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| ISO 9001:2015 | Document No. TDG 0005 | Rev. 2-3 | Date Effective 00/04/2025 |
| Document Title: Item Specific Guideline & Schedule of Technical Requirements for Manufacture and Supply of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners | | | |



RESEARCH DESIGNS AND STANDARDS ORGANISATION

Manak Nagar, Lucknow - 226011

Document No. TDG 0005 Rev. ~~'2'~~ **'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 |
| 00.04.2025 | 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-44-2023 (**Rev. 2 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 for manufacturing & 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 Procedure / Details

Procedure/details are annexed.

4.0 Referenced Documents:

- i) IRS Specification for Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners, IRS T-44-2023
- 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/AIE/ ADE | M&C Dte. | All approved vendors through website |
| Compliance of directives contained in this document | DD/ AIE/ ADE | Director/ Track Design -IV | - | - | - |
| Requirement of deviation from this directive | ED/Track-II/ Director/Track-IV | PED/ INFRA-I | DD/AIE/ ADE | M&C Dte. | - |

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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 |
| AIE | Assistant Inspecting Engineer. |
| ADE | Assistant Design Engineer. |

8.0 The process of approval of 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 website <https://www.ireps.gov.in>.
- ii) Submit duly filled-in online fresh application form along with vendor registration charges as applicable at the time of submission.
- iii) Upload the document as mentioned along with QAP and legal documents for technical approval by this office.
- iv) The specification & relevant drawings are available on RDSO website & UVAM portal and same can be downloaded from RDSO website. The charges of these documents are included in fresh registration charges and no need to deposit separate charges for these documents at the first time.
- v) Application / proforma along with documents & charges will be scrutinized by RDSO and if details are found satisfactory, the works unit of the firm will be visited for Capability Assessment.
- vi) If any shortcomings are observed during the visit, the same will be conveyed to the firm for their compliance.
- vii) After satisfactory compliance by the firm, the firm shall be advised to submit Inspection gauges of the drawings for the particular item applied for will be checked and approved prior to / during STR verification visit.
- (viii) After satisfactory verification of documents and CCA (Capacity cum Capability Assessment), the name of the firm shall be considered to be placed in the **“List of RDSO vendors for Developmental order”** for 24 months period subject to technical clearance of Prototype / Test samples and successful completion of field trials for the 6 months duration (to be mentioned in check note in Vendor directory). The field trial shall be required only for HVN liners.
- (ix) After clearance / approval of two sets of inspection gauges as mentioned in para (vii) above, the firm would be advised to start trial production and to 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 would be advised for drawl of samples manufactured in presence of RDSO official from their works.

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- (x) The testing of the samples drawn will be carried out as per clause laid down in IRS Specification for Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners, Sl. No. T-44-2023 (Rev. 2). If test report is found satisfactory and other conditions are fulfilled, the conditional check note in Vendor directory as mentioned in para viii) above shall be removed. The firm will be advised to start production of the product. If implementation of QAP is found satisfactory, the purchaser may be advised to get the inspection of the initial quantity by RDSO/nominated inspecting agency and regular quantity by nominated inspecting agency.
- (xi) In the case of new Vendor/firms the process of approval will be initiated only if the firm has applied on-line or has been placed with developmental order from Zonal Railways / Railway Board or given go ahead from RDSO as per instructions /guidelines of Railway Board from time to time. Rest of the procedure for approval will be the same as detailed in para 1.0 above.
- (xii) In case, firms approved for manufacturing of one drawing for a particular item (GFN/HVN), desires to develop the product to other drawings for 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 at RDSO. If test results on samples found satisfactory, the firm would 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 mentioned in RDSO's latest ISO apex document.

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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 to vendor seeking approval 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-44-2023.
2. After 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 and these shall be drawn by him. 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 invited 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 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.

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B. SCHEDULE OF TECHNICAL REQUIREMENTS OF FIRMS 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 permanent way track on Indian Railways.

2. GENERAL & MANUFACTURE FACILITIES

The vendor seeking approval shall comply with all the below mentioned requirements.

- 2.1 Covered area with adequate space for storage of raw material and finished product should be available which is free from dampness and humidity. They should have separate damp free secured bond room with adequate space for accommodating at least 50,000 nos. of such finished product.
- 2.2 De-humidifier with digital temperature and humidity controller & indicator of dew point of suitable capacity for pre-dehumidiation of raw material should be available. Low Pressure Vacuum drying equipment can also be used for 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 nos. for each size & drawing no.) should be available. Dies/moulds may be of two cavity or multi-cavity, but permission will be given for bulk production as per the cavity number used during approval time. It is mandatory to use hot runner moulds in case where manufacturer is using moulds having more than 4 cavities. However vendors who desire to use hot runner mould having four cavities or less is permitted.
- 2.7 Annealing tank of suitable capacity with thermostat facility and digital temperature indicator should be available.
- 2.8 All the moulds/die shall be of hardened steel including the mould for tensile test piece. The manufacturer's insignia, drg. no. and cavity no. shall have permanent engraving while the manufacturing year marking may be of injector-pin type.
- 2.9 The manufacturer should have all in-house arrangement for screen printing so that the products treated & finished inside the factory.
- 2.10 De-flashing tools of suitable design in adequate nos. to be available.

