BS EN 13200-6:2012

BSI Standards Publication

Spectator facilities

Part 6: Demountable (temporary) stands

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National foreword

This British Standard is the UK implementation of EN 13200-6:2012. It supersedes BS EN 13200-6:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/552, Spectator facilities.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Zuschaueranlagen - Teil 6: Demontierbare (provisorische) Tribünen

This European Standard was approved by CEN on 13 October 2012.

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Foreword

This document (EN 13200-6:2012) has been prepared by Technical Committee CEN/TC 315 “Spectator facilities”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2013, and conflicting national standards shall be withdrawn at the latest by June 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13200-6:2006.

Compared with the previous version, the scope of the present document has been changed in order to exclude stands of moveable type in which the last row of places for spectators is less than 1 m height from the ground.

This European Standard (EN 13200), with the general title “Spectator facilities”, is divided into seven parts:

— EN 13200-1, *Spectator facilities — Part 1: General characteristics for spectator viewing area*;

— CEN/TR 13200-2, *Spectator facilities — Layout criteria of service area — Part 2: Characteristics and national situations*;

— EN 13200-3, *Spectator facilities — Part 3: Separating elements — Requirements*;

— EN 13200-4, *Spectator facilities — Part 4: Seats — Product Characteristics*;

— EN 13200-5, *Spectator facilities — Part 5: Telescopic stands*;

— EN 13200-6, *Spectator facilities — Part 6 : Demountable (temporary) stands*;

— prEN 13200-7, *Spectator facilities — Part 7: Entry and exit elements and routes;*

— prEN 13200-8, *Spectator facilities — Part 8: Safety Management;*

— prEN 13200-9, *Spectator facilities — Part 9: Communications systems in spectator facilities*.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard has been prepared in order to specify the general design criteria for spectator facilities (permanent, movable, demountable and telescopic), with the purpose of enabling their functionality.

Within this standard, minimum and recommended values for dimensions are occasionally presented. It should be recognised that these values are to be considered as values that, in part, recognise different national requirements as a basic provision.

Attention is drawn to the fact that in certain countries additional/different requirements may be applicable due to existing national regulations or the equivalent.

1 Scope

This European Standard specifies product characteristics for demountable (temporary) stands at permanent or temporary entertainment venues including sports stadiums, sport halls and indoor and outdoor facilities. Stands in fairgrounds and amusement parks are excluded from this standard (see EN 13814).

This European Standard is not applicable to stands of moveable type in which the last row of places for spectators is less than 1 m height from the ground.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1991-1-1, *Eurocode 1: Actions on structures — Part 1-1: General actions — Densities, self-weight, imposed loads for buildings*

EN 1991-1-4, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

EN 13200-1:2012, *Spectator facilities — Part 1: General characteristics for spectator viewing area*

EN 13200-3, *Spectator facilities — Part 3: Separating elements — Requirements*

3 Terms and definitions

For the purposes of document, the terms and definitions given in EN 13200-1:2012 and the following apply.

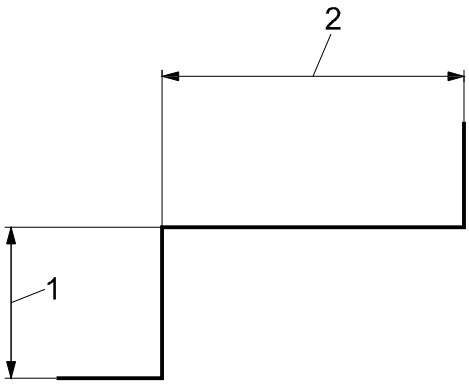
3.1
demountable (temporary) stands
tiered system constructed from standardised components that can be erected and dismantled, moved from place to place and deployed in various configurations both indoors and outdoors to produce standing or seating accommodation for spectators

3.2
design documentation
documents provided by the designer of demountable (temporary) stands that ensure that the basis of design may be clearly understood and from which all design criteria can be verified

3.3
guard rail
safety barrier fitted to the sides, rear or front of a grandstand or within the seating area in order to protect users from falling

3.4
handrail
component designed to protect and assist the passage of users of the grandstand

3.5
riser
vertical component between one row and another row or landing above or below it (see Figure 1)



