








 PRODUCT STANDARD TME DIVISION, BHOPAL TME 2011	TM 00285																																																																
	REV 01																																																																
	PAGE: 01 OF 04																																																																
<u>Specification for Fiberglass tape and sheet- Silicone Rubber Coated (Semi-cured)</u>																																																																	
<u>REQUIREMENTS:</u>																																																																	
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company	1. <u>Fiberglass Cloth:</u> To be woven from alkali free, continuous filament glass yarns. To be clean, white lustrous, smooth and odorless; as well as free from broken, uneven or spliced yarn and free from weak filling and broken selvages. Thickness of the fiberglass cloth before coating:																																																																
	<table border="1"> <thead> <tr> <th>Type</th> <th>Thickness (inches)</th> </tr> </thead> <tbody> <tr> <td>R 15</td> <td>0.007 ± 0.001</td> </tr> <tr> <td>R 18</td> <td>0.007 ± 0.001</td> </tr> <tr> <td>R 20</td> <td>0.007 ± 0.002</td> </tr> <tr> <td>R 25</td> <td>0.014 ± 0.002</td> </tr> <tr> <td>R 38</td> <td>0.007 ± 0.001</td> </tr> </tbody> </table>	Type	Thickness (inches)	R 15	0.007 ± 0.001	R 18	0.007 ± 0.001	R 20	0.007 ± 0.002	R 25	0.014 ± 0.002	R 38	0.007 ± 0.001																																																				
	Type	Thickness (inches)																																																															
	R 15	0.007 ± 0.001																																																															
	R 18	0.007 ± 0.001																																																															
	R 20	0.007 ± 0.002																																																															
	R 25	0.014 ± 0.002																																																															
	R 38	0.007 ± 0.001																																																															
	2. <u>Silicone Rubber:</u> Silicone rubber, whether for sizing or final coating, to meet all requirements of TM00282 Grade S-2027 (Index 1094). Silicone rubber after curing, to be reversion-resistant and to possess excellent heat stability at 250°C. Silicone rubber as calendered, to be cured only sufficiently to prevent (1) adhesion between layers on the roll or between sheets, (2) extrusion of the rubber through the cloth during vulcanization tests, section 9, and (3) migration of rubber at corners of electrical components during application of tape and sheet. Material to this specification shall be so processed as to give a uniform product with good slitting properties and which will demonstrate adequate conformability in the manufacturing operations.																																																																
	3. <u>Thickness of *COATED Tape*:</u> The sample shall be cured for 4 hours at 250°C before measuring thickness. Measurement shall be made per ASTM D-751-73**, using a dial micrometer with a 0.375 ± 0.001" flat pressure foot weighted to apply a load of 6.0 ± 0.1 ounces.																																																																
<table border="1"> <thead> <tr> <th>Type</th> <th>Thickness (inches)</th> </tr> </thead> <tbody> <tr> <td>R 15</td> <td>0.015 - 0.017</td> </tr> <tr> <td>R 18</td> <td>0.017 - 0.019</td> </tr> <tr> <td>R 20</td> <td>0.019 - 0.021</td> </tr> <tr> <td>R 25</td> <td>0.025 - 0.027</td> </tr> <tr> <td>R 38</td> <td>0.037 - 0.039</td> </tr> </tbody> </table>	Type	Thickness (inches)	R 15	0.015 - 0.017	R 18	0.017 - 0.019	R 20	0.019 - 0.021	R 25	0.025 - 0.027	R 38	0.037 - 0.039																																																					
Type	Thickness (inches)																																																																
R 15	0.015 - 0.017																																																																
R 18	0.017 - 0.019																																																																
R 20	0.019 - 0.021																																																																
R 25	0.025 - 0.027																																																																
R 38	0.037 - 0.039																																																																
* Unless otherwise specified on engineering drawing.																																																																	
4. <u>Width and Length Tolerances:</u> Tapes, less than 6" wide ----- ± 1/32" from nominal width. Sheets, cut - to - size pieces, and tapes 6" wide and over ----- ± 1/16" - 1/32"																																																																	
<table border="1"> <tr> <td colspan="3">Revision Details: As per revision sheet</td> <td>Distribution</td> <td>Qty.</td> <td colspan="3">Approved</td> </tr> <tr> <td colspan="3"></td> <td></td> <td></td> <td colspan="3">Sr.DGM/TME </td> </tr> <tr> <td>Rev. No.</td> <td>Date of Rev</td> <td>Reaffirmed Year</td> <td>MDX TME</td> <td>1</td> <td colspan="3" rowspan="4">  Prepared K Dugvekar Dy. Mgr/TME </td> </tr> <tr> <td>01</td> <td>26.09.2019</td> <td>Feb 2022</td> <td>TAM</td> <td>1</td> </tr> <tr> <td></td> <td></td> <td></td> <td>CIM</td> <td>1</td> </tr> <tr> <td></td> <td></td> <td></td> <td>QC/CIM</td> <td>1</td> </tr> <tr> <td colspan="3"></td> <td></td> <td></td> <td colspan="3">  Checked V.Rawtiya DGM/TME </td> </tr> <tr> <td colspan="3"></td> <td></td> <td></td> <td colspan="3">Dt. of 1st Issue</td> </tr> <tr> <td colspan="3"></td> <td></td> <td></td> <td colspan="3">--</td> </tr> </table>			Revision Details: As per revision sheet			Distribution	Qty.	Approved								Sr.DGM/TME 			Rev. No.	Date of Rev	Reaffirmed Year	MDX TME	1	 Prepared K Dugvekar Dy. Mgr/TME			01	26.09.2019	Feb 2022	TAM	1				CIM	1				QC/CIM	1						 Checked V.Rawtiya DGM/TME								Dt. of 1 st Issue								--		
Revision Details: As per revision sheet			Distribution	Qty.	Approved																																																												
					Sr.DGM/TME 																																																												
Rev. No.	Date of Rev	Reaffirmed Year	MDX TME	1	 Prepared K Dugvekar Dy. Mgr/TME																																																												
01	26.09.2019	Feb 2022	TAM	1																																																													
			CIM	1																																																													
			QC/CIM	1																																																													
					 Checked V.Rawtiya DGM/TME																																																												
					Dt. of 1 st Issue																																																												
					--																																																												

