මෙය රාජ්‍ය භාෂාවෙන් වෙනම මුද්‍රණය කර ඇත.

ලංකා ප්‍රමිති 97: 1970
CEYLON STANDARD 97: 1970

විශ්ව දශම වර්ග කිරීම; U.D.C. 621·882·1/3: 669·141·24

විටිවන් ඉස්කුරුප්පු පොට සහිත මෘදු වානේ හය පට්ටම් හා හතරැස් කළු බඳුණ ඉස්කුරුප්පු හා මුරිච්චි පිළිබඳ ලංකා ප්‍රමිති පිරිවිතර.

Ceylon Standard Specification for Mild Steel Hexagon and Square Black Bolts, Screws and Nuts with Whitworth Threads.

ලංකා ප්‍රමිති කාර්යාංශය
BUREAU OF CEYLON STANDARDS

CEYLON STANDARD SPECIFICATION FOR MILD STEEL HEXAGON AND SQUARE BLACK BOLTS, SCREWS AND NUTS WITH WHITWORTH THREADS

C.S. 97: 1970

Gr.6

BUREAU OF CEYLON STANDARDS
53, Dharmapala Mawatha,
COLOMBO 3

Ceylon Standards are subject to periodical revision in order to accomodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract.

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CEYLON STANDARD SPECIFICATION FOR MILD STEEL HEXAGON AND SQUARE BLACK BOLTS, SCREWS AND NUTS WITH WHITWORTH THREADS

FOREWORD

This Ceylon Standard Specification for Hexagon and Square Black Bolts, Screws and Nuts with Whitworth threads has been prepared by the Drafting Committee on nuts and bolts. It was approved by the Mechanical Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 14th August, 1970.

Details of hexagon and square bolts, screws, and nuts with Whitworth screw threads are given in this Standard for use until Metric threads are adopted,

This standard is to be read in conjunction with C.S. 96 1969 Ceylon Standard Specification for parallel screw thread of Whitworth form.

The British and Indian Standards were consulted in the preparation of this Standard and the assistance gained thereform is acknowledged.

1. SCOPE

This Standard relates to ferrous bolts, screws and nuts with Whitworth coarse pitch. The fit shall be medium class and free class for bolts and screws and normal class for nuts.

2. TYPES

2·1 Heads or bolts and screws and nuts shall be hexagon or Square (see figures 1 to 9).

2·2 Nuts specified herein shall be of the following types:-

(a) Single chamfered (full bearing)

(b) Washer faced

(c) Double chamfered

(d) Lock nuts

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3. MATERIAL

The steel used for the manufacture of bolts, screws and nuts shall be such that the finished product has

(a) a minimum ultimate tensile strengh of 26 tonf/in^2 (40·95kgf/mm^2) and a minimum elongation of 17 per cent on a gauge length of $5 \cdot 65 \sqrt{\text{area}}$

or (b) a minimum ultimate tensile strength of 28 tonf/in^2 (44·10kgf/mm^2) and a minimum elongation of 14 per cent on a gauge length of $5 \cdot 65 \sqrt{\text{area}}$

The choice of either material will normally be at the option of the manufacturer except when the purchaser specifically states which of the two he requires.

4. THREAD FORM

4·1 The screw threads shall be of the Whitworth coarse form in accordance with C.S. 96: 1969, Ceylon Standard Specification for parallel screw thread of Whitworth form.

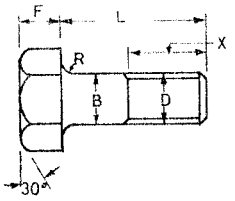
4·2 The screw threads may be cut or rolled at the option of the manufacturer and shall comply with the limits and tolerances specified in the aforementioned Standard.

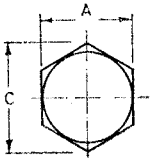
5. WORKMANSHIP

Bolts, screws and nuts shall be neatly and cleanly made and shall be free from burrs and bruising of threads.

6. DIMENSIONAL CHARACTERISTICS

6·1 Bolts, screws and nuts shall conform to the demensions and tolorances given in Tables 1 to 3.





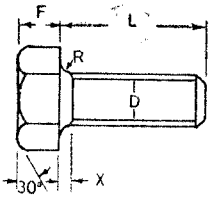
L = LENGTH

X = SEE CLAUSE 6. 3.