Key

1 riser

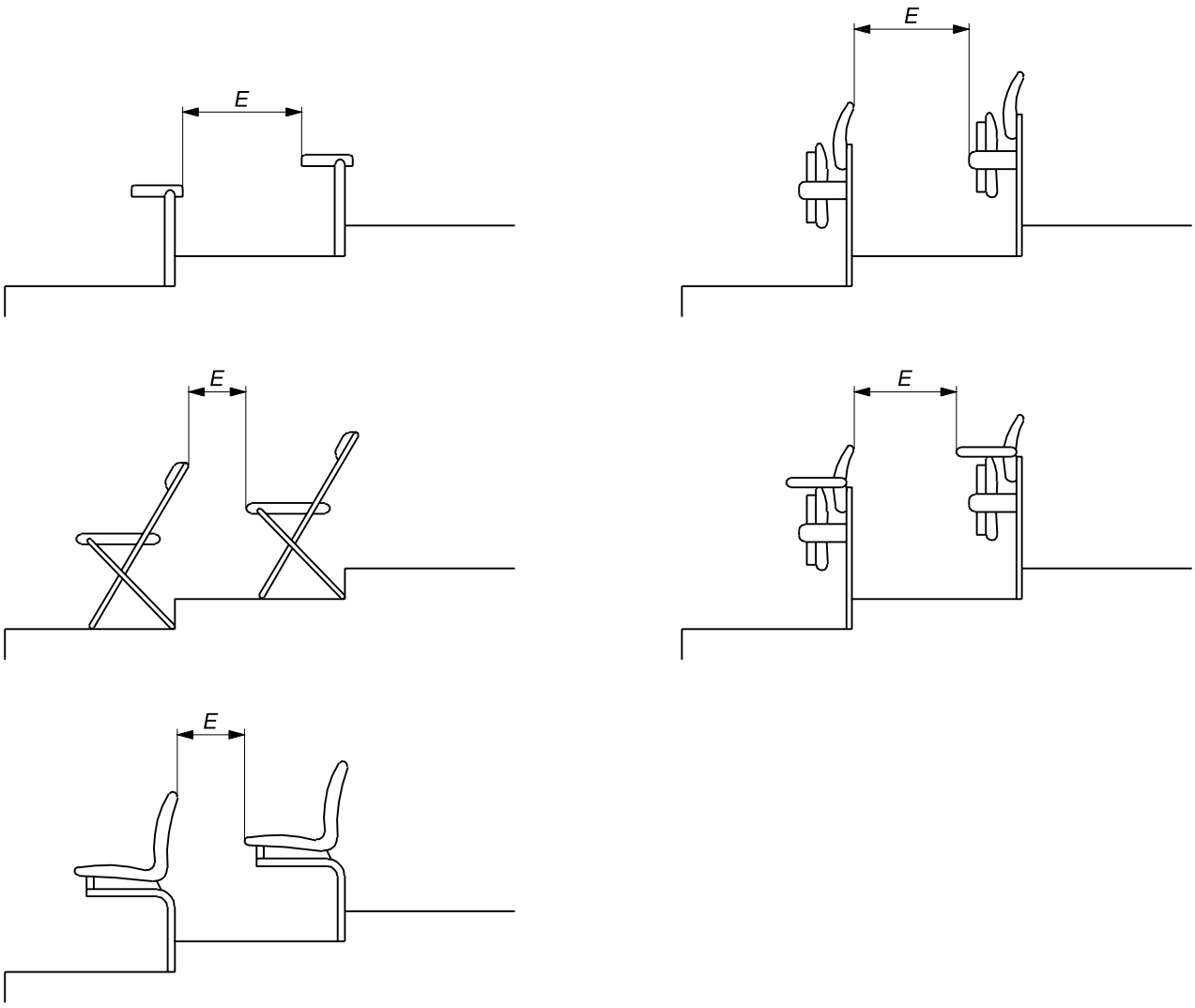
2 row depth

Figure 1 — Riser

3.6
row depth
horizontal distance between successive risers (see Figure 1)

3.7
seat-way
clearway
clear space measured at right angles between perpendiculars

Note 1 to entry: See Figure 2: In all the following cases, the minimum value of the seat-way ‘E’ is 350 mm and the recommended minimum value is 400 mm.



