INTER PLANT STANDARD - STEEL INDUSTRY

IPSS	SPECIFICATION FOR ALLOY STEEL CHAIN SLING (FIRST REVISION) BASED ON IS 2760:1980	IPSS:1-07-038-96 FORMERLY: IPSS:1-07-038-86

0. FOREWORD

0.1 This Inter plant Standard prepared by the Standards Committee on Paints and Portable Maintenance Equipment, IPSS 1:7 with the active participation of the representatives of all the steel plants and established manufacturers of Alloy Steel Chain and was adopted in January 1996.

0.2 This standard was first issued in 1986. This first revision of the standard involves the following changes:

a) Construction of the chain sling assembly, terminology as per IS 2760:1980 and eye hook conforming to BS 3458:1962.

b) References relating to Master (Oblong), O-ring etc. and dimensions of chain link mentioned in the earlier version of standards have been omitted and tables have been recast.

c) Proforma for test certificate as per Appendix-A of IS 2760:1980 considered in this revision.

1. SCOPE

1.1 This standard covers the requirements of non-calibrated alloy steel chain slings for lifting purposes of Grade-S (6) conforming to IS 2760:1980 (read with amendment No 1 May 1984).

1.2 This standard does not apply to mechanically joined chain slings or welded chain slings having legs of unequal nominal reach.

2. TERMINOLOGY

2.1 For the purpose of this standard the terms and definitions used in IS 2760:1980 shall apply.

3. REQUIREMENTS

3.1 The requirements of chains sling shall be as follows.

a) The chain used shall conform to Grade S (6) of IS 6217:1982.

b) The master link and joining link shall conform to Grade S(6) of IS 2760:1980 (*read with amendment No 1*).

c) The dimensions of Eye hook shall conform to BS 3458:1962.

d) Material and heat treatment of the Eye hook shall conform to grade S of IS 3822:1982.

3.2 The conditions of acceptance shall be as per IS 5616:1982.

4. TYPE AND DIMENSION

4.1 Type 1, Single leg chain sling (Refer Fig-1 and Table-1).

4.1.1 The construction of single leg chain sling shall be any one of the following as specified by the purchaser:

a) *Style ME* - One master link (A) as upper terminal fitting, two joining links (B1), chain and eye hook as lower terminal fitting as shown in Fig-1 (a) *(page- 6)*.

b) *Style MM* - Two master links (A) one each as upper terminal and lower terminal fittings, two joining links (B1) and chain as shown in Fig-1 (b) *(page- 6)*.

4.2 Type 2, two leg chain sling (Refer Fig-2 and Table-2).

4.2.1 The construction of two leg chain sling shall be any one of the following, as specified by the purchaser:

a) *Style ME* - One master link (A) as upper terminal fitting common for the assembly of two legs of slings. Each leg of sling shall have two joining links (B1), chain and one eye hook as lower terminal fitting as shown in Fig-2(a) *(page- 8)*.

b) *Style MM* - One master link (A) as upper terminal fitting common for the assembly of two legs of slings. Each leg of sling shall have two joining links (B1), chain and one master link (A) as lower terminal fitting as shown in Fig-2(b) *(page- 8)*.

4.3 Type 3, three leg chain slings (Refer to Fig-3 and Table-3).

4.3.1 The construction of three leg chain sling shall be as follows:

One master link (A) as upper terminal fitting, common for the assembly of three legs of slings. Each leg of sling shall have two joining links (B1),chain and one eye hook as lower terminal fitting as shown in Fig-3 *(page- 10)*.

4.4 Type 4, four leg chain slings (Refer Fig-4 and Table-4).

4.4.1 The construction of four leg chain sling shall be as follows:

One master link (A) as upper terminal fitting, common for the assembly of two sets of joining links (B1). Each set of joining link (B1) shall have two legs of chain slings. Each leg of chain sling shall have chain, one joining link and one eye hook as lower terminal fitting as shown in Fig-4 *(page- 12)*.

4.5 The dimensions of eye hook shall be as given in Fig-7 *(page- 14)* and Table-5.

4.6 The dimension of each component shall be such as to ensure free articulation in the chain sling.

5. MATERIALS

5.1 Material for Chain

5.1.1 The steel used for the chain shall be produced by open hearth process or electric process or by an oxygen-blown process.

