GENERAL STANDARD

FOR

SAFETY BELTS

ORIGINAL EDITION

OCT. 1996

This standard specification is reviewed and updated by the relevant technical committee on Feb. 2003. The approved modifications are included in the present issue of IPS.

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0. INTRODUCTION

Safety belts and harnesses are means of protective equipment, which are filled around the upper parts of the body protecting the user against fall, and create self-confidence when used in the correct manner.

In designing and selecting a belt or harness for any particular work, care should be taken to ensure that the equipment gives the wearer, as far as it is compatible with safety, the maximum degree of comfort, and freedom of movement, and also in the event of wearer falling, the greatest possible security against injury.

Self-locking anchorage, lanyards and other component parts are safety protective devices against falls. In assessing the performance of safety belts and harnesses reliance is to be placed on maintenance, inspection and storage of equipment.

1. SCOPE

This Standard applies to protective equipment against fall and covers the minimum requirements for:

a) Design, adjustment, use of equipment, material specifications, manufacture, tests, performance requirements and inspection of safety belts and harnesses.

b) Design, materials for lanyards (chain and webbing), requirements for braided ropes and test of self-locking safety anchorages.

Note:

This standard specification is reviewed and updated by the relevant technical committee on Feb. 2003. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No 222 on Feb. 2003. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

BSI (BRITISH STANDARD INSTITUTION)

BS.AU 183 (1983)	"Specification for Passive Seat Belt Systems"
BS EN ISO 7500 (1999)	
BS 2087 (1981)	"Preservative Textile Treatments"
BS 3144 (1987)	"Methods of Sampling and Physical Testing of Leather"
BS 3146 (1984)	"Investment Castings in Metal"
BS 3382 (1968)	"Electroplated Coatings on Threaded Components"
BS EN 818 (1996)	
BS 7773 (1995)	
BS EN 696 (1995)	
BS EN 697 (1995)	
BS EN 699 (1995)	
BS EN 700 (1995)	
BS EN 701 (1995)	

3. DEFINITIONS AND TERMINOLOGY

For the purpose of this Standard the following definitions apply.

3.1 Pole Strap

The part of pole belt which is passed round a pole or similar structure.

3.2 Pole Belt

The combination of waist belt and pole strap.

3.3 Breeching Attachment

An attachment permitting a pole belt to be worn so that the load on the wearer is taken by the buttocks. It consists of a waist belt with two or more droppers to which the pole belt is attached.

3.4 Droppers

That part of the breeching attachment providing the connecting links between the waist belt and the pole belt.

3.5 Safety Lanyard

The line for connecting the safety belt or harness to an anchorage point.

3.6 Load-Bearing Component

Any component of a safety belt, of a safety harness, or of a safety lanyard to which a load can be applied by the wearer's body while working or in the event of an arrested fall.

3.7 Primary Straps

Straps which take the direct load in the event of an arrested fall.

3.8 Secondary Straps

Straps used for connecting and positioning primary straps in assembly and in use.

3.9 Positioning Device

A device that is normally locked onto an anchorage line and which requires manual release to permit free travel.

3.10 Structural Anchorage

A secure point of attachment on a structure to which an anchorage line may be secured.

3.11 Anchorage Line

A rigid or flexible line secured to a structure to which a positioning device may be secured.

3.12 Connector

Any single item or arrangement of items that connects the safety belt or harness to the appropriate connecting feature on the positioning device or anchorage line including any tail on the harness or belt.

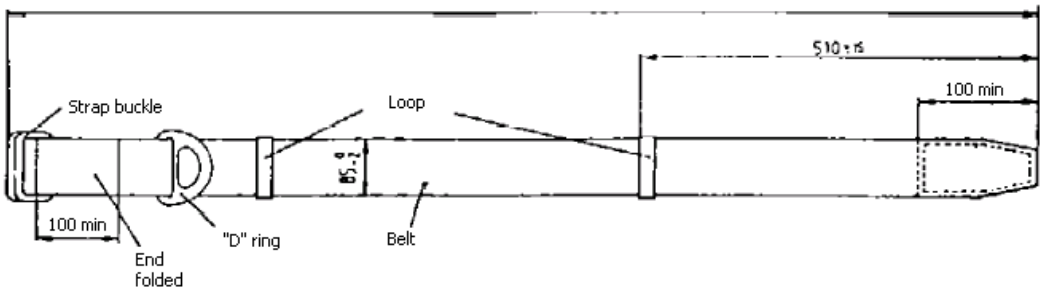
3.13 A system components material configured a device that fastens around the waist only and designated as ladder belt of an escape belt.

4. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

5. SPECIAL REQUIREMENTS

5.1 Safety belts are not expected to conform to the design illustrated in Figs. 1 through 4 herein , compliance is only required in respect of the dimensions specified. (Dimensions in mm)



SAFETY BELT WITH ONE "D" RING AND WITHOUT DOUBLE - SPIKED BUCKLE
Fig. 1

6. TYPES

6.1 Types of belts and harnesses are as follows:

6.1.1 Type (A)

Pole belts.

6.1.2 Type (B)

General purpose safety belts.

6.1.3 Type (C)

Chest harness.

6.1.4 Type (D)

General purpose safety harnesses.

6.1.5 Type (E)

Safety rescue harnesses.

7. DESIGN

7.1 Type A

7.1.1 The belt shall be capable of being firmly attached round the wearer and at the same time firmly secured round the structure. It shall be made to one of the following general patterns:

a) Separate waist belt and pole strap connected with snap hooks and 'D' rings or other suitable fittings;

b) waist belt and pole strap permanently connected on one side, and connected on the other side with snap hook and 'D' ring or other suitable fitting;

c) either (a) or (b) but having a waist belt with suspended breeching belt and pole strap designed so that the load is taken by the wearer's buttocks;

d) see also Clause 13.

7.2 Types B and C

7.2.1 The belt shall be designed to comply with the requirements of Clause 13 when tested on any safety lanyard attachment point on the belt.

7.3 Type D

7.3.1 The harness shall be designed to comply with the requirements of Clause 13 when tested on any safety lanyard attachment point on the harness. The harness shall provide support for the body around the lower chest, over the shoulders and around the thighs.

7.4 Type E

7.4.1 Rescue harnesses shall be designed to comply with the requirements of Clause 13 when tested on any of the rescue line attachment points on the harness.

