BRITISH STANDARD

BS 64 : 1992

Specification for

Normal and high strength steel bolts and nuts for railway rail fishplates

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) to Technical Committee ISM/74, upon which the following bodies were represented:

British Industrial Fasteners Federation
British Railways Board
British Steel Industry
Department of Transport (Transport Industries)
London Underground Ltd.
Railway Industry Association of Great Britain

This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 November 1992

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Contents

Foreword

This British Standard has been prepared under the direction of the Iron and Steel Standards Policy Committee and supersedes BS 64 : 1946 which is withdrawn.

In this revision the requirements for fishbolts have been rationalized and updated to ensure compatibility with BS 11 and BS 47 : Part 1.

Purchasers ordering to this standard are advised to specify in the purchasing contract that the supplier operates a quality system in compliance with BS 5750 : Parts 1, 2 or 3 as relevant to assure to their satisfaction that products claimed to comply with BS 64 consistently achieve the required level of quality.

Marking BS 64 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of this standard. The accuracy of such a claim is therefore the sole responsibility of the manufacturer.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This British Standard specifies the dimensions and requirements for normal and high strength bolts and nuts for fishplates conforming to BS 47 : Part 1 : 1991 for use with railway rails conforming to BS 11 : 1985.

The provisions of this specification are not restricted to fishbolts for use with rails and fishplates conforming to BS 11 : 1985 and BS 47 : Part 1 : 1991 and may be applied to fishbolts for any rail section of 24.8 kg/m (50 lb/yd) or greater linear mass and the complementary fishplates.

2 References

2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Material

The steelmaking process and grade of steel shall be at the discretion of the manufacturer to obtain the mechanical properties specified in clause **6**.

The sulfur and phosphorus content shall not exceed 0.06 %.

4 Manufacture

Bolts shall be produced by hot or cold forging. Nuts shall be hot or cold forged or machined from bar.

Bolts and nuts shall be free from manufacturing defects adversely affecting their behaviour in service.

No manufacturing operations shall be carried out with the object of concealing defects.

5 Heat treatment

Bolts and nuts shall be heat treated when necessary to obtain the mechanical properties given in clause **6**. Cold forged bolts shall be thermally stress relieved.

No heat treatment shall be applied which would adversely affect the performance of the fishbolts or nuts in service.

6 Mechanical properties

6.1 General

After manufacture, including heat treatment if applied, bolts and nuts shall be tested to ascertain the mechanical properties of the batch. Representative samples or test pieces prepared shall not be subjected to additional heat treatment prior to testing.

6.2 Frequency of testing

The following rates of testing shall apply:

a) normal	one per 5 t batch (or part thereof) per cast;
b) high strength	one per cast per diameter per heat treatment batch.

6.3 Bolts

6.3.1 *General*

The test method given in **6.3.2** or **6.3.3** shall be used.

6.3.2 *Full size bolts*

6.3.2.1 *Strength under wedge loading*

When tensile tested on a 4° angled washer in accordance with BS EN 20898 : Part 1 : 1992 the ultimate tensile load shall conform to tables 1 and 2 as appropriate. The fracture shall occur in the shank or threaded portion of the bolt and not between the head and the shank.

6.3.2.2 *Proof load test*

When proof load tested in accordance with BS EN 20898 : Part 1 : 1992 high strength grade bolts shall conform to tables 1 or 2 as appropriate.

6.3.3 *Machined test pieces (from full size bolts)*

When tested in accordance with BS EN 10002-1 : 1990 the bolts shall have the mechanical properties given in table 3.

6.4 Nuts

When tested in accordance with the appropriate British Standard the nuts shall have the hardness values given in table 4.

6.5 Retests

If any of the mechanical tests carried out fail to conform to **6.1** to **6.4**, two further retests from the same batch of fishbolts or nuts shall be taken. If one or both of the retests is not satisfactory the corresponding batch shall not have conformed to this British Standard.

In the event of failure to meet the mechanical test requirements, the manufacturer shall have the right to reheat treat the batch not more than twice and to resubmit it for testing.