5.1.2 In its finished state, as supplied to the chain maker it shall meet the following requirements as determined by check analysis on the rod, wire or finish link.

5.1.3 It shall be an alloy steel of reliable welding quality capable of being heat treated to produce the mechanical properties required.

5.1.4 It shall be fully killed and shall contain alloying elements in sufficient quantities to guarantee the mechanical properties of the chain after appropriate heat treatment. The alloy steel used shall contain atleast one of the following alloy elements or their equivalent:

nickel,
chromium and
molybdenum

In no case manganese or silicon shall be considered as alloying element.

5.1.5 Its content of sulphur and phosphorus shall be restricted as follows:

	Cast Analysis	Check Analysis
Sulphur (max)	0.035%	0.040%
Phosphorus (max)	0.035%	0.040%

5.1.6 The steel shall be made in conformity with fine grain practice to give an austenitic grain size of 5 or finer when tested in accordance with IS 2853:1964. This could be accomplished by ensuring that it contains sufficient Aluminium, or an equivalent element to allow manufacture of chains stabilized against strain age embrittlement during service; a min. value of 0.02% metallic Aluminium is recommended for guidance.

5.2 The material used for manufacture of other components shall meet the conditions laid down in respective Indian Standards as given in clause 3 of this standard.

6. HEAT TREATMENT

6.1 The chain shall be hardened and tempered before being subjected to proof force as specified in IS:6217-1982.

6.2 The master link and joining link shall be heat treated in a manner so as to have similar property as the chains used in the slings, before being subjected to the proof load test.

6.3 Heat treatment of eye hook shall be as per IS 3922:1982.

6.4 Details of heat treatment given to the chain sling shall be endorsed on the makers' test certificate.

7. GENERAL REQUIREMENTS

7.1 **Welding** - The chain links, master links and joining links shall be welded by any one of the following methods:

a) Electric resistance butt welding,
b) Electric flash butt welding,

c) Electric arc welding for sizes above 50 mm. In this method, the weld shall be radiographically examined to ensure penetration and fusion throughout.

7.1.1 The welded joints shall be free from any crack or other defects and shall be smooth all around.

7.2 **Length** - The length (nominal reach) of each leg of the sling shall, as far as possible, meet the requirements.

When constructing the sling a tolerance of -0, +2 pitch links is permissible on the nominal reach ordered by the purchaser. However, after proof loading, the difference between longest and shortest legs of multi-leg sling when measured under a tension of 1/5 WLL, shall not exceed 6 mm for legs upto 2 m the length. For slings in excess of 2 m the difference between longest and shortest legs may be increased by 3 mm per m.

7.3 **Finish** - Each component of the chain sling shall be smooth and shall not be bent, twisted or deformed at any point of the chain sling. And shall be within the tolerances specified in the relevant Indian Standards.

7.4 The eye hook shall be drop forged in single piece with a finish to meet the requirements of clause 3.1 of this standard. It shall be free from any defects.

7.5 **Surface Coating** - Finished chain slings shall be coated with suitable oil to prevent rusting in storage and transit.

8. TEST

8.1 Test shall be conducted on chain sling and its components conforming to clause 11 and 12 of IS 2760:1980.

9. DESIGNATION

9.1 Alloy steel chain sling shall be designated by nominal size of chain, nominal reach of chain sling, number of legs, attachment at top and bottom and IPSS number, for example:

i) A single leg alloy steel chain sling of nominal size of chain 16 mm and nominal reach 2000 mm, type 1, style ME with master link as upper terminal fitting and eye hook as lower terminal fitting shall be designated as:

16 x 2000, TYPE 1, STYLE ME - IPSS:1-07-038-96

ii) A two leg alloy steel chain sling of nominal size of chain 16 mm and nominal reach 2000 mm, type 2 style MM with master link as upper and lower terminal fitting shall be designated as:

16 x 2000, TYPE 2, STYLE MM - IPSS:1-07-038-96

10. TEST CERTIFICATE

10.1 Every chain sling shall be provided with a test certificate as per clause 8 of this standard issued by any recognized test house or Government certified Inspector at the manufacturer's premises. The proforma for test certificate shall be as per Appendix-A of IS 2760:1980.

