GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

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Vadodara: 390 007

TECHNICAL SPECIFICATION OF H/W FOR 400/220KV S/S

GETCO/E/TS – HW017/ R2 July 2022.

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SECTION-I

TECHNICAL SPECIFICATION FOR INSULATOR /CONDUCTOR HARDWARE.

1.0 SCOPE:

This specification covers the design, manufacture, assembly, inspection, testing, packing and delivery of fittings such as (i) Insulator/conductor hardware suitable for ACSR `Moose' conductor (54/7/3.53mm) & ACSR 'Zebra" conductor (54/7/3.18mm) with Single, Twin and Quadruple formation and (ii) ground wire accessories (7/3.66mm & 7/3.15mm). The hardware fittings, accessories, are required for out-door bus and structures of 400/220KV, 220/132/66KV switchyard, in the state of Gujarat. The material offered should be complete with all components that are necessary for efficient operation. Such parts shall be deemed to be within scope of the supply whether specifically mentioned or not. Fittings shall confirm in all respect to the highest standard of engineering, design and workmanship and shall be capable of performing trouble free continuous operations.

2.0 Requirements :

2.1 In accordance with clause 3.1 of IS-731-1971, reference atmospheric conditions at which insulator characteristics shall be expressed for the purpose of comparison shall be as under :

a)	Ambient temperature	-	20°C
b)	Barometric pressure	-	1013 Mille bars
c)	Absolute humidity	-	63 % relative humidity at 20°C

2.2 Test for the purpose of this specification may be carried out under conditions naturally obtained at the time of the test. The barometric pressure, air temperature and humidity shall be recorded for the purpose of corrections.

2.3 The hardware fittings etc. offered shall be suitable for employing hot line maintenance techniques and with requisite speed, ease and safety.

3.0 CLIMATIC CONDITIONS:

3.1 The overall climatic conditions are moderate hot humid, tropical, highly polluted and conductive to rust and fungus growth. The hardware fittings and earth wire accessories shall be given tropical and fungidal 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 variations in ambient conditions with material offered shall be suitable for installations at any of the switchyard in Gujarat State.

3.2 The climatic conditions at site under which the offered fittings shall operate satisfactorily are as under:

1)	Maximum Ambient Temperature °C	50
2)	Max. Temperature in shade °C	40
3)	Minimum temperature in shade °C	3.5
4)	Maximum rainfall (mm)	1150
5)	Relative Humidity during monsoon (%)	95
6)	Isomeric level	30
7)	Max. Altitude above main sea level (Mtrs.)	500
8)	Max. Wind pressure kg/mm2	150
9)	Seismic level (horizontal acceleration)	0.1 to 0.30
10)	Average number of thunder storm per annum	30(nos.)

4.0 STANDARDS

4.1 Design, manufacture, performance of the hardware fitting as well as earth wire accessories shall comply with all currently applicable standards regulations and safety codes of the locality where the same will be installed. Unless otherwise specified fittings should conform to the latest applicable Indian Standards and in particular to the following:

1)	IS: 3188	-	Dimensions of insulators.
2)	IS; 2121	-	Fittings for aluminium and steel cored aluminium conductors for overhead power lines.
3)	IS: 3138	-	Hexagonal Bolts and nuts.
4)	IS: 209	-	Specification for Zinc.
5)	IS: 5561	-	Electrical power connectors.
6)	IS: 2633	-	Method of testing, weight, thickness and
7)	IS: 6745		uniformity of coating on
8)	IS: 1573	-	hot dip galvanized for H.D.G. of iron and steel.
9)	IS: 2629/2833	-	Recommended practice for H.D.G. of Iron and steel.
10)	IS: 2486(Part-I,II,III)-		Specification for insulator fittings for overhead line with nominal voltage greater than 1000 volts.
11)	IS-2071(Part-I,II,III)		Method of high voltage testing.
12)	IS:8263		Method of RIV tests of HV Insulators.
13)	IS:8369	-	Method of switching impulse test on HV Insulators.

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4.2 Material conforming to any other national standards that ensure equal or better services shall be acceptable. The salient point of this specification and point of difference between those in the above specification shall be clearly brought in the tender.

4.3 Any material offered confirming to the IS, BS, IEC other than the one indicated above the same shall be with full justification and it shall have better properties, performance etc. compared to the provisions of the Standards indicated above.

4.4 Any variation in the IS indicated shall be clearly brought out in the Technical bid, however, the acceptance of the same shall be fully at the discretion of the GETCO.

