

**SRI LANKA RAILWAY STORES SPECIFICATION FOR STEEL FISH PLATES FOR 80 LBS, 88 LBS. & 90(A) LBS.
AND JUNCTION FISH PLATES 88/90A, 80/90A & 60E1/90A LBS.**

1 Scope

This Part of BS 47 specifies the chemical composition and tensile property requirements for the steel used, and the dimensions and tolerances of rolled steel fishplates intended for use with railway rails of linear mass equal to or greater than 24.8 kg/m (50 lb/yd).

The provisions of this specification are not restricted to fishplates for use with rails that comply with BS 11 and may be applied to fishplates for any rail section of 24.8 kg/m (50 lb/yd) or greater linear mass.

NOTE 1. Whilst this standard does not specify requirements for forged or cast fishplates some of its provisions may be applied to such products where appropriate.

NOTE 2. Recommended batch inspection procedures are described in appendix A. The section properties are given for information in appendix B. Information to be supplied by the purchaser is given in appendix C.

NOTE 3. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Manufacture

2.1 Manufacture of steel

The source of the steel and the steelmaking process shall be the responsibility of the manufacturer of the fishplates. If requested by the purchaser at the time of enquiry the manufacturer shall describe the source of steel supply and the steelmaking and casting processes employed. The manufacturer shall not alter these without the agreement of the purchaser.

2.2 Manufacture of fishplates

Manufacturing of Junction Fish Plates shall be done according to drop forge method. If not the items supplied shall be rejected.

Sufficient crop shall be taken to ensure that end defects are removed.

The rolling and fishplate finishing processes shall be the responsibility of the manufacturer. If requested by the purchaser at the time of enquiry or order the manufacturer shall describe the rolling and fishplate finishing processes employed. The manufacturer shall not alter these without the agreement of the purchaser.

3 Chemical composition

When tested in accordance with clause 11 the chemical composition of the steel shall comply with the limits given in table 1.

In the event of dispute, analyses shall be carried out by the appropriate methods described in BS 6200 and BSI Handbook No. 19.

NOTE. The chemical composition and mechanical property requirements of grade 080M40 or grade 080M36 of BS 970 : Part 1 : 1983 may be specified by the purchaser.

4 Dimensions and properties

Dimensions and properties for all fishplates shall be in accordance with table 2 (see also figures 1 and 2). In addition, dimensions and properties for all fishplates ordered for use with a BS rail section number shall be in accordance with the values in tables 3 and 4 (see also figure 3) and figures 4 to 23.

NOTE 1. With the exception of the fishplate for the 113A rail, all fishplates were designed in imperial units. The drawings for these fishplates are therefore shown in imperial units. For the convenience of users some data are also shown in metric units.

NOTE 2. The section properties are given for information in appendix B.

5 Marking

Brand marks shall be rolled in relief in such a position, clear of the bearing of the fishbolt head and nut, that the following information can be seen when the fishplate is fixed in position:

- the identity of the rail section to which the fishplate belongs;
- the identification mark of the manufacturer;
- the last two figures of the year of manufacture.

Each element of the brand mark shall be separated by a hyphen of minimum length 0.7 times the height of the brand letters and numbers.

Example

BS 95 R - X & Co - 90

Table 1. Chemical composition

	Carbon	Silicon	Manganese	Phosphorous	Sulphur
	% by mass	% by mass	% by mass	% by mass	% by mass
Ladle analysis	0.30 min. 0.45 max.	0.35 max.	0.90 max.	0.05 max.	0.05 max.
Product analysis	0.27 min. 0.48 max.	0.38 max.	0.94 max.	0.058 max.	0.058 max.

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- the last two figures of the year of manufacture.

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Example

BS 95 R - X & Co - 90

Table 1. Chemical composition

	Carbon	Silicon	Manganese	Phosphorous	Sulphur
	% by mass	% by mass	% by mass	% by mass	% by mass
Ladle analysis	0.30 min. 0.45 max.	0.35 max.	0.90 max.	0.05 max.	0.05 max.
Product analysis	0.27 min. 0.48 max.	0.38 max.	0.94 max.	0.058 max.	0.058 max.

6 Tensile properties

When tested in accordance with clause 12 the tensile strength and elongation of the steel shall comply with the following.

Tensile strength	Minimum elongation (Gauge length $5.65 \sqrt{S_0}$)
N/mm ²	%
600 ± 50	18

where

S_0 is the cross-sectional area of the test piece (in mm²).

NOTE. Where the purchaser specifies the use of a grade of steel complying with BS 970 : Part 1 then the associated tensile property requirements of this grade are applicable (see clause 3).

7 Templates and working gauges

The manufacturer shall make available to the purchaser a set of clearly identified master templates, internal and external, for the section of fishplate ordered and shall obtain the purchaser's approval of them before rolling of the fishplate section begins. The master templates shall be made available on request for the checking of working gauges.

In addition to the master templates, the manufacturer shall make available go and no-go working gauges incorporating the dimensional tolerances given in table 2.

NOTE. The same master templates may be used by several purchasers (see item (b) of appendix C).

8 Freedom from defects

Fishplates shall be free from manufacturing defects adversely affecting their performance in service.

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

NOTE. Minor surface defects may be removed using a method approved by the purchaser.

9 Finishing

9.1 Straightness

The straightening operation shall be carried out with gradual pressure and without impact.

9.2 Fishplate length

The significantly rolled bars used shall be cut to length by any suitable method which does not deform the section or change the properties of the steel. Each cut shall be clean and free from burrs.

9.3 Bolt holes

One or more of the following methods shall be used for producing the holes:

- drilling;
- hot punching;
- machining.

All necessary precautions shall be taken to ensure that the fishing surfaces are not significantly deformed or the steel impaired. The dimensions of the hole shall remain within the tolerances given in table 2.

Burrs resulting from these operations shall be removed.

10 Tolerances

The tolerances of rolled bar and finished fishplate shall comply with table 2.

11 Chemical analysis

11.1 Ladle analysis

The chemical composition of each cast of steel shall be determined by representative ladle analysis and shall comply with the requirements of clause 3. If the result of the ladle analysis does not comply, all fishplates from that cast or part cast shall be deemed not to comply with this standard, subject to the provisions of 11.2.

NOTE. Determination may be made chemically, spectrographically or by other accepted modern instrumental methods.

11.2 Product analysis

Should the result of the ladle analysis fail to comply with the requirements of clause 3, or should the purchaser require it (see item (d) of appendix C) the manufacturer shall make tests on two separate product samples from the cast or part cast.

If the results of these tests comply with the product analysis requirements in clause 3 the cast or part cast shall be accepted. If one or both of the test pieces fail, the cast or part cast shall be rejected.

12 Tensile tests

12.1 Method of test

The manufacturer shall determine the tensile properties of the steel in accordance with BS 18 using a standard circular cross section tensile test piece.

