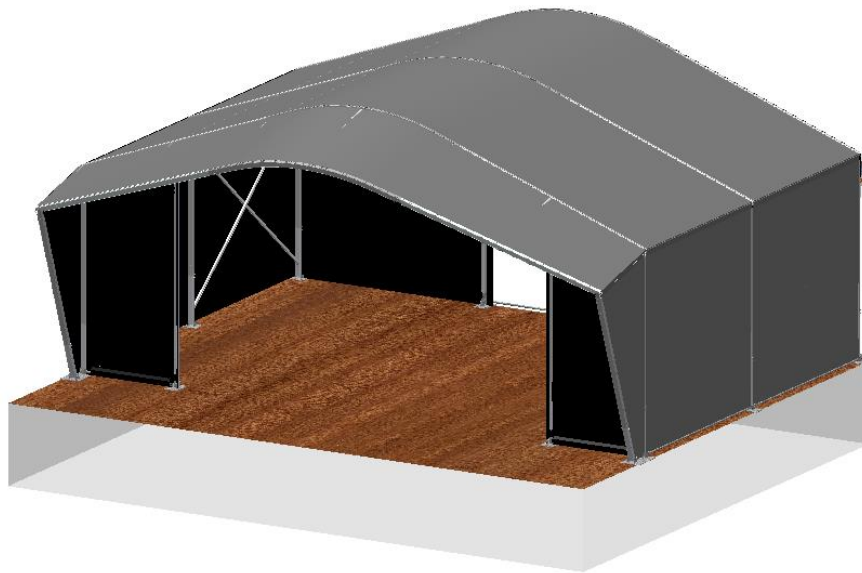


ELLIPSE STAGE INSTALLATION HANDBOOK

Basic Structure Operation & Safe Use



Ellipse Stage Installation Manual

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Introduction

The purpose of this document is to provide a source of information for the operators of the Ellipse Stage, explaining its safe and effective methods of use.

The Ellipse Stage comprises of an aluminium frame with steel knuckles, covered by PVC sheeting.

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

This is a list of the components needed to put up an Ellipse Stage. A full bill of materials can be supplied if requested.

- 500& 700mm Leg Inserts
- Base plate (for 3/6/9m)
- Corner plate
- Cross-bracing (also known as Scissors)
- Eave Knuckle with internal eye
- Eave Rail
- Foot Pins & Bolts
- Gable End Legs Assembly
- Ground Rail
- Curved roof keystone insert
- Leg
- Purlin
- R Clip
- Roof Beam, 2 with additional gable leg holes
- Roof Wire
- Steel Base plate
- 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.

Part Two (Assembly)

Recommended Tools Required

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

Layout, Anchoring and Staking

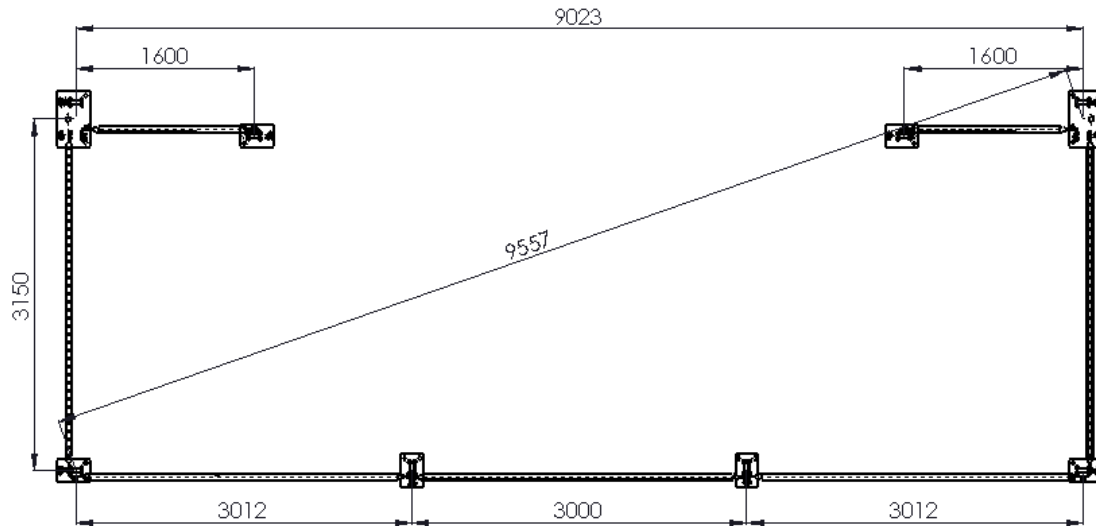
The installer needs to ensure that the ground holding for the structure is sufficient to resist the design wind loads.