4.5 All the IS, BS, IEC etc. shall be read with the latest amendments. The latest amendments on the date of opening of the Tech.bid shall be applicable

5.0 MATERIALS:

5.1 The Hardware and Accessories offered shall be of the Best quality and workmanship as per approved design only.

5.2 The material employed/used for the manufacture of the Hardware & Accessories Viz. Aluminium Alloy. Mild Steel, Forged Steel etc. shall be corrosion resistance and machinable having minimum required strength as specified in the specification.

5.3 All components shall be free from flaws, cracks, shrinks and or other defects and shall be smooth, closed grained and of true forms and dimensions. All components shall be forged steel except plates. All machined surfaces shall be true, smooth and well finished.

5.4 Metal fittings shall be of drop forged steel and string hardware, except suspension and tension clamps which are required to have excellent mechanical properties such as strength, toughness and high corrosion resistant and free from Carona formation.

5.5 The Suspension and Tension clamps shall be made from aluminium alloy having high mechanical strength. The tension clamp made of Aluminium alloy shall be provided with the steel sleeve to be compressed on the steel core of the conductor.

5.6 The hardware fittings shall be supplied with high tension HDG nut bolts and washers instead of rivette pin to assure proper fittings.

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6.0 GALVANISING :

6.1 All the ferrous parts except those made of Stainless steel shall be protected by hot dip galvanizing in accordance with the specified IS Spring washers, however, shall be Electro galvanized.

6.2 The threads in the Nuts and in the tapped holes shall be cut after galvanizing.The same shall be lubricated or greased. However, all other threads shall be cut before galvanizing.

6.3 The threads of the Bolts shall be under cut to take care of the increase of the diameter due to galvanizing and if required shall be re-run after galvanizing.

7.4 The Zinc used for Galvanizing shall be Zn 98 grade and shall satisfy the following contents requirements.

Sr.No.	Constituent	Requirement - % (Zn-98)
1.	Zinc (Minimum)	98.00
2.	Lead (Maximum)	1.60
3.	Cadmium (maximum)	0.50
4.	Iron (maximum)	0.05
5.	Total impurities (maximum)	2.00

8.0 SIZE AND CONSTRUCTION

8.1 The size, type, materials, failing load etc. of all the Hardware and Accessories for the ACSR Moose/Zebra Conductor shall be as given in the Section-II of the Specification.

8.2 All the Hardware and the Accessories shall be designed such that the effect of vibrations on the fitting as well as conductor shall be practically zero.

8.3 A care shall be taken at the Design stage to avoid any bimetallic corrosion in the Hardware of Accessories when installed at the site during total service life.

8.4 In case of rods, wires etc. no joint shall be allowed except in the base rod or wire, before final drawings.

8.5 The Hardware and Accessories shall be inherently resistant to the atmospheric corrosion or be suitably protected against atmospheric effects, both during storage and use at actual site during the service.

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8.6 All the current carrying parts shall have minimum contact resistance.

8.7 The temperature of the fittings shall not exceed that of the Quad Moose/ twin moose conductor carrying full load current situated at a distance of 450/350mm. The rise in the temperature on the surface of the conductor under full load condition does not exceed 40^0 C above the ambient. The ambient temperature shall be as per the Climatic data given in this specification.

8.8 The parts and complete assembly shall not have any sharp edges, abrasions, projections, etc. and shall not cause any damage to the conductor in any way during fixing the same or during operation at site, which other wise may produce high electrical stresses even under normal operating or strung condition.

8.9 All the Bolts and clamps shall have locking arrangement to safe guard the fitting and the conductor against vibration loosening etc. The same shall be protected by providing check nuts on each and every fitting.

8.10 The name and the mark of the manufacturer, on complete assembly and each of its parts, shall be clearly visible after complete finishing i.e. ready to use. The same shall be clearly legible even after installation in position at the site and put to service, till its complete life.

8.11 On complete sample of each items offered shall be submitted along with the Technical Bid at GETCO's Asoj store consigned to E.E.Const.Jambuva Vadodara.

8.12 The sample shall not be returned and GETCO may use the same at its own discretion.

8.13 Any damage to the samples etc. shall be at the risk and cost of the Bidder. The GETCO will not have any bearing on the pretext or the other for any damage etc. to the sample.

8.14 If in the opinion of the GETCO, the sample is not up to the mark, the same will be summarily rejected and GETCO will not enter into any correspondence with the Bidder or assign any reason for rejection of the sample.

8.15 The sample should reach the destination at least one day in advance of the opening of the Technical Bid. The Tender of those bidders who have not submitted the sample within the time limit, will be rejected out-rightly. The proof of submission of the samples shall be included in the Technical Bid.