Fig. 1 Hexagon Head Bolt

L = LENGTH

X = SEE CLAUSE 6.3. (ii)



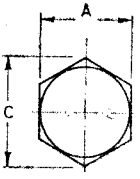
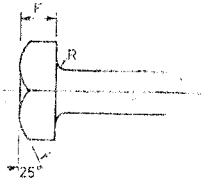


Fig 2 Hexagon Head Screw



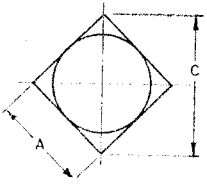
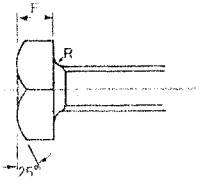


Fig. 3 Square Head Bolt



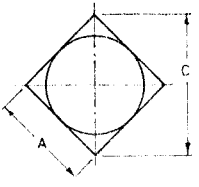


Fig. 4 Square Head Screw

Fig. 5 Rounded End

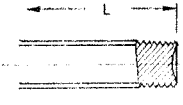


Fig. 6 Rolled Thread End

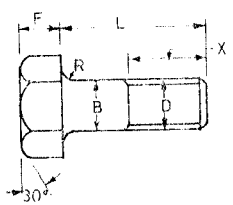
L = LENGTH

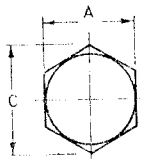
R = RADIUS = APPROXIMATELY $1\frac{1}{2}$ D

TABLE 1.
HEXAGON AND SQUARE HEAD BOLTS AND SCREWS

Nominal size D	Diameter of unthreaded shank B	No. of threads per in.	Width across flast A hex. & square		Approx. max. width across corners C		Radius under head R	Thickness of head F hex. and square	
	max.	B.S.W.	max.	min.	hex.	square	max.	max.	dasic
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
in.	in.		in.	in.	in.	in.	in.	in.	in.
1/4	0·280	20	0·445	0·435	0·51	0·63	1/32	0·186	0·166
5/16	0·342	18	0·525	0·515	0·61	0·74	1/32	0.228	0·208
3/8	0·405	16	0·600	0·585	0·69	0·85	1/32	0·270	0·250
7/16	0·468	14	0·710	0·695	0·82	1·00	1/32	0·312	0·292
1/2	0·530	12	0·820	0·800	0·95	1·16	1/32	9·363	0·333
9/16	0·592	12	0·920	0·900	1·06	1·30	3/64	0·405	0·375
5/8	0·665	11	1·010	0·985	1·17	1·43	3/64	0·447	0·417
3/4	0·790	10	1·200	1·175	1·39	1·70	3/64	0·530	0·500
7/8	0·915	9	1·300	1·270	1·50	1·84	1/16	0·623	0·583
1	1·040	8	1·480	1·450	1·71	2·09	1/16	0·706	0·666
1 1/8	1·175	7	1·670	1·640	1·93	2·36	1/8	0·79	0·75
1 1/4	1·300	7	1·860	1·815	2·15	2·63	1/8	0·89	0·83
1 3/8*	1·425	6	2·050	2·005	2·37	2·90	1/8	0·98	0·92
1 1/2	1·550	6	2·220	2·175	2·56	3·14	1/8	1·06	1·00
1 5/8*	1·685	5	2·410	2·365	2·78	3·41	1/8	1·18	1·08
1 3/4	1·810	5	2·580	2·520	2·98	3·65	1/8	1·27	1·17
2	2·060	4·5	2·760	2·700	3·19	3·90	1/8	1·43	1·33
2 1/4	—	4	3·150	3·090	3·64	4·45	3/16	1·60	1·50
2 1/2	—	4	3·550	3·490	4·10	5·02	3/16	1·77	1·67
2 3/4	—	3·5	3·890	3·830	4·49	5·50	3/16	1·93	1·83
3	—	3·5	4·180	4·080	4·83	5·91	3/16	2·15	2·00
3 1/4*	—	3·25	4·530	4·430	5·23	6·41	1/4	2·32	2·17
3 1/2	—	3·25	4·850	4·750	5·60	6·86	1/4	2·48	2·33
3 3/4*	—	3	5·180	5·080	5·98	7·33	1/4	2·65	2·50
4	—	3	5·550	5·450	6·41	7·85	1/4	2·82	2·67
4 1/2	—	2·875	6·380	6·255	7·37	9 02	1/4	3·20	3·00
5	—	2·750	7·300	7·175	8·43	10·32	1/4	3·53	3·33
5 1/2	—	2·625	8.350	8·225	9·64	11·81	1/4	3·87	3·67
6	—	2·5	9·450	9·325	10·91	13·36	1/4	4·20	4·00

* To be dispensed with wherever possible.





