

SPECIFICATION NO. Tx-1.01
(Revised in Sep, 2003)

SPECIFICATION FOR 100KVA AND 50KVA 11/0.433KV
DISTRIBUTION TRANSFORMERS

1 Standard Specifications:

The Distribution Transformers shall conform to the latest edition of IEC 60076, BS 171 or any other equivalent international standard. The design and construction of the transformers shall be subject to the approval of The Federal Electricity & Water Authority (FEWA).

2 Site Conditions:

The Transformers shall be installed outdoors in UAE in salt laden dusty atmosphere where the maximum humidity of 100% and maximum ambient temperature of 50 Deg. C can be experienced. The Transformers shall be suitable for continuous operation at the above site conditions.

3 Scope and Nature of Work:

The specification provides for design, manufacture, test at manufacturer's works in presence of FEWA representatives, suitable packing, transportation and off-loading at site of works or FEWA Stores in satisfactory condition and proper stacking as directed by FEWA.

4 System Voltage and Fault Level:

The transformers shall be suitable for satisfactory operation on the following system:

- a) The nominal primary voltage shall be 11KV, 50Hz and the system highest voltage shall be 12KV. The neutral point of the system is earthed through a neutral earthing resistor. The prospective symmetrical fault level of the 11KV network shall be 500MVA.
- b) The secondary voltage at no-load shall be 433 volts, 50Hz. The neutral point shall be earthed.

5 Type:

The transformers shall be of core type and naturally cooled, outdoor, oil immersed, conservator or hermetically sealed type.

6 Rating:

The normal rating specified shall be the continuous rating under the worst temperature conditions encountered in UAE. Tenderers shall state in Schedule 'D' the equivalent continuous rating of the same transformers at an average operating ambient temperature as per relevant clauses of IEC 60076. They should also submit calculations and a derating curve indicating the derating factor applied to arrive at site ratings specified.

7 Voltage Ratio:

The normal voltage ratio of the transformers at normal tapping and on no-load shall be 11000/433 volts.

8 Temperature Rise:

The transformers shall be capable of carrying full normal rated current continuously under the worst temperature conditions encountered in UAE and at any tapping, without temperature rise of oil in the hottest region exceeding 45 Deg.C as measured by thermometer and of winding not exceeding 50 Deg.C as measured by resistance.

9 Connections:

The transformers shall be wound to IEC standard 60076 vector reference Dyn 11

10 Off Circuit Tapping:

The 11KV windings of the transformers shall have tapping at + 2.5% and + 5% i.e. 5 tapping positions operated by an off-circuit tapping switch with clearly marked position indicator. Locking facility shall be provided such that the lock can be inserted only when the switch is on a definite tap. Lock and keys shall be arranged by FEWA. Detailed drawings, technical data, materials of tap changer etc. shall be submitted to FEWA for approval.

11 Impedance Voltage:

The percentage Impedance voltage shall be 4.75% for each of the 100KVA and 50KVA.

12 Duty under faults:

The transformers shall be capable of sustaining a three phase symmetrical short circuit on the LV side with the fault power maintained on the HV side without damage or distress for duration of 2 seconds.

13 Cooling:

Cooling of the transformers shall be by natural circulation of oil (ONAN).

14 Core:

The core shall be constructed of the best quality low loss, high permeability cold-rolled grain oriented steel laminations. The flux density in any part of the core shall not exceed 1.6 Tesla (16,000 lines per sq.mm) at normal voltage and frequency. Typical loss curve (iron loss vs. magnetic flux density) at 50Hz for the proposed laminations along with steel manufacturer's name, type and composition of proposed steel etc. shall be enclosed along with the offer. The supplier shall also include B-H curve clearly indicating the maximum flux density at which the proposed steel could be operated without undue core heating under the worst operating conditions.

The core plates shall be insulated from one another to reduce the core loss to a minimum and the core shall be held together by bolts and clamping plates all of which shall be adequately insulated. The completed core shall be provided with lifting eyes to facilitate its removal from the transformer tank and shall be adequately braced and supported to prevent movement during transit or service. It shall be possible to repair the active part easily. Wound cores shall not be acceptable.

15 Windings:

All transformer windings should be manufactured from electrolytic copper having a conductivity of 99.9% as per relevant international standards. The maximum current density in both HV and LV windings shall be within acceptable limits. Adequate cooling ducts shall be provided to ensure that temperature rise is within the permissible limits at normal operating conditions. All windings shall be fully insulated to IEC60076 for basic insulation level and for a system highest voltage of 12KV. It shall be able to withstand the short time temperature rise and mechanical forces developed during short circuit condition.

16 Basic Insulation Level:

The basic insulation of transformer shall be according to the latest relevant IEC specifications and shall be designed to withstand 28KV rms for power frequency test voltage and 75KV peak for impulse test voltage.

17 Transformer Termination:

The transformer shall have bushings on the high voltage side and cable box on the low voltage side for terminating the over head conductor and cable respectively. The high voltage bushings shall be suitable for connecting the transformer directly to the overhead line through jumpers of bare conductor, while the cable box shall be suitable for connecting aluminum cable as below:

- a) one 3.5 core 95 sq.mm. XLPE/SWA/PVC aluminum cable for 100 KVA transformer.
- b) one 3.5 core 70 sq.mm. XLPE/SWA/PVC aluminum cable for 50 KVA transformer.

