NEPAL ELECTRICITY AUTHORITY

(An Undertaking of Government of Nepal)

PROJECT MANAGEMENT DIRECTORATE

Province No. 2 Electrification Project

BIDDING DOCUMENT
FOR
Rural Electrification and Distribution Network Reinforcement in Province No. 2
(Lot 1, Lot 2, Lot 3, Lot 4 and Lot 5)

(Design, Supply and Install)

Single-Stage, Two-Envelope
Bidding Procedure

Issued on:	**……**
Invitation for Bids No.:	**ICB-PMD-REDNRP-076/77-01**
OCB No.:	**ICB-PMD-DSAEP-076/77-01**
Employer:	**Nepal Electricity Authority**
Country:	**Nepal**

VOLUME IIB OF III

(Lot 3, Lot 4 and Lot 5)

March 2020

Province No. 2 Electrification Project
Project Management Directorate
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REQUIREMENTS FOR EXECUTION OF WORKS

FOR

LINE AND DISTRIBUTION TRANSFORMER CONSTRUCTION WORKS

Requirements for Execution of Works

1. General

1.1 These Standard Specifications, together with the Standards of Nepal Electricity Authority shall govern the performance of the Works and shall be the basis for inspection and acceptance of the Work by the Project.

1.2 The Standard Specifications and the Standards of Nepal Electricity Authority shall be considered as mutually inclusive, and the conditions stated in each shall supplement the other as appropriate.

1.3 All Standard Specifications shall be followed at all times by the Contractor unless specifically accepted in writing by the Project, or unless some aspects of the work covered by these General Specifications are not required by the Scope of Work.

2. Site Office Management

2.1 The Contractor and/or sub-contractors as per GCC shall establish and maintain throughout the period of the performance of the contract a site office to serve as a base for all the operations necessary to perform the works and shall maintain adequate store facilities for storing materials and equipment issued by the employer. In case the above-mentioned facilities and establishments are not found satisfactory during the site verification, the employer shall have right to instruct the contractor for rectification of the same.

3. Contractor's key personnel and workforce

3.1 The contractor shall have experienced and qualified administrative, accounting and store keeping staffs capable to undertake respective jobs. An office manager with adequate qualification and experience to run such establishment efficiently must head the site office. The contractor shall employ only experienced, competent and skilled office staff as required in the tender document.

3.2 The line construction and supervisory staff of the contractor shall be examined by the employer to ensure their capability to perform proper quality of work before commencement of the work.

3.3 The site and field staff as approved by the employer shall be made available for the entire construction period of the project. All the staff and workforce of the contractor shall be issued identity cards jointly certified by the contractor and the employer. Replacement of any such staff or site personnel must not be made without prior permission of the employer.

3.4 The contractor is required to pay salary and wages of his staff and workforce at an interval not exceeding a month. The rate of wages payable to the labors shall not be less than as prescribed by the labor law of Nepal.

4. Tools and Equipment

4.1 The Contractor shall have owned, leased or hired tools and equipment for successful execution of the work. Prior to beginning of the work the contractor shall show these items in his possession. In case of the heavy tools equipment and vehicles the contractor is required to submit the source of these items with credible documents such as contract papers conforming their availability at the time of the execution of the works.

4.2 The employer shall examine to verify the availability of all such tools and equipment before commencement of the work. The contractor shall be allowed to start his work only after verification of such tools and equipment in satisfaction of the employer. No tools and equipment shall be provided by employer.

5. Workmanship and quality of work

5.1 The contractor shall be attentive to maintain workmanship and quality of work while performing the work and shall obey to all the instructions of the field staff of the project time to time in this regard.

5.2 Special items such as concrete works, cable jointing works and transformer installation works etc. must be performed in presence of the project field staff. In case of the concrete works the project staff shall assess quantity of cement and steel to be used for each of the job and this must be followed for performing the job. Sand and aggregate must be supplied as per the standard specification of the tender document. The project field staff shall check quality of such materials and the contractor shall use the same after his approval. Curing of concrete works must be carried as per standard practice. The field staff shall have right to ask the contractor to repeat concrete works in case of his failure to execute the job as above or in his absence.

5.3 Each and every item of the standard data sheet (SDS) shall also be checked by the project staff for the satisfaction of quality of workmanship as per the prescribed specification of the tender document. In case of failure of the contractor to execute any item of the work as per proper workmanship or quality, the project shall have right to ask the contractor to revise or remedy such work at the cost of the contractor.

6. Construction Time Schedule

6.1 Before the commencement of construction works the contractor shall be required to submit a detail construction time schedule showing details of each event of construction of different components of works so as to complete the whole work within the time frame as per the requirement of the contract. The contractor's proposal shall be examined by the employer to ensure his ability to perform the work in time and approval shall be given with any modification, if necessary, in satisfaction of the employer.

6.2 If the contractor fails to execute the any component of work within the period specified in the construction schedule, the employer shall have right to warn the contractor to make up for such delay in time. In case the contractor fails to overcome delay in different components of the works instead of repeated reminders by the employer, he shall be made fully responsible for any delay in final time schedule and no consideration shall be made for any extension of construction period for the whole work.

7. Technical Documentation

7.1 All technical documentation as specified herein, shall be prepared by the Contractor. The Contractor shall employ skilled drafting personnel to produce all documentation specified. All technical documentation prepared by the Contractor shall be subject to the approval of the Project prior to acceptance by the Project of such documentation. All technical documentation shall be prepared in the English language.

7.2 Structure Data Sheets (SDS), Material Data Sheet (MDS) along with the GIS maps shall be prepared in accordance with the format provided by NEA. Structure Data Sheets shall be prepared by the Contractor showing his proposed construction details for erection of facilities in accordance with the Standards of Nepal Electricity Authority. Submission of SDS, MDS and GID maps for approval shall in clearly legible copy. Any unclear or illegible form entry or reproduction shall be rejected. Project may require any revisions to be made, at their sole discretion, prior to approval of the SDS, MDS and GIS maps for construction. An approved and field checked SDS is required for all Construction Units invoiced by the Contractor. Field checking of the SDS, MDS and GIS maps shall be performed jointly by the Contractor and Project representative. The SDS and As-Built Plan are intended as permanent records for Project. Any construction performed prior to the Contractor’s receipt of approved SDS from Project shall be completely at the Contractor's risk, and Project shall have the right to require any correction due to the un-approved construction activities.

4.3 As-Built Drawings along with GIS maps shall be prepared by the Contractor in the general format provided by the Project. The Project shall provide any available environmental background data for inclusion on the various drawings and the Contractor shall record (in ink) all facilities as-built.

4.4 The Contractor shall prepare other technical drawings, in the same medium and format as the As-Built Drawings, for As-Built Drawings index sheets, pole maps, and One-Line Diagrams as specified and required by the Project.

8. Approval of Drawings

8.1 The contractor must get approval from the employer in writing before he starts execution of construction of any of the segment of work. If the contractor executes any work without the employer's prior approval, he may be asked to revise the same without paying any compensation to him.

9. Pole Setting

9.1 Poles shall be set in accordance with the appropriate Sections of the Standards of Nepal Electricity Authority.

9.2 Each pole shall be assigned a unique construction number at the time of structure staking for preliminary identification and preparation of structure Data Sheets (SDS).

9.3 Subsequent to the preparation and approval of SDS, and prior to provisional acceptance of a given line section, the Project shall provide the Contractor with unique permanent pole numbers. The Contractor shall then apply the specified permanent pole numbers to each pole with black oil-based paint in neat clear English letters and/or Latin numerals. Permanent pole numbers shall be applied in letters/numerals five (5) centimeters in height at a point on the pole 1.6 meters above ground level. Numbers shall be applied on the side of the pole facing the adjacent street or travelled way.

10. Route of Circuits

10.1 To the greatest extent practicable, all overhead circuits should be located along streets or travelled ways ordained by the local level authority or other required authority as public property, except as required for Service drops and circuits to individual consumers.

10.2 All structures should be located at the outer limits of public property along streets or travelled ways. Structures should also be located along streets at property lines of adjacent private property. Structures and stays running parallel or perpendicular to the line route shall not block portions of streets, travelled ways, drives, passages, or gates.

10.4 All structures shall be so located as to reduce, to the greatest extent practicable, obstacles to pedestrian and vehicular traffic. Barriers shall be provided in accordance with instructions by the employer. As far as practicable, transformer structures shall be located to reduce visual and noise impact on adjacent residences or businesses.

10.5 Where underground facilities are indicated by surface conditions, or where such facilities can be located, structures and stays shall be so located as to avoid conflict with such facilities during construction.

10.6 All structure and stay lead locations shall be staked. At points of intersection (P.I.) of tangent line sections, steel rebar stakes shall be used to locate the P.I. A minimum of two (2) side sightings will be made at each P.I to permit re-location of P.I. in the event of stake removal. All structure locations in tangent line sections shall be staked.

10.7 All distances between structures, and other necessary measurements of length, shall be measured to accuracy of 0.1 metre and all angles shall be determined by transit to an

accuracy of 0.1 decimal degree. All elevations shall be measured to an accuracy of 0.1 metre by means acceptable to the Project.

10.8 All measuring and staking activity shall be accomplished by personnel with experience in survey procedures, and standard survey equipment acceptable to the employer shall be used to perform the survey work. Field survey notes covering all survey work shall be produced and maintained and shall be turned over to the Project at the time of completion of the Works. The format of proposed survey notes shall be submitted to the Project for approval.

10.9 Survey work and Survey reports shall be prepared and submitted in hard copy and soft copy. The complete SDS and GIS reports shall be submitted to the project for approval. After the final construction, the as-built drawings and reports shall also be prepared and submitted in hard as well as soft copy. The complete GIS maps shall be prepared and submitted as directed by the Project.

11. Materials

11.1 All materials and equipment of the Project shall be located at the designated store of the Contractor as approved by the Project. During issue and handing over of these materials it shall be the Contractor's responsibility to load all of them and provide all necessary lifting and handling equipment, labor and suitable transport as required to transport the various items of materials and equipment to the Contractor's site of storage and operations.

11.2 Accountability for all materials and equipment procured and issued for the project shall be based on the material lists associated with the various construction drawings and sole responsibility of the contractor.

11.3 If the Contractor fails to account for all materials and equipment procured for the Project, the Contractor shall be charged for the missing materials or equipment. The Project shall have the right to withhold money due or to become due to the Contractor, as reimbursement for the deficit in the Contractor's material.

11.4 Prior to the rehabilitation work, representative of the NEA's local branch office, the Site Engineer and the Contractor shall jointly inspect the materials to be dismantled and list down such materials. It shall be the contractor's responsibility to pack those goods appropriately, transport them to the nearest NEA store and get receipt. Such receipts shall be enclosed with the subsequent invoices claimed by the contractor.

12. Material Storage

12.1 The Contractor shall procure all materials and equipment stated in the Bill of quantities. The Contractor shall provide all labor, equipment, and vehicles to load and transport materials and equipment to the Contractor storage facilities and worksites as required. All materials and equipment turned in to the Project reclaimed after demolition of existing facilities if any shall be transported to the Project warehouse and unloaded in the same manner.

12.2 Worksite

a) Extended storage of materials along the routes of lines will not be permitted. All small items of material shall be provided to the work crews on a daily basis and no small items of materials may be stored on the worksite overnight.

b) Transformers, cable, conductor reels and line accessories may be spotted at the worksites for a short period prior to installation provided that crating and reel lagging are intact to protect the items. Poles may be spotted at structure locations for short periods prior to setting.

c) All poles, transformers, cable, conductor and line accessories placed at the worksites shall be located so that the items are not subject to damage and do not impede pedestrian or vehicular traffic.

d) Any damage caused by imprudent placement of equipment and materials by the Contractor at the worksites shall be corrected by the Contractor, in a manner acceptable to the Project, at the Contractor's cost.

12.3 Contractor Storage Facility

a) The Contractor shall be financially responsible for the secure and proper storage of materials, prior to installation of the materials and equipment, to prevent loss or damage to any materials.

b) Any items of material and equipment contained in degradable packaging shall be stored under roof and protected from moisture. Other materials, except as specified in subparagraph (c) below shall be stored and covered in a well-drained level area, free from accumulation of surface water.

c) Transformers, disconnecting switches, reels of ABC Cable, reels of Cover Conductor, reels of XLPE Cable may be stored outdoors in a well-drained, level area free from accumulation of surface water. Reels of cable may be stacked on reel sides not more than three (3) reels high. Cable reels shall be placed on Wood pallets, wood lagging, or well-graveled level surface.

d) Packaged items of material and equipment shall not be uncrated, or have packaging removed, prior to installation. The Contractor shall exercise due caution and care in the transportation, storage, and handling of all materials which are to be provided by the Project. Equipment consisting of, or containing, porcelain insulation should be transported and handled to avoid cracks or chipping. Lagging or other protection shall not be removed from ABC cable reels until the cable is to be installed.

e) The ends of installed cables shall be sealed immediately after being cut with a non-absorbent covering fastened around the outer jacket.

13. Local Materials

13.1 Certain minor items of materials, including civil materials, required by the Standards of Nepal Electricity Authority are designated Local Materials in the Standards and shall be furnished and installed by the Contractor as part of the completed unit of construction.

13.2 The contractor shall include the cost of such items of materials in his quoted construction unit prices and no other payments for such materials shall be made to the contractor.

13.3 It shall be the Contractor’s responsibility to determine his requirements for any items of Local Material in a timely manner and make procurement accordingly. No delays shall be allowed, and no exceptions shall be made to the required use of Local Materials due to the unavailability of such materials.

14. Excavations

14.1 All excavations made for the installation, or demolition, of facilities shall be accomplished in a timely manner according to the scheduled installation. Required excavations shall be opened, material installed, and backfill placed, as specified, in a continuing operation to the greatest extent practicable.

14.2 Any excavation left open during discontinuous construction which is accessible to the public or along public thoroughfare, shall be covered or barricaded, and marked by suitable visual means, to prevent a public hazard.

14.3 Excavations shall be properly located and sized for the intended use. Pole and stay plate/ anchor excavations shall be correctly sized to retain undisturbed soil to the greatest extent

consistent with the means of excavation. Pole holes shall be made by power-driven auger or by manual methods; power-driven shovel equipment shall not be used. Pole holes shall be excavated to the specified depth with no tolerance shallow and tolerance of ten (10) centimeters deep. The bottom of pole holes shall be undisturbed soil, gravel or rock. Stay plate holes shall be excavated by manual methods to specified depth with no disturbed soil in the direction of the anchor rod.

14.4 All excavations shall be backfilled with excavated material, or as specified for the installation. Backfill shall be free of foreign materials and shall be well tamped with excess backfill graded over the excavated area to prevent depressions resulting from eventual natural compaction. Large amounts of excess backfill shall be removed from the site by the Contractor if so directed by employer. If so directed by Project, the Contractor shall provide suitable backfill materials for excavations where existing removed materials is insufficient, or inappropriate, to provide suitable grading of the excavated area.

15. Demolition

15.1 The Contractor shall perform the removal of all existing facilities, if any, in accordance with the specific directions of the Employer. All materials removed shall remain the property of Project and the Contractor shall deliver all salvaged materials to the Project warehouse, or as specifically directed by the Employer.

15.2 All poles shall be removed by pulling the complete pole from the ground; poles shall not be cut off at the ground line. Holes shall be backfilled and compacted completely with sufficient added backfill piled above grade to prevent depressions being created by natural compaction. Backfill material shall be provided by the Contractor.

15.3 All conductor materials removed shall be returned to the Project. Methods of conductor removal shall be specified by the Project. If conductor is removed in the longest length practicable for future re-use, the said conductor shall be wound on empty conductor reels, with the reels marked with the conductor size and approximate length. Different conductor sizes shall not be mixed on any reel. If conductor is removed from structures and specified as scrap, conductors may be cut down in lengths and made up in rolls. Conductor sizes for scrapping may be mixed; different conductor metals shall be separated.

15.4 Care shall be taken in removing, handling, and transporting cutouts, and surge arresters to minimize porcelain damage.

15.5 Transformers removed from service shall be delivered to the Project warehouse or as specifically directed by the Employer. Care shall be taken in removing, lifting, and transporting transformers.

15.6 Other structures shall be removed, such as concrete transformer pedestals in the most appropriate manner, as specified by the Project. Existing stay rods may be cut 20 centimeters below finished ground level.

16. Tree Cutting and Trimming

16.1 Any tree cutting or tree trimming authorized and directed shall be accomplished by the Contractor under the direct supervision of Project.

16.2 All cutting shall be removed by the Contractor with disposition of cutting as specified by Project.

17. Safety

17.1 The Contractor shall take all measures required to safeguard the public and private property from any hazard to life, limb, or property which may arise during the performance of the

construction of the works. Such measures shall include, but not be limited to: barricades, signs, newspaper announcements, traffic control by police, or other advisory and control methods deemed appropriate.

17.2 The Contractor shall provide his work force with all tools and equipment in sufficient numbers and quality to perform all aspects of the works in a safe manner. The Contractor shall provide protective headgear for all members of his workforce, and shall provide protective clothing as required for specific tasks. The Contractor shall instruct his work force in proper and safe construction techniques and shall continuously monitor compliance with safety instructions throughout the period of the Contract.

17.3 The Contractor shall provide and require use of protective grounding equipment when:

a) Work is being performed on lines adjacent either in extension of or parallel to energized circuits.
b) Work is being performed on isolated circuits after conductors have been installed.

17.4 The Contractor shall maintain all tools and equipment in good working order. All mechanized equipment shall have adequate safety mechanisms and guards in place and be fully operational. Operators of such equipment shall be skilled and fully trained in the operation of such equipment.

17.5 The Contractor shall provide and maintain emergency medical supplies to cover with accidents and snakebites for his work force on a readily available basis. The Contractor shall also instruct all supervisory personnel in the action to be taken in the event of serious injury, and the sources and locations of professional medical assistance which shall be employed in such cases.

17.6 The Contractor shall apply all accidental insurance policies to his work force for an accident occurring during the working period of the construction.

18. Interruptions to Existing Service

18.1 The Contractor shall arrange for interruptions of service to existing lines with Project. Every effort shall be made to limit such interruptions to the minimum.

19. Tests

19.1 The Contractor shall furnish the electrical test equipment and personnel to perform electrical tests of equipment and circuits, as specified by, and under the supervision of the Project.

19.2 The Contractor shall megger all circuits installed with a motor-driven megger to demonstrate the acceptable insulation characteristics of the line prior to energization and Provisional Acceptance. 11 kV and 400 V overhead circuits shall be tested at 2500/1000 volts AC and 33 kV overhead circuits shall be tested at 5000 volts AC.

19.3 The Contractor shall megger all transformers with a motor-driven megger prior to installation

19.4 All tests specified shall be conducted during suitable atmospheric conditions under the supervision and witness of the Project. All test results shall be documented and signed by both parties.

20. Commissioning of work

20.1 After completion of entire work of any village or load center, the project after necessary tests shall arrange to electrically charge the same. In case of successful operation in satisfaction to the project the contractor shall be issued a provisional certificate starting from the date of such commissioning.

20.2 The Project shall be authorized to change such date of commissioning in case of failure of the line due to any defect in the quality of construction.

20.3 Final acceptance of work shall be issued only after completion and satisfactory commissioning of whole work of the contract.

21. Measurement of work and material

21.1 The contractor after completion of work of any segment of work as per approved drawing of the project shall submit detail work measurement in structure data sheet (SDS) provided.

21.2 Measurement of the work performed by the contractor shall be jointly checked by the contractor and the staff deputed by the employer. In case of any discrepancy or dissatisfaction of employer staff the contractor shall be notified for making corrections for the same and the contractor shall have to submit his revised measurement schedule.

22. Cleanup

22.1 The Contractor shall ensure that all worksites shall be free of all manner of debris resulting from the construction activity.

22.2 All crating, cable and conductor reels, packaging materials, conductor scraps, and other miscellaneous items are removed from the workplace. All holes resulting from removal of facilities shall be filled. If trees or bush have been cut or trimmed, all cuttings shall be removed. The worksites shall be left in clean natural conditions.

22.3 Site cleanup shall be an integral part of the Provisional Acceptance process, and no line section shall be provisionally accepted unless all cleanup work has been accomplished.

Structure Data Sheet (SDS)

Structure Data Sheets (SDS) shall be prepared to provide details of specific construction information necessary for erection of pole structures with hardware and accessories and conductor installation. The SDS shall be used in conjunction with the area plan drawing to document the works to be performed. A sample copy of the SDS format is attached herewith.

Abbreviations used in the preparation of SDS shall be defined as follows,

S.N.	Particular	Description	Code
1	Circuit Type	Single Circuit	SC
		Double Circuit	DC
2	Pole Type	Steel Telescopic Pole	TTP
		Steel Tubular Pole	STP
3	Conductor/ Cable Type	33 kV 400 mm^2 XLPE Power Cable, 1C	XLPE,400,33, 1C
		33 kV 400 mm^2 XLPE Power Cable, 3C	XLPE,400,33, 3C
		ACSR 'WOLF' Conductor	WOLF
		120 mm^2 XLPE insulated Covered Conductor for 11 kV line	Covered,120
		ACSR 'DOG' Conductor	DOG
		LT AB Cable (3x95+70)	ABC, 3x95+70
		LT AB Cable (4x70)	ABC,4x70
4	Pole Frame Type (33kV and 11 kV Line)	Single Pole Single Arm	SPSA
		Single Pole Double Arm	SPDA
		H-structure	HS
		Three Pole or Four Pole Structure	MP
		Single Pole Double Dead End Structure	SPDDE
		Tap-Off structure (TO)	TO
		Dead End Structure (DE)	DE
		Offset Structure	OFF
		Composite	CO
		Transformer pole Dead End Type Structure (TR-DE)	TR-DE
		Transformer Pole Intermediate Structure (TR-IN)	TR-IN
5	Pole Frame Type (400 V Line)	Low voltage frame type A1	A1
		Low voltage frame type A2	A2
		Low voltage frame type B	B
		Low voltage frame type C	C
		Low voltage frame type D	D
		Low voltage frame type E	E
6	Stay Type	Single stay	S
		Double Stay	D
		Flying type stay	F
7	Load Break Switch	Load Break Switch	LB
8	Angle of Deflection	Angle of line deflection in degree	BA

Note:

a) Information for a single pole location need not be confined to a single row.
b) All works, whether new or on existing systems, shall be documented on the SDS.
c) Each SDS shall include the applicable "As Built" Plan Drawing number(s). Similarly, each "As-Built" Plan Drawing shall include the applicable SDS number(s).

NEPAL ELECTRICITY AUTHORITY

Structure Data Sheet (SDS) of 11kV and 400V Line

Province:
District:
Municipality:
Ward No:
Tole:

Distribution Centre:
Name of the Project:
Contract No.:
Contractor:
Authorized Subcontractor:

S.N	Pole No.		Geo Co-ordinates	Span	Circuit Type	Composite	BA	Pole Type	Pole Frame Type			Stay						Conductor /Cable		Distribution Transformer (kVA)	Switch	Remark
												S	D	F	S	D	F					
	From	To							HT	LT	TRF	HT			LT			HT	LT			
1																						
2																						
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SECTION – 2

SPECIFICATIONS OF LINE MATERIALS

FOR

LINE AND DISTRIBUTION TRANSFORMER CONSTRUCTION WORKS

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Distribution Transformer

1. Scope

These specifications cover the requirements of oil-immersed, natural-cooled single and three-phase distribution transformers suitable for outdoors installation on 11kV, 50 Hz distribution systems.

2. Service Condition

The transformers shall be designed and constructed for outdoor installation and operation under the following conditions:

Ambient temperature: -5 deg. C to 50 deg. C

Relative humidity: up to 99%

Altitude: up to 3000m above the mean sea level

3. Standards and Quality Certification

3.1 The equipment specified in this Section of the Contract shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards. In particular:

IEC 60076 Power transformers

IEC 60137 Insulating Bushings for alternating voltages above 1 kV

IEC 60156 Insulating liquids-Determination of the breakdown voltage at power frequency-test method

IEC 60296 Specification for unused mineral insulating oils for transformers and switchgear

IEC 60551 Determination of transformer and reactor sound levels

IEC 60616 Terminal and tapping materials for power transformer

IEC 60722 Guide to lightning and switching impulse testing of power transformers and reactors

IEC 60733 Determination of water in insulating oils.

3.2 The manufacturer of the offered transformers must have been accredited with the latest edition of ISO 9001 (including design in the scope of registration) quality certification.

4. Description

4.1 Technical details are provided in the tables below.

S.N.	Description	Unit	Required ratings/features
1	Type		Three-phase, 11/0.4 kV
2	Rated power	kVA	100, 200, 300
3	Rated voltage		
3.1	Primary	kV	11
3.2	Secondary	V	400
4	Maximum system voltage		
4.1	Primary	kV	12
4.2	Secondary	V	440
5	Rated frequency	Hz	50
6	Connection		
6.1	Primary		Delta
6.2	Secondary		Grd. Wye
7	Cooling System		ONAN
8	Vector group		Dyn11
9	Rated impedance voltage		3.5 - 4.5%
10	BIL for windings and bushings for primary side	kV	75
11	Power frequency withstand voltage, 50 Hz, 60 Sec.		
11.1	Primary	kV	28
11.2	Secondary	kV	3
12	No load tap changer		+/- 2.5%, +/- 5% on HV side
13	Mounting		Platform

S.N.	Description	Unit	Required ratings/features
14	Insulation levels (IEC)		LI 75 AC 28/AC 3
15	Insulation temperature class A		A
16	Maximum allowable noise level at 3 metre hemispherical radius	dB	<44
17	Applicable standard		IEC

4.2 Tank

The tank shall be of welded construction and fabricated from mild steel of adequate thickness. All seams shall be properly welded to withstand requisite impact during short circuit without distortion. All welding shall be stress relieved. The tank cover shall be bolted on to the tank with weatherproof, hot-oil resistant, resilient gasket in between for complete oil tightness. Pressed-steel radiators shall be mounted on transformer-tanks of 50 kVA and higher rating transformers. The radiator shall be of pressed-steel of corrugated type design. Heat dissipation calculation in respect of the number, size and length of the radiators are to be satisfied by design calculation.

Each transformer shall be provided with a case of rigid construction, which shall be oil-tight and gas-tight. The thickness of all tank sides except the tank bottom and cover shall not less than 3.2 mm. The thickness of tank, the tank bottom and cover shall not be less than 4.0 mm. The tank shall be capable of withstanding, without leakage or permanent distortion, a pressure 25% greater than the maximum operating pressure. The tank cover shall be bolted. Each transformer shall be provided with earthing terminal with clamp type connector. The radiator shall be of pressed steel or corrugated type design.

4.3 Painting

All sheet steel works shall be phosphated in accordance with the following procedure and in accordance with ISO 2063 and ISO 12944.

The tank body shall be sand/shot blasted to remove the welding scales. Oil, grease, dirt shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water, followed by final rinsing with dilute dichromate solution and even drying. The phosphate coating shall be sealed by the application of two coats of stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. Touch up shall be applied after completion of tests. The color for the finishing paint shall be light gray or as approved by Employer. The final finished thickness of paint film on steel shall not be less than 60 microns. Finished painted surface shall present aesthetically pleasing appearance free from runs and drips. A small quantity of finishing paint shall be supplied for minor touching up required at site.

4.4 Core

The transformer shall be of core type. The cores shall be constructed with prime core-material of interleaved grade non-aging, low loss, high permeability, grain oriented and cold rolled silicon steel laminations, properly treated after being sheared to remove any burrs and shall be re-annealed to remove any residual stresses. The steel shall be thin in lamination. The core shall be M4 type or better.

The yoke laminations shall be in single piece instead of pieces to reduce chances of introducing more air gaps in the core construction. All steel sections used for the support of the core shall be thoroughly sand/shots blasted after cutting, drilling and welding.

All laminations shall be properly insulated with the materials that will not deteriorate due to pressure and hot oil. The core shall be rigidly clamped with positive locking device to ensure adequate mechanical strength. Core and coil assembly shall be capable of withstanding the vibrations and shock during transportation, installation, service and adequate provision shall be made to prevent movement of core and coil assembly relative to the tank during these conditions. The core shall be provided with lifting lugs suitable for lifting complete core and coil assembly of transformer.

Permissible Flux Density and Over Fluxing

Flux density at rated voltage and frequency shall not exceed 1.6 T. The no-load current at rated voltage and at 112.5% voltage shall not exceed the values given below with tolerance as indicated.

At 100% rated voltage 2% of rated full load current + 30% as tolerance.

At 112.5% rated voltage max 4% of rated full load current

The bidder shall submit the design calculation in support of flux density and no-load current at 100% and 112.5% voltage along with drawings of core-steps, limb diameter, window-height, limb-center, etc.

4.5 Winding

The design, construction and treatment of winding shall give proper consideration to all service factors. The winding shall be so designed that all coil assemblies are of identical voltage ratio and shall be interchangeable. All delta leads should be clamped tightly on to the special frame/bracket making pie (π) frame. The leads leading to the bushing terminals should be clamped to the horizontal support base of the pie frame so that vibration during short circuit is not passed on to the windings.

The completed assembly of core and coils shall be dried in a vacuum sufficient to ensure elimination of air and moisture within the insulating structure. After the drying process, the assembly shall be immediately impregnated with dry oil to develop full electrical strength in the windings. The windings of the transformer shall be fabricated from copper materials.

Current density for any part of the winding shall not exceed 2.5 amp/mm2 for copper winding transformers.

4.6 Oil Preservation System

The transformers up to 25 kVA of voltage rating 11/0.4kV shall be completely oil filled type. The transformers of higher ratings shall be provided with conservator. The conservator vessel shall have a capacity between highest and the lowest levels of not less than 7.5% of the total cold oil volume of the transformer.

Each conservator vessel shall be fitted with a sufficient-size breather in which silica gel shall be used as the drying agent. Windows in the silica-gel breathers shall be sufficiently large enough to allow crystal color change to be easily observed from a distance of 6 m. The position of the silica gel breather shall be such that maintenance can be carried out without the need to de-energize the transformer.

4.7 Short Circuit Capacity

The transformer shall be designed and constructed to withstand without injury the mechanical and thermal stress produced by short-circuit current limited by the impedance of the transformer only.

4.8 Tap Changer

An externally - operated tap changer shall be furnished with each transformer, to be operated only when the transformer is de-energized. The tap changer shall include an operating handle, visible indication of tap position and means for locking the tap changer in any desired position. The locking device shall be arranged to prevent locking the tap changer in an off position. Mechanical means shall be provided for limiting the maximum and minimum travelling of the extreme tap positions to be at the maximum and minimum position of the tap changer.

4.9 Insulating Oil

The insulating oil shall be refined mineral oil. Necessary quantity of oil for the transformer shall be furnished by the contractor.

4.10 Bushings

The bushings shall be made of homogeneous and well vitrified porcelain. The color of the insulator shall be brown and the surface shall have polished glaze.

The high voltage bushings shall have bolted terminal lugs (samples should be approved by NEA) suitable for terminating 30-120 mm2 stranded conductor.

The low voltage bushings shall have bolted terminal lugs (samples should be approved by NEA) suitable for terminating aluminum conductor compatible to the kVA rating (with 100% factor of safety) of the transformer.

The low voltage neutral bushings shall include a bolted terminal lug for terminating together an earth wire and an aluminum conductor of neutral circuit of the LV system.

4.11 Temperature rise

Maximum oil-temperature rise and maximum winding-temperature rise above ambient-temperature of 45 deg. C when carrying maximum continuous rated current shall

not exceed the following:

a) In oil by thermometer 50 deg. C

b) In winding by resistance 55 deg. C

The temperature rise of the insulating oil shall be measured near the top of the main tank.

4.12 Gaskets

All sealing washers/Gaskets shall be made of oil and heat resistance nitrile/neoprene/synthetic rubber bonded with cork gasket. Gasket made with natural rubber and cork shall not be acceptable. The thickness of the tank cover gasket shall not be less than 6 mm before compression.

4.13 Clearances

Minimum electrical clearances between the phases and phase to earth shall not be less than the values given below:

Voltage	Medium	Phase to phase, mm	Phase to earth, mm
11kV	Air	255	320
400V	Air	75	55

The clearances shall be maintained by fixing the bimetallic connectors in position.

4.14 Accessories

The following accessories shall be provided with each transformer.

- Lower oil filter and drain valve
- Liquid level gauge
- Lifting Lug
- Name plate
- Tank grounding terminal connector suitable for grounding cable
- Pressure relief device of explosion vent type for 25 kVA and higher ratings

4.15 Rating and Terminal Marking Plate

Each transformer shall be provided with a non-detachable rating and terminal marking plate of weather proof material, preferably of brass fitted in a visible position mentioning the following information:

- Guaranteed No Load Loss and Load loss
- Details of rating (rated output, voltage, phases, frequency etc.)
- Cooling
- Connection and vector diagram
- Weights (Total, weight of core, weight of winding and weight of oil)
- Name of manufacturer and year of manufacture

- Standards of manufacture
- Physical dimension of the transformer
- Any other relevant information

The face of the transformer body shall display the words “Property of Nepal Electricity Authority" on all four sides written in indelible paint.

5 Tests

Tests shall be performed in accordance with these specifications in line with the relevant IEC standards.

5.1 Type Tests

The Bidder shall submit, along with the Bid, type test reports (detail) on the following tests performed on identical units on each ratings of the transformer

- Temperature rise tests
- Dielectric Type Tests (Impulse Voltage Tests and Separate source AC withstand voltage test)

If the type test report for identical unit of transformer is not available, the type test report of similar type transformer may be considered acceptable during bid evaluation, provided that the bidder shall upon award of the Contract and prior to mass production of transformer, undertake to carry out type test on identical unit of each type (and rating) of transformer from an independent laboratory accredited by International Accreditation Corporation (ILAC) or International Accreditation Forum (IAF) or other reputed Accreditation Agencies acceptable to Nepal Electricity Authority in the presence of representative appointed by NEA at no extra cost to the NEA.

In this case, for purpose of evaluation, the values of no-load and load losses shall be considered from the values guaranteed by the bidder.

5.2 Routine Tests

The routine tests shall be performed on each unit of transformer by the manufacturer as per the IEC before dispatch and submit the test-reports to the Employer. The bidders are required to furnish the testing facilities available at the manufacturer’s premises for conducting the test

5.3 Tests to be witnessed by the Employer

To ensure about the quality of transformers, the following acceptance tests shall be carried out:

(i) If the type test report for identical unit of transformer is not available as mentioned above during bid evaluation, the bidder shall upon award of the Contract and prior to mass production of transformer, shall carry out type test on identical unit of each capacity of transformer in one of the testing laboratories as mentioned above in the presence of representative appointed by Nepal Electricity Authority at no extra cost to NEA.

(ii) Stage Inspection will be done when the raw material is received, and the assembly is in progress in the shop floor. After the main raw-materials i.e. core and winding materials and tanks are arranged and transformers are taken for production on shop floor and 20-25% under each lot of assembly has been completed, the supplier shall intimate NEA, so that an inspecting officer for carrying out such inspection could be deputed, as far as possible within fifteen days from the date of intimation. During the stage inspection, a few assembled cores shall be dismantled to ensure that the CRGO laminations used are of superior quality. During this stage inspection the Manufacturer shall provide the inspectors documentary evidence such as purchase order, bill of lading, delivery receipt, factory test certificate and type test report (from the independent laboratory accredited by International Accreditation Corporation (ILAC) or International Accreditation Forum (IAF) or other reputed Accreditation Agencies) of the core and winding materials to be used specifically for the manufacturing of Transformers under the subjected contract.

(iii) Pre-dispatch factory acceptance tests will be carried out at finished stage i.e. transformers are fully assembled and are ready for dispatch. As and when the transformers are ready for dispatch, an offer intimating about the readiness of transformers for pre dispatch inspection for carrying out routine tests shall be sent by the manufacturer along with Routine Test Certificates as specified in Clause 5.2. The Pre-dispatch factory acceptance tests as per IEC shall be conducted on at least two (2) percent of the transformers to be supplied. In addition to above, the Employer's representative(s) shall also witness the temperature-rise test for each type (and rating) of transformer on at least one unit of each type (and rating) of transformer to be procured. The sample for routine and additional tests shall be selected by the Employer's representative(s) from the complete-lot ready for dispatch. The above mentioned tests shall be carried out in the premises of the Manufacturer.

(iv) The Contractor shall carry-out [which the Employer's representative(s) shall witness] the following tests in a laboratory owned or nominated by the Employer after delivery in Nepal.

a) Temperature rise test on at least one transformer of each rating.

b) No Load Loss and Load Loss test on hundred (100) percent of transformer

The sample shall be selected by the Employer's representative(s) from the completed lot of delivered transformers. **Cost for such tests shall be quoted in the Price Schedule and shall be paid by the Contractor/Manufacturer.**

6. Evaluation

6.1 The transformer no-load and load losses shall not exceed the following prescribed values. If the guaranteed no load and load losses exceed the prescribed values below, the offer shall be rejected.

S.N.	Transformer Rating	No Load Loss (W)	Load Loss (W)
1	11/0.4 kV, 100 kVA, 3-Phase	220	1210
2	11/0.4 kV, 200 kVA, 3-Phase	365	2100
3	11/0.4 kV, 300 kVA, 3-Phase	550	3000

6.2 Capitalization of Losses

The transformer losses shall be capitalized as follows:

Value of No Load Loss = US$ 4684.00 per kW

Value of Load Loss = US$ 1180.00 per kW

Loss associated with cooling fan = US$ 393.00 per kW

6.3 **Penalty for Excessive losses:**

During testing as per 5.3 above, if it is found that the actual measured losses are more than the values guaranteed by the bidder (provided that they are within the limit specified in Clause 6.1 above), a penalty shall be recovered from the bidder at double the loss capitalization rates arrived at clause 6.2 above. For fraction of a kW, proportionate penalty will be recovered.

6.4 For the purpose of this Specification type tests are defined as tests performed on similar transformers of the same general arrangements, same ratings and same mechanical and electrical characteristics.

6.5 If at any stage it is established that the type test report submitted by the bidder is not satisfactory, discrepant or ambiguous, the NEA reserves the right to ask the bidder/supplier to conduct the type test on the rating/s of transformers chosen by the NEA in presence of their representative to reputed national/international testing laboratory prior to its mass production and/or dispatch. The costs involved in organizing and conducting such tests shall be borne by the bidder/supplier.

7. Bid Documentation

7.1 The Bidder shall furnish with the Bid, the following documentation:

a) Copy of the IEC standards governing fabrication and testing of the transformers.

b) Certified copies of type tests carried out for each rating as required by the governing IEC standard and the specifications.

c) Certified outline drawings for each kVA rating showing dimensions, arrangements, and locations of all parts.

d) A clause-by-clause commentary on the specification, specifying compliance or deviations, if any.

GUARANTEED TECHNICAL PARTICULARS

(To be completed separately for each transformer rating)

(To be completed by the Bidder/Manufacturer)

Item: Distribution Transformer

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Year of manufacturing experience			
3	Model No.			
4	Applicable Standards			
5	Winding material:			
6	Primary Winding BIL	kV		
7	Primary Bushing BIL	kV		
8	Accessories listed below furnished?			
8.1	Lower oil filter valve	Yes/No	Yes	
8.2	Liquid level gauge	Yes/No	Yes	
8.3	Lifting lugs	Yes/No	Yes	
8.4	Hand hole	Yes/No	Yes	
8.5	Tank earthing terminal	Yes/No	Yes	
8.6	Overload protection	Yes/No	Yes	
	If yes, details attached?	Yes/No	Yes	
9	Testing facilities available (mention name of the test equipment/facility below)			
9.1	Applied voltage test			
9.2	Induced voltage test			
9.3	No load loss and excitation current test			
9.4	Impedance voltage and load loss tests			
9.5	Resistance measurement			
9.6	Ratio tests			
9.7	Polarity and phase relation tests			
9.8	Leakage tests			
9.9	Insulation resistance tests			
10	Design Information			
10.1	Rated kVA (IEC rating)	kVA		
10.2	Number of phases	Number	3	
10.3	Frequency, Hz	Hz	50	
10.4	Voltage ratio at no-load	V/V	11000/400	
10.5	Winding connections		Dyn11	
10.6	Type of core sheet			
10.7	Magnetizing current at normal ratio:			
	in HV side	A		
	in LV side	A		
10.8	Maximum flux density in core iron at normal voltage and frequency based on the net section of iron:			
	in Cores	T	1.6	
	in Yokes	T	1.6	
10.9	Type of winding:			
	HV winding			
	LV winding			
10.10	Maximum current density in winding at rated power:			
	in HV winding	A/mm^2	2.5	
	in LV winding	A/mm^2	2.5	
10.11	Type of insulation used for			
	HV winding			
	LV winding			
10.12	No-load loss at normal voltage ratio and 75°C	W		

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
10.13	Load loss at rated current and at 75°C	W		
10.14	Regulation at 75°C and rated power as a percentage of normal voltage			
	at power factor =1	%		
	at power factor =0.8	%		
10.15	Impedance voltage at 75°C and rated power			
	at normal tapping	%	7	
	at -5% tapping	%		
	at +5% tapping	%		
10.16	Efficiency			
	at 1 p.f and 125% of rated current	%		
	at 1 p.f and 110% of rated current	%		
	at 1 p.f and 100% of rated current	%		
	at 1 p.f and 75% of rated current	%		
	at 1 p.f and 50% of rated current	%		
	at 1 p.f and 25% of rated current	%		
10.17	Temperature rise at rated kVA by thermometer in oil	°C		
10.18	Temperature rise at rated kVA by resistance of windings	°C		
10.19	Permissible overload			
10.20	Transformer insulating oil specification			
10.21	Total volume of insulating oil at 20°C	L		
10.22	Effective expansion capacity of conservator.	L		
11	Approximate weight and dimensions			
11.1	Weight of transformer core	kg		
11.2	Weight of transformer windings	kg		
11.3	Weight of transformer tank and fittings	kg		
11.4	Weight of Oil	kg		
11.5	Total weight of transformer	kg		
11.6	Thickness of tank sides	mm		
11.7	Thickness of tank bottom	mm		
11.8	Thickness of radiator	mm		
11.9	Approximate dimensions including fittings			
11.9.1	Overall length	mm		
11.9.2	Overall width	mm		
11.9.3	Overall height	mm		
12	Delivery of equipment following award of contract and approval of drawing	months		
13	ISO 9001 holder (including design)	yes/no	yes	
13.1	ISO 9001 certificate submitted	yes/no	yes	
14	Type test certificate submitted	yes/no	yes	
14.1	Submitted for the required ratings	yes/no		
14.2	Type test certified by			
15	User's certificate submitted	yes/no	yes	
16	Has exported to third country	yes/no	yes	
17	Copies of relevant standards attached	yes/no	yes	
18	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Transformer Platforms

1. **Scope**

1.1 This specification covers the fabrication and supply of transformer platforms used in overhead power line construction.

2. **Material**

2.1 The transformer platform shall be fabricated from hot-rolled channels, angles and steel members.

2.2 The steel channels and angles for transformer platform shall be fabricated in accordance with Indian Standards IS: 226 and IS: 808 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable. The minimum tensile strength of the steel shall be 4200 kg/cm2.

3. **Description**

3.1 The platform shall be fabricated out of galvanized steel members without any welded joints and field assembled by bolting.

3.2 The platform will support the transformer above the ground and will be supported by two-pole structures of tubular steel or pre-stressed concrete (PSC) poles. Transformers will be bolted to the platform at four (4) points. Provision should be made for the mounting of transformers of different physical dimensions and ratings up to 300 kVA.

