



GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS

SPECIFICATION  
FOR

LIGHT WEIGHT SECTION INSULATOR ASSEMBLY

..... 2021

ISSUED BY

TRACTION INSTALLATION DIRECTORATE RESEARCH DESIGNS AND STANDARDS ORGANISATION  
MANAK NAGAR, LUCKNOW-226 011(INDIA)

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SPECIFICATION FOR LIGHT WEIGHT SECTION INSULATOR ASSEMBLY

1. **SCOPE:** This specification covers the requirement of light weight sectioning insulator (LWTSI) assembly for use in 25 kV A.C. Single Phase 50 Hz, Traction Overhead Equipment (OHE). This equipment provides electrical isolation between the two elementary sections of the traction overhead equipments. It is required to provide a smooth passage to pantographs of electric rolling stock for current collection without any perceptible arcing in either direction when installed in any position in a span of overhead equipment. The separate model for speeds of **120/160 Kmph** may be used by zonal railways as per requirement.
2. **DEVIATIONS FROM SPECIFICATION:** Any deviations from this specification to improve the performance, efficiency and utility of the equipment, proposed by the manufacturer will be given due consideration on merits provided full technical particulars with justification therefore are furnished. In such a case the manufacturer shall quote according to this specification and indicate the deviation(s) separately in a "Statement of Deviations" for such deviations.
3. **SERVICE CONDITIONS:**
  - 3.1 The LWTSI Assembly shall be suitable for outdoor use in moist tropical climate and areas subjected to heavy wind, rainfall and severe lightning in India. The limiting weather conditions which the LWTSI Assembly has to withstand in service are indicated below:

SN	Conditions	Value
1	Max. Temperature of air in shade	45°C
2	Min. Temperature of air in shade	0°C
3	Max. Temperature attainable by an object exposed to sun	70° C
4	Max. Relative humidity	100%
5	Average annual rain fall	1750 to 6250mm
6	No. of thunder storm days/annum	35 Max.
7	No. of dust storm days/annum	35 Max.
8	No. of rainy days per annum	120
9	Max. Wind pressure	216 kgf/m <sup>2</sup>
10	Altitude	Up to height 2500 m from sea level

- 3.2 The OHE in which the assembly is to be installed is subjected to vibrations caused by wind and passage of trains. The assembly is required to provide smooth passage to the pantograph(s) of electric locomotives, electric multiple units, in either direction up to a maximum speed of **120/160 kmph**. **The Separate model for these two speeds shall be used.** The pantograph is fitted with metalized carbon strip. However, in future the use of pure carbon strips can be made. The pantograph used on the locomotive/EMU is AM-12 and AM-92 type. The static thrust of pantograph varies from 6 to 9kgf.
- 3.3 The assembly shall be suitable for installation within the first one tenth and one third of the span with simple regulated OHE which consists of a catenary conductor and a contact wire. The working tension in each of catenary conductor and contact wire may vary from 1000 kgf to 1500 kgf. The assembly shall be suitable for installation at steep gradient and sharp curvatures. The assembly shall be suitable for use with the following combination of catenary conductor and contact wire, the details of which shall be obtained by the manufacturer from the purchaser.

SN	Catenary Wire		Copper contact wire	
	Configuration	Breaking load Kgf (min)	Configuration	Breaking load kgf (min)
1	19/2.10 mm (65mm <sup>2</sup> ) cadmium copper	3920	107mm <sup>2</sup> grooved copper	3905

2.	19/2.10 mm (65mm2) cadmium copper	3920	150mm2 grooved copper	5475
3	37/2.10mm 125 mm2 cadmium copper	7650	150 mm2 grooved copper	5475
4	37/2.10mm 125 mm2 cadmium copper	7650	193mm2 grooved copper	7045
5	<del>19/2.79 mm (65mm2)</del> <del>aluminum alloy</del>	<del>3311</del>	<del>150mm2 grooved copper</del>	<del>5475</del>
6	37/2.92mm(242mm2) hard drawn copper	9140	193mm2 grooved copper	7045
7	37/3.35 mm 323 mm2 Hard drawn Standard copper Catenary Wire.	12202	193mm2 grooved copper	7045

Note:-The configuration of contact wire is shown at Annexure II.