17.1 Transformer Bushings:

The electrical characteristics of HV bushings insulator shall be as follows:

- | | | |
|----|---------------------------------------|----------|
| 1. | One minute P.F dry withstand voltage | : 70 KV |
| 2. | One minute P.F wet withstand voltage | : 45 KV |
| 3. | Power frequency dry flashover voltage | : 75 KV |
| 4. | Power frequency wet flashover voltage | : 50 KV |
| 5. | Impulse withstand voltage | : 110 Kv |
| 6. | Impulse withstand voltage ,Positive | : 115 KV |
| | Negative | : 115KV |
| 7. | Power frequency puncture voltage | : 125KV |

The total creepage distance of bushing's insulator should not be less than 480 mm. The bushings are to be fitted with arcing horns of not less than 12.7 mm. dia rod.

17.2 Cable Boxes:

The cable boxes on the low voltage side of the transformer shall be suitable for approved type heat shrinkable terminations and shall be complete with all the necessary fittings such as suitable cable lugs, glands, armor clamps etc. Heat shrinkable termination shall be arranged by FEWA.

HV and LV bushings shall be replaceable without difficulty. Replacement of LV bushings shall not require removal of top cover, which means hand holes

should be provided on top cover to facilitate replacement of bushings.

18 Earthing Terminals:

Each transformer shall have two separate earth terminals for connection to the earthing system.

19 Fittings:

The transformer shall be completely assembled with all its fittings and supplied with first fill of oil, the tenderer can offer either conservator or hermetically sealed type. Therefore, the fittings on the transformer shall be according to the type of transformer offered and the following shall be considered as the minimum requirements.

- i) Oil filling hole and cap.
- ii) Over pressure relief valve.
- iii) Magnetic oil level gauge
- iv) Main tank drain valve and plug
- v) Dial type thermometer with maximum reading pointer for measuring oil temperature.
- vi) Thermometer pocket for measuring oil temperature.
- vii) Rating and diagram plates as per the latest relevant IEC requirements.
- xiii) Lifting eyes for lifting of core.
- ix) Tank earthing terminals
- x) Lifting lugs for lifting of whole transformer.
- xi) Two mild steel channels as per BS EN 10210-1, 1994 of 2.2 meters length & size 100x50mm and of weight not less than 9.2 Kg/M and galvanized as per BS EN ISO 1461, 1999 with suitable drilled holes, nuts and bolts for fixing the transformer on 'H' pole.

Steel channels shall be packed in suitable wooden box and delivered with each transformer.

All bolts and nuts and all metal portions exposed to atmosphere continuously shall be treated suitably to withstand the weather conditions in UAE.

Note:-

For conservator type transformer :

In view of the 100% humidity prevailing in UAE Silica gel breather should be liberally designed and shall contain much larger quantity of gel than normal to avoid the need for frequent replacement of the gel and conservator vessel should be fitted with oil filling hole and cap.

20 Tank:

Tank shall be made of steel of excellent quality and shall be constructed with necessary stiffeners so as to withstand pressures developed during normal and abnormal operation of the transformer without any deformation. The top cover of tank should be designed in such a way that rain water does not accumulate. The mild steel shall conform to BS EN 10210-1, 1994, grade 43A or high tensile steel of an approved grade to BS EN 10210-1m 1994. All welds shall be inspected by approved methods during tank fabrication. Radiators shall be welded to the main tank. They may be of corrugated form .

21 Tank finish:

The process of painting of mild steel parts shall ensure that no corrosion takes place for a period of not less than five years under severe climatic conditions prevailing in UAE. Evidence of having applied the particular painting process successfully in the past shall be furnished. The manufacturer shall furnish details of the proposed painting process which should resist the salt spray test in accordance with ASTM117. The final color shall be light gray in shade (RAL7032).

The quality of protection, in addition to the above, shall be at least equal to that recommended in the latest edition of BS CP1014.

22 Gaskets:

All the gaskets used for sealing the tanks and connected external parts shall be made from suitable materials that totally prevent the leakage of oil and ingress of humidity and air to the oil and windings under all operating conditions. The manufacturer should present sufficient information and details about the type, thickness, material etc. of the gaskets with his offer.

23 Tests:

All transformers shall be subjected to routine tests including oil leakage, according to the relevant approved specifications. The transformers shall be tested under a pressure equivalent to 4 meters of oil above normal oil level of transformer(.i.e.0.35 bar) for a period of not less than 24 hours.

Certified copies of the type and special test certificates not older than seven years from accredited laboratory for an identical transformers shall be submitted along with the offer. If approved type and special test certificates pertaining to identical transformers are not enclosed with the offer, FEWA reserves the rights to ask for short circuit withstand test, impulse withstand test and temperature rise test to be carried out in the presence of FEWA representatives at no extra cost to The Authority.

Routine tests shall be repeated in the presence of FEWA representatives on 10% of the quantity offered for inspection, chosen at random, subject to a minimum of 2 Nos. of each type of transformer. All ordered units shall be subjected to oil pressure test in the presence of FEWA representatives at the manufacturer's works. It should be possible for FEWA representatives to check the pressure of any individual transformer at any time. Manufacturer shall give details of the procedure for this test in his offer.

The supplier shall make provision in his offer to bear all costs that are incurred in carrying out these tests to the satisfaction of FEWA. However, the costs towards travel, accommodation etc. of FEWA representatives shall not be included in the quoted price.

24 Load and No load losses:

The maximum acceptable losses at 75 deg. C and at rated voltage, full site rated load and principal tap shall be as stipulated in the following table. Tenderers offering transformers with losses exceeding the following figures shall not be evaluated.

<u>Sl. No.</u>	<u>Site rating in KVA</u>	<u>Losses in Watts</u>	
		<u>No load loss (Iron loss)</u>	<u>Load loss (Copper loss)</u>
1.	50	200	700
2.	100	300	1200

25 Rejection:

Offers without filling guaranteed losses may be rejected. Transformers for which the actual losses at the time of testing exceed 15% of individual losses and 10% of total guaranteed losses will be rejected.

