GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

(RAILWAY BOARD)

INDIAN RAILWAY

STANDARD SPECIFICATION

FOR

GLASS FILLED NYLON-66 & HIGH VISCOUS NYLON-66 INSULATING LINERS

SERIAL NO. T - 44 - 2025

(Fourth Revision)

RESEARCH DESIGNS AND STANDARDS ORGANISATION

LUCKNOW – 226 011

CONTENTS

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0. FOREWORD

1.1 This specification was originally issued in 1980. In its first revision in 1987, the tensile and cross-breaking strength values were revised.

1.2 In the second revision of the provisional specification issued in 1993, the acceptance tests earlier required to be conducted on “as moulded specimens” were specified to be conducted on liners after the conditioning, except that the cross-breaking load test of GFN Liner shall be done on “as moulded” liners.

1.3 For deciding whether a particular requirement of this standard is complied with, the final value observed or calculated expressing the results of a test or analysis, shall be rounded off in accordance with IS 2. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1.4 The IRS Specification (provisional)-1993 second revision was discussed in the 66th Track Standards committee meeting and as approved by the Railway Board, the specification has been issued under the fixed serial No.T-44-1995 with minor modification in clause 4.2.2 in the present form.

1.5 To improve the quality and serviceability, corrigendum no. 01 to 06 were issued in 2007, 2009, 2010, 2013, 2016 & 2018 respectively.

1.6 This specification has now been revised and issued in 2020 to cover the entire Corrigendums issued to this specification till date and updating the latest revision of relevant codes.

1.7 This specification has now been revised and issued in 2025 to cover the provisions for HVN-66 liner.

1. SCOPE

This specification covers the requirements, method of tests and sampling for Glass filled Nylon-66 and High Viscous Nylon-66 insulating liners interposed between the rail and the Elastic Rail Clips in rail fastening assembly mainly to provide electrical insulation.

All the provisions contained RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 dated 30.11.2022. (titled *"vendor-changes in approved status"*) and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways, to maintain quality of products supplied to Railways.

2. TERMINOLOGY

2.1 **GFN-66:** It is glass filled nylon-66

2.2 **HVN-66:** High Viscous Nylon-66

2.3 **As moulded specimen:** It is defined as that specimen which upon immediate removal from the mould is sealed in container impermeable to moisture/water vapour.

2.4 **Dry weight:** It refers to the weight of the as moulded specimen

2.5 **Conditioning:** It is the process which consists in keeping the liners immersed in boiling water for a period sufficient for the liner to absorb specified percentage of water.

2.6 **Type tests:** These refer to the tests given in Table-1 of this specification to be conducted on moulded test specimen to assess the moulding capability/process control of a firm for quality assurance.

2.7 **Pre-acceptance tests:** These refer to the tests which are required to be conducted on the test specimen before according clearance to the firm for bulk production of liners.

2.8 **Acceptance tests:** These refer to the tests conducted on the liners for purpose of acceptance/rejection of the liners during inspection.

3. REFERENCE DOCUMENTS:

3.1 This standard refers to the following/BS/IS/ASTM specifications. These should be available at the manufacturer's work premises for reference.

S. No.	Standard	Title
~~1.~~	~~IS:5762-1970, (Reaffirmed 2020)~~	~~Method for Determination of Melting Point and Melting Range.~~
2	BS EN ISO 1183-1:2019	Plastics- Method for determining the density of non cellular plastic
3	BS ISO 14309:2019	Rubber, Vulcanized or thermoplastic- Determination of volume and/or surface resistivity
4	IS:1998-1962 (Reaffirmed 2018)	Method of test for thermosetting synthetic resin bonded laminated sheets.
5	(ASTM D785 – 08(2015)	Standard test method for Rockwell hardness of plastics and electrical insulating materials.
6	ASTM-D-638-14	Standard test method for tensile properties of plastics.
7	ASTM-D-149-20	Standard test method for dielectric breakdown voltage and dielectric strength of solid electrical insulating materials at commercial power frequency.
8	IS: 2-1960 (Reaffirmed 2016)	Rules for rounding off numerical values.
9	IS:7151-91	Corrugated fiberboard boxes for para-dropping of supplies – specification
10	ISO:178:2010 or ASTM:D790	Determination of flexural properties
11	ISO: 307	Determination of viscosity number
12	IS :3073-1967 (Reaffirmed 2009)	Assessment of surface roughness
13	ISO 111357-3:2018	Determination of temperature and enthalpy of melting and crystallization
14	ASTM D3418-21	Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

3.2 The specific provision in this standard will over-ride these in the above specification where these are not in conformity with one another. Any specific requirement given in the drawing of the liner will over-ride the relevant provision of this standard specification.

3.3 RDSO drawings relevant to the liner under production should be available for reference at the manufacturer's works.

4 MANUFACTURE

4.1 Material

4.1.1 Material for GFN Liner: The material used for manufacture of insulating liners shall be glass filled nylon 66 (GFN-66) Moulding Nylon Granules ~~of natural colours~~ with about 33% glass filler equipped with UV resistant properties which should be clearly indicated in the raw material certificate. The Colour scheme shall be as specified in RAL colour standard mentioned in this clause or otherwise mentioned in the relevant drawing. ~~Addition of any colourants during moulding of liners is not permitted and the reconstituted or recovered material shall not be used for the manufacture of liners~~. Regenerated / reconstituted material shall not be used for the manufacture of liners.

