



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 1 of 9 Date: 20.10.2021
----------------------	--	---

Name	Designation	Signature	Date	Level
Sh. Pranitesh S. Ranjan	SSE/Design	<i>Pranitesh Ranjan</i>	20.10.2021	Prepared
Sh. Abhinav Yadav	SME/Design-III	<i>Abhinav Yadav</i>	20.10.2021	Agreed
Sh. Lalit Kishore	Dy. CME/Design	<i>Lalit Kishore</i>	20.10.2021	Reviewed
Sh. Mahesh Kumar	CDE	<i>Mahesh Kumar</i>	20.10.2021	Approved

Pranitesh Ranjan
Prepared By

81
Agreed By



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 2 of 9 Date: 20.10.2021
---------------	---	---

FOREWORD:

This schedule is intended to cover in two parts i.e. A&B. Section-A intends to cover the technical requirements/provisions relating to materials, constructions and tests and does not include all the necessary provisions of the contract. The Section-B covers the infrastructural, testing and quality control facilities required to manufacture the fire-retardant ethylene propylene diene terpolymer (EPDM) rubber items for interior furnishing of LHB coaches.

This schedule draws reference to some of the relevant specifications. Latest version of these specifications shall be taken as reference.

SECTION 'A'

1. SCOPE:

This section intends to cover the technical requirements/provisions relating to materials, constructions and tests and does not include all the necessary provisions of the contract.

2. RAW MATERIAL:

The Fire Retardant rubber items of all type shall be made of EPDM rubber.

3. Properties:

3.1 PROPERTIES OF FIRE RETARDANT RUBBER PROFILE OF ALL TYPE MADE OF ETHYLENE PROPYLENE DIENE TERPOLYMER(EPDM)

S.NO.	Properties	Specified values	Evaluation Standard
1.	Shore Hardness	The shore hardness shall be 65 ± 5	IS:3400 Part-2: 1987
2.	Specific Gravity	1.3 to 1.4	IS: 3400, Part-9, 1978
3.	Colour	Unless otherwise stipulated in the order the colour of the rubber shall be black	-----
4.	Odour	The odour shall be slight as possible and shall not be objectionable.	-----
5.	Tensile Strength	Tensile strength Min: Shall be 9 MN/Sq.m	As per IS:3400, Part-I, 1987
6.	Elongation	Elongation at break percent – Min 400	As per IS:3400, Part-I, 1987
7.	Compression Set Max. at $70 \pm 1^\circ\text{C}$ for 24^{+0}_{-2} hrs.	35% Max.	As per IS:3400, Part-10, 1977

Prepared By *[Signature]*

38
Agreed By



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 3 of 9 Date: 20.10.2021
----------------------	--	---

8.	Accelerated Aging Test 8.1. After aging for 72 hours at 70±1°C in air oven, A) Hardness, B) Tensile strength C) Elongation at break	+7-0 ±20% +50%-30%	As per IS:3400, Part-4, 1987
9.	Resistance to Ozone Cracking	100 hrs. at 38°C, 50 pphm concentration, 30% Elongation. No visible cracks @ 2x & 10x magnification.	As per IS:3400, Part-20, 1994
10.	Rubber Content	Min. 25%	EPDM (From NABL certified lab)
11.	Resistance to bending	There shall be no visible sign of cracking on the surface of the rubber when tested to breaking test	As per IS:638-1979 Cl. 3.7.1
12.	Resistance to spread of flame	Min. class 'A'	As per Appendix 6 of UIC-564-2
13.	Deterioration of visibility due to smoke	Min. class 'A'	As per Appendix 15 of UIC-564-2
14.	Limiting Oxygen	Min. 35	Index as per IS: 13501
15.	Toxicity Index	Less Than 1	As per NCD 1409

