



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

***Technical Specifications
For
Distribution Materials And
Equipments***

1. General Specifications

General Specification

Completeness of Contract

- 1.1.1 All apparatus, accessories or fittings which may not have been specifically mentioned, but which are usual or necessary in the respective equipment for the completeness of the finished work in an operable status, shall be deemed to be included in the Contract and shall be provided by the Supplier without any extra charge. All equipment shall be complete in all details, whether or not such details are mentioned in the Specifications. This includes fixation details and connection clamps and/or terminals.
- 1.1.3 Any reference in the quantity and price schedules, the delivery period schedule or in the various clauses and schedules of the text of either the Specification or the Bid, to any equipment shall imply that the equipment is complete with all accessories, apparatus and fittings as outlined in sub-clause 1.1.1 above.
- 1.1.4 The Supplier shall be responsible for ensuring that the equipment supplied is fit for the purpose intended. Available information on the characteristics of the system to which the works will be connected and associated will be supplied on request to the Supplier who shall be responsible for obtaining and determining all applicable knowledge relevant to the works.

Drawings and Documentation

The Supplier shall prepare and submit to the Purchaser for approval dimensioned general and detailed design drawings and other pertinent information of all the Equipment specified in the Specifications.

The Supplier shall supply detailed instructions for erection, operation and maintenance of all equipment and components in English and preferably Arabic language.

In the event of any difference between the drawings and the Specifications, the latter shall prevail.

Approval of drawings shall not relieve the Supplier of his obligations to supply the Plant in accordance with the Specifications. In the event of any difference between scaled dimensions and figures on the drawings, the figures shall prevail.

All text on drawings provided by the Supplier shall be in the English language in addition, if necessary, to that of the country of origin.

All drawings shall be dimensioned in millimeters.

Time of Delivery and Completion

The guaranteed delivery times shall be stated and the guarantee therein signed by the Bidder.

Quality of Materials

All materials supplied under this Contract shall be new and of the best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions arising under working conditions without distortion or deterioration in the setting up of undue stresses in any parts and also without affecting the suitability of the various parts of the Works for which they were designed. No toxic material (such as Halon, PCB, and Asbestos) shall be utilized.

Bidder's Quality Assurance Procedures

The Bidder shall have established a quality assurance system based on ISO 9001 or 9002. The Bidder shall include a documentation of the system with a list of current procedures, an organogram of the quality organization and the name of the quality manager. He shall also submit a list of quality revisions performed the last twelve months with a list of closed and unclosed findings as well planned revisions the coming twelve months.

The Bidder shall submit for approval a programme of quality control and inspection procedures to assure that the product during manufacture and on completion complies with the specified requirements. The programme shall relate the quality control and inspection activities to the production cycle. In support of the quality control and inspection programme the Bidder shall provide details of quality control and inspection procedures available for use in the execution of the Contract. The Bidder shall retain responsibility for quality control and inspection activities made by his sub- Bidders and shall indicate on the programme, which items are to be sub-contracted.

Guarantees and Particulars

The Works shall comply with the technical guarantee data stated in the Bid. The Supplier shall be responsible for any discrepancies, errors and omissions in the particulars and guarantees.

Places of Manufacture and Sub- Suppliers

The manufacturer's identity and places of manufacture, testing and inspection before shipment for the various portions of the Contract Works shall be specified in the Technical Schedules and shall not be departed from without the agreement of the Purchaser.

All Sub- Suppliers and Sub- Suppliers of components and materials shall be subject to the approval of the Purchaser. Information shall be given on each Sub-order sufficient to identify the material or equipment, to which the sub-order relates, stating that the material is subject to inspection by the Purchaser before dispatch.

All equipment offered shall be the product of recognized and experienced manufacturers and shall be proven equipment of the same basic design and size similar to that which has been in successful continuous operation for at least three years preferably under similar climatic conditions. Proven plant reliability and high availability are of prime importance and the attention of the Supplier is drawn to these particular requirements.

Inspection and Testing

All materials used in the Contract Works may be to inspection by the Purchaser and it is the Supplier 's responsibility to advise the Purchaser when equipment and materials are available for inspection, at least 1.5 month in advance.

Factory tests on equipment shall be made according to the applicable IEC Standards, or as specifically specified or according to standards approved by the Purchaser.

Routine tests shall be made on each unit of all equipment.

Type tests shall be made on one unit of each type of different equipment. Instead of carrying out the type tests the Supplier may submit suitable certificates of tests made on equipment of the same type; however, the Purchaser reserves the right of accepting these certificates or to reject them partially or totally.

The Purchaser shall be at liberty to demand any additional testing at the manufacturer's works, at site or elsewhere in order to verify that the equipment complies with the conditions of the Specifications.

A test programme shall be submitted to the Purchaser for approval at least 1.5 month ahead of the commencement of testing.

Measuring apparatus shall be approved by the Purchaser and if required shall be calibrated at the expense of the Supplier at an approved laboratory.

Tools

The Supplier shall supply in lockable boxes, for the Purchaser's use, any special tools that may be required for assembly, dismantling and adjustments to the equipment. The tools shall be unused and in new condition at the time of hand over. Suitable special spanners shall be provided for bolts and nuts, which are not properly accessible by means of an ordinary spanner.

2. General Technical Specification

General

This Chapter covers the general technical specifications of the electrical equipment to be procured under the Project.

The design shall incorporate every reasonable precaution and provision for the safety of the general public as well as for all those engaged in the operation and maintenance of the Contract Equipment and of associated works supplied under other Contracts.

Drawings

The Bidder shall in his Bid enclose overall drawings showing dimensions, main working principles, and internal components and fixing methods to a detail level allowing the Purchaser to evaluate the functionality and completeness of the equipment.

Standards

Ratings, characteristics, tests and test procedures, etc. for the electrical equipment encompassed by this specification shall comply with the relevant provisions and requirements of the Recommendations of the International Electro-technical Commission (IEC), unless otherwise expressly stated in Particular Technical Specifications. This applies even where the specific standards are not referred to in the Particular Specifications. Where the IEC Recommendations do not fully cover all provisions and requirements for the design, construction, testing, etc. and for equipment and components that are not covered by IEC Recommendations recognized national standards shall be applied. The rules of CEE (International Commission for the approval of electrical equipment) and the standards of CENELEC (Committee European de Normalization Electrotechnique) may also be applied.

The latest revision or edition in effect at the time of Bid Invitation shall apply. Where references are given to numbers in the old numbering system from IEC it shall be taken as to be the equivalent number in the new five digit number series.

The Precise Standard, complete with identification number, to which the various equipment and materials are manufactured shall be specifically stated by the Bidder.

In case of conflict or disagreement between the particulars of the Standard adopted by the Bidder and the particulars of this Specification, this Specification shall prevail over the Standard. All conflicts or disagreements, mentioned above, must be clearly stated, failing which the materials and equipment offered shall be deemed to comply in every respect with this Specification both in manufacture and in performance, and compliance thereof be insisted upon without additional cost to the Purchaser.

Units

The SI-system (meter, Newton, second) shall be used throughout the works covered by this Specification.

Definitions

Whenever the following terms or words are found in the specifications and/or other documents, they shall have the following meaning:

"High Voltage Equipment" (HV):

Mostly used for equipment provided for a maximum operating voltage higher than 36 kV (generically also used for voltages down to 1000 V).

"Medium Voltage Equipment" (MV):

Equipment provided for a maximum operating voltage higher than 1000 V and up to 36 kV.

"Low Voltage Equipment" (LV):

Equipment provided for operation at 1000 V or below. (For transformers the term Low Voltage Winding is used for the side with lowest rated voltage regardless of value, ref. IEC 60076)
Reference to degree of protection (IP) is according to the classification in IEC 60529

System Characteristics

The basic characteristics of the electrical systems and equipment shall be as follows:

MV Equipment 33 kV

Maximum operating voltage 36 kV, 3-phase, 50 Hz, neutral solid earthed.

MV Equipment 22 kV

Maximum operating voltage 24 kV, 3-phase, 50 Hz, neutral solid earthed.

MV Equipment 11 kV

Maximum operating voltage 12 kV, 3-phase, 50 Hz, neutral solid earthed. Except for cables then the Maximum operating voltage 15 kV, 3-phase, 50 Hz, neutral solid earthed.

MV Equipment 6.6 kV

Maximum operating voltage 7.2 kV, 3 phase 50 Hz, neutral solid earthed.

LV Equipment, 0.4 kV

Maximum operating voltage 420 V, 3-phase, 50 Hz, loaded and effectively earthed neutral TN-S system. and TN-C system

Phase Relationship

The standard phase colours are Red (L1), Yellow (L2), and Blue (L3) (RYB).

Design Criteria

The equipment shall be designed to withstand the design stresses given below without damage and disruption of service. All tests shall as a minimum is based on these design parameters.

Item	Description	Unit	Nominal voltage level				
			33	22	11	6.6	0.4
1	Nominal system voltage phase to phase	kV	33	22	11	6.6	0.4
2	Highest system voltage phase – phase ¹⁾	kV	36	24	12 ⁴⁾	7.2	0.42
3	System Frequency	Hz	50	50	50	50	50
4	System earth(see above)	----	Solid	solid	Solid	Solid	Solid
	Minimum Design Short circuit Current (1 sec. arch test) ²⁾	kA	25	25	25	25	25
5	Impulse withstand voltage (1.2/50 μ sec wave) ³⁾	kV peak	170	125	75	75	-
6	Power frequency withstand voltage (1 min.) ³⁾	kV	70	50	28	28	2.5
7	Min Creepage distance over outdoor insulators	Cm	105	90	33	31	-

Note 1)

Ref. IEC 60038

Note 2)

For all current carrying parts the permissible short circuit duration shall be at least 1 second. Indoor equipment shall be tested in accordance with IEC 60298 amendment 2. The dynamic or momentary short circuit current on which the equipment design shall be based shall be computed by multiplying the R.M.S value of the symmetrical short circuit current by the factor $1.8 \times \sqrt{2}$.

Note 3)

Ref. IEC 60071

Note 4)

Except for Under Ground Cables Highest system voltage phase – phase is 15kV

Ambient Temperatures, Relative Humidity, Wind Pressure

Unless otherwise specifically stated in Particular Technical Specification, any equipment, component and assembly shall be designed for the following service conditions:

Description	Unit	Value
1 Altitude of site above sea level	m	0 to + 1000
2 Ambient Temps:- Maximum	°C	45
Minimum	°C	- 5
3 Wind Speed	m/s	15
4 Isokeraunic Level		15
5 Pollution Type		Dust
6 Relative Humidity Maximum	%	100
Minimum	%	<10
7 Rainfall Average annual	mm	600
8 Hail		Yes
9 Fog		Yes
10 Sand Storms		Occasional

Wherever any of these maximum or 24 hour average temperatures exceed the normal service condition temperatures of the IEC Recommendations for the relevant equipment, or of such other standard which is approved to be applied, the permissible temperature rises of the recommendations or the standard shall be reduced by the same amount as the difference between the above figures and the normal service condition temperatures.

The Bidder shall guarantee these reduced temperature rises.

Power Cables

The following assumed values of soil thermal resistivity, soil and air temperatures are for Tender evaluation purposes only.

Ground temperature	°C	20-40
Soil thermal resistivity	°C m/W	1.8
Max. Ambient shade temperature	°C	35-45

Materials

1. Standardisation of Equipment

The Bidder shall be responsible for the standardization of all small mechanical and electrical equipment, materials and devices.

Where electrical sockets are specified Palestine standard sockets shall be used. Single phase sockets shall be 16A with earth plug if nothing else is specified.

Where nothing else is specified, LV power fuses above 63 amps shall be of high rupturing capacity cartridge, type NH gl, according to DIN VDE 0636 and IEC 60295. All fuse bases shall have a load switching capacity and a thermal rating equal to the rating of the largest fuse it can accommodate.

2. Locking Devices and Padlocks

Miniature circuit breakers shall replace fuses in control and power circuits 63 amps and below.

Facilities for applying safety or security padlocks to circuit breaker operating mechanisms, isolator and switch operating handles, control switches, control cubicles, outdoor cabinets etc. shall be provided. The facilities shall be suitable for padlocks having a hasp diameter of 10 mm. Padlocks are not required.

3. Electrical Equipment Materials

All material delivered shall be of the best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions arising under specified conditions without distortion or deterioration or the setting up of undue stresses in any part and also without affecting the strength and suitability of the various

parts for the work which they have to perform. No welding, filling or plugging of defective parts will be permitted without the sanction in writing of the Purchaser.

Materials that are susceptible to mold growth under tropical conditions shall be treated to exclude moisture and prevent growth of mold after all machining has been carried out.

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage that might be caused in the event of fire. All plastic material used in boxes, panels and boards shall be self-extinguishable.

Copper and aluminum used as electrical conductors shall be of the electrolytic type and comply with the respective ASTM or DIN Standards.

Cast iron shall not be used for chambers of oil-filled apparatus or for any part of the equipment that is in tension or subject to impact stresses except where it can be shown that service experience has been satisfactory with the grade of cast iron and the duty proposed.

4. Surface Treatment and Painting, Electrical Equipment

4.1 Cleaning and Painting

Before painting or filling with oil or compound all un-galvanized parts shall be thoroughly cleaned, free from rust, scale, burrs, grease and moisture and all external rough surfaces on castings shall be filled.

Successive coats of paint shall be applied to a clean, dry and properly prepared surface. Each coat shall be compatible with the preceding coat and the coat to follow.

The colour and shade of all painted external surfaces shall be to the approval of the Purchaser.

The following minimum painting requirement shall apply to all ferrous parts unless the Bidder can show, to the satisfaction of the Purchaser that any alternative he proposes is in all respects equal or superior to the specified requirements:

Apparatus	Painting
INTERNAL SURFACES	
Oil filled chambers and tanks	One coat of oil resisting varnish or paint
Kiosks and apparatus boxes for use outdoors	Three coats of paint, the final coat being an anti-corrosion finish colored white or light grey
Cubicles, kiosks and apparatus boxes for use indoors	Three coats of paint, the final coat being a white or light color.
EXTERNAL SURFACES	
All galvanized surfaces other than nuts, bolts and washers may be removed for maintenance purposes, for use outdoors	<u>At Works</u>
	(a) One priming coat of corrosion inhibiting paint applied immediately after cleaning
	(b) Two coats of non-glossy oil and weather resisting paint applied after inspection and testing and before dispatch.
Exposed, ungalvanized nuts, bolts and washers which may be removed for maintenance purposes for use <u>outdoors</u>	<u>At Site</u>
	One finishing coat of glossy, oil and weather resisting, non-fading paint applied after erection is complete. For equipment dispatched completely assembled, the final coat may be applied at the works unless otherwise required by the Purchaser.
	One coat of oil and weather resisting, non-fading paint applied after erection
Panels, Cubicles, Kiosks and apparatus boxes for use <u>indoors</u>	Three coats of paint, the colour and finish of the final coat to be to the approval of the Purchaser.

4.2 Galvanizing

Galvanizing shall be applied by the hot dipped process. The preparation for galvanizing and the galvanizing process shall not affect the mechanical properties of the material being coated. Drilling, punching, cutting, bending, removal of burrs and all machining shall be completed before galvanizing.

The zinc coating shall be smooth, clean and of uniform thickness and free from defects. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the coated material. All galvanized steel that has been cut, drilled or worked on site shall be painted with an approved zinc rich paint.

The average thickness of the zinc coating shall be equivalent to not less than 0.6 kg/m² of zinc for all surfaces, except steel wires, bolts and nuts. Galvanizing will be tested in accordance with the appropriate standards in order to determine that it complies with this requirement. The thickness of the zinc coating for steel wires shall be in accordance with a national standard and shall be approved by the Purchaser. All galvanized wires on which tools have been used or cut shall be treated with approved bitumastic paint.

All bolts and screwed rods for the connection of galvanized steel parts shall be galvanized including the threaded portion(s) to a minimum average coating weight of 305 g/m². The threads of all bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specially approved by the Purchaser. All nuts shall be galvanized with the exception of the threads that shall be oiled.

White rust formation subsequent to galvanizing must be inhibited using an approved inhibitor applied according to the manufacturer's instructions. Material on which galvanizing has been damaged shall be re-dipped unless; in the opinion of the Purchaser the damage is local and can be repaired by applying a coat of galvanizing repair paint. Where such repair is authorized, the damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits or xylene followed by wire brushing. After wire brushing, the area shall be re-cleaned with solvent to remove residue and shall be given a minimum of two coats of zinc rich paint in accordance with the manufacturer's instructions. Such painting shall be applied as soon as possible and in no case more than 4 hour after the surface preparation.

5. Insulating Oil and Gas

All electrical equipment requiring insulating oil or other insulating or gas shall be furnished with the first filling including flushing, if required. An excess of 10% of the net amount of oil or liquid required for each component shall also be furnished by the Supplier as spare.

The insulating oil shall not contain matters that are not biodegradable such as PCB etc.

The Supplier shall endeavor to employ, as far as practicable, one type and make of insulating oil only for all the electrical equipment.

SF6 gas shall comply with the requirements of IEC 60376. The high pressure cylinders for shipment and storage of the SF6 gas shall comply with the applicable national regulations.

All the necessary pipes, couplings, flexible tubes and valves for coupling to the switchgear for filling or evacuating all the gases or oil to be used, with all necessary instructions for the storage of this equipment, shall be provided.

6. Aluminum and aluminum Alloys

Aluminum shall be of high commercial quality. The composition, including the percentage and nature of any impurities, shall be stated in the Schedules. All aluminum alloys shall be of approved compositions as stated in the Schedules. Aluminum and alloy castings shall be sound and free from air pockets and pinholes.

7. Bolts, Studs, Nuts, Screws, Washers, etc.

All bolts, studs, nuts, etc. shall have a standard metric threading and conform to the relevant standards as regards shape and tolerance. They shall be marked with the manufacturer's symbol and class of strength.

Bolts and nuts for electrical connections shall preferably be of brass M6 size. Alternatively size M5 may be used, but these must be of stainless steel, phosphor bronze or high tensile brass.

All bolts, studs, nuts, washers, screws, etc., above 10mm diameter, if not in stainless steel or other corrosion-resistant material, shall be hot-dip galvanized, except for bolts above Strength Class 8.8. In this case, corrosion-resistant material will be required.

Bolts, etc., smaller than 10mm diameter shall be electrolytic zinc-coated if not provided in stainless steel or other corrosion-resistant material.

Bolts, nuts, studs and screws that require frequent tightening and unbolting during inspection or maintenance procedures shall be of stainless steel.

All bolts and nuts shall be hexagonal, either normally or of the round head socket type and secured in an approved manner against becoming loose during operation.

The Supplier shall supply the net quantities plus 5% of all permanent bolts, screws and other similar items and materials required for installation of the works at the site. Any such rivets, bolts, screws, etc., which are surplus after the installation of the equipment has been completed shall become spare parts and shall be wrapped, marked and handed over to the Purchaser.

Bolts shall not protrude more than four threads or 10 mm beyond the nut (except for terminals) but not less than two full threads.

8. Nameplates and signs

All equipment shall be clearly and permanently labeled in English, to the approval of the Purchaser. Where labels are provided for making clear the method of operation of equipment they shall be concise and preferably diagrammatic in form.

All outdoor nameplates and signs shall be made of non-corrosive weatherproof material as traffolyte, aluminum or stainless steel.

Danger labels shall have red lettering on a white background. All other labels shall have black lettering on a white background.

Before production of labels and notices the Supplier shall submit to the Purchaser full scale drawing of the proposed labels

9. Motors

All motors shall comply with IEC 60034 and dimensions with IEC 60072. They shall be capable of operating continuously under actual service conditions without exceeding the specified temperature rises, determined by resistance, at any frequency between 48 and 51 Hz together with any voltage between +/-10 percent of the nominal value.

All motors shall be totally enclosed (IP 23 or better), and if situated in the open they shall be weatherproof and suitable for outdoor operation IP (54). They shall be provided with a suitable means of drainage to prevent accumulation of water due to condensation and with suitable means of breathing.