The GFN Liner Manufacturer, who possesses the facility of in-house compounding of glass fiber with Nylon 66, shall have a valid tie-up with a Nylon-66 Manufacturer, in the form of a written Memorandum of Understanding (MOU) or Contract.

The GFN Liner Manufacturer, who does not possess the facility for in-house compounding of glass fiber with Nylon 66, shall have a valid tie-up with a GFN-66 Manufacturer, who shall be a producer of Nylon 66, in the form of a written Memorandum of Understanding (MOU) or Contract

4.1.2 **Material for HVN Liner**: The material used for the manufacture of Insulating Liners shall be "High Viscosity Nylon 66". The Colour scheme shall be as specified in RAL colour standard mentioned in this clause or otherwise mentioned in the relevant drawing. Regenerated / reconstituted material shall not be used for the manufacture of liners.

The manufacturer of HVN liner shall have a valid tie-up in the form of a written Memorandum of Understanding (MOU)/Contract with Primary raw material manufacturer for "Nylon 66 (HVN-66)", covering raw material supplies and technical support including quality control. The manufacturer of the HVN insulating liners shall only mould the liners out of the material supplied to them by the primary manufacturer.

Note:

i) Primary raw material manufacturer can have a valid MOU/Contract with one or more manufacturers of HVN liners or vice versa

ii) A Primary raw material manufacturer should mandatorily have facility of polymerization plant to manufacture HVN 66 material starting from the precursor materials like Hexa Methylene Diamine (HMD) and / or Adipo Nitrile (ADN)

The credentials of primary raw material manufacturer should be clearly mentioned in the MoU/Contract and following should include.

a) Declaration that they are the primary raw material manufacture as defined above
b) Grade of raw material being supplied along with its data sheet.

iii) Self-declaration by 'Primary Raw Material Manufacturer (not from the dealer or distributer) of their PA-66 (Nylon 66) polymerization capacity and polymerization plant's location.

iv) Primary Raw Material Manufacturer must notify about available plant capacity to produce HVN (High Viscosity Nylon) PA-66 resin meeting raw material properties mentioned in Table 1B

v) Primary Raw Material Manufacturer should share information about their technical partner or distributor having presence in India, to deliver technical assistance and assist on sustainable suppliability of raw material to Indian Railway's approved vendors for HVN-66 Insulating liners.

vi) Primary Raw Material Manufacturer should apprise Indian Railways about their future localization plan of HVN PA-66 resin manufacturing in India under 'Make-in-India' policy.

vii) Raw material manufacturer should submit supply statement on quarterly basis in signed hard copy as well as in excel format with following information to RDSO.

i) Buyer's name,
ii) Quantity purchased,
iii) Supplier's invoice date, with invoice number,
iv) Buyer's PO number,
v) Supplier warehouse location, buyer plant location etc.

During inspection of HVN Liner, the supplier should submit, the invoice alongwith e-way bill in support of procurement of raw material of particular grade from the primary raw material manufacturer with whom the written Memorandum of Understanding (MOU)/Contract has been signed.

Respective RAL color for HVN-66 / GFN-66 Liner should be colour-fast coloured master batches

S No.	Color	RAL	HVN Liner Drg. No.
1	Brown Red	3011	RT-3702

2	Brown Red	3011	RT-3706
3	Mint Green	6029	RT-3707
4	Cobalt Blue	5013	RT-3708
5	Mint Green	6029	RT-6938
6	Cobalt Blue	5013	RT-6939
7	Brown Red	3011	RT-8751
8	Mint Green	6029	RT-8752
9	Cobalt Blue	5013	RT-8753
10	Mint Green	6029	RT-8222
11	Cobalt Blue	5013	RT-8223

4.1.3 The physical properties of GFN-66 material used for the manufacture of nylon mouldings shall conform to the requirements given against item S. No. 1, 2, 3 of Table-1A. Other properties as given in Table-1A refer to the as moulded test specimen of GFN-66 material.

TABLE-1A (For GFN Liners)

S. No	Property	Units	`Acceptance Values GFN Liner	Test method
1.	Melting point	°C	258-268	~~IS:5762-1970~~ ISO 11357-3-2018
2.	Specific gravity	-	1.38-1.43	BS EN ISO 1183-1:2019
3.	Glass filler/	%	33±2	Appendix IIIA
4.	Hardness Rockwell	R	110(min)	ASTM D-785-08(2015)
5.	Tensile strength	Kg/mm^2	17.5(min)	ASTM D-638-14
6.	Elongation at break	%	10 (max)	-do-
7.	Cross-breaking strength	Kg/mm^2	20.0(min)	IS:1998-1962 (Reaffirmed 2018)
8.	Dielectric strength	KV/mm	11(min)	ASTM D-149-20
9.	Volume resistivity	Ohm. Cm	10^8(min)	BS ISO 14309:2019

4.1.4 The physical properties of HVN-66 material used for the manufacture of nylon mouldings shall conform to the requirements given against item S. No. 1, 2, 3 & 9 of Table 1B. Other properties as given in Table-1B refer to the as moulded test specimen of HVN-66 material.

