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*भारतीय मानक*

# वस्त्रादि — सामान्य कार्यों के लिए मानव निर्मित रेशों से बुनी फ्लैट वेबिंग सिलिन्ज

*Indian Standard*

# TEXTILES — FLAT WOVEN WEBBING SLINGS MADE OF MAN-MADE FIBRES FOR GENERAL SERVICES

ICS 59.060.20 ; 59.080.50



**BUREAU OF INDIAN STANDARDS**
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*December* 2001 **Price Group 6**

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Narrow Fabrics, Webbings and Braids Sectional Committee had been approved by the Textile Division Council.

While preparing this standard considerable assistance has been derived from BS 3481: Part 2:1983, 'Flat lifting slings: Part 2 : Specification for flat woven webbing slings made of man-made fibre for general service'.

The type of sling referred in this standard comprises man-made fibre webbing of any required length and of 25 to 320 mm width that is wrapped with a smooth contact surface around the load so as to offer support across the whole webbing width and to distribute the pressure evenly. For certain loads a stronger, wider sling than is necessary to lift the load may be useful. However, the possibility of uneven loading increases with increase of width and it may be inadvisable to rate a very wide sling as highly as a narrower one. For this reason this standard is only applicable to slings of width up to 320 mm.

The slings are of three types, namely, single sling with soft eyes, single sling with metal end fittings and endless sling. They normally lift loads with the sling reeved around the load (choke hitch), or on two parts of the sling (basket hitch). They are tested in straight pull.

In order to ensure that webbings produced from man-made fibres meet the requirements for flat woven slings, materials are specified [high tenacity polyamide (nylon), polyester or polypropylene continuous multifilament] that have a high wet and dry strength, selective resistance to chemical and microbiological attack and high resistance to abrasion.

The extensible nature of the materials provides a high degree of energy absorption. The increase in length resulting from the application of a load is not entirely lost when the load is removed. Furthermore, some time may elapse before the sling recovers to a fixed length. This characteristic does not affect the usefulness of the sling in most applications, but it makes it necessary to measure the effective length of the sling before the first application of load.

The Composition of the Committee responsible for formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

# TEXTILES — FLAT WOVEN WEBBING SLINGS MADE OF MAN-MADE FIBRES FOR GENERAL SERVICES

## 1 SCOPE

**1.1** This standard specifies the basic characteristics of flat woven webbing slings made of certain man-made fibres [Polyamide (nylon), Polyester and Polypropylene] used for lifting purpose or handling loads and the tests and procedures needed to verify these characteristics.

**1.2** In addition this standard specifies the method of manufacture, identification and marking of these slings as well as the means of recording their characteristics. It does not specify working load limits but instead specifies a test for verifying the working load limit chosen.

**1.3** This standard also specifies the modes of assembly of single and endless slings and the mode factors to be used with each, together with related maximum safe working loads.

## 2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

| *IS No.* | *Title* |
|---|---|
| 6359 : 1971 | Method for conditioning of textiles |
| 7702 : 1975 | Method for determination of thickness of woven and knitted fabrics |

## 3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

**3.1 Sling** — A flexible component for connecting the lifting appliance and the load during handling and lifting.

**3.2 Sling in Basic Configuration** — A single or endless sling *(see* **3.17, 3.18** and **3.21**) as used for determination of working load limit (*see* Fig. 1)

**3.3 Sling or Sling Assembly** — A sling in the form in which it is actually used.

NOTE — In some cases this will be the same as the sling in basic configuration, in others it will be a form thereof, as in choke hitch, or a derivation therefrom or a multiple thereof.

**3.4 Woven Webbing** — A part of the sling comprising a woven narrow fabric generally of a coarse weave and multiple plies, the prime function of which is load bearing.

**3.5 End Fittings** — Fittings attached to the end of the sling by stitching of the webbing (*see* **4.4**).

**3.6 Flat Woven Webbing Sling** — A sling consisting of webbing with woven edges, sometimes terminating in end fittings.

**3.7 Representative Sling** — A sling representative of a production run or batch of slings of the same type, that is having webbing of the same type of weave, the same width and the same material, the same type of stitching and the same end fitting (if applicable), but not necessarily of the same length.

**3.8 Soft Eye** — An end of the sling webbing in the form of an eye, sewn so as to allow reeving or connection to a lifting device.

