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RESEARCH DESIGNS AND STANDARDS ORGANISATION

Manak Nagar, Lucknow - 226011

Document No. **TDG 0005 Rev. '3'**

Document Title: **Item Specific Guidelines & Schedule of Technical Requirements for Manufacture and Supply of Glass Filled Nylon-66 (GFN) & High Viscous Nylon-66 (HVN) Insulating Liners**

Amendment History:

Amendment Date	Version	Reasons for Amendment
24.08.2018	1.0	First issue under new documentation system
30.05.2022	TDG 0005 Rev. '1'	Amendment in Specification and quality improvement
10.08.2023	TDG 0005 Rev. '2'	Provisions for HVN Liner added
31.07.2025	TDG 0005 Rev. '3'	Revision in Specification

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GENERAL:

1.0 Purpose:

These guidelines are based on Indian Railway Standard Specification for manufacture of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners to IRS T-44-2025 (Rev.3)

The purpose is to specifically define the guidelines and technical & other requirements for manufacture & supply of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners.

2.0 Scope of Application

This document shall be applicable on manufacturing and supply of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners. This document shall be applicable for initial capability assessment, periodic Quality Audit for extension of approval, up-gradation of vendors and maintaining their approved list for Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners.

3.0 Procedures / Details

Procedures/details are annexed.

4.0 Referenced Documents:

i) IRS Specification for Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners, IRS T-44-2025

ii) ISO Apex Documents of RDSO

5.0 Referenced Documents of External Origin

None

6.0 Associated Records

None

7.0 Responsibility and Authority

Activity	Responsible	Approver	Supporting	Consulted	Informed
Creation, maintenance of this document	ED/Track-II/ Director / Track-IV	PED/ Infra-I	DD/ARE/ ADE	M&C Dte.	All approved vendors through website
Compliance of directives contained in this document	DD/ ARE/ ADE	Director/ Track Design - IV	-	-	-
Requirement of deviation from this directive	ED/Track-II/ Director/Track-IV	PED/ Infra-I	DD/ARE/ ADE	M&C Dte.	-

Abbreviations

PED/INFRA-I	Principal Executive Director/ Infra-I
ED/Track-II	Executive Director/Track Design-II
RDSO	Research Designs & Standards Organization
DD	Dy. Director
ARE	Assistant Research Engineer.
ADE	Assistant Design Engineer.

8.0 The process of vendor approval for Glass Filled Nylon-66 Insulating Liners and High Viscous Nylon-66 Insulating Liners will involve following steps / activities.

i) Vendor seeking fresh registration for the particular item (GFN/HVN) shall register online on UVAM portal at website https://www.ireps.gov.in.

ii) The vendor shall submit duly filled-in online fresh application form along with vendor registration charges as applicable at the time of submission.

iii) The vendor shall upload the documents specified in ISO Documents of RDSO along with QAP and legal documents for technical approval by RDSO.

iv) The specification and relevant drawings are available on UVAM portal and can be downloaded.

v) Application / proforma along with documents will be scrutinized by RDSO and if details are found satisfactory, the work unit of the firm will be visited for STR verification and Capacity-cum-Capability Assessment (CCA).

vi) If any shortcomings are observed during the visit, the same will be conveyed to the firm for compliance.

vii) After satisfactory compliance by the firm, the firm shall be advised to submit Inspection Gauges for the drawings for the particular items for which application has been made. The Inspection Gauges will be checked and approved prior to / during STR verification.

(viii) After satisfactory verification of documents and CCA (Capacity cum Capability Assessment), the name of the firm shall be considered for placement in the **"List of RDSO vendors for Developmental order"** for 24 months period subject to technical clearance of Prototype / Test samples.

(ix) After clearance / approval of two sets of inspection gauges as mentioned in para (vii) above, the firm will be advised to start trial production and submit internal test results in formats as per Quality Assurance Programme (QAP) for manufacture and testing. If the internal test results are found satisfactory, the firm will be advised for drawl of samples manufactured in the presence of RDSO officials.

(x) The testing of the samples will be carried out as per the provisions of IRS Specification for Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners, Sl. No. T-44-2025. If test report is found satisfactory and other conditions are fulfilled, the firm will be advised to start production.

(xi) In the case of new vendor/firm, the process of approval will be initiated only if the firm has applied on-line.

(xii) In case, firms approved for manufacturing of one drawing for a particular item (GFN/HVN), desires to develop the product to other drawings of the same item, the requisite inspection gauges will have to be approved by RDSO. After getting satisfactory internal test reports, the samples will be drawn and tested by RDSO. If test results on samples are found satisfactory, the firm will be considered for inclusion in the "List of RDSO Vendors for Developmental Orders" as per the provisions of latest ISO apex documents.

