

Lifting equipment for performance, broadcast and similar applications —

**Part 1: Specification for the design and
manufacture of above stage equipment
(excluding trusses and towers)**

ICS 53.020.99

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee MHE/3, Cranes and derricks, to Subcommittee MHE/3/13, Lifting equipment for performance, upon which the following bodies were represented:

- Association of British Theatre Technicians
- Broadcasting Entertainment Cinematograph and Theatre Union
- Co-opted Members
- Health and Safety Executive
- Lifting Equipment Engineers Association
- Professional Lighting and Sound Association
- Safety Assessment Federation Ltd.
- Theatres Advisory Council

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Foreword

This British Standard has been prepared by Technical Subcommittee MHE/3/13. It does not supersede any previous British Standard.

As with all British Standards for lifting equipment, the primary object of this specification is to ensure reliability and safety without placing restrictions on the general design of lifting or the methods employed in construction.

This Standard is Part 1 of a two part standard:

— *Part 1: Specification for the design and manufacture of above stage equipment (excluding trusses and towers);*

— *Part 2: Specification for design and manufacture of aluminium and steel trusses and towers.*

This standard is not intended as a Code of Practice for the use of the equipment; the BS 7906 series deals with this.

Annex A, Annex B and Annex C are informative.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Attention is drawn to the following statutory regulations:

The Provision and Use of Work Equipment Regulations (PUWER) 1998 [1];

The Lifting Operation and Lifting Equipment Regulations (LOLER) 1998 [2];

The Supply of Machinery (Safety) Regulations 1992 as amended [3].

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 62, an inside back cover and a back cover.

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1 Scope

This British Standard specifies requirements for the design and manufacture of components and systems used to lift and traverse equipment and personnel for the following applications:

- a) film;
- b) television;
- c) theatre and similar entertainment events;
- d) conferences and exhibitions.

Lifts and elevators are not covered by this standard.

Nothing in this standard is intended to replace the requirements of The Provision and Use of Work Equipment Regulations (PUWER) [1], The Lifting Operation and Lifting Equipment Regulations (LOLER) [2] and The Supply of Machinery (Safety) Regulations 1992 as amended [3].

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to apply.

- BS 46-1, *Keys and keyways and taper pins — Part 1: Specification for keys and keyways*.
- BS 228, *Specification for short-pitch transmission precision roller chains and chain wheels*. (ISO 606)
- BS 1290, *Specification for wire rope slings and sling legs for general lifting purposes*.
- BS 2573 (all parts), *Rules for the design of cranes*.
- BS 2853, *Specification for the design and testing of steel overhead runway beams*.
- BS 3266, *Specification for thimbles for natural fibre rope*.
- BS 3481-2, *Flat lifting slings — Part 2: Specification for flat woven webbing slings made of man-made fibre for general service*.
- BS 4235-1, *Specification for metric keys and keyways — Part 1: Parallel and taper keys*.
- BS 4429, *Specification for rigging screws and turnbuckles for general engineering, lifting purposes and pipe hanger applications*.
- BS 5281, *Specification for ferrule-secured eye terminations for wire rope*.
- BS 6166-3, *Lifting slings — Part 3: Guide to the selection and safe use of lifting slings for multi-purposes*.
- BS 6570, *Code of practice for the selection, care and maintenance of steel wire ropes*.
- BS 6668-2, *Textile lifting slings — Part 2: Specification for round slings made of man-made fibre for general service*.
- BS 7671, *Requirements for electrical installations — IEE Wiring Regulations*.
- BS 7905-2, *Lifting equipment for performance, broadcast and similar applications — Part 2: Specification for design and manufacture of aluminium and steel trusses and towers*.
- BS 7909, *Code of practice for design and installation of temporary distribution systems delivering a.c. electrical supplies for lighting, technical services and other entertainment related purposes*.
- BS EN 292, *Safety of machinery — Basic concepts, general principles for design*.
- BS EN 364, *Personal protective equipment against falls from a height — Test methods*.
- BS EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design*.
- BS EN 795, *Protection against falls from a height — Anchor devices — Requirements and testing*.
- BS EN 818 (all parts), *Short link chain for lifting purposes*.
- BS EN 1677 (all parts), *Components for slings*.
- BS EN 20898 (all parts), *Mechanical properties of fasteners*.
- BS EN 60204-1, *Safety of machinery. Electrical equipment of machines — Part 1: Specification for general requirements*.

BS ISO 6336 (all parts), *Calculation of load capacity of spur and helical gears*.

DIN 6899:1988, *Steel thimbles for fibre ropes*.

3 Terms and definitions

For the purposes of this part of this British Standard the following terms and definitions apply¹⁾.

3.1

anchorage

fixture forming the interface between the temporary or permanent supporting structure and other items of lifting equipment, by means of which the loads are transmitted into the supporting structure

NOTE Sometimes referred to as “hanging point” or “suspension point”.

3.2

bar

length of tube or other section, usually steel or aluminium, to which loads are attached

NOTE Sometimes referred to as “barrel” or “pipe”.

3.3

bottom limit

means for preventing lowering below the working range of travel

3.4

certified

identified and supplied with a certificate signifying compliance with the standard and/or the appropriate load (this includes test details if appropriate)

3.5

competent person

person who has such practical and theoretical knowledge and such experience as is necessary to carry out their work and is aware of the limits of his/her own competence, expertise and knowledge

3.6

controlled stop

stop at a predetermined rate

3.7

D:d ratio

pitch circle diameter of the pulley or winding drum divided by the diameter of the rope

3.8

duality

ability of a system to maintain the position or intended movement of a load when there is failure of any one component in that system

3.9

dynamic working coefficient

breaking load of a component divided by the sum of the maximum static and dynamic loads applied to that component

3.10

emergency stop

device that causes a controlled stop as quickly as safely possible and which overrides all other controls

3.11

ferrule

aluminium, copper or steel sleeve compressed by dies or swages onto a wire rope to form a permanent termination

NOTE Sometimes referred to as “crimp”, “swage” or “sleeve”.

