

Gujarat Power Research & Development Cell, GUVNL

Wedge Connectors

Project No: RP-018

Annexure-C

Technical Specifications of Wedge Connector

1. SCOPE:

This specification covers design, manufacture, testing, inspection, packing and dispatch at destination of the Wedge connectors specified herein for their satisfactory performance on various power distribution lines. The wedge connector is suitable for Weasel, Rabbit and Dog conductors. Fitting shall conform all respect to the highest standard of engineering, design and workmanship and shall be capable of performing trouble free continuous operation.

Wedge connector shall be used for line jumpers, cut-points, making connection to the equipment's like CTs and PTs, Lightning Arresters, DTC etc. The equipment required shall be complete with all components which are necessary or usual for their efficient performance for a longer time and satisfactory maintenance.

2. APPLICABLE STANDARDS:

The Wedge connector shall conform to the following International/Indian Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

In the event of the supply of connector conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the standards proposed by the Supplier and those specified in this document will be provided by the Supplier to establish their equivalence.

Sl. No.	International /Indian Standard	Description
1	IS 2121	Fittings for aluminum and steel covered aluminum conductors for overhead lines
2	IS 5561	Electrical Power Connectors
3	IS 617	Cast Aluminium and Its Alloys_Ingots and Castings for General engineering Purposes Specifications
4	ANSI C 119.4-2004	American Standard for "Connectors for Use Between Aluminum-to-Aluminum" or Aluminum-to-Copper Conductors
5	IS 9000(Part-XI):1983	Salt Mist testing Procedure-1
6	IS 6009 (1970 UPDATED)	Method for evaluation of results of accelerated corrosion test

3. Service Conditions

The overall climate is moderate hot, humid, tropical, highly polluted and conducive to rust and fungus growth. The clamps/connector shall be given tropical and fungicidal treatment and shall be capable of satisfactory operation under the hot and humid climatic conditions that would prevail at sites. The climatic conditions are prone to wide range of variation in ambient conditions. The materials offered shall be suitable for installation at any of the Electricity Distribution network in Gujarat State.

I.	Maximum Ambient Temperature (°C)	50
II.	Relative humidity (%)	10 to 100
III.	Maximum Annual Rainfall (mm)	1450
IV.	Maximum Wind Pressure (Kg/mm ²)	150
V.	Maximum Altitude above mean sea level (Meter)	1000
VI.	Isoceraunic Level (days/year)	50
VII.	Seismic Level (Horizontal acceleration)	0.3 g
VIII.	Ground Temperature (°C)	30
IX.	Thermal Resistivity of Soil (deg. C cm/Watt)	150
X.	Moderate hot and humid tropical climate, Conducive To rust and fungus growth	

4. SYSTEM PARTICULARS:

I.	Nominal System Voltage	11 KV
II.	Highest System Voltage	12 KV
III.	Short circuit level for	20KA for 3 Secs
IV.	Frequency	50 Hz±3%
V.	Basic insulation level	75 KV
VI.	Numbers of Phases	3
VII.	System of Earthing	Effectively Earthed

5. **Terms and Conditions of supply:** The Commercial terms and conditions of GUVNL for supply of material shall be applied.

6. General Technical Requirements of Connectors

- 6.1. It consists of a spring "C" member and a Wedge, both made from Aluminum Alloy of high ductility and electrical conductivity (Minimum 85% aluminum) and Configuration that creates spring action and electrical conductivity.
- 6.2. The connector shall be useful for the conductor size as mentioned in this Specification.
- 6.3. The installation practice for Wedge Connector shall be using hammer.
- 6.4. The "C" wedge connectors shall be of universal type facilitating to take horizontal or vertical jumps.
- 6.5. The material used shall be specially designed with close tolerances on the chemical composition to ensure consistency of the "C" member production regarding dimensions and mechanical properties.
- 6.6. The "C" member shall have suitable elastic properties to accommodate the variations in conductor dimensions due to thermal effects
- 6.7. The dimensions for the wedges are manufactured to close tolerances to ensure repeatability and reliability of the connection.
- 6.8. All casting shall be free from shrinking, blow holes, surface blisters, cavities, cracks, other defects and quality of product shall be uniform throughout. All sharp edges and corners shall be blurred and rounded off.
- 6.9. Assembly shall be designed and manufactured in such a way so as to have minimum contact resistance.
- 6.10. The fittings offered shall be inherently resistive to atmospheric corrosion or be suitable to protect against corrosion both during storage as well as in service.
- 6.11. The clamp itself have suitable design to safeguard against vibration and loosening.
- 6.12. No part of a clamp shall be less than 5 mm thick for fittings suitable up to size of rabbit conductor, No part of a clamp shall be less than 7 mm thick for fittings suitable for Dog conductor
- 6.13. The terminal connector for equipment's shall be suitable for single Weasel/Rabbit/Dog conductor for 11 KV.
- 6.14. The clamps/connector shall not cause any damage to the conductor in any way.