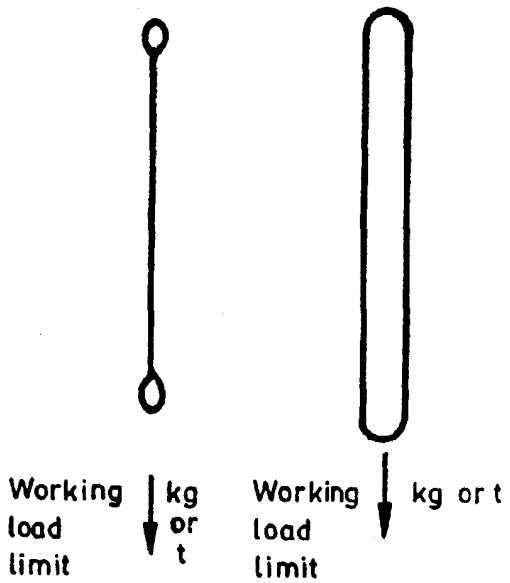


FIG. 1 BASIC CONFIGURATIONS

NOTES

1 The inside of this eye can be reinforced in the same way as in 3.12.

2 Three types of soft eyes are recognized (*see* 3.9, 3.10 and 3.11)

**3.9 Flat Eye** — A soft eye produced by sewing the webbing back on to itself without twisting (*see* Fig. 2).

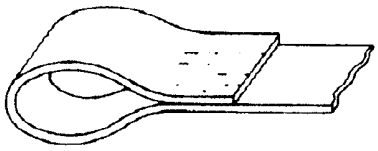

FIG. 2 FLAT EYE

**3.10 Reversed Eye** — A soft eye produced by sewing the webbing to itself after turning it through 180° so that the top of the webbing is placed on the back of the same webbing (*see* Fig. 3).

NOTE — The term 'reversed eye' is sometimes (incorrectly) used to describe an eye formed by dividing the ends of the webbing into two equal parts in a longitudinal sense, as shown in the figure below. This type of eye does not comply with this standard.

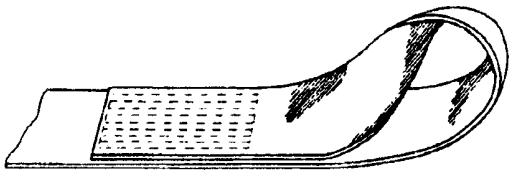

FIG. 3 REVERSED EYE

**3.11 Folded Eye** — A soft eye produced by folding the parts of the webbing that form the eye on to each other or to the webbing itself (*see* Fig. 4).

NOTE —The folded eye can be provided with a 'sleeve' (of leather or fabric, for example) for further protection and may also be a reversed type (*see* 3.10).

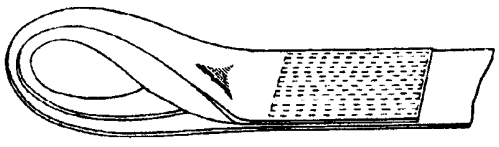

FIG. 4 FOLDED EYE

**3.12 Eye Reinforcement** — A piece of reinforcing material put between the webbing and its end fitting.

NOTE — The reinforcement may be sewn to the webbing by a seam (*see* 3.14).

**3.13 Protective Sleeve** — A component of leather, woven fabric or other material to provide extra protection to the webbing but having no effect on the strength of the sling.

**3.14 Seam** — Method of securing the webbing to itself, or of securing several webbings to each other, by means of a number of stitches produced by thread traversing the layers.

**3.15 Non-Load-Bearing Seam** — A seam joining two or more webbings in layers without affecting the strength of the sling.

**3.16 Load-Bearing Seam** — A seam by means of which end of the webbing is joined either to the body of the webbing to form a soft eye or to carry a metal attachment, or to itself to form an endless sling. The load-bearing seam withstands the force imposed upon the sling.

**3.17 Single Sling with Soft Eyes** — A sling consisting of webbing of which each end is sewn to form a soft eye.

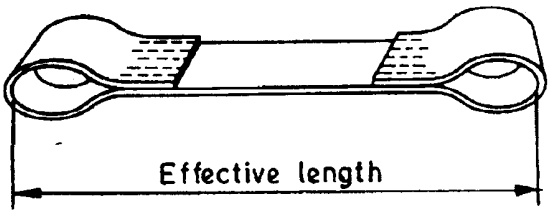


FIG. 5 SINGLE SLING WITH SOFT (FLAT) EYES

**3.18 Single Sling with End Fittings** — A sling consisting of webbing, each end of which is terminated with an end fitting (*see* Fig. 6).

NOTE — The two end fittings need not be identical; if the sling is to be used in choked lift, one fitting is made to pass through the other fitting.