3.2 PROPERTIES OF FIRE RETARDANT OTHER TYPE OF RUBBER ITEMS MADE OF ETHYLENE PROPYLENE DIENE TERPOLYMER (EPDM)

S.NO.	Properties	Specified values	Evaluation Standard
1.	Shore Hardness	The shore hardness shall be 65± 5	IS:3400 Part-2 : 1987
2.	Specific Gravity	1.3 to 1.4	IS: 3400, Part-9, 1978
3.	Colour	Unless otherwise stipulated in the order the colour of the rubber shall be black	-----
4.	Odour	The odour shall be slight as possible and shall not be objectionable.	-----
5.	Tensile Strength	Tensile strength Min: shall be 9 MN/Sq.m	As per IS:3400, Part-I, 1987
6.	Elongation	Elongation at break percent – Min. 400	As per IS:3400, Part-I, 1987

Prepared By *P. S. Sankar*

Agreed By *38*



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 4 of 9 Date: 20.10.2021
----------------------	--	---

7.	Compression Set Max. at 70±1°C for 24+0-2hrs.	40% Max.	As per IS:3400,Part-10, 1977
8.	Accelerated Aging Test 8.1 After aging for 72 hours at 70±1°C in air oven, A) Hardness, B) Tensile strength C) Elongation at break	+7 -0 ± 20% +40 % -30 %	As per IS:3400, Part-4 , 1987
9.	Resistance to Ozone Cracking	100 hrs. at 38°C, 50pphm concentration, 30% Elongation. No visible cracks @ 2x & 10x magnification.	As per IS:3400, Part-20, 1994
10.	Rubber Content	Min. 25%	EPDM (From NABL certified lab)
11.	Resistance to Bending	There shall be no visible sign of cracking on the surface of the rubber when tested to breaking test	As per IS:638-1979 Cl. 3.7.1
12.	Resistance to spread of flame	Min. class 'A'	As per Appendix 6 of UIC-564-2
13.	Deterioration of visibility due to smoke	Min. class 'A'	As per Appendix 15 of UIC-564-2
14.	Limiting Oxygen	Min. 35	Index as per IS: 13501
15.	Toxicity Index	Less Than 1	As per NCD 1409

3.3 PROPERTIES OF FIRE RETARDANT OTHER TYPE OF RUBBER ITEMS MADE OF ETHYLENE PROPYLENE DIENE TERPOLYMER (EPDM Sponge Rubber)

S.NO.	Properties	Specified values	Evaluation Standard
1.	Oven Aging	7 days at 70°C, change from original compression deflection ±20%	Testing as per ASTM. D1056
2.	Compression deflection(at 25% deflection)	14 to 35 KPa	Testing as per ASTM. D1056
3.	Ozone Resistance	70hrs. at 40° c, 50pphm concentration, 30% Elongation no visible cracks at 7X magnification.	Testing as per ASTM: D1171, Method-B
4.	Compression Set	22 hrs. at 70°C with 50% deflection – 30% max	Testing as per ASTM. D1056
5.	Low Temperature test	Change from original deflection value at 40°C=50%	Testing as per ASTM. D1056

Prepared By *P. Anandh Raja*

Agreed By *[Signature]*



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 5 of 9 Date: 20.10.2021
----------------------	--	---

6.	Resistance to spread of flame	Min. class 'A'	As per Appendix 6 of UIC-564-2
7.	Deterioration of visibility due to smoke	Min. class 'A'	Appendix 15 of UIC-564-2
8.	Limiting Oxygen	Min. 35	Index as per IS: 13501
9.	Toxicity Index	Less Than 1	As per NCD 1409

4. Additional practical testing of product

A confirmatory practical test of product by exposure of product in direct flame of common cigarette lighter for 28 sec to 32 sec after which continuous burning time should be less than 2 seconds in still air condition (in closed room without running any fan).

5. SURFACE FINISH

The surface should be free from imperfections like blisters, cracks and porosity.

Prepared By *[Signature]*

Agreed By *[Signature]*



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 6 of 9 Date: 20.10.2021
----------------------	--	---

SECTION – 'B'

1. Scope

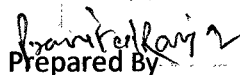
The section covers the infrastructural requirements for manufacture of fire retardant ethylene propylene diene terpolymer (EPDM) rubber items for interior furnishing of LHB coaches.