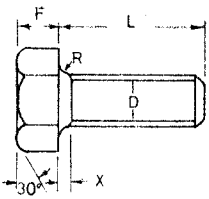
L = LENGTH

X = SEE CLAUSE 6. 3.

Fig. 1 Hexagon Head Bolt

L LENGTH

X = SEE CLAUSE 6.3. (ii)



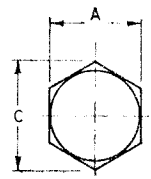


Fig 2 Hexagon Head Screw

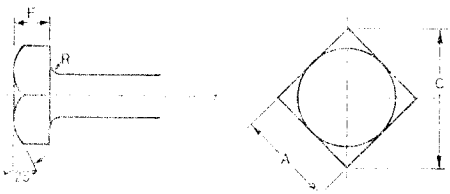


Fig. 3 Square Head Bolt

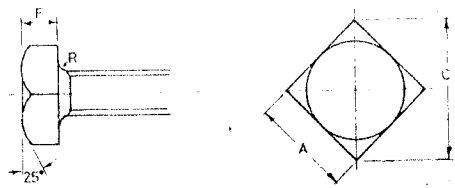


Fig. 4 Square Head Screw

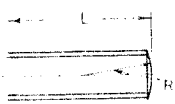


Fig. 5 Rounded End

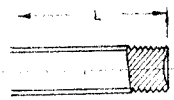


Fig. 6 Rolled Thread End

L = LENGTH

R = RADIUS = APPROXIMATELY 1½ D

TABLE 2.

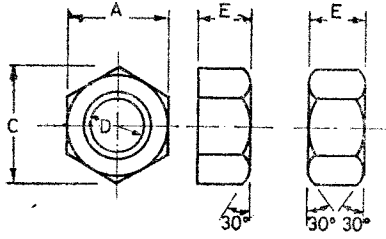
HEXAGON AND SQUARE HEAD BOLTS UNDER HEAD, AND FACED UNDER HEAD AND TURNED ON SHANK

