INDIAN RAILWAY
STANDARD SPECIFICATION
FOR
GLASS FIBER REINFORCED NYLON- 6 SIGNALLING COMPONENTS

SPECIFICATION NO. IRS: S 97/2000

Revision 1.0

Number of pages 15

SIGNAL DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANISATION
LUCKNOW-226011

DOCUMENT DATA SHEET			
Designation **IRS: S 97/2000**			**Revision** **1.0**
Title of Document **Indian Railways Standard Specification for Glass Fibre Reinforced Nylon- 6 Signalling Components**			
Authors **Director/ Signal/ RDSO**			
Approved by **Sr. Executive Director/ Signal, RDSO**			
Abstract This document specifies Technical specification for Glass Fibre Reinforced Nylon- 6 Signalling Components			

DOCUMENT CONTROL SHEET

NAME	ORGANIZATION	FUNCTION	LEVEL
Director/ Signal	**RDSO**	**Member**	**Prepare**
Sr. Executive Director/ Signal	**RDSO**	**-**	**Approve**

Converted into electronic form on 23.11.2004

Prepared By: R. G. Gupta,
Sr. Section Engineer / Signal

Checked By: R. Sahariya
Asstt. Design Engineer

AMENDMENTS

Version	Chapter/ Annexure	Amendment	Effective date
IRS: S 97/1999		FIRST ISSUE	1999
IRS: S 97/2000		Revision 1	2000

TABLE OF CONTENTS

GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

(RAILWAY BOARD)

INDIAN RAILWAY

STANDARD SPECIFICATION

FOR

GLASS FIBER REINFORCED NYLON- 6 SIGNALLING COMPONENTS

0. FOREWORD

0.1 This specification is issued under the fixed Serial No. S: 97/2000. The final number indicates the year of the original adoption or in the case of revision, the year of last revision.

ADOPTED 1999

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

IRS: S10	Mechanical Signalling and Interlocking Equipment.
IRS: S23	Electrical Signalling and Interlocking Equipment.
ASTM: D256	Standard Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials.
ASTM: D570	Standard Test Methods for Water Absorption of plastics.
ASTM: D638M	Standard Test Method for Tensile Properties of Plastics (Metric).

ASTM: D 785	Standard Test Method for Rockwell Hardness of Plastics and insulating Materials.
ASTM: D 792	Specific Gravity and Density of Plastics by Displacement.
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 signalling components of Glass Fiber Reinforced Nylon-6 and does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This specification covers the requirements of Glass Fiber Reinforced Nylon-6 Signalling components.

1.2 Wherever reference is made to ‘components’ in this specification, it shall be taken to mean only signalling components made of Glass Fiber Reinforced Nylon-6 as per clause 3.2.

2. TERMINOLOGY

For the purpose of this standard, terminology given in IRS specification No. S10 and S23 shall apply.

3. GENERAL REQUIREMENTS

3.1 The components shall conform to the drawings approved by the purchaser. Where they are not explicitly indicated, tolerances of ± 0.5 mm may be adopted for linear dimensions and hole centres.

3.2 The components shall be moulded from 30% Glass Fiber Reinforced Nylon-6, with 2 to 3% carbon black particles of size between 50 to 70 microns well dispersed, on automatic screw type injection moulding machine. Addition of black colourants during moulding of components is not permitted. Recovered material or re-constituted material shall not be used for the manufacture of components.

3.3 The surface of the components shall be smooth and free from moulding defects, such as bubbles, surface streaks, splash marks, burn marks, voids, surface sinking, crazing and blistering of the surface, windows, warping, weld lines, laminations, 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 A guarantee shall be given by the manufacturer that no reconstituted or recovered material has been used for the manufacture of components.

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

4. TESTS AND PERFORMANCE REQUIREMENT

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

4.1 TYPE TESTS

4.1.1 The following shall constitute type tests:

a) Tests on raw material (Appendix 'A').
b) Chemical test (Clause 4.8).

4.1.2 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.

4.1.3 A minimum of six samples shall be tested for the tests of tensile strength and elongation at break. Other tests shall be conducted on three samples each.

4.1.4 The test for tensile strength and percentage elongation shall be conducted on dumb bells moulded as per figure '1'. The speed of the testing shall be 5 mm/minute.

