

BRITISH STANDARD

Code of practice for safety nets on construction sites and other works

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Foreword

Publishing information

This British Standard was published by BSI and came into effect on 31 May 2007. It was prepared by Subcommittee B/514/27, *Nets and sheets*, under the authority of Technical Committee B/514, *Access and support equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

This British Standard shows how safety nets manufactured to conform to BS EN 1263-1 and arranged in the manner specified in BS EN 1263-2 can be used to enhance safety for those working at height.

Use of this document

This British Standard is intended for use by designers, engineers, scaffolding contractors, safety net erectors and authorities having jurisdiction.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

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

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

Attention is particularly drawn to the legal requirements listed in Annex A.

Introduction

Safety nets are used on construction sites and similar works mainly to arrest a person's fall, although they can also be used to catch or contain debris. They reduce injury because they absorb a large proportion of the energy from a falling body through suffering plastic deformation when impacted, dissipating this energy with minimum rebound.

They provide a collective protection system that is constantly available for those persons working above it, i.e. one which requires no input and little co-operation from the workers it is being used to protect.

Safety nets are manufactured from synthetic materials. While they are lightweight and rot-resistant, they can be easily damaged by improper use, wear and tear, heat or flame, handling and storage. They can also be adversely affected by weathering, UV degradation and environmental factors, resulting in some strength loss. It is therefore essential that safety nets are subject to regular examinations by competent persons including periodic testing in accordance with the manufacturer's instructions.

1 Scope

This British Standard provides guidance and recommendations on the safe use, erection and effective maintenance of safety nets on construction sites and other works where there is a risk of fall. It is applicable generally to safety nets that conform to BS EN 1263-1 and that are erected within the positioning limits given in BS EN 1263-2. However, as these standards are very specific, this British Standard also gives advice on how to assess the reliability of safety nets outside these limits.

NOTE This advice is given in Annex B.

This British Standard covers safety net systems "S", "T" and "U" as given in BS EN 1263-2. It does not cover system "V".

This British Standard does not cover temporary support nets, which are intended for persons to stand on either for access, egress or work.

2 Normative references

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

BS 7883, *Code of practice for the design, selection installation, use and maintenance of anchor devices conforming to BS EN 795*

BS 7955:1999, *Containment nets and sheets on construction works – Specification for performance and test methods*

BS EN 362, *Personal protective equipment against falls from a height – Connectors*

BS EN 795, *Protection against falls from a height – Anchor devices – Requirements and testing*

BS EN 1263-1:2002, *Safety nets – Part 1: Safety requirements, test methods*

BS EN 1263-2:2002, *Safety nets – Part 2: Safety requirements for the positioning limits*

3 Terms and definitions

For the purposes of this British Standard the following terms and definitions apply.

3.1 anchorage device

device or system used to connect a safety net to an anchor point

3.2 anchor point

feature or position on a structure to which a safety net is attached

3.3 bagging

gathering up surplus net at the edges or providing reinforcing at unsupported eaves or at frames

3.4 border rope

NOTE See also BS EN 1263-1.

rope that passes through each mesh at the perimeter of a safety net and determines the overall dimensions of the net

3.5 catching width

distance beyond the working area into which a person could fall

NOTE The extent of the catching width will depend on the horizontal trajectory of the falling body together with the height of the fall plus an additional area of at least 2 m width.

3.6 class

classification of a net according to energy absorption capacity and mesh size

3.7 competent person

person with sufficient professional or technical training and knowledge, actual experience and authority to enable them to:

- carry out their assigned duties at the level of responsibility allocated to them;
- recognize potential hazards related to the work (or equipment) under consideration and be able to implement adequate control measures;
- detect any defects or omissions in that work (or equipment), recognize any implications for health and safety caused by those defects and omissions, and be able to specify a remedial action to mitigate those implications

NOTE 1 “Authority” in this context means authority delegated to the individual by his or her employer.

NOTE 2 See Annex C for guidance on competence, supervision and training.

NOTE 3 See also BS EN 1263-1.

3.8 containment net containment sheet

NOTE Containment nets and sheets are also known as debris nets.

relatively fine net or sheet conforming to BS 7955, laid over a safety net and used to catch or contain lightweight debris

3.9 coupling rope

NOTE This is sometimes referred to as a lacing rope.

rope that joins two or more safety nets together

3.10 eaves bagging

rigging technique that removes the natural waisting form, or horizontal deflection, at an unsupported net perimeter

3.11 initial sag

amount of sag induced by the weight of a net when influenced by the horizontal tension within the net

3.12 karabiner

safety link formed as a complete loop with a spring-loaded entry gate safeguarded in the closed position, conforming to BS EN 362

3.13 laced joint

joint formed around items, such as service pipes and ducts, which penetrate the net system

