

Research Designs and Standards Organisation
(Traction Installation Directorate)

Reasoned document of RDSO's Specification No. TI/SPC/OHE/CW(Cu-Ag)/0130 (02/2020) for SILVER BEARING GROOVED COPPER CONTACT WIRE FOR ELECTRIC TRACTION (DRAWN OUT OF CONTINUOUS CAST SILVER BEARING COPPER RODS)

1. RDSO's Specification No. TI/SPC/OHE/CW(Cu-Ag)/0130 (02/2020) for SILVER BEARING GROOVED COPPER CONTACT WIRE was uploaded on RDSO website for one month dated 29.06.2020 for seeking comments,
2. Comments/Suggestion received from viewers are as below.

Clause No.	Particular	Comments Recieved	RDSO's Remark
1.2 (New para added in Final draft specification)	----	<u>M/s Hindalco Industries Limited</u> The preference should be given to the Domestic manufacturers of CCSBC Rods in line with the Make in India and Atmanirbhar Bharat.	In compliance of Spl DG letter no. SpIDG(VD)/Misc dated 25.06.2020 regarding inclusion of Make in India clause in the technical specification, para 1.2 added.
2.1.2	IS: 1778-1980 or latest -Specification for Reels and drums for bare conductors.	---	Clause 2.1.2 was discarded in draft revised specification as steel drum was made compulsory, but again incorporated as per comment of Western Railway Steel drum for Contact wire are not suitable for 8 wheeler tower wagon.
2.1.6	IS: 1608-1995 Mechanical Testing of metals		To incorporate latest standard IS: 1608 Part 1-2018 or latest Metallic Materials-Tensile Testing-Method of Test at Room Temperature
3.1 (ix) & (x)	Basic wind pressure -210 kgf/mm ² Altitude: 1000 m above mean sea level. Altitude: 2000m in J& K area.		Updated to Basic wind pressure -216 kgf/mm ² Altitude: 2500 m above mean sea level.

4.1	<p>The Silver Bearing Copper Contact Wire shall be drawn out of indigenous or imported CCSBC Rods manufactured by any of the following processes:</p> <p>(a) Continuous Cast & Rolled (CCR) Process (b) Vertical upward continuous casting process Diameter of the rod so obtained, shall be as given in Table-3</p> <p>Copper used, should be Electrolytic grade Copper cathodes conforming to the requirement of LME Grade `A` copper as listed in the London Metal Exchange.</p> <p>The chemical composition of the Continuous Cast Sliver Bearing Copper (CCSBC) Rod shall be as given in Table-2.</p> <p>The manufacturer of CCSBC Wire Rod which is used in the manufacture of prototype Contact Wire will be treated as approved vendor for CCSBC Wire Rod once the prototype Contact Wire manufactured by this CCSBC Wire Rod is approved.</p>	<p><u>M/s APAR Industries</u></p> <p>CCSBC rods manufactured by vertical upward casting process will require further processing of Extrusion. Extruded rod will meet all the properties of CCSBC rods for drawing of silver bearing contact wire</p> <p><u>M/s Hindalco Industries Limited</u></p> <p>The Silver Bearing Copper Contact Wire shall be drawn out of indigenous or imported CCSBC Rods manufactured by any of the following processes: (a) Continuous Cast & Rolled (CCR) Process . (b) Vertical upward continuous casting process similar to Rautomead Machine followed by rolled down process.</p> <p>Reason: <input type="checkbox"/> Rods to be produced from both the process are not of similar nature. The Rods produced by CCR process is entirely different than the Vertical Cast process rods. CCR process is produced on CAST & ROLL basis whereas the vertical cast rods are in AS-CAST stage only without rolling.</p> <p><input type="checkbox"/> The Grain size, in Vertical Cast Process are columnar & big in sizes. which is not accepted by the specs. Clause 8.5.6</p> <p><input type="checkbox"/> The Vertical Cast material will also do not meet the minimum requirement of tensile strength at the</p>	<p>May be accepted to achieve properties of CCSBC rods manufactured by vertical upward casting process.</p> <p>Rautomead is one of the proprietary name of Vertical upward continuous casting process. To avoid usage of proprietary names in Specification only name of manufacturing process are specified.</p> <p>Further processing (Hot rolling/cold rolling/extrusion) of rod manufactured by Vertical upward continuous casting process is added. As per M/s APAR Industries comment, extruded rod will meet all properties of CCSBC rods.</p> <p>As per RDSO ISO document no. QO-D-8.1-15 for Product development, Specification will be finalised after field trials(validation of actual performance of item), if desired properties will not achieve in prototype testing/ or trials result of Contact wire drawn out of CCSBC rod manufactured by Vertical upward continuous casting process, the process will be omitted from the Specification.</p>
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		<p>conductor stage. Clause 8.5.4</p> <p><input type="checkbox"/> Also not sure that the vertical cast rod will meet the desired properties of the final product (contact wire).</p> <p><u>M/s Hindalco Industries Limited</u></p> <p>To achieve the desired property of the end product on consistent basis, the continuous cast rolling process should be the best manufacturing process. The vertical upward casting process may not give desired property consistently except the Rautomead Vertical Cast Machine as they claim and it will require to further rolled down after casting which may not possible by any vertical cast machines.</p>	
		<p><u>M/s Vedanta Limited</u></p> <p>Copper used, should be Grade `A` copper conforming LME A grade cathodes as listed in LME</p> <p>Amend - "Copper used, should be Grade `A` copper conforming to the chemical composition of Cu-Cath-1 of IS 191:2007 or latest"</p>	<p>Not accepted. To ensure quality of copper used.</p>
		<p>-----</p>	<p>"Procurement of CCSBC wire rod on job work basis is not allowed." Added in para 4.1 & para 8.5.9.5</p>