After establishing the desired location of the stage, 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)

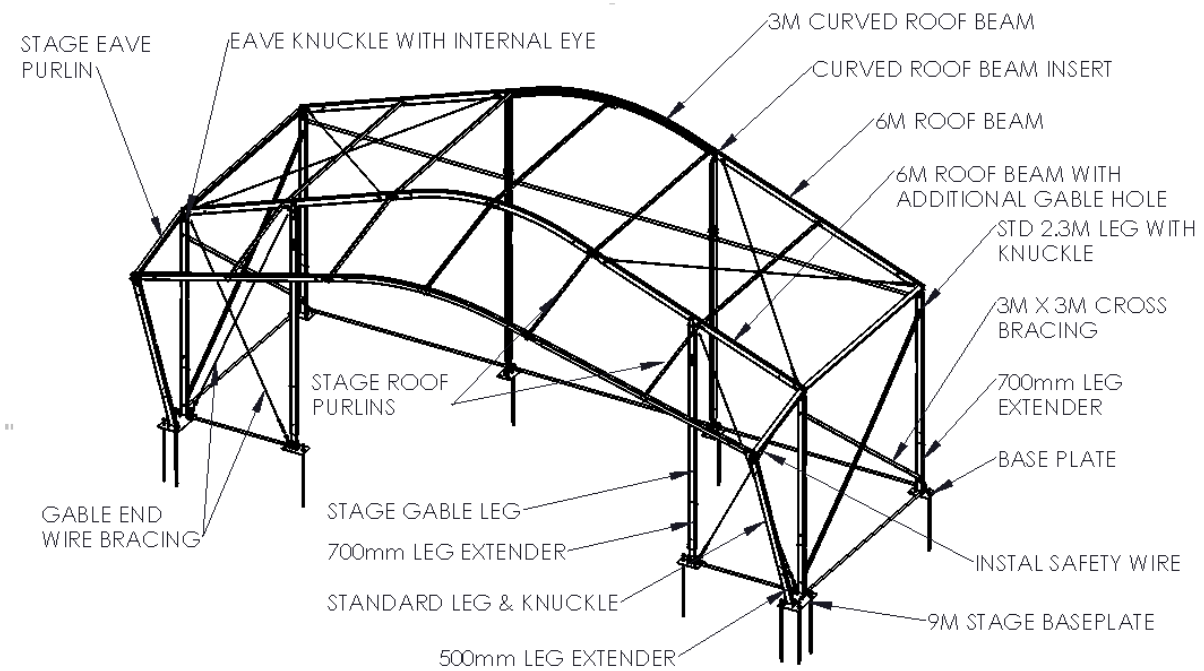
Next, determine the positions of the other corners by careful measurement. There are two recommended methods for ensuring the plates are square:

- ❑ Use measurements from layout plan, (below) or:
- ❑ Use the 3-4-5 Method:

See illustration showing quantity of stakes required at end of manual.



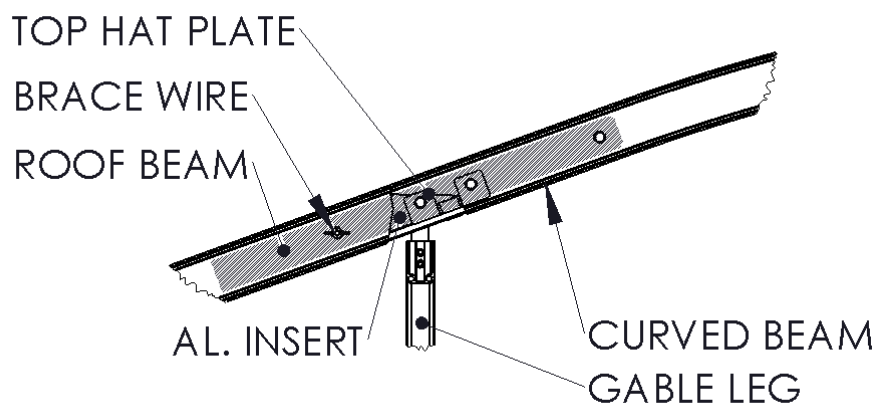
**BASEPLATE LAYOUT FOR 9M ELLIPSE STAGE
DIMS IN mm TO CENTRE OF BASEPLATE**