TABLE-1B (For HVN Liners)

S. No	Property	Units	Acceptance Values HVN Liner	Test method
1.	Melting point	°C	258-268	ISO 11357-3-2018
2.	Specific gravity	-	1.10-1.16	BS EN ISO 1183-1:2019
3.	Ash content	%	0.5 (max)	Appendix IIIB
4.	Hardness Rockwell	R	100 (min)	ASTM D-785-08(2015)
5.	Tensile strength	Kg/mm^2	7.0(min)	ASTM D-638-14
6.	Elongation at break	%	35 (min)	-do-
7.	Dielectric strength	KV/mm	11(min)	ASTM D-149-20
8.	Volume resistivity	Ohm. Cm	10^{14}(min)	BS ISO 14309:2019
9.	Viscosity Number of raw material	cm^3/g	270 (min)	ISO 307
10	Flexural Modulus	Kg/mm^2	250.0 (min)	ISO:178:2010 or ASTM: D 790
11	Flexural strength	Kg/mm^2	9 (min)	As per details in Appendix X

4.1.5 The conformity of physical properties of raw material to clause, 4.1.3 or 4.1.4, as applicable shall be checked through outside independent agencies i.e. Government laboratory or from lab accredited by Accreditation agency as per extant guidelines issued by RDSO or National Test House or Regional Test Centre (RTC).

For this purpose, raw material & samples (specifically prepared & sealed in the presence of RDSO officials) shall be sent to such labs / agencies for testing at firm's cost at a frequency of once in three years and /or in the event of change of raw material procurement source.

The test report of such samples shall be directly sent to RDSO by such labs/agencies. After receipt of satisfactory report, raw material shall be permitted for use. Responsibility of using the passed raw material for manufacture of liners shall lie with the firm.

The records of raw material procurement, whatever the case may be, shall be maintained along with its consumption details and furnished to RDSO/ Railway Officials/Inspecting Authority as and when required by them. The responsibility of ensuring authenticity of all such records shall lie with the firm.

4.2 MANUFACTURING PROCESS

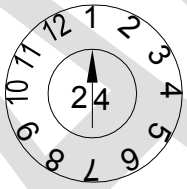
4.2.1 The glass filled nylon-66 and High viscous nylon-66 liners shall be manufactured by automatic screw type injection moulding machine.

Raw Material must be preheated in Dehumidifier Chamber (with dew point from – 20^0 C to – 30^0 C). Before moulding moisture content should not be more than 0.2%.

4.2.2 The GFN liner and shall be conditioned by immersing in boiling water for adequate time to ensure minimum 3% absorption of water for GFN Liner as provided in para 7.7 (iii)

The HVN liner may be conditioned by immersing it in boiling water for a sufficient duration to achieve maximum water absorption up to 1.5%. This conditioning of HVN liner is optional and should be performed solely at the discretion of the manufacturer. The manufacturer should ensure that the conditioning does not adversely affect other properties of the HVN liner.

4.2.3 **Marking:** Each nylon moulding shall be legibly embossed in 3mm letters and figures with manufacturer's initials of manufacture, part number and year and month stamp of 06 to 08mm dia. as shown in RDSO drawing.



4.2.4 **Freedom From Defects:** The surface of the nylon liners shall be smooth, sound and free from moulding defects such as bubbles, splash marks, burn marks, voids, surface sinking, crazing and blistering of the surface, windows, weld lines, laminations, jotting and cracks. All edges shall be neatly finished and free from flash.

5 PRE ACCEPTANCE TESTS:

5.1 **Type tests**: These tests shall be conducted on 'as moulded test specimen' as per scheme of testing given in Appendix I. The results of testing shall conform to the values given in Table 1A & 1B.

5.2 Product testing:

5.2.1 For GFN liners all tests shall be conducted on conditioned liners, for HVN liners all tests shall be conducted on as moulded liners, for the properties and scheme of testing as given in Appendix 1(B). The results of the tests shall conform to the requirements of clause 7.

5.2.2 The cross breaking load test for GFN liner shall be conducted as per method of test given in Appendix II. Each test value shall conform to the requirement of test value given in Appendix II.

5.2.3 The dimensions shall be checked by means of inspection gauges, as per RDSO drawings.

6 ACCEPTANCE TESTS

All tests given under Clause **7** shall be conducted on conditioned GFN liners and un-conditioned HVN liners. HVN liner shall not be conditioned by immersing in boiling water.

6.1 **Lot size:** For purpose of inspection of the liners, 10,000 nos. of liners or part thereof duly conditioned shall form a lot.

6.2 **Sample size:** The sample size for tests shall be as given in each test. The samples for different tests shall be drawn at random from each lot.

7. TESTS

Test as given clause 7.1 to 7.4 shall be conducted on any three of the five sample liners as drawn for internal cavity test under clause 7.5.

7.1 Melting point

Three sample liners per lot shall be checked for melting point of the material of the liners. For acceptance of the lot, each individual sample shall pass the requirement of the test value given in Table-1A for GFN & Table-1B for HVN when tested in accordance with the relevant standard given in respective tables.

7.2 Specific gravity

Three sample liners per lot shall be checked for specific gravity of the material of the liners. Specimen for specific gravity shall be taken from middle portion of the liners. For acceptance of the lot, each individual sample shall pass the requirement of the test value given in Table-1A for GFN & Table-1B for HVN when tested in accordance with the relevant standard given in respective tables.

7.3 Glass filler/ Ash Content

Three sample liners per lot shall be checked for glass filler (percent) for GFN Liners or Ash content (percent) for HVN Liners. For acceptance of the lot, each individual sample shall pass the requirement of the test value given in Table-1A

for GFN & Table-1B for HVN when tested in accordance with the method given in Appendix-IIIA or IIIB as applicable.