4.2 ACCEPTANCE TESTS

4.2.1 The following shall constitute acceptance tests:

a) Visual inspection test (Clause 4.4)

b) Checking of dimensions (Clause 4.5)

c) Checking of weight (Clause 4.6)

d) Specific gravity test (Clause A-1, Appendix-'A')

e) Melting point test (Clause A-2, Appendix-'A')

f) Hardness test (Clause 4.7)

g) Chemical Test (Clause 4.8)

h) Glass Fiber content test (Clause 4.9)

4.2.2 The sampling procedure for acceptance test is given in the Table of Appendix 'D'.

4.2.3 For acceptance tests (d) to (h), a minimum number of three components which have passed acceptance tests (a), (b) and (c) shall be selected.

4.2.4 The components shall successfully pass acceptance tests for conformity with the requirements of the specification, as per Clause D-2, Appendix 'D'.

4.3 ROUTINE TESTS

4.3.1 The following shall constitute routine tests:

a) Visual inspection test (Clause 4.4)

b) Checking of dimensions (Clause 4.5)

c) Checking of weight (Clause 4.6)

4.3.2 The manufacturer shall perform routine test on all the components. The manufacturer shall submit the test sheets to the inspecting officer, whenever a lot is put for inspection.

4.4 Visual Inspection Test

The components shall be visually inspected for compliance with requirements of clause 3.3 of this specification.

4.5 Checking of dimensions

The dimensions of the components shall be checked for conformity with the approved drawings.

4.6 Checking of Weight

The weight of the components shall be checked for conformity with the approved drawings.

4.7 Hardness Test

The hardness (Rockwell, R scale) shall be determined by using standard Rockwell testing machine, at 3 different points on each sample and the average worked out. The value shall conform to the requirement given in Clause A-6, Appendix-'A'.

4.8 Chemical Test

Take approximate 250 mg of granules in a 500 ml volumetric flask and add approx. 250 ml of 4.2 N Hydrochloric acid. Shake the flask for one hour. If the granules dissolve in 4.2 N HCL, then the sample is Nylon-6.

4.9 Glass Fiber Content Test

The Glass Fiber content shall be checked by testing the samples and evaluating the percentage of Glass Fiber content in accordance with the method given in appendix 'C'. The percentage shall conform to the requirement given in Clause A-8, Appendix-'A'.

5. MARKING

Each component shall be clearly and indelibly marked and indicate:

a) Name or trade mark of the manufacture.
b) Drawing number.
c) The legend IR to signify that it is the property of the Indian Railway.
d) Year of manufacture.

6. PACKING

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

APPENDIX 'A'

(Clause 3.4)

TESTS ON RAW MATERIAL USED FOR THE MANUFACTURE OF COMPONENTS

S.No.	PROPERTIES	VALUES	TEST METHOD
A-1	Specific Gravity	1.35-1.40	ASTM: D 792 (Method 509A)
A-2	Crystaline Melting Point (º C)	215-225	BS: 2782, Pt-I (Method 103C) or capillary method or approved melting point apparatus.
A-3	Tensile Strength (Kgf/mm sq.), Min.	16.0	ASTM:D638M
A-4	Elongation at Break (%)	0-10	ASTM:D638M
A-5	Izod Impact Strength (Joule/Metre), min.	90	ASTM: D256
A-6	Hardness Rockwell, R Scale, Min.	115	ASTM: D785
A-7	Water Absorption, 24 hrs. (%), Min.	1.2	ASTM : D 570
A-8	Glass Fiber by ash (%)	27.5 - 35	Appendix 'C'

APPENDIX 'B'

(CLAUSE 3.6)

WATER ABSORPTION

B-1 The components shall be immersed in boiling water in a suitable tank for 24 hours 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 components before and after immersion in boiling water. The amount of water absorption shall not be less than 1.2 % of the initial weight.

B-3 If the amount of water absorption is less than 1.2% of the initial weight of the components, they shall be conditioned further till the water absorption is equal to or more than 1.2%.

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

APPENDIX 'C'

(Clause 4.9)

GLASS FIBER- PERCENTAGE

C-1 **METHOD:**

C-1.1 Take a crucible and heat it by keeping in a muffle furnace till a constant weight is obtained of the crucible.