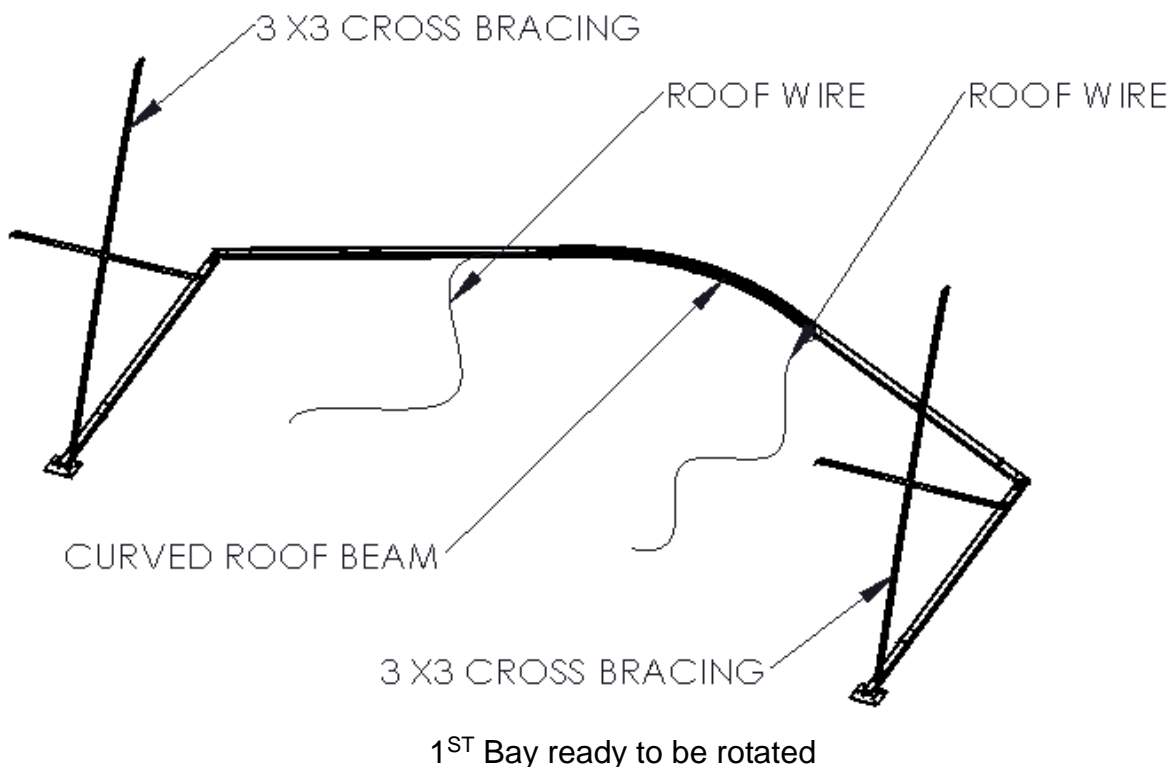
Components of Ellipse stage

Frame Assembly

- Identify all the components and layout those required for the rear arch. This consists of the following, from one base plate over the arch to the other base plate .3 Hole base plate with single hole facing inwards, 700mm leg extender, connected to base plate with 12mm foot pin facing outwards. Standard 2.3m eave leg with attached knuckle, standard 6m roof beam, curved roof beam with aluminium insert then in reverse order to the base plate.
- Secure the roof beam to the insert with a 6m roof wire and the lowest hole in the leg to the 6m roof beam with another roof wire. Ensure the bottle screw is at the eave knuckle end.



- With the arch laid flat fix the 3m x 3m bracing scissor set to each leg, so that when the arch is rotated up it meets the adjacent arch.



