CROSS Safety Report

Rotting plywood decking on grandstand

As the summer event season gets under way in the UK, we present a safety report highlighting the need for robust inspections of temporary demountable structures.

Overview

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Report

This report is from a firm that undertakes visual structural inspections of temporary demountable grandstands for a number of sporting venues in the UK. Although temporary in nature, these structures can remain standing for a number of months exposed to the elements. In some cases, it is known that venues utilise them as permanent structures.

While there are several providers of these stands, the structural form is largely similar. In general, they are found to comprise aluminium raking beams spanning between a proprietary scaffold framing system. Spanning horizontally between the raking beams are further aluminium sections that act as the riser and support both the seat modules and terrace decking. Of the stands inspected, the terrace decking comprised coated plywood deck sections.

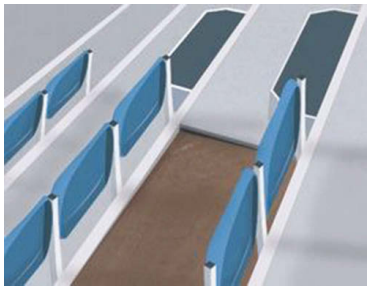
During an inspection of a temporary grandstand in the summer of 2021, a decking board **(Figure 1)** failed when it was walked upon. On closer inspection, the board had failed in shear as a result of it being rotten. It is believed that this occurred because moisture had become trapped within the ends embedded in the aluminium edges and over time the plywood had degraded.

Other boards failed to a lesser degree during the inspection. The reporter noted that a single person walking over the boards provides significantly less load than they are subjected to in service. The reporter was therefore concerned there is a risk that defects could go undetected during pre-occupation inspections, only to manifest themselves once the boards are fully loaded, potentially with serious consequences. Indeed, the reporter's firm found defective boards at other venues in 2020 and 2021 and was also aware of further incidents where boards had failed in service.

The reporter notes that once the boards have been installed, it is very difficult from a visual inspection to check the condition of the plywood embedded within the trim. Adequacy of the deck boards was therefore almost totally reliant on pre-inspection procedures of the installers, which on the stand concerned had apparently failed, leaving the stand not safe for use.

The reporter concludes that it would be beneficial if the various stand suppliers/installers could work together to develop a coordinated approach to the management of these types of structures. Robust pre-inspection regimes or, indeed, *in situ* tests need to be developed which are backed up with comprehensive audit trails that clients and event organisers can rely on.

↓FIGURE 1: Illustration of damaged ply boarding



Expert Panel comments

In procuring a demountable structure, the client will more than likely have specified the use of the structure and the duration of such uses. Demountable structures are usually designed to be easily erected and dismantled, and are capable of adaptation to different situations. This often means that they are relatively lightweight, made from slender components and need to be erected and inspected before each use by competent persons.

Demountable structures may be designed to be in place, or in use, for

Key learning outcomes

For clients, event organisers, suppliers and inspectors of temporary grandstands:

- →| Inspection regimes should take into account how long a structure has been standing, or has been in storage, since it was last dismantled and checked
- →| Consider the potential for degradation of all elements and check for hidden defects, particularly in timber decking
- →| *Temporary demountable structures: Guidance on procurement, design and use* provides significant guidance
- →| Stand suppliers should be aware of the potential for hidden degradation at the edges of plywood decking

> **IT IS A REQUIREMENT THAT COMPETENT PERSONS ARE EMPLOYED TO DESIGN, ERECT, INSPECT AND DISMANTLE ANY SUCH STRUCTURE**

a short time (generally no more than 28 days) and erected and dismantled regularly. When the structures are dismantled and next erected, an inspection of all elements is possible.

Demountable structures are by their very nature intended to be demountable and are designed as such, potentially for differing loadings to permanent structures. Leaving a temporary structure permanently erected may mean it is used in a manner not envisaged by the designer/manufacturer. Proprietary temporary systems should be used in accordance with the manufacturer's instructions.

Inspection and testing methodologies

In any structural system where degradation is a risk, as it clearly is with exposed timber, the features at risk should ideally be 'inspectable' and not hidden. It is, after all, not possible to assure safety if degradation can progress to become dangerous without becoming obvious.

It appears the immediate cause of the floorboard failure, in this case, was the rot eroding the board's resistance to shear at the supporting edges. Metal trims on plywood boards can promote water ingress and the retention of water which enables fungal attacks of the plywood. Such degradation of the plywood may not be readily discoverable.

In inspecting a stand, the engineer should assess areas of potential weakness; design documentation may be helpful to identify areas of potential concern. A visual inspection may be insufficient since, as in this instance, the area of weakness was not obvious. Deflections can be used to predict a potential failure due to bending; however, shear failures would be sudden with minimal deflection. Simply walking over boards to assess deflections may therefore be insufficient.

However the inspection and testing are undertaken, they must be sufficient to find the areas of concern highlighted by the reporter and other potential faults. Those inspecting grandstands could consider whether their testing and inspection processes are adequate, taking account of pertinent factors such as local weather, exposure, time since last dismantle and full inspection, manufacturer's recommendations, usage and potential for material degradation including hidden defects. The potential for degradation of materials that have been stored damp, wet or externally should be taken into account.

Stand suppliers should be aware of the susceptibility of plywood edges to hidden degradation. Where short-life elements including timber deck boards are concerned, it may be that an 'element life' marking system could be implemented if not already put in place by the grandstand manufacturer. While it was the decking board that failed in this instance, clearly, inspections should assess all elements of the structure.

The Institution of Structural Engineers has published a guidance note, *Procurement and use of demountable structures*, that provides a brief overview of these structures and also directs people to where further detailed information and advice can be sought. The guidance note reminds people of their legal responsibilities when procuring and using temporary demountable structures for events. It is a requirement that competent persons are employed to design, erect, inspect and dismantle any such structure.

Fuller and more detailed technical guidance is available through the Institution's publication *Temporary demountable structures: Guidance on procurement, design and use*, which also addresses testing and inspection of temporary structures. It should, however, be noted that this guidance is primarily aimed at demountable structures which are designed as temporary structures for short-duration use.

General advice is also given in the HSE publication *Temporary demountable structures (TDS) - stages, seating, marquees etc* and, more recently, the Advisory Group on Temporary Structures (AGOTS) has put together brief guidance for landlords, local authorities and event organisers: *Temporary demountable structures - Winter 2020/21 considerations*.

The use of a structure on a more permanent basis is a different proposition and requires an appropriate assessment to appropriate standards by competent persons.

It will normally be the case that public liability insurance at the venue will at least be contingent upon adequate schemes of design, erection, maintenance and inspection.

The full report, including links to guidance mentioned, is available on the CROSS website (report ID: 1092) at **www.cross-safety.org/uk/safety-information/cross-safety-report/rotting-plywood-decking-grandstand-1092.**

What is CROSS?

Collaborative Reporting for Safer Structures (CROSS) helps professionals to make structures safer by publishing safety information based on the reports it receives and information in the public domain.

CROSS operates internationally in the UK, US, and Australasia. All regions cover structural safety, while CROSS-UK also covers fire safety.

How reporting to CROSS works

The secure and confidential safety reporting system allows professionals to share their experiences to help others.

Professionals can submit reports on safety issues related to buildings and other structures in the built environment. Reports typically relate to concerns, near misses or incidents. Find out more, including how to submit a safety report, at https://bit.ly/cross-safety. Your report will make a difference.

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