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Specification for

Telegraph material (insulators, pole fittings, etc.)

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- British Ceramic Manufacturers' Federation
- EEIA (BEAMA)

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Foreword

This is a revision of BS 16:1949, which was itself a revision of BS 16:1937 incorporating standards developed as a result of consideration of war emergency designs.

BS 16:1937 was a revision of part of the Interim Report published in 1905 entitled “British Standard Specifications and Tables for Telegraph Material”. In this latest specification, proof load tests have been included on metal components containing welds.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 46, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

1.1 Scope

This British Standard specifies dimensions, material, tests, workmanship and finish for insulators and pole fittings. The metric sizes have been so chosen that components may be used for replacement purposes.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

1.2 Definitions

For the purposes of this British Standard, the definitions in BS 4727 apply.

1.3 General requirements

1.3.1 Quality of steel. Unless otherwise required, steel parts specified in this standard shall be made to either grade 43A of BS 4360 or BS 970-1, with metric values in BS 970-6, or alternatively as agreed between the supplier and the purchaser.

1.3.2 Screw threads. Unless otherwise required, screw threads on bolts and other parts shall be formed after galvanizing; they shall be to BS 3643 coarse series, free fit. The threads shall be well oiled with an agreed grade of oil before the nuts or other items are fitted. The nuts shall be well fraised before galvanizing. Nuts and other parts with internal threads shall be tapped to BS 3643 coarse series free fit after galvanizing.

Where the thread on bolts and other parts is to be galvanized, it shall be to BS 3643 coarse series, free fit, before galvanizing. In this case, the nuts and other parts shall be tapped up to 0.4 mm oversize to suit the galvanized bolt or other threaded part.

1.3.3 Galvanizing. Where a part is required to be hot dip galvanized, such coatings shall comply with the requirements of BS 729.

1.3.4 Dimensions. Unless otherwise specified, dimensions apply to parts after galvanizing.

2 Galvanized bolts, nuts and washers

2.1 Dimensions

The bolts, nuts and washers shall comply in all respects with Table 1a, Table 1b, and Table 1c and Figure 1 and Figure 2. The purchaser shall state at the time of ordering the number of washers required per bolt, if any.

NOTE It has been decided to retain square headed bolts and square nuts in this standard because they have been found to be most suitable for field usage.

If for reasons of availability or cost it is preferred to use hexagon headed bolts and hexagon nuts, these should be to the dimensions given in BS 4190.

2.2 Materials

The bolts and nuts shall be of steel (as in 1.3.1) and galvanized to the requirements of BS 729. The material of the washers shall be mild steel unless otherwise specified and they shall be galvanized to the requirements of BS 729.

2.3 Workmanship and finish

The bolts and nuts shall be well forged and free from inequalities, flaws and other defects. The heads shall be solid and in every respect well formed and shall not fail when the bolts are tested to fracture at their full section of tensile stress.

The washers shall be cleanly cut off and punched, and shall be entirely free from cracks after punching.

The screw threads shall be as specified in 1.3.2.

2.4 Tests

The finished bolts, when subjected to tensile test, shall comply with the breaking load requirements of Table 1a.

Table 1a — Dimensions and breaking load of bolts

NOTE In the first column the letter M indicates that the bolt/nut combination is to metric dimensions.

BS size no.	Diameter of bolt <i>D</i>	Length of bolt <i>L</i>	Length of screw thread <i>S</i>	Minimum breaking load
	mm	mm	mm	kN
320 M	10	50	25	23
325 M		60	40	
330 M		75	40	
335 M		90	40	
340 M		100	50	
345 M		115	50	
350 M		130	50	
355 M		150	50	
420 M	12	50	25	33
425 M		60	40	
430 M		75	40	
435 M		90	40	
440 M		100	50	
445 M		115	50	
450 M		130	50	
455 M		150	50	
520 M	16	50	25	62
525 M		60	40	
530 M		75	40	
535 M		90	40	
540 M		100	50	
545 M		115	50	
550 M		130	50	
555 M		150	50	
4065 M	12	175	60	33
4075 M		200		
4085 M		225		
4095 M		250		
4105 M		275		
4115 M		300		
4125 M		325		
4135 M		350		
4145 M		375		
5065 M	16	175	70	62
5075 M		200		
5085 M		225		
5095 M		250		
5105 M		275		
5115 M		300		
5125 M		325		
5135 M		350		
5145 M		375		
5155 M		400		
5165 M		425		
5175 M		450		
5185 M		475		
5195 M		500		
5205 M		525		
5215 M		550		
5225 M		575		
5235 M		600		