#### 4 GENERAL CONSTRUCTION:

4.2 The light weight section insulator assembly with composite insulator shall consist of the following:

- a) In the contact wire, Resin bonded fiber glass (or equivalent) insulators covered with PTFE (or equivalent) adequately dimensioned, circular in cross section and rated for the application shall be provided. The salient features of the insulator shall be indicated on the drawings. The insulators shall have suitable end fitting for connections to the contact wire through end fitting or similar other arrangement for connections to the running contact wire. End fittings will be sealed so as not to allow pollution or ultraviolet radiation to penetrate to the resin bonded fiber glass insulators rod.
- b) The complete section insulator assembly shall be suspended from the stranded catenary wire by means of suitable diameter dropper/cable hanger attached to lugs and maintained its level. Suitable means of suspension of the components of the assembly from the catenary conductor shall be provided.
- c) Suitable runners/glidors of copper or stainless steel shall be provided. The air gap between the runners and the metallic parts of the insulator of the contact wire shall not be less than 160 mm and upto 220mm.
- d) The assembly shall be such that the pantograph passes through the assembly smoothly without any shock.
- e) The complete assembly shall be as light as possible and so constructed that adjustment of components can easily be made during erection and maintenance.
- f) Total weight of the assembly with all the fittings shall be upto 27kg.
- g) All the components of the Section Insulator Assembly shall be freely interchangeable between one section insulator assembly and the other.

#### 5 MATERIAL SPECIFICATION:

- 5.1 All the fasteners shall be of stainless steel and shall conform to grade A4 property class 50,70 class 80 of **ISO-3506-1 (latest) AISI-316 or grade specified** in Specification No. TI/SPC/OHE/Fasteners/0120 (rev.1).
- 5.2 Manufacturer's initials, month and year of manufacture and Part No. shall be clearly etched/embossed on each of the components for easy identification. The letters/figures shall normally be between 2.5 mm-5 mm in height. In addition each insulator shall be marked with specified mechanical load (SML). The markings on the insulators shall be legible and indelible. Etching/embossing on the components which are otherwise very small is not necessary.

#### 6 TECHNICAL LITERATURE, DATA AND DRAWINGS:

- 6.1 Manufacture shall furnish the schedule of guaranteed technical particulars of insulators and all other components of the assembly complete in all respects for scrutiny in the Proforma attached at Annexure-III along with the application for registration. The manufacturer shall also furnish detailed literature on erection, maintenance etc. of the Section Insulator assembly and also the detailed list of spare parts which are required for replacement during the service.
- 6.2 The manufacturer shall submit for scrutiny, the following drawings in one set in standard size of 210 mm x 297 mm or in multiples.

- i) Drawing showing the assembly of sectioning insulator (plan, elevation and end view) indicating major dimensions.
- ii) Assembly drawing of parts/components should show major dimension including tightening torque of fasteners.
- iii) Detailed dimensional drawings of each part/component indicating tolerances, particularly of those components which are interchangeable.
- iv) Any other drawing deemed necessary by the Manufacturer or as required by the Purchaser.

Note: Each drawing shall carry the tabulation for item reference, item's name, drawing number, material, and material specification with grade, quantity and weight. Salient technical particulars of the assembly/components shall also be mentioned in the respective drawings. A block as indicated below shall be provided on each drawing for approval by Director General/TI, RDSO, and Lucknow:

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FOR DIRECTOR GENERAL/TI RDSO, LUCKNOW, INDIA

- 6.3 After all the drawings are approved; the manufacturer shall submit three Reproducible Tracing Films (RTF) for each drawing for signature of approving authority.
- 6.4 Only after all the design and drawings have been approved and clearance given by purchaser/RDSO to this effect, the manufacturer shall take up manufacture of the prototype for RDSO's inspection. It is to be clearly understood that any changes required to be done in the proto-type as required by RDSO shall be done expeditiously.
- 6.5 The manufacturer shall clearly specify the effective sectioning length of the assembly, the total length of the assembly, the total weight of the assembly along with speed potential and salient feature in the LWTSI assembly drawing. The manufacturer shall necessarily furnish the material specification with grade for each component on each drawing. Technical parameter of copper runners shall conform to IS: 1897-2008 (reaffirmed 2016) or DIN: 1787 or equivalent.

