

REF: SC/10/077
October 2010**TEMPORARY EVENT STRUCTURES: 'SADDLE SPAN' TYPE TENTS****Background**

The use of sophisticated temporary structures is becoming more common at public events such as music festivals. One such type of stage structure is the 'saddle span' type tent.

In this note 'sophisticated' refers to the critical nature of the structural installation in relation to the manufacturers design, and also the operational management on site, in order to ensure its stability against adverse conditions.

1 General issues

Readers are reminded of the SCOSS Topic Paper issued in February 2008 on 'Risk issues associated with large TV/Video screens at public event' (<http://www.scoss.org.uk/publications.asp>).

Although, as the name implies, this related to a particular form of outdoor structure, many of the points made are applicable to all temporary structures. In particular:

- i) the legal requirement to engage competent organisations
- ii) the obligation to adopt a safe system of work. Within this requirement lies an implicit obligation to allow sufficient time to complete tasks safely. Unrealistic timescales are likely to lead to difficulties and those imposing them are likely to attract some responsibility.
- iii) the essential need for good communications and clarity of responsibility
- iv) the need for adequate and clear data from the suppliers of proprietary equipment, tents and other items.

The adequacy of the manufacturer's data includes aspects such as:

- Clarity of information (e.g. the avoidance of poorly reproduced drawings containing too much information within the space available)
- Avoidance, without sufficient explanation, of quotes from, or use of foreign codes of practice or other working references.
- Clear indication as to whether any loads given are 'ultimate (failure)' or 'working' loads.
- Clear definition of wind speeds (see below)

Where the structure is sophisticated, as saddle span type tents are, it is essential that the manufacturer's data is given in adequate detail and presented in a clear manner.

The Institution of Structural Engineers' publication 'Temporary Demountable Structures' and the Health and Safety Executive publication 'HSG 195: 'The Event Safety Guide' are also essential and authoritative guides to the safe use of temporary structures.

CROSS published details of a lightweight structure which failed in the 18th Newsletter, April 2010 (<http://www.cross-structural-safety.org/newsletters/>).

2 Saddle span type tented structures

Saddle span type tented structures appear to provide effective solutions to the needs of event organisers. However they require careful design, erection and management. In particular:

- i) The alignment of the tent roof and the tent's orientation to the prevailing wind
- ii) The positioning and spacing of the anchors
- iii) The adequacy of the ground, and subsequent assessment of ground anchorages, at the anchor locations over the duration of the event
- iv) Assessment of imposed loading on the roof
- v) The competent management of the facility: planning, erection, in use and dismantling.

All these points are particularly critical to the safety of this style of tented structure. Specifically however:

Ground fixings

Saddle span type tents are wholly reliant upon robust ground fixings for their stability. It is essential that:

- i) they are positioned in accordance with the manufacturer's recommendations
- ii) their capacity, over the period of use, is adjudged by those with appropriate structural engineering competence.
- iii) appropriate allowance is made for any reduction in capacity if the weather is likely to be adverse.
- iv) their performance is monitored e.g. by use of paint markers, to identify any movement.

The criticality of the ground anchors for this style of tent means that traditional subjective assessments of the ground may not be satisfactory and the advice of competent persons e.g. structural engineer competent in this field of work, in conjunction with a soils investigation may be required. This has programming and cost implications.

Management

Whilst all the general points made above in Section 1 apply to these tents, there are some specific issues which require particular attention, viz:

- i) the required orientation of the saddle span type tent may affect the layout of the entire site and hence must be considered by all relevant parties and finalised at the preliminary site planning stage.
- ii) the criticality of the erection and management in use must be reflected in the procurement and competency of those involved.
- iii) the design must be independently checked and any variation must be formally approved by appropriate persons.
- iv) the event safety management plan (ESMP) must be comprehensive and up to date.

Management based on limiting wind speeds

It is common practice to base the safe use of temporary event structures on a limiting wind speed. In these cases it is essential that:

- i) the limiting wind speed is clearly defined i.e. is it a mean, or a gust (of specified duration)?
- ii) the wind data source is representative of the site.
- iii) the required accuracy of the data, for safety purposes, is compatible with the achievable accuracy of measurement in the field or from local forecasts.
- iv) the adopted period allows for any possible increase in the time the tent remains erected
- v) there is a robust wind management action plan included within the ESMP.

It should be noted that the effect of an error in the measurement of the wind speed is 'squared' in terms of the increase in wind force. For example, an error of 10% in reading the wind speed could increase the wind force on the tent by 22%. This could be sufficient to subsume a substantial portion of the safety margin on many designs as wind may be the dominant action.

Use in conjunction with other structures

It appears that tented structures are occasionally placed on stage structures in order to obtain greater headroom than would be the case by placing the stage structure on the ground within the tent. Such an arrangement will require careful consideration and should not proceed without adequate information and design checks on both tent and stage.

Other References

Safe Use and Operation of Marquees and Temporary Structures
MUTA June 2009