11. MARKING

11.1 The identification mark, working load limit and grade S (6) of the chain sling shall be indelibly marked on the master link of each sling. In addition, the chain sling shall be provided with the information specified in clause 13 of IS 2760:1980.

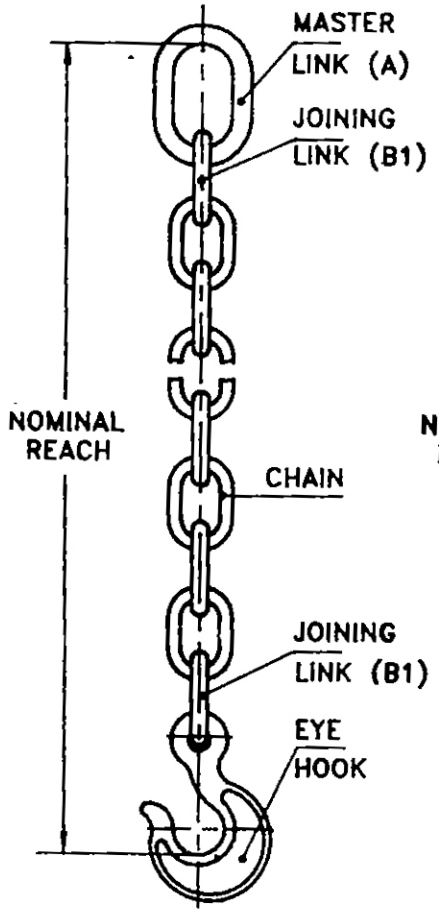


FIG. 1A SINGLE LEG CHAIN SLING
TYPE 1 STYLE ME

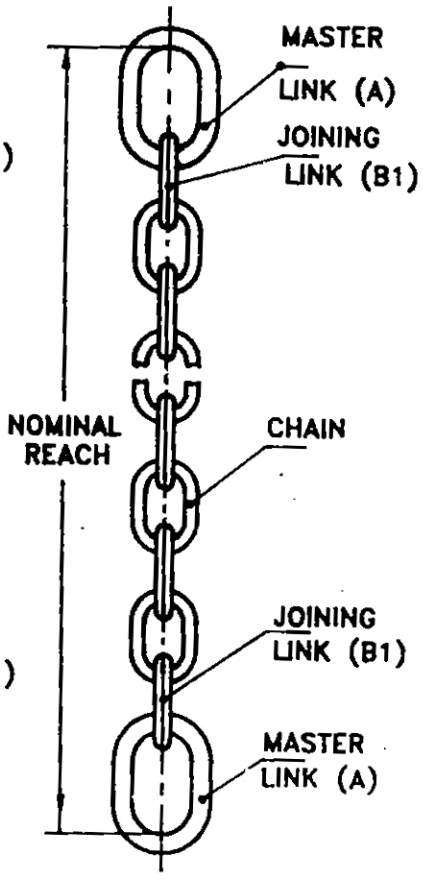


FIG. 1B SINGLE LEG CHAIN SLING
TYPE 1 STYLE MM

(To be read with table 1)

FIG. 1 SINGLE LEG CHAIN SLING

TABLE 1

*DIMENSIONS OF CHAIN LINK, MASTER LINK A, JOINING LINK B1 WITH RESPECT TO WORKING LOAD LIMIT FOR SINGLE LEG CHAIN SLING TYPE 1, STYLE ME & MM

(Clause 4.1 & Fig-1, 5 & 6)

(All dimensions are in mm)

Nominal size of the chain dn	Working load limit WLL (in tonnes)	Chain Link		Master Link A			Joining Link B1		
		l	W (Max)	Nom. size d1	b1	l1	Nom size d2	b2	l2
10	2.5	50 max 47 min	35	18	54	95	12	30	50
12	4.0	60 max 57 min	42	25	75	135	14	35	60
16	6.3	80 max 76 min	56	28	90	160	18	40	75
18	8.0	90 max 85 min	63	32	90	160	20	45	80
20	10	100 max 95 min	70	36	110	200	22	50	90
25	16.0	125 max 119 min	88	45	125	250	28	60	110
28	20.0	140 max 133 min	98	50	125	250	32	70	130
32	25.0	160 max 152 min	112	56	140	275	36	75	150
36	32.0	180 max 171 min	126	56	140	275	40	85	160

* Only the major dimensions are given in the table. All other dimensions shall be as per IS 6217:1982 & IS 2760:1980.

