BS EN 13200-1:2012

BSI Standards Publication

Spectator facilities

Part 1: General characteristics for spectator viewing area

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 13200-1:2012. It supersedes BS EN 13200-1:2003 which is withdrawn.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.

Published by BSI Standards Limited 2012

ISBN 978 0 580 74224 8

ICS 91.040.10; 97.220.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2012.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13200-1

August 2012

ICS 91.040.10; 97.200.10; 97.220.10

Supersedes EN 13200-1:2003

English Version

Spectator facilities - Part 1: General characteristics for spectator viewing area

Installations pour spectateurs - Partie 1: Caractéristiques générales des espaces d'observation pour spectateurs

Zuschaueranlagen - Teil 1: Allgemeine Merkmale für Zuschauerplätze

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

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13200-1:2012: E

Contents

Page

Foreword

This document (EN 13200-1:2012) has been prepared by Technical Committee CEN/TC 315 “Spectator facilites”, 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 February 2013, and conflicting national standards shall be withdrawn at the latest by February 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 13200-1:2003.

The significant changes with respect to this previous version (EN 13200-1:2003) are:

a) quality of figures improved;

b) new Clause 4 "Materials and technical installations" introduced;

c) requirements added in Clause 5 in order to cover places for spectators with special needs.

The European Standard EN 13200, “Spectator facilities” is divided into seven parts:

— EN 13200-1, *Spectator facilities — Part 1: General characteristics for spectator viewing area* (the present document);

— CEN/TR 13200-2:2005, *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*.

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, with the purpose of enabling their functionality. Within this European Standard, minimum and recommended values for dimensions are occasionally presented.

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

In certain countries, the minimum number of spectators is related to the application of this standard.

1 Scope

This European Standard specifies design and management requirements for spectator facilities at permanent or temporary entertainment venues including sport stadia, sport halls, indoor and outdoor facilities for the purpose of enabling their functionality.

This European Standard is not applicable to other permanent venues such as theatres, cinemas, opera houses, auditoriums, lecture halls and similar places where persons congregate.

NOTE Provisions for media facilities are not included in this standard.

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*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
spectator facility
area of congregation comprising an activity area, a viewing area and a service area

Note 1 to entry: A spectator facility includes all the spaces where the public assembles, indoors or outdoors, permanently or temporarily, views sports, entertainment or miscellaneous events (see Annex A).

3.2
activity area
area where the event takes place

3.3
viewing area
area from which the spectators view the event

Note 1 to entry: The viewing area includes stands for spectators seated, standing and with special needs, passageways and gangways necessary for circulation, vomitories for entry and exit.

3.4
service area
area where publically accessible utilities are found

Note 1 to entry: The service area includes toilets, first aid, cafeterias, souvenirs shop, including passages, concourses, ramps and stairs between the viewing area and the external area (see Annex A).

3.5
place
space in the viewing area needed for a safe and good view of the event taking place, which is for a spectator who is sitting or standing or a wheelchair-user

3.6
vomitory
element of passage that provides entry to or exit from the viewing area

3.7
stand
structure providing a viewing area

3.8
sector
unit of the viewing area comprising one or more similar blocks

3.9
block
unit of the viewing area comprising a number of rows between rear and/or front gangways and one or two lateral passageways

3.10
row
line of a number of similar and adjacent places for spectators that are laterally spaced

3.11
passageway
access route to a sector or block

Note 1 to entry: A passageway, on level ground, slope or stair, includes vomitory and gangway.

3.12
sightline
line joining the eye of a spectator and the point of interest on the activity area without optical interruption

3.13
point of interest
point on the activity area from which the sightline is linked to the eye point

3.14
design capacity
total number of spectators for which a spectator facility or some division of a spectator facility (block or sector) is designed

3.15
flow capacity
number of spectators that can safely pass through a given width of a space in a specified time

3.16
viewing slope
non-stepped sloping area providing standing accommodation for the spectator

3.17
place of safety
place where a person is no longer in danger from fire or other emergencies

3.18
external area
place external to the activity area, viewing area and service area intended to be used as public road, parking and passages for spectators

3.19
indoor facility
facility in which both the activity area and viewing area are covered and enclosed

3.20
outdoor facility
open facility or uncovered activity area

4 Materials and technical installations

4.1 General

The materials and technical installations shall be made in accordance with the law in force in each country and shall take into account the applicable European Standards.

4.2 Structures, finishes and furniture

Fire resistance requirements of structural elements shall be assessed in accordance with the requirements and test procedures established by the regulations in force in each country, regardless of the type of material structural elements are made of (e.g. concrete, clay, steel, solid wood, laminated timber, composite members).

The size, thickness and protections of the above-mentioned types of materials and the classification of the premises according to fire load shall be determined in accordance with the tables and methods specified by the regulations in force in each country. The applicable European standards shall also be taken into account.

Passages, stairs and steps of outdoor facilities shall be free from stagnation in case of rain and provide appropriate slip resistance.

NOTE The pavements of outdoor sports facilities do not require classification for the purposes of reaction to fire.

Chairs and other upholstered furniture shall belong to reaction to fire class 1 IM, whereas seats that are neither upholstered nor coated, and that are made of rigid combustible materials, shall belong to a reaction to fire class not higher than 2.

In indoor facilities where the viewing area is extended to the activity area, reaction to fire classification of pavements is needed.

If the pavements are made of combustible materials, they shall clearly be counted within fire load for the assessment of the fire resistance requirements of structural elements of sports facilities.

If devices are provided for actual improvement of overall safety conditions of indoor facilities and of indoor premises in outdoor facilities, such as effective gas evacuation systems installed with automatic fire detection systems and/or automatic sprinkler systems, the use of materials that belong to higher reaction to fire classes may be permitted.

4.3 Electrical installations

For the purposes of fire prevention, electrical installations:

— shall not be a cause of fire or explosion;

— shall neither keep the fire alight nor be a privileged way of spreading fire. The fire behaviour of structural members shall be compatible with the specific intended use of each of the premises;

— shall be divided so that possible failures do not bring the entire system out of order;

— shall have switching devices located in "protected" positions and shall be provided with clear indications of the relevant circuits.

The following safety equipment shall be provided:

— lighting installation;

— alarm system;

— detection system;

— fire-extinguishing systems.

Safety electrical power supply should be automatic with short interruption (< 0,5 sec) for signaling systems, alarm systems and lighting installations and with average interruption (< 15 sec) for water firefighting systems.

Battery chargers shall be automatic and shall be capable of being fully charged within 12 h.

The safety electrical power supply endurance shall allow safe conduct of rescue and turning off operations for the necessary time. The minimum endurance is established for each plant as follows:

— indication and alarm system: 30 min;

— emergency lighting: 60 min;

— water firefighting systems: 60 min.

Indoor facilities, outdoor facilities intended for night use and indoor premises of outdoor sport facilities shall be equipped with emergency lighting.

The emergency lighting shall ensure a lighting level not lower than 5 lx 1 m above the floor along exit routes; self-powered lamps that can ensure functioning for at least 1 h are allowed.

If an event takes place after sunset or lasts beyond sunset, spectator areas shall be fitted with lighting. Indoor spectator facilities and spectator viewing areas shall be fitted with lighting. For visual comfort of spectators rather than safety or emergency reasons, the lighting level shall be at least 10 lx.

NOTE For more information about lighting, see EN 12193 and EN 1838.

4.4 Spectator control devices

Where provided, a closed circuit television system (CCTV) shall allow the observation of the viewing area, service area and passageways of the facility, from a dedicated and attended room, as well as registration of relevant images.

The system shall also allow the recognition of an individual spectator during night-time events.

