Doc. MED 14 (28050) WC
May 2025

BUREAU OF INDIAN STANDARDS

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भारतीय मानक **मसौदा**

कॉलर के साथ आई बोल्ट — विशिष्टि

(आईएस 4190 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Eye Bolts with Collars — Specification

(*Second Revision* of IS 4190)

ICS 53.020.30

Cranes, Lifting Chains and Related Equipment Sectional Committee, MED 14	Last date for receipt of comments is **19 June 2025**

FOREWORD
(*Formal clause will be added later*)

This standard was first published in 1967 subsequently revised in 1984. The present revision has been taken up with a view to incorporating the modifications found necessary as a result of experience gained on the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standard, and references to Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act*, 2016.

This specification covers collar eyebolts designed for use with shackles. The collar significantly increases the strength of an eyebolt, while eyebolts without collars are unsuitable for angular loading. Eyebolts intended to accept a load hook are excluded from this specification, as their size would need to be considerably larger, making them uneconomical. Due to tension in the horizontal portion of a sling, safe working loads may be exceeded when eyebolts are used in pairs with a continuous sling looped onto a load hook. Therefore, when used in pairs, eyebolts should be loaded using individual sling ends. Correct and incorrect slinging methods are shown in Annex A.

Periodic annealing is not required after manufacture, but eyebolts shall undergo regular critical examination. If threads show damage or the eye is bruised, the eyebolt shall be scrapped. Excessive tightening—during service or installation—must be avoided. Collar eyebolts are meant for permanent attachment to heavy items needing periodic lifting, typically fitted in pairs for use with shackles and two-leg slings, as shown in Annex A. Each eyebolt must be firmly seated, with its collar in full contact with the machined surface.

The plane of each eye shall not deviate by more than 5° from the plane containing both axes. If not achieved initially, this should be corrected by machining the collar's underside, ensuring it remains flat and perpendicular to the eyebolt axis. Loads must always lie in the plane of the eye. When two pairs of eyebolts are used, two-leg slings with a spreader bar are recommended, and clear lifting instructions must be provided. To ensure reliability, eyebolts should be sourced from manufacturers with adequate heat treatment and testing facilities and competent inspection personnel.

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 or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*Second Revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft *Indian Standard*

EYE BOLTS WITH COLLARS — SPECIFICATION

(*Second Revision*)

1 SCOPE

1.1 This standard specifies the basic dimensions, material, lifting capacity and conditions of use of lifting eyebolts of grade M. These eyebolts, which are described as 'universal' may be used in all cases involving vertical and inclined lifting.

1.1.1 This standard covers only eyebolts with eyes of internal diameters capable of permitting direct engagement with eyehooks of the same lifting capacity (working load limit) for use with Grade T (8) chain. In the case of eyehooks for use with Grade M (4) chain, it may be necessary to use an intermediate component such as a shackle to make the connection.

1.1.2 It excludes eyebolts which are not forged in one piece.

NOTE — The grading of lifting components is given in IS/ISO 1834.

2 REFERENCES

The following 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*
IS 1570 (Part 2/Sec 1) :1979	Schedules for wrought steels: Part 2 carbon steels (Unalloyed Steels): Sec 1 wrought products (other than wires) with specified chemical composition and related properties (*first revision*)
IS 1875: 1992	Carbon steel billets, blooms, slabs and bars for forgings — Specification (*fifth revision*)
IS 1367 (Part 17) : 2023 ISO 3269 :2019	Technical supply conditions for threaded steel fasteners: Part 17 Inspections sampling and acceptance procedure (*fifth revision*)
IS 1500 (Part 1): 2019 ISO 6506-3: 2014	Metallic materials — Brinell hardness test: Part 1 test method (*fifth revision*)
IS 14962 (Part 3) : 2022 ISO 965-3 :2021	ISO general purpose metric screw threads — Tolerances Part 3: Limit deviations for screw threads
IS 4748 : 2021 ISO 643 : 2019	Steel - Micrographic determination of the apparent grain size
IS 4218 (Part 1) : 2001 ISO 68-1	ISO general purpose metric screw threads: Part 1 basic profile (*second revision*)

IS 4218 (Part 2) : 2001 ISO 261	ISO general purpose metric screw threads: Part 2 general plan (*second revision*)
IS 4258 : 2018 ISO 18265 : 2013	Metallic materials — Conversion of hardness values (*third revision*)
IS/ISO 1834 : 1999	Short link chain for lifting purposes – General conditions of acceptance

3 TYPES

Two types of eyebolts are included in this standard:

a) Type l — Eyebolt with recessed collar (*see* Fig. 1a) suitable for use with chamfered or non-chamfered holes; and
b) Type 2 — Eyebolt without recessed collar (*see* Fig. 1b) suitable for use with chamfered holes only.