8. USE OF BELTS AND HARNESSES

8.1 Type A

- Is for use of linesmen, not intended in situations permitting a drop of more than 60 cm.

8.2 Type B

- Used in conjunction with lanyard where mobility is limited.
- Length of drop to within a max. of 60 cm.

8.3 Type C

Chest harness is used with lanyard. Combined effects of anchorage and length of lanyard limits drop to max. of 2 m.

8.4 Type D

Used in conjunction with lanyard where freedom of movement is required. Limit of drop to max. of 2 m.

9. MEANS OF ADJUSTMENT

9.1 Types A, B, C, and D

- Means of adjustment for length to fit the wearer.
- Self-lock adjusters securely lock on belt or strap, do not present roughened surfaces and sharp edges (knurled bars are permitted).
- Retain pole strap at the extremity of adjustment.
- "D" rings shall be attached to waist or breeching belt.
- Connection and disconnection of the snap hook to be of single handed operations.
- When "D" ring is fastened to the waist or breeching belt, the belt should pass through "D" ring and secured by reinforcement.
- If it is possible for snap hook to pass through "D" ring, it shall be capable of easy withdrawal

after any degree of rotation.

Notes:

1) If pole belt is used with breeching attachment, the droppers shall be located on waist belt or on pole strap so that they can not be moved laterally more than 10 cm.

2) "D" ring or rings or other equivalent facility shall be provided on the waist belt for the attachment of the safety lanyard and shall be capable of accepting two such lanyards.

3) Where "D" ring is secured to waist belt by a loop, the loop shall be as strong as the belt and shall pass through the "D" ring and capable of easy withdrawal after any degree of rotation.

4) "D" ring or other equivalent facility provided for the attachment of lanyard shall be located in the upper part of harness so that the angle formed between the spine of suspended wearer and lanyard does not exceed 45°.

10. MATERIALS FOR BELTS AND HARNESSES

10.1 Webbing for Belts and Harnesses

10.1.1 Quality

The yarn used for man-made fiber webbing shall be of virgin, bright, high-tenacity polyamide, or nylon, or polyester fibers having a uniform breaking strength or any other suitable man-made material. Natural fiber webbing shall be made from flax or cotton yarn, well spun and evenly twisted, and having a uniform breaking force. It shall be suitably processed at an appropriate stage of manufacture to render it rot-proof by suitable processing in accordance with BS 2087.

10.1.2 Strength

Webbing used for primary straps shall have a minimum breaking force of 9 kN (902 kgf) per 25 mm width. Webbing used for secondary straps shall have a minimum breaking force of 4.5 kN (451 kgf) per 25 mm width. This ensures adequate thickness to prevent ’roping of the webbing.

10.2 Leather

10.2.1 Quality

Best quality butt leather only shall be used. The leather shall be free from flaws which would reduce its strength and from soft and loose fibered leather. There shall be no blind warbles in those parts where buckle holes are punched.

The leather shall not be treated as to obscure defects, and shall not be treated with a non-permeable surface finish. It shall not be stained with compounds of iron.

10.2.2 Acidity

The pH value of an aqueous extract from the leather shall not be below 3.3.

10.2.3 Tensile strength

The tensile strength of the leather shall not be less than 20.7 N/mm² (211 kgf/cm²). For this test one sample is to be cut from each butt, the sample being cut parallel and adjacent to the backbone with

one end of the sample within 50 mm of the root of the tail. The minimum thickness in the restricted portion of the test piece shall be used for determining the area of cross section.

10.2.4 Cracking

The leather shall not crack on the grain side when bent grain outwards through an angle of 180° around a mandrel of diameter 19 mm when tested in accordance with method 7 of BS 3144: 1987. This test shall only be applied to parts of leather where there are no buckle holes or stitching.

10.3 Threads for Sewing

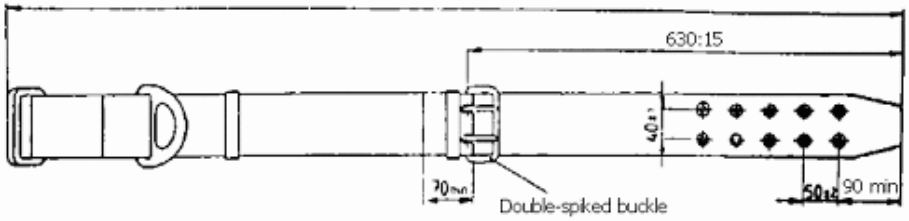
10.3.1 Color

Threads shall be of a different color from the sewn material.

10.3.2 for hand-sewing leather

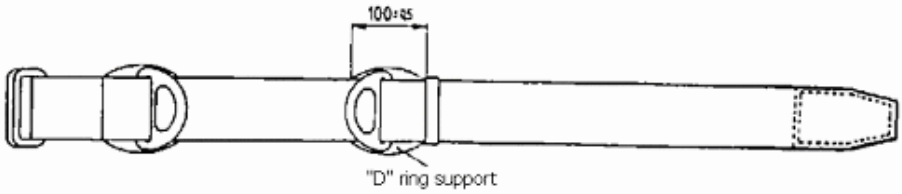
The threads shall preferably be of best quality flax or hemp, and shall be of 6-cord No. 12 white flax or thread of comparable strength. The cords of strands used in making up the threads shall be well twisted and thoroughly waxed. Alternatively, equivalent and suitable synthetic threads shall be used.

SAFETY BELT WITH TWO "D" RINGS AND A DOUBLE - SPIKED BUCKLE



OTHER DIMENSIONS AND NOMENCLATURE AS OF Fig. 1
Fig. 2

SAFETY BELT WITH ONE "D" RINGS AND WITHOUT A DOUBLE - SPIKED BUCKLE



OTHER DIMENSIONS AND NOMENCLATURE AS OF Fig. 1
Fig. 3

SAFETY BELT WITH TWO "D" RINGS AND A DOUBLE - SPIKED BUCKLE

OTHER DIMENSIONS AND NOMENCLATURE AS OF Fig. 1

Fig. 4

10.3.3 for machine-sewing leather

Stout linen or similar thread, well-waxed and of suitable thickness, shall preferably be used. Alternatively, equivalent and suitable threads of man-made fibers shall be used.