Table 1b — Dimensions of bolt heads, nuts and washers
BS sizes 320 M to 555 M (see Figure 1)

Diameter <i>D</i>	Heads and nuts						Round washers to BS 4320:1968 Form F		
	Width across flats, heads and nuts		Thickness				Diameter of hole after galvanizing	Outside diameter <i>W</i>	Thickness <i>T</i>
			Heads <i>B</i>		Nuts <i>C</i>				
<i>D</i>	<i>A</i>		<i>B</i>		<i>C</i>			<i>W</i>	<i>T</i>
mm	max. mm	min. mm	max. mm	min. mm	max. mm	min. mm	mm	mm	mm
10	15.2	14.9	7.1	6.6	8.4	7.9	12	24	2
12	20.8	20.3	10.2	9.4	11.7	10.9	14	30	2.5
16	25.7	25.0	13.0	12.2	15.2	14.2	18	34	3.0

Table 1c — Dimensions of bolt heads, nuts and washers
BS sizes 4065 M to 5235 M (see Figure 2)

Diameter <i>D</i>	Heads and nuts						Washers						
	Width across flats, heads and nuts		Thickness				Diameter of hole after galvanizing	Neck			Nut		
			Heads		Nuts			Length	Width	Thickness	Length	Width	Thickness
	<i>A</i>	<i>B</i>	<i>C</i>	<i>V</i>	<i>W</i>	<i>T</i>	<i>X</i>	<i>Y</i>	<i>Z</i>				
mm	max. mm	min. mm	max. mm	min. mm	max. mm	min. mm	mm	mm	mm	mm	mm	mm	mm
12	20.8	20.3	10.2	9.4	11.7	10.9	14	50	50	3	75	50	6
16	25.7	25.0	13.0	12.2	15.2	14.2	18	75	50	6	75	50	6

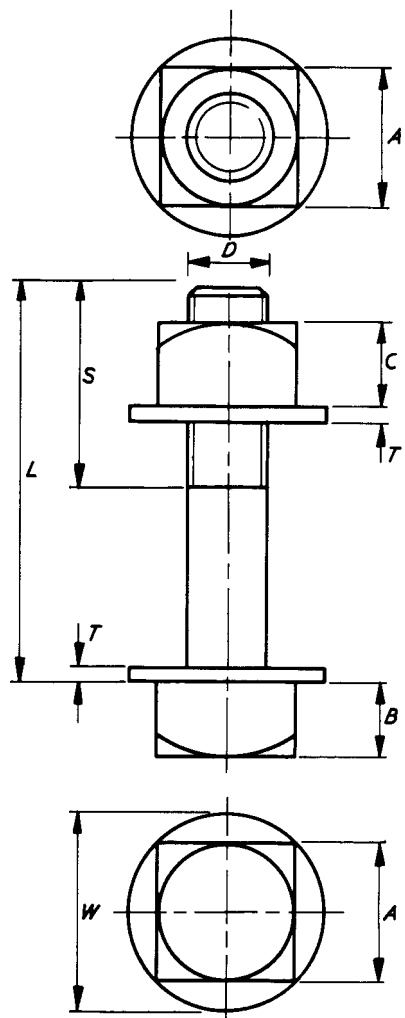


Figure 1 — Galvanized bolts, nuts and washers
(see Table 1a and Table 1b)

