

## TECHNICAL SPECIFICATIONS

### 1. GENERAL

Materials included in this tender are for use in electricity distribution networks including (33) kV overhead lines and associated substations.

Tenderer must ensure that materials are of the best quality and confirm to the latest BS standards or equivalent.

#### 1.1 SYSTEM PARAMETARS

System Voltage	33 kV
System Highest Voltage	36 kV
System Frequency	50 Hz
Method of Earthing	Resistance
System Fault Level	1500 MVA
No. OF Phases	3

#### 1.2 SERVICE CONDITION

Maximum ambient temperature	50°C
Lowest ambient air temperature	- 5°C
Average relative humidity	40%- 90%
Annual average rainfall approx.	30 CMS
Annual average thunderstorm days	16

#### 1.3 STANDERS

**BS 3288** Insulator and conductor fittings for overhead power lines.

**BSI BS EN ISO 1461** Specification for hot dip galvanized coatings on iron and steel articles.

**IEC 61284** Overhead lines - Requirements and tests for fittings.

**IEC 60120**                      Dimensions of ball and socket couplings of string insulator units.

**IEC 60372**                      Locking devices for ball and socket couplings of string insulator units - Dimensions and tests.

## **2. M.V CONDUCTOR SPECIFICATION**

### **2.1 ALUMINIUM CONDUCTOR STEEL REINFORCED (ACSR), AND ALL ALUMINUM ALLOY (AAA)**

M.V line conductors shall be (100 mm<sup>2</sup>), (150 mm<sup>2</sup>) and (200mm<sup>2</sup> (26/7)) Aluminum Conductor Steel Reinforced (ACSR), code name DOG, DINGO and IBIS respectively, and All Aluminum Alloy (AAA) code name OAK, which shall comply with IEC (61089) standard or equivalent.

### **2.2 MANUFACTURING**

The aluminum shall be of the highest purity commercially obtainable, and the supplier shall submit certificates of analysis giving the percentage and nature of any impurities in the metal of which the aluminum wires are made. The copper content of the aluminum wires shall not exceed 0.04 percent.

There shall be no joints in steel wires forming the core of composite conductor except those made in the base rod or wire before drawing, provided that the supplier guarantees that the joint will have at least 90% of the tensile strength of the unjointed rod.

Records for all joints made in the conductor wires shall be submitted.

Joints in individual wires are permitted; additionally, to those made in the base rod or wire before drawing, but no two joints shall be less than 15m apart in the complete steel core. There shall be no joints in the individual wires of the outer layers of the aluminum wire.

The steel core aluminum conductors shall be given additional protection from corrosion by treating the inner layers with a cover of grease. The grease shall have a drop point of at least 100° C.

The outermost layer of all conductors shall be stranded with the right hand lay.

All wires making up the conductor shall be free from dirt, splints, scratches and all imperfections not consistent with the best commercial practice.

The size and continuous current carrying capacity of the conductor shall be based on a maximum permissible continuous temperature of 90°C taking into account the solar radiation and wind effects.

The breaking strength of the composite conductor shall not be less than 95% of the rated strength.

The conductor shall be tightly and uniformly stranded with no loose strands. The wires shall be built up in concentric layers and when subjected to 50% of ultimate strength, the conductor shall maintain a true cylindrical form.

### **3. TENSION STRING SET (DEAD END CLAMPS) BOLTED TYPE FOR (100mm<sup>2</sup> ACSR AND AAA)**

For fastening of the M.V conductors to the tension insulators bolted type with 3 bolts tension dead-end clamps for lines 100mm<sup>2</sup> (ACSR and AAAC) conductor (code name DOG, OAK respectively) shall be supplied, and these accessories should be complied with above mentioned standard.

These accessories should be complied with above mentioned standard Tension clamps shall be made of **aluminum alloy (Wrought aluminum alloy)** of min ultimate tensile strength (U.T.S.) 60 KN, for

U bolts, nuts, washers where used shall be of hot dip galvanized steel and cotter pins shall be of stainless steel.

Each tension clamp shall be comprised of the following components according to above mentioned standards:

- TENSION DEAD END CLAMP
- ANCHOR SHACKLE.
- BALL EYE.
- SOCKET TONGUE.