10.3.4 for natural fibers webbing

Best quality linen thread of size appropriate to the thickness of folded webbing to be sewn, shall preferably be used. Alternatively, equivalent and suitable thread of man-made fibers shall be used.

10.3.5 for man-made fibers webbing

Best quality man-made fiber thread appropriate to the thickness of folded webbing to be sewn shall be used and it shall be compatible with the chemical resistance of the main fabric.

10.4 Rivets and Washers

10.4.1 for leather

Tinned solid copper rivets of best quality shall be used with tinned copper washers.

10.4.2 for webbing

Rivets and washers as specified in 10.4.1 for leather, or other suitable rivets of comparable quality, may be used in addition to stitching. The riveted strength shall not be less than the unriveted strength.

10.5 Metal Components

10.5.1 Materials

Metal components shall be constructed either of stainless steel or of one of the basis metals specified in Table 1.

10.5.1.1 Finishing

All metal components shall be smoothly finished, free from any defects due to faulty material or manufacture, and those made other than of stainless steel shall comply with the requirements specified in Table 1 that are appropriate to the finish used. When, in a multi-part component, more than one finish is present, each finish shall be assessed separately.

10.5.1.2 Hooks

Hooks shall be of the self-closing variety and of such a type of design that pressure exerted accidentally on the tongue or latch will not permit disengagement; this shall be achieved by means of a locking device to prevent the accidental opening of the tongue or latch. The springs of the hooks shall preferably be so loaded that, when the hooks are closed, the springs rest tightly in position and are free from any movement until pressure is applied to engage or release. Alternatively, hooks or main connectors shall be so designed that, when intended to be affixed only to a mating fitting, they cannot be accidentally released from such a fitting.

10.5.2 Coatings

Metal components, other than those constructed of stainless steel and threaded components, shall be coated. Threaded components, other than those constructed of stainless steel, shall be coated in accordance with BS 3382: Parts 1, 2, 3, 4 or 7 as appropriate to the basis metal and coating to be applied.

When in a multi-part component more than one coating is present, each coating shall comply separately with the requirement of this clause. If metal components have been coated with a plastics material, the plastics coating shall be removed before performing corrosion tests in accordance with Table 1 of this Standard.

Note:
Where there are dissimilar metals in contact, attention should be given to the possibility of galvanic action.

TABLE 1 - COATINGS OF METAL COMPONENTS

	COATING	BRITISH STANDARD	GRADE	ASSESSED FOR
Steel	Electroplated zinc*	1706	Zn_3	Appearance, adhesion, coating thickness
	Electroplated cadmium*	1706	Cd_3	Appearance, adhesion, coating thickness
	Hot dip galvanized	729	NA	Appearance, adhesion, coating thickness
	Sherardized	4921	Class 2	Coating thickness
	Electroplated nickel	1224	Medium application grade	Appearance, adhesion, coating thickness and, for nickel plus chromium
	Electroplated nickel and chromium	1224	Service condition No. 2	Corrosion resistance
Copper or brass	Electroplated nickel	1224	Medium application grade	Appearance, adhesion, coating thickness and, for nickel plus
	Electroplated nickel and chromium	1224	Service condition No. 2	Chromium corrosion resistance
Aluminum	Anodized	1615	AA10	Appearance, coating thickness, sealing
	Electro-Plated nickel	1224	Medium application grade	Appearance, adhesion, coating thickness
Aluminum alloy	Electroplated nickel and chromium	1224	Service condition No. 2	and, for nickel plus chromium corrosion resistance
Screw threads	Any of the above coatings covered by BS 3382	3382	NA	Appearance, adhesion, plating thickness porosity (where appropriate)

*** Denotes preferred finishes. Zinc coatings are more suitable for general use including use in industrial atmospheres, and cadmium is more suitable for use in marine environments.**

Notes:

1) Where tolerances are important it is recommended that the manufacturer should also specify a maximum coating thickness (which should not be less than twice the minimum thickness).

2) Attention is drawn to the clauses concerning hydrogen embrittlement in the relevant standards. It is necessary that the platter be informed of the specification of the steel to be plated.

3) The cleaning and preparation of parts before coating should be carried out to the highest standard (see BS 7773).

11. LANYARDS

11.1 Design of Safety Lanyards

11.1.1 Safety lanyards are an essential component of general-purpose safety belts and harnesses and it is essential that they are always attached to a "D" ring or other equivalent facility provided on the primary straps.

11.1.2 Length

Safety lanyards shall be designed so that their length cannot be extended beyond their intended length by any arrangement of their components. The effective length of the lanyard, including attachment devices and any shock absorber shall not exceed 1.2 m for type B belts and 2 m for Types C and D harnesses.

11.1.3 Design of rope safety lanyards

Lanyards made from man-made fibers shall have a spliced eye at each end for attaching to the belt or harness and for attachment of the safety snap hook or other means of attachment to the permanent structure. The splice for laid ropes or loops shall consist of four full tucks using all the yarns in the strands and two tapered tucks. The length of the splicing tails emerging after the last tuck shall be at least one rope diameter. Tails shall be whipped to the rope with a sealing compound compatible with the rope fiber and protected with a rubber or plastics sleeve. Eyes shall be formed round a plastics or metal thimble of appropriate size and strength.

8-strand (plaited) polyamide, or nylon, ropes shall be spliced by making one double strand full tuck and four single strand full tucks. The tails emerging after the last tuck shall be at least two rope diameters in length and shall be whipped to the ropes as described above.

11.1.4 Design of chain safety lanyards

Lanyards shall consist of an arrangement of length(s) of chain, terminal and intermediate links such that one end can be secured with a self-closing hook to the harness or belt and the other end to an anchorage point.

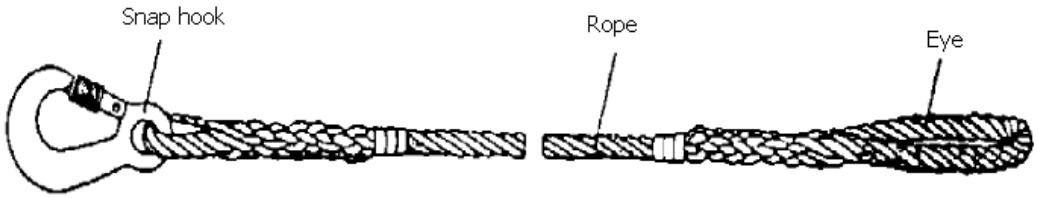
11.1.5 Design of webbing lanyards

Lanyards shall comprise the webbing and any thimbles, fairing or protective piece, hooks and other fittings necessary for the lanyard to comply with the requirements of this Standard whether it is permanently attached to a safety belt/harness or is supplied as an accessory. The webbing shall be secured with a compatible synthetic thread.