4 EYEBOLT NUMBER (THREAD DIMENSIONS)

Eyebolts are identified according to their basic thread dimensions. The maximum axial lifting capacity (*WLL*) for each eyebolt is given in Table 1.

5 MATERIALS

5.1 The steel shall be produced by the open-hearth process, the electrical process, or by an oxygen blown process.

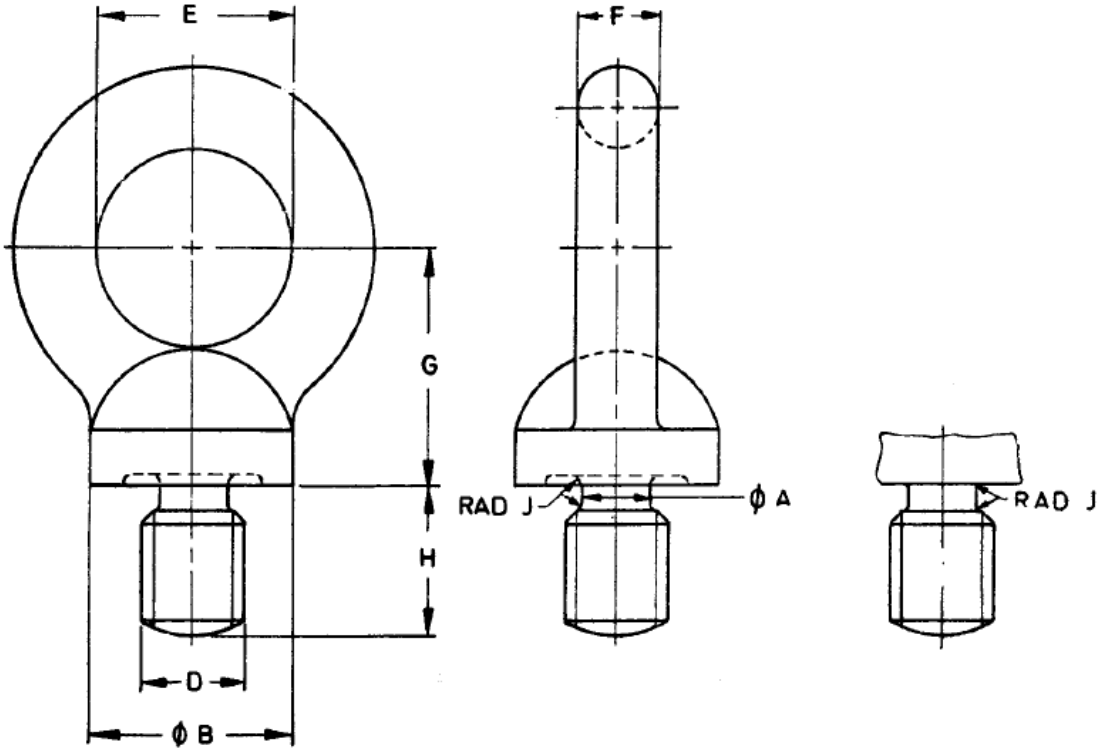
5.2 In its finished state, as supplied to the eyebolt maker, the steel shall meet the following requirements as determined by a cast or product analysis on the bar or on the finished eyebolt:

a) It shall be fully killed, shall be suitable for forging and shall be capable of being heat to obtain the mechanical properties required by this standard; and
b) The properties of sulphur and phosphorus shall be limited as follows:

	Cast Analysis	*Product Analysis*
Sulphur percent, *Max*	0.045	0.050
Phosphorus percent, *Max*	0.040	0.045

5.3 The steel shall be made in conformity with a suitable deoxidization practice in order to obtain an austenitic grain size of 5 or finer when tested in accordance with IS 4748/ ISO 643.