## 7 TESTS:

- 7.1 The manufacturer shall arrange for tests at his works. In case facilities do not exist in the manufacturer's works for conducting any tests, such tests shall be got carried out at any reputed NABL accredited laboratory or test house at the manufacturer's cost.
- 7.2 Before giving call to RDSO for inspection/testing of the prototype of the LWTSI assembly, the manufacturer shall submit detailed test schedule consisting of details of each of the tests, venue of the test, duration of each test and the total number of days required to complete the tests at one stretch. Once the schedule is approved, the tests shall invariably be done accordingly. However, during the process of type testing or even later, RDSO reserves the right to conduct any additional test(s) besides those specified herein, on the assembly/component/system or sub- system so as to test the system to his satisfaction or for gaining additional information and knowledge. In case any dispute or disagreement arises between the manufacturer & RDSO during the process of testing as regards the type test and/or the interpretation and acceptability of the type test results, it shall be brought to the notice of the Director General (Traction Installation), RDSO whose decision shall be final and binding.
- 7.3 **Design tests:** These tests are intended to verify the suitability of the design, materials and method of manufacture (technology). The following design tests shall be carried out by the manufacturer and records shall be maintained. The test report shall be furnished by the manufacturer along with the offer. These tests shall be conducted as per IEC 61109-2008-05 Edition 2.0 or the latest version.
  - 7.3.1 Tests on interfaces and connections of end fittings.
  - 7.3.2 Tests on shed and housing material
  - 7.3.3 Tests on the core material.
  - 7.3.4 Assembled core load-time test.

## 8 Type Tests:

- 8.1 Type tests shall be carried out to demonstrate the suitability of the design, materials and method of construction and the capability of the manufacturer to produce the Light Weight Section Insulator in accordance with the specification. All such tests shall be Witnessed by RDSO representative. The cost of samples or components destructed during type testing shall be borne by the manufacturer. The conductors required for testing of fittings etc. shall be arranged by the manufacturer at his own cost.
- 8.2 In the event of the tests not being carried through to completion at one stretch for any reason attributable to the successful manufacturer and it is required for the representative of Director General (Traction Installations), Research Designs and Standards Organisation, Manak Nagar, Lucknow, to go again or more number of times to the works of the manufacturer or other place(s) for continuing and/or completing the tests on the prototype (s) of the **equipment, the guide** line of ISO documents No. ISO9001:2008 Document No: QO-D-8.1-10 Version No: 1.0 Date Effective: 12/09/2018 (latest) for Vendor sample type testing and ISO9001:2008 Document No: QO-D-8.1-14 Version No: 1.3 Date Effective 17/03/2020 (latest) for Vendor registration schedule of charges shall be followed.
- 8.3 **The following type tests, Acceptance test, Routine test shall be conducted on the components and assemblies.**  
Each type test shall be conducted on three components/assemblies unless otherwise specified. All the samples shall satisfy the requirements of relevant clauses.

SN	Type of Test	Type Test	Acceptance Test	Routine Test	Clause No.
i	Visual examination of components	Yes	Yes	Yes	10 (i)
ii	Dimensional verification of components	Yes	Yes	-	10 (ii)
iii	Visual and dimensional examination of complete assembly	Yes	Yes	-	10 (iii)
iv	Interchangeability of components	Yes	Yes	-	10 (iv)
v	Physical and chemical tests on test Bars representing the casting and forgings (ferrous and non-ferrous).	Yes	Yes	-	10 (v)
vi	Radiographic examination of castings (ferrous and non-ferrous)	Yes	No	-	10 (vi)
vii	Liquid dye penetration test on castings and forgings (ferrous and non-ferrous)	Yes	Yes	Yes	10 (vii)
viii	Load test on end fittings of catenary Conductor and contact wire	Yes	Yes	-	10 (viii)
ix	Chemical analysis of fittings/ components	Yes	Yes	-	10 (ix)
x	Dry lightning impulse withstand voltage test on insulators	Yes	-	-	10 (x)
xi	One minute wet power frequency withstand voltage test on insulators	Yes	-	-	10 (xi)
xii	Mechanical load time test on insulators	Yes	-	-	10 (xii)
xiii	<b>Mechanical load time test on assembly</b>	<b>Yes</b>	<b>-</b>	<b>-</b>	<b>10 (xiii)</b>
xiv	Tests on fasteners	Yes	Yes	-	10 (xiv)
xv	<del>Cycle tensile load test on insulating rods</del>	<del>Yes</del>	<del>-</del>	<del>---</del>	<del>10 (xv)</del>
xvi	<del>Wear test on insulating Rods</del>	<del>Yes</del>	<del>No</del>	<del>---</del>	<del>10 (xvi)</del>
xvii	Mechanical routine test on insulators	-	Yes	Yes	10 (xvii)
xviii	Field trial	Yes	No	No	10 (xviii)