In general, a video surveillance installation that is capable of managing and controlling the flow of spectators inside and outside a sports facility implies the structural analysis of the sports facility.

Cameras for the protection of fan passageways and entrance/exit areas shall be deployed so that movements of people near the perimeter fence are always under control.

The number of cameras varies depending on the type of installation. The key requirement is to cover the entire viewing area.

CCTV may be extended to service and external areas.

An essential feature is the capability of the system to monitor real-time incidents that occur on the grandstands and outside, with a resolution that allows authorities to identify the responsible people.

The cameras should be placed on secure vibration-free points that are inaccessible to the public.

The speed of operation and then the rotation should be controlled to allow a 180° reorientation in few seconds.

4.5 Public address announcements

4.5.1 General

Concerning the public address system, it is important to ensure that the sound levels are suitably adjusted to take account of any changes during an event. This can be achieved automatically by the installation of an ambient noise sensing system. Where such a system is installed, it is important that it be fail-safe at maximum power.

Consideration should be given to occupational health through excessive noise.

4.5.2 Public address announcement and systems

It is essential that event holders facilitate spectator safety and that security authorities are capable of communicating clearly with spectators inside and outside the spectator facilities by means of a sufficiently powerful and reliable public address system.

Such a system should:

— have its control centre located in, or immediately adjacent to, the spectator facilities control room, in a position where the operator has CCTV coverage of the spectator facility;

— be capable of addressing messages exclusively to individual sectors of the spectator facilities, including banks of turnstiles, internal rooms, hospitality suites and blocks of seating;

— be capable of having its volume automatically increased to guarantee that messages will always be audible to spectators even when sudden increases in the crowd noise level occur.

NOTE For example the scoring of a goal during the delivery of a safety message would cause the volume level of the system to instantly and automatically rise above the surge in crowd noise levels.

— have an override which would permit the spectator facilities controller to cut in to any separate sound in the event of an emergency;

— have an emergency, alternative power supply which would ensure that the system remained operative without interruption in the event of a power failure for a minimum period of three hours.

4.6 Auxiliary power

It is essential that power be maintained to provide the continuous operation of all control point functions and of the selected communication systems in the event of a power failure, fire or other emergency.

Auxiliary power should therefore be provided, sufficient at the very least to enable emergency lighting and all other safety related installations to function for a minimum of three hours after the failure of the normal supply.

NOTE Examples include Public address system, CCTV, etc.

It is essential to test the necessary communication systems to ensure that they do continue to function normally when the auxiliary power takes over.

4.7 Scoreboards and videoscreens

The scoreboards and video screens within the spectator facilities are an important issue which shall be addressed at an early stage of the design process. The screens are to be placed in a location where they do not represent any risk to spectators.

They can be positioned to fill in open corner spaces between side and end of stands. They can also be situated on top of or suspended from a grandstand roof.

The principal determining factors when deciding the best position for the screen are:

— to provide optimal viewing for all spectators;

— to eliminate or minimise the capacity reduction caused by loss of seats;

— to be placed in a location where the screens do not represent any risk to spectators.

The scoreboards shall resume the main information delivered by communication or alarm systems. The scoreboards and video screen shall be used for displaying messages during emergencies and should be connected to an electrical installation with a three-hour standby power supply in the event of a normal power outage.

Scorebounds and video screens can be provided and used to record in written form the match result and provide short and simple public messages.

4.8 Orientation system

The signs inside and outside of the spectator facilities shall be included in the design.

Clear, comprehensive signposting shall be provided at the spectator facilities approaches, around and throughout the spectator facilities in order to show the routes to the different sectors. Prominent, clearly visible signage that guides spectators to exits, toilets, concessions, retail outlets, exits and other customer services should be provided.

Tickets should clearly identify the location of the seats for which they have been issued.

Information on the tickets should correlate with the information provided on signposts, both outside and inside the spectator facilities. Colour-coding of tickets can be used to support the entry process.

The design of the way finding system should meet the requirements of people with special needs (e.g. color contrast, size of information) and provide the information based on the two sense principle (e.g. tactile and visual, visual and audio).

NOTE For more information on graphical symbols, see ISO 7001.

5 Viewing area

5.1 General requirements

5.1.1 Standing places and seating places of the Viewing Area shall be located on a horizontal surface, a viewing slope or on rows of steps.

5.1.2 The viewing area shall provide unobstructed viewing of the activity area in all directions for each spectator.

5.1.3 An appropriate subdivision of the viewing area, in case of large groups of spectators, can be achieved by using separating elements. Each sector shall have its own entrances and/or exits. There shall be at least two exits in a subdivision.

5.1.4 All passageways and gangways of the viewing area may be on a plane or on an inclined plane or can be composed of steps with a recommended maximum rise of 200 mm and a recommended minimum tread of 250 mm. The maximum inclination however shall not exceed 35°.

5.1.5 All passageways and gangways shall also be designed so that people with special needs can move easily and self-sufficiently.

An increase in the inclination shall require a risk assessment.

5.2 Requirements for seating places

5.2.1 General

Seating places shall be clearly numbered and similarly seating rows shall be clearly labelled.

The labelling should meet the requirements of people with special needs (e.g. colour contrast, size of information) and provide the information based on the two sense principle (tactile and visual).

5.2.2 Seating places with individual seats

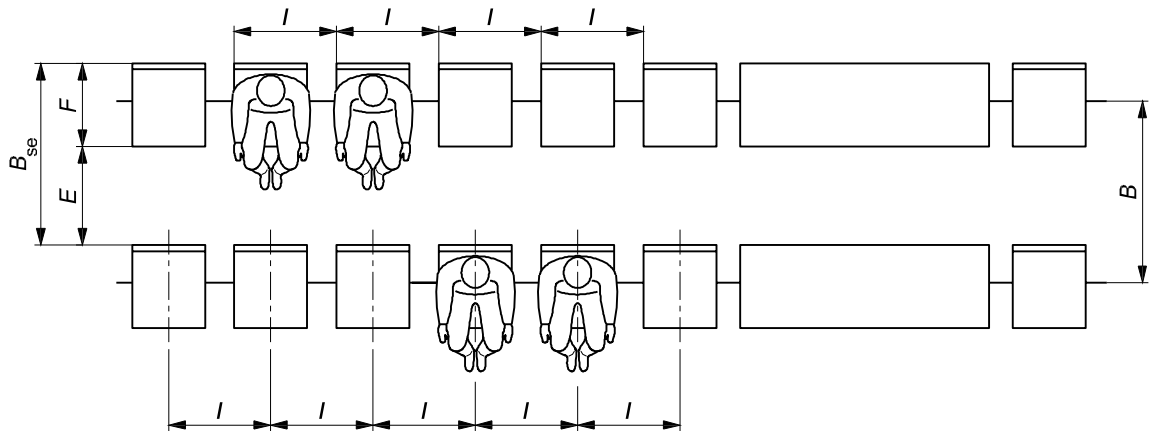
Where seating accommodation consists of single seats the minimum tread (B_{se}) shall be 700 mm (recommended tread: 800 mm).

The minimum dimension (I) for lateral boundaries (equal to centre to centre) of a single place shall be 450 mm (recommended dimension: 500 mm).