Motors operating in an ambient temperature not exceeding 40°C shall have Class 'F' insulation or better, but where the ambient temperature may exceed this figure or where the motor may be appreciably affected by conducted heat, Class 'B' temperature rise shall be used.

All motors shall be suitable for direct starting at full voltage as well as 10% under and over voltage.

Motors shall have sealed ball or roller bearings with mechanical load attached.

The three line connections of A.C. motors shall be brought out to a terminal box. The terminal arrangement shall be suitable for the reception of Aluminum cable. Terminal markings shall be made in a clear and permanent manner and shall comply with IEC 60034. A permanently attached diagram or instruction sheet shall be provided giving the connections for the required direction of rotation. All terminal boxes shall be of the totally enclosed type designed to exclude the entry of dust and moisture and sealed from the internal air circuit of the motor. All joints shall be flanged with gaskets of neoprene or other approved material. Natural rubber insulation shall not be used.

Where single phase motors are employed the motors shall be grouped so as to form, approximately, a balanced three phase load.

10. Motor control gear

Control gear shall comply with the requirements of IEC 60947, the control gear being rated according to the duty imposed by the particular application. No replacement of equipment shall be necessary after short circuit (ref. IEC 60947)

Motor contactors shall comply with IEC 60947 classes of intermittent duty 0-3 with type IP 52 enclosure protection and an utilization category AC4. The contactors and their associated apparatus shall be capable of switching the stalled current, and shall have a continuous current rating of at least 50% greater than the full load current of the motors they control.

The operating currents of overload trips fitted to motor contactors shall be substantially independent of ambient temperature conditions, including the effect of direct sunlight on the enclosure in which the contactors are installed.

Where small motors are connected in groups, the group protection shall be arranged so that it will operate satisfactorily in the event of a fault occurring on a single motor. The control and protection equipment shall be accommodated in the control cabinet or marshaling kiosk.

Each motor or group of motors shall be provided with control gear for starting and stopping by hand and automatically. Overload and single-phasing protection shall be provided. Facilities for padlocking the supply in off position shall be provided.

Design and Construction

1. General Requirements

The Contract Supplies shall be designed to facilitate inspection, cleaning and repairs and for operation, in which continuity of service is the first consideration. All apparatus shall be designed to ensure reliable and safe operation under the atmospheric conditions prevailing at the Site and under such sudden variations of load and voltage as may be met with under working conditions of the system, and short circuits, including those due to faulty synchronizing, within the rating of the apparatus. The general operating conditions are given in this specification.

In no part of the equipment, including busbars, connection, isolators, fuses, contacts and cable boxes shall the temperature rise exceed the values specified in the relevant IEC or equivalent Standards.

Corresponding parts liable to renewal shall be interchangeable. When required by the Purchaser, the Supplier shall demonstrate this quality. All apparatus shall operate without undue vibration and with the least practicable amount of noise.

Means shall be provided for the easy lubrication of all bearings and where necessary, of any mechanism or moving part. Grease lubricators shall be fitted with hexagon nipples. All mechanisms shall, when necessary, be constructed of stainless steel, brass or gunmetal to prevent sticking due to rust or corrosion.

All taper pins used in any mechanism shall be of the split type. All connections and contacts shall be of ample section and surface for carrying continuously the specified full load currents without undue heating and shall be secured by bolts or set screws of ample size fitted with locking devices of approved type and material.

All rubbing or wearing surfaces shall be machine surfaced. Joints employing a gasket material shall be so constructed that the packing is maintained under sufficient compression in all parts so that an efficient joint can be made without the use of jointing compounds. Gasket material shall be of the minimum thickness necessary and have approved composition.

All apparatus shall be designed to exclude vermin and insects from entering the equipment.

All outdoor apparatus including bushing insulators and fittings shall be designed so that water cannot collect at any point

2. Erection Marks

All Plant equipment that requires assembly at Site shall have distinguishing marks on it to facilitate erection and to identify the material in relation to drawings, material lists or shipping documents. All marks shall be legible and easily visible. Where relevant, erection marks shall be stamped before galvanizing and shall be clearly visible after galvanizing.

3. Switchboards and Panels

Switchboards as well as distribution, control, relay and metering boards and panels shall be of robust free-standing construction, formed of a steel frame and covered with smooth steel plate. The steel plate shall be properly stiffened to prevent distortion.

All cabinet shall be touch proof (IP 2X) when the doors are opened. Safe replacement of fuses shall be possible without risk for arcing or use of special tools, the replacement shall preferable be possible with an integrated load breaker/fuse holder making fuse replacement possible only in de-energized state or by insulated fuse cowers with load breaking capacity.

Outdoor cabinets shall be dust and water proof (IP 54) and provided with thermostat controlled heaters to inhibit collection of moisture. The heater must be arranged not to overheat any cables

or equipment. Openings for drainage of condense shall be provided at the lowest point in the cabinets.

The frames of the boards shall be designed to permit firm anchoring on the floor and easy erection.

All contactors or relay coils and other parts shall be suitably protected against corrosion.

The Supplier's supply shall include all necessary mounting brackets, framing, foundation bolts and respective embedded metal, if required, to permit proper installation of the boards.

All terminals and all equipment shall be accessible without dismantling other components.

4. Wiring and Terminal Blocks

All wiring shall be stranded conductor; PVC insulated suitable for operation at voltages below 1000 V in compliance with the provisions of the applicable IEC Recommendations. Conductors shall not be smaller than 2.5 mm² for current transformer circuits and 1.5mm² for all other control circuits. The selection of conductor sizes for current transformer circuits shall be supported by calculations.

For wiring within boards the "bunch" pattern shall be adopted. For a small number of connections, wiring may be grouped using flexible plastic bands or equivalent. For a large number of connections a system using support strips or U-shaped troughs (with covers) shall be used. The latter principle arrangement shall apply for cable distribution racks.

It shall be possible to work on small wiring for extension, maintenance or test purposes without making a switchboard dead.

All cables control wiring and terminals shall be marked in a systematic manner, both on the drawings and on the cables, wires and terminals themselves. The markings shall be in accordance with a system presented and coordinated by the Supplier throughout the plants, but subject to approval by the Purchaser. The cable marking shall be fire proof.

All wiring shall terminate at terminal blocks. The latter shall be of the molded type and provided with barriers to separate power from control cables. It shall be possible to replace a single terminal block without dismantling a whole row.

Where appropriate, terminal blocks shall be equipped with facilities for testing, such as short-circuiting, separating, plugging in, etc. Terminal blocks shall be located at least 300mm from the bottom of the panel and shall be easily accessible. They shall be clearly marked the designations being those entered in the respective wiring diagrams.

Terminal blocks using screws acting directly on the wire (conductor) as well as spring type terminal blocks are not acceptable. To avoid squeezing of the wire the screw pressure shall be applied by a pressure plate having smooth edges.

Only one conductor shall be connected to each side of a terminal block and the branch-offs shall be made by interconnecting the necessary number of neighboring blocks by means of copper strips, unless otherwise approved by the Purchaser.

Technical Specifications - LOT1

Steel Components



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

TECHNICAL SPECIFICATIONS FOR STEEL STRUCTURES

July 2015

1. Steel Materials

1.1 General

Steel structures shall be of lattice steel self-supporting, bolted construction.

The structures shall be designed with main dimensions and electrical clearances according to the Employer's standard design.

The structures shall be designed in accordance with BS, ASCE or other recognized standard to the approval of the Purchaser.

All steel materials weights shall be according to the attached drawings without any tolerances.

1.2 Structure types

The types and sizes of structure shall be as described in the schedule of quantities and prices. The types and design shall comply with PEA and Israeli standard practice.

1.3 Accessories to structures

All accessories, such as cross-arms, transformer arms, brackets, bases, bolts, nuts, washers and all other parts necessary for completeness of supply shall be included in the supply and be suitable to the structures as described in the schedule of quantities and prices. All accessories shall be compliance with PEA and Israeli standard practice.

1.4 Corrosion Protection

1.4.1 General

All parts of the work shall be protected against corrosion under service conditions. The protection shall also prevent corrosion during transport, handling, storage and erection.

Damage to the protection during transport, handling, erection etc. and jointing shall be repaired to the same quality as specified for the object.

1.4.2 Galvanizing

Except where otherwise specified all ferrous parts shall be galvanized.

Galvanizing shall be applied by the hot-dip process and shall consist of a continuous coating to minimum thickness as follows:

	Average of Specimens tested $\mu\text{m (g/m}^2\text{)}$	Any Individual Specimen tested $\mu\text{m (g/m}^2\text{)}$
Rolled steel exposed to		
The atmosphere only	t<5 mm 87 (610)	79 (550)
	t>5 mm 95 (685)	87 (610)
Rolled steel under ground		
Surface and in contact with ground	215 (1550)	190 (1370)
Cast iron and malleable iron	87 (610)	70 (500)
Bolts, nuts and washers	45 (305)	45 (305)

The zinc coating shall meet the requirements according to ASTM A123, A153, A239 and A385, or relevant BS.

All steel shall be fully fabricated before galvanizing, no machine or shop work, boring, punching etc. will be allowed after galvanizing. Minor damage to the galvanizing resulting from transportation and the like shall be repaired at site in an approved manner, e.g. by painting with an approved zinc-rich paint, containing at least 92 weight per cent zinc powder.

After galvanizing all members shall be dipped in a dichromate solution bath to avoid formation of white rust during storage and transportation.

Prior to bundling of towers, after galvanizing, all members shall be completely dry.

Underground parts shall be coated with one layer of bitumen after installation on site.

1.4.3 Structural Steel

Structural steel shall be made by the open hearth basic oxygen or electrical furnace process, and shall comply in quality with the requirements for RST37-2 in DIN17100 or Grade 43 A in BS 4360 Steel of higher tensile grade if offered, shall comply with relevant DIN or BS Standards.

Only two strength classes may be used, low tensile steel (yield point 220-250 N/mm²) and a high tensile steel (yield point 300-350 N/mm²).

Steel shall comply with the requirements of ASTM A143 and embitterment tests shall be made in accordance with that specification.

If the bidder intends to use more than one quality of steel, he will be required to take every precaution to the satisfaction of the Purchaser against any possible intermixing of different qualities during transport, storage, handling, manufacture and installation.

Cast iron shall have a tensile strength of at least 140 N/mm². It shall be made from the best grey pig and scrap iron and shall be close-grained, tough and uniform in character.

Malleable iron shall be of the black hearth type with a tensile strength of not less than 330 N/mm².

1.4.4 Bolted Connections

Bolts shall conform to the requirements of clause 1.4.5 below

Bolted connections may have one bolt only.

Minimum bolt spacing is equal to two point five (2.5) times the bolt diameter.

The distance from the center of a fastener hole to the end and any connected part shall not be less than two (2.0) times the bolt diameter minus five (5.0) mm and the distance to the adjacent edge shall not be less than one point five (1.5) times the bolt diameter.

The distance from the Centre of a bolt to the face of the outstanding flange of an angle or other members shall be such as to permit the use of a socket wrench, in tightening the nut.

The bolt hole diameter shall be equal to the bolt diameter plus one point five (1.5) mm.

Allowable ultimate bearing stress for bolts as well as members are equal to one point zero (1.0) times the ultimate stress F_u of the steel.

Allowable ultimate shearing stress for bolts and members is equal to zero point six (0.6) times the ultimate stress F_u of the steel.

1.4.5 Bolts, Nuts and Washers

Bolts in poles shall be high strength with M-threads. Connection bolts, step bolts and nuts shall be high strength bolts conforming to ASTM - A325 or equivalent, except as specified herein and shall be hot galvanized.

Bolts and nuts shall be of standard design. Nuts shall be tapped after galvanizing and the threads of the nuts left bare and greased. Washers shall be used under the nuts. Bolt lengths shall be such as to ensure that bearing is upon the shank and not upon the thread of the bolt. The threaded part shall end within the washer. When installed, the bolt shall project through the nut not less than three (3) mm and not more than ten (10) mm. Taper washers shall be used where required.

An extra 5% bolts, nuts and washers shall be delivered to compensate for loss during construction. The cost of the extras shall be included in the appropriate unit prices in the Prices Schedules.

1.4.6 Splices

Splices in all members shall be of the butt-splice or lap-splice type.

Splices of the main members shall be located immediately above horizontal members or diagonal brace connection.

1.4.7 Cutting

Members shall be cut, drilled or punched and shaped to jig or by other means ensuring a proper fit. Arris formed by sawing or shearing shall be removed. Cracks and unevenness or sheared surface shall be removed by suitable means. Burrs shall be removed.

1.4.8 Holes

Final hole diameter may not exceed the corresponding bolt diameter by more than 1.5 mm. Holes may be punched to full size in steel not exceeding 13 mm in thickness provided that the diameter of the hole exceeds the thickness of the material. Holes in steel thicker than 13 mm may be punched to a diameter 3 mm less than final and Centre drilled to full size. Steel thicker than 16 mm must not be punched.

Incorrectly drilled or punched holes shall not be refilled by welding.

Cutting and punching may not be carried out at lower steel temperature than 0oC.

Detail design shall be such as to avoid as far as possible eccentricities of joints. Pockets or depressions which would hold water shall be avoided. Tubes and similar profiles shall be properly drained.

1.4.9 Labeling

All materials shall painted with Non- erasable paint including the name and code of Poles ,Bases ,Arms.

If the arms supply more than one piece, the Manufacturer shall paint on every Part of the Arms.

The Arms painting shall be in the outer edge of the bottom of the Arms Away from the Poles and on the top of the Bases in the Outer Interface and on 3 meter from the Ground in the Outer Interface for Poles.

The paint shall clean and legible and shall be done with special Non- erasable ink for galvanized steel and black color with minimum 40 mm height.

GEDCo prefer to use device HANDJET® EBS®-260 for painting.

1.4.9 Welding

1.4.9.1 Qualification for Executing the Welding Work

The welding work on the structures, if employed, shall be performed with a labour management experienced in welding and with skilled welders. The qualifications shall be testified by a certificate.

1.4.9.2 Execution of the Welding Work

The sequence of welding shall be such as to cause as small deformations and welding stresses as possible.

The welding shall be performed with equipment and in premises suitable for the purpose.

Equipment shall be well suited to the type of weld to be performed so that the right quality shall be attained.

No gaps or hollows may appear in the welding into which acid may penetrate during the pickling procedure preceding galvanizing.

The weld shall be ground flush to the surface in such places where the welding bulge prevents a perfect fitting of components together.

A high bulge or uneven weld surface may be leveled out by chiseling or grinding.

1.4.9.3 Filler Metals for Welding

Standard filler metals shall be used and the strength class and quality shall be chosen to correspond to the base material.

1.4.10 Acceptance

GEDCo has the right to visit the factory before manufacturing, also three GEDCo representatives at the expense of the Supplier will visit the manufacturer factory to request and examined samples before delivery, and the committee have the right to refuse the all non-conforming materials.



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For

***Impregnated Wood Poles for MV and LV
Overhead Lines***

Impregnated Wood Poles for MV and LV Overhead Lines

1.1. General

1.1.1. Scope

This specification covers the technical characteristics and inspection methods and tests as basis for acceptance of wood poles which are to be purchased for use in medium voltage (MV) and low voltage (LV) electric power overhead lines.

1.1.2. General Standards

BS 144-1973	Coal Tar Creosote for the Preservation (Impregnation) of Timber.	
BS 913-1973	Wood Preservation by means of Pressure Creosoting.	
BS 1990:Part-1:1984	Wood Poles for Overhead Power and Telecommunication Lines. Part-1. Specification for Softwood Poles . (Medium Poles)	
BS 4072-1975	Wood Preservation by means of Water-borne Compositions.	Copper/Chrome/Arsenic
NWPC1,4,1,1/70	Nordic Wood Preparation Council	

1.2. Characteristics

1.2.1. Type of Wood

The impregnated wood poles shall be PINE tree and preferably PINUS SYLVESTRIS. The English and Latin names of the type of wood, the country of origin and the felling year shall be submitted properly. The raw wood poles to be provided from local forests shall be PINE tree.

1.2.2. Dimensions of Wood Poles

The lengths, top diameter and Minimum Diameter at 1.5 m from butt end of the wood poles are given below.

Heights	Top Diameter		Minimum
	Min.	Max.	Diameter at 1.5 m from butt end
m	cm	cm	cm
8.5	15	18	21.5
10	16	18.5	23
12	17	19	25
14	20	22	30

1.3. Preservative Impregnation Substances

The impregnating substances to be used on wood poles shall be one of and preferably pure Creosote with properties as per English standard BS 144/1993 obtained by distilling hard coal at high temperature or soluble salts like Copper/Chromium/Boron (CCB) and Copper/Chromium/Arsenic (CCA) preparatus or soluble mixed preparatus with the same or better qualities and soluble mixed preparatus to receive a solution with required density or other impregnating substances used for wood poles and proved with the applied procedure.

1.4. Impregnation of Raw Poles

1.4.1. Impregnation with Creosote

The wood poles shall impregnated as per empty-cell Rueping process and as per conditions stipulated at English Standard BS 913:1973. During application of this, periods of pressure and vacuum numbers and repeating numbers shall be stated clearly.

- Creosote detained shall be 115 kg. Per m³ of pole.
- Creosote shall penetrate completely into the live wood.

1.4.2. Measuring the depth of penetration of Creosote

Samples for the test shall be taken with a test auger from minimum 1.5 meter distance from any end of the pole. It shall be seen at the received sample that the live wood part is covered with

Creosote. Immediately after the test the auger bore shall be closed with a wood plug impregnated with Creosote. If the live wood part of the pole cannot be easily recognized visually, chemical method shall be applied instead of it. If non-impregnation is seen in one or more poles samples are taken these poles (ones found non-impregnated) shall be subject to new impregnation. From this same group same number of sample shall be taken again. If complete live wood of all of these poles are seen impregnated the rest of this group shall be accepted as impregnated.

- If non-impregnation is seen in the samples taken for the second time, these poles (ones found non-impregnated) shall be subject to new impregnation, and this procedure shall go on like this.

The poles impregnated again shall be tested in the same way.

1.4.3. Determining the Creosote quantity left in the Poles

The total volume of the poles put into the tank and the total weight of it is determined. Total weight of the poles is measured after the impregnation. By subtracting the first weight from the second the weight of creosote left inside the poles is calculated. This weight is divided by the total volume of the poles and the creosote quantity left in the poles per m3 is calculated. This figure shall be 115 kg/m3.

The deduction for the missing creosote quantity shall be calculated from usd/m3 price, no payment shall be made to the exceeding quantity.

1.4.4. Impregnation with Salts Soluble in Water

1.4.4.1. Impregnation method

The poles shall be impregnated by 'Vacuum / Pressure and Full Cell Treatment' method This operation shall be continued until deep impregnating is provided.

Deep impregnating shall be accepted as provided if:

- More than 5 liters per m3 is deeply impregnated in 15 minutes inside the tank,
- After this, the pressure is kept for 30 minutes
- Only when minimum pressure continues for 45 minutes.

1.4.4.2. Preparation of the Impregnation Solution

The impregnation salt shall be added by introducing slowly into the water in the mixing tank and shall be agitated continuously to provide the melting of the salt. This stirring shall go on for at least

45 minutes. When the mixed preparatus is being prepared the temperature of the water shall be minimum 20°C.

1.4.4.3. The temperature of Impregnation Solution

The temperature of the impregnation solution shall never exceed 30°C while impregnation.

1.4.4.4. Impregnation process

First vacuum shall be increased to 63.5 cm. mercury in a longer period than 60 minutes. If 63.5 cm. mercury pressures are reached in a shorter time, the vacuum shall be kept until 60 minute time duration is completed.

While this first vacuum is continuing the pressure vessel shall be filled with the impregnation solution. After this vacuum shall be stopped and pressurizing shall start.

Pressure shall be 10.545 kg/cm² for Pine.

The last vacuum is the sending of the solution back to the storage tank while taking the poles out from the tank after the impregnation operation and this time duration is 5 to 10 minutes.

The impregnated poles shall not be left inside the solution in the tank for more than 12 hours.