Note : The dimensions of joining link is for guidance only.

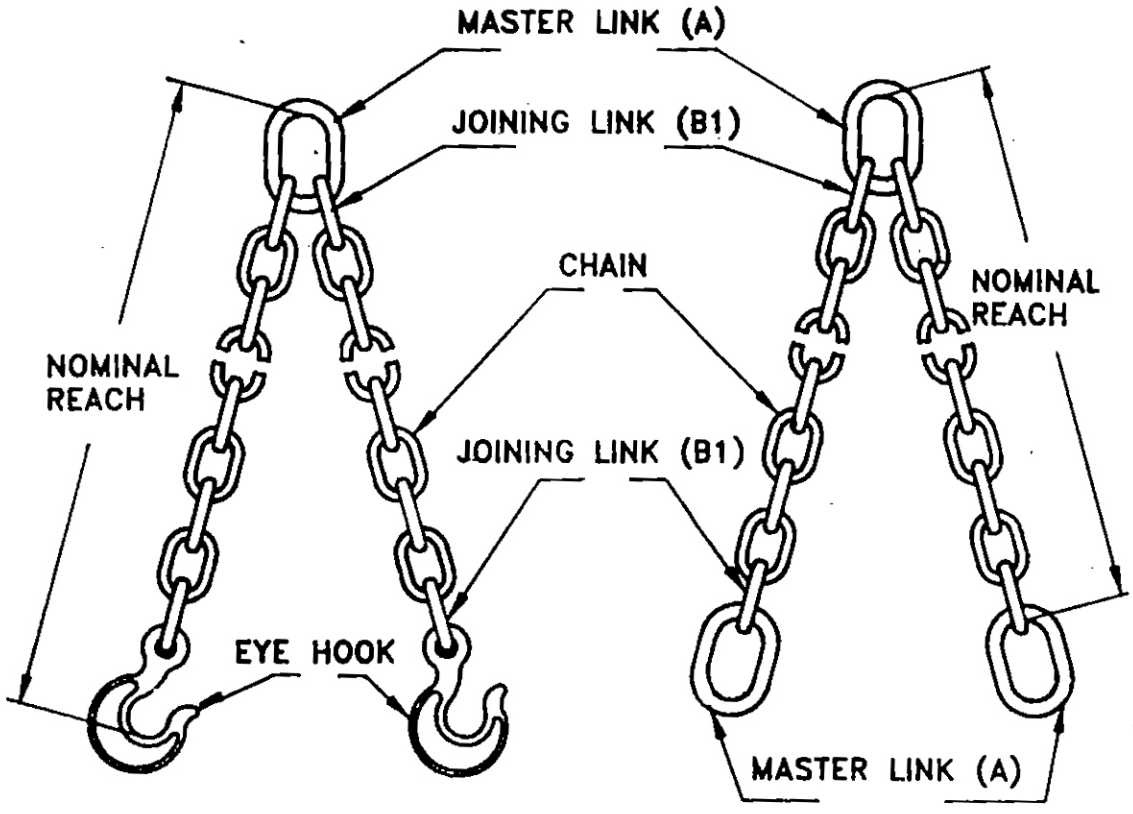


FIG. 2A TWO LEG CHAIN SLING TYPE 2 STYLE ME

FIG. 2B TWO LEG CHAIN SLING TYPE 2 STYLE MM

(To be read with table 2)

FIG. 2 TWO LEG CHAIN SLING

TABLE 2

* DIMENSIONS OF CHAIN LINK, MASTER LINK A, JOINING LINK B1 WITH RESPECT TO WORKING LOAD LIMIT FOR TWO-LEG CHAIN SLING TYPE 2, STYLE ME & MM

(Clause 4.2 & Fig-2, 5 & 6)