- 6.15. The connector for connecting solid/ stranded conductor shall be suitable for use on any of the following combination:
- i. AAAC TO AAAC
 - ii. ACSR TO ACSR
 - iii. Dog to Dog
- 6.16. It shall be pre-coated with corrosion inhibitor compound.
- 6.17. It shall be coated with a conductive inhibitor containing abrasive particles to help in cleaning the contact surface during installation. The coating shall be done at factory itself.
- 6.18. Wedge notch (end portion) shall have self-locking facility so that once the wedge is fixed with inhibitor it will not loosen and come back.
- 6.19. The wedge connector shall be designed to withstand the flow of continuous minimum current as follows:
- i. Weasel 200 Amp
 - ii. Rabbit 300 Amp
 - iii. Dog 400 Amp

Note: Responsibility of satisfactory design of the clamps/connectors to safely withstand the specified mechanical stresses and carry the rated current without exceeding the temperature rise specified, shall solely rest with the bidder. For this purpose, a minimum factor of safety 2 (two) shall be taken into account.

- 6.20. The temperature rise when carrying full load current shall not exceed 45. °C above site ambient temperature of 40. C. The rated current for which the clamp connectors are designed with respect to the specified ambient temperature shall be marked on each component of clamps and connectors.

6.20.1. "C" member

The "C" member shall be formed from aluminum alloy so that the grain runs perpendicular to the conductor i.e. from top portion of C-groove to the bottom portion of the C groove.

The material used shall be specially designed with tighter tolerance on the chemical composition to ensure consistency of the C-member production regarding dimension and mechanical properties.

6.20.2. Wedge

The dimension for the wedge shall be manufactured to close tolerance to ensure repeatability and reliability of the connection.

6.20.3. Inhibitor

An oxidation inhibitor shall be applied to the surface there by elimination of oxidation of metallic surface. The chemical composition of the inhibitor shall be synthetic and compatible with the rubber gloves used by the utilities. This inhibitor shall contain special aluminum abrasive particles, optimized in size and quantity, to ensure repeatability and reliability of the electrical contact made in every connection.

6.20.4. Freedom from Defect:

The wedge type connectors shall be smooth and free from cavities, blow holes, and such other defects, which would likely cause them to be unsatisfactory in service.

The wedge type connectors shall be so designed and proportioned that they are capable of safely withstanding stresses to which they may be subjected (including those due to short circuit and climate conditions) and that the effects of vibration both on conductor and connector are minimized. They shall be designed, manufactured and finished so as to avoid sharp radius of curvature, ridges and excrescences, which might lead to, localized pressure on or damage to the conductor in service.

7. Test

Individual fittings, clamps, connectors shall be subjected to following type tests, acceptance test and routine test as per applicable standards (as mentioned in clause 2 of this specifications) with latest amendments.

7.1. Type Test

- i. Tensile Test
- ii. Resistance Test
- iii. Temperature rise Test as per IS 5561(the conductor current value considered at 75 °C of conductor current carrying capacity)
- iv. Short Time current Test
- v. Dimension Check
- vi. Chemical composition test
- vii. Corrosion test/Salt spray test - type test certificate as per IS 9000(Part-XI):1983 of Salt Mist Test Procedure –I for the Wedge Connector and for evaluation red rusting should not occur after completion of Salt Mist test & the overall maximum resistance change should not be allowed more than 10%, which is to be measured before and after Salt Mist Test by testing laboratory across the specimen of wedge connector.

7.2. Acceptance Test

- i. Tensile Test
- ii. Resistance Test
- iii. Dimension Check
- iv. Chemical composition test

7.3. Routine Test

- i. Visual Inspection
- ii. Dimension Check

7.4. Testing Certificate

The bidder shall furnish detailed type test reports of the offered Wedge Type Connector for the tests as per this specification. All the above Type Tests shall be carried out as per the relevant standards at laboratories which are accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) of Government of India to prove that the Wedge Type Connector offered meet the requirements of the specification. These type tests should have been carried out within seven years prior to the date of opening of this tender.

7.5. Testing Equipment's and its facility

- i. The following additional facilities shall be available at Supplier's works: -
- ii. Test Laboratory for Routine and Acceptance test shall be available at manufacturer's works and all instruments/equipment should have valid calibration and approved from NABL accredited lab.
- iii. Calibration Reports from Government approved testing laboratory/NABL accredited Lab of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer etc.
- iv. Standard resistance for calibration of resistance bridges.