#### 9. **Acceptance tests:**

- 9.1 **Only after clear written approval communicated by RDSO to firm, the manufacturer shall be taken up bulk manufacture of the Light Weight section insulator assemblies. Bulk manufacturing of LWTSI shall be done strictly with the same material and process as adopted for the prototype testing. In no circumstances shall the material other than those approved in the design/drawings and/or the prototype be used. ~~for bulk manufacture on the plea that they had been obtained prior to the approval of the prototype.~~**
- 9.2 The manufacturer shall offer the Light Weight Section Insulator assemblies in lots of not more than 100. Two complete assemblies shall be selected at random for

Acceptance tests. Only if there is no failure at all, the lot shall be accepted. If any failure occurs the entire lot shall be rejected. Acceptance tests are listed below in the above table:

These tests shall be carried out by manufacturer in the presence of Inspecting authorities. The records of the test results maintained by manufacturer shall be produced, if required by the purchaser.

10. **TEST METHODS:**

- (i) **Visual examination of components:** All the components of the assembly shall be carefully examined to see that they are free from defects, deformations, and flaws and have smooth surface finish. Particular attention shall be paid to smooth finish of contact surfaces of runners. The visual examination of contact wire insulators and catenary insulators shall be carried out as per clause 12.1 and 12.2 of IEC 61109-2008-05 Edition 2.0 or latest.
- (ii) **Dimensional verification of components:** The dimensions of the components of the complete assemblies selected in accordance with clause 8.3 for type tests & clause 9.2 for acceptance tests shall be checked. The dimensions shall be within the limits specified in manufacturer's drawings approved by the RDSO.
- (iii) **Visual and dimensional examination of complete assembly:** Two complete assemblies shall be made and the effective sectioning length and total length shall be measured. The dimension should be according to that specified in manufacturer's drawings approved by the RDSO. The distance of the arc trap tip from the nearest live point shall be checked. It shall be adjustable within the limits specified in manufacturer's drawings approved by the RDSO. The level of runners, if used, shall be adjustable so that smooth passage of Pantograph from insulator to contact wire and vice-versa is obtained. In case the runners are not used in the assembly, other means of assuring the smooth passage of pantograph shall be checked. Other major dimensions of the assembly shall be checked which should be according to approved drawings.
- (iv) **Interchangeability of components:** If any of the components selected at random permit their assembly without any further machining or forming operations with their matching components and the assembly so made meet the requirements of clause 10.1, the requirement of this test shall be deemed to have been complied with.
- (v) **Physical and chemical tests on test bars representing the castings and forgings (ferrous and non-ferrous):**
  - (a) For each material used for ferrous/non-ferrous castings and forgings the Manufacturer shall test one of the two test bars from each melt/lot for physical properties and chemical composition. Only if the test results are in conformity with relevant standards the fittings/components from that melt/lot shall be utilized and offered for acceptance otherwise the lot shall be re-melted.
  - (b) The second test bar shall be tested by the Inspector for each lot of fittings/components from each melt/lot for physical properties only. If the requirements of physical properties are not met with, the particular lot shall be rejected and fittings/components broken or re-melted in the presence of the Inspector. If the requirement of physical properties is met with the lot shall be accepted.
- (vi) **Radiographic examination of castings (ferrous and nonferrous):** Radiographs of the castings (ferrous and Non-ferrous) selected for the purpose shall be taken and evaluated by RDSO for inclusions, blow holes, cavities, cracks, porosity etc. if the casting fail in radiographic examination, the lot shall be rejected and destroyed in the presence of inspecting authority. The accepted radiographs shall be retained By RDSO.
- (vii) **Liquid dye penetration test on castings and forgings (ferrous and non ferrous):** All the castings and forgings (ferrous and non-ferrous) shall be tested for cracks, porosity etc. by the liquid penetrate flaw detection method in accordance with IS:3658-1999 or latest. The castings/forgings shall satisfy the requirements of the specification.
- (viii) **Load test on end fittings of catenary conductor and contact wire:** A suitable length of the conductor with which the end fittings are intended to be used, shall be fixed in the fitting with bolts and nuts tightened with specified torque. The assembly shall be held in a tensile testing machine. A tensile load of fifty percent of the breaking load of the conductor shall be applied and the conductor shall be marked in such a way that the movement relative to fitting can be easily detected. Without any subsequent adjustment of the fitting, the load shall be increased to 90% of the breaking load of the conductor and maintained for one Minute. There shall be no movement of the conductor relative to the fitting during this period and no failure of the fitting. The load shall further be increased till the failure of fitting or conductor. Failure of fitting shall not occur at a load below 95% of the breaking load of conductor.