7.4 Hardness Test (Method of testing as per ASTM D-785-08)

Three tests sample liners per lot shall be checked for hardness (Rockwell) of the liners at three different locations on the surface of the liners. For acceptance of the lot each individual value on the three sample liners shall not be less than 100 Rockwell for GFN liner and HVN liner.

7.5 Internal cavity test:

Five sample liners per lot shall be checked for internal cavities. On sectioning along "y-y" shown in the PLAN of the liner in fig.1 Appendix-XI, no sample liner shall reveal any internal cavities when examined visually or with the help of a magnifying glass, for acceptance of the lot.

7.6 Dimensional check:

(i) Dimensional checking shall be done with approved inspection gauges as per RDSO drawings. For acceptance, each sample liner should pass the requirement of the gauges. Sampling shall be done as per clause 7.6.1 (ii).

(ii) **Sampling:**

(a) 2% liners per lot shall be checked for dimensions in the first 1,00,000 liners of one design manufactured by a firm.

(b) 0.5% liners per lot shall be checked for dimensions consequent to 1,00,000 liners of one design being found satisfactory. In case, any lot is rejected for dimensions, 2% liners per lot shall be checked from next lot onwards till 1,00,000 liners (in one or more lots) are found satisfactory, and thereafter the sampling rate shall be 0.5% per lot again.

7.7 Percent water absorption test:

(i) For water absorption test, 10 nos. of 'as-moulded' GFN liners from each lot or part thereof produced from all cavities used for production shall be preserved by the manufacturer for determination of dry weight of the liners.

(ii) Three sets, each set consisting of 10 liners, shall form the sample for this test. Average weight of each set shall be considered individually as weight of liner after conditioning.

(iii) For calculation of percent water absorption of liners, the dry weight of liners shall be the average weight of 10 liners, as in para 6 and retained by the manufacturer before conditioning.

(iv) For acceptance of the lot, the percent water absorption for the three sets considered individually shall not be less than 3% for GFN liner when calculated in the manner given in Appendix IV.

7.8 **Cross- Breaking load test:** (for GFN Liners only)

Three samples of GFN liners per lot shall be tested and accepted as explained in clause 5.2.2 above.

7.9 **Viscosity Number:** (for HVN Liners only)

Three sample liners per lot shall be checked for viscosity number. For acceptance of the lot each individual value on the three sample liners shall not be less than 230 cm^3/g.

7.10 **Surface Roughness:** (for HVN Liners only)

Three sample liners per lot shall be checked for surface roughness. For acceptance of the lot each individual value on the three sample liners shall be maximum upto 0.2 Ra. Surface roughness shall be checked both on top and bottom surface of liners.

7.11 **RAL Colour Test:** (for HVN Liners only)

Three sample liners per lot shall be checked for RAL colour shade of moulded HVN Liners. For acceptance of the lot each individual RAL number of the three sample liners shall conform with the requirement given in clause 4.1.2.

7.12 **Cross bending Strength**: **(for HVN Liners only)**

Three samples of HVN liners per lot shall be tested in a manner as shown in Appendix-IX. For acceptance of the lot, none of the liners should break when subjected to a deflection of 20% of the span. The sample HVN liners shall be tested as per the method of testing prescribed in Appendix II.

7.13 **Impact Test (For HVN / GFN Liners):**

Sample HVN / GFN Liners shall be tested for Impact test as per Appendix-XII. For acceptance, each sample HVN / GFN liner should not break or crack. Sampling shall be done as per Appendix-I (B)

8. RE-TEST

8.1 Should any of the test sample fail in in following tests, no re-testing shall be undertaken and lot shall stand rejected.

I Melting point or Specific gravity or Glass filler percentage for GFN liner

ii. Viscosity No. or Melting point or Specific gravity or Ash content percentage or Impact test of HVN Liner or Cross bending strength for HVN liner

8.2 Should only one test sample fail in following tests, twice the number of samples drawn earlier for testing, shall be tested for that particular test in which the earlier sampled failed. In this re-testing all the samples should pass the test value for acceptance of the lot represented by these samples otherwise the entire lot shall be rejected.

i. Hardness or internal cavity or cross breaking load for GFN Liners or

ii. Hardness or internal cavity or surface roughness or Colour test for HVN Liners,

8.3 Should any one test sample fail in dimensions, the manufacturer may re-offer the liners lot wise only once after sorting out the defectives, with written permission of the inspecting authority. The re-offered lot shall be inspected for all tests in terms of acceptance test clause 7. If the reoffered lot fails again in dimensions, entire lot shall be rejected.

8.4 Should the GFN liners fail in percentage water absorption, the liners may be re-conditioned and re-offered for inspection only once, with written permission of the inspecting authority. The re-offered lot shall be inspected for all tests in terms of acceptance test clause 7. If the reoffered lot fails again in percentage water absorption, entire lot shall be rejected.

9. FINAL INSPECTION/TESTING AND DOCUMENTATION

The manufacturer shall carry out the final inspection and testing internally in accordance with the plan of testing given under the acceptance test clause and shall maintain the records as per Appendix-V to Appendix-VII, to ensure that the liners have passed the inspection criteria.

10. PACKING

The liner shall be packed in multiple of 100 nos., in black colour polybags / transparent or translucent polybags / gunny bags so as to avoid loss or damage during transit and 3 to 5 nos. of these polybags / gunny bags shall be put in sturdy corrugated box as per IS:7151-91 and sealed.

11. TEST FACILITIES

The liner manufacturer shall be required to install all the necessary test facilities for inspection of liners in a separate well lit, clean and properly ventilated laboratory room provided with easily maintainable floor and platform.