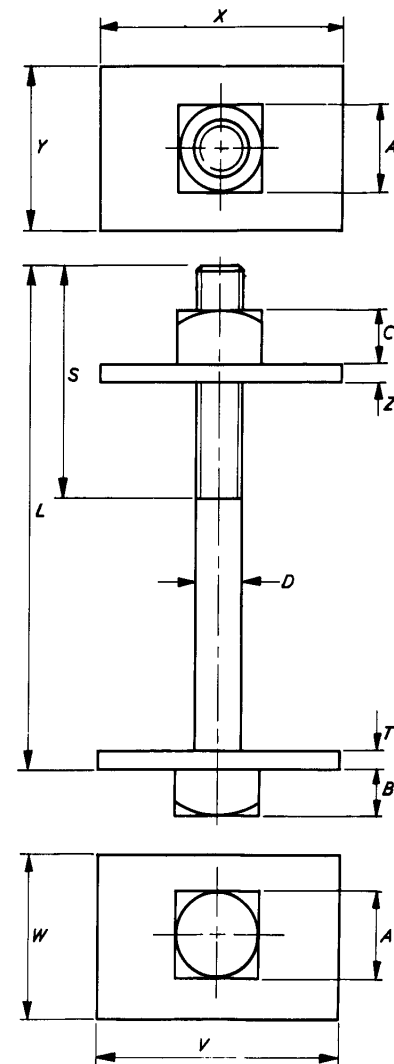


Figure 2 — Galvanized bolts, nuts and washers
(see Table 1a and Table 1c)

3 Stay swivels

3.1 Dimensions

The frames, eye-bolts, swivel eyes and thimbles shall comply in all respects with the requirements of Table 2 and Table 4 and Figure 3.

3.2 Material

The frames, eye-bolts, swivel eyes and thimbles shall be of steel to Grade 43A of BS 4360 or to an agreed alternative to satisfy the breaking load required in Table 2, and galvanized to BS 729.

3.3 Workmanship and finish

3.3.1 The frames, eye-bolts and swivel eyes shall be soundly made and free from defects.

3.3.2 The swivel eye shall be free to rotate in the frame.

3.3.3 Screw threads shall be as specified in 1.3.2.

3.3.4 Thimbles shall be closed on to eyes before galvanizing.

3.4 Tests

The assembled swivels, when subjected to tensile load applied from eye to eye, shall comply with the requirements of Table 2. Proof load tests (40 % of breaking load) shall be performed on all swivels containing welded joints.

Table 2 — Dimensions and breaking load of stay swivels (see Figure 3)

BS size no. mm	A	D^a min.	L^b		BS thimble ^c			Breaking load (min.) kN
			max.	min.	Q	R	S	
	mm	mm	mm	mm	mm	mm	mm	
1 M	12	19	430	300	51	32	13	33
2 M	16	25	860	560	64	45	19	62
3 M	20	25	860	560	70	48	22	96

^a The eye may be round or pear shaped.
^b The two values of L cover the range of adjustment (for inspection, the lower value is a maximum and the higher value is a minimum).
 L max. and L min. may be varied by agreement between the manufacturer and the purchaser.
^c By agreement between the manufacturer and the purchaser, suitable thimbles in accordance with BS 464 may be used.

4 Stay rods and stay tighteners

4.1 Dimensions

The rods, eye-bolts, bows, ratchet nuts, thimbles and washers or plates shall comply in all respects with the dimensions specified in Table 3 (rods, eye-bolts and bows), Table 4 (thimbles), Table 5 (washers), Table 6 (plates) and Figure 4 and Figure 5.

All dimensions apply to the parts after galvanizing.

4.2 Material

4.2.1 The rods, eye-bolts and bows shall be of steel, suitable to give the strength required in 4.4. The cross-head may be made of forged mild steel, malleable cast iron or grey cast iron.

4.2.2 The thimbles, washers and plates shall be of mild steel.

The ratchet nuts shall be of steel or malleable cast iron to BS 309 or BS 2789.

4.3 Workmanship and finish

4.3.1 The rods, eye-bolts and bows shall be soundly made and free from defects.

4.3.2 The sides of each assembly shall be well riveted into the cross-head and shall not draw when the assembly is tested to fracture by tensile loading.

4.3.3 The ratchet nuts and the ratchet face of each cross-head shall be well formed, so that any nut and any cross-head of the appropriate size shall provide a good ratchet action.

4.3.4 The washers or plates shall be cleanly cut off and punched and shall be free from cracks after punching.

4.3.5 Unless otherwise required, all parts shall be galvanized to BS 729. Thimbles shall be closed on to eyes before galvanizing.

4.4 Tests

The assembled stay rods and stay tighteners, when subjected to the tensile test, shall comply with the breaking load requirements of Table 7.

