structural components have been designed in full accordance with the following Design Codes.

Structural steelwork:	BS 5950 Part 1 (1985)
Structural aluminium:	BS 8118 Part 1 (1991)
Wind loading:	BS 6399 Part 2 (1997)

Material Specification

Steelwork:	Mild Steel (Grade 43)
Aluminium:	Alloy (Grade 6005 T6) (0.2% proof stress = 240N/mm^2.) (Tensile stress = 270N/mm^2.)

Design Conditions — The combined structural framework has been designed to safely withstand the imposed factored loading arising from a design wind speed of 36.0 metres per second.

(*NB: Owing to the structure's limitation of supporting the maximum possible snow loading, it is recommended that during wintry weather conditions the area below is heated in order to prevent a large accumulation of snow on the roof.)*

Structural Components — 12m Span

Aluminium roof beam & legs	114mm x 80mm x3mm
Eave Rail	67mm x 45mm x2mm
Purlin Centre & Ridge	30mm x 30mm x2.5mm
Gable End Legs	94mm x 48mm x 3mm
Eave Knuckle (Steel)	70mm x 70mm x 8mm with 30mm x12mm bracing to the back
Roof Knuckle (Steel)	70mm x 70mm x 3mm
Bracing (vertical)	35mm x 30mm x 2.5mm
Bracing (roof)	8mm dia. wire rope

Technical Specification Coverspan plus 15m span
114mm x 80mm profile

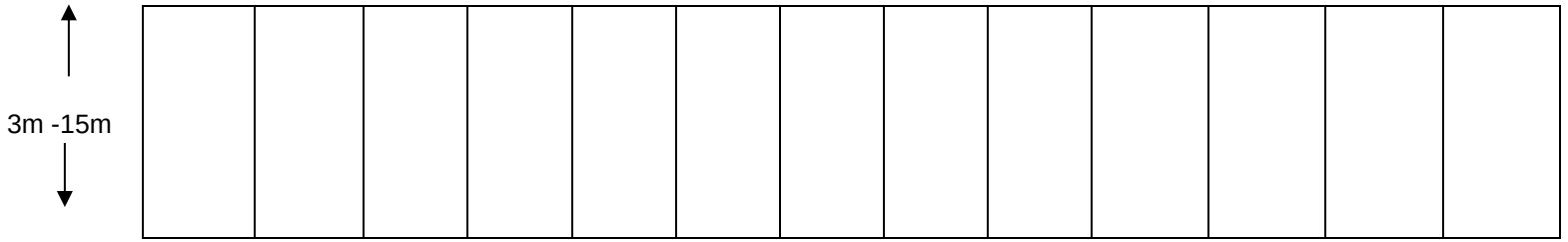
Design Codes	The structural components have been designed in full accordance with the following Design Codes.	
	Structural steelwork:	BS5950 Part 1 (1985)
	Structural aluminium:	BS8118 Part 1 (1991)
	Wind loading	BS6399 Part 2 (1997)
Material Specification	Steelwork:	Mild steel (Grade 43)
	Aluminium:	Alloy (Grade 6005 T6)
Design Conditions	The combined structural framework has been designed to safely withstand the imposed factored loading arising from a design wind speed of 28.0 metres per second. (NB the structure is not designed to carry an imposed snow load.)	

Structural Components: 15m Span

Aluminium roof beam & legs	114mm x80mm x 2mm
Eave Rail	67mm x45mm x 3mm
Purlin Centre & Ridge	40mm x30mm x 2.5mm
Gable End Legs	94mm x48mm x 3mm
Eave Knuckle (Steel)	70mm x70mm x 8mm with 30mm x 8mm bracing to the back and front.
Roof Knuckle (Steel)	70mm x 70mm x3mm
Bracing (roof)	8mm dia. Plastic coated wire rope

Bracing Requirements

Marquees with more than 3 bays require extra bracing for stability. The specifications for these are given below:



