TECHNICAL SPECIFICATION
FOR
NON CORROSIVE NFTC APPARATUS CASE
FOR
RAILWAY SIGNALLING
(TENTATIVE)

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Abstract This document specifies Technical Specification for Non Corrosive NFTC Apparatus Case for Railway Signalling			

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Technical Specification for Non Corrosive NFTC Apparatus Case For Railway Signaling
(TENTATIVE)

0. FOREWORD

0.1 This specification is issued under the fixed serial number RDSO/SPN/184/2004.

0.2 This specification requires reference to the following Indian Railway Standards / Indian Standards specifications:

C-9601	Schedule of requirements for Natural Fiber Thermoset Composite floor and chequered board for use in flooring of passenger coaches (Issued by RDSO)
ETI/OHE/13 (4/84)	Specification for hot dip zinc galvanisation of steel masts (rolled and fabricated), tubes and fittings used on 25 kV ac OHE (Issued by RDSO)
IS:2629	Recommended practice for hot dip galvanizing of iron and steel
IS:6745	Methods for determination of mass of zinc coating on zinc coated iron and steel articles
IS:2046-1995	Specification for decorative thermosetting synthetic resin bonded laminated sheets
IS:1998-1962	Methods of test for thermosetting synthetic resin bonded laminated sheets
IS:2553-1971	Specification for safety glass
IS:266	Specification for sulphuric acid
IS:4020(Part 16)-1998	Door shutters – Methods of tests
IS:1573-1986	Specification for electroplated coatings of zinc on iron and steel
IS:1365-1978	Specification for slotted countersunk head screws
ASTM:D785	Standard test method for Rockwell Hardness of plastics and electrical insulating materials

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

0.4 This specification is intended to cover the technical provisions and it does not include all the necessary provisions of a contract.

1.0 SCOPE

1.1 This specification covers technical requirements and tests of non-corrosive Apparatus Cases, for railway signaling, made of Natural Fibre Thermoset Composite (NFTC) material.

1.2 All sides of Apparatus Case including doors and top shall be made of Natural Fibre Thermoset Composite (NFTC) material. Parts of Apparatus Case which are made of NFTC material shall be manufactured through compression moulding. Any other recognised method can also be used subject to prior approval of RDSO.

2.0 TECHNICAL REQUIREMENT

2.1 Natural Fibre Thermoset Composite (NFTC) material shall be made from natural fibre and thermoset resins with or without fillers. This may contain inorganic materials and colouring agents.

2.2 NFTC material shall be weatherproof and shall not loose shape or rot in service. This shall be anti termite/ fungus/ borer. This shall withstand attack by vermin. This shall not warp, split, delaminate or blister. Expansion or contraction due to thermal changes shall be negligible.

2.3 Chemical and Physical properties of NFTC parts of Apparatus Case shall be as under -

Sl. No.	Property	Specified value	Test procedure
1.	Density	1.4 ± 0.1 gm/cc	Appendix-A
2.	Cross Breaking Strength (Min.)	75 MPa	IS:1998-1962
3.	Izod Impact strength (Min.)	100 J/M	IS:1998-1962
4.	Rockwell Hardness (Min.)	110	ASTM:D785
5.	Resistance to drop impact	To Pass	Appendix-B
6.	Tensile strength (Min.)	25 MPa	IS:1998-1962
7.	Compression strength (Min.)	120 MPa	IS:1998-1962
8.	Resistance to abrasion (% loss in weight) Max.	0.5	C-9601

9.	% water absorption (Max.)	0.75	IS:1998-1962
10. a. b.	Resistance to boiling water % Water absorbed (max.) % Increase in thickness (max.)	 1.0 5	C-9601
11.	Resistance to dilute acid	To Pass	Appendix-C
12.	Resistance to cigarette burns	To Pass	Appendix-D
13.	Resistance to spread of flame	To Pass	C-9601
14.	Resistance to ageing	To Pass	C-9601
15. a. b.	Screw holding capacity (min.) At edge At surface	 3000 N 3200 N	IS:4020(Part 16)-1998

Table-I

3.0 DESIGN CRITERIA

3.1 Dimensions shall be as per drawing no. SDO/003 for Non Corrosive NFTC Apparatus Case (Large).

3.2 Thickness of NFTC parts of Apparatus Case shall not be less than 8 mm at any point.

3.3 Surface of NFTC parts of Apparatus Case shall not show blisters, porosity or cracks. The surface shall be reasonably smooth and even.