Key
E clearway

Figure 2 — Seat-way

3.8
tread
horizontal component of a step

3.9
vomitory
access route built into the gradient of a stand which directly links spectator accommodation with routes for ingress, egress or emergency evacuation

3.10
stands of movable type for spectators
light stands, composed of prefabricated modules, each module being designed to be used independently from one another and to be moved and lifted manually in upright position for storage

4 Materials requirements

Demountable (temporary) stands incorporate elements from a range of materials including steel, aluminium, timber, plywood, paints and plastic components. Where materials, components and methods of design and construction are not specifically covered by CEN Standards, the designer should be satisfied that the materials and methods to be employed are such as to ensure sufficient levels of safety, durability, integrity, strength, serviceability and performance. Alternatively, a test assembly should be built to test the structure, component, material or method under consideration. The test assembly should be representative as to materials, workmanship and details of the design and construction for which approval is sought.

5 Design

5.1 General

Demountable stands shall fulfil the national requirements for fire escape and emergency evacuation.

Demountable (temporary) stands may be described as a seating or standing deck of a stepped tiered nature supported by a substructure possessing large numbers of common elements.

Demountable (temporary) stands are used for a wide spectrum of events both indoors and outdoors ranging from minor local events to major international events seating thousands of spectators.

A seating place is required to provide a minimum viewing standard together with a sufficient level of safety for the spectator body. Viewing standards refer to the ability of a seated spectator to see a predetermined focal point in the activity area. This viewing standard is often referred to as a sight line.

The layout of the seating deck and the geometry of the deck are required to provide for the safe ingress and egress of spectators.

Protective barriers at the perimeter of the seating deck and within the seating layout provide protection against falling.

The supporting structure is required to safely resist the static and dynamic forces created by the spectator body and other dynamic forces that are required by applicable national standards.

Criteria concerning sightline, layout and protection from falling are similar to permanent and temporary seating decks. The nature of vertical support of permanent and temporary seating decks is significantly different as is the ratio of live load to dead load.

For demountable stands manufactured before the publication of this standard, a written risk assessment shall be necessary to justify a departure from the minimum values.

5.2 Sightlines

Requirements and recommendations pertaining to sightlines are given in EN 13200-1.

Where sightlines resulting from the installation of temporary seating do not meet the standards required for permanent seating, the matter should be dealt with by a risk assessment made by the contracted provider of the installation.

5.3 Basic specification

5.3.1 General

Where demountable stands are used outdoors and in the absence of applicable national standards, the spectator body should be able to reach a place of relative safety in eight minutes.

Where demountable stands are used in enclosed areas, relevant national fire requirements will normally specify maximum travel distances for a user of the stand. A travel distance shall be measured along the route defined by rows and passageways.

Seats are to be of constant depth throughout the length of a row. Where the seats tip-up automatically the width of the clearway should be measured between the back of one seat unit and the maximum projection of the seat unit behind when the seat is in the upright position.

With respect to relative lateral positioning, seat centres should be a minimum of 450 mm apart for seats without arms and a minimum of 500 mm for seats with arms.

In tiered seating blocks, the riser height of steps in passageways should not exceed 200 mm. The recommended maximum riser height is 170 mm.

The minimum riser height or step height is 100 mm. The riser height should be uniform throughout the access stairs and preferably be uniform with connecting stairs.

Closed risers are preferred and should be designed to minimise any tripping hazard.

5.3.2 Row depth

Requirements and recommendations are given in EN 13200-1.

5.4 Loading

5.4.1 Self weight

Self-weight is calculated from the unit weights given in EN 1991-1-1 or from the actual known weights of the material used.

5.4.2 Imposed vertical loads

EN 1991-1-1 considers various categories of loading appropriate to the type of activity/occupancy for the part of a building or structure.

Loading ranges are given in EN 1991-1-1. The following recommended loading values are given in **bold number**.

Category C concerns **Areas where people may congregate**.

Category C2 concerns areas with fixed seats. The imposed loading range is:

Uniformly distributed load 3,0 kN/m^2 to **4,0** kN/m^2.