26 Noise level:

Every care shall be taken to ensure that the design and manufacture of all transformers with their accessories shall be such as to reduce noise and vibration to acceptable level. The average surface noise level of any transformer shall not exceed the following values as per NEMA TRI-9.04.

50 KVA Transformer	:	52 db
100 KVA Transformer	:	52 db

The transformer shall be subjected to noise measurement as per IEC EN 60551. The tenderer is required to submit noise measurement test certificate along with the offer.

27 Approvals:

The transformer and all associated materials quoted by the manufacturer shall have to be approved by the Authority. Tenderers shall furnish all relevant technical information, drawings etc. to the Authority for approval prior to the start of manufacturing.

28 Transformer Overall Dimensions:

The overall dimensions of the transformers shall be kept to the minimum and shall not exceed 120 x 90 x 120 mm.(LxWxH) for transformers 100KVA and 50KVA The tap changer, oil & winding temperature indicators, silica gel breather if provided, H.T & L.T cable boxes shall be suitably located so that O & M staff can have easy access to these items. These arrangements shall be to the approval of FEWA.

**MAIN FEATURES OF 11/6.6/0.433 KV DUAL RATIO
DISTRIBUTION TRANSFORMERS**

These transformers shall be supplied as per the quantities mentioned in BOQ.

Type of cooling	:	ONAN
Vector group	:	Dyn11
Percentage Impedance	:	4.75% for 50KVA and 100KV
Off Circuit Tapping	:	+ 2.5%, -5%,
Voltage ratio	:	11/6.6/0.433KV; dual ratio on HV side
System highest voltage	:	12KV for 11KV system 7.2KV for 6.6KV system
System fault level respectively.	:	500 MVA/250 MVA for 11/6.6 KV system
Ambient temperature	:	50 Deg.C.
Temperature rise limit :		
Oil	:	45 Deg.C. above ambient
Winding	:	50 Deg.C. above ambient
Mounting	:	Pole mounted
Rating	:	50KVA/100KVA as mentioned in BOQ .
LV cable box	:	Required.

All other requirement shall be as per the relevant clauses of specification No. Tx-1.01.

The Contractors are required to make separate set of schedule of guaranteed particulars (Schedule-D) for these dual ratio transformers.

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SCHEDULE 'A'

The Tenderer shall state below the names of the sub-manufacturers to the main manufacturer and details of the equipment proposed to be manufactured or supplied by them.

Name and address of the Sub- Manufacturer	Description of Equipment

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'B'

PLACE OF MANUFACTURE, TESTING AND INSPECTION

The Tenderer to complete the following schedule for all materials he proposes to supply.

Item No.	Description	Manufacturer	Place of Manufacturing	Place of testing & inspection

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'C'

DEVIATION FROM TENDER SPECIFICATION

The Tenderer to state in the following schedule, the deviations from the tender specifications proposed in his offer. Deviations other than those specifically listed below will not be considered :

Item No.	Description	Precise Details of the Deviations

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'D'
GUARANTEED PARTICULARS

Tenderer is to give below the particulars of the 100/50 KVA, 11/0.433 KV Distribution Transformers:

SI No.	Description	Unit	Particulars of 11/0.433 KV Transformers	
			100 KVA	50 KVA
1	Applicable standards			
2	Manufacturer's name			
3	Conservator or sealed type			
4	Continuous rating under UAE conditions of 50 Deg.C ambient temp. & 100% humidity	KVA		
5	Equivalent IEC continuous rating	KVA		
6	Rated Voltage	KV		
7	System highest voltage	KV		
8	Rated voltage ratio at principal tapping	KV		
9	Method of cooling			
10	Vector group			
11	Maximum temp. rise at rated full loading at 50 C			
	a) Oil	Deg.C		
	b) Winding	Deg.C		
12	Percentage impedance voltage :			
	a) At principal tapping & rated frequency	%		
	b) At highest tapping & rated frequency	%		

Name of Tenderer :

Designation :

Signature :

Date :

Schedule 'D' (Contd.....)

Sl. No.	Description	Unit	Particulars of 11/0.433 KV Transformers	
			100 KVA	50 KVA
	c) At lowest tapping & rated frequency	%		
13	a) Power frequency test voltage for 1 minute duration.	KV		
	b) Impulse test voltage			
	I) 1.2/50 full wave	KV		
	II) 1.2/50 chopped wave	KV		
14	Maximum flux density in core at normal voltage and frequency.	Tesla		
15	Maximum flux density in yoke at normal voltage and frequency.	Tesla		
16	a) Iron loss at rated voltage & frequency	W		
	b) Iron loss at 105% rated voltage & frequency	W		
17	Iron loss per kg. Weight of core	W		
18	Thickness of lamination	mm		
19	a) Magnetising current at rated voltage as percentage of full load current	%		
	b) At 105% rated voltage	%		
20	Current density at rated output :			
	a) Primary winding	Amps/sq. mm		
	b) Secondary winding	Amps/sq. mm		
21	Current density at short circuit :			
	a) Primary winding	Amps/sq. mm		
	b) Secondary winding	Amps/sq. mm		

Name of Tenderer :

Designation :

Signature :

Date :

Schedule 'D' (Contd.....)

