



**GUJARAT ENERGY TRANSMISSION
CORPORATION LTD.**

**Sardar Patel Vidyut Bhavan, Race Course,
Vadodara: 390 007**

**TECHNICAL SPECIFICATION
OF
ACCESSORIES SUITABLE
FOR
7/3.15 mm G.I. EARTH WIRE**

GETCO/E/TS – EAC020/R2 July 2022

BLANK

BLANK

SECTION – I

GENERAL TECHNICAL REQUIREMENTS FOR ACCESSORIES SUITABLE FOR 7/3.15 mm G.I. EARTH WIRE

1.1 SCOPE

- 1.1.1 This section of the specification covers design, manufacture, testing at the manufacturer's works before dispatch, supply and delivery for ground wire accessories suitable to 7/3.15 mm 110 Kg. Quality G.I. Earth Wire for 220 KV/132 KV/66 KV transmission lines.

1.2 STANDARDS

- 1.2.1 Ground wire accessories although not specifically covered under any Indian Specification shall generally satisfy the requirements of the following Indian Standard Specification or other authoritative standards for similar equipment.

- (1) IS: 2121-1981 Specification for fittings for aluminium and steel cored aluminium conductors for overhead power lines (latest if any) except where specified otherwise in these specifications.
- (2) IS: 2486 (Part-I) Specification for Insulator fittings for overhead power lines with nominal voltage greater than 1000 Volts (latest amendment if any)

1.3 MATERIAL

- 1.3.1 The material offered shall be of best quality and workmanship.
- 1.3.2 The materials employed in the manufacture of accessories shall be malleable cast iron/forged steel etc. depending on the types of application for which accessories are used and shall have requisite mechanical strength, be corrosion resistant and mechanic able.

- 1.3.3 Ground wire accessories shall be free from inequalities, spills, splits or other defects and shall be smooth and of the true forms and dimensions.

1.4 **SIZES AND CONSTRUCTIONS**

- 1.4.1 Design and construction of G. S. S. ground wire accessories shall be such that they can be easily fitted and are free from unnecessary projections or sharp edges. All castings shall be free from blowholes and other casting defects, such as cracks. All fittings shall be so designed that the effects of vibration on the ground wire and the fitting itself are minimum. All parts of the fittings shall either be inherently resistant to atmospheric corrosion or be suitably protected against corrosion both during storage and in service.

1.5 **GALVANISING**

- 1.5.1 All ferrous metal parts of ground wire accessories except those made of stainless steel shall be hot dip galvanized in accordance with IS: 2629-1966 with latest amendment, if any, recommended practice for hot dip galvanizing of iron and steel or some other authoritative standard equivalent. Spring, washers where used shall also be electro-galvanized. The threads in nuts and in tapped holes shall be cut after galvanizing and shall be well lubricated or greased. The bolt threads shall be under-cut to take care of the increase in diameter due to galvanizing and if required should be re-run after galvanizing.

1.6 **STRAIGHT COMPRESSION JOINTS**

- 1.6.1 Compression type straight joints are required for making joints in the galvanized steel stranded ground wire. The straight joint shall be so designed that when installed no air space is left within the finished joint and they should withstand at least 95% of the breaking strength of the ground wire without any slippage or deformity. The inner and outer diameters and lengths of these joints, before and after compression, shall be clearly shown in the drawing.

1.7 **SUSPENSION CLAMPS**

- 1.7.1 Suspension clamps of suitable size are required for holding the galvanized steel stranded ground wire at suspension points. The suspension clamps shall be suspended from the tower hanger or 'U' bolt of 16/20 mm dia. and should, therefore, be supplied with a suitable attachment that would allow the clamp to swing freely both in the transverse and longitudinal direction. The clamp shall be so designed that the effect of vibration both on the ground wire and the fitting itself is minimum. The clamps shall be designed, manufactured and finished to

avoid sharp point of curvature, ridges or any excrescence, which might lead to localized pressure on or damage the ground wire on long easy curves to take care of required steep vertical and horizontal angles. The clamps shall permit the ground wire to slip before the failure of the later occurs. On leg of the 'U' bolt holding the keeper piece of the clamps shall be kept sufficiently long and shall be provided with threads, nut & locking nut for fixing the fixable earthing bond between the suspension clamp and the tower structure.