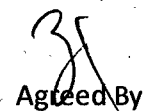
2. REQUIREMENTS:

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

3. PLANT, MACHINERY & INFRASTRUCTURE REQUIREMENTS

S.No.	For Fire Retardant Rubber Profile of All Type Made of Ethylene Propylene Diene Terpolymer (EPDM)	For Fire Retardant Other Type of Rubber Items Made of Ethylene Propylene Diene Terpolymer (EPDM)	For Fire Retardant Other Type of Rubber Items Made of Ethylene Propylene Diene Terpolymer (EPDM Sponge Rubber)
1	Covered area free from dampness and humidity with adequate space for storage of raw rubber, carbon and chemicals with suitable dust collector to be provided around Kneader.	Covered area free from dampness and humidity with adequate space for storage of raw rubber, carbon and chemicals with suitable dust collector to be provided around Kneader.	Covered area free from dampness and humidity with adequate space for storage of raw rubber, carbon and chemicals with suitable dust collector to be provided around Kneader.
2	The automatic weighing/batching machine for measuring chemical and other raw material constituents.	The automatic weighing/batching machine for measuring chemical and other raw material constituents.	The automatic weighing/batching machine for measuring chemical and other raw material constituents.
3	Facilities for storage of mixed rubber compound batch-wise. (i)The storage room for mixed rubber compounds must be cool, dry and dust free. (ii)Storage temperature should range between +15 to +35 deg. C.	Facilities for storage of mixed rubber compound batch-wise. (i)The storage room for mixed rubber compounds must be cool, dry and dust free. (ii)Storage temperature should range between +15 to +35 deg. C.	Facilities for storage of mixed rubber compound batch-wise. (i)The storage room for mixed rubber compounds must be cool, dry and dust free. (ii) Storage temperature should range between +15 to +35 deg. C.

Prepared By 

Agreed By 



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 7 of 9 Date: 20.10.2021
----------------------	--	---

	<p>(iii) The air humidity in storage room should be below 65%.</p> <p>(iv) Rubber compound should be protected in particular against direct sun light and strong artificial light with a high ultra violet content.</p> <p>(v) Thermometer and hygrometer for measurement of ambient temperature and humidity shall be provided at suitable location in storage area</p>	<p>(iii) The air humidity in storage room should be below 65%.</p> <p>(iv) Rubber compound should be protected in particular against direct sun light and strong artificial light with a high ultra violet content.</p> <p>(v) Thermometer and hygrometer for measurement of ambient temperature and humidity shall be provided at suitable location in storage area</p>	<p>(iii) The air humidity in storage room should be below 65%.</p> <p>(iv) Rubber compound should be protected in particular against direct sun light and strong artificial light with a high ultra violet content.</p> <p>(v) Thermometer and hygrometer for measurement of ambient temperature and humidity shall be provided at suitable location in storage area</p>
4	<p>Facilities for mixing of rubber compound in internal mixer (kneader) along with appropriate arrangement of cooling tower/Chilling plant to control mixing process temperature.</p> <p>(i) Temperature during mixing to be controlled and should not exceed 60°C.</p>	<p>Facilities for mixing of rubber compound in internal mixer (kneader) along with appropriate arrangement of cooling tower/Chilling plant to control mixing process temperature.</p> <p>(i) Temperature during mixing to be controlled and should not exceed 60°C.</p>	<p>Facilities for mixing of rubber compound in internal mixer (kneader) along with appropriate arrangement of cooling tower/Chilling plant to control mixing process temperature.</p> <p>(i) Temperature during mixing to be controlled and should not exceed 60°C.</p>
5	<p>Mixing Mill for mixing of various other ingredients/chemicals and refining of rubber compounds for better dispersion can be achieved in open mixing mill. The temperature at this stage is to be within specified range to avoid oxidation of rubber compound. Therefore, in the mixing mill –</p> <p>(i) Cooling tower/Chilling</p>	<p>Mixing Mill for mixing of various other ingredients/chemicals and refining of rubber compounds for better dispersion can be achieved in open mixing mill. The temperature at this stage is to be within specified range to avoid oxidation of rubber compound. Therefore, in the mixing mill –</p> <p>(i) Cooling tower/Chilling</p>	<p>Mixing Mill for mixing of various other ingredients/chemicals and refining of rubber compounds for better dispersion can be achieved in open mixing mill. The temperature at this stage is to be within specified range to avoid oxidation of rubber compound. Therefore, in the mixing mill –</p> <p>(i) Cooling tower/Chilling</p>