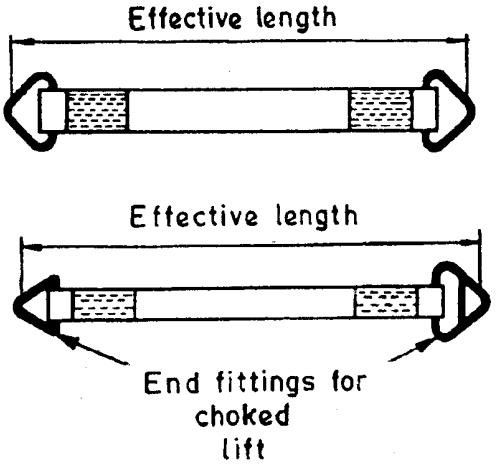


FIG. 6 SINGLE SLING WITH END FITTINGS

**3.19 Multiple Sling** — A sling formed by two or more identical pieces of webbing placed side by side, terminated at each end by a fitting common to all the pieces (*see* Fig. 7).

NOTE — The pieces can be joined to each other in various places.

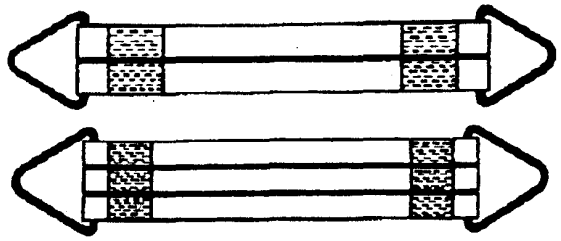

FIG. 7 MULTIPLE SLINGS

**3.20 Multi-Layer Sling** — A sling consisting of two or more layers of identical webbings superimposed in the lengthwise direction (*see* Fig. 8).

NOTE — When such slings also comprise several width of webbing, they are known simultaneously as multiple and multi-layer slings.

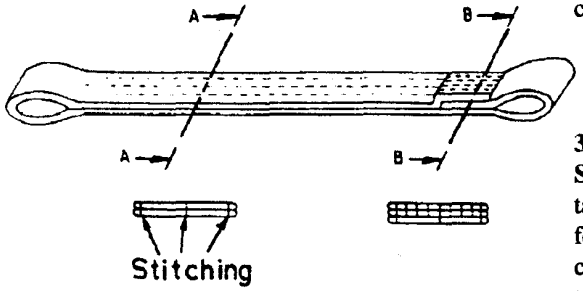


FIG. 8 MULTI-LAYER SLING

**3.21 Endless Sling** — A sling consisting of a webbing either with its ends sewn to each other or woven endless without a seam (*see* Fig. 9).

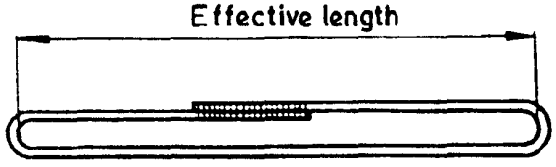


FIG. 9 ENDLESS SLING (SINGLE LAYER)

**3.22 Effective Length** — A distance between the bearing points of the sling stretched out by hand (without noticeable tension) on a flat surface (*see* Fig. 5, 6 and 9).

**3.23 Strength of the Webbing Components** — The maximum force, in decanewtons (daN), that the sewn webbing components can withstand when tested in the form of a representative sling that is complete with end fittings (if any) in accordance with **5.2**.

NOTE —1 daN is equivalent to a load of 1.02 kg.

**3.24 Safety Factor** — The ratio of strength to the maximum force of utilization.

**3.25 Maximum Force of Utilization (MFU)** — The maximum static force, in decanewtons, that the sling in basic configuration is permitted to sustain.

The maximum force or utilizations =

$$\frac{\text{Strength of the webbing component}}{\text{Safety factor for the webbing component}}$$

**3.26 Working Load Limit (WLL)** — The maximum mass, in kilograms or tonnes, that the sling in basic configuration is permitted to sustain vertically (*see* Fig. 1).

NOTE — The working load limit in kilograms corresponds to the maximum force of utilization in decanewtons × 1.02.

**3.27 Mode Factor (*M*)** —The factor that takes into account the geometry of the assembly, the multiplicity of parts, and empirically determined constant considerations.

NOTE — Each mode of sling is defined by a figure and a mode factor (*see* **A-1**) which are used to calculate the maximum safe working load (*see* **A-2**).

**3.28 Maximum Safe Working Load (Maximum SWL)** — (Under normal condition of use, that is, not taking into consideration extreme conditions resulting, for example, from the action of extreme heat, abrasion, chemical reagents, etc.). The mass in kilograms or tonnes, that the finished sling or sling assembly, as shown in Annex A, is permitted to support after applying the mode factor to the working load limit.