¹⁾ See also Annex B.

3.12**fleet angle**

angle of deflection of rope as it leaves a drum or pulley

NOTE See Figure 27.

3.13**hoist**

lifting machine (including lighting hoist, chain hoist, winch, power hoist and flying bar)

3.14**hook clamp**

lifting accessory used to support lighting and similar equipment hanging from bars

3.15**“in view” flying wire**

wire that can be seen by the audience, and which for artistic reasons needs to be as thin as practicably possible without compromising safety

3.16**karabiner**

connector with a lockable, self-closing and load bearing gate

3.17**lifting accessory**

component or equipment separate from the lifting machine and placed between the lifting machine and the load or on the load to attach it

NOTE Lifting accessories are not capable of providing movement.

3.18**lifting machine**

machine which is intended to raise, lower and suspend materials or persons

3.19**lifting system**

assembly of lifting machines and accessories

3.20**load**

suspended item or force related to mass

3.20.1**alternating load**

force which is applied sometimes in one direction and then in the opposite direction

3.20.2**axial load**

force in line with axis, e.g. the axis could be the centre line of a hydraulic cylinder

3.20.3**dead load**

force arising at any part of a system at rest due to mass in the system and excluding any forces due to live load (see 3.20.7)

3.20.4**design load**

prevailing force according to design

3.20.5**dynamic load**

force arising at any part of a system due to acceleration or deceleration of mass

3.20.6

imposed load

equivalent to live load (see 3.20.7)

3.20.7

live load

mass attached to lifting system

NOTE Sometimes called “payload”.

3.20.8

minimum breaking load

applied force below which an item will not break

3.20.9

overload

live load greater than the safe working load

3.20.10

point load

force applied at one place

3.20.11

service load

force expected during normal use

3.20.12

shock load

force generated during impact

3.20.13

specific load

force that is specified

3.20.14

static load

force imposed on a part of a system when at rest

3.20.15

uniformly distributed load (UDL)

force evenly spread over the force withstanding item

3.20.16

safe working load (SWL)

maximum mass that is permitted to be raised, lowered or suspended

3.20.17

working load limit (WLL)

maximum permitted mass that equipment is designed to lift, as specified by the equipment manufacturer

3.20.18

load bearing

withstanding of force, e.g. a load bearing beam is a beam which withstands force due to loading

3.20.19

load capacity

amount of force sustainable by design

3.20.20

load factor

arbitrary factor established and tabulated relative to force

3.20.21**load path**

assembly of items connected to one another to withstand force whereby each item is subjected to force due to the load considered

3.20.22**load testing**

application of known force to assess integrity of equipment

3.21**maximum speed**

designed top speed of operation

3.22**permanent**

not intended to be dismantled or decommissioned during the life of the product, except for servicing

NOTE See 3.35 for definition of temporary.

3.23**personnel flying**

lifting, lowering or suspension of an artiste in performance, to give the impression of levitation or flying

3.24**pitch circle**

effective circle of rolling without slip between transmitting elements

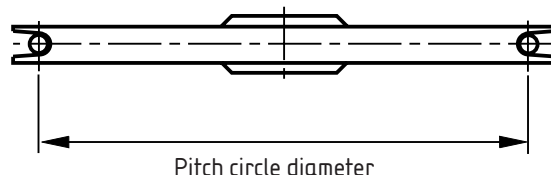


Figure 1 — Pitch circle

3.25**range of travel**

designed distance between the highest and lowest positions

3.26**rope diameter**

diameter of the smallest circle that can encompass all strands of a rope

3.27**rope lock**

device to hold a rope by means of friction

3.28**safety bond**

form of secondary suspension that is capable of arresting the fall of an individual item of equipment when there has been a dislocation of its primary attachment to the lifting system

3.29**safety factor**

minimum breaking load of a component divided by the maximum designed static load

NOTE Safety factor is also known as “working coefficient” (see Annex C for discussion).

3.30

static test

test during which machinery or a component is subjected to the loading equivalent to the SWL multiplied by a static test coefficient

3.31

static test coefficient

factor applied during a static load test to allow for dynamic loading

NOTE Static test coefficient has the following minimum values:

- a) 1.5 for manually operated machinery and lifting accessories;
- b) 1.25 for other machinery.

3.32 Stress

3.32.1

ultimate stress

force required to pull material apart divided by original cross-sectional area (see BS EN 10002-1)

3.32.2

yield stress

minimum force required to pull material, such that the unloaded length is increased after removal of the force; divided by the original cross-sectional area (see BS EN 10002-1)

3.33

swivel

device that enables one part to turn relative to the other part while axially loaded

3.34

swivel hook

swivel hook has a hook and swivel combined

3.35

temporary

intended to be decommissioned and/or dismantled during the life of the product, so that it may be reused for a similar or different purpose

NOTE See 3.22 for definition of permanent.

3.36

thimble

captive device that protects the eye termination of a rope

3.37

top limit

means for preventing lifting beyond the working range of travel

3.38

trim

to adjust a bar or scenic unit or other item so that it is parallel to the floor or as required

3.39

ultimate limit

means for preventing further lifting or lowering in case of top or bottom travel limit failure

3.40

whipping

binding applied to the end of a rope to prevent fraying or unlaying

3.41

wire rope grip

removable device that allows clamping two parts of wire rope together as in forming an eye at the end of a rope

NOTE Wire rope grips are also known as “bulldogs” or “dogs”.