(All of these components shall be made of **hot dip galvanized steel** of min U.T.S.60KN).

Galvanizing shall be in accordance with B.S. standard or an equivalent approved standard to give a uniform thickness free from defects and minimum average thickness of 85 microns.

Tension clamp shall be bolted type and shall be such as not to permit slipping or cause damage to or failure of the conductor, at a load less than 95% of the ultimate strength of conductors; the tenderer should state in his offer the minimum and ultimate torque on the nuts of the U bolts.

## 4. Tension String Set (Dead End Clamps) compression type

### 4.1 Tension String Set (Dead End Clamps) compression type for ACSR 100mm<sup>2</sup>,150mm<sup>2</sup> and 200mm<sup>2</sup>

For fastening of the M.V conductors to the tension insulators compression type tension dead-end clamps for 100 mm<sup>2</sup>, 150mm<sup>2</sup> and 200 mm<sup>2</sup> ACSR conductor (code name DOG, DINGO and IBIS respectively) shall be supplied.

These accessories should be complied with BS standard or equivalent. Tension clamps set shall be made of min ultimate tensile strength (U.T.S.) 60KN for accessories of DOG conductor and 80KN for accessories of DINGO and IBIS conductors.

The components of clamps and joints (tubular and connection part) shall be aluminum alloy (wrought aluminum alloy) to be to maintain the proper electrical characteristic, and the component that designed to guarantee mechanical resistance shall be hot dip galvanized steel.

For bolts, nuts, washers where used shall be of hot dip galvanized steel and cotter pins shall be of stainless steel.

Each tension clamp shall be comprised of the following components according to BS 3288 and IEC 61284:

- Compression dead end clamp with its eye and nuts (AL alloy & steel) as clarified.
- wrought AL alloy cable shoes to be suitable for ACSR 100,150 mm<sup>2</sup> and 200mm<sup>2</sup> code names DOG, DINGO and IBIS respectively (jumper terminal)
- Anchor shackle (**hot dip galvanized steel**)

- Socket tongue (**hot dip galvanized steel or iron**)
- Ball eye (**hot dip galvanized steel or iron**)

Galvanizing shall be in accordance with B.S standard or an equivalent approved standard to give a uniform thickness free from defects and minimum average thickness of 85 microns.

Tension clamp shall be compression type and shall be such as not to permit slipping or cause damage to or failure of the conductor at a load less than 95% of the ultimate strength of 100mm<sup>2</sup>, 150 mm<sup>2</sup> and 200 mm<sup>2</sup> ACSR the code name are DOG, DINGO, and IBIS conductor respectively, the tenderer should state in his offer the minimum and ultimate torque on the nuts of the bolts.

The tension sets shall be comprised of:

- a) tension clamp with its eye and nuts (min failing load 80KN that use for 150 mm<sup>2</sup> and 200mm<sup>2</sup> ACSR code name DINGO, and IBIS conductor respectively and 60KN for 100mm<sup>2</sup> code name DOG conductor).
- b) Cable shoe suitable for ACSR 100 mm<sup>2</sup>, 150 mm<sup>2</sup> and 200mm<sup>2</sup> code name DOG, DINGO and IBIS respectively (jumper terminal)
- c) Socket tongue (min failing load 80KN that use for 150 mm<sup>2</sup> and 200mm<sup>2</sup> ACSR code name DINGO and IBIS conductor respectively and 60KN for 100mm<sup>2</sup> code name DOG conductor).
- c) Anchor shackle (min failing load 80KN that use for 150 mm<sup>2</sup> and 200mm<sup>2</sup> ACSR code name DINGO, and IBIS conductor respectively and 60KN for 100mm<sup>2</sup> code name DOG conductors).

d) Ball eye (min failing load 80KN that use for 150 mm<sup>2</sup> and 200mm<sup>2</sup> ACSR code name DINGO, and IBIS conductor respectively and 60KN for 100mm<sup>2</sup> code name DOG conductors).

The number of above components and/or other equivalent components shall be suitable to complete the installation of the dead-end set.

Grease shall be added inside tube.