3.3 The platform shall be designed by the supplier and fabricated, in general, in accordance with the conceptual configuration provided by the Employer. The design shall provide support for a transformer of a minimum of 1500 kg in weight with a minimum safety factor of 2.0. The Platform shall be stiff and shall be capable of withstanding horizontal forces and an overturning moment due to seismic effects on a transformer with center of gravity 0.5 meter above its base and seismic horizontal acceleration of 0.4g. The platform shall be stiff and shall not visibly deflect under static loading.

3.4 The platform shall be supplied disassembled, complete with all required members and fastenings. Packing may be made by banding structural members. Fastenings shall be separately packed. Structural members shall be clearly identified for ease of assembly in accordance with the assembly drawing furnished by the supplier.

3.5 The platform shall be suitable for fixing to support tubular poles of 100 to 200 mm diameter, and PSC poles of rectangular section with 250 to 350 mm in width and 140 to 180 mm depth.

4. Galvanizing

4.1 All ferrous parts of transformer platform shall be galvanized with minimum thickness of 90 microns after fabrication in accordance with IS: 2629 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable.

5. **Tests**

5.1 Apart from the tests indicated herein in the referenced standards, the transformer platform shall undergo following tests:

- Visual Inspection;
- Verification of Dimensions;

6**. Quality Assurance Program**

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9001;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any the type, special, acceptance and routine tests specified in the relevant standards.

7. **Bid Documentation**

7.1 A preliminary design of the platform shall be submitted with the Bid. Data to be supplied with the preliminary design shall be:

a) Steel classification proposed to be used and the characteristics thereof;

b) Two copies of Preliminary detail drawings of the proposed platform;

c) Data regarding:

i) Vertical and horizontal loading on poles,
ii) Resultant safety factor,
iii) Resultant deflection,
iv) Resultant percent of allowable tension, compression, and shear limits for the steel selected and associated fastening,
v) Moments on pole due to seismic effects on the platform and transformers.

7.2 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

7.3 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

GUARANTEED TECHNICAL PARTICULARS
(To be completed by the Bidder/Manufacturer)

Item: Transformer Platform

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	**Manufacturer**			
2	Preliminary details drawing furnished?	Yes/No	Yes	
3	Steel Classification/ Characteristics furnished?	Yes/No	Yes	
4	Governing Standard for galvanization		IS: 2629 or ISO 1461	
5	Thickness of Galvanization		Min. 90 micron	
6	Vertical Load on pole			
7	Resultant Safety Factor			
8	Resultant Deflection at design load	mm		
9	% of allowable tension			
10	% of allowable compression			
11	% of allowable shear limits			

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Surge Arrester

1. SCOPE

This specification covers the general requirements of the design, manufacture, testing, supply and delivery of Surge Arrester of Gapless Metal-Oxide type commonly installed on overhead 11kV power lines of the Nepal Electricity Authority.

2. System Parameters

a)	Nominal Voltage	11kV
b)	System Highest Voltage	12kV
c)	System frequency	50Hz
d)	No. of Phases	3
e)	Neutral Earthing	Effective
f)	System fault current	20kA rms

3. Service Condition

a)	Ambient temperature	-5 to 55 deg. C
b)	Annual average ambient temperature	30 deg. C
c)	Maximum relative humidity	99%
d)	Environmental condition	Humid Tropical climate
e)	Operational altitude	Up to 3000m above msl
f)	Isokeraunic (Thunder day) level	90 days
g)	Solar Radiation	1.6kW/m2

4. Applicable Standards

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof and the NEA Specifications specified hereafter.

a)	IEC 60099-4 Part 4 Surge Arresters	Metal-oxide surge arresters without gaps for a.c. systems
b)	IEC 60099-5 Part 5	Selection and application recommendations
c)	IEC 61109	Composite insulator for a.c. over headlines with a nominal voltage greater than 1000V - Definitions, test methods and acceptance criteria
d)	IEC 60507	Artificial pollution tests on high voltage insulators to be used on a.c. Systems

5. Technical Parameters

5.1 Minimum Technical Requirements

S.N.	Description	Unit	Required ratings/features
1	Voltage rating	kV	9
2	Nominal system voltage	kV	11
3	Maximum system voltage	kV	12
4	System frequency	Hz	50
5	Nominal discharge current	kA	10
6	Type of Housing Insulator		Polymeric
7	Creepage distance (terminal to base)	mm	390
8	Minimum power-frequency withstand Voltage		
8.1	Wet	kV	50
8.2	Dry	kV	70
9	Impulse withstand (1.2/50μsec) Voltage	kV (Peak)	95
10	Maximum discharge (residual) voltage at 10kA lighting impulse current	kV (Peak)	29
11	Steep current residual voltage	kV (Peak)	32
12	Line Discharge Class		1
13	Energy absorption Capability with (4/10	kJ/kV	Not less than 3.2

	wave)		
14	Pressure relief class		B
15	High current		for 0.2s 20 kA
16	Low current		for 0.5s 0.8 kA
17	One Second TOV withstand capability	kV	>1.15x12

5.2 Power Frequency Voltage vs Time Characteristics

The manufacturer shall provide the power frequency voltage vs time characteristics, preheated to 60°C with no prior energy and with prior energy (specified by the manufacturer) in order to verify the TOV capability of the Arrester.

If a particular manufacturer is unable to meet the TOV condition of 1.15Ur (rated voltage of the Arrester) for 1 sec. duration, has the option of offering of an Arrester of a higher rating.

6. BASIC FEATURES

6.1 Design

The Surge Arresters shall be designed for outdoor service conditions stipulated above. They will be connected between phase and earth to protect distribution transformers and switchgear. It shall be complete with the following:

a) Clamps suitable to receive Copper/Aluminum (Line) Conductors from 4 mm-16mm
b) The mounting clamps suitable for bracket mounting on a structure made out of 100x50x6mm Channel Iron.

6.2 Manufacture

The Surge Arrester shall be of the non-linear metal-oxide resister type without spark gaps and the non-linear metal-oxide resister shall be housed in a hermetically sealed insulator casing to prevent ingress of moisture.

6.3 Insulator Details

The housing insulator of the surge arrester shall be of polymeric type and the insulator sheds shall be designed to minimize trapping of contamination.

The complete arrester shall withstand a 1000h salt fog test at continuous voltage as described in IEC 61109/IEC 60507. Additional cycle tests as described in IEC 61109 shall also be passed satisfactorily.

6.4 Moisture Sealing

The manufacturing procedure shall include an effective leak test and the manufacturers shall carry out the Special Thermal Stability Test as specified in IEC 60099-4.

6.5 Partial Discharge

Each surge arrester shall be tested to prove absence of partial discharge contact noise as specified in IEC 60099-4.

6.6 Arrester Disconnector

The Surge Arrester shall have a device for disconnecting it from the system in the event of arrester failure to prevent a persistent fault in the system and it shall give a visible indication when the arrester has failed. The arrester disconnector shall be tested as per IEC 60099-1.

6.7 Insulating Bracket

A robust insulating bracket together with suitable mounting clamps to mount the Surge Arrester to 100x50x6mm Channel Iron Cross Arms shall be supplied with the Surge Arrester. The power frequency withstand voltage of the insulating bracket shall not be less than 20kV.

7. ADDITIONAL REQUIREMENTS

7.1 Rating Plate Markings

The following ratings and data of the arresters shall be provided and it shall be weather proof and corrosion proof. The plate shall be positioned at the bottom flange base and visible from the ground level.

(a) Number and year of the standard adopted
(b) Rated voltage / frequency
(c) Continuous operating voltage
(d) Arrester type and discharge class
(e) Nominal discharge current
(f) Manufacturer's identification
(g) Year of manufacture
(h) Serial number
(i) Contract No.

7.2 Packing

Each set of Surge Arrester shall be packed in a suitable box. Number of these boxes shall be held together in a firm position and measures shall be taken to avoid damage against jerks and collision between adjacent units during transportation.

Each packing shall contain a copy of installation instruction in English Language. The voltage rating, manufacturer's name/identification, Country of Origin, and the quantity shall be clearly marked on each packing.

8. INSPECTION AND TESTING

8.1 Acceptance Test

The successful Bidder shall make necessary arrangements for pre-shipment inspection and tests by the nominated NEA Inspectors to carry out in his presence the necessary Sample/Acceptance tests conforming to the relevant IEC on equipment and materials offered. Routine test report for all the items shall be furnished for the observation of the Inspector.

The acceptance tests as per IEC shall be witnessed by the NEA Inspector.

(a) Power frequency reference voltage test
(b) Partial discharge test.
(c) Lightning Impulse Residual voltage test.
(d) Thermal Stability test

8.2 Routine Test

The Routine Tests shall be carried out on all the arresters as per the relevant IEC and the test report shall be made available for the observation of the NEA Inspector at the time of inspection.

(a) Power frequency reference voltage test.
(b) Residual voltage tests.
(c) Partial discharge test.
(d) Leakage test

9. BID DOCUMENTATION

9.1 The following shall be furnished with the offer.

(a) Product Catalogues/Technical literature describing the constructional features, materials used for components, operational feature of the equipment, indicating the model number etc.
(b) Energy withstand capability & a description of the test carried out to measure the same.
(c) Power frequency withstand voltage versus time characteristic curve covering the time range from 0.1 sec. to 24 minutes.
(d) Dimensional drawings of the bracket mounting base, live conductor clamps, earth lead and automatic earth disconnecting device and overall dimensional drawing.
(e) Drawing of name plate to scale incorporating the particulars called for.

(f) Completed Schedule of Guaranteed Technical Particulars
(g) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(h) Type Test Certificates: The Type Test Certificates shall be from an Accredited Independent Testing Authority acceptable to the Purchaser.
(i) Copy of the Governing Standards
(j) Technical Literature in English Language on installation, operation and maintenance with necessary circuit diagrams and drawings.

9.2 Type Test Certificates

Following Type Test certificates conforming to IEC 60099-4, IEC 60507 and IEC 61109 shall also be submitted with the offer.

(a) Insulation withstand test,
(b) Residual voltage tests,
(c) Long duration current impulse
(d) Operation duty test
(e) Tests of arrester disconnector,
(f) Partial discharge test,
(g) Seal leakage test,
(h) Tracking & erosion test for polymeric insulation

Test Certificates shall clearly identify the equipment concerned showing the manufacturer's identity, Type, Model and Serial Number of the equipment tested. Type Test Report shall include a complete drawings and the model/type of the offered Arrester. Type Test Report shall be from a recognized accredited independent testing authority acceptable to the purchaser.

GUARANTEED TECHNICAL PARTICULARS
(To be filled by the Bidder/Manufacturer)

Item: Surge Arresters

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
	Year of manufacturing experience			
2	Model No.			
3	Applicable Standards		IEC	
4	Lightning arrester type		Gapless metal oxide	
5	Line Discharge Class		1	
6	Pressure relief class		B	
7	Type of Housing Insulator		Polymeric	
8	Voltage rating	kV	9	
9	Nominal system voltage	kV	11	
10	Maximum system voltage	kV	12	
11	System frequency	Hz	50	
12	Nominal discharge current	kA	10	
13	Creepage distance (terminal to base)	mm	390	
14	Minimum power-frequency withstand Voltage			
14.1	Wet	kV	50	
14.2	Dry	kV	70	
15	Impulse withstand (1.2/50μsec) Voltage	kV (Peak)	95	
16	Maximum discharge (residual) voltage at 10kA lighting impulse current	kV (Peak)	29	
17	Steep current residual voltage	kV (Peak)	32	
18	High current		for 0.2s 20 kA	
19	Low current		for 0.5s 0.8 kA	
20	One Second TOV withstand capability	kV	>1.15x12	
21	Energy absorption Capability with (4/10 wave)	kJ/kV	Not less than 3.2	
22	Ground lead disconnector provided?	Yes/No	Yes	
23	Delivery of equipment following award of contract and approval of drawing	months		
24	ISO 9001 holder (including design)	yes/no	yes	

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
24.1	ISO 9001 certificate submitted	yes/no	yes	
25	Type test certificate submitted	yes/no	yes	
25.1	Submitted for the required ratings	yes/no		
25.2	Type test certified by			
26	User's certificate submitted	yes/no	yes	
27	Has exported to third country	yes/no	yes	
28	Copies of relevant standards attached	yes/no	yes	
29	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Distribution Cutout (Drop-Out Fuses)

1 SCOPE

This Specification covers the general requirements of the design, manufacture, testing, supply and delivery of drop out fuse complete with fuse carriers and mounting brackets commonly used on the primary side of 11 kV distribution transformers as protective device.

2. System Parameters

a)	Nominal Voltage	11kV
b)	System Highest Voltage	12kV
c)	System frequency	50Hz
d)	No. of Phases	3
e)	Neutral Earthing	Effective
f)	System fault current	20kA rms

3. Service Condition

a)	Ambient temperature	-5 to 55 deg. C
b)	Annual average ambient temperature	30 deg. C
c)	Maximum relative humidity	99%
d)	Environmental condition	Humid Tropical climate
e)	Operational altitude	Up to 3000m above msl
f)	Isokeraunic (Thunder day) level	90 days
g)	Solar Radiation	1.6kW/m2

4. Applicable Standards

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof and the NEA Specifications specified hereafter.

a)	IEC 60282-2	H.V. Fuses - Expulsion and similar fuses
b)	IEC 60071-1	Insulation co-ordination.- Part I Definitions, principles and rules
c)	IEC 60071-2	Insulation co-ordination - Part 2 - Application guide
d)	IEC 60273	Characteristic of indoor & outdoor post insulators for systems with nominal voltages greater than 1000V
e)	IEC 60694	Common Specifications for high-voltage switchgear & control gear standards
f)	IEC 60060-2	High-voltage test techniques -Part 2 Measuring systems

5. Technical Parameters

5.1 Minimum Technical Requirements

S.N.	Description	Unit	Required ratings/features
1	Rated Voltage	kV	12
2	Rated Frequency	Hz	50
3	Rated Continuous Current	A	100
4	Dry Impulse withstand voltage (peak)		
4.1	Across isolating distance of the fuse base	kV	85
4.2	To earth and between poles	kV	75
5	Power Frequency withstand voltage (Wet 1min)		
5.1	Across isolating distance of the fuse base	kV	32
5.2	To earth and between poles	kV	28
6	Minimum power frequency withstand voltage		
6.1	Dry	kV	35
6.2	Wet	kV	30
7	Mounting Angle (to vertical plane)	deg	~15-20
8	Interrupting Rating		
8.1	Symmetrical Interrupting rating (min) rms	kA	8.0

8.2	Asymmetrical Interrupting rating (min) rms	kA	9.6
8.3	X/R ratio		4.0
9	Interrupting capacity	kA	10
10	Temperature Rise Limit (In air)		
10.1	Copper contacts silver faced	deg. C	40
10.2	Terminals	deg C	30

6. BASIC FEATURES

6.1 Design

The Dropout Fuse shall be of Class A as per IEC 60282-2. It shall be suitable for use in outdoor circuits under tropical conditions. The Dropout Fuse shall be complying with the minimum technical requirements stipulated above.

6.2 Manufacture

a) The Dropout Fuse shall be designed with a solid core, bird proof, one-piece Porcelain Insulator and should robust enough to withstand shocks due to frequent operations. The fuse carrier shall drop-out immediately following the blowing of the fuse.
b) Dropout Fuse within the same voltage class shall be so designed that fuse carrier together with mounting assembly shall be dimensionally compatible to facilitate the interchange of fuse carriers of the cutouts of corresponding rating.
c) The Dropout fuse shall be able to mount on a single channel iron cross arm (100mm x 50mm x 6mm) at an angle of 15 to 20 degrees to the vertical. The whole unit shall be complete with long mounting bracket, bolts, nuts & washers.
d) Fuse carrier shall be made of high strength fiberglass filament wound tube or suitable insulating material and it shall be protected from weather and environment by ultraviolet resistant coating. Inside liner of the fuse tube shall be constructed of a synthetic arc quenching material.
e) Copper Arc Shortening rod shall be attached to the cap of the fuse tube to obtain higher interrupting rating. A removable button head type fuse link having M6x1 thread shall be able to fix to the arc shortening tube.
f) The installation and removal of the fuse carrier shall be facilitated by inserting the operating rod into a lifting eye at the hinge end (lower) of the fuse carrier when it is in the dropped out position. An operating lever eye shall be provided at the top of the carrier to facilitate a downward pull by the operating rod to release the latch incorporated in the stationary upper contact
g) All castings such as upper and lower moving and fixed contacts, clamp type terminals, toggle mechanism shall be of phosphor bronze, silicon bronze, aluminum bronze or Silver-plated brass.

6.3 Stationary and Movable Contacts

a) The Stationary and Movable Contact surfaces shall be silver plated to minimize the contact resistance.
b) The upper stationary contact assembly shall be provided with a safety latch to prevent the fuse carrier from dropping due to vibration and The upper contacts shall be protected from any airborne contaminants.
c) A back up spring made out of stainless steel or phosphor bronze shall be provided to ensure constant pressure between the upper stationary contact and the upper movable contact of the fuse carrier.
d) The lower stationary contact support and the fuse carrier shall be machined at the swiveling or axle point to enable the fuse carrier with the fuse link to be correctly guided into the latching position by an operating rod. The hinge at the stationary contact shall be so designed to prevent the dropping off of the fuse carrier in the drop-out position, due to shock and vibration.
e) A suitable guiding arrangement shall be provided in the upper contact to ensure easy engagement of the fuse carrier.
f) The Asymmetrical breaking current ratings shall be permanently marked on the upper metal part.

6.4 Terminals

a) The upper and lower terminals shall be of Bi-metallic type, suitable to accommodate Copper/Aluminum Conductors of Sizes from 5mm to 14mm diameter.

b) The upper terminal shall be positioned to receive the conductor from either side or upward direction while the lower terminal shall be able to receive the conductor from either side or downward direction.
c) The maximum temperature rise for contacts (movable and stationary) shall not be more than 40°.C and, for terminals the temperature rise shall not be more than 30° C.

6.5 Galvanizing

All iron and steel parts such as mounting and support brackets, bolts and nuts, washers etc. shall be galvanized after processes such as sawing, shearing, drilling, punching, filling, bending and machining are completed. Galvanizing shall be the hot-dip process to comply with the standard ISO 1461.

7. ADDITIONAL REQUIREMENTS

7.1 Rating Plate Markings

The ratings and data of the Dropout Fuse shall be provided in the rating plate, which shall be weather and corrosion proof. The main rating plate near the supporting bracket of the insulator base shall carry the following information:

a) Number and year of the Standard adopted
b) Rated voltage/Rated maximum current
c) Class designation/Manufacturer's name or trademark,
d) Asymmetrical current rating/Symmetrical current rating/X/R Ratio.
e) Year of manufacture
f) Contract No.

The following information shall be marked on the fuse carrier.

a) Manufacturer's name or trademark
b) Rated Voltage/Rated frequency
c) Rated maximum current
d) Rated breaking capacity (Asymmetrical/Symmetrical current rating & X/R Ratio).

7.2 Packing

The pre-assembled dropout fuse unit (Dropout Fuse Base, Fuse Carrier and Mounting Bracket) shall be packed in a suitable hardboard box and the rated voltage of the unit shall be clearly marked on the box. Spare fuse carrier shall be supplied in suitable hardboard boxes, the quantity and the voltage rating applicable shall be clearly marked on the boxes.

8. INSPECTION AND TESTING

8.1 Acceptance Test

The successful Bidder shall make necessary arrangements for pre-shipment inspection and tests by the nominated NEA Inspectors to carry out in his presence the necessary Sample/Acceptance tests conforming to the relevant IEC on equipment and materials offered. Routine test report for all the items shall be furnished for the observation of the Inspector.

The acceptance tests as per IEC shall be witnessed by the NEA Inspector.

(a) Dimensional Verification
(b) Dielectric tests
(c) Mechanical Tests
(d) Measurement of resistance of fuse-links

9. BID DOCUMENTATION

9.1 The following shall be furnished with the offer.

(a) Product Catalogues/Technical literature describing the constructional features, materials used for components, operational feature of the equipment, indicating the model number etc.
(b) Energy withstand capability & a description of the test carried out to measure the same.
(c) Power frequency withstand voltage versus time characteristic curve covering the time range from 0.1 sec. to 24 minutes.
(d) Dimensional drawings of the bracket mounting base, live conductor clamps, earth lead and automatic earth disconnecting device and overall dimensional drawing.

(e) Drawing of name plate to scale incorporating the particulars called for.
(f) Completed Schedule of Guaranteed Technical Particulars
(g) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(h) Type Test Certificates. The Type Test Certificates shall be from an Accredited Independent Testing Authority acceptable to the Purchaser.
(i) Copy of the Governing Standards
(j) Technical Literature in English Language on installation, operation and maintenance with necessary circuit diagrams and drawings.

9.2 Type Test Certificates

Following Type Test certificates conforming to IEC 60282-2, IEC 60060 at a reference frequency of 50 Hz. where applicable shall also be submitted with the offer.

a) Dielectric Tests
b) Temperature Rise Tests
c) Artificial Pollution Tests
d) Mechanical Tests
e) Breaking Tests
f) Interrupting Tests
g) Beam Strength of Porcelain Base

Test Certificates shall clearly identify the equipment concerned showing the manufacturer's identity, Type, Model and Serial Number of the equipment tested. Type Test Report shall include a complete drawings and the model/type of the offered Arrester. Type Test Report shall be from a recognized accredited independent testing authority acceptable to the purchaser.

GUARANTEED TECHNICAL PARTICULARS

(To be filled in by the Bidder/Manufacturer)

Item: Distribution Cutout (Drop Out Fuse)

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
	Country of Origin			
2	Year of manufacturing experience			
3	Model offered			
4	Applicable standard		IEC	
5	Rated Voltage	kV	12	
6	Rated Frequency	Hz	50	
7	Rated Continuous Current	A	100	
8	Dry Impulse withstand voltage (peak)			
8.1	Across isolating distance of the fuse base	kV	85	
8.2	To earth and between poles	kV	75	
9	Power Frequency withstand voltage (Wet 1min)			
9.1	Across isolating distance of the fuse base	kV	32	
9.2	To earth and between poles	kV	28	
10	Minimum power frequency withstand voltage			
11.1	Dry	kV	35	
11.2	Wet	kV	30	
12	Interrupting Rating			
12.1	Symmetrical Interrupting rating (min) rms	kA	8.0	
12.2	Asymmetrical Interrupting rating (min) rms	kA	9.6	
12.3	X/R ratio		4.0	
13	Temperature Rise Limit (In air)			
13.1	Copper contacts silver faced	deg.C	65	
13.2	Terminals	deg.C	50	
14	Mounting Angle (to vertical plane)	deg	~15-20	
15	Interrupting capacity	kA	10	
16	Clamp type terminals for copper/ aluminium cable 25-150 mm^2 size ?	Yes/No	Yes	
17	Steel mounting bracket provided?	Yes/No	Yes	
18	All the features are as mentioned in the specifications ?	Yes/No	Yes	
19	Delivery of equipment following award of contract and approval of drawing	months		
20	ISO 9001 holder (including design)	yes/no	yes	

20.1	ISO 9001 certificate submitted	yes/no	yes	
21	Type test certificate submitted	yes/no	yes	
21.1	Submitted for the required ratings	yes/no		
21.2	Type test certified by			
22	User's certificate submitted	yes/no	yes	
23	Has exported to third country	yes/no	yes	
24	Copies of relevant standards attached	yes/no	yes	
25	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer …….

Fuse Link

1. Scope

This Specification covers the supply of button head fuse links commonly used in the protection of distribution transformers with the Distribution Cutouts above.

2. Description

The button-head fuse link shall be fabricated in full compliance with the relevant IEC, or latest revision thereof or any other international standards that ensures at least a substantially equal quality to the standard mentioned above, will also be acceptable.

The fuse link shall have fast characteristics and shall be suitable for protection of distribution transformers. The fuse link shall be supplied in accordance with the type and ratings shown in the bid package.

3. Tests

The distribution cutout and surge arrester shall be tested in accordance with the relevant provisions of the governing standard.

4. Bid Documentation

The Bidder shall furnish copies of governing standards for fabrication and testing of fuse links

The Bidder shall furnish copies of catalogue of fuse links.

The Bidder shall furnish a clause-by-clause commentary on specification, specifying compliance and deviations, if any.

The Bidder shall also furnish with the Bid copies of the following data with respect to the fuse links furnished:

a) Time-Current (TC) characteristic curves at 30°C, including minimum melting time and total clearing time.
b) Preloading adjustment factors or curves.
c) Ambient temperature adjustment factors or curve

All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents

GUARANTEED TECHNICAL PARTICULARS
(To be filled in by the Bidder/Manufacturer)

Item: Fuse Link

S.N.	Description	Unit	NEA Requirement	To be filled by

				Bidder
1	Manufacturer			
2	Country of Origin			
3	Model offered			
4	Governing Standard			
5	Minimum melting time			
6	Total clearing time			
7	Is the fuse link suitable to the Distribution Cutout supplied?	Yes/No	Yes	
8	Time Curve attached ?	Yes/No	Yes	
9	Preload adjustment data attached?	Yes/No	Yes	
10	All the features are as mentioned in the specifications ?	Yes/No	Yes	
11	Certification		ISO 9001 (including design)	
12	Copy of notarized ISO certificated attached	Yes/No	Yes	
13	Copy of Governing Standards attached?	Yes/No	Yes	
14	Copy of certified type test attached?	Yes/No	Yes	
15	Ambient temperature adjustment data attached?	Yes/No	Yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Grounding Rods, Clamps and Conductor

1. **Scope**

This Specification covers the fabrication and supply of galvanized steel ground rods, clamps and galvanized stranded steel grounding conductor for use in the neutral and body grounding for use in distribution transformers and overhead power line construction.

2. Description

2.1 Ground Rod

The ground rod shall be made of high carbon, open-hearth steel so as to achieve maximum strength. It shall be hot dip galvanized. The ground rod shall be 19mm in diameter and 4,000 mm in overall length. The driven end of the ground rod shall have a truncated cone point. The cone point shall be approximately 13mm long, measured along the axis of the ground rod. The driving head of the ground rod shall have an approximate 3 mm, 45-degree chamfer. The manufacturing process shall assure that ground rod does not bend when driven into hard soils.

2.2 Ground Rod Clamp

The ground rod clamp shall be heavy duty forged steel clamp provided with a hex head cup point set screw of high strength steel with machine-cut threads. It shall be so manufactured that it gives low resistance connection. The ground rod clamp shall be galvanized. The clamp shall suitably accommodate and clamp a 19 mm. ground rod and a stranded grounding conductor.

2.2 Ground Wire

The conductor shall be 7-wire stranded conductor and shall conform to the characteristics as specified herein. Stranded conductor shall be galvanized.

S.N.	Description	Unit	Required ratings/features
1	Diameter of Wire	SWG	7/12
2	Diameter of Single Strand	mm	2.67
3	Direction of Lay		Right
4	Weight	kg/km	299
5	Short time fusing current	kA	12
6	Resistivity	μΩcm	15

2.3 Galvanizing

The galvanization of ground rod, clamp and grounding conductor shall be in accordance with ISO 1461 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable. The minimum thickness of galvanization shall be 90 microns.

3. Applicable Standards

The equipment and components supplied shall be in accordance with the relevant IEC standards, or latest revision thereof or any other international standards and the NEA Specifications specified herein.

4. Tests

Grounds rods and clamps shall undergo type and routine tests in accordance with the relevant governing standards.

5. BID DOCUMENTATION

The following shall be furnished with the offer.

(a) Product Catalogues/Technical literature describing the constructional features, materials used for components, etc.
(b) Completed Schedule of Guaranteed Technical Particulars
(c) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(d) Type Test Certificates. The Type Test Certificates shall be from an Accredited Independent Testing Authority acceptable to the Purchaser.
(e) Copy of the Governing Standards
(f) Technical Literature in English Language on installation, operation and maintenance with necessary circuit diagrams and drawings.

GUARANTEED TECHNICAL PARTICULARS
(To be filled in by the Bidder/Manufacturer)

Item: Ground Rods and Clamps

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Model offered			
4	Governing Standard for manufacturing and testing			
5	Governing Standard for galvanization		ISO 1461	
6	Material Grade Used for Ground Rod			
7	Dimensions of Ground Rod			
8.1	Length	mm	4000	
9.2	Diameter	mm	19	
10	Material Grade Used for Ground Rod Clamp			
11	Dimensions of Ground Rod Clamp	mm		
12	Material Description furnished	Yes/No	Yes	
13	All the features are as mentioned in the specifications ?	Yes/No	Yes	
14	Certification	Yes/No	ISO 9001 (Including design)	
15	Copy of notarized ISO Certificate attached?	Yes/No	Yes	
16	Copies of Standard attached ?	Yes/No	Yes	
17	Copy of certified type test attached ?	Yes/No	Yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date……..
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS
(To be filled in by the Bidder/Manufacturer)

Item: Grounding Conductor

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
2	Country of Origin			
3	Model offered			
4	Governing Standard for manufacturing and testing			
5	Governing Standard for galvanization		ISO 1461	
6	Diameter of Wire	SWG	7/12	
7	Diameter of single wire	mm	2.67	
8	Cross Section	sq.mm.		
9	Short time fusing current	kA	12	
10	Weight	kg/km	299	
11	Resistivity of Wire		15	
12	Resistance at 20 deg. C	ohms/km		
13	Direction of Lay			
14	All the features are as mentioned in the specifications ?	Yes/No	Yes	
15	Certification		ISO 9001 (Including design)	
16	Copy of notarized ISO Certificate attached?	Yes/No	Yes	
17	Copies of Standard attached ?	Yes/No	Yes	
18	Copy of certified type test attached ?	Yes/No	Yes	

Signed by……..

Designation……..

As Representative for……..
Place……
Date……..
Seal of Bidder/Manufacturer ……

Distribution Panel Board

1. **Scope**

This Specification covers the design, fabrication, testing and supply of Distribution Panel Boards to be used in the Low Voltage Overhead Distribution system of the Nepal Electricity Authority (NEA) to provide overload and short circuit protection for Distribution lines up to Customer Distribution Panel.

2. **Description**

The panel board shall be pole-mounted and used in conjunction with pole-mounted distribution transformers to house moulded case circuit breaker (MCCB) feeding 400/230 Volt circuits.

The panel board shall be rectangular in shape with an entrance door in the front of the panel board. The panel board shall be equipped with interior standoffs suitable for mounting MCCB and for supporting cables. The panel board will be fixed to the pole by exterior mounting brackets attached to the back of the panel board. Details of these components shall be as specified in the following text.

The panel board shall be fabricated to prevent ingress of moisture due to rainfall and dripping. The panel board shall be provided with means for natural ventilation.

2.1 Material

The panel board case and door shall be fabricated out of steel sheet of minimum 2 mm. in thickness and pole mounting brackets shall be fabricated out of mild steel flat of 6 mm. in thickness. The interior standoffs shall be fabricated of steel sheet of sufficient thickness to support installed circuit breaker and cables without lateral movements.

2.3 Construction

The panel board case and all interior and exterior attachment shall be spot-welded. All welding shall be of the highest quality. The panel boards shall be formed and welded square and all attachments to the interior and exterior surfaces shall be welded square and perpendicular to the panel attached.

The panel board shall be so constructed as to be water tight from blowing of free-falling rain. There shall be no apertures in the panel board case other than those provided for the entrance door, cable fittings, or ventilation. The top extension and bottom shall be so formed to provide a drip edge and prevent water from flowing on the respective under-surfaces.

All individual pieces of metal shall be edge finished prior to assembly to provide surfaces and edges which are free from sharp points and edges. After welding in place, all welds shall be finished to smooth condition.

2.4 Panel board Front

The front panel shall be fabricated as a separate piece containing the panel board door and doorframe. The front shall be attached to the panel board housing by suitable bolting arrangements to provide a watertight and dust tight seal at the perimeter.

The door shall be equipped with a gasketed removable door, door-handle lock, and suitable hinges. The door and panel frame shall be so fabricated to provide an integrated structure which is warp-resistant and which will maintain dust-tight and watertight seal. Gasketing material shall be heat-resistant and shall retain its resilience over time to precluded degradation of dust-tight and watertight properties.

The insertable (and removable) door handle shall provide a door a locking function. The handle shall be insulated.

The door hinge may be continuous type or separate hinge units. However, the type of hinge furnished must accommodate, and not degrade, the dust-tight and watertight characteristics and must provide adequate door alignment and support over time.

2.5 MCCB Standoffs

The standoffs shall be shaped and dimensioned to accommodate the MCCBs as required by Bid Packages. The standoffs shall be precisely located.

2.6 Cable Standoffs

The cable standoffs shall be properly shaped and dimensioned. The standoff shall have the metal edges contoured and smoothed to prevent abrasion of applied cable serving. The standoff shall be located within the panel board to make allowance for cable bending radii and the location of other components.

2.7 Bus bars

The neutral and phase bus bars shall consist of copper bus bar insulated from the panel board by 600 V porcelain insulators. The copper bus bar shall be of proper size (ampere capacity) and properly dimensioned. The bus bars shall be located within the panel board to provide adequate clearance for the installation and correct functioning of all items.

If it is required to drill or penetrate the panel board back to install 600 V insulators, the outside of the panel board shall be permanently sealed over the attachment to retain water-tightness.

2.8 Cable Entrance Fittings and Knockouts

Knockouts for cable entrance fittings (bushings) shall be provided in the bottom of the panel board. All necessary cable entrance fittings shall be supplied for proper connection of all circuits to fulfil the requirement of the Bid Package. The fittings shall be designed to be suitable for exposed cables entering the panel board from below and shall secure the cable with inserts to prevent lateral and longitudinal movement of the cables.

The fittings shall be threaded multi-piece construction which when installed securely locks the fittings to the panel board. The fittings may be of metal or polymer material. Metal fittings shall be galvanized or plated as appropriate. The fitting inserts may be single or multi pieces and shall be of material sufficiently elastic and resilient to securely grip the PVC cable sheath without damage. The fitting components shall enable capturing of the inserts to preclude insert creep and fallout due to clamping pressure.

2.9 Ventilation

The panel board shall be provided with apertures for natural draft ventilation in the panel board bottom and in the top overhang. The ventilation apertures shall be covered with bronze screen materials of a mesh sufficiently to preclude passage of small insects. The edges of the bronze screening shall be surely fastened to the panel board by means of soldering or epoxy adhesive. The mesh shall be protected during panel board fittings to preclude clogging of mesh openings by finished materials.

2.10 Pole Mounting Bracket

The panel board shall be provided with two (2) pole mounting brackets. The size of poles will be confirmed by the purchaser before manufacturing.

2.11 Grounding Stud

The panel board shall be provided with a brass grounding stud located in an approved location. The grounding stud shall be fitted to the panel board to insure low resistivity and water tightness of the installation. The grounding stud shall be complete with pressure washer, lock washer, and nuts.

2.12 Finish

After fabrication, the panel board shall be thoroughly cleaned of all dirt, grease, mill scale, and weld slag on all interior and exterior surfaces and all surfaces of all component. After thorough cleaning of panel board one (1) coat of red oxide metal priming paint and two (2) finish coats of paint color shall be thoroughly applied. The paint color shall be of light grey (RAL 7032). The finish coats shall be of oil based or epoxy paint. Alternatively, powder coating of panel board may also be acceptable.

The bronzed screen ventilation holes, working surfaces of door hinge and door lock, and outside face of grounding stud shall be free from all finishing materials.

3. Bid Documentation

The following shall be furnished with the offer.

(a) The Bidder shall furnish fabrication drawings showing all views, section, and dimensions of individual components and assembled panel board.
(b) The Bidder shall furnish complete description of all materials to be used, including cable entrance fittings and finishing materials.
(c) The Bidder shall furnish a clause-by-clause commentary on specification, specifying compliance and deviations, if any.
(d) All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.
(e) Completed Schedule of Guaranteed Technical Particulars
(f) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(g) Technical Literature in English Language on installation, operation and maintenance with necessary circuit diagrams and drawings.

GUARANTEED TECHNICAL PARTICULARS

(To be filled in by the Bidder/Manufacturer

Item: Distribution Panel Board

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Year of manufacturing experience			
3	Model offered			
4	Governing Standard for fabrication, manufacturing and testing			
5	Governing Standard for Materials Used			
6	Description of cable entrance fittings attached?	Yes/No	Yes	
7	Description of all materials attached?	Yes/No	Yes	
8	Copy of Fabrication Drawings Attached?	Yes/No	Yes	
9	All the features are as mentioned in the specifications ?	Yes/No	Yes	
10	Delivery of equipment following award of contract and approval of drawing	months		
11	ISO 9001 holder (including design)	yes/no	yes	
11.1	ISO 9001 certificate submitted	yes/no	yes	
12	Type test certificate submitted	yes/no	yes	
12.1	Submitted for the required ratings	yes/no		
12.2	Type test certified by			
13	User's certificate submitted	yes/no	yes	
14	Has exported to third country	yes/no	yes	
15	Copies of relevant standards attached	yes/no	yes	
16	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Moulded-Case Circuit Breakers (MCCB)

1. **Scope**

This specification covers the design, manufacture and testing of Moulded Case Circuit Breakers (MCCB) used with Distribution Panel Board in the Low Voltage Overhead Distribution system of the Nepal Electricity Authority (NEA) to provide overload and short circuit protection for Distribution lines up to Customer Distribution Panel.

2. System Parameters

a)	Nominal Voltage	400/230V, 3 Phase and Neutral
b)	System Highest Voltage	440/250V, 3 Phase and Neutral
c)	System frequency	50Hz
d)	Method of Earthing	Solidly earthed neutral
e)	System fault current	25kA

3. Service Condition

a)	Ambient temperature	-5 to 55 deg. C
b)	Annual average ambient temperature	30 deg. C
c)	Maximum relative humidity	99%
d)	Environmental condition	Humid Tropical climate
e)	Operational altitude	Up to 3000m above msl
f)	Isokeraunic (Thunder day) level	90 days
g)	Solar Radiation	1.6kW/m2

4. Applicable Standards

The equipment and components supplied shall be in accordance with the latest editions of the standards IEC 60947 and amendments thereof and the NEA Specifications specified hereafter.

5. Technical Parameters

5.1 Minimum Technical Requirements

S.N.	Description	Unit	Requirements
1	No. of Poles		3
2	Rated frequency	Hz	50
3	Rated operational voltage (Ue)	V	400/230
4	Rated insulation voltage (Ui)	V	750
5	Impulse withstand voltage (Uimp)	kV	8
6	Continuous Current Rating (In)	A	80, 160, 250, 320, 500
7	Ultimate Short Circuit Breaking Capacity (Icu) (up to 100 A)	kA	25
8	Ultimate Short Circuit Breaking Capacity (Icu) (above 100 A)	kA	50
9	Operating Short Circuit Breaking Capacity (Ics)		50 % of Icu
10	Utilization Category		A
11	Rated duty		uninterrupted
12	Trip device		Thermal adjustable magnetic
13	Rated current adjustment		(0.8-1)In
14	Instant opening current adjustment		10 x In
15	Mechanical Life Operation		>15000
16	Electrical Life Operation		>10000
17	Line load reversibility features		Yes
18	Interrupting Capability		(IEC category P2)
19	Thermal Rating declared at 50 deg C		Yes
20	Operating Range		-5 to 55 deg. C
21	Creepage distance suitable for		Pollution Degree 3 and suitable for isolation
22	Suitable for isolation		Yes

23	Trip Characteristics		inverse time and instantaneous
24	Universal Accessory Fitting		Yes
25	External Accessory		Rotary Operating Handle (Extended for >200A) Suitable Extended Terminals Phase Barriers Mounting Screws

6. BASIC FEATURES

6.1 Design

The circuit breakers shall be of three poles with moulded case design, suitable for operation at a maximum relative humidity of 99% and at maximum ambient temperature of 55 deg. C. The maximum permissible temperature- rise of various components of the breaker shall not exceed the values stipulated in IEC 60947.

The MCCB shall be completely enclosed in a moulded case and shall be factory sealed. The case shall be moulded from insulated material possessing high thermal stability and good mechanical strength, able to withstand robust use without fracture or permanent distortion.

The MCCB shall have a quick make, quick break, over current switching mechanism that is mechanically trip-free for simultaneous tripping of all poles. Tripping due to overload or short circuit shall be clearly indicated by the position of the handle. The ON and OFF positions shall be clearly marked on the breaker case.

The case should be stamped with the letters “NEA” for the purpose of identification. The Moulded Case Circuit Breaker shall be of surface mounting type and shall be suitable for mounting in an enclosure for outdoor application. It shall be possible to reverse feed the breaker without any reduction in performance.

6.2 Construction

6.2.1 Operation Mechanism

The circuit breaker shall be provided with trip free features for manual ON-OFF operation.

The operating mechanism shall be quick make and break type, with the speed of operation independent of the operator, and mechanically trip free from the operating handle so as to prevent the contacts from being held closed against short circuit and overload conditions.

The operating mechanism shall be constructed to operate all poles of the breaker simultaneously during, opening, closing and tripping conditions.

The breaker shall be operated by a toggle, which shall clearly indicate the 3 positions ON, OFF and TRIPPED.

The breaker shall have current-limiting function which works according to the opposite magnetic force principle.

The MCCB shall be of inverse time and instantaneous trip type. The trip device shall be of thermal-magnetic type.

6.2.2 Contacts

The MCCB shall be of the uninterrupted duty type and the contacts shall be of Silver alloy or Silver faced Copper having high current carrying capacity with good arc resistance property.

6.2.3 Overload Release

Each pole of the MCCB shall be provided with bimetallic Thermal Element type of overload protection with the tripping time decreasing with increasing tripping current characteristic (inverse time delay).

6.2.4 Short Circuit Release

An electromagnetic element type instantaneous short circuit protection shall be fitted in each pole assembly affecting immediate tripping of the circuit breaker if the current exceeds the breaking ratings.

6.2.6 Terminals

The terminals of the breaker shall be suitable for front connection of cables and insulated phase barriers shall be provided for all poles. All breaker terminals, compression terminals, stacking spacers, and bolting shall be compatible with Aluminum conductors to avoid bimetallic reaction.

6.2.7 Mounting Bolts

The circuit breakers shall be suitable for mounting in outdoor distribution panels and each breaker shall be furnished complete with one (1) set of bolt fastenings, complete with nuts and lock washers of the correct diameter for the mounting hole and of a length equal to the depth of the MCCB body plus approximately two (2) centimeters.

7. Additional Requirement

7.1 Rating Plate Markings

Each Circuit Breaker shall be marked in a durable manner with the following data as stipulated in IEC 60947 and shall be visible and legible when the circuit breaker is installed.

(a) Rated current
(b) Suitability for isolation, with symbol
(c) Indication of the open and closed positions

Ultimate breaking capacity (Icu) for various values of the rated operational voltage (Ue) shall be recorded on the device.

The following data should be marked externally on the breaker and they need not visible when the breaker is installed.

(a) Manufactures identification (Name or Trade Mark)
(b) Type designation or serial number
(c) Number and Year of the standard adopted
(d) Utilization category
(e) Rated operational Voltage and Frequency
(f) Rated service short-circuit breaking capacity
(g) Rated ultimate short-circuit breaking capacity
(h) Rated short-time withstand current/duration

7.2 Packing and Transportation

The MCCB shall be suitably packed in biodegradable material (cardboard boxes) to prevent damage during transport, handling and storing.

All relevant drawings, technical literature, product catalogue, hand-books etc. required for installation, operation and maintenance of the equipment shall be supplied with the equipment. Routine test report shall also be supplied with the equipment.

7.3 Storing

The moulded case circuit breakers of different current ratings shall be stored according to the serial number and rating in batches of 100 separately so as to select breakers for acceptance inspection and testing by random sampling method.

8. Inspection and Testing

8.1 Routine Tests

The following routine tests as per IEC 60947 shall be carried out on all the MCCB and routine test report shall be made available for the observation of the inspector at the time of inspection.