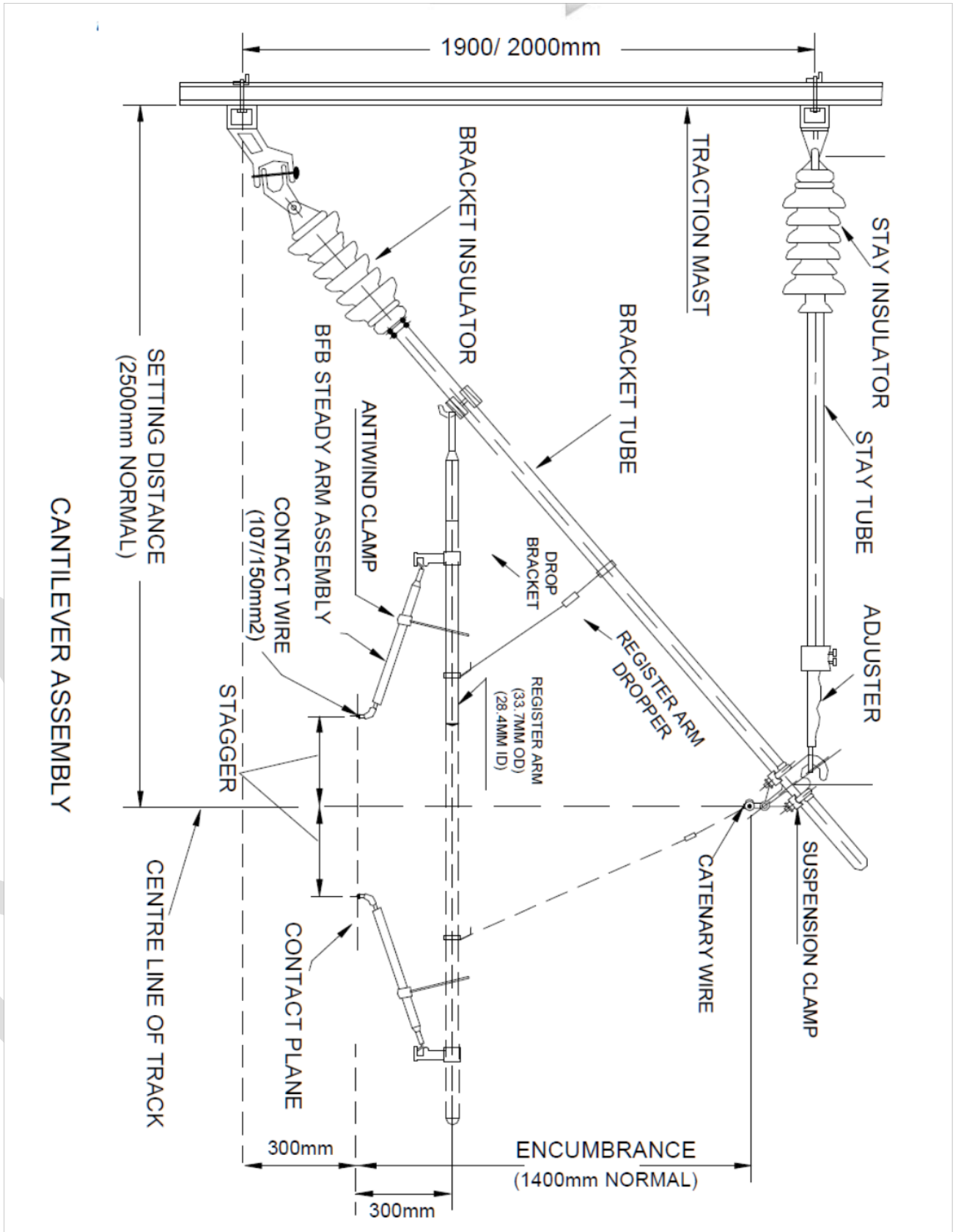
- (ix) **Chemical analysis of fittings/components:** All fittings/components shall be chemically analyzed. The chemical composition shall be in accordance with the relevant specifications mentioned in the approved drawings.
- (x) **Dry lightning impulse withstand voltage test on insulators:** The insulators shall withstand 1.2/50 microsecond, impulse voltage minimum of 250 kVp positive and 260 kVp negative polarity when tested in accordance with clause 11.1 of IEC 61109-2008-05 Edition 2.0 ( For altitude 2500 m the value shall be 300.50 Kv positive & 313 Kv Negative polarity).
- (xi) **One minute wet power frequency withstand voltage test on insulators:** The insulators in horizontal position shall withstand one minute wet power frequency voltage minimum of 125 kV rms (50 Hz) when tested in accordance with clause 11.1 of IEC 61109-2008-05 Edition 2.0 (For altitude 2500 m the value shall be 151 kV rms).
- (xii) **Load time test on Insulator:** The insulator shall be tested in accordance with clause 11.2 of IEC 61109 Ed-2 (2008-05). In continuation, the load shall further be increased till failure occurs. Failure of fittings/joint/insulator rod shall not occur below the SML/breaking load of LWTSI assembly divided by number of insulator used in assembly.
- ~~(xiii) **Mechanical load time test on insulators** assembly: The insulators shall be tested in accordance with clause 11.2 of IEC 61109-2008-05Edition 2.0 in continuation, the load shall further be increased till failure occurs. Failure of fittings/joint/insulator rod shall not occur below 9900kgf.~~
- a. The assembly of insulator of LWTSI without runner, splice and clamp etc (contact wire side for breaking load of contact wire upto 7045 kgf) shall be held in a tensile testing machine. The load shall be increased to 95% of 9900 kgf and maintained for one Minute. The load shall further be increased till the failure of fitting or insulator assembly. ~~tested in accordance with clause 11.2 of IEC 61109 Ed (2005-08).~~ The value of SML/Breaking load shall not be less than 9900 kgf. In continuation, failures of fittings/joint/insulator rod of assembly shall not occur below 9900 kgf.
- b. The insulator assembly (catenary wire side for breaking load of catenary wire upto 7650 kgf) shall be held in a tensile testing machine. The load shall be increased to 95% of 9900 kgf and maintained for one Minute. The load shall further be increased till the failure of fitting or insulator assembly. ~~in accordance with clause 11.2 of IEC 61109 Ed (2005-08).~~ The value of SML/breaking load shall not be less than 9900 kgf. In continuation, failures of fittings/joint/insulator rod of assembly shall not occur below 9900 kgf.