- Next build the 2nd arch. This is built exactly the same way except that the eave knuckle needs to be a knuckle with an internal eye and the foot pins are replaced with eyebolts. (to take the gable bracing). Use the double base plates for the second arch

- Once the two arches are built, they should be laid out opposite each other. Secure the base plate then rotate up the first arch and rest this on the scissor bracing. The rotate up the second arch and secure to the loose end of the scissor bracing. Fit the 3m eave rail both sides to secure.

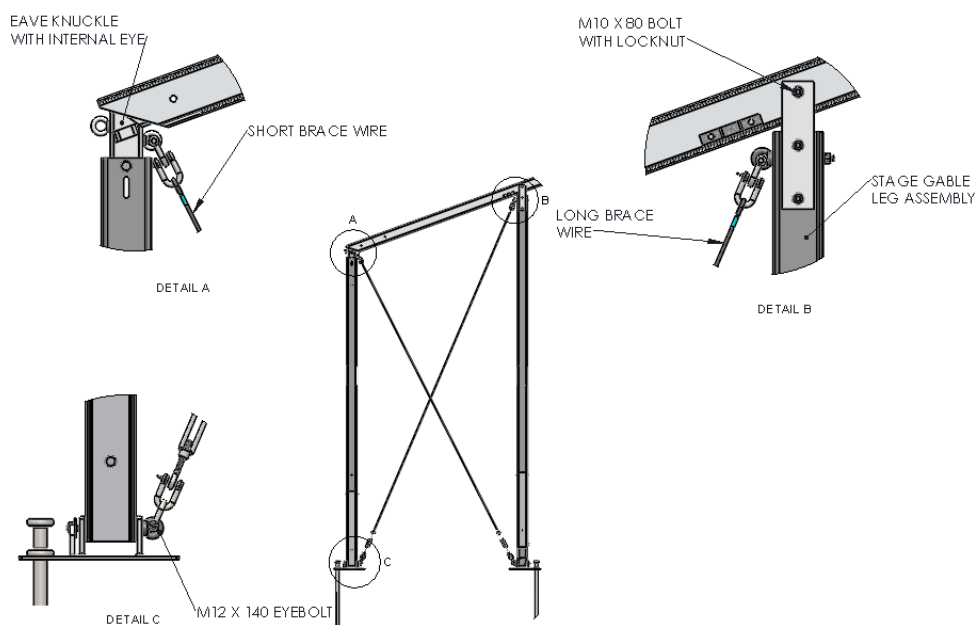
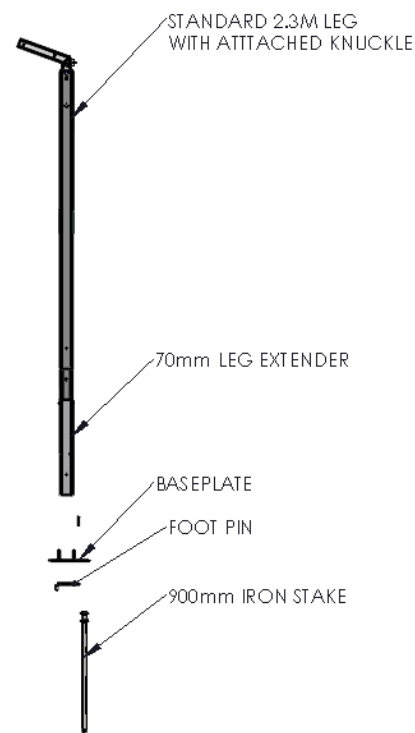
- Fit the remaining 5 ridge purlins, using the purlin prop and secure the roof bracing wires.

- The gable legs are assembled using the 700mm leg extenders and bolted to the roof beam. Fit curtain rails across the rear gable between the legs.

- The front braced gable leg is fitted by bolting through the extra hole in the 6m roof beam. The eyebolt at the top of the gable leg should be facing the side of the stage, to allow the bracing wire to be fitted. Once the leg is in place and base plate staked, fit the two cross wires and tension.

- Now fit the eyebrow arch. This has the same build as the 1st arch except it uses 500mm leg extenders in place of the 700mm extenders. Once the arch is assembled on the ground, fit a safety wire to the outer eave knuckle eye on both sides. Rotate the eyebrow arch up towards the 2nd arch and once vertical attach the safety wire to the 2nd arch using the eave knuckle outer eye.