(a) Mechanical operation tests
(b) Dielectric Tests

(c) Verification of the calibration of releases
(d) Temperature rise test

8.2 Inspection

The successful Bidder shall make necessary arrangements for pre-shipment inspection by Inspecting engineers sent by the NEA or by an authority acceptable to the NEA to carry out the necessary acceptance tests of the equipment offered.

8.3 Acceptance/Sample Tests

The following Tests as per IEC 60947 shall be witnessed by the inspecting Engineers.

(a) Mechanical operation tests
(b) Dielectric Tests
(c) Verification of the calibration of releases
(d) Temperature rise test

8.4 Selection of Test Samples

The number of moulded case circuit breakers to be selected by random sampling method for acceptance inspection and testing shall be as indicated below.

S. N.	No. of units	No. of samples to be selected
1	Less than 100	5
2	100-500	15
3	500-1000	50
4	1000-1500	100
5	Above 1500	150

9. Bid Documentation

9.1 The following shall be furnished with the offer.

(a) Catalogues describing the equipment and indicating the model number and the literature describing the operational features of the equipment.
(b) Constructional features, materials used for components and relevant technical literature and complete dimensional drawings.
(c) Completed Schedule of Guaranteed Technical Particulars.
(d) Quality Assurance Certificate conforming to ISO 9001
(e) The Characteristics
(f) The tripping time-current characteristics curves covering both thermal and magnetic current settings for each type of circuit breaker offered.
(g) If over-current and instantaneous releases are of static type, then the manufacture shall furnish evidence that the components used are tropicalised, (suitable for the climatic conditions stipulated in Clause 3.0 above) and the field tests on the equipment have been satisfactory.
(h) Discriminating table indicating proper coordinating shall be submitted.

9.2 Type Test Certificates

Following Type Test certificates for each rating of MCCBs shall also be submitted with the offer.

a) Verification of constructional requirements
b) Verification of temperature-rise
c) Verification of dielectric-properties
d) Verification of making and breaking capacities
e) Verification of short-circuit breaking and making capacities
f) Verification of operating limits
g) Verification of operational performance
h) Verification of degree of protection of enclosed equipment

The Type Test Certificates referred to above shall be issued from the reputed independent Testing Authority acceptable to NEA.

Test Certificates, Performance Curves and Tables etc., of the Type Test performed shall conform to the standard specified, at a reference frequency of 50 Hz where applicable. The Test Certificates should clearly identify the equipment concerned, showing the manufacturer's identity, Type No. and basic technical parameters.

GUARANTEED TECHNICAL PARTICULARS

(To be filled in by the Bidder/Manufacturer)

Item: Moulded Case Circuit Breaker

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Year of manufacturing experience			
3	Model offered			
4	Governing Standard for manufacturing and testing		IEC 60947	
5	No. of Poles		3	
6	Rated frequency	Hz	50	
7	Rated operational voltage (Ue)	V	400/230	
8	Rated insulation voltage (Ui)	V	750	
9	Impulse withstand voltage (Uimp)	kV	8	
10	Continuous Current Rating (In)	A		
11	Ultimate Short Circuit Breaking Capacity (Icu) (up to 100 A)	kA	25	
12	Ultimate Short Circuit Breaking Capacity (Icu) (above 100 A)	kA	50	
13	Operating Short Circuit Breaking Capacity (Ics)		50 % of Icu	
14	Utilization Category		A	
15	Rated duty		uninterrupted	
16	Trip device		Thermal adjustable magnetic	
17	Rated current adjustment		(0.8-1)In	
18	Instant opening current adjustment		10 x In	
19	Mechanical Life Operation		>15000	
20	Electrical Life Operation		>10000	
21	Line load reversibility features	Yes/No	Yes	
22	Interrupting Capability		(IEC category P2)	
23	Thermal Rating declared at 50 deg C	Yes/No	Yes	
24	Operating Range		-5 to 55 deg. C	
25	Creepage distance suitable for		Pollution Degree 3 and suitable for isolation	
26	Suitable for isolation		Yes	
27	Trip Characteristics		inverse time and instantaneous	
28	Contacts Type			
29	Universal Accessory Fitting	Yes/No	Yes	
30	External Accessory provided			
31	Dimensions (lxbxh)	mm		
32	Weight	kg		
33	Type of Mounting Arrangement			
34	All the features are as mentioned in the specifications ?	Yes/No	Yes	
35	Copies of time - current characteristic trip curves for each breaker rating attached?	Yes/No	Yes	
36	Copies of outline drawings attached?	Yes/No	Yes	
37	Delivery of equipment following award of contract and approval of drawing	months		
38	ISO 9001 holder (including design)	yes/no	yes	
38.1	ISO 9001 certificate submitted	yes/no	yes	
39	Type test certificate submitted	yes/no	yes	
39.1	Submitted for the required ratings	yes/no		
39.2	Type test certified by			
40	User's certificate submitted	yes/no	yes	

41	Has exported to third country	yes/no	yes	
42	Copies of relevant standards attached	yes/no	yes	

Signed by……
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Steel Tubular Pole

1. **Scope**

1.1 This Specification covers the design, fabrication, testing and supply of swaged type galvanized steel tubular poles to be used to support overhead electric lines and equipment.

2. **Description**

2.1 The steel tubular pole shall be manufactured and tested in accordance with IS:2713. The poles shall be fabricated of seamless tubes of suitable lengths as specified in **Table 1** made out of welded tubes, swaged and joined together. The diameters of various sections of the fabricated pole shall be as specified therein. A bid not conforming to the requirements of **Table 1** shall be rejected as being non responsive.

2.2 There are some numbers of poles which shall be of folding type. The folding type poles shall be fabricated in such a way that the bottom section and middle section of the poles could be securely fixed by two sets of galvanized nuts/bolts of suitable size and length at 90^0 each other. All other design requirements and parameters for folding type poles shall be as per section above and IS:2713.

2.3 The separate galvanized steel pole cap shall be provided with top section of the pole. The bottom section of the pole shall be provided with a base plate. The base plate shall be square of size 300x300 mm and 10 mm thick and it shall be welded at the bottom of the pole. The base plate shall have a hole of dia. approx. 50 mm in the center, for draining out of water.

2.4 The total supply quantity of steel tubular poles (total of non-folding type and folding type) are given in the Price Schedule. Supply quantity of folding type poles shall be finalized after pre-construction survey.

3. **Material**

3.1 The poles shall be fabricated from steel having tensile strength not less than 410 N/mm^2. The pole shall be composed of three sections in diminishing diameters and minimum diameter and thickness and lengths of poles shall be as shown in **Table below.**

3.2 The steel tubes shall confirm to the requirements of IS:2713, or latest revision thereof or other recognized international standards that ensures at least a substantially equal quality to the standard mentioned above.

4. **Manufacture**

4.1 All tubes forming the part of the pole shall be made from hot finished seamless or continuously welded steel in accordance with IS 2713, or equivalent international standards. Following tolerances shall be maintained.

a) Tolerance on outside diameter: +/- 1%
b) Tolerance on length: +/- 40mm on any section
+/-25mm on overall length
c) Tolerance on weight: No negative tolerance
d) Tolerance on thickness: No negative tolerance
e) The out-of-straightness of the finished pole shall not exceed 1/600 of its length.

4.2 All welding of the poles shall be carried out at the manufacturers' plant.

4.3 Each section of the pole shall have only one longitudinal weld. No circumferential joints/welds of the tubes are permitted. All welds shall be capable of withstanding, without failure or cracking the stresses in a pole when subjected to its ultimate design loads.

4.4 The pole shall have hole configurations and sizes as shown in the drawings attached to this specification. The hole sizes and the locations of the hole must however be confirmed with the Project prior to manufacture.

5. **Corrosion Protection**

5.1 All sections of the pole shall be galvanized both internally and externally. Galvanizing shall be applied by the hot dip process, and shall be done in single bath (single dip) to result in a uniform thickness both internally and externally. Galvanizing of the poles shall be done after completion of fabrication process. Drilling, punching, cutting, bending and removal of burrs shall be completed before galvanizing. The preparation for galvanizing and the galvanizing process shall not adversely affect the mechanical properties of the material being coated. All galvanizing shall be in accordance with ISO 1461 or IS:4736 or an equivalent international

standard, and shall result in uniform thickness galvanization and be free from defects. The pole cap and the base plate shall also be galvanized.

5.2 The minimum thickness of the zinc coating shall not be less than 500 g/m^2 (equivalent to 70 microns) of zinc for all surfaces of steel including the base plate and the pole cover.

6. **Marking of Pole**

6.1 The pole shall have an identification marked with indelible paint on the pole at a position approximately 3.5 m. from the butt end, which is clearly and indelibly marked with:

a) Date of manufacture and identification mark of manufacture.
b) Length of pole in meters and its design working loads as defined in this specification.
c) Name of the Employer
d) Contract Number.

6.2 The pole shall be marked with a permanent horizontal line at a point 1/6th of the pole height from the butt end of the assembled pole.

7. Earthing Lug, Base Plate and Pole Cap

Each pole shall be provided with earthing lug at 300 mm above the ground level. Separate pole cap shall be provided for each pole. The plate for pole cap shall be of 3 mm. minimum thickness.

8. Tests

8.1 The following test(s) shall be performed on finished poles. All testing shall be fully documented and certified test reports shall be provided to the Project.

- Test for dimensional and structural properties, and for the physical requirements of the finished poles
- Test for galvanization
- Tensile test and chemical analysis test
- Deflection test
- Permanent set test, and
- Drop test.

8.2 Poles selected for tests shall be a representative sample from each lot. The number of poles selected for conducting deflection, permanent set and drop tests shall be as follows.

S.N.	Lot size	No. of poles
1.	Up to 500	5
2.	501-1000	8
3.	1001-2000	13
4.	2001-3000	18
5.	3001 and above	20

8.3 The number of poles selected for conducting tensile test and chemical analysis tests shall be as follows:

S.N.	Lot size	No. of poles
1.	Up to 500	1
2.	501-1000	2
3.	1001-2000	3
4.	2001-3000	4
5.	3001 and above	5

8.4 The above test shall be performed as per IS:2713 or other recognized international standards. The following particulars shall be recorded:

a) Manufacturer's name and plant location;
b) Batch No. of steel plate or tubing;
c) Test date;
d) Pole type;
e) Dimensions of pole;
f) Increments of load and the deflections at each increment of load;
g) Permanent deflection;
h) Load of failure;

8.5 For deflection test, each pole shall be rigidly supported for a distance from the butt end equal to the length the depth to which it to be planted in the ground. It shall then be loaded as cantilever and the appropriate deflection load applied at right angle of the axis of pole 300 mm from the top of the poles for poles up to 9m length and 600 mm for poles over 9m length. The temporary deflection at the point of application of the applied load shall not exceed 157.5 mm

8.6 The permanent set test shall be carried out immediately after the deflection test, on the same test sample. After application of the proper load, the permanent set measured from the zero position at the point of application of load after the release of the applied load shall not exceed 13 mm.

8.7 To perform the drop test, the pole shall be dropped vertically with the bud end downward, three times in succession from a height of 2 m onto a hardwood block 150 mm thick laid on a concrete foundation. The pole shall not show any signs of telescoping or loosening of joints.

8.8 Should any of the poles first selected fail to pass any of the tests specified above, two further poles shall be selected for testing from the same batch i.e. same pole length manufactured on the same day from the same steel plate or tubing in respect of each failure. Should one or both these additional poles fail, the test material represented by the test samples shall be deemed as not complying with this specification.

9. Quality Assurance Program

9.1 Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9000;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

9.2 The manufacturer shall perform, among others, the following inspections/test on each consignment of raw steel, prior to fabrication. A certificate shall be provided to the Employer showing the test results:

i. Visual, dimensional and mechanical tests, to identify the steel meets the required strength/grade ensure compliance with the relevant Standards, and to ensure the absence of rust and surface imperfections. If the steel does meet the strength or grade required, the batch shall be rejected.

ii. Dimensional tests to ensure that the material is within the production tolerances of IS 2713 or BS 4360 and BS 6323 or equivalent Standards. One sample shall be taken from each batch for which a certificate is provided. If the first sample fails the test, a second sample shall be taken. If the second sample fails the test, the batch shall be rejected.

10. Packing

Poles shall be stacked together and banded securely to ensure that each individual bundle does not break or the shifting of individual poles does not take place during transportation and

handling. Any loose items shall be suitably banded together or packed to avoid loss during transportation and storage.

11. Bid Documentation

11.1 The Bidder shall provide with the Bid copies of the governing standards for selection of tubing, fabrication and testing of Steel Tubular Poles and copies of all other relevant standards referenced therein.

11.2 The Bidder shall provide a complete design, description and certified dimensional drawings of each type of pole.

11.3 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

11.4 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

Table 1: Pole Attributes

S.N.	Description	Unit	Value	
			For 11m Pole	For 9m Pole
1	Overall Length	m	11	9
2	Pole Designation		410 SP-52	410 SP-31
3	Section Length			
3.1	Top (h1)	m	2.7	2.0
3.2	Middle (h2)	m	2.7	2.0
3.3	Bottom (h3)	m	5.6	5.0
4	Outside Diameter			
4.1	Top (h1)	mm	114.3	114.3
4.2	Middle (h2)	mm	139.7	139.7
4.3	Bottom (h3)	mm	165.1	165.1
5	Thickness			
5.1	Top (h1)	mm	3.65	3.65
5.2	Middle (h2)	mm	4.50	4.50
5.3	Bottom (h3)	mm	4.50	4.50
6	Crippling Load	kgf	307	367
7	Approximate Weight (excluding the weight of galvanization, base plate and pole cap)	kg	175	147
8	Application of load from top of pole	m	0.6	0.3
9	Planting Depth	m	1.8	1.5

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: 11m Steel Tubular Poles

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Years of Manufacturing Experience			
3	Governing Standard for Tubing, Manufacturing and Testing			
4	Are the poles fully Galvanized?	Yes/No	Yes	
5	Governing Standard for Galvanization		ISO 1461 or IS:4736 or an equivalent international standard	
6	Number of Sections	Number	3	
7	Overall Length	m	11	
8	Pole Designation		410 SP-52	
9	Section Length			
9.1	Top (h1)	m	2.7	

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
9.2	Middle (h2)	m	2.7	
9.3	Bottom (h3)	m	5.6	
10	Outside Diameter			
10.1	Top (h1)	mm	114.3	
10.2	Middle (h2)	mm	139.7	
10.3	Bottom (h3)	mm	165.1	
11	Thickness			
11.1	Top (h1)	mm	3.65	
11.2	Middle (h2)	mm	4.50	
11.3	Bottom (h3)	mm	4.50	
12	Crippling Load	kgf	307	
13	Approximate Weight (excluding the weight of galvanization, base plate and pole cap)	kg	175	
14	Application of load from top of pole	m	0.6	
15	Planting Depth	m	1.8	
16	Delivery of equipment following award of contract and approval of drawing	months		
17	ISO 9001 holder (including design)	yes/no	yes	
17.1	ISO 9001 certificate submitted	yes/no	yes	
18	Type test certificate submitted	yes/no	yes	
18.1	Submitted for the required ratings	yes/no		
18.2	Type test certified by			
19	User's certificate submitted	yes/no	yes	
20	Has exported to third country	yes/no	yes	
21	Copies of relevant standards attached	yes/no	yes	
22	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer …….

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: 9m Steel Tubular Poles

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
	Country of Origin			
2	Years of Manufacturing Experience			
3	Governing Standard for Tubing, Manufacturing and Testing			
4	Are the poles fully Galvanized?	Yes/No	Yes	
5	Governing Standard for Galvanization		EN ISO 1461 or IS:4736 or an equivalent international standard	
6	Number of Sections	Number	3	
7	Overall Length	m	9	
8	Pole Designation		410 SP-31	
9	Section Length			
9.1	Top (h1)	m	2.0	
9.2	Middle (h2)	m	2.0	
9.3	Bottom (h3)	m	5.0	
10	Outside Diameter			
10.1	Top (h1)	mm	114.3	
10.2	Middle (h2)	mm	139.7	
10.3	Bottom (h3)	mm	165.1	
11	Thickness			
11.1	Top (h1)	mm	3.65	
11.2	Middle (h2)	mm	4.50	

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
11.3	Bottom (h3)	mm	4.50	
12	Crippling Load	kgf	367	
13	Approximate Weight (excluding the weight of galvanization, base plate and pole cap)	kg	147	
14	Application of load from top of pole	m	0.3	
15	Planting Depth	m	1.5	
16	Delivery of equipment following award of contract and approval of drawing	months		
17	ISO 9001 holder (including design)	yes/no	yes	
17.1	ISO 9001 certificate submitted	yes/no	yes	
18	Type test certificate submitted	yes/no	yes	
18.1	Submitted for the required ratings	yes/no		
18.2	Type test certified by			
19	User's certificate submitted	yes/no	yes	
20	Has exported to third country	yes/no	yes	
21	Copies of relevant standards attached	yes/no	yes	
22	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Pre-Stressed Concrete (PSC) Pole

1. **Scope**
These specifications apply to design, manufacture, and testing of rectangular pre-stressed concrete poles for use in electrical distribution.

2. **Description**
The pre-stressed concrete pole shall be designed and fabricated in full compliance with IS: 1678-1978, or latest revision thereof or any other national or international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.

3. **Load**
The working loads of various pole categories are as per the design parameters. The design ultimate strength shall be calculated using a safety factor of 2.5. Pole Attributes are listed in the design parameters.

4. Materials

4.1 **Cement**
Cement to be used in the manufacture of pre-stressed concrete poles shall be ordinary for rapid hardening Portland cement confirming to IS: 269-1976 (Specification for ordinary and low heat Portland cement) or IS: 8041 E-1978 (Specification for rapid hardening Portland cement).

4.2 **Aggregates**
Aggregates to be used for the manufacture of pre-stressed concrete poles shall confirm to IS:383 (Specification for coarse and fine aggregates from natural sources for concrete) The nominal maximum sizes of aggregates shall in no case exceed 12 mm.

4.3 **Water**
Water should be free from chlorides, sulphates, other salts and organic matter. Potable water will be generally suitable.

4.4 **Admixture**
Admixture should not contain Calcium Chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel. The admixture shall conform to IS: 9103.

4.5 **Pre-stressing Steel**
The pre-stressing steel wires should confirm to the IS 1785 OR IS 6003. The plain wire should be of 4 mm in diameter with a guaranteed ultimate strength of 175 kg/mm^2. The strands shall be made from cold-drawn non-alloy steel (high carbon content) wires. The seven-wire strand consists of a group of wires arranged in stranded formation and shall have the following properties. The seven-wire strands shall confirm to IS:6006-1983, or latest revision thereof or any other equivalent national or international standards.

Geometrical Properties:

Type of material:	Seven-wire strand
Nominal diameter of strand	7.9 mm (7/2.6mm)
Nominal cross-sectional area of strands	37.4 mm^2

Mechanical Properties:

Nominal mass of strand:	64.50 kN
Minimum breaking load:	294 g/m
0.2% proof load	54.70 kN

Long Term Behavior:

Maximum relaxation after 1000 h of operation at initial load equivalent to 60%, 70% and 80% of breaking load shall not be higher than 1.0%, 2.5% and 4.5% respectively.

4.6 **Concrete Mix**

Concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 (Code of practice for pre-stressed concrete) and IS: 456 – 1978 (Code of practice for plain and reinforced concrete).

5. **Design**

5.1 The poles shall be as per following design parameters and the dimensions shall be shown in Drawing.

Design Parameters:

Concrete mix:	M40
Minimum diameter of pre-stressing wire:	Refer Table 2
Working Load:	Refer Table 1
Depth of Plantation:	Refer Table 2
Point of Application of Load	Refer Table 2

5.2 The minimum strength of concrete in the pole shall meet the requirements laid down in IS:1343-1960 and IS:456-1964 or in any other equivalent national or international standards.

5.3 The pre-stressing strands shall be accurately positioned and satisfactorily protected against the formation of rust or other corrosion prior to the placement of the concrete. All pre-stressing strands shall be free from loose rust, dirt, grease, oil and other lubricants or substance that might impair their bond with the concrete.

5.4 The cement employed shall be the Ordinary Portland Cement (OPC), which shall conform to the chemical and physical requirements as set forth in IS 269, or any other equivalent national or international standards.

5.5 The amount of concrete cover on the outside of the pre-stressed reinforcement shall be not less than 20 mm.

5.6 Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compacting shall not be permitted.

5.7 The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material and kept constantly wet up to the time when the strength of concrete is at least equal to the minimum strength of concrete at transfer of pre-stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit the interval should depend on the atmospheric humidity and temperature. The pre-stressing wires shall be detensioned only after the concrete has attained the specified strength at transfer (i.e. 200 or 210 kg/cm^2 as applicable). The cubes cast for the purpose of determining the strength at transfer should be coursed, a sear as possible, under condition similar to those under which the poles are cured. The transfer stage shall be determined based on the daily tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343(code of practice for pre-stressed concrete). The manufacture shall supply, when required by the owner or his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

5.8 The pole shall include cast-in holes. Typical hole patterns are shown in the drawings. Hole patterns must be confirmed with the NEA prior to manufacture.

5.9 All poles shall be unpolished but free of roughness, chips, excess cements, and other surface irregularities. All poles shall present a straight and symmetrical appearance after erection. The corners of all the poles shall be rounded so that they do not present a dangerously sharp edge, which could cause tearing or excessive wearing of safety belts.

5.10 All poles shall be provided with lifting hooks at two points for loading and unloading of poles.

Table 1

Working Load

S.N.	Pole Length (m)	Design Load (kgf)
1	11	350
2	9	200

Table 2

Pole Attributes

S.N.	Description	Unit	9m PSC Pole	11m PSC Pole
1	Standard		IS 1678	IS 1678
2	Length of PSC Pole	m	9	11
3	Size	mm	300*150*140	400*180*150
4	Approximate Weight	kg	680	1150
5	Working Load	kgf	200	350
6	Ultimate Load	kgf	500	875
7	Concrete Grade		M40	M40
8	Pre-stressing Wire			
8.1	Diameter	mm	7.9 mm (7/2.6mm)	7.9 mm (7/2.6mm)
8.2	Standard		IS 1785	IS 1785
9	Factor of Safety		2.5	2.5
10	No of tensioned wire		6	8
11	No of stirrups (6mm MS)		12	12
12	Depth of Plantation	m	1.5	1.8
13	Point of Application of load from pole top	m	0.6	0.6

6. Tests

Definition of various types of loads:

Working load = Expected Load

Design Working Load = Expected Load x Factor of Safety (FOS)

Ultimate Transverse Load (UTL) = Load when applied at specified point of the pole, the failure

occurs.

Minimum Ultimate Transverse Load (MUTL) = Load when applied at specified point of the pole, the first crack appears.

Design Transverse Load (DTL) = Design Working Load

Design Ultimate Transverse Load (DUTL) = Design load at the transverse direction at which the first crack expected to appear (given by the Designer after calculation)

The **Design Ultimate Transverse Load (DUTL)** is less or equal to Ultimate Transverse Load

6.1 *Transverse Strength Test*

The pole shall be rigidly supported at the butt end for a distance equal to the specified planting depth. The load shall be applied at a point specified in Table 2 from the top of the pole and shall be steadily and gradually increased to the design transverse load until the occurrence of the first crack. The deflection is then measured. Prior to the application of the design transverse load there shall be no crack.

The load shall then be reduced to zero and increased gradually to a load equal to the first crack load plus 10% of the minimum ultimate transverse load, and held for 2 minutes. This procedure shall be repeated until the load reaches the value of 80% of the minimum ultimate transverse load and thereafter increased by 5% of the minimum ultimate transverse load until failure. Each time the load is applied, it shall be held for 2 minutes. The ultimate transverse load shall not be less than the design ultimate transverse load.

6.2 *Measurement of Cover*

The cover shall be measured at 3 points, one within 1.8m from the butt end of the pole, second within 0.6m from the top and the third at the intermediate point. The mean value of the measured cover should not differ by more than +/-1mm from the specified value, and the individual value should not differ by more than+/-3mm from the specified value.

6.3 The number of poles selected for testing and their conformity criteria shall be as follows:

Lot Size	Sample Size	Permissible No. of Defective Samples	No. of Poles for Transverse Strength Test
Up to 100	10	1	2
101 to 200	15	1	3
201 to 300	20	2	4
301 to 500	25	3	5

6.4 All the poles selected in 5.3 shall be tested for overall length, cross-section and up-rightness. The tolerance shall be +/-15mm on overall length, +/-3mm on cross-sectional dimensions, and 0.5% on uprightness.

6.5 The number of poles which do not satisfy the requirements of overall strength, cross-section and uprightness shall not exceed the number given in 5.3. If the number of such poles exceeds the corresponding number, all poles in the lot shall be tested for requirements, and those not satisfying the requirements shall be rejected.

6.6 All the poles tested for transverse strength test shall satisfy the requirements of the test. If one or more poles fail, twice the number of poles originally tested shall be selected from those

already selected and subjected to test. If there is no failure among these poles, the lot shall be considered to have satisfied the requirements of the test.

7. Marking

The poles shall be cleanly and indelibly marked with the following:

a) Month and year of manufacture, at approximately 3m from the butt end;
b) Specified working load in kg, at approximately 3m from the butt end; and
c) The design lifting point.
d) The pole should be marked with the Identification of the Project/Contract at approximately 5m from the butt end.

8. Bid Documentation

8.1 The Bidder shall furnish following documents together with Bid;

a. Two (2) clear copies of the standards, governing fabrication and testing of pre-stressed concrete poles and two (2) clear copies of other standards indicated in the specifications.

b. Two (2) clear copies of detailed design and drawings of each type of pole.

c. Two (2) clear certified copies of all tests performed on similar poles of same sizes and similar working loads.

d. A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

8.2 The Bidder shall provide the following details:

a) Pole dimensions in cross-section and pole taper;
b) Location and size of pre-stressing strands;
c) Hole locations;
d) Design ground line;
e) Marking of the lifting point;
g) Minimum ultimate transverse load;
h) Transverse load at first crack
i) Concrete design mix and cement specification
j) Specifications of the pre-stressing strands, their tensile strength and sizes

GUARANTEED TECHNICAL PARTICULARS
(To be completed by Bidder/Manufacturer)

Item: PSC Poles

S.N.	Description	Unit	NEA Requirement	11 m PSC Pole	9 m PSC Pole
1	Manufacturer				
	Country of Origin				
2	Years of Manufacturing Experience				
3	Governing Standard		IS 1678		
4	Length of PSC Pole				
5	Approximate Weight of the Pole				
6	Dimensions				
6.1	Top Width				

S.N.	Description	Unit	NEA Requirement	11 m PSC Pole	9 m PSC Pole
6.2	Bottom Width				
6.3	Pole Thickness				
7	Working Load				
8	Ultimate Load				
9	Concrete Grade		M40		
10	Pre-Stressing wire				
10.1	Governing Standard		IS 1785		
10.2	Diameter		7.9 mm (7/2.6mm)		
11	No. of Tensioned Wire				
12	No. of Stirrups		12		
13	Cement specifications				
13.1	Make				
13.2	Grade				
13.3	Is Nepal Standard Certified?	yes/no	yes		
14	Concrete quantity per pole				
15	Steel quantity per pole				
16	Delivery of equipment following award of contract and approval of drawing	months			
17	ISO 9001 holder (including design)	yes/no	yes		
17.1	ISO 9001 certificate submitted	yes/no	yes		
18	Type test certificate submitted	yes/no	yes		
18.1	Submitted for the required ratings	yes/no			
18.2	Type test certified by				
19	User's certificate submitted	yes/no	yes		
20	Has exported to third country	yes/no	yes		
21	Copies of relevant standards attached	yes/no	yes		
22	Outline Drawings and associated GA attached	yes/no	yes		

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Steel Lattice Towers

1. Scope:

1.1 The specification covers the design, fabrication, testing, supply and erection of steel Lattice Towers complete set as per the design data provided in the specification.

1.2 The towers shall be self-supporting, hot dip galvanized, latticed steel type & designed to carry the line conductors with necessary insulators, earth wires and all fittings under all loading conditions.

1.3 The tower shall be fully galvanized using mild steel or/and high tensile steel sections as specified in the Specifications. Bolts and nuts with spring washer are to be used for connections.

2. Material:

IS Steel Sections of tested quality of conformity with IS: 2062:2011 grade E250 (Designated Yield Strength. 250 MPa) and/ or grade E350 (Designated Yield Strength 350 MPa) are to be used in towers, extensions, stubs and stub setting templates. For Snow Zone towers MS & HT Steel Sections shall conform to E250 Grade-C & E350 Grade-C respectively. The Contractor can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards viz BSEN 10025. However, use of steel grade having designated yield strength more than that of EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) is not permitted, unless otherwise indicated in this specification.

The material of towers must be galvanized steel conforming to BS; 4360 Gr-43A or equivalent standard.

3. Design:

3.1 The towers are intended to be used for very long spans which cannot be crossed by normal poles arrangement like valley and river crossings etc. The angle towers shall be proposed. These Towers shall be developed as per the site requirement. Additional weight of tower due to strengthening shall be paid on pro-rata basis derived from the quoted price and final weight of the standard (+/- 0) tower after successful testing.

3.2 Design Criteria

Towers shall be designed based on spans and clearances as per as per the standards and requirements and loading conditions as per the site.

3.3 Design Temperatures

The following temperature range for the conductors and ground wires shall be adopted for line design:

i)	Minimum Temperature	:	0 deg.C
ii)	Every day temperature of conductor	:	32 deg.C
iii)	Max. temperature of		
	a) Conductor	:	80 deg.C
	b) Earthwire exposed to sun	:	53 deg.C

3.4 The following data must be incorporated in the design of the Towers. A detail design and drawing of tower and that of the foundation must be submitted to the Employer for prior approval. The exact site requirements shall be identified during the pre-construction survey and approval of SDS and route.

S.N.	Description	Data
1	Factor of safety	2
2	Design span or normal ruling span of Towers	Minimum 400m

3	Wind span and weight span of Conductor	1.5 times of span
4	Minimum ground clearance from the bottom conductor	7m
5	Wind zone	4
6	Circuit on Towers	Single or double
7	Angle of Deviation	As per site condition
8	Phase to Phase clearance Horizontal Vertical	 2.7m 1.75m
9	Disc insulator	As necessary
10	Conductor	ACSR-DOG or WOLF

3.5 Thickness of Members

The minimum thickness of angle sections used in the design of towers, unless otherwise specified elsewhere in this Specification**,** shall be kept not less than the following values:

a) Main corner leg members including the earthwire peak and main cross arm : 5 mm

b) For all other members : 4 mm

3.6 Vibration Dampers

Each tower set should be provided with the vibration dampers suitable

3.7 SLENDERNESS RATIO

Slenderness ratio for members shall be computed in accordance with the relevant standards. The following maximum limit of the slenderness ratio i.e. the ratio of unsupported length of the section in any plane to the appropriate radius of gyration will be adopted:

		VALUE OF KL/R
a)	For main corner leg members including the corner members of earthwire peak and the lower corner members of the cross-arms	120
b)	For other members having calculated stresses	200
c)	For redundant members	250
d)	For members having tensile stress only	375

3.8 Earthing

Each tower should be provided with earthing set complete. The earthing set is 2-inch diameter galvanized pipe of length 3 meters with suitable connector and wire of sufficient length to connect to the Tower footing.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: Steel Lattice Towers

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
	Country of Origin			
	Years of Manufacturing Experience			
2	Governing Standard for Steel			
3	Are the poles fully Galvanized?	Yes/No	Yes	
4	Governing Standard for Galvanization		EN ISO 1461 or IS:4736 or an equivalent international standard	
5	Overall Length	m		
6	Design Working Load	kg		
7	Factor of Safety			
8	Minimum Breaking Load	kg		

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
9	Overall Height	m		
10	Center to center between 2 tower legs	M		
11	Tower width at Ground Level	M		
12	Maximum width of tower(Foundation width per leg)	M		
13	Complete Earthing set as per specification provided	yes/no	yes	
14	Delivery of equipment following award of contract and approval of drawing	months		
15	ISO 9001 holder (including design)	yes/no	yes	
15.1	ISO 9001 certificate submitted	yes/no	yes	
16	Type test certificate submitted	yes/no	yes	
16.1	Submitted for the required ratings	yes/no		
16.2	Type test certified by			
17	User's certificate submitted	yes/no	yes	
18	Has exported to third country	yes/no	yes	
19	Copies of relevant standards attached	yes/no	yes	
20	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Pole Accessories (Cross Arms and Braces)

1. Scope

This Specification covers the fabrication and supply of galvanized overhead power line accessories commonly used in overhead power line construction of 33kV and 11kV System. The items used are

- steel cross-arms and bracing members
- pole clamps
- steel bolts and nuts.

2. Material and Description

2.1 Steel Cross Arms and Bracing Angles & Flats

The steel cross-arms and bracing angles and flats shall be fabricated from hot-rolled channels and angles.

The steel channels, angles and flats shall be fabricated and tested in accordance with Indian Standards IS: 226-1975 and IS-808-1964 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable. The minimum tensile strength of the steel shall be 4200 kg/cm2.

The steel cross-arms and bracing angles shall be of sizes shown in the Table 1: Cross-arms, bracing angles and flats, contained herein.

Conceptual hole pattern and size of holes on cross-arm channels are shown in appropriate drawings herein, however, the Supplier must confirm with the Project the locations and sizes of holes prior to the manufacture.

The surface of the steel shall be flat after drilling or (punching) and free of dimpling or imperfections. The hole edges shall be broken by reaming. The holes shall be full dimension after galvanizing and no minus tolerance of specified hole size will be accepted.

The steel cross-arm and bracing angles & flats shall be furnished reasonably smooth on all surfaces and free of burrs or sharp projections.

The brace shall have a minimum tensile strength of 3182 kg at the bolt-hole and bolt slot.

The brace shall be capable of being bent 10 degrees at the bolt hole or slot and 140 degrees at any point between hole and slot without cracking of the base metal on the outside of bent portion.

2.2 Pole Clamps

The pole clamp shall be fabricated out of hot-rolled steel flat.

The steel flat for pole clamp shall be fabricated and tested in accordance with IS: 226-1975, and IS-1731-1971 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable. The minimum tensile strength of the steel shall be 4200 kg/cm2.

Outline details of pole clamps are to be approved by the Employer. Dimensions may be changed to comply with the final pole sizes selected. Therefore, the dimensions must be confirmed with the Employer prior to manufacture.

The fittings shall be free of burrs, splinters, splits, sharp points and edges, which may damage conductors or show evidence of poor workmanship.

The surface of the steel shall be flat after drilling or (punching) and free of dimpling or imperfections. The hole edges shall be broken by reaming. The holes shall be full dimension after galvanizing and no minus tolerance of specified hole size will be accepted.

The pole clamps shall have a minimum tensile strength of 3182 kg at the bolt-hole and bolt slot.

2.3 Steel Bolts and Nuts

The bolts and nuts shall be manufactured and tested in accordance with IS: 1363 (Part I)-1984 or the latest version thereof or any other national or international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.

Bolts and nuts shall be furnished in the types, strength, diameters and lengths as specified and required for fixing the cross-arms, bracing angle & flats and pole clamps. However, the dimensions and length of threading of bolt must be confirmed with the Project prior to manufacture.

Thread forms shall be consistent with all material/items listed herein and shall not strip or slip under sustained tensile loading equal to the design tensile strength of the threaded material item.

3 Galvanizing

The pole accessories shall be galvanized with minimum thickness of 90 microns after fabrication in accordance with IS: 2629-1985 or any revision thereof or other equivalent national or international standard provided that ensure at least equal or better quality to the standard mentioned above will also be acceptable.
Spring washers shall be electro galvanized.

4. Tests

Apart from the tests indicated herein in the referenced standards, the pole accessories shall undergo following tests:
- Visual Inspection;
- Verification of Dimensions;
- Verification of Galvanization thickness

5. Quality Assurance Program

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO 9000;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

6. Bid Documentation

7.1 The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of channels and angles and two (2) clear copies of all other relevant standards referenced therein.

7.2 The Bidder shall provide a complete description, catalogue and certified dimensional drawings of all channels and angles.

7.3 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

7.4 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

Table 1: Steel Cross-arm Channels and Angle Braces

S.No.	Description	Type	Dimension in mm
1	**33kV Line Single Pole**		
1.1	Cross Arm Pole Top	ISMC 100	300
1.2	Cross Arm Standard	ISMC 100	1900
1.3	Brace	Flat	40x6x760
2	**33kV Line H Pole**		
2.1	Cross Arm Standard	ISMC 100	3300
2.2	Bracing angle	ISA	50x50x6x2872
2.3	Bracing angle	ISA	50x50x6x2416
3	**11kV Line Single Pole**		
3.1	Cross Arm Pole Top	ISMC 100	300

3.2	Cross Arm Standard	ISMC 100	1200
3.3	Brace	Flat	40x6x660
4	**11kV Line H Pole**		
4.1	Cross Arm Standard	ISMC 100	2390
4.2	Bracing angle	ISA	50x50x6x2723
4.3	Bracing angle	ISA	50x50x6x2071
5	**11kV Line Offset**		
5.1	Cross Arm	ISMC 100	1700
5.2	Brace	Flat	40x6x877

GUARANTEED TECHNICAL PARTICULARS

(To be completed separately for each items)

(To be completed by the Bidder/Manufacturer)

Item: Cross-arm and bracing angle & flats
Item: Pole Clamps
Item: Steel Bolts and Nuts

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Governing Standard		IS: 226-1975 and IS-808-1964	
5	Governing Standard for galvanizing			
6	Steel Classification			
7	Minimum tensile strength of steel	kg/cm2.	4200	
8	Is the cross arm and angles fabricated from hot-rolled steel sections?	Yes/No	Yes	
9	Delivery of equipment following award of contract and approval of drawing	months		
10	ISO 9001 holder (including design)	yes/no	yes	
10.1	ISO 9001 certificate submitted	yes/no	yes	
11	Type test certificate submitted	yes/no	yes	
11.1	Submitted for the required ratings	yes/no		
11.2	Type test certified by			
12	User's certificate submitted	yes/no	yes	
13	Has exported to third country	yes/no	yes	
14	Copies of relevant standards attached	yes/no	yes	
15	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

ACSR Conductor

1. **Scope**

This Specification covers the fabrication and supply of aluminum conductors, steel reinforced (ACSR) commonly used on overhead power line construction.

2. **Description**

2.1 The manufacturer of the ACSR conductor must have been accredited with ISO quality certification.

2.2 The ACSR conductor shall be a concentrically stranded right-hand lay conductor.

2.3 The ACSR conductor shall be fabricated in accordance with IS: 398 or any other international standards that ensures a substantially equal quality to the standard mentioned above, will also be acceptable.

2.4 The following types of conductors shall be supplied:

S.N.	Description	Unit	ACSR 'DOG' Conductor
1	Nominal Aluminum Area	mm^2	100
2	Stranding	Al/Steel	6/7
3	Wire Diameter		
	Aluminum	mm	4.72
	Steel	mm	1.57
4	Overall Sectional Area		
	Aluminum	mm^2	105.0
	Steel	mm^2	13.50
	Total	mm^2	118.5
5	Overall Diameter of Conductor	mm	14.15
6	Approximate Mass	kg/km	394
7	Calculated Resistance at 20°C	Ω/km	0.27
8	Breaking Load	kN	32.41

3. **Packaging**

3.1 The packaging of goods shall be in accordance with IS:398. All conductors shall be furnished on non-returnable steel drums/reels. Protective external lagging of sufficient thickness shall be provided and fitted closely on the reels. Binder consisting of steel straps shall be provided over the external laggings. The reel shall be new and sufficiently sturdy in construction to withstand ocean shipping, road transport, several loading and unloading, storage in tropics, hauling and field erection of conductor without distortion or disintegration.

3.2 Each reel/drum of the conductors furnished shall contain only one (1) length of conductor.

3.3 All reels shall be legibly marked in paint with the following information:

a) Size of conductor
b) Type of conductor
c) Length in meters
d) Net weight of conductor
e) Direction of rolling

3.4 The standard non-joined length of the completed conductor in each drum/reel shall be as below:

Conductor	ACSR 'DOG'
Standard non-joined Length in each drum (m)	500

4. **Tests**

4.1 The manufactured conductor shall be tested in full compliance with the governing standard including following routine tests:

Aluminum wire

a) Tensile test
b) Wrapping test
c) Resistivity test

Steel wire

a) Determination of stress at 1% elongation
b) Tensile test

c) Torsion test or elongation test as appropriate
d) Wrapping test
e) Galvanization test
f) Ductility test

5. **Bid Documentation**

5.1 The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of the ACSR conductor and two (2) clear copies of all other relevant standards referenced therein.

5.2 The Bidder shall provide certified type test results of all types of ACSR conductor as required by governing standards.

5.3 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

5.4 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: ACSR Conductor

S.N.	Description	Unit	NEA Requirement	To be Filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Governing Standard		IS 398 or Equivalent	
5	Nominal Aluminum Area	mm^2	100	
6	Stranding	Al/Steel	6/7	
7	Wire Diameter			
7.1	Aluminum	mm	4.72	
7.2	Steel	mm	1.57	
8	Overall Sectional Area			
8.1	Aluminum	mm^2	105.0	
8.2	Steel	mm^2	13.50	
8.3	Total	mm^2	118.5	
9	Overall Diameter of Conductor	mm	14.15	
10	Approximate Mass	kg/km	394	
11	Calculated Resistance at 20°C	Ω/km	0.27	
12	Breaking Load	kN	32.41	
13	Delivery of equipment following award of contract and approval of drawing	months		
14	ISO 9001 holder (including design)	yes/no	yes	
14.1	ISO 9001 certificate submitted	yes/no	yes	
15	Type test certificate submitted	yes/no	yes	
15.1	Submitted for the required ratings	yes/no		
15.2	Type test certified by			
16	User's certificate submitted	yes/no	yes	
17	Has exported to third country	yes/no	yes	
18	Copies of relevant standards attached	yes/no	yes	

S.N.	Description	Unit	NEA Requirement	To be Filled by Bidder/Manufacturer
19	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer …….

Parallel Groove (PG) Clamps

1. **Scope**

1.1 This Specification covers design fabrication testing and supply of universal parallel groove (PG) clamps and fittings commonly used in overhead electric power lines.

2. **Description**

2.1 The PG clamp shall be designed and manufactured to achieve full compatibility between clamps and conductors and produce uniform and electrically efficient connections between conductors for the class of connection intended.

2.2 The manufacturer of PG Clamp must have been accredited with ISO 9001 with design and manufacturing quality certification.

2.3 The PG clamp is intended to be used for ACSR to ACSR conductor.

2.4 The body of PG clamp shall be made of aluminum alloy from a permanent mould process and hardware consisting of nuts, bolts and washer shall be made of hot dip galvanized steel. The PG clamps shall have sufficient mass and contact area to provide the thermal capacity required for load cycling and fault current. The clamps shall be designed to provide the distributed current density necessary to prevent hot spots, and current carrying rating of the conductors for which they are designated. PG clamp shall have oxide inhibiting compound and contact aid.

2.5 The clamps shall be manufactured to accommodate ACSR conductors as shown in Table 1.

2.6 The grooves on the clamps shall be open-edged on two (2) edges for easy installation over a run conductor and insertion of tap conductor.

2.7 The clamp shall be tested in accordance with the relevant ANSI standard or other equivalent national or international standard specifying the performance requirement for the electrical and mechanical characteristics of clamps. The clamps shall conform to all testing requirements of that standard for the classes of clamps considered.

2.8 Each clamp shall be marked with the type and size of conductor, which will correctly fit each groove.

3. Tests

The PG clamps shall undergo type and routine tests in accordance with the relevant governing standard.