Sl. No.	Description	Unit	Particulars of 11/0.433 KV Transformers	
			100 KVA	50 KVA
22	a) Copper loss at rated voltage and tap on full Load at 75 deg.C	W		
	b) At tapping having highest losses on full Load at 75 deg. C	W		
	c) Copper loss per Kg. Of winding	W		
23	Resistance of windings per phase At 75 deg. C			
	a) HV Winding	Ohms		
	b) LV Winding	Ohms		
24	Cross sectional area of winding in sq.mm :			
	a) Primary Winding	Sq mm		
	b) Secondary Winding	Sq mm		
25	No. of turns in winding per phase :			
	a) Primary Winding	Nos.		
	b) Secondary Winding	Nos.		
26	Length of winding per phase :			
	a) Primary Winding	M		
	b) Secondary Winding	M		
27	Length of lead between winding & bushing :			
	a) Primary Winding	M		
	b) Secondary Winding	M		
28	Efficiency			
	a) 100% load at 1.0 P.F.	%		
	b) 100% load at 0.8 P.F.	%		
29	Regulation at 0.8 P.F. lagging	%		
	Regulation at 1.0 P.F.	%		
30	Thickness of tank plate :			
	a) Sides	mm		
	b) Bottom	mm		
	c) Top	mm		
	d) Radiator/ fins	mm		

Name of Tenderer :

Designation :

Signature :

Date :

Schedule 'D' (Contd.....)

Sl. No.	Description	Unit	Particulars of 11/0.433 KV Transformers	
			100 KVA	50 KVA
	e) Max. pressure tank can sustain	bar		
	f) Working pressure in tank	bar		
	g) Setting of pressure on over pressure Device.	bar		
31	a) Total oil required	Liters		
	b) Mass of oil	Kgs.		
32	Oil grade and standard spec. adopted			
33	Mass :			
	a) Winding (total of all phases)	Kgs.		
	b) Core	Kgs.		
	c) Complete trans. excluding oil	Kgs.		
	d) Complete trans. including oil	Kgs.		
	e) Trans. arranged for shipment	Kgs.		
34	Overall dimensions :			
	a) Height	cm.		
	b) Length	cm.		
	c) Width	cm.		
35	a) Type of weatherproof anti-rust primer applied			
36	Painting			
	a) Type of paint applied externally			
	b) Thickness of paint			
	c) Process of paint			
	d) Applicable standards for painting process			
37	a) Type of paint applied internally			
38	Noise level	db		

Name of Tenderer :
 Designation :
 Signature :
 Date :

Schedule 'D' (Contd.....)

Sl. No.	Description	Unit	Particulars of 11/0.433 KV Transformers	
			100 KVA	50 KVA
39	<u>Bushing:</u> a) Name of manufacturer b) Type c) Creepage distance of insulator d) Protected creepage distance of insulator e) Dry withstand voltage (power frequency) f) Wet withstand voltage (power frequency) g) Power frequency dry flashover voltage h) Power frequency wet flashover voltage i) Impulse withstand voltage j) Impulse flashover voltage : - Positive - Negative k) power frequency puncture voltage	mm mm KV KV KV KV KV KV KV KV KV		
40	<u>Arcing Horns:</u> a) diameter of rod in mm b) Arcing horn gap in mm c) Material of rod			
41	<u>Gasket Details:</u> a) Type b) Material c) Thickness in mm			

Name of Tenderer :
 Designation :
 Signature :
 Date :

SCHEDULE - 'E'

DETAILS OF PAST EXPERIENCE OF MANUFACTURER
DISTRIBUTION TRANSFORMERS 100KVA/ 50 KVA

Name and Address Of Purchaser	Rating	Conservator type or hermetically Sealed type	Quantity Supplied	Year of Supply	Remarks

Name of Tenderer :
Designation :
Signature :
Designation :
Date :

SPECIFICATION NO. Tx-1.02
(Revised in Sep, 2003)

SPECIFICATION FOR 2000KVA/1500KVA/1000KVA/500KVA/250KVA,
11/0.433KV DISTRIBUTION TRANSFORMERS

1 Standard Specifications:

The Distribution Transformers shall conform to the latest edition of IEC 60076, BS 171 or any other equivalent international standard. The design and construction of the transformers shall be subject to the approval of The Federal Electricity & Water Authority (FEWA).

2 Site Conditions:

The Transformers shall be installed outdoors in UAE in salt laden dusty atmosphere where the maximum humidity of 100% and maximum ambient temperature of 50 Deg. C can be experienced. The Transformers shall be suitable for continuous operation at the above site conditions.

3 Scope and Nature of Work:

The specification provides for design, manufacture, test at manufacturer's works in presence of FEWA representatives, suitable packing, transportation and off-loading at site of works or FEWA Stores in satisfactory condition and proper stacking as directed by FEWA.

4 System Voltage and Fault Level:

The transformers shall be suitable for satisfactory operation on the following system:

- a) The nominal primary voltage shall be 11KV, 50Hz and the system highest voltage shall be 12KV. The neutral point of the system is earthed through a neutral earthing resistor. The prospective symmetrical fault level of the 11KV network shall be 500MVA.
- b) The secondary voltage at no-load shall be 433 volts, 50Hz. The neutral point shall be earthed.

5 Type:

The transformers shall be of core type and naturally cooled, outdoor, oil immersed, conservator or hermetically sealed type.

6 Rating:

The normal rating specified shall be the continuous rating under the worst temperature conditions encountered in UAE. Tenderers shall state in Schedule 'D' the equivalent continuous rating of the same transformers at an average operating ambient temperature as per relevant clauses of IEC 60076. They should also submit calculations and a derating curve indicating the derating factor applied to arrive at site ratings specified.

7 Voltage Ratio:

The normal voltage ratio of the transformers at normal tapping and on no-load shall be 11000/433 volts.

8 Temperature Rise:

The transformers shall be capable of carrying full normal rated current continuously under the worst temperature conditions encountered in UAE and at any tapping, without temperature rise of oil in the hottest region exceeding 45 Deg.C as measured by thermometer and of winding not exceeding 50 Deg.C as measured by resistance.

9 Connections:

The transformers shall be wound to IEC standard 60076 vector reference Dyn 11.