Proof load tests (40 % of the breaking load) shall be performed on all stay rods and stay tighteners containing welded joints.

Table 3 — Dimensions of stay rods, eye bolts, bows and nuts (see Figure 4)

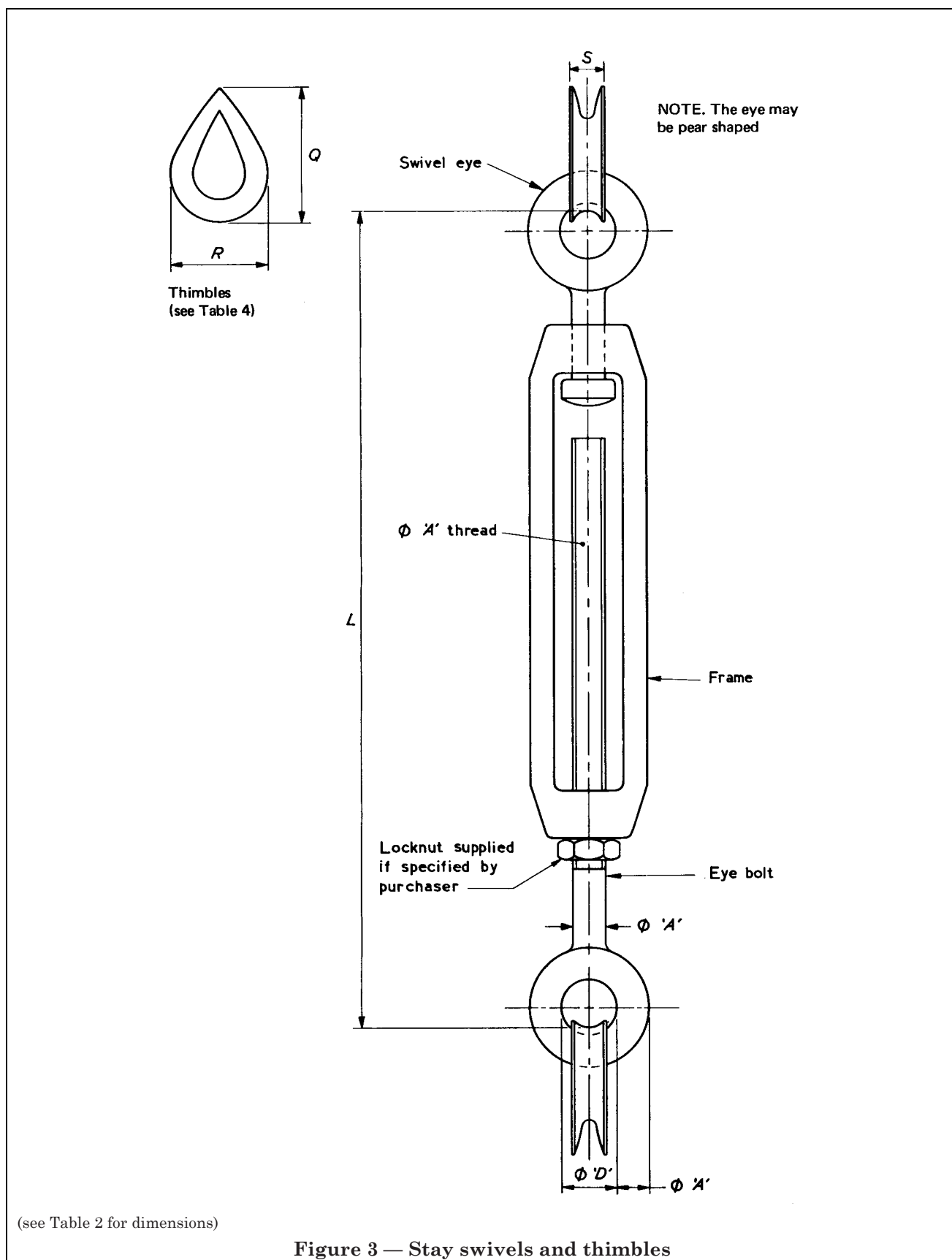
BS Pattern 1								
Dimension		No. 11 M	12 M	13 M	14 M	15 M	16 M	17 M
Rods	A	mm 1 400	mm 1 400	mm 1 800*	mm 1 800	mm 2 400*	mm 1 800	mm 2 400*
	B	12	16		20		24	
	C	230	300		300		300	
	D	25.4	31.8		38.1		44.5	
	E	12	16		20		24	
	E ¹	10	12		12		16	
Eye-bolts	L	350	450		450		500	
	d min.	19	25		25		30	
	C	230	300		300		300	
	B	12	16		20		24	
Bows	F	10	12		14		18	
	G	300	400		400		425	
	H min.	12	16		20		24	
	J	75	88		110		127	