(xiii) Up-gradation from "List of RDSO Vendors for Developmental Orders" to "List of Approved Vendors" shall be as per procedure stipulated in RDSO's latest ISO apex document.

A. ITEM SPECIFIC GUIDELINES

In addition to the procedure for vendor approval given in the 'ISO Documents' the following specific guidelines shall also be applicable for manufacture of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners.

1. After successful assessment of firm in accordance with the 'ISO Documents' and approval of inspection gauges the firm will be asked to submit Internal test results of type tests and product testing as per scheme of testing for pre- acceptance test for approval of samples as embodied in the IRS specification for Glass Filled Nylon-66 & High viscous Nylon-66 liners IRS.T-44-2025.

2. If the above results are considered acceptable by RDSO, samples for type tests and product testing for approval in RDSO shall be required to be manufactured in the presence of RDSO's representative. The samples for type tests and product testing shall be drawn in the same go.

2.1 Samples for approval shall be tested in two stages as given below:

i) For type test
ii) For product testing.

2.2 The product testing shall be undertaken only if the samples have passed in the 'type tests'. If the samples fail in the type test, samples in product testing shall also be deemed to have failed and fresh samples shall be drawn both for the 'type tests' as well as for the 'product testing'.

2.3 If the samples pass in type tests and fail in product testing fresh samples shall be drawn only for the product testing.

2.4 It shall be the firm's responsibility to ensure that 'as moulded' samples/specimen are sealed and guarded against the ingress of moisture. The samples should bear the signature of the RDSO's representative deputed to witness production and to draw the samples and signatures of the representative of the firm.

2.5 The samples will be left in sealed condition with the firm and it shall be the responsibility of the firm to deliver the same to RDSO (M&C Dte.) within 15 days from the date of drawl of samples. The samples along with a set of approved gauges shall be sent to RDSO, with a letter addressed to the Director General/M&C RDSO, Lucknow and copy to the Director General/Track, RDSO, Lucknow.

2.6 If the samples are not found satisfactory as per specification in RDSO testing, the firm will be intimated to submit fresh samples for testing as per the procedure described above.

2.7 After the passing of samples both in type tests as well as in product testing, the firm will be considered for inclusion in the list of 'Vendors for Developmental order' of 'Vendor Directory', for the type of liners developed, as per the criteria laid in the ISO document for vendor approval.

B. SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE OF GLASS FILLED NYLON-66 & HIGH VISCOUS NYLON-66 LINERS

1. SCOPE

The schedule of technical requirements covers the norms for manufacture of Glass Filled Nylon-66 & High viscous Nylon-66 liners to be used in track on Indian Railways.

2. GENERAL & MANUFACTURE FACILITIES

The vendor seeking approval shall comply with all the following requirements.

2.1 Covered area with adequate space for storage of raw material and finished product should be available which should be free from dampness and humidity. The vendor should have separate damp free secured bond room with adequate space for accommodating at least 50,000 nos. of the finished product.

2.2 De-humidifier with digital temperature and humidity controller & indicator of dew point of suitable capacity for pre-dehumidification of raw material should be available. Low Pressure Vacuum drying equipment can also be used for the above purpose as an optional equipment.

2.3 Horizontal screw type fully automatic PLC based injection-moulding machine should be available for moulding, preferably 380 gms shot (granules) capacity.

2.4 Temperature of hydraulic oil and moulds should be kept controlled by suitable cooling system.

2.5 Electrical hoist/manual block & tackle for mounting & dismounting of moulds should be available.

2.6 Suitably designed dies & moulds for products (minimum 2 numbers for each size & drawing number) should be available. Dies/moulds may be of two cavity or multi-cavity type. Permission will be given for bulk production as per the mould used at the time of approval. It is mandatory to use hot runner moulds if moulds having more than 4 cavities are used. However, there shall be no bar on use of hot runner moulds for four cavities or lesser.

2.7 Annealing tank of suitable capacity with thermostat facility and digital temperature indicator should be available.

2.8 All the moulds/dies shall be of hardened steel including the mould for tensile test piece. The manufacturer's insignia, drawing number and cavity number shall have permanent engraving while the manufacturing year marking may be of injector-pin type.

2.9 The manufacturer should have all in-house arrangements for screen printing.

2.10 De-flashing tools of suitable design in adequate numbers should be available.

2.11 Minimum infrastructure for maintenance and polishing of dies & moulds should be available in-house.

2.12 Generator of adequate capacity should be installed to take up the load of the entire plant in case of power failure.