Samples shall be taken with a test auger after the impregnation operation is completed from 10 ea. of the poles of one charge, if the number of poles with inadequate impregnation solution is more than one the whole charge, if the number of pole with inadequate impregnation solution is equal to one that special pole shall be impregnated again.

1.4.4.5. Net Dry Salt Quantity to be used at the Impregnation of Poles and Solution Percentages

For pines the salt preparatus with Copper/Chromium/Boron (CCB) in its composition with % 4 concentration, 350 liter/m³ and with Copper/Chromium/Arsenic (CCA) in its composition with % 3 concentration, 350 liter/m³ mixture shall be absorbed.

For pine poles the net average salt quantity to be absorbed with Copper/Chromium/Boron (CCB) shall be 14 kg/m³ , with Copper/Chromium/Boron (CCB) shall be 14 kg/m³ .

1.4.5. Impregnation with other Chemicals

If other impregnation materials other than salts of Copper/Chromium/Boron (CCB) and Copper/Chromium/Boron (CCB) is proposed the commercial name, chemical formula and national and international standard shall be given.

- The impregnation material shall be especially appropriate for wood electric poles and average weather conditions.
- The impregnation method shall be explained in details and national and international standard shall be given.
- The net quantity of the chemical material to be used per m3 or per pole and its resisting duration shall be given clearly and international standard about these shall be given too.
- The country of origin and places used and places being used at present, the institutions/establishments used, the quantities used and obtained results of the proposed chemical impregnation material and the reports and documents of government and private institutions/establishments and research centers shall be given.
- Certificates and results showing the poisoning limit against harmful fungus and insects and penetrating ability.

1.5. Other Subjects

In the event of a difference between international standards (IEC, BS, and ANSI) specifications and the PEA specifications, the reference shall be according to PEA Specifications.

The Pole shall be good quality, straight, with a smooth surface, few knots, free from twists, cracks and per formations by insects. Big knots are to be hewn and smoothed.

The first 2 meters from the top of the pole shall not contain more than 3 middling knots.

The Poles shall be straight, Free from Sweeps and Crooks so that straight-line dram between the center of the top and center of the bottom shall at no time fall outside the pole and no pole shall have curvature in more than one direction.

The final length of poles shall not exceed the specified length by more than 25 mm for each 3 m of pole. The poles shall not be shorter than the specified length by more than 25 mm for any poles.

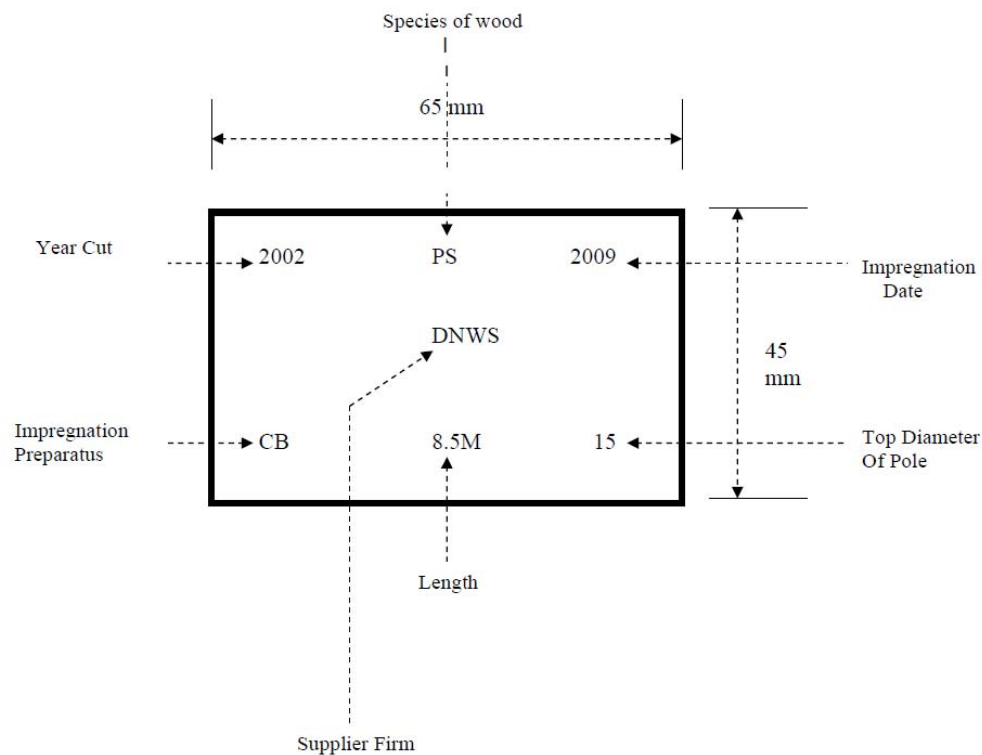
If so required by the Purchaser, representative samples of poles selected at random among lots ready for dispatch, shall be subject to tests in order to verify their conformity with the specification.

1.6. The Marking of the Wood Poles

The wood poles shall be marked firmly by Aluminum labels, which will contain the following information:

- Type of the tree
- Length (m)
- Top diameter (cm)
- Impregnation material
- Impregnation year
- The Abbreviation of the Firm

Such marked Aluminum plaquets shall be nailed at 4 meter high measured from the base of the Pole.



Technical Specifications - LOT2

Overhead Transformers



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

TECHNICAL SPECIFICATIONS FOR DISTRIBUTION TRANSFORMERS

February 2016

PARTICULAR TECHNICAL SPECIFICATIONS FOR DISTRIBUTION TRANSFORMERS

1.1 Scope

This chapter covers the particular technical requirements of the medium 24 kV voltage equipment to be procured under this contract. By conflict between the general specification and the particular specifications below the particular specifications shall prevail.

1.2 Applicable Standards

The equipment and the components supplied shall be in accordance with the latest edition of the standards specified below and amendments thereof. However the GEDCO Specification shall supersede these Standards in the event there is a discrepancy:

- a) IEC 60076 (1993) - Power Transformers
- b) DIN42500 - Three-phase oil-immersed distribution transformers 50 Hz, 50 up to 2500 kVA; general requirements and requirements for transformers Um up to 24 kV; German version HD 428.1 S1:1992
- c) IEC 60156 (1995) - Insulating liquids-determination of the breakdown voltage at power frequency – test methods
- d) IEC 60296:3 - unused minerals insulating oils for transformers and switch-gear
- e) IEC 60354 (1991) - Loading guide for oil-immersed transformers
- f) IEC 60551 (1987) - Determination of transformer and reactor sound levels
- g) IEC 60616 (1978) - Terminal and tapping markings for power Transformers
- h) IEC 60722 (1982) - Guide to the lightning impulse and switching impulse testing
- i) IEC 60815 (1986) - Guide for the selection of insulators in respect of polluted conditions
- j) IEC 60137 (1995) - Insulating bushing for alternating voltages above 1 kV
- k) BS 5493 (1997) - Protective coating of iron and steel structures against corrosion
- l) IEC 60085 - Thermal evaluation and classification of electrical insulation

1.3 Basic Features

The transformers shall be 22/0.4kv, 3-phase, two winding, liquid immersed, sealed or Breathing type rated for continuous operation under site ambient conditions at full rated power, naturally cooled (ONAN), with off load, manual, operated tap-changer, lockable in all positions on primary side.

1.4 Vector Group

Unless otherwise specified, the transformer shall be connected delta-star in accordance with vector group reference Dyn11.

1.5 Impedance Voltage

The impedance voltage at normal tap shall be 4% for transformers up to 800KVA and 6% for 800KVA transformers or greater.

1.6 Temperature Rise:

At the rated power, the transformer shall comply with the following maximum temperature rises:

Top oil 45°C Max.

Winding 50°C Max.

Hot Spot 98°C Max.

Avg. temperature to short circuit 250°C Max.

1.7 Overload Capacity

After thermal equilibrium has been reached at 75% of rated load, the transformer shall be capable of sustaining the overload conditions listed in the following table without the transformer winding hot spot temperature exceeding 110 °C:

Load Percent of rating (%)	Minimum Duration in Minutes at Ambient Temperature of Percent of	
	30 °C	40 °C
133	240	155
150	98	65

The supplier shall demonstrate by test and calculation that these requirements are met.

1.8 Noise Level

In general is to be less than 68 dB at 0.3m for ratings up to 2000 kVA and in accordance with IEC 551.

1.9 Transformer Construction

- ❖ The primary and secondary windings shall be constructed from high conductivity E.C. grade copper. All turns of windings shall be adequately supported to prevent movement. The high voltage winding shall be of layered winding and the low voltage winding shall be of foil winding using Copper sheets.
- ❖ The Windings shall contain minimum two ventilation channels.
- ❖ The core and coil assembly shall have the core and coils rigidly connected. The core/coil assembly shall be mounted on the cover plate so that the assembly could be removed from the tank using the suitably placed lugs provided on the cover plate.
- ❖ There must be a possibility of easy to take out the windings from the core.
- ❖ No material which can be deleteriously affected by the action of oil under the operating conditions of the transformers shall be used in the transformers or leads or bushings.
- ❖ To ensure that the core and coils of transformers are seated on the floor of the tank, supporting frames shall be designed to accommodate variations in tank height. The core and coil assembly shall be rigidly connected to the tank and suitably closed lugs shall be provided for removing the core and coil assembly from the tank.
- ❖ Construction features shall permit local repairs to be easily carried out in the event of equipment failure.
- ❖ All internal connections shall be made of copper wires.

1.10 Transformer Tank

- ❖ Variable volume steel tank, with corrugated wall design forming integral cooling pockets, heavy rolled and welded steel bottom and base frame and hermetically sealed bolted-on cover. Tank is to be completely filled with insulating liquid drawn in under vacuum. Tank cover is to have provision for two thermometers or temperature sensors, lugs for lifting, four lashing lugs and filler-pipe with valve. Tank is to have drain plug at bottom, earthing bolt on cover and earthing pad on base-frame, and a rating plate.

- ❖ The transformer tank shall be fabricated from steel and shall be of robust construction. Care should be taken at the manufacturing stage so as not to have leaks during transportation or when the transformer is continuously operated at rated power.
- ❖ With the exception of radiator elements, all external joints shall be seam welded. There shall be only one vertical seam weld for the fin radiator and the other three vertical corner edges of the transformer shall be formed by bending. Corner ribs shall be avoided for the fin radiator. The bearing surface of the tank to which bushings are clamped shall be substantially flat.
- ❖ All matching faces of joints shall be made oil tight and finished with a smooth surface to ensure that the gasketing materials make a satisfactory joint.
- ❖ Flanges and covers of tanks shall be of sufficient thickness to prevent any depression occurring, which would retain water around the bolts. The horizontal edges of the cover plate shall be bent over the tank flange to facilitate water dripping out of the tank. The bent collar width shall be about 10mm to 15mm.
- ❖ All the nut and bolts used shall be hot dip galvanized and spaced at sufficiently close intervals to avoid buckling of either flange or covers and shall provide reasonably uniform compression of the gasket.
- ❖ Each transformer shall be provided with a minimum of two closed lifting lugs. The minimum diameter of the hole or width of the slot shall be 25 mm. The two lifting lugs shall be located such that there would be a minimum of 50 mm between the lifting chain and the nearest part of the bushings.

1.11 Transformer Sealing / Gasket

- ❖ The transformers shall provide with a satisfactory lid sealing gaskets. The gasket shall be of good quality to maintain the sealing effect through its life span and shall prevent seeping of oil due to ageing and extreme operating temperature.
- ❖ Gaskets provided with the transformers shall be suitable for making oil tight joints, and there would be no deleterious effects on either gaskets or oil when the gaskets are continuously in contact with hot oil. No gaskets shall be used in which the material of the gasket is mounted on a textile backing.
- ❖ Exterior gaskets shall be of rubberized cork material, weather-proof and shall not be affected by strong sunlight.

1.12 Internal and External Finish

- ❖ The external surface shall be prepared for powders painting by applying a suitable etch primer. The powder shall then be applied and the powder used shall be epoxy polyester cured with hydroxyl alkyl. The powder coating thickness shall not be less than 50µm.
- ❖ **The Finish color shall be Silver.**

1.13 Rating Plate

- ❖ A brass /stainless steel rating plate shall be fitted to each transformer. The information shall be deeply etched including the diagram of the connections of the windings, the vector diagram showing the general phase relations of the transformer, and a diagrammatic plan of the transformer cover showing the terminal positions and marking and other essential particulars.
- ❖ The plate shall be mounted in an accessible position and following information shall be clearly and indelibly marked in English language.
 - a) Transformer type
 - b) Manufacturer's name
 - c) Manufacturer's serial number
 - d) Year of manufacture
 - e) Number of phases
 - f) Rated power
 - g) Rated frequency
 - h) Rated voltages
 - i) Rated currents
 - j) Connection symbol (Vector Group)
 - k) Mass of insulating oil
 - l) Insulation levels
 - m) Details regarding tapping

- n) Gross weight
- o) Impedance voltage at rated current
- p) Type of cooling
- q) Total mass

1.14 Bushings

- ❖ All bushings shall be of porcelain clad, of the highest quality and comply with IEC 60137.
They shall be sealed in a manner to prevent ingress of moisture and to facilitate removal.
The neutral bushings and stems shall be identical to those provided for phase terminations. Bushing palms shall be made of brass and be suitable for the bolting of conductor compression lugs.
- ❖ The palms shall be suitably dimensioned, to suit the bushing rod and the holes spaced sufficiently apart to enable tightening of bolts using standard spanners and to prevent overlap of lugs. The LV bushing palms shall be as indicated in the attached drawings
- ❖ The MV bushings shall be labeled U, V, and W by using indelible black color paint. Phase identification by adhesive stickers is not acceptable.
- ❖ All Indoor Transformers MV bushings shall be K180 –AR3 Type
- ❖ All Outdoor Transformers MV bushings shall be 30 NF -250 Type
- ❖ All Transformers LV bushings shall be as below bushings type
- ❖ The Transformers 160 KVA & 250 KVA LV bushings shall be with drilled hole 2x Ø14 mm Brass Flag
- ❖ The Transformers 400 KVA, 630 KVA, 800 KVA, 1000 KVA, 1250 KVA, 1600 KVA and 2000 KVA LV bushings shall be with drilled hole 4x Ø14 mm Brass Flag.

Rating (kva)	Installation	Type of bushing	
		H.V	L.V
2000	Indoor	K180 –AR3	DT4000
1600	Indoor	K180 –AR3	DT3150
1250	Indoor	K180 –AR3	DT2000
800	Indoor	K180 –AR3	DT2000
800	Outdoor	30 NF -250	DT2000
630	Indoor	K180 –AR3	DT2000
630	Outdoor	30 NF -250	DT2000
400	Outdoor	30 NF -250	DT1000
250	Outdoor	30 NF -250	DT630

1.15 Earthing Connections

- ❖ Earthing connections shall be provided with connection facilities for 70mm² copper stranded conductors.
- ❖ Three bolts of M12 size shall be located on either side of the tank base (two) and on the cover plate (one).

1.16 Off Load Tap Changer

- ❖ The Tap changer shall made of Metal.
- ❖ Voltage tapings shall be provided on the primary side of each transformer. Tapping step shall be $\pm 2.5\%$. Number of tapings shall be as specified in Technical guarantees.
- ❖ The tapings shall be selected by an 'off load' tapping switch with an external hand wheel with provision for locking on to a selected tapping. The shaft shall be adequately sealed so that no seepage of oil occurs under all conditions of service.
- ❖ The voltage operating positions, together with tap change positions shall be ` clearly and indelibly marked.

1.17 Surge Arrester Mounting Bracket/Bracket to fixing the fuse holder

- ❖ The surge arrester mounting bracket/ Bracket to fixing the fuse holder made of steel shall be provided on the transformer cover plate.

- ❖ The bracket shall be hot dip galvanized and suitable to accommodate three surge arresters/fuse holder as indicated Specifications in the drawings.

1.18 Oil

- ❖ Generally all transformers shall be filled to the required level with a new, unused, clean, standard mineral oil in compliance with IEC60296.
- ❖ PCB synthetic liquids (Poly Chlorinated Biphenyls) or other chlorinated hydro carbons are not acceptable and shall not be used.

1.19 Conservator

- ❖ For Outdoor Transformers only, the Conservator shall have an adequate sump, a filling cap and a drain valve.
- ❖ Level gauge with markings to be provided on conservator. The level gauge to indicate maximum, minimum and normal level.

1.20 Radio Interference

When operated at voltage even up to 10% in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

1.21 Accessories

All outdoor transformers shall be including below accessories:

- a) Expansion vessel (Conservator)
- b) Oil Filling Opening
- c) Manual Ball Oil Drain Valve with Sampling Devices
- d) Grounding Terminals
- e) Diagram and Name Plate
- f) Thermometer Pocket
- g) Oil Level Indicator

- h) Lifting lugs
- i) Safety Valve (over Pressure Relief Device)
- j) U - Base
- k) Dehydrating breather (silica-gel breather)
- l) Buchholz relay with ability to Connection with SCADA System for Indication.
- m) Oil temperature indicator with ability to Connection with SCADA System for Indication.

All indoor transformers shall be including below accessories:

- a) Oil Filling Opening
- b) Manual Ball Oil Drain Valve with Sampling Devices
- c) Grounding Terminals
- d) Diagram and Name Plate
- e) Thermometer Pocket
- f) Oil Level Indicator for indoor transformers ratings up to 630 KVA
- g) Oil temperature indicator with ability to Connection with SCADA System for Indication for indoor transformers ratings up to 630 KVA
- h) Lifting lugs
- i) Safety Valve (over Pressure Relief Device)
- j) U - Base with Wheels
- k) DGPT (Combined Gas-Pressure Temperature Relay) or R.I.S. (Integrated Safety detector) Including Oil Level Indicator for indoor transformers ratings bigger than 630 KVA.

1.22 Characteristics

- a. Rated power: 1600 kVA /1250 kVA /1000Kva/ 800kVA /630kVA
/400KVA/250KVA/160KVA/100KVA/50KVA
- b. Winding connection: Dyn 11, neutral insulated and brought out
- c. Frequency: 50 Hz
- d. Rated voltage primary: 22 kV

- e. Rated voltage secondary 0.4 kV
- f. Impedance 6% For 800 , 1250, 1600KVA ,
4% for 50,100,160,250,400,630KVA
- g. Tap-changer positions: Plus 1x 2.5% Minus 3x 2.5%
- g. Insulation level :
 - Impulse withstand voltage (Peak 1.2/50 μ s (kV)): 125
 - Power Frequency withstand Voltage (r.m.s 1 minute (kV)): 50
- h. Available fault current of system at location: 20kA
- i. Duration of short-circuit: 3 sec.
- j. Terminal connections:
 - HV side: Fully insulated with epoxy sealed end, bolted
 - LV side: LV busbars

1.23 Losses, Impedance Voltage and Noise Level

The indicated figures below are the maximum acceptable values with zero Tolerance. Tolerances will not be accepted by PEA, and Transformers with losses exceeding these values will be rejected.

Rating (kVA)	Losses (Watt)		Impedance Voltage (%)	Noise Level (dB)
	No load	Load		
2000	2050	17500	6	68
1600	1700	14000	6	66
1250	1300	11400	6	64
800	950	7400	6	62
630	900	5100	4	60
400	610	3850	4	58
250	425	2750	4	55
160	300	2350	4	52
100	210	1750	4	49
50	125	1100	4	47

1.24 Outline Drawings, Maintenance Manual and Packing

Outline drawings and other necessary drawings bearing an effect on customers' installation shall be provided with each transformer and a comprehensive maintenance manual shall also be provided.

- ❖ The Bidder shall furnish the Final Drawings before starting the manufacturing of transformers and must be obtained the final Approve of the PEA's before manufacturing.

1.25 Quality Assurance

The manufacturer shall possess ISO 9001 Quality Assurance Certification for the manufacture of distribution transformers for the plant where the manufacture of distribution transformers is done. Bidders shall furnish a copy of the ISO certificate certified as true copy of the original by the manufacturer, along with the offer.