Nuts	P	23.4 max 22.9 min	27.9 max 27.4 min		33.0 max 32.5 min		42.4 max 41.9 min	
	R	13.2 max 12.7 min	16.5 max 16.0 min		19.6 max 19.1 min		25.9 max 25.4 min	
	R ¹	R + 2.5	R + 2.5		R + 2.5			
BS Pattern 2								
Dimension		No. 21 M	22 M	23 M	24 M	25 M	26 M	27 M
Rods	A	mm 1 400	mm 1 400	mm 1 800*	mm 1 800	mm 2 400*	mm 1 800	mm 2 400*
	B	12	16		20		24	
	C	230	300		300		300	
	D	25.4	31.8		38.1		44.5	
	E	12	16		20		24	
	E ¹	10	12		12		16	
Eye-bolts	L	350	450		450		500	
	d min.	19	25		25		30	
	C	230	300		300		300	
	B	12	16		20		24	
Bows	F	10	12		14		18	
	G	280	370		380		400	
	H min.	12	16		20		24	
	J	52	59		73		92	
Nuts	R	6.4	7.9		10.1		12.7	
	R ¹	R + 2.5	R + 2.5		R + 2.5		R + 2.5	
	X	17.6–18.0	20.3–20.8		25.0–25.7		32.3–33.0	