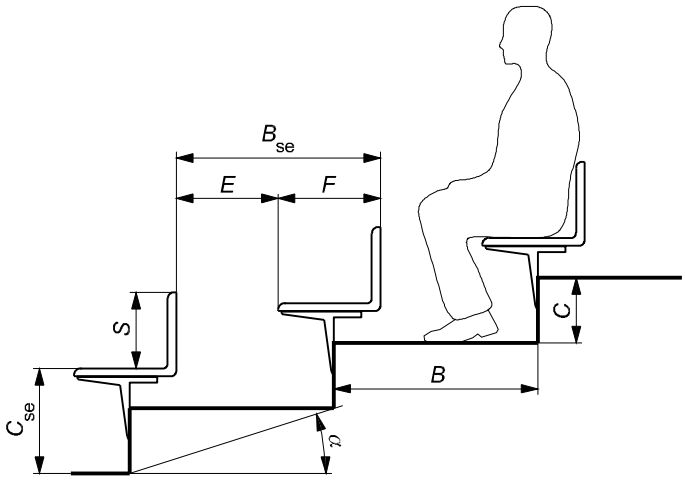
The minimum depth of a seat (F) shall be 350 mm (recommended depth: 400 mm).

The minimum width (E) of clear way shall be 350 mm (recommended width: 400 mm; see Figures 1, 2 and 3).

NOTE Where seats are provided with arms, the arm-rests can affect the dimension of the clearway E' (see Figure 2).



a)



b)

Key

B_{se} dimension of the tread where there are seating places (seating row depth) (B_{se} = B)
min = 700 mm rec = 800 mm

C riser between each tread

E clear width for the row-passage, B_{se} - F
min = 350 mm rec = 400 mm

F depth of seat
min = 350 mm rec = 400 mm

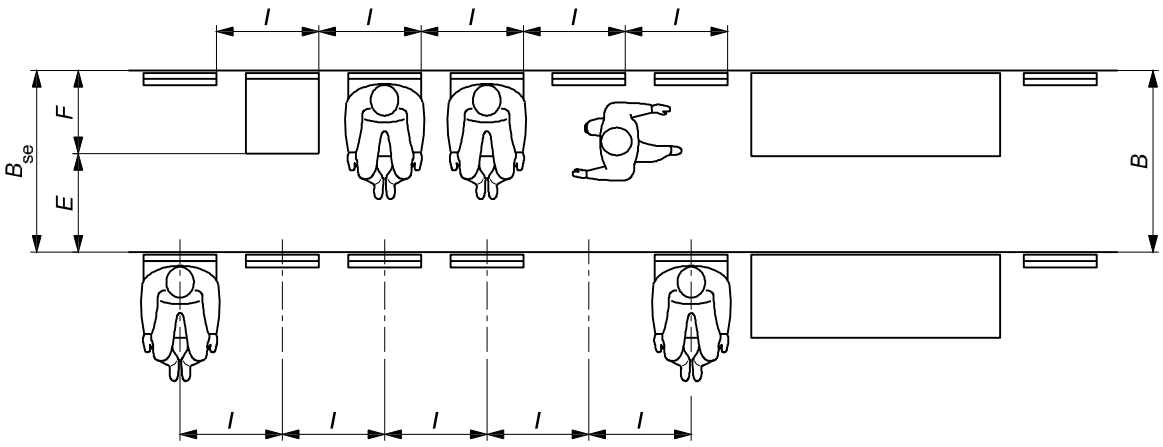
C_{se} difference of level between seat and tread or passage below
max = 450 mm rec = 400 mm

α angle of inclination of the stand
max 35°

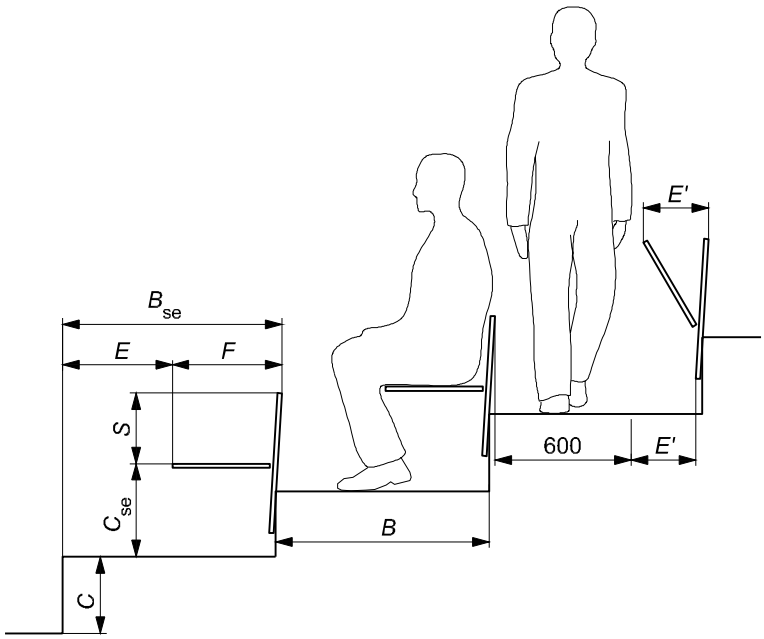
S the height of seat back
min = 300 mm

I width of lateral boundaries
min = 450 mm rec = 500 mm

Figure 1 — Example of seating places — non tip-up seats



a)



b)

Key

B_{se} dimension of the tread where there are seating places (seating row depth) (B_{se} = B)

E clear width for the row-passage with seat down, B_{se} - F

F depth of seat including the thickness of the seat back
min = 350 mm rec = 400 mm

C_{se} difference of level between seat and tread or passage below
max = 450 mm rec = 400 mm

S height of seat back
min = 300 mm

E' max = B_{se} - 600 mm

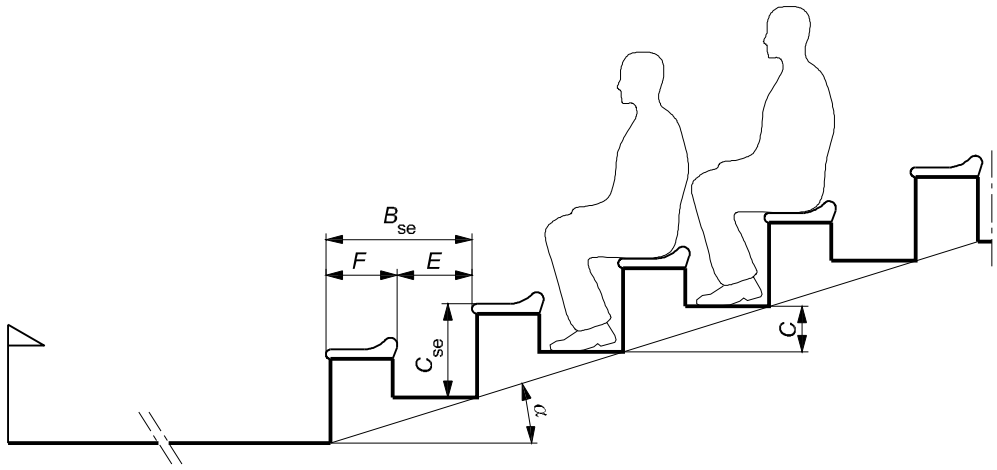
I width of lateral boundaries
min = 450 mm rec = 500 mm