1.26 List of Reference

Bidders shall furnish the list of reference obtained from Electricity Supply Authorities to whom the Bidder have supplied Distribution Transformers of similar type in the past 3 years, the list shall indicate the Type, Rating, Voltage &, Year of Supply, the Quantity Supplied and shall furnish certificates for the last 3 years from the end user (utilities) including full name, address and phone number.

1.27 Factory Visit

GEDCO have the right to send two representatives at the expense of the supplier, for visiting the factory to verify the capability of the manufacturer to produce transformers within stipulated time before or during the manufacturing.

1.28 Routine Tests

The following routine tests as per IEC 60076: 1993 shall be carried out on all the distribution transformers ordered and the routine test reports shall be made available for the observation of the GEDCO representatives at the time of inspection.

- a) Measurement of winding resistance
- b) Measurement of insulation resistance
- c) Separate source voltage withstand test (High Voltage tests on HV & LV)
- d) Induced Over voltage Withstand test (DVDF test)
- e) Measurement of voltage ratio

- f) Measurement of No Load Loss & Current.
- g) Measurement of Load Loss & Impedance. (Efficiency & Regulation)
- h) Vector Group Verification

1.29 Type Tests

The following Type tests as per IEC 60076 and shall be witnessed with three GEDCO representatives and must be conducted on Four transformers (one outdoor 630KVA and one 800 KVA as below:

- a) Lightning Impulse withstand voltage test.
- b) Temperature-rise test.
- c) Acoustic Sound Level Measurements.

1.30 Special Tests

1.30.1 Short Circuit Withstand Ability Test

The Bidder shall be furnished with the offer the Short circuit withstand ability test Certificates by an internationally recognized independent testing authority which shall be conducted in the last 7 years.

If the Bidder cannot Furnish the certificate The Bidder Price shall include The Short circuit withstand ability test and the certificate shall offered before any production of tender transformers.

The Short circuit withstand ability test shall have been conducted by a reputed independent laboratory accredited by International Laboratory Accreditation Corporation (ILAC) or International Accreditation Forum (IAF) or other reputed accreditation agencies.

1.30.2 Overload Capacity Test

The Overload Capacity Test shall conducted on Four transformers (one outdoor 630KVA and one 800 KVA and shall be witnessed by three GEDCO representatives according the item 1.7 (Overload Capacity) requirements.

1.30.2 Testing the L.V and H.V winding material

The GEDCO representatives will choose one transformer to make sure that the used transformer windings are made of high grade Copper wires by cutting the transformer L.V and H.V windings.

The costs of this process shall be at the Bidder's own expense.

1.31 Acceptance /Sample Tests

The following Acceptance/Sample tests conforming to IEC 60076 on 11 transformers (Three outdoor 630 KVA and Two outdoor 800KVA) and shall be witnessed by three GEDCO representatives. Extra copies of these Test Certificates shall also be supplied with the equipment.

1. Measurement of winding resistance
 2. Measurement of insulation resistance
 3. Separate source voltage withstand test (High Voltage tests on HV & LV)
 4. Induced Over voltage Withstand test (DVDF test)
 5. Measurement of voltage ratio
 6. Measurement of no Load Loss & current.
 7. Measurement of Load Loss & Impedance. (Efficiency & Regulation)
 8. Vector Group Verification
 9. Oil leakage test
- ❖ GEDCO will select the transformers before the testing procedures.
 - ❖ The Place of tests must be in the manufacturer's factory or in specialized laboratories for this tests.
 - ❖ The No-load losses and Load losses at 75C° shall be according to the technical schedules, if any increases on the losses during the tests the transformers will be rejected.
 - ❖ If any material is rejected, the supplier shall be obliged to replace it without extra payment.

1.32 Information's to be furnished with the Offer

The following Information shall be furnished the offer:

- a) Technical Guarantees.

- b) Constructional features and materials used for components.
- c) Separate explanatory drawings and dimensions of tap changer.
- d) Overall dimensional drawings.
- e) Transformers internal dimensions (core, windings and spaces)
- e) Drawing of rating plate to scale incorporating the particulars called for.
- f) Certified copy of the quality assurance conforming to ISO 9001.
- g) List of Reference for goods and certificates from the end user (utilities) for the last 3 years including full name, address and phone number.
- h) The Bidder shall provide clear name and the address of the manufacturers.

1.33 Operating conditions:

- ❖ The existing transformers may expose to sudden loads that may reach 150%.
- ❖ The loads of the low voltage directly is connected to the transformers through Manual L.V Disconnecter with Fuses.
- ❖ There is excess voltage levels resulted from the manual disconnecting and connection due to the load shedding program which is applied due to the electricity shortage.
So the manufacturer must design the transformers to be able to withstand such high and sudden loads.

1.34 Note:

The transformer shall be designed to resist system fault current due to the short circuit.

Technical Specifications - LOT3

Wires and Cables



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For

***XLPE Insulated Single Core Underground
Cables 12/20Kv Rated Voltage***

January 2016

1. Medium Voltage XLPE Insulated Single Core Cables

Scope

This specification covers the general requirements of the design, manufacture and test of Cross-linked Poly-ethylene (XLPE) Insulated single core cables for medium voltage systems.

1.1 System Details and Service Conditions

The performance of the cable and accessories shall be guaranteed for the upper operating, and environmental conditions of Palestinian National Authority areas.

1.2 Installation Conditions

- Cable laying method: Directly buried and Cables partially installed in separate pipes
- Laying depth: 100-110 cm
- Laying arrangement: flat or trefoil
- Average soil temperature at bury depth 30 °C
- Thermal resistivity of soil 1.5-1.8 Km/W
- Power factor: 0.90

1.3 Applicable Standards

The items supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof.

- IEC 60502- Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1.2$ kV) up to 30 kV ($U_m = 36$ kV)
- IEC 60228- Conductors of insulated cables
- IEC 60885- Electrical test methods for electric cables

- IEC 60540- Test methods for insulations and sheaths of electric cables and cords (elastomeric and thermoplastics compounds)
- IEC 60229- Tests on cable over sheaths which have a special protective function and are applied by extrusion
- IEC 60811- Common test methods for insulating and sheathing materials of electric cables
- IEC 60230- Impulse tests on cables and their accessories

1.4 Ratings and Performance/General

- ❖ Rating, performance and testing of each product shall meet the requirements described in the relevant clauses.
- ❖ The specified ratings and the minimum guaranteed performance shall be for the distribution system and service conditions described in the general specifications.
- ❖ All the materials used in the construction of the cable shall be capable of withstanding mechanical, electrical and thermal stresses developed during the normal working (permanent or temporary loading), short circuit and emergency overloading under the service conditions described in the general specifications.

1.5 Construction Details

The cables are intended for underground lying it shall be 12/20 kv (max. service voltage 24kv), single core, XLPE insulated and class 2 Circular stranded Compacted aluminum or Copper conductors.

The cable construction consists from these layers:

- 1- Conductor
- 2- Inner semi-conductive layer
- 3- XLPE insulation
- 4- Outer semi-conductive layer
- 5- Semi-Conductive Swellable Tape.
- 6- Copper Wire Screen (including Equalizing Tape)

7- Separation sheath (Swelling tape)

8- LDPE outer cover

1.5.1 Conductor

The conductor shall be class 2, Circular stranded Compacted Aluminum or Copper wires, and it must comply with IEC60228.

The resistance of each conductor at 20 °C shall be in accordance with relevant IEC standard, the conductor shall be clean, uniform in size, shape and quality, smooth and free from scale, spills, splits, sharp edges and other harmful defects. The cable phase conductor shall be longitudinally sealed (voids between conductors wires shall be filled with moisture swelling powder)

1.5.2 Inner semi-conductive layer (Conductor Screen)

Conductor screen shall be of Extruded Semi-conducting Compound type. The extruded layer shall be continuous and shall cover the surface of the conductor completely. The Conductor Screen shall be applied in the same operation as the insulation.

1.5.3 XLPE Insulation

The insulation shall be XLPE and shall be applied by extrusion and cross-linked to form a compact and homogeneous layer in accordance with the Standards specified.

The thickness of insulation shall conform to the relevant IEC standard and compliance shall be checked by the tests given in the relevant IEC standard.

Only dry processes shall be used in vulcanizing and cross linking of the XLPE-insulation. Special precautions shall be taken to avoid ingress and spreading of moisture and development of water-treeing. The Bidder shall documents the construction measures used to achieve these requirements. The Supplier can purpose an alternative treatment to prevent the possibility for treeing.

1.5.4 Outer semi- conductive layer (Insulation screen)

The insulation screen shall consist of extruded (triple extruded) semi - conducting thermosetting compound. The screen shall be firmly bonded (thermosetting) to the insulation. The thickness of semi – conducting layer of the conductor or over the insulation, shall not be included in the thickness of the insulation XLPE. Conductor screen, insulation and insulation screen shall be applied (extruded) simultaneously, using triple extrusion head, and shall cover the surface of the insulation completely.

The insulation screen shall be cold strippable to ease the process of terminating.

1.5.5 Semi conductive water swelling tape (Inner covering)

Extruded or lapped materials suitable for the operating temperature of the cable and compatible with the insulating materials, Conditions of cable being buried direct in ground in sustained wet conditions should be considered. Semi-conductive bedding tapes shall be used to assure good electrical connection between the concentric wire screen and the extruded semi-conducting insulation screen.

1.5.6 Copper Wire screen

The core shall be covered with a Copper wire screen including Equalizing Tape, the cross sectional area of the metallic screen shall be able to withstand the specified fault current & duration.

1.5.7 Separation sheath (Swelling tape)

Water barrier nonconductive swelling tape shall be provided to protect against longitudinal water penetration.

1.5.8 LDPE Outer Covering

The cable shall have an outer non - metallic Black Color sheath, it shall consist of LDPE ST7 (Low Density polyethylene).

The sheathing material shall be suitable for its operating temperature in accordance with sub-clause 4.3 IEC 60502.

Chemical additives will be requested for use in the over sheath for special purpose for example termite protection but they should not include materials harmful to mankind or environment acc. to IEC 60502.

The over sheath shall withstand the DC voltage test in accordance with relevant IEC standard. This test shall be carried out on each delivery lengths.

1.6 Manufacture

Adequate consideration shall have been given in the design of the cable and in the manufacturing process on the following **(Documentary evidence shall be supplied along with the tender)**

- i) Maximum design electrical stress shall be such that purity of raw materials, manufacturing conditions and ageing of cables has been taken into account.
- ii) Purity of raw materials.
- iii) Close control of extrusion process to achieve smooth extruded surfaces, homogeneous extrudes and prevention of void formations.

1.7 Manufacturing Experience

- ❖ The Manufacturer shall provide the years of experience in the manufacture of XLPE Insulated Cables and he shall furnish sufficient documentary evidence in the Bid to prove his manufacturing experience.
- ❖ The Bidder shall provide clear name and the address of the manufacturers.

1.8 List of Reference

Bidders shall furnish the List of Reference obtained from Electricity Supply Authorities to whom the Bidder have supplied XLPE Insulated Cables of similar type in the past 3 years, the list shall indicate the Type, Size, Voltage & Current ratings of the XLPE Insulated Cables, Year of Supply and the Quantity Supplied.

1.9 Diagrams and Drawings

The following diagrams and drawings shall be submitted with the tender as a part of the tender documents:

- Complete sets of detailed dimension drawings and catalogues of the offered product.
- Calculation sheets for construction, thickness, and electrical stresses.
- Current rating computation and curves.
- Correction Factors

1.10 Testing

The product shall be tested in accordance with the standards and specifications mentioned in this book.

1.10.1 Type Test

The type Test Certificates conforming to the relevant IEC Standards shall be furnished as listed in the applicable IEC 60502, IEC60230 and IEC60811 standards.

Type test reports shall be in English language. The type test shall make in independent laboratory or in the laboratory which have accreditation certificate from international testing laboratory firms which acceptable to the purchaser.

- a) Bending test
- b) Partial discharge
- c) Tan δ measurement
- d) Heating cycle test, followed by a partial discharge test
- e) Impulse test, followed by a voltage test
- f) Voltage test for 4 h
- g) Resistivity of semi-conducting screens

Type Test Certificate, Performance Curves, Tables etc. based on Type Tests shall conform to the relevant Standards specified. The Test Certificate should clearly identify the Items concerned, showing the manufacturers identity, type No. /catalogue No. and basic technical

parameters. The Type Test Certificates shall carry an indication of the total number of pages in it (e.g. page 1 of 4 etc.) and all the tests shall be conducted in the last 7 years. any incomplete Type Test Certificates or copies with missing pages etc. will be rejected.

1.10.2 Routine Test

The routine test reports/ Factory test reports shall also be supplied with the cables to include following tests.

The Following tests shall perform on every completed cable as required in IEC60502-2 and IEC60885-3:

- a) Measurement of electrical resistance of conductors
- b) Measurement of electrical resistance of Copper wire screen
- c) Power frequency voltage test (High Voltage test $3.5 \cdot U_0$)
- d) Partial discharge test

1.10.3 Acceptance Test

The Following tests shall perform on samples selected. The Factory test reports shall be supplied with the cables as required in IEC60502-2 and IEC60811-1-1 and IEC60811-2-1 and Witnessed by three GEDCo Representatives:

- a) Conductor examination
- b) Measurement of thickness of insulation
- c) Measurement of thickness of non- metallic sheath
- d) Measurement of external diameter
- e) Examination of sheath and protective coverings
- f) Insulation and Sheath Elongation
- g) Insulation and Sheath Tensile Strength
- h) Hot set test for XLPE insulation & sheaths (under load and after cooling)
- i) Measurement of electrical resistance of conductors and Copper wire screen

- e) Power frequency voltage test (High Voltage test $3.5 \cdot U_0$)
- f) Partial discharge test

After Tests, the certificates shall include in addition to test results the following:

- a) The manufacturer's drum number.
- b) The date of testing.
- c) The signature of the test engineer.

- Before the examination all quantities manufacturing and laying on the drums shall be finished.

-If during inspection tests carried out by or supervised by GEDCo. Any material proved defective or not manufactured according to the contractual specifications, GEDCo shall have the right to reject such material.

- If any material is rejected, the supplier shall be obliged to replace it without extra payment.

- If any samples fail in any of the acceptance tests, the acceptance or rejection will be according to sub-clause 17.3 of IEC 60502-2.

1.11 Packing and Shipment

- The type of packing should be suitable and provide complete protection inland transportation of drums in addition to that it should be robust and have suitable dimensions and weights.

- The supplier will take care on his own account that the commodity will be packed carefully in order to avoid damage of delivered materials and should be accepted by insurance company.

- The strength and quality of the packing materials should correspond to the weight of the packed materials.

- Delivery of cables shall be on drums of new wood .The cables on drum shall be protected by wooden batten.

- Empty drums after usage shall be non - returnable.

- The drums shall be new, substantially made to an approved international standard. An arrow on the side of each drum shall indicate the rolling direction.
- Both ends of the cable shall be sealed with adhesive coated heat shrink end caps to prevent the ingress of moisture in transport, shipping and storage
- The drums shall be transported in an upright position and properly secured against damage in transportation.
- The design details and the dimensioned drawing of the drum shall be submitted with the tender including design, material and marking to be approved by the Purchaser prior to manufacture.
- The drum shall meet all the above requirements, any deviation in the drum design, material and marking shall be with the approval of the GEDCo.
- Sufficient steel bands for drum shall be in accordance with their weight and dimensions.
- Each drum must include the packing list fixed on it.

1.12 Marking and Identification

1- Cable outer covering identification: The marking shall be hot stamping on the cable outer covering and shall be indelible, distinct, Big Letter and clearly show the following as sample:

Electric Cable, 12 /20 KV, 1 x 400 mm² AL/XLPE / LDPE

Marking of length each 1 m / year and name of Manufacturer / GEDCo

2- It is important to mark each drum, clearly by the following:

- Contract number;
- GEDCo, the purchaser;
- Delivery number, shipment number;
- Manufacturing date;
- Name of manufacturer;
- Kind of materials;

- Quantities contained length;
- Main technical specification;
- Cross section;
- Gross weight, net weight
- The marking must be clear and written on two sides of the drum with un_erasable materials also metal label in both sides of drum including the same information (no.3) above should be fixed.



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications
For
Medium Voltage XLPE Cables Fittings

January 2012

1. Medium Voltage XLPE Cables Fittings

1.1 Heat Shrinkable Outdoor Termination Kit for XLPE Cable

SCOPE:

These specifications cover the minimum technical requirements for the design manufacture. Supply and transportation to the site(s) and testing of 24 kV and 36 kV Heat Shrinkable Outdoor Termination Kit for XLPE Cables

1.1.1 System Details and Service Conditions

The performance of the Outdoor Terminations shall be guaranteed for the proposed operating, installation and environmental conditions as specified in general specifications

1.1.2 STANDARDS

IEC-60502 Power cables with extruded insulation and their accessories for rated voltages from 1 KV ($U_m = 1.2$ kV) up to 30 KV ($U_m = 36$ KV).

CENELEC HD629.1 S1:- Test requirements on accessories for use on power cables of rated voltage from 3,6/6 (7,2) kV up to 20,8/36 (42) kV - part 1: Cables with extruded insulation.

VDE-0278 Load cycling test.

IEEE-48 Test procedures and requirements for high voltage alternating current cable terminations.

IEC-60466 Continuous condensation test.

IEC-60507 Salt fog test.

IEEE-404 Test procedures and requirements for high voltage alternating current cable Splices

1.1.3 Design & Construction

The insulation tubing shall be generally suitable for outdoor installation, ultra-violet and chemical resistant and without adhesive coatings and shall be capable of being stored without damage at temperatures up to 50°C.

Terminations for all MV cables shall be of an appropriate heat shrink design incorporating a suitable arrangement of stress control, and rain-sheds for outdoor use

Termination kits shall include suitable heat shrink tubing to effectively shroud, seal and insulate the exposed cable conductor and connector, and shall include a heat shrink glove to effectively seal the crutch of the cable to prevent ingress of moisture into the interstices of the cable. Suitable arrangements shall be provided to earth the cable screen and armour (if specified).

Terminations shall include Bimetallic Terminal Mechanical lug with 13 mm Hole and 3 each Shear Head Bolts (for Aluminium or Copper Conductors)

As soon as possible after the commencement of a contract and before materials are despatched, copies of the termination instructions.

Terminations to be supplied shall be submitted in English to the Engineer/GEDCO for approval, together with details of the physical and electrical characteristics of the filling medium proposed.

Higher thickness of heat shrinkable sleeves shall be preferable to counter erosion due to pollution.

The stress cone must; be of proven design of stress control. The suitable provision for covering the cable cores with re-useable protective system from the crotch seal to the bottom of stress cone should be made.

Proper stress control, stress grading and non-tracking arrangement in the terminations shall be offered by means of proven methods, details of which shall be elaborated in the offer. Detailed sectional view of assemblies shall be submitted along with the offer.

Suitable creepage extension/rain protection sheds for outdoor termination shall be provided.

The; terminations shall be supplied in kit forms. All insulating and sealing materials, consumable items, conductor fittings, earthing arrangements and lugs etc. shall be included in the individual kit.

1.1.4 Heat Shrink Materials

Heat shrink tubing and moulded parts shall be flexible, flame retardant, made from Specially Formulated Cross-Lined Polymeric of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for outdoor use in the conditions prevailing on site.

Each part shall bear the manufacturer's mark, part number and any other necessary markings to ensure correct identification for use on the correct size and type of cable. Each set of parts shall be packed as one unit with full and complete installation instructions and clearly marked to show the application.

The material shall reduce to the predetermined size and shape when heated above 120°C. The components shall also be provided with an internal coating of hot melt adhesive compound that shall not flow or exude at temperature below 85°C. All parts and materials shall be tested to a programme of tests to be agreed with the manufacturer.

1.1.5 Marking:

All components shall be clearly marked with the manufacturer's name and reference numbers. The marking shall be done before coating the adhesive onto the component.

Electrically conducting components shall be marked 'conducting' clearly and permanently.