4**. Quality Assurance Program**

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9000;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

5. **Bid Documentation**

5.1 The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of PG clamp.

5.2 The Bidder shall provide a complete description, and catalogue/drawing of PG clamp.

5.3 The Bidder shall provide certified type test results of PG clamp as required by governing standards.

5.4 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

5.5 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Parallel Groove (PG) Clamps

S.N.	Description	Unit	NEA Requirement	To be Filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Governing Standard			
5	Type/Model No.			
6.1	Main Conductor		DOG	
6.2	Branch Conductor		DOG	
7	Current Rating	A	400	
8	Type of Connection			
9	Construction			
9.1	Body Material			
9.2	Screw Material			
10.1	Bolts size	mm		
10.2	Tightening torque	Nm		
11.1	Size	mm		
11.2	weight	Kg		
12	Markings			
13	Delivery of equipment following award of contract and approval of drawing	months		
14	ISO 9001 holder (including design)	yes/no	yes	
14.1	ISO 9001 certificate submitted	yes/no	yes	
15	Type test certificate submitted	yes/no	yes	
15.1	Submitted for the required ratings	yes/no		
15.2	Type test certified by			
16	User's certificate submitted	yes/no	yes	
17	Has exported to third country	yes/no	yes	
18	Copies of relevant standards attached	yes/no	yes	
19	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Mid-Span Compression Connectors

1. **Scope**

This Specification covers the design, testing, manufacture and supply of mid-span joints of compression type commonly used in overhead electric power line construction,

2. **Description**

2.1 Compression connectors shall be manufactured and tested in accordance with the relevant national or international standard.

2.2 The compression connectors shall be designed and manufactured to achieve full compatibility between connectors and tools and produce uniform and electrically efficient connections between conductors for the class of connection intended. Conductor sizes are nominal and allowance shall be made for the actual conductor sizes to be supplied.

2.3 The compression connectors shall be tested in accordance with the applicable national or international standard specifying the performance requirements for the electrical and mechanical characteristics of connectors under operating conditions, and shall conform to all testing requirements of that Standard for the classes of connectors concerned.

2.4 The compression connectors for ACSR conductor to ACSR conductor shall be made of electrical grade aluminum. The connectors shall have sufficient mass and contact area to provide the thermal capacity required for load cycling and fault current. The connector shall be designed to provide the distributed current density necessary to prevent hot spots, and conductivity shall exceed the full load current rating of the conductors for which they are designed.

2.5 The joints shall be so designed that when installed no air space is left within the finished joints. The joints shall have the conductivity as specified in relevant Clause.

3. General Requirements

The full tension sleeve connectors shall be dual tension (2-piece) for use with ACSR conductors furnished in accordance with Table 1.

For ACSR conductors, the steel sleeve for the conductor core shall be heavily plated for resistance to corrosion and compatibility with aluminum and shall be abrasive lined for maximum holding strength.

For ACSR conductors, the aluminum outer sleeve for 100 sq. mm. ACSR conductor shall have a filler hole to permit entering over the steel sleeve and permit inhibitor application. An aluminum hole plug shall be furnished.

The conductor shall achieve the same mechanical strength that of undamaged conductor at connecting point.

4. Tests

The compression connectors shall undergo type and routine tests in accordance with the relevant governing standard.

5**. Quality Assurance Program**

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9000;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

6. **Bid Documentation**

6.1 The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of compression connectors.

6.2 The Bidder shall provide a complete description, and catalogue/drawing of compression connectors.

6.3 The Bidder shall provide certified type test results of compression connectors as required by governing standards.

6.4 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

6.5 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

TABLE 1

Connector Type	Conductors
Full Tension Sleeve	100 sq. mm. ACSR "DOG"

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Mid-Span Compression Connectors

S.N.	Description	Unit	NEA Requirement	To be Filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Years of Manufacturing Experience			
3	Governing Standard			
4	Model No.			
5	Type		Compression	
6	Current Rating	A	400	
7	Material			
7.1	Outer Sleeve			
7.2	Inner Sleeve			
8	Dimension of Compression Joint for Aluminum part			
8.1	Outer	mm		
8.2	Inner	mm		
9	Dimension of Compression Joint for Steel part			
9.1	Outer	mm		
9.2	Inner	mm		
10	Minimum Failing Load	kN		
11	Electrical Resistance at 20 deg. C			
12.1	Size	mm		
12.2	weight	Kg		
13	Markings			
14	Delivery of equipment following award of contract and approval of drawing	months		
15	ISO 9001 holder (including design)	yes/no	yes	
15.1	ISO 9001 certificate submitted	yes/no	yes	
16	Type test certificate submitted	yes/no	yes	
16.1	Submitted for the required ratings	yes/no		
16.2	Type test certified by			
17	User's certificate submitted	yes/no	yes	
18	Has exported to third country	yes/no	yes	
19	Copies of relevant standards attached	yes/no	yes	

S.N.	Description	Unit	NEA Requirement	To be Filled by Bidder/Manufacturer
20	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Porcelain Insulators and Fittings

1. Scope

This Specification covers the Type Test, fabrication and supply of pin insulators, disc insulators stay insulators, disc insulator fittings and insulator pins as herein specified for use on overhead power line construction.

2. General

1.1 General Requirements of Insulators

Insulators shall be fabricated and tested in accordance with the Standards referenced for each type of insulator or equivalent standards.

The Type Test shall be conducted in the recognized laboratory.

Porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed. The glaze shall be brown in color. The glaze shall cover all exposed parts of the insulators.

The design of insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with hard metal.

The cement used in construction of insulators shall not give rise to chemical reaction with metal fittings and its thickness shall be as uniform as possible.

The insulators should be manufactured in automatic temperature-controlled kilns to obtain uniform baking and better electrical and mechanical properties.

The preferred make of disc, pin and stay insulators and fittings are Allied Ceramics Pvt. Ltd., BHEL, Aditya Birla Insulators Ltd., Hindustan Chemicals Ltd. or equivalent reputed.

1.2 General Requirements of Disc Insulators fittings

The disc insulator fittings shall be designed, manufactured and tested in accordance with IS: 2486 or any other national or international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.

The disc insulator fittings shall be supplied with ball and socket couplings and twisted straps. The insulator fittings shall conform to the shape and dimension as per the governing standards

Disc insulator fittings like ball and socket, nuts and bolts shall be made of hot rolled steel and the twisted cross arm strap shall be made of MS sheet metal. Cotter bolts and U-bolts shall be of galvanized steel. Cotter pins shall be of stainless steel.

All forgings and castings shall be of good finish and free from flaws and other defects. The edges on the outside of fittings, such as the ball socket and holes, shall be rounded. The nominal dimensions of the ball and socket, ball eye and twisted cross arm straps, shall be as per the governing standards.

All ferrous fittings and the parts other than those of stainless steel, shall be hot dip galvanized as per IS: 2629 or equivalent international standards.

1.3 General Requirements of Insulator Pins

The insulator pins specified herein shall be fabricated from hot rolled steel. The pin shall be a single piece obtained preferably by the process of forging. It shall not be made by jointing, welding, shrink fitting or any other processes from more than one piece of material. It shall be of good finish free from flaws and other defects. The finish of the collar shall be such that a sharp angle between the collar and the shank is avoided.

All ferrous pins, nuts and washers except those made of stainless steel shall be hot dip galvanized. The threads of nuts shall be cut after galvanizing and shall be well oiled and greased. The galvanizing shall conform to IS 2629-1985 or equivalent national or international standard.

All insulator pins shall be reasonably smooth on all surfaces and free of sharp projections.

3. Specific Requirements

3.1. Pin Insulator

The pin insulator shall be manufactured and tested in accordance with IS: 731 and IS:3188 or the latest version thereof or any other national or international standards that ensures at least

equal or better quality to the standard mentioned above, will also be acceptable. The lead thread shall be compatible with the insulator pin specified in these documents.

The pin insulator shall have following ratings and features:

S.N.	Description	Unit	11 kV pin insulator
1	Highest system voltage	kV	12
2	Rated voltage	kV	11
3	Creepage distance (minimum)	mm	265
4	Wet power frequency withstand voltage	kV	35
5	Impulse withstand voltage	kV	75
6	Puncture power frequency voltage (minimum)	kV	105
7	Visible discharge voltage (Effective)	kV	9
8	Cantilever strength	kN	5
9	GI pin head		Small

3.2 Disc Insulator

The disc insulator shall be manufactured and tested in accordance with IS: 731 or latest version thereof or any other national or international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.
The disc insulator shall be ball and socket fitting type. The disc insulator shall have the following ratings and features:

S.N.	Description	Unit	Value
1	Highest system Voltage	kV	12
2	Rated Voltage	kV	11
3	Porcelain Diameter (minimum)	mm	255
4	Spacing	mm	145
5	Creepage Distance (minimum)	mm	320
6	Power Frequency Puncture withstand Voltage		1.3 x Actual dry flashover voltage
7	Wet Power Frequency Withstand Voltage	kV	35
8	Impulse Withstand Voltage	kV	75
9	Puncture Power Frequency Voltage (minimum)	kV	105
10	Visible Discharge Voltage	kV	9
11	Mechanical Strength	kN	45
12	Ball and Socket Size		16 mm B
13	Applicable Standard for Special Characteristics		IS: 3188

3.3 Stay Insulator

The stay insulator shall be manufactured and tested in accordance with IS: 5300 or latest version thereof or any other national or international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.
The stay insulator shall have the following ratings and features:

S.N.	**Description**	**Unit**	**Stay Insulator for 11 kV and 400V Line**
1	IS Designation		A
2	Length	mm	90
3	Diameter	Mm	65
4	Cable Hole Diameter	mm	16
5	Creepage Distance (minimum)	mm	41
6	Minimum failing load	kN	44

7	Power Frequency Withstand Voltage		
7.1	Dry	kV	18
7.2	Wet	kV	8

3.4 Insulator Pins

The insulator pins to be supplied shall conform to IS: 2486 or equivalent international standards and to the shape and dimensions shown in the drawings contained in this specification. The insulator pin shall be furnished with a spring steel split lock washer and nut assembled on the insulator pin. The ratings and features of the insulator pins shall be as follows:

S.N.	Description	Unit	Required ratings/features For 11 kV
1	Head type		Small S165P
2	Total length	mm	315
3	Stalk length	mm	165
4	Shank length	mm	150
5	Minimum failing load	kN	5
6	Applicable standard		IS: 2486 or equivalent international standard.

The insulator pins shall be compatible with the insulators specified above.

3.5 Disc Insulator Fittings

Disc insulator fittings like Ball and socket, nuts, bolts shall be made of hot rolled steel and the twisted cross arm strap shall be made of MS sheet metal. Cotter bolts and U-bolts shall be of galvanized steel. Cotter pins shall be of stainless steel.

All forgings and castings shall be of good finish and free from flaws and other defects. The edges on the outside of fittings, such as the ball socket and holes, shall be rounded. The nominal dimensions of the ball and socket, ball eye and twisted cross arm straps, are given in Drawings. The ultimate strength of the fittings shall not be less than 41 KN.

All ferrous fittings and the parts other than those of stainless steel, shall be hot dip galvanized as per IS: 2629-1985 or equal internationally recognized standards.

4. Marking

Each insulator shall be legibly and indelibly marked to show the following:

a) Name or trademark of manufacturer.
b) Year of manufacture.
c) Minimum failing load in Newton
d) Name of Employer

Markings on porcelain shall be printed and shall be applied before firing.

5. Tests

The insulators and fittings shall comply with the type tests and routine tests as per relevant governing standards.

6. BID DOCUMENTATION

The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of pin insulator and insulator pin and two (2) clear copies of all other relevant standards referenced therein.

The Bidder shall provide certified type test results of pin insulator and insulators pin as required by governing standards.

The Bidder shall provide standard catalogue and certified dimensional drawings of pin insulator and insulator pins.

A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Pin Insulator

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standards		IS: 731; IS:3188	
6	Marking as per specifications	Yes/No	Yes	
7	Highest system voltage	kV	12	
8	Rated voltage	kV	11	
9	Creepage distance (minimum)	mm	265	
10	Wet power frequency withstand voltage	kV	35	
11	Impulse withstand voltage	kV	75	
12	Puncture power frequency voltage (minimum)	kV	105	
13	Visible discharge voltage (Effective)	kV	9	
14	Cantilever strength	kN	5	
15	GI pin head		Small	
16	Delivery of equipment following award of contract and approval of drawing	months		
17	ISO 9001 holder (including design)	yes/no	yes	
17.1	ISO 9001 certificate submitted	yes/no	yes	
18	Type test certificate submitted	yes/no	yes	
18.1	Submitted for the required ratings	yes/no		
18.2	Type test certified by			
19	User's certificate submitted	yes/no	yes	
20	Has exported to third country	yes/no	yes	
21	Copies of relevant standards attached	yes/no	yes	
22	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: 11 kV Disc Insulator

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standards		IS: 731-1971	
6	Marking as per specifications	Yes/No	Yes	
7	Highest system Voltage	kV	12	
8	Rated Voltage	kV	11	
9	Porcelain Diameter (minimum)	mm	255	

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
10	Spacing	mm	145	
11	Creepage Distance (minimum)	mm	320	
12	Power Frequency Puncture withstand Voltage		1.3 x Actual dry flashover voltage	
13	Wet Power Frequency Withstand Voltage	kV	35	
14	Impulse Withstand Voltage	kV	75	
15	Puncture Power Frequency Voltage (minimum)	kV	105	
16	Visible Discharge Voltage	kV	9	
17	Mechanical Strength	kN	45	
18	Ball and Socket Size		16 mm B	
19	Applicable Standard for Special Characteristics		IS: 3188-1980	
20	Delivery of equipment following award of contract and approval of drawing	months		
21	ISO 9001 holder (including design)	yes/no	yes	
21.1	ISO 9001 certificate submitted	yes/no	yes	
22	Type test certificate submitted	yes/no	yes	
22.1	Submitted for the required ratings	yes/no		
22.2	Type test certified by			
23	User's certificate submitted	yes/no	yes	
24	Has exported to third country	yes/no	yes	
25	Copies of relevant standards attached	yes/no	yes	
26	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: **Stay Insulator**

S.N.	Description	Unit	Stay Insulator for 11 kV and 400 V Line	
			NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standard		IS: 5300-1969	
6	Marking as per specification?	Yes/No	Yes	
7	IS Designation		A	
8	Length	mm	90	
9	Diameter	Mm	65	
10	Cable Hole Diameter	mm	16	
11	Creepage Distance (minimum)	mm	41	
12	Minimum failing load	kN	44	
13	Power Frequency Withstand Voltage			
13.1	Dry	kV	18	
13.2	Wet	kV	8	
14	Delivery of equipment following award of contract and approval of drawing	months		
15	ISO 9001 holder (including design)	yes/no	yes	
15.1	ISO 9001 certificate submitted	yes/no	yes	
16	Type test certificate submitted	yes/no	yes	
17.1	Submitted for the required ratings	yes/no		
17.2	Type test certified by			
18	User's certificate submitted	yes/no	yes	
19	Has exported to third country	yes/no	yes	
20	Copies of relevant standards attached	yes/no	yes	
21	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..

Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS
(To be completed by the Bidder/Manufacturer)

Item: Disc Insulator Fittings

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standard		IS: 2486	
6	Steel Classification		As per specification	
7	Ferrous parts are galvanized As per IS 2629 – 1985?	Yes/No	Yes	
8	Thickness of Galvanizatiioin	micron		
9	Cotter Pins are Stainless Steel?	Yes/No	Yes	
10	Ultimate Strength of Fittings	kN		
11	Delivery of equipment following award of contract and approval of drawing	months		
12.1	ISO 9001 holder (including design)	yes/no	yes	
12.2	ISO 9001 certificate submitted	yes/no	yes	
13.1	Type test certificate submitted	yes/no	Yes	
13.2	Submitted for the required ratings	yes/no		
13.3	Type test certified by			
14	User's certificate submitted	yes/no	Yes	
15	Has exported to third country	yes/no	Yes	
16	Copies of relevant standards attached	yes/no	Yes	
17	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS
(To be completed by the Bidder/Manufacturer)

Item: Insulator Pins

S.N.	Description	Unit	11 kV Insulator Pin	
			NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standard		IS: 2486	
6	Type of steel used		Hot rolled steel	
7	Head type		Small S165P	
8	Total length	mm	315	
9	Stalk length	mm	165	
10	Shank length	mm	150	
11	Minimum failing load	kN	5	
12	Delivery of equipment following award of contract and approval of drawing	months		
13.1	ISO 9001 holder (including design)	yes/no		
13.2	ISO 9001 certificate submitted	yes/no		
14.1	Type test certificate submitted	yes/no		

S.N.	Description	Unit	11 kV Insulator Pin	
			NEA Requirement	To be filled by Bidder/Manufacturer
14.2	Submitted for the required ratings	yes/no		
14.3	Type test certified by			
15	User's certificate submitted	yes/no		
16	Has exported to third country	yes/no		
17	Copies of relevant standards attached	yes/no		
18	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for…..……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Preformed Wire Products

1. **Scope**

This Specification covers the fabrication and supply of pin insulator ties and wire strand grips for stay set commonly used in overhead power line construction.

2. **Requirements**

The design of the preformed wire products specified herein shall be appropriate for the optimum combination of conductor strand diameter, inside diameter, rod diameter, pitch diameter, number of pitch lengths, direction of lay, and raw materials of the specific application.

The preformed wire product shall be so designed to grip the designated surface evenly, with evenly-spaced gaps, and shall not bridge the gripped surface due to excessive number of strands in the grip or tie.

All pin insulator ties shall be suitable for use on the ACSR conductors “DOG”100 mm^2.

3. **Pin Insulator Top Tie**

The top tie shall be designed for use with C-Neck Pin insulators specified in SPECIFICATION: SP3.1.1 (IS: 731-971) and ACSR bare conductors shown in Table 1. However, details of neck diameter and other details of the pin insulator shall be provided before manufacturing of ties.

The tie shall be manufactured of aluminum-clad steel wire. It shall be furnished with a semi conductive-rubber tie pad so as to protect insulator against abrasion. The top tie shall be right-hand lay. Applied length of tie shall not be less than 800 mm.

The tie shall be color-coded for conductor size and insulator head-style. The tie shall have an, identification tag attached showing manufacturer's catalog number and applicable conductor identification.

4. **Double-Support Top Tie**

The double-support top tie shall be designed for use with C-Neck Pin insulators specified in SPECIFICATION: SP3.1.1 (IS: 731-971) and ACSR bare conductors shown in Table 1. However, details of neck diameter and other details of the pin insulator shall be provided before manufacturing of ties.

The tie shall be manufactured of aluminum-clad steel wire. It shall be furnished with a semi conductive-rubber tie pad so as to protect insulator against abrasion. The top tie shall be right-hand lay. Applied length of tie shall not be less than 800 mm.

The tie shall be color-coded for conductor size and insulator head-style. The tie shall have an identification tag attached showing manufacturer's catalog number and applicable conductor identification.

5. **Pin Insulator Side Tie**

The side tie shall be designed for use with C-Neck Pin insulators specified in SPECIFICATION: SP3.1.1 (IS: 731-971) and ACSR bare conductors shown in Table 1. However, details of neck diameter and other details of the pin insulator shall be provided before manufacturing of ties.

The tie shall be manufactured of aluminum-clad steel wire. It shall be furnished with a semi conductive-rubber tie pad so as to protect insulator against abrasion. The top tie shall be right-hand lay. Applied length of tie shall not be less than 800 mm.

The side tie shall be color-coded for conductor size and insulator head-style. The side tie shall have an identification tag attached showing manufacturer's catalog number and applicable conductor identification.

6. **Double Side Tie**

The double side tie shall be designed for use with C-Neck Pin insulators specified in SPECIFICATION: SP3.1.1 (IS: 731-971) and ACSR bare conductors shown in Table 1. However, details of neck diameter and other details of the pin insulator shall be provided before manufacturing of ties.

The tie shall be manufactured of aluminium-clad steel wire. It shall be furnished with a semi conductive-rubber tie pad so as to protect insulator against abrasion. The top tie shall be right-hand lay. Applied length of tie shall not be less than 800 mm.
The double side tie shall be color-coded for insulator neck size and crossover point and for insulator identification. The double side tie shall have an identification tag attached showing manufacturer's catalogue number and applicable conductor identification.

7. **Steel Wire Strand Grip for Stay Set**

The steel wire strand grip shall be designed for use with thimble eye or double eye stay rod and tightner fabricated in accordance SPECIFICATION: SP3.2.1, stay wire fabricated in accordance with SPECIFICATION: SP3.2.2 (B.S. 183 1972/(1983)) and stay insulator fabricated in accordance with SPECIFICATION: SP3.1.1 (IS:5300-1969).
The steel wire strand grip shall be furnished for strand size and grade in accordance with Table 2.
The steel wire strand grip shall be manufactured of a galvanized steel wire in cabled loop form with long and short legs. The grip shall have a left-hand lay. Galvanizing shall be equivalent to Class C zinc coating per ASTM A-475.
The steel wire strand grip shall be color-coded for strand size and length and shall have one (1) or two (2) crossover marks for different diameter fittings. An identification tag shall be attached showing the manufacturer's catalogue number and applicable strand size.

8. Tests

The performs shall undergo type and routine tests in accordance with the relevant governing standard.

9**. Quality Assurance Program**

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9000;
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

10. **Bid Documentation**

The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of preformed wire products and two (2) clear copies of all other relevant standards referenced therein.
The Bidder shall provide certified type test results of preformed wire products as required by governing standards.
The Bidder shall provide complete description, and catalogue of preformed wire products.
A clause-by-clause commentary on specification, specifying compliance and deviations, if any.
All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

TABLE 1

INSULATOR TIES

Tie Application	***Identification Tag and Color Code***					
	100 sq. mm. "Dog"		50 sq. mm. "Rabbit"		30 sq. mm. "Weasel"	
Top Tie	TT-1	Red	TT-2	Yellow	TT-3	Blue
Double Support Top Tie	DTT-1	Red	DTT-2	Yellow	DTT-3	Blue
Side Tie	ST-1	Green	ST-2	Black	ST-3	Pink
Double Side Tie	DST-1	Green	DST-2	Black	DST-3	Pink

Note: All designations shown are used for product identification for the purpose of this IFB.

TABLE 2

STEEL WIRE STRANDED GRIPS

Tie Application for Strand Size	*Identification Tag and Color Code*	
7/8 SWG	*GS-1*	*Red*
7/12 SWG	GS-2	Blue

Note: All designations shown are used for product identification for the purpose of this IFB.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Preformed Wire Products

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Model No.			
5	Governing Standards			
6	**Pin Insualtor Tie**			
6.1	Material Description furnished?	yes/no	yes	
6.2	Aluminum clad steel wire			
6.3	Bidder Certitifies that all items offered are suitable for use with ACSR "DOG" and "RABBIT" conductors?	yes/no	yes	
6.4	Bidder Certitifies that all items offered are suitable for use with insulators specified in specifications?	yes/no	yes	
6.5	Holding Rating of Top tie for "DOG"	kg		
6.6	Holding Rating of Double support Top tie for "DOG"	kg		
6.7	Holding Rating of Side tie for "DOG"	kg		
6.8	Holding Rating of Double support Side tie for "DOG"	kg		
6.9	Holding Rating of Top tie for "RABBIT"	kg		
6.10	Holding Rating of Double support Top tie for "RABBIT"	kg		
6.11	Holding Rating of Side tie for "RABBIT"	kg		
6.12	Holding Rating of Double support Side tie for "RABBIT""	kg		
7	**Steel Wire Strand Grip**			
7.1	Material Description furnished?	yes/no	yes	
7.2	Bidder Certitifies that steel strand grip offered is suitable for use with insulator; stay set and stay wire specified in specifications?	yes/no	yes	
7.3	Holding Rating of Grip for 7/8 SWG	kg		
7.4	Holding Rating of Grip for 7/8 SWG	kg		
8	Delivery of equipment following award of contract and approval of drawing	months		
9	ISO 9001 holder (including design)	yes/no	yes	
9.1	ISO 9001 certificate submitted	yes/no	yes	
10	Type test certificate submitted	yes/no	yes	
10.1	Submitted for the required ratings	yes/no		
10.2	Type test certified by			

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder
11	User's certificate submitted	yes/no	yes	
12	Has exported to third country	yes/no	yes	
13	Copies of relevant standards attached	yes/no	yes	
14	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Stay Sets

1. Scope

This Specification covers the fabrication and supply of adjustable threaded, galvanized, ferrous, stay sets and nuts for use in overhead line construction.

2. Description

2.1 The stay set shall consist of mild steel; galvanized stay rod; stay tightener or adjustable head complete with stay plate a thimble of suitable dimensions

2.2 The stay rod shall be fabricated of mild steel of minimum tensile strength of 4200 kg/sq.cm. The other technical features and dimensions are given in table attached herewith.

2.3 The stay tightener shall be made of mild steel of minimum ultimate tensile strength of 42,000kg/sq.cm. The thimbles shall be made of 1.219mm (18 SWG) GI sheet, and shall be suitable for terminating steel stay wire with a preformed grip.

2.4 The stay plate shall be square type MS plate of dimensions as mentioned in Table herewith. The plate shall have a matching hole at the center to fit the end of the stay rod.

3. Fabrication

3.1 The stay rod and nut shall be fabricated to the shape and dimensions shown in table attached herewith.

3.2 The thread form at the threaded end of the rod, and that of the accompanying nut, shall be optional with the supplier. However, it shall be the responsibility of the Supplier to supply the stay rod with a thread form that shall sustain the rated loads specified in table without creep or stripping over the full life of the rod material at specified diameter.

3.3 After fabrication, the stay rod and nut shall be hot-dip zinc galvanized in accordance with IS 2629-1985, latest edition, or to an equivalent hot-dip galvanizing standard which produces equal or superior result.

3.4 After galvanizing, the nut and rod threading shall be such that the nut may be run the full length of the thread without the use of tools.

4. Tests

4.1 Apart from the tests indicated in the relevant referenced standard of steel , the stay set shall undergo following tests:

-Visual Inspection.

-Verification of dimensioned.

–Tensile strength: The stay set assemblies shall withstand a minimum tensile loads specified in Table 1.

-Bend test: The stay rod shall be bend-tested over a mandrel of 19 mm millimeter through an angle of 90 degrees at any point in the un-threaded section of the rod without fracture of the steel. Temperature of the test shall be 68 degrees Fahrenheit (22.5 deg Celsius).

5. Bid Documentation

5.1 The Bidder shall furnish with the Bid a complete description of the stay sets proposed to be supplied including, but not limited to, steel classification of base metal, detailed drawings showing shape, dimensions, and threading certified type test results as required by paragraph 4 herein, the identity of the proposed manufacturer, and manufacturers catalogue number, plus catalogue cuts. The technical data furnished shall be bound separately from the Bid Document.

Table 1 : Ratings and Features of Stay Sets

S.N.	Description	Unit	Stay Sets for 11 kV and 0.4 kV line
1	Length of stay rod	m	1.8
2	Diameter of stay rod	mm	16
3	Ultimate tensile strength of stay rod and turn-buckle	kg/cm^2	4200
4	Minimum breaking load	kg	6,433
5	Length of threaded portion	mm	300
6	Thimble shape		Suitable for 7/12 mm stay wire

S.N.	Description	Unit	Stay Sets for 11 kV and 0.4 kV line
7	Thimble section		18 SWG min.
8	Stay plate section	mmxmmxmm	300x300x6
9	Eyebolt length	mm	300
10	Eyebolt diameter	mm	16

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: Stay set for 11 kV and 0.4 kV Line

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
	Years of Manufacturing Experience			
	Model No.			
3	Governing Standards			
6	Marking as per specifications	Yes/No	Yes	
7	Length of stay rod	m	1.8	
8	Diameter of stay rod	mm	16	
9	Ultimate tensile strength of stay rod and turn-buckle	kg/cm^2	4200	
10	Minimum breaking load	kg	6,433	
11	Length of threaded portion	mm	300	
12	Thimble shape		Suitable for 7/12 mm stay wire	
13	Thimble section		18 SWG min.	
14	Stay plate section	mm	300x300x6	
15	Eyebolt length	mm	300	
16	Eyebolt diameter	mm	16	
17	Delivery of equipment following award of contract and approval of drawing	months		
18	ISO 9001 holder (including design)	yes/no		
18.1	ISO 9001 certificate submitted	yes/no		
19	User's certificate submitted	yes/no		
20	Has exported to third country	yes/no		
21	Copies of relevant standards attached	yes/no		
22	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Stay Wire

1. Scope

This Specification covers the fabrication and supply of zinc-coated steel wire for use in overhead power line as stay wire ropes for line supports (poles).

2. Description of Strands

The steel strand shall be fabricated in accordance with IS 2141 or an equivalent international standard. The steel wire strand shall have a left-hand lay. The steel wires shall have no joint throughout the whole length. Strands shall be uniform and shall have no defects such as cracks, dust encapsulation or crevices. Further details are given in Table herein.

3. Packing

The steel wire strand shall be furnished in reels holding minimum of 100 kg. Each reel shall have a weather-resistant tag securely attached showing the length, nominal diameter, number of individual wires, grade of the strand, and the class of zinc coating.

4. Bid Documentation

4.1 The Bidder shall furnish the following technical data with the Bid:

a) If the material to be offered is to be manufactured in accordance with the specified B.S. standard, full technical data for the material and the identification of the manufacturer.

b) If the material offered to be manufactured in accordance with an equivalent standard, two (2) clear copies of that standard shall be furnished in addition to the data required in (a) above.

All technical data furnished shall be bound separately from the Bids.

5. Tests

The testing of individual wires and complete conductor shall be in accordance with the nominated standards.

Table: Ratings and Features of stay wire

S.N.	Description	Unit	Stay Wire for 11 kV and 0.4 kV Line
1	Steel Wire Size	(Nos of wire/SWG)	7/12
2	No. of Wire	Nos	7
3	Diameter of Each wire	mm	2.64
4	Strand Diameter (Overall)	mm	7.8
5	Overall Cross Sectional Area	mm^2	44.19
6	Steel Quality		Gr.700
7	Minimum Tensile Strength of Steel	N/mm^2	700
8	Min. Breaking load of single wire	kN	3.71
9	Min. Breaking load of strand	kN	26
10	Approximate Weight	kg/km	300
11	Minimum weight of Wire in each reel	kg	100
12	Left hand Lay	Yes/No	Yes
13	Minimum Thickness of Zinc Coating	g/m^2	230

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: Stay Wire for 11 kV and 0.4 kV Line

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
	Years of Manufacturing Experience			
2	Applicable Standard		IS 2141	
3	Governing Standard for galvanization		IS 4826	
4	Steel Wire Size	(Nos of wire/SWG)	7/12	

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
5	No. of Wire	Nos	7	
6	Diameter of Each wire	mm	2.64	
7	Strand Diameter (Overall)	mm	7.8	
8	Overall Cross Sectional Area	mm^2	37.15	
9	Steel Quality		Gr.700	
10	Minimum Tensile Strength of Steel	N/mm^2	700	
11	Ultimate Tensile Strength	N/mm^2		
12	Min. Breaking load of single wire	kN	3.71	
13	Min. Breaking load of strand	kN	26	
14	Approximate Weight	kg/km	300	
15	Minimum weight of Wire in each reel	kg	100	
16	Left hand Lay	Yes/No	Yes	
17	Minimum Weight of Zinc Coating	g/m^2		
18	Delivery of equipment following award of contract and approval of drawing	months		
19	ISO 9001 holder (including design)	yes/no		
19.1	ISO 9001 certificate submitted	yes/no		
20	Type test certificate submitted	yes/no		
21.1	Submitted for the required ratings	yes/no		
21.2	Type test certified by			
23	User's certificate submitted	yes/no		
24	Has exported to third country	yes/no		
25	Copies of relevant standards attached	yes/no		
26	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

11 kV Air Break Switch

1 SCOPE

This specification provides for manufacture, testing at works and delivery for supply of 11 kV AB switches. The 11 kV AB switches shall conform to IS: 9920 (Part-I to IV)

2 AB SWITCHES

The 11KV Air Break Switches are required with two poles in each phase. The AB Switches shall be supplied complete with phase coupling shaft, operating rod and operating handle. It shall be manually gang operated and vertically break and horizontal mounting type.

The AB Switch shall be designed for a normal current rating of 400 Amps and for continuous service at the system voltage specified as under: 11 KV AB Switch: 11KV + 10% continuous 50 C/s solidly grounded earthed neutral system. The length of break in the air shall not be less than 400 mm for 11KV AB Switches.

The 11KV AB Switches are required with post insulators. The AB switches should be suitable for mounting on the structure. The mounting structure will be arranged by the purchaser separately. However, the AB Switches shall be supplied with base channel for mounting on the structure which will be provided by the purchaser. The phase to phase spacing shall be 750mm in case of 11KV AB Switches.

3 POST INSULATORS

The post insulators should conform to the latest applicable Indian standards IS: 2544. Creepage distance should be adequate for highly polluted outdoor atmosphere in open atmosphere. The porcelain used for manufacture of AB Switches should be homogeneous and free from flaws or imperfections that might affect the mechanical dielectric quality. They shall be thoroughly vitrified, tough and impervious to moisture. The glazing of the porcelain shall be of uniform brown in color, free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable. The porcelain and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and porcelain parts through the range of temperature variation shall not loose the parts or create undue internal stresses which may affect the electrical or mechanical strength. Cap and base of the insulators shall be interchangeable with each other. The cap and base shall be properly cemented with insulators to give perfect grip. Excess cementing must be avoided.

The bidder shall in variably enclose with the offer, the type test certificate and other relevant technical guaranteed particulars of insulators offered by them. Please note that AB Switches without type test certificates will not be accepted.

Each 11kV Post Insulators should have technical particulars as detailed below:

S.N.	Particular	Value
1	Nominal system voltage KV (rms)	11
2	Highest system voltage KV (rms.)	12
3	Dry Power Frequency one minute withstand voltage (rms) in kV	35
4	Wet Power frequency one minute withstand voltage (rms) in kV	35
5	Power Frequency puncture KV (rms) voltage	1.3 times the actual dry flashover voltage
6	Impulse withstand voltage KV (Peak)	75
7	Visible discharge voltage KV (rms)	9
8	Creepage distance in mm (minimum)	320

4 The rated insulation level of the AB Switches shall not be lower than the values specified below:

S.N.	Standard declared Voltage	Rated voltage of the AB switch	Standard impulse withstand voltage (positive & negative polarity Isolating distance		One Minute power frequency withstand voltage KV (rms)	
			Across the Isolating distance	To earth & between poles	Across the Isolating distance	To earth & between poles
1	11KV	12kV	85kV	75kV	32kV	28 kV

5 TEMPERATURE RISE:

The maximum temperature attained by any part of the equipment when in service at site under continuous full load conditions and exposed to the direct rays of Sun shall not exceed 45 degree above ambient.

6 MAIN CONTACTS:

AB Switches shall have heavy duty self-aligning type contacts made of hard drawn electrolytic copper/brass. The various parts should be accordingly finished to ensure inter changeability of similar components. The moving contacts of the switch shall be made from hard drawn electrolytic copper brass. This contact shall have dimensions as per drawing attached so as to withstand safely the highest short-circuit currents and over voltage that may be encountered during service. The surface of the contact shall be rounded smooth and silver-plated. In nut shell the male and female contact assemblies shall ensure.

a. Electro-dynamic withstands ability during short circuits without any risk of repulsion of contacts.

b. Thermal withstands ability during short circuits.

c. Constant contact pressure even when the lower parts of the insulator stacks are subjected to tensile stresses due to linear expansion of connected bus bar of flexible conductors either because of temperature variations or strong winds. Wiping action during closing and opening.

d. Fault alignment assuring closing of the switch without minute adjustments

7 CONNECTORS:

The connectors shall be made of hard drawn electrolytic copper or brass suitable for DOG/RABBIT ACSR conductor for both 11KV AB Switches. The connector should be 4 -bolt type.

8 OPERATING MECHANISM:

All AB Switches shall have separate independent manual operation. They should be provided with ON/OFF indicators and padlocking arrangements for locking in both the end positions to avoid unintentional operation. The isolating distances should also be visible for the AB Switches.

The AB Switch will be supplied with following accessories:

S.N.	Item	Size of 11 kV AB Switch
1	Operating Rod (GI dia)	Length 5.50 meter, dia 25 mm
2	Phase coupling square rod (GI)	Length 1800 mm, Size 25x25 mm
3	Hot dip galvanized Operating handle (GI)	1 No.

The AB Switches shall be capable to resist any chance of opening out when in closed position. The operating mechanism should be of robust constructions, easy to operate by single person and to be located conveniently for local operation in the switchyard. The GI pipe shall conform to ISS: 1239-68 and the vertical down rod should be provided with adequate joint in the mid section to avoid bending or buckling. Additional leverage should be provided to maintain mechanical force with minimum efforts. All iron parts should be hot dip galvanized. All brass parts should be silver Plated and all nuts and bolts should be hot dip galvanized

9 ARCING HORNS:

It shall be simple and replaceable type. They should be capable of interrupting line charging current. They shall be of first make and after break type.

10 BUSH:

The design and construction of bush shall embody all the features required to withstand climatic conditions specified so as to ensure dependable and effective operations specified even after long periods of inaction of these Air Break Switches. They shall be made from highly polished Bronze metal with adequate provision for periodic lubrication through nipples and vent.

11 DESIGN, MATERIALS AND WORKMANSHIP:

The successful tenderers shall assume full responsibility for co-ordination and adequate design. All materials used in the construction of the equipment shall be of the appropriate class, well finished and of approved design and material. All similar parts should be accurately finished and interchangeable.

Special attention shall be paid to tropical treatment to all the equipment, as it will be subjected during service to extremely severe exposure to atmospheric moisture and to long period of high ambient temperature. All current carrying parts shall be of non- ferrous metal or alloys and shall be designed to limit sharp points/edges and similar sharp faces. The firm should submit the following type test certificate along with the certified copy of the drawing. The type test should not be older than 5 years from the date of opening of tender.

1. Test to prove capability of rated peak short circuit current and the rated short time current. The rated short time current should correspond to minimum of 10kA and the peak short circuit current should correspond to minimum of 25kA.
2. Lightning impulse voltage test with positive & negative polarity.
3. Power Frequency voltage dry test and wet test.
4. Temperature rise test.
5. Mill volt drop tests.

12. Dimension of 11 kV AB Switches in (Max.) Tolerance 5%.

S.N.	Particular	11KV AB Switch
1	MS Channel	450x75x40
2	Creepage distance of Post Insulator	320mm (Min)
3	Highest of Port shell	254 mm
4	Fixed contact assembly	
	i) Base	165x36x8
	ii) Contact	70x30x6
	iii) GI cover	110X44
5	Spring	6nos
6	Moving contract assemble	
a	Base Assembly	135x25x8

b	Moving	180x25x9
c	Bush	Bronze Metal
d	Thickness of Grooves	7

13 CONNECTORS:

The bidder should provide AB Switches with terminal connectors, set of insulators, mechanical inter works and arcing horns sets. The base channel for the mounting of AB Switches shall also be included in the scope of AB Switches. The operating mechanisms together with down pipe operating handle etc. are also included in the scope of supply.

14. ROUTINE TEST CERTIFICATE: -

The Routine test certificate should invariably be submitted in duplicate of each lot offered for inspection as per IS: 9920 (part-I to IV). The offers received without Routine test certificate shall not be entertained.

15 ACCEPTANCE TEST: -

At the time of inspection following test shall be carried out: -

a. Physical verification and measurement of dimension.

b. Power frequency high voltage test.

c. Temperature rise test.

d. Mechanical endurance test / operation test.

e. Milli volt drop test.

f. Galvanising test

16 NAME PLATE: -

The name plate in the following design shall be fixed on each AB Switch.

a. Name of supplier :

b. Name of purchaser :

c. Rating :

d. Serial number of unit :

The size of name plate shall be 2" x 1" for 11 KV AB Switch.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: 11 kV Air Break Switch

SNo	Particular	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer		
2	Country of Origin		
3	Years of Manufacturing Experience		
4	Type		
5	Applicable Standard		
6	Maximum permission continuous service voltage (KV)	12 kV	
7	Length of the Break/Phase (Min.)	400 mm	
8	Phase to Phase Spacing	750 mm	
9	Power Frequency withstand test voltage for		

SNo	Particular	NEA Requirement	To be filled by Bidder/Manufacturer
	completely assembled switches		
9.1	Against ground		
9.1.1	Dry KV	28 kV	
9.1.2	Wet KV	28 kV	
9.2	Across open contact		
9.2.1	Dry KV	32 kV	
9.2.2	Wet KV	32 kV	
9.3	Between Phases		
9.3.1	Dry KV	28 kV	
9.3.2	Wet KV	28 kV	
10	Impulse withstand test voltage of completely assembled switch without arcing horns with 1.2/50 micro second impulse wave KV (Peak)	85 kV	
11	100% impulse flashover voltage of completely assembled switch with arcing horns with 1.2/50 micro second impulse wave KV (Peak)	85 kV	
12	Particulars of the main contacts i.e. fixed contacts and moving contacts		
12.1	Type	Spring loaded fixed & knife type moving contacts	
12.2	Material	Hard drawn electrolytic copper alloy	
12.3	Surface Treatment & Thickness of Silver Coating	Silver plated of thickness of 5 micron	
12.4	Contact Pressure	25 kg	
13	Continuous Current Rating, Amps	400 A	
14	Short Time Current Rating KA (rms) min. for1 sec	16 kA	
15	Rated Peak Short Circuit Current (KA Peak)	25 kA	
16	No. of operations which the switch can withstand without deterioration of contacts	2000	
17	Type of Mounting	Horizontal up right mounting	
18	Type & Material used in connector	Brass/ Bronze strips	
19	Location and Type of Bushing	Bush bearing at rotating insulator	
20	Particulars of Post Insulators		
20.1	Make	To be indicated	
20.2	Type	11 KV Post insulator type	
20.3	Strength	10 kN	
20.4	Weight	5 kg /unit	
20.5	No. of units per stack	one	
20.6	Height of stack	254 mm	
20.7	Creepage distance mm	320 mm	
20.8	One Minute Power Frequency Dry withstand voltage KV (rms)	65 kV	
20.9	Power Frequency Flashover voltage KV (rms)	70 kV	
20.10	Impulse flashover voltage KV (Peak)	85 kV	
20.11	Impulse withstand voltage KV (Peak)	80 kV (peak)	
20.12	Puncture voltage (KV)	105 kV	
21	Delivery of equipment following award of contract and approval of drawing	months	
22.1	ISO 9001 holder (including design)	yes/no	
22.3	ISO 9001 certificate submitted	yes/no	
23.1	Type test certificate submitted	yes/no	
23.2	Submitted for the required ratings	yes/no	
23.3	Type test certified by		
24	User's certificate submitted	yes/no	
25	Has exported to third country	yes/no	
26	Copies of relevant standards attached	yes/no	
27	Outline Drawings and associated GA attached	yes/no	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Underground Cable

1.1 Scope

This specification covers the design, manufacture, factory test, supply, delivery, type test, construction, of single core, aluminum conductor, single core cross-linked polyethylene (XLPE) insulated Power Cables to be used for underground line at 33 kV and 11 kV Voltage level including all its accessories required.

The equipment and installation works specified in this Section shall conform to the latest edition of the appropriate IEC specifications and/or other recognized international standards

The XLPE power cable shall be manufactured and tested in accordance with IEC 60502-2 or the latest version thereof or other equivalent international standards that ensures at least a substantially equal quality to the standard mentioned above.

2. General Requirements

2.1 The cable shall be cross-linked polyethylene insulated, PVC separation sheathed, steel armored and PVC outer sheathed.