10 Off Circuit Tapping:

The 11KV windings of the transformers shall have tapping at + 2.5% and + 5% i.e. 5 tapping positions operated by an off-circuit tapping switch with clearly marked position indicator. Locking facility shall be provided such that the lock can be inserted only when the switch is on a definite tap. Lock and keys shall be arranged by FEWA. Detailed drawings, technical data, materials of tap changer etc. shall be submitted to FEWA for approval.

11 Impedance Voltage:

The percentage Impedance voltage shall be 4.75% for each of the 1000KVA, 500KVA and 250KVA transformers and 6% for 1500 KVA transformers and 8% for 2000KVA transformers.

12 Duty under faults:

The transformers shall be capable of sustaining a three phase symmetrical short circuit on the LV side with the fault power maintained on the HV side without damage or distress for duration of 2 seconds.

13 Cooling:

Cooling of the transformers shall be by natural circulation of oil (ONAN).

14 Core:

The core shall be constructed of the best quality low loss, high permeability cold-rolled grain oriented steel laminations. The flux density in any part of the core shall not exceed 1.6 Tesla (16,000 lines per sq.mm) at normal voltage and frequency. Typical loss curve (iron loss vs. magnetic flux density) at 50Hz for the proposed laminations along with steel manufacturer's name, type and composition of proposed steel etc. shall be enclosed along with the offer. The supplier shall also include B-H curve clearly indicating the maximum flux density at which the proposed steel could be operated without undue core heating under the worst operating conditions.

The core plates shall be insulated from one another to reduce the core loss to a minimum and the core shall be held together by bolts and clamping plates all of which shall be adequately insulated. The completed core shall be provided with lifting eyes to facilitate its removal from the transformer tank and shall be adequately braced and supported to prevent movement during transit or service. It shall be possible to repair the active part easily. Wound cores shall not be acceptable.

15 Windings:

All transformer windings should be manufactured from electrolytic copper having a conductivity of 99.9% as per relevant international standards. The maximum current density in both HV and LV windings shall be within acceptable limits. Adequate cooling ducts shall be provided to ensure that temperature rise is within the permissible limits at normal operating conditions. All windings shall be fully insulated to IEC60076 for basic insulation level and for a system highest voltage of 12KV. It shall be able to withstand the short time temperature rise and mechanical forces developed during short circuit condition.

16 Basic Insulation Level:

The basic insulation of transformer shall be according to the latest relevant IEC specifications and shall be designed to withstand 28KV rms for power frequency test voltage and 75KV peak for impulse test voltage.

17 Cable Boxes:

The transformer shall have HV and LV cable boxes. The HV cable box shall be suitable for 3 core XLPE/SWA/PVC Aluminum cables of size upto 95 sq.mm for 2000KVA, 1500KVA, 1000KVA, 500KVA and 250KVA transformers. The L.V. cable box shall be suitable for the following sizes of cables:

- a) 14 Single core 630 sq.mm. (4 cables for each phase & 2 cables for neutral) XLPE/PVC copper cables for 2000 kVA Transformer.
- b) 11 Single core 630 sq.mm. (3 cables for each phase & 2 cables for neutral) XLPE/PVC copper cables for 1500 kVA Transformer.
- c) 7 single core 630 sq.mm (2 cables for each phase + one cable for neutral) XLPE/PVC copper cables for 1000 KVA transformer.
- d) 4 single core 630 sq.mm XLPE/PVC copper cables for 500KVA transformer.
- e) One 3.5 core 300 sq.mm XLPE/PVC/SWA Aluminum cables for 250KVA transformer.

The cable boxes on the transformer shall be suitable for the above arrangement and shall be complete with all necessary fittings, suitable cable lugs, glands, armor clamp etc. Heat shrinkable terminations shall be arranged by FEWA.

The cable boxes shall be suitable for approved type of heat shrinkable terminations.

The dimension of HV cable box should be suitable for indoor type heat shrinkable termination with 450mm tail length. The outdoor bushing type covered for cable entry shall not be accepted.

HV and LV bushings shall be replaceable without difficulty. Replacement of bushings shall not require removal of top cover, which means hand holes should be provided on top cover to facilitate replacement of bushings.

18 Earthing Terminals:

Each transformer shall have two separate earth terminals for connection to the earthing system.

19 Fittings:

The transformer shall be completely assembled with all its fittings and supplied with first fill of oil, the tenderer can offer either conservator or hermetically sealed type. Therefore, the fittings on the transformer shall be according to the type of transformer offered and the following shall be considered as the minimum requirements.

- i) Oil filling hole and cap.
- ii) Over pressure relief valve.
- iii) Magnetic oil level gauge
- iv) Main tank drain valve and plug
- v) Dial type thermometer with maximum reading pointer for measuring oil temperature.
- vi) Thermometer pocket for measuring oil temperature.
- vii) Rating and diagram plates as per the latest relevant IEC requirements.
- xiii) Lifting eyes for lifting of core.
- ix) Tank earthing terminals
- x) Lifting lugs for lifting of whole transformer.

All bolts and nuts and all metal portions exposed to atmosphere continuously shall be treated suitably to withstand the weather conditions in UAE.

Note:-

For conservator type transformer :

In view of the 100% humidity prevailing in UAE Silica gel breather should be liberally designed and shall contain much larger quantity of gel than normal to avoid the need for frequent replacement of the gel and conservator vessel should be fitted with oil filling hole and cap.

20 Tank:

Tank shall be made of steel of excellent quality and shall be constructed with necessary stiffeners so as to withstand pressures developed during normal and abnormal operation of the transformer without any deformation. The top cover of tank should be designed in such a way that rain water does not accumulate. The mild steel shall conform to BS 4360, grade 43A or high tensile steel of an approved grade to BSS 4360. All welds shall be inspected by approved methods during tank fabrication. Radiators shall be welded to the main tank. They may be of corrugated form .