NOTE — Maximum safe working load = Working load limit × mode factor *M*.

**3.29 Safe Working Load (SWL)** — The maximum mass (as certified by a competent person) that the finished sling or sling assembly may raise, lower or suspend under the particular service conditions.

NOTE — The safe working load will normally be the same as the maximum safe working load, but it may be less.

**3.30 Strength Test**— A test that confirms the strength of the sewn webbing component, the end fittings or the sewn webbing component with end fittings.

**3.31 Proof Force** — The force, in decanewtons, to which the finished sling and/or sling assembly and/or end fitting may be submitted in order to check its qualities prior to use.

NOTE — The proof force is equivalent to the product of the maximum safe working load and a test factor of 2.

**3.32 Proof Load —** The mass, in kilograms or tonnes, that submits the finished sling and/or sling assembly and/or end fittings to a force equivalent to the proof force (*see* **3.31**).

## 4 REQUIREMENTS

### 4.1 Webbing

#### 4.1.1 *Materials*

The webbing shall be woven wholly from yarns of one of the following:

a) Polyamide (nylon) high tenacity continuous multifilament;

b) Polyester high tenacity continuous multifilament; and

c) Polypropylene high tenacity continuous multifilament.

NOTE—Resistance of man-made fibres to chemical, microbiological and physical attack is summarized below (*see also* **B-8**):

Polyamide is virtually immune to the effects of alkalis. It is attacked by moderate-strength acids (a moderate - strength on a sling becomes progressively stronger by evaporation). User's attention is drawn to the loss of strength of polyamides on wetting, which may be of the order of 15 percent.

Polyester is resistant to moderate strength acid but is damaged by alkali.

Polypropylene is little affected by acids and alkalis and is suitable for applications where the highest resistance to chemicals (other than certain solvents) is required. Care should be taken to ensure that polypropylene is adequately stablilized against ultraviolet degradation.

All these fibres are highly resistant to mildew and other microbiological attacks.

#### 4.1.2 *Weaving*

**4.1.2.1** The webbing shall be uniformly woven, free from any significant defect. All yarns shall be of the same material. The edges shall not be such that they can be 'unpicked' when one of the yarns breaks.

**4.1.2.2** The method of weaving shall be such that the width of the finished webbing decreases by no more than 10 percent when submitted to a force equal to the maximum force of utilization.

#### 4.1.3 *Width*

The following tolerances shall be permitted on nominal width:

a) ±10 percent for widths less than or equal to 100 mm; and

b) ±8 percent for widths greater than 100 mm.

NOTE — Preferred widths are 25, 35, 50, 75, 100, 150, 200 and 300 mm.

#### 4.1.4 *Thickness*

When tested in accordance with **5.3**, webbing shall be of minimum thickness 1.2 mm. When the sling consists of several assembled webbings, these shall be identical.

NOTE — The surfaces of the webbing may be covered with suitable protection.

#### 4.1.5 *Dyeing*

The webbing may be supplied either dyed or undyed. The dyestuff or the dyed product shall not prove toxic to human being (*see* Note under **4.1.6**).

#### 4.1.6 *Other Treatments, Aftertreatments or Coverings*

The treatments and products used shall not prove toxic to human beings.

NOTE — Any effects of dyeing or other treatments on the webbing should be taken into account when assessing the strength of the sling.

### 4.2 Sewing of Slings

**4.2.1** Non-load bearing seams and load bearing seams shall be made from good quality thread in the same material as the webbing. To facilitate inspection of the stitching, thread of a different colour from that of the rest of the sling may be used. The load-bearing seams shall be made in such a way that, when finished, they have a strength as near as possible to that of the webbing.

**4.2.2** The seams shall be made on a machine with a lock stitch; the damage caused by the stitching shall be minimal (for example, no overheated needles.)

**4.2.3** The stitches shall traverse the parts of the webbing to be sewn together; the seams shall be flat and penetrate the surface of the webbing in such a way that no part of the thread (with the exception of the end stitches) stands proud of the surface; the locking of the stitches shall not be visible on either side of the webbing.

**4.2.3.1** The stitches shall not touch or affect the edge and shall cover at least the full width of the portion lying between 2 mm and 4 mm from each edge for webbing up to 10 mm thick and between 4 mm and 8 mm from each edge for thicker webbing.

**4.2.4** The stitches shall begin and end with back stitching of at least 25 mm length.

**4.2.4.1** There shall be no more than one fault (a missed stitch, broken thread, etc) in a seam length of 100 mm; each fault shall be compensated for by back stitching.