All components shall be capable of being stored without deterioration within the temperature range of -10°C to +55°C. Components or materials, if subjected to a shelf life limitation, shall have the final date of use prominently and permanently shown on all packages.

Each hard box shall be printed with the following information:

- a) Termination/accessories catalogue number
- b) Purchase order number/tender
- c) Manufacturer's name
- d) Year of manufacture
- e) Date of expiry

Each wooden box shall be fixed with an Aluminium plate bearing the following information:

- a) Purchase order number/tender
- b) Manufacturer's name
- c) Year of manufacture
- d) Date of expiry
- e) Termination catalogue number
- f) Gross weight
- g) Position of slinging points and other relevant handling instructions.

1.1.6 Diagrams and Drawings

The drawings shall be submitted with the tender as a part of the tender documents.

Actual drawings showing the terminations, and accessories including terminations into equipment in respect of which the independent test reports have been obtained.

Typical drawings are not acceptable.

Catalogue for all the components used. Catalogue numbers for the offered items shall be highlighted.

Duly completed attached technical data schedule for each offered item.

1.1.7 Testing

All Routine Tests and Type Tests of The terminations and accessories shall be tested in accordance with the latest standards.

Type Tests:

The termination kits of offered design should have been got tested from accredited laboratory as per relevant standards with latest version.

Acceptance Tests:

Initially the following tests shall constitute as acceptance tests:-

- i) Dimensional checking as per approved drawings.
- ii) Volume resistivity test for various components.
- iii) AC High voltage test after installation of terminations
- iv) Dielectric strength of major components.

- v) D.C. High voltage test.
- vi) Tracking resistance.
- vii) Ultimatic Elongation.

Routine Tests:-

The following tests shall constitute routine test:

- i) Dielectric strength.
- ii) Density.
- iii) Heat shock.
- iv) Shrinkage ratio.

The tenderer must specify the details of routine tests (being conducted at their works) along with the standard applicable, in their offer.

The routine test certificates shall be furnished along with the inspection call for each offered lot.

1.1.8 Packing and shipment

Each kit of termination with appropriate Installation instructions shall be packed separately in hard board box Palletized non-returnable wooden boxes.

Packing notes shall be included in each hard board box giving a description of the goods packed.

Packing shall be designed to protect against ingress of moisture and mechanical damage.

The kits shall not be packed in any organic material.

1.2 Indoor Screened Separable Termination Kit for XLPE Cables

SCOPE:

These specifications cover the minimum technical requirements for the design manufacture. Supply and transportation to the site(s) and testing of:

- **250A, 24 kv Indoor Screened Separable Elbow Termination Kit for 12/20 kv XLPE Cable**
- **630A, 24 kv Indoor Screened Separable Termination Kit for 12/20 kv XLPE Cable**
- **630A, 36 kv Indoor Screened Separable Termination Kit for 18/30 kv XLPE Cable**

1.2.1 System Details and Service Conditions

The performance of the indoor Terminations shall be guaranteed for the proposed operating, installation and environmental conditions as specified in general specifications

1.2.2 STANDARDS

IEC-60502 Power cables with extruded insulation and their accessories for rated voltages from 1 KV (Um = 1.2 kV) up to 30 KV (Um= 36 KV).

CENELEC HD629.1 S1:- Test requirements on accessories for use on power cables of rated voltage from 3,6/6 (7,2) kV up to 20,8/36 (42) kV - part 1: Cables with extruded insulation.

CENELEC HD506 S1 Bushings for Liquid Transformers Above 1kv up to 33kv

EN 50180 Bushings Above 1 kV up to 36 kV and from 250 A to 3.15 kA for Liquid Filled Transformers-Includes Corrigendum April 1998; Supersedes HD 506 S1:1989

EN 50181 Plug-in Type Bushings above 1 kV up to 36 kV and from 250 A to 1.25 kA for Equipment Other Than Liquid Filled Transformers

DIN 47636 Bushing for separable accessories for power cable with protruding cone; up to 36 kV. Bushing without mounting flange

IEEE-386-1995 Standard for separable insulated connector system for power distribution systems above 600 Volts.

VDE-0278 Load cycling test.

IEC 60540- Test methods for insulations and sheaths of electric cables and cords (elastomeric and thermoplastics compounds)

1.2.3 Design & Construction

Screened separable connectors are designed to connect single -core XLPE cables to medium-voltage gas insulated switchgear

Made of a highly modified silicone rubber and protected by a thin walled outer conductive screen connected to earth, connectors are equally suited for indoor and outdoor installation.

Supporting a wide application range, the design incorporates one body and two stress cone adapters to cover all cross-sections.

Minimum space in the terminal box connectors are equipped with a capacitive test point for determining whether the circuit is energized. This test point is protected by a conductive cap.

The; terminations shall be supplied in kit forms. All insulating and sealing materials, consumable items, conductor fittings, earthing arrangements and Bimetallic Compression Pin-Connector Designed with Locking Ring, to Connect Both Aluminium and Copper Conductor Cables for Elbow Termination Kit and Mechanical Lug with Shear-Head Bolts and Central Barrier for AL or CU Conductors for Screened Separable Tee Termination Kit or DIN Compression Lug for AL or CU Conductors etc. shall be included in the individual kit.

All dimension according attached drawings with technical guarantees.

1.2.4 Marking:

All components shall be clearly marked with the manufacturer's name and reference numbers. The marking shall be done before coating the adhesive onto the component.

Electrically conducting components shall be marked 'conducting' clearly and permanently.

All components shall be capable of being stored without deterioration within the temperature range of -10°C to +55°C. Components or materials, if subjected to a shelf life limitation, shall have the final date of use prominently and permanently shown on all packages.

Each hard box shall be printed with the following information:

- a) Termination/accessories catalogue number
- b) Purchase order number/tender
- c) Manufacturer's name
- d) Year of manufacture
- e) Date of expiry

Each wooden box shall be fixed with an Aluminium plate bearing the following information:

- a) Purchase order number/tender
- b) Manufacturer's name
- c) Year of manufacture
- d) Date of expiry
- e) Termination catalogue number
- f) Gross weight
- g) Position of slinging points and other relevant handling instructions.

1.2.5 Diagrams and Drawings

The drawings shall be submitted with the tender as a part of the tender documents.

Actual drawings showing the terminations, and accessories including terminations into equipment in respect of which the independent test reports have been obtained.

Typical drawings are not acceptable.

Catalogue for all the components used. Catalogue numbers for the offered items shall be highlighted.

Duly completed attached technical data schedule for each offered item.

1.2.6 Testing

All Routine Tests of The terminations and accessories shall be tested in accordance with the latest standards.

All Type Tests of The termination kits of offered design should have been got tested from accredited laboratory as per relevant standards with latest version.

1.2.7 Packing and shipment

Each kit of termination with appropriate Installation instructions shall be packed separately in hard board box Palletized non-returnable wooden boxes.

Packing notes shall be included in each hard board box giving a description of the goods packed.

Packing shall be designed to protect against ingress of moisture and mechanical damage.

The kits shall not be packed in any organic material.

1.3 24 kv Heat Shrinkable Straight Joint for Single Core XLPE Cables

SCOPE:

These specifications cover the minimum technical requirements for the design manufacture. Supply and transportation to the site(s) and testing of 24 kv Heat Shrinkable Straight Joint

1.3.1 System Details and Service Conditions

The performance of the Straight Joint shall be guaranteed for the proposed operating, installation and environmental conditions as specified in general specifications

1.3.2 STANDARDS

IEC-60502 Power cables with extruded insulation and their accessories for rated voltages from 1 KV ($U_m = 1.2$ kV) up to 30 KV ($U_m = 36$ KV).

CENELEC HD629.1 S1 Test requirements on accessories for use on power cables of rated voltage from 3,6/6 (7,2) kV up to 20,8/36 (42) kV - part 1: Cables with extruded insulation.

IEEE-404 Test procedures and requirements for high voltage alternating current cable Splices

ASTM-E28 Test method for softening point by ring-and-bell apparatus.

1.3.3 Design & Construction

The Tenderer shall submit with his Tender drawings showing the types of joints proposed for each of the cables included in the Contract.

The joints shall be of a watertight, pull-over heat shrink type (Raychem or similar) without moulding, free from sharp points or ridges, thoroughly clean internally and externally. The sleeves shall be of sufficient diameter and length to permit colour-to-colour jointing without undue bending, handling or deformation of the cores.

The cable joints shall meet all requirements of IEEE-404, and shall be designed such that no insulating or semi-conducting tapes shall be required, except void filler tape and sealing mastic.

The cable joints shall provide water-proofing, mechanical and electrical protection and be completely sealed from cable jacket to cable jacket.

The diameter of heat shrinkable materials shall reduce to a pre-determined size upon application of heat in excess of 120°C yielding a minimum shrink ratio of 3 to 1 and a maximum longitudinal shrinkage of 5%.

The recovered wall thickness of insulation tubing over the connector shall be uniform and equal to or greater than the cable insulation thickness as given in IEC-60502

The adhesive shall have a softening temperature not less than 90°C, in accordance with ASTM-E28, be compatible with other components of joints and cables, and after curing shall not flow at temperatures of normal service.

The cable joints shall meet all the test requirements mentioned the Specifications.

The Joint shall include 24 kV Mechanical Connector with Shear-Head Bolts and Central Barrier for AL or CU Conductors for phases and Mechanical Connector with Shear-Head Bolts and Central Barrier for Copper Shield.

1.3.4 Design

At the screen end yellow void filling mastic is applied and the cable end is covered with a heat-shrinkable stress control tubing, the conductors are jointed with mechanical connector supplied with the joint, the connection area is covered with a stress control patch, heat shrinkable triple-extruded elastomeric joint body provides the correct thickness of insulation and the screening over the insulation, copper mesh wrapped around the joint area rebuilds the metallic screen , earth connection system must supplied with the kit the outer sealing and protection is performed by an adhesive coated , thick-wall, heat-shrinkable tubing

1.3.5 Instructions

As soon as possible after the commencement of a contract and before materials are despatched, copies of the jointing and termination instructions applicable to the joints, sealing ends and terminations to be supplied shall be submitted in English to the Engineer/GEDCO for approval, together with details of the physical and electrical characteristics of the filling medium proposed.

1.3.6 Heat Shrink Materials

Heat shrink tubing and moulded parts shall be flexible, flame retardant, polyolefin-based material of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for use indoors or outdoors in the conditions prevailing on site.

Each part shall bear the manufacturer's mark, part number and any other necessary markings to ensure correct identification for use on the correct size and type of cable.

Each set of parts shall be packed as one unit with full and complete installation instructions and clearly marked to show the application.

The material shall reduce to the predetermined size and shape when heated above 120oC. The components shall also be provided with an internal coating of hot melt adhesive compound that shall not flow or exude at temperature below 85oC. All parts and materials shall be tested to a programme of tests to be agreed with the manufacturer.

1.3.7 Fabrication

Cable joints shall be supplied in complete kit form with all materials and components required to complete the installation. Connectors shall be included in the kits. The cable joints shall be suitable for cables specified in the tender/inquiry.

Components shall not be adversely affected in any manner by contact with other materials normally used in the construction of cable joints and shall not increase the rate of corrosion of any metal with which they may come into contact.

All components of a Joint shall perform without distress under the normal conditions, cyclic loading and fault conditions.

Components supplied with adhesive coatings shall have means to prevent the coated surfaces from adhering to each other.

1.3.8 Marking

All components shall be clearly marked with the manufacturer's name and reference numbers. The marking shall be done before coating the adhesive onto the component.

Electrically conducting components shall be marked 'conducting' clearly and permanently.

All components shall be capable of being stored without deterioration within the temperature range of -10°C to +55°C. Components or materials, if subjected to a shelf life limitation, shall have the final date of use prominently and permanently shown on all packages.

Each hard box shall be printed with the following information:

- a) Joint/accessories catalogue number
- b) Purchase order number/tender
- c) Manufacturer's name
- d) Year of manufacture
- e) Date of expiry

Each wooden box shall be fixed with an Aluminium plate bearing the following information:

- a) Purchase order number/tender
- b) Manufacturer's name
- c) Year of manufacture
- d) Date of expiry
- e) Joint/accessories catalogue number
- f) Gross weight in kilograms
- g) Position of slinging points and other relevant handling instructions.

1.3.9 DIAGRAMS AND DRAWINGS

The drawings shall be submitted with the tender as a part of the tender documents.

Actual drawings showing the terminations, and accessories including terminations into equipment in respect of which the independent test reports have been obtained.

Typical drawings are not acceptable.

Catalogue for all the components used. Catalogue numbers for the offered items shall be high-lighted.

Duly completed attached technical data schedule for each offered item.

1.3.10 TESTING

All Routine Tests and Type Tests of The terminations and accessories shall be tested in accordance with the latest standards.

Below Type tests reports by qualified laboratory:

AC Voltage Withstand

Partial Discharge

Impulse Voltage Withstand

Short Time Current

Cyclic Aging

DC Voltage Withstand

High Voltage Time

Shielding

1.3.11 PACKING AND SHIPMENT:

Installation instructions shall be packed separately in hard board box

Packing notes shall be included in each hard board box giving a description of the goods packed.

Packing shall be designed to protect against ingress of moisture and mechanical damage.

The kits shall not be packed in any organic material.



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications
For
Aluminum Conductor Steel Reinforced
(ACSR)

March 2012

1. Aluminum Conductor Steel Reinforced (ACSR) Overhead Line Conductors

1.1 Scope

This Specification covers the design, manufacture, factory test, supply and delivery of Aluminum conductor steel reinforced (ACSR) for use in the construction of 24kv, 3-phase, 4-wire, overhead distribution systems and Frequency 50Hz.

1.2 Applicable Standards

The aluminum Conductors Steel-reinforced shall be manufactured in accordance with the latest editions of the Standards specified below and amendments thereof.

- **BS215 PART 2** for aluminum Conductor Steel reinforced wires with codes Rabbit, Dog and Dingo
- **DIN48204** for aluminum Conductor Steel reinforced wires 50/8, 95/15 and 150/25
- **BS 4565 (1990)** - Galvanized Steel Wires for ACSR
- **BS 2627 (1985)** - Wrought aluminum for Electrical purposes, Wire.
- **ANSI/ASTM B 233-77** - aluminum 1350 Re-draw Rod for electrical purposes.
- **BS EN 50182:2001**- Conductors for overhead lines. Round wire concentric lay stranded conductors
- **BS EN 50189:2000** Conductors for overhead lines. Zinc coated steel wires
- **BS EN 60889:1997** Hard drawn Aluminium wire for overhead line conductors

1.3 Design of Wire

- ❖ All conductors should be of Aluminum Conductors Steel Reinforced (ACSR) construction and shall be manufactured in strict conformity to BS215 Part 2 for Rabbit, Dog, Dingo wires and to German Conductor Sizes DIN48204 for 50/8, 95/15 and 150/25 wires.
- ❖ The Galvanized High Tensile Steel Wire used in the manufacture of ACSR shall conform to BS 4565.
- ❖ The aluminum and steel wires shall be uniform in quality, circular in cross section, clean, smooth and free from harmful defects, splinter irregularities and brittle places.

- ❖ The resistivity of the aluminum wire shall not be more than 0.028264 ohm mm²/m at 20°C and the Coefficient of linear expansion is $23 \times 10^{-6}/^{\circ}\text{C}$.
- ❖ The correct tension must be maintained on the stranding machine when spinning the conductor to avoid the possibility of bird caging during stringing. Any condition not complying may be rejected at the discretion of the Purchaser.
- ❖ The other technical specifications of the conductors are given in Technical Guarantees which should be filled and stamped by manufacturer and Tenderer.

1.4 Construction of aluminum Conductors Steel Reinforced (Stranding)

- ❖ In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.
- ❖ Steel wires shall be formed during stranding so that they remain inert when the conductor is cut.
- ❖ The completed conductor shall be smooth and free from imperfections, dirt, grit, excessive amounts of drawing oil and other foreign deposits.

1.5 Materials

1.5.1 aluminum Re-draw Rods

Aluminum Re-draw Rods used in the manufacture of aluminum wire for the fabrication of aluminum Conductors Steel-Reinforced (ACSR) shall conform to ANSI / ASTM B 233-77.

The Quality of aluminum re-draw rods used for the manufacture of ACSR Conductor shall be as stipulated below.

- a) The purity of the aluminum re-draw rods shall not be less than 99.5%. The percentage composition of other elements shall not be more than the values stipulated below.

<u>ELEMENT ALLOWED</u>	<u>% Max.</u>
i. Silicon	0.10
ii. Iron	0.40
iii. Copper	0.05

iv. Manganese	0.01
v. Chromium	0.01
vi. Zinc	0.05
vii. Boron	0.05
viii. Gallium	0.03
ix. Vanadium plus titanium, total	0.02
x. Other elements, each	0.03
ix. Other elements, total	0.10

Total % of impurities shall not be more than 0.5

The bidder shall submit the certificates of analysis giving the percentage and the nature of any impurities in the metal from which the wires are made.

- b) Quality Assurance System conforming to ISO 9002 shall be followed in the manufacture of the aluminum Re-draw Rods. The Bidders shall furnish documentary evidence that the aluminum Re-draw Rods manufacturers have obtained ISO 9002 Certification.

1.5.2 Reinforcement Steel Wire

- a) The Galvanized High Tensile Steel Wire used for the reinforcement of the ACSR Conductor shall conform to BS 4565 – 1990
- b) The tensile strength and stress at 1% elongation values, calculated on the nominal dimensions of the finished wire, shall be not less than those given in table 2 of BS 4565.
- c) The elongation shall not be less than 4%, measured after fracture on an original gauge length of 200mm and the Coefficient of linear expansion is $11.5 \times 10^{-6}/^{\circ}\text{C}$.
- d) The steel wire shall not fracture when wrapped for eight complete close turns round a mandril of diameter equal to the wire diameter.
- e) The weight and uniformity of coating and Zinc adhesion shall be in accordance with BS 443.

- f) The tolerance on nominal diameter of the galvanized steel wire shall not be more than $\pm 2\%$. The difference between the maximum and the minimum measurements, taken at the same cross section, shall not exceed 4% of the nominal diameter.
- g) Quality Assurance System conforming to ISO 9002 shall be followed in the manufacture of the Galvanized High Tensile Steel Wire. The Bidders shall furnish documentary evidence that the Galvanized High Tensile Steel Wire manufacturers have obtained ISO 9002 Certification.

1.5.3 Grease

The steel core shall be galvanized and greased; the first layer of aluminum shall be greased. The grease shall retain its properties as resistance to oxidation and chemical stability at all service temperatures. The grease used for corrosion protection in the manufacture of ACSR shall have the following requirements.

- a) It shall not add appreciably to the weight of the Conductor.
- b) It shall not flow or deteriorate at temperatures up to 75°C and the grease neither flow nor extrude from the conductor.
- c) It shall not be inimical to aluminum or Galvanized Steel.
- d) It shall have good adhesive and co-hesive properties and shall retain these qualities after weathering.
- e) It shall not extrude a surplus to the outside of the Conductor after erection.

1.6 Additional Requirements

- ❖ Precaution shall be taken during the manufacturing, storage and erection of steel core aluminum conductors to prevent the possibility of contamination by copper or other materials, which may adversely affect the aluminum. The manufacture of steel core aluminum shall be carried out in a portion of factory specially set aside for such purposes. Machinery previously used in the manufacture of copper or copper-bearing conductors shall not be for the manufacture of these aluminum or steel wires. The size and the composition of the entire conductor shall be as stated in general specification.
- ❖ The conductors shall be supplied on drums of approved construction. The drums shall be securely battened to protect the conductor. Drum battens shall not be removed until the drum is properly mounted on the drum station on line and battens shall be immediately refitted to the drum if any surplus conductor is left therein. Each drum shall be marked the manufacturer's name, direction of rolling, any mark, code name, the length, size stranding, net weight, gross weight, approximate measurement and production date of the conductor and manufacturing

batch number incised. The minimum length of the conductor shall be at least 1 km per drum and maximum 3 km per drum.