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nom. size D	Diameter of shank: Faced under head	Diameter of shank: Faced under head and turned on shank		Number of threads per inch		Width across flats A		Approx. max. width across corners C		Radius under head R	Thickness of head F hexagon and square		Nom. size D
	max.	max.	min.	B.S.W.	B.S.F	max.	min.	hex.	sq.	max.	max.	min.	
in	in	in	in			in	in	in	in.	in	in	in	in
1/4	0.280	0.2500	0.2465	20	26	0.445	0.435	0.51	0.63	1/32	0.176	0.156	1/4
5/16	0.342	0.3125	0.3090	18	22	0.525	0.515	0.61	0.74	1/32	0.218	0.198	5/16
3/8	0.405	0.3750	0.3715	16	20	0.600	0.585	0.69	0.85	1/32	0.260	0.240	3/8
7/16	0.468	0.4375	0.4335	14	18	0.710	0.695	0.82	1.00	1/32	0.302	0.282	7/16
1/2	0.530	0.5000	0.4960	12	16	0.820	0.800	0.95	1.16	1/32	0.343	0.323	1/2
9/16	0.592	0.5625	0.5585	12	16	0.920	0.900	1.06	1.30	1/32	0.375	0.345	9/16
5/8	0.665	0.625	0.619	11	14	1.010	0.985	1.17	1.43	1/32	0.417	0.387	5/8
3/4	0.790	0.750	0.744	10	12	1.200	1.175	1.39	1.70	1/32	0.500	0.470	3/4
7/8	0.915	0.875	0.867	9	11	1.300	1.270	1.50	1.84	1/32	0.583	0.553	7/8
1	1.040	1.000	0.992	8	10	1.480	1.450	1.71	2.09	1/32	0.666	0.636	1
1 1/8	1.175	1.125	1.117	7	9	1.670	1.640	1.93	2.36	3/64	0.75	0.71	1 1/8
1 1/4	1.300	1.250	1.242	7	9	1.860	1.815	2.15	2.63	3/64	0.83	0.79	1 1/4
1 3/8*	1.425	1.375	1.365	6	8	2.050	2.005	2.37	2.90	3/64	0.92	0.88	1 3/8*
1 1/2	1.550	1.500	1.490	6	8	2.220	2.175	2.56	3.14	3/64	1.00	0.96	1 1/2
1 5/8*	1.685	1.625	1.615	5	8	2.410	2.365	2.78	3.41	3/64	1.08	1.02	1 5/8*
1 3/4	1.810	1.750	1.740	5	7	2.580	2.520	2.98	3.65	3/64	1.17	1.11	1 3/4
2	2.060	2.000	1.990	4.5	7	2.760	2.700	3.19	3.90	3/64	1.33	1.27	2
2 1/4	—	2.250	2.240	4	6	3.150	3.090	3.64	4.45	1/16	1.50	1.42	2 1/4
2 1/2	—	2.500	2.490	4	6	3.550	3.490	4.10	5.02	1/16	1.67	1.59	2 1/2
2 3/4*	—	2.750	2.740	3.5	6	3.890	3.830	4.49	5.50	1/16	1.83	1.75	2 3/4
3	—	3.000	2.990	3.5	5	4.180	4.080	4.83	5.91	1/16	2.00	1.90	3
3 1/4	—	3.250	3.235	3.25	5	4.530	4.430	5.23	6.14	3/32	2.17	2.07	3 1/4*
3 1/2	—	3.500	3.485	3.25	4.5	4.850	4.750	5.60	6.86	3/32	2.33	2.23	3 1/2
3 3/4*	—	3.750	3.735	3	4.5	5.180	5.080	5.98	7.33	3/32	2.50	2.40	3 3/4*
4	—	4.000	3.980	3	4.5	5.550	5.450	6.41	7.85	3/32	2.67	2.57	4
4 1/4	—	4.500	4.480	2.875	4	6.380	6.255	7.37	9.02	1/8	3.00	2.85	4 1/2
5	—	5.000	4.980	2.75	4	7.300	7.175	8.43	10.32	1/8	3.33	3.18	5
5 1/2	—	5.500	5.480	2.625	4	8.350	8.225	9.64	11.81	1/8	3.67	3.52	5 1/2
6	—	6.000	5.980	2.5	4	9.450	9.325	10.91	13.36	1/8	4.00	3.85	6

* To be dispensed with wherever possible.

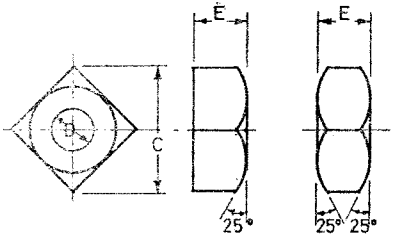
C. S. 97: 1970

TABLE 3.
HEXAGON AND SQUARE NUTS HEXAGON LOCK NUTS



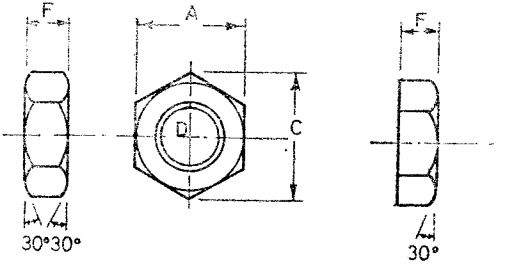
DOUBLE CHAMFERED

Fig. 7 Hexagon Nut



DOUBLE CHAMFERED

Fig. 8 Square Nut



DOUBLE CHAMFERED

Fig. 9 Hexagon Lock Nut

Nominal size D	Number of threads per inch		Width across flats A		Approx. max. width across corners O		Thickness of nut E						Thickness of lock nuts F				Tolerance for squareness of thread to face of nut (see Clause 7·1)	
							Black		Faced one side		Faced both sides		Black		Faced both sides		Black	Machined
	B.S.W.	B.S.F.	max.	min.	hex.	square	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	max.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
in.			in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1/4	20	26	0·445	0·435	0·51	0·63	0·220	0·200	0·200	0·180	0·200	0·190	0·185	0·180	—	—	0·014	0·007
5/16	18	22	0·525	0·515	0·61	0·74	0·270	0·250	0·250	0·230	0·250	0·240	0·210	0·200	—	—	0·018	0·009
3/8	16	20	0·600	0·585	0·69	0·85	0·332	0·312	0·312	0·292	0·312	0·302	0·260	0·250	—	—	0·020	0·010