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- 2.11 Minimum infrastructure for maintenance and polishing of dies & moulds should be available in-house.
- 2.12 Diesel 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 facility.
- 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 should also 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 should exist with digital display for melting point. The weighing balance used for weighing sample in air/water should have digital display.
- 3.4 A single pa digital type chemical balance shall be available having capacity to read upto 4th decimal.
- 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 0-1000°C with temperature controller & indicator should be available along with sufficient numbers of desiccator 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 in the laboratory should be available.
- 3.10 All measuring gauges of the products should be hardened/or chrome plated (two sets).
- 3.11 One magnifying glass of min 20x for checking surface finish and internal cavity should be available.
- 3.12 For checking calibration of tensile / compression testing machine, preferably one number proving ring of min. 5t capacity duly calibrated by NPL should be available with suitable links for in-house calibration.

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- 3.13 3-D laser based equipment for measurement of critical dimensions (i.e. liner thickness, rib thickness and outer dimension) of GFN liners with facility for laser paint marking (green dots for dimensionally OK material and red dot for dimensionally not OK material) with provision for automatic segregation of pass and un-passed material shall be provided. The equipment shall be provided on production line (after annealing) itself.-

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, ~~with the use of sulphuric acid 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 test should be available.~~
- 3.18 Necessary apparatus for testing the melting point as per ISO 11357-3-2018
- 3.19 Necessary 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 to identify the raw material composition from the finish product stage.
- 4.2 Ensure that the system of First-in First-out is followed for raw material and the intermediate stage products.
- 4.3 Ensure that there is a Quality Assurance for the product detailing various 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 details in ISO documents issued by RDSO / Lucknow.
- 4.4 There should be at least one plastic technologist having a minimum bachelor's degree in relevant field & 5 years experiences or a person with diploma in relevant field with 12 years experience. He should be free from day-to-day production, testing & quality control responsibility. 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 Ensure that the in-charge of the quality control section is having a qualification of minimum bachelor's degree in the relevant field and have minimum five

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years experience or a diploma holder 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 at any stage the control over manufacturing and testing of the said railway product.
- 4.8 Ensure that proper analysis is being done on monthly basis to study the rejection at various internal stages and it is documented.
- 4.9 Ensure that all the relevant drawings, specifications, IS, BS standards, ASTM, ISO and test methods are available with the firm.
- 4.10 It is to 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 checked at least once in month or after 50,000 nos. production (whichever is earlier) & observation recorded & shall be rectified if warranted by such records.
- 4.11 Training need should be identified for all concerned officials & regular training shall be organized & imparted on maintenance of machine, quality assurance, safety parameters etc. & records maintained.

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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 worksKm.

FromRailway 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, if available.

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 your 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)

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1.7 Man Power Management:

- (a) Managerial staff
- (b) Shop floor Engineers / Supervisors
(Their nos. with their qualifications and service experience)
- (c) Laboratory In charge whether full time or part time. Indicate their names, qualifications and service experience
- (d) Inspection & quality control staff,
(give their name, qualifications and service experience).
- (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 their:

- 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 (granuls) capacity.

2.1.2 De-humidifier with digital temperature, indicates:

- a) Number capacity
- b) Make
- c) Age
- d) Automatic temperature control device at 80-85°C range

Note: De-humidifier with digital temperature and humidity controller & indicator of suitable capacity for pre-dehumidiation of raw material should be available. The unit shall be

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of sealed unit type so that granules after preheating is charged into the injection machine automatically by suction awarding and contact with ambient air.

2.1.3 Electrical (Thermoplastically controlled annealing baths capable of heating water upto 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 should be available which is free from dampness and humidity.

2.1.6 Tool room cum die making facilities:

- a) De-flashing tools of suitable design in adequate nos. to 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 should be available which is free from dampness and humidity. They should have separate damp free secured bond room with adequate space for accommodating at least 50,000nos. of such finished product.

2.2 Test facilities cum quality control steps.

2.2.1 Laboratory room

- (i) Size of room.

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- (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) ii) Testing facility for Melting point test (For HVN) | Test Method as per IS:5762-1970 or capillary method apparatus 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 | Compression testing machine & arrangement as per IRST for liners. (Attach drawing of test fixture and | |

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cross bending loading arrangement)
strength for HVN
liner

- 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 of surface of HVN Liner Apparatus for measuring surface roughness in Ra
- 2.2.2.11 Facility for checking color 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 & XII A 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.
- 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:
- Production staff
 - Quality assurance:
(Production stage, Lab Testing)
 - Staff for quality monitoring in production stage
 - Staff for laboratory testing
- 2.2.7 Do you possess the relevant standards (BS, ASTM, BIS / IS) as referred in IRS Specification

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| ISO 9001:2015 | Document No. TDG 0005 | Rev. 2-3 | Date Effective 00/04/2025 |
| Document Title: Item Specific Guideline & Schedule of Technical Requirements for Manufacture and Supply of Glass Filled Nylon-66 & High Viscous Nylon-66 Insulating Liners | | | |

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

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- 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 shall agree to abide by all the stipulations laid therein.

Signature of Authorized Signatory
(Name and Designation)

Place:

Date:

Stamp of the firm