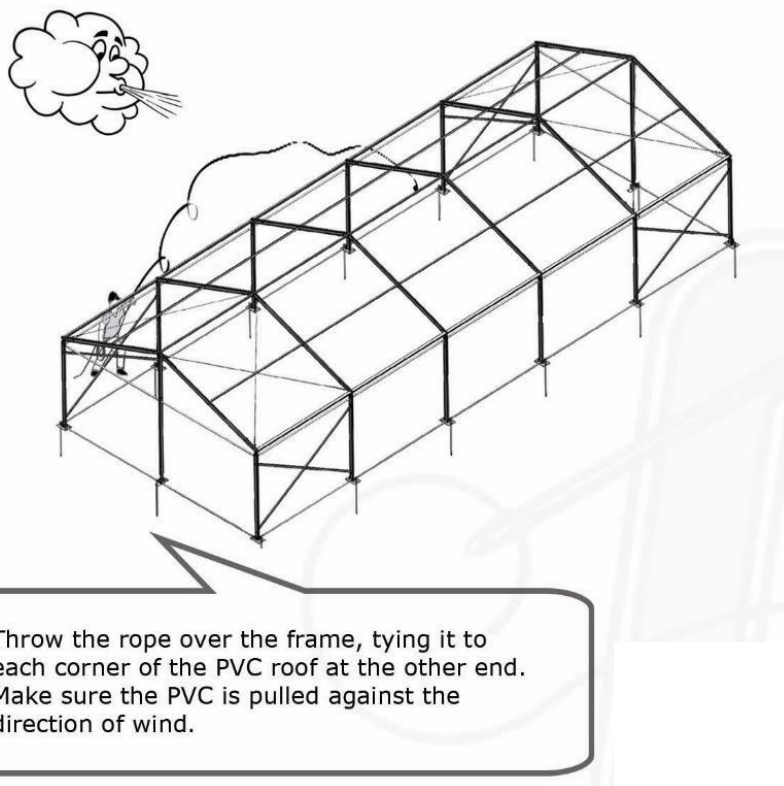
- The covers are now fitted and then the purlins for the eyebrow inserted.