- c. The insulator assembly (catenary wire side, for breaking load of catenary wire beyond 7650 kgf and upto 12202kgf) shall be held in a tensile testing machine. the load shall be increased to 95% of 12202 kgf and maintained for one Minute. The load shall further be increased till the failure of fitting or insulator assembly ~~in accordance with clause 11.2 of IEC 61109 Ed (2005-08).~~ The value of SML/breaking load shall not be less than 12202 kgf. In continuation, failures of fittings/joint/insulator rod of assembly shall not occur below 12202 kgf.
- (xiv) **Tests on fasteners:** The stainless steel fasteners when tested shall conform to grade A4 property class 50 or class 80 of ISO 3506-1 (latest) or ~~AISI 316~~ as per Specification No. TI/SPC/OHE/Fasteners/0120 (Rev.1). ~~If fasteners are procured from CORE/RDSO approved firms and produce test certificate then the test on fasteners shall not be carried out.~~
- ~~(xv) **Cyclic tensile load, bend and torsion test on insulating rod:** Insulating rods shall be tested for 500000 cycling tensile load operations i.e. 20 kN applications shall be cycled between 10 kN-30 kN. The rods should retain 80% of its original minimum breaking strength i.e. 80 kN after the cyclic tensile load. The rod shall also be cyclically tested in bending load between 100 N-700 N for 5000,00 cycles and torsion angle between 0-90 degrees.~~
- ~~(xvi) **Wear test on insulating Rods:** Wear test on insulators shall be conducted to evaluate a total life of the insulating rod for more than 400000 panto pan passes.~~
- ~~(xvii) **Mechanical routine test on insulators:** Every insulator of the lot shall be tested in accordance with Clause 13.1 if IEC 61109-2008-05Edition 2.0.~~  
Each insulator assembly without runner, splice and clamp (contact wire and catenary wire side) shall be tested on half of specified breaking load of LWTSI assembly/ SML.
- (xviii) The LWTSI assembly shall be installed by the manufacturer on OHE with the assistance of Railways for field trial for three months. After completion of three months from the date of installation, the performance report of the LWTSI assembly would be sent to DG/TI RDSO Lucknow by the Zonal Railway.