**4.2.5** The ends of cut webbing shall be treated in such a way as to avoid unravelling (for example, fused by heating) unless the webbing has previously been thoroughly impregnated to prevent thread slippage, in which case the ends may simply be oversewn.

**4.2.5.1** Treatment of cut ends by heating shall not damage adjacent stitching and ends so treated shall not be oversewn.

### 4.3 Soft Eyes

**4.3.1** Whatever their types, soft eyes should be made with care so as not to diminish the load-bearing capabilities. The inside length, *L*, of the eyes (*see* Fig. 10) when measured flat shall be of the following minimum dimensions:

a) 100 mm for webbing of widths from 25 to 35 mm ;
b) Three times the width of the webbing for widths from 36 to 150 mm; and
c) Two and a half times the width of the webbing for webbing of width greater than 150 mm.

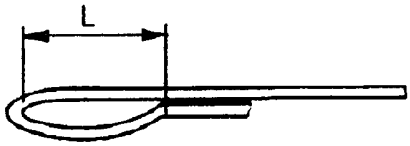


FIG. 10 INSIDE LENGTH OF EYE

**4.3.2** When connecting a sling with soft eyes to a lifting device the part of the lifting device which bears on the sling shall :

a) have a diameter of not more than one-third of the inside length of the eye and;
b) be essentially straight unless the bearing width of the sling is not more than 75 mm, in which case the bearing part of the lifting device may be curved but the radius of curvature shall be atleast 0.75 times the bearing width of the sling.

NOTE — Direct attachment to a lifting device of slings with soft eyes of a bearing width at the lifting device of more than 75 mm is not recommended.

### 4.4 End Fittings

#### 4.4.1 *General*

End fittings if required shall be inserted in an eye formed by a fold of webbing, which shall then be sewn in the manner specified in **4.2**. The inside length of the eye shall be not less than 2.5 times and not more than four times the thickness (or diameter) of that part of the end fitting that passes through the eye.

#### 4.4.2 *Material*

End fittings shall be of metal, but not cast; they shall be shock resistant. They shall have a breaking load of at least four times the maximum safe working load of the sewn webbing component.

NOTE—They should have good resistance to ageing, fatigue and mechanical stress and to normal temperature ranges from –30°C to + 80°C.

#### 4.4.3 *Finish*

All surfaces shall be finished with no sharp edges. The part through which the sling passes shall be finished in such a way as to cause no damage to the webbing. The seating of the end fitting where the webbing rests during lifting shall be well rounded.

#### 4.4.4 *Form*

The junction between the webbing and seating of the end fitting shall allow a uniform spread of force across the whole width of the webbing. The seating, on which the webbing bears, shall be essentially straight unless the bearing width of the sling is not more than 75 mm, in which case the seating or rings or links, if used, may be curved but the radius of curvature shall be at least 0.75 times the bearing width of the sling.

NOTE — Rings or links should not be used for slings of bearing width greater than 75 mm.

#### 4.4.5 *Proof Testing*

End fittings shall be proof tested in accordance with **5.4** and shall be free from permanent deformation, cracks, flaws or other defects examined after testing.

NOTE — The proof testing of end fittings may be carried out prior to the assembly of the fittings into the finished sling.

#### 4.4.6 *Re-use by the Manufacturer of End Fittings Returned by the User*

A complete end fitting, transferred from a damaged sling to a new sling, shall be examined by a competent person. The fitting shall only be re-used if:

a) it complies with all the requirements of this standard, and
b) it is found to be free from damage or fault.

NOTE — The competent person may, at his discretion, request a new proof test.

**4.4.6.1** An end fitting that has been subjected to a load greater than twice its maximum safe working load shall not be re-used.

### 4.5 Working Load Limit

The working load limit for each sling in basic configuration (*see* Fig. 1) shall be verified by use of the strength test given in **5.2**.

NOTE — It is preferred that the working load limits for slings in basic configuration be chosen from following values either in kilograms or tonnes, taken from the R10 series of preferred numbers:
160, 200, 250, 315, 400, 500, 630, 800 kg
1, 1.25, 1.6, 2, 2.5, 3.1, 4.5, 6.3, 8, 10, t

### 4.6 Maximum Safe Working Load

The maximum safe working load for a sling or sling assembly shall be the product of the working load limit of the sling in basic configuration and the mode factor

as specified in **A-1**. The maximum safe working load for slings having preferred values for working load limit shall be as specified in **A-2**.

