9 pages

(9+7 = 16 Page)

IRS:S_40
84

(With Amdt No-01)
7-5-2002.

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GOVERNMENT OF INDIA
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FOR OFFICIAL USE ONLY

INDIAN RAILWAY
STANDARD SPECIFICATION
for
NYLON INSULATED JOINTS-NYLON-COMPONENTS
(Tentative)
Serial No. S40-84

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0. FOREWORD

0.1 This specification is issued under fixed Serial No. S40. The final number indicates the year of the original adoption as standard or in the event of revision, the year of last revision.

ADOPTED 1970, REVISED, 1975 and 1984

0.2 This specification requires reference to the following Indian Railway Standard(IRS), American Society of Testing Materials (ASTM) and British Standard (BS) specifications.

IRS : 323 Electrical Signalling and Interlocking Equipment (tentative).

ASTM : D 570-77 standard Method of Test for water absorption of plastics.

ASTM : D 638-77a Method of Test for Tensile properties of plastics.

BS : 2782 Method of testing plastics.

0.3 Wherever in this specification, any of the above mentioned specifications is referred to by number only, without mentioning the year of issue, the latest issue of that specification is implied otherwise the particular issue referred to is meant.

0.4 This specification is intended chiefly to cover the technical provisions and the provisions relating to supply of the com-ponents of Nylon insulated joints and does not include all the necessary provisions of a contract.

SCOPE

1.1 This specification covers the requirements of nylon insulating components of insulated rail joints, insulated split stretcher bars, insulated pod joints, etc.

1.2 Wherever reference is made to 'Insulator' in this specificatio it whall be taken to mean any of the insulating components.

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2. TERMINOLOGY

2.1 For the purpose of this standard, terminology given in IRS specification No. S23 (Electrical Signalling and Interlocking Equipments) shall apply.

3. GENERAL REQUIREMENTS

3.1 The insulators shall conform to the drawings approved by the purchaser. Where they are not expressly indicated, tolerances of ± 1.0mm may be adopted for linear dimensions and hole centres.

3.2 The insulators shall be moulded from Nylon Type 66-Natural Colour on automatic injection screw type moulding machines.

3.3 The surface of the insulators shall be smooth, sound and free from moulding defects, such as bubbles, surface streaks, spla marks, burn marks, voids, surface sinking, crazing and blis--tering of the surface, windows, warping, weld lines, lamina--tions, jetting, cracks, etc. All edges shall be neatly finished and free from flash.

3.4 The raw material used for the manufacture shall conform to the requirements prescribed in Appendix 'A'.

3.5 The raw material shall be resistant to oil contamination. guarantee shall be given by the manufacturer that no re--constituted or recovered material has been used for the manufacture of insulators.

3.6 The insulators, after manufacture, shall be conditioned for water absorption according to the procedure described in Appendix 'B'.

4. TESTS AND PERFORMANCE REQUIREMENTS.

4.0 Unless specifically called for in the individual test specifications, all tests shall be conducted under ambient conditions.

4.1 Type Tests :- The following shall constitute type tests :
a) Tests on raw material (Appendix 'A')
b) Chemical test (Clause 4.6)

4.1.1 The tests given in Appendix 'A' shall be conducted on "As Moulded Specimens". "As Moulded specimens" are defined as those which, upon immediate removal from the mould, are sealed in containers impermeable to water vapours.

4.1.2 A minimum of three samples shall be tested for each type test. There shall be no failure.

4.1.3 The test specimen for tensile strength and percentage elongation at break shall be as per Figure 1. The test speed shall be maintained at 5 mm/min.

4.2 ACCEPTANCE TESTS :- The following shall constitute accep--tance tests :-

a) Visual inspection Test (Clause 4.4)
b) Checking of dimensions (Clause 4.5)
c) Specific gravity test (Clause 4.2.4)
d) Melting point test (Clause 4.2.5)
e) Tensile Strength (Clause 4.2.6)
f) Elongation at break (Clause 4.2.6)

g) Surface Hardness Shore 'D' scale (Clause 4.2.7)

h) Crushing Test (Clause 4.2.8).

(Clauses 4.2 (e), (f) and (h) will be applicable to insulated rail joints only).

