AMENDMENT OF SPECIFICATION / STR

Ref: Current Spec. No. RDSO/2009/CG-03 Amendment- 2, and draft amendment slip.no.3 STR for Injection Moulded Polyacetal Protective Tube for ICF type B.G. Mainline & EMU Trailer Coaches.

1. RDSO is reviewing the specification/STR to cater to the latest technological developments in the field, modify clauses not relevant in the present context and making them more enabling with focus on functional requirements.

2. It is requested that your comments / suggestions with regard to improvements / modifications in specification / STR of this item and also on draft amendment slip no. 3 of the same may be submitted in the following format along with the justification for the changes required.

Part A: Basic Information

SN	Particulars	Information
1	Name	
2	Designation	
3	Professional Qualification	
4	Organization / Firm's Name	
5	Address for Correspondence	
6	Contact No.	
7	Email ID	
8	In case of Firm / Individual: Manufacturing experience of item (or similar Item) on which comments are offered	
9	Where relevant: Whether any technical document to support suggested changes is available / enclosed for better appreciation	

Part B: Comments / suggestions on the specification

SN	Clause No. of RDSO STR / Spec	Clause, as exists in RDSO STR / Spec	Clause , as it should read after incorporation of comments / suggestions in the RDSO Spec / STR	Justification for changes

Comments may be sent to:

Executive Director /Carriage
Research Designs and Standards Organization
Manak Nagar, Lucknow – 226011
Email: edcar.rdso@gmail.com, dirssrdso@gmail.com

INDIAN RAILWAYS

सत्यमेव जयते

SCHEDULE OF TECHNICAL REQUIREMENTS
FOR
INJECTION MOULDED POLYACETAL PROTECTIVE TUBE FOR ICF TYPE B.G. MAIN LINE & EMU TRAILER COACHES
~~(Tentative)~~

S. No.	Month/Year of issue	Revision / Amendment	Page No.	Reason for Amendment
1.	April-2009	-	-	First issue
2.	July, 2013	Amendment-1	3&10	1.Pre-load for transverse load specified in Appendix-1 2. Trial period under clause -2.1.4 of Section –A has been specified as "One POH" in place of Existing criteria of 24 months.
3.	August,2016	Amendment-2	3	ISO Document No. QO-D-7.1-11 has been added as new sub clause 1.2 in Scope of Section-A
4.	August-2020	Amendment-3	5,6&7	1. Clause no. 8.1, 8.4 & 8.5 of Section-A, are modified. 2. In Clause 2.1 of Section –B, is modified

ISSUED BY:

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MANAK NAGAR LUCKNOW - 226 011

Signature			
Name & Designation			

Amendment Slip No.-3

Amendment Slip No.-3 of August- 2020 in RDSO Spec. no. RDSO/2009/CG-03 for Injection Moulded Polyacetal Protective Tube for ICF type B.G. Mainline & EMU Trailer Coaches

Section –A

8.1 Protective Tube shall be procured from ~~RDSO approved firm only.~~ Registered vendors, approved by vendor approving Authority.

8.4 A request for the registration for the Protective Tube shall be made in the prescribed form to ~~RDSO~~ vendor approving Authority. The request for registration shall be accompanied with in-house test results and a valid copy of MOU as specified under clause 2.1.2 of Section-A of this schedule.

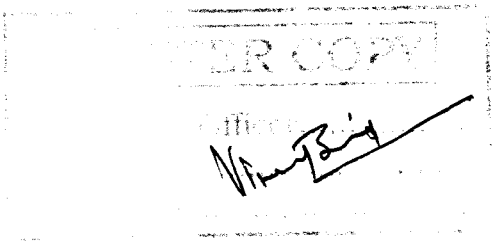
8.5 The firm will be assessed by ~~RDSO~~ Vendor Approving Authority for compliance of STR & QAP in accordance with extant procedure. All tests mentioned in the schedule are mandatory for product approval.

Section –B

2.1 All vendor seeking registration with ~~RDSO~~ Vendor approving authority must fulfill the requirements of this schedule.