1.7 Testing

1.7.1 Routine Test

The routine test reports/ Factory test reports shall also be supplied with the wires to include following tests.

The Following tests shall perform on every completed cable as required in BS2627, BS4565 and BS215 standards:

- a) Tensile test for aluminum and Steel wires and Breaking load test for the complete Conductor
- b) Wrapping test for aluminum and Steel wires
- c) Resistivity test for aluminum wires
- d) Galvanization test for Steel wires
- e) Elongation test for Steel wires
- f) Density and Dimension Tests for aluminum and Steel wires

1.7.2 Acceptance Tests

The following acceptance tests shall be made on the conductor at the manufacturer's plant in accordance with international standards and in the presence of the two GEDCo Representatives:

- a) The conductor according to EN 50182 standard:**
 - Surface condition (shall be from all imperfections) and visual inspection
 - Number and type of wires
 - Diameter
 - Mass per unit length
 - Conductor Resistance
- b) Aluminium wires according to EN 50889 standard:**
 - Diameter

- Tensile strength
- Wrapping test
- Weight for Aluminium
- c) **Steel wires according to EN50189 standard:**
 - Diameter
 - Stress at 1% extension
 - Tensile strength
 - Breaking elongation test
 - Galvanization test and Mass of Zinc
 - Wrapping test
 - Weight for Steel
- ❖ Before the examination all quantities manufacturing and laying on the drums shall be finished.
- ❖ If during inspection tests carried out by or supervised by GEDCo. Any material proved defective or not manufactured according to the contractual specifications, GEDCo shall have the right to reject such material.
- ❖ If any material is rejected, the Supplier shall be obliged to replace it without extra payment.

1.7.3 Type Test

Type test of the offered conductors shall have been conducted in internationally reputed testing agency as below:

(1) aluminum RE-draw Rods

- i) Tensile test.
- ii) Determination of chemical composition and purity.
- iii) Temper test.
- iv) Electrical resistivity test.

(2) Aluminum wires

- i) Dimension Tests.
- ii) Tensile test.
- iii) Wrapping test.
- iv) Resistivity test.

(3) Steel wires

- i) Dimension Tests.
- ii) Determination of stress at 1% elongation.
- iii) Tensile test.
- iv) Elongation test.
- v) Wrapping test.
- vi) Galvanizing test.

(4) Grease

- i) Determination of Temperature at which the grease flows / melts.

GEDCO, reserve the rights to send the samples of the manufactured ACSR conductor for the type test to the internationally reputed testing laboratory to verify whether the offered conductor meets the test requirements as per the referenced standard at the cost of Supplier.

1.8 Size and Quantity

-Sizes of conductor shall be:

Rabbit, Dog, Dingo wires, 50/8, 95/15mm², 150/25mm²etc.

-The required quantity of the wires of above sizes shall be as shown in the Price Schedule(s).

1.9 Packaging

- ❖ Each reel of the wire furnished shall contain only one (1) length of conductor.
- ❖ The wire shall be supplied on non-returnable seasoned new wooden drums. These shall be fully lagged and triple banded to provide adequate protection during transit. All timber shall be treated to provide protection against rot and insects; the treatment process not having deleterious effect on the wire.
- ❖ Size and weight of drum shall be according International Standards.
- ❖ All reels shall be legibly marked on Both Sides with unerasable painting with the following information:
 - a) Type of conductor
 - b) Cross Section of conductor
 - c) Length of the conductor in meters
 - d) Production year
 - e) Order No.
 - f) Name of the manufacturer
 - g) Name of the Beneficiary "GEDCO"
 - h) Net of gross weight
 - i) Direction of rolling

- ❖ The drum barrel shall be covered with a layer of waterproof sheet plastic or wax paper or in the case of Aluminum conductors shall be painted with Aluminum flake paint. The inner cheeks of the drum shall be painted with a bitumen-based paint or in the case of Aluminum conductors with Aluminum flake paint. The outer layer of conductor on the drum shall be covered by a layer of sheet plastic or waxed paper secured immediately under the circumference battens so that it is not in contact with the conductor.
- ❖ All drums must be of suitable quality to withstand a minimum of twenty-four (24) months exposure to all types of weather conditions during outdoor storage without deterioration.
- ❖ The inner end of the conductor shall be secured to the drum to ensure that the conductor end will not flick off the drum barrel when the conductor is being run out.

1.10 List of Reference

Bidders shall furnish the List of Reference obtained from Electricity Supply Authorities to whom the Bidder have supplied ACSR wires of similar type in the past 3 years, the list shall indicate the Type, Size, Year of Supply and the Quantity Supplied.

1.11 Bid Documentation

- ❖ The Bidder shall also provide the list of reference.
- ❖ The Bidder shall also provide with the certificate of compliance, as specified in BS215Part2: 1970 at the time of the shipment of each lot of conductor or as required by the appropriate selection of the equivalent national standard.
- ❖ The Bidder shall provide certified type test results of all types of ACSR conductors as required by governing standards.
- ❖ All data, drawings, catalogue and others technical documents shall be bound separately from the Bid documents.
- ❖ Erection Sag-Tension tables based on
 - Spans of 70-120m in 10m steps.
 - Design maximum tension on % 25 rated breaking loads, 0°C (no ice).
 - Erection temperature range 10-35°C in steps of 5°C.
- ❖ The Bidder shall provide clear name and the address of the manufacturers.



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For

Low Voltage Aerial Bundled Cable (ABC)

March 2015

1. Low Voltage Aerial Bundled Cable (ABC)

SCOPE

This Specification covers the design, manufacture, factory test, supply and delivery of 0.6/1 kV cross-linked polyethylene (XLPE) insulated aerial bundled cable (ABC) for use in the construction of 230/400V, 3-phase, 4-wire, overhead distribution systems and Frequency 50Hz.

1.1 Description

1.1.1 The cable shall be suitable for use within Gaza Strip: altitude range above sea level -50 - +200 meters, typical temperature range -5 °C to 55 °C, relative humidity 70-95%.

1.1.2 GEDCo used the Low Voltage Aerial Bundled Cables in this type:

LV Aerial Bundled Cables with insulated Neutral Messenger

1.2 Applicable Standards

The cable shall comply with the latest revision of CENELEC HD 626 S1:1996 PART 6 Section E included in National Standards NFC 33209, BS 7870-5 or comparable internationally recognized standards which will result in the cable of equal or better quality.

- ❖ The three phase conductors and Lighting conductors if any shall consist of compact round stranded Aluminium wires, and the Neutral messenger conductor shall consist of compact round stranded Aluminium alloy wires, which shall be of heat treated Aluminium magnesium silicon alloy wires containing approximately 0.5% each of magnesium and silicon respectively.
- ❖ The complete cable shall consist of three equal-size insulated conductors stranded together and two lighting if any with one messenger, and the direction of lay shall be right-hand. The type of construction shall cause the tensile load to be over messenger conductor.
- ❖ The outer covering of the Neutral conductor of the cable shall be embossed with the name of the manufacturer, name of the Beneficiary "GEDCo", the cross sections, type of insulation followed by "ABC Cable: 600/1000 Volts", Production year and shall also be embossed with length of the cable per meter.
- ❖ The individual phase cores of a four-core bundle shall be identified by one, two and three continuous longitudinal ribs. The ribs shall have an approximate base width of 1 mm and an approximate separating distance of 1 mm. The minimum rib height shall be 0.5 mm
- ❖ The Insulated cores shall be laid up a left-hand direction of lay, protective, The Length of lay of the cores shall be 22 to 28 times the calculated diameter of the assembly as given in BS 7870-5 Standard.
- ❖

1.3 Identification

The identification of the phase conductors shall be provided by means of ribbing on the external surface of the insulation. The 3 phases shall have one, two and three ribs respectively. Space between ribs in phases shall be 5 mm. The neutral conductor shall not have any ribs.

The lighting Conductors if any marking shall be with no 1 and 2.

1.4 Testing

The following acceptance and routine tests shall be made on the completed cable at the manufacturer's plant in accordance with governing standards and in the presence of the Two GEDCo representatives:

- Construction Test: Verification of diameters of conductor and insulated conductor, and thickness of insulation
- XLPE insulation Hot set tests
- XLPE insulation Tensile strength
- XLPE insulation Elongation at break
- Conductor Tensile Test
- Insulated Conductor Bending test
- 4 kv Voltage test
- Conductor D.C resistance at 20 °C.
- Cable Slippage Test
- Overall cable Laying-up test
- The manufactured conductor shall be tested in full compliance with the governing standard and a certified type test report shall be produced for all tests conducted performed on all types of cable offered.
- Type test of the offered ABC cable shall have been be conducted in internationally reputed testing agency.
- Gedco, reserve the rights to send the samples of the manufactured ABC Cable for the type test to the internationally reputed testing laboratory to verify whether the offered cable meets the test requirements as per the referenced standard at the cost of Supplier.
- The manufacturer shall furnish the details of whole manufacturing process, quality assurance plan (QAP), and list of machinery/ plants for the production of ABC Cable.

-Gedco may, at its own cost, visit the factory to verify the capability of the manufacturer to produce ABC Cable in the required quantity within stipulated time before and during the manufacturing.

1.5 Packaging

- Each reel of the cable furnished shall contain only one (1) length of cable.

- The cable shall be supplied on non-returnable seasoned new wooden drums. These shall be fully lagged and triple banded to provide adequate protection during transit. All timber shall be treated to provide protection against rot and insects; the treatment process not having deleterious effect on the cable.

-Before dispatch, the end 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.

- Size and weight of drum shall be according International Standards.

- All reels shall be legibly marked on Both Sides with unerasable painting with the following information:

- a) Type of conductor
- b) Cross Section of cable/conductor
- c) Length of the cable in meters
- d) Production year
- e) Order No.
- f) Name of the manufacturer
- g) Name of the Beneficiary "GEDCo"
- h) Net of gross weight
- i) Direction of rolling

- All drums must be of suitable quality to withstand a minimum of twenty-four (24) months exposure to all types of weather conditions during outdoor storage without deterioration.

- The ends of the individual cores of the cables shall be sealed against the ingress of moisture by means of heat shrink end caps or other approved methods.

- The inner end of the cable shall be secured to the drum to ensure that the cable end will not flick off the drum barrel when the cable is being run out.

1.6 Bid Documentation

- The BIDDER shall provide with the Bid two (2) clear copies of the Standard governing fabrication of the conductor and two (2) clear copies of all other specifications referenced therein as relevant to the fabrication and testing LV ABC.

- Type and Routine test report of identical type and ratings of ABC Cables specified in the Schedule of Requirements.

- Drawings and Catalogues: 2 set showing general construction, size and weight.
- The BIDDER shall provide the name and the address of the manufacturers of the cable being offered and the length of the cable in the manufacturer's standard reels, including net and gross weights.
- Details of type tests and Quality Control procedure.
- All data supplied shall be bound separately from the Bid Document.

Technical Specifications - LOT4

Switches and Accessories



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For

***36Kv, 3-phase Outdoor Isolating Switch
with Built-In Arc Interruption***

March 2012

3 36 Kv, 3-phase Outdoor Isolating Switch with Built-In Arc Interruption

SCOPE

This specification covers the general requirements of the design, manufacture and test of 36 Kv, 3-phase outdoor isolating switch with Built-In arc interruption

3.1 Applicable Standards

The equipment and the components supplied shall be in accordance with the latest edition of the standards specified below and amendments thereof.

- a) IEC 60265-1 (1998) - High-voltage switches for rated voltages above 1kV and less than 52kV.
- b) IEC 129 amendment 1 (1984) - Alternating Current Disconnectors (Isolators) and earthing switches
- c) IEC 694 (1996) - Common clauses for high voltage switchgear and controlgear standards
- d) IEC 62217 - Polymeric insulators for indoor and outdoor use with a nominal voltage >1 000 V –General definitions, test methods and acceptance criteria
- e) IEC 273 (1990) - Characteristics of Indoor & Outdoor Post Insulators for Systems with Nominal Voltage greater than 1000V.
- f) IEC 71-1 & 71-2 (1973) - Insulation Coordination
- g) BS 729 (1971) - Hot dip galvanized coatings on iron and steel articles.
- h) IEC 60-1 (1989) Part 1 - High-voltage test techniques General definitions and test requirements

3.2 Basic Features

3.2.1 Design and Construction

- All isolators shall be of the triple pole, gang operated open type, suitable for outdoor installation designed in accordance with IEC 60129 The isolators shall be for horizontal or vertical mounting in standard lattice towers and shall be supplied complete with base plates, pole coupling rods, operating rods, angels and triangular plates for operating rods, operating handles and all accessories, including items such as guide plates or mounting brackets. Facilities shall be incorporated in the design for aligning the main contacts and adjusting the linkages during erection and maintenance, and all the conductor straps, nuts, bolts, and washers necessary to mount and electrical connect the isolators, together with all auxiliary equipment, on their supports shall be provided.
- Provision shall be made for adjusting the insulator posts in the vertical axis.
- Contacts shall be of the high pressure; self-aligning type made of metal not subject to corrosion, for example hard drawn copper or phosphor bronze. If silver plating is applied the plating shall be in accordance with BS 2816 applying a coating that has a specified silver content of at least 95.0 % by mass, and a thickness of at least 25 µm.
- The design of the contacts shall be such that periodic lubrication of their surfaces is unnecessary for efficient operation of the switch. Service conditions require that isolating

switches shall remain live, and in service without being operated for periods of up to two years. The contacts will therefore be expected to remain capable of carrying their rated load and short circuit currents without overheating or welding for this period under the atmospheric and climatic conditions existing at site. The advantage of the electromechanical forces created by a fault current to increase the contact pressure where most needed at the contact shall be incorporated in the design.

- Isolators shall be designed and tested such that the isolator cannot be opened by forces due to short circuit currents passing through it, and shall be self-locking in both the "open" and "closed" positions
- The stationary contacts shall be backed by stainless steel pre-stressed compression springs with multi finger contacts to provide the required contact pressure, resulting in minimum electrical clearance.
- Isolators shall be including Chrome-plated solid brass Master Key Lock with Boron-steel alloy U-Shackle and master key.
- Where "outboard" bearings are required they shall be suitable for mounting at either end of the isolator.
- All roller or ball type bearings shall be grease packed and efficiently sealed to prevent the ingress of dust and moisture. Completely enclosed, weatherproof type bearings that require no maintenance are preferred.
- When made of steel or malleable iron, operating boxes, handles, rods, tubes and other fittings for outdoor equipment shall be hot dip galvanized.
- Bidders shall state in the Technical Schedules the load current, line charging current and transformer magnetizing current which they guarantee that all isolators offered will break without damage to the contacts. Bidders shall declare in their Bid whether special contacts are required to achieve any of the current breaking conditions; details of any such contacts shall be given.
- Full details of all heavy current carrying contacts which incorporate moving parts shall be submitted with the tender together with associated electrical and mechanical type test reports.
- All isolators shall be prepared for extension with load breaking heads allowing breaking of minimum 630 A when operating the isolator. The isolator functions shall be retained when the load break head is mounted.

3.2.2 Insulators

- The post insulator shall be of high quality composite material, polymer insulators utilizing clean aero-dynamic sheds giving extended creepage distances and excellent performance even under conditions of heavy atmospheric pollution

- The total creepage distance and the protected creepage distance (if applicable) shall be as stipulated in Technical guarantees.

3.2.3 Load Interruption

- The load interruption shall take place within the interrupter head without an external arc or flame conforming to IEC 265, Category A. Electronic controlled arc interrupters are not acceptable.
- The load interruption shall be achieved by providing a parallel circuit for re-directing the load current path from the main isolator contacts at the instant of their separation. The design of the equipment shall allow the replacement of load interrupter head after a specified number of operations. The manufacturer shall indicate the number of load break operation possible without changing the interrupter head.
- The inner layer of the arcing chamber shall be suitable for generating arc-quenching-gas. The generated deionized gas shall extinguish the arc and be dissipated through a rear exhaust chamber, well clear of the switch.
- The internal contacts shall be spring loaded and be of such design as to provide a positive and independent tripping action.
- The interrupter contacts shall not be in the main current path when the main contacts are in a fully closed position.
- The load interrupter head shall be designed to prevent leakage of water to the arcing chamber (where the control mechanism including the spring for opening and closing is housed) and be made of non-corrosive materials.

3.2.4 Operating Handle

- Operating mechanisms shall be designed so that all three poles close simultaneously and be arranged so that any mechanism may be mounted at either end of the supporting structure. All operating handles shall be securely earthed.

3.2.5 Galvanizing

- Unless otherwise specified all iron and steel parts shall be galvanized after the sawing, shearing, drilling, punching, filling, bending and machining operations.
- All required materials shall be hot dipped galvanized to comply with the relevant specifications for galvanizing.
- All iron and steel components shall be effectively galvanized to consist of a coating not less than 610 gm of zinc per square meter of surface and the components shall have a galvanized coating of uniform thickness not less than 0.086mm.
- All threaded sections shall have a coating of at least 493 gm of zinc per/square meter.

- The galvanized coating on all items shall be smooth, continuous, uniform and free from flux stains and holes shall be free from nodules of spelter.
- All galvanized items shall be treated with Sodium Dichromate solution after galvanizing to prevent the formation of white rust.

3.3 Remote Control

- It shall be possible to equip the isolators and switch isolators with a motor driven mechanism connecting to the normal operation rod. The switches must be so designed that such installation also can be done at a later stage. Where the motor operated mechanism is specified it shall be designed to provide electrically initiated opening and closing of the isolator from local or remote switches or relays. Local manual tripping shall also be provided together with manual closing of the isolator; the manual closing operation shall reset a spring or weight operated mechanism.
- Provision shall be made for locking the local tripping device with a padlock to be supplied by the Employer. The mechanisms shall be totally enclosed in weatherproof and vermin proof metal panel with padlock hasp.
- Automatic operating mechanisms shall be provided with an auxiliary switch to isolate the trip or operating coil when the switch is opened.
- Auxiliary contacts should clearly indicate the position of the switch.

3.4 Rating Plate

The rating and data of the load break switch shall be engraved or embossed on a weather and corrosion proof metal plate. The rating plate containing the following information shall be positioned at the base supporting frame of the post insulator and shall be prominently visible.

- a) Manufacturer's Identification
- b) Country and Year of Manufacture.
- c) Designation of Type, Class etc.
- d) Rated voltage and frequency
- e) Rated 1 minute power frequency withstand voltage (kV) wet.
- f) Rated lightning impulse withstand voltage (kV) dry.
- g) Rated continuous current (A)
- h) Rated short circuit making current (KA)
- i) Rated short time (1 sec.) current (KA)
- j) Total net weight (kg)

3.5 Packing

Each unit shall be securely and individually packed in a wooden box suitable for overseas shipment to a tropical country and to withstand rough handling. Each packing shall contain a copy of Installation Instruction and Erection Drawings and Maintenance Instruction in English Language.

Each packing shall be clearly marked with the following:

- a) Name of Item
- b) Rated Voltage
- c) Rated Current
- d) Manufacturer's Name and Identification mark
- e) Country of Origin
- f) Gross weight

3.6 Information to be supplied with The Offer

3.6.1 The following shall be furnished with the offer.

- a) Particulars requested in attached technical guarantees
- b) Constructional features and materials used for components
- c) Separate explanatory drawings and dimensions of operating mechanisms; movable and stationary contacts; clamping terminals.
- d) Overall dimensional drawings
- e) Drawing of rating plate to scale incorporating the particulars called for.
- f) The following Certificate of Type Tests,
 - 1) In accordance with IEC 694 : 1996
 - i) Dielectric tests
 - ii) Temperature-rise tests
 - iii) Measurement of the resistance of the main circuit.
 - iv) Short-time withstand amount and peak withstand current tests.
 - 2) In accordance with IEC 265-1
 - v) Making and Breaking Tests.
 - vi) Mechanical Endurance Test.

3.6.2 Test Certificates furnished shall be based on the Type Tests conform to the relevant standard. The Test Certificates shall clearly identify the equipment showing the manufacturer's identity, Type No. and basic technical parameters, and shall be from a recognized Independent Testing Authority acceptable to the Purchaser.