Prepared By

Pranishat Rawra

Agreed By

RF



Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 8 of 9 Date: 20.10.2021
----------------------	--	---

	plant to control mixing process temperature. (ii) The optimum temperature to be maintained during mixing should not exceed 60°C. (iii) Each batch should be marked with batch number & date.	plant to control mixing process temperature. (ii) The optimum temperature to be maintained during mixing should not exceed 60°C. (iii) Each batch should be marked with batch number & date.	plant to control mixing process temperature. (ii) The optimum temperature to be maintained during mixing should not exceed 60°C. (iii) Each batch should be marked with batch number & date.
6	Facilities for extrusion with roller head should be available.	Hydraulic press size minimum 36" x 42" with temperature controller.	----
7	In house availability of minimum infrastructure for maintenance & repair.	In house availability of minimum infrastructure for maintenance & repair.	In house availability of minimum infrastructure for maintenance & repair.
8	Facilities for measuring temperature of surface.	Facilities for measuring temperature of surface.	Facilities for measuring temperature of surface.
9	Facility for adequate storage of finished product, batch-wise to avoid mix up.	Facility for adequate storage of finished product, batch-wise to avoid mix up.	Facility for adequate storage of finished product, batch-wise to avoid mix up.

4.0 TESTING FACILITIES:

Following testing facilities and measuring instruments should be available with the firm:

- 4.1 A separate laboratory with temperature and humidity control should be available with the firm.
- 4.2 Tensile testing machines capable to read the load and elongation with data storage facility as per the requirement of the product.
- 4.3 Heating oven with temperature controller and timer.
- 4.4 Shore 'A' hardness testing machine with standard test pieces.
- 4.5 Specific gravity testing apparatus.
- 4.6 Digital balance and crucibles.
- 4.7 Sufficient number of compressions set equipment with suitable steel separators.
- 4.8 Apparatus for conducting resistance to spread of flame test as per UIC-564-2.
- 4.9 Apparatus for conducting deterioration of visibility due to smoke as per UIC-564-2.
- 4.10 Apparatus for conducting limiting Oxygen Index as per IS: 13501.
- 4.11 Toxicity Index as per NCD 1409.
- 4.12 The following measuring instruments along with calibration certificate from NABL/BIS/MoEF certified labs in adequate number:

Prepared By *[Signature]*


[Signature]
Agreed By

Specification	Schedule of Technical Requirements for "Fire Retardant Ethylene Propylene Diene Terpolymer (EPDM) Rubber Items for Interior Furnishing of LHB Coaches	MMDTS20047, Rev-0 Page 9 of 9 Date: 20.10.2021
----------------------	--	---

- (i) Dial gauges
- (ii) Digital vernier calipers
- (iii) Dumbbell and test specimen cutter
- (iv) Steel Scale (Linear)
- (v) Hygrometer (Humidity Recorder) of suitable range.
- (vi) Dry & Wet thermometer of suitable range.

5.0 QUALITY CONTROL REQUIREMENTS:

- 5.1 Firm should be ISO 9001; 2015 certified and the product, Fire Retardant EPDM rubber items, should be clearly endorsed in the certificate.
- 5.2 There should be a system to ensure the traceability of the product from raw material sample to finished product stage. This system should also facilitate identification of raw material composition from the finished product stage.
- 5.3 There should be a QAP/ Quality manual for the product detailing following aspects.
 - (i) Organizational Chart
 - (ii) Flow Process Chart
 - (iii) Stage inspection details
 - (iv) Plants and machinery as per STR
- 5.4 Quality person/head should be minimum with degree/diploma in engineering and experience of Minimum 05 years/12 years respectively.
- 5.5 Lab in-charge minimum M.Sc. Chemistry/B.E. Chemical with 05years experience.
- 5.6 All the relevant specifications and IS Standards should be available with the firm.

Prepared By 

Agreed By 