Signature			
Name & Designation			

INDIAN RAILWAYS



SCHEDULE OF TECHNICAL REQUIREMENTS FOR INJECTION MOULDED POLYACETAL PROTECTIVE TUBE FOR ICF TYPE B.G. MAIN LINE & EMU TRAILER COACHES (Tentative)

S. No.	Month/Year of Issue	Revision/ Amendment	Page No.	Reason for Amendment
1.	April, 2009	-	-	First issue
2.	July, 2013	Amendment-1	3 & 10	1. Pre-load for transverse load specified in Appendix-1. 2. Trial period under clause-2.1.4 of section-A has been specified as "One POH" in place of existing criteria of 24 months.
3.	August, 2016	Amendment-2	3	ISO Document No: QO-D-7.1-11 has been added as new sub Clause 1.2 in Scope of section- A

Issued By

Research Designs and Standards Organization
Manak Nagar, Lucknow-226 011

Signature	MK Arun	26/8/16	26/8/16
Name & Designation	Prepared By:- M.K. Arun SSE/SS/Carriage	Checked By:- Praveen Kumar Dy. Director/SS/Carriage	Approved By- Vineet Singhal Director/SS/Carriage

Amendments slip No. 2 of August, 2016 to Spec No. RDSO/2009/CG-03 for Schedule of Technical requirements for Injection Moulded Polyacetal Protective Tube for ICF type B.G. Main Line & EMU Trailer Coaches

Add new sub **Clause 1.2** in **Scope** of section- A, as under:

All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-7.1-11 dated 19.07.2016 (titled "**Vendor – Changes in approved status**") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain quality of products supplied to Railways.

Amendment Slip No.1 of July 2013 of specification No. RDSO/2009/CG-03 for Injection Moulded Polyacetal Protective Tube for ICF BG Mainline and EMU Trailer Coaches (Tentative).

1. Clause 2.1.4 of Section – A may be read as under:

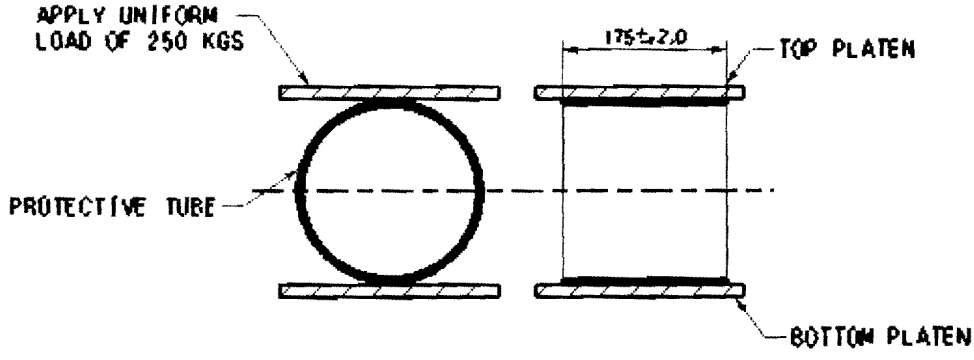
   2.1.4 In case alternative equivalent material is offered for manufacture of protective tube other than DuPont's "Derlin–100" material already undergone trials. The protective tube made from alternate material will be subjected to successful field trials on min[m]. of 50 coaches for **one POH** on two Railways. After successful completion of trials final approval may be considered subject to capacity assessment of the firm and compliance of other clauses of this specification.

2. Appendex-1 is replaced as under:

TRANSVERSE LOAD TEST

The test shall be carried out at room temperature (27±2°C) with machine speed of 10±5 mm/minute. A cylindrical section cut out of the protective tube, shown in Fig.1 shall be subjected to a pre-load of 10 kg and dial/digital display set zero for deflection. Increase the load upto 200Kg and 250Kg and read the deflection on dial/digital display. The deflection measured shall be within the specified limits as given below. At the maximum loading the sample shall not show any evidence of cracking.