Table 1. Minimum proof loads and minimum and maximum ultimate tensile loads for British Standard Whitworth (BSW) screw threads

Nominal thread diameter in	Number of threads per inch	Nominal stress area mm^2	Normal grade		High strength grade		
			Minimum ultimate tensile load kN	Maximum ultimate tensile load kN	Minimum proof load kN	Minimum ultimate tensile load kN	Maximum ultimate tensile load kN
$\frac{3}{4}$	10	217	119	152	160	217	250
$\frac{13}{16}$	10	260	143	182	191	260	299
$\frac{7}{8}$	9	299	164	209	220	299	344
$\frac{15}{16}$	9	350	193	245	257	350	403
1	8	392	216	274	288	392	451
$1\frac{1}{8}$	7	494	272	346	363	494	568

Table 2. Minimum proof loads and minimum and maximum ultimate tensile loads for British Standard fine (BSF) screw threads

Nominal thread diameter in	Number of threads per inch	Nominal stress area mm^2	Normal grade		High strength grade		
			Minimum ultimate tensile load kN	Maximum ultimate tensile load kN	Minimum proof load kN	Minimum ultimate tensile load kN	Maximum ultimate tensile load kN
$\frac{3}{4}$	12	227	125	159	167	227	261
$\frac{13}{16}$	12	272	150	190	200	272	313
$\frac{7}{8}$	11	314	173	220	231	314	361
$\frac{15}{16}$	11	366	201	256	269	366	421
1	10	414	228	290	304	414	476
$1\frac{1}{8}$	9	525	289	368	386	525	604

Table 3. Mechanical properties for test pieces machined from bolts			
	Minimum 0.2 % proof strength N/mm^2	**Tensile strength** N/mm^2	**Minimum elongation %** (Gauge length $5.65\sqrt{S_o}$)
Normal	—	550 to 700	15
High strength	835	1000 to 1150	9

Table 4. Hardness requirements for nuts								
Strength grade	**Brinell hardness, HB,** $F = 30D^2$ (see BS 240 : 1986)		**Rockwell hardness, HR** (see BS 891 : 1989)				**Vickers hardness, HV** (see BS 427 : 1990)	
	min. HB	**max.** HB	**min.** HRB	**max.** HRB	**min.** HRC	**max.** HRC	**min.** HV	**max.** HV
Normal grade	130	185	72	90	N/A	N/A	130	185
High strength grade	201	271	93	N/A	N/A	28	200	286
NOTE. 'N/A' indicates that there is no hardness requirement for the relevant grade.								

7 Dimensions and tolerances

7.1 General

Fishbolts and nuts shall conform to tables 5 and 6; bearing surfaces shall be perpendicular to the axes of the threads within 2°.

7.2 Tolerances on fishbolt length

For all fishbolt lengths the tolerances on length shall be $^{+\frac{1}{8}}_{0}$ in for diameters below 1 in and $^{+\frac{3}{16}}_{0}$ in for diameters 1 in and over.

7.3 Tolerance on thread length

For all fishbolt diameters the permissible tolerance on the nominal thread length shall be $^{+2\frac{1}{2}}_{0}$ pitches.

7.4 Screw thread

NOTE. The screw thread required (BSW or BSF) should be stated by the purchaser at the time of placing the order (see annex Ae).

A British Standard Whitworth or British Standard fine thread form shall be used, conforming to the medium class tolerance of BS 84 : 1956 (see annex B).

7.5 Gauging

Gauges used to establish conformity with dimensions and tolerances shall be included in the manufacturer's calibration system for periodic checking to confirm their accuracy and be traceable to national standards.

8 Quality control

The manufacturer shall inspect all batches of fishbolts and nuts and ensure that they conform to this British Standard. All nonconforming batches shall be clearly marked.

The inspection or quality assurance system to be applied shall be defined at the time of enquiry or order (see annex Ah) and shall be based on one of the following:

a) the manufacturer shall take responsibility for quality assurance based on a procedure in conformity with BS 5750 : Part 1 : 1987, BS 5750 : Part 2 : 1987 and BS 5750 : Part 3 : 1987;

NOTE 1. See the foreword.

b) alternatively, the manufacturer shall advise the purchaser of the date of forging, sample selection and mechanical testing of the test pieces to enable the purchaser to witness these procedures, and of the availability of the finished product for inspection.

There shall be access during working hours for the purchaser to observe the manufacturing process and to inspect the finished product.

NOTE 2. Any batches which do not conform should be sorted before submission for the purchaser's inspection.