Length	1st Bay	2nd Bay	3rd Bay	4th Bay	5th Bay	6th Bay	7th Bay	8th Bay	9th Bay	10th Bay	11th Bay	12th Bay	13th Bay
3	X												
6	X												
9	X												
12	X			X									
15	X				X								
18	X					X							
21	X			X			X						
24	X				X			X					
27	X				X				X				
30	X			X			X			X			
33	X			X				X			X		
36	X				X				X			X	
39	X				X				X				X

Bracing requirements for up to 15m width Coverspan Marquees.
Bracing to include Scissors and Roof wires where span > 4.5m

Snow Loading Guidance

- Custom Covers Marquees are not designed to take a snow load. This follows common practice amongst European manufacturers which typically do not include snow loading in design calculations.

- If it snows, active management is therefore required to keep any snow loading to a minimum

- Removal of the snow is required, especially wet snow as this builds up weight very rapidly

- Removal can be mechanical, by use of brushes from the outside or pushing from inside, but it is important to check the area where the snow will land is free of people and other obstructions

- Build up can be significantly reduced by heating the structure to at least 12 ºC as this heats the PVC and melts the snow as it falls.

- When Clearing snow mechanically specific care is to be taken if operating from ladders

- Ropes thrown over the structure and pulled along the roof will also help loosen the snow allowing it to fall.

- This is the Official MUTA Guidance on the subject:
    - 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.
    - 6.7.1 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.

Appendix E – IFAI Anchorage advice

This information is extracted from the IFAI Staking Guide 2006.
See www.tentexperts.org

Pull out Capacity for a Single Stake
The method estimates the stake pull out capacity for a “baseline” stake, and then applies correction factors for conditions that vary from the baseline case. The baseline case for a tent stake is as follows:
1) stake diameter is 25mm (1.0 inch)
2) the side of the stake is smooth
3) the steel stake is driven vertically
4) the stake is embedded (driven) 915mm (36 inches) in the ground
5) The load is fastened at 51mm (2 inches) above the ground surface, and
6) The load is pulled at a 45 degree angle

Consistency	Soil Resistance	Stake penetration resistance	Pull out capacity for base calculation Kgf
Hard (very Dense)	Indented with difficulty by thumbnail	< 5mm	1,135
Very Stiff (Dense)	Readily indented by thumbnail	5 -13mm	725
Stiff (medium Dense)	Readily indented by thumb	13 – 40mm	365
Medium (medium)	Can be penetrated several cm by thumb with moderate effort	40 - 76mm	185
Soft (loose)	Easily penetrated several inches by thumb	76 – 150mm	90
Very Soft (very Loose)	Easily penetrated several inches by thumb	> 150mm	45
Notes:- Soil Consistency selection is subjective. For fine-grained soils, use both the soil resistance description and the stake penetration to select the appropriate capacity. For coarse-grained soil, use the penetration to assess soil. Stake penetration is based on the average penetration of the stake per blow with a 16lb sledge hammer with a normal swing Load applied at 45° to horizontal			
Information taken from ‘ A pocket guide on the Pullout capacity of Tent Stakes’ published by the Industrial Fabrics Association International.			

Please refer to the full document for the correction factors applicable to multiple staking arrangements

Actual holding is a function of

- Pullout of a single stake
- Length of stake
- Height of fastening above soil level
- Angle of stake from vertical
- Angle of load
- Diameter of stake

Two stakes working together increase effectiveness by 1.22

Appendix F: Glossary of Marquee Terms

Bar Tension System

Tensions Roofs and Gables using a Bar through a pocket in the edge of the fabric. It is tensioned by Ratchet Straps or by Push Down Tensioner. See appendix B

Base Plate

The primary function of the plate is to attach the marquee to the ground and is also used as a pivot point to rotate A Frames into their vertical positions. They are also known as Foot Plates.

Bottle screw

Wire tensioning device using two-handed screw threads.