Sr. No.	Load in Kg.	Deflection in mm	
		Minimum	Maximum
1	200	65	75
2	250	80	90



Signature			
Name & Designation	Prepared By Maneesh Kumar Arun/SSE	Checked By Rakesh Kumar Dy.Director/ Carriage	Approved By Mahesh Kumar Director /Carriage

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SCHEDULE OF TECHNICAL REQUIREMENTS FOR INJECTION MOULDED POLYACETAL PROTECTIVE TUBE FOR ICF TYPE B.G. MAIN LINE & EMU TRAILER COACHES (Tentative)

0. FOREWORD

0.1 This schedule consists of two parts viz. Section A and Section B. Section A covers the technical requirements/provisions relating to material, manufacture and tests and does not include the necessary provisions of the contracts. Section B covers the requirement for manufacturing, testing and quality control facilities for manufacture of Injection Moulded Polyacetal Protective Tube of ICF Type B.G. Mainline & EMU Trailer coaches.

0.2 This schedule draws references to some of the relevant ASTM / ISO specifications. Unless otherwise specified, latest version of these specifications shall be taken as reference.

0.3 For the purpose of deciding whether a particular requirement of the schedule is complied with, the final value observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960. The number of significant places retained in the rounded off value shall be the same as that of the specified values in this schedule.

0.4 While preparing this specification, due consideration has been given to the latest developments in the field of polymeric materials and process technologies, service requirements of the Indian Railways and practices followed in advanced countries.

SECTION – A

1.0 SCOPE

1.1. This section covers the technical requirements/ provisions relating to material, manufacture, tests, sampling and method of tests for Injection Moulded Polyacetal Protective Tube hereinafter referred to as "Protective Tube" for ICF type BG Mainline & EMU Trailer coaches.

2.0 REQUIREMENTS

2.1 Material

2.1.1 The material used for manufacture of Protective Tube shall be "Delrin-100" made by DuPont or any other equivalent polyacetal material. Use of regenerated/ reconstituted raw material is not permitted.

2.1.2 The manufacturer shall have a valid tie-up in the form of a written Memorandum of Understanding (MOU)/contract with M/s. E.I. DuPont India (P) Limited for manufacture of Protective Tube using "Delrin-100" or with primary manufacturer of equivalent polyacetal material, covering raw material supplies and technical support including quality control.

2.1.3 The Protective Tube shall be supplied in natural colour.

2.1.4 In case alternative equivalent material is offered for manufacture of Protective Tube other than DuPont's "Delrin-100" material already undergone trials, the Protective Tube made from alternate material will be subjected to successful field trials on minimum of 50 coaches for 24 months on two railways. After successful completion of trials final approval may be considered subject to capacity assessment of the firm and other clauses of this specification.

3.0 DIMENSIONS AND TOLERANCES

3.1 Protective Tube shall be strictly manufactured as per the respective drawing. The dimensions and tolerances of the Protective Tube shall be as indicated in the relevant drawing.

4.0 CONSTRUCTIONS , WORKMANSHIP, AND FINISH

4.1 The Protective Tube shall be manufactured from "Delrin-100" using Microprocessor Controlled fully automatic type Injection Molding Machine having a minimum locking tonnage of 400 tonnes.

4.2 The surface of the Protective Tube shall be smooth, free from moulding defects such as bubbles, surface streaks, splash marks, voids, surface sinking, crazing and blistering of the surface, cracks etc. All edges shall be neatly finished and free from flash.

5.0 PROPERTIES

5.1 The raw material used for manufacture of Protective Tube shall conform to the requirements given in the Table-1 and shall be measured on prepared test specimen.

5.2 The finished Protective Tube shall conform to the requirements as given in Table-2.

Table - 1
(To be measured on test specimen prepared from Raw Material)

Sr.No	Property	Value	Unit	Test Method
1	Hardness	120 ± 4	Rockwell R	ASTM D-785
2	Specific Gravity	1.40 – 1.43		ASTM D-792
3	Tensile strength (min)	65	MPa	ASTM D-638
4	Elongation at Break (min)	40	%	ASTM D-638
5	Melt Flow Rate @ 190^0 C at 2.16 kg. load (max)	2.90	Gm/10 min.	ASTM D-1238

Note: Tests shall be carried out on "Dry As Moulded (DAM) Sample", defined as those, which upon immediate removal from the mould, are sealed in containers impermeable to water, vapour/ moisture.