It should be noted that the shock absorbing properties of the lanyard will be reduced if it is formed of two or more lengths of webbing sewn together lengthwise.

11.2 Materials for Safety Lanyards

11.2.1 A lanyard is protective equipment against fall consisting of rope or webbing with an attachment device (eye, snap hook) at its ends which connects a belt (safety belt, safety harness, rescue harness) to an anchorage point (see Fig 5).



EXAMPLE OF LANYARD (ILLUSTRATING A ROPE LANYARD WITH SNAP HOOK AND EYE)
Fig. 5

Warning Note:

In choosing a safety lanyard it is important to keep in mind that if there is a requirement to protect a wearer against a drop of between 60 cm and 2 m, chain and natural fiber rope are unsuitable unless adequate shock absorbing properties are built into the harness or lanyard. These materials should only be used when overriding considerations render unsuitable the use of polyamide, or nylon, and polyester ropes. Safety lanyards should never be knotted.

Polyamide, or nylon, degrades in direct contact with acids. Polyester degrades in direct contact with alkalis and may swell in contact with certain chlorinated solvents. Attacks by concentrated phenols are severe and should be avoided.

11.2.2 Materials for rope lanyards

11.2.2.1 Ropes shall have a minimum diameter of 12 mm and a minimum breaking force of 29.4 kN (3000 kgf) [see 13.4 (c) method of use].

11.2.2.2 Ropes shall be made of virgin, bright, high-tenacity continuous polyamide, or nylon, or polyester filament and shall comply with the requirements of BS EN 696, 697, 699, 700, 701 (1995). For the purposes of this Standard, Table 2 covers 8-stand (plaited) polyamide, or nylon, filament ropes.

TABLE 2 - REQUIREMENTS FOR 8-STRAND PLAITED POLYAMIDE (NYLON) AND POLYESTER FILAMENT ROPES

Size or Reference Number	Polyamide (Nylon) Ropes				Polyester Ropes			
	Nominal Mass Per 100 m	Minimum Breaking Load	Minimum Breaking Strength	Maximum Length of 20 Plait Pitches	Nominal Mass per 100 m	Minimum Breaking Load	Minimum Breaking Strength	Maximum Length of 20 Plait Pitches
	kg	kg	kN	m	kg	t	kN	m
1	4.2	1.4	14	0.30	5.1	1.0	9.8	0.30
1½	9.4	3.0	29	0.45	11.6	2.3	23	0.45
2	16.6	5.3	52	0.60	20.5	4.1	40	0.60
2½	26.0	8.3	81	0.75	31.9	6.3	62	0.75
3	27.3	12.0	118	0.90	46.0	9.1	89	0.90
3½	51.0	15.8	155	1.05	62.8	12.2	120	1.05
4	66.4	20.0	196	1.20	81.9	15.7	154	1.20
5	104	30.0	294	1.50	128	23.9	234	1.50
6	150	42.0	412	1.80	185	33.5	329	1.80
7	203	56.0	549	2.10	251	44.7	438	2.10
8	265	72	706	2.40	327	57.0	559	2.40
9	336	90	883	2.70	414	72	706	2.70
10	415	110	1080	3.00	511	88	863	3.00
11	501	131	1285	3.30	619	106	1040	3.30
12	597	154	1510	3.60	736	125	1225	3.60
13	700	180	1765	3.90	860	145	1420	3.90
14	810	210	2060	4.20	1000	165	1620	4.20
15	930	240	2355	4.50	1150	190	1865	4.50
16	1060	270	2650	4.80	1310	215	2110	4.80
17	1200	305	2990	5.10	1480	245	2400	5.10
18	1340	340	3335	5.40	1660	270	2650	5.40

Note:

The reference or size number of an 8-strand plaited rope corresponds to the circumference in inches of a 3-strand rope of the same fiber having an equivalent mass per 100 m and breaking strength. This number may be derived from the 3-strand rope diameter in millimeters by dividing by 8.

11.2.3 Strand (plain or hawser laid) ropes

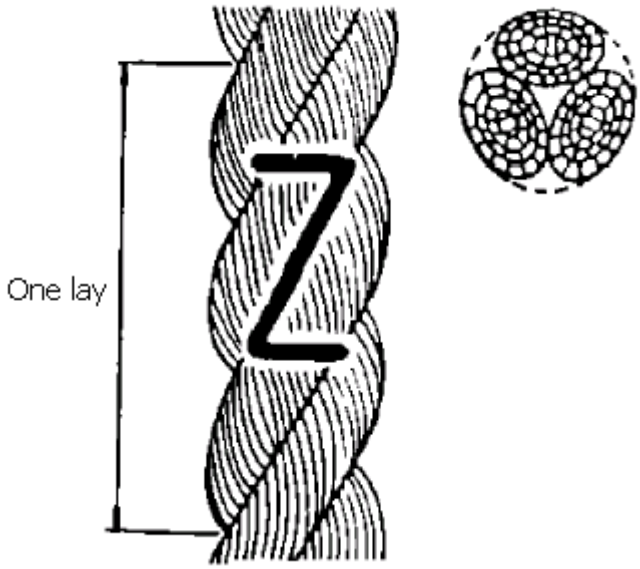
11.2.3.1 Direction of lay

For 3-strand (plain or hawser laid) ropes the direction of lay, shall be "Z" or right-hand lay (see Fig. 6).

11.2.3.2 Length of lay

The length of 10 lays shall be as specified in Tables 1 and 2, when tested in accordance with A.3 of BS 4928 (1985).