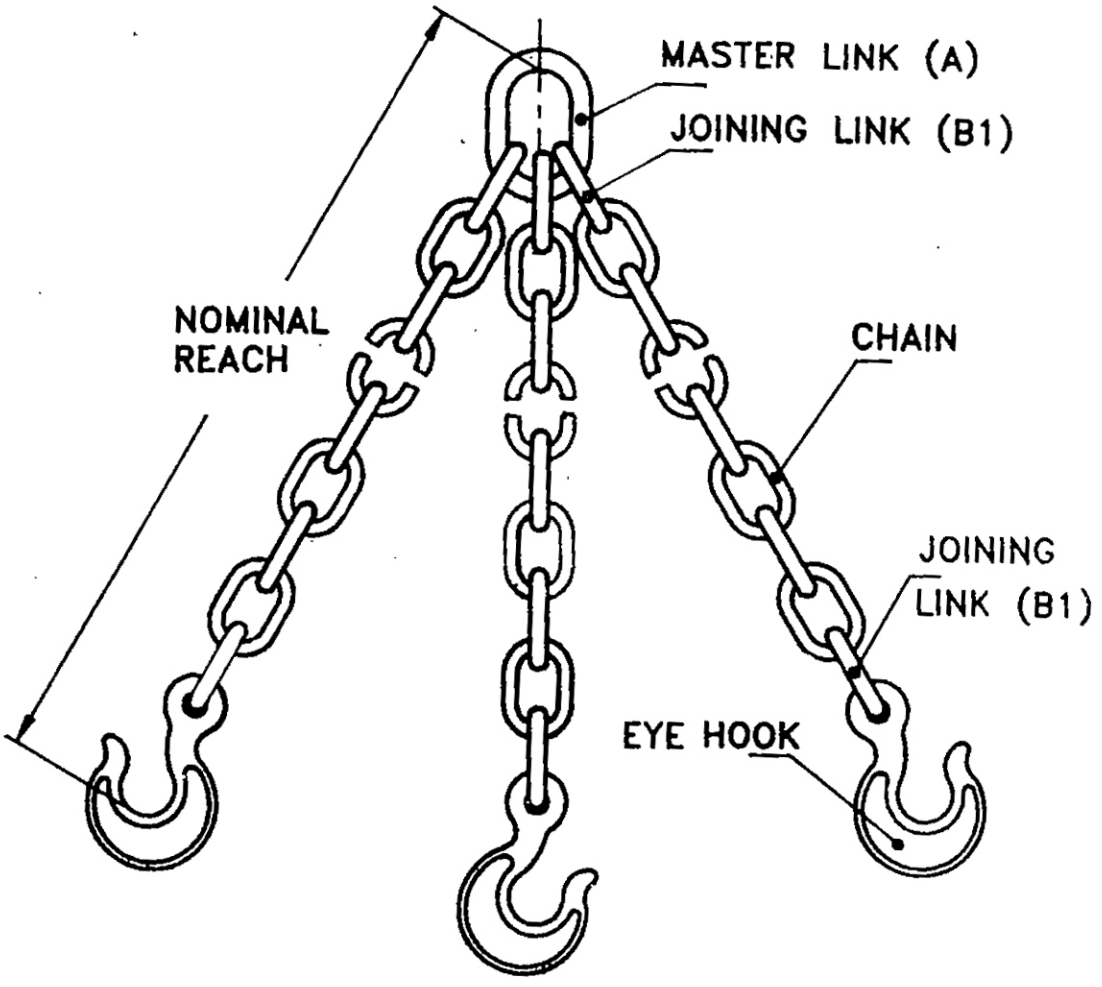
(All dimensions are in mm)

Nominal size of the chain dn	** Working load limit WLL (in tonnes)	Chain Link			Master Link A			Joining Link B1	
		l	W (Max)	Nom. size d1	b1	l1	Nom. size d2	b2	l2
10	3.5	50 max 47 min	35	22	75	135	12	30	50
12	5.6	60 max 57 min	42	28	90	160	14	35	60
16	8.8	80 max 76 min	56	32	90	160	18	40	75
18	11.2	90 max 85 min	63	36	110	200	20	45	80
20	14.0	100 max 95 min	70	40	110	200	22	50	90
25	22.4	125 max 119 min	88	50	125	250	28	60	110
28	28.0	140 max 133 min	98	56	140	275	32	70	130
32	35.0	160 max 152 min	112	63	165	325	36	75	150
36	44.8	180 max 171 min	126	71	165	325	40	85	160

* Only the major dimensions are given in the table. All other dimensions shall as per IS 6217:1982 & IS 2760:1980.