<div>TM 00285</div> <div>REV 01</div> <div>PAGE: 02 OF 04</div>		<div><div><div>बी एच ई एल</div><div>BHEL</div></div><div>PRODUCT STANDARD</div><div>TME DIVISION, BHOPAL</div><div>TME 2011</div></div>													
<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED</div> <div>It must not be used directly or indirectly in any way detrimental to the interest of the company</div>	5.	<p>Packaging: Tape to be rolled tightly and evenly on non-collapsing 1-1/2" diameter cardboard tube cores with rubber side facing outward. Silt rolls to be stored and shipped on cut -edges. Sheet pieces to be interleaved to prevent sticking and to be packaged in bundles of 50 sheet, maximum. These bundles to be stacked or shipped in stacks of 6 bundles, maximum, high.</p> <p>Quantities for Roll:</p> <table><thead><tr><th><u>Tape Type</u></th><th><u>Length (Yards)</u></th></tr></thead><tbody><tr><td>R 15</td><td>27</td></tr><tr><td>R 18</td><td>18</td></tr><tr><td>R 20</td><td>18</td></tr><tr><td>R 25</td><td>12</td></tr><tr><td>R 38</td><td>8</td></tr></tbody></table> <p>Tolerance for all types (+2 , -0) yards</p>	<u>Tape Type</u>	<u>Length (Yards)</u>	R 15	27	R 18	18	R 20	18	R 25	12	R 38	8	
	<u>Tape Type</u>	<u>Length (Yards)</u>													
	R 15	27													
R 18	18														
R 20	18														
R 25	12														
R 38	8														
6.	<p>Lot identification: Cores to be distinctly color coded to identify the individual supplier. Day, month, and year of manufacture and individual lot or roll number to be stamped on container. Day, month, and year of manufacture to be stamped on the I.D of each core.</p>														
7.	<p>Mill Roll (For Slitting Into Taps) : Rolls to have 23", minimum , usable width. Roll O.D. to be 17", maximum. (Note: it is desired that roll diameter be as large as is consistent with commercial practice within the diameter limitation). Roll core to have 3" I.D., and to be 24-26 inches long. 10%, maximum, of rolls in any one shipment may have 1, maximum, splice; spliced lengths to be 50 yards, minimum, long; splices to be clearly marked with 27 inch lengths of pressure sensitive tape coloured to contract with this material ; tape shall project out both end of roll. (Note: Vulcanised splices are not allowable.) Telescoping of rolls to be 3/4", maximum. Spongy (poorly rolled) rolls and egg shaped rolls are not allowable. Defective areas in rolls to be marked with fast drying paint or dye; paint or dye shall not adhere to glass back of next layer in roll. (Note: Interleaving is not allowable.) Mill rolls to be wrapped in polyethylene film or polyethylene coated paper; following information to appear on outside of wrapping: manufacturer, thickness, yardage, lot (roll) number, day, month, and year of manufacture; if roll is spliced, it must be so indicated. Each mill roll to be accompanied by separately wrapped test sample 18" long by full width of roll from each end of each length of materials in the roll. Samples to be identified as follows: sample # 1 from core end; sample # 2 next closest to core; # 3, next closest to core, etc.</p> <p>The mill rolls to be packaged and shipped in wooden boxes with the cover held on by steel banding. The ends to be slotted to allow a 1-1/2 inch shaft to be passed through the mill roll to lift the mill roll from the box. The slot is to be closed to passage of dirt or dust during transit. The roll is to be supported on the protruding core ends, but after removal of the box top, is to be free to be lifted out. The boxes are to be palletized or provided with cleats for handling by fork truck. The boxes are to be shipped and handled in a horizontal position, <u>NEVER ON END.</u></p>														