Notes:
1) The length of one lay is illustrated in Fig. 6.
2) 3-strand ropes made from polyamide (nylon) and polyester may be heat treated to set the lay and obtain dimensional stability. Polyamide (Nylon) Ropes Polyester Ropes



3 - STRAND PLAIN OR HAWSER LAID ROPE
Fig. 6

11.2.4 8-Strand (plaited) ropes

11.2.4.1 Construction and twist of strands

8-strand plaited ropes shall consist of four pairs of strands, each alternative pair consisting of two 'S' twist strands and two 'Z' twist strands respectively (see Fig. 7).

11.2.4.2 Length of plait pitches

The length of 20 plait pitches shall be as specified in Tables 3 and 4 when tested in accordance with A.3. of BS 4928: (1985).

Note:

The length of one plait pitch is illustrated in Fig. 7.

11.2.4.3 The following Table 3 cover 8-strand (plaited) polyamide, or nylon, filament ropes having referenced and size Nos. 1½ and 1¾.

TABLE 3

REFERENCE OR SIZE No.	NOMINAL MASS PER 100 m kg	MIN. BREAKING FORCE		MAXIMUM LENGTH OF 10 STITCHES mm
		kN	kgf	
1½	9.37	29.4	3000	420
1¾	12.80	40.2	4100	490

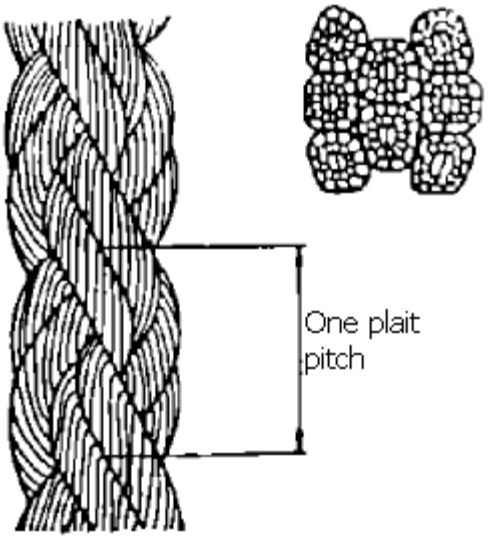
11.2.5 Double braided ropes

11.2.5.1 Double braided ropes shall comprise a braided core covered by a braided sheath.

11.2.5.2 Half the strands in both the core and sheath shall have "S" twist and half shall have "Z" twist.

11.2.5.3 With the exception of the requirements of 11.3.4.2 each strand of the sheath shall be of the same construction and each strand of the core shall be of the same construction.

Note:
The constructions of the sheath strands and the core strands need not be the same.



8-STRAND PLAITED ROPE
Fig. 7

11.2.6 Materials for chain lanyards

The chain shall comply with the requirements of the 6.3 mm chain size given in BS 4942: Part 3. The terminal egg links and intermediate links shall comply with the requirements given in BS 2902 for those links used with ¼ in chain. If special intermediate links are used, the dimensions shall be agreed by the purchaser and the manufacturer and the links shall comply with the appropriate performance requirements of BS 2902.

The materials used for terminal egg links and intermediate links in the lanyard shall be compatible with the chain for heat treatment purposes. After fitting any terminal egg links and/or intermediate links, the lanyard shall be adequately heat treated with a final process of hardening and tempering.

This requirement is waived if the chain itself has been hardened and tempered previously and if link heaters are used to treat the additional links.

11.2.7 Material for webbing lanyards

The yarn used for webbing lanyards shall be of virgin, bright, high-tenacity polyamide, or nylon, or polyester fibers having a uniform breaking strength. Webbing lanyards shall be tested in accordance with Appendix A of BS 1397 and shall have a minimum breaking force of 20 kN (2040 kgf) and a maximum width of 50 mm.

12. MANUFACTURE

12.1 Webbing Safety Belts and Harnesses and Webbing Lanyards

The attachment of metal load-bearing components and the making of splices and joints in the material of the belt or harness shall be such that the finished assembly will comply with the requirements of Clause 13.

All machine sewing shall be carried out with even tension on a suitable lockstitch machine and securely finished off by back sewing for at least 13 mm, except where sewn by an automatic lock stitching machine when the first and last stitches shall be sewn in such a way as not to provide a natural starting point for a break in the stitching. Sewing shall not be carried out within 2.5 mm of any edge of the webbing. This does not exclude over sewing of sealed ends. Heat sealed edges shall not be over sewn unless the over sewing stitching is protected.

Where a prong buckle is used, the belt shall be provided with effective reinforcements that will prevent the disengagement of the prong if the webbing fails. Metal load-bearing components shall be designed or protected to prevent abrasion of the webbing passing round them.

All securing buckles (i.e., buckles other than those used primarily for adjustment of fit) shall be designed so that either they can only be assembled in the correct manner or, if they are capable of assembly in more than one way, each method of assembly shall comply with the requirements of Clause 13.

12.2 Leather Safety Belts and Harnesses

12.2.1 Thickness and width

Leather safety belts and harnesses shall be at least 4.75 mm in thickness and load-bearing straps shall not be less than 50 mm wide.

12.2.2 Quality

They shall be free from cuts or other flaws due to manufacturing processes and shall be well and smoothly finished at the edges.

12.2.3 Position of holes

Strips cut, for safety belts and harnesses, in which holes for buckles are punched shall be placed so that the shoulder ends are either used to receive the buckles or attached to other portions of the belt or harness, and so that the holes are punched in the butt portion.

12.2.4 Splices

Splices shall be used only where the design of a pole belt renders their use unavoidable and they shall, where possible, be placed where they are reinforced by the body belt.

12.2.5 Beveling of ends

The ends of all overlaps, joints or splices, or straps of reinforcements, where attached to the belts and harnesses, shall be satisfactorily beveled (skived) and fitted to ensure sound joints and to avoid abrupt terminal points.

12.2.6 Punching

At the end of a strap to which a buckle is fitted, a crew punch shall be used to make the hole through which the tongue is to pass. At the other end, the holes for the buckle tongue shall be made with an oval punch.

12.2.7 Buckles

Buckles shall be inserted so that when the leather is bent around the shoulder of the buckle, it fits over a core of not less than 13 mm diameter. Beveled leather reinforcements shall be passed around the shoulders of buckles before attaching the belt or strap.