### 4.7 Safety Factor

The maximum value for the safety factor, as defined in **3.24**, shall be 6 for the sewn webbing component of slings, and 4 for end fittings.

## 5 TEST METHODS

### 5.1 Atmospheric Conditions for Conditioning and Testing

The tests shall normally be carried out under prevailing atmospheric conditions. In all cases of dispute, however, tests shall be carried out on samples which have been conditioned for 24 h in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS 6359) Where practicable, tests shall be conducted in the standard atmosphere, otherwise they shall be done as quickly as possible but not exceeding 15 minutes of removal of the test pieces from the conditioning atmosphere.

### 5.2 Strength Test

**5.2.1** *Principle*

A representative sling is submitted to a force equal to at least the product of maximum force of utilization and the safety factor for sewn webbing component, that is, to a load at least equal to the product of the chosen working load limit and the safety factor.

**5.2.2** *Apparatus*

A tensile testing machine of appropriate capacity with constant rate of traverse of straining head not exceeding 250 mm per minute and with a maximum scale reading not greater than ten times the test force.

**5.2.3** *Selection of Specimens*

The first manufactured sling of same each material and working load limit shall be the first test specimen and further test specimens of the same type shall be selected at intervals of at least 250 slings manufactured. If the slings as manufactured are of a length unsuitable for testing on available equipments, a test specimens shall be made identical with the slings but of a length suitable for testing.

NOTE — In cases where slings are produced with end fittings having a strength less than the product of the maximum force of utilization and the appropriate safety factor for the sewn webbing component, the specimen should be selected from 250 slings of the same type made at the same time as the production lot but without the end fittings.

**5.2.4** *Test Procedure*

Place the specimen straight and without twist in the test machine and submit it to a test force as described in **5.2.1**. For an endless sling, apply the force to both parts. Apply the force so that the extension of the sling takes place at a constant rate of between 6 percent and 10 percent of the initial length of the sling per minute, but not exceeding 250 mm/min. Where possible apply the force at such a rate that the test force is reached in 60 ± 10 s.

**5.2.4.1** Test slings with soft eyes on the machine by using bars of such diameter that the resulting angle between the parts of the eye does not exceed 20°. Test endless slings on the machine using bars of diameter not exceeding 100 mm or 10 percent of the eventual length of the sling, whichever is the lesser. Ensure that the whole of the stitching is free of the bars during the test.

**5.2.5** *Results*

If the test force specified in **5.2.4** or **5.2.4.1** is reached without breakage, the specimen shall be satisfactory.

### 5.3 Thickness Test

Thickness of webbing shall be determined in accordance with the requirements of IS 7702.

### 5.4 Proof Test of End Fittings

**5.4.1** *Apparatus*

A tensile testing machine as described in **5.2.2**.

**5.4.2** *Procedure*

Subject the specimen to a force equivalent to twice its maximum safe working load and examine for freedom from defects. No specimen including end fittings, shall show any sign of abnormality, such as beginings of breaks or split sewings, in the webbing, or any permanent deformation, cracks, flaws or other defects in the end fittings (*see also* Annex C).

## 6 MARKING

**6.1** Each sling shall have a label securely attached to it on which the following shall be marked:

a) Identification mark or number;
b) Manufacturer's name or trade-mark;
c) Material of the webbing, for example, polyester;
d) Safe working load of the sling in basic configuration; and
e) Month and year of manufacture.

**6.1.1** Each sling may also be marked with other information such as effective length, thickness, width and safe working loads for various modes of use.

**6.1.2** The material of the webbing may additionally be identified by the colour of the label itself, in which case the following label colours shall be reserved exclusively for this use:

Polyamide (nylon) = Green
Polyester = Blue
Polypropylene = Brown

**6.1.3** End fittings shall be individually marked or numbered so as to identify them with the test report referred to in **7.3**.

### 6.2 BIS Certification Marking

Each sling may also be marked with the Standard Mark.

**6.2.1** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 7 DESIGNATION, STATEMENT OF CONFORMITY AND INFORMATION TO BE SUPPLIED WITH ENQUIRY OR ORDER

### 7.1 Designation

The following information shall comprise the full designation of a flat woven webbing sling in accordance with this standard required when making an enquiry or placing an order:

a) the expression 'FLAT WOVEN WEBBING SLING';

b) type, including end fitting details and effective length and width;

c) constituent materials of the webbing and end fittings;

d) either maximum safe working load or safe working load;

e) required safety factor if it is other than the minimum value specified;

f) dyeing of the webbing if any, and

g) further treatment given, if any.