** WLL calculated as WLL of single leg x 1.4 (Ref. Clause 10.2 of IS 2760:1980.

Note : The dimensions of joining link is for guidance only.



(To be read with table 3)

FIG. 3 THREE LEG CHAIN SLING TYPE 3

TABLE 3

* DIMENSIONS OF CHAIN LINK, MASTER LINK A, JOINING LINK B1 WITH RESPECT TO WORKING LOAD LIMIT FOR THREE-LEG CHAIN SLING, TYPE 3.

(Clause 4.3 & Fig-3, 5 & 6)

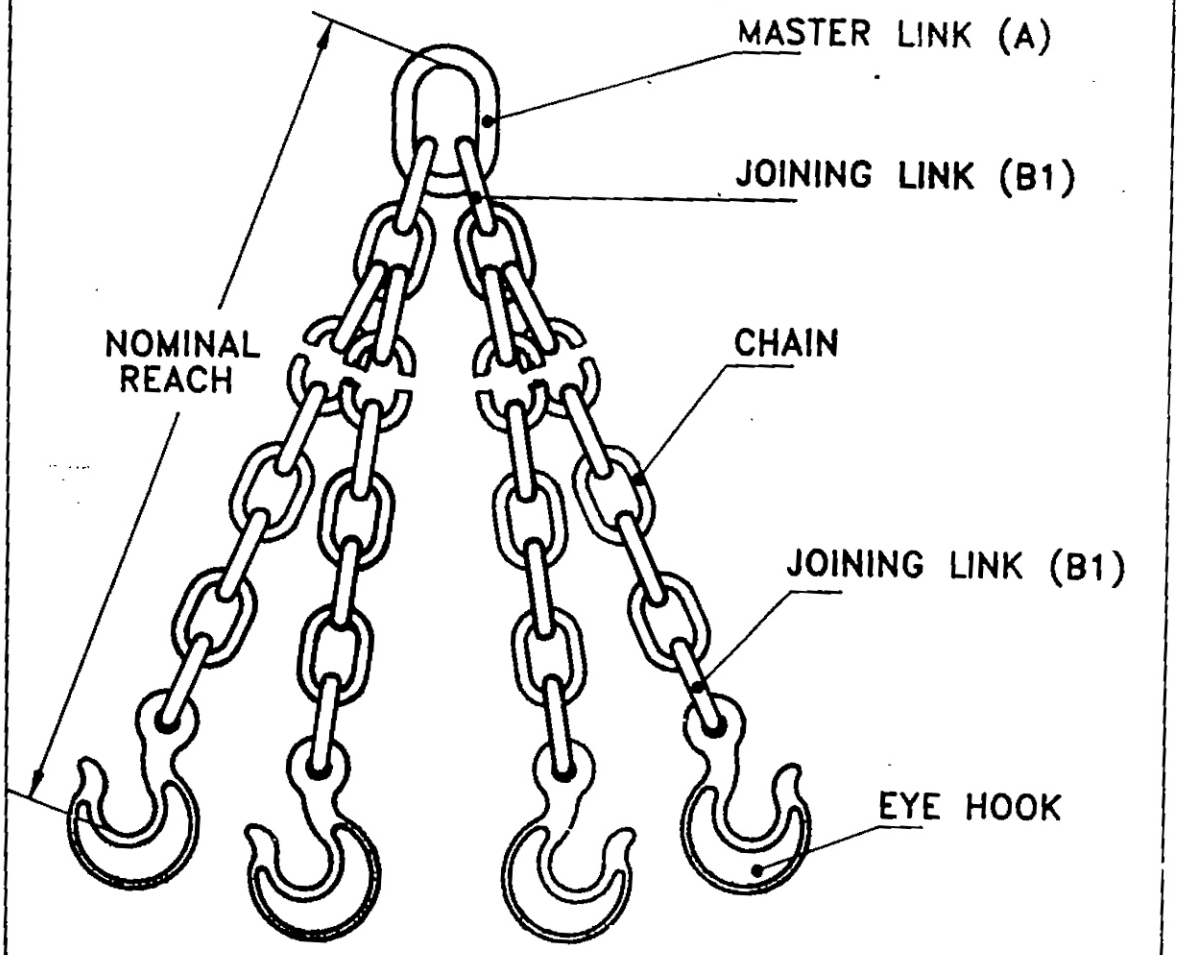
(All dimensions are in mm)