- v. The bidder shall require to have all the routine and acceptance testing facilities, in house, however for acceptance testing of chemical composition test: If testing facility is not available at manufacture's place then, it will be allowed to conduct testing at NABL accredited Lab in presence of Engineer In charge of the DISCOM with prior approval from the DISCOM.

7.6. Additional Test

The DISCOM reserves the right of getting done any other test(s) of reasonable nature carried out at Supplier's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the specifications.

In such case all the expenses will be to Suppliers account.

8. Drawings and sample:

The bidder shall submit their drawings and free samples of the tendered item along with the bid. The acceptability of the bid shall be subject to confirmation of type tests as mentioned above on samples carried out in any government approved NABL lab. The price bid of the bidder whose sample does not confirm any of the type test shall not be opened.

9. QUALITY ASSURANCE PLAN

9.1. The bidder shall invariably furnish following information along with his offer, failing which his offer shall be rejected.

- a. List of manufacturing facilities available.
- b. Level of automation achieved and list of areas where manual processing exists.
- c. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- d. List of testing equipment available with the Supplier for final Testing of Wedge Connector for Conductors specified (as per size mentioned in tender). In the case if the suppliers does not possess all the Routine and Acceptance testing facilities the tender will be rejected.
- e. The DISCOM reserves the right for factory inspection to verify the facts quoted in the offer. If any of the facts are found to be misleading or incorrect the offer of that Bidder will be out rightly rejected and he may be black listed.
- f. Special features provided to make it maintenance free.

9.2. The bidder shall also submit following information to the purchaser along with the technical Bid.

- a. List of raw materials as well as bought out accessories, and the name of suppliers of raw materials as well as bought out accessories.-If applicable
- b. Type test certificates of the raw material and bought out accessories.-If applicable
- c. Quality assurance plan (QAP) withhold points for purchaser's inspection.

9.3. The Supplier shall submit the routine test certificates of all the bought out items, accessories etc.

10. DOCUMENTATION

- 10.1. Two sets of type test reports, duly approved by the Purchaser shall be submitted by the Supplier, before commencement of supply. A copy of acceptance and routine test certificates, duly approved by the purchaser shall accompany the dispatch consignment.
- 10.2. The manufacturing of the connector shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the Purchaser. All manufacturing work in connection with the connector prior to the approval of the drawing shall be at supplier's risk.
- 10.3. Approval of drawing etc. by the purchaser shall not relieve the Supplier of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The connector shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or material which in his judgement is not in full accordance therewith.

11. Marking

Each "C" member and wedge shall be marked with distinct identification code. This identification code is also marked on the packing to ensure that the correct parts are used for the application. Thereby installer can make a quick before installing.

12. Packing

For Packing, suitable materials shall be used. The packing shall be fit to withstand rough handling during transit and storage at destination. The heads and threaded portion of fasteners fitting if any should be properly protected against damage. The gross weight of the packing shall not exceed 50 kg per box or case. All different fitting components shall be packed in different cases and shall be completed with minor accessories fitted in places. The bidder should be approved the packing list before dispatching the material.

13. Guaranteed Technical particular

GTP of Wedge Connector shall be as per specification. Any deviation w.r.to this specification shall be clearly mentioned. GTP of Wedge connector is as under.

GUARANTEED TECHNICAL PARTICULARS

"C" Type wedge connector

Sr. No	Particulars	As per Specifications	As offered/Confirmed
1	Manufacturer's Name & address		
2	Brand Name & Country of Origin		
3	Applicable Standards	As mentioned in Specifications	YES/NO

4	Material of Wedge connector a) "C" Member b) Wedge Member c) Inhibitor	Aluminum – 85%- 88% Silicon – 10-13% Other Components as per IS 617 : 1994	YES/NO
5	Connector suitable for conductor size	Weasel (34mm ²) Rabbit(55mm ²) DOG (100mm ²)	YES/NO
6	Designed as per Rated current	Weasel: 200 Amp Rabbit : 300 Amp Dog: 400 Amp	YES/NO
7	Dimensions	As per drawing	YES/NO

Drawing:

C Member

Wedge

Wedge Connector Dimensions (mm)				
	A	B	C	E
DOG	50	70	18	1
Rabbit	62	82	15	7
Weasel	63	82	15	7

Notes:

- All Dimension are in mm.
- Drawing is not to the scale.
- Material shall be Aluminium Alloy.

Project Name: Wedge Connector

Drawn By: [Signature]

Checked By: [Signature]

Approved By: [Signature]

Date: 22/11/17

Research Proj. No.: RP 018

Drawing No.: R10318F00

Date: 23-11-2017

Customer: Gujarat Power R&D Co. Ltd.

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