Bungee flange

PVC section, welded to roof with length of bungee used to secure the roof section onto the Eave Rail.

Bungee Tension System

Tensions roofs using elasticated bungee cord hooked to Eave Rail.

Corner plate

Angled steel plate with a Ground Rail fixing pin, used at each corner to enable Gable Ground Rail attachment.

Curtain Rail

Support rail for the top section of the PVC wall.

Dropnose Pin

Connecting pin with an over centre locking device at one end.

Dutch Lacing

Loops of rope laced through eyelets in marquee fabric sections to attach them together.

Eave

Lower edge of the marquee roof.

Eave Knuckle

Structural element joining Roof Beam and Leg.

Eave Rail/Purlin

Section forming Eave of structure. Two types of Eave Rail are available:

Bar Tension – used with Bar Tension System
Symmetrical – used with Bungee Tension System

Flame Retardancy

A measure of a material's ability to resist the propagation of combustion. Tested against International Standards

Gable

End wall of a marquee.

Gable Triangles

Triangular top section of Gable wall that attaches to the Roof Beam along the Kader track. A tent set comprises enough fabric to cover two ends.

Ground Rail

Horizontal bar that secures the bottom edge of wall sections.

Hip ends

End panel option where Roof panel leads from Eave to the central end point of the Ridge

Kader

Attachment system for fixing PVC to Aluminium extrusion using a PVC extrusion fitted within an Aluminium channel.

Kader track

Aluminium channel/track with slot to take Kader.

Keystone Section

Section used to extend Roof Beams, increasing a 12m marquee to 15m.

Lamp Loom

Secondary cable in Starlight lining to which the LEDs are attached. Connects to the Master Loom.

LED

Light Emitting Diode use in starlight roofs

Lining Clamp

Device securable in Kader track for attaching lining wires.

Lifting Pole

Pole used to hoist roof linings

Master Loom

Main low voltage cable in Starlight lining.

Portal Beam

An alternative to a scissor brace used when a window or door is required in a bracing bay.

Purlin

A longitudinal member in the roof of a structure used to stabilise the Roof Beam.

Purlin Prop

Device used to lift Purlin sections overhead.

Push Down Tensioner

Device fitted to Eave of marquee generating tension by screwing down onto Bar Tension Bar.

R-clip

Securing clip for pins.

Ratchet Strap

Device used in Bar Tension System. Fixes between tension bar and hole in leg.

Ridge

The line defining the longitudinal axis of the marquee roof. This line runs along the centre locations at the highest point on the marquee roof.

Ridge Knuckle

Structural element joining two Roof Beams at the Ridge.

Roof Beams

Structural element supporting Ridge to which roof fabric is attached.

Roof Wire

Part of bracing equipment allowing the marquee to stand upright and resist Gable end forces

Spacing bar

Fixed length bar used as aid to setting out structure.

Stake

A steel shaft driven into the ground as marquee anchoring device.

Stake Puller

Devise for removing stakes from ground.

Starlight Lining

Decorative lining with inlaid Pea Bulbs, LEDs, or Optic Fibres giving starlight effect.

Pelmets

Decorative linings covering gap between the bottom of the roof lining and the top of the wall lining. Can be swagged or pleated.

Top Hat

Section attached to Roof Beam to allow Purlins to be attached.

Valance

See **Pelmets**

Webbing Strap

Strong, narrow, closely woven tape designed for bearing weight/tension.

Revision History

Rev 2

- Updated staking drawings
- Added text re securing non staking option
- Added Tri Cone & Cruciform instructions

Rev 3 (RESB)

- Added Cruciform (9m and 12m)
- Added Porch
- Updated Appendices

Rev 4 (RESB)

- Reduced to Basic Manual
- Update Glossary

Rev 5 (RSPB)

- Added bar tension info
- Amended safety instructions.

Rev 6 (RSPB)

- General review & Update

Rev 7 (RSPB)

- General review & Update