3.14 mesh cord

NOTE This is often referred to as mesh rope.

cord from which the mesh of a net is constructed

3.15 mesh size

distance between the centres of mesh cords
[simplified from BS EN 1263-1]

3.16 net system

arrangement of mesh, border ropes, coupling ropes, tie ropes and/or anchorage devices, and supporting framework, which are linked together as a system to provide a means of arresting falls

3.17 safety net

net itself plus border rope, test meshes or cords, labels and serial numbers

3.18 safety zone

area immediately below the maximum expected (or calculated) deflected shape formed by a safety net as it is struck by a falling body, which is kept clear of obstructions

3.19 supporting framework

structure to which nets are attached and which can contribute to the absorption of the kinetic energy due to a fall

3.20 test cord

NOTE Test cords are only present in knotted nets.

separate sacrificial length of net cord of the same material as the net, produced in the same batch and used for periodic testing

3.21 test mesh

NOTE Test meshes are present in knotless nets and occasionally in knotted nets.

separate sacrificial area of net mesh of the same material as the net, produced in the same batch and used for periodic testing

3.22 tie rope

rope used for securing the border rope of a safety net to a suitable anchorage

3.23 under-rolling

means of reducing the width of a standard net to fit a specific space or to provide a strong edge to which the tie rope or attachment system is attached

3.24 waisting

effect of the self-weight of a net at an unsupported perimeter where the net pulls horizontally away from an adjacent structure or the required line of the net

4 Layout and applications

4.1 Layout

4.1.1 General

Safety nets may be used by themselves or in combination with other fall arrest and fall prevention systems in maintenance, construction works, theatres, prisons, manufacturing, etc., to provide protection against the consequences of a fall at openings or edges, or where working over or near fragile materials. Safety nets of various sizes may be linked together (see **6.3.4**) so as to span large areas.

Nets may be used in the form of a protection fan (e.g. BS EN 1263-1:2002, Figure 2), enhanced where required, by placing containment nets or sheets conforming to BS 7955 over the safety nets to prevent smaller debris from falling through the net. The size and spacing of the containment net should be suitable and sufficient for the type of material likely to fall into it. Consideration should be given to the avoidance of gaps in the containment net at edges and around service ducts, etc.

In order to minimize the risk of injury to those who might fall into safety nets, nets should be capable of deforming and deflecting sufficiently under impact to largely absorb the energy of the falling person, this deformation and deflection being possible through the net cords slipping and tightening (knotted nets) or net meshes (knotless nets) deforming or stretching through plastic deformation. Tie ropes and border ropes might also stretch under load, so absorbing some of the falling energy. Safety nets should have sufficient clearance below them in order to allow for this deflection while ensuring that the person falling does not strike any object.

Generally, the greater the fall height and the smaller the net area, then the greater the energy absorption capacity per unit area that is required to safely contain the fall (for further information see Annex B).

While safety nets are designed to catch people, they can also be used to retain or control debris – although debris within the net can also injure anyone subsequently falling into it. The effect of debris in the net will depend on the mass, shape, nature and falling height of the debris. If therefore it is assessed that debris might fall into the net and cannot be regularly cleared, advice should be obtained from a competent person as to any limitations that should be observed. In particular this assessment should consider the likelihood of the net being overloaded causing excessive deflection and tension in the net, ties and anchorages, and/or the risk of material bouncing out of or being deflected from the net, to the danger of anyone in the vicinity. Safety nets used with or without containment nets as protection fans (system “T”) should not be used to catch materials deliberately thrown into them or for the storing of debris or materials.

Following the impact of any heavy objects into the nets, the nets should be taken out of service for checking or testing, and repaired when necessary (see 7.1.1 and Clause 7 generally).

Under normal circumstances, damaged nets should be immediately taken out of service. However, as an immediate short-term measure, damage to a single mesh cord could be repaired by a suitably competent person, with a tie rope. There should not be more than two temporary repairs in a single net. Once the immediate work is complete the damaged net should be either repaired fully before reuse, or destroyed (see Clause 7).

Care should be taken to ensure that no one enters the areas below the safety nets when persons are working above them unless there is no risk of them being struck by falling objects.

4.1.2 Classification of safety nets

Safety nets conforming to BS EN 1263-1 are classified according to mesh size and energy absorption characteristics, as shown in Table 1. Two energy absorption capabilities are referenced, each in two mesh sizes.

Table 1 **Classification of nets according to mesh size and energy absorption**

Type (from BS EN 1263-1)	Energy absorption kJ	Max. mesh size mm
A1	2.3	60
A2	2.3	100
B1	4.4	60
B2	4.4	100

NOTE Safety nets of both mesh sizes described in BS 1263-1 are suitable for use, although the 100 mm mesh net usually is lighter and will have a lower initial sag due to its self-weight. All classes of safety net are available as either diamond mesh (when their designation includes the letter “D”) or square mesh (when their designation includes the letter “Q”) (see BS EN 1263-1:2002, Figure 1). Generally a square mesh will sag less when rigged. Therefore at its mid-point it will be closer to the working level, thus minimizing the possible fall height (see 4.1.3).