Figure 2 — Example of seating places — tip-up seats

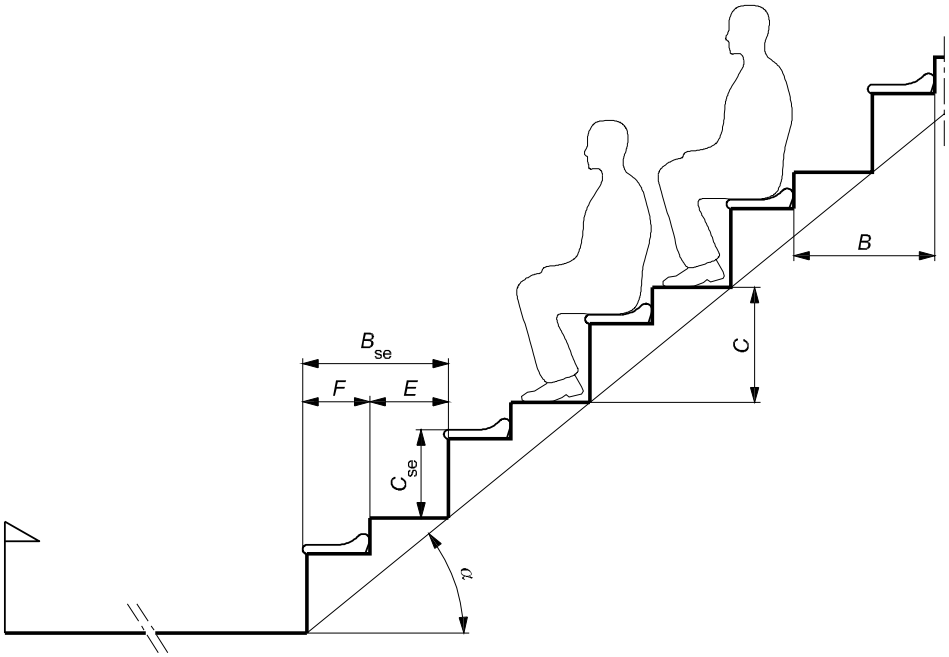
5.2.3 Seating places with benches

Where seating accommodation consists of benches, the minimum width for the row-passage E shall be 350 mm. In this case, the minimum tread B_{se} shall be 700 mm (see Figure 3).

The recommended minimum width (E) is 400 mm. The recommended minimum dimension of minimum tread (B_{se}) is 800 mm.



a)



b)

Key

B_{se} dimension of the tread where there are seating places (B_{se} = B)
min = 700 mm rec = 800 mm

B distance from one spectator to the spectator behind

C_{se} difference of level between seat and tread or passage below
max = 450 mm rec = 400 mm

E clear width for the row-passage B_{se} – F
min = 350 mm rec = 400 mm

F depth of seat
min = 350 mm rec = 400 mm

C dimension of the riser of the step
min = 170 mm max = 510 mm (B_{se} min= 750mm)

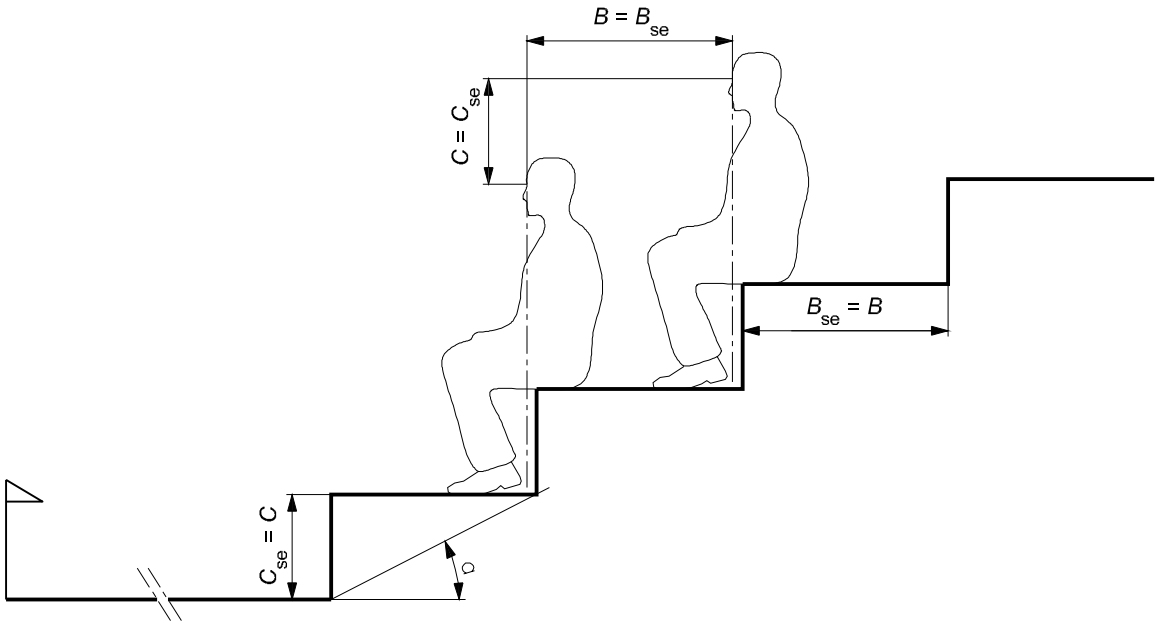
α angle of inclination of the stand
max 35°

Figure 3 — Example of seating places provided by benches

5.2.4 Seating places provided by steps

Where seating accommodation consists of steps, the recommended maximum riser shall be 450 mm and the minimum tread (B_{se}) shall be 700 mm (see Figure 4).

The recommended value for the tread B_{se} is 800 mm (see Figure 4).



Key

B_{se}	dimension of the tread (B_{se} = B)
	min = 700 mm max = 800 mm
C= C_{se}	dimension of the riser of the step
	max = 450 mm rec = 400 mm
α	angle of inclination of the stand

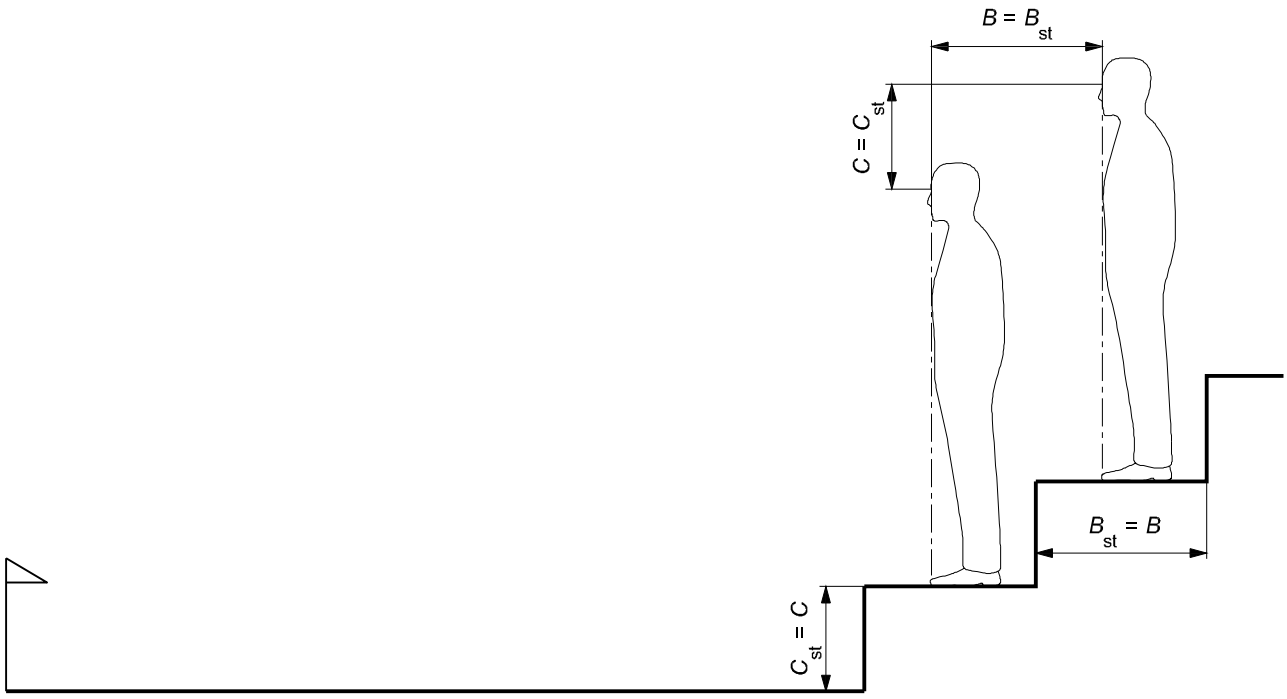
Figure 4 — Example of seating places provided by steps

5.3 Requirements for standing places

5.3.1 Standing places provided by steps

Where viewing accommodation for standing consists of steps, the tread B_{st}, shall be at least 350 mm. Consideration shall be given to the needs of access, the density of spectator population and the provision of crush barriers (see Figure 5). See EN 13200-3 for separating elements and crush barriers.