7/16	14	18	0·710	0·695	0·82	1·00	0·395	0·375	0·375	0·355	0·375	0·365	0·275	0·265	—	—	0·022	0·011
1/2	12	16	0·820	0·800	0·95	1·16	0·467	0·437	0·437	0·417	0·437	0·427	0·300	0·290	—	—	0·026	0·013
9/16	12	16	0·920	0·900	1·06	1·30	0·530	0·500	5·500	0·480	0·500	0·490	0·333	0·323	—	—	0·026	0·013
5/8	11	14	1·010	0·985	1·17	1·43	0·602	0·562	0·562	0·542	0·562	0·552	0·410	0·375	0·375	0·365	0·028	0·014
3/4	10	12	1·200	1·175	1·39	1·70	0·728	0·687	0·687	0·668	0·687	0·677	0·490	0·458	0·458	0·448	0·034	0·017
7/8	9	11	1·300	1·270	1·50	1·84	0 810	0·750	0·750	0·720	0·750	0·740	0·550	0·500	0·500	0·490	0·040	0·020
1	8	10	1·480	1·450	1·71	2·09	0·935	0·875	0·875	0·835	0·875	0·865	0·630	0·583	0·583	0·573	0·040	0·020
1 1/8	7	9	1·670	1·640	1·93	2·36	1·060	1·000	1·000	0·960	1·000	0·990	0·720	0·666	0·666	0·656	0·048	0·024
1 1/4	7	9	1·860	1·815	2·15	2·63	1·205	1·125	1·125	1·080	1·125	1·105	0·810	0·750	0·750	0·730	0·048	0·024
1 3/8*	6	8	2·050	2·005	2·37	2·90	1·330	1·250	1·250	1·190	1·250	1·230	0·890	0·833	0·833	0·813	0·052	0·026
1 1/2	6	8	2·220	2·175	2·56	3·14	1·455	1·375	1·375	1·315	1·375	1·355	0·980	0 916	0·916	0·896	0·052	0 026
1 5/8*	5	8	2·410	2·365	2·78	3·41	1·580	1·500	1·500	1·440	1·500	1·480	1·060	1·000	1·000	0·980	0·052	0·026
1 3/4	5	7	2·580	2·520	2·98	3·65	1·725	1·625	1·625	1·565	1·625	1·605	1·160	1·083	1·083	1·063	0·060	0·030
2	4·5	7	2·760	2·700	3·19	3·90	1·850	1·750	1·750	1·690	1·750	1·730	1·250	1·166	1·166	1·146	0·060	0·030
2 1/4	4	6	3·150	3·090	3·64	4·45	1·975	1·875	1·875	1·815	1·875	1·855	1·430	1·250	1·250	1·229	0·060	0·030
2 1/2	4	6	3·550	3·490	4·10	5·02	2·225	2·125	2·125	2·065	2·125	2 105	1·600	1·416	1·416	1·396	0·070	0·035
2 3/4	3·5	6	3·890	3·830	4·49	5·50	2·475	2·375	2·375	2·315	2·375	2·355	1·770	1·580	1·580	1·560	0·070	0·035
3	3·5	5	4·180	4·060	4·83	5·91	2·775	2·625	2·625	2·525	2·625	2·605	1·980	1·750	1·750	1·730	0·080	0·040
3 1/4*	3·25	5	4·530	4·430	5·23	6·41	3·025	2·875	2·875	2·775	2·875	2·845	2·150	1·915	1·915	1·882	0·080	0·040
3 1/2	3·25	4·5	4·850	4·750	5·60	6·86	3·275	3·125	3·125	3·025	3·125	3·095	2·320	2·083	2·083	2·051	0·090	0·045
3 3/4*	3	4·5	5·180	5·080	5·98	7·33	3·525	3·375	3·375	3·275	3·375	3·345	2·480	2·250	2·250	2·212	0·090	0 045
4	3	4·5	5·550	5·450	6·41	7·85	3·775	3·625	3·625	3·525	3·625	3·595	2·650	2·417	2·417	2·387	0·100	0·050
4 1/2	2·875	4	6·380	6·255	7·37	9·02	4·200	4·000	4·000	3·850	4·000	3·970	3·030	2·666	2·666	2·636	0·110	0·055
5	2·750	4	7·300	7·175	8·43	10·32	4·700	4·500	4·500	4·350	4·500	4·470	3·370	3·000	3·000	2·970	0·120	0·060
5 1/2	2·625	4	8·350	8·225	9·64	11·81	5·200	5·000	5·000	4·850	5·000	4·970	3·700	3·333	3·333	3·303	0·130	0·065
6	2·500	4	9·450	9·325	10·91	13·36	5·700	5·500	5·500	5·350	5·500	5·470	4·030	3·666	3·666	3·636	0·140	0·070

* To be dispensed with wherever possible.