4.1.3 Positioning parameters and net selection

Safety nets should be arranged in accordance with BS EN 1263-2 and additionally with the following recommendations.

- a) Safety nets are manufactured to absorb safely falls of up to 6 m; however, they should always be rigged as close as possible to the working level. The extent of the area protected by the safety nets should be clearly identified to those working above, to warn them not to move beyond the protected area.
- b) Where safety nets are used as the primary form of protection, i.e. where falls would not be prevented by other means, they should preferably be not more than 2 m below the working level.
- c) Where used in system “T”, safety nets should normally only be used as a secondary form of protection to supplement the use of, for example, guard rails and toe boards. System “T” nets should be either laid horizontally or slightly inclined back towards the working surfaces.
- d) Where safety nets conforming to class A and in system “S” are subject to falls greater than 2 m, their individual area should be not less than 35 m² and their shortest side should be not less than 5 m. Where either of these two criteria cannot be met then a class B net should be used. Safety nets of smaller areas should be installed only after consultation with the manufacturer. (See also Annex B.)
- e) Where nets are to protect persons falling from an edge of an area, they should extend for a suitable catching width appropriate to the likely horizontal trajectory of anyone falling from that edge (typically 3 m).
- f) The desired working life of a net in any particular location should be taken into account when selecting the appropriate net for a given application, as the energy absorption capacity can reduce with age. Therefore where nets are to remain in place for a year or more, checks should be carried out to confirm that the ageing process while the net is in use will not reduce its energy absorption capacity below its classified level.

4.2 Applications

4.2.1 New roof construction

Safety nets used to give protection against falls during roof work might be required to guard a person having a horizontal trajectory as well as a vertical one, such as might occur at the eaves of the roof.

Safety nets can be provided to protect the roofer when loading out and fixing purlins and sheets [for use when laying metal decking and concrete floor slabs (see 4.2.4)]. However, materials should not be stored on safety nets, and safety nets should not be used to provide a means of access or as a place of work.

Care should be taken to prevent steel components, particularly sheets and offcuts, from falling into the net (see 4.1.1). Precautions to prevent this could include stacking and securing the sheets in positions where they cannot be blown or fall onto the net.

NOTE Guidance on this is given in Advisory Committee for Roofwork publication ACR[CP]001 [1].

Generally the nets should be supported from the truss/rafter members of the building, and rigged to follow the line of the roof.

Generally the net can be kept within 2 m vertical distance of the work area by securing it to the portal rafter itself.

Care should be taken at the eaves to prevent the net from waisting across the bay with the risk of leaving a gap through which a person could fall (see Figure 1). If an eaves beam is available and has sufficient structural capacity to withstand a characteristic loading of 6 kN at 45° to the horizontal, this could be used to tie the edge of the net (i.e. no need for eaves bagging). Nets should not be secured to gutter supports or sheeting rails unless there is evidence that the supports have sufficient capacity to withstand the lateral forces from a fall. Care should also be taken to ensure that the ties holding the safety net will not restrict the erection of other building components [see 5.2a), b), e)].

Similarly, safety nets should not be fitted to cold-formed sections such as purlins or sheeting rails as these might not have the required structural capacity to support the energy from a falling body and could cut or damage the tie ropes. If it is essential to tie the nets to such items which have the required structural capacity then any sharp edges should be wrapped to protect the tie ropes.

In most cases where safety nets are anchored to hot-rolled steel members and to node points in trusses, there will be sufficient anchorage capacity.

With certain types of new build roofing, the structural liner will span across the truss/portal bays, and will sit flush on top of the primary steelwork. In this case it might be necessary to fit the nets to clamp brackets onto the steelwork, or other suitable attachment devices (see 6.3.9). In such cases it is still important to arrange the anchors so that the net remains as close to the working surface as possible, and within 2 m of it.

The nets can be extended into overhung eaves, or raised up the outside of clad parapets to further protect the roofer (in the mode of system “U”). In both situations there has to be a suitable structure available to which the nets can be attached, such as scaffold frames or barriers with proven anchorage capacity. Care should be taken not to restrict the fitting of gutters and cladding unless specific arrangements have been agreed with the roofing contractor. Care is also required to ensure that the nets and ties, etc., can be recovered after the construction work has been completed, unless it has been agreed that items trapped by the work can be left behind or cut free and destroyed.

Overhung gables can present rigging problems, as often in these situations the only structure available will be the rail across the end of the cantilevered purlins. Consideration should be given to eaves bagging to enable the net to span between the rafters.