4.2.1 A sampling procedure for acceptance tests for visual inspection, checking of dimensions, specific gravity and melting point tests is given in Table 1 of Appendix 'D'

4.2.2 For acceptance tests(c) and (d), a minimum number of three insulators which have passed acceptance tests (a) and (b) shall be selected. The insulators shall successfully pass these acceptance tests for conformity with the requirements of this specification. If any of these insulators fails in any of these acceptance tests, the purchaser or his nominee at his discretion may call for fresh insulators not exceeding twice the original number and subject them again to all the tests or to the tests in which the failure (s) occur. Should any of the insulators fail (s) in the repeat test(s), the lot shall be rejected.

4.2.3 A sampling procedure for acceptance tests for tensile strength, elongation at break and crushing tests is given in table 2 of Appendix 'D'.

4.2.4 The test for specific gravity shall be conducted as per BS : 2782/Pt 5 (method 509 A). The specific gravity shall lie between 1.13 and 1.15.

4.2.5 The test for melting point shall be to BS : 2782/Pt I (method 103 C) or capillary method or by means of an approved melting point apparatus. The melting point shall lie between 255° C and 265° C.

4.2.6 The tests for tensile strength and percentage elongation shall be conducted on specimens cut from channel side plates and end posts (Figs. 2 & 3) previously conditioned as per Appendix B. Before conducting these tests, the specimens shall be kept immersed in water under room temperature for a period of 24 ± 1 hours. The testing shall be completed within a period of ½ hour after removing the specimens from the water tank. The speed of testing shall be 50mm/minute. The tensile strength and elongation shall not be less than 4.0 kgf /mm^2(39 N/mm^2)and 40% respectively.

4.2.7 The surface hardness shall be determined by using the standard shore 'D' Hardness Testing Machine, and 3 nos. of samples at random from channel side plates and end posts each shall be selectedand hardness determined at 10 points on each sample and the average worked out. The average value of hardness (Shore "D" scale) shall not be less than 75.

4.2.8 Crushing tests will be carried out on insulating bushes as per Fig. 4. The bush shall be held between smooth surface of parallel jaws of a vice and the jaws brought gradually closer until they are apart to the extent of 0.6 D where D is the outside diameter of the bush. It s hall be held in that position for 5 minutes before the

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jaws are gradually closed again till they are 0.5 D apart where it shall be held for a further period of 5 minutes. The jaws shall then be opened out and the bush taken out and examined. It shall be free of any surface cracks.

4.3 Routine Tests - The following shall constitute routine tests :-

a) Visual inspection test (Clause 4.4)

b) Checking of dimensions (Clause 4.5)

c) Melting point test (Clause 4.2.5)

4.3.1 The manufacturer shall perform visual inspection test on all the insulators. The manufacturer shall also perform tests for checking of dimensions and melting point on at least 3 insulators from each day's production. The manufacturer shall give a certificate to the purchaser of his nominee to this effect before a lot is put up for inspection.

4.4 Visual Inspection Test :- The insulators shall be visually inspected for compliance with the requirements of clause 3.3 of this specification.

4.5 Checking of Dimensions :- The dimensions of the insulators shall be checked for conformity with the drawings approved by the purchaser.

4.6 Chemical Test :-

4.6.1 Method - Place a few milligrames of the sample in the bottom of an ignition tube (about 50 x 10mm in size) clamping the tube in a vertical position. Gently heat the lower end with a small flame until at 350° C to 400°C heavy vapours rise to the upper portion. Bring a narrow strip of filter paper moistened with a freshly saturated solution of O-nitrobenzaldehyde in 2N-Na OH, into contact with the vapours.

4.6.2 The colour produced on the strip of filter paper shall be deep mauve black which fades in the air.

5. MARKING

5.1 Each insulator shall be clearly and indelibly marked and indicate :-

a) Name or trade mark of the manufacturer.

b) Drawing number.

c) Rail section for which suitable.

d) LH or RH for channel side plates.

e) Year of manufacture.