4 Structural integrity

4.1 General

The load-bearing capacity of building elements or structures shall be checked to ensure that they are capable of bearing both the static and dynamic loads imposed by the lifting equipment before it is installed. This assessment shall include checking the likely anchorages, and also the resulting local and overall effects.

NOTE The choice of method for the assessment of load-bearing capacity is outside the scope of this standard.

4.2 Outdoor applications

Whilst this standard covers the specification of lifting systems and associated equipment for use outdoors, special factors such as ground condition and profile, wind loading, water accumulation on temporary structures and other criteria shall also be taken into account in these circumstances.

NOTE This standard should therefore be read in conjunction with the current versions of “*Temporary demountable structures*” [4] published by the Institution of Structural Engineers, and the HSE publication “*The event safety guide*” [5].

5 Components

5.1 General requirements for all components

Components shall be either:

- a) discrete items; or
- b) sub-assemblies that can only be separated by dismantling the assembly.

NOTE Components may be used as lifting accessories or lifting machines or form part of a lifting system.

When used as lifting accessories, components shall be tested (individually or in batches as appropriate) and marked with their SWL. Unmarked components shall not be used as lifting accessories.

When components form part of a lifting machine, the lifting machine shall be tested and marked with its SWL.

When components are incorporated as part of a lifting system, the lifting system as a whole shall be tested and marked with its SWL.

Appropriate certification shall be issued.

Components designed to clamp bars having a nominal diameter of 48 mm to 51 mm, shall be capable of clamping all bars within this range.

5.2 Component strength

5.2.1 General

Where a component is permanently installed in a machine and will not be subjected to dynamic loads by other machinery, only the dynamic loads induced by the machine shall be taken into account. In all other cases the component shall be designed to withstand dynamic loads equivalent to the static test (see 3.30).

In applications where any load exceeds the static test load criteria, the component shall be designed for the higher loading.

All components, other than screw fasteners, pantograph arms, bars and trusses, shall be designed so that the maximum stress in each component when subjected to its maximum design load is less than 30 % of the ultimate stress and less than 40 % of the yield stress for that component.

All load-bearing components subject to wear or alternating stress shall have a dynamic working coefficient of at least 4.

NOTE 1 This includes shafts, winding drums, pulleys and pulley fixings.

Fatigue shall be taken into account in the design of every component.

NOTE 2 For screw fasteners see 5.2.2, for bars see 5.7.1, for trusses see 5.7.2.

5.2.2 Fasteners (nuts, bolts, etc.)

Bolts shall conform to BS EN 20898 class 8.8 unless otherwise specified in the design.

Screw fasteners shall be correctly tightened.

Screw fasteners that have a critical tightening torque shall be identified and the required tightening torque specified.

NOTE 1 If the tightening torque is not specified it should achieve approximately 40 % of the yield stress in the fastener.

Fasteners shall not be subjected to a significant increase in tension when loading changes from zero to SWL. Any such tension increase shall not result in material stress more than 40% of yield stress.

NOTE 2 Load change can cause the fastener tension to be distributed differently between support of load and compression of host material.

If there is alternating load at mating surfaces secured by bolts, the basic shear stress in each fastener shall not exceed 50 N/mm², and shall be less than 35 % of yield stress.

Screw fasteners shall be prevented from loosening in service (e.g. due to vibration).

For special applications, fasteners other than screw fasteners shall conform to BS 2573 or be used in accordance with the supplier's instructions.

5.3 Rope, chain and associated terminations

5.3.1 Ropes general

Ropes shall conform to the appropriate standard for the type of rope selected, and shall be suitable for handling (where handling is required).

All lengths of rope shall be identifiable and certified (see 3.4).

Ropes shall be compatible with the equipment.

The cut ends of rope shall be prevented from unlaying/fraying.

5.3.2 Fibre ropes

Each rope assembly shall have a safety factor (see 3.29) of not less than eight.

NOTE 1 In the specification of fibre ropes attention should be applied to handling comfort, elasticity, and change in length.

If hand spliced eyes are used, they shall be spliced in accordance with good, well established practice.

NOTE 2 BS 6668 explains some techniques.

5.3.3 Wire rope

Each rope assembly shall have a safety factor of not less than eight. Usage shall be in accordance with BS 6570. Where bending occurs during normal use, the radius of curvature shall be derived from the D:d ratio, which shall not be less than 18, except under the circumstances described in note 5 below.

NOTE 1 For in view flying wires see clause 9.