#### **4.2 Tension String Set (Dead End Clamps) compression type for AAA 100mm<sup>2</sup>**

For fastening of the M.V conductors to the tension insulators compression type tension dead-end clamps for 100 mm<sup>2</sup>, AAAC conductor (code name OAK) shall be supplied.

The components of clamps and joints (tubular and connection part) shall be aluminum alloy (wrought aluminum alloy) to be suitable for 100 mm<sup>2</sup>, AAAC conductor (code name OAK).

For bolts, nuts, washers where used shall be of hot dip galvanized steel and cotter pins shall be of stainless steel.

Each tension clamp shall be comprised of the following components that shall be designed to be used for 100 mm<sup>2</sup>, AAAC conductor (code name OAK). According to BS 3288 and IEC 61284:

- Compression dead end clamp with its eye and nuts. **wrought aluminum alloy**
- cable shoes (jumper terminal) **wrought aluminum alloy**
- Anchor shackle (**hot dip galvanized steel**)
- Socket tongue (**hot dip galvanized steel or iron**)

- Ball eye (**hot dip galvanized steel or iron**)

Galvanizing shall be in accordance with B.S. standard or an equivalent approved standard to give a uniform thickness free from defects and minimum average thickness of 85 microns.

Tension clamp shall be compression type and shall be such as not to permit slipping or cause damage to or failure of the conductor at a load less than 95% of the ultimate strength of 100mm<sup>2</sup>, OAK conductor, the tenderer should state in his offer the minimum and ultimate torque on the nuts of the bolts.

The tension sets shall be comprised of:

- a- tension clamp with its eye and nuts (min failing load 60KN)
- b- Cable shoe suitable for AAAC 100 mm<sup>2</sup>, Code name OAK (jumper terminal)
- c- Socket tongue (min failing load 60KN for 100mm<sup>2</sup> code name OAK).
- d- Anchor shackle (min failing load 60KN for 100mm<sup>2</sup> code name OAK).
- e- Ball eye (min failing load 60KN for 100mm<sup>2</sup> code name OAK).

The number of above components and/or other equivalent components shall be suitable to complete the installation of the dead-end set.

## **7- Parallel Groove Clamps**

For the connection of the M.V conductors in loop and jumpers, bolted type – 3 bolts- parallel groove current clamps. The function of these clamps is to connect aluminum overhead conductors to each other at terminal and section locations. The clamps must be designed to carry

and to allow the flow of the full load current of the conductor and must insure reliable mechanical and electrical connection.

These accessories should be used with 33kV overhead line conductors; (3 bolts will be used for ACSR 150mm<sup>2</sup>, and 200 mm<sup>2</sup>; code name DINGO, and IBIS conductor respectively, which comply with BS standard or equivalent).

The body of the Parallel Groove Clamp shall be made of **aluminum Alloy** and other parts shall be made of **hot dip galvanized steel**.

### **3. TESTS:**

All Components shall be tested in accordance with BS standard or equivalent. Tests shall prove the required parameters laid down in the specifications, guaranteed schedules and bidder's offer. Detailed test certificates shall be submitted to EDCO.

The following Routine Tests shall be carried as per IEC 61284:-

- Visual examination
- Dimensional and material verification
- Hot dip galvanizing
- Mechanical test (damage and failure load test )
- Mechanical test (slip test )
- Chemical analysis for all component of string set shall be attached ,included (anchor shackle ,ball eye ,socket tongue ,tension clamp, cable shoe and the jumper terminal part of the clamp that is connected to the lugs, where the Si ratio in jumper part of the clamp that is connected to the lugs shall not exceed 1% )

## **REFERENCE:**

Bidder must include with his offer a detailed list reference indicating types, quantities, and years of service of the same offer items he supplied as well as detailed address of buyers, particularly these buyers having same climatic conditions in the region.

## **4. OFFER CATALOGUES AND SAMPLES:**

Each offer should be attached **with catalogues** with a clear drawing with dimensions and other technical specifications for each type of the offer items.