5.2 The requirements of clause 5.1 shall not apply to insulating bushes.

6. PACKING.

6.1 The insulators shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

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APPENDIX 'A'
(Clause 3.4)

TESTS ON RAW MATERIALS USED FOR THE MANUFACTURE OF INSULATORS

S.No.	Properties	Values	Test Method
i)	Tensile Strength, kgf/mm^2 (Min.) N/mm^2 (Min).	8 / 78	ASTM : D 638
ii)	Elongation at break, % (Min)	40	ASTM : D 638
iii)	Melting Point, °C	255°-265°C	BS : 2782 Part I (method 103C) or capillary method or approved melting point apparatus.
iv)	Specific Gravity	1.13-1.15	BS : 2782 part 5 (Method 509 A)
v)	Water Absorption, 24 hrs, % Min.	1.3	ASTM: D 570
vi)	Inherent Viscosity, Min.	0.88	See Appendix 'C'

APPENDIX 'B'
(Clause 3.6)

WATER ABSORPTION

B-1 The insulators shall be immersed in boiling water in a suitable tank for a sufficient time depending upon the size of the component after which the amount of water absorption shall be checked.

B-2 The amount of water absorption shall be checked by taking the weight of a minimum of twenty insulators before and after immersion in boiling water. The amount of water absorption shall not be less than 4% of the initial weight.

B-3 If the amount of water absorption is less than 4% of the initial weight of the insulators, they shall be conditioned further until the water absorption is not less than 4% .

B-4 The insulators after conditioning shall not be taken out immediately from the tank but allowed to cool slowly to the ambient temperature to avoid quenching strains.

APPENDIX 'C'
(APPENDIX 'A' CLAUSE VI)

MEASUREMENT OF INHERENT VISCOSITY

C-1 APPARATUS

a) 50ml. volumetric flask,

b) Pipette.

c) No. 1 sintered filter.

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d) U-tube viscometer (Figure 5) and accessories.

e) Stop watch reading to 0.1 second.

f) Balance to weigh up to 0.001 gm.

g) Water bath controlled at 25° C ± 0.1° C.

h) A pair of safety spectacles.

i) A pair of medium industrial gloves.

C-2 SOLVENT :- The solvent shall be formic acid of concentration 90 ± 0.1%. Keep the solvent in such a way that its concentra-tion is not altered by frequent removal of the stopper from the container.

C-3 PROCEDURE :- Weigh 0.25 ± 0.002 gm. of finely divided nylon and transfer it to the 50 ml. volumetric flask. Add about 25 ml. formic acid and shake well until the last trace of nylon is dissolved. Add more formic acid in the flask till the level is 25 mm below 50 ml. mark. Transfer the flask to the water bath and keep it undisturbed for at least 12 minutes. There after adjust the level of the solution to the 50 ml. mark by adding formic acid.

C-4 Charge the viscometer through the sintered filter, with a slight excess of solution, using a long pipette to minimize any operation, this may be done before the viscometer is placed in its holder in the bath. After the viscometer has attained temperature equilibrium with the bath, adjust the volume of solution so that the liquid level (bottom of the meniscus) settles at the mark 'G'.

C-5 Particular care must be taken to see that the capilary arm is vertically held in its holder.

C-6 Apply pressure or suction to bring the level of solution to a point about 5 mm above the timing mark 'E' avoiding any bubble formation. Release the pressure or suction. Record the flow time for the bottom of meniscus to pass from the top edge of mark 'E' to the top edge of mark 'F'. Carry out two timed runs. These should agree to ± 0.1 second.

Note :- The flow time of pure solvent shall be determined first.

C-7 Before viscometer is used, after discordant readings and at intervals during regular use, clean it with a mixture of equal volumes of concentrated sulphuric acid and saturated solution of postassium dichromate in water. Rinse it with water followed by acetone and dry it by drawing through a stream of air free from dust. Between successive satis-factory determinations, wash the viscometer with acetone and dry as described above or alternatively, rinse it twice with the liquid on which the next flow time is required.

C-8 Calculation : Inherent Viscosity = $\frac{\text{Log}_e T_1 / T_2}{C}$

Where,

T_1 = Flow time of solution.

T_2 = Flow time of solvent.

C = Solution concetration, g/100ml.

wetting of the viscometer above mark 'G'; for conmenience in

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C-9.1 Ostwald viscometer No. 1 size shall normally be used for the measurement of inherent viscosity. Any other type of viscometer used shall have a flow time of 40 to 150 seconds for solvent i.e. 90% formic acid.