Nominal size of the chain dn	** Working load limit WLL (in tonnes)	Chain Link			Master Link A			Joining Link B1	
		l	W (Max)	Nom. size d1	b1	l1	Nom. size d2	b2	l2
10	5.25	50 max 47 min	35	28	90	160	12	30	50
12	8.4	60 max 57 min	42	32	90	160	14	35	60
16	13.23	80 max 76 min	56	40	110	200	18	40	75
18	16.8	90 max 85 min	63	45	125	250	20	45	80
20	21.00	100 max 95 min	70	50	125	250	22	50	90
25	33.6	125 max 119 min	88	63	165	325	28	60	110
28	42.0	140 max 133 min	98	71	165	325	32	70	130
32	52.5	160 max 152 min	112	80	200	360	36	75	150
36	67.2	180 max 171 min	126	90	220	380	40	85	160

* Only the major dimensions are given in the table. All other dimensions shall be as per IS 6217:1982 & IS 2760:1980.

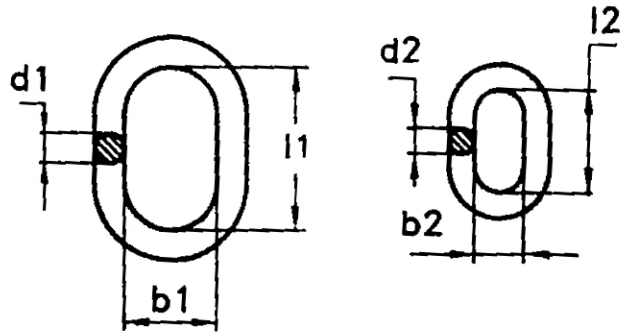
** WLL calculated as WLL of single leg x 2.1 (Ref. Clause 10.2 of IS 2760:1980.

NOTE : The dimensions of joining link is for guidance only.



(To be read with table 4)

FIG. 4 FOUR LEG CHAIN SLING TYPE 4



MASTER LINK A JOINING LINK B 1

(To be raed with table1,2,3 & 4)

FIG. 5 DIMENSIONS OF MASTER LINK A AND JOINING LINK B1

TABLE 4

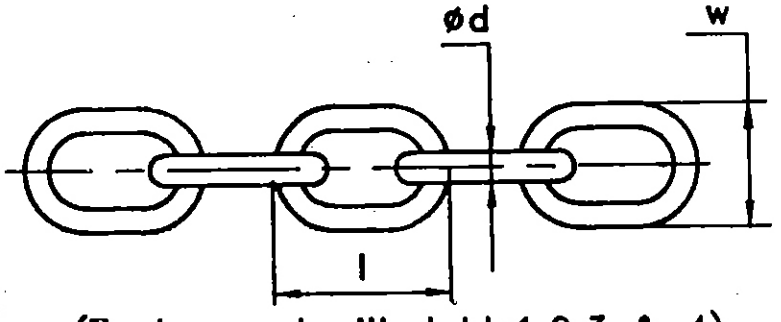
* DIMENSIONS OF CHAIN LINK, MASTER LINK A, JOINING LINK B1 WITH RESPECT TO WORKING LOAD LIMIT FOR FOUR-LEG CHAIN SLING, TYPE 4.
(Clause 4.4 & Fig-4, 5 & 6) (All dimensions are in mm)

Nominal size of the chain dn	** Working load limit WLL (in tonnes)	Chain Link			Master Link A			Joining Link B1	
		l	W (Max)	Nom. size d1	b1	l1	Nom. size d2	b2	l2
10	5.25	50 max 47 min	35	28	90	160	12	30	50
12	8.4	60 max 57 min	42	32	90	160	14	35	60
16	13.23	80 max 76 min	56	40	110	200	18	40	75
18	16.8	90 max 85 min	63	45	125	250	20	45	80
20	21.00	100 max 95 min	70	50	125	250	25	55	110
25	33.6	125 max 119 min	88	63	165	325	28	60	110
28	42.0	140 max 133 min	98	71	165	325	32	70	130
32	52.5	160 max 152 min	112	80	200	360	36	75	150
36	67.2	180 max 171 min	126	90	220	380	40	85	160

* Only the major dimensions are given in the table. All other dimensions shall be as per IS 6217:1982 & IS 2760:1980.