3.6.3 Failure to furnish the particulars requested in clause 3.6.1 will result in the offer being rejected.

3.7 Quality Assurance

Manufacturer shall possess ISO 9001 quality assurance certificate for manufacture of 36kV Load Break Switches at the plant where the manufacture is done. Certified copy of the ISO certificate shall be furnished.

3.8 Technical Literature & Drawings

The selected Bidder shall supply along with the equipment all relevant drawings with dimensions, technical literature, hand books etc., in order to facilitate easy installation, faultless operation and maintenance.

3.9 Routine Tests

The following routine tests conforming to IEC 694 shall be carried out during the Manufacture. Extra copies of these Test Certificates shall also be supplied with the equipment.

- i) Power frequency voltage withstand tests**
- ii) Measurements of the contact resistance**
- iii) Mechanical operating test**



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For

ABC Cables Accessories

March 2016

1. Low Voltage ABC Clamps, Joints and Connectors

The Clamps and Joints for Low Voltage Aerial Bundled Cables (ABC) shall be of manufacturer's standard design and shall meet the basic dimensional and performance requirements of this Specification in all respects and as per technical guarantees.

1.1 Applicable Standards:

The design, performance and test requirements shall confirm to this specification and the following standards. However in case of any conflict, the requirements of this specification shall prevail

NFC 33-040 Support materials for overhead networks of insulated twisted conductors. of 0.6/1kV rated voltage.

NFC 33-041 Anchoring materials for overhead networks of insulated twisted conductors. of 0.6/1kV rated voltage.

NFC 33-042 Anchoring materials for overhead and overhead-underground connections in insulated conductors of 0.6/1kV rated voltage

NFC 33-020 Insulated cables and their accessories for networks - Insulation perforation derivation connectors for network and overhead connections in twisted insulated conductors of 0.6/1kV rated voltage.

NFC 33-209 LV Aerial Bundled cables

NFC 20-540 Environment Testing for Outdoor

NFC 33-004 Electrical Ageing Test

1.2 Suspension Clamps:

- a) Suspension clamps Bushing Material for Self-Supporting LV Aerial Bundled Cables Clamp shall be Weather and UV resistant Elastomer (EPDM) and the Clamp Body Material and Clamp Butterfly End Nut Material shall be Hot Galvanized Steel.
- b) Suspension clamps body for LV Aerial Bundled Cables with insulated Neutral Messenger shall be Weather resistant Aluminum alloy and Body Coating and Keeper shall be Weather and UV resistant Glass Fibre Reinforced Polymer with Movable Link with hole diameter 24 mm.
- c) All mechanical, electrical & thermal ratings should meet or exceed 90% of the corresponding ratings of the cable, or the values specified herein, whichever are more stringent.
- d) No losable part in the process of clamping arrangement.

1.3 Tension Clamps:

- a) Tension clamps Wedges Material for Self-Supporting LV Aerial Bundled Cables shall be weather and UV Resistant Glass Fibre Reinforced Polymer and all ferrous parts shall be Hot Galvanized Steel.
- b) Tension clamps Clamp Wedges and Thimble Material for LV Aerial Bundled Cables with insulated Neutral Messenger shall be Weather and UV resistant Glass Reinforced Polymer and Clamp Body Material (Straps) shall be Corrosion Resistant Aluminum Alloy and bail shall be stainless steel with insulation wear resistant Saddle.
- c) All mechanical, electrical & thermal ratings should meet or exceed 90% of the corresponding ratings of the cable, or the values specified herein, whichever are more stringent.
- d) No losable part in the process of clamping arrangement.

1.4 Insulation Piercing and Tap Connectors:

- a) The Connectors Body shall be Weather and UV resistant Glass Fibre Reinforced Plastic and Contact plate (teeth) shall be Aluminum alloy.
- b) The Connectors Sealing cover shall be Thermoplastic elastomer (TPE)
- c) The Connectors Bolt and washer shall be Stainless steel or hot galvanized steel; the bolts shall be equipped with a second (shear-head) nut.
- d) The Connectors should be provided with a cap to seal the cut end of the insulated Branch cable. It should be of a design that once the connector is fitted, it shall not be possible to remove the cap without dismantling the connector.
- e) Design of The Connectors should be such as to not cause damage to installation of adjacent conductors due to vibration and relative movement during service.
- f) All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling and should be confirm to the long duration tests.
- g) Connectors shall be tightened up to 70% of the minimum torque indicated by the Manufacturer. At this torque electrical contact should have occurred between conductors to be joined. Then connectors shall be tightened up to the breakdown of the shear heads and lastly, up to 1.5 times the max torque indicated by the manufacturer.

- h) For the connector fitted with two screws on the same core, after the breakdown of the shear heads tightening may be carried out manually and alternatively using a torque meter. The test conditions shall be as close as possible to those defined for the use of the test machine as per NF-C standard.

1.5 ABC Cables Tension Joints:

The Joints shall be for ABC Cables Waterproof Pre_Insulated Hexagonal Compression Connectors

The Insulation Material shall be Weather and UV Resistant Polymer

It shall have Stop in the Middle and Filled with Contact Grease

For conductors of self-supporting system the tension joint breaking load shall be %80 of conductor breaking load.

For system of neutral messenger the tension joint breaking load for phase conductors shall be %60 of phase conductor breaking load.

For system of neutral messenger the tension joint breaking load for neutral messenger conductor the joint shall be %100 of messenger breaking load.

1.6 Testing:

- The Bidder shall provide the test certificates according to the international standards from internationally reputed testing agency, otherwise the bidder have the right to reject the offered materials.
- The Dielectric voltage test shall be 4kV in air
- Type Test Reports should be submitted from an Independent Laboratory of Repute or the Works Laboratory in case of a foreign manufacturer covering the following (on any convenient size of fitting of same design made from the same materials).

No	Test	Type test	Acceptance Test	Routine Test
1	Visual		****	****
2	Dimensional		****	****
3	Mechanical test	****	****	****
4	Electrical continuity and shear head and mechanical behavior	*	*	*
5	Effect of tightening the mechanical strength of main core	*	*	*
6	checking mechanical strength of tap core	*	*	*
7	Water tightness test	****	****	****

8	Climatic ageing test	****		
9	Corrosion test	****		
10	Electrical ageing test	****		
11	Voltage test	***	***	***
12	Dynamic test	**		
13	Endurance Test under Thermal & Mechanical Stresses	***		

**** For all Accessories

*** For Suspension and tension clamps

** For tension clamps

* For connectors and Joints



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications
For
Overhead Line Insulators

March 2012

1 Overhead Line Insulators

1.1 General

Pin, post and reel type insulators shall be brown glazed porcelain or epoxy resin and shall comply with the requirements of adequate IEC/BS publications.

Tension insulators shall be either of strings of toughened glass disc insulators or comprise epoxy resin long rod type units. The design of insulators and fittings shall be such as to avoid local corona formation and no significant radio interference shall be exhibited. The insulator units and the complete insulator sets shall conform to the electrical and mechanical design criteria given in General Technical Specification of this Specification.

1.2 Pin Insulators for Over Head Lines

Pin type insulators for use on 22 kV lines shall have as a minimum the electrical characteristics required in General of this Specification and they shall be fitted with galvanized mild steel spindles having a minimum failing load of 12.5kN.

Spindles for pilot insulators must have a minimum failing load of 700N. Conductor sizes to be accommodated shall vary from 6.0mm to 19.0mm diameters with Preformed Distribution Ties.

1.3 Tension Insulators

Tension insulator sets shall be either made up of strings of toughened glass disc insulators of 255mm diameter and fixing centers at 140mm of 16mm ball and socket couplings, or of epoxy resin long rod type insulators of equivalent electrical and mechanical performance.

Complete tension insulator sets, including fittings, shall have a minimum withstand factor of 2.5 based upon the ultimate mechanical strength.

The ultimate mechanical strength of an insulator set shall be the load at which any part of the insulator string fails to perform its function of providing a mechanical support without regard to electrical failure.

Individual insulator units shall have a minimum withstand factor of 2.5 based upon the combined electro-mechanical strength of the insulator unit. This is defined as that load at which any part of the insulator fails to perform its function either electrically or mechanically when voltage and mechanical stresses are applied simultaneously.

1.4 Marking of Insulators

Each insulator shall have marked upon it the manufacturer's name or trade mark, the date of manufacture or firing, and indication of the guaranteed electro-mechanical strength and other such marks as may be required to denote each batch for the purpose of sample tests.

Unless otherwise approved the insulators submitted, as a batch for a test shall bear the same marks.

These marks shall be imprinted and not impressed. For porcelain, the marks shall be imprinted before glazing. When a batch of insulators bearing a certain identification mark has been

rejected no further insulators bearing this mark shall be submitted and the Supplier shall satisfy the Engineer that adequate steps will be taken to mark or segregate the insulators constituting the rejected batch in such a way that there shall be no possibility of the insulators being re-submitted for test or supplied for the use of the Employer.

1.5 Porcelain Insulators

All porcelain shall be sound, free from defects and thoroughly vitrified. The glaze shall not be depended upon for insulation. The glaze shall be smooth, hard, of a uniform shade and shall cover completely all exposed parts of the insulator. Insulators and fittings shall be unaffected by atmospheric conditions due to weather, proximity to the coast, fumes, ozone, acids alkalis, dust or rapid changes of air temperature between minus 40°C and plus 75 °C under working conditions.

1.6 Insulator Caps and Pins

The caps of insulator units shall be of malleable cast iron or other suitable material having the necessary strength to enable the complete unit to comply with this Specification. The pins shall be made of steel or other suitable material of such quality that the finished unit shall comply with this Specification.

The design of the unit shall be such that stresses due to expansion and contraction of any part of the insulator shall not lead to deterioration.

The porcelain shall not engage directly with hard metal. Cement used in the construction of an insulator shall not fracture by virtue of expansion, or loosen by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as uniform as possible.

1.7 Fittings

Ball and socket connections shall be provided with specially designed a "W" clip, which effectively locks the connection against accidental uncoupling without detracting from its flexibility. The "W" clip shall be of stainless steel.

The design shall be such as to permit easy removal for replacement of insulator units under live line conditions without the necessity of removing the entire string from the cross-arm. All split pins for securing the attachment of fittings of insulator sets shall be of stainless steel and shall be backed by washers. Plated split pins shall not be used.

1.8 Composite insulators

The insulator shall be made of composite materials of high resistance to moisture, ultraviolet radiation, high temperatures and tropical sunshine conditions. The core shall be made of resin-impregnated glass fibres free from defects. The housing of the insulator shall be manufactured from high quality silicone rubber according international standards and all necessary specifications attached in technical guarantees.

The under surface and grooves of sheds or skirts shall be easy cleaning. Sheds shall be substantially symmetrical in shape without appreciable warping.

1.9 SHACKLE INSULATOR

The shackle insulator shall be manufactured and tested in accordance with the latest version of international standards that ensures at least equal or better quality to the standard mentioned above, will also be acceptable.

The shackle insulator shall have following ratings and features:

- Highest System Voltage 1 kV
- Power Frequency Withstand Voltage ,1 minute: Dry 25 kV, Wet 12 kV
- Power Frequency Puncture Withstand voltage, 1 minute: 1.3 x actual dry flashover voltage
- Mechanical Strength 13 kN

The shackle insulator shall including U - Bracket, Nail & Buckle and Steel Bolt

The dimensions shall be as attached drawings with technical guarantees

1.10 Ferrous Metal Parts

All ferrous metal parts except those of stainless steel shall be hot dipped galvanized to give an average coating of zinc equivalent to 610 grams per square meter.

1.11 Quality Assurance

The manufacturer of insulator and hardware components shall have obtained quality assurance certification conforming to ISO 9002 for the manufacture of same and the bidder shall furnish documentary evidence with the offer to prove this.

1.12 Tests

Design tests, type tests, sampling tests and routine tests shall be done in accordance with the requirement of IEC 1109, IEC 383, IEC 575, BS137, ISO 1460 and the requirements of this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

Certified true copies of previous design and type test reports by the relevant Independent/International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited laboratory) shall be submitted with the offer for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.

Copies of test reports for the following Design and Type Tests shall be submitted for tender evaluation:

Tests on interfaces and connections of metal fittings;

- Assembled core load-time test;

- Test of housing: tracking and erosion test. The test reports MUST include resistance to ageing tests (under climate chambers to mimic the conditions – sunshine, salinity, temperature, humidity, spray and so on – typical of tropical climate in addition to the highest system voltage);
- Tests for the core material;
- Flammability test;
- Dry lightning impulse withstand voltage test;
- Wet power frequency test;
- Mechanical load-time test and test of the tightness of the interface between end fittings and insulator housing.

1.13 ADDITIONAL REQUIREMENTS

1.13.1 Identification

Each insulator shall be marked with the following information and the marking shall be legible and indelible.

- a) Manufacturer's identification
- b) Minimum failing load kN .
- c) Year of manufacture.

The manufacturer's identification mark shall be indelibly marked before galvanizing on all the hardware components of the string insulator sets.

1.13.2 Packing

The String Insulators and the Hardware shall be packed separately in palletized wooded boxes

1.14 INFORMATION TO BE SUPPLIED WITH THE OFFER

The following shall be furnished with the Offer.

- a) Catalogues describing the item and indicating Model No.
- b) Constructional features, materials used for components.
- c) Complete dimensional drawings.
- d) Certificate of type tests carried out in accordance with the specified standard by an acceptable testing authority. Test certificates should cover all the tests in group 1 (type test) of BS 137 Part 1: 1993, IEC 1109 and IEC 383 (1993). Test Certificates shall be given for String Insulator Units as well as for complete Suspension and Tension Insulator sets.

In addition Type Test Certificates for the string insulator units shall include thermal mechanical performance test as per IEC 575 (1977)

e) Quality Assurance Certification conforming to ISO 9002 for the manufacturer of insulators as well as hardware components.

f) The particulars requested in Annex - B.

g) A list of names and addresses of five leading purchasers outside the country of origin (to whom the manufacturer have supplied the insulators of similar or higher voltage rating), giving dates of delivery and quantities supplied during the past five years.

Failure to furnish these particulars will result in the tender being rejected.

1.15 SAMPLE AND ROUTINE TEST

Following test shall be witnessed by the Engineer nominated by the GEDCo. Extra copies of these test certificates shall also be supplied with the equipment.

1.15.1 Sample Test

Verification of the locking system (Ball & Socket Couplings)

Verification of the dimensions

Verification of the displacements

Temperature cycle test

Electro-mechanical failing load test

Mechanical failing load test

Thermal shock test (on toughened glass Insulators only)

Puncture test

Porosity test (on Porcelain Insulators only)

Galvanizing Test

1.15.2 Routine Test (as per Clause 34 of IEC 383 1983)

The following routine test reports shall be made available for the observation of the GEDCo Inspector at the time of inspection

1) Electrical routine test

2) Mechanical routine test

3) Visual examination



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications
For
Overhead Lines Accessories

March 2015

1. Overhead Lines Clamps, Joints and Connectors

The Clamps and Joints shall be of manufacturer's standard design and shall meet the basic dimensional and performance requirements of this Specification in all respects and as per technical guarantees.

The Parallel Groove Clamps and joints shall be capable of the connection of the range of hard drawn stranded copper and ACSR conductors as defined in technical specification.

Conductor Fitting shall be identified with the manufacturer's identification marks and fitting references.

This marking shall also be applied to any component of the fitting where the component is separate from the fitting when dispatched by the manufacturer.

The marking information shall be engraved or embossed outside of all fittings.

1.1 Parallel Groove Clamps

The Parallel Groove Clamps shall be of a two part design and shall allow the attachment to the largest conductors without total removal of any component of the connector. Stability of contact pressure shall be maintained by the use of Belleville washers. Keeper bars or thrust plates are NOT acceptable.

The surfaces in contact with the conductors shall be grooved in a direction transverse to the conductor axis to penetrate the oxide layer on the surface of the conductor.

The connectors shall be supplied with M8, M10 or M12 bolts with head dimensions in accordance with the relevant International Standards.

The Aluminum Parallel Groove Clamps shall be of materials which are High strength, corrosion-resistant, Aluminum alloy (AlMgSi1) and the Bolts and Nuts shall be hot-dip galvanized.

The Copper Parallel Groove Clamps shall be of materials which are High Strength Copper Alloy (Cu Ni 2 Si) and the Bolts and Nuts shall be High Strength Copper.

The Aluminum Copper Parallel Groove Clamps shall be of materials which are High strength; corrosion-resistant, Aluminum alloy (AlMgSi1) with hot forged bimetallic sheet, for copper tap-off and the Bolts and Nuts shall be hot-dip galvanized.

The junction point of the Aluminum to copper Clamps is to be protected against corrosion by a permanent layer or covering of insulating material applied to the exposed bi-metal interface or by other methods which from tests indicate negligible susceptibility to corrosion. Any protective material must have a service life equivalent to that of other materials used in the Clamp.

The current carrying capacity of the Clamp shall not be less than that of the main conductor.

The temperature rise of the Clamp shall not be more than that of the main conductor.

1.2 Dead End Non-Tension Clamps

The Dead End Non-Tension Clamps shall be of a two part design and shall allow the attachment to the largest conductors without total removal of any component of the connector. Stability of contact pressure shall be maintained by the use of Belleville washers. Keeper bars or thrust plates are NOT acceptable.

The surfaces in contact with the conductors shall be grooved in a direction transverse to the conductor axis to penetrate the oxide layer on the surface of the conductor.

The connectors shall be supplied with M8, M10 or M12 bolts with head dimensions in accordance with the relevant International Standards.

The Aluminum Dead End Non-Tension Clamps shall be of materials which are High strength, corrosion-resistant, Aluminum alloy (AlMgSi1) and the Bolts and Nuts shall be hot-dip galvanized.

The Copper Dead End Non-Tension Clamps shall be of materials which are High Strength Copper Alloy (Cu Ni 2 Si) and the Bolts and Nuts shall be High Strength Copper.

1.3 Dead End Tension Clamps (Strain Clamps)

The ACSR Dead End Tension Clamps Body and keeper shall be of materials which are High Strength Corrosion Resistant Aluminum alloy and the Bolts and Nuts shall be hot-dip galvanized.

The Copper Dead End Tension Clamps Body and keeper shall be Galvanized Ductile Iron, the hardware, Bolts and Nuts shall be hot-dip galvanized, Cotter pin and compression spring shall be Stainless Steel.

The Failure Load of the Clamp shall not be less than that of the conductor.

1.4 Overhead Line Automatic splices (Joints)

Aluminum and Copper Automatic Overhead Line Splices shall be according ANSI C119.4 full tension Class A for ACSR or copper Connectors.

For ACSR Shell Material shall be High Strength Aluminum alloy, and the Jaws Material shall be Aluminum alloy

Copper Automatic Overhead Line Splices Shell Material shall be drawn copper tube, and the Jaws Material shall be Bronze alloy.

1.5 Full and non-Tension Compression Joints

The compression sleeve non-tension and full-tension Aluminum compression joints and of full-tension copper compression joints shall be prefilled with compression compound which must not be removed before the compression, neither completely nor in part.

Any compression compound escaping during the compression should be wiped off.

Copper Full and non-Tension Compression Joint shall made from Electrolytic Copper

Aluminum Full and non-Tension Compression Joint shall made from Aluminum alloy (ALMgSi)

2. Terminal Lugs

2.1 Compression Terminal Lugs (Compression Lugs)

2.1.1 Scope

This Specification is for Terminal Lugs (Compression Lugs) for use on distribution power Lines operating at a nominal Voltage of 1kv, 24 kv and Frequency 50Hz.

2.1.2 Description

This Specification covers the following:

- a- Copper Compression Lugs;
- b- Aluminum Compression Lugs;
- c- Bi-metallic Compression Lugs

All cable/conductor lugs shall be compression type

All cable/conductor lugs shall be of class A, which intended for electricity distribution or industrial networks in which they can be subjected to short-circuit of relatively high intensity and duration.