The recommended value for the tread (B_{st}) is 400 mm.



Key

C dimension of the riser of the step

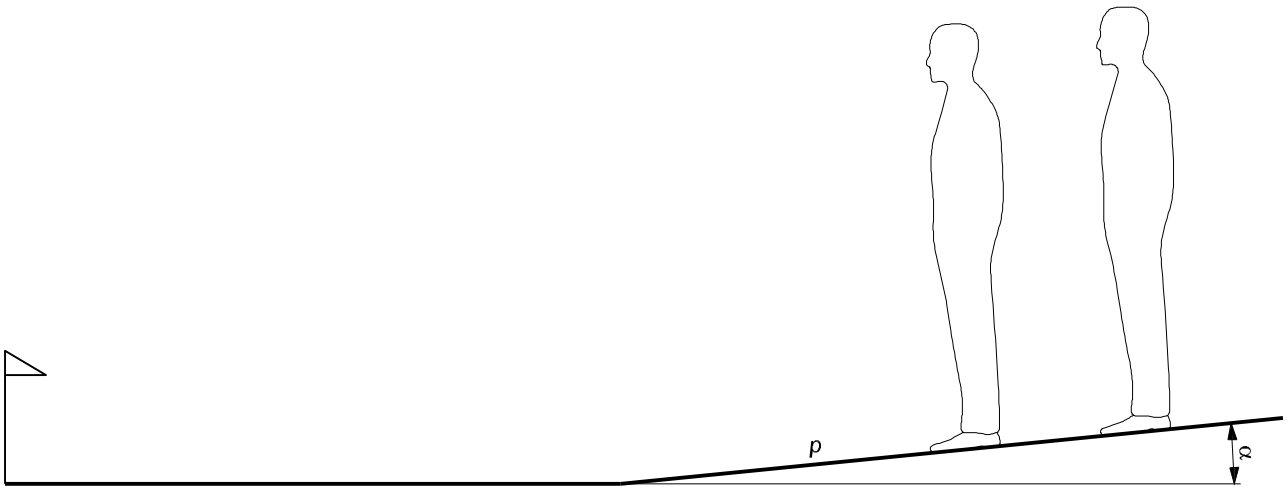
B_{st} dimension of the tread providing a standing place
min = 350 mm rec = 400 mm

C_{st} difference of level between to successive treads in standing areas
max 225 rec = 170 mm

Figure 5 — Example of standing places provided by steps

5.3.2 Standing places provided by slope

The recommended inclination of viewing slopes shall not exceed 10%. For a slope exceeding the recommended inclination, a risk assessment shall be required (see Figure 6).



Key

α angle of the inclination of the slope
max = 6°

p grade of the slope
max 10%

Designers and spectator facilities owners should take into consideration the possible future conversion of standing areas to seating accommodation and that this will have an effect on the selection of dimensions and sightlines.

Figure 6 — Example of standing places provided by slope

5.4 Places for spectators with special needs

New and existing stands should provide accessible viewing areas to all disability groups, including ambulant disabled spectators. These areas should be located around the spectator facility in sufficient numbers to give spectators with special needs a suitable range of viewing options and be of an appropriate viewing quality.

Table 1 gives the appropriate guidance on the recommended provision of wheelchair spaces in relation to viewing area, stand or sector capacity.

Table 1 — Recommended provision of wheelchair spaces at spectator facilities

Capacity of stands	***Number of wheelchair spaces***
Under 400	Minimum of 2
Under 1 600	Minimum of 8
Under 5 000	Minimum of 25
Under 10 000	Minimum of 50
10 000 to 20 000	100 plus 5 per 1 000 above 10 000
20 000 to 40 000	150 plus 3 per 1 000 above 10 000
40 000 or more	210 plus 2 per 1 000 above 40 000

Refer also to national legislation or equivalent for the application of this requirement.

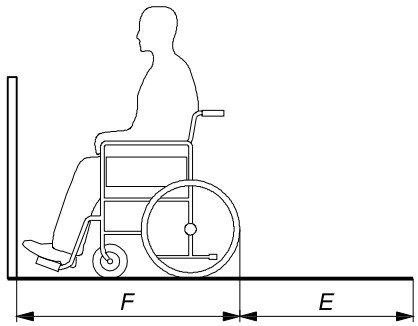
Provisions relating to spectators seating are as follows.

— Wheelchair users should be able to manoeuvre easily to a space that allows them a clear view of the event.

— Wheelchairs users should be provided with a choice of sitting next to a disabled or non-disabled companion.

— Some seats should be located so that an assistance/guide dog can accompany its owner and rest in front of, or under, the seat.

Although an individual wheelchair place can be provided by a clear space with a width of at least 900 mm and a depth of at least 1 400 mm, it is recommended that each designated place measure 1 400 mm x 1 400 mm. This measurement allows enough space for one helper per wheelchair space to sit alongside in a fixed or removable seat.



Key

E clear width for passage

F depth of place

Figure 7 — Place for spectator with wheelchair

NOTE See CEN/TR 15913 for further information relating to layout facilities for spectators with special needs [3].

6 Determination of design capacity for viewing area

6.1 Standing places

The spectator recommended density in standing places on horizontal plane shall be 35 spectators per 10 m^2 but shall not exceed 47 spectators per 10 m^2 on steps (passageways not included). Appropriate separating elements shall be in place.

6.2 Seating places

The design capacity for seating accommodation composed of steps without seats or of benches, is obtained by dividing the linear development of the rows (metres) (passageways are not included) by the coefficient I = 0,50 (minimum).

The design capacity for seating accommodation composed of individual seats is determined by the total number of seats.

A radial passageway shall be on a plane or on an inclined plane or can be composed of steps with a recommended maximum riser of 200 mm and a recommended minimum tread of 250 mm.

In the case of a row being served by two passageways, the row shall contain a maximum of 40 seats for outdoors and a recommended maximum of 28 seats for indoors. Where a row is served by one passageway, these numbers shall be divided by two.

7 Flow capacity of Exit from Viewing Area

The following factors shall be considered for the evacuation of a viewing area:

— time taken to reach a place of safety;

— distance of travel to a place of safety;

— physical dimensions of exit routes;

— flow capacities;

— total number of people present in the viewing area.

Where there is no national legislation, the values specified in Annex E (informative) may be applied.

8 Loads and other dynamic actions

Stands that provide either seating or standing places shall be able to support characteristic actions in accordance with EN 1991-1-1.