12.2.8 Sewing

All hand-sewing of leather shall be carried out by the ’double-hand’ method, with not less than six and not more than seven stitches to 25 mm. Sewing shall be continuous, and back-sewn with at least two drop-stitches before fastening off the threads. For leather, if not hand-sewn, all sewing shall be carried out on a heavy lockstitch machine and as stated in the previous paragraph.

Sewing shall not be carried nearer than 6 mm to the edges of the leather on strips 38 mm wide or more, and not nearer than 5 mm on strips less than 38 mm wide. In no case shall stitching be placed at right angles to the length of the belt or strap. Belts or straps 50 mm wide or more shall have three rows of sewing; those less than 50 mm wide shall have two rows of sewing.

13. PERFORMANCE REQUIREMENTS

13.1 Tests

13.1.1 Self-Locking safety anchorages

13.1.2 A self-locking safety anchorage is an item of protective equipment consisting of an anchorage line (e.g., rigid or flexible) and a movable arrestor attached to it, to which a safety belt or safety harness can be fixed by means of a connector.

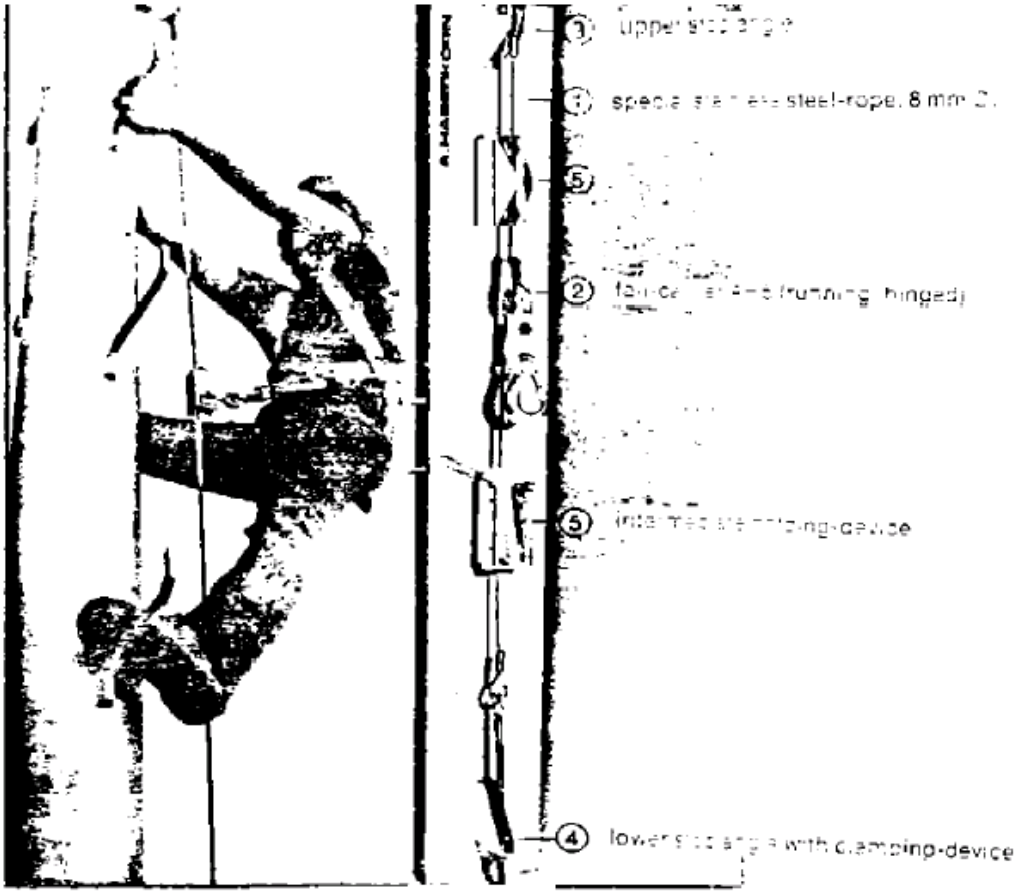
13.1.3 An arrestor is a device which is fitted to an anchorage line to move in the direction specified, is designed to permit the attachment of a connector, responds to loading and, thus, keeps the person to be protected attached to the anchorage. The connector may be part of the arrestor.

13.1.4 An anchorage line is a device, which permits the arrestor to move in the direction specified. An anchorage line may be fitted with a bracket to fix it to a ladder or to a structure.

13.1.5 A connector (e.g., rope, strap, fittings, chains) is that part of the protective equipment, which connects the arrestor to the ‘D’ rings, has the safety belt or safety harness.

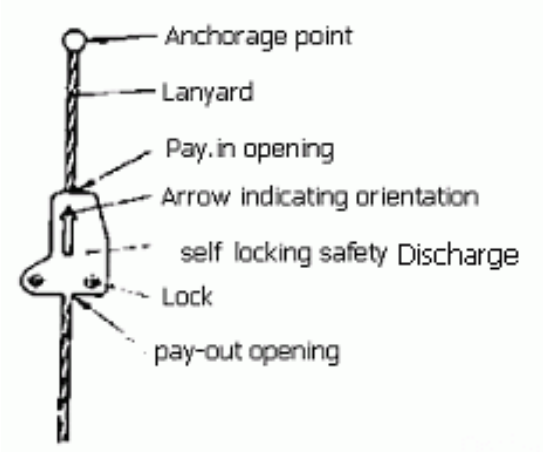
13.1.6 Points are a device permitting the arrestor to be moved from one anchorage line to another.