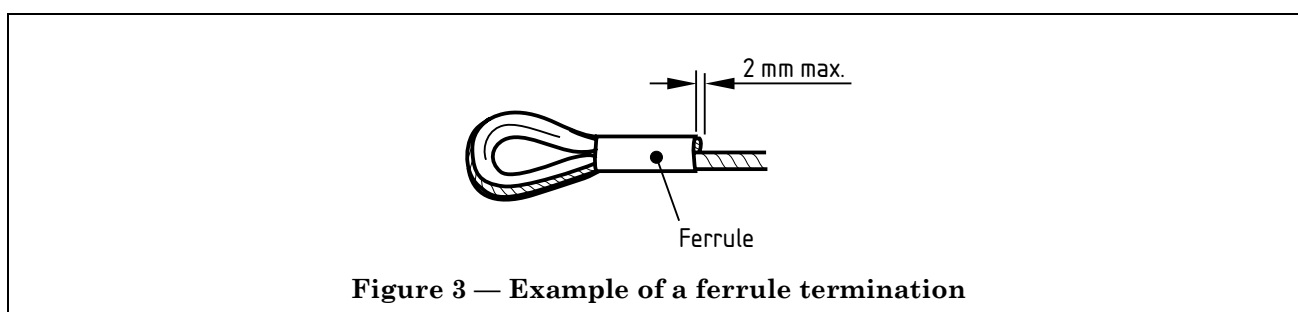
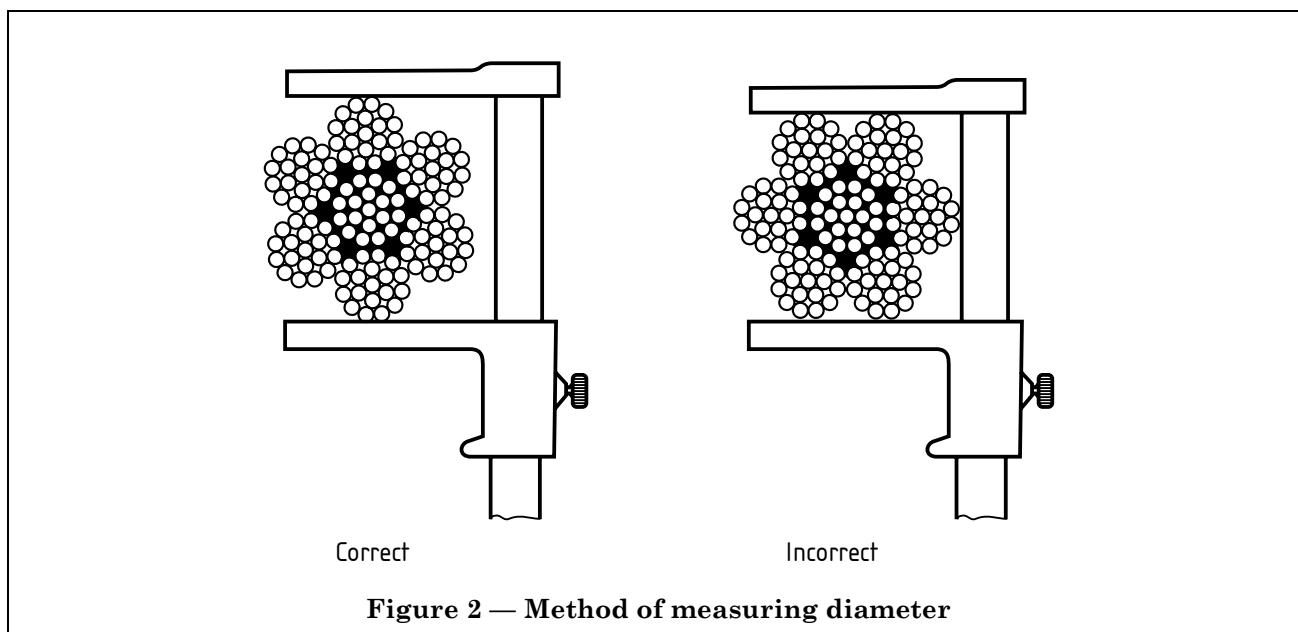
NOTE 2 Ropes should conform to BS 302.

NOTE 3 To obtain a reasonable rope fatigue life, the minimum distance between pulleys should be 3 lay lengths (20 rope diameters) or the distance travelled in 0.4 seconds at the design speed, whichever is the greater. In exceptional circumstances where shorter distances are required, the reduction in rope fatigue life should be evaluated and a means should be provided to enable the rope to be renewed in accordance with BS 6570. Ropes for flexing around pulleys or for winding onto drums should have 7 × 19 stranded construction, or alternative stranded construction as specified by the machinery supplier. Figure 2 shows an example of a cross section through a wire rope.

NOTE 4 Where pre-coloured galvanised rope is used, care should be taken to ensure that the colouring process does not reduce the protection against galvanic corrosion.

NOTE 5 Where wind-up stands are equipped with fall arresters to ensure safety in the event of wire rope failure, it is acceptable for the D:d ratio to be reduced to a figure not less than 10, and in accordance with BS 6570.

NOTE 6 Figure 2 shows the correct method of measuring the diameter of a 7 × 19 wire rope.



5.3.4 Wire rope terminations

5.3.4.1 General

Wire rope terminations shall have a strength of at least 80 % of the minimum breaking load of the rope. Terminations shall remain secure in the event of a slack rope condition and shall be fitted in accordance with the manufacturer's instructions. Typical rope terminations include ferrules, wire rope grips, sockets, etc.

Devices or attachments requiring maintenance of tension or load, or designed primarily for use under static load conditions, such as in fencing or guy wires, shall not be used in dynamic applications.

5.3.4.2 Ferrules (crimps, swages, etc.)

Terminations shall be fitted in accordance with the manufacturer's instructions and shall be tested to twice the SWL and the test result recorded.

For wires up to 8 mm in diameter with eye terminations secured by ferrule, the dead end of the wire shall visibly protrude out of the ferrule, but by not more than 2 mm.

Materials shall be selected to guard against corrosion.

Each termination shall be inspected to ensure it is free from visible flaws and defects.

Wire ropes of 6 × 12 construction shall not be fitted with ferrules, as they are not considered suitable.

NOTE Figure 3 shows an example of a ferrule termination.