21 Tank finish:

The process of painting of mild steel parts shall ensure that no corrosion takes place for a period of not less than five years under severe climatic conditions prevailing in UAE. Evidence of having applied the particular painting process successfully in the past shall be furnished. The manufacturer shall furnish details of the proposed painting process which should resist the salt spray test in accordance with ASTM117. The final color shall be gray in shade (RAL7032).

The quality of protection, in addition to the above, shall be at least equal to that recommended in the latest edition of BS CP1014.

22 Gaskets:

All the gaskets used for sealing the tanks and connected external parts shall be made from suitable materials that totally prevent the leakage of oil and ingress of humidity and air to the oil and windings under all operating conditions. The manufacturer should present sufficient information and details about the type, thickness, material etc. of the gaskets with his offer.

23 Tests:

All transformers shall be subjected to routine tests including oil leakage, according to the relevant approved specifications. The transformers shall be tested under a pressure equivalent to 4 meters of oil above normal oil level of transformer(i.e.0.35 bar) for a period of not less than 48 hours.

Certified copies of the type and special test certificates not older than seven years from accredited laboratory for the identical transformers shall be submitted with the offer. If approved type and special test certificates pertaining to identical transformers are not enclosed with the offer, FEWA reserves the rights to ask for short circuit withstand test, impulse withstand test and temperature rise test to be carried out in the presence of FEWA representatives at no extra cost to The Authority.

Routine tests shall be repeated in the presence of FEWA representatives on 10% of the quantity offered for inspection, chosen at random subject to a minimum of 2 Nos. of each type of transformer. All ordered units shall be subjected to oil pressure test in the presence of FEWA representatives at the manufacturer's works. It should be possible for FEWA representatives to check the pressure of any individual transformer at any time. Manufacturer shall give details of the procedure for this test in his offer.

The supplier shall make provision in his offer to bear all costs that are incurred in carrying out these tests to the satisfaction of FEWA. However, the costs towards travel, accommodation etc. of FEWA representatives shall not be included in the quoted price.

24 Load and No load losses:

The maximum acceptable losses at 75 deg. C and at rated voltage, full site rated load and principal tap shall be as stipulated in the following table. Tenderers offering transformers with losses exceeding the following figures shall not be evaluated.

<u>Sl. No.</u>	<u>Site rating in KVA</u>	<u>Losses in Watts</u>	
		<u>No load loss (Iron loss)</u>	<u>Load loss (Copper loss)</u>
1.	250	500	2000
2.	500	900	3500
3.	1000	1600	6000
4.	1500	2200	9000
5.	2000	2500	14000

25 Rejection:

Offers without filling guaranteed losses may be rejected. Transformers for which the actual losses at the time of testing exceed 15% of individual losses and 10% of total guaranteed losses will be rejected.

26 Noise level:

Every care shall be taken to ensure that the design and manufacture of all transformers with their accessories shall be such as to reduce noise and vibration to acceptable level. The average surface noise level of any transformer shall not exceed the following values as per NEMA TRI-9.04.

250 KVA Transformer	:	55 db
500 KVA Transformer	:	56 db
1000 KVA Transformer	:	58 db
1500 KVA Transformer	:	60 db
2000 KVA Transformer	:	60 db

The transformer shall be subjected to noise measurement as per IEC 60551. The tenderer is required to submit noise measurement test certificate along with the offer.

27 Approvals:

The transformer and all associated materials quoted by the manufacturer shall have to be approved by the Authority. Tenderers shall furnish all relevant technical information, drawings etc. to the Authority for approval prior to the start of manufacturing.

28 Transformer Overall Dimensions:

The overall dimensions of the transformers shall be kept to the minimum and shall not exceed 2000 x 2000 x 2000 mm. for transformers up to 1500KVA and 2500 x 2000 x 2000mm.(L x W x H) for 2000KVA transformers. The tap changer, oil & winding temperature indicators, silica gel breather if provided, H.T & L.T cable boxes shall be suitably located so that O & M staff can have easy access to these items. These arrangements shall be to the approval of FEWA.

**MAIN FEATURES OF 11/6.6/0.433 KV DUAL RATIO
DISTRIBUTION TRANSFORMERS**

These transformers shall be supplied as per the quantities mentioned in BOQ.

Type of cooling	:	ONAN
Vector group	:	Dyn11
Percentage Impedance	:	4.75% for 250KVA, 500KVA, 1000KVA Transformers 6% for 1500KVA and 8% for 2000KVA Transformers
Off Circuit Tapping	:	$\pm 2.5\%$, $\pm 5\%$,
Voltage ratio	:	11/6.6/0.433KV; dual ratio on HV side
System highest voltage	:	12KV for 11KV system 7.2KV for 6.6KV system
System fault level	:	500 MVA/250 MVA for 11/6.6 KV system respectively.
Ambient temperature	:	50 Deg.C.

Temperature rise limit :

Oil	:	45 Deg.C. above ambient
Winding	:	50 Deg.C. above ambient
Mounting	:	Ground mounted
Rating	:	2000/1500/1000/500/250KVA as mentioned in BOQ .
HV & LV cable box	:	Required.

All other requirement shall be as per the relevant clauses of specification No. Tx-1.02.

The Contractors are required to make separate set of schedule of guaranteed particulars (Schedule-D) for these dual ratio transformers.

Tx-1-02(4)
sm.

SCHEDULE 'A'

The Tenderer shall state below the names of the sub-manufacturers to the main manufacturer and details of the equipment proposed to be manufactured or supplied by them.

Name and address of the Sub- Manufacturer	Description of Equipment

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'B'

PLACE OF MANUFACTURE, TESTING AND INSPECTION

The Tenderer to complete the following schedule for all materials he proposes to supply.