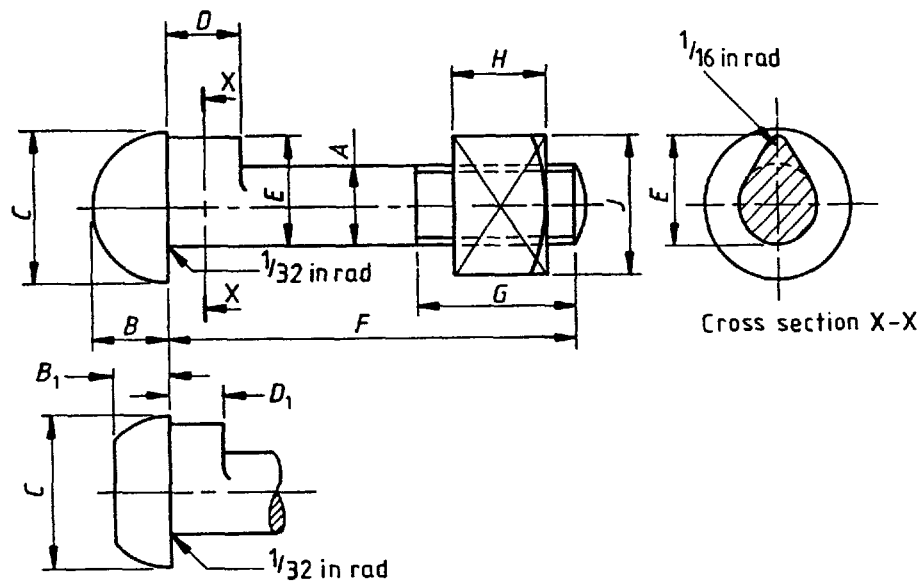
9 Marking

Identification markings on fishbolt heads shall be either embossed or indented. High strength bolts shall carry the letter V and all bolts shall carry the trade (identification) mark of the manufacturer and any additional marking specified (see annex Af).

10 Protective coating

Unless otherwise specified at the time of ordering (see annex Ag) the finished fishbolts and nuts shall be protected before despatch from atmospheric corrosion, under normal storage conditions, by a protective medium.

When plastics or other non-ferrous materials form part of a locking device care shall be taken to ensure that their properties are not adversely affected by the protective medium.



All dimensions are in inches.

Figure 1. Cup/pear and pan/pear fishbolts and nuts for fishplates with pear shaped holes (see table 5)

Table 5. Dimensions of cup/pear and pan/pear fishbolts and nuts for fishplates with pear shaped h

Number of British Standard section of rail	Nominal size	*A* Diameter of unthreaded shank		*B* Depth of head		B_1 Depth of head		*C* Diameter of head		*D* Length of nib	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
70 and 75	$\frac{7}{8}$	0.915	0.865	0.915	0.875	0.665	0.625	1.780	1.750	0.790	0.750
80, 85R, 90R, 95R, 100R	$\frac{15}{16}$	0.978	0.928	0.915	0.875	0.665	0.625	1.780	1.750	0.915	0.875

NOTE. See figure 1.

holes

Dimensions in inches

	D_1 Length of nib		E Dimension over nib		Radius under head		G Thread length	F Length of bolt	H Thickness of nut		J Width across flats	
	Max.	Min.	Max.	Min.	Max.	Min.			Max.	Min.	Max.	Min.
)	0.665	0.625	1.238	1.188	0.063	0.031	2	BSF 4	0.935	0.875	1.510	1.490
								BSW $4\frac{1}{8}$	1.060	1.000		
5	0.665	0.625	1.300	1.250	0.063	0.031	2	BSF $4\frac{1}{2}$	1.060	1.000	1.635	1.615
								BSW $4\frac{7}{8}$	1.185	1.125		

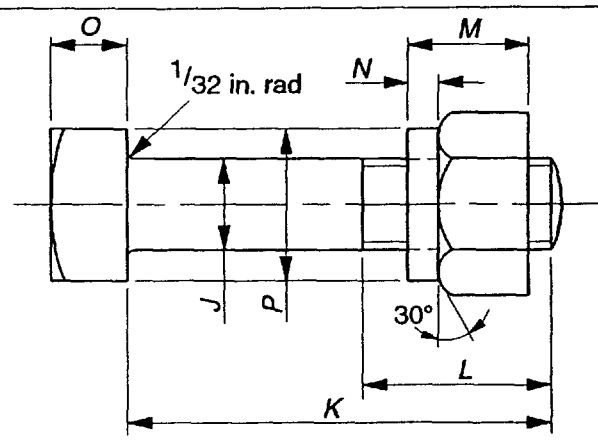


Figure 2. Square headed fishbolts and nuts
(see table 6)

Table 6. Dimensions of square headed fishbolts and nuts for flat bottom rails with round holes