12.2 Number of tests

One tensile test shall be carried out on each type of fishplate per cast for casts of 50 tonnes or less. For larger casts, one test shall be carried out for each additional 50 tonnes or part thereof.

12.3 Test pieces

The test pieces shall be cut with longitudinal axes in the rolling direction and taken in the area adjacent to one of the fishing surfaces without, however, touching it. Cutting and finishing shall be carried out entirely in the cold state, by means of machine tools and without any hammering, cold deformation, hardening or annealing (see BS 18).

12.4 Retests

If the sample part selected for the test, from the batch corresponding to a cast or part cast, does not satisfy the conditions laid down, two retests from the same batch shall be carried out. If one or both of the retests is not satisfactory the corresponding batch does not comply with this standard.

NOTE. Non-complying batches may be subjected to rectification operations and further testing only after receipt of the purchaser's approval.

13 Manufacturer's tests and certificate

The manufacturer shall be responsible for the supply, preparation and testing of test pieces.

The manufacturer shall supply the purchaser with certificates showing the source and method of steelmaking/casting used and the results of the mechanical and chemical tests.

14 Inspection

The manufacturer shall inspect all batches of fishplates and ensure that they comply with this Part of BS 47. All non-conforming batches shall be clearly marked.

NOTE 1. Recommended inspection procedures are described in appendix A.

The inspection or quality assurance system to be applied shall be defined at the time of enquiry or order (see item (e) of appendix C) and shall be based on one of the following.

(a) The purchaser shall require the manufacturer to take responsibility for quality assurance based on a procedure in compliance with BS 5750.

(b) Alternatively, the purchaser shall be advised in advance by the manufacturer of the dates of rolling, of sample selection and of mechanical testing of the test pieces to enable the purchaser to witness these procedures. The purchaser shall also be advised by the manufacturer of the availability of the finished product for inspection.

The purchaser shall have access during working hours to observe the manufacturing process and to inspect the finished product.

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

15 Purchasing of Sample Junction Fish Plates

Manufacturing of Junction Fish Plates shall be done according to available Junction Fish Plates in SLR. Samples could be obtained from Sri Lanka Railways on payment of Rs. 8,000.00 per Junction Fish Plate.

Appendices

Appendix A. Batch inspection procedure

A.1 General

The fishplates should be grouped into batches of the same kind.

Inspection should be carried out by random sampling from the batches.

The selected samples should be marked and these marks should be kept intact until the end of inspection.

One of the sampling procedures described in A.2, A.3 and A.4 should be used to define the acceptable levels of quality and risks and the size of the batch and of the sample.

A.2 BS 6001

The relevant tables of BS 6001 should be stated by the purchaser.

A.3 A sampling programme according to the Wald method

This design is shown in figure 24 with the resubmitted batch sampling diagram in figure 25.

The risks with this method are as follows:

- (a) a 5 % maximum probability of the rejection of a batch containing no more than 5 % of faulty parts;
- (b) a 5 % maximum probability of the acceptance of a batch containing not less than 15 % of faulty parts.

The test shall be terminated as soon as the point representing the progress of the check enters the acceptance or rejection area.

A.4 A sampling programme designed and detailed by the purchaser

This programme should state:

- (a) the batch size;
- (b) the sample size;
- (c) the maximum percentage of rejected plates in the sample which will permit the batch to be accepted;
- (d) the percentage of rejected plates in the sample which will cause the batch to be inspected on an individual plate basis;
- (e) the retest programme for batches where the percentage of rejected plates in the sample falls between the reject/accept percentage (where applicable).