Item No.	Description	Manufacturer	Place of Manufacturing	Place of testing & inspection

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'C'

DEVIATION FROM TENDER SPECIFICATION

The Tenderer to state in the following schedule the deviations from the tender specifications proposed in his offer. Deviations other than those specifically listed below will not be taken note of:

Item No.	Description	Precise Details of the Deviations

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE 'D'
GUARANTEED PARTICULARS

Tenderer is to give below the particulars of the 250/500/1000/1500/2000 KVA/11/0.433 KV Distribution Transformers.

Sl No.	Description	Unit	Particulars of 11/0.433kV Transformers				
			250 KVA	500 KVA	1000 KVA	1500 KVA	2000 KVA
1	Applicable standards						
2	Manufacturers name						
3	Conservator or sealed type						
4	Continuous rating under UAE conditions of 50 Deg.C ambient temp. & 100% humidity	KVA					
5	Equivalent IEC continuous rating	KVA					
6	Rated Voltage	KV					
7	System highest voltage	KV					
8	Rated voltage ratio at principal tapping						
9	Method of cooling						
10	Vector group						
11	Maximum temp. rise at rated full load at 50° C:						
	a) Oil	Deg.C					
	b) Winding	Deg.C					
12	Percentage impedance voltage :						
	a) At principal tapping & rated frequency	%					
	b) At highest tapping & rated frequency	%					
	c) At lowest tapping & rated frequency	%					
13	a) Power frequency test voltage for 1 minute duration	KV					
	b) Impulse test voltage						
	I) 1.2/50 full wave	KV					
	ii) 1.2/50 chapped wave	KV					
14	Maximum flux density in core at normal voltage and frequency	Tesla					

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

Schedule 'D' (Contd....)

Sl. No.	Description	Unit	Particulars of 11/0.433kV Transformers				
			250 KVA	500 KVA	1000 KVA	1500 KVA	2000 KVA
15	Maximum flux density in yoke at normal voltage and frequency	Tesla					
16	a) Iron loss at rated voltage & frequency	W					
	b) Iron loss at 105% rated voltage & frequency	W					
17	Iron loss per kg. Weight of core	W					
18	Thickness of lamination	mm					
19	a) Magnetising current at rated voltage as percentage of full load current	%					
	b) At 105% rated voltage	%					
20	Current density at rated output :						
	a) Primary winding	Amps/sq.mm					
	b) Secondary winding	Amps/sq.mm					
21	Current density at short circuit :						
	a) Primary winding	Amps/sq.mm					
	b) Secondary winding	Amps/sq.mm					
22	a) Copper loss at rated voltage and tap on full load at 75 deg.C	W					
	b) At tapping having highest losses on full load at 75 deg.C	W					
	c) Copper loss per kg. of winding	W					
23	Resistance of windings per phase at 75 deg.C						
	a) HV Winding	Ohms					
	b) LV Winding	Ohms					
24	Cross sectional area of winding in sq.mm :						
	a) Primary Winding	Sq.mm					
	b) Secondary Winding	Sq.mm					
25	No. of turns in winding per phase :						
	a) Primary Winding	Nos.					
	b) Secondary Winding	Nos.					
26	Length of winding per phase :						
	a) Primary Winding	M					
	b) Secondary Winding	M					

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

Schedule 'D' (Contd....)

Sl. No.	Description	Unit	Particulars of 11/0.433kV Transformers				
			250 KVA	500 KVA	1000 KVA	1500 KVA	2000 KVA
27	Length of lead between winding & bushing :						
	a) Primary Winding	M					
	b) Secondary Winding	M					
28	Efficiency						
	- 100% load at 1.0 P.F.	%					
	- 100% load at 0.8 P.F.	%					
29	Regulation at 0.8 P.F. lagging	%					
	Regulation at 1.0 P.F.	%					
30	Thickness of tank plate :						
	a) Sides	mm					
	b) Bottom	mm					
	c) Top	mm					
	d) Radiator / fins	mm					
	e) Max. pressure tank can sustain	Bar					
	f) Working pressure in tank	Bar					
	g) Setting of pressure on over pressure device	Bar					
31	a) Total oil required	Liters					
	b) Mass of oil	Kgs.					
32	Oil grade and standard spec. adopted						
33	Mass :						
	a) Winding (total of all phases)	Kgs.					
	b) Core	Kgs.					
	c) Complete trans. excluding oil	Kgs.					
	d) Complete trans. including oil	Kgs.					
	e) Trans. arranged for shipment	Kgs.					
34	Overall dimensions :						
	a) Height	cm.					
	b) Length	cm.					
	c) Width	cm.					
35	a) Type of weatherproof anti-rust primer applied						
36	Painting:						
	a) Type of paint applied externally						
	b) Thickness of paint						
	c) Process of paint						
	d) Applicable standard for painting process						
37	Type of paint applied internally						
38	Noise level	db					

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SCHEDULE - 'E'

DETAILS OF PAST EXPERIENCE OF MANUFACTURER
DISTRIBUTION TRANSFORMERS 2000KVA/ 1500 KVA/1000 KVA/ 500 KVA/250 KVA

Name and Address Of Purchaser	Rating	Conservator type or hermetically Sealed type	Quantity Supplied	Year of Supply	Remarks

Name of Tenderer : _____

Designation : _____

Signature : _____

Date : _____

SPECIFICATION NO. 1.07
(Revised in March , 2010)

SPECIFICATION FOR 11KV RING MAIN UNITS

1.1 STANDARD SPECIFICATION:

- i) The ring main units shall be designed to meet the requirement of the latest edition of British E.S.I standard 41-12 or equivalent international standard which shall be subject to the approval of the Authority.
- ii) The relevant standards to which the R.M.U. shall generally conform are detailed below.
 - a) I.E.C. 298 - AC metal enclosed switchgear
B.S. 5227
 - b) I.E.C. 265 - High voltage switches
 - c) I.E.C. 420 - H.V. AC fuse switch combinations
 - d) B.S. 148
I.E.C 296 - Insulating oil
 - e) B.S. 5463 - AC switchgear of rated voltages above 1 kv
 - f) I.E.C. 529 - Degress of protection provided by enclosures
 - g) I.E.C. 129 - AC disconnectors

One copy of the standard specifications to which the RMUs are manufactured and tested are to be forwarded with the offer. The equipment shall be designed to comply with the latest editions of the relevant IEC/BS standards. In case of any discrepancy in these standards, the most stringent clauses shall be applicable and the decision of FEWA shall be final.