- ❖ **The recommended drawings are attached.**
- ❖ **A sample of each type should be submitted with the offer and any offer received without drawings and samples will be rejected during evaluation without any prior notice.**

## **5. SCHEDULES AND GUARANTEES**

<b><u>SCHEDULE NO.</u></b>	<b><u>DESCRIPTION</u></b>
<b>A</b>	<b>Schedule of Requirements</b>
<b>B</b>	<b>Price schedules</b>
<b>C</b>	<b>Guaranteed delivery period schedules</b>
<b>D</b>	<b>Manufacturers, places of manufacture and testing place</b>
<b>E</b>	<b>Technical Particulars and Guarantees Schedules</b>
<b>F</b>	<b>List of type test certificates</b>
<b>G</b>	<b>Reference list</b>
<b>H</b>	<b>Deviation from specifications Schedules if any</b>

**SCHEDULE (A)**  
**SCHEDULE OF REQUIREMENTS**

	<b>Description</b>	<b>Stock Code</b>	<b>Unit Item</b>	<b>required quantity</b>
1-	<p>complete set of Compression type dead end for the specified ACSR 100mm<sup>2</sup> complete including the followings:</p> <ul style="list-style-type: none"> <li>- Compression dead end clamp with its eye and nuts</li> <li>- 2 Anchor shackle</li> <li>- Socket tongue</li> <li>- cable shoe suitable for ACSR 100mm<sup>2</sup> code name DOG (jumper terminal)</li> <li>- Ball eye</li> </ul>		<b>set</b>	<b>200</b>

**SCHEDULE (B)**  
**PRICES SCHEDULES**

ITEM NO.	DESCRIPTION	QTY AND UNIT	UNIT PRICE & CURRENCY .....		TOTAL PRICE C & F AQABA JORDAN
			FOB	C & F AQABA	
1-	<p>complete set of Compression type dead end for the specified ACSR 100mm<sup>2</sup> complete including the followings:</p> <ul style="list-style-type: none"> <li>- Compression dead end clamp with its eye and nuts</li> <li>- 2 Anchor shackle</li> <li>- Socket tongue</li> <li>- cable shoe suitable for ACSR 100mm<sup>2</sup> code name DOG (jumper terminal)</li> <li>- Ball eye</li> </ul>	<b>200 set</b>			
<b>TOTAL PRICE (C &amp; F) AQABA ITEMS (1)</b> <i>( must be appeared in tender agreement summary)</i>					
Cost for one engineer from EDCO to attend factory acceptance test (FAT) for one week. With full accommodation					

**IMPORTANT NOTES:**

**1-EDCO HAS THE RIGHT TO ACCEPT PARTIAL OFFERS AND TO AWARD PART OF THE ITEMS OR QUANTITIES WITHOUT ANY LIMIT REGARDLESS CLAUSE (2.3) FROM SECTION III (GENERAL CONDITIONS OF CONTRACT).**

**2- EDCO HAS THE RIGHT TO REJECT ANY OFFER BASED ON EDCO EVALUATION TO THE QUALITY, RELIABILITY AND WELL-KNOWN MANUFACTURERS.**

**SCHEDULE (C)**

**GUARANTEED DELIVERY PERIODS IN WEEKS**

DESCRIPTION	DELIVERY PERIOD FOB-SPECIFY PORT	DELIVERY PERIOD AQABA PORT JORDAN
complete set of Compression type dead end for the specified ACSR 100mm <sup>2</sup> complete including the followings: <ul style="list-style-type: none"><li>- Compression dead end clamp with its eye and nuts</li><li>- 2 Anchor shackle</li><li>- Socket tongue</li><li>- cable shoe suitable for ACSR 100mm<sup>2</sup> code name DOG (jumper terminal)</li><li>- Ball eye</li></ul>		

**Note 1:** All time periods are weeks from date of Contract Placement.

**Note 2:** For purposes of Tender Evaluation, the time from commencement date within which the material is required to be delivered to CFR AQABA Port – JORDAN shall be less than 14 weeks.