2.2 The conductor shall consist of compact round stranded aluminum wires. They shall comply with the latest IEC standard or any other national or international standards that ensure at least a substantially equal quality to the standard mentioned above will also be acceptable. The maximum conductor temperature shall be 90 deg. C.

2 The insulation shall be of XLPE compound with the minimum thickness as specified. The make of XLPE compound shall be from reputed manufacturers like DOW Chemicals (USA), Hanwha Chemical (Korea), Borealis AG (Austria) or Equivalent reputed make.

2.1 Each conductor shall be wrapped with a layer of semi-conducting tape or free stripping extrusion as a conductor (strand) screen. The conductor shall be insulated by cross-linked polyethylene material (XLPE). The XLPE layer shall be surrounded by insulation screen of semiconducting tape or free stripping extrusion. Above the insulation screen a metallic screen of plain copper tape shall be provided. All three conductors shall be assembled together with fillers and bound with a tape, which shall be again warped in PVC inner covering.

2.2 The armor shall be of hard drawn round aluminum wires for mechanical protection of the cable. The size of armor shall be as specified in the relevant Standards.

2.3 The outer covering of the cable shall be black PVC suitable for the operating temperature of cable and shall meet the requirements of the IEC Standard or any other national or international standards.

2.4 The minimum thickness of insulation at any point shall not fall below the as guaranteed value. Negative tolerances are not allowed for the thickness of insulation.

2.5 The minimum thickness of separation sheath or outer sheath at any point shall not fall below the nominal value.

2.6 The supplied cable shall be longitudinal water tight. For this purpose, a layer of suitable water swellable absorbent tape shall be provided over insulation screen.

2.7 Rating and features of the cables to be furnished shall be as per the requirements.

2.8 The outer covering of the cable shall be embossed with the name/brand of the manufacturer, type designation, Voltage grade, cable size, year of manufacture, name of the Purchaser, type of insulation at the spacing of each 2 meters. Every meters of outer covering of the cable shall also be embossed with length of the cable.

3. Specific Requirements

3.1 Small cut piece lengths of cables will not be accepted. Cables up to 500 meters in length or as approved by Employer/Employer's Representative shall be of one length shipped in a drum of

adequate size. For higher quantities, multiple lengths/drums may be shipped subject to the approval of Employer/Employer's Representative.

TABLE 1: Rating and Features

SN	Description	11 kV Line
1	Rated voltage, phase to phase (Uo)	11 kV
2	Highest voltage of three-phase system (Um)	12 kV
3	Rated lightning impulse withstand voltage	75 kVp
4	Rated power-frequency short duration withstand voltage for one minute	28 kV
5	Insulation	
5.1	Material of Insulation	XLPE
5.2	Thickness of Insulation (minimum)	3.4 mm
6	Conductor	
6.1	Type of Conductor	EC grade aluminum
6.2	Stranded Conductor	yes
7	Number of Cores	
8	Maximum Initial conductor Temperature during operation	< 90 deg. C
9	Maximum Final Conductor Temperature during short circuit	< 250 deg. C

4. TESTS

(a) Type Tests

The Type Test from the recognized laboratory shall be conducted.

(b) Routine Tests (Factory Acceptance Tests)

The following tests shall be carried out at the manufacturer's plant before shipment as far as applicable for each type of conductors and cables:

i) Appearance check
ii) Conductor resistance measurement
iii) Capacitance measurement
iv) Insulation resistance measurement
v) A.C. withstand voltage
vi) A.C. long duration withstand voltage
vii) Impulse withstand voltage
viii) A.C. long duration breakdown voltage
ix) Impulse break-down voltage
x) Dielectric loss tangent
xi) Temperature-voltage characteristic
xii) Dimension
- Conductor outermost diameter
- Insulation thickness
- Sheath thickness
- Over-sheath thickness
- Thickness of each tape

- Interval of tape lapping
- Total diameter

xiii) Bending withstand characteristic

xiv) Over-sheath, tensile strength

xv) - do. - , thermal aging

xvi) - do. - , oil-proof

xvii) - do. - , non-inflammability

xviii) - do. - , thermal deformation

xix) - do. - , hardness

5. **Packaging**

The conductor shall be supplied in non-returnable drums/reels. The drum/reel shall be made of steel suitably protected against corrosion. Protective external lagging of sufficient thickness shall be provided and fitted closely on the reels. Binder consisting of steel straps shall be provided over the external laggings. The drum shall be new and sufficiently rugged in construction to withstand ocean shipping, road transport, several loading and unloading, storage in tropics, hauling and field erection of cables without distortion or disintegration.
Each reel of conductor furnished shall contain only one (1) length of cable.

All reel shall be legibly marked in paint with the following information:

a) Voltage grade of Cable
b) Size of cable
c) Type of Conductor
d) Type of insulation
e) Length in meters
f) Net weight of cable

6. Drawings, Data & Manuals

The following information shall be furnished along with the Tender.

(a) Manufacturer's leaflets giving constructional details, dimensions and characteristics of different cables.

(b) Current rating of cables including de-rating factor due to grouping, ambient temperature and type of various installation.

(c) Write-up with sketches illustrating the manufacturer's recommendation for splicing, jointing and termination of different types of cables.

(d) Type test report of power cables. The Bidder shall clearly describe the type and routine tests to be performed on cables.

(e) Drum length for each of cable.

Cable Termination and Joint Kits

1. **Scope:**

This specification covers the design, manufacture, factory test, supply and delivery of cable termination and joint kits for single core, aluminum conductor, XLPE insulated armored power cable used in underground 33 kV and 11 kV distribution system.

2. Description:

2.1 All high voltage terminations and jointing kits shall be standard quality type. They shall be factory engineered kits containing all the necessary components to reinstate the cable insulation, metallic shielding of each core, together with the reinstatement of the sheath, of the cable being terminated.

2.2 The heat shrinkable termination and joint kit shall be manufactured and tested in accordance latest version of IEC, or any other national or international standard that ensures at least a substantially equal quality to the standard mentioned above will also be acceptable.

2.3 The manufacturer of the termination and joint kit (Indoor, outdoor and straight- through) must have been accredited with ISO 9001 quality certification.

2.4 The entire termination and joint kit shall be environmentally sealed and capable of preventing the ingress of external moisture and contamination.

2.5 Kits shall contain sufficient cleaning solvents and cleaning clothes for the proper making of the joint or termination.

2.6 Voltage stress relief shall be provided and this may be inherent in the heat recoverable polymeric material.

2.7 The terminating or jointing materials shall not be subjected to storage limitations such as controlled temperature or humidity restrictions, nor have self-life limitations.

3. Other Requirements

3.1 The outdoor termination kits shall be suitable for terminating the cable at steel cross arm complete with brackets, terminals, saddles and all necessary materials for fixing the termination. The heat shrinkable termination kit to be supplied and installed under this scope of work shall be capable enough to cope with all the weather change. Terminations that do not require manually built stress relief cones or field pouring compound are preferred.

3.2. The straight through joint kit shall be suitable for jointing single core of cables. The termination kits shall include all necessary components to join two alike cables sections together directly buried. Kits that do not require manually built stress relief cones or field pouring of compound are preferred.

3.3 Each of the above terminations and joint kits shall be complete in every respect and include clear, detailed instructions in English illustrating steps by step procedure in preparing the cable and applying the termination compounds.

3.4 Cross bond or suitable design of earthing shall be employed so that shielding of both sides of each joint shall be connected to the shielding of the other phase, so as to suppress the induced voltage. Necessary materials for such appropriate earthing shall be provided by the Contractor.

3.5 The minimum creepage distance of outdoor terminal/sealing-ends shall be as required for heavily polluted atmospheres in line with the appropriate IEC Standard.

3.6 Terminating and jointing kit shall be in a separate package, a list of materials indicating quantities and weights and an instruction sheet shall be included in the package.

3.6 Accessories shall match the cable test ratings in all respects. The supplied termination and joint kits shall be of suitable for the cables mentioned in Price Schedule

4. Testing

The routine tests of the kits shall be done at manufacturer's plant in accordance with IEC or other equivalent national or international standards including following tests.

- Appearance Test
- Construction Test
- High Voltage Test

5. Bid Documentation

1. The Bidder shall provide with the Bid two (2) clear copies of the manufacturer governing Standard of the termination and joints and kits two (2) clear copies of all other relevant standards referenced herein.
2. The Bidder shall provide certified type test results of the termination and joint kits as required by governing standards.
3. The Bidder shall provide complete description, catalogue and drawings of the termination and joint kits.
4. A clause-by-clause commentary on specification, specifying compliance and deviation, if any.
5. All data, drawing, catalogue and other technical documents supplied shall be bound separately from the Bid Document.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Power Cable (XLPE)

S.N.	Description	Unit	11 kV Line	
			NEA Req.	To be Filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
	Years of Manufacturing Experience			
2	Applicable standard			
3	Cable Type Designation			
4	Rated Voltage	kV		
4.1	Maximum System Voltage	kV	12	
4,2	Rated Voltage between conductor and screen	kV		
4.3	Rated Voltage between two conductors	kV		
4.4	Power Frequency Withstand Voltage	kV	28	
4.5	Impulse Withstand Voltage (BIL)	kV	75	
5	Conductor			
5.1	Conductor Material		EC grade AL	
5.2	Cross section of the Conductor	sq. mm.		
5.3	Is Conductor Stranded?	(Yes/No)	yes	
5.4	Stranded Conductor			
	i) Number of strands in each core			
	ii) Size of strand	Sq. mm.		
	iii) Maximum DC Resistance at 20 deg. C	Ohm/km		

	iv) Class of Stranding			
6	Number of Cores			
7	Insulation			
7.1	Insulation material and Type Designation		XLPE	
7.2	XLPE Compound make			
7.3	Minimum thickness of insulation	mm	3.4	
7.4	Minimum volume resistivity at 27 deg. C, 70 deg. C and 90 deg. C	Ohm-cm		
8	Sheath			
8.1	Material for inner sheath, type of sheathing and Type Designation			
8.2	Minimum thickness of inner sheath	mm		
8.3	Material for outer sheath, type of sheathing and Type Designation			
8.4	Minimum thickness of outer sheath	mm		
9	Armor			
9.1	Material			
9.2	Shape			
9.3	Dimension	mm		
10	Conductor Screen			
10.1	Material			
10.2	Thickness	mm		
11	Insulation Screen			
11.1	Material			
11.2	Thickness	mm		
12	Metallic Layer/Screen			
12.1	Type			
12.2	Material			
12.3	Thickness	mm		
13.1	Overall Diameter of the Cable	mm		
13.2	Geometric Mean Radius (GMR) of the Cable/Conductor	mm		
14	Minimum Bending Radius	mm		
15	Insulation Resistance at 27 deg. C	Ohm/km		
16	Capacitive Reactance	Ohm/km		
17	Inductive Reactance	Ohm/km		
18	Conductor Temperature rise during			
18.1	Normal Operation	deg. C	90	
18.2	Short Circuit	deg. C	250	
19	Continuous Current Carrying Capacity			
19.1	Continuous Current Carrying Capacity in air and Corresponding assumptions/Conditions of installation	A		
19.2	Continuous Current Carrying Capacity under ambient temperature	A		
19.3	Continuous Current Carrying Capacity under Cable laid in Covered cable trenches	A		
19.4	Continuous Current Carrying Capacity under 3-6 Cables per tray touching each other in Covered cable trenches	A		
19.5	Continuous Current Carrying Capacity under ambient temperature for Cable laid in ground	A		
20	Short circuit current			
20.1	Short circuit current for 0.1 sec	kA		
20.2	Short circuit current for 1.0 sec (minimum kA)	kA		
20.3	Short circuit current for armor 1.0 sec	kA		

	(minimum kA)			
21.1	Minimum tensile strength of insulation	kg/sq. cm		
21.2	Minimum elongation at break	%		
22.1	Minimum tensile strength of sheath	kg/sq. cm		
22.2	Minimum elongation at break	%		
23.1	Minimum tensile strength of armor	kg/sq. cm		
23.2	Minimum elongation at break	%		
24.1	Weight of Cable per km	kg/km		
24.2	Standard length of Cable per drum	m	min. 500m	
24.3	Net weight of cable in drum	kg		
25	Method of Core identification			
25.1	For Cables up to Five Cores			
25.2	For Cable with more than Five Cores			
26	Details of Anti Termite Covering			
27	Fire Retardant	yes/no	yes	
28	Moisture Resistant	yes/no	yes	
29	Longitudinal water tight	yes/no	yes	
30	Details of Marking on Outer Sheath			
31	Please indicate in YES or NO whether the following tests have been carried out			
31.1	Ageing Test	yes/no	yes	
31.2	Loss of Mass Test	yes/no	yes	
31.3	Cold Impact Test	yes/no	yes	
31.4	Heat Shock Test	yes/no	yes	
31.5	Fire Retardant Test	yes/no	yes	
32	ISO 9001 holder (including design)	yes/no	yes	
32.1	ISO 9001 certificate submitted	yes/no	yes	
33	Type test certificate submitted	yes/no	yes	
33.1	Submitted for the required ratings	yes/no		
33.2	Type test certified by			
34	User's certificate submitted	yes/no	yes	
35	Has exported to third country	yes/no	yes	
36	Copies of relevant standards attached	yes/no	yes	
37	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

GUARANTEED TECHNICAL PARTICULARS

(To be completed by the Bidder/Manufacturer)

Item: Outdoor Termination Kit and Straight Through Joints (XLPE)

S.N.	Description	Unit	11 kV Line	
			NEA Req.	To be Filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Applicable standard			
5	Type			
6	Insulation level			
7	Maximum design voltage			
8	Impulse withstand voltage(BIL)			
9	Fire resistance treated	yes/no	yes	
10	Smoke resistance treated	yes/no	yes	
11	Stress relief performed	yes/no	yes	
12	Installation Instruction attached	yes/no	yes	
13	List of Installation Accessories Supplied			
14	ISO 9001 holder (including design)	yes/no	yes	
14.1	ISO 9001 certificate submitted	yes/no	yes	
15	Type test certificate submitted	yes/no	yes	
15.1	Submitted for the required ratings	yes/no		
15.2	Type test certified by			
16	User's certificate submitted	yes/no	yes	
17	Has exported to third country	yes/no	yes	
18	Copies of relevant standards attached	yes/no	yes	
19	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Installation of Underground Cable

a) General Scope

The contractor shall lay cables in accordance with IS 1255 or equivalent national or international Standards by using flexible pipes and HDPE pipes on crossings. The cable laying methodology based upon the applicable standards shall be duly approved by the Employer before the commencement of works.

b) Installation of cables

The underground cable lines consist of one or three core power cables.

Joint and/or terminal works for the cables shall be made with utmost care by the skilled workers. Extra loop of approximately 2 to 5 m length at cable termination and joint shall be made as far as the space is available.

The contractor shall install the steel and/or concrete cable mark as approved by the Employer at 100 m intervals along the cable route.

The cables shall be terminated with sealing ends and bushings. Each terminal shall be provided with phase identification marks of R-Y-B.

Arrangement of flexible pipes for cable installation shall be approved by the Employer. Joints and terminations of those pipes shall be properly made so that penetration of water inside the flexible pipes after completion of the works is not allowed.

Prior to pull-through of the cable into the flexible pipes, the Contractor shall calculate the pull-through length of the cable and confirm that the pull-through tension is not more than permissible tension.

The shields of the power cables shall be grounded in the approved manner at each joint.

c) Installation of Terminal/ Sealing Ends

The cable end at both sides of the Park at river banks shall be made as per IEC standard. Necessary additional steel structure with concrete foundation shall be constructed for the installation of bushings as well as LA.

d) Inspection and Tests

Through the work execution, various inspections and tests on the progressing works will be ordered to the Contractor by the Employer.

Following inspections and tests will be carried out after completion of the works section by section. The Contractor shall perform all the inspections and tests in accordance with IEC Standard.

a) Visual inspection of the underground cable lines

- Back filling and grade
- Cable and joint marks
- Cable termination and connection

b) Measurement insulation resistance of the lines

c) H. V. test

Flexible Pipe

1. General

Hard corrugated flexible conduit pipe of designated diameter shall be used for installation of 33 kV and 11 kV XLPE power cable. The flexible pipe shall be buried before the cable installation and, then the cables shall be pulled in.

2. Requirement

The flexible conduit pipe shall be of polyethylene and shall be strong enough to withstand the compression force from heavy trucks or lorries when it is buried more than 80 cm below the ground level. The pipe's projected cross section shall be practically round and it shall be corrugated to get flexibility. The pipe should be suitable for 4 kgf/cm^2 pressures. However, HDPE pipes of 6 kgf/cm2 shall be used along road crossings.

3. Accessories

The flexible conduit pipe shall be provided with necessary accessories, such as joints and sealing material etc.

The straight joint sleeve shall be made of high density polyethylene coloured black and to be so designed as to be screwed on to flexible pipe.

Bell mouth shall be fixed to the end of corrugated pipe to facilitate cable pulling in.

The bell mouth shall be so designed as to screwed into the pipe. It shall be made of hard density polyethylene and colored black.

Water proof materials for pipes in manhole shall be mounted to an outlet of duct to keep the water tightness.

The waterproof materials shall be comprised the components such as sand-proof seal, sealing tape, neo seal compound, VUL-CO tape, PVC tape and other necessary materials to complete the specified scope of works.

GUARANTEED TECHNICAL PARTICULARS
(To be completed by the Bidder/Manufacturer)

Item: Flexible Pipe

S.N	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
2	Country of Origin			
3	Years of Manufacturing Experience			
4	Applicable standard			
5	Manufacturer Type Designation			
6	Type		Corrugated hard polyethylene	
7	Thickness of pipe	mm		
8	Outer diameter of the pipe	mm		
9	Tensile Strength	N/mm^2		
10	Compressive Strength	N/mm^2		
11	Bending Strength	N/mm^2		
12	Delivery of equipment following award of contract and approval of drawing	months		
13	ISO 9001 holder (including design)	yes/no		
13.1	ISO 9001 certificate submitted	yes/no		
14	Type test certificate submitted	yes/no		
14.1	Submitted for the required ratings	yes/no		
147.2	Type test certified by			
15	User's certificate submitted	yes/no		

16	Has exported to third country	yes/no		
17	Copies of relevant standards attached	yes/no		
18	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Covered Conductor

1. **Scope**

This Specification covers the general requirements of design, manufacture and testing of XLPE covered aluminum alloy conductor for 11kV overhead distribution system.

2. **Description**

2.1 The conductor shall be of multi-strand round compacted hard drawn aluminum alloy conforming to AS 3675 with latest revision thereof or any recognized international standards that ensures at least a substantially equal quality to the standard mentioned above. The Conductor wires shall not have any joints except for those made on the base wire.

2.2 The covering insulating material shall be of track resistant UV stabilized (weather resistant). The make of XLPE compound shall be from reputed manufacturers like DOW Chemicals (USA), Hanwha Chemical (Korea), Borealis AG (Austria) or Equivalent reputed make. The average thickness of the covering insulation shall not be less than that stipulated in the Technical Requirements. The hardness of the covering XLPE shall be such that it should not get damaged by the kite string and shall be suitable for fixing insulation piercing Arc Protectors. The covering shall be fully pressure extruded and dry cured so as to provide a uniform thickness throughout the length of the conductor.

2.3 Suitable water blocking material shall be incorporated between the conductor and the covering during the extrusion process to prevent the ingress of water along the conductor. The water blocking material shall be of contrasting colour to that of the conductor. The water blocking material shall not affect the inter-strand conduction and also not affect the adhesion between the conductor and the XLPE cover. Water blocking material shall be stable at maximum operating temperature of 80^{o}C and full technical particulars with regard to the above shall be furnished with the offer.

2.4 The following types of covered conductors shall be supplied:

A) Nominal conductor area mm2 – 120
i) Number of strands Nos. - 7
ii) Diameter of the wire mm - 4.75
iii) Nominal conductor diameter mm - 14.5
iv) Max. linear resistance at 200C Ohms/km - 0.239

B) Covering Insulation
i) Minimum average thickness of XLPE covering mm - 2.0
ii) Minimum thickness of XLPE covering at any point - 1.7
iii) Maximum thickness of XLPE covering at any point - 2.5

C) Covered Conductor
i) Minimum breaking strength of conductor (kN) – 27.1
ii) Short time current rating/1sec. (kA) – 11.0
iii) Conductor Operating Temperatures (Max.)
1) Continuous operation ^{0}C - 80
2) Emergency operation ^{0}C - 100
3) Short circuit operation (5 sec) ^{0}C - 210

iv) Covered conductor overall diameter range mm - 19.3 to 21.9

3. **Packaging**

3.1 The finished covered conductors shall be delivered in continuous lengths of 500 ± 5 meters and the ends of the covered conductors shall be effectively sealed with heat shrinkable cap to prevent ingress of moisture. The conductor shall be wound to the drum with the lowest number at the inner end of the drum. They shall be supplied on non-returnable steel drums capable of withstanding all normal transportation and handling. Protective external lagging of sufficient thickness shall be provided and fitted closely on the drums. Binder consisting of steel straps shall be provided over the external laggings. The drums shall be new and sufficiently sturdy in

construction to withstand ocean shipping, road transport, several loading and unloading, storage in tropics, hauling and field erection of conductor without distortion or disintegration.

3.2 Each reel of the conductors furnished shall contain only one (1) length of conductor.

3.3 All reels shall be legibly marked in paint with the following information:

a) Size of conductor
b) Type of conductor
c) Length in meters
d) Net weight of conductor
e) Direction of rolling

3.4 The standard length of the completed covered conductor in each reel shall be as per the table below:

Conductor Size (sq. mm):	120
Normal Length of the Conductor (m):	500

4. Tests

4.1 Routine Tests

The manufactured conductor shall be tested in full compliance with the governing standard including following routine tests:

Test on wire before stranding

i) Wire diameter
ii) Ultimate tensile strength
iii) Wrapping test
iv) Resistivity test

Test on finished covered conductor

i) Inter-strand conductivity test
ii) Thickness of covering
iii) Static water blocking test
iv) Stripping test
v) Spark test

4.2 Type Tests

The Bidder shall submit the type test reports along with the Bid. The Covered Conductors shall be type tested conforming to AS 3675 of 1993 or revisions thereof, or IEC Standard or UK ESI or NFC and certified copies of the type test certificates shall be furnished with the bid. The test shall have been carried out in internationally recognized independent testing authority. The employer also reserves the right to have tests carried out at his own cost by an independent agency, whenever there is a dispute regarding the quality of supply. The cable shall be subjected to the following type tests:

a) Tests on wire before stranding
b) Tests on covering material
c) Tests on finished covered conductor

The Type Test Certificates furnished shall be from a recognized independent testing authority acceptable to the purchaser.

5. Bid Documentation

5.1 The Bidder shall provide with the Bid two (2) clear copies of the governing standards for fabrication and testing of the covered conductor and two (2) clear copies of all other relevant standards referenced therein.

5.2 The Bidder shall provide certified type test results of the types of covered conductor as required by governing standards.

5.3 The Bidder shall also furnish the Certificate of Compliance at the time of the shipment of each lot of conductor, or as required by the appropriate section of the equivalent international standard.

5.4 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

5.5 All data, drawings, catalogues and other technical documents shall be bound separately from the Bid documents.

GUARANTEED TECHNICAL PARTICULARS

(To be completed by Bidder/Manufacturer)

Item: Covered Conductor

S.N.	DESCRIPTION	UNIT	NEA REQ.	To be Filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
	Years of Manufacturing Experience			
2	Applicable standard		AS/NZ or Equivalent	
3	Cable Type Designation			
4	Rated Voltage	kV		
4.1	Maximum System Voltage	kV		
4.2	Power Frequency Withstand Voltage	kV		
4.3	Impulse Withstand Voltage (BIL)	kV		
5	Conductor			
5.1	Conductor Material		AL	
5.2	Alloy Type/Grade			
5.3	Cross section of the Conductor	sq. mm.	120 sq.mm.	
5.4	Is Conductor Stranded?	(Yes/No)		
5.5	Stranded Conductor			
	v) Number of strands in each core			
	vi) Size of strand	Sq. mm.		
	vii) Maximum DC Resistance at 20 deg. C	Ohm/km		
	viii) Class of Stranding			
6	Number of Cores		One	
7	Covering Insulation			
7.1	Insulation material and Type Designation		XLPE	
7.2	Minimum average thickness of XLPE covering	mm		
7.3	Minimum thickness of XLPE covering at any point	mm		
7.4	Maximum thickness of XLPE covering at any point	mm		
7.5	Tolerance on the measured value of thickness	%		
7.6	Minimum volume resistivity at 27 deg. C, 70 deg. C and 90 deg. C	Ohm-cm		
	Water Blocking Material			
8	Sheath			
8.1	Material for sheath, type of sheathing and Type Designation			
8.2	Thickness of sheath and tolerance on measured value	mm, %		
13.1	Overall Diameter of the Cable	mm		
13.2	Tolerance on diameter	%		
13.3	Geometric Mean Radius (GMR) of the Cable/Conductor	mm		
14	Minimum Bending Radius	mm		
15	Insulation Resistance at 27 deg. C	Ohm/km		
16	Capacitive Reactance	Ohm/km		
17	Inductive Reactance	Ohm/km		
18	Conductor Temperature rise during			
18.1	Normal Operation	deg. C		

18.2	Short Circuit	deg. C		
19	Continuous Current Carrying Capacity	A		
20	Short circuit current			
20.1	Short circuit current for 0.1 sec	kA		
20.2	Short circuit current for 1.0 sec (minimum kA)	kA		
21.1	Minimum tensile strength of insulation	kg/sq. cm		
21.2	Minimum elongation at break	%		
22.1	Minimum breaking strength of conductor	kg/sq. cm		
22.2	Minimum elongation at break	%		
23.1	Minimum tensile strength of armor	kg/sq. cm		
23.2	Minimum elongation at break	%		
24.1	Weight of Cable per km	kg/km		
24.2	Standard length of Cable per drum	m		
24.3	Tolerance on length of cable per drum	%		
24.4	Net weight of cable in drum	kg		
25	Please indicate in YES or NO whether the following tests have been carried out			
25.1	Ageing Test	Yes/No	Yes	
25.2	Loss of Mass Test	Yes/No	Yes	
25.3	Cold Impact Test	Yes/No	Yes	
25.4	Heat Shock Test	Yes/No	Yes	
25.5	LV and Tertiary Winding	Yes/No	Yes	
25.6	Oxygen index test and temperature index test	Yes/No	Yes	
25.7	Fire Retardant Test	Yes/No	Yes	
26	Delivery of equipment following award of contract and approval of drawing	months		
27	ISO 9001 holder (including design)	yes/no	yes	
27.1	ISO 9001 certificate submitted	yes/no	yes	
28	Type test certificate submitted	yes/no	yes	
29.1	Submitted for the required ratings	yes/no		
29.2	Type test certified by			
30	User's certificate submitted	yes/no	yes	
31	Has exported to third country	yes/no	yes	
32	Copies of relevant standards attached	yes/no	yes	
33	Outline Drawings and associated GA attached	yes/no	yes	

Signed by……..
Designation……..

As Representative for……..
Place……
Date…….
Seal of Bidder/Manufacturer ……

Fitting for Covered Conductors

1. Scope

This Specification covers the fabrication and supply of fittings and associated apparatus for with HV AAC XLPE covered conductors.

2. Description

2.1 The fittings, hardware and equipment shall be fabricated in accordance with International recognized standards such as BS/EN, NFC for Fittings and Associated Apparatus that ensures at least a substantially equal quality to the standard mentioned above, will also be acceptable. The fitting and accessories shall be suitable for 11 kV nominal voltage applications.

2.2 The Covered Conductor hardware manufacturing company shall have been accredited with ISO 9001 quality certification (including design for covered conductor accessories).

2.3 The fittings shall be for use in conjunction with XLPE covered conductor of 120 sq. mm and 80 sq.mm. nominal cross-sectional areas.

2.4 Contractor shall get approval of all drawings and hardware sample from Purchaser before starting the fabrication of all hardware.

3. Power Arc Devices

Power arc devices are used as an arcing protection device for covered conductors.

4. Pin insulator for covered conductor

The Pin insulators should be porcelain type and specially designed to be used with covered conductors. There shall be a plastic sleeve in the top-groove of the insulator to enable pulling of conductor without using pulleys. The conductor can be tied to the top-groove or to the neck.

4. Tension insulator for covered conductor

The tension insulators should be porcelain type and specially designed to be used with covered conductors.

5. Horizontal and Terminal Cross-Arm for covered conductor

The horizontal and terminal cross-arms including braces and accessories should be hot dipped galvanized steel specially designed for use with covered conductors for 11 kV distribution lines. The strength and loading of lines and material grade of steel shall be similar to the other overhead 11 kV distribution lines but of suitable for covered conductors.

7. Dead End Clamps/ Anchor Clamps

The covered conductors shall be suitable to be tensioned using the tension insulator string with bolted/wedge type tension clamp. The bolted type covered conductor tension clamps are made of aluminum alloy and suitable for fixing to pin of the ball and socket type disc insulators. The purpose of terminating covered conductors over the covering fitting shall include, but are not limited to the cone, bolted or wedge type clamp and preformed helical fittings. The fittings shall be able to withstand the specific minimum failure load (SMFL) and shall not damage the covering and shall be designed to prevent the ingress of moisture during service.

8. Preformed Ties/ Composite Ties

Preformed ties/ Composite ties shall be used for attaching 120 sq mm and 80 sq.mm. AAC XLPE covered conductors to pin insulators either for straight line position or angle position. The ties for MV covered conductor shall be composite prefabricated type with a white rigid PVC rod covered by a black resistive conductive layer, no metal parts are allowed. Ties shall be used without removing the sheath of covered conductors. They shall combine the necessary mechanical holding function with protection of the conductor sheath from long term deterioration caused by electrical stress. The electrical integrity of covered conductor/ insulator system shall be maintained. The bidder shall furnish the climate ageing test report for 1000 hrs, failing which the bid shall be liable for rejection.

9. Mid Span Full Tension Joints

Mid span full tension joints are intended to ensure mechanical and electrical connection between two lengths of same cross section of bare conductors.

Each mid-span full tension joint comprises one aluminum alloy sleeve and a galvanized steel sleeve allowing the hexagonal compression on conductor core and one water tightened system heat shrinkable cover to prevent the penetration of water into the covered conductor.

Mid-span full tension joints shall be used for 120 sq. mm. and 80 sq.mm. XLPE AAC covered conductor. The Mid-span full tension joints shall be hexagonal compression type. These joints guarantee mechanical and electrical features at least equivalent to those of the conductor on which they are installed.

When in use, no conductor failure shall appear next to the mid-span full tension joints and no conductor slip shall appear at tensile load below the nominal breaking load value of the conductor.

10. Heat Shrinkable Cable End Cap

The insulated end cable cap shall be suitable for effectively sealing the end terminal of the covered conductors and shall have wet flashover voltage not less than 11 kV. The cap shall be heat shrinkable type and the inner diameter of the cap shall be such that it shall tightly fit to the covered conductors to prevent entry of moisture.

11. Insulation piercing connectors

These insulation-piercing connectors are intended to connect two covered conductors with the same or different cross section between them. The main conductor should be stretched or not. The tap connector shall be a bridge constituted by a not stretched linking covered conductor. The insulation piercing connector shall not have losable components that are liable to be lost during installation. The housing shall be made entirely of mechanical and resistant plastic insulation material and no metallic part outside the housing is acceptable except for the tightening system. The housing shall be an integral part of the connector.

The number and the length of the teeth shall be adequate enough to penetrate the relevant covered conductor insulation to establish proper contact without any contract resistance and without the need to strip the covered conductor insulation. To achieve the required water tightness a special rubber seal be provide around the teeth of the present connector. The bolts and washers shall be of corrosion resistant type. The piercing of insulation shall be simultaneous on main and tap conductor when tightening the bolts. Two different types of piercing connectors are used in covered conductor which shall be supplied with two bolts.

Main covered conductor to tap covered conductor with capacity from 50 to 120 sq mm both side

Main bare aluminum conductor to tap covered conductor with capacity main capacity 50 to 120 sq mm bare aluminum and tap covered conductor 50 to 120 sq mm.

12. Tests

12.1 Type test

The bidder shall submit the type test report along with the Bid. The report shall be issued by a recognized independent testing authority. The tests shall comply with relevant IEC/NF C Standard or the governing standard. The Employer also reserves the right to have tests carried out at his own cost by and independent agency, whenever there is a dispute regarding the quality of supply. In respect of the following fittings, the test shall include, but not limited to the following:

Dead End clamps:

- Mechanical test
  - Tensile (high tension) test on bracket
  - Tensile on anchoring clamps
- Climate ageing test

  - voltage test
  - mechanical strength test
- Voltage test
- Corrosion test
- Dynamic test at low temperature
- Endurance test under mechanical and thermal stresses
  - slippage checking test
  - voltage test

Insulation piercing connectors:

- Current carrying capacity test of the connector
- Temperature rise and over current test
  - Initial temperature test
  - Over current test
  - Final temperature test
- Electrical ageing test
- Climate ageing test
- Corrosion test
- Installation test at low temperature
- Mechanical test
  - Electrical continuity test
  - Mechanical tightening test
  - Mechanical strength of tap
- Electrical heat cycle test
- Voltage and water tightness test

Mid Span Full Tension Joint:

- Mechanical test
  - Crimping ability test
  - Tensile test
- Voltage and water tightness test
- Climate ageing test
- Corrosion test
- Electrical ageing test
- Endurance test under mechanical and thermal stresses

Tests for fittings and hardware shall be conducted in accordance with the NF C and IEC Standard or equivalent international standards including voltage and water tightness test wherever applicable.

12.2 Routine tests

Each batch of fittings shall be subjected to routine tests while manufacturing to confirm to the specified standard.

13. Quality Assurance Program

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9001; 2008

vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

14. Bid Documentation

14.1 The Bidder shall furnish with the Bid two (2) clear copies of the Standard governing fabrication and testing of the fittings and accessories for LV ABC and two (2) clear copies of all other relevant standards referenced therein.

14.2 The Bidder shall furnish two (2) sets of complete description, catalogue, dimensional drawings showing general construction and size of all fittings and accessories.

14.3 The Bidder shall furnish two (2) clear certified copies of type test report for Dead end clamp/Anchor clamp, mid span full tension joints and IPCs, failing which the bid shall be liable for rejection.

14.4 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

14.5 All technical data, drawings, catalogues and other technical documents shall be bound separately from the bid documents. Drawings for Dead end clamp/Anchor clamp, mid span full tension joints and IPCs must be submitted failing which the bid shall be liable for rejection.

14.6 The NEA may ask to furnish the type test report for other accessories from the substantially responsive bidders.

14.7 The Bidder shall furnish the sample of accessories such as Composite Ties and IPCs along with the bid, failing which the bid shall be liable for rejection.

Aerial Bundled Conductor (ABC)

1. **Scope**

This Specification covers the design, manufacture, factory test and supply of 0.6/1 kV cross-linked polyethylene (XLPE) insulated with insulated neutral messenger conductor self-supporting aerial bundled conductors (ABC) for use in the construction of 400/230V, 3-phase, 4-wire distribution network of Nepal Electricity Authority.

2. System Parameters

a)	Nominal Voltage	400/230V
b)	System Highest Voltage	1kV
c)	System frequency	50Hz
d)	No. of Phases	3
e)	Neutral Earthing	Effective
f)	System fault current	20kA rms

3. Service Condition

a)	Ambient temperature	-5 to 55 deg. C
b)	Annual average ambient temperature	30 deg. C
c)	Maximum relative humidity	99%
d)	Environmental condition	Humid Tropical climate
e)	Operational altitude	Up to 1000m above msl
f)	Isokeraunic (Thunder day) level	90 days
g)	Solar Radiation	1.6kW/m2
h)	Wind Zone	Zone 4

4. Applicable Standards

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof or any international equivalent standards and the NEA Specifications specified hereafter.

a)	BS 7870-5	Polymeric Insulated aerial bundled conductors (ABC) of rated voltage 0.6/1kV for overhead distribution
b)	IS 14225	Aerial Bundled Cables – for working voltages up to and including 1100V

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In case of conflict the order of the precedence shall be (1) IEC standards, (2) ISO standards, (3) European or British Standards, (4) Indian Standards, (5) Other alternative standards.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor or the necessity of providing the goods complying with other relevant standards or recommendation.

5. Technical Parameters

5.1 Minimum Technical Requirements

S.N.	Description	Unit	Requirements
1	Rated Voltage	kV	
2	Maximum System Voltage	kV	
3	Rated Voltage between two conductors	kV	
4	Power Frequency withstand voltage	kV	
5	Number of Cores		4
6	Phase Conductor		3
6.1	Material Type		EC Grade Al.

S.N.	Description	Unit	Requirements
6.2	No. and Diameter of Strand	No/mm.	7/
7	Messenger Conductor		
7.1	Material Type		AAAC
7.2	No. and Diameter of Strand	No/mm.	7/
8	Insulation Material		XLPE
9	Conductor Temperature Rise during Normal Operation	deg. C	90
10	Conductor Temperature Rise during Short Circuit	deg. C	250
11	Direction of Lay		Right Hand
12	Standard Length of Cable Per drum	m	Min. 500

5.2 Requirements of size

The required size of cable shall be:
4x95 mm2 and 4x70mm2

6. Basic Features

6.1 Design

The Aerial Bundled Conductor shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

6.2 Conductors

The phase conductor shall be of multi-strand round aluminum of compacted circular cross-section conforming to IEC or equivalent international standards. The neutral messenger conductor shall be of multi-strand round compact aluminum alloy conforming to IEC. The conductors shall be insulated by extruded black & UV stabilized cross-linked polyethylene (XLPE) material. The make of XLPE compound shall be from reputed manufacturers like DOW Chemicals (USA), Hanwha Chemical (Korea), Borealis AG (Austria) or Equivalent reputed make.

The complete cable shall consist of four insulated conductors stranded together, and the direction of lay shall be right-hand. The type of construction shall cause the tensile load to be shared equally between conductors. The properties of the aluminum wires (Tensile strength & Resistivity) before stranding shall be as per relevant standards. No joints are allowed in the conductor except those made on the base rod or wire before first drawing within the standard length.

6.3 Insulation

The Aerial Bunched Cables shall be insulated with extruded cross-linked polyethylene (XLPE) material. The voltage class and the insulation wall thickness shall be determined in accordance with applicable standards.

The insulating material shall be black and suitable to resist ultra violet radiation, salt laden sprays, chemical pollution, ageing effects, abrasion and mechanical shocks and mechanical and electrical stress at temperature up to 90 deg. C in normal operation and 250 deg. C under short circuit conditions. The carbon black content in the XLPE insulation shall be as per the applicable standards.

6.4 Phase Identification & Marking

The identification of the conductors shall be provided by means of ribbing on the external surface of the insulation. R, Y and B phase conductors shall have one, two, and three ribs respectively. Space between the ribs in R, Y and B phases shall be 5 mm. Ribs shall be in rounded form. The neutral messenger conductor shall have four ribs.

Each individual conductor comprising the bundle shall be embossed with the following at the spacing of five meters. The embossing should be very clear and easily visible to naked eye. The height of the printed lettering shall be not less than 20% of the overall diameter of the conductor. Every meter of outer covering of the cable shall also be embossed with length of the cable.

- Applicable Standards
- Name/Identification of the manufacturer,
- Name of the Purchaser 'Nepal Electricity Authority'
- Year of Manufacture '20XX'
- Designation of Conductor Type/Cross Section
- Rated Voltage Class
- Type of Insulation 'XLPE'
- Back up conductor identification: conductors with one, two and three projections shall be marked 'R', 'Y' and 'B' respectively. The conductor with no projection shall be marked 'N'.

7. Additional Requirements

7.1 Packaging

All conductors shall be furnished on non-returnable steel drums capable of withstanding all normal transportation and handling. Protective external lagging of sufficient thickness shall be provided and fitted closely on the drums. Binder consisting of steel straps shall be provided over the external laggings. The drums shall be new and sufficiently sturdy in construction to withstand ocean shipping, road transport, several loading and unloading, storage in tropics, hauling and field erection of conductor without distortion or disintegration.

Before dispatch, the ends of the bundled conductors shall be sealed to prevent moisture ingress during transportation and storage. Both ends of every length of the assembled bundle shall be temporarily bound in such a manner as to prevent cores from separating.
Each reel of the conductors furnished shall contain only one (1) length of conductor. The minimum length of each drum shall be minimum of 500m. All drums shall be legibly marked in paint with the following information:

(i) Manufacturer's Name and Trademark (if any)
(ii) Drum Number or identification number
(iii) Type of conductor
(iv) Size of conductor
(v) Voltage Grade
(vi) Length in meters
(vii) Gross Weight
(viii) Net weight of conductor
(ix) Direction of rolling

8. INSPECTION AND TESTING

8.1 Acceptance Test

The successful Bidder shall make necessary arrangements for pre-shipment inspection and tests by the nominated NEA Inspectors to carry out in his presence the necessary Sample/Acceptance tests conforming to the relevant governing standards on the completed cables offered.

8.2 Routine Test

The Routine Tests shall be carried out on the completed cables at the manufacturer's plant in accordance with the governing standards. The test reports shall be made available for the observation of the NEA Inspector at the time of inspection.

9. BID DOCUMENTATION

9.1 The following shall be furnished with the offer.

(a) Complete description, catalogue, drawings showing general construction and size of the cables including dimensional drawing of cable drum for each type of ABC.

(b) Completed Schedule of Guaranteed Technical Particulars
(c) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(d) Type Test Certificates: The Type Test Certificates shall be from an Accredited Independent Testing Authority acceptable to the Purchaser.
(e) Copy of the Governing Standards
(f) Technical Literature in English Language on installation, operation and maintenance with necessary diagrams and drawings.

9.2 Type Test Certificates

The material offered shall be fully type tested by an independent accredited testing laboratory acceptable to the Employer. The bidder shall submit the type test reports along with the offer. The tests shall comply with relevant Standards. The Employer also reserves the right to have tests carried out by an independent agency, whenever there is a dispute regarding the quality of supply. The Aerial bundled Cable shall be subjected to the following type tests:

(a) Tensile test
(b) Wrapping test
(c) Conductor resistance test
(d) Test for thickness of insulation
(e) Tensile strength and elongation at break of insulation
(f) Physical tests for XLPE insulation
(g) Ageing in air oven
(h) Shrinkage test
(i) Hot deformation
(j) Loss of mass in air oven
(k) Heat shock test
(l) Thermal stability
(m) Test for bleeding and blooming of pigment
(n) Insulation resistance test
(o) High voltage test including water immersion test
(p) High voltage test at room temperature
(q) Flammability test
(r) Resistance test at each phase/neutral of the conductor at 20 deg. C
(s) Breaking load test (to be made on the finished conductors) (for messenger only)
(t) Elongation test (for messenger only)

GUARANTEED TECHNICAL PARTICULARS

(To be filled by the Bidder/Manufacturer)

Item: Aerial Bundled Conductor

S.N.	Description	Unit	4x95mm2	4x70mm2
1	Manufacturer			
	Country of Origin			
2	Years of Manufacturing Experience			
3	Applicable standard			
4	Cable Type Designation			
5	Rated Voltage	kV		
6	Maximum System Voltage	kV		
7	Rated Voltage between two conductors	kV		
8	Power Frequency withstand voltage	kV		
9	Number of Cores			
10	Phase Conductor			
10.1	Material Type			
10.2	Min. Cross Section Area	sq.mm.		
10.3	No. and Diameter of Strand	No/mm.		
10.4	Overall Diameter			
10.5	Max. DC resistance at 20 deg. C	Ohm/km		
11	Messenger			
11.1	Material Type		AAAC	AAAC
11.2	Min. Cross Section Area	sq.mm.	95	70
11.3	No. and Diameter of Strand	No/mm.		
11.4	Overall Diameter	mm		
11.5	Max. DC resistance at 20 deg. C	Ohm/km		

S.N.	Description	Unit	4x95mm2	4x70mm2
11.6	Minimum Breaking Load	kN		
12	Overall Diameter of Bundled Conductor	mm		
12	Insulation Material			
12.1	Min. Thickness of Insulation	mm		
12.2	Max. Volume resistivity of Insulation at 27 deg. C			
13	Conductor Temperature Rise during Normal Operation	deg. C		
14	Conductor Temperature Rise during Short Circuit	deg. C		
15	Continuous Current Carrying Capacity in air & corresponding assumptions/conditions of installation	A		
16	Short Circuit Current for 0.1 sec	A		
17	Short Circuit Current for 1.0 sec	A		
18	Tensile Strength of Insulation	kN		
19	Min. elongation at break (insulation)	%		
20	Direction of Lay			
21	Weight of Cable	kg/km		
22	Standard Length of Cable Per drum	m		
23	Net Weight of Cable per Drum	kg		
24	Core Identification and marking			
25	Delivery of equipment following award of contract and approval of drawing	months		
26	ISO 9001 holder (including design)	yes/no		
26.1	ISO 9001 certificate submitted	yes/no		
27	Type test certificate submitted	yes/no		
27.1	Submitted for the required ratings	yes/no		
27.2	Type test certified by			
28	User's certificate submitted	yes/no		
29	Has exported to third country	yes/no		
30	Copies of relevant standards attached	yes/no		
31	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

Fitting for Aerial Bundled Conductor (ABC Fittings)

1. Scope

This Specification covers the fabrication and supply of fittings and associated apparatus for with LV aerial bundled conductors (ABC).