Cable/conductor lugs shall meet or exceed the performance of conductor in all respect.

Particular requirements for each type of compression lugs as may be relevant for a specific requisition are given in section 4.3

The specification also covers inspection and test of the lugs as well as schedule of guaranteed technical particulars to be filled, signed by the Bidder and submitted for tender evaluation.

The Specification stipulates the minimum requirements for lugs acceptable for use in PEA and it shall be the responsibility of the manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the lugs for PEA.

This specification does not purport to include all the necessary provisions of a contract.

2.1.3 Standards

The Following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply.

DIN 46329: Cable lugs; for compression connections, ring type, for Aluminum conductors

DIN 46235: Cable lugs; for compression connections, cover plate type, for copper conductors

IEC 61238-1: Compression and mechanical connectors for power cables for rated voltages up to 36 kV - Part 1: Test methods and requirements

DIN 40500-2: copper for electrical purposes; tubes, technical terms of delivery.

2.1.4 Requirements

2.1.4.1 Service Conditions

The Lugs shall be suitable for continuous operation outdoors in areas at altitudes of up to 200m above sea level, humidity of up to 95%, average ambient temperature of +30 °C with a minimum of -5 °C and a maximum of +55 °C and Heavy saline conditions along the coast.

2.1.4.2 General Requirements

The lug shall be tabular type and be suitable for jointing to insulated cables and stranded conductors by use of compression tools. It shall correctly fit the cable or conductor it is intended for use with.

The lug shall comprise a barrel (tube) and a straight palm. The palm shall have one hole for marking connection between the cable and apparatus by means of a bolt or stud and the hole diameter for all types shall be 13 mm.

To prevent entry of water/moisture in outdoor applications, inspections/filling hole shall not be provided.

The Lugs shall be in accordance with attached general arrangement and Dimensions.

The faces on each side of the palm shall be sufficiently parallel and flat to provide a suitable contact surface.

The lug shall have a current rating at least equal to that of the cable it is to be used with.

The lug shall have a mechanical breaking load not less than 60% of that of the conductor it is to be used with.

All parts of the lug including the stud hole shall go through deburring and polishing operations (during manufacture) to eliminate all sharp edges.

2.1.4.3 Particular Requirements

2.1.4.3.1 Copper Compression Lugs

The Lug shall be made from seamless copper tube of electrolytic tough pitch high conductivity copper as per DIN 40500.

The Lug shall have a barrel to accommodate stranded copper conductor and palm with a single stud hole.

The barrel shall be counter bored (for 10 mm of barrel length) to accommodate the insulation of cable.

The lug shall be electro tinned. The tin coating thickness shall be at least 5 microns.

The lug shall be attached to the copper cable by compression jointing and recommended compression positions shall be clearly marked on the barrel.

Tolerance on inner and outer diameters shall be $\pm 0.075\text{mm}$ and $\pm 0.10\text{mm}$ respectively.

2.1.4.3.2 Aluminum Compression Lugs

All aluminum lugs shall be made of aluminum 99.5%, it shall be tin plated of thickness not less than 7 microns, filled with proper conductive oxide inhibiting compound and capped.

The lug shall be suitable for connecting stranded Aluminum cables or stranded all Aluminum conductors or stranded Aluminum conductor steel reinforced (ACSR) to Aluminum terminations.

The barrel shall be packed with abrasive neutral high melting point soft grease and ends sealed with a plastic cover. The quantity of grease shall be approximately half the volume of the bore.

The palm faces shall be flat and shall have a single hole for termination.

The barrel shall be counter bored (for 10 mm of barrel length) to accommodate the insulation of cable.

The lug shall be attached to the Aluminum conductor by compression jointing and recommended compression positions shall be clearly marked on the barrel.

The palm faces shall be protected with oil impregnated strippable plastic or other strippable suitable coating.

Tolerance on inner and outer diameters shall be $\pm 0.15\text{mm}$.

2.1.4.3.3 Bi-Metal Compression Lugs

The lugs shall be suitable for connecting stranded Aluminum conductor to copper busbar or equipment with copper terminal studs.

The lug shall comprise of an Aluminum tubular portion friction welded to a solid copper palm stud hole section.

The barrel shall be packed with abrasive neutral high melting point soft grease and ends sealed with a plastic cover. The quantity of grease shall be approximately half the volume of the bore.

The palm faces shall be flat and shall have a single hole for termination.

The barrel shall be counter bored (for 10 mm of barrel length) to accommodate the insulation of cable.

The lug shall be attached to the Aluminum conductor by compression jointing and recommended compression positions shall be clearly marked on the barrel.

Tolerance on inner and outer diameters shall be $\pm 0.15\text{mm}$.

2.1.5 Testing and Inspection:

All lugs shall be tested in accordance with the latest standard IEC61238-1.

2.1.5.1 Routine Tests:

These tests shall be carried out in accordance with the requirements of standard to which the lugs are offered and shall be carried out at the factory.

2.1.5.2 Type Tests:

Electrical and Mechanical Tests:

The vendor shall provide certified copies of independent laboratory electrical and mechanical type test reports with the bid for the materials offered as per relevant specification.

When the design of a lugs meets the requirement of this standard, then it is expected that during its service:

- a) The resistance of connection will remain stable.
- b) The mechanical strength will be fit for the purpose.
- c) Application of short-circuit currents must not affect (a) and (b).

2.1.6 Marking:

All components of lugs shall be clearly marked with the manufacturer's name, die number, cable/conductors size, number of crimps and position.

13.6.2.2 Each hard box shall be printed with the following information:

- a) Purchase order number/tender
- b) Lugs catalogue number
- c) Manufacturer's name
- d) Year of manufacture

2.1.7 Submittals:

2.1.7.1 Submittals Required with Tender/Inquiry:

Two (2) copies or one set of reproducible of the following shall be supplied along with the tender. Additionally CD for complete technical specifications pertaining exactly to the items shall be submitted before purchase order is issued.

2.1.7.2 Certified Independent Test Reports:

- a) To show that the material offered meet the electrical type tests as per applicable standard.
- b) To show that the material offered meet the mechanical and physical type tests as per the applicable standards.

2.1.7.3 Full details of the proposed quality assurance procedures, sampling, routine tests and special tests.

2.1.8 Drawings, Catalogues & Technical Data Schedules:

Actual drawings for lugs shall be submitted.

Catalogue for all the components used. Catalogue numbers for the offered items shall be highlighted.

Duly completed attached technical data schedule for each offered item.

2.1.9 Submittals Required following Award of Contract:

Factory Test Reports:

- a) Quality Assurance Tests
- b) Routine and Special Tests
- c) Manufacturing/Test Schedules

2.2 Mechanical Terminal Lugs and Connectors

2.2.1 Scope

This Specification is for Mechanical Terminal Lugs and Connectors for use on distribution power Lines operating at a nominal Voltage of 24 kv and Frequency 50Hz.

4.2.2 Requirements

- The Lugs/Connectors shall be suitable for continuous operation outdoors in areas at altitudes of up to 200m above sea level, humidity of up to 95%, average ambient temperature of +30 °C with a minimum of -5 °C and a maximum of +55 °C and Heavy saline conditions along the coast.
- All cable/conductor lugs/Connectors shall be Bi-metallic Mechanical type.
- The lug/Connectors bodies shall be made of a high-tensile, tin-plated Aluminum alloy. The internal surfaces of the conductor holes shall be grooved.
- All Contact bolts shall be made of a special Aluminum alloy, these contact bolts shall be double shear-head bolts with hexagon heads. The bolts shall be treated with a highly lubricating agent and equipped with a special contact ring. Contact bolts are irremovable once their heads have been sheared off.
- And it's possible to use Brass shear bolts with Steel threaded stud as a substitute for Contact bolts.
- The Lugs/Connectors shall be including inserts for small conductor sizes or by using centering sleeves, the inserts shall have lengthwise striations and a positioning guide.
- The palm faces shall be flat and shall have a single hole for termination.
- All cable/conductor lugs/Connectors shall be of class A, which is intended for electricity distribution or industrial networks in which they can be subjected to short-circuit of relatively high intensity and duration.
- All cable/conductor Connectors shall have block in the center of the hole.
- Cable/conductor lugs/Connectors shall meet or exceed the performance of conductor in all respects.
 - The specification also covers inspection and test of the lugs as well as schedule of guaranteed technical particulars to be filled, signed by the Bidder and submitted for tender evaluation.
- The Lugs/Connectors shall be in accordance with attached general arrangement and Dimensions.
- The Specification stipulates the minimum requirements for lugs acceptable for use in the PEA and it shall be the responsibility of the manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the lugs for PEA.
- The faces on each side of the palm shall be sufficiently parallel and flat to provide a suitable contact surface.
- The lug/Connectors shall have a current rating at least equal to that of the cable it is to be used with.
- All parts of the lug including the stud hole shall go through deburring and polishing operations (during manufacture) to eliminate all sharp edges.

- This specification does not purport to include all the necessary provisions of a contract.

2.2.3. Testing and Inspection:

All lugs/Connectors shall be tested in accordance with the latest standard CENELEC HD 629.1 S2 or IEC61238-1.

CENELEC HD 629.1 S2: Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV Part 1: Cables with extruded insulation

IEC 61238-1: Compression and mechanical connectors for power cables for rated voltages up to 36 kV - Part 1: Test methods and requirements

2.2.3.1 Routine Tests:

These tests shall be carried out in accordance with the requirements of standard to which the lugs/Connectors are offered and shall be carried out at the factory.

2.2.3.2 Type Tests:

2.2.3.1 Electrical and Mechanical Tests:

The vendor shall provide certified copies of independent laboratory electrical and mechanical type test reports with the bid for the materials offered as per relevant specification.

2.2.3.2 When the design of a lugs/Connectors meets the requirement of this standard, then it is expected that during its service:

- a) The resistance of connection will remain stable.
- b) The mechanical strength will be fit for the purpose.
- c) Application of short-circuit currents must not affect (a) and (b).

2.2.4 Marking:

All components of lugs/Connectors shall be clearly marked with the manufacturer's name, die number, cable/conductors size, number of crimps and position.

Each hard box shall be printed with the following information:

- a) Purchase order number/tender

- b) Lugs catalogue number
- c) Manufacturer's name
- d) Year of manufacture

2.2.5. Submittals:

2.2.5.1 Submittals Required with Tender/Inquiry:

Two (2) copies or one set of reproducible of the following shall be supplied along with the tender. Additionally CD for complete technical specifications pertaining exactly to the items shall be submitted before purchase order is issued.

2.2.5.2 Certified Independent Test Reports:

- a) To show that the material offered meet the electrical type tests as per applicable standard.
- b) To show that the material offered meet the mechanical and physical type tests as per the applicable standards.

14.6.3 Full details of the proposed quality assurance procedures, sampling, routine tests and special tests.

2.2.5.3 Drawings, Catalogues & Technical Data Schedules:

Actual drawings for lugs/Connectors shall be submitted.

Catalogue for all the components used. Catalogue numbers for the offered items shall be highlighted.

Duly completed attached technical data schedule for each offered item.

2.2.5.6 Submittals Required following Award of Contract:

Factory Test Reports:

- a) Quality Assurance Tests
- b) Routine and Special Tests
- c) Manufacturing/Test Schedules



شركة توزيع كهرباء محافظات غزة

Gaza Electricity Distribution Corporation

Technical Specifications

For Surge Arresters

March 2012

1 Metal-Oxide Surge Arresters gap-less Type for 22KV Network with Silicon-Polymeric housing

SCOPE

These specifications cover the minimum technical requirements for the design manufacture. Supply and transportation to the site(s) and testing of Metal-Oxide surge Arrestors gap-less type with silicon-polymer housing for outdoor installation in the 22KV distribution system.

1.1 STANDARDS

The latest revision of the following codes and standards shall be applicable for the equipment/material covered in this specification. In case of any deviation, the vendor/manufacture may propose equipment/material conforming to an alternate code or standard.

1. ANSI C62.1 Standard specification for surge arrester for AC power circuit.
2. NEMA LA1 Standard specification for Surge Arresters.
3. IEC 60099-4 Standard specification for non-linear resistor type arrester for A.C. system.
4. IEC TC37- Standard specification for metal oxide type arrester with Part-3(wg-4) out spark gaps.
5. IEC 168 Insulators.
6. BS 729 Galvanizing.

1.2 RATINGS AND PERFORMANCE/GENERAL

3.1 Rating, performance and testing of each product shall meet the requirements described in the relevant clauses.

3.2 The specified ratings and the minimum guaranteed performance shall be for the distribution system and service conditions described in clause 1.

3.3 All materials used in the construction of the Surge Arrestor shall be capable of withstanding mechanical, electrical and thermal stresses developed during the normal working (permanent or temporary loading), short circuit and emergency overloading under the service conditions described in General Specifications.

1.3 Design

The Arrestors shall be capable of protecting the following equipment:

- Transformers which are directly connected to a line
- Transformers which are connected to a line via cables

- Capacitors
- Cables
- Autoreclosers and sectionalisers
- Circuit breakers and isolators
- Instrument transformers

The Surge Arrestors shall be of the metal oxide gap-less type, complying with IEC 60099-4.

The Surge Arrestors shall have the following characteristics:

Description	Unit	Guaranteed Data
Rated Voltage	kV	24
Maximum continues operating voltage (M.C.O.V)	kV	19.5
Nominal discharge current (8/20 μ s)	kA	10
Class Distribution Min. protective ratio		1.2

The Arrestors shall be designed horizontally or vertically (standing or hanging) in standard lattice towers. The Arrestors shall be supplied complete with fixing materials and connection clamps.

Surge Arrestor distribution classes shall be as defined in IEC 60099-4, 10KA Arrestor-heavy duty class

The Surge Arrestors shall be fitted with a pressure relief device.

All Arrestors shall be fitted with in corrodible metal nameplates which are visible when the Arrestor is completely mounted and which clearly indicate the data specified in IEC in engraved or embossed characters.

1.4 Protection Characteristics

This is a combination of the following:

- Maximum residual voltage for steep current impulse (1/20 μ s)
- Maximum residual voltage for current impulses with waveform (8/20 μ s) and 0.5, 1.0 and 2.0 times nominal current
- Maximum residual voltage for switching impulse (30-100/60-200 μ s)

- The protection level for lightening impulse is the highest of
- Maximum residual voltage for steep current impulse divided by 1.15

and

- Maximum residual voltage at nominal current and 8/20 μ s

The protection level for switching impulse is the maximum residual voltage at the specified switching impulse current.

The protection level shall have at least a margin of safety of 30 % compared to the BIL of the Arrestor housing.

1.5 Energy Requirements

The Surge Arrestors shall be designed to minimum line discharge class 1 according to IEC 60099-4 for heavy duty Arrestors.

1.6 CONSTRUCTION DETAILS

The surge Arrestors shall be designed for outdoor service and for installation between phase and earth. The surge Arrestors shall be composed of one or several series connected units. The surge Arrestors unit shall be interchangeable with like rated units to the same type and design. The active part of the surge Arrestors shall consist of one or more non-linear metal oxide resistors, connected in series and/or parallel but having no integrated series or parallel spark gaps.

The construction consists from these layers:

1.6.1 Housing:

The outer housing shall be of a silicone rubber material offering high resistance to pollution. The specific creepage distance for any Arrestor shall be 910mm, corresponding to heavy pollution according to IEC.

The internal part of the surge Arrestors shall be enclosed.

Polymeric insulator designed to withstand the environmental conditions.

The insulators shall meet the requirements and test requirements described in the relevant IEC standards.

1.6.2 Over Pressure Relief Device:

Arrestor shall be provided with a pressure relief device, a mean for relieving internal pressure in an Arrestor and preventing explosive shattering of the housing following prolonged passage of flow current or internal flashover of the Arrestor.

1.6.3 Disconnection Feature:

Disconnecter shall be incorporated. It is a device for disconnecting an Arrestor from the system in the event of Arrestor failure to prevent a persistent fault on the system and to give visible

indication of the failed Arrestor. The method of operation of Disconnecter shall be described by supplier.

1.6.4 Terminals:

The surge Arrestors shall be furnished with two parallel vertical flat terminal connection pads suitable for connection to the Medium voltage system made of copper for connection similarly with a horizontal pad for grounding.

1.6.5 Galvanizing:

Exposed iron and steel parts shall be hot dip galvanized according to any proposed international standards. The average thickness of the coating except for small parts shall be 50 µm.

1.6.6 ACCESSORIES:

- 1) Disconnecter.
- 2) Earth Lead Disconnecter 12mm.
- 3) Bird Cap
- 4) Bracket
- 5) Earth lead Cable Cross Section 70 mm² and shall be Extra Flexible PVC Insulated Copper (Multi Stranded Wires according to DIN VDE 0295 Class5)

1.7 DIAGRAMS AND DRAWINGS

The following diagrams and drawings shall be submitted with the tender as a part of the tender documents.

- Complete sets of detailed dimension drawings and catalogues of the offered products.
- Calculation sheets for construction.
- Other necessary drawings (open view for complete surge Arrestors).

The Contractor shall submit detailed working drawings together with the calculations justifying their use as soon as possible after elaboration of the contract, instruction document for maintenance, installation and putting in operation of the equipment.

1.8 TESTING

The offered products shall be tested in accordance with the standards and specifications mentioned in IEC 60099-4 Standard.

If type tests have been already affected by an independent testing authority, the type test reports and certificates shall be enclosed with the tender.

The offerer shall supply, on request, copies of the type test certificates for the raw materials used.

The contractor shall provide GEDCO with a schedule of proposed tests to be carried out together with copies in English of all testing standards and procedures including electric drawings, diagrams and data curves, measuring method and all required and useful information.

Test certificates shall include in addition to test results:

- (a) The manufacturer's number.
- (b) The date of testing.
- (c) The signature of the test engineer.

Routine Test:

Supplier shall provide detail of the routine tests, which will be performed on the arresters with the minimum requirement being following.

Leakage current test: - Measurement of the leakage current of the arresters at voltage to 100%, 80% and %60 of the rated voltage.

- 1) Power frequency reference or low current.
- 2) Residual voltage test.
- 3) Insulator tests.

1.9 PACKING AND SHIPMENT:

The type of packing should be suitable for export and provide complete protection for marine or truck or rail transportation and for loading, for example (boxes, cases, etc...) should be robust enough and have suitable dimensions and weights.

Tenderer will take care on his own account that the commodity will be packed carefully in order to avoid damage of delivered materials and to be acceptable to the insurance company.

The strength and quality of the packing materials should correspond to the weight of the packed materials.

Appropriate measures according to each commodity type shall be taken to prevent vibration, sliding or movement inside boxes or cases.

Boxes which should be handled with care according to the contents must be marked accordingly and clearly.

Sufficient steel bands for boxes shall be in accordance with their weight and dimensions, sensitive instruments and similar materials must be packed carefully to prevent exposure of elements to rain, sun, dust, etc... with the appropriate packing of nylon bags oiled paper and foam materials.

Packing list: each case must contain equipment of the same kind and their accessories.

Each case must include the packing list fixed on the case and protected in addition to the list inside the case.

1.10 MARKING AND IDENTIFICATION

GEDCO stresses great importance on distinct and durable identification.

Arrestor identification:

Metal-oxide surge Arrestors shall be identified by the following minimum information which shall appear on a nameplate permanently attached to the Arrestor:

- continuous operating voltage.
- rated voltage.
- nominal discharge current.
- the manufacturer's name or trade mark, type and identification of the complete Arrestor.
- identification of the assembling position of the unit (for multi-unit Arrestors only).
- the year of the manufacture.
- GEDCO, the purchaser.

Note – If sufficient space is available the nameplate should also contain:

- * line discharge class or high lightning duty type.
- * contamination withstand level of the enclosure, see IEC 815.

It is important to mark each case or box clearly by the following:

- contract number.
- GEDCO, the purchaser.
- delivery number, shipment number.
- manufacturing date.
- name of manufacturer.
- kind of materials.
- quantities contained.
- main technical specification.
- gross weight, net weight.
- item number.

The marking must be clear and written on two sides of the box with unerasable materials.