12. INSPECTION GAUGES

The inspection gauges for dimensional check shall conform to RDSO drawings. The manufacturer shall submit two sets of inspection gauges for the approval of inspecting authority. One set shall be used as 'Master gauge' and shall be preserved safely by the liner manufacturer. The second set shall be for use by the inspecting official. For internal quality control, the firm should use an additional set of gauges as per drawing.

13. DISPOSAL OF REJECTED LINERS

The rejected liners shall be out into pieces and made un-usable.

14. REPORT

The inspection official shall report the test observations in the format prescribed in Appendix-V to VII.

15. GENERAL

15.1 The liner manufacturer shall furnish at his cost, the liners required for all tests and shall provide necessary manpower and facilities for carrying out tests at his cost.

15.2 Purchaser / inspecting officer or his representative shall have free access to the works of the manufacturer at all reasonable times and shall be at liberty to inspect the manufacture at any stage and to call for records, pertaining to manufacture which shall be made available to him within reasonable time.

15.3 Type tests may be repeated at any stage during currency of the contract, at the discretion of the inspecting authority.

15.4 The material shall be offered for inspection as per call letter given in appendix-VIII.

APPENDIX-I

(IRS-T-44-2025)

SCHEME OF TESTING FOR ACCEPTANCE TESTS

(A) TYPE TESTS

S. No.	Property	No. of samples to be tested	Criteria value for acceptance/rejection	No. of samples to be drawn
1	Tensile strength	5	Individual	7
2	Elongation at break	5	Individual	-
3	Cross breaking strength	5	Average	7
4	Di-electric strength	3	Individual	3
5	Volume resistivity	3	-do-	3
6	Hardness	3	-do-	3
7	Melting point	3	-do-	-
8	Specific gravity	3	-do-	-
9	Glass filler/ Ash content	3	-do-	-
10	Flexural Modulus	3	-do-	-
11	Viscosity number	3	-do-	-
12	Flexural Strength	3	-do-	-

Note: (i) Tests at S.No.7, 8 & 9 shall be conducted on broken pieces after the tensile test.

(ii) Tensile strength and Elongation at break tests shall be conducted at speed of 5mm per minute.

(iii) Tensile strength & Elongation at break tests shall be done on the same samples.

(iv) Samples shall be signed by the firm's representative & the inspecting official drawing the samples.

(v) For tests at S.No.1 & 3, two extra samples have been shown to be drawn. These shall be used for setting the test equipment before final testing.

(vi) S.No.10 & S.No.12 are conducted on as moulded specimen and Sr. No. 11 is conducted on Raw Material Granules.

(B) PRODUCT TESTING

S. No.	Property	No. of samples to be tested	Criteria value for acceptance/rejection	No. of samples to be drawn
1	Cross-breaking load of GFN Liner	10	Individual	12
2	Melting point	3	-do-	-
3	Specific gravity	3	-do-	-
4	Glass filler/ Ash content	3	-do-	-
5	% water absorption	8	Average	8
6	Hardness	3	Individual	3
7	Internal cavity test	3	-do-	3
8	Dimensions	8	-do-	8
9	Viscosity no.	3	-do-	3
10	Surface roughness	3	-do-	3
11	RAL colour test	3	-do-	3
12	Impact test	5	Individual	-
13	cross bending strength test	5	Individual	-

Note: (i) Tests at S. No. 2, 3, 4 shall be done on cut pieces of samples after internal cavity test (S. No. 7)

(ii) Test at S. No. 5 shall be done as per Appendix-IV.

(iii) % water absorption test for GFN Liners shall be ensured at firm's premises by the sample drawing authority before collection of samples.

(iv) Samples shall be signed by the firm's representative and the inspecting official drawing the samples.

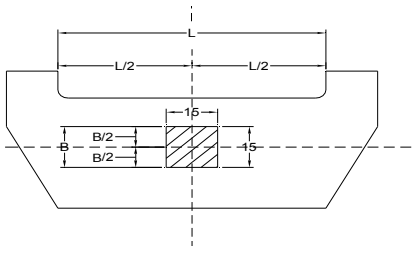
(v) For cross-breaking load test, 2 extra samples have been shown to be drawn. These shall be used for setting the test equipment before final testing.

(vi) Test piece for specific gravity shall be taken from middle portion of the liner.

(vii) Test at S. No. 9 shall be done on cut pieces of samples of HVN liner after internal cavity test (S. No. 7)

(viii) Test at S. No. 10 and 11 shall be done on the same samples of HVN liner before hardness test (S. No. 6).

"Test piece for specific gravity shall be taken from middle portion of liner as shown in the sketch"



TEST FOR CROSS BREAKING LOAD FOR GFN LINER AND CROSS BENDING STRENGTH FOR HVN LINER

1. METHOD

1.1 The test shall be carried out as per IS:1998 with the following changes:

i) The liner will be tested in a manner as shown in-Appendix-IX

ii) The radius of support points and of loading point shall be 1.5 mm.

iii) The distance between the support points, rate of traverse of jaws of the testing machine and the acceptable value of cross-breaking load shall be as given in the table below:

S.No	Drawing No	Distance between support points(x)	Rate of traverse of jaws	Cross breaking load (min) (For GFN Liner)	Cross bending strength at deflection of 20% of the span (For HVN Liner)
(1)	(2)	(3)	(4)	(5)	(6)
1.	RDSO/T-2505	45mm	5 mm/mt	360kg	No break
2.	RDSO/T-3516	45mm	5 mm/mt	420kg	No break
3	RDSO/T-3702	60mm	5 mm/mt	480kg	No break
4	RDSO/T-3706	60mm	5 mm/mt	390kg	No break
5	RDSO/T-3707	60mm	5 mm/mt	720kg	No break
6	RDSO/T-3708	60mm	5 mm/mt	960kg	No break
7	RDSO/T-3723	45mm	5 mm/mt	600kg	No break
8	RDSO/T-8751	60mm	5 mm/mt	490kg	No break
9	RDSO/T-8752	60mm	5 mm/mt	760kg	No break
10	RDSO/T-8753	60mm	5 mm/mt	1000kg	No break
11	RDSO/T-6938	60mm	5 mm/mt	648kg	No break
12	RDSO/T-6939	60mm	5 mm/mt	864kg	No break
13	RDSO/T-8222	60mm	5 mm/mt	885kg	No break
14	RDSO/T-8223	60mm	5 mm/mt	914kg	No break

Note: For GFN liners other than those mentioned above, the CBL value shall be specified by RDSO as per requirement.

The cross bending strength test for HVN liner shall be conducted as per

clause 1.1 above.

A. GLASS FILLER CONTENT

1. METHOD

1.1. Take a crucible and heat it by keeping in a muffle furnace till a constant weight of the crucible is obtained. Let its weight be = W_C

1.2 Take approximately 2 gm of the specimen of the GFN-66 liner in the above crucible and find the weight of the crucible and specimen as above.

Lot combined weight = W_{CGN}

1.3 Then 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.

1.4 Then weigh the above crucible and glass after cooling. Let its combined weight be = W_{CG}

2 GLASS FILLER % CALCULATION

2.1 Find out weight of GFN-66 specimen as:

$W_{GN} = W_{CGN} - W_C$

2.2 Find out weight of Glass filler as:
$W_G = W_{CG} - W_C$

2.3 Therefore, weight of Glass filler % = $\frac{W_G}{W_{GN}} \times 100$

B. ASH PERCENT of HVN LINER

1. METHOD

1.1. Take a crucible and heat it by keeping in a muffle furnace till a constant weight of the crucible is obtained. Let its weight be= W_1

1.2 Take approximately 2gms of the test specimen of the liner in the above crucible and find the weight of the crucible and test specimen.

Let combined weight = W_2

1.3 Then burn the test specimen by keeping the crucible in the muffle furnace at 550 ± 50°C. Allow it to cool to the room temperature.

1.4 Then weigh the above crucible and ash after cooling. Let its combined weight be = W_3

2. ASH % CALCULATION

Weight of nylon test specimen = $W_2 – W_1$

Weight of Ash content = $W_3 – W_1$

Therefore, % Ash content = $\frac{W_3 – W_1}{W_2 – W_1} X100$

Appendix-IV
(IRS-T-44-2025)

PERCENT WATER ABSORPTION (CONDITIONING)

1. PROCESS:

1.1 The GFN-66/HVN-66 liners shall be immersed in boiling water in a water tank for 20 hours or as necessary after which the amount of water absorbed shall be checked.

1.2 The amount of water absorption may be checked by taking the weight (W_b) of 10 liners before and (W_a) after immersion in boiling water.

1.3 Water absorption %

$$= \frac{W_a - W_b}{W_b} \times 100$$

Appendix-V
(IRS-T-44-2025)

Name of the firm: M/s.

Liner to Drg. No.:

…….Railway's P.O No.:
Quantity on order:

Test results of

1. Internal Cavity
2. Cross Breaking Load
3. % Water absorption
4. Viscosity No.
5. Colour Test
6. Cross Bending Strength

Lot No	Qty. in Nos.	Internal cavity Test for GFN/HVN liner	Cross breaking load test of GFN Liner	Water absorption test for GFN/HVN Liner	Viscosity no. test for HVN Liner	Colour Test for HVN Liner	Cross bending strength of HVN Liner at deflection of 20% of span

		Sample No.	Free from Internal cavity Yes / No	Sample No.	Cross Breaking Load (Kg)	Sample No.	% water absorption	Sample No.	Viscosity No.	Sample No.		Sample No.	Break (Yes /No)
1	10000	1		1		1.1		1		1		1	
		2		2		2.		2		2		2	
		3		3		3.		3		3		3	
		4				4.						4	
		5				5.						5	
2	10000	1		1		1.		1		1		1	
		2		2		2.		2		2		2	
		3		3		3.		3		3		3	
		4				4.						4	
		5				5.						5	

& so on

Appendix-VI
(IRS-T- 44-2025)

Name of the firm:

M/s

TEST RESULTS OF

(1) Melting point
(2) Specific gravity
(3) Ash content
(4) Hardness
(5) Surface Roughness

(1) Liner to Drg. No.

(2) Qty. on order

(3) ….Railway's P.O. No

Lot No	Qty. in Nos.	Sample No.	Melting point	Specific gravity	Glass filler of GFN Liner/ Ash content of HVN Liner	Hardness (min)	Surface Roughness HVN Liner

1	10,000	1					
		2					
		3					
2	10,000	1					
		2					
		3					

Appendix-VII
(IRS-T-44-2025)

Name of the firms:

M/s

TEST RESILTS OF: DIMENSIONS & IMPACT TEST

(1) Liner to Drg. No.
(2) Qty. on order:
(3) …Railway's P.O. No.