2. Description

2.1 The fittings, hardware and equipment shall be fabricated in accordance with International recognized standards such as IEC, NFC for Fittings and Associated Apparatus for use with LV ABC of latest revision, and all referenced standards therein, or latest revision thereof or other recognized international standards that ensures at least a substantially equal quality to the standard mentioned above, will also be acceptable.

2.2 The ABC Cable hardware manufacturing company shall have been accredited with ISO 9001 quality certification (including design for LV ABC accessories).

2.3 The preferable make of the AB Cable Accessories are Sicamex, Ensto, Raychemrpg, 3M or equivalent international reputed make.

2.4 The fittings shall be for use in conjunction with insulated neutral messenger 3-core phase, and 1-core neutral messenger ABC of 95 sq. mm, 70 sq.mm., 50 sq. mm. and 25 sq.mm. nominal cross-sectional areas.

2.5 Contractor shall get approval of all drawings and hardware sample from Purchaser before starting the fabrication of all hardware.

3.1 Anchor clamp with bracket:

The clamps should be designed to anchor insulated messenger of ABC. The clamp should consist of an aluminum alloy corrosion resistant body, bail of stainless steel and self-adjusting plastic wedges which shall anchor/hold the neutral messenger without damaging the insulation.

The clamp should be installed properly with no losable part. It shall conform to the standard NFC33-041 or equivalent other international standards. The clamp body should be made of corrosion resistant aluminum alloy, bail should be of stainless steel to prevent from corrosion & climatic variations, a plastic saddle should be installed on the flexible bail to limit abrasion with hook/bracket and wedges should be of weather and UV resistant polymer. It should be fixed with pole by eye hook/bracket. Bracket should be made of corrosion resistant aluminum alloy. Ultimate Tensile Strength of the clamp should not be less than 12 KN for 50/70 sq.mm insulated messenger wire / 8 KN for 25/35 sq.mm insulated messenger wire. Slip load of the clamp should not be less than 5KN for 50/70 sq.mm insulated messenger & 3KN for 25/35 sq.mm insulated messenger wire. Design as per furnished drawing.

3.2 Suspension clamps with bracket:

The clamp should be designed to hang LV-ABC with insulated neutral messengers. The neutral messengers should be fixed by an adjustable grip device. A movable link should allow longitudinal and transversal movement of the clamp body.

The suspension clamp range to accommodate messenger shall be 25-95mm2. The clamp should be installed properly with no losable parts. The clamp shall conform to the standard NFC33-040 or other equivalent international standards. The clamp and movable link made of weather and UV resistant thermoplastic polymer should provide additional insulation between the cable and the pole. The clamps and the movable links should be made of weather and UV resistant thermoplastic polymer. Clamps should be fixed with pole by eye hook/bracket. Bracket should be made of corrosion resistant aluminum alloy. The Suspension Clamp & the bracket will be preferably delivered together in order to minimize abrasion between two materials. Ultimate Tensile Strength of the clamp should not be less than 12 KN for 25-95 sq.mm insulated messenger wire. Maximum Allowable load of the clamp should not be less than 12 KN for 25-95 sq.mm insulated messenger wire. Slip load of the clamp should not be less than 300N for 25-95 sq.mm insulated messenger wire. The clamp should sustain to

maximum angle of deviation of 60 degrees of the conductors. Design as per furnished drawing.

3.3. Insulated cable end caps

The insulated cable end caps shall be made of weather and age resistant insulating material and shall have wet flashover voltage not less than 6 kV. The cap shall be heat shrinkable type or without heat shrinkable and shall be coated internally with a suitable sealant. The caps shall be suitable for supplied sizes of ABC.

3.4. Insulated insulation piercing connectors (IPC)

The insulated insulation piercing connector (or the connector for short) shall be suitable for using with aluminum ABC and concentric cables. It shall be made of high quality, weather, heat and age resistant insulating material having wet flashover voltage not less than 6 kV. It shall be watertight and suitable for making connections to the live lines. The piercing of main line and the tapping shall be done simultaneously. The design of the connectors shall be such that its removal is possible even after breaking of the shear head. The connector shall be provided with end cap for tapping end. The IPCs for the network application (Type A) shall be preferably of two bolt type and service application (Type B) shall be preferably of single bolt type. The IPCs for the network application shall withstand at least 5 kA fault current for 1s without damage. The connector shall be suitable for following cables.

Type	Main	Tapping
Type A	50-120 sq. mm, ABC	50-120 sq. mm, ABC
Type B	50-120 sq. mm, ABC	6-25 sq. mm, ABC/ concentric cable

3.5. Core separators (pairs)

The core separators shall essentially comprise two wedges to facilitate the installation of connectors on tensioned ABC cable. The two separators shall be joined together with a nylon cord. The two separators, which shall be made from wither hardwood or rigid plastic, shall be so shaped as to be capable of being positively locked in position.

3.6. Jointing sleeves

The joint should be Pre-Insulated for Phases, neutral messengers and Street Lighting conductors. Sleeve should be made of Aluminum, insulated with an anti UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings to prevent water penetration. The sleeves shall be water tight with wet flashover voltage not less than 6kV upon installation.

3.7. Stainless Steel Strap and Buckle

The stainless steel strap shall be of 20x0.7mm size and be supplied in a roll of 50m. The breaking strength of the strap shall be at least 0.95 kN/mm2

3.8. Stainless Steel Strap Binding Tool

The strap binding tool shall be of ratchet type to be operated by the lines men by hand while working on the poles.

4. Tests

4.1 Type tests

The bidder shall submit the type test report along with the Bid. The report shall be issued by a recognized independent testing authority. The tests shall comply with relevant IEC Standard or the governing standard. The Employer also reserves the right to have tests carried out at his

own cost by and independent agency, whenever there is a dispute regarding the quality of supply. In respect of the following fittings, the test shall include, but not limited to the following:

Anchor clamps:

- Mechanical test
  - Tensile (high tension) test on bracket
  - Tensile on anchoring clamps
- Climate ageing test
  - voltage test
  - mechanical strength test
- Voltage test
- Corrosion test
- Dynamic test at low temperature
- Endurance test under mechanical and thermal stresses
  - slippage checking test
  - voltage test

Suspension clamps:

- Mechanical test
  - Tensile test on bracket
  - Tensile test on sub-assembly
- Slip test on the clamp
- Voltage test
  - on the supports
  - on sub-assembly
- Mechanical strength test
- Climate ageing test
- Corrosion test
- Endurance test under mechanical and thermal stresses
  - slippage checking test
  - voltage test

Insulation piercing connectors:

- Current carrying capacity test of the connector
- Temperature rise and over current test
  - Initial temperature test
  - Over current test
  - Final temperature test
- Electrical ageing test
- Climate ageing test
- Corrosion test
- Installation test at low temperature
- Mechanical test
  - Electrical continuity test
  - Mechanical tightening test
  - Mechanical strength of tap
- Electrical heat cycle test
- Voltage and watertightness test

Tests for fittings and hardware shall be conducted in accordance with the NF C and IEC Standard or equivalent international standards including voltage and water tightness test wherever applicable.

4.2 Routine tests

Each batch of fittings shall be subjected to routine tests while manufacturing to confirm to the specified standard.

5. Quality Assurance Program

Along with the Bid the Bidder shall furnish quality assurance program of the manufacturer which includes the Quality System and the Quality Plans, which shall include, among others, information to meet the following requirement, failing which the Bid shall be liable for rejection.

i. The structure of the organization;
ii. The duties and responsibilities assigned to staff ensuring quality of works;
iii. The system for purchasing, taking delivery and verification of materials;
iv. The system for ensuring quality of workmanship;
v. The quality assurance arrangement shall conform to relevant requirements of ISO9001; 2008
vi. Statement giving list of important raw materials, names of manufacturer for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials;
vii. List of manufacturing facilities available;
viii. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections;
ix. List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

6. Bid Documentation

6.1 The Bidder shall furnish with the Bid two (2) clear copies of the Standard governing fabrication and testing of the fittings and accessories for LV ABC and two (2) clear copies of all other relevant standards referenced therein.

6.2 The Bidder shall furnish two (2) sets of complete description, catalogue, dimensional drawings showing general construction and size of all fittings and accessories.

6.3 The Bidder shall furnish two (2) clear certified copies of type test report for Anchor clamp, Suspension clamp and IPCs failing which the bid shall be liable for rejection.

6.4 A clause-by-clause commentary on specification, specifying compliance and deviations, if any.

6.5 All technical data, drawings, catalogues and other technical documents shall be bound separately from the bid documents. Drawings for Suspension clamp with bracket, Anchor clamp with bracket, Jointing sleeves and IPCs must be submitted failing which the bid shall be liable for rejection.

6.6 The NEA may ask to furnish the type test report for other accessories from the substantially responsive bidders.

6.7 The Bidder shall furnish the sample of accessories such as Type A IPCs along with the bid, failing which the bid shall be liable for rejection.

LT Power Cable (PVC)

1. **Scope**

This Specification covers the design, manufacture, factory test and supply of 1.1 kV grade PVC insulated multicore power cables. The cables will be used for the purpose of 400V use of Nepal Electricity Authority.

2. Rated Voltage

The rated voltage of the cables shall be 1100V

3. Service Condition

a)	Ambient temperature	-5 to 55 deg. C
b)	Annual average ambient temperature	30 deg. C
c)	Maximum relative humidity	99%
d)	Environmental condition	Humid Tropical climate
e)	Operational altitude	Up to 1000m above msl
f)	Isokeraunic (Thunder day) level	90 days
g)	Solar Radiation	1.6kW/m2
h)	Wind Zone	Zone 4

4. Applicable Standards

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof or any international equivalent standards and the NEA Specifications specified hereafter.

a)	IS 1554	Specification for PVC Insulated heavy duty Electric cables for working voltages upto & including 1100 V
b)	IS 8130	Specification for conductors for insulated electric cables and flexible cords

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In case of conflict the order of the precedence shall be (1) IEC standards, (2) ISO standards, (3) European or British Standards, (4) Indian Standards, (5) Other alternative standards.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor or the necessity of providing the goods complying with other relevant standards or recommendation.

5. Technical Parameters

5.1 Minimum Technical Requirements

S.N.	Description	Unit	Requirements
1	Rated Voltage	kV	
2	Maximum System Voltage	kV	
3	Rated Voltage between two conductors	kV	
4	Power Frequency withstand voltage	kV	
5	Number of Cores		4
6	Phase Conductor		3
7	Insulation Material		PVC
8	Conductor		EC Grade Al.
9	Minimum Number of Strand		
10	Nominal Thickness of Insulation		
11	Minimum Thickness of inner sheath		
12	Type and dimensions of armor		
13	Minimum thickness of outer sheath		

S.N.	Description	Unit	Requirements
14	Conductor Temperature Rise during Normal Operation	deg. C	70
15	Conductor Temperature Rise during Short Circuit	deg. C	160
16	Direction of Lay		Right Hand
17	Standard Length of Cable Per drum	m	Min. 500

5.2 Requirements of size

The required size of PVC insulated, aluminum Conductor, armored cable shall be: 4x400 mm^2, 4x300 and 4x150mm2

6. Basic Features

6.1 Design

The power cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

6.2 Conductors

The conductor shall be of multi-strand round aluminum of compacted circular cross-section conforming to IEC or equivalent international standards. The conductor shall be clean and reasonably uniform in size and shape and its surface shall be free from sharp edges.

6.3 Insulation

The conductor shall be provided with PVC insulation applied by extrusion. Type of insulation shall be A for general purpose PVC.

6.4 Laying up of Cores

In twin, three & multi core cables, the cores shall be laid up together with a suitable lay, the outermost layer shall have right hand lay and the successive layer shall be laid with opposite lay.

6.5 Inner Sheath

The laid up cores shall be provided with Inner Sheath applied by extrusion. It shall be ensured that the shape of Cable is as circular as possible. Inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damaging the insulation.

6.6 Armour

The armour wires/strips shall be applied as closely as practicable. A binder tape may be provided on the armour.

6.7 Outer Sheath

The outer sheath shall be applied by extrusion over the armouring. The colour of outer sheath is black unless otherwise specified. Thickness of outer sheath should be as per IS: 1554.

7 Cable Identification and Marking

The following shall be embossed on the outer sheath of the cable throughout the length of cable at 1.0 meter spacing. The embossing should be very clear and easily visible to naked eye. The height of the printed lettering shall be not less than 20% of the overall diameter of the conductor. Sequential length shall be marked on the outer sheath of the cable throughout the length by Printing in each meter length interval.

- Applicable Standards
- Name/Identification of the manufacturer,
- Name of the Purchaser ‘Nepal Electricity Authority’
- Voltage Grade of Cable

— Type of Insulation, material of conductor
— Number of Cores and nominal cross sectional area of conductor
— Cable Code
— Year and Month of Manufacture

Each phase of the core shall be identified with the color Red, Yellow, Blue and Black on the inner sheath.

8 Packaging

All conductors shall be furnished on non-returnable steel drums capable of withstanding all normal transportation and handling. Protective external lagging of sufficient thickness shall be provided and fitted closely on the drums. Binder consisting of steel straps shall be provided over the external laggings. The drums shall be new and sufficiently sturdy in construction to withstand ocean shipping, road transport, several loading and unloading, storage in tropics, hauling and field erection of conductor without distortion or disintegration.

Each reel of the conductors furnished shall contain only one (1) length of conductor. The minimum length of each drum shall be minimum of 500m. All drums shall be legibly marked in paint with the following information:

(i) Manufacturer's Name and Trademark (if any)
(ii) Drum Number or identification number
(iii) Type of conductor
(iv) Size of conductor
(v) Voltage Grade
(vi) Length in meters
(vii) Gross Weight
(viii) Net weight of conductor
(ix) Direction of rolling

8. INSPECTION AND TESTING

8.1 Acceptance Test

The successful Bidder shall make necessary arrangements for pre-shipment inspection and tests by the nominated NEA Inspectors to carry out in his presence the necessary Sample/Acceptance tests conforming to the relevant governing standards on the completed cables offered.

8.2 Routine Test

The Routine Tests shall be carried out on the completed cables at the manufacturer's plant in accordance with the governing standards. The test reports shall be made available for the observation of the NEA Inspector at the time of inspection.

9. BID DOCUMENTATION

9.1 The following shall be furnished with the offer.

(a) Complete description, catalogue, drawings showing general construction and size of the cables including dimensional drawing of cable drum for each type of cable.
(b) Completed Schedule of Guaranteed Technical Particulars
(c) A copy of the Manufacturer's ISO 9001 Certificate conforming to design and manufacture
(d) Type Test Certificates: The Type Test Certificates shall be from an Accredited Independent Testing Authority acceptable to the Purchaser.
(e) Copy of the Governing Standards
(f) Technical Literature in English Language on installation, operation and maintenance with necessary diagrams and drawings.

9.2 Type Test Certificates

The material offered shall be fully type tested by an independent accredited testing laboratory acceptable to the Employer. The bidder shall submit the type test reports along with the offer. The tests shall comply with relevant Standards. The Employer also reserves the right to have

tests carried out by an independent agency, whenever there is a dispute regarding the quality of supply.

GUARANTEED TECHNICAL PARTICULARS

(To be filled by the Bidder/Manufacturer)

Item: LT Power Cable

S.N.	Description	Unit	NEA Requirement	To be filled by Bidder/Manufacturer
1	Manufacturer			
	Country of Origin			
2	Years of Manufacturing Experience			
3	Applicable standard			
4	Cable Type Designation			
5	Rated Voltage	kV		
6	Maximum System Voltage	kV		
7	Rated Voltage between two conductors	kV		
8	Power Frequency withstand voltage	kV		
9	Number of Cores			
10	Conductor			
10.1	Material Type			
10.2	Min. Cross Section Area	sq.mm.		
10.3	No. and Diameter of Strand	No/mm.		
10.4	Overall Diameter			
10.5	Max. DC resistance at 20 deg. C	Ohm/km		
11	Insulation			
11.1	Material			
11.2	Nominal Thickness of Insulation			
12	Inner Sheath			
12.1	Material			
12.2	Minimum Thickness of inner sheath			
13	Armour			
13.1	Armouring Material			
13.2	Nominal dimensions of armour			
13.3	Max. DC resistance of armour at 20 deg. C			
14	Outer Sheath			
14.1	Material			
14.2	Minimum thickness of outer sheath			
15	Overall diameter of the cable			
16	Method of Core identification			
17	Maximum operating Temperature of conductor	deg. C	70	
18	Conductor Temperature Rise during Short Circuit	deg. C	160	
19	Continuous Current Carrying Capacity in air & corresponding assumptions/conditions of installation	A		
20	Short Circuit Current for 0.1 sec	A		
21	Short Circuit Current for 1.0 sec	A		
22	Tensile Strength of Insulation	kN		
23	Min. elongation at break (insulation)	%		
24	Direction of Lay			
25	Weight of Cable	kg/km		
26	Standard Length of Cable Per drum	m		
27	Net Weight of Cable per Drum	kg		
28	Core Identification and marking			
29	Delivery of equipment following award of contract and approval of drawing	months		
30	ISO 9001 holder (including design)	yes/no		
30.1	ISO 9001 certificate submitted	yes/no		
31	Type test certificate submitted	yes/no		
31.1	Submitted for the required ratings	yes/no		
31.2	Type test certified by			
32	User's certificate submitted	yes/no		
33	Has exported to third country	yes/no		
34	Copies of relevant standards attached	yes/no		
35	Outline Drawings and associated GA attached	yes/no		

Signed by……..
Designation……..

As Representative for……..
Place……
Date……
Seal of Bidder/Manufacturer ……

VOLUME – IIB OF III

SECTION – 3

INSPECTION, TESTING AND COMMISSIONING

FOR

LINE AND DISTRIBUTION TRANSFORMER CONSTRUCTION WORKS

1. Scope of work

The whole of the Works supplied under the Contract shall be subject to inspections and tests by the Employer or their Representatives during manufacture, erection and after completion. The inspections and tests shall include, but not be limited to, the requirements of this section of the Specifications.

The Contractor shall provide all costs, appliances, apparatus, supervision, labor and services necessary to carry out all tests, unless specifically stated otherwise.

The Contractor shall furnish the detailed schedule of his commissioning line at least one month prior to the scheduled date. The schedule shall include the commissioning procedures, testing sequences and details of special testing equipment, tests and commissioning record formats, information about relevant standards etc.

The scope of the commissioning program includes the site testing and putting into successful operation of all the line sections.

2. Objectives

The objectives of commissioning work, prior to the successful energization of lines at full voltage and connection to the system, are the following:

- Confirm the integrity (correctness) of installation.
- Confirm the integrity of insulation, connections and phasing.
- Ensure proof of equipment characteristics.
- Review workmanship.
- Confirm the correct implementation of the design.
- Check equipment ratings.

3. QUALITY ASSURANCE, INSPECTION AND TESTING

To assure that the supply and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his subcontractor's premises or at the Site or at any other place of work, are in accordance with the Specifications, the Contractor shall adopt suitable quality assurance program to control such activities at all points necessary. Such program shall be outlined by the Contractor and shall be finally accepted by the Employer after discussions before the award of the Contract. A quality assurance program of the Contractor shall generally cover, but not be limited to the following:

(a) His organization structure for the management and implementation of the proposed quality assurance program.

(b) Documentation control system.

(c) Qualification data for bidder's key personnel.

(d) The procedure for purchases of materials, parts, components, and selection of sub-contractors' services including vendor analysis, source inspection, incoming raw materials inspection, and verification of materials purchases.

(e) System for shop manufacturing including process controls and fabrication and assembly controls.

(f) Control of non-conforming items and system for corrective actions.

(g) Control of calibration and testing of measuring and testing equipment.

(h) Inspection and test procedure for manufacture.

(i) System for indication and appraisal of inspection status.

(j) System for quality audits.

(k) System for authorizing release of manufactured products to the Employer.

(l) System for maintenance of records.

(m) System for handling storage and delivery.

(n) A quality plan detailing out the specific quality control procedure adopting for controlling the quality characteristics relevant to each item of supply.

The quality plan shall be mutually discussed and approved by the Employer after incorporating necessary corrections by the Contractor as may be required.

- Quality Assurance Documents

The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Employer's inspection of material/equipment.

The Employer, through his duly authorized representatives, reserves the right to carry out Quality Audit and Quality Surveillance of the systems and the procedures of the Contractor's and the subcontractor's Quality Management and Control Activities.

- Inspection, Testing and Inspection Certificates

The provisions of the clauses on Test and Inspection of the General Conditions of Contract and Special Conditions of Contract shall be applicable to the supply and erection portions of the Works. The Employer shall have the right to re-inspect at his expenses, any material though it would have been previously inspected and approved by him at the Contractor's works before, and if, after the same are inspected at Site following the latter, material is found defective, then the Contractor shall bear the cost of this inspection and reinstatement according to specification.

4. Tests at Manufacturers Works

4.1 General

Where no specific test is specified, then the various items of materials and equipment shall be tested in accordance with the relevant Standards. Where no appropriate standard is available, tests shall be carried out in accordance with the maker's standard practice, which shall be subject to the Employer's approval.

At least fourteen days' prior notice, in writing or by tele-fax, shall be given to the Employer of the readiness of the plant for test or inspection and every facility shall be provided by the Contractor and sub-Contractor (s) to enable the Employer or their Representative to carry out the inspections and witness the tests. This includes progress, test rig and packing inspections also.

Inspection of equipment will not be carried out unless the Employer has approved copies of the relevant sub-orders, drawings and test procedures. No equipment shall be packed, prepared for shipment, or dismantled for the purpose of packing for shipment, unless it has been satisfactorily inspected, or inspection has been waived by the Employer.

Functional electrical and mechanical tests shall be carried out on the completed plant after assembly in the Works. The extent and method of recording the results shall be agreed by the Employer in sufficient time to enable the tests to be satisfactorily witnessed or to make any changes to the proposed program of tests. All instruments and apparatus used in the performance of the tests shall be subject to the approval of the Employer and, if required by the Employer, shall be calibrated to an agreed standard at a laboratory of national standing to be nominated by the Contractor and approved by the Employer. The costs of carrying out such calibration shall be borne by the Contractor in all cases.

The costs of making/performing any test shall be borne by the Contractor. This shall apply to tests performed at the site or elsewhere.

After receiving the prior information about the completion of manufacturing at the factory, the Employer will depute his personnel to the manufacturer's factory to witness the fabrication, assembly and testing of any or all parts of major equipment. The costs of such visits shall be

borne by the Employer. If any additional Tests are required or the listed below visit is insufficient, the manufacturer/contractor shall bear the cost required for visit by the Employer/Employer's representative. The number of the Employer's personnel and equipment to be witnessed will be as listed below. The duration of such visits shall be minimum of three days to maximum of seven days as per inspection/testing requirements.

33 & 11 kV Line and Distribution Transformer		
S.N	**Equipment**	**No. of visit and person**
1	Distribution Transformer	2 persons, 2 visit
2	XLPE Power Cable and Accessories	1 person, 1 visit
3	ACSR Conductor and Accessories (PG Clamp & Compression Joints)	1 person, 2 visit
4	AB Cable and & Accessories	1 persons, 2 visit
5	Covered Conductor & Accessories	1 persons, 2 visit
6	Steel Tubular Pole	1 person, 2 visit
7	Insulators and Insulator Fittings	1 person, 2 visit
8	DO, LA, Air Break Switch	1 person, 1 visit
9	MCCB with Box	1 person, 1 visit
10	Transformer Platform	1 person, 1 visit
	Pole Accessories (Channel, Angle, Braces) and Stay Wire and Stay Set	1 person, 1 visit

During the visit of Manufacturer's premises by the Employer/Employer's representative, all tests shall be duly completed by the manufacturer with the witness of Employer/Employer's representative. "Factory Acceptance Test" reports shall be duly signed and if the results are satisfactory, the dispatch clearance instructions shall be provided by the Employer/Employer's representative.

4.2 Test Certificates

Within 30 days of the completion of any test, triplicate sets of all principal test records, test certificates and performance curves shall be supplied to the Employer.

These test records, certificates and performance curves shall be supplied for all tests, whether or not they have been witnessed by the Employer or his representative. The information given on such test certificates and curves shall be sufficient to identify the material or equipment to which the certificate refers and should also bear the Contract reference title. Specified requirements shall be shown on each certificate for comparison with actual test results.

When all equipment has been tested, test certificates of all factory and site tests shall be compiled by the Contractor into volumes and bound in an approved form complete with index. Two copies of each volume shall be supplied to the Consultant and two copies to the Employer.

4.3 Type Tests

Type tests are required to prove the general design of the equipment and the Contractor may submit certificates of such design tests, which have been carried out on identical equipment. Notwithstanding any provision in relevant Standards, the Employer shall have the right to accept such certificates in line of the specified type tests or to reject them.

The type tests prescribed shall be carried out at the Contractor's cost in all cases, where either such certificates are not available or are rejected by the Employer.

5. Responsibilities

To ensure that the test jurisdiction and transfer of responsibilities is regulated by strict safety and handover procedures, the Contractor agrees the interface with the Employer to establish and implement handover procedures consistent with the terms of these Specifications.

The Employer shall retain full jurisdiction over all commissioning activities, which may affect the operation of the existing system. In these circumstances and when so requested, shall provide technical advices and assistances.

The Contractor shall be responsible for technical guidance and assistance in establishing the scope and method of tests, witnessing of the testing, assessment of results, and re-negotiation of the changes in test schedules which may be necessary as a result of other circumstances, such as delays in the delivery, possible equipment failures.

6. Safety Procedures

The Contractor shall share the responsibility for safety procedures with the Employer. The Contractor shall establish and implement a work permit and tagging system and associated safety procedures (subject to the review of Employer) for all equipment, systems and areas not covered by the Employer’s safety procedures.

The Employer will assume responsibility for the establishment and implementation of tagging, safety and work permit procedures for the protection of personnel and equipment, as soon as equipment and systems are connected to or are energizeable from the existing system.

7. Training of the Employer's Staff

The Contractor shall plan for the Employer’s staffs’ participation, either continuously or on a regularly recurring basis, in the commissioning work and:

Allow the Employer’s staffs to become familiar with the operating and maintenance aspects of the new equipment supplied by him,

Maintain a continuing assessment with the Employer of the precautions required in or possible consequences of, initial energization of equipment, Allow for the above two necessary objectives in the preparation of schedules.

The Contractor shall station at site, at least, one technical expert for a minimum of six months continuously after commissioning to rectify any problems, as well as train the Employer's attending staffs. If required, the length of his stay shall be extended as per requirement, which shall be at the Employer's discretion.

8. Commissioning Staff

The Contractor shall provide commissioning personnel including skilled and unskilled labor as required. Submit a list with names, experience and proposed duration of the stay of key personnel on site, consistent with the construction schedule, along with the commissioning program.

Ensure that only staffs assigned to commissioning fulfills that duty for the duration of the assignment.

Ensure that commissioning staffs have authorization, and the competence, to undertake minor repairs or to make temporary redesigns and to reconnect systems to meet the specified system performance to preclude delays in energization and putting into commercial service of any part of the works.

9. Test Equipment

The Contractor shall ensure that all instruments, tools and other equipment required for testing and commissioning are available on site, ensure that the test equipment is of satisfactory quality and condition and, where necessary, is calibrated by an approved authority or standard.

Make arrangements for the provision of power supplies for testing with necessary vector configuration, voltage and current rating.

10. COMMISSIONING PROGRAM

Prepare a commissioning program for approval by the Employer and for incorporation into the Project master construction program. Allocate adequate time in this program to permit full commissioning of all components.

Carry out all testing during normal working hours as far as practicable. Tests, which involve existing apparatus and system outages, may be carried out outside normal working hours. Give the Employer sufficient notice to allow for the necessary outage arrangements to be made in conformity with the testing program.

Note that no tests listed in the agreed program will be waived except upon the instructions or consent of the Employer in writing.

10.1 Test Procedures

The following basic tests, in addition to others, shall be carried out:

- Measurement of insulation resistance.
- AC withstand voltage test

10.2 Requirements for Field Tests

The field tests shall be carried out in presence of Employer under the following conditions:

- AC withstand test voltages for conductors and outdoor equipment shall be normal operation voltage of the transmission line and, withstand voltage test shall be carried out for ten (10) minutes by the normal voltage mentioned above. The field tests shall be carried out by the Contractor after adjustment of all the equipment have been completed.
- Expandable and lead wires and other materials required for the field tests shall be arranged by the Contractor. The Contractor shall be responsible for providing all measuring instruments, test equipment and tools required for the tests.
- Preparation of the test record sheets and test reports shall be the responsibility of the Contractor and the results of the field tests shall be submitted by the Contractor for Employer's approval.

Measurement of insulation resistance of the equipment shall be performed by at least 1000 V megger.

After completion of the measurement of insulation resistance mentioned above, ac withstand voltage test shall be performed by the normal operation voltage of the existing power system in accordance with the following procedure:

- 11 and 33 kV Main Circuit: The 11 kV and 33 kV circuit breakers and disconnecting switches, except for circuit breakers receiving power for the test from the existing power system through a transmission line, shall be closed, succeeding, normal operation voltage shall be charged on the equipment and bus conductors for ten (10) minutes for ac withstand voltage test. The indication value of meters mounted on the board during the ac withstand voltage test shall be recorded on the test record sheets prepared by the Contractor.

Submit test procedures, consisting of detailed test methods and samples of the related test record forms, for all equipment to be tested, to the Employer for approval along with the commissioning program. Strictly adhere to these procedures for the commissioning tests.

10.3 Records

Maintain an up-to-date record of all commissioning activities on site.

Record the results of the tests clearly on forms and formats approved by the Employer and with clear references to the equipment and items tested, so that the record can be used as the basis for maintenance tests, in future. Submit the required number of site test records to the Employer as soon as possible after completion of the tests.

Record the details of the test equipment and instruments used in the test sheets, in those cases where the instrument or equipment characteristics can have a bearing on the test results.

10.4 "As-Built" Drawings

Keep an ongoing record of all changes on a master set of drawings. Produce and supply a minimum of five complete sets of marked-up "As Constructed/As-Built" drawings before leaving the Site. Correct and re-issue the original drawings as soon as possible as per this specification.

10.5 Test Methods

Carry out all necessary tests for commissioning the sub-transmission and distribution line. The contractor must strictly adhere to the methods of testing approved by the Employer.

(a) Particular Constraints and Special Tests

The Contractor shall be prepared to cooperate with any special tests requested by the Employer.

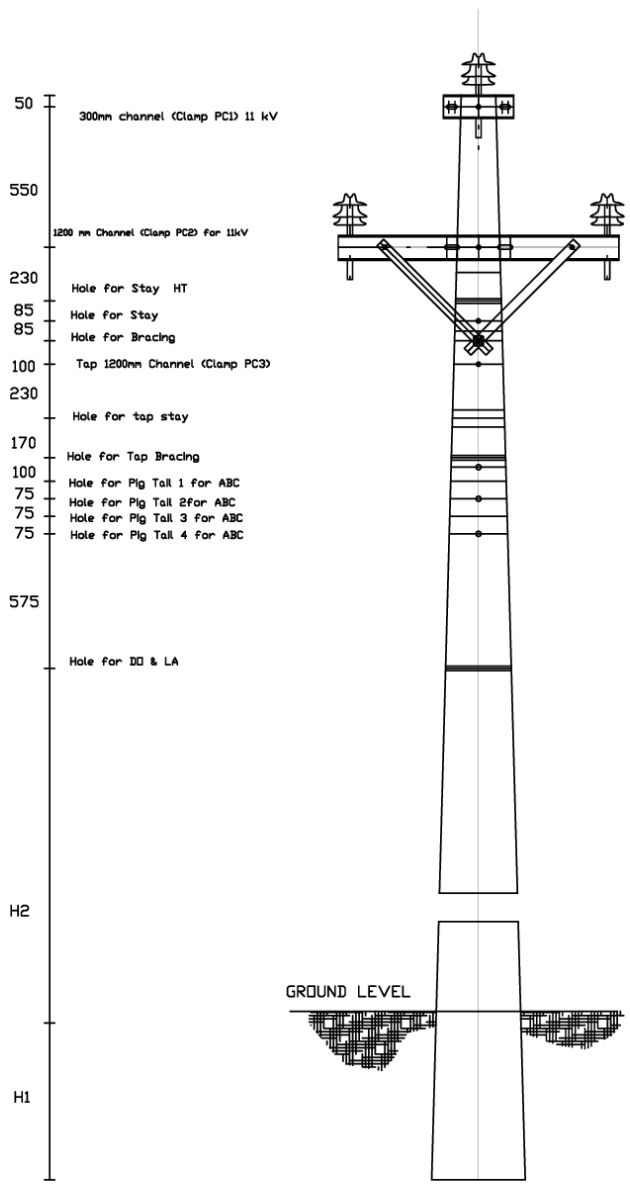
VOLUME – IIB OF III

SECTION – 4

DRAWINGS

FOR

LINE AND DISTRIBUTION TRANSFORMER CONSTRUCTION WORKS



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	5900	6800
POLE WIDTH AT TOP 'WT' IN MM	180	180
POLE WIDTH AT BOTTOM 'WB' IN MM	380	400
POLE DEPTH 'D'	150	150

ALL DIMENSIONS ARE IN MM

Drawing	11kV, 10/11 m PSC Pole	NEPAL ELECTRICITY AUTHORITY
CS11-PSCP-04	**Single Arm Structure**	**Technical Services / Commercial Department**
		Distribution and Consumer Services

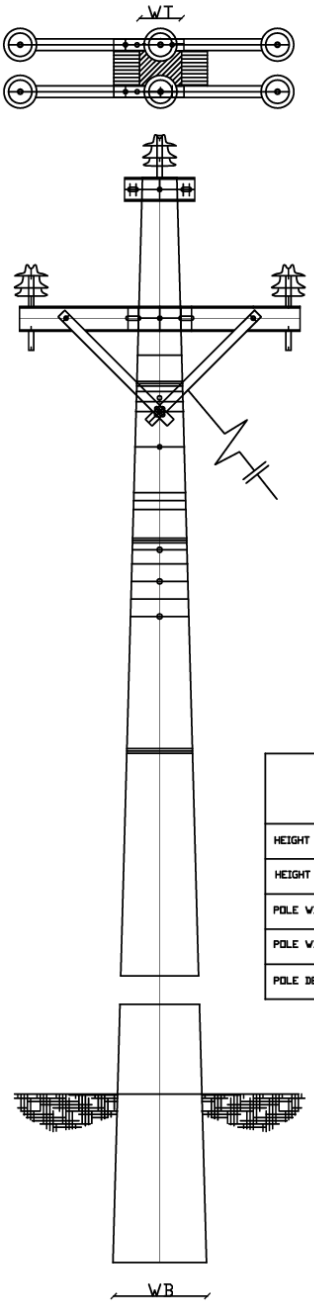
Refer Drawing No: CS11-PSCP-04

S.No.	QTY.	UNIT	MATERIAL
1	3	NOS	PIN INSULATOR
2	3	NOS	INSULATOR PIN
3	3	NOS	PREFORM PIN TIES (TOP TIES)
4	1	NOS	STEEL CROSSARM CHANNEL (100x 50x6.4x300) mm.
5	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC1)
6	1	NOS	STEEL CROSSARM CHANNEL (100x 50x6.4x1200) mm.
7	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC2)
8	2	NOS	FLAT CROSSARM BRACE(40x 6.0x660) mm
9	2	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x51) mm for BRACE
10	1	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (16 x203) mm for BRACE
11	1	NOS	PSC POLE 10 m /11m

CONSTRUCTION STANDARDS
11 kV SINGLE ARM STRUCTURE (SA)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services

Top view of double arm pole



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	5900	6800
POLE WIDTH AT TOP 'WT' IN MM	180	180
POLE WIDTH AT BOTTOM 'WB' IN MM	380	400
POLE DEPTH 'D'	150	150

ALL DIMENSIONS ARE IN MM

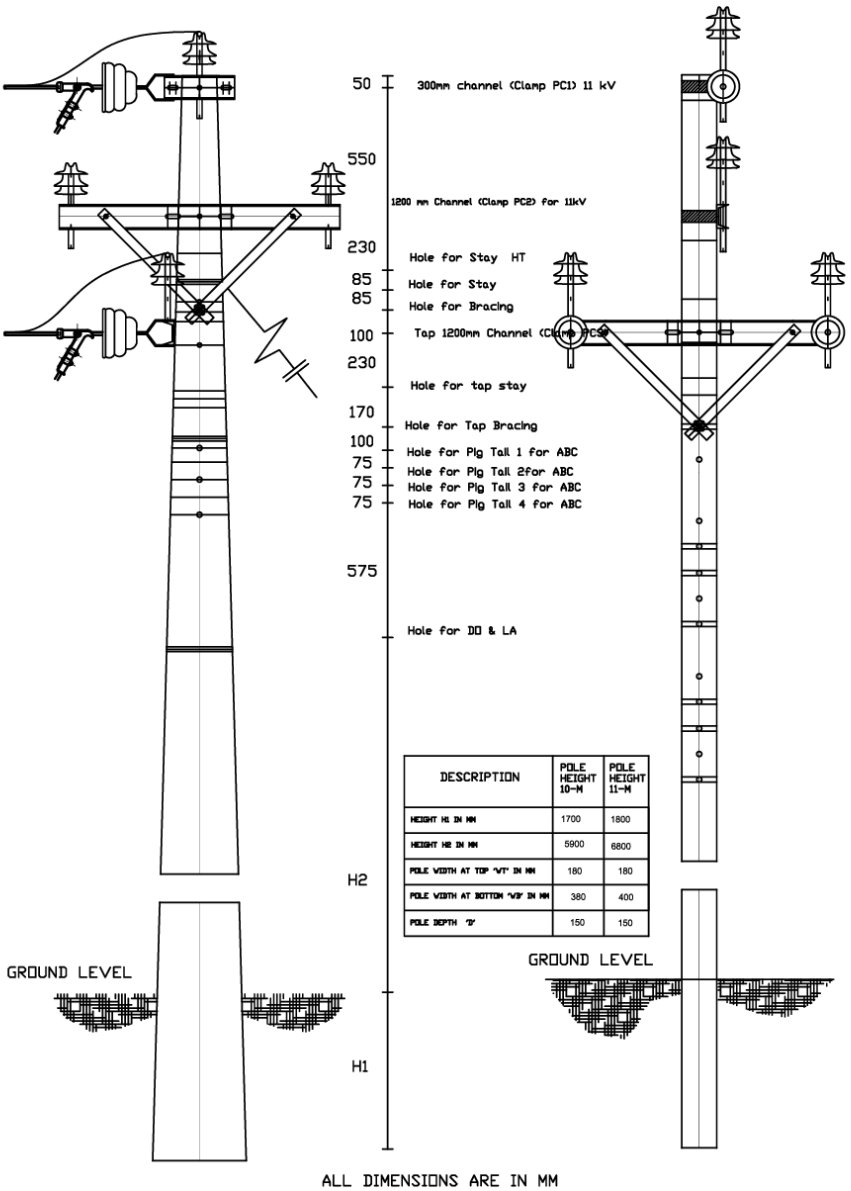
Drawing **CS11-PSCP-05**	**11 kV, 10/11 m PSC Pole Double Arm Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-PSCP-05

S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR
2	6	NOS	INSULATOR PIN
3	6	NOS	PREFORM PIN TIES (TOP TIES)
4	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 300) mm.
5	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1200) mm.
6	4	NOS	FLAT CROSSARM BRACE (40x 6.0 x 660) mm
7	4	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
8	1	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (16 x 203) mm
9	4	SET	DOUBLE ARMING BOLTS WITH NUTS AND WASHERS(16 x 305) mm
10	1	LOT	HT STAY SET (AS REQUIRED)
11	1	NOS	PSC POLE 10 m / 11m

CONSTRUCTION STANDARDS
11 kV DOUBLE ARM STRUCTURE (DA)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	5900	6800
POLE WIDTH AT TOP 'WT' IN MM	180	180
POLE WIDTH AT BOTTOM 'WB' IN MM	380	400
POLE DEPTH 'D'	150	150

ALL DIMENSIONS ARE IN MM

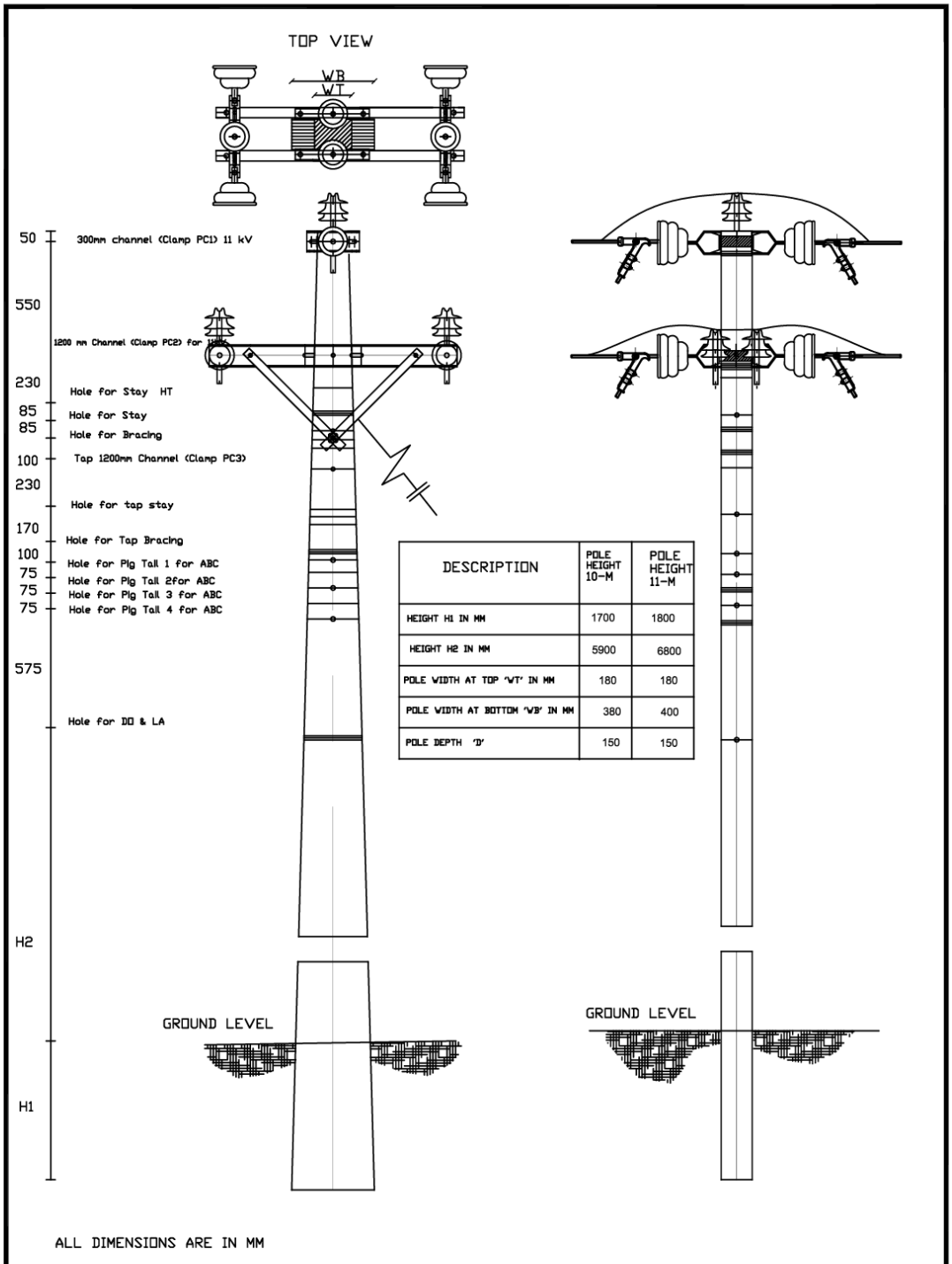
Drawing **CS11-PSCP-06**	**11 kV, 10/11 m PSC Pole** **Tap Off Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-PSCP-06