TME 2011

PRODUCT STANDARD
TME DIVISION, BHOPAL

TM 00285

REV 01

PAGE: 03 OF 04

8. **Dielectric Strength** (ASM D149 -64**- Short Time Test, 1/4" Electrodes For Type 4" wide and less, 2" Electrodes for sheet and mill rolls over 4" wide) :

<u>Tape Type</u>	<u>Minimum Average ^a Dielectric Strength</u>	<u>Minimum Individual ^b Dielectric strength</u>
R 15	325 VPM	200 VPM
R 18	380	200
R 20	380	200
R 25	200	125
R 38	450	400

a- Average of 10 tests at 6" intervals on any roll or sheet , all test specimens conditioned 4 hours at 250 ° C

b- Minimum value on any of the 10 individual tests.

9. **Vulcanising Test:** At receival the peel strength and spot vulcanised strength per inch of width of material bonded to the back of another sample of material from the same shipment shall be as indicated below (average of not less than 3 tests). After 60 days storage at our works at 75° F. , maximum, peel and spot vulcanised strength shall not be less than 90 % of these values:


<u>Tape Type</u>	<u>Peel Strength Pounds, minimum</u>	<u>Spot Vulcanized strength Pounds, minimum</u>
R 15	7.5	5.0
R 18	9.5	5.0
R 20	9.5	5.0
R 25	9.5	5.0
R 38	9.5	5.0

Bond procedure: Place two pairs of 1" x 6" samples of material assembled rubber to fibreglass, with rubber side of sample up, equality spaced, on a ¼" thick cool silastic sheet. Cover with a thin teflon glass sheet and apply 50 Psi for 5 minutes at temperatures indicated below. Release and air cool.