Lot No	Qty in nos.	Sample size	Dimensions		Impact test (For HVN / GFN Liner)	
			As per gauges to drg. no.	Failing in dimension	No Break/Crack	Break/Crack
1	10,000	50	Satisfactory	-	Satisfactory	-

Appendix-VIII
(IRS-T-44-2025)

Letter of offer from the firm

(Address of inspecting agency)

Sub: Call letter for inspection of GFN-66/ HVN-66 insulating liner to drg. No. RDSO/T..

Ref: …Railway P.O. No……. dt….. for GFN-66/HVN-66 liner to drg. No. RDSO/T…

GFN-66 / HVN-66 insulating liners as per following details are offered for inspection in terms of the above referred purchase order. These have been internally checked and found satisfactory as per drawing no. RDSO/T…. and relevant IRS specification.

The test results are mentioned in the proforma as prescribed in the IRS specification.

1. Lot No.
2. Quantity on order
   (a) Against original order

(b) Against extension

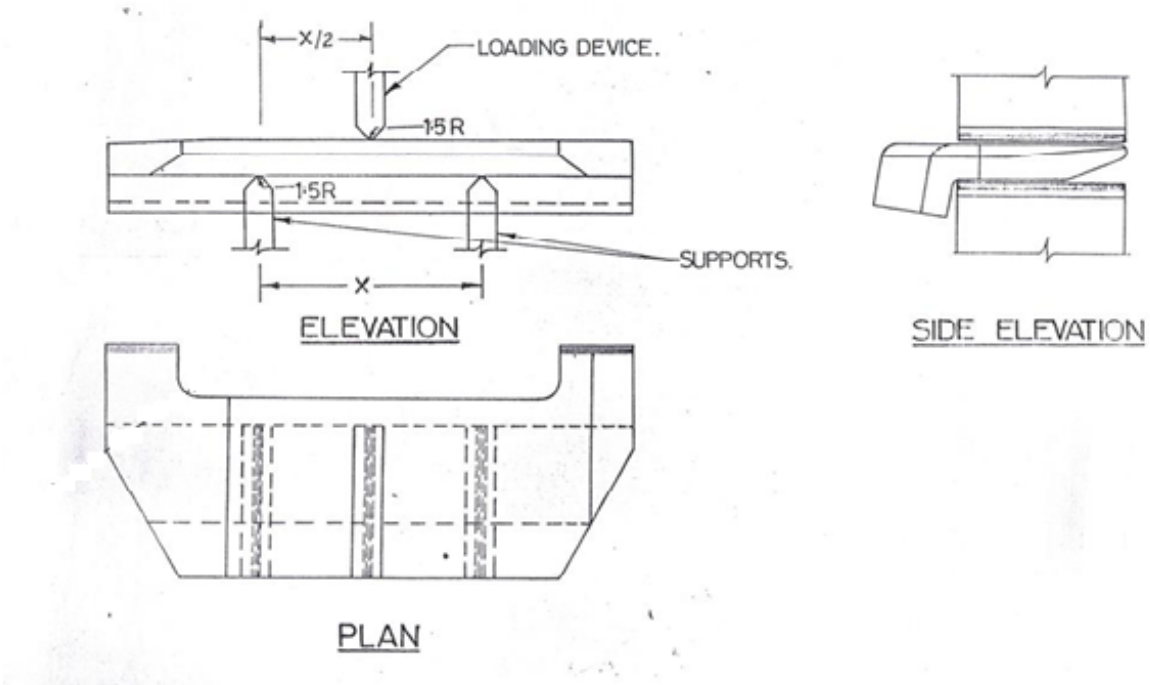
3. Quantity previously inspected and passed
4. Quantity now offered for inspection
   (a) Against original order
   (b) Against extension
5. Rate per liner
6. Marking on liner
7. Delivery period
   (a) Original
   (b) Extended
   (c) Letter No. (for extension)
8. Consignee
9. Consignee letter of authority no.
10. Packing
11. Test certificate of raw material

Thanking you,

Yours faithfully,
(Signature with date of the
firm's authorized person)

Appendix-IX
(IRS-T-44-2025)

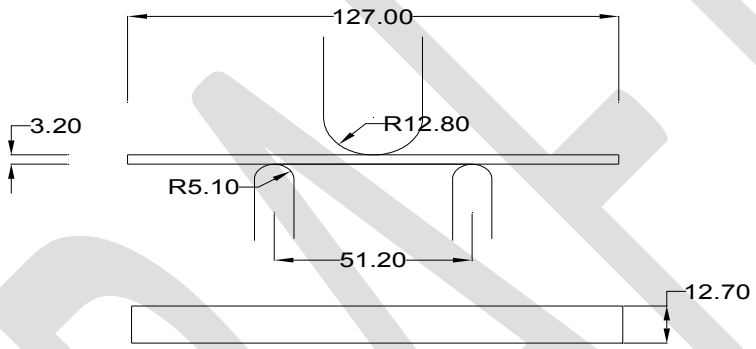
CROSS BREAKING LOAD TEST ARRANGEMENT



1. All dimensions are in mm.
2. The distance between the supports (x) shall be as per Appendix-II.

FLEXURAL STRENGTH

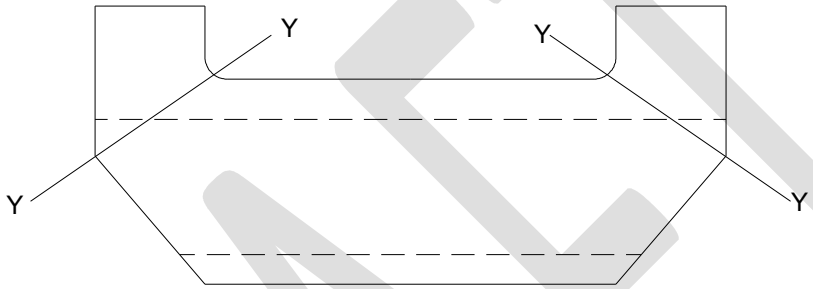
The flexural strength of five tests specimen is to be carried out on a bar of rectangular cross section resting on two supports and loaded by means of a loading nose midway between the supports as shown in following figure.