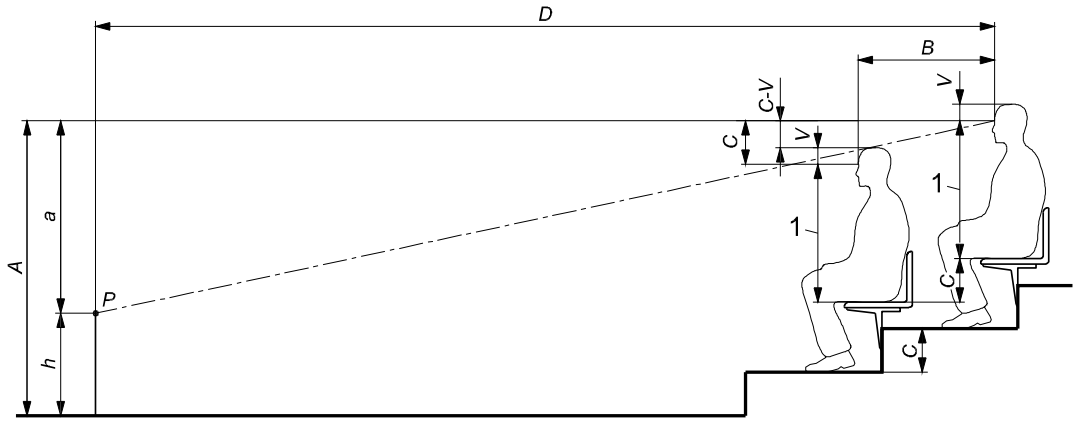
NOTE Attention is drawn to the fact that EN 1991-1-1 does not comprehensively cover dynamic excitation arising from spectator activity.

9 Sightline

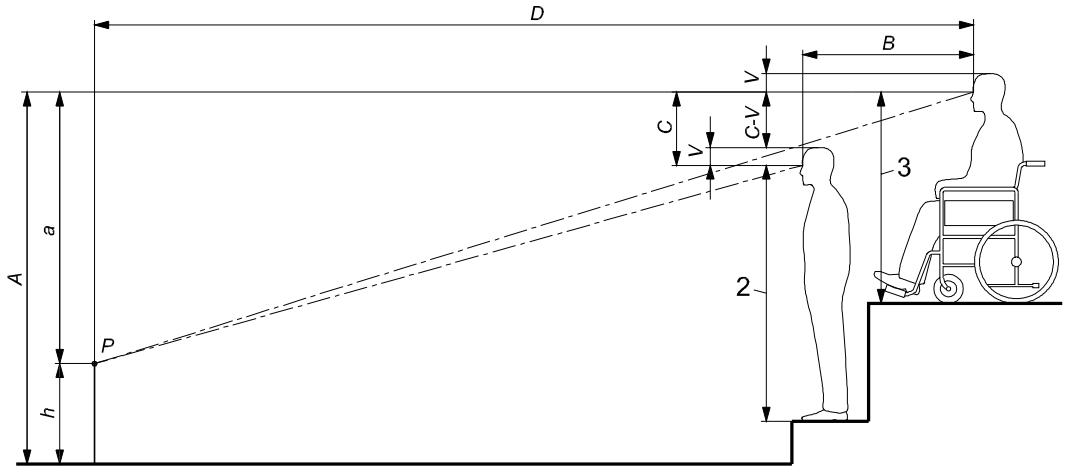
Sightlines shall be such that all spectators have a clear view of the event to the activity area, unobstructed by persons in front, by roof stanchions or by other obstructions. The provision of areas located around the stadium designated for spectators in wheelchairs has implications for the sightlines of both disabled spectators and other spectators seated or standing nearby.

Stands shall respect the minimum value of horizontal distance D between the spectator's eyes situated at height A and the nearest point P of focus along the line of sight as obtained from a geometrical construction and calculation formula as follows:

$$D = \frac{a \times B}{C - V} \tag{1}$$



a)



b)

Key

A height of eyes

B distance from one spectator to the spectator behind

C dimension of the riser of the step

h height of point of interest P (see Annex C)

D horizontal distance between spectator's eyes situated at height and nearest point P of focus

P nearest point of focus along the line of sight

V vertical distance from eyes of a spectator to the top of the head: 90 mm (minimum), 120 mm (recommended). C-V should be measured from the top of the head of the person sitting in the front row to the eye-level of the person sitting in the row behind.

a A - h (difference between height of eyes and height of point of interest

1 distance from the eyes of a seating spectator and his plane of seat: 800 mm

2 distance from the eyes of a spectator and the tread 1 600 mm

3 distance from the eyes of a spectator in wheelchair and his plane 1 150 mm

The figures stress the importance of the clear view looking at the section; the clear view in the lateral, diagonal and horizontal direction shall be considered.

NOTE The sightline calculation value V will vary between a range of 90 to 120 mm. In certain conditions where values outside of this range are proposed, the designer will need to demonstrate that the quality of the view of the spectator has not been compromised.

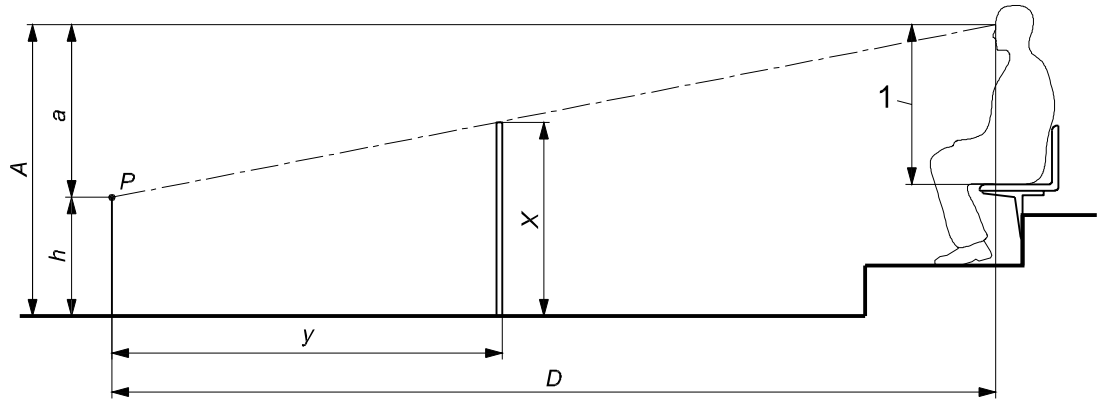
Figure 8 — Parameter of calculation of the formula for seating places

The height h of point of interest (Figure 8) depends on the activity and may typically vary between 0 mm and 1 000 mm.(see Annex C, Table C.2).

The formula for testing the value V of the vertical distance from eyes of a spectator to the top of the head is given as follows:

$$V = C - \frac{a \times B}{D} \tag{2}$$

No constructive obstacle is allowed between the eye of a spectator and his point P of focus. For calculation formula and sightline construction of frontline spectators, see Figure 9.



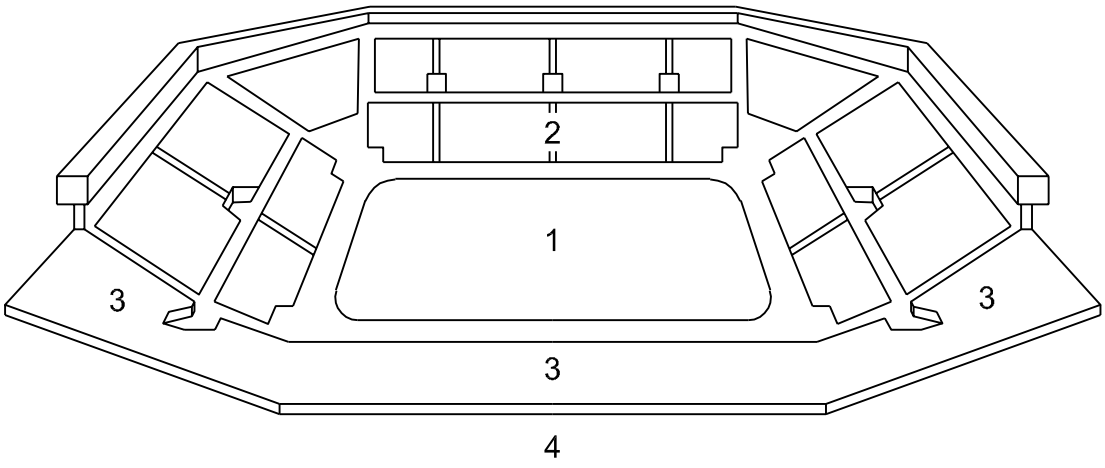
Key

A height of eyes
h height of point of interest (h is dependent on the activity and may typically vary between 0 mm and 1000 mm)
P nearest point of focus along the line of sight
D horizontal distance between point of interest and the eyes of a spectator
X height of advertising board or visual obstacle
y distance from point of interest to advertising board
a A - h (difference between eyes height and height of point of interest
1 distance from the eyes of a seating spectator and his plane of seat: 800 mm