## 11.0 PACKING AND MARKING:

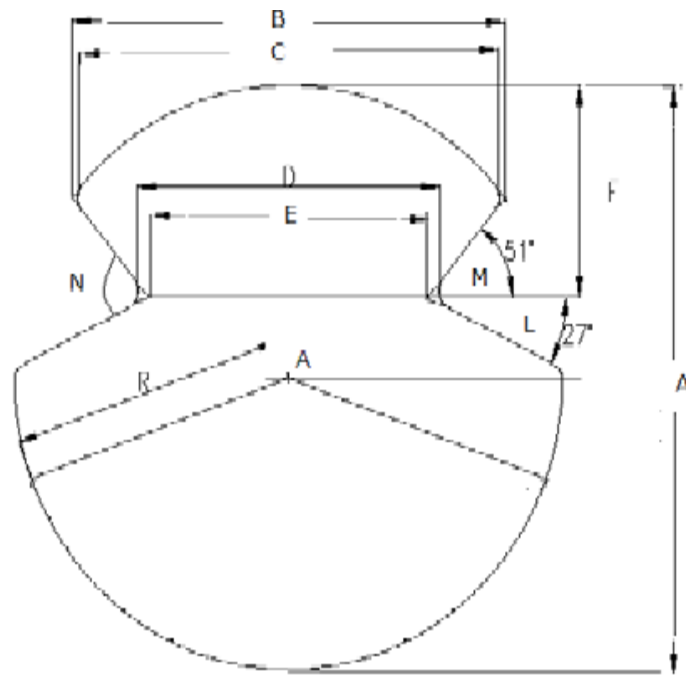
- 11.1 The fittings and components excluding insulators of the neutral section assembly shall be packed in knocked down condition in proper wooden boxes to prevent damage during transit. Every box shall contain a list of fittings/components giving quantity of each item packed in the box. Erection and maintenance instructions/drawings for assembling fitting/components to form the complete light weight section insulator assembly should also be included in the box. The insulators properly wrapped and protected from damage during transit shall be packed separately in strong wooden boxes.
- 11.2 Every box shall carry in legible and indelible lettering the following information.
- 11.3 Manufacturer's trade name and brand mark.
- 11.4 Number of insulators/components of assemblies packed.
- 11.5 Contract/purchase order number with date.
- 11.6 Consignee's address.
- 11.7 Date of inspection and inspecting authority.
- 11.8 Any other particulars specified by the purchaser.
- 11.9 Encl: Annexure I, II, III
- 12.0 All the provisions contained in RDSO's ISO procedures laid down in Document No:QO-D-8.1-11 Version No: 1.7 Date Effective: 22.01.2021 Document Title: Vendor - Changes in approved status and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by railways to maintain quality of products supplied to railways".
- 13.0 The "Make in India" policy-2017 of Government of India shall be applicable.
- 14.0 Following should be ensured:
- a. The development/ product/process is original and there is no infringement of Patent Rights. Indian Railways shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of similar components in the design & development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/matters lies with the manufacture/supplier.
  - b. Details/design/documents given are not infringing any IPR and we are responsible in absolute and full measure instead of railways for any such violations. Data, specifications and other IP as generated out of interaction with railways shall not be unilaterally used without the consent of RDSO and right of Railways / RDSO on such IP is acceptable to firm.