NOTE 1 In the various column headings, the addition of the letter M indicates that the bolt/nut combination is metric.

NOTE 2 Those sizes marked with an asterisk are to be regarded as the primary standard.

NOTE 3 Unless otherwise specified, each rod shall be provided with a washer (see Table 5) and each bow with a thimble (see Table 4).

NOTE 4 Each eye-bolt and each bow to be provided with a thimble (see Table 4).



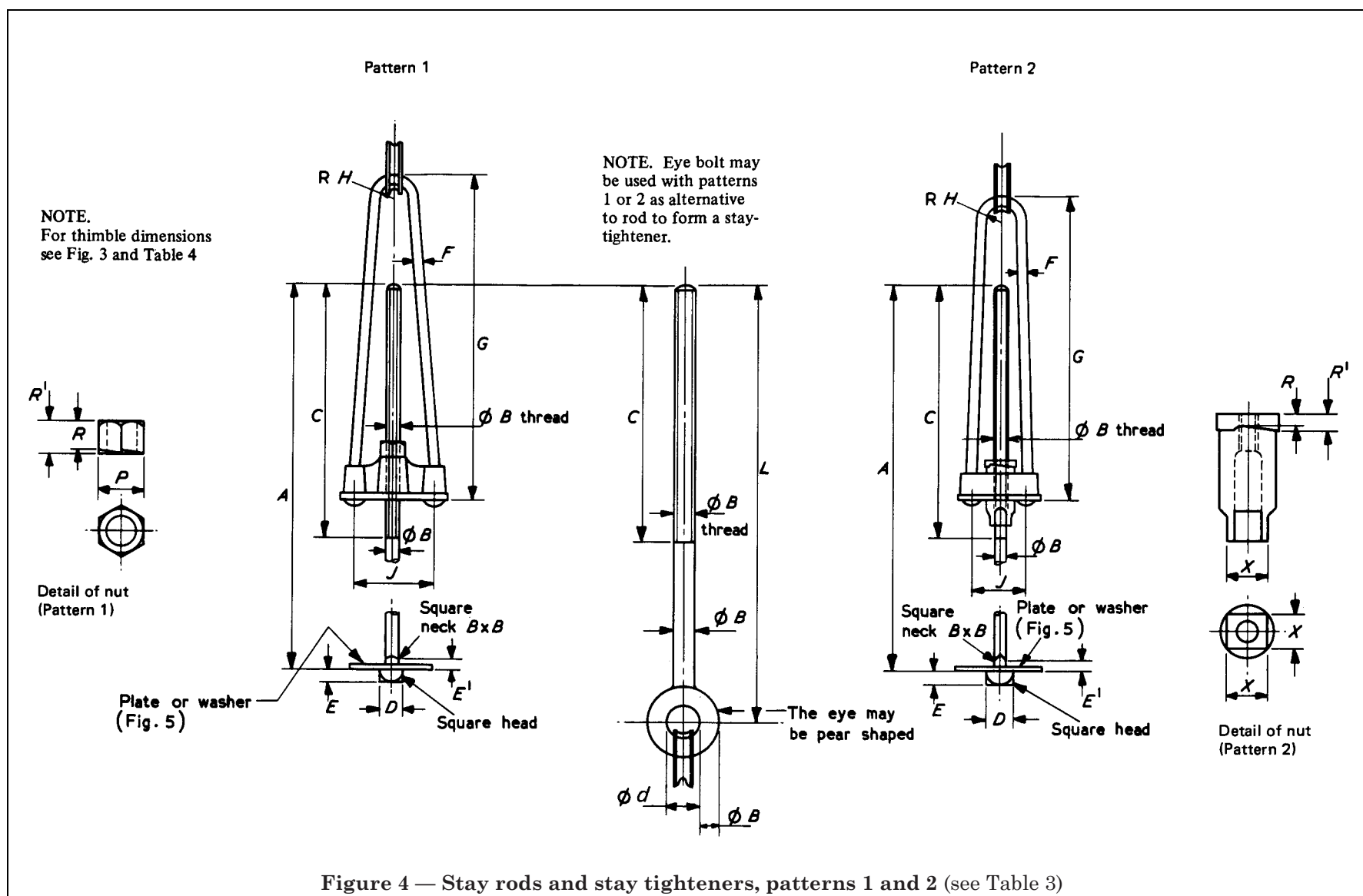


Table 4 — Thimbles (see Figure 3)

BS size no.	Dimensions ^a			For use with bows and eye bolts nos.	For use with stay swivels nos.
	Q	R	S		
	mm	mm	mm		
1 M	51	32	13	11 M, 21 M	1
2 M	64	45	19	12 M, 13 M, 22 M, 23 M	2
3 M	70	48	22	14 M, 15 M, 24 M, 25 M	3
4 M	76	51	25	16 M, 17 M, 26 M, 27 M	—

^a By agreement between the manufacturer and the purchaser, suitable thimbles in accordance with BS 464 may be used.

Table 5 — Stay rod washers (see Figure 5)

BS size no.	Dimensions					For rod nos.
	A	B	C	D	E	
	mm	mm	mm	mm	mm	
1 M	100	14	12	22	7	11 M, 21 M
23 M	100	18	12	22	7	12 M, 13 M, 22 M, 23 M
45 M	150	22	12	25	8	14 M, 15 M, 24 M, 25 M
67 M	150	26	12	25	8	16 M, 17 M, 26 M, 27 M