1.8 DEAD-END ASSEMBLIES

1.8.1 Compression-type dead-end assemblies for tension Ground-wire shall be required for use on the tension towers. The dead-end assemblies are supplied complete with jumper terminals, nuts & bolts, suitable link pieces between the steel clevis and tower strain plate so as to provide sufficient flexibility to the attachment. Dead-end assembly shall have conductivity not less than that of G.S.S. ground wire and tensile strength not less than 90% that of G.S.S. ground wire.

1.8.2 One of the bolt holding jumper terminal of dead-end assemblies shall be kept sufficiently long-end threaded and shall be provided with washers, nuts and locking nuts for fixing the flexible earthing bond between the dead-end assembly and tower structure.

1.9 COPPER EARTH BONDS

1.9.1 The Bidder shall offer tinned copper bonding for connecting the ground wire suspensions and tension clamps to the tower legs suitable for earthing. Each bond piece shall have suitable tinned copper lug or thimble on either end for making connections to clamps and tower legs. The size, strength etc. of the bonding piece is given in Section-II of this Specification.

1.10 TYPE TESTS FOR GROUNDWIRE ACCESSORIES

1.10.1 Bidder shall submit following tests from NABL accredited/Government Laboratory. The test shall be carried out in accordance with latest /amended / up to date IS. The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL accredited/Government Laboratory shall not be older than Seven years. Type test reports shall be valid as on the last date of submission of bid.

1.10.1.1 Type tests for clamps

- a) Visual examination
- b) Verification of dimensions
- c) Slip strength tests (for Suspension clamps only)
- d) Chemical composition test
- e) Electrical resistance test (for tension clamps only)
- f) Mechanical Strength test
- g) Galvanizing tests

1.10.1.2 Type tests for Straight Compression Joint & Flexible Copper Bond

- a) Visual examination
- b) Verification of dimensions
- c) Slip strength tests
- d) Chemical composition test
- e) Electrical resistance test (for MSJ only)
- f) Galvanizing tests

1.10.1.3 In case of non-submission of type test reports; the evaluation shall be carried out accordingly.

Important Note:

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited/Government Laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid. Furthermore, purchaser reserve right to select the sample from Manuf. Works & recommend the NABL lab to carry out type tests in case of non-submission/ partial submission or type test reports of which validity is over.

1.10.2. ACCEPTANCE TESTS

- 1) Visual examination test.
- 2) Dimensional verification.
- 3) Slip strength test for clamps,
- 4) Mechanical failing load test for clamps & points & fittings.
- 5) Galvanizing/Electroplating test.

6) Chemical Composition Test

7) Magnetic Particle Inspection (NDT) test for forgings as per ASTM E 709

For performing Chemical Composition Test and Magnetic Particle Inspection test on forging, sampling plan shall be 1 number each type on offered lot of inspection

1.10.2.1 SLIP STRENGTH TEST FOR CLAMPS

1.10.2.2 Suspension Clamps

The suspension clamp shall be vertically suspended by means of some flexible attachment. A suitable length of the specified ground wire shall be fixed in the clamp with bolts & nuts tightened with the specified torque. A load shall then be gradually applied at one end of the ground wire and the value of the load at

which the ground wire in the clamp begins to slip shall be noted. The ground wire should not slip at a load of 15 percent of the breaking load of the ground-wire for the purpose of this test; the breaking load of the ground-wire shall be taken as the value given in Section-II of this Specification.