5.3.1 This could be accomplished, for example, by ensuring that it contains sufficient aluminium or equivalent element to permit the manufacture of eyebolts stabilized against strain-age embrittlement. A minimum of 0.02 percent of metallic aluminium is recommended for guidance.



a) Type 1 Recessed Collar b) Type 2 Non-Recessed Collar

NOTE — These drawing illustrate the specified dimensions only and not the actual from the eye bolt which is left to manufacturer.

FIG. 1 DIMENSION OF EYEBOLT (TABLE 1) SHOWING RECESSED AND NON-RECESSED COLLAR

Table 1 Dimension of Eyebolts

(*Clause* 4.1, 6.1 and Fig. 1)

All dimensions are in millimetres

Sl No.	Thread size *D*	Maximum Axial lifting (*WLL*) capacity t	*E Min*	*A Min*	*G Min*	*H Min*	*F Max*	*J Min*	*B Min* For unmachined collar	*B* Machined collar
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

i)	M8	0.16	20	6	20	15	6.3	1	20	$20 - \frac{0.040}{0.092}$
ii)	M10	0.25	24	7.7	25	17	8	1	24	$24 - \frac{0.040}{0.092}$
iii)	M12	0.40	28	9.4	30	20	9.5	1	28	$28 - \frac{0.040}{0.092}$
iv)	M16	0.63	34	13	36	24	12.5	1	34	$34 - \frac{0.050}{0.112}$
v)	M20	1	40	16.4	45	27	16	1	40	$40 - \frac{0.050}{0.112}$
vi)	M24	1.6	48	19.6	53	31	19	2	48	$48 - \frac{0.050}{0.112}$
vii)	M30	2.5	56	25	64	39	24	2	56	$56 - \frac{0.060}{0.134}$
viii)	M36	4	67	30.3	75	48	28	3	67	$67 - \frac{0.060}{0.134}$
ix)	M42	6.3	80	35.6	90	56	34	3	80	$80 - \frac{0.060}{0.134}$
x)	M48	8	95	41	100	65	38	3	95	$95 - \frac{0.072}{0.159}$
xi)	M56	10	112	48.3	119	73	45	4	112	$112 - \frac{0.072}{0.159}$
xii)	M64	16	125	55.7	135	85	50	4	125	$125 - \frac{0.085}{0.185}$
xiii)	M72 × 6	20	140	63.7	153	95	58	4	140	$140 - \frac{0.085}{0.185}$
xiv)	M80 × 6	25	160	71.7	165	110	63	4	160	$160 - \frac{0.085}{0.185}$
xv)	M90 × 6	32	180	81.7	180	125	71	5	180	$180 - \frac{0.085}{0.185}$
xvi)	M100 × 6	40	200	91.7	195	140	80	5	200	$200 - \frac{0.100}{0.215}$

5.4 Within the above limitations or as otherwise agreed with the purchaser it is the responsibility of the eyebolt maker to select the steel so that the finished eyebolt, suitably heat-treated, meets the mechanical properties required by this standard.

5.5 The following steels in the hardened and tempered condition are recommended for the manufacture of eyebolts:

Class 3 or 3A of IS 1875.
Grades 20 Mn 2 and C 35 Mn 75 of IS1570 (Part 2/Sec1).

6 DIMENSIONS AND TOLERANCES

6.1 The form and basic dimensions of eyebolts shall be in accordance with Fig. 1 and Table 1. They are formulated on the basis of the available threads listed in IS 4218 (Part 1).

6.2 A symmetrical tolerance on ovality of +5 percent is permitted in respect of the internal diameter *E* of the eyebolt.

6.3 A symmetrical tolerance of 5 percent on the diameter *F* of the steel of the eye is permitted.

7 MANUFACTURES

Each eyebolt, including the shank, shall be forged in one piece without any joint**.**

8 MACHINING

The eyebolts shall be machined to ensure that:

(a) The threads of the shanks comply with IS 4218 (Part 2). Unless otherwise specified the coarse series thread form of IS 4218 (Part 2) shall be used and the tolerance of the threads shall conform to IS 14962 (Part 3).
(b) The machined face of the collar and the axis of the threaded shank are at right angles, subject to a tolerance of 30′.
(c) The axis of the cylindrical part of the collar and the threaded shank are the same.