Table – 2
(To be measured on finished Protective Tube)

Sr. No	Property	Value	Unit	Test Method
1	Hardness	120 ±4	Rockwell R	ASTM D-785
2	Specific Gravity	1.40– 1.43		ASTM D-792
3	Melt Flow Rate @ 190^0 C at 2.16 kg. load (max)	3.00	Gm/10 min.	ASTM D-1238
4	Weight	790 ± 20	Gms	Digital Balance
5	Transverse Load test	250	Kg.	Appendix -1
6	Flange Flex Test	4000	Kg.	Appendix-2

5.3 Unless otherwise specified, all tests shall be carried out at a temperature of 27 ± 2^0 and relative humidity 65±5%.

6.0 TESTS

6.1 The tests for all the requirements laid down in this schedule are mandatory for product approval.

6.2 The tests specified in Table-1 shall constitute Type Test and shall be carried out at the time of approval of the firm and at an interval of one year.

6.3 The tests specified in Table-2 are Acceptance Test and shall be carried out on each lot/ batch.

6.4 RDSO may also draw samples for quality check at its discretion and the firm shall arrange the testing of these samples in a reputed outside laboratory as decided between RDSO and manufacturer. The testing charges shall be borne by the manufacturer.

7.0 SAMPLING CRITERIA FOR CONFORMITY

The sampling plan for acceptance tests for Protective Tube shall be as under:

7.1 The inspection lot shall consist of 500 Numbers of Protective Tubes or part thereof.

7.2 The Protective Tubes to be selected from the lot for Acceptance Test shall be

a	Visual Inspection	Minimum 10 samples shall be drawn at Random from each lot.
b	Dimensional Check & product weight	
c	Hardness	5 samples shall be drawn at random from each lot. Out of these samples, two nos. shall be tested for c, d, and e.
d	Specific Gravity	
e	Melt Flow Rate	
f	Transverse Load & Flange Flex Test	2 samples at random from each lot.

7.3 Sample selected for Acceptance Test shall conform to the requirements as laid down under Clause 5.2 of this schedule. Should any one of the test samples fail to meet the requirements of Acceptance Test, double the number of samples from the same lot shall be drawn for retesting. Should any of these samples fail. the entire lot shall be rejected.

7.4 In case of non-compliance in regard to dimensional check, the manufacturer may be given one chance to segregate the lot for dimensional conformity.

7.5 In the event of rejection of the lot, all the Protective Tubes constituting the lot shall be made un-usable in the presence of the Inspecting Authority.

7.6 During inspection, Purchasing/ Inspecting Authority, at their discretion may conduct Type Test and the samples shall conform to the requirements as laid down under clause 5.1 of this schedule.

8.0 APPROVAL OF FIRMS

8.1 Protective Tube shall be procured from RDSO approved firms only.

8.2 During bulk production, the supplier shall not alter any material or process after having successfully undergone the approval process.

8.3 The firm shall have all the facilities mentioned in Section B of this STR.

8.4 A request for the registration for the Protective Tube shall be made in the prescribed form to RDSO. The request for registration shall be accompanied with in-house test results and a valid copy of MOU as specified under clause 2.1.2 of Section-A of this schedule.

8.5 The firm will be assessed by RDSO for compliance of STR & QAP in accordance with extant procedure. All tests mentioned in the schedule are mandatory for product approval.

9.0 MARKING

9.1 Each Protective Tube shall be suitably marked with the following legend as per size and location indicated in the drawing.

i. Manufacturer's name/initial/trade mark
ii. The month and year of manufacture
iii. Batch No. / Lot No.

The markings should be clearly visible and readable.

10.0 PACKING

10.1 The Protective Tube shall be securely packed individually in plastic bag.18 nos. of such bags shall be packed in a cardboard carton strong enough to resist damage in transit/ storage.