3.4 Exposed edges of NFTC parts shall be rounded off to 5 R.

3.5 Non Corrosive NFTC Apparatus Case shall be weatherproof and shall not change in shape during any season / climatic condition. This shall not rot, crack, warp or splinter.

3.6 Non Corrosive NFTC Apparatus Case shall be anti termite/ fungus/ borer. This shall withstand attack by vermin.

3.7 Non Corrosive NFTC Apparatus Case shall be cold and boiling water resistant. This shall also be resistant to oil, gasoline, dilute acid / alkali and salted water.

3.8 Non Corrosive NFTC Apparatus Case shall be Fire Retardant.

3.9 Gasket lining in groove shall be provided in Apparatus Case frame at housing of door to prevent ingress of rain, insect etc. Gasket shall be of good quality to have long life.

3.10 Two ventilators with steel wire mesh, one at top and another at bottom portion of door shall be provided to provide ventilation while preventing ingress of insects etc.

3.11 Non Corrosive NFTC Apparatus Case shall have provision for fixing one or more boards in horizontal plane at any desired height for keeping signalling equipments and batteries as per user's requirement.

3.12 Two NFTC boards of not less than 10 mm thickness shall be provided with Apparatus Case for keeping signalling equipments and batteries as per clause 3.11 above. These boards, when fixed in Apparatus Case, shall be able to sustain 50kg. weight at centre of the board without any deformation or sag.

3.13 Non Corrosive NFTC Apparatus Case shall have provision for fixing bakelite sheets in vertical plane at any desired height parallel to door with adequate clearance (18 to 20 cm.) from the door to facilitate fixing of relays / wire termination etc..

3.14 Provision of one pocket inside each door shall be made for keeping maintenance card etc.

3.15 Miniature E type lock as per RDSO drawing no. SA 3474/M shall be used in Non Corrosive NFTC Apparatus Case for locking doors.

3.16 Hinge arrangement of doors shall be sufficiently robust and durable to ensure doors operate properly for the entire life of Non Corrosive NFTC Apparatus Case.

3.17 NFTC moulded parts shall be fastened by zinc coated MS screws as per IS: 1365-1978 of length not less than 15mm and dia not less than 5mm. Zinc coating shall be as per Service Grade no. 1 of IS:1573-1986. Head of screw should be sunk 2mm from the surface. 2mm gap from level of surface to sunk head should be filled up by epoxy putty. Fastening and epoxy putty should last for entire life of Apparatus Case.

3.18 Metallic parts/components (including locking arrangement) wherever used, shall be hot dip zinc galvanised as per IS: 2629. These shall be rust proof for entire life of Apparatus Case. Weight of zinc coating shall not be less than 1000 gm. per square meter.

3.19 Steel used in metallic parts/ components shall be such that it withstands normal hot dip zinc galvanisation operation without embrittlement.

3.20 Weight of Non Corrosive NFTC Apparatus Case (Large), including two NFTC boards as per clause 3.11 above, shall be 150 kg ±5 kg.

3.21 Apparatus case (except for hot dip galvanised parts) shall be spray painted in silver ash colour with Hammerton design. The apparatus case should not require repainting for 10 years (approx.).

4.0 SCOPE OF SUPPLY

4.1 The supply shall include all necessary fittings and painting as per drawing no. SDO/003 for Apparatus Case (Large) including door opener and key of E type lock.

5. INFORMATION TO BE GIVEN BY PURCHASER

i) Size of Apparatus Case : Large
ii) Ward of E type lock

6.0 INSPECTION AND TESTING

6.1 Type Tests:

For type test, one sample of Non Corrosive NFTC Apparatus Case (Large) shall be subjected to following tests-

i) Visual inspection & dimensional check (Clause 3.1, 3.2, 3.3, 3.4, 3.9, 3.10, 3.11, 3.13, 3.14, 3.15, 3.16, 3.17, 3.21, 4, 5)
ii) Chemical and Physical properties of NFTC parts of Apparatus Case (Clause 2.3)
iii) Weight of Apparatus Case (Clause 3.20)
iv) Load carrying capacity (Clause 3.12)
v) Checks for hot dip zinc galvanisation (Clause 3.18, IS:2629 & IS:6745)
   a) Visual inspection
   b) Uniformity in thickness of zinc coating
   c) Mass of zinc coating
   d) Adhesion of zinc coating