Bracing layout for front Gable leg

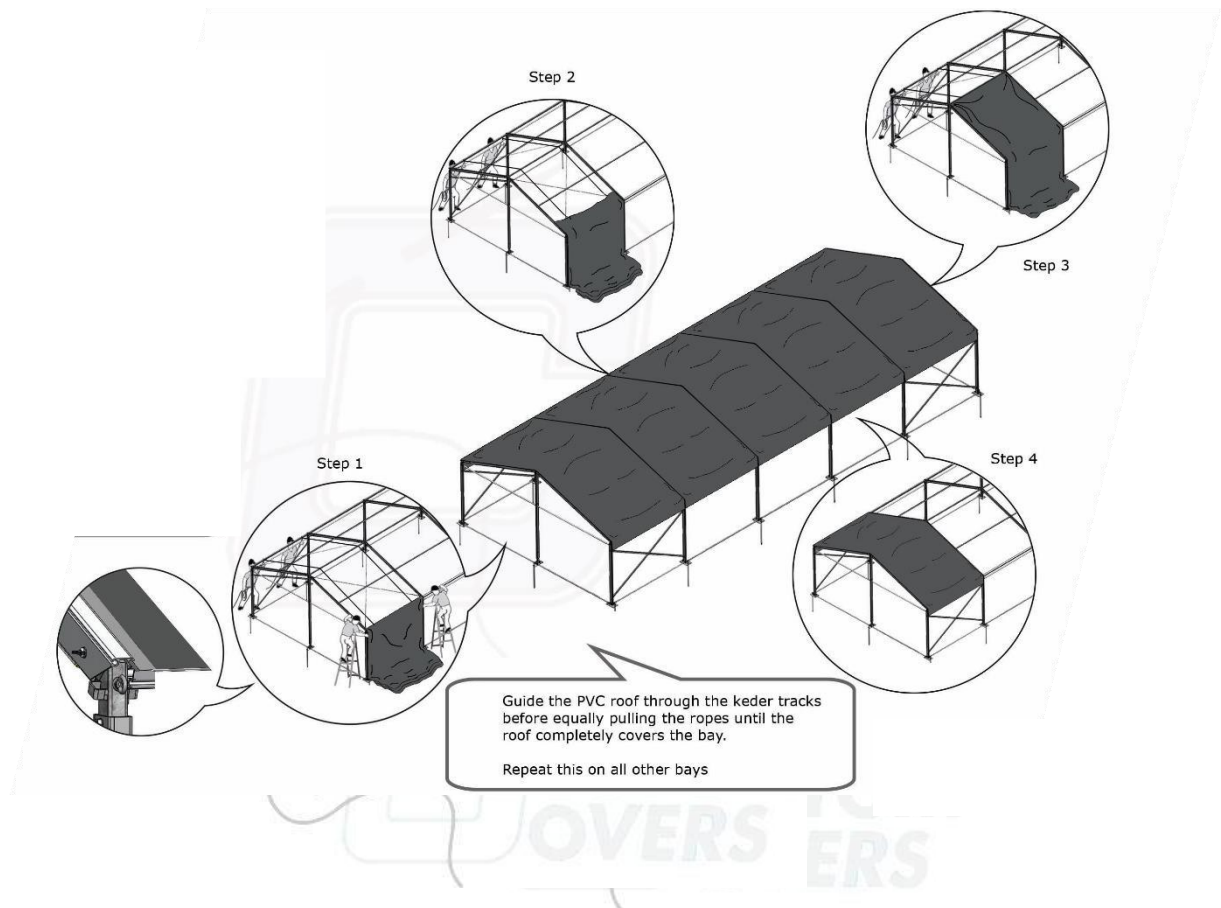
Cover Installation

- PVC roofs: Once the frame is assembled, throw one rope with carabine 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 ropes 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 keder 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. It is most efficient to pull into the wind as this lifts the roofs away from the purlins.



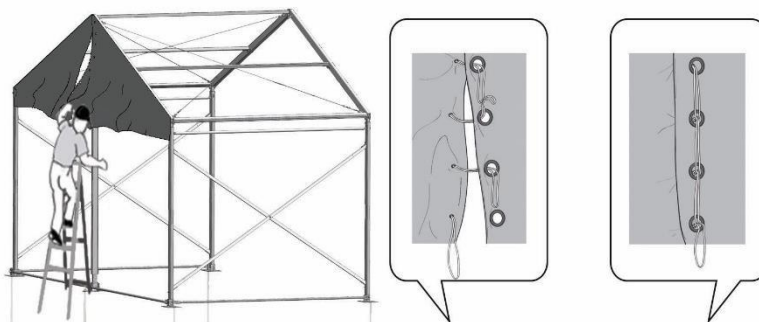
- Then feed the wall section of the roof down the leg feeding in from the top of the leg extrusion. Keep the sheet square whilst feeding this to avoid locking the sheet. Fit a ground rail each side and fix to the base plate foot pins.

Ellipse Stage Installation Manual

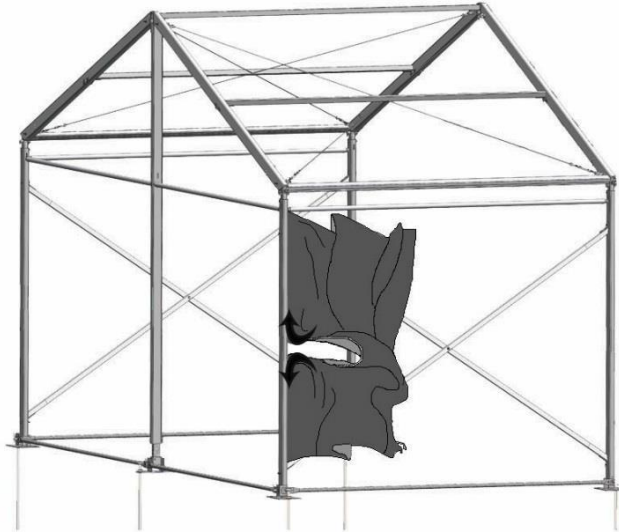


- The Gable Triangles slides into the top channel of the roof beams, making sure the lacing is facing inwards. Then lace up the two sides of the gable and attach to the gable legs with straps. Hook & loop flaps can then cover the edges of the roofs and gables.