Let the weight of the crucible = W1

C-1.2 Take approximately 2 gm of the specimen of the component in the above crucible and find the weight of the crucible and the specimen as above.

Let the combined weight of the crucible and specimen = W2.

C-1.3 Burn the Nylon of the specimen by keeping the crucible in the muffle furnace till shining glass is noticed. Allow it to cool to the room temperature.

C-1.4 Weigh the above crucible and glass after cooling.

Let the combined weight of the crucible and glass = W3.

C-2 GLASS FIBER PERCENTAGE CALCULATION:

C-2.1 The weight of the specimen of the component W4= W2 –W1.

C-2.2 The weight of the Glass Fiber content in the specimen W5= W3- W1.

C-2.3 Percentage of the Glass Fiber content = (W5/W4) x 100.

APPENDIX 'D'

(Clause 4.2)

SAMPLING FOR ACCEPTANCE OF LOT

D-1 LOT

D-1.1 In any consignment, all the components 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 components shall be selected at random and subjected to acceptance tests, Clause 4.2. Any components failing to satisfy the appropriate requirements shall be considered as defective.

D-2 CRITERIA FOR CONFORMITY

The actual number of components to be selected from a lot shall be in accordance with the Table where N1 is the size of the first sample. If the number of defectives found in this sample is less than or equal to C1, the lot shall be considered as conforming to the requirements of the specification. If the number of defectives in the first sample lies between C1 and C2, a further sample of N2 components shall be taken and tested. If the number of defectives in the two samples combined is less than C2, 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.

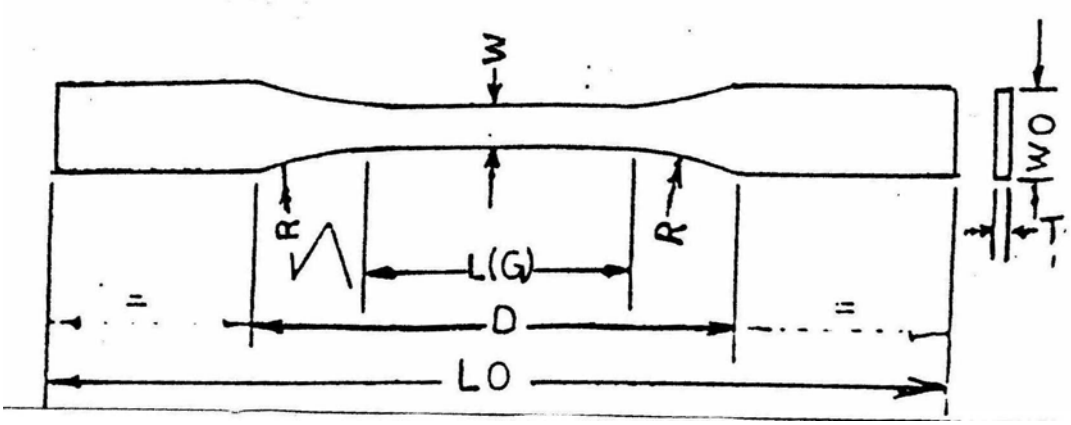
TABLE
(Sampling Plan for acceptance tests, Clause 4.2)

Lot size	First sample N1	Second sample N2	N1+N2	No. of defectives in sample	
				N1 C1	N1+N2 C2
Upto 500	5	10	15	0	2
501 to 1000	10	20	30	0	3
1001 to 10000	15	30	45	1	5
10000 & above	20	40	60	2	6

SPECIMEN FOR TEST OF TENSILE PROPERTIES

(Clause 4.1.4)

FIG-1



DIMENSIONS FOR TEST SPECIMEN

	DIMENSIONS	TOLERANCE
W-WIDTH OF NARROW SECTION	10	± 0.5
L-LENGTH OF NARROW SECTION	60	± 0.5
G-GAUGE LENGTH	50	± 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:

1. ALL DIMENSIONS IN MILLIMETERS.
2. THE SPECIMEN SHALL BE FREE OF DRAFT OR FIN.
3. SPEED OF TESTING SHALL BE 5mm/ min.
4. MINIMUM AREA OF CROSS SECTION WITHIN GAUGE LENGTH SHALL BE ADOPTED FOR CALCULATION OF TENSILE STRENTH.

FIGURE-1

---------- X ----------