1.10.2.3 **Compression Type Clamps**

The compression clamp shall be compressed with the specific ground-wire of suitable length and shall be held in the tensile testing machine by means of flexible attachment. A tensile load of about 50 percent of the breaking load of the ground-wire shall be applied and the ground-wire shall be marked in such a way that movement relative to the clamp can be detected,

1.10.3 **MECHANICAL TEST**

1.10.3.1 **Suspension Clamps**

The suspension clamp fitting shall be held in tensile testing in a manner approximately as nearly as possible to the arrangement to be used in service, the ground-wire being replaced by a riding bar of suitable size. A tensile load equal to one-half of the specified minimum failing load shall be applied and increased at a steady rate. The failure of the fitting shall not occur at a load less than the specified minimum failing load.

Note:

This test is intended to prove the capacity of the suspension clamp to carry the vertical load.

1.10.3.2 **Compression type Clamps**

For compression clamp shall be mounted in tensile testing machine and anchored in a manner approximating as nearly as possible to the arrangement to be used in service. A tensile load equal to one-half of the specific minimum failing load shall be applied and increased at a steady rate. Failure of the fitting shall not occur at a load less than the specified minimum failing load.

1.10.4 **GALVANISING/ELECTRO-PLATING TEST**

The uniformity of zinc coating of hot dip galvanized ferrous string fittings shall satisfy the requirements of IS: 2633/1972 or any other equivalent authoritative standard electro galvanized ferrous fittings shall be checked in accordance with IS: 1573-1960 or any other equivalent authoritative standard.

1.10.5 **STRAIGHT COMPRESSION JOINT**

1.10.5.1 **Failing load Test**

A tensile load of about 50 percent of the breaking load of the ground wire given in Section-II of this specification shall be applied and the ground-wire shall be marked in such a way that movement relative to the fitting can easily be detected. Without any subsequent adjustment of the fitting, the load shall be

steadily increased to 90 percent of the load and maintained for one minute. There shall be no movement of the ground-wire relative to the fitting during this one-minute period and no failure of the fitting.

1.10.6 QUALITY ASSURANCE PLAN

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

- i) Statement giving list of important raw materials names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of supplier's representative and as routine and / or acceptance during production and on finished goods, copies of test certificates.
- ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.
- iii) List of manufacturing facilities available.
- iv) Level of automation achieved and lists of areas where manual processing exists.
- v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- vi) List of testing equipment available with the Supplier for final testing of Conductor specified. In the case if the suppliers does not possess all the Routine and Acceptance testing facilities the tender will be rejected.
- vii) The GETCO reserves the right for factory inspection to verify the facts quoted in the offer. If any of the facts are found misleading or incorrect the offer will be out rightly rejected and Bidder may be black listed.
- viii) Special features provided to make it maintenance free.

1.11 INTERCHANGEABILITY

The parts of similar accessories shall be made to gauge or jig and shall be interchangeable in every respect.

1.12 INSPECTION AND TESTING FACILITIES

1.12.1 The Bidder shall clearly state in his bid the facilities available at his works to perform the tests specified in this Specification. The Bidder shall at his own expense, allow the Purchaser or his authorized representative all reasonable facilities for satisfying himself that the material supplied is in accordance with the Specification. The Purchaser or his authorized representative shall have free access all times, while work on the order is being performed, to such parts of the manufacturer's work as area connected with the manufacture of material. The name and address of the Manufacturer or accessories shall be indicated in the tender.

1.12.2 All tests and inspection shall be made at the place of manufacturer prior to dispatch unless otherwise specified in writing. In the event of the Bidder not being in a position to provide suitable facilities of carrying out tests in accordance with this Specification, the purchaser or his authorized

representative may require the Bidder to have the material tested at a place where such facility is available and in this case the Bidder shall bear the cost so incurred.

1.13 DRAWINGS

1.13.1 Bidder shall submit detailed dimensional drawings of the items offered. All dimensions must be in metric units. Schedule of drawings must accompany the tender.

1.13.2 The successful Bidder will have to submit ten sets of approved drawings for the use of the Purchaser. And one set in soft copy in Auto CAD format.

1.13.3 Any manufacturing started prior to the approval of the drawing will be at the Supplier's risk. The Purchaser shall have the right to require the Supplier to make any changes in the design, which may be necessary in his opinion to make the equipment conform to the stated provisions and intent of those specifications without additional cost to the Purchaser.