Size of the test specimen will be 127mm length, 3.2 mm depth and 12.7mm width. The specimen is deflected until rupture occurs in the outer surface of the test specimen or until a maximum strain of 5% (maximum deflection 6.8 mm) is reached whichever occurs first.

The procedure referred in ISO: 178:2010 or ASTM D-790-03 should be followed for conducting this test.

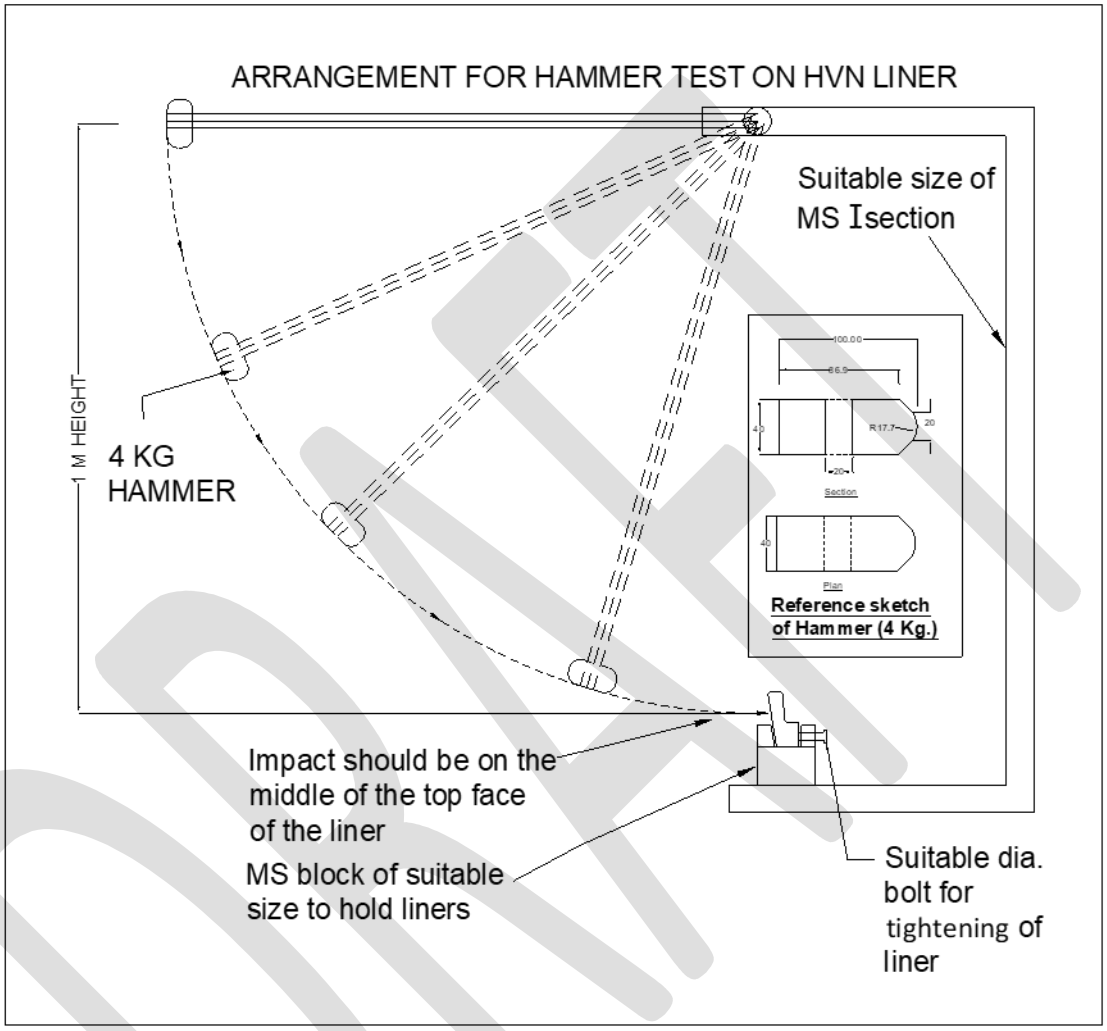
INTERNAL CAVITY TEST



PLAN

Fig-1

ARRANGEMENT FOR IMPACT TEST ON HVN / GFN LINER



Note:

1) The Liner shall be placed horizontally with horns of the Liner in the holding block and tightened with side bolt.
2) 4 kg hammer shall be lifted till its arm is horizontal, i.e. the hammer is at a height of 1 m above the level of Liner.
3) The hammer shall be allowed to swing and fall freely on the face of the Liner.
4) It shall be ensured that movement of hammer and the attached rod is smooth and free.
5) Weight of rod attached to hammer should be in the range of 0.8 to 1.0 kg