Category C5 concerns areas susceptible to overcrowding and includes stands. The imposed loading range is:

Uniformly distributed load **5,0** kN/m2 to 7,5 kN/m2.

All floors should be designed to carry the uniformly distributed load derived using appropriate load factors.

Vertical imposed loads shall be taken into account as quasi-static actions (see EN 1990). The load models may include dynamic effects if there is no risk of resonance or other significant dynamic response of the structure (see Eurocodes Standards).

Overcrowding is considered to be greater spectator occupancy of a space than would arise during expected use.

Concentrated loading can arise from spectators jumping from a standing position on seats and may need to be considered as a design requirement. EN 1991-1-1 gives concentrated loads and their manner of application for categories C2 and C5. It is considered that in many cases the concentrated loads given in EN 1991-1-1 will not necessarily apply to demountable stands. The appropriate concentrated loads for demountable stands should derive from consideration of the intended use, a recorded risk analysis and national requirement.

5.4.3 Isolated loads

The floor or bench components of a demountable stand shall be capable of withstanding isolated loads of 1 kN spaced according to an 0,50 m orthogonal grid. For purposes of design, the area of application of an isolated load shall be 0,20 m × 0,20 m.

5.4.4 Horizontal loads

Demountable stands are subjected to horizontal loads induced by spectator actions. In addition, geometrical imperfections of frames, such as lack of alignment of vertical members which transfer loads from the deck to the ground are likely to be present. In order to accommodate both of these factors, notional horizontal loads may be applied to ensure that the structure can resist horizontal loads induced by spectator actions.

A notional horizontal load of **6%** of the vertical imposed load shall be adopted.

Normal deflection criteria in terms of span and overhang shall apply. The ratio of deflection to appropriate span or overhang should not be more than **1:200**.

Partial factors for dead and imposed loads for use in the limit state design of stands should correspond to the structural codes of practice relevant to the material. For notional horizontal loads, the partial factor should be 1,5 for the load combination case with factored values of self-weight and imposed loads.

The notional horizontal load should be combined with the operational wind load (exterior use only) for designing the structural elements of a stand.

The stated loads should be considered as the minimum values to be adopted.

For the design of structural elements, the previously stated loading values should be used in accordance with the relevant standards.

NOTE Demountable stands are relatively flexible structures which will respond dynamically to spectator movements.

The manner in which the designer of any structure likely to be subject to dynamic excitation has considered this matter should be apparent in the design documentation. The possibility of resonant excitation should be considered in accordance with EN 1991-1-1. Where appropriate, specialist advice should be sought.

Consideration should be given to any potential seismic risk.

5.4.5 Wind loading

For purposes of deriving the wind loading on temporary structures, EN 1991-1-4 shall apply.

This standard requires that wind loads shall be calculated for the whole structure, i.e. components, cladding units and their fixings.

The national annexes of EN 1991-1-4 recognise the variations in the European wind climate. The design of a temporary structure shall satisfy the national annex applicable to any location where the structure is used.

Temporary stand structures are likely to be used in a variety of locations where differing wind environments will apply. A number of design approaches are possible:

a) Design the stand and necessary anchorage for the worst wind loading environment.

b) Design each stand and necessary anchorage specifically for the site of intended use.

c) Design a standard system and necessary anchorage for use up to a maximum operational wind speed which can withstand possible maximum wind speeds, when occupied or unoccupied, without experiencing structural failure, overturning or the dislodgement of component parts.

A method statement should define arrangements for monitoring the wind speed and for ensuring the safety of persons in and around the structure if the operational wind speeds are exceeded.

In the design of the structural components and necessary fixings, the components should be designed in accordance with the relevant material code and the appropriate partial factors.