8.16 The total cost of the sample, its transportation, freight, insurance etc. will be to the Bidders account.

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8.17 Special care shall be taken to ensure smooth finish surface throughout. Adequate bearing area between fittings shall be provided and 'point' and 'line' contacts shall not be permitted.

9.0 GENERAL TECHNICAL REQUIREMENT OF HARDWARE FITTINGS:

9.1 The number, type, size, electrical – mechanical strength, and length of insulator strings etc. are given in the section-II of the specification. The Hardware and string assemblies offered by the Bidder, shall be as per the requirements specified in this specification only.

9.2 Hardware for suspension and Tension insulators shall be suitable for insulators with nominal pin, ball, and socket diameter of 20/16mm as the case may be.

9.3 Each set of hardware shall be supplied complete in all respect and shall generally include the hardware components as indicated hereunder.

9.3.1 Standard anchor shackle for attachment of suspension string to the tower hanger of the Suspension Tower and of Tension string to structure/tower strain plate of angle Tower.

9.3.2 Suitable yoke assembly for single and double suspension as well as tension strings for the Quad/Twin – bundle conductor arrangement shall be provided as specified.

9.3.3 Suitable arcing horns and fittings.

9.3.4 Suspension or Tension clamps.

9.3.5 Combined Carona Control Ring and allied fittings.

9.3.6 Sag adjustment plate for Dead End Assembly having adjustment of upto 100mm in equal segment of 25mm .

9.3.7 Bolts, nuts, washers, split-pins etc.

9.3.8 Other fittings necessary to make the Hardware complete such as eye links, chain links, ball clevis, socket clevis, clevis eye, clevis-clevis etc.

9.4 The Bidder shall be responsible to satisfy himself that all the hardware are suitable for the tower structure and conductor specified in the Technical specification.

9.5 Various hardware fittings and earth wire accessories shall meet the technical specifications.

9.6 The clamps and fittings required for the conductor and insulators are shown in the various indicative drawings attached with this specification. Responsibility of satisfactory design of the hardware and earth wire accessories to safely withstand the specified mechanical stresses and carryout 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 in to account.

9.7 The hardware fittings and earth wire accessories shall incorporate the highest quantity of modern engineering, design, workmanship (Collaboration arrangement, if any, with any reputed manufacturer, may be clearly stated in the tender).

9.8 The material offered shall be complete with all components, accessories that are necessary for their satisfactory performance and efficient maintenance. Such parts shall be deemed to be within the scope of the specification whether specifically included or not.

9.9 The design, manufacture and individual control of all items shall be such as to give maximum factor of safety with minimum weight but capable for maximum working load highest mobility complete elimination of sharp edge and corners, best resistance to corrosion, good fittings, minimum electrical resistance and power loss.

9.10 All castings shall be free from shrinking, surface, blisters blow holes, cracks and other defects and quality of products shall be uniform throughout.

9..11 All casted components of the offered items shall be manufactured by die castings only.

9.12 The edge of fixing holes shall be adequately thick so as to have sufficient U.T.S. against over tighting of bolts to the extent of safety factor specified in of this specification.

9.13 Hardware fittings shall be designed and manufactured in such a way so as to have minimum contact resistance of all current carrying parts.

9.14 If required, modifications shall have to be incorporated as per site requirements without any additional cost to the GETCO for items ordered.

9.15 The fittings offered shall be inherently resistive to atmospheric corrosion and be suitable to protect against corrosion both during storage as well as in service.

9.16 The fittings shall have no sharp ends or edge, abrasion, projections etc., and shall not cause any damage to the conductor in any way during fitting the same or during continued operation.

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9.17 All bolts clamps etc, shall have suitable locking arrangement to safe-guard against vibration and loosening effects.

9.18 All threads of the bolts projecting cut of Nut beyond 2 mm shall be machined and rounded off suitably.

9.19 Mild steel, hot dip galvanized, ISI marked bolts, nuts,washers, of sufficient strength (considering the safety factor) shall have to be provided with all fittings.

9.20 All bolts & nuts shall have hexagonal heads and thread as per relevant Indian Standard's.

9.21 The Bidder shall furnish all description and illustrations of the fittings offered along with information regarding special features if any. They shall furnish complete information as in their own opinion, is needed to give full description and detail of each successful operation and satisfactory performance of the fittings offered by them.

9.22 The number, type, size, electrical and mechanical strength, creep age distance of insulators, insulator string arrangements and length of insulator string etc. are given in Annexure `A' attached to this specification. The hardware and string assembly offered by the bidder shall be suitably to meet the requirement given in the specification.

9.23 The hardware for suspension and tension insulators shall be suitable for insulators with nominal pin shank diameter of 20/16mm. Each insulator string hardware shall generally include hardware components that are essential as per the respective indicative drawing attached with the specification. Each set of insulator hardware shall be supplied complete in all respects and shall generally include the components as per the drawings.