The dimensions of black lock nuts in the above table are designed to permit the product to be manufactered by either hot forging, cold forming or cold pressing, at the option of the manufacturer.

6·2 Length of bolts and screws

6·2·1 The nominal length of a bolt or screw shall be the distance from the underside of the head to the further end of the shank including any chamfer or radius.

6·2·2 The recommended stock sizes of black bolts are indicated in Table 7. (See Appendix).

6·2·3 The permissible tolerance on the nominal length shall be as given in Table 4 below:-

TABLE 4

TOLERANCES ON NOMINAL LENGTH

Nominal length	Diameter	Tolerance on length
in.	in.	in.
All lengths	Below 1 in.	+ 1/8in., - 0
	1 in. and over	+ 3/16 in., - 0

6·3 Length of screw thread

6·3·1 **Bolts** - the length of thread shall be such that when a mechined nut is screwed as far as possible on to the bolt by hand the distance between the underside of the bolt head and the nearest face of the nut shall be not more than the nominal length of the bolt minus the values given in (i) or (ii) below as applicable.

(i) Bolts as forged

Length of bolt	All diameters up to and including $\frac{1}{2}$ in.	All diameters over $\frac{1}{2}$ in.
in.		
Up to and including 4	2 diameters	$1\frac{1}{2}$ diameters
Over 4 and up to and including 8	2 diameters	2 diameters
Over 8	$2\frac{1}{2}$ diameters	$2\frac{1}{2}$ diameters

(ii) Bolts faced under the head with or without turning on the shank.

Length of bolt	All diameters
All lengths	2 diameters

Bolts that are too short for minimum thread shall be threaded as screws

6·3·2 **Screws** - screws shall be threaded to permit a standard screw ring gauge to be screwed by hand to within a distance from the underside of the head as follows:-

Threads per inch	Distance from underside of head
16 and under	2 × pitch
Over 16 up to and including 20	$2\frac{1}{2}$ × pitch
Over 20	3 × pitch

6·4 Ends of bolts and screws

The ends of bolts and screws may at the option of the manufacturer, be finished with either a flat chamfer with a 90° included angle to a depth slightly exceeding the depth of thread, or with a radius approximately equal to $1\frac{1}{4}$ times the nominal diameter of shank. When bolts and screws are made with rolled threads the lead formed at the end of the bolt or screw by the thread rolling operation may be regarded as providing the necessary chamfer to the end, no other machining operation being necessary, and the end shall be reasonable square with the centre line of the shank.

6·5 **Chamfering and facing**

6·5·1 **Bolts and screws** - Hexagon bolt heads and screw heads shall be chamfered at an angle of approximately 30° and square heads at an angle of approximately 25° on their upper faces. The diameter of the ring formed by the chamfer on the upper face of the bolt or set screw head shall not be smaller than 90 per cent of the minimum across flats dimension (see Fig. 10). The lower or bearing face shall be machined only if specified by the purchaser.

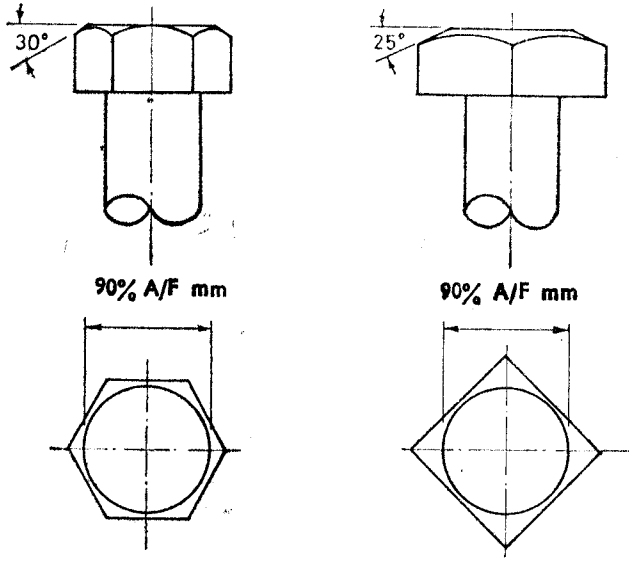


Fig. 10.