3. TESTING FACILITIES

A. Common for GFN and HVN Liners

3.1 Ambience in the testing laboratory should be suitably controlled for humidity and temperature with digital indicator facilities.

3.2 Computerized tensile testing machine with extensometer or suitable measuring arrangement and all provisions in accordance with ASTM-D-638-14 & EN-ISO 527-1:2019 or testing strength and elongation percentage and speed gear system to suit the different testing speeds for different types/drg. no. should be available. Test fixture for checking cross breaking load /cross bending strength should be available.

3.3 Necessary apparatus for testing the melting point and specific gravity in accordance with IS: 5762-1970 & BS EN ISO 1183-1:2019, respectively with digital display for melting point should be available. The weighing balance used for weighing samples in air/water should have digital display.

3.4 A digital type chemical balance with capacity to read up to 4^{th} decimal place should be available.

3.5 Digital vernier calipers should be available.

3.6 One Rockwell hardness tester having R-scale facility along with standard test block should be available.

3.7 One muffle furnace of capacity 0-1000ºC with temperature controller & indicator should be available along with sufficient numbers of desiccators and crucibles for checking glass filler by ash content (%).

3.8 Stopwatch with least count reading of 0.1 seconds should be available.

3.9 Barometer & hygrometer should be available in the laboratory.

3.10 Two sets of all measuring gauges of the products, hardened / chrome plated should be available.

3.11 One magnifying glass of min 20x magnification should be available for checking surface finish and internal cavity.

3.12 For checking calibration of tensile / compression testing machine, preferably one number proving ring of min. 5t capacity duly calibrated by NABL should be available with suitable links for in-house calibration.

3.13 It is preferable that 3-D laser based equipment be used for measurement of critical dimensions (i.e. liner thickness, rib thickness and outer dimension) of GFN and HVN liners with facility for laser paint marking (green dots for dimensionally OK material and red dot for dimensionally not OK material). The equipment should have provision of automatic segregation of passed and un-passed material. The equipment shall be installed on the production line (after annealing).

B. Additional testing facilities for HVN Liners

3.14 One Ubbelohde type Viscometer as per ISO 307, complying with the requirements of size no. 2 of ISO 3105, for measuring viscosity number should be available. 96% sulfuric acid shall be used.

3.15 Apparatus for measuring surface roughness in 'Ra' should be available.

3.16 Colorimeter or spectrophotometer should be available to measure RAL.

3.17 Apparatus / fixture for measurement of Flexural Strength should be available.

3.18 Apparatus for testing the melting point as per ISO 11357-3-2018 should be available.

3.19 Apparatus for conducting Impact test as per Appendix-XII should be available.

4. QUALITY CONTROL REQUIREMENTS

4.1 There should be a system to ensure the traceability of the product from raw material stage to finished product stage. This system should also facilitate identification of the raw material composition from the finished product stage.

4.2 It should be ensured that the system of First-in First-out is followed for raw material and the products at the intermediate stages.

4.3 Ti should be ensured that the Quality Assurance Programme should include following aspects:

- Organizational Chart
- Flow process chart
- Stage inspection details
- Non conformities in various parameters & control over them

The QAP shall be available as per the requirement detailed in ISO documents issued by RDSO / Lucknow.

4.4 There should be at least one plastic technologist having minimum bachelor's degree in relevant field and 5 years' experience or a person with diploma in relevant field with 12 years' experience. He should be free from day-to-day production, testing & quality control responsibilities. He should be mainly responsible for development and regular production of the product, analysis of products, control over raw material, corrective action in case of difficulties in achieving the parameters.

4.5 It should be ensured that the in-charge of the quality control section possesses minimum bachelor's degree in the relevant field with minimum 5 years' experience or a diploma in the relevant field with minimum 8 years'

experience. He should be actively involved in day-to-day activities of quality control / stage inspection / compliance of QAP etc.

4.6 The firm should have acquired ISO: 9000 certification and the product for which an approval is sought should be broadly covered in the scope of the certification for manufacture and supply.

4.7 The quality manual of the firm for ISO: 9000 should clearly indicate the control over manufacturing and testing of the said railway product.

4.8 It should be ensured that proper analysis is being done on monthly basis to study the rejection at various internal stages with proper documentation.

4.9 It should be ensured that all the relevant drawings, specifications, IS, BS standards, ASTM, ISO and test methods are available with the firm.