9.24 The bidders shall be responsible to satisfy themselves that all hardware fittings in the strings and earth wire accessories are entirely suitable for the sub station structures, conductor and G.I. wire specified. The manufacturing of the Accessories shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the Accessories prior to the approval of the drawing shall be at supplier's risk.

9.25 Approval of drawing etc. by the GETCO 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 Accessories shall conform in all respects to high

standards of engineering, design, workmanship and latest revisions of relevant standards in vogue on the day of opening of the Technical Bid and the GETCO shall have the power to reject any work or material which in its judgement is not in full accordance with the provision of the relevant IS and this specification.

9.26 The clamp shall be designed to carry the same current as the conductor (i.e.900 Ampere for single moose conductor)The temperature – rise when carrying full load current shall not exceed 35º C above site ambient temperature. The rated current for which the item is designed with respect to the specified ambient temperature shall be marked approximately. All Hardware's shall be free from visible corona.

10. DOUBLE TENSION STRING.

10.1 Anchor shackle :

Anchor shackle shall be made of forged steel complete with G.I. rivets and stainless steel split pin, minimum breaking strength shall be 23000 kgs. For double tension string.

10.2 Ball Clevis, Socket Clevis :

The Ball clevis shall be made of forged steel and socket clevis from malleable cast iron complete with G.I. rivet and stainless steel split pins. Ball and socket clevis shall be suitable for insulator string for appropriate fitting to which they are connected. All ball and clevis shall be a minimum breaking strength of 11500 kgs.

10.3 Clevis – Clevis

Clevis fittings shall be made of malleable cast iron, complete with G.I. rivet and stainless steel split pins. Clevis shall be suitable for connecting to yoke plate on sub-station structure side. Minimum breaking strength of the clevis shall be 11500 kgs.

10.4 Yoke plate :

Yoke plate shall be made of mild steel. The minimum breaking strength of the yoke plate shall be 23000 kgs. It shall be either triangular or rectangular as required. All corners of the plate shall be rounded off with a radius approximately equal to half the plate thickness. The yoke plate shall have holes for fixing corona rings if required. Necessary arrangement in the yoke plate, to make use of hot line maintenance tools, shall be made.

10.5 Turn buckle

It shall be made of forged steel. The minimum adjustment in the movement facilitated by the turn buckle shall be 175mm. The minimum breaking strength of the turn buckle shall be 16500 kg and requisite locking arrangement shall be provided for safe guarding shearing of threads under working conditions. The same shall be specifically indicated in the drawings.

10.6 Tension clamps

The tension clamps shall be compression type made out of high strength aluminum alloy and steel suitable for specified conductor. The tension clamps shall not permit slipping of, or damage or failure of the conductor at a load less than 95% of the ultimate strength of the conductor. The mechanical efficiency of the tension clamps shall not be affected by the method of erection involving core along clamp or similar clamp itself. The strain clamps shall have to same conductivity as the conductor and shall be of a design that will ensure unrestricted flow of current without use of parallel groove clamps.

10.7 Corona control ring

It shall be provided with corona control ring assembly. Requisite spacer shall be provided for quadruple double tension hardware fittings to use a dropdown conductor so that the jumper does not coincide with the bottom conductor. Spacing between two anchoring points of double Tension hardware's string shall be 450 mm&350mm as per schedule.

10.7.1 The Corona Control Ring shall be provided on outer side of each insulator string and shall be of such Design and shape that it reduces the voltage across the unit adjacent to the conductor for each insulator string, to a value which prevents visual Corona formation on the metal caps and pins of the insulators and shall minimise the Radio/Video Interference voltage from complete insulator and Hardware assemblies when operated at the Voltage up to 420 KV.

10.7.2 The Corona Control Rings shall be of such Design that when added to suspension and tension assemblies, the resulting flash over values of the complete insulator string shall not be reduced below the percentage indicated here under, of corresponding flash over values with the Corona Rings omitted.

10.7.3 The Percentages are:

a) Dry 50 Hz. 94%
b) Wet 50 Hz. 100%
c) 1.2/50 Impulse 96%
d) Flashover Positive and Negative 96%

10.7.4 The Corona Rings shall be of E.C. Grade Aluminium tube having outside diameter as required for corona control and minimum thickness of 2.5 mm. The brackets for supporting the rings shall be of high strength wrought aluminium the mounting bolts shall be high strength alloy steel.

10.7.5 The details of the rings, brackets and methods of mounting shall be of such design that the rings may be readily replaced under 'hotline' maintenance.