1.2 SITE CONDITIONS:

The ring main units shall be installed in open and salt laden dusty atmosphere in UAE where maximum humidity of 100% and maximum ambient temperature of 50 Deg.C. can be experienced. The RMUs shall be suitable for continuous operation at the above site conditions.

1.3 SCOPE AND NATURE OF WORK:

- 1.3.1 The specification provides for the design, manufacture, test at manufacturer's works in presence of FEWA representatives, suitable packing, transportation and off loading at site of works or FEWA stores in satisfactory condition and proper stacking as directed by FEWA. The ring main units shall be suitable for free standing applications indoor or outdoor and shall be bolted on a level foundation with suitable grouting bolts. Necessary grouting bolts, nuts and washers shall be supplied with the R.M.Us.

Two sets of operation and maintenance manuals shall also be supplied with each ring main unit

1.3.2 SF-6 INSULATED R.M.Us:

Whereas the following specification gives detailed requirements of RMUs with oil switches, RMUs with gas insulated (SF6) switches shall also be considered provided the tenderers submit along with the offers the experience certificate from public utilities from the Gulf countries to the effect that the offered SF-6 insulated RMUs have been satisfactorily in operation for at least 3 years in their outdoor system.

As specified elsewhere 11KV XLPE insulated cables and heat shrinkable terminations are used in the system. The terminal arrangement shall be suitable for terminating the cables by heat shrinkable terminations. Terminal arrangements shall provide sufficient space for crossing the cores without damage to the core insulation.

All accessories, such as gland plate with glands, bimetallic lugs, armour clamps etc. except heat shrinkable terminations shall be included in the scope of supply. The successful tenderer shall be in a position to demonstrate the installation and site testing of SF-6 insulated RMUs to maximum of 10 Nos. of the actual quantities ordered of RMUs at different locations in the Northern Emirates as directed by FEWA. The tendered price shall include all expenses for demonstration. The offer should also include two sets of exhaustive erection, operation and maintenance manuals along with the detailed list of recommended spares for three years of operation and their prices.

The manufacturer shall provide the details informations of requirement of filters and SF6 gas pressure indicator and a pressure VS temperature curve and purity detector. They will also provide one set of gas filling device with a spare gas cylinder of minimum 40 kg capacity and one leakage detection instrument with their literature and catalogues clearly describing their operational procedure on every supply of twenty nos. of equipments.

1.4 GENERAL ARRANGEMENT AND LAYOUT:

The layout and general arrangement of each Ring Main Unit shall comprise of 11KV ring main switch assemblies and Tee Off Fuse Switch for controlling a 11KV/433 Volts Transformer at a remote location. The two oil switches and a tee off switch should be skid base mounted, capable of being moved and hauled as a single unit. Each ring main unit assembly shall be provided with:

- 1 set of floor fixing pedestals with fixing bolts, nuts and washers.
- 1 Busbar chamber complete with set of 3 phase copper/aluminium busbars or copper connections to switches in case the switches are in one tank i.e. without any separate chamber, and shall be of 400A continuous rating.

The material used for busbar will be either copper or aluminium. The manufacturer will produce sufficient documentary evidence and reasons/justification along with catalogues for using either of the metals to the Authority for approval. The acceptance and rejection of the same is entirely dependent on Authority's discretion.

Each Ring Main Switch assembly shall be provided with:

- 1 400A rating, triple pole oil immersed switch, rated for a symmetrical short circuit capacity of 350 MVA at 11KV.
- 1 Spring operated manual closing mechanism with mechanically linked 'ON' 'OFF' and 'CABLE EARTH' position indicators.
- 1 Fully interlocked cable test access.
- 1 Set of 3 phase cable earthing contacts.
- 1 Earth fault indicator assembly complete with CTs etc. on cable side to be reset manually (one per unit).
- Oil Level Indicator.
- Sufficient quantity of new oil for first filling.

Each fuse tee-off switch assembly shall be provided with:

- 1 triple pole oil immersed fuse switch with a continuous rating of not less than 175A.
- 1 spring operated manual closing mechanism with mechanically linked 'ON' 'OFF' and 'Earth' position indicator.
- 1 fully interlocked cable test access.
- 1 set of three phase earthing contacts.
- Oil level indicator.
- Sufficient quantity of new oil.

Tee off oil fuse switch shall be having either push button release or other mechanical device to trip all three phases.

The metal frames of all items shall be connected. Two separate earth terminals shall be provided for connecting to the station earthing.

● Please note the followings :-

-All switches of the RMU shall have facility to be motorized at the site in the future

- Marshalling box shall be provided in each type of RMU along with all accessories and

Any connections required to enable us to monitor all conditions of the RMU

(i.e. all the switches , earth fault indicators , etc.....)

-Facility to show the voltage such as (lamp , voltmeter ,.....) or any other suitable arrangement approved by FEWA should be provided in each switch of the unit

1.5 RATING:

All current carrying parts of the