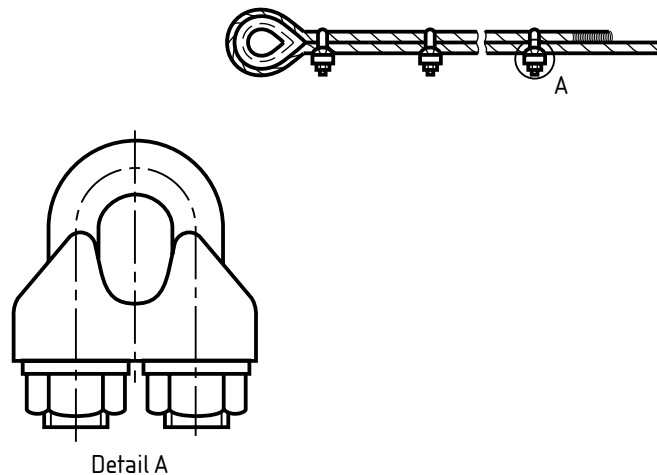


Figure 4 — Wire rope grip and application

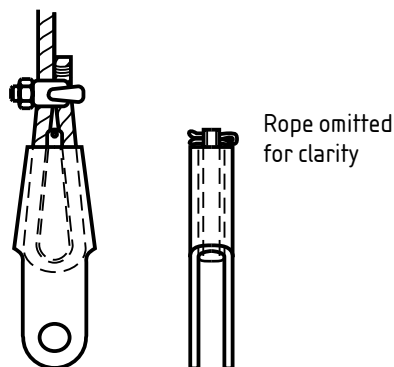


Figure 5 — Symmetrical wedge socket

5.3.4.3 Wire rope grips

Wire rope grips shall be fitted in accordance with the manufacturer's instructions.

NOTE 1 DIN 1142 gives guidance.

NOTE 2 Figure 4 shows an example of a wire rope grip and application.

5.3.4.4 Wedge socket

Wedge sockets shall be fitted in accordance with the manufacturer's instructions.

NOTE 1 Wedge socket is defined as a wire rope termination device where the rope is looped around the wedge and retained by a socket. Symmetrical wedge sockets conforming to DIN 15315 are recommended.

Asymmetrical wedge sockets shall not be used where there is a possibility of lack of compatibility between components.

NOTE 2 Figure 5 shows an example of a symmetrical wedge socket. Figure 6 shows an example of an asymmetrical wedge socket.

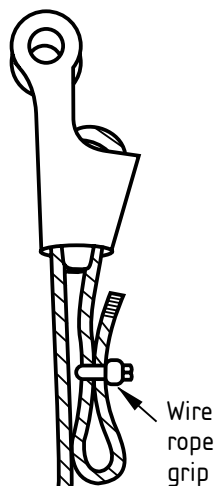


Figure 6 — Asymmetrical wedge socket

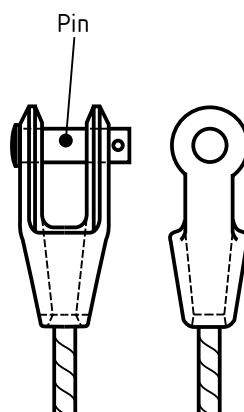


Figure 7 — Socket

5.3.4.5 Socket

Sockets shall be fitted in accordance with the manufacturer's instructions.

NOTE 1 BS 463 gives guidance for sockets.

NOTE 2 BS 7035 gives guidance for fitting

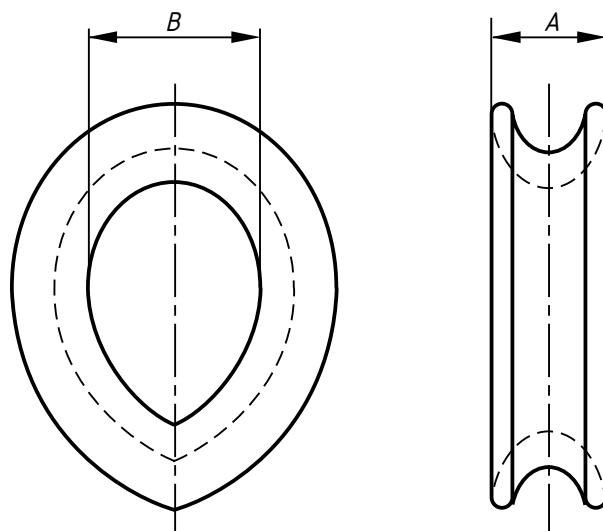
NOTE 3 Figure 7 shows an example of a socket.

5.3.4.6 Wire rope thimble

Where thimbles are used with ferrules and wire rope grip terminations, the following specifications shall be met:

- a) the overall thickness (A) of the thimble shall be less than 2.3 times the rope diameter;
- b) the inside diameter (B) of the thimble shall be between 2.4 and 3.5 times the nominal rope diameter;
- c) thimbles shall be zinc coated mild steel or stainless steel;
- d) care shall be taken to protect thimbles against corrosion, particularly between different materials.

NOTE BS 464 specifies some sizes of thimbles for wire ropes. Figure 8 shows an example of a typical wire rope thimble.

**Key**

A is the overall thickness;

B is the inside diameter.

Figure 8 — Wire rope thimble**5.3.4.7 Fibre rope thimble**

Thimbles shall be used in the spliced eye of a fibre rope in all applications where the eye is to be used over a pin of diameter smaller than twice the diameter of the rope, or where damage could occur to the rope by fretting.

Selection of the thimble shall be on the basis of rope diameter or the need for a hole different to that of a standard thimble specified in BS 3226 or DIN 6899 type BF.

Thimble material shall be galvanized steel, stainless steel or nylon. If nylon is chosen the user shall establish that loads on the rope will not distort the material.

5.3.5 Chain

The safety factor for chain shall be at least four.

Any chain used as part of an assembly shall be supported by the appropriate certification. All chains shall be terminated at their ends with a connector compatible with the mating equipment. The connector shall conform to the appropriate part of BS EN 1677 or provide equivalent strength when forming part of a lifting machine.

5.3.6 Sling

All slings shall be selected in accordance with BS 6166-3.

Chain slings shall conform to BS EN 818.

Woven webbing slings shall conform to BS 3481-2.