10.7.6 The horizontal distance between corona rings at suspension rings and suspension rings at suspension insulator assemblies shall be kept as small as practicable to accomplish the required reduction in RIV.

11.0 TYPE TEST & TEST CERTIFICATION:

11.1.1 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.

Type tests for clamps
a) Visual examination
b) Verification of dimensions
c) Slip strength tests
d) Ultimate strength tests
e) Electrical resistance test (for tension clamps only)
f) Heating cycle test (for tension clamps only)
g) Galvanizing / electroplating tests
h) Corona
i) RIV test
Type tests on insulator string fittings except clamps
a) Visual examination
b) Verification of dimensions
c) Mechanical tests
d) Galvanizing tests
e) Chemical composition test
f) Corona
g) RIV test

Type tests on non-tension components
a) Visual examination
b) Verification of dimensions
c) Mechanical tests

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

11.2.1 The purchaser reserves the right to ask the supplier to arrange type tests on samples selected from any of offered lot for inspection in presence of GETCO representative. The testing charges for the same shall be borne by the GETCO if the sample withstands the tests successfully otherwise Bidder have to bear the same.

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.

11.3 ACCEPTANCE TESTS

11.3.1 These are the Tests to be carried out on each of the lot offered for inspection, in presence of the GETCO's Representative as indicated in I.S.

11.3.2 The number of sample to be selected for acceptance test shall be as per relevant standards, but shall not be less than 10% of the offered lot and all the consequences due to this will be at the risk and cost of the supplier.

11.3.3 Some of the Acceptance Tests required to be carried out by the successful Bidder are indicated below, however the same is subject to clause indicated above.
i) Dimensional Checks
ii) Galvanizing Tests
iii) Mechanical Tests

11.3.4 Following additional Acceptance Tests shall also be performed
i) Chemical Composition Test
ii) Magnetic Particle Inspection (NDT) test for forgings as per ASTM E 709

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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

11.4 ROUTINE TESTS

11.4.1 These are the Tests carried out on each and every finished item to ensure the quality of the materials manufactured and supplied.

11.4.2 The test Reports for these tests shall be submitted to the GETCO's inspector deputed for the inspection of the offered materials.

11.4.3 Some of the Routine Tests required to be carried out by the successful Bidder are indicated below, however the same is subject to clause indicated here before.
i) Visual Examinations Tests
ii) Routine Mechanical Tests

11.4.4 Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the purchaser's representative

11.4.5 Test Certificates of test during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the purchaser

12. TESTING

12.1 CORONA TEST -All the Accessories and the fitting offered against this specification shall be subjected to Corona test for 400KV class only.

12.2 CORONA DISCHARGE VOLTAGE

12.2.1 The fittings and accessories shall be designed and manufactured to make it cent percent Corona free and discharge free which are likely to cause interference to either sound or vision transmission etc. This is likely to cause damage to the conductor or the accessories themselves.

12.2.2 The Testing shall be in accordance with the relevant IS, IEMA, and the values given in the GTP of this specification.

12.2.3 The corona shall not take place and shall extinguish at the voltages specified i.e. when a voltage of the specified value applied (Phase to Neutral i.e. RMS) the corona shall appear and shall disappear again at the specified value of voltage.

12.2.4 The corona inception and extinction voltages shall be as indicated in the GTP attached with this specification.

12.2.5 The Corona inception and extinction voltages shall be measured both under Dry and Wet conditions.

12.3 RADIO INTERFERANCE VOLTAGE TEST

12.3.1 All the Accessories and the fitting offered against this specification shall be subjected to Radio interference Voltage Test (RIV Test).

12.3.2 The RIV shall be less than the Voltage specified in this specification.

12.4 RADIO INTERFERANCE VOLTAGE

12.4.1 The fittings and accessories shall be designed and manufactured such that the interference voltage remains well within the specified value of the relevant IS, IEEMA, and the one mentioned in the GTP of this specification.

12.4.2 This is the value, which is mainly responsible for the interference between the power line and the telecommunication line, which ultimately leads the induction of voltage in the telecommunication line due to crossing of the power line with it.

13.0 QUALITY ASSURANCE PLAN

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

i) Statement giving list of important raw materials, proposed to be used in the manufacture of the Hardware & accessories against this specification, 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 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 list 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 Hardware & accessories specified. In the case if the supplier does not possess all the routine and acceptance testing facilities the tender will be rejected.

vii) Special features provided to make it maintenance free.

viii) The GETCO 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 supplier will be out rightly rejected and he may be black listed.