With respect to overturning as a result of wind, the 'worst case' load combination of dead, imposed and wind loading should be considered and against this combination a margin of safety of not less than 1,5 against overturning should be provided:

1,5 x overturning moment < restoring moment

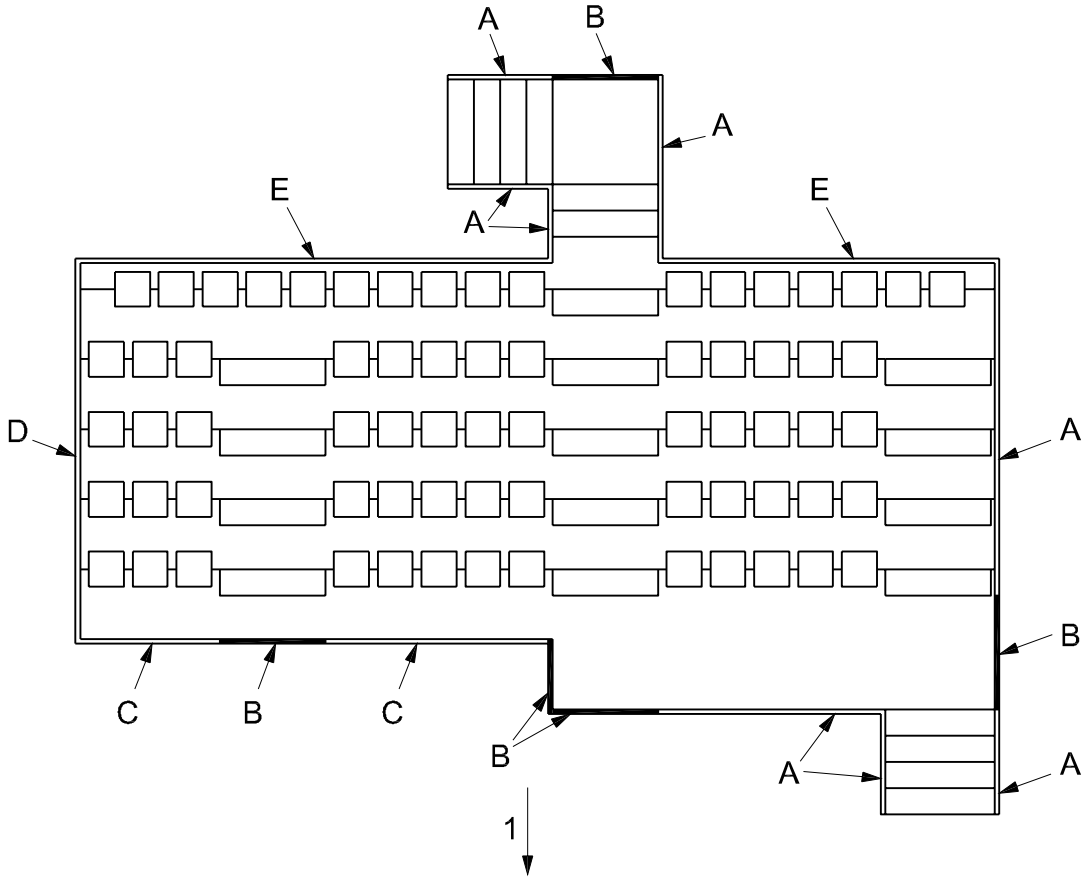
For demountable stands using components manufactured prior to 2004, a written risk assessment shall be necessary to justify any departure from minimum values stated in this standard.

5.5 Provision for people with disabilities

The provisions given in EN 13200-1 are applicable.

National building regulations require provision to be made for all people, including those with disabilities, at spectator events. It is necessary that these requirements be given due recognition in the provision of demountable accommodation in all types of facilities.

5.6 Protection against falling



Key

A barrier type A
B barrier type B
C barrier type C
D barrier type D
E barrier type E
1 direction of view

Figure 3 — Small elevated seating structure

Figure 3 is a plan view of a small elevated stand providing seating accommodation. The characteristics of different types of barriers are given in Table 1.

Table 1 — Type of barriers

Barrier type reference	Barrier type description	Value or recommended range of values of imposed loads (KN/m length)
Type A	Provides for the safety of individuals moving along a gangway or using a stairway in a direction parallel to the guardrail.	2,0 to 1,5
Type B	Provides for safety of individuals subjected to forces arising from spectators moving in a direction perpendicular to the guardrail direction. Individuals in a gangway or on a stair can create considerable horizontal forces on this guardrail through pushing or as a consequence of a domino collapse down the gangway or stairway.	3,0 to 2,0
Type C	Provides for the safety of individuals entering and exiting seats in the front row.	1,5
Type D	Provides for the safety of an individual occupying a seat adjacent to the guardrail.	1
Type E	Provides for the safety of individuals at the rear of the stand.	1

It is recommended that any element of a stand should be constructed such that a 100 mm diameter sphere cannot pass through any part, the maximum diameter of sphere that cannot pass through any part being 120 mm.