13.1.7 An attachment/detachment point is the point on the anchorage line where the arrestor is fitted or detached.



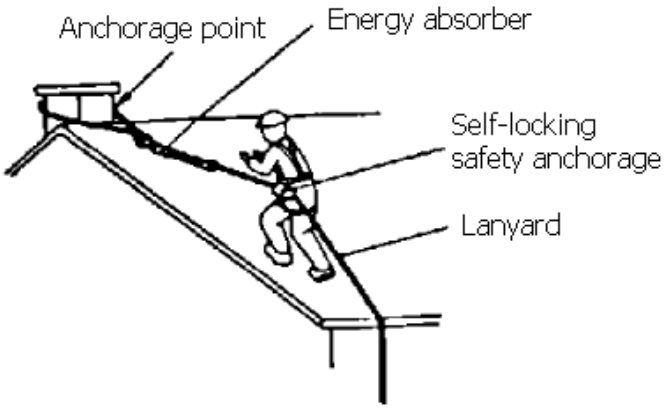
EXAMPLE OF A SELF-LOCKING SAFETY ANCHORAGE WITH LADDER

Fig. 8

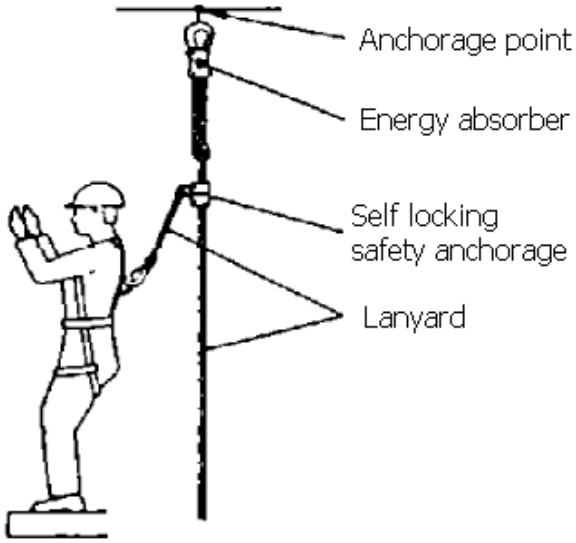


EXAMPLE OF A SELF-LOCKING SAFETY ANCHORAGE ON A LANYARD

Fig. 9



EXAMPLE OF A SELF-LOCKING SAFETY ANCHORAGE ATTACHED DIRECTLY TO THE BELT
Fig. 10



EXAMPLE OF A SELF-LOCKING SAFETY ANCHORAGE WITH A LANYARD
Fig. 11

13.2 Belts and Harnesses

13.2.1 When type "A" belts are tested the provision given in Appendix A.2 of BS 1397 (1979) shall be followed.

13.2.2 When Types B, C, D and E belts and harnesses are tested the provision given in Appendix A.3 of BS EN 354, 355, 358, 361, 362, 363, 364, 365 (1993) shall be followed.

13.3 Strength and Tests

13.3.1 Hooks, safety lanyard and pole belt attachment fittings

13.3.1.1 Any hooks shall be of the self-closing variety of such a type or design that pressure exerted accidentally on the tongue or latch will not permit disengagement. This shall be achieved by means of a locking arrangement to prevent the accidental opening of the tongue or latch. The springs of the hooks shall be free from any movement when the hooks are closed, and engaged or released when pressure is applied on them. Each attachment or components of hooks, safety lanyard shall be proof tested to 11 kN (1120 kgf). The application of the proof load shall reproduce as closely as practicable the direction in which the component is stressed in service. After proof testing the component shall be free from flaw, defect or distortion.

When tested to destruction components shall have a minimum breaking force of 22 kN. In the case of hooks, both of the foregoing tests shall be carried out with latches closed by the self-closing arrangement but with the securing device in the open position.

13.3.1.2 Other load bearing components

Each of these components shall be proof tested to 50% of the ultimate tensile strength but with a maximum of 11 Kn (1120 kgf) without showing signs of flaw, defect or permanent distortion. The application of the proof load shall reproduce as closely as practicable the manner in which the component is stressed in service.

13.3.2 Additional provisions for castings

Where castings are used for steel load-bearing components they shall be made by the investment casting process and shall be in accordance with BS 3146. Where castings are used for aluminum load bearing components they shall be made by gravity die-casting.

Note:

If safety belts, harnesses and lanyards are to be used in potentially flammable or explosive atmospheres, purchasers should specify that no metal components shall be made of aluminum, magnesium or titanium; neither shall any alloy containing one or more of these constituents be used unless both the total content of these three constituents does not exceed 15% by mass, and the content of magnesium and titanium together does not exceed 6% by mass. These limitation have been imposed to avoid the hazards of spark due to friction between rusted steel or iron and the metals described.

13.4 Method of Use

13.4.1 The following points are applicable to any work:

a) Inspection of the appliance before use.

b) Correct fitting and adjustment.

c) Selection and inspection of suitable anchorage points. A suitable anchorage point is one, which is strong enough and allows free movement of the attachment, and is as high as possible to reduce the amount of fall. It should also be as nearly vertical as possible above the place of work to reduce the liability to swing.

d) After use, the appliance should be stored as indicated in Appendix A.2.

e) If the appliance has been used to arrest an accidental fall it should be withdrawn from use. It is strongly recommended that consideration be given to it being destroyed.

Where work is such that the position of anchorages cannot be used above the point of work the use of double lanyards or self locking safety devices, or both, is recommended. Where double lanyards are used it is essential that one safety lanyard is always attached to an anchorage.

13.5 Instruction for Use

13.5.1 Clear instructions for fitting, adjustment and use shall be supplied with each safety belt and harness. The instructions shall include a warning in general terms and also susceptibility of material to any kind of chemicals.

14. INSPECTION

14.1 The wearer should make a visual inspection at least daily before using the appliance to ensure that the appliance is in a serviceable condition. A record should be kept of all, examinations. Each

belt should be marked with a serial number for identification purposes.

The appliance should be withdrawn from use if found to be damaged and it should not be returned to service until the necessary repairs have been effected.

14.2 Frequency of Examination and Inspection

Users should establish their own routine inspections in accordance with Appendices A, B and C and also; the following procedure is recommended:

a) All rope used as a component of, or in conjunction with safety belts or harnesses should be examined immediately before being taken into use.
b) When rope has been brought into use the user should also inspect it every week, or more frequently if used under adverse conditions or subjected to very hard wear.
c) All rope used as a component of, or in conjunction with safety belts or a competent person should also examine harnesses every three months, or more frequently if used under adverse conditions or subjected to very hard wear.

15. STORAGE, MAINTENANCE OF EQUIPMENT SELECTION AND USE

For details of the above subjects reference should be made to Appendices A, B and C.

16. MARKING

16.1 Marking on Belts and Harnesses

Safety belts and harnesses shall be clearly and indelibly marked or permanently labeled by any suitable method not having a harmful effect on materials with the following information:

a) The number of national Standard

b) The name, trademark or other means of identification of the Manufacturer;

c) The year of Manufacture;

d) The words "MAXIMUM SAFE DROP 2 m (or 60 cm)" as appropriate, together with details of recommended safety lanyards for use with the safety belt or harness;

e) The type of belt or harness, i.e., A, B, C, D or E as in Clause 6.

f) The manufacturer’s serial number.