Number of British Standard section of rail	Nominal size	*J* Diameter of unthreaded shank		*P* Width across flats of bolt head, nut and diameter of nut collar		*O* Thickness of head		*K* Length of bolt	*L* Thread length	Radius under head	
		Max.	Min.	Max.	Min.	Max.	Min.			Max.	Min.
50 '0'	$\frac{3}{4}$	0.790	0.740	1.300	1.280	0.686	0.656	$3\frac{7}{8}$	2	0.047	0.031
60 A	$\frac{3}{4}$	0.790	0.740	1.300	1.280	0.686	0.656	$3\frac{7}{8}$	2	0.047	0.031
60 R	$\frac{3}{4}$	0.790	0.740	1.300	1.280	0.686	0.656	$3\frac{7}{8}$	2	0.047	0.031
70 A	$\frac{15}{16}$	0.853	0.803	1.390	1.370	0.758	0.718	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
75 A	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
75 R	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
80 A	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
80 R	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
80 R Angled	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
80 '0'	$\frac{7}{8}$	0.915	0.865	1.480	1.460	0.806	0.766	$4\frac{1}{8}$	$2\frac{1}{4}$	0.063	0.031
90 A	$\frac{15}{16}$	0.978	0.928	1.580	1.560	0.868	0.828	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.031
90 R	$\frac{15}{16}$	0.978	0.928	1.580	1.560	0.868	0.828	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.031
95 A	1	1.040	0.990	1.670	1.650	0.915	0.875	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.031
95 R	1	1.040	0.990	1.670	1.650	0.915	0.875	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.031
95 R BH	$\frac{15}{16}$	0.978	0.928	1.580	1.560	0.868	0.828	5	$2\frac{1}{4}$	0.063	0.03
95 R BH Skirted	$\frac{15}{16}$	0.978	0.928	1.580	1.560	0.868	0.828	5	$2\frac{1}{4}$	0.063	0.03
95 N	1	1.040	0.990	1.670	1.650	0.915	0.875	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.03
100 A	1	1.040	0.990	1.670	1.650	0.915	0.875	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.03
100R	1	1.040	0.990	1.670	1.650	0.915	0.875	$4\frac{15}{16}$	$2\frac{5}{16}$	0.063	0.03
110 A	1	1.040	0.990	1.670	1.650	0.915	0.875	$6\frac{1}{4}$	$2\frac{11}{16}$	0.063	0.03
113 A	1	1.040	0.990	1.670	1.650	0.915	0.875	$6\frac{1}{4}$	$2\frac{11}{16}$	0.063	0.03

NOTE. See figure 2.

Dimensions in inches

der	*M* Overall thickness of nut		*N* Thickness of nut collar	
Min.	Max.	Min.	Max.	Min.
0.031	1.041	1.000	0.270	0.250
0.031	1.041	1.000	0.270	0.250
0.031	1.041	1.000	0.270	0.250
0.031	1.123	1.063	0.270	0.250
0.031	1.216	1.156	0.301	0.281
0.031	1.216	1.156	0.301	0.281
0.031	1.216	1.156	0.301	0.281
0.031	1.216	1.156	0.301	0.281
0.031	1.216	1.156	0.301	0.281
0.031	1.216	1.156	0.301	0.281
0.031	1.279	1.219	0.301	0.281
0.031	1.279	1.219	0.301	0.281
0.031	1.373	1.313	0.333	0.313
0.031	1.373	1.313	0.333	0.313
0.031	1.279	1.219	0.301	0.281
0.031	1.279	1.219	0.301	0.281
0.031	1.373	1.313	0.333	0.313
0.031	1.373	1.313	0.333	0.313
0.031	1.373	1.313	0.333	0.313
0.031	1.373	1.313	0.333	0.313
0.031	1.373	1.313	0.333	0.313

Annexes

Annex A (informative)

Information to be supplied by the purchaser

The following information should be stated by the purchaser on the enquiry and order:

a) the number and date of this British Standard, i.e. BS 64 : 1992;

b) the strength grade required, normal or high strength (see clause **6**);

c) the rail and fishplate sections the fishbolt is to be used with;

d) the design of the fishbolt and nut (Design A, B or C) (see clause **7**);

e) the type of thread required (see clause **7**);

f) the type of marking to be used on the bolt heads (see clause **9**);

g) the type of protective medium if one is to be used or any special requirements for corrosion protection (see clause **10**);

h) the type of quality assurance system required (see clause **8**).