Round slings shall conform to BS 6668-2.

5.4 Bridle components

NOTE 1 Bridles are commonly made from wire rope but they may be chain or webbing types. A bridle is a two-legged sling comprising two legs connected at their upper ends by a suitable ring or link. Several bridles may be required to support a long scenery bar or truss.

The angle between the leg of a bridle rope and the horizontal shall be not less than 30° , unless rated and marked for use at a smaller angle taking full account of the resultant increased stresses.

The SWL of all bridle components shall be selected with regard to the load and angles involved.

The structural integrity of members that are being drawn together or put in compression by the bridle shall be assessed by a competent person.

NOTE 2 Figure 9 shows a typical bridle arrangement and Figure 10 shows the distribution of forces to be found with differing angular configurations.

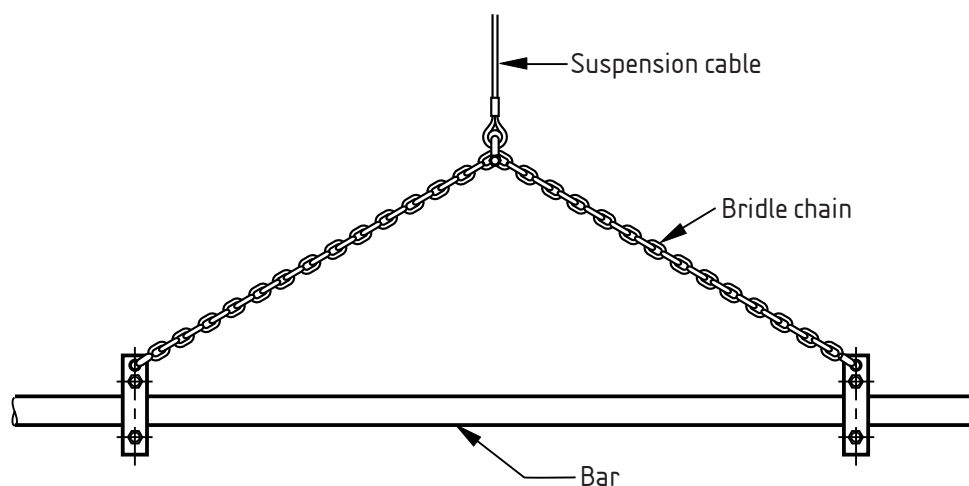
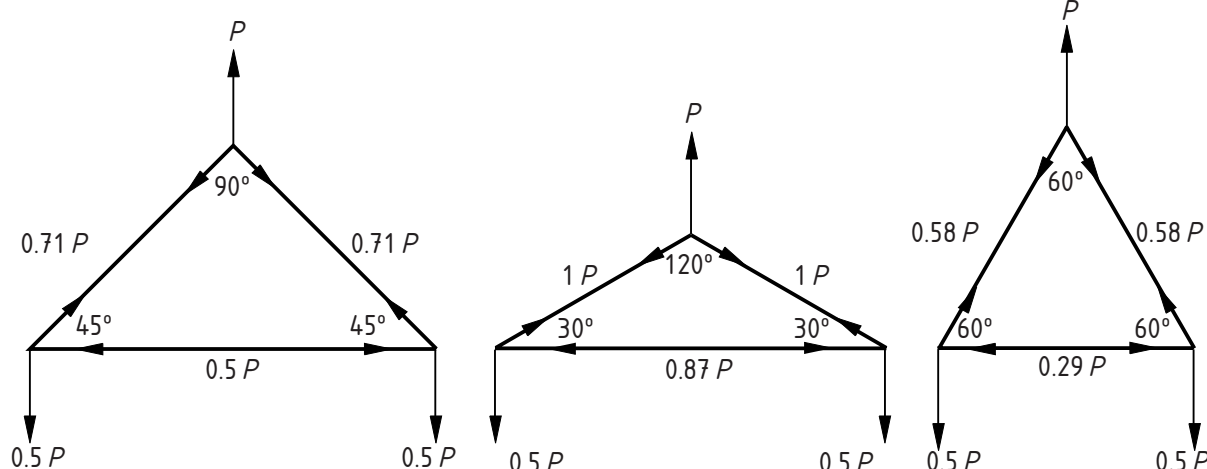


Figure 9 — Bridle



Key
P is load.

Figure 10 — Distribution of forces to be found with differing angular configurations

5.5 Anchorage

5.5.1 General

All anchorage points from which a load is to be suspended, raised or lowered, which are part of the fabric of the building or internal structure, shall have their strength determined and certified by a competent person (see also clause 11 Marking).

The load at each anchorage shall not exceed the SWL of that anchorage in the direction in which the load is applied.

NOTE For details of anchorages for use with personal protective equipment see BS EN 795.

5.5.2 Clamps

NOTE A beam clamp is used to attach a load to the flange of a steel beam. This load is usually vertical and in the plane of the web of the beam. Figure 11 shows a typical design. Other designs are also acceptable.

Marking shall either be in accordance with clause 11, or when a beam clamp is designed as part of a system, the marking of the system and the related technical file shall be sufficient.

The dynamic working coefficient shall exceed four and type testing shall demonstrate no permanent deformation after loading to twice the SWL.

Manufacturer's instructions shall be obeyed and shall define:

- a) the allowable direction of loading;
- b) the beam dimensions intended for use with clamps;
- c) the SWL for use with each different beam size and shape and loading direction(s).

All clamps shall be installed in such a way that the clamp is secured against falling in the event of removal of load. Only positive locking devices shall be used.

5.5.3 Cleat and belaying pins

NOTE 1 A cleat is used to secure a fibre rope by means of winding the rope around the two arms in sequence. A belaying pin mounted in a flyrail also serves as a cleat.