9 HEAT TREATMENT

9.1 Eyebolts shall be suitably heat treated to get the proper hardness values as given in **10.1**. The following heat treatment is recommended for eyebolts after forging:

a) Heating to a temperature between 860 and 89O°C, followed by quenching in oil or water and tempering at a suitable temperature between 550 and 660°C.

10 HARDNESS TEST

10.1 Eyebolt shall have a Brinell hardness of 190 ± 25 *HB*. When practicable, the tests shall be made in accordance with IS1500 (Part 1), using a 10 mm ball and a load of 300 kg. If another method is employed conversion shall be made in accordance with IS 4258.

10.1.1 The surface on which the impression is to be made shall be obtained by filing, grinding or smooth machining.

10.1.2 Suitable precautions shall be taken to ensure that the surface tested is representative of the material and that its hardness is not affected by decarburization, carburization or by the method used for the preparation of the test sample.

11 MECHANICAL PROPERTIES

11.1 Maximum Lifting Capacity

11.1.1 *In Axial Loading*

The maximum lifting capacity (*WLL)* in axial loading shall be as specified in Table 2.

11.1.2 *In Inclined Loading*

The maximum lifting capacity (*W*) in axial loading, for a pair of eyebolts, when the angle between the sling legs is < 45°, shall be as specified in Table 3.

11.2 Minimum Axial Breaking Force

The minimum axial breaking force for eyebolts of each specified working load limit shall be as given in Table 2.

11.3 Bend Test

Eyebolts of 36 mm or less in diameter, after being screwed into a steel block to the full thread length and bent 45° by pressure or blows, shall not show any visible surface ruptures in the un-threaded section of the eyebolts.

11.4 The sampling shall be in accordance with IS 1367 (Part 17)/ISO 3269.

Table 2 Mechanical Properties

(*Clause* 11.1.1, 11.2 and 12.3.1)

SI No.	Thread Size D	Maximum Axial Lifting Capacity WLL	Axial Proof Force	Minimum Axial Breaking Force
		t	kN	kN
(1)	(2)	(3)	(4)	(5)
i)	M8	0.16	3.2	6.3
ii)	M10	0.25	5	10
iii)	M12	0.40	8	16
iv)	M16	0.63	12.5	25
v)	M20	1	20	40

vi)	M24	1.6	32	63
vii)	M30	2.5	50	100
viii)	M36	4	80	160
ix)	M42	6.3	125	250
x)	M48	8	160	320
xi)	M56	10	200	400
xii)	M64	16	320	630
xiii)	M72 × 6	20	400	800
xiv)	M80 × 6	25	500	1000
xv)	M90 × 6	32	630	1250
xvi)	M100 × 6	40	800	1600

NOTE — 1 kgf = 9.81 = 10 N within 2 percent
1 t f = 1000 kgf = 9.81 kN
= 10 kN

12 PROOF LOADING

12.1 Each eyebolt after manufacture and subsequent heat-treatment shall be subjected to an axial proof force, as specified in Table 2. After removal of proof force, each eyebolt shall be examined by a competent person and shall be accepted only if found free from visible flaw or defect.

12.2 Method

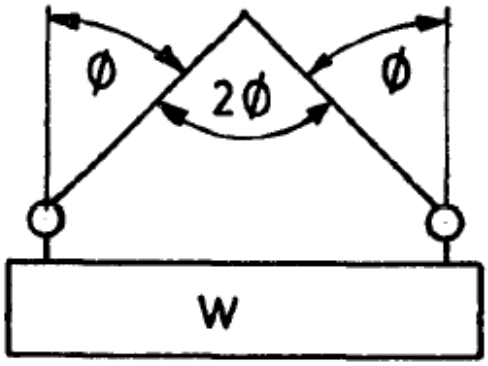
The force is applied using a freely rotating round section pin of diameter not exceeding 50 percent of the eye diameter. The force should be applied continuously and gradually for a minimum duration of 3 seconds, held for 5 seconds at the specified proof force, and gradually reduced to zero.