### 7.2 Statement of Conformity

The supplier shall submit to the buyer, upon request, a statement of conformity, dated, signed and certifying that the items detailed thereon have been inspected and tested and comply in all respects with the requirements of this standard, alongwith the following information:

a) Name and address of supplier;

b) Identification mark or number of the sling ; and

c) Designation of the sling (*see* **8.1**).

**7.2.1** When a transaction concerns a batch of slings of the same designation the supplier shall submit only one overall statement.

### 7.3 Test Report for End Fittings

If the sling is provided with end fittings, a report of the proof test and examination carried out in accordance with **5.4** shall be provided.

## 8 USE, MAINTENANCE AND INSPECTION

Guidelines for the use, maintenance and inspection of slings are given in Annexes B and C.

# ANNEX A

(*Clauses* 3.27, 3.28 *and* 4.6)

## MODES OF ASSEMBLY, MODE FACTORS AND MAXIMUM SAFE WORKING LOADS FOR SINGLE AND ENDLESS SLINGS

### A-1 MODES OF ASSEMBLY AND MODE FACTORS

For single and endless slings shall be as shown in Fig. 11.

### A-2 MAXIMUM SAFE WORKING LOAD

The maximum safe working loads for slings having the preferred values for working load limit (*see* **4.5**) shall be as given in Table 1.

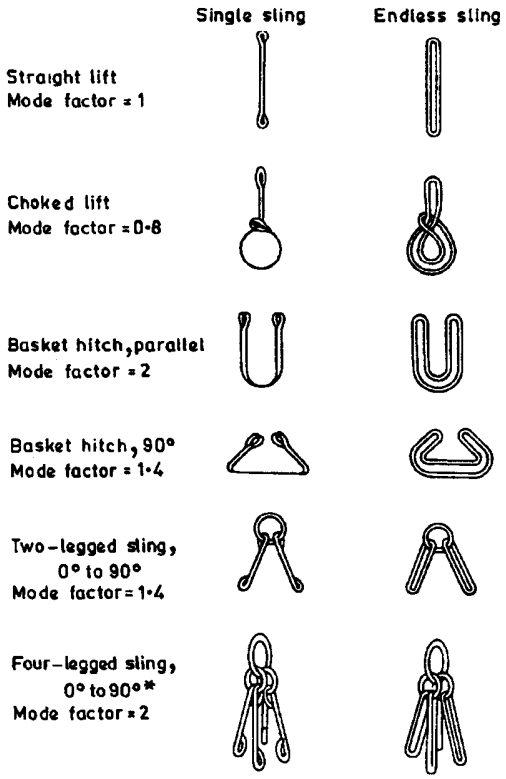


FIG. 11 MODES OF ASSEMBLY FOR SINGLE AND ENDLESS SLINGS

## Table 1 Maximum Safe Working Loads for Preferred Working Load Limits

(*Clause* A-2)

| Working Load Limit for Each Sling in Basic Configuration | Corresponding Minimum Strength of the Sewn Webbing Component | Maximum Safe Working Loads | | | | | |
|---|---|---|---|---|---|---|---|
| | | Straight Lift | Choked Lift | Basket Hitch | | 2-Legged Sling 0 to 90° | 4-Legged Sling 0 to 90° |
| | | M[1] = 1 | M = 0.8 | Parallel M = 2 | 90° M = 1.4 | M = 1.4 | M = 2 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| kg | daN | kg | kg | kg | kg | kg | kg |
| 160 | 940 | 160 | 130 | 320 | 220 | 220 | 320 |
| 200 | 1 180 | 200 | 160 | 400 | 280 | 280 | 400 |
| 250 | 1 470 | 250 | 200 | 500 | 350 | 350 | 500 |
| 315 | 1 850 | 315 | 250 | 630 | 440 | 440 | 630 |
| 400 | 2 350 | 400 | 320 | 800 | 560 | 560 | 800 |
| | | | | t[2] | | | t |
| 500 | 2 940 | 500 | 400 | 1.0 | 700 | 700 | 1.0 |
| 630 | 3 700 | 630 | 500 | 1.25 | 880 | 880 | 1.25 |
| | | | | | t | t | |
| 800 | 4 700 | 800 | 640 | 1.6 | 1.1 | 1.1 | 1.6 |
| t | | t | | | | | |
| 1.0 | 5 880 | 1.0 | 800 | 2.0 | 1.4 | 1.4 | 2.0 |
| | | | t | | | | |
| 1.25 | 7 350 | 1.25 | 1.0 | 2.5 | 1.8 | 1.8 | 2.5 |
| 1.6 | 9 410 | 1:6 | 1.3 | 3.2 | 2.2 | 2.2 | 3.2 |
| 2.0 | 11 760 | 2.0 | 1.6 | 4.0 | 2.8 | 2.8 | 4.0 |
| 2.5 | 14 700 | 2.5 | 2.0 | 5.0 | 3.5 | 3.5 | 5.0 |
| 3.1 | 18 500 | 3.1 | 2.5 | 6.3 | 4.4 | 4.4 | 6.3 |
| 4.0 | 23 500 | 4.0 | 3.2 | 8.0 | 5.6 | 5.6 | 8.0 |
| 5.0 | 29 400 | 5.0 | 4.0 | 10.0 | 7.0 | 7.0 | 10.0 |
| 6.3 | 37 000 | 6.3 | 5.0 | 12.6 | 8.8 | 8.8 | 12.6 |
| 8.0 | 47 000 | 8.0 | 6.4 | 16.0 | 11.2 | 11.2 | 16.0 |
| 10.0 | 58 000 | 10.0 | 8.0 | 20.0 | 14.0 | 14.0 | 20.0 |