NOTE 2 Figure 12 and Figure 13 show examples of a cleat and belaying pins.

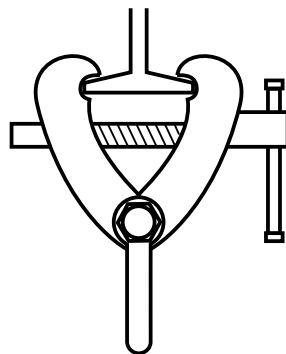
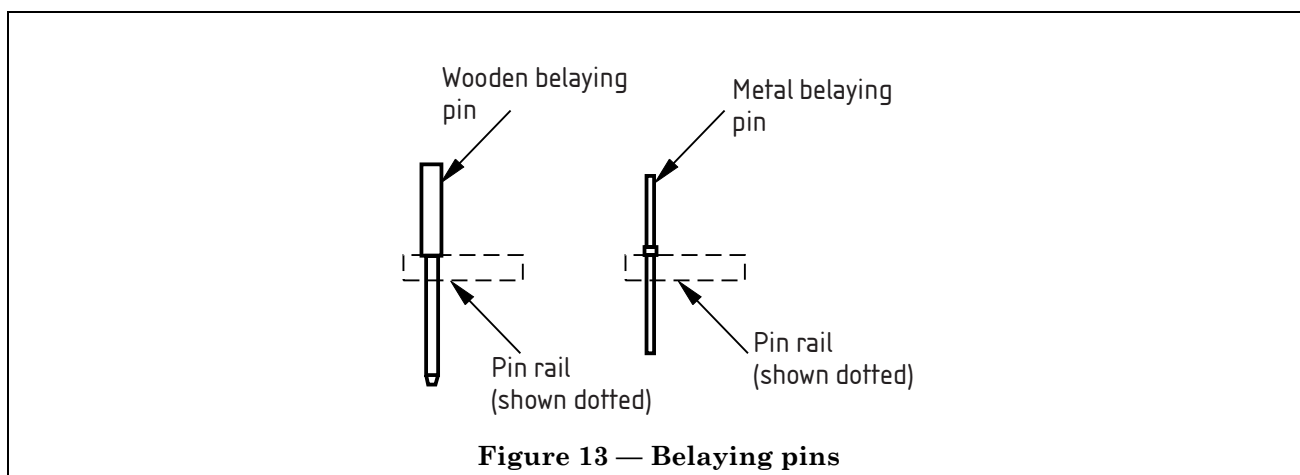
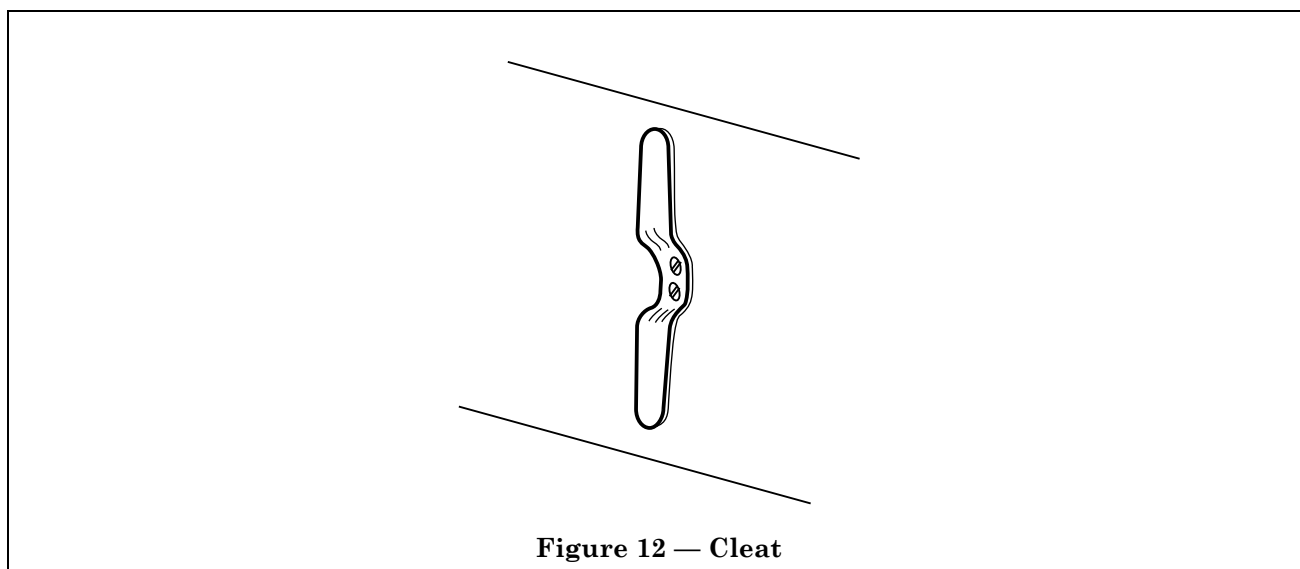


Figure 11 — Beam clamp



5.5.4 Flyrails (also known as pinrails or cleat rails)

NOTE A flyrail is a horizontal rail designed to be used to attach loads. A pinrail is a flyrail with a number of holes sized and positioned to accept belaying pins to enable them to be used as cleats.

Flyrails shall be permanently fixed and positioned at optimum levels for ease of operation. They shall be capable of sustaining all loads imposed by the suspension rope lines, and all other loads that may be applied, e.g. when diverting the hanging position of the load by horizontal deflection, sometimes referred to as brailing or breasting.

For full hemp set operations the flyrails shall be positioned in pairs with the top of the lower rail 0.6 m above floor level, and the top of the upper rail 1.1 m above floor level.

Loading notices shall be provided.