6·5·2 **Nuts - Hexagon and square** These shall be chamfered at an angle of appoximately 25 in. in one or both faces at the option of the manufacturer. They shall be machined on one or both faces only when so specified.

6·5·3 **Unmachined lock nuts** - These shall be chamfered at an angle of approximately 30° on one or both faces at the option of the manufacturer. They shall be machined and chamfered on both faces only when so specified.

7. DETAIL REQUIREMENTS

7·1 **Squareness of nut facing** – The bearing surface of unmachined (black) nuts shall be square to the axis of the thread of the nut within the tolerances given in Column 18 of Table 3. The bearing surface of machined nuts shall be square to the axis of the thread of the nut within the tolorances given in column 19 of Table 3.

7·2 Heads of bolts and screws, and the nuts shall be ture hexagons or true squares and the body of the bolts and screws and the thread of the nut shall be concentric with the hexagons or squares.

8. FINISH

The surface of bolts, screws and nuts may be finished bright in the case of machined surfaces if so required by the purchaser.

9. SAMPLING

9·1 **Lot** – All nuts or bolts of one consignment of the same size, type and manufactured under similar processes of production shall constitute a lot.

9·2 The number of nuts or bolts to be selected from a lot shall depend upon the size of the lot and shall be in accordance with column 1 to 3 of Table 5. All these nuts or bolts shall be taken at random form the lot.

9·3 If the nuts/bolts in the lot are packed in different bags/cases a suitable number of bags/cases (not less than 20 per cent of the total in the lot subject to a minimum of 2) shall be chosen at random. From each of the bags/cases so chosen, an approximately equal number of nuts/bolts shall be picked up from its different parts so as to obtain the required number of nuts/bolts specified in Table 5.

TABLE 5.

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

Lot Size	Visual Characteristics				Dimensional Characteristics			
	Sample	Sample size	Ac	Re	Sample	Sample size	Ac	Re
(1)	(2)	(3)	(4)		(5)	(6)	(7)	
Up to 500	First	50	2	7	First	20	0	2
	Second	100	6	7	Second	40	1	2
501 to 800	First	75	4	9	First	25	0	3
	Second	150	8	9	Second	50	2	3
801 to 1,300	First	100	5	12	First	35	1	3
	Second	200	11	12	Second	70	2	3
1,301 to 3,200	First	150	7	19	First	50	1	4
	Second	300	18	19	Second	100	3	4
3,201 to 8,000	First	200	9	25	First	75	1	6
	Second	400	24	25	Second	150	5	6
8,001 to 22,000	First	300	12	36	First	100	2	6
	Second	600	35	36	Second	200	5	6
over 22,000	First	500	14	41	First	150	3	8
	Second	1,000	40	41	Second	300	7	8

Ac = Acceptance Number

Re = Rejection Number

·4 **Visual Characteristics** – All the nuts or bolts drawn under Clause 9·2 shall be first examined for visual characteristics like type, finish workmanship, etc. If in the first sample, the number of defective nuts/bolts is less than or equal to the corresponding acceptance number, the lot shall be declared as conforming to the requirements for the visual characteristics. If the number of defectives is greater than or equal to the corresponding rejection number, the lot shall be deemed as not meeting the requirements for the visual characteristics. If the number of defectives is greater than the acceptance number but lees than the rejection number, a second sample of twice the number of nuts/bolts selected as the first sample shall be taken to determine the conformity or otherwise of the lot. The number of defectives found in the first and second samples shall be combined and if the combined number of defectives is less than or equal to the corresponding acceptance number, the lot shall be declared as conforming to the requirements: otherwise not.

9·5 **Dimensional Characteristics** – The lot which has been found satisfactory in respect of visual characteristics (see Clause 9·4) shall next be tested for dimensional characteristics like diameter, length, pitch, etc. The nuts/bolts for this purpose shall be taken at random from those already drawn (see Clause 9·2 and Column 1 of Table 5) in accordance with Columns 5 and 6 of Table 5, and tested for the dimensional characteristics. If the number of nuts/bolts failing to satisfy the requirements for these characteristics is less than or equal to the corrosponding acceptance number given in Col. 7 of Table 5. The lot shall be declared to have met the requirements of the specification in respect of these characteristics. If the number of defectives is greater than or equal to the rejection number, given in Column 7 of Table 5, the lot shall be deemed as not conforming to these characteristics. In case the number of defectives lies in between the acceptance and rejection numbers, a second samble of double the size shall be taken and inspected for the dimensional characteristics and inference drawn accordingly.