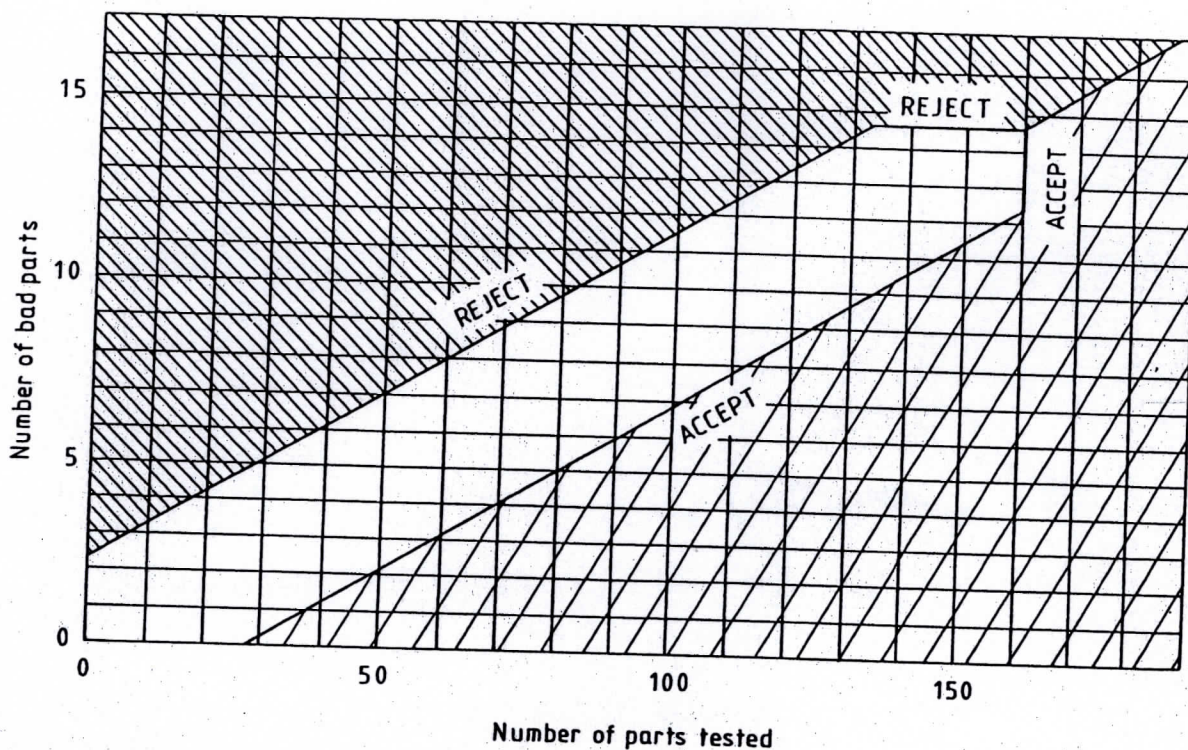
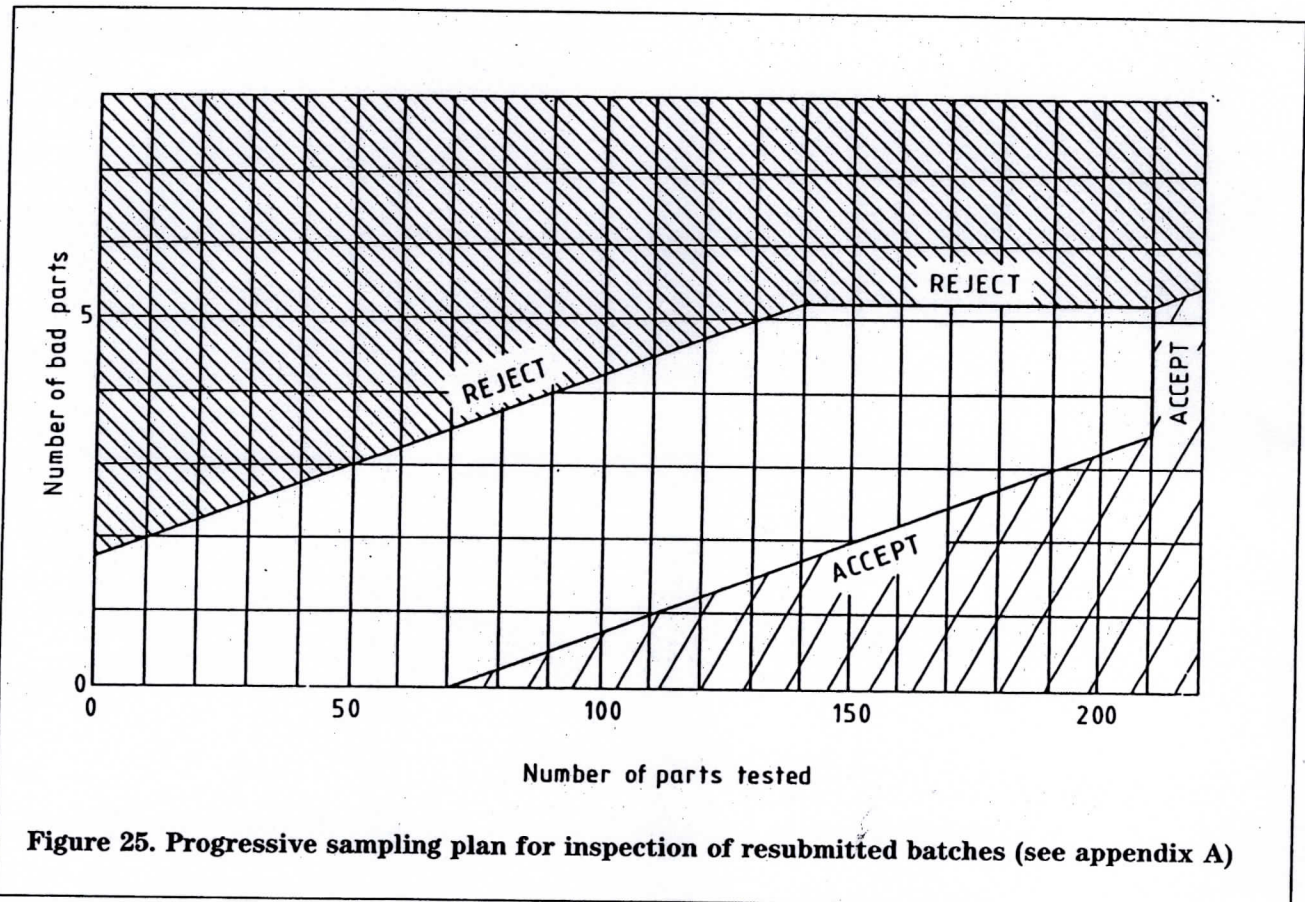


Figure 24. Progressive sampling plan — Wald method (see appendix A)



Appendix B. Holing of rails to BS 11; dimensions of fishbolts and nuts to BS 64 and section properties of fishplates

B.1 For details of the holing of rails see BS 11 and for the dimensions of fishbolts and nuts see BS 64.

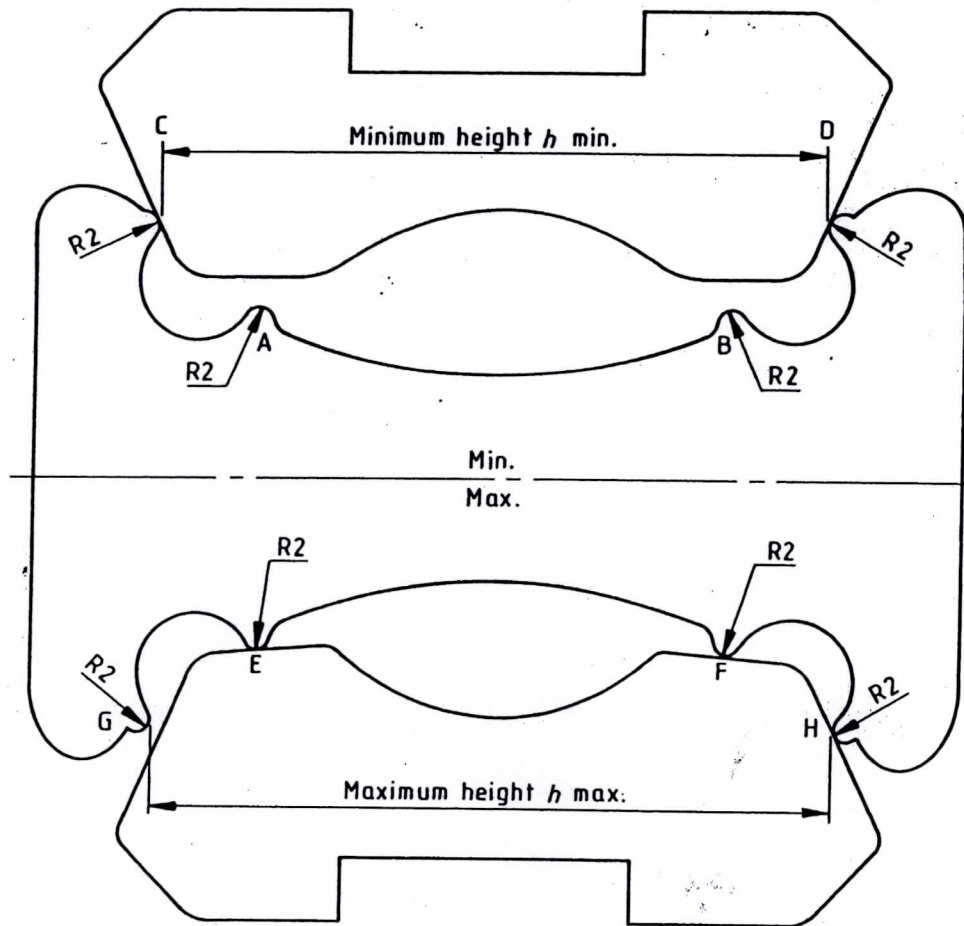
B.2 The areas, calculated masses and properties for rolled steel fishplate bar and finished fishplates are shown in imperial units in table 5 and in metric units in table 6 for information.