S.No.	QTY.	UNIT	MATERIAL
1	5	NOS	PIN INSULATOR
2	5	NOS	INSULATOR PIN
3	5	NOS	PREFORM PIN TIES (TOP TIES)
4	3	SET	DISC INSULATOR
5	3	SET	BRACK STRAP
6	3	SET	TENSION SET WITH BALL AND SOCKET EYE
7	6	NOS	PG CLAMP
8	1	NOS	STEEL CROSSARM CHANNEL (100x 50x 6.4 x 300) mm.
9	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC1)
10	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1200) mm.
11	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC2)
12	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC3)
13	4	NOS	FLAT CROSSARM BRACE (40x 6.0 x 660) mm
14	4	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
15	1	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (16 x 203) mm
16	1	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (16 x 305) mm
17	1	LOT	HT STAY SET (TYPE AS REQUIRED)
18	1	NOS	PSC POLE 10 m / 11 m

CONSTRUCTION STANDARDS
11 kV TAP OFF STRUCTURE (TO)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	5900	6800
POLE WIDTH AT TOP 'WT' IN MM	180	180
POLE WIDTH AT BOTTOM 'WB' IN MM	380	400
POLE DEPTH 'D'	150	150

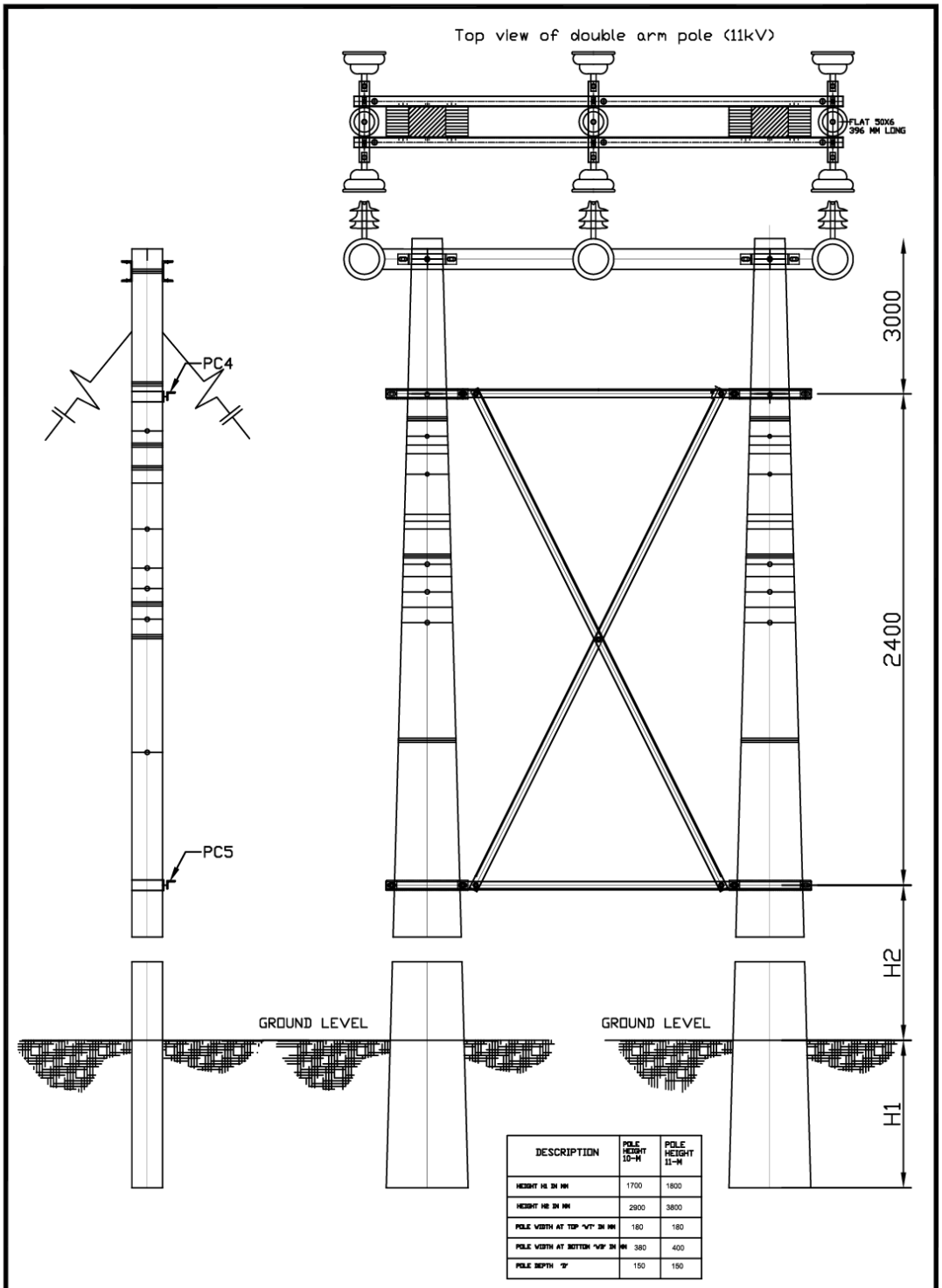
Drawing		
CS11-PSCP-08	**11 kV, 10/11 m PSC Pole Double Dead End Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-PSCP-08

S.No.	QTY.	UNIT	MATERIAL
1	4	NOS	PIN INSULATOR
2	4	NOS	INSULATOR PIN
3	4	NOS	PREFORM PIN TIES (TOP TIES)
4	6	NOS	DISC INSULATOR
5	6	SET	BRACK STRAP
6	6	SET	TENSION SET WITH BALL AND SOCKET EYE
7	6	NOS	PG CLAMP
8	2	NOS	STEEL CROSSARM CHANNEL (100x 50x 6.4 x 300) mm.
9	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1200) mm.
10	4	NOS	FLAT CROSSARM BRACE (40x 6.0 x 660) mm
11	12	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
12	1	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (16 x 203) mm
13	4	SET	DOUBLE ARMING BOLTS WITH SUITABLE NUTS AND WASHERS (16 x305) mm
14	4	NOS	STRAP FOR INSULATOR STRING (50 x 6 x 396) mm
15	1	LOT	HT STAY SET (TYPE AS REQUIRED)
16	1	NOS	PSC POLE 10 m / 11 m

CONSTRUCTION STANDARDS
11 kV DOUBLE DEAD END STRUCTURE (DDE)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	2900	3800
POLE WIDTH AT TOP "WT" IN MM	180	180
POLE WIDTH AT BOTTOM "WB" IN MM	380	400
POLE DEPTH "D"	150	150

Drawing **CS11-PSCP-10**	**11 kV, 10/11 m PSC Pole** **H - Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

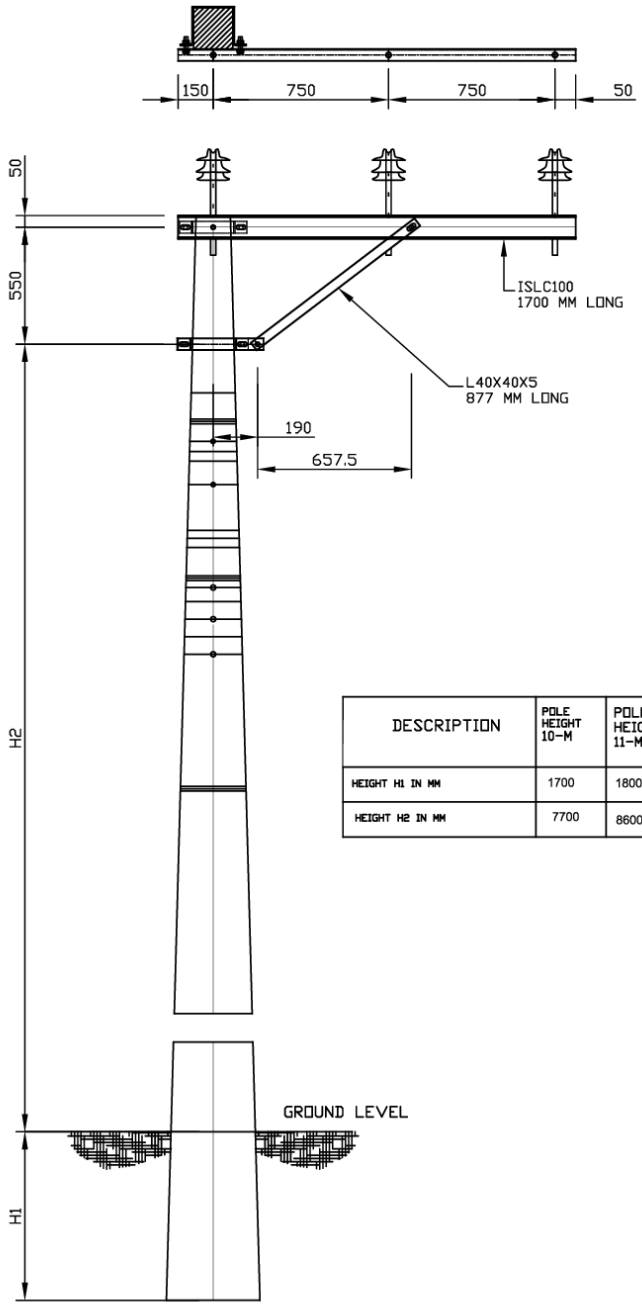
Refer Drawing No: CS11-PSCP-10

S.No.	QTY.	UNIT	MATERIAL
1	3	NOS	PIN INSULATOR
2	3	NOS	INSULATOR PIN
3	3	NOS	PREFORM PIN TIES (TOP TIES)
4	6	NOS	DISC INSULATOR
5	6	SET	BRACK STRAP
6	6	SET	TENSION SET WITH BALL AND SOCKET EYE
7	6	NOS	PG CLAMP
8	2	NOS	STEEL CROSSARM CHANNEL (100x 50x 6.4 x 2390) mm.
9	2	NOS	BRACING ANGLE (40 x 40 x 5 x 2071) mm.
10	2	NOS	CROSSARM BRACING ANGLE (40 x 40 x 5.0 x 2723) mm
11	17	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
12	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC4)
13	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC5)
14	4	SET	DOUBLE ARMING BOLTS WITH SUITABLE NUTS AND WASHERS (16 x305) mm
15	6	NOS	STRAP FOR INSULATOR STRING (50 x 6 x 396) mm
16	5	SET	HT STAY SET (TYPE AS REQUIRED)
17	2	NOS	PSC POLE 10 m / 11 m

CONSTRUCTION STANDARDS
11 kV H- STRUCTURE (HS)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services

TOP VIEW



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	7700	8600

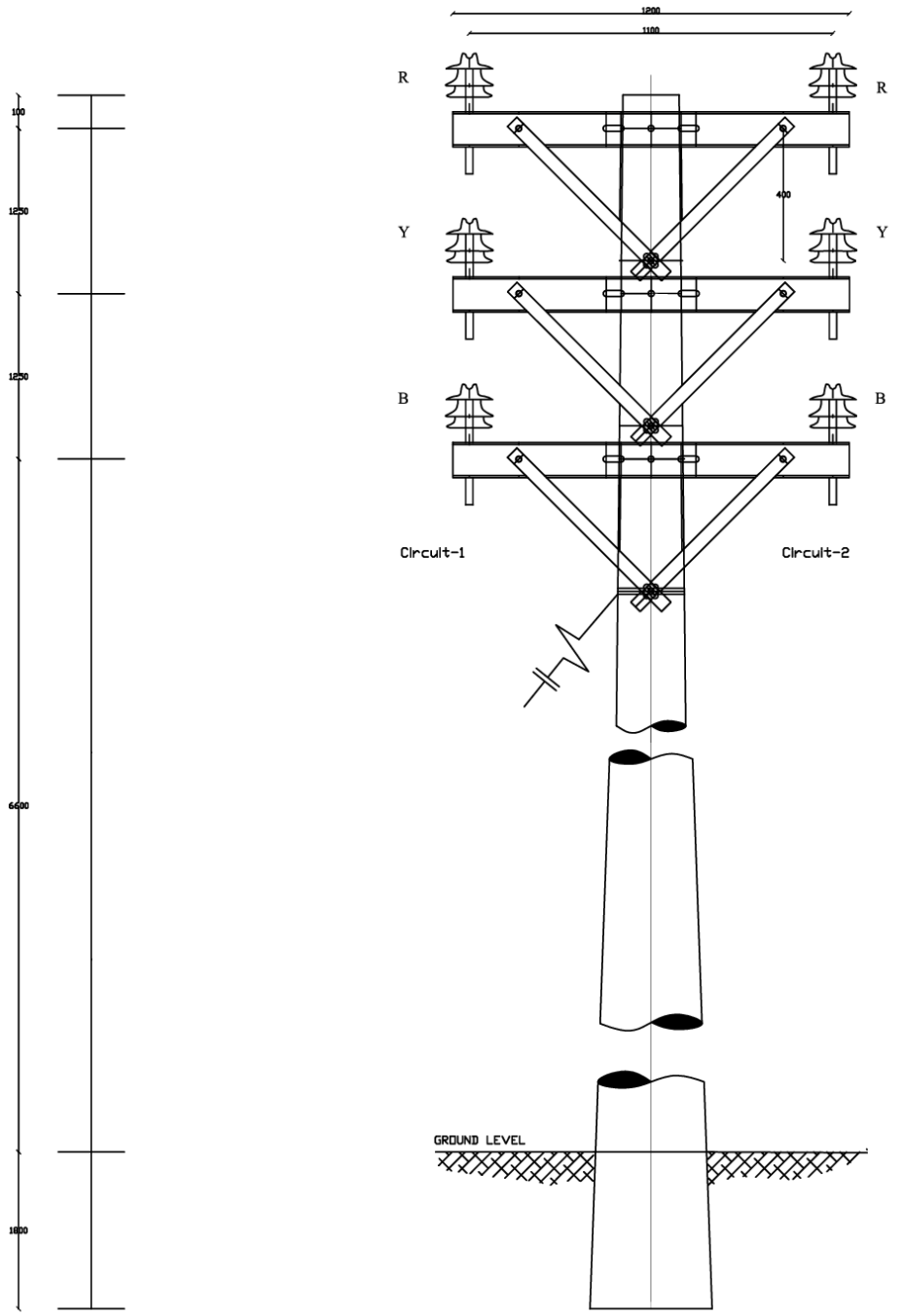
Drawing **CS11-PSCP-09**	**11 kV, 10/11 m PSC Pole** **Offset Pole Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-PSCP-09

S.No.	QTY.	UNIT	MATERIAL
1	3	NOS	PIN INSULATOR
2	3	NOS	INSULATOR PIN
3	3	NOS	PREFORM PIN TIES (TOP TIES)
4	1	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1700) mm.
5	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC1)
6	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (PC2)
7	1	NOS	BRACING CROSSARM ANGLE (40 x 40 x 5 x 877) mm.
8	2	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
9	1	NOS	PSC POLE 10 m / 11m

CONSTRUCTION STANDARDS
11 kV OFFSET STRUCTURE
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing **CS11-DCKT-09**	**11 kV, 11 m Single Pole Double Circuit (Vertical) Angle Type**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-DCKT- 09

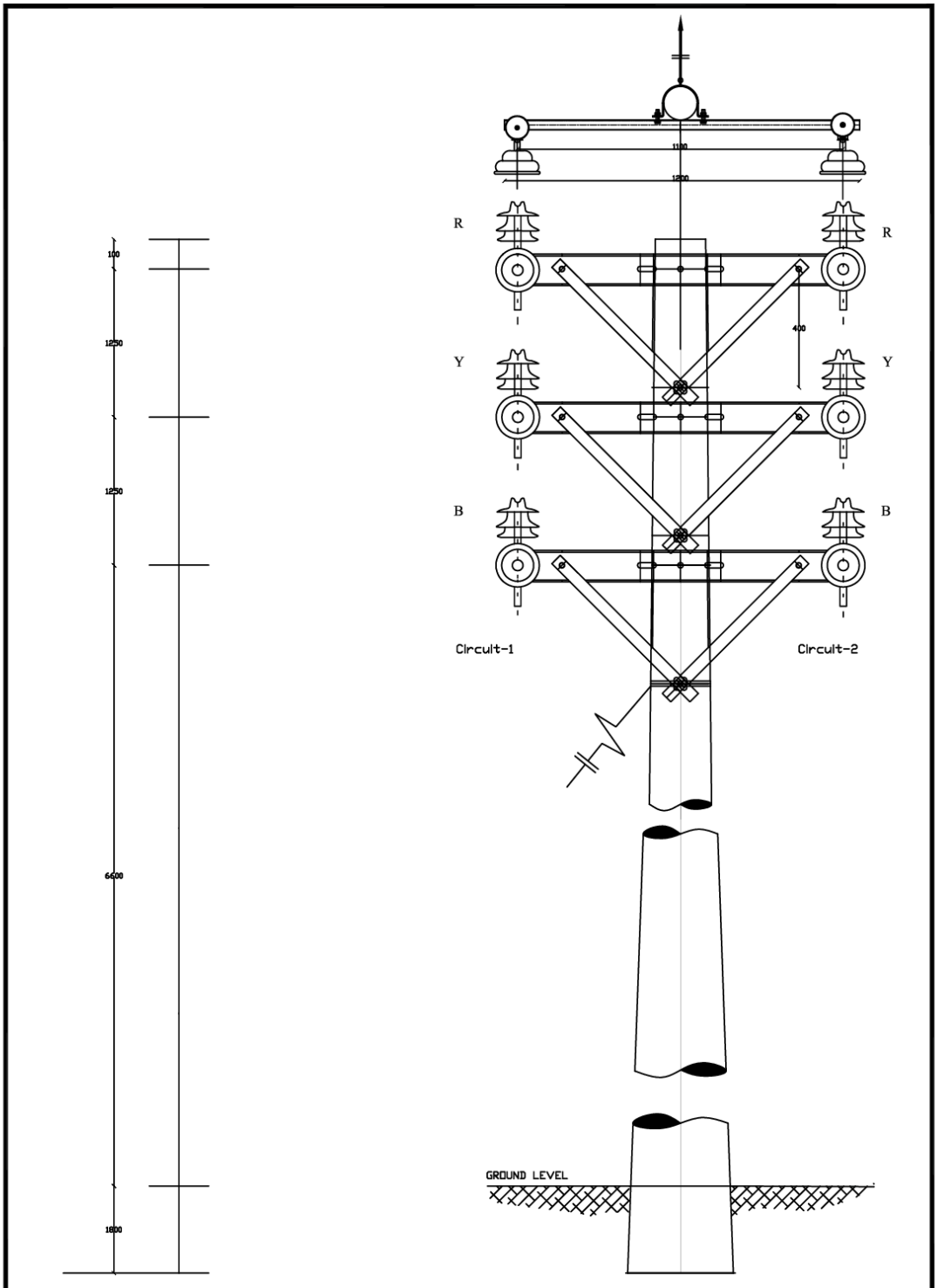
S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR
2	6	NOS	INSULATOR PIN
3	6	NOS	PREFORM PIN TIES (TOP TIES)
4	3	NOS	STEEL CROSSARM CHANNEL (100x 50x6.4x1200) mm.
5	3	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
6	6	NOS	FLAT CROSSARM BRACE(40x 6.0x660) mm
7	15	SET	BOLTS WITH SUITABLE NUTS AND WASHERS AS REQUIRED
8	1	LOT	HT STAY SET (AS REQUIRED)
9	1	NOS	POLE TELESCOPIC/TUBULAR 11m

CONSTRUCTION STANDARDS

11 kV SINGLE POLE DOUBLE CIRCUIT (VERTICALLY)
TELESCOPIC /TUBULAR POLE (ANGLE)

NEPAL ELECTRICITY AUTHORITY

Technical Service/ Commercial Department
Distribution and Consumer Services



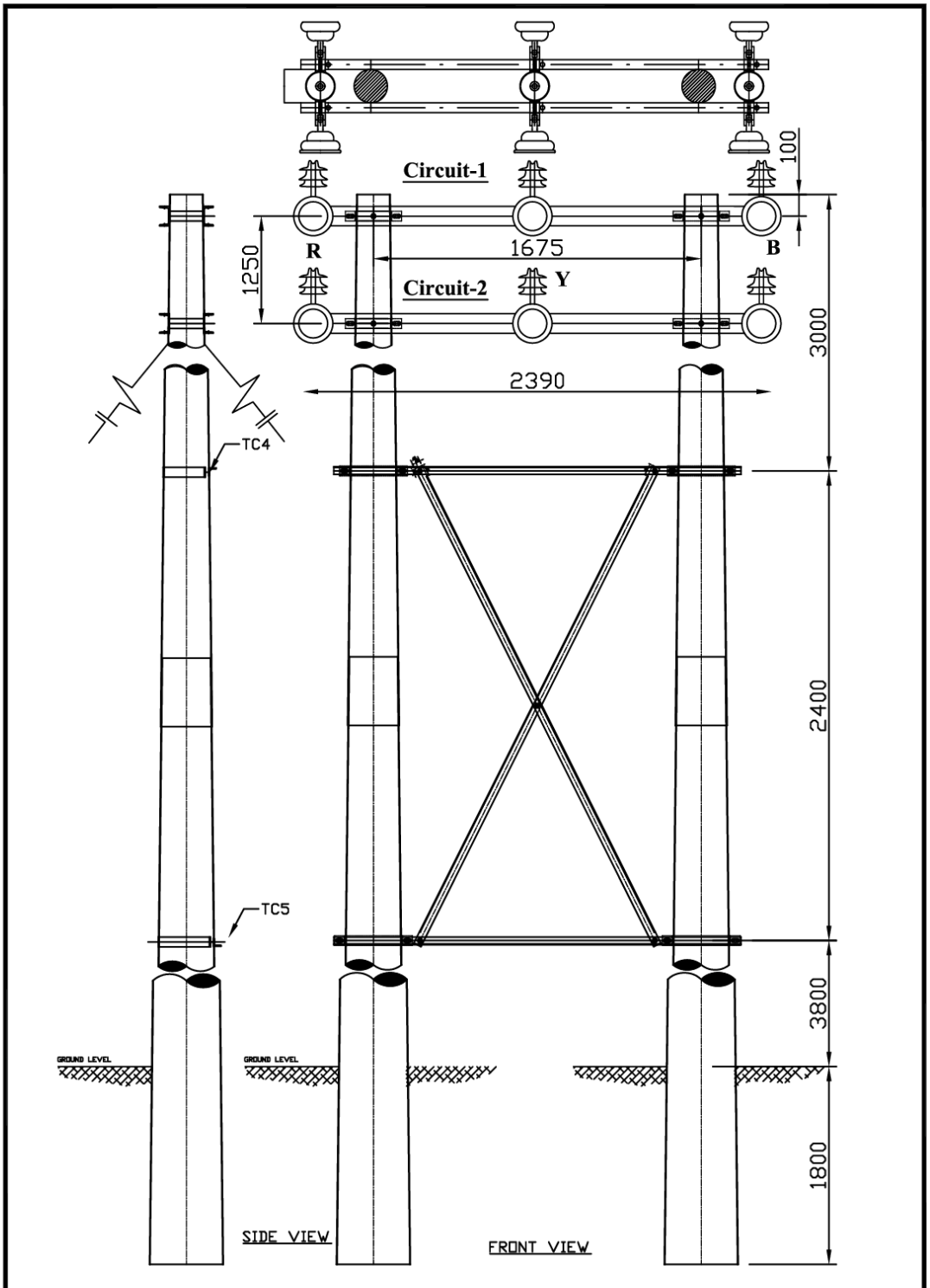
Drawing **CS11-DCKT-10**	**11 kV, 11 m Single Pole Double Circuit (Vertical) Dead End Type**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-DCKT- 10

S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	DISC INSULATOR
2	6	SET	BACK STRAP
3	6	SET	TENSION SET WITH BALL AND SOCKET EYE
4	3	NOS	STEEL CROSSARM CHANNEL (100x 50x6.4x1200) mm.
5	3	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
6	6	NOS	FLAT CROSSARM BRACE (40x 6.0x660) mm
7	17	SET	BOLTS WITH SUITABLE NUTS AND WASHERS AS REQUIRED
8	1	LOT	HT STAY SET (AS REQUIRED)
9	1	NOS	TELESCOPIC/TUBULAR POLE 11m

CONSTRUCTION STANDARDS
11 kV SINGLE POLE DOUBLE CIRCUIT (VERTICALLY)
TELESCOPIC /TUBULAR POLE (DEAD END)

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing **CS11-DCKT-11**	**11kV, 11 m Double Pole Double Circuit (Horizontal)**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-DCKT- 11

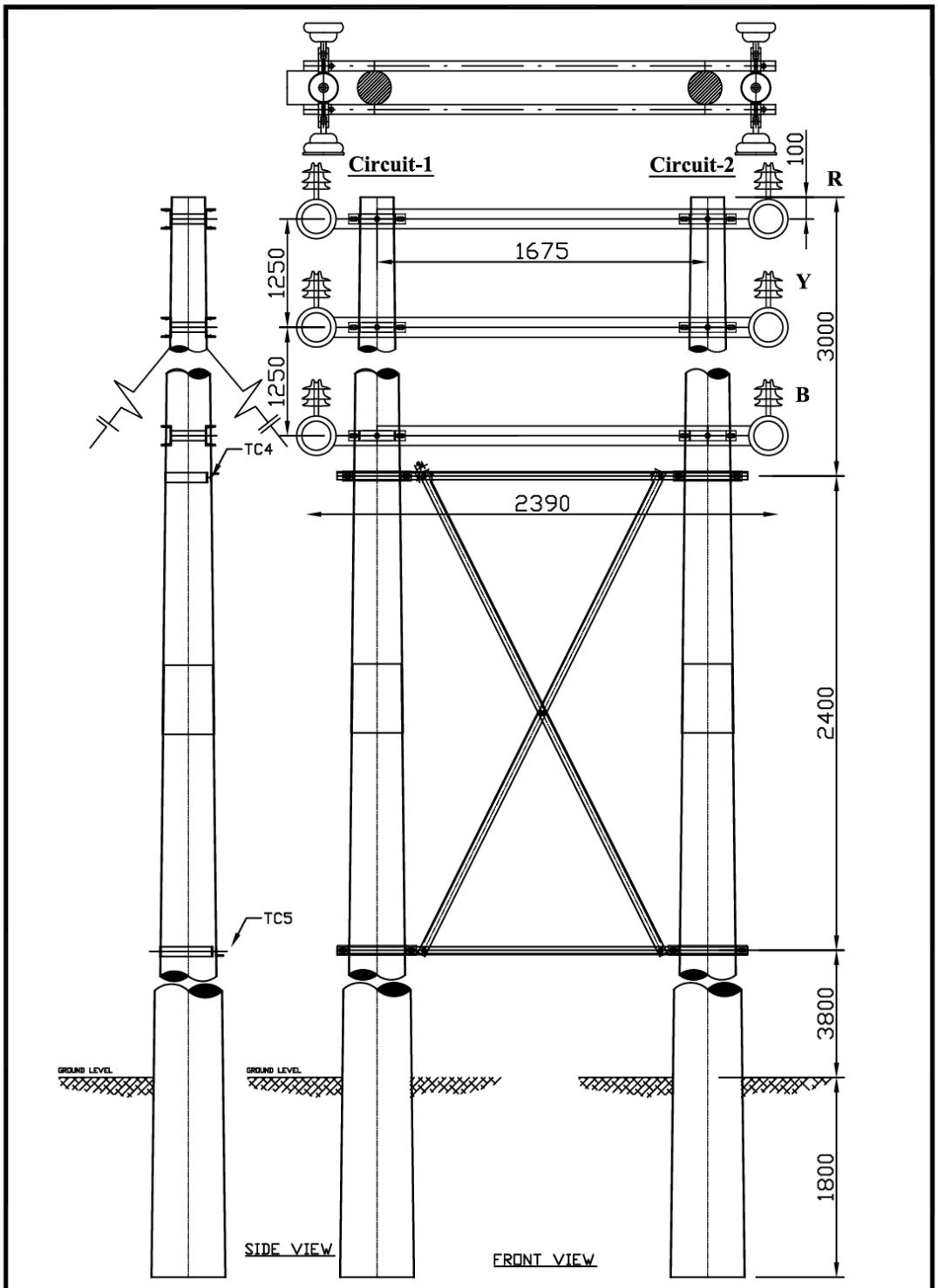
S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR
2	6	NOS	INSULATOR PIN
3	6	NOS	PREFORM PIN TIES (TOP TIES)
4	12	NOS	DISC INSULATOR
5	12	SET	BACK STRAP
6	12	SET	TENSION SET WITH BALL AND SOCKET EYE
7	12	NOS	PG CLAMP
8	4	NOS	STEEL CROSSARM CHANNEL (100x 50x 6.4 x 2390) mm.
9	2	NOS	BRACING ANGLE (40 x 40 x 5 x 2071) mm.
10	2	NOS	CROSSARM BRACING ANGLE (40 x 40 x 5.0 x 2723) mm
11	17	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
12	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (TC4)
13	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (TC5)
14	8	SET	DOUBLE ARMING BOLTS WITH SUITABLE NUTS AND WASHERS (16 x305) mm
15	12	NOS	STRAP FOR INSULATOR STRING (50 x 6 x 396) mm
16	5	SET	HT STAY SET (TYPE AS REQUIRED)
17	2	NOS	TELESCOPIC/TUBULAR POLE 11m

CONSTRUCTION STANDARDS

11 kV DOUBLE ARM STRUCTURE FOR DOUBLE CIRCUIT TELESCOPIC /TUBULAR POLE TELESCOPIC POLE (H-STRUCTURE)

NEPAL ELECTRICITY AUTHORITY

Technical Service/ Commercial Department
Distribution and Consumer Services

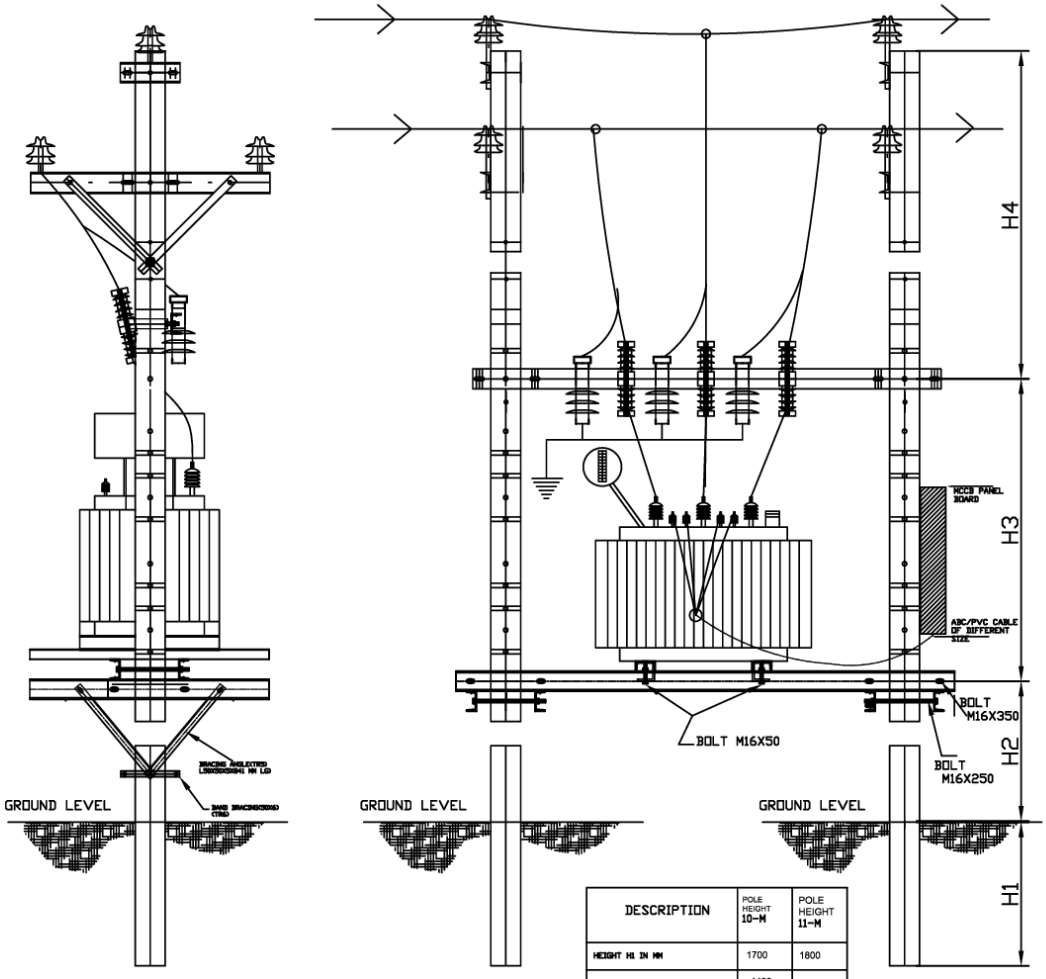


Drawing **CS11-DCKT-12**	**11kV, 11 m Double Pole Double Circuit (Vertical)**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-DCKT- 12

S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR
2	6	NOS	INSULATOR PIN
3	6	NOS	PREFORM PIN TIES (TOP TIES)
4	12	NOS	DISC INSULATOR
5	12	SET	BACK STRAP
6	12	SET	TENSION SET WITH BALL AND SOCKET EYE
7	12	NOS	PG CLAMP
8	6	NOS	STEEL CROSSARM CHANNEL (100x 50x 6.4 x 2390) mm.
9	2	NOS	BRACING ANGLE (40 x 40 x 5 x 2071) mm.
10	2	NOS	CROSSARM BRACING ANGLE (40 x 40 x 5.0 x 2723) mm
11	17	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
12	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (TC4)
13	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS (TC5)
14	12	SET	DOUBLE ARMING BOLTS WITH SUITABLE NUTS AND WASHERS (16 x305) mm
15	12	NOS	STRAP FOR INSULATOR STRING (50 x 6 x 396) mm
16	5	SET	HT STAY SET (TYPE AS REQUIRED)
17	2	NOS	TELESCOPIC/TUBULAR POLE 11m

CONSTRUCTION STANDARDS **11 kV DOUBLE POLE DOUBLE CIRCUIT (VERTICALLY) TELESCOPIC/ TUBULARPOLE (H-STRUCTURE)**	**NEPAL ELECTRICITY AUTHORITY** **Technical Service/ Commercial Department** **Distribution and Consumer Services**



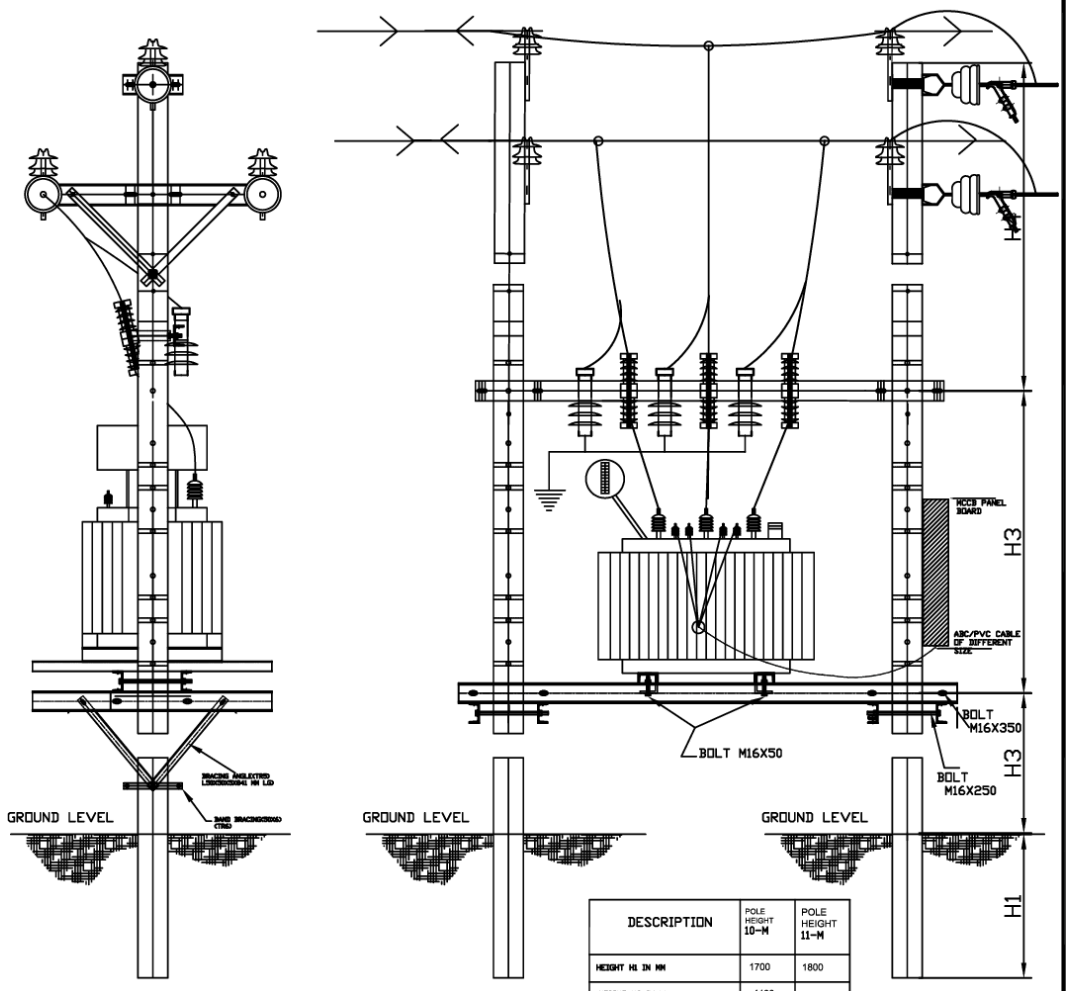
DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	4400	3500
HEIGHT H3 IN MM	2400	2400
HEIGHT H4 IN MM	2400	2400

Drawing **CS11-TRN-03**	**10/11 m PSC Pole 11/0.4 kV Intermediate Transformer Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS 11 -TRN-01 AND 03

S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR WITH PIN AND NUTS/WASHER
2	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x300) mm.
3	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1200) mm.
4	1	NO	STEEL CROSSARM CHANNEL FOR DO / LA (100 x 50 x 6.4 x2348) mm.
5	1	SET	TRANSFORMER PLATFORM (REFER CS LV-)
6	3	NOS	9 kV SURGE ARRESTOR WITH FITTING ARRANGMENTS
7	3	NOS	11 kV DISTRIBUTION CUTOUT WITH SUITABLE FUSE HOLDERS
8	2	SET	POLE CLAMP WITH NUTS AND BOLTS (TC1)
9	4	SET	POLE CLAMP WITH NUTS AND BOLTS (TC2)
10	2	SET	POLE CLAMP WITH NUTS AND BOLTS (TC7)
11	4	NOS	ANGLE CROSS ARM(50 x 50 x 5 x 841) mm
12	4	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
13	2	SET	EARTHING SET (WITH GROUND RODS AND ACCESSORIES)
14	1	SET	LV CONNECTOR TYPE AS REQUIRED
15	1	SET	MCCB WITH PANEL BOARD
16	6	SET	PREFORM ED PIN INSULATORS
17	18	M	ABC OR PVC CABLE OF REQUIRED RATING
18	10	M	ACSR CONDUCTOR
19	3	SET	PG CLAMP
20	2	NOS	TELESCOPIC / PSC POLE

CONSTRUCTION STANDARDS **11/0.4 kV TRANSFORMER STRUCTURE** **TELESCOPIC/PSC POLE (INTERMEDIATE)**	**NEPAL ELECTRICITY AUTHORITY** **Technical Service/ Commercial Department** **Distribution and Consumer Services**



DESCRIPTION	POLE HEIGHT 10-M	POLE HEIGHT 11-M
HEIGHT H1 IN MM	1700	1800
HEIGHT H2 IN MM	4400	3500
HEIGHT H3 IN MM	2400	2400
HEIGHT H4 IN MM	2400	2400

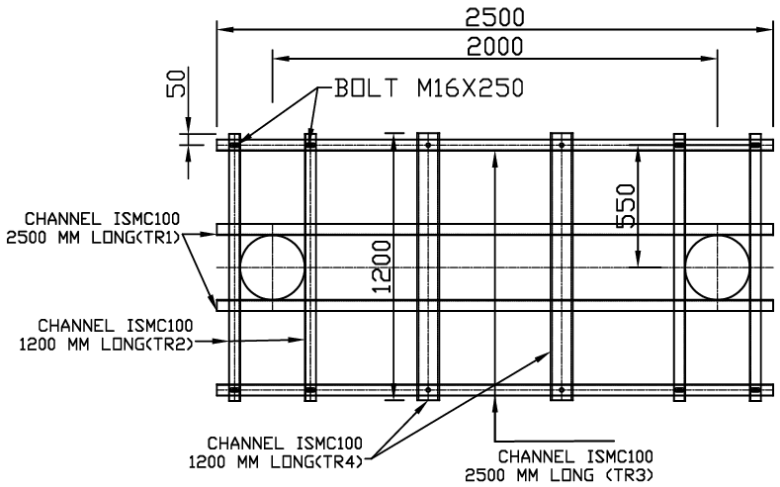
Drawing **CS11-TRN-04**	**10/11 m PSC Pole** **11/0.4 kV Dead End** **Transformer Structure**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS 11 -TRN-02 AND 04