**SCHEDULE (D)**  
**MANUFACTURERS, PLACES OF MANUFACTURE AND**  
**TESTING PLACE**

DESCRIPTION	MANUFACTURER	PLACE OF MANUFACTURE	PLACE OF TESTING
<p>complete set of Compression type dead end for the specified ACSR 100mm<sup>2</sup> complete including the followings:</p> <ul style="list-style-type: none"> <li>- Compression dead end clamp with its eye and nuts</li> <li>- 2 Anchor shackle</li> <li>- Socket tongue</li> <li>- cable shoe suitable for ACSR 100mm<sup>2</sup> code name DOG (jumper terminal)</li> <li>- Ball eye</li> </ul>			

**SCHEDULE (E)**

**TECHNICAL PARTICULARS AND GUARANTEES**

**FOR HARDWARE SET**

This Schedule shall be completed by the Tenderer, and particulars and guarantees will be binding on the contractor.

			<b>Compression type</b>
<b>Item</b>	<b>Description</b>	<b>Unit</b>	<b>Guarantees</b>
<b>TENSION CLAMP</b>			<b>DOG</b>
1.	Material Of Tension Clamp		
2.	Ultimate Tensile Strength Of Tension Clamp Body	KN	
3.	Diameter Of Pulling Loop		
4.	Ultimate Tensile Strength Of Pulling Loop	KN	
5.	Slip Strength Of Tension Clamp As % Of Uts Of Conductor	%	
6.	continuous current carrying capacity	..... ..... ...	
7.	According To IEC ----- According BS-----		
8.	Anchor Shackle Material	..... ..... ...	
9.	Material Of Twisted Strap	.....	

	Bolts and Nuts	..... ...
10.	Size Of Twisted Strap Fixing Bolts	..... ..... ...
11.	Twisted Strap Are Hot Dip Galvanized	YES/ NO
12.	Twisted Strap Long	..... ..... ...
13.	Ultimate Tensile Strength Of Twisted Strap Body According To Iec ----- According Bs-----	KN ----- -
14.	Socket tongue material	..... ..... ...
15.	Socket tongue Is Hot Dip Galvanized	..... ..... ...
16.	Ultimate Tensile Strength of Socket tongue	..... ..... ...
17.	According To IEC ----- According to BS-----	YES/ NO
18.	Socket tongue Fitted with Security Clip	..... ..... ...
19.	All Ferrous Parts Are Hot Dip Galvanized Socket tongue Is Hot Dip Galvanized	KN ----- ----- ---
20.	Ball Eye Material	..... ..... ...
21.	Ball Eye Is Hot Dip Galvanized	YES/ NO
22.	Ultimate Tensile Strength of Socket Eye	KN
23.	According To IEC -----	-----

	According to BS-----	- ----- --
24.	Ball Eye Fitted With Security Clip	YES/ NO
25.	All Ferrous Parts Are Hot Dip Galvanized	YES/ NO
26.	cable shoe and the jumper terminal part of the clamp that is connected to the lugs	..... ..... ...
27.	Is Hot Dip Galvanized	YES/ NO
28.	Ultimate Tensile Strength of Socket Eye	KN
29.	According To IEC ----- According to BS-----	----- - ----- --
30.	Ball Eye Fitted With Security Clip	YES/ NO
31.	All Ferrous Parts Are Hot Dip Galvanized	YES/ NO
32.	Si ratio	

**SCHEDULE (F)**  
**LIST OF TYPE TEST CERTIFICATES FOR OFFERED**  
**MATERIALS (COMPRESSION TYPE)**

Tenderers shall provide the information required below for the type test certificates from a recognized testing station covering the offered materials to BS or IEC recommendations & shall be submitted with the tender.

**Failure to provide copies of type test certificates/reports will result in rejection of the tender.**

<b>Type test made on identical designs of equipment to those offered</b>	<b>Certificate No.</b>	<b>Certificate Authority</b>

**SCHEDULE (G)**

**SERVICE EXPERIENCE OF FOR OFFERED  
MATERIALS (COMPRESSION TYPE)**

Tenderers shall provide the information required below for the service experience of the same offered materials.

<b>Customer</b>	<b>Description</b>	<b>Total Qunt. (Pc.)</b>	<b>No. of years in service</b>

**SCHEDULE (H)**

**DEVIATIONS FROM SPECIFICATIONS (IF ANY)**  
**TO BE COMPLETED BY THE TENDERER**  
**(COMPRESSION TYPE)**

<b>ITEM NO.</b>	<b>BREIF DESCRIPTION</b>	<b>DEVIATIONS</b>