C-9.2 The viscometer shall be kept filled with chromic acid solution while not in use.

Notes :-

i) It is convenient to have an additional water bath controlled at 25° C ± 0.1°C which can be used to keep solvent and glass-ware at approximately the required temperature. This helps to prevent temperature errors in the accurate bath and also cuts down the time to reach equilibrium.

ii) Safety spectacles and rubber gloves should be worn because of the corrosive nature of formic acid.

APPENDIX 'D'
SAMPLING FOR ACCEPTANCE OF LOTS

D-1 LOT

D-1.1 In any consignment, all the insulators of the same type manufactured by the same factory during the same period shall be grouped together to constitute a lot.

D-1.2 From each lot a certain number of insulators shall be selected at random and subjected to acceptance tests (a) to (d) given in Clause 4.2 . Anyinsulator failing to satisfy the appropriate requirements shall be considered as defective

D-2 CRITERION FOR CONFORMITY

D-2.1 The actual number of insulators to be selected from a lot shall be in accordance with Table 1 and 2 where N_1 is the size of the first sample. If the number of defectives found in this sample is less than or equal to C_1, the lot shall be considered as conforming to the requirements of the specification. If the number of defectives in the first sample lies between C_1 and C_2, a further sample of N_2 insulators shall be taken and tested. If the number of defectives in the two samples combined is less than C_2, the lot shall be considered as conforming to the requirements of the specification, otherwise the lot shall be considered as not conforming to the requirements of the specification.

TABLE 1
(Sampling plan for Acceptance tests (a) to (d)-Clause 4.2)

Lot Size	First sample N_1	Second sample N_2	$N_1 + N_2$	Acceptance No. C_1	Rejection No. C_2
1	2	3	4	5	6
Up to 100	3	6	9	0	2
101 to 200	4	8	12	0	2
201 to 500	7	14	21	0	3
501 to 800	10	20	30	0	3
801 and above	13	26	39	1	3

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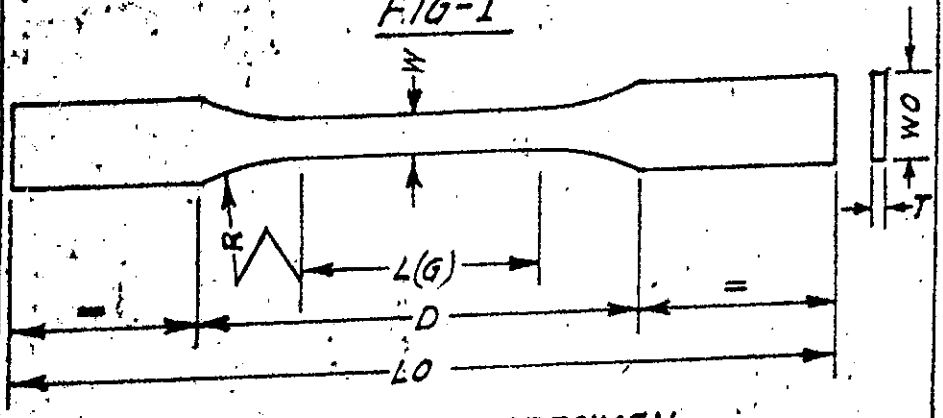
TABLE 2

(Sampling plan for acceptance tests (e), (f) and (h)-Clause 4.2)

Lot size	First sample N_1	Second sample N_2	$N_1 + N_2$	Acceptance No. C_1	Rejection No. C_2
1	2	3	4	5	6
Up to 1000	2	4	6	0	2
1001 and above	3	6	9	0	3

SPECIMEN FOR TENSILE TEST FOR 'AS MOULDED' NYLON COMPONENTS

FIG-1



DIMENSIONS FOR TEST SPECIMEN

DESIGNATION	DIMENSIONS	TOLERANCE
W- WIDTH OF NARROW SECTION	10	±0·5
L(G)- LENGTH OF NARROW SECTION (ALSO) GAUGE LENGTH	60	±0·5
WO- WIDTH OVERALL	20	±0·5
LO- LENGTH OVERALL	216	±5·0
D- DISTANCE BETWEEN GRIPS	115	±5·0
R- RADIUS OF FILLET	60	±5·0
T- THICKNESS	3·5	±0·5

NOTE:-

4. THE SPECIMEN SHALL BE FREE OF DRAFT OR FIN.
3. SPEED OF TESTING SHALL BE 5 m.m/MIN.
2. MIN. AREA OF CROSS SECTION WITHIN GAUGE LENGTH SHALL BE ADOPTED FOR CALCULATION OF TENSILE STRENGTH.
1. ALL DIMENSIONS IN MILLIMETRES.