The minimum height of a guardrail is 1 m and the recommended height is 1,1 m.

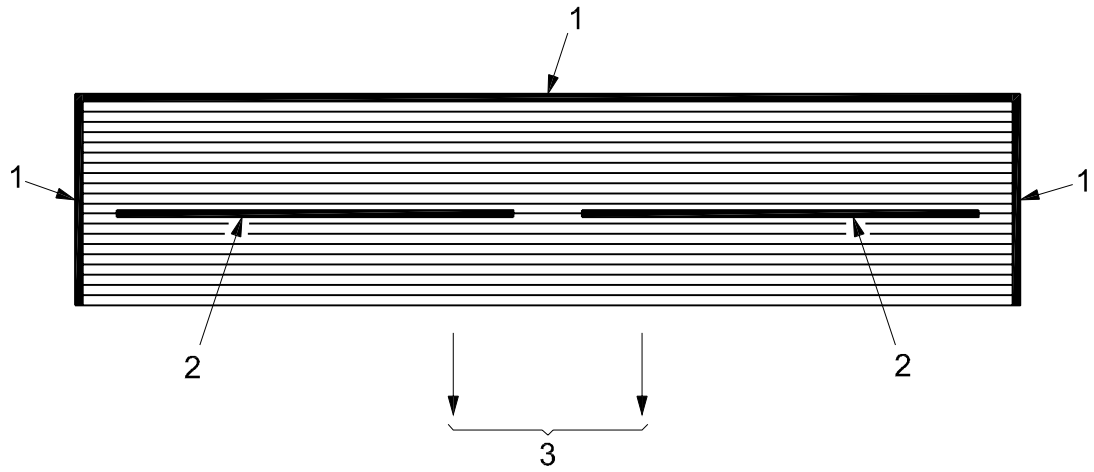
Guardrails that interfere with sightlines can be reduced to a height of 800 mm other than where they protect spectators in a passageway or lateral passageway. If a guardrail height of less than 900 mm is used a risk assessment is mandatory.

Rear guard rails, the height of the guardrail is 1,1 m as measured from the seat level.

5.7 Demountable standing accommodation

Standing accommodation may be provided by a demountable structure, schematically illustrated in plan in Figure 4, in order to enhance viewing.

The accommodation provided shall be considered as Category C5.



Key

1 type G
2 type F
3 direction of view

Figure 4 — Standing accommodation

The criteria and recommendations given in EN 13200-1 and EN 13200-3 shall apply with regard to riser and tread geometry, barrier loadings and guardrail configuration.

The guardrail configuration may comprise multiple rows of guardrails; the characteristic loading for such guardrails should be ascertained, taking into account the geometry of the stand and the nature of its proposed use.

In the absence of an appropriate risk assessment, guardrail types G and F are required to resist a characteristic loading of 3 kN/m (type B).

Where the nature of the spectator body is considered as a design factor this shall be recorded in the risk assessment associated with the use of the structure.

Annex A
(informative)

Procurement, erection and dismantling of demountable (temporary) stands

A.1 General

Demountable stands may be considered in two categories:

1) Demountable (temporary) stands that are purchased.

2) Demountable (temporary) stands that are hired for a single event.

The hiring contractor is not necessarily the manufacturer of the stand.

With reference to the second category, the procurement, erection, use and dismantling of demountable (temporary) stands may be beneficially viewed as a product characteristic in order to properly consider spectator safety. This annex primarily considers guidance pertinent to Category 2.

Spectator accommodation, both indoors and outdoors provided by demountable (temporary) stands and seating is required to provide levels of safety equal to permanent spectator accommodation.

The design of demountable (temporary) stands should be the responsibility of a competent person and the design should be independently checked by a chartered engineer of appropriate skill and experience.