14.0 INSPECTION AND TESTING FACILITIES;

14.1 The supplier shall possess all the Routine and acceptance test facilities within his premises. He should clearly indicate in the technical bid the availability of the testing equipment along with their complete details like name of manufacturer, date of purchase, range, date of last calibration etc. The GETCO reserves the right to reject any offer on the basis of the availability of the testing equipments.

14.2 The GETCO's authorized representative shall have access to any of the part of the work of the supplier, where the manufacturing and the testing works are going on. However, the access will be till the completion of the order in toto, including the additional order if any. The GETCO's representative may also ask the Bidder to give a proof to the effect that the raw materials used in the manufacture of the items ordered on him are of the quality upto the mark. If the supplier fails to prove the same, the order will be cancelled.

14.3 Over and above at any time during the pendency of the order the GETCO may carryout the factory inspection before placement of an order and the bidder shall co-operate with the GETCO representative and provide all the details required.

14.4 Materials shall be offered for routine and acceptance tests before dispatch of the same at the destination. After successful inspection of the materials the same shall be dispatched to the destination only after the receipt of written dispatch instruction from CE(PROJECT) H.O.BARODA

14.5 In case the test facilities at the works of manufacture are not found working satisfactorily, the tests shall be carried out at the Government Approved Laboratory and all the costs etc. shall be to the supplier's account.

14.6 Bidder should submit true copies of Type tests certificates in respect of above-mentioned tests for consideration with technical bid.

15.0 TESTS REPORTS:

The Purchaser reserves the right of getting done any other test(s) of reasonable nature carried out at Purchaser'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 supplier's account.

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16.0 MARKING:

Each pack shall have the following information stenciled on it in indelible ink along with other essential data.

a) Contract/Award letter/Order No.
b) Name and address of consignee
c) Manufacturer's name and address
d) Pack number
e) Item contained
f) Number of items
g) Gross weight of pack with items.
h) Wight of empty pack.
i) Arrow marking for opening of the pack.

All the parts/accessories/equipments supplied shall clearly indicate the embossed Name and monogram of the manufacturer. Thus the sample shall have clear identification mark of manufacturer so that the identification at any time during the service life becomes easy.
Any sample without this will be out rightly rejected. Also during actual supply if it is found that the material supplied does not have these markings, the whole lot will be out rightly rejected and actions up to cancellation of the order at the risk and cost of the supplier will be taken by the GETCO.

17.0 DRAWINGS:

17.1 The Bidder has to accept the condition for supply of all the items quoted by him as per the enclosed drawings only.

17.2 The successful bidder, however, have to submit the detailed drawings, showing Elevation, plan, cross sectional views etc. for approval. The details like dimensions, part nos. material of each part, name of each part, the location of the part to be used in the complete assembly of the item, etc. shall have to indicate clearly in the drawing. The dimensions shall only be in Metric Unit.

17.3 The sole proprietary of the reproducible along with the drawings will be of GETCO. The GETCO may at its discretion use the same and the supplier will have no objection to it or any claim for the same.

17.4 The supplier shall not start manufacturing of any item or part thereof before the approval of the drawings by the Head Office in writing. The GETCO may insist upon the supplier to make the changes in the design, as per requirement, which has to be accepted by him without any additional financial burden on the GETCO.Technical details with descriptive literature and photograph, if available, for the items offered.

The nature of the material used for various parts the breaking strength of all the components shall be clearly specified on the drawings.

The list of the tender drawing in quadruplicate to be submitted is as follows:

i)Dimensional drawings.

ii)Dimensional assembly drawings for the complete fittings for each type of hardware.

iii)Separate detailed dimensional drawings including Part Darwings for all components of hardware fittings such as conductor clamps, tension clamps, anchor shackles, ball and clevis, socket clevis, clevis-clevis, clevis eye, yokes, chain links, corona rings and other attachment to the string etc.

17.5 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.

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

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

19.0 SAMPLES:

19.1 The bidder has to submit at least one complete set each of the hardware fittings, offered by him to Executive Engineer (Const.) GETCO, Destination Asoj before due date and time for submission of the Technical bids

19.2 A proof to the effect that the sample has been submitted to the destination shall accompany the Technical bid, any bid without this will be out rightly rejected.

20.0 DEVIATIONS:

20.1 Any deviation to this tender specification will be out rightly rejected. All the Bidders have to submit this specification duly authenticated without any alterations, additions etc. on each page along with the Technical .bid. Any offer without this will be out rightly rejected.

21.0 INSTRUCTION BOOK/CATALOGUES:

21.1 The supplier has to submit detailed instructions manual / catalogues etc. in triplicate to the Purchaser for its record and field use.