NOTE. The section masses quoted in this standard have been determined by multiplying the section area in mm^2 by 0.007 85 to give the mass in kg/m or by multiplying the section area in in^2 by 10.209 to give the mass in lb/yd .

Appendix C. Information to be supplied by the purchaser of the fishplates

When placing an order for fishplates complying with this standard the purchaser should state:

- details of fishplate section and holing (see clause 4);
- whether or not new templates and working gauges are required (see clause 7);
- the method to be used for producing the bolt holes (see 9.3);
- whether product analysis is required (see 11.2);
- the procedure to be used for inspection (see clause 14).



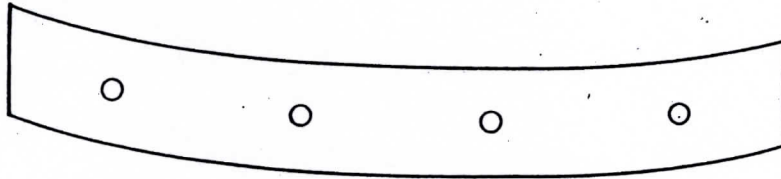
The height of the fishplate is to be checked along a vertical line which passes through the centre point of the upper fishing surface of the fishplate.

For checking height h :

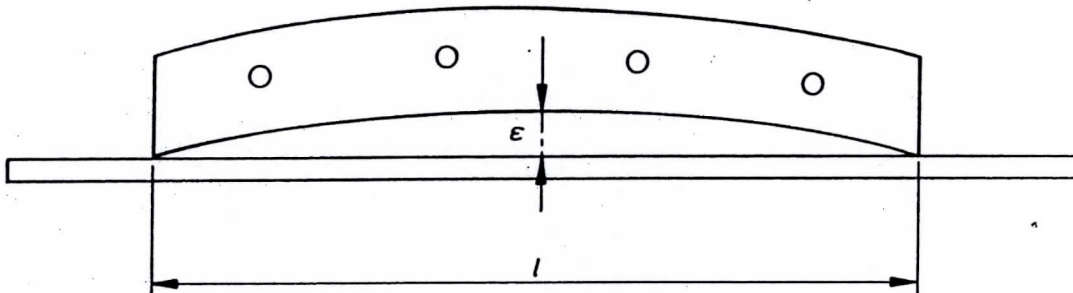
Minimum: if both stops A and B touch the vertical part of the fishplate and the gap between C or D and the fishplate is greater than 0.05 mm (0.002 in) the fishplate is deemed to be under the minimum height of h min.

Maximum: if both stops G and H touch the fishplate and the gap between E or F and the vertical part of the fishplate is greater than 0.05 mm (0.002 in) the fishplate is deemed to be in excess of the maximum height h max.

Figure 1. Referee gauge for checking fishplate height (h)

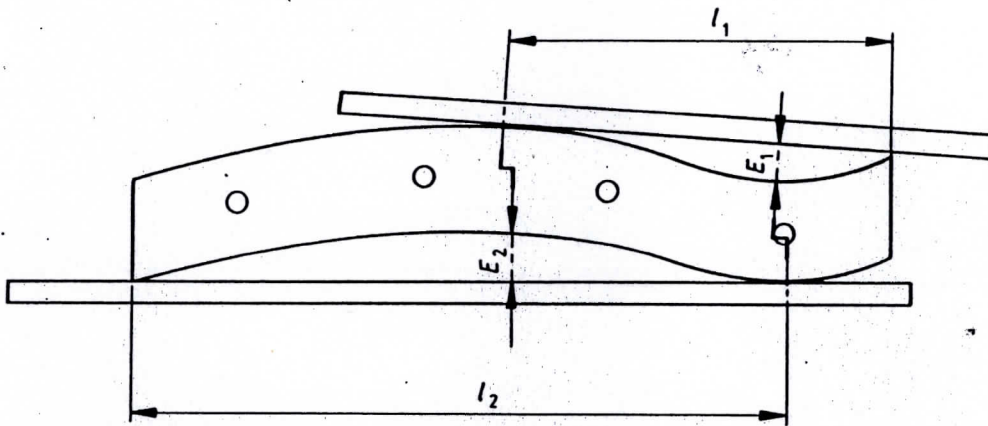


(a) Unacceptable deformation (centre lower than ends)



(b) Limiting deformation (centre higher than ends). The maximum deviation is 0.1 % of the fishplate length.

$$\epsilon \leq 0.1 \% \text{ of } l$$



(c) Limiting compound deformation. The maximum deviations permitted are 0.1 % of the chord lengths (l_1 and l_2).

$$\epsilon_1 \leq 0.1 \% \text{ of } l_1 \text{ and } \epsilon_2 \leq 0.1 \% \text{ of } l_2$$

Figure 2. Method for checking longitudinal straightness in a vertical direction

Table 2. Dimensional and finished tolerances

Dimensions	Tolerances	Method of checking
Height h of the fishplate (height at the check point selected)	mm $H < 165$ $165 \leq H < 180$ $180 \leq H < 190$ $190 \leq H$ Where H is the height of the matching rail (defined as A in figure 4 of BS 11 : 1985).	Figure 1
Diameter of bolt holes (see note 1)	$\phi \leq 32$ $\phi > 32$	
Position of bolt holes	<p>The position of the holes shall enable the fishplate to be mounted on a gauge with cylindrical pins, consisting of a piece of rail to nominal section, and in the body of which are fixed a number of cylindrical pins corresponding to the holes in the fishplate. The vertical height and longitudinal spacing of the pin centres shall conform with the nominal bolt hole centres shown in figure 3 and tables 3 and 4 of this standard or the agreed purchaser's drawing. The pins shall have a diameter 1 mm less than the diameter of holes ≤ 32 mm and 2 mm less than the diameter of holes > 32 mm. When the rail and the fishplates are brought together, all the pins shall engage simultaneously in the holes.</p>	
Straightness for fishplates supplied in rolled bars	On the flat: 1 mm/m The total deflection on the rolled bar length shall not exceed 0.4 % of the length	Checked by 1 m straightedge
Straightness for fishplates supplied as units	Vertical direction: 0.1 % of the chord length. Centre should not be lower than the ends Horizontal direction: 0.16 % of the length	Figure 2
Length	As given in tables 3 and 4 + 3 mm	Checked by 1 m straightedge
Inclination of the fishing surfaces	As given in figures 4 to 23 ± 3.6 % of the specified inclination	
End-squareness	+ 2 mm	
Tolerances on other dimensions defining the cross section	+ 0.5 mm	
NOTE 1. For punched holes, the tolerances shown are increased by 0.05 times the thickness of the fishplate for the diameter on the side where the punch emerges.		

Table 3. Length and holing of fishplates (imperial dimensions)

NOTE. All fishplates are designed to have a ¼ in gap between rail ends

No. of BS section of rail	Fig. 3 ref.	50 'O'	60 A	60 R	70 A	75 A	75 R	80 A	80 R	80 R angled	80 'O'	90 A	90 R	95 A	95 R	95 RBH	95 RBH skirted	95 N	100 A	100 R	110 A	113 A thick ¹⁾	
Length of 4-bolt fishplate	A	in 16	16	16	16	16	16	16	16	in 16	20	18	18	18	18	in 18	18	18	18	18	in 20	in 1)	
Length of 6-bolt fishplate	B	24	24	24	24	24	24	24	24	in 24	30	27	27	27	27	N/A	N/A	27	27	27	in 36	in 1)	
Centres of bolt holes in fishplates	C	2	2	2	2	2	2	2	2	in 2	2½	2½	2½	2½	2½	2	2	2½	2½	2½	2½	2½	2½
	D	4	4	4	4	4	4	4	4	in 4	5	4½	4½	4½	4½	N/A	N/A	4½	4½	4½	8	1)	
	E																						F
Diameter of bolt holes in fishplates	J	13/16	13/16	13/16	15/16	15/16	15/16	15/16	15/16	in 15/16	15/16	1 1/16	1 1/16	1 1/16	1 1/16	1	1	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1)

¹⁾ Designed in metric units.

NOTE. Fishbolts and nuts are described in BS 64.

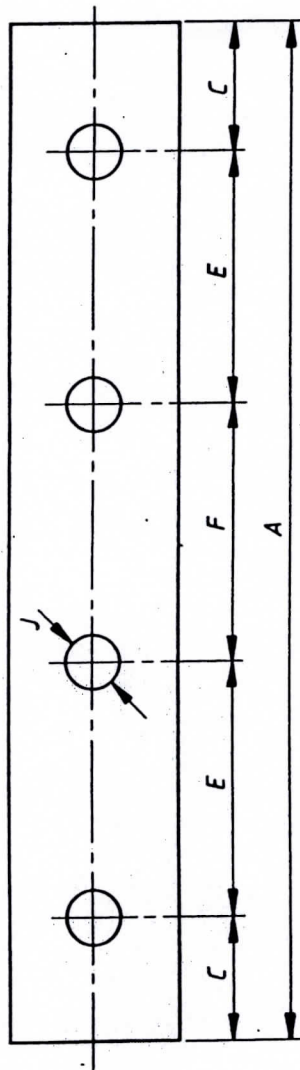
Table 4. Length and holing of fishplates (metric dimensions)

NOTE. All fishplates are designed to have a 6.35 mm gap between rail ends

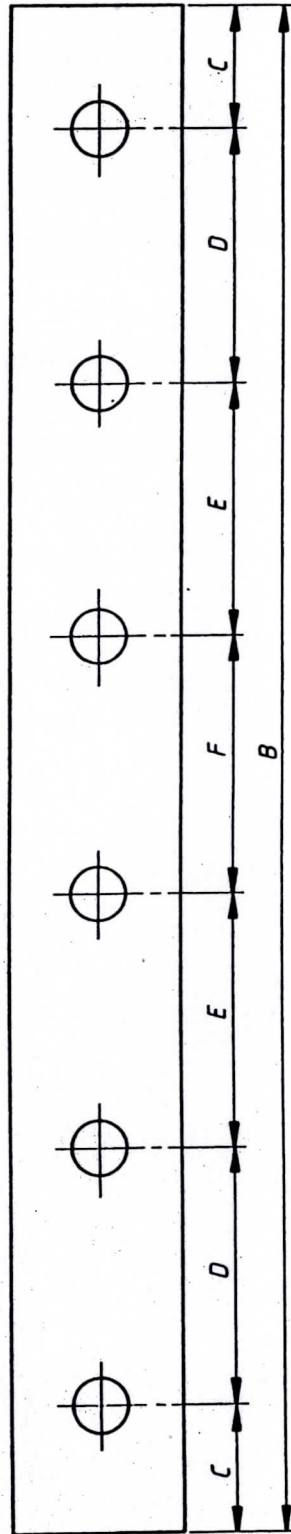
No. of BS section of rail	Fig. 3 ref.	50 'O'	60 A	60 R	70 A	75 A	75 R	80 A	80 R	80 R angled	80 'O'	90 A	90 R	95 A	95 R	95 RBH	95 RBH skirted	95 N	100 A	100 R	110 A	113 A thick ¹⁾
Length of 4-bolt fishplate	A	mm 406.4	406.4	406.4	406.4	406.4	406.4	406.4	406.4	mm 406.4	508	457.2	457.2	457.2	457.2	mm 457.2	457.2	457.2	457.2	457.2	mm 508	mm 507
Length of 6-bolt fishplate	B	609.6	609.6	609.6	609.6	609.6	609.6	609.6	609.6	mm 609.6	767	685.8	685.8	685.8	685.8	N/A	N/A	685.8	685.8	685.8	mm 914.4	mm 914
Centres of bolt holes in fishplates	C	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	mm 50.8	63.5	57.15	57.15	57.15	57.15	50.8	50.8	57.15	57.15	57.15	63.5	63.5
	D	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	mm 101.6	127	114.3	114.3	114.3	114.3	N/A	N/A	114.3	114.3	114.3	203.2	203
	E																					
Diameter of bolt holes in fishplates	J	20.64	20.64	20.64	23.81	23.81	23.81	23.81	23.81	mm 23.81	23.81	26.99	26.99	26.99	26.99	25.4	25.4	26.99	26.99	26.99	26.99	27

¹⁾ Designed in metric units.

NOTE. Fishbolts and nuts are described in BS 64.



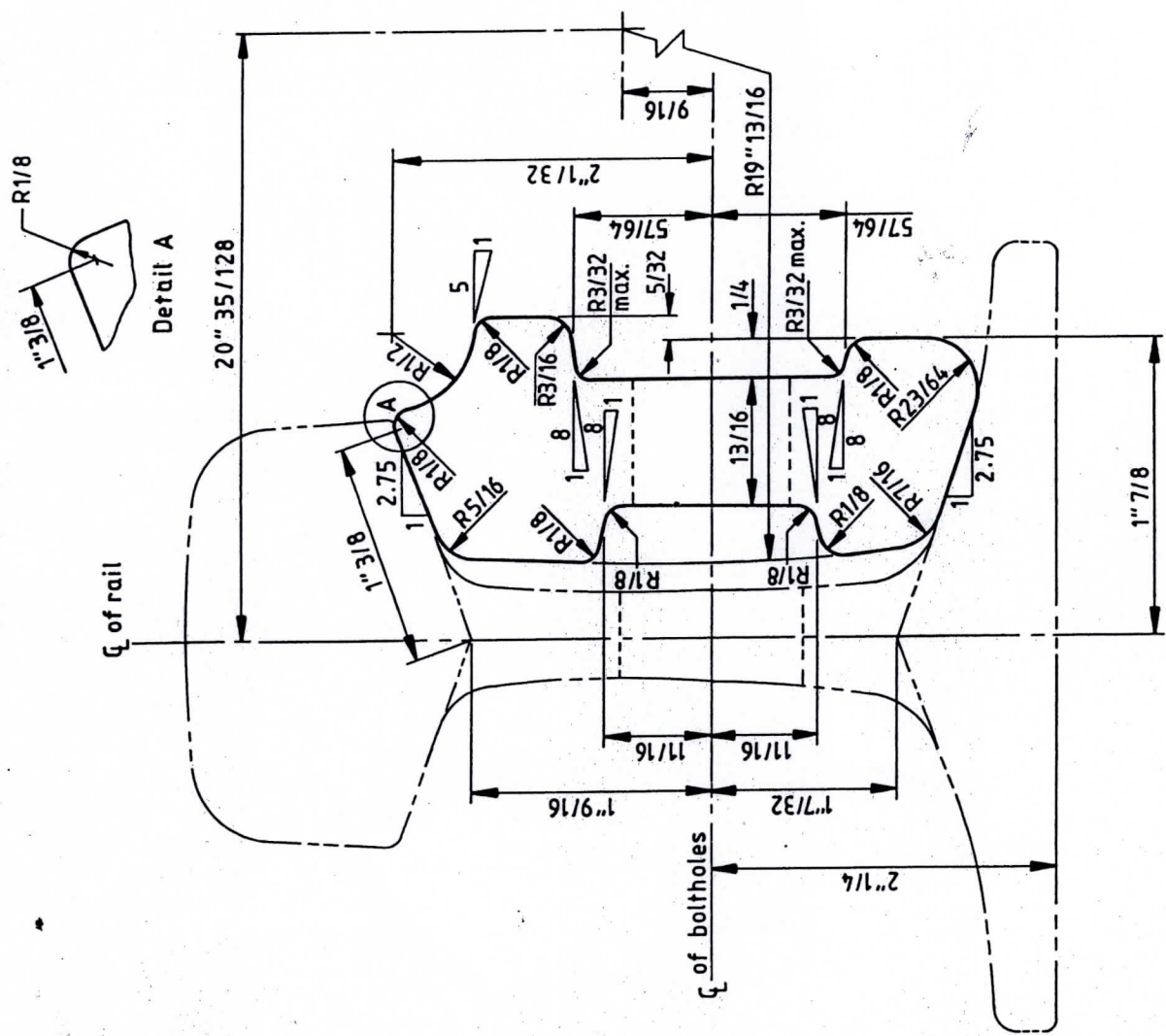
Position of bolt holes in 4-bolt fishplate



Position of bolt holes in 6-bolt fishplate

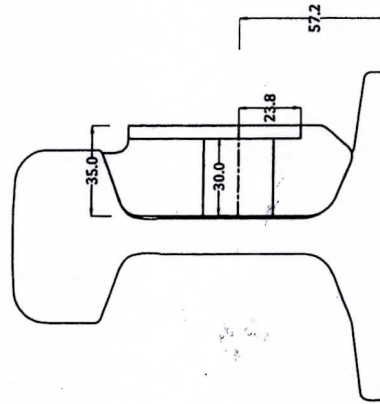
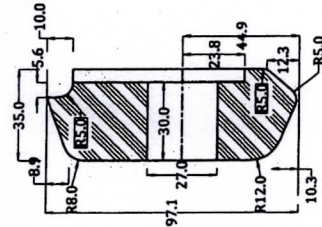
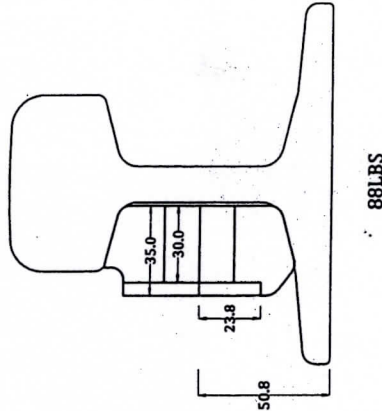
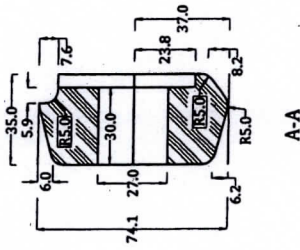
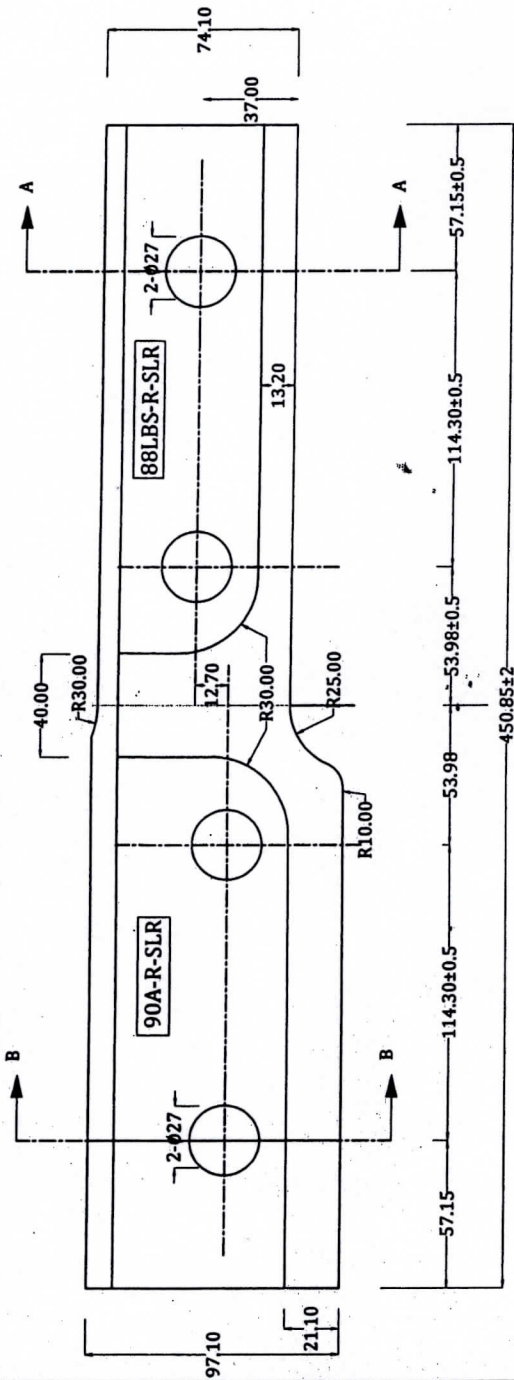
Figure 3. Key to tables 3 and 4

	Imperial units	Metric units
Rolled section		
Cross-sectional area	3.9180 in ²	2527.8 mm ²
Section weight	40.00 lb/yd	19.84 kg/m
Moment of Inertia (I_{xx})	4.575 in ⁴	190.41 cm ⁴
Section modulus (J_{xx})		
— Top	2.461 in ³	40.32 cm ³
— Bottom	2.374 in ³	37.90 cm ³
Finished fishplate		
Height of neutral axis above bolt hole centres	0.181 in	4.59 mm
Calculated weight per pair (4 hole)	38.55 lbs	17.49 kg
(6 hole)	57.83 lbs	26.23 kg



All dimensions are in inches

Figure 14. Fishplates for flat bottom rail No. 90 A



TECHNICAL REQUIREMENT

STANDARD : BS 47-1-1991

1. CHEMICAL COMPOSITION % :

- C: 0.27-0.48
- Si ≤ 0.38
- Mn ≤ 0.94
- P ≤ 0.058
- S ≤ 0.058

2. FINISHED : PLAIN

**3. TENSILE STRENGTH : 600 ± 50N/mm²
ELONGATION ≥ 18%**

4. UNMARKED TOLERANCE ±0.8

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. WEIGHT IS 7.86 Kg

B-B

90A

SLR - TYPE PLAN

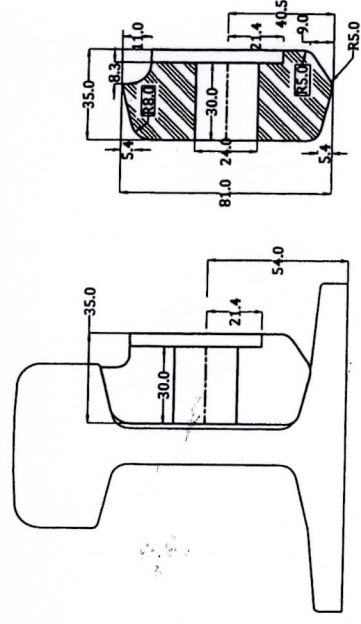
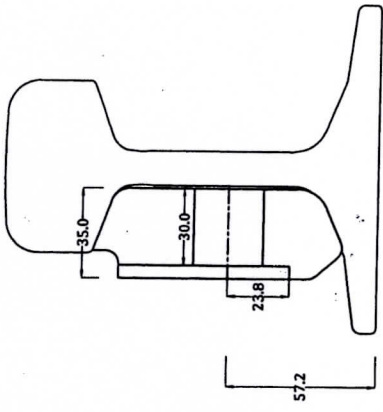
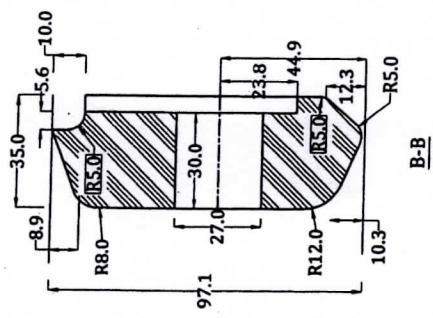
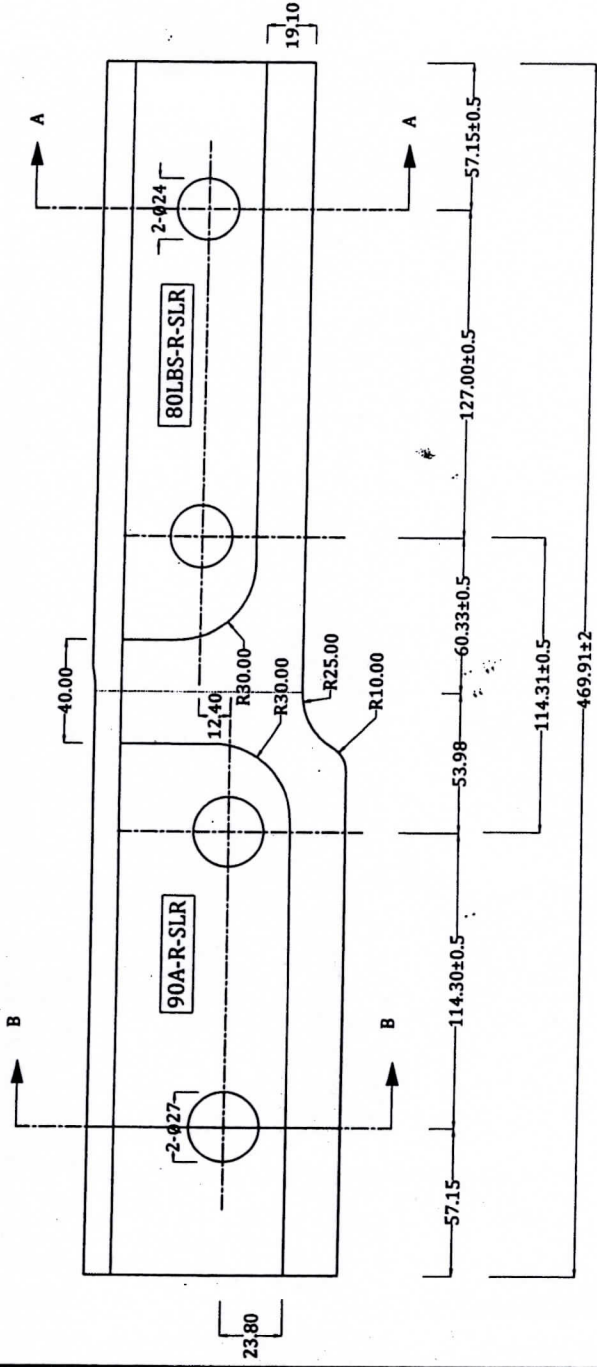
JUNCTION FISH PLATE
88 LBS & 90A
(RIGHT SIDE)

DRAWN BY:	SRI LANKA RAILWAYS
DESIGNED BY:	WAY & WORKS DEPARTMENT
CHECKED BY:	DRG NO: 22822-A
DATE:	DATE : FEB/2022
DESIGN ENGINEER:	<i>[Signature]</i>
APPROVED BY:	CHIEF ENGINEER

SCALE : AS SHOWN PAGE : 01 OF 01

SRI LANKA RAILWAYS - JUNCTION FISH PLATE - 80 LBS & 90A (RIGHT SIDE)

DRG NO: 22821-A



TECHNICAL REQUIREMENT

STANDARD : BS 47-1-1991

1. CHEMICAL COMPOSITION % :

- C: 0.27-0.48
- Si ≤ 0.38
- Mn ≤ 0.94
- P ≤ 0.058
- S ≤ 0.058

2. FINISHED : PLAIN

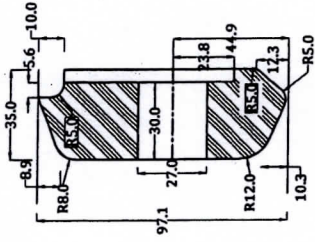
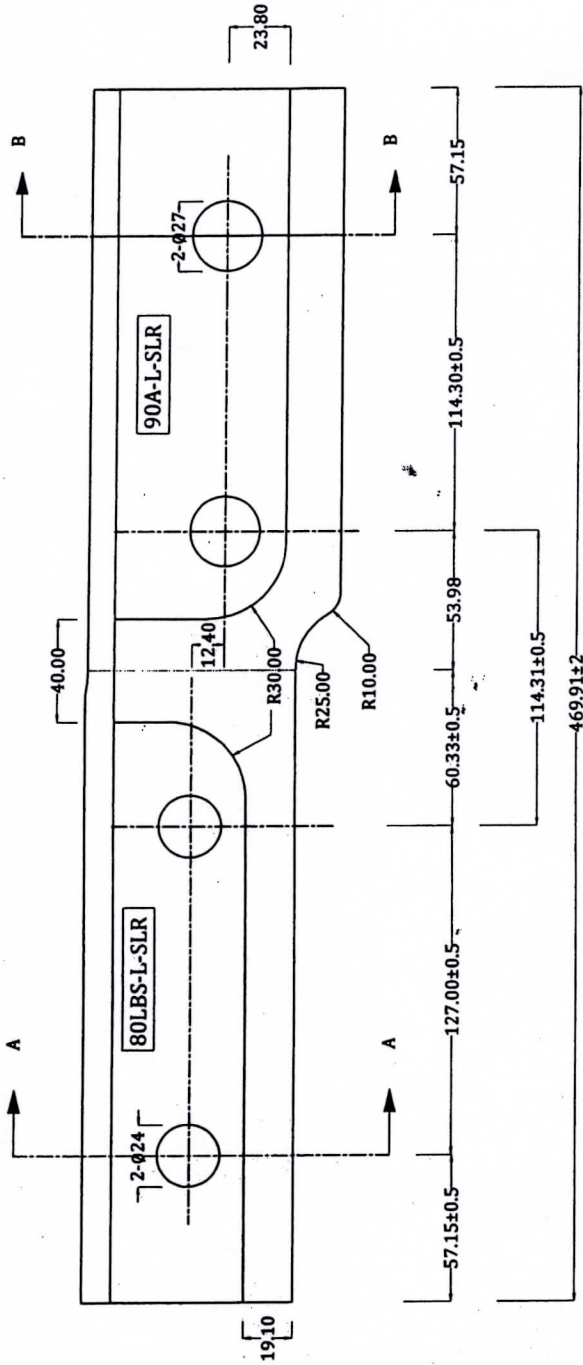
**3. TENSILE STRENGTH : 600 ± 50N/mm²
ELONGATION ≥ 18%**

4. UNMARKED TOLERANCE ±0.8

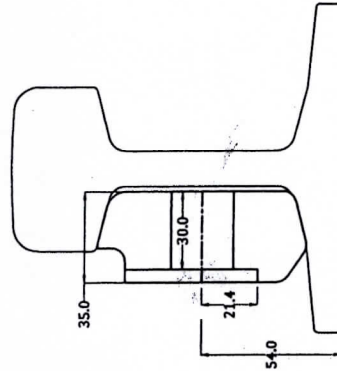
NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. WEIGHT IS 8.62 Kg

SLR - TYPE PLAN		SRI LANKA RAILWAYS	
JUNCTION FISH PLATE 80 LBS & 90A (RIGHT SIDE)		WAY & WORKS DEPARTMENT	
DRAWN BY:	REGISTERED BY:	DRG NO: 22821-A	DATE: FEB/2022
DESIGN ENGINEER:	APPROVED BY:	CHIEF ENGINEER	
SCALE: AS SHOWN	PAGE: 01 OF 01		



B-B



A-A

80LBS

TECHNICAL REQUIREMENT

STANDARD : BS 47-1-1991

1. CHEMICAL COMPOSITION % :

- C: 0.27-0.48
- Si ≤ 0.38
- Mn ≤ 0.94
- P ≤ 0.058
- S ≤ 0.058

2. FINISHED : PLAIN

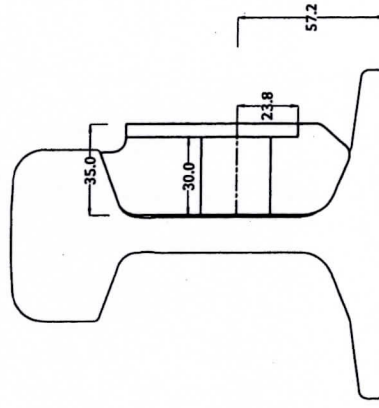
3. TENSILE STRENGTH : 600 ± 50N/mm²

ELONGATION ≥ 18%


4. UNMARKED TOLERANCE ±0.8

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. WEIGHT IS 8.62 Kg



90A

SLR - TYPE PLAN		SRI LANKA RAILWAYS	
JUNCTION FISH PLATE		WAY & WORKS DEPARTMENT	
80 LBS & 90A		DRG NO : 22821-B	
(LEFT SIDE)		DATE : FEB/2022	
DRAWN BY:	DESIGN ENGINEER:	APPROVED BY:	CHIEF ENGINEER
CHECKED BY:			
SCALE: AS SHOWN	PAGE: 01 OF 01		

THE LIST OF FOREIGN MISSIONS ABROAD

1. The Ambassador for the Democratic Socialist Republic of Sri Lanka in Austria, Belgium, People's Republic of China, Cuba, Egypt, France, Federal Republic of Germany, Indonesia, Iran, Iraq, Italy, State of Israel, Japan, Jordan, Republic of Korea, State of Kuwait, Lebanon, Myanmar, Nepal, the Netherlands, Sultanate of Oman, the Philippines, Poland, State of Qatar, Russian Federation, Kingdom of Saudi Arabia, Sweden, Thailand, U.A.E and U.S.A.
2. The High Commissioner for the Democratic Socialist Republic of Sri Lanka in Australia, Bangladesh, Canada, India, Kenya, Malaysia, Republic of Maldives, Pakistan, Singapore, South Africa and United Kingdom.
3. The Consulate General of the Democratic Socialist Republic of Sri Lanka in Federal Republic of Germany and Norway.
4. The Deputy High Commissioner for the Democratic Socialist Republic of Sri Lanka in Madras.