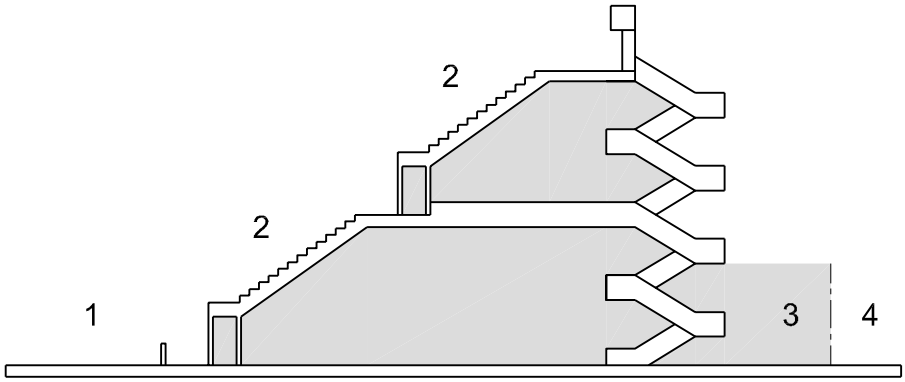
Figure 9 — Sightline of frontline spectator

Annex A
(informative)

Example of Spectator Facility



a) Perspective view

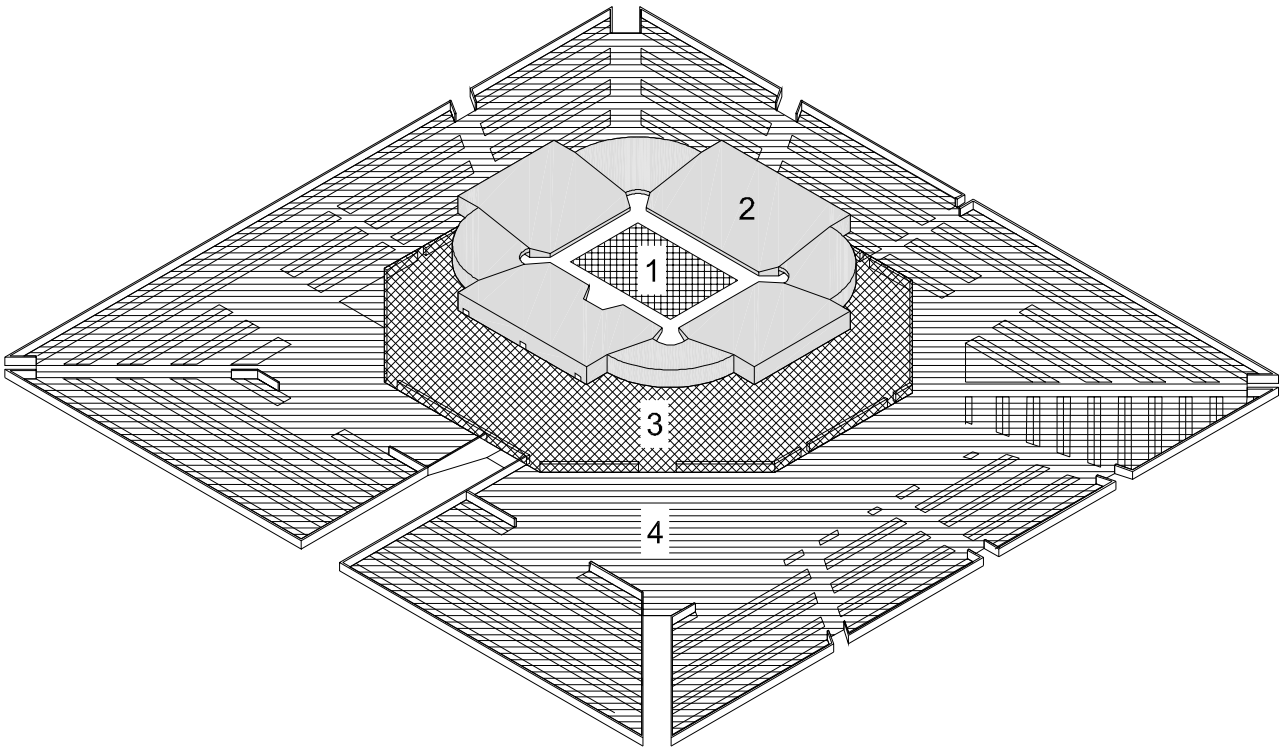


b) Section

Key

1 Activity area
2 Viewing area
3 Spectator service area
4 External area

Figure A.1 — Spectator facility



Key

1 Activity area
2 Viewing area
3 Spectator service area
4 External area

Figure A.2 — Scheme of spectator facility

Annex B
(informative)

Largest distance of vision

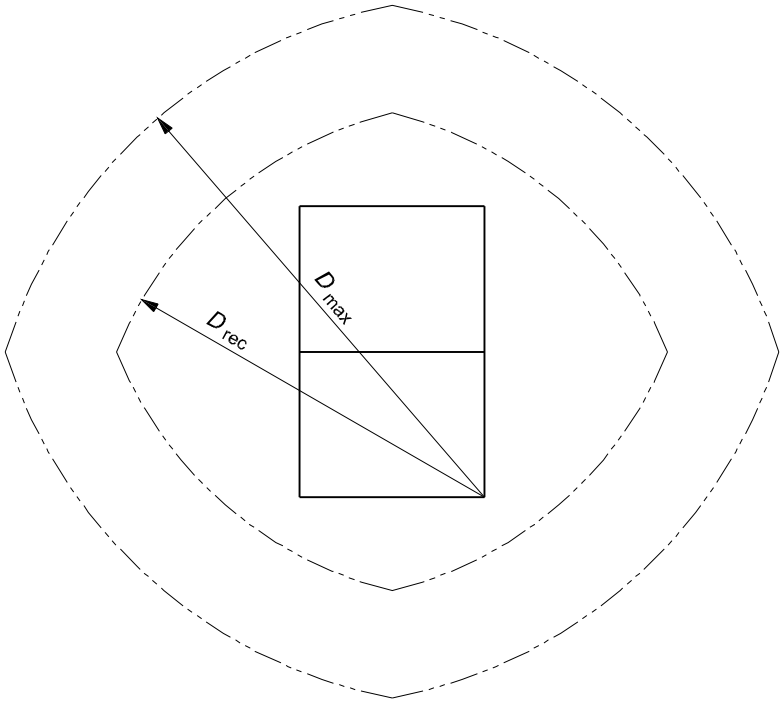
Sport can be divided into six groups A,B,C (outdoor facilities) and AA, BB, CC (indoor facilities) characterised mainly by the speed of the action occurring, the dimensions of the object and the dimensions of activity area. (See Table C.2 for the list of sport.)

The maximum distance from the sporting event can be adequately followed depending on the size of the activity area and the size and speed of the object being observed (see Table B.1 and Figure B.1).

Table B.1 — Recommended and admitted viewing distance

	Group	**D** rec (m)	**D** max (m)
outdoor	A	190	230
	B	150	190
	C	70	100
indoor	AA	110	130
	BB	85	110
	CC	60	80

NOTE D is the distance between the farthermost recommended focus point P and eyes of the spectator measured in the ground plan.