A demountable (temporary) stand will often need to be procured, erected, used and dismantled in a much shorter time scale than a conventional structure and this factor needs to be understood and properly addressed by all interested parties in order to ensure adequate provision of safety.

A.2 Principal responsibilities

The manufacturer or supplier of a demountable (temporary) stand should be considered as responsible for ensuring that the design satisfies the applicable design codes of practice. Design calculations and an appropriate method statement for the erection and dismantling of the stand should be available upon request.

The procurement of a demountable (temporary) stand and its use should be an integral part of the planning, management and supervision of the event for which it is required. It is the client's responsibility to provide demountable (temporary) stands that are fit for their purpose.

A risk assessment, including a fire risk assessment, of the proposed use of the demountable (temporary) stand should be made. Once the structure has been handed over, responsibility for managing the structure prior to and during use passes to the client.

An event organiser has a responsibility to ensure that competent persons are employed to design, erect, inspect and dismantle the demountable (temporary) stand. Competent technical advice should be sought where necessary.

A.3 Specification of requirements

The event organiser should provide the hiring contractor for the demountable (temporary) stand with a written technical specification of requirements, namely:

— site of the event and location of the stand at the site;

— nature of the event and spectator body;

— timetable for supply of the stand;

— accommodation required on the structure;

— site access;

— support conditions.

The division of responsibility should be clearly understood by all parties involved in the management of a stand. The responsibility for design and erection of a stand and safe placement should rest with the contractor.

The erection and dismantling after use should be carried out by competent persons. Design calculations and drawings together with the independent design check should be made available to the client.

The event organiser is responsible for satisfying any regulatory conditions relating to the use of a stand.

Ready availability of documentation can assist all parties.

The provision of lighting for normal and emergency use may be a necessary consideration. Electrical installations in demountable (temporary) grandstands should be adequately earthed in accordance with normal standards.

A.4 Ground and site conditions

Demountable (temporary) stands are used in a wide variety of situations both indoor and outdoor. The means of support for a demountable (temporary) stand, be it an existing structure or ground, is a necessary consideration, and bearing pressures shall be within acceptable limits. The designer should specify the foundation loads on the erection drawings including any uplift forces and lateral loads. Adequate resistance to sliding and uplift should be provided. A minimum safety factor of 1,5 should be applied to the characteristic loads for sliding and uplift. Where there is a calculated net uplift, (applying a safety factor of 1,5 on disturbing forces and 1,0 on resisting forces) a fixing to the ground should be provided using ground anchors or ballasts. The design calculations would be required to consider the ramifications of any fixing procedure.

A.5 Erection

An Erection Method Statement with necessary drawings including a site plan should be available during assembly of any demountable (temporary) stand. The drawings should be detailed enough to enable the main structural components, including connectors to be identified. Components should be marked wherever possible in a manner that is not detrimental to structural performance. The assembly tolerances should be specified by the designer.

For system scaffolds and modular seating units, the manufacturer’s recommendations for tolerances of assembly should be followed.

A.6 Inspection

Inspection is essential to maintain the safety and integrity of demountable (temporary) stands. Inspections are required at various stages and the responsibilities of the client, contractor and any regulating body should be evident in the contract documentation. The client should be provided with a full set of erection documents. All inspection work shall be recorded. Specific reference should be made to remedial measures that have been identified and to dates agreed for carrying out of repairs.

A.7 Dismantling

The dismantling of demountable (temporary) stands is important since the components are likely to be reused.

The safest dismantling plan will normally be to reverse the erection procedure. Minor damage to the structure may have occurred whilst in service and the damaged components should be clearly marked for ease of identification when dismantling. During dismantling, the contractor should examine all components for signs of wear, deformation or damage. Damaged components, or those with temporary repairs, should be set to one side for rejection or permanent repair off site.

Bibliography

[1] EN 1990, *Eurocode: Basis of structural design*

[2] CEN/TR 13200-2, *Spectator facilities — Layout criteria of service area — Part 2: Characteristics and national situations*

[3] EN 13200-4, *Spectator facilities — Part 4: Seats — product characteristics*

[4] EN 13200-5, *Spectator facilities — Part 5: Telescopic stands*

[5] EN 13814, *Fairground and amusement park machinery and structures — Safety*

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