[1]M = Mode factor

[2]t = tonne

# ANNEX B

(*Clause* 8.1)

## PRACTICAL ADVICE FOR THE USE AND MAINTENANCE OF FLAT WOVEN SLINGS

**B-1** Use only identified slings (*see* **6**).

**B-2** Do not use a damaged sling. Damage observed on the surface is the most noticeable cause of weakness, particularly if a new undamaged sling is available for comparison. In extreme cases the faces of the webbing become so worn that outer yarns of the weave are severely damaged.

**B-3** Observe the mode factor (*see* Annex A).

**B-4** Do not use choked lift for intensive use without protection of the eye. The angle of the choke should form naturally and not be forced.

**B-5** Never engage a soft eye with anything that may damage it. The lifting device engaged by the eye should be:

a) smooth, without any sharp edges; and
b) of such dimensions and shape as not to tear the sewn joints apart or overload the webbing (*see* **4.3**).

**B-6** Observe the following precautions:

a) ensure that the load and sling are suited each to the other;
b) when moving the sling and load, do not drag;
c) do not make knots;
d) do not lift with twisted sling;
e) do not use the sling for a load with sharp edges without protective sleeves, especially on the parts of the webbing where abrasion or cuts could occur;
f) do not allow the sling to remain under load if this could cause damage;
g) do not pull the sling out from under the load when the load is resting on the sling;
h) avoid snatch or shock loading;
j) avoid eye opening angles in excess of 20°; and
k) ensure that angles for two-legged and four-legged sling do not exceed 90° (see Fig. 11).

**B-7** Carry out lifting so that the load is stable. If the length of the load is such that several slings have to be used. Use equipment so that the slings hang nearly vertically and the effect of the load is as nearly as possible equally divided between the legs of the slings.

**B-8** If slings are used to handle chemicals or are used at high temperature. Observe the manufacturer's instructions for such occasions (*see* Note under **4.1**). If slings are intended to be used in such abnormal environments, it is recommended that the advice of the sling manufacturer or supplier be sought.

**B-9** Slings are subject to degradation by ultraviolet light, so store them away from sunlight and other sources of ultra violet radiation.

**B-10** Do not store or dry a sling near a source of heat.

**B-11** Inspect each sling before every period of use (*see* Annex C).

**B-12** Never repair a damaged sling. Always seek the advice of the manufacturer or supplier.

**B-13** Store slings on a suitably designed rack when not in use.

# ANNEX C

(*Clauses* 5.4.2 *and* 8.1)

## RECOMMENDATIONS FOR INSPECTION OF SLINGS (FOR DETECTION OF DAMAGE)

**C-1** Slings should be examined throughout their length to surface chafe, cross or longitudinal cuts in webbing, cuts or chafe damage to the selvedges, or any damage to the stitching, eyes or end fittings.

**C-2** The effect of the chafe on the fabric surface is variable but some loss of strength should be expected. Any substantial chafe, particularly localized, should be viewed critically. Local abrasion, as distinct from general wear, may be cause by the passage of the sling over sharp edges whilst under tension and may cause a serious loss of strength.

**C-3** Chemical attack is indicated by local weakening or softening of the material in the webbing so that surface fibres can be plucked or rubbed off, as a powder in extreme cases.

**C-4** Cuts, particularly at the selvedge, will result in a serious loss of strength. A sling so affected should be taken out of service immediately.

**C-5** Seams should not be allowed to deteriorate.

# ANNEX D

*(Foreword)*

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