6.2 Acceptance Tests:

i) Visual inspection & dimensional check (Clause 3.1, 3.2, 3.3, 3.4, 3.9, 3.10, 3.11, 3.13, 3.14, 3.15, 3.16, 3.17, 3.21, 4, 5)
ii) Resistance to impact (Sl. No. 5 of Clause 2.3)
iii) Resistance to cigarette burns (Sl. No. 12 of Clause 2.3)
iv) Load carrying capacity (Clause 3.12)
v) Weight of Apparatus Case (Clause 3.20)

6.2.1 Lot and Lot size:

Lot is a collection of apparatus cases of one type and size manufactured by same process under similar conditions of production and offered for inspection at a time and the number of apparatus cases in a lot will form lot size.

6.2.2 For acceptance test, sampling criteria shall be as under-

Lot size	For Visual inspection & dimensional check		Physical properties (Acceptance tests Sl. No. ii. iii & iv)
	No of samples to be tested	Permissible No. of defects	No of samples to be tested
Up to 100	2	0	1
101-200	3	0	1

201-300	5	1	2
301-500	8	1	3
501& above	10	2	4

Table – 2

6.2.3 In acceptance test, physical properties shall be tested on any one side of Apparatus Case. No failure is permitted in physical properties. In case any sample drawn fails to satisfy the requirements, twice the number of samples shall be drawn and tested. If any of the retested samples also fails, the entire lot shall be rejected.

6.3 Routine Tests:

i) Visual inspection & dimensional check (Clause 3.1, 3.2, 3.3, 3.4, 3.9, 3.10, 3.11, 3.13, 3.14, 3.15, 3.16, 3.17, 3.21, 4, 5)
ii) Chemical and Physical properties of NFTC parts of Apparatus Case (Clause 2.3)
iii) Checks for hot dip zinc galvanisation (Clause 3.18, IS:2629 & IS:6745)
   a) Visual inspection
   b) Uniformity in thickness of zinc coating
   c) Mass of zinc coating
   d) Adhesion of zinc coating

6.3.1 Visual inspection & dimensional check shall be done on 100% Apparatus Cases. Tests of chemical and physical properties of NFTC parts and checks for hot dip zinc galvanisation shall be done lot wise.

7. MARKING

7.1 Manufacturer shall engrave/emboss its recognised trade mark on all NFTC parts of Apparatus Case at conspicuous locations.

7.2 Manufacturer shall engrave/emboss permanent identification mark indicating his name/brand name, date of manufacture and lot or batch number at a conspicuous place.

8. PACKING

Manufacturer shall be responsible for safe transportation of apparatus case. Apparatus case should be delivered in good condition to consignee at his depot. If there is any damage, manufacturer shall replace the damaged apparatus case free of cost.

APPENDICES

A. Determination of Density

Specimens of size 5cm x 5cm x t * cm (t* is the thickness of the sample) free from major defects shall be taken and density determined using standard method** at temperature 27±1 deg C.
Three test specimens shall be subjected to this test and average value taken for consideration as given in Table I.
(** Standard method = Specimen Weight/ Specimen Volume)

B. Resistance to drop impact

Specimen of size 30cm x 30cm x t* cm (t* is the minimum thickness of NFTC parts used in Apparatus Case which should be ≥ 8mm) is supported in a suitable square (see fig.3 of IS : 2553 - 1971). The steel ball of 1 Kg. is dropped from a height of 1.5 metres by a suitable device to strike the specimen within 25 mm from its centre.

Three test specimens shall be tested. After the test, the specimen shall not develop any cracks in or around the area of impact.

For acceptance test, this shall be tested on Apparatus Case at that NFTC part which has min. thickness.

C. Resistance to dilute acid

Immerse a specimen of 75 mm square of NFTC board as per Cl. 3.12 for 8 hours in battery grade acid (dilute) as per IS-266. Examine the specimen. This shall not show any sign of delamination, deformation, deterioration etc. on surface or edges.

Three test specimens shall be subjected to this test.

D. Resistance to cigarette burns

This test shall be conducted as per annexure P of IS: 2046 – 1995 and shall comply with the requirement as given in rating scale no. 3, i.e. moderate change of gloss and / or moderate brown stain.

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