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21.2 The instruction manual / catalogue shall contain application, part list, operation and maintenance instructions in English. The manual shall contain all the equipment, parts etc. supplied against this specification alongwith the complete details which may be needed for assembling/disassembling, repair, identification of parts particularly for ordering, replacement operations, and maintenance etc. free of cost.

21.3 The manual for all the parts / equipment shall be covered in one cover. The same shall be supplied at the time of issuance of D.I.

22.0 PACKINGS:

The suspension/tension clamp, plates, clevises and other hardware shall be packed in boxes of tin bags. All threaded parts shall be properly protected against damage. The various types of fittings shall be packed in different cases and shall be complete with their minor accessories fitted in place. All nuts shall be hand tightened over the bolts upon the farthest points. All labels used on crates, boxes or tags shall be of tin, securely bound on with wire and shall have the descriptive markings stamped thereon. Each shipment or assembled strings shall be accompanied by the complete quantities of hardware's fittings so that the same can be erected simultaneously on receipt at site without loss of time. All parts shall be adequately marked to facilitate erection in the field.

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SECTION II

SPECIFIC TECHNICAL REQUIREMENTS

SYSTEM PARTICULAR DETAILS:

1	Nominal system voltage	-	400-220 kV	
2	Highest system voltage	-	420-245 kV	
3	Short circuit current for 3 seconds.		40kA	
4	Frequency	-	-------- 50 Hz --------	
5	Basic insulation level (1.2/50micro second wave)	-	1425-1050 kVP	
6	Number of phases	-	Three	
7	System earthing	-	Effectively earthed.	
8	No. of sub – conductor / bus	-	4/1, 2/1	1/1
9	a) Size of the Moose conductor(AL/STEEL)	-	-54/7/3.53mm	54/7/3.18
	b) Overall diameter of	-	31.77mm	28.62
	c) Approx. weight of the conductor.	-	2004kg/km. (Moose)	1621 (Zebra)
10	a) Size of earthing wire	-	7/3.66	7/3.15
	b) Overall dia of the earthing wire.	-	10.98mm	9.45
	c) Approx. weight of the earthing wire.	-	583kg/Km	428
11	Ultimate tensile strength of the Conductor.	-	16250 kg.	13030
12	Calculated resistance at 20°C When corrected to standard weight.	-	0.05653Ohms/KM	0.08416
13	Spacing between sub-conductor of the bus.	-	450mm and 350mm in Quadruple & twin formation respectively.	
14	Maximum working tension of the bus.	-	2000 kg. per sub-conductor	
15	Span of the bus	-	56/36 Mtrs.	

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16 Conductor temperature range - Min. 3.5°C Max., 64.5°C
17 Inter phase spacing (Horizontal) - 7 Mtrs. & 4.5 Mtrs.
18 Size of IPS aluminium tubular - 114.3mm(4") 60.33mm(2")
19 Factor of safety -- 2
20 No of string of insulators for switchyard -
For 400kV system-Twin (2) comprising 24 Nos of AF insulators of 160KN for suspension and Twin comprising 25 Nos of AF insulators of 160kN for Tension
For 220kV system - Twin (2) comprising 15 Nos of AF insulators of 120KN for suspension and Twin comprising 16 Nos of AF insulators of 120kN for Tension.

DETAILS OF INSULATORS

Sr.No	Description	
1.	Diameter-mm	320
2.	Mechanical Strength - KN	160/120
3.	Height – mm	170/145
4.	Ball and socket – mm a)nominal b)Tolerance	 20 ±0.4
5.	Creepage –mm (minimum)	430

ACSR Moose/ Zebra Conductor

Sr. No.	**Description**	**Conductor**	
1)	Materials	ACSR CONDUCTOR Moose	ACSR CONDUCTOR Zebra
2)	Size & stranding	54/3.53-AL /7/3.53-ST	54/3.18-AL /7/3.18-ST
3)	Ultimate Tensile strength	16250 Kg	13030 Kg
4)	Weight	2004 Kg. / Km	1621 Kg. / Km
5)	Overall diameter	31.77 mm	28.62mm
6)	Area of cross-section	597 mm^2	429.60mm^2
7)	Modulus of elasticity	9.3036x10^6 Kg / cm^2	9.3036x10^6 Kg / cm^2
8)	Co-efficient of linear expansion.	$19.3x10^{-6}$/Deg.C.	$19.3x10^{-6}$/Deg.C.

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SCHEDULE OF 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.