Note: A curtain pole can be used to push the gable up the track via the D-ring fitted to the gable.

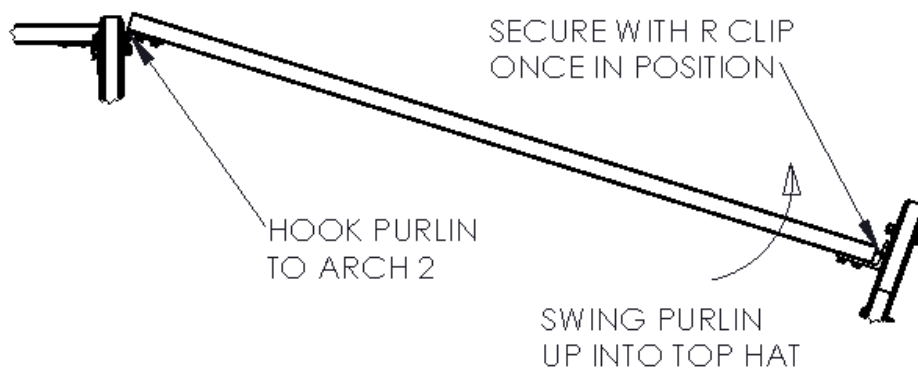


- The gable walls are fitted by sliding the bottom half of the kedered edge into the outside leg channel using the cut out in the centre of the leg this is followed by the top half of the wall. The walls should have rings at the top, and a pocket on the outside at the bottom. Repeat this for the other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

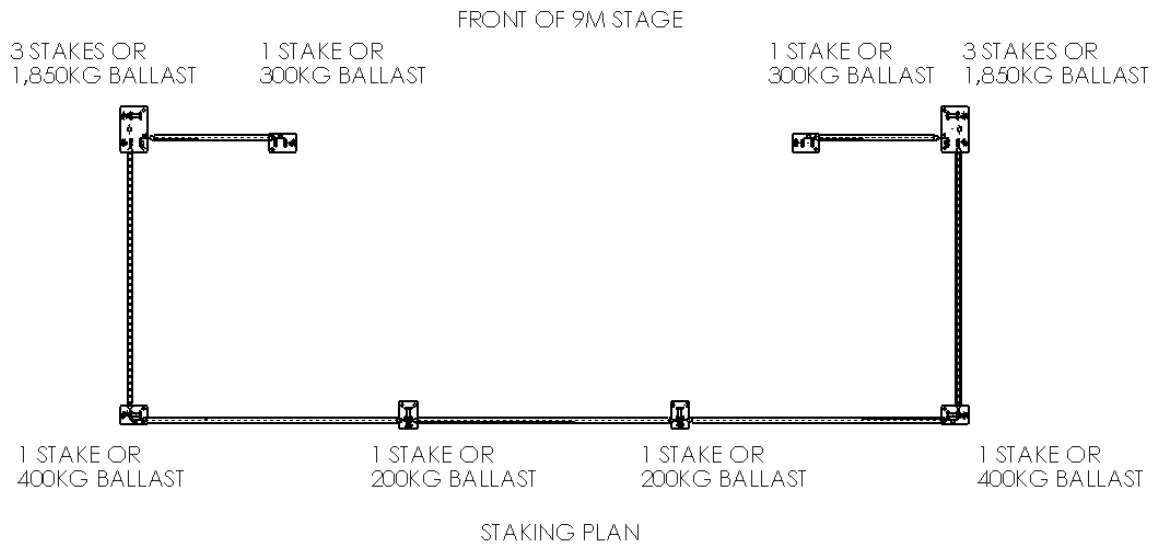


Gable wall installation

- ❑ The eyebrow roof sheet is fed into the roof beams of arch 2 & 3 at the same time. Close up arch 3 so that it is vertical and then start to feed the roof sheet into the roof beams at eave level. The roof is marked with an arrow and the letter F to identify the front of the roof. This side pulls into the eyebrow arch. Pull the roof section over and out at eave level. Even up the roof, then slide the wall section down the legs.
- ❑ Once the eyebrow roof is fitted allow the eyebrow to fall forward and install the eyebrow eave rails, then roof purlins. These are first hooked into the purlin top hats on arch 2 and then rotated up into the top hats of arch 3 and secured with an R clip.