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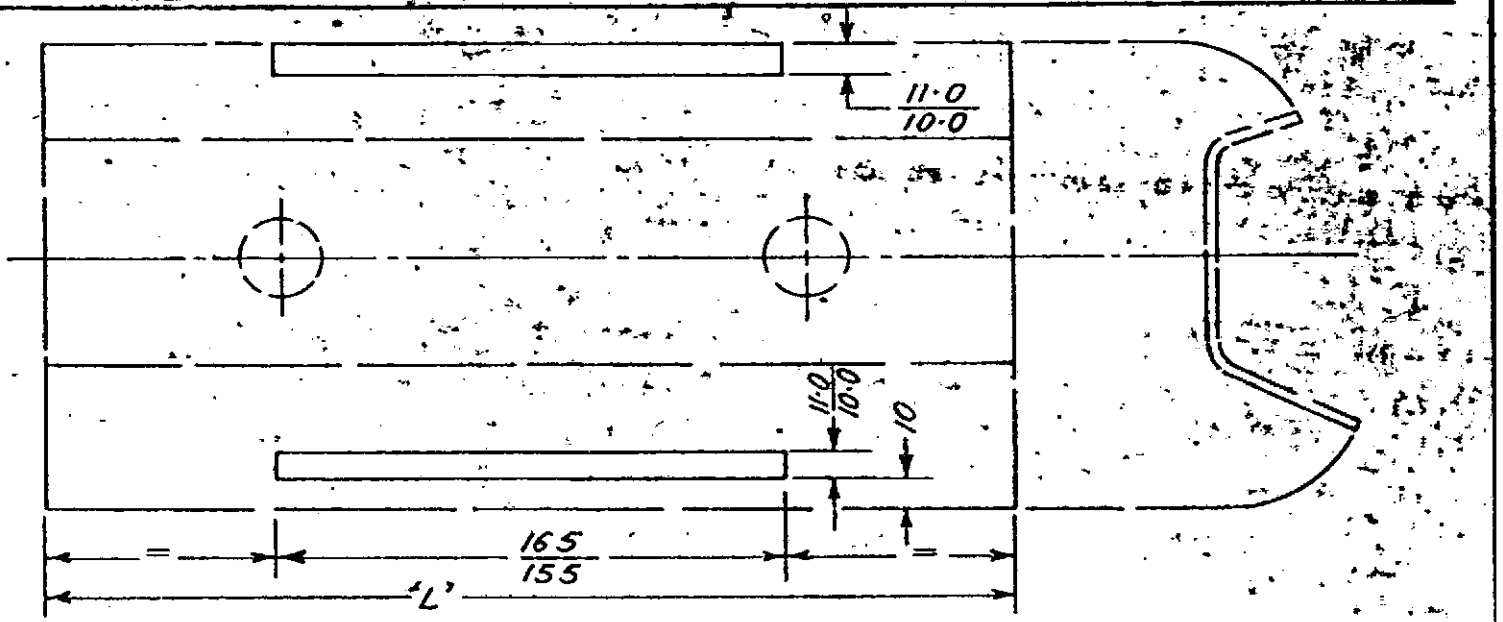
SPECIMEN FOR TENSILE TEST ON CHANNEL SIDE PLATE (FIG. 2)



DRG. No.	S22103-04	S22113-14	S22123-24	S22133-34	S22143-44	S22173-74	S22183-84	S22193-94
RAIL SECTION	52 Kg.	90R	75R	60R	50R	60 Kg	60 Kg UIC	90R
DIM. 'L'	305	230	210	205	205	305	305	305

NOTE

1. ALL DIMENSIONS IN MILLIMETRES.
2. DISTANCE BETWEEN GRIPS SHALL BE 80 WHICH SHALL ALSO BE GAUGE LENGTH.
3. MIN. AREA OF CROSS SECTION WITHIN GAUGE LENGTH SHALL BE ADOPTED