NOTE. Where fishbolts and nuts are required with dimensions not covered by tables 5 and 6, a fully dimensional drawing should be supplied.

Annex B (informative)

Basic sizes of British Standard screw threads for bolts and nuts

For ease of reference the basic sizes of British Standard screw threads for bolts and nuts are given in tables B.1 to B.4.

Table B.1. Limits and tolerances of British Standard Whitworth screw threads for medium fit bolts[1)]

Dimensions in inches

Nominal thread diameter	Number of threads per inch	Major diameter	Effective diameter	Minor diameter
$\frac{3}{4}$	10	$0.7482\,^{0}_{-0.0092}$	$0.6842\,^{0}_{-0.0060}$	$0.6202\,^{0}_{-0.0123}$
$\frac{13}{16}$	10	$0.8125\,^{0}_{-0.0094}$	$0.7485\,^{0}_{-0.0062}$	$0.6845\,^{0}_{-0.0125}$
$\frac{7}{8}$	9	$0.8750\,^{0}_{-0.0097}$	$0.8039\,^{0}_{-0.0064}$	$0.7328\,^{0}_{-0.0131}$
$\frac{15}{16}$	9	$0.9375\,^{0}_{-0.0099}$	$0.8664\,^{0}_{-0.0065}$	$0.7953\,^{0}_{-0.0132}$
1	8	$1.0000\,^{0}_{-0.0103}$	$0.9200\,^{0}_{-0.0068}$	$0.8400\,^{0}_{-0.0139}$
$1\frac{1}{8}$	7	$1.1250\,^{0}_{-0.0110}$	$1.0335\,^{0}_{-0.0072}$	$0.9420\,^{0}_{-0.0148}$

[1)]Based on table 4 of BS 84 : 1956, for British Standard Whitworth screw threads and including $\frac{11}{16}$ in and $\frac{15}{16}$ in size.

Table B.2. Limits and tolerances of British Standard Whitworth screw threads for medium fit nuts

Dimensions in inches

Nominal thread diameter	Number of threads per inch	Minimum major diameter	Effective diameter	Minor diameter
$\frac{3}{4}$	10	0.7500	$0.6920\,^{0}_{-0.0060}$	$0.6490\,^{0}_{-0.0270}$
$\frac{13}{16}$	10	0.8125	$0.7547\,^{0}_{-0.0062}$	$0.7115\,^{0}_{-0.0270}$
$\frac{7}{8}$	9	0.8750	$0.8103\,^{0}_{-0.0064}$	$0.7620\,^{0}_{-0.0292}$
$\frac{15}{16}$	9	0.9375	$0.8729\,^{0}_{-0.0065}$	$0.8245\,^{0}_{-0.0292}$
1	8	1.0000	$0.9268\,^{0}_{-0.0068}$	$0.8720\,^{0}_{-0.0320}$
$1\frac{1}{8}$	7	1.1250	$1.0407\,^{0}_{-0.0072}$	$0.9776\,^{0}_{-0.0356}$

[1)]Based on table 3 of BS 84 : 1956, BSW threads and including $\frac{11}{16}$ in and $\frac{15}{16}$ in size.

Table B.3. Limits and tolerances of British Standard fine screw threads for medium fit bolts[1)]

Dimensions in inches

Nominal thread diameter	Number of threads per inch	Major diameter	Effective diameter	Minor diameter
$\frac{3}{4}$	12	$0.7482\,^{0}_{-0.0088}$	$0.6948\,^{0}_{-0.0059}$	$0.6414\,^{0}_{-0.0117}$
$\frac{13}{16}$	12	$0.8125\,^{0}_{-0.0089}$	$0.7591\,^{0}_{-0.0060}$	$0.7057\,^{0}_{-0\ 0118}$
$\frac{7}{8}$	11	$0.8750\,^{0}_{-0.0092}$	$0.8168\,^{0}_{-0.0062}$	$0.7586\,^{0}_{-0.0122}$
$\frac{15}{16}$	11	$0.9375\,^{0}_{-0.0094}$	$0.8793\,^{0}_{-0.0064}$	$0.8211\,^{0}_{-0.0124}$
1	10	$1.0000\,^{0}_{-0.0098}$	$0.9360\,^{0}_{-0.0066}$	$0.8720\,^{0}_{-0.0129}$
$1\frac{1}{8}$	9	$1.1250\,^{0}_{-0.0102}$	$1.0539\,^{0}_{-0.0069}$	$0.9828\,^{0}_{-0.0136}$

[1)]Based on table 10 of BS 84 : 1956, BSF threads and including $\frac{13}{16}$ in and $\frac{15}{16}$ in size.