11.0 STORAGE

11.1 The Protective Tube shall be stored in a cool and dry place, free from constraints, in the original packing.

11.2 Protective Tube shall be kept covered and free from exposure to bright light, particularly sunlight.

11.3 Protective Tube shall be stocked and arranged in such order as to ensure use of old stock first.

12.0 WARRANTY

The store supplied against an order shall bear a warranty of the manufacturers against defective material/workmanship and performance for a minimum period of 33months from the date of supply or 27 months from the date of fitment whichever is earlier. In case, the Protective Tube cracks, deforms within the Warranty Period, it shall be replaced by a new one, free of cost within one month of receipt of information.

SECTION - B

INFRASTRUCTURE & TESTING FACILITIES REQUIRED FOR MANUFACTURE OF INJECTION MOULDED POLYACETALPROTECTIVE TUBE FOR ICF TYPE B.G. MAIN LINE & EMU TRAILER COACHES

1.0 SCOPE

1.1. This Section covers the infrastructural requirements for manufacture of Protective Tube for ICF type B.G. Mainline & EMU Trailer Coaches.

2.0 REQUIREMENTS

2.1 All vendors seeking registration with RDSO must fulfill the requirements of this schedule.

3.0 PLANT, MACHINERY & INFRASTRUCTURE REQUIREMENTS

3.1 The Manufacturer shall have adequate space and covered area with cemented floor to accommodate the following & for smooth logistics:

a) Damp-free place for storage of raw materials
b) Adequate manufacturing area
c) Finishing, Assembly and Inspection area
d) Storing and dispatch of finished products

3.2 The Manufacturer shall have at least one Micro Processor Controlled Injection Molding Machine of minimum locking tonnage of 400 tonnes. Each machine shall be equipped with the following ancillaries:

a. Oil filtering machine
b. Mould Temperature Controller (MTC)

3.3. The firm shall have the following.

a. One mould for Protective Tube.
b. Cooling Water Tank
c. Cooling Tower
d. Air Compressor of suitable capacity

3.4 The Manufacturer shall have suitable tools, cutters, polishing files, and Buffing Machine for de-flashing of molded products.

3.5 The Manufacturer shall have a system to ensure that molds are checked at regular intervals and adequate mold handling facilities like Chain Pulleys or Electric Hoists or other suitable equipment for moving heavy molds.

3.6 Prior to release of dies/molds for production, these are to be checked dimensionally and records containing details of such inspection and date, maintained.

3.7 The manufacturer shall have Electronic Weighing Machine of reputed make, having minimum 1 kg. Capacity of accuracy minimum 1 gm.

3.8 Weighing machines shall be calibrated regularly by Govt. approved agency. The frequency of calibration shall be as recommended by the manufacturer of weighing machine.

3.9 Manufacturer should have suitable in house facilities for minor repair of dies/ moulds.

4.0 TESTING FACILITIES

4.1 The Manufacturer shall have the following testing and other equipments installed in a Laboratory set up with controlled temperature and humidity.

1. Tensile Testing Machine/UTM
2. Melt Flow Rate Tester.
3. Apparatus to measure Melting Point.
4. Weighing Balance with specific gravity determination kit.
5. Height Gauge
6. Vernier Depth Gauge

4.2 The Manufacturer shall have UTM/ Load compression testing machine of minimum 5t with suitable arrangement to test the Transverse Load test & Flange Flex Test.

4.3 Manufacturer shall have a stopwatch with least count of 0.1 second.

4.4 The Manufacturer shall have arrangements like vice, cutter, polishing files etc. for preparation of various samples for tests such as Tensile Strength, Hardness and Specific Gravity etc.

5.0 QUALITY CONTROL REQUIREMENTS

5.1 The firm should have acquired ISO: 9001-2000 certificate accredited by NABCB and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacture and supply.

5.2 The Quality manual of the firm for ISO 9001-2000 shall clearly indicate stagewise control over the manufacturing and testing of the product.