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8.5.4	When tested in accordance with IS: 1608-1995 or latest "Mechanical Testing of Metals" for tensile strength and elongation, the material shall have a tensile strength of 20.4 kgf/mm ² (min.) and a minimum of 46% elongation. But the gauge length of the sample for this test shall be of 250 mm.	---	Modified as "When tested in accordance with IS: 1608- Part 1 : 2018 or latest "Metallic Materials-Tensile Testing-Method of Test at Room Temperature" for tensile strength and elongation, the material shall have a tensile strength of 20.4 kgf/mm ² (min.) and a minimum of 46% elongation. But the gauge length of the sample for this test shall be of 250 mm." To incorporate latest standard
8.5.5	The material shall have the chemical composition as given in Table-2. The trace elements shall be determined by Spectrometric method. The copper shall be determined in accordance with IS: 440-1964 or latest. Oxygen content, may be determined by oxygen analyzer or Spectrometer.-However, Inspection authority may send the samples to Government Approved Laboratory for verification of oxygen content.	----	Modified to "The material shall have the chemical composition as given in Table-2. The trace elements shall be determined by Spectrometric method. The copper shall be determined in accordance with IS: 440-1964 or latest. Oxygen content, may be determined by oxygen analyzer or Spectrometer". Last line discarded as in-house testing facility for verification of oxygen content is mentioned in STR.
10.9	Hardness of sample of Contact Wire shall be determined on Brinell Scale with 2.5 mm dia. balls and load of 62.5 kg. in accordance with IS: 1500 -1983. The hardness shall be measured at mid radius of the cross section of Contact Wire and average of 3 such values shall be considered for qualifying purpose.	-----	Modified to "Hardness of sample of Contact Wire shall be determined on Brinell Scale with 2.5 mm dia. balls and load of 62.5 kg. in accordance with IS: 1500 -- Part 1:2019 "Metallic Material- Brinell Hardness Test-Test Method". The hardness shall be measured at mid radius of the cross section of Contact Wire and average of 3 such values shall be considered for qualifying purpose." To incorporate latest standard

10.11	The contact wire shall be shall be ultrasonically tested by the manufacturer continuously during production for the entire length. The defect if any, observed shall require that entire tension length of Contact wire to be discarded. Records shall be maintained for the purpose and produced before the inspector on demand. The Contact Wire drawing machine should stop automatically if any defect is observed during ultrasonic testing.	----	New line added "The Contact Wire drawing machine should stop automatically if any defect is observed during ultrasonic testing." in compliance to para 2.1.1(b) of STR no. TI/STR/040																		
11.3.1.1	The contact wire shall be supplied properly wound on either wooden drums or corrugated steel drums (type of drum required whether wooden or steel to be specified by the purchaser in his purchase order) in specified weights as required by the purchaser, the turns of the wire being close and continuous without any overriding except on the first and last turns of each layer.	-----	To incorporate wooden drum. Steel drum was made compulsory in draft specification but again made optional as per comment of Western Railway Steel drum for Contact wire are not suitable for 8 wheeler tower wagon.																		
11.3.5	<p>The wooden drum shall comply with IS: 1778 1980 or latest "Specification for Reels and Drums for bare conductors" and shall have the dimensions as indicated in TABLE 4.</p> <p style="text-align: center;">TABLE 4</p> <p style="text-align: center;">DRUM DIMENSION FOR DIFFERENT SIZE OF CONTACT WIRE</p> <table border="1" data-bbox="465 898 1216 1107"> <thead> <tr> <th>Size of Contact Wire (mm²)</th> <th>Length of* Contact Wire (m)</th> <th>Flange** dia(mm)</th> <th>Barrel dia (mm)</th> <th>Traverse (mm)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>107</td> <td>1600</td> <td>1530</td> <td>1200</td> <td>600</td> <td></td> </tr> <tr> <td>107</td> <td>2000</td> <td>1575</td> <td>1200</td> <td>600</td> <td></td> </tr> </tbody> </table> <p>*These are higher limits which may not exceed by more than 50m.</p> <p>** Flange diameter subject to a maximum of 1900mm.</p>	Size of Contact Wire (mm²)	Length of* Contact Wire (m)	Flange** dia(mm)	Barrel dia (mm)	Traverse (mm)	Remarks	107	1600	1530	1200	600		107	2000	1575	1200	600		-----	Clause 11.3.5 was discarded in draft specification as steel drum was made compulsory, but again incorporated as per comment of Western Railway Steel drum for Contact wire are not suitable for 8 wheeler tower wagon.
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