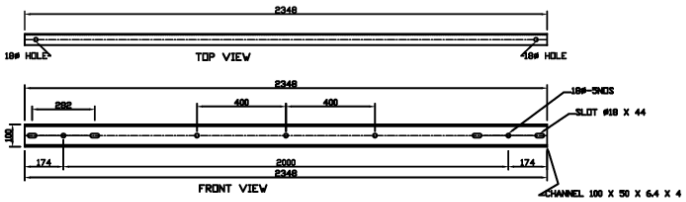
S.No.	QTY.	UNIT	MATERIAL
1	6	NOS	PIN INSULATOR WITH PIN AND NUTS/WASHER
2	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x300) mm.
3	2	NOS	STEEL CROSSARM CHANNEL (100 x 50 x 6.4 x 1200) mm.
4	1	NO	STEEL CROSSARM CHANNEL FOR DO / LA (100 x 50 x 6.4 x2348) mm.
5	1	SET	TRANSFORMER PLATFORM (REFER CS LV-)
6	3	NOS	9 kV SURGE ARRESTOR WITH FITTING ARRANGMENTS
7	3	NOS	11 kV DISTRIBUTION CUTOUT WITH SUITABLE FUSE HOLDERS
8	2	SET	POLE CLAMP WITH NUTS AND BOLTS (TC1)
9	2	SET	POLE CLAMP WITH NUTS AND BOLTS (TC2)
10	2	SET	POLE CLAMP WITH NUTS AND BOLTS (TC7)
11	4	NOS	ANGLE CROSS ARM(50 x 50 x 5 x 841) mm
12	4	SET	BOLTS WITH SUITABLE NUTS AND WASHERS (12 x 51) mm
13	2	SET	EARTHING SET (WITH GROUND RODS AND ACCESSORIES)
14	1	SET	LV CONNECTOR TYPE AS REQUIRED
15	1	SET	MCCB WITH PANEL BOARD
16	6	SET	PREFORM ED PIN INSULATORS
17	18	M	ABC OR PVC CABLE OF REQUIRED RATING
18	10	M	ACSR CONDUCTOR
19	6	SET	DISC INSULATOR
20	6	SET	TENSION SET
21	6	SET	BACK STRAP
22	3	SET	PG CLAMP
23	2	NOS	TELESCOPIC / PSC POLE

CONSTRUCTION STANDARDS
11/0.4 kV TRANSFORMER STRUCTURE(DEAD END)
TELESCOPIC/PSC POLE

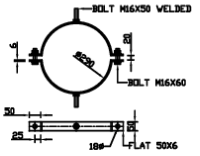
NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



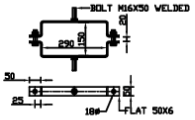
TRANSFORMER PLAT-FORM TOP VIEW



CROSS ARM CHANNEL FOR LA AND DO
ISLC100 (2348 MM LONG)

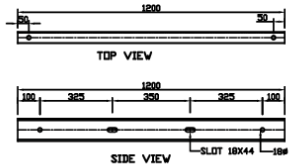


BRACING BAND (TR6) DETAIL
(FOR TELESCOPIC POLE ONLY)

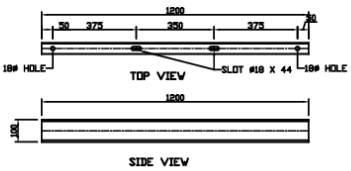


BRACING BAND (TR6P) DETAIL
(FOR PSC POLE ONLY)

SPECIAL NOTE-
ALL DIMENSION ARE SAME FOR BOTH PSC AND TELESCOPIC POLE



PLATFORM CHANNEL (TR2)
ISMC100X1200 MM LONG)



PLATFORM CHANNEL (TR4)
ISMC100X1200 MM LONG)

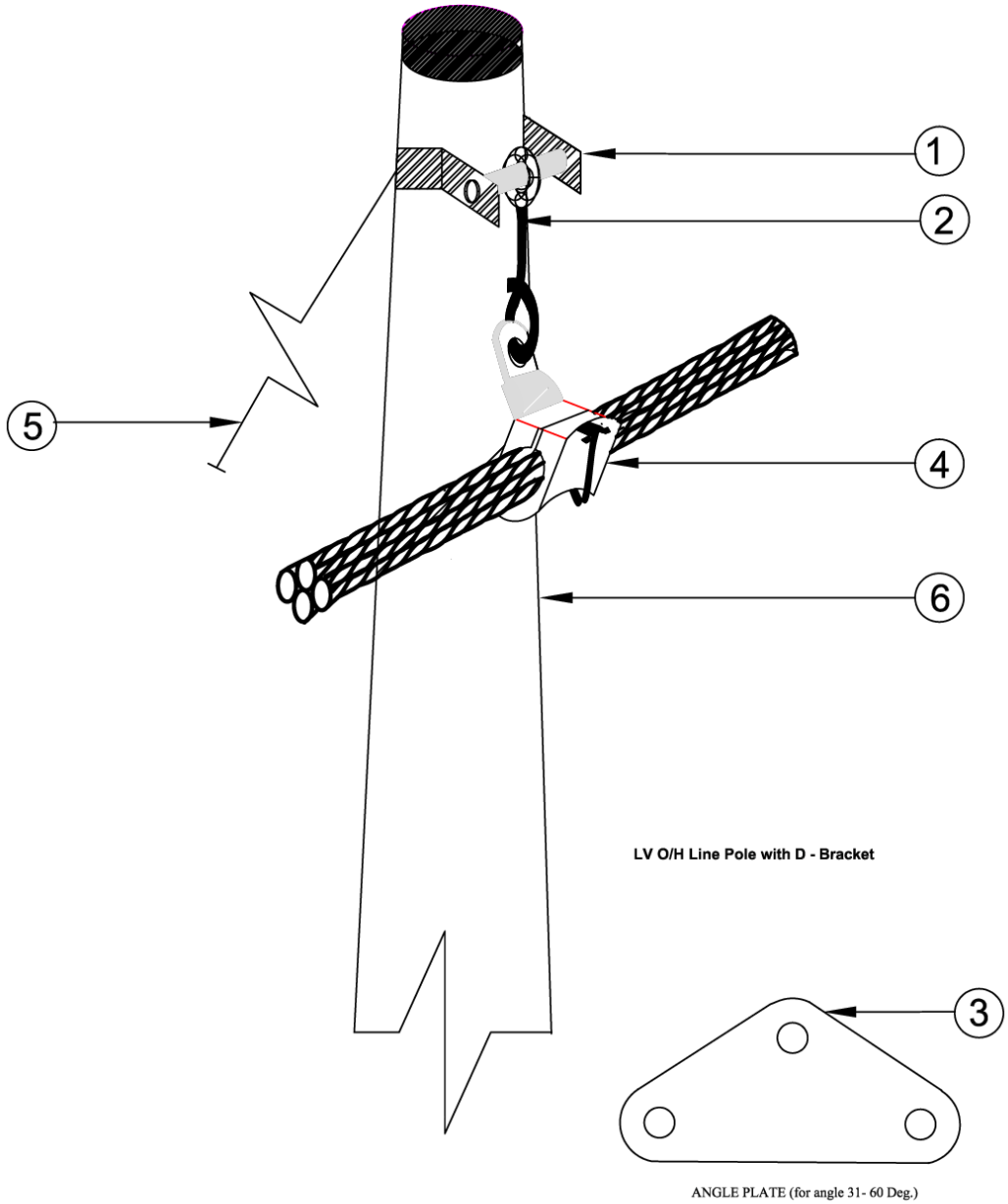
Drawing **CS11-TRN-06**	**Transformer Platform and Accessories**	NEPAL ELECTRICITY AUTHORITY **Technical Services / Commercial Department** Distribution and Consumer Services

Refer Drawing No: CS11-TRN-06

S.No.	QTY.	UNIT	MATERIAL
1	1	NO	CHANNEL FOR DO / LA (100 x 50 x 6.4 x 2348) mm
2	2	NOS	PLATFORM CHANNEL TR1 (100 x 50 x 7.5 x 1200) mm
3	4	NOS	PLATFORM CHANNEL TR2 (100 x 50 x 7.5 x 2500) mm
4	2	NOS	PLATFORM CHANNEL TR3 (100 x 50 x 7.5 x 2500) mm
5	2	NOS	PLATFORM CHANNEL TR4 (100 x 50 x 7.5 x1200) mm
6	8	NOS	BRACING ANGLE TR5 (50 x 50 x 5 x841) mm
7	2	SET	BRACING BRAND TR6 WITH 2-M16 x60 BOLTS,2-M16 x50 BOLTS , 8-M16 NUT, 8-M16 WASHER
8	24	SET	M16 x50 BOLTS WITH 2-M16 NUT AND 2-M16 WASHER
9	4	SET	M16 x250 BOLTS WITH 2-M16 NUT AND 2-M16 WASHER
10	8	SET	M16 x350 BOLTS WITH 2-M16 NUT AND 2-M16 WASHER
11	1	NO	PSC POLE

CONSTRUCTION STANDARDS
TRANSFORMER PLATE
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



LV O/H Line Pole with D - Bracket

ANGLE PLATE (for angle 31- 60 Deg.)

Drawing		
CSLV-ABC-01	**ABC -TTSP-Suspension Type - TYPE A**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 01

0^O TO 30^O

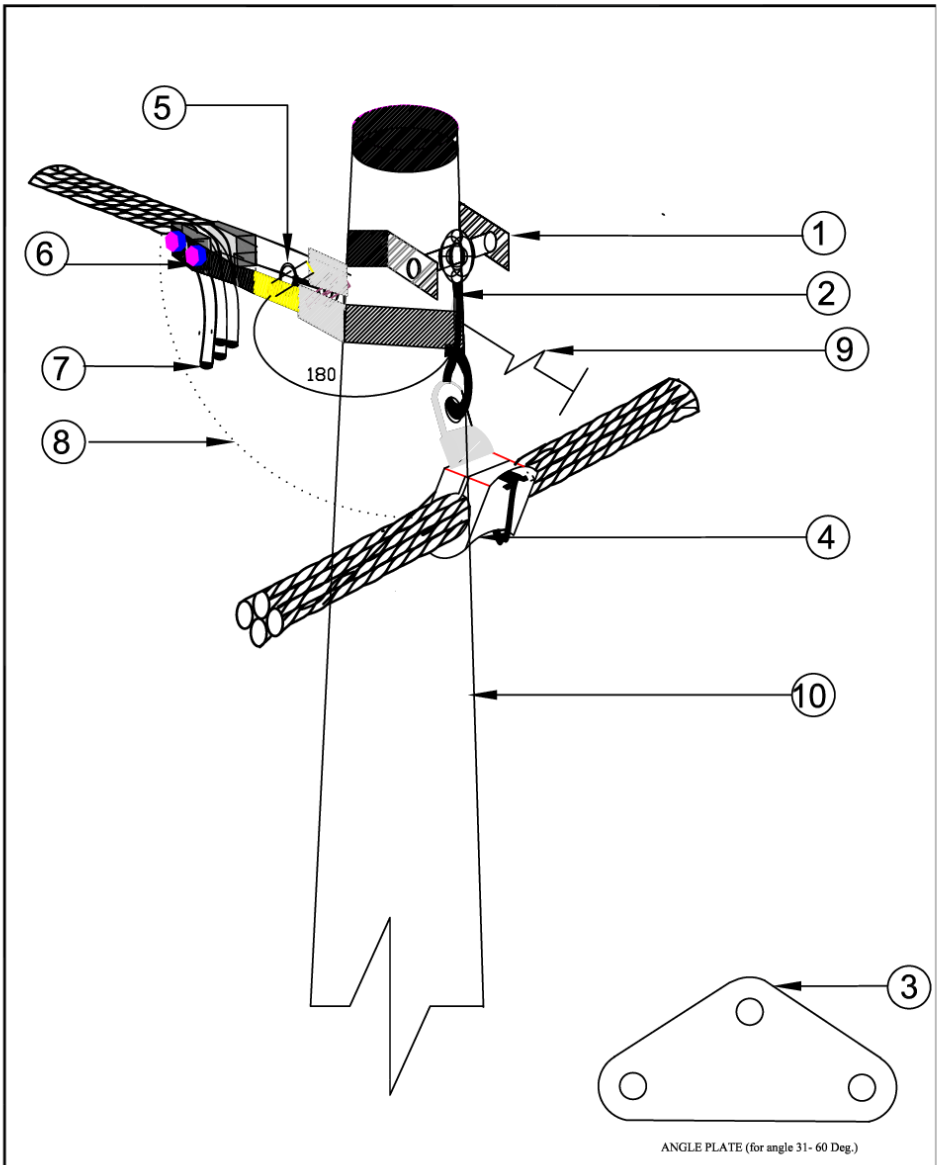
S.No.	QTY.	UNIT	MATERIAL
1	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	1	SET	PIGTAIL WITH FABRICATED EYE
3	0	NO.	ANGLE PLATE
3	1	SET	SUSPENSION CLAMP
4	1	NO.	LT STAY SET (TYPE AS REQUIRED)
5	1	NO.	POLE TELESCOPIC 8 m / 9 m

31^O TO 60^O

S.No.	QTY.	UNIT	MATERIAL
1	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	1	SET	PIGTAIL WITH FABRICATED EYE
3	1	No.	ANGLE PLATE
4	1	SET	SUSPENSION CLAMP
5	1	No.	LT STAY SET (TYPE AS REQUIRED)
6	1	No.	POLE TELESCOPIC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-A (SUSPENSION TYPE) TELESCOPIC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing **CSLV-ABC-02**	**ABC -TTSP-Suspension Type with an Anchor for Dead-TYPE B**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 02

0^O TO 30^O

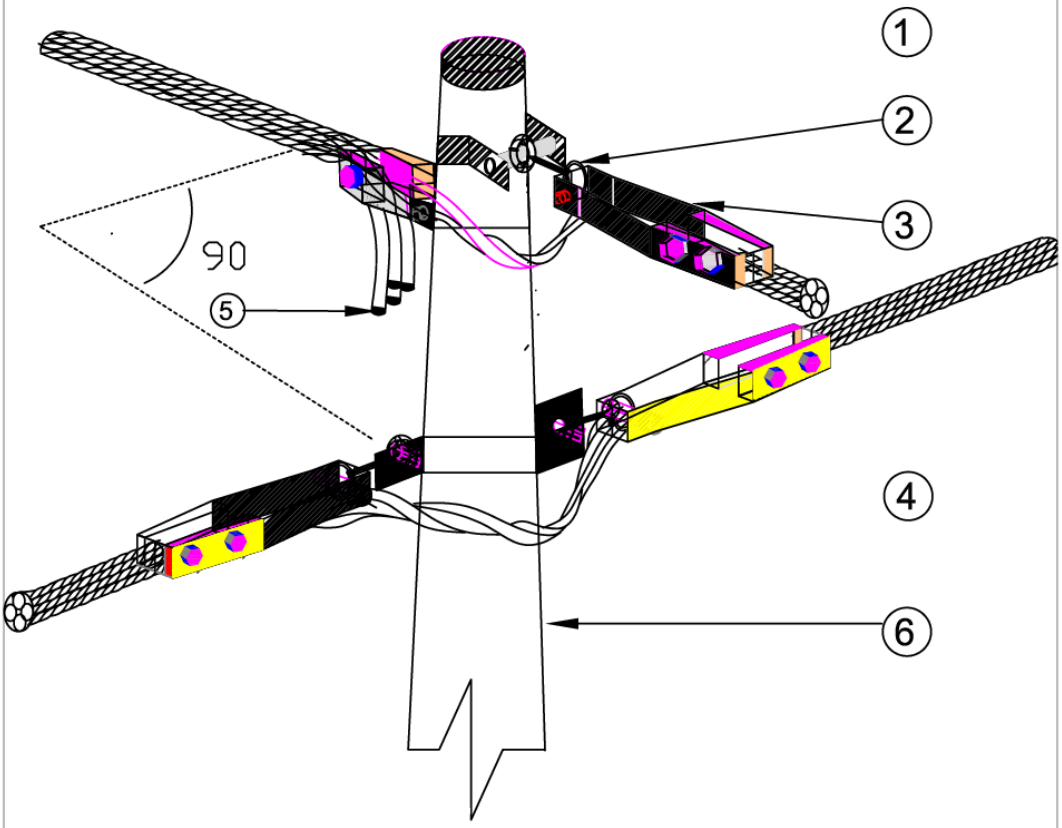
S.No.	QTY.	UNIT	MATERIAL
1	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	1	SET	PIGTAIL WITH FABRICATED EYE
3	1	SET	SUSPENSION CLAMP
4	0	NO.	ANGLE PLATE
5	1	NO.	TWISTED DOUBLE EYE
6	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
7	4	NOS	INSULATED CABLE CAP
8	8	NOS	INSULATED PIERCING CONNECTOR
9	1	NO.	LT STAY SET (TYPE AS REQUIRED)
10	1	NO.	POLE TELESCOPIC 8 m / 9 m

31^O TO 60^O

S.No.	QTY.	UNIT	MATERIAL
1	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	1	SET	PIGTAIL WITH FABRICATED EYE
3	1	No.	ANGLE PLATE
4	1	SET	SUSPENSION CLAMP
5	1	No.	TWISTED DOUBLE EYE
6	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
7	4	NOS	INSULATED CABLE CAP
8	8	NOS	INSULATED PIERCING CONNECTOR
9	1	No.	LT STAY SET (TYPE AS REQUIRED)
10	1	No.	POLE TELESCOPIC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-B (SUSPENSION WITH AN ANCHOR FOR DEAD) TELESCOPIC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



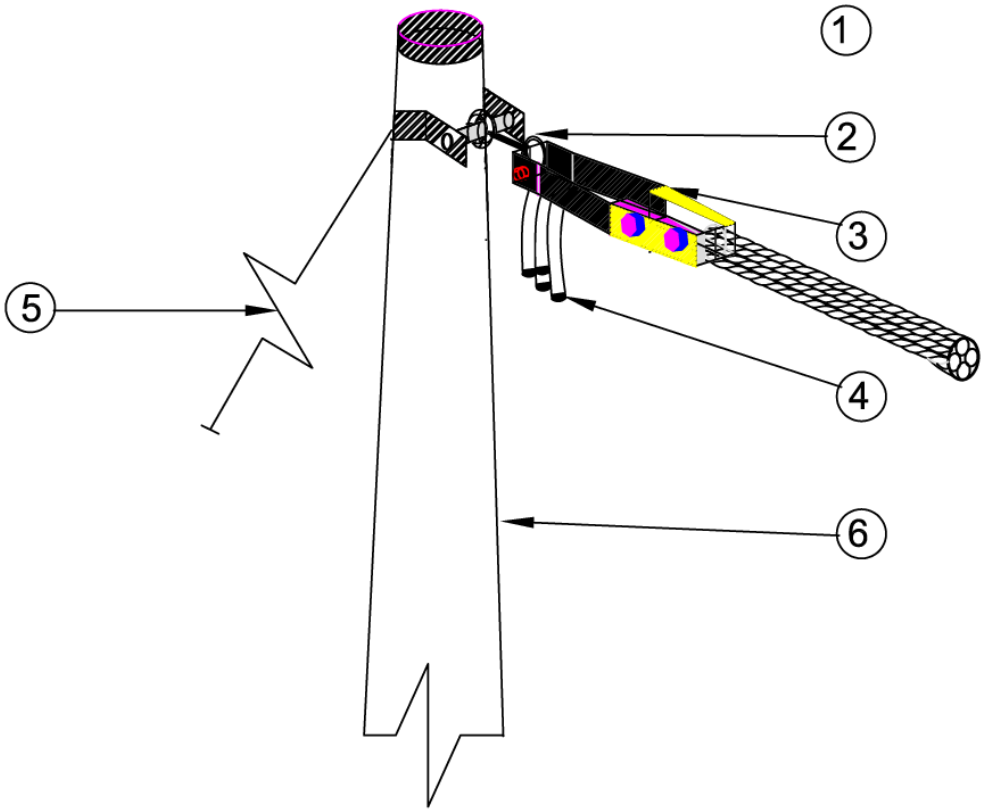
Drawing	ABC-TTSP-Four Anchor Dead End- TYPE C	NEPAL ELECTRICITY AUTHORITY
CSLV-ABC-03		**Technical Services/ Commercial Department**
		Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 03

S.No.	QTY.	UNIT	MATERIAL
1	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	4	No.	TWISTED DOUBLE EYE
3	4	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
4	16	NOS	INSULATED PIERCING CONNECTOR
5	16	NOS	INSULATED CABLE CAP
6	1	No.	POLE TELESCOPIC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-C (FOUR ANCHOR DEAD END)
TELESCOPIC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



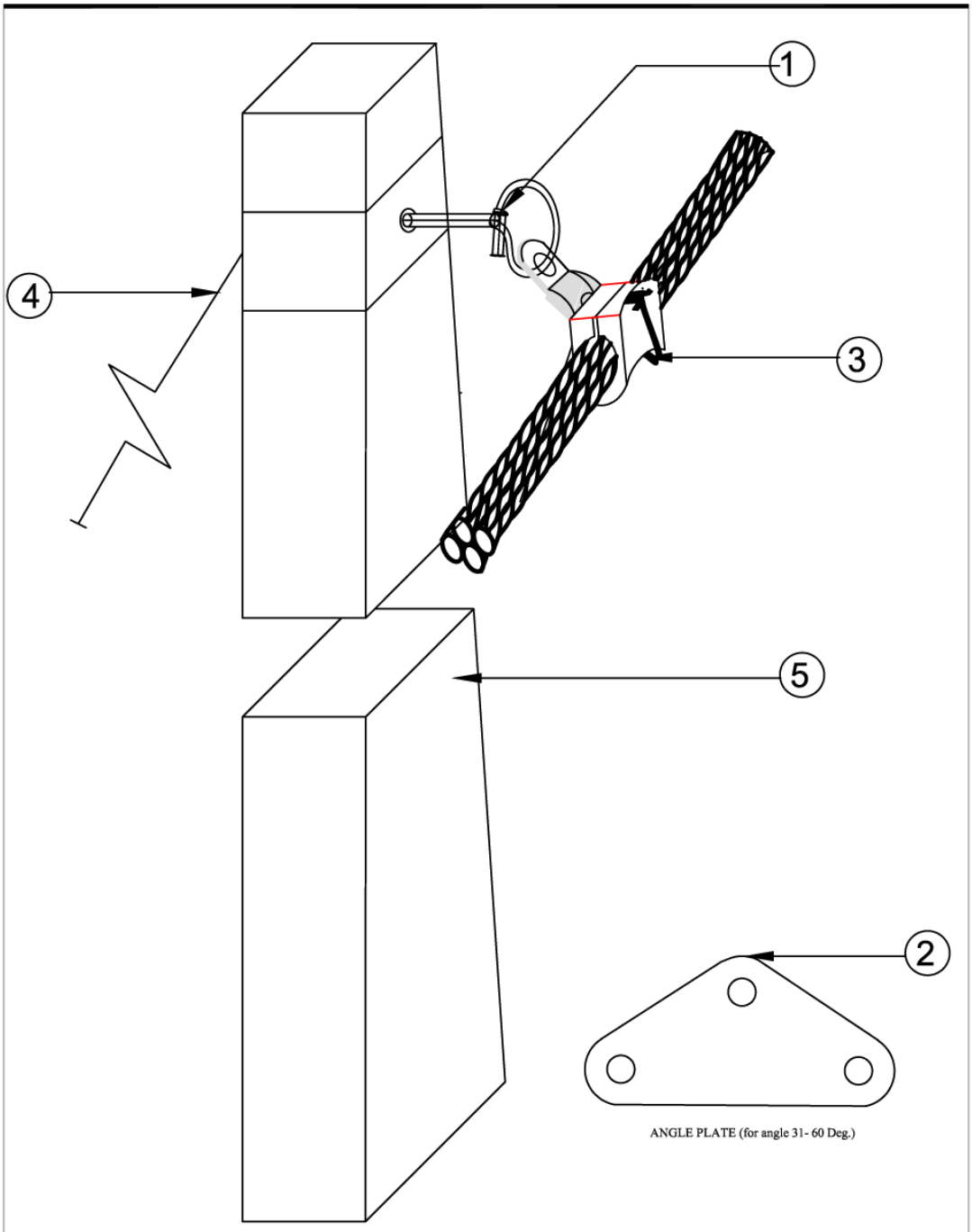
Drawing **CSLV-ABC-05**	**ABC-TTSP-Single Anchor Dead End - TYPE F**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 05

S.No.	QTY.	UNIT	MATERIAL
1	1	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	1	SET	PIGTAIL WITH FABRICATED EYE
3	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
4	4	NOS	INSULATED CABLE CAP
5	1	No.	LT STAY SET (TYPE AS REQUIRED)
6	1	No.	POLE TELESCOPIC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-F (SINGLE ANCHOR DEAD) TELESCOPIC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing **CSLV-ABC-06**	**ABC-PSC-Suspension Type-TYPE A**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 06

0^O TO 30^O

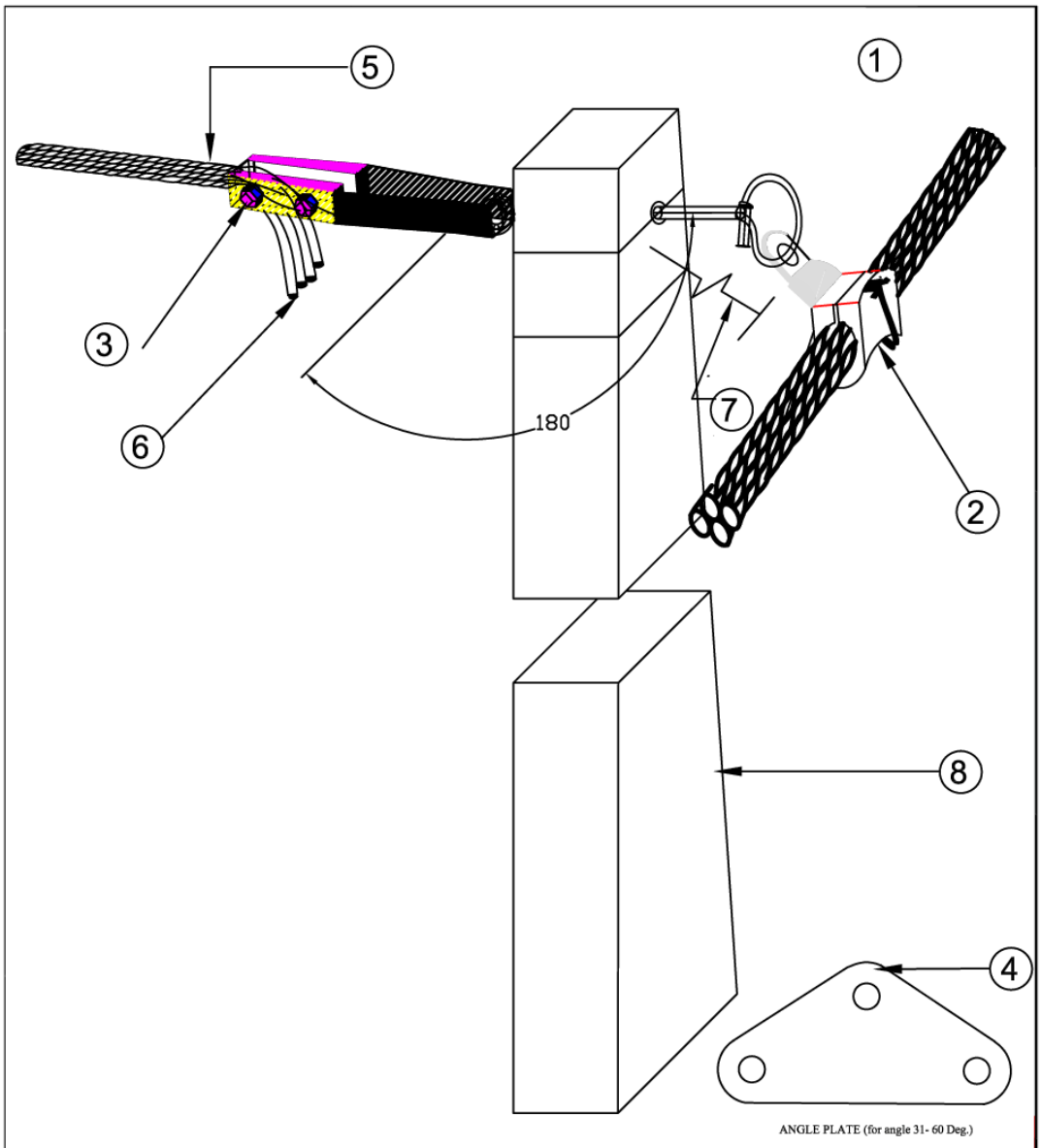
S.No.	QTY.	UNIT	MATERIAL
1	1	SET	PIGTAIL WITH HEXAGONAL NUTS AND WASHERS (16 * 203) mm
2	0	No.	ANGLE PLATE
3	1	SET	SUSPENSION CLAMP
4	1	No.	LT STAY SET (TYPE AS REQUIRED)
5	1	No.	POLE PSC 8 m / 9 m

31^O TO 60^O

S.No.	QTY.	UNIT	MATERIAL
1	1	SET	PIGTAIL WITH HEXAGONAL NUTS AND WASHERS (16 * 203) mm
2	1	No.	ANGLE PLATE
3	1	SET	SUSPENSION CLAMP
4	1	No.	LT STAY SET (TYPE AS REQUIRED)
5	1	No.	POLE PSC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-A (SUSPENSION TYPE)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing **CSLV-ABC-07**	**ABC -PSC-Suspension Type with an Anchor for Dead-TYPE B**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC- 07

0^O TO 30^O

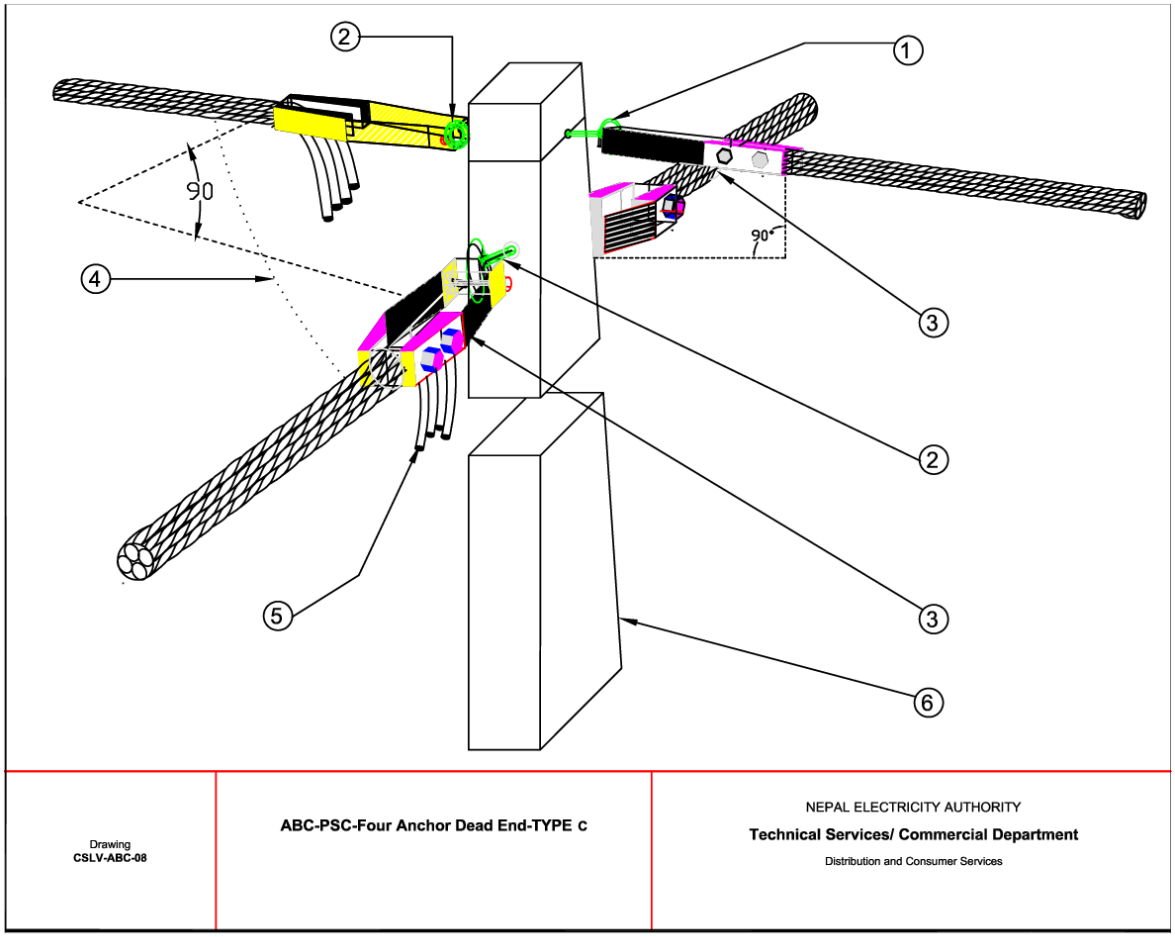
S.No.	QTY.	UNIT	MATERIAL
1	2	SET	PIGTAIL WITH HEXAGONAL NUTS AND WASHERS (16 * 203) mm
2	1	SET	SUSPENSION CLAMP
3	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
4	0	NO.	ANGLE PLATE
5	8	NOS	INSULATED PIERCING CONNECTOR
6	4	NOS	INSULATED CABLE CAP
7	1	NO.	LT STAY SET (TYPE AS REQUIRED)
8	1	NO.	POLE PSC 8 m / 9 m

31^O TO 60^O

S.No.	QTY.	UNIT	MATERIAL
1	2	SET	PIGTAIL WITH HEXAGONAL NUTS AND WASHERS (16 * 203) mm
2	1	SET	SUSPENSION CLAMP
3	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
4	1	NO.	ANGLE PLATE
5	8	NOS	INSULATED PIERCING CONNECTOR
6	4	NOS	INSULATED CABLE CAP
7	1	NO.	LT STAY SET (TYPE AS REQUIRED)
8	1	NO.	POLE PSC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-B (SUSPENSION WITH AN ANCHOR FOR DEAD)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services

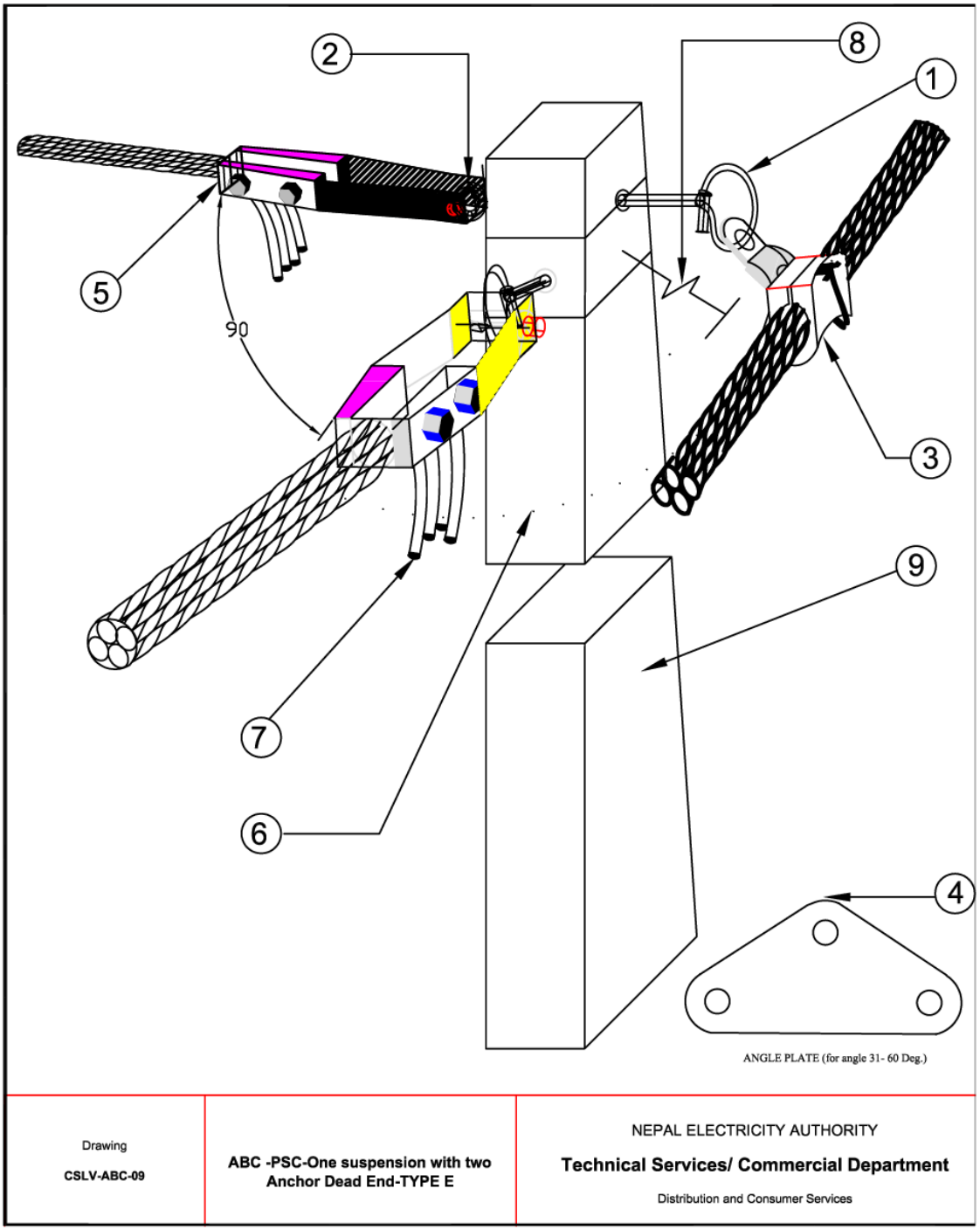


Drawing **CSLV-ABC-08**	**ABC-PSC-Four Anchor Dead End-TYPE C**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC-08

S.No.	QTY.	UNIT	MATERIAL
1	2	SET	POLE CLAMP WITH NUT,BOLT AND WASHERS
2	2	No.	EYE NUT
3	4	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
4	16	NOS	INSULATED PIERCING CONNECTOR
5	16	NOS	INSULATED CABLE CAP
6	1	No.	POLE PSC 8 m / 9 m

CONSTRUCTION STANDARDS **LV TYPE-C (FOUR ANCHOR DEAD END)** **PSC POLE**	**NEPAL ELECTRICITY AUTHORITY** **Technical Service/ Commercial Department** **Distribution and Consumer Services**



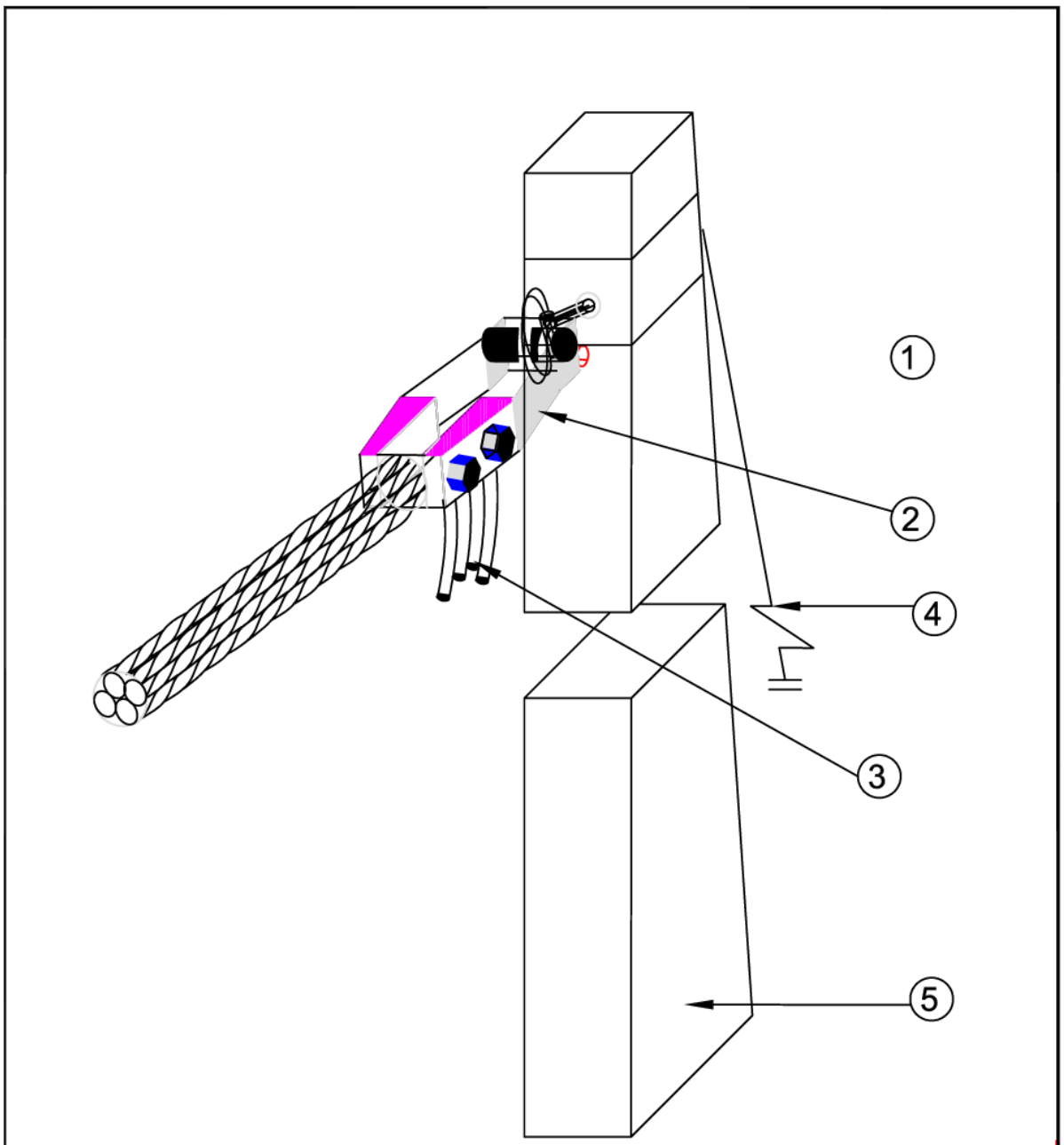
Drawing **CSLV-ABC-09**	**ABC -PSC-One suspension with two Anchor Dead End-TYPE E**	NEPAL ELECTRICITY AUTHORITY **Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC-09

S.No.	QTY.	UNIT	MATERIAL
1	2	SET	PIGTAIL WITH HEXAGONAL NUTS AND WASHERS (16 * 203) mm
2	2	No.	EYE NUT
3	1	SET	SUSPENSION CLAMP
4	1	NO.	ANGLE PLATE
5	2	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
6	16	NOS	INSULATED PIERCING CONNECTOR
7	8	NOS	INSULATED CABLE CAP
8	1	No.	LT STAY SET (TYPE AS REQUIRED)
9	1	No.	POLE PSC 8 m / 9 m

CONSTRUCTION STANDARDS
LV TYPE-E (ONE SUSPENSION WITH TWO ANCHOR DEAD)
PSC POLE

NEPAL ELECTRICITY AUTHORITY
Technical Service/ Commercial Department
Distribution and Consumer Services



Drawing		NEPAL ELECTRICITY AUTHORITY
CSLV-ABC-10	**ABC-PSC-Single Anchor Dead End-TYPE F**	**Technical Services/ Commercial Department** Distribution and Consumer Services

Refer Drawing No: CSLV-ABC-10

S.No.	QTY.	UNIT	MATERIAL
1	1	SET	PIGTAIL WITH FABRICATED EYE
2	1	SET	ANCHOR CLAMP WITH NUTS AND BOLTS
3	4	NOS	INSULATED CABLE CAP
4	1	No.	LT STAY SET (TYPE AS REQUIRED)
5	1	No.	POLE PSC 8 m / 9 m

CONSTRUCTION STANDARDS

LV TYPE-F (SINGLE ANCHOR DEAD END) PSC POLE

NEPAL ELECTRICITY AUTHORITY

Technical Service/ Commercial Department

Distribution and Consumer Services