5.6 Connectors

5.6.1 Bar adjuster

NOTE A bar adjuster is a device to enable the trim of a suspended bar to be adjusted.

5.6.1.1 Trim chain

Trim chains used to connect suspension wire ropes to bars shall conform to 5.3.5.

5.6.1.2 Trimming bar hanger with adjustable clamp

For a trimming bar hanger the vertical suspension wire rope shall be diverted round grooved quadrants or pulleys with a D:d ratio greater than 9:1 set plumb beneath the overhead pulley to pass horizontally to the bar clamp.

Adjustment shall be achieved by sliding the clamp along the bar to an appropriate position and then clamping tight to prevent movement.

The design shall allow for all horizontal and vertical forces.

NOTE Figure 14 shows an example of a sliding bar hanger with adjustable clamp.

5.6.1.3 Rigging screw/turnbuckle

Rigging screws shall be constructed of welded or seamless steel tube. The full length of the thread in the tapped holes at the ends of the body shall be not less than 1.5 times the diameter of the screwed shank.

A tommy-bar hole shall be drilled through both walls of the body at the centre of its length, central to and at right angles to the axis.

A probe hole shall be provided to check the thread of the shank is fully engaged.

Rigging screws shall be used with a minimum engagement of 1.6 times the screw thread diameter. Rigging screws or turnbuckles shall be fitted with eye or fork ends. Open hooks shall not be used. Means shall be provided to enable the setting to be locked.

NOTE 1 BS 4429 gives guidance.

NOTE 2 Figure 15 shows an example of a rigging screw/turnbuckle.

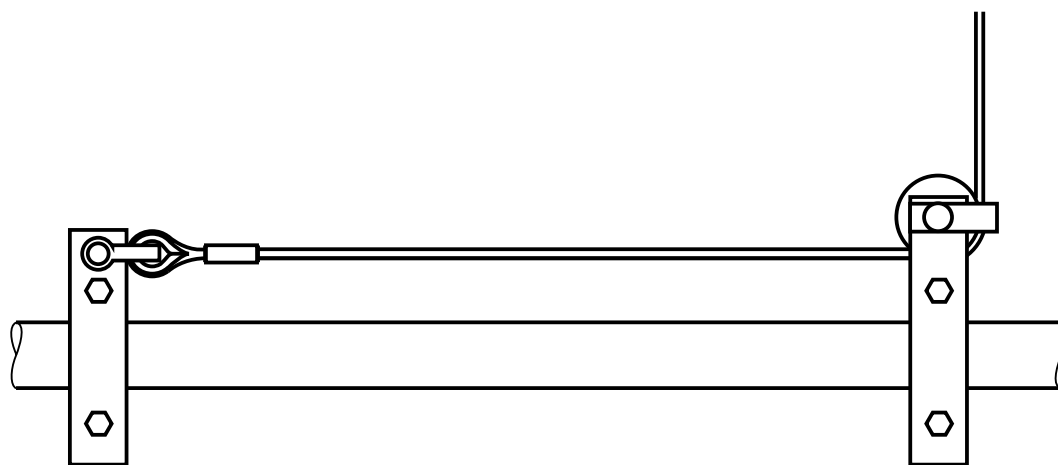


Figure 14 — Sliding bar hanger with adjustable clamp

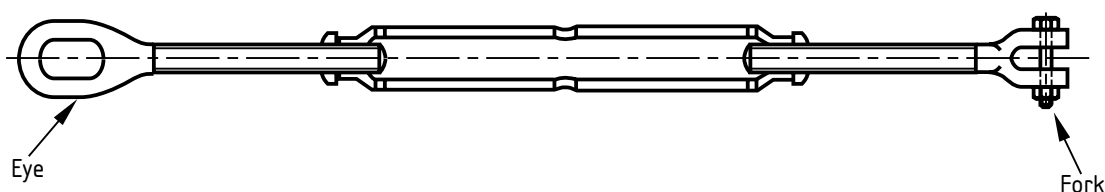


Figure 15 — Example of a rigging screw/turnbuckle

5.6.2 Bar hanger (barrel clamp)

Bar hangers shall secure suspension wires to bars without the possibility of sliding.

NOTE A bar hanger is a means of supporting a bar by clamping two shaped plates to the bar to provide an attachment for the suspension wire or chain. Figure 16 shows an example of a bar hanger.

5.6.3 Clew

Where required to prevent problems associated with the rotation of the ropes, clews shall be guided or provided with swivels.

NOTE A clew is a device for the attachment of a single rope to a number of ropes. Figure 17 shows an example of a clew with a swivel.

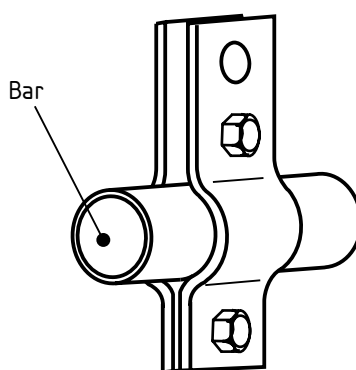


Figure 16 — Bar hanger

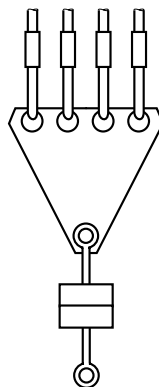


Figure 17 — Clew with swivel

5.6.4 Eyebolt

Where required, collared type eyebolts shall be used for general lifting applications.

Dynamo eyebolts shall only be used for installation and maintenance of equipment and shall only be used for axial lifting applications.

Uncollared long threaded eyebolts shall only be used for straight lifting applications.

NOTE Figure 18 shows an example of a collared eyebolt and a dynamo eyebolt.