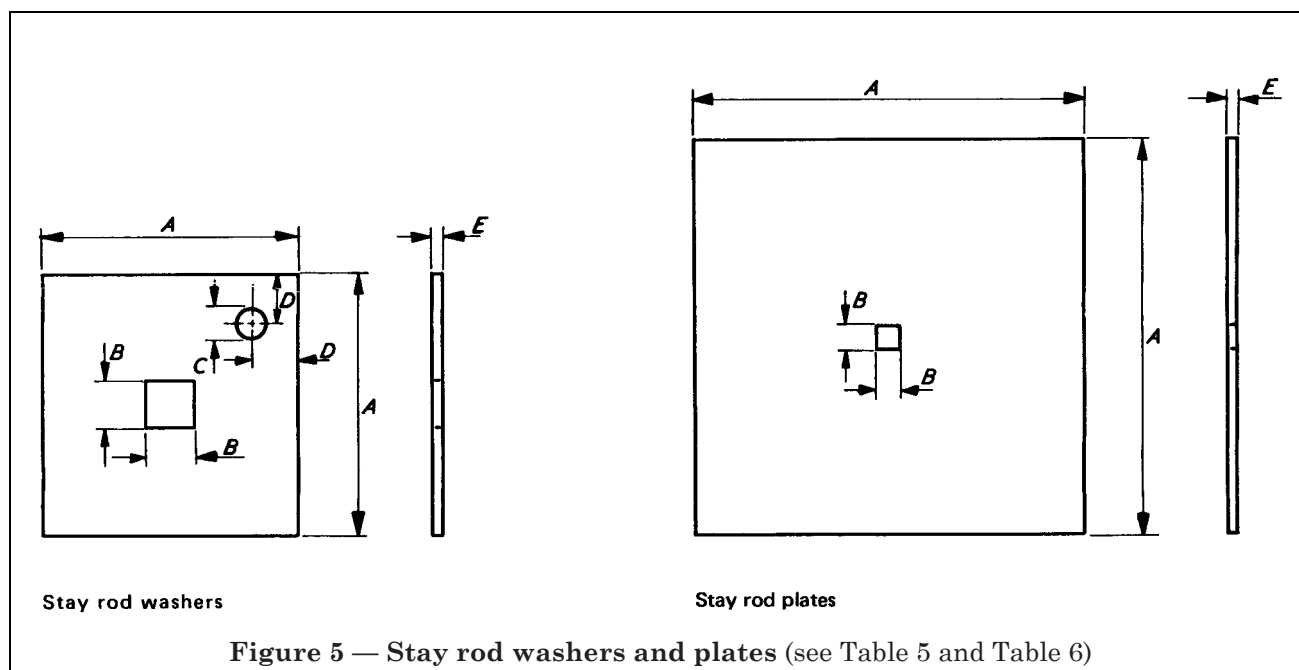


Table 6 — Galvanized stay rod plates (see Figure 5)

BS size no.	Dimension			For rod nos.
	<i>A</i>	<i>B</i>	<i>E</i>	
	mm	mm	mm	
1 M 1*	230	14	4	11 M, 21 M
1 M 2	300	14	4	
23 M 1*	300	18	4	12 M, 13 M, 22 M, 23 M
23 M 2*	380	18	4	
45 M 1*	380	22	4	14 M, 15 M, 24 M, 25 M
67 M 1*	380	26	4	
67 M 2	450	26	6	16 M, 17 M, 26 M, 27 M

NOTE Those sizes marked with an asterisk are to be regarded as the primary standard.

Table 7 — Tensile test on stay rods and stay tighteners

Diameter of rod or eye bolt (<i>B</i> in Table 3)	Breaking load (min.)
mm	kN
12	33
16	62
20	96
24	135

5 Tie bolts, distance tubes and washers (plain and taper)

5.1 Dimensions

The bolts, nuts, washers and tubes shall comply with the requirements of Table 8 and Figure 6.

The purchaser shall state at the time of ordering the number of washers required per bolt, if any.

5.2 Material

The bolts and nuts shall be of steel (as specified in 1.3.1). The material of the washers shall be mild steel unless otherwise specified. The distance tubes shall be of mild steel. All items shall be galvanized to BS 729.

5.3 Workmanship and finish

The workmanship and finish shall be as in 2.3.

5.4 Tests

The finished tie bolts, when subjected to the tensile tests, shall comply with the requirements of Table 8.

Table 8 — Dimensions and tensile test for tie bolts (see Figure 6)

Diameter of bolt	Length of bolt <i>L</i>	Length of thread <i>S</i>	Breaking load (min.)	Width across flats head and nuts <i>A</i>	Thickness	
					Head <i>B</i>	Nut <i>C</i>
mm	mm	mm	kN	mm	mm	mm
20	460 540	100	96	25.0 to 25.7	12.7 to 13.5	17.4 to 16.9
	610 760 920 1 150 1 370 1 600 1 830	230				

6 Arm combiners and braces

6.1 Dimensions

Arm combiners and braces shall comply with the requirements of Figure 7.

6.2 Material

The arm combiners and braces shall be of steel (as in 1.3.1) and they shall be galvanized to BS 729 unless otherwise required.

6.3 Workmanship and finish

The arm combiners and braces shall be free from flaws and other defects. The ends shall be squarely and cleanly cut-off. The holes shall be cleanly and accurately punched, special care being taken to ensure that accurate pitch of the holes is obtained.