-End-



## ANNEXURE-II

## CONFIGURATION OF CONTACT WIRE



Cross Section mm <sup>2</sup>	E Dimensions(mm)						Dimensions (Degree)		
	A	B	C	D	E	F	L	M	N
107	12.24 ±0.16	-	-	6.92± 0.15	6.50	4.43	27 (+1,-0)	51(+1,-0)	78(+2,-0)
150	14.50 ±0.20	-		6.92± 0.15	6.50	4.00	27 (+1,-0)	51(+1,-0)	78(+2,-0)
161	15.00 ±0.15	12.2	12.0 ±0.25	8.50 (+0.18- 0.30)	8.10	5.75	27 (+2,-0)	51(+2,-0)	78(+3,-0)
193	16.40 ±0.15	12.2	12.0± 0.25	8.50 (+0.18- 0.30)	8.10	5.3	27 (+2,-0)	51(+2,-0)	78(+3,-0)

## SCHEDULED OF GUARANTEED TECHNICAL PARTICULARS

## ANNEXURE-III

S.N.	Parameter	Value
1.	Assembly	

Page <b>12</b> of <b>12</b>		SPEC No. TI/SPC/OHE/LWTSI/0060 (Rev.1)		Effective from July,2016	
a	Speed potential				
b	Total length				
c	Sectioning length				
d	Total weight				
e	Safe working load				
i	Contact wire side				
ii	Catenary conductor side				
iii	Assembly				
f	Whether suitable for AM 12 or AM 92 Pantograph with metallised carbon strip/pure carbon strips				
g	Whether suitable for erection symmetrically on either side of support.				
h	Permissible stagger at support for erection				
i	Minimum radius of Curve of track for assembly erection				
j	Maximum gradient of track for assembly erection				
2.	Insulators	Contact wire side:	Catenary wire side		
i	Material of core of insulator and specification With grade.				
ii	Material of covering of insulator and specification with grade.				
iii	Material of end fittings and specification With grade.				
iv	Type of coupling of end fittings With core.				
v	Specified mechanical load.				
vi	Routine test load				
vii	Tensile failing load				
viii	1.2/50 micro sec. dry lightning impulse withstand voltages				
ix	Wet one minuets power frequency				
x	Creepage distance				
xi	Safe working load				
3.	Fittings				
a	Castings				
i	Type of casting (sand cast/die cast/pressure die cast)				
ii	Material with specification and grade of each Casting(name the castings also)				
iii	Mechanical properties of the test bars for Respective castings				
	a. Tensile Strength				
	b. Elongation for a gauge length mm				
	c. Yield stress or other Stresses				
b	Other fittings: Material with specification and grade of each fitting.				
c	End Fittings: Mechanical Failing load	Contact wire	Catenary conductor		
4.	Fasteners				
a	Material with specification and grade				
b	Salient mechanical properties of bolts and nuts				
c	Freedom from carbide precipitation				
d	Resistant to inter-crystalline corrosion				
5.	Earth wire				
a	Material with specification and grade				
b	Construction				
c	Mechanical failing load				
d	Salient electrical properties				
6.	Provision of identification marking				
a	Insulators				
b	Fittings and components				
7.	Available of interchangeability				
8.	Galvanized Components				
a	Mass of zinc coating				
b	Thickness of zinc coating				
c	Number of successful dips in preece test				
9.	Suitability of assembly in Indian environment				