Table B.4. Limits and tolerances of British Standard fine screw threads for medium fit nuts[1)]

Dimensions in inches

Nominal thread diameter	Number of threads per inch	Minimum major diameter	Effective diameter	Minor diameter
$\frac{3}{4}$	12	0.7500	$0.7025\,^{0}_{-0.0059}$	$0.6669\,^{0}_{-0.0237}$
$\frac{13}{16}$	12	0.8125	$0.7651\,^{0}_{-0.0060}$	$0.7294\,^{0}_{-0.0237}$
$\frac{7}{8}$	11	0.8750	$0.8230\,^{0}_{-0.0062}$	$0.7838\,^{0}_{-0.0252}$
$\frac{15}{16}$	11	0.9375	$0.8857\,^{0}_{-0.0064}$	$0.8463\,^{0}_{-0.0252}$
1	10	1.0000	$0.9426\,^{0}_{-0.0066}$	$0.8990\,^{0}_{-0.0270}$
$1\frac{1}{8}$	9	1.1250	$1.0608\,^{0}_{-0.0069}$	$1.0120\,^{0}_{-0.0292}$

[1)]Based on table 9 of BS 84 : 1956, BSF threads and including $\frac{13}{16}$ in and $\frac{15}{16}$ in size.

List of references (see clause 2)

Normative references

BSI standards publication

BRITISH STANDARDS INSTITUTION, London

BS 11 : 1985	*Specification for railway rails*
BS 47 :	*Fishplates for railway rails*
BS 47 : Part 1 : 1991	*Specification for rolled steel fishplates*
BS 240 : 1986	*Method for Brinell hardness test and for verification of Brinell hardness testing machines*
BS 427 : 1990	*Method for Vickers hardness test and for verification of Vickers hardness testing machines*
BS 891 : 1989	*Methods for hardness test (Rockwell method) and for verification of hardness testing machines (Rockwell method)*
BS 5750 :	*Quality systems*
BS 5750 : Part 1 : 1987	*Specification for design/development, production, installation and servicing*
BS 5750 : Part 2 : 1987	*Specification for production and installation*
BS 5750 : Part 3 : 1987	*Specification for final inspection and test*
BS EN 10002 :	*Tensile testing of metallic materials*
BS EN 10002-1 : 1990	*Method of test at ambient temperature*
BS EN 20898 :	*Mechanical properties of fasteners*
BS EN 20898-1 : 1992	*Bolts, screws and studs*

Informative references

BSI standards publication

BRITISH STANDARDS INSTITUTION, London

BS 84 : 1956	*Specification for parallel screw threads of Whitworth form*

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BSI STANDARDS

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to BS 64 : 1992

Specification for normal and high strength steel bolts and nuts for railway rail fishplates

Corrections

Figure 2. Square headed fishbolts and nuts

Delete the existing figure and substitute the new figure 2, which shows the nut collar facing the bolt head.

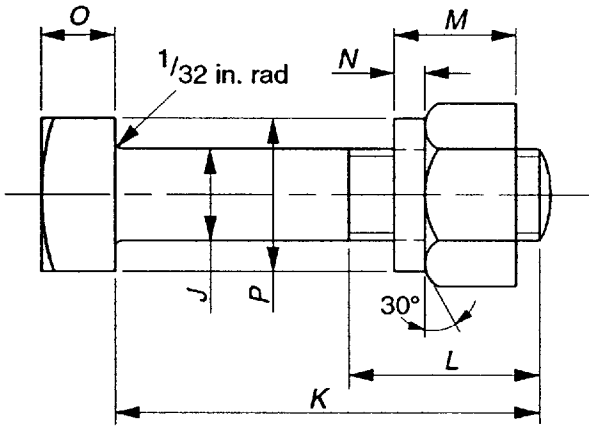

Figure 2. Square headed fishbolts and nuts
(see table 6)

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Table 6. Dimensions of square headed fishbolts and nuts for flat bottom rails with round holes

In column 1, row 19 delete '10R' and substitute '100R'.

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Table B.2 Limits and tolerances of British Standard Whitworth screw threads for medium fit nuts

In column 4, row 4, for nominal thread diameter 15/16 delete '0.8792' and insert '0.8729'.

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9407—0.5k—PP