1.13.4 All the drawings, i.e. elevation, side view, plan, cross sectional view etc., in AutoCAD format and manuals in PDF format, for offered item shall be submitted. Also the hard copies as per specification shall be submitted.

1.13.5 The bidder shall submit Quality Assurance Plan for manufacturing process and Field Quality Plan with the technical bid.

1.13.6 All the points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.

1.14 MARKING AND PACKING

1.14.1 All accessories shall be legibly and indelibly marked with trade mark of the Manufacturer and suitable identification mark.

1.14.2 All accessories shall be supplied in strong wooden boxes and crates with steel hoop and bands for strength and durability to withstand rough handling during transit and storage.

However, the Stores may be packed in double gunny bags with proper packing filters if delivered by road transport on door delivery basis.

The gross weight of wooden packing shall not normally exceed 500 Kg. Different fittings with the accessories shall be packed in different packings. All nuts should be hand tightened to the maximum possible point.

1.15 INSPECTION

1.15.1 The Purchaser reserves the right to inspect the material at the time of tests. All tests shall then be performed in the presence of Inspecting Authority appointed by the Purchaser. The Bidder shall have to give intimation of place , date and time of each test to enable the later to be present to witness the test. All the test results must be recorded in presence of the inspecting authority and no materials shall be dispatched, without having been passed by Purchaser's duly appointed Inspector and specific dispatch instruction in writing received from Chief Engineer (Project).

1.16 GUARANTEED TECHNICAL PARTICULARS

1.16.1 The Bidder shall fill in the guaranteed technical particulars in "Schedule-A", Section-III of this specification and submit the same with his tender. In absence of which, the offer shall be rightly rejected.

1.17 INSTRUCTION TO THE BIDDERS

1.17.1 The Purchaser reserves the right to award the contract on item-wise basis or reject the offers without assigning any reason.

SECTION - II

SPECIFIC TECHNICAL REQUIREMENTS

2.1 SCOPE

2.1.1 This section covers the specific technical particulars, requirement and desired delivery, climatic & isoceraunic conditions, etc. suiting which the ground wire accessories, shall be offered. The equipment offered shall also conform to the general technical requirement covered under Section-I of this specification.

2.2 CLIMATIC AND ISOCERAUNIC CONDITION

2.2.1 This climatic and Isoceraunic conditions are given below:

- i) Temperature:
 - a) Minimum: 0°C
 - b) Maximum: 60°C
 - c) Every day: 32°C
- ii) Relative Humidity:
 - a) Maximum: 95%
 - b) Minimum: -
- iii) No. of rainy days per year: 90
- iv) Average rainfall per year: 1150 mm.
- v) Altitude: 500 meters
- vi) Pollution: Heavily polluted.
- vii) Isoceraunic level: 15
- viii) Susceptibility to Earthquake: Horizontal Seismic Coefficient
- ix) Snow incidence: Nil

2.3 SPECIFIC TECHNICAL PARTICULARS

2.3.1 Specific Technical Particulars of the power system, ground wire accessories are given as under:

2.3.1.1 System Particulars:

- i) Line voltage: 220 KV/132 KV/66KV
- ii) Frequency: 50 c/s
- iii) Number of circuits: Single circuit and Double circuit
- iv) Tower configuration: Barrel type
- v) Normal span: 350/260 meters
- vi) Wind Span: 385/290 meters.
- vii) Weight Span:

- a) Maximum: 525/435 meters.
 - b) Minimum: 230/110 meters.
- viii) Wind pressure on ground wire: 75 Kg/m²
- 2.3.2 Ground wire Accessories: For 7/3.15 mm Earth Wire.
 - i) Suspension Clamps: (Drg. No. GETCO/E/2S-STD/SHW-031/001)
 - a) Material: MCI (Hot Dip Galvanized)/Forged Steel
 - b) Min. Slip Strength: 15% of Ultimate Strength of Ground Wire
 - c) Min. Failing Load: 50% of UTS of Ground Wire
 - d) Ferrous Parts: Hot Dip Galvanized
 - e) Spring Washers: Electro Galvanized
 - ii) Compression Type Dead-end: (Drg. No. GETCO/E/2S-STD/SHW-031/002)
 - Clamps
 - a) Material: MCI/Forged Steel
 - b) Min. Failing Load: 90% of Ultimate Strength of Ground Wire (5710 Kgs.)
 - c) Min. Slip Strength: 90% of UTS of Ground Wire
 - d) Ferrous Parts: Hot Dip Galvanized
 - e) Spring Washers: Electro Galvanized
 - iii) Straight Compression Joint: (Drg. No. GETCO/E/2S-STD/SHW-031/003)
 - a) Material: Steel
 - b) Min. Failing Load: 90% of Ultimate Strength of Ground Wire (5710 Kgs.)
 - c) Min. Slip Strength: -do-
 - d) Ferrous Parts: Hot Dip Galvanized
 - iv) Copper Earth bond: (Drg. No. GETCO/E/2S-STD/SHW-031/004)
 - a) Material: Tinned Copper Flexible Bond
 - b) Weight: Min. 200 Gms.

2.3.3	CROSS BY CLIPS:	(Drg. No. GETCO/E/2S-STD/SHW-031/005)
	a) Type:	2 'U' Bolts
	b) Material:	Aluminium Alloy
	c) Ferrous Parts Galvanizing:	M. S. Hot Dip Galvanized
	d) Plain and Spring Washers:	M. S. Hot Dip Galvanized

SECTION - III

SCHEDULE - "A"

GUARANTEED TECHNICAL PARTICULARS

The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.

(A) Suspension Clamps:

- i) Maker's Name and Address:
- ii) Material:
- iii) Size:
- iv) Suitable for ground wire:
- v) Weight:
- vi) Slip Strength:
- vii) Minimum failing load:
- viii) Galvanization:
 - a) Ferrous parts:
 - b) Spring Washers:
 - c) Quality of Zinc used:
 - d) Number of dips which the:
Clamp can withstand
1 minute:
1/2 minute
- ix) Standard to which conforming:
- x) Packing details:
- xi) Any other particulars:

(B) Compression Type Dead end Assemblies:

- i) Maker's Name and Address:
- ii) Material:
- iii) Size:
- iv) Suitable for ground wire:
- v) Weight:
- vi) Minimum failing load:
- vii) Galvanization:
 - a) Ferrous parts:

- b) Spring Washers:
 - c) Quality of Zinc used:
 - d) Number of dips which the:
Clamp can withstand
1 minute
1/2 minute
 - viii) Standard to which conforming:
 - ix) Packing details:
- (C) Straight Compression Joint:
- i) Maker's Name and Address:
 - ii) Material:
 - iii) Size :
 - iv) Suitable for ground wire:
 - v) Weight:
 - vi) Minimum failing load:
 - vii) Galvanization:
 - a) Ferrous parts:
 - b) Spring Washers:
 - c) Quality of Zinc used:
 - d) Number of dips which the:
Clamp can withstand
1 minute
1/2 minute
 - viii) Standard to which conforming:
 - ix) Packing details:
 - x) Any other particulars:
- (D) Copper Bond:
- i) Maker's Name and Address:
 - ii) Material:
 - iii) Size:
 - iv) Weight (approx.):
 - v) Standard to which conforming:
 - vi) Packing details:
 - vii) Drawing:
- (E) Cross By clip:
- i) Maker's Name and Address:
 - ii) Material:

- iii) Size:
- iv) Suitable for ground wire:
- v) Weight:
- vii) Minimum failing load:
- viii) Galvanization:
 - a) Ferrous parts:
 - b) Spring Washers:
 - c) Quality of Zinc used:
 - d) Number of dips which the:
Clamp can withstand
 - 1 minute
 - 1/2 minute
- viii) Standard to which conforming:

Signature of the Bidder: _____

Name: _____

Designation: _____

Date: _____

**Authorized common rubber
Stamp / seal of the bidder:** _____