** WLL calculated as WLL of single leg x 2.1 (Ref.Cl. 10.2 of IS 2760:1980)

NOTE : The dimensions of joining link is for guidance only.



(To be raed with table1,2,3 & 4)

FIG. 6 DIMENSIONS OF CHAIN

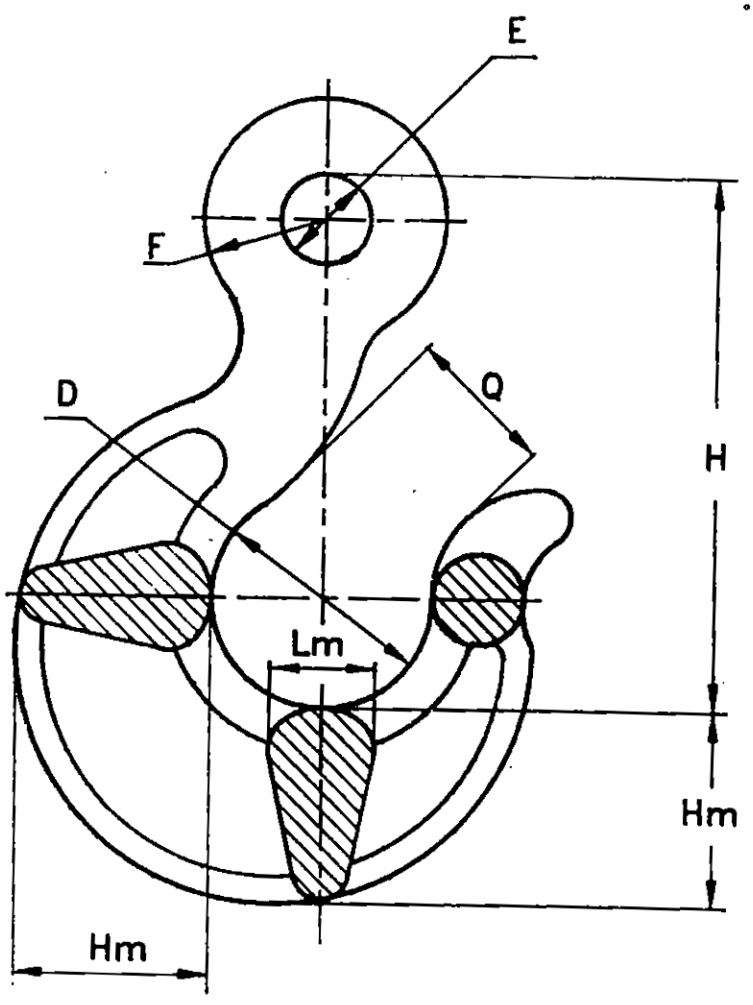


FIG. 7 DIMENSIONS OF EYE HOOK

(Note: Major dimensions and shape are as per BS: 3458–1962.)

TABLE 5

DIMENSIONS OF EYE HOOK (TRAPEZOIDAL SECTION)

(Clause 4.5 & Fig-7)

(All dimensions are in mm)

Nominal size of the chain dn	Working load limit WLL (in tonnes)	D	Q	H	Hm (Max)	Lm (Max)	E	F
10	2.5	51.0	38.0	121	40.0	25.0	19.0	16.0
12	4.0	57.0	43.0	138	44.0	29.0	22.0	19.0
16	6.3	71.0	54.0	173	56.0	37.0	29.0	23.0
18	10.0	86.0	65.0	206	67.0	44.0	33.0	28.0
20	10.0	86.0	65.0	206	67.0	44.0	33.0	28.0
25	16.0	108.0	81.0	259	84.0	56.0	41.0	35.0
28	20.0	129.0	97.0	311	100.0	65.0	51.0	43.0
32	25.0	149.0	113.0	362	117.0	76.0	59.0	50.0
36	32.0	171.0	130.0	410	133.0	98.0	67.0	57.0

NOTE: Only the major dimensions (in approximate) of Eye hook are given. All other dimensions shall be as per as per BS 3459:1962.

THE SHAPE OF EYE HOOK SHALL BE GENERALLY TO BS 3458:1962