9·6 **Tensile Strength** – The test for tensile strength shall be carried out on bolts taken at random from those which have passed the tests given in Clauses 9·4 and 9·5. The number of bolts to be drawn for the tensile test shall be as shown in Table 6.

TABLE 6

SCALE OF SAMPLING FOR TENSILE TEST

Lot size (1)	Sample size (2)	Acceptance No. (3)
Up to 800	5	0
801 to 3,200	10	0
3,201 to 8,000	15	0
8,001 to 22,000	20	0
Over 22,000	30	1

If the number of defectives is less than or equal to the corresponding acceptance number in column (3) of Table 6 the lot shall be deemed as conforming to the standard; otherwise not.

10. EXAMINATION AND TESTS

The samples drawn in accordance with the sampling procedure shall be tested in the following order–

(a) visually examined for manufacturing defects.

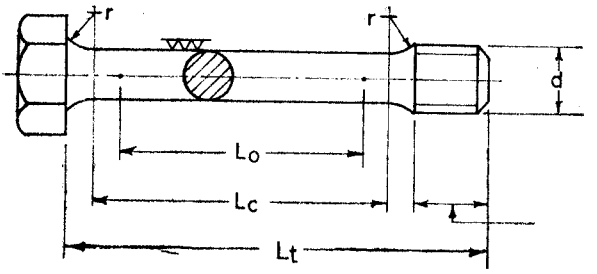
(b) examined for dimensional characteristics.

(c) physical tests.

11. METHODS OF TEST

11·1 **Tensile test** – Tensile test shall be conducted in accordance with C.S. 12/1967, Method of tonsile testing of steel products other than sheet, strip, wire and tube, on a test piece as shown in fig. 11. A minimum screw length equal to L_t shall be used in order to determine the elongation for a gauge length

$$L_o = 5 \cdot 65 \sqrt{\frac{\pi d^2}{4}}$$



d_1 < Minor diameter

$L_c = L_o + d_1$

$L_o = 5{\cdot}65\sqrt{\frac{\pi d_1^2}{4}}$

$L_t = L_c + 2 \times r +$ at least d

Fig. 11 Tensile test piece

In the case of bolts and screws above 5/8 in. diameter any reduction over 25 percent in shank diameter (which is approximately equal to 45 percent in area) shall not be permitted in the preparation of the test piece. In such cases the test piece shall be prepared as shown in Fig. 12 below:-

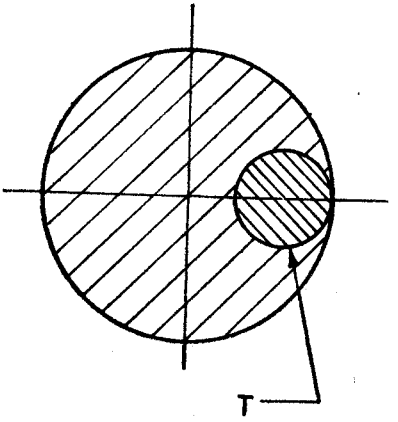


Fig. 12 Test piece for larger diameters

The tensile strength and elongation shall comply with the value specified in Clause 3.

12. CONFORMITY TO STANDARD

If the number of defectives exceed the corresponding number given in Table 5 and Table 6 the batch represented by them shall be deemed not to conform to this standard.

13. PACKING

All black grade threaded fasteners shall be packed in bags or wooden boxes, the weight of individual package being $\frac{1}{2}$ cwt. or 1 cwt.

APPENDIX

TABLE 7.

STOCK SIZES OF STEEL HEXAGON HEAD BLACK BOLTS

Nominal size D	NOMINAL LENGTH IN INCHES																							
	½	⅝	¾	1	1¼	1½	1¾	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12
in.																									
1/4	X	X	X	X	X	X	X	X	X	X															
5/16		X	X	X	X	X	X	X	X	X	X	X													
3/8		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
7/16				X	X	X	X	X	X	X	X	X													
1/2				X	X	X	X	X	X	X	X	X	X	X	X	X									
5/8				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3/4					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7/8						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1							X	X	X	X	X	X	X	X	X	X	–	X	–	X	–	X	X	X	X

NOTE: Stock sizes for screws are as above, but are restricted to 4 in. maximum length

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