4.10 It should be ensured that the dies and moulds are checked for accuracy for various critical predefined dimensions at least on weekly basis or after production of 50,000 pieces, whichever is earlier and observations are recorded. The wear and tear of nozzle and barrels of injection moulding machine should also be checked at least once in a month or after production of 50,000 pieces (whichever is earlier) & observations should be recorded. Rectification should be done if warranted as per the observations.

4.11 Training need should be identified for all concerned officials and regular training shall be organized and imparted on maintenance of machine, quality assurance, safety parameters etc. Records of such trainings shall be maintained.

C. PROFORMA FOR TECHNICAL CAPABILITY ASSESSMENT FOR MANUFACTURE AND SUPPLY OF GFN/HVN LINERS DRAWING NO……..

(To be filled in duplicate. Attach extra sheets wherever necessary)

1.0 SECTION-I : GENERAL INFORMATION (For record purpose only)

1.1 Name of the firm:

1.2 Address:

(a) Head Office

(b) Works

(c) Location of works …….Km.

From ……Railway Station.

1.3 Factory Area (Sqm):

a) Covered

b) Uncovered

c) Is the factory site in your name or on rental basis?
Support with documents.

d) Telephone No. / Mobile No.

(i) Head Office
(ii) Works

e) Telegraphic / Telex / Fax / E-mail ID address

(i) Head Office
(ii) Works

1.4 SSI/NSIC Registration No. (Enclose Copy):

1.5 Power availability (KVA)

(a) General allotted capacity

(b) Standby generator and its capacity
Diesel Generator of adequate capacity should be installed to take up the load of the entire plant in case of power failure

(c) Name the party / person in whose name the power is sanctioned and agreement with the party/person (Support with documents)

1.6 Name of any other units located in the above premises.
(As indicated in 1.3)

1.7 Man Power Management:

(a) Managerial staff

(b) Shop floor Engineers / Supervisors
(Numbers with qualifications and service experience)

(c) Laboratory In charge, whether full time or part time. Indicate the name, qualification and service experience

(d) Inspection & quality control staff,
(Provide names, qualifications and service experiences).

(e) Workmen

(i) Highly skilled

(ii) Semi-skilled

(iii) Un-skilled.

2.0 SECTION-II: TECHNICAL INFORMATION

(Availability of Plant & Machinery as indicated by manufacturer should be physically verified by the assessment official)

2.1 Infrastructure for production and production capability

2.1.1 Automatic screw type injection moulding machines:

Indicate:

a) Their numbers

b) Shot capacity of each machine

c) Make of the machines

d) Age of each machine

e) Automatic temperature control Device range

Note: Preferably Horizontal screw type fully automatic PLC based injection-moulding machine should be available for moulding of min. 380gms shot (granules) capacity.

2.1.2 De-humidifier with digital temperature, indicate:

a) Number

b) Capacity

c) Make

d) Age

e) Automatic temperature control device at 80-85°C range

Note: De-humidifier with digital temperature and humidity controller with indicator of suitable capacity for pre-dehumidification of raw material should be available. The unit shall be of sealed unit type so that granules, after preheating are charged into the injection machine automatically by suction avoiding any contact with ambient air.

2.1.3 Electrical Thermoplastically controlled annealing baths capable of heating water up to 100°C)

(a) Nos.

(b) Size

(c) Availability of thermostat facility and digital temperature indicator

2.1.4 Source of Raw material

2.1.5 Arrangement for storing of Raw material

Note: Covered area with adequate space for storage of raw material and finished product free from dampness and humidity should be available..

2.1.6 Tool room cum die making facilities:

a) De-flashing tools of suitable design in adequate nos. should be available

b) Minimum infrastructure for maintenance and polishing of dies & moulds should be available in-house

2.1.7 Any other facilities which the firm considers relevant

2.1.8 Rated production capacity per month

2.1.9 Describe arrangement for storing finished product, batch wise to avoid mixing:

Note: Covered area with adequate space for storage of raw material and finished product free from dampness and humidity should be available.. The firm should have separate damp free secured bond room with adequate space for accommodating at least 50,000 nos. of finished product.

2.2 Test facilities cum quality control steps.

2.2.1 Laboratory room

(i) Size of room.
(ii) Air conditioning arrangement for controlling temperature and humidity in the room.