Staking plan



Design rigging load

Uniformly distributed load of 10kg/m has been applied to the eyebrow arch.

Checks

Post-Assembly

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

- ❑ Anchorages 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

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 - 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 Structures are not snow loaded. This follows common practice amongst European manufacturers which typically do not include snow loading in design calculations.
- ❑ 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 Routes and entrances must be clearly marked and unobstructed
- ❑ The PVC covers 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 on our website.

Wind Loading Capabilities

(For a quick reference see wind management table)

The following information summarises the design criteria for the Ellipse Stage and the basic anchoring requirements. There are four main ways of holding a stage down, stakes, ground anchors, weights or bolts. Staking forces are dependent on the cohesiveness of the soil. High clay content soils give a very good holding whereas sandy or rocky soils do not have as much grip. It is important for the installer to assess the soil grip and add stakes as required.

9 metre Stage

The maximum design wind loading capability of the 6 & 9m marquee is calculated for 21.5-Metres per second or 48 mile per hour winds (Beaufort force 9). This generates a max uplift of up to 1.8 tonne per leg, that is resisted by the friction of the stake in the soil. In normal weather condition three 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. This assumes no other loading on the frame structure.

The stage can have a suspended load of 10kg/mtr along the eyebrow arch. This reduced the design wind speed to 21 metres per second or 47 miles per hour.

Other Measures

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 needs 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, Stage 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 stage. 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. Please see the attached diagram for full details at each leg

Wind Management

This wind management advice is based on an extract from Temporary Demountable Structures published by the Institute of Structural Engineers (4th Edition).

The operational maximum gust speed should be taken as a three second gust measured 10m above ground level

Two levels of warning are suggested.

Level 1; When wind monitoring registers a gust wind speed in excess of 75% operational maximum gust speed in conjunction with an increasing general trend of recorded wind speed. Staff to be put on alert that action may be required. If erection in progress consideration to be taken whether to delay erection.

Level 2; When wind monitoring registers a gust wind speed in excess of 90% of operation maximum gust speed in conjunction with an increasing trend in wind speed the operational management plan should be implemented and the site secured against access by the public.

If an isolated gust exceeds either limit against a background of a decreasing trend in wind speed then further monitoring may be appropriate

CC structures	Design wind speed (mph)	Level 1 75% alert level (mph)	Level 2 90% action level (mph)
9.0m span Ellipse stage	48	37	43

When Level 1 is reached the structures should be checked to ensure that all stakes and ballast are firmly in place and that all openings are securely closed. Consideration should be given to providing additional forms of protection by adding additional guying where possible

When level 2 is reached evacuation is necessary for all but safety critical staff

What to do If wind speeds exceed design speed of structure

If forecasts are predicting that wind speeds will be above those that the stage is designed for, and there is sufficient time, then the structure should be taken down and stowed safely as it normally would.

If the conditions occur whilst the structure is in use, the priority is to evacuate everybody to a safe distance upwind of the stage.

If the conditions allow, the PVC roofs and gables should be removed first to stop the aerofoil effect of the PVC skin. Walls can be removed afterwards to stop the side force applied. If the roofs are missing in high winds, it is possible for the purlins to be blown out of their brackets so it is essential that the structure is cordoned off and only trained staff with the necessary PPE can enter the area until it can be made safe.

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If conditions are so extreme that it is not possible to remove the PVC covers as normal, then they can be cut out with a sharp bladed knife around the keder. This may release sheets of PVC to be blown downwind, but is preferable to allowing the framework to fail as this can do considerably more damage.

Aluminium & PVC Structures

Technical Specification 9m Ellipse stage 94 x 48mm profile

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

Structural steelwork:	BS EN 1993
Structural aluminium:	BS EN 1999
Wind loading:	BS EN 1991
Stage and Production areas	CWA 15902-02

Material Specification	Steelwork:	Mild Steel (Grade S275)
	Aluminium:	Alloy (Grade 6005A T6)

Design Conditions The combined structural framework has been designed to safely withstand the imposed factored loading arising from a design wind speed of 21.5 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 9m Ellipse Stage

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
Bracing (vertical)	35mm x 40mm x 2.5mm
Bracing (Wires)	6mm dia. wire rope