In the case of eyebolts in axial loading, the force is applied to the eyebolt by an in-line pull between the threaded shank and the eye.

In the case of eyebolts in inclined loading, the force is applied at an angle of 45° to their axes, such that the resultant axial force on a pair of eyebolts equals that specified in Table 3.

Table 3 Use of Eyebolts in Inclined Loading Conditions

(*Clause* 11.1.2 and 12.2)



Sl No.	**Thread Size** *D*	**Maximum Axial Lifting Capacity of Single Eyebolt** ***WLL***	**Maximum Lifting Capacity (*W*) for A Pair of Eyebolts When the Angle Between each Sling Leg and Vertical (ϕ) is 0° to 45°**	**Deformation Force[1)] *E* or *A* Pair of Eyebolts, When the Angle Each Sling Leg and the Vertical (ϕ) is 45°**
		t	t	kN
(1)	(2)	(3)	(4)	(5)
i)	M8	0.16	0.08	1.6
ii)	M10	0.25	0.125	2.5
iii)	M12	0.40	0.2	4.0
iv)	M16	0.63	0.32	6.3
v)	M20	1	0.5	10.0
vi)	M24	1.6	0.8	16.0
vii)	M30	2.5	1.25	25
viii)	M36	4	22	40
ix)	M42	6.3	3.2	63
x)	M48	8	4	80
xi)	M56	10	5	100
xii)	M64	16	8	160

xiii)	M72 × 6	20	10	200
xiv)	M80 × 6	25	12.5	250
xv)	M90 × 6	32	16	320
xvi)	M100 × 6	40	20	400

NOTES

1) The equivalent deformation force if required to be applied to the eye of a single eyebolt at 45° to its axis is $\frac{1}{\sqrt{2}}$ × tabulate value.
2) Working loads are given for eyebolts when used in pairs for inclined loading conditions, with the collars screwed down on the faces and the eyes in the plane of the lifting sling.
   In order to achieve the necessary alignment of the eye, it may be necessary to use shims (spacing washers) or to machine the collar.
   Care should be taken not to overtighten the eyebolt in an attempt to achieve the correct alignment, beyond that tightness achieved by hand without mechanical aid, as this can cause overstressing in the shank which can reduce the lifting capacity of the eyebolt.
3) The use of eyebolts for included angle of more than 90° is not permitted.

12.3 Deformation

12.3.1 *In Axial Loading*

Each eyebolt shall be capable of sustaining the axial force specified in Table 2 without permanent deformation exceeding 0.5 percent of the external diameter of the eye, and without permanent deformation of the shank.

12.3.2 *In Inclined Loading*

Eyebolts when used in pairs shall be capable of sustaining the force specified in Table 3 when loaded at 45° to their axis, without permanent deformation exceeding 0.5 percent of the external diameter of the eye, and without permanent deformation of the shank.

13 INSPECTIONS, CERTIFICATE OF TEST AND EXAMINATION

13.1 The representative of the purchaser shall have access to the works of the manufacturer at all reasonable times for the purpose of witnessing the specified tests and inspecting the machine and methods of examination.

13.2 The manufacturer shall supply a certificate of test and examination as given in Annex B with every supply of eyebolts. The certificate shall give the results of all tests made.

14 IDENTIFICATION MARKING

14.1 Each eyebolt shall be legibly and permanently identified in the zone bounded by the shoulder and the horizontal axis of the eye with the following markings:

a) Such marks or symbols as shall allow identification with the manufacturer's certificate;
b) Eyebolt number, that is, thread dimension (as column 1 of Table 1);
c) Maximum axial lifting capacity (*WLL*), in general service (*see* column 2 of Table 2);

14.1.1 The stamps shall have a concave surface and the indentation should be neither too sharp nor excessive in depth.
The recommended sizes of stamps shall be as given below:

Sl No.	*Diameter of Material in Bow Piece*	*Size of Mark*
	mm	mm
(1)	(2)	(3)
i)	Up to and including 25	5
ii)	Over 25	6

14.2 BIS Certification Marking

The product may also be marked with Standard Mark.

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

15 ADDITIONAL TESTS

15.1 If the purchaser requires tests or chemical analysis of the material, or additional tests on the finished eyebolts, these requirements shall be clearly stated in the enquiry and order and, if so desired, the samples shall be selected by a person representing or approved by the purchaser.