2.2.2 Laboratory equipment/ test facilities. Indicate availability of the following equipment / test facilities. All equipments should be in working order:

SN	Test	Requirement	Indicate availability
2.2.2.1	Test facilities for tensile strength	Test method as per ASTM D-638-14, Computerized Tensile testing machine i) Type ii) Make iii) Age iv) Capacity: 2.5M/T(min.) v) Operating speed 1.5mm/min, 5.0mm/min, 50mm/min	
2.2.2.2	Test facilities for cross breaking strength	Test method as per IS:1998-1962	
2.2.2.3	i) Testing facility for Melting point test (for GFN)	Test Method as per IS:5762-1970 or capillary method apparatus	
	ii) Testing facility for Melting point test (For HVN)	Test Method as per ISO 11357-3-2018 (DSC method)	
2.2.2.4	Specific gravity test	Test method as per BS EN ISO 1183-1:2019 i) Single pan chemical balance (Accuracy: 0.1mg) ii) Beakers etc.	
2.2.2.5	Hardness test	Test method as per ASTM-D-785-08(Hardness tester Rockwell)	
2.2.2.6	Facility for check on glass filler by ash (%)	i) Single pan chemical balance (accuracy: 0.1mg) ii) Muffle furnace, temp. 1000°C iii) Desiccators iv) Crucibles	
2.2.2.7	Facility for Cross-breaking load test for GFN liners and cross bending strength for HVN liner	Compression testing machine & arrangement as per IRST for liners (Attach drawing of test fixture and loading arrangement)	

2.2.2.8	Facility for compressive load for GFN liners	-Do-
2.2.2.9	Facility for measurement of Viscosity number of HVN	One Ubbelohde Viscometer as per ISO 307, of size no. 2 complying with the requirements of ISO 3105.
2.2.2.10	Facility for checking surface of HVN Liner	Apparatus for measuring surface roughness in Ra
2.2.2.11	Facility for checking colour code of HVN Liner	Colorimeter or spectrophotometer should be available to measure RAL
2.2.2.12	Gauge for dimensional check	Minimum two sets as per RDSO drawing
2.2.2.13	i) Fixture for Flexural Strength Test	As per Annexure-X of IRS T-44
	ii) Fixture for Impact test of HVN	As per Annexure-XII of IRS T-44
2.2.2.14	In house facility for checking calibration of tensile testing machine	Min. 5t capacity tension/ compression proving ring calibrated by NABL or other Govt. approved test house with suitable fixing links.

2.2.3 Facilities for measuring through 3D laser (preferable).

2.2.4 Periodicity of checking calibration of equipment and agency deployed for checking calibration:

2.2.5 Do you undertake the raw material identification tests before its use or depend upon the supplier's certificate?

2.2.6 Staff strength:

a. Production staff
b. Quality assurance:
(Production stage, Lab Testing)
i) Staff for quality monitoring in production stage
ii) Staff for laboratory testing

2.2.7 Do you possess the relevant standards (BS, ASTM, BIS / IS) as referred in IRS Specification for GFN/HVN Liner. Please list these as per availability.

2.2.8 Describe (in a separate sheet) the various steps for stage inspections for quality monitoring and

control during production. The quality assurance programme (including the proforma for maintenance of records) proposed to be adopted for the product, should be submitted.

3.0 SECTION-III: EXPERIENCE (For record purpose only)

3.1 Indicate various types of items being manufactured in your works and the name of the agency / client for whom it is being manufactured.

3.2 Indicate important customers for the last three years both Govt. and non Govt. if any, for information furnished in your reply to 3.1.

3.3 Indicate details (contract reference, item and quantity manufactured and supplies of important orders executed in the past three years for the following. Indicate the inspecting agency for each

(i) Govt. Department, Central, State and Govt. Undertaking other than Railway
(ii) Directly to the Railways.
(iii) Outside important firms.

3.4 Please specify current orders in hand on your firm (Contract reference, client, item, quantity under manufacture and supply)

3.5 Whether firm is already registered with RDSO for other P. Way items. If so, name the item with supporting documents.

3.6 Whether firm is already registered with RDSO for items other than P. way items. If so, name the item with for registered, supported by documents.

3.7 Indicate annual turnover of your company.

4 DECLARATION:

4.1 We do hereby declare that the above particulars are correct and no discrepancy shall be found during actual investigation before and during execution of order on our firm.

4.2 Any change in the plant and machinery and change of place of office and of works site shall be brought to the notice of RDSO for clearance and approval.

4.3 We also declare that our concern has not been black-listed by Railways / Railway Board / RDSO for business with the Railways.

4.4 We hereby undertake that all our equipments for manufacturing and testing as listed above shall be maintained in good working order at all times.

4.5 We hereby declare that the contents and the instructions of latest "Apex ISO document for Vendor Approval" issued by RDSO have been read and understood by us and our firm agrees to abide by all the stipulations laid therein.

Signature of Authorized Signatory
(Name and Designation)

Place:

Date: Stamp of the firm