Key

D_{max} = Maximum distance of vision

D_{rec} = Recommended distance of vision

Figure B.1 — Largest distance of vision

Annex C
(informative)

Classification of sports areas and criteria for the determination of groups

Sports can be divided into six groups A,B,C(outdoor facilities) and AA,BB,CC (indoor facilities) characterised mainly by the speed of the action occurring, the dimensions of the object and the dimensions of the activity area as shown in Table C.1

Table C.1 — Criteria for determination of groups

Group	Dimension activity area	Dimension of the object	Speed
A	Large	Large	Slow
B	Large	Medium	Medium
C	Large	Small	Medium
AA	Medium	Large	Medium
BB	Medium	Medium	Medium
CC	Small	Small	Fast

Table C.2 — Classification of sports considering speed of action and dimensions of activity area including the height of point of interest

Sport	Group	h (in mm)
American football	A	0 (outline)
Archery	B	500 (at the stand point of the archer)
Athletic: Long jump and triple jump outside of the round tracks Running activities and all other activities performed outside round tracks	A	 0 (centre of the outer track) 500 (external marking of the outer running track)
Badminton	BB	0
Bandy	B	0
Baseball	B	500
Basketball	AA	500
Billiards	CC	1 000
Bowls (flat and short man)	CC	0
Boxing	AA	The sightline shall be at least horizontal to the level of the boxing ring
Cricket	C	0
Cricket nets	C	
Cycle racing	A	500
Darts	CC	Height of the centre of target (target disk)
Equestrian	A	For equestrian: 1 000 For dressage: 0
Fencing	BB	0 (height of the fencing lane)
Football/soccer	B	0
Five a side (football)	BB	0

Table C.2 *(continued)*

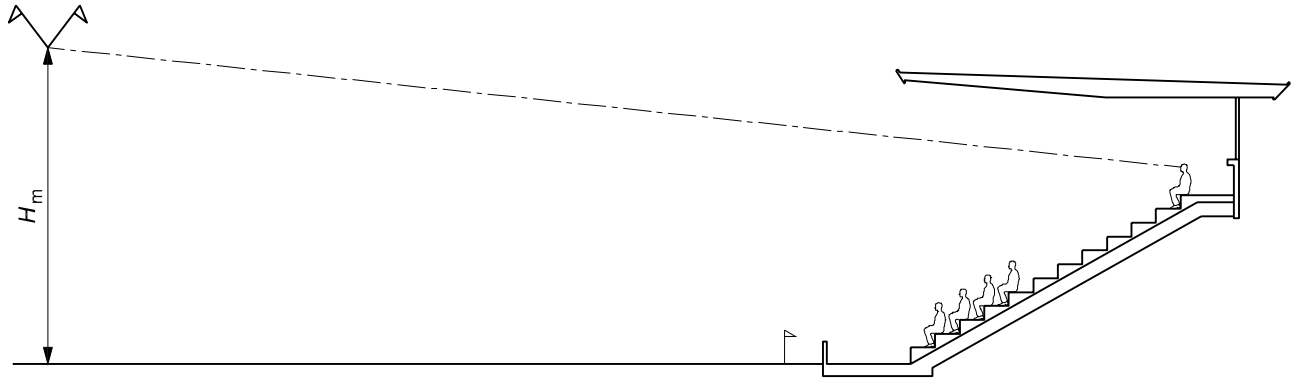
Sport	Group	h (in mm)
Golf	C	0
Handball	CC	500
Hockey	C	0
Horse racing	A	1 000
Ice Hockey	CC	Height of the non-transparent boards
Ice sport artistic	BB	Height of the non-transparent boards
Judo	BB	0
Martial arts	BB	0
Rhythmic gymnastic	BB	Height of podium or platform
Roller skating	A	Height of boards
Rugby	B	0
Shooting	C	500 (at stand point of the shooter)
Skiing all disciplines	B	0
Snooker	CC	1 000
Softball	C	500
Speed skating	B	500
Squash	CC	0
Swimming (all activities)	A	0
Ten pin bowling (including nine pin bowling)	CC	0
Table tennis	CC	Height of the table
Tennis	BB	0
Trampoline jumping	AA	Height of podium or platform

Annex D
(informative)

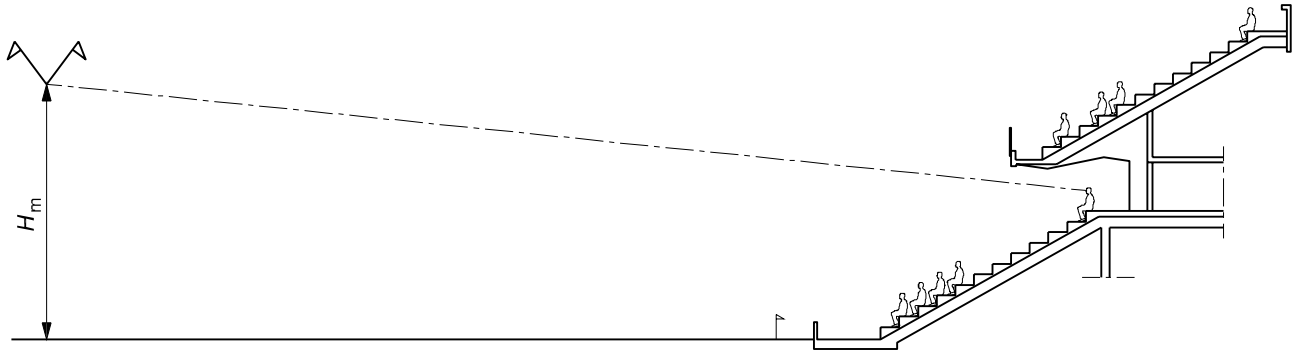
Roof coverings of stands

The height of roof coverings and overhanging structures such as balconies should be designed, as far as it is possible, so that the view of the centre and its height H_m is unobstructed for all rows of the spectator viewing area.

NOTE The information board or panel needs to be seen without obstruction from all places. For example in football facilities, the height from the centre of playing field is 15 m (for indoor international football competition it is 20 m) and the height at all points of activity area is 7,5 m.



a)



b)

Key

H_m height at the centre of the activity area

Figure D.1 — Examples for roof coverings or balconies — Schemes for unobstructed viewing

Annex E
(informative)

Flow capacity from exit from viewing area

Each row between a radial or parallel passageway and another should contain a maximum of:

— 28 seats indoors;

— 40 seats outdoors.

All spectators should be able to enter into a free flowing exit system (vomitories, lateral gangways, etc.) within a maximum of eight minutes for outdoor areas and within a maximum of two minutes for indoor areas.

NOTE Deviation from the proposed values is accepted by risk assessment that should accompany the derivation of the capacity calculation of a viewing area.

The maximum distance of travel for an individual spectator to enter a free flowing exit system should be 30 m indoors and maximum 60 m outdoors.

The spectator travel distance should be measured along the route defined by rows and passageways.

The flow capacity of the exit routes within these requirements:

— on a level surface: 100 people can reasonably exit through a width of 1,20 m in 1 min;

— on a stepped surface: 79 people can reasonably exit through a width of 1,20 m in 1 min;

The evacuation of wheelchair spectators also needs to be considered. Deviation from these values requires a risk assessment.

Bibliography

[1] EN 1838:1999, *Lighting applications — Emergency lighting*

[2] EN 12193:2008, *Light and lighting — Sports lighting*

[3] CEN/TR 15913, *Spectator facilities — Layout criteria for viewing area for spectators with special needs*

[4] ISO 7001:2007, *Graphical symbols — Public information symbols*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™