<u>Test</u>	<u>Bonding Temp. , °F</u>
Peel	340 - 350
Spot vulcanised	230 ± 8

Testing: The tests shall be made in a tensile tester similar to the Scott model L-4. The free end of one of the samples shall be clamped in the fixed jaw , the other shall be turned back 180° and clamped in the movable jaw. The testing speed shall be 20" per minute. Reading shall be taken with a floating pendulum when complete line contract is observed on the bonded portion.

COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
It must not be used directly or indirectly in any way detrimental to the interest of the company

		 <p style="text-align: center;">PRODUCT STANDARD TME DIVISION, BHOPAL</p>	<p style="text-align: center;">TM 00285</p> <p style="text-align: center;">REV 01</p> <p style="text-align: center;">PAGE: 04 OF 04</p>																								
<p style="text-align: center;">COPYRIGHT AND CONFIDENTIAL</p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED It must not be used directly or indirectly in any way detrimental to the interest of the company</p>		<p>10. <u>Edge Tear Strength (Tape Only) (ASTM DS27-47**- As Amended Herein):</u></p> <p>(a) Beam in stirrup to be rectangular steel 3/16" \pm 0.003" thick with edges rounded to 3/32" radius and set at 90° angle from horizontal.</p> <p>(b) 2" per minute cross-head speed.</p> <p>(c) Centreline of tape aligned with direction of tensile stress and placed at center of blade with rubber face in contact with blade.</p> <p>(d) Tear strength :</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><u>Tape Type</u></th> <th><u>Width (inches)</u></th> <th><u>Minimum Tear strength, lbs</u></th> </tr> </thead> <tbody> <tr><td>R 15</td><td>3/4</td><td>50</td></tr> <tr><td>R 15</td><td>1-1/4</td><td>70</td></tr> <tr><td>R 18</td><td>1</td><td>70</td></tr> <tr><td>R 20</td><td>3/4</td><td>50</td></tr> <tr><td>R 20</td><td>1</td><td>70</td></tr> <tr><td>R 25</td><td>1-1/4</td><td>70</td></tr> <tr><td>R 38</td><td>3/4</td><td>50</td></tr> </tbody> </table>	<u>Tape Type</u>	<u>Width (inches)</u>	<u>Minimum Tear strength, lbs</u>	R 15	3/4	50	R 15	1-1/4	70	R 18	1	70	R 20	3/4	50	R 20	1	70	R 25	1-1/4	70	R 38	3/4	50	
	<u>Tape Type</u>	<u>Width (inches)</u>	<u>Minimum Tear strength, lbs</u>																								
R 15	3/4	50																									
R 15	1-1/4	70																									
R 18	1	70																									
R 20	3/4	50																									
R 20	1	70																									
R 25	1-1/4	70																									
R 38	3/4	50																									
	<p>11. <u>Condition:</u> Rubber surface and glass backing to be free from dirt and any other foreign material.</p> <p>Note: Engineering Approval of source is required for the purchase of this material.</p> <p>Note : Handling and usage to be in accordance with A.I .1935</p> <p>** Note: Wherever the specification or test of any society is referred to herein with its date, number, or revision letter stated, no other dated or more recent revisions are acceptable except by revision of this specification.</p> <p><u>GENERAL INFORMATION (Not Mandatory Vendor Requirement)</u></p> <p>This specification covers silicone rubber coated fibreglass tape and sheet, with continuous filament glass cloth backing and semi-cured silicone rubber, for use as insulation on traction motors and generators.</p> <p>Note : OVERSEAS SHIPMENT OF THIS MATERIAL TO BE IN ACCORDANCE WITH TM00286</p> <p><u>DRAFTING INFORMATION</u></p> <p>This material shall be designated on the bulk number drawing as :</p> <p style="text-align: center;">MATERIAL : TM00285 Followed by Tape or Sheet, whichever is applicable.</p> <p>Note: These specification were developed without considering whether patents may or may not be involved. In all cases, therefore, the supplier shall be required to assume patent liability.</p> <p><u>Reference to EMD Standards:</u></p> <p>This specification is identical to EMD specification EMS 558.</p>																										