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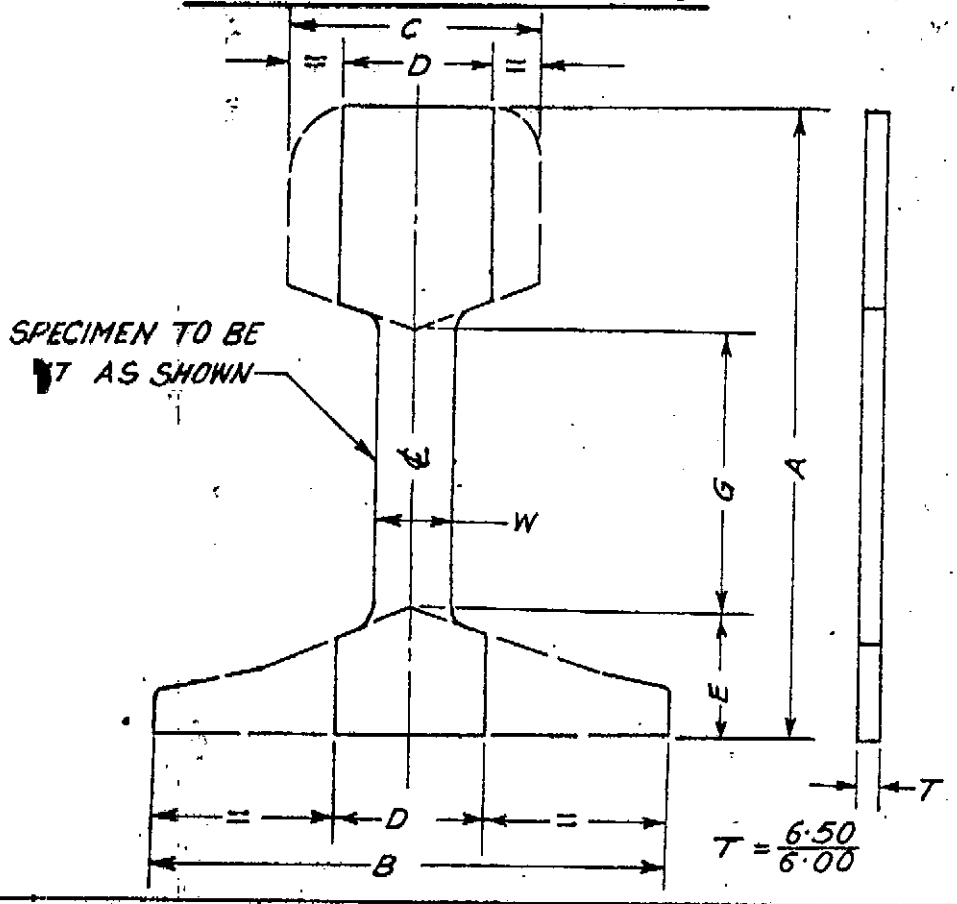
SPECIMEN FOR TENSILE TEST ON END POST (FIG. 3)



DRG. No.	RAIL SECTION	DIMENSIONS						
		A	B	C	D	E	G	W
S 22105	52 Kg.	156	136	67	40	32	70	22
S 22115	90R	143	136·5	66·7	40	25	70	20
S 22125	75R	128·6	122·5	61·9	40	25	50	20
S 22135	60R	114·3	109·5	57·2	40	25	50	18
S 22145	50R	104·8	100	52·4	40	25	50	16
S 22175	60 Kg.	172	150	72·5	40	32	70	24※
S 22185	60 Kg UIC	172	150	74·5	40	32	70	24※

※ MINIMUM WIDTH

NOTE

1. ALL DIMENSIONS IN MILLIMETRES.
2. 'G' DENOTES GAUGE LENGTH AND ALSO DISTANCE BETWEEN GRIPS.
3. MIN. AREA OF CROSS SECTION WITHIN GAUGE LENGTH SHALL BE ADOPTED FOR