SR.NO.	DESCRIPTION	
1.	Manufacturers Name and address	To be furnished by the Bidder

ANCHOR SHACKLE

SR.NO.	Item	Value
1.	Material	Forged steel
1.	Breaking Strength – kg a)between Sr & Hardware b)between S.A Plate and D.E.assembly	 23000 11500
2.	Corona – KV (Dry and Wet – Inception and Extinction)	≥320
3.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
4.	Type test report details	To be furnished
5.	Weight - kg	To be furnished
6.	Maximum weight per pack - kg	200
7.	Total nos. per pack nos.	To be furnished
8.	Conductivity % (of conductor ACSR Moose)	105
9.	Resistance - % (of conductor ACSR Moose)	75
10.	Power loss - watts	≤1.00
11.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

BALL AND SOCKET CLEVIS

SR.NO.	Item	Value
1.	Material	Forged steel
1.	Breaking Strength – kg	11500
2.	Corona – KV (Dry and Wet – Inception and Extinction)	≥320
3.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
4.	Type test report details	To be furnished

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5.	Weight - kg	To be furnished
6.	Maximum weight per pack - kg	200
7.	Total nos. per pack nos.	To be furnished
8.	Conductivity % (of conductor ACSR Moose)	105
9.	Resistance - % (of conductor ACSR Moose)	75
10.	Power loss - watts	≤1.00
11.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

CLEVIS – CLEVIS

SR.NO.	Item	Value
1.	Material	Forged steel
1.	Breaking Strength – kg	11500
2.	Corona – KV (Dry and Wet – Inception and Extinction)	≥320
3.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
4.	Type test report details	To be furnished
5.	Weight - kg	To be furnished
6.	Maximum weight per pack - kg	200
7.	Total nos. per pack nos.	To be furnished
8.	Conductivity % (of conductor ACSR Moose)	105
9.	Resistance - % (of conductor ACSR Moose)	75
10.	Power loss - watts	≤1.00
11.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

YOKE PLATE

SR.NO.	Item	Value
1.	Material	M.S.plate
1.	Breaking Strength-kg (for both end)	23000
2.	Corona – KV (Dry and Wet – Inception and Extinction)	≥320
3.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
4.	Type test report details	To be furnished
5.	Weight - kg	To be furnished
6.	Maximum weight per pack - kg	200
7.	Total nos. per pack nos.	To be furnished
8.	Conductivity % (of conductor ACSR Moose)	105
9.	Resistance - % (of conductor ACSR Moose)	75
10.	Power loss - watts	≤1.00
11.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

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TENSION CLAMP

SR.NO.	Item	Value
1.	Material	Al. Alloy (high strength)
1.	Slipping strength - % (UTS of conductor)	95
2.	Conductivity - % (of Conductor)	105
3..	Corona – KV (Dry and Wet – Inception and Extinction)	≥320
4.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
5.	Type test report details	To be furnished
6.	Weight - kg	To be furnished
7.	Maximum weight per pack - kg	200
8.	Total nos. per pack nos.	To be furnished
9.	Conductivity % (of conductor ACSR Moose)	105
10.	Resistance - % (of conductor ACSR Moose)	75
11.	Power loss - watts	≤1.00
12.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

CORONA CONTROL RINGS:

SR.NO.	Item	Value
1.	Material A) Corona tube b) Brackets c) Mounting bolts	 E.C.Grade Al. tube Wrought Al. Alloy steel
2.	Diameter	As per drg.
3.	Thickness of tube-mm (minimum)	2.5
4.	Corona – kv (Dry. And wet – Inception and Extinction)	≥320
5.	Radio interference voltage at 320kV –mV (dry and wet)	≤1000
6.	Type test report details	To be furnished
7.	Weight - kg	To be furnished
8.	Maximum weight per pack - kg	200
9.	Total nos. per pack nos.	To be furnished
10.	Conductivity % (of conductor ACSR Moose)	105
11.	Resistance - % (of conductor ACSR Moose)	75
12.	Power loss - watts	≤1.00
13.	Make of bolts and nuts	GWK, NEX, RAJ Entr. And Simplex

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TENSION HARDWARE (CLAMP/ASSEMBLY)

SR. NO.	DESCRIPTION	VALUE
1	Type	Compression
2	Materials	Mild & Forged Steel (As per Drg.)
3	Slip Strength- % of UTS (Minimum)	90
4	Failing Load- % of UTS (Minimum)	100
5	Galvanizing – All Ferrous Parts	To be furnished
6	Galvanizing- Bolts & Nuts	To be furnished
7	Galvanizing- Spring Washers	To be furnished
8	Pins- Stainless Steel/ Bronze	To be furnished
9	Packing-Kgs . Maximum	200 Kg. (Nos. To Be Furnished)

Signature of the Bidder: _____
Name: _____
Designation: _____
Date: _____

Authorised common rubber
Stamp / seal of the bidder: _____

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