5.3 There should be in force, a system to ensure the traceability of the product from raw material stage to finished stage. The system should also enable identification of the raw material composition at the finish product stage.

5.4 A Quality Assurance Plan for the product detailing the following shall be available.

- Organisation chart
- Process flow chart
- Stage inspection details from the raw material stage to finished product stage.
- Parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
- Disposal system of rejected raw material and components

5.5 There should be atleast one full time technologist having a bachelor's degree in relevant field with 5 years practical experience or a diploma with 12 years practical experience. He should not be involved in day-to-day production, testing and quality control responsibilities. He shall be responsible for development, analysis of products, control over raw material, and corrective action in case of difficulties arising.

5.6 The Quality Control Manager shall possess a bachelor's degree in the relevant field and 5 years practical experience, or a diploma with 12 years practical experience. He shall be involved in stage inspection, compliance of QAP etc.

5.7 The firm must ensure that proper analysis is being done on monthly basis to study rejections at various stages and documentation maintained.

5.8 The firm shall make available latest version of the relevant specifications.

6.0 DOCUMENTATION

Firm shall maintain the following documents/ records/ systems:

6.1 Quality Plan.

6.2 Records of raw material received from primary manufacturers, references of supplies and internal test results.

6.3 Stage inspection results including finished products results.

6.4 Records of internal rejection, analysis and action plan for rejection control.

6.5 Records of final inspection by external agencies (like RDSO), Non-conformity Reports and case analysis as well as action taken thereof.

6.6 Records for maintenance of dies/moulds.

6.7 System for dealing with customer complaints.

7.0 TRAINING

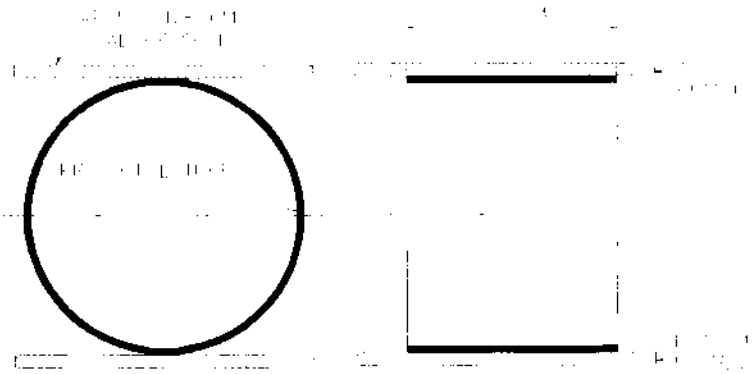
7.1 Training needs should be identified for all concerned officials and regular training shall be organized and imparted on maintenance of machines, quality assurance, safety parameters etc.

Appendix -1

TRANSVERSE LOAD TEST

The test shall be carried out at room temperature (27 ± 2°C) with machine speed of 10 ± 5 mm/minute. A cylindrical section cut out of the Protective Tube, shown in Fig-1 shall be subjected to a load of 250 kg and deflection recorded. The deflection measured shall be within the specified limits as given below. At the maximum loading the sample shall not show any evidence of cracking.

Load in Kg	Deflection in mm
200	38 - 47
250	50 - 60



Appendix -2

FLANGE FLEX TEST

The test shall be carried out at room temperature (27 ± 2^{0}C) with machine speed of 10 ± 5 mm/minute. Protective Tube, as shown in Fig-2 (a) shall be subjected to a load of 100 kg and the dial gauge set to zero. Subsequently a load upto 4 tonne shall be applied and deflection measured for different loads specified below. The load of 4 tonne shall be held for 5 sec. and released immediately thereafter. At the maximum loading the sample shall not show any evidence of cracking.

The flange lift measured after one hour as shown in Fig- 2(b) shall be measured with the help of a 2mm no go slip gauge. Further, the height as shown in Fig- 2(c) shall also be measured with the help of vernier caliper depth gauge and shall be within the specified tolerances of the drawing.

Load in Tonne	Deflection in mm
1	0.60 – 1.60
2	1.00 – 2.20
3	1.50 – 2.90
4	2.20– 5.10