ANNEX A

(*Forward*)

CORRECT AND INCORRECT METHODS OF SLINGING

A-1 The correct and incorrect methods of slinging are shown in Fig. 2.

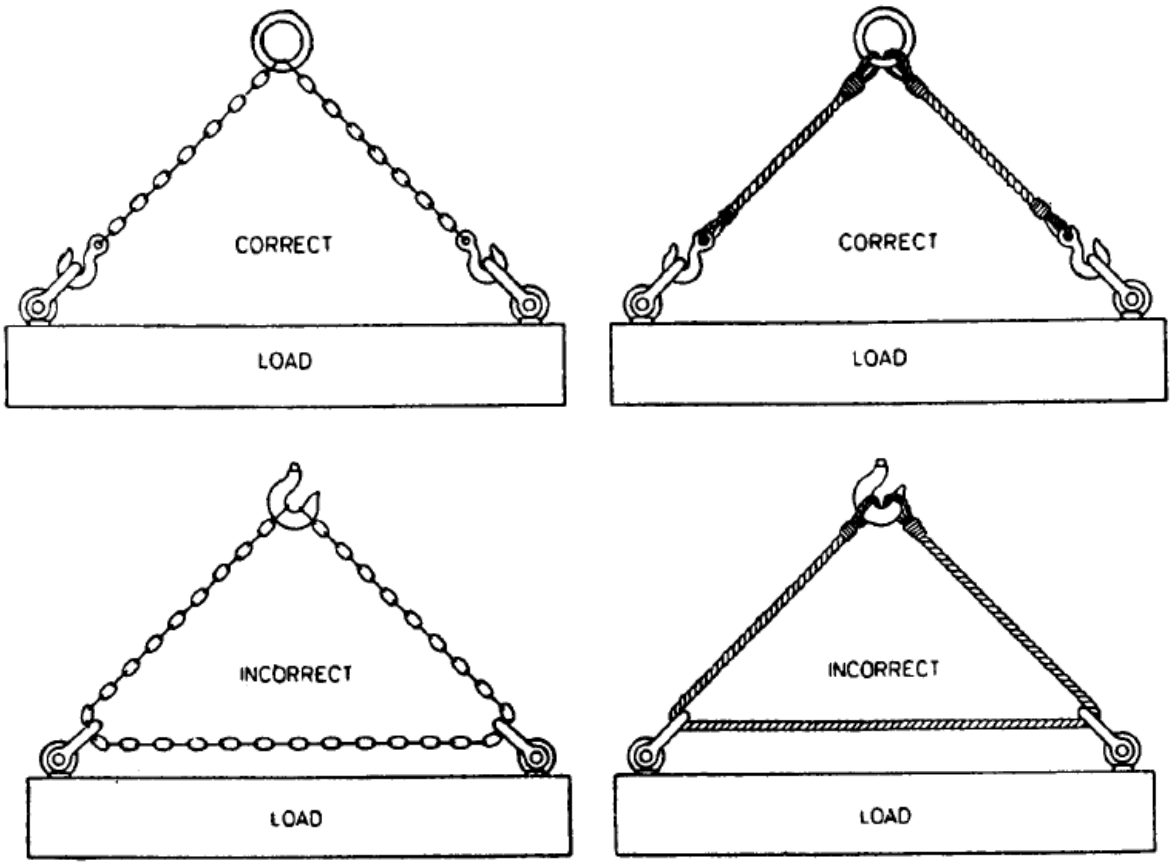


FIG. 2 CORRECT AND INCORRECT METHOD OF SLINGING

ANNEX B

(*Clause* 13.2)

CERTIFICATE OF TEST AND EXAMINATION

Sl No.	**Distinguishing Mark**	**Eyebolt Number**	**Proof Force Applied**	**Maximum Axial Lifting Capacity tonnes**
(1)	(2)	(3)	(4)	(5)
i)	**…**	**…**	**…**	**…**
Particulars of heat treatment to which the eyebolts have been subjected are as follows:				
We hereby certify that the eyebolts, described above, comply in all respects with IS 4190 and that they were subjected to the proof load and subsequently examined and passed by a competent person. Signature**……** Date**……**				