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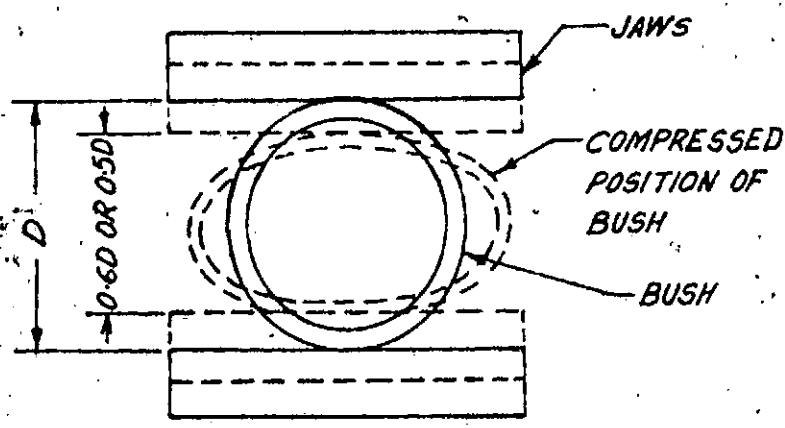
METHOD OF TEST ON NYLON BUSH (FIG. 4)



DRG. No.	RAIL SECTION	DIMENSIONS		
		D	0·6D	0·5D
S 22109	52 Kg, 90R & 75R	$\frac{31·4}{31·0}$	18·5	15·5
S 22139	60R	$\frac{28·4}{28·0}$	17·0	14·0
S 22149	50R	$\frac{24·4}{24·0}$	14·5	12·0
S 22179	60Kg, 60Kg. U.I.C	$\frac{31·4}{31·0}$	18·5	15·5

1. ALL DIMENSIONS IN MILLIMETRES.

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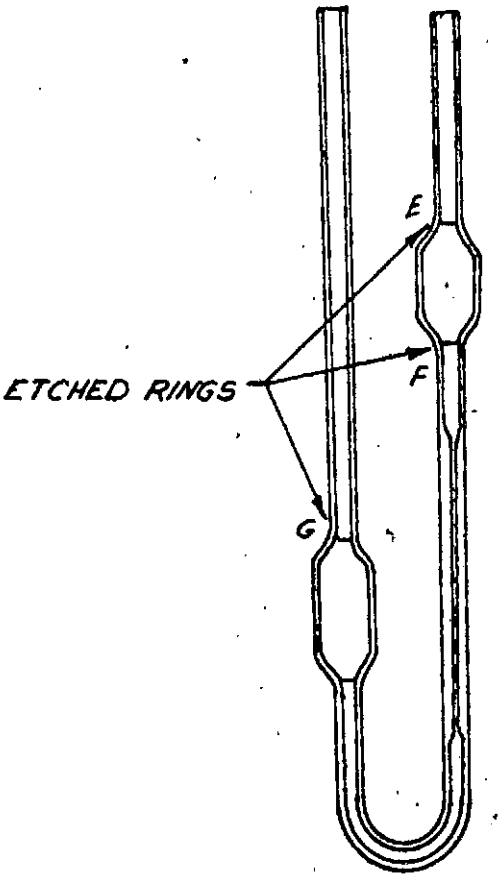
U-TUBE VISCOMETER
(FIG. 5)



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North East Frontier Railway, Maligaon, Guwahati-781 001
Southern Railway, Park Town, Chennai-600 003
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The General Manager/S&T, Delhi Metro Rail Corporation, 3rd floor, NBCC Place, Bhishampitamaha Marg, New Delhi-110 003.

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North West Railway, Jaipur

The Director/IRISET, Tarnaka Road, Lallaguda,P.O Secunderabad-500 017.

Sub: Amendment No. 1 to Specification 40-84
for Nylon Insulated Joints – Nylon components.

The following amendments to IRS Specification No. S-40-84 of Nylon Insulated Joints are hereby issued as Amendment No. 1.