16.2 Marking on Lanyards

Lanyards not permanently attached to belts or harnesses shall be clearly and indelibly marked or permanently labeled by any suitable method not having a harmful effect on materials with the following information:

a) The manufacturer’s model number and the type of belt or harness i.e., A. B, C, D or E, with which the lanyard is designed to be used. Chain lanyards shall be additionally marked in a manner to enable the manufacturer to identify the batch from which the chain and any intermediate link, terminal link and special intermediate link were selected.

16.3 Label Attached to Lanyards

Lanyards shall be supplied with an attached label bearing the words:

"For maximum safety; attach the free end to a point as high as possible above and avoid looping the lanyard around small joists and angles with narrow edges."

In addition Clause 16 above should be also considered.

17. PACKAGING

Each belt and harness shall be supplied wrapped, but not sealed, in moisture proof material and shall bear in a clearly visible manner appropriate instructions for storage in accordance with Appendix A.

18. AUTOMOBILE SEAT BELT

For specification of automobile passive seat belt reference can be made to BS AU 183 (1983).

APPENDICES

APPENDIX A

STORAGE, EXAMINATION AND MAINTENANCE OF SAFETY BELTS AND HARNESSES

(See also Appendix C)

A.1 Records

A card or history sheet should be kept for each belt and harness and particulars of all examinations and other items of interest recorded. Each belt and harness should be marked with a serial number for identification purposes.

A.2 Storage

Belts and harnesses should be stored in a cool dry place and not subjected to direct sunlight.

A.3 Examination

To provide the maximum degree of safety for wearers, it is essential that all belts and harnesses are thoroughly examined periodically by a competent person, and any showing any defect should be withdrawn from service immediately.

During the examination particular attention should be directed to the following points:

a) Webbing and leather

Examine for cuts, cracks, tears or abrasions, undue stretching and damage due to deterioration contract with heat, acids or other corrosives (see also B.1(g)).

b) Snap hooks

Examine for damaged or distorted hooks or faulty springs.

c) Buckles

The tongues should be carefully examined where fitted to the shoulder of buckles; inspect for open or distorted rollers.

d) Sewing

Examine for broken, cut or worn threads.

e) Ropes and chains

Examine for any damage or signs of wear, and in, the case of ropes, interstrand wears, unraveling extension and fusion.

APPENDIX B

MAINTENANCE OF EQUIPMENT

B.1 Examination of Man-Made Fiber Rope Lanyards

It is very important that rope used in conjunction with a safety belt or harness should be periodically and carefully examined by a competent person. The following notes give the principal causes of weakness in ropes.

a) External wear due to dragging over rough surfaces causes a general reduction of the cross section of the strands.

b) Local abrasion as distinct from general wear may be caused by the passage of the rope over sharp edges while under tension and may cause serious loss of strength.

c) Cuts, contusions, etc. may cause internal as well as external damage.

d) Internal wear caused by repeated flexing of the rope, particularly when wet.

e) Heavy loading may result in permanent stretching so that the extension available in an emergency is reduced.

Note:

The extension should not exceed 10% for polyamide and polyester fiber ropes.

f) Chemical attack may be of many forms. All rope is susceptible to attack by acids even in fine spray or mist as may be given off in some industrial processes, and alkalis may be harmful if concentrated.

g) Strong sunlight may cause degradation, although only after prolonged exposure.

h) Heat may, in extreme cases, cause charring, singeing of fusing. Any sings of these would obviously merit rejection of the rope, but rope may be damaged by heat without any such obvious warning. Never dry a rope in front of a fire or store it near a source of heat.

B.2 Maintenance of Belts and Harnesses

B.2.1 Maintenance of leather belts and harnesses

Leather belts and harnesses should be cleaned and dressed and examined regularly. The frequency will depend upon the conditions under which the equipment is used, but in any even should not be less often than every three months.

B.2.2 Maintenance of man-made fiber webbing belts or harnesses

Belts and harnesses made of man-made fiber webbing should be cleaned and examined regularly. The frequency will depend upon the conditions under which the equipment is used, but in any event should not be less than every three months.

(to be continued)

APPENDIX B - (continued)

B.3 Examination of Man-made Fiber Webbing

The following notes give the principal causes of weakness in man-made fiber webbings and the signs by which they may be recognized. If, after examination, there is any doubt as to the safety of the belt or harness it should be withdrawn from service:

a) General external wear

External wear due to contact with rough surfaces causes filamentation, this will be shown by a fluffiness of the surface.

b) Local abrasion as distinct from general wear may be caused by the passage of the webbing over sharp edges or protrusions while under tension and may cause serious loss of strength.

c) Cuts, contusions, etc.

Cuts on the edges of the webbing exceeding 6 mm in length, or holes cut or burnt in the webbing are potentially dangerous and should lead to rejection.

d) Chemical attack

Oil, grease, creosote or paints stains are harmless, but other forms of chemical attack of a sufficient degree may be indicated by local weakening of softening of the webbing so that the surface fibers can be plucked or rubbed off, as a powder in extreme cases.

e) Heat may, in extreme cases, cause fusing

Any signs, other than the heat-sealing of webbing edges carried out during the manufacturing processes, should obviously lead to rejection.

APPENDIX C

RECOMMENDATIONS FOR THE SELECTION AND USE OF APPROPRIATE APPLIANCES

C.1 Selection

It is strongly recommended that where a choice of appliance is possible a harness is used in preference to a belt.

C.2 Method of use

a) Inspection of the appliance before use.

b) Correct fitting and adjustment.

c) Selection and inspection of suitable anchorage points.

d) After use, the appliance should be stored as indicated in A.2.

C.3 Inspection

The wearer should make a visual inspection at least daily before using the appliance to ensure that the appliance is in a serviceable condition.

Not less often than at quarterly intervals the appliance should be examined by a competent person other than the wearer. A record should be kept of this examination. Each belt should be marked with a serial number for identification purposes.

C.4 Storage

While on site and when not being worn appliances should be stored in accordance with A.2. Dry the appliances naturally away from an open fire or other source of heat.