1. A new clause 7 may be added after existing Clause 6 as given below:

"7 MAINTENANCE

..2/-

7.1 In case of a failure, replacement of complete insulation joint is desirable

7.2 All procurement shall be made in complete sets.

2 The existing Clause D-2.1 in Appendix 'D' may be amended as under

D-2.1 The actual number of insulators to be selected from a lot shall be in accordance with Table 1 and 2 wherein N is the size of the sample. If the number of defectives found in this sample is less than or equal to C, the lot shall be considered as conforming to the requirements of the specification. **Second sampling shall not be permitted in any case.**

TABLE 1

(Sampling plan for Acceptance tests (a) to (d) – Clause 4.2)

Lot Size	Sample size N	Acceptance No. C
Upto 100	3	0
101 to 200	4	0
201 to 500	5	0
501 to 800	10	0
801 and above.	13	1

TABLE 2

(Sampling plan for Acceptance tests (e), (f) and (h) – Clause 4.2)

Lot Size	Sample size N	Acceptance No. C
Upto 1000	2	0
1001 and above	3	0

3 Other contents of the above specification shall remain unchanged. The amendment may please be incorporated suitably in the specification copies available with you.

DA: NIL

(R.K.Jain)
Director / Signal
for Director General

Copy forwarded along with one ferro-print each of the altered drawings to :

1 The Secretary/Signal, Railway Board, Rail Bhavan, New Delhi
2 The Secretary/S&T/RE, Railway Board, Rail Bhavan, New Delhi

..3/-

Market, Nsew Delhi-110 001.

4. The Director Insp./S&T, RDSO, Ist floor, New Annexe Building, Western Railway, Churchgate, Mumbai-400 020
5. The Director Inspection/S&T, RDSO, 4th floor, West Wing, 17, N.S.Road, Fairlie Place, Calcutta-1
6. The Director Inspection/S&T, RDSO, Ground floor, DRM Office, Bangalore-23
7. The Jt Director Inspection/S&T, RDSO, IInd floor, Annexe-I Building, Manak Nagar, Lucknow-226011
8. M/s Black Burn & Co Pvt. Ltd., 65, Cotton Street, 3rd floor, Kolkatta-700007
9. M/s Bihani Udyog, 8-A, Industrial Area, Jhotwara, Jaipur (W)-302012
10. M/s. Carbonaire Industries (Madras), Pvt. Ltd., 144, Old Mahabalipuram Road, Post Bag No. 895, Perrungudi, Chennai-600096
11. M/s Hari Narayan Bihani, 8-B, Industrial Area, Jhotwara, Jaipur (W)-302012.
12. M/s Krishna Engineering Pvt. Ltd , 20/B, Co-operative Industrial Estate, Kanpur-208 022
13. M/s. O.K Industries, A-35, MIDC, Industrial Area, Andheri (East), Mumbai-400 093.
14. M/s Polyset Plastics Ltd., A-44/45 M, MIDC, Maro Industrial Area, Street No 2, Mumbai-400 093.
15. M/s Synthetic Moulders Limited, 16, Nsetaji Subhash Road, Kolkatta-700 001
16. M/s. Unique Plastic Industries, 6, Canal Road, New Alipore, Kolkatta-700 053
17. M/s. Agarwal Engg. Works, 25, Abul Kalam Azad Road, Howrah-711 101
18. M/s Calcutta Springs Limited, 18, R.N.Mukherjee Road, Kolkatta-700001
19. M/s. Car Plast India, 144, Old Mahabalipuram Road, Post Bag No. 895, Perrungudi, Chennai-600 096
20. M/s. Calcast Ferrous Ltd., 18, R.N.Mukherjee Road, Kolkatta-700001
21. M/s Dhingra Enterprises (P) Ltd., Opp: Modipon, Hapur Road, Modinagar-201 204
22. M/s. Interplast India (P) Ltd., 16, Nsetaji Subhash Road, Kolkatta-700 001
23. M/s Indicator Manufacturing Co., 25, Pusa Road, New Delhi-110055
24. M/s. Moulded Fibre Glass Products, 65, Cotton Street, Kolkatta-700007
25. M/s N D Techno Engineering (Pvt) Ltd., Shanti Niketan, 8, Camac Street, 7th flooor, Suite No.9, Kolkatta-700 017
26. M/s R Sons Pipes & Elect Pvt. Ltd , Plot No B-143, Road No. 9-G, V K I. Area, Jaipur-302013.
27. M/s TSS India Limited, 24, Abul-Kalam Azad Road, Howrah-711 101.
28. Dy. Director (EM)/Motive Power Directorate, RDSO, Manak Nagar, Lucknow-226011 for information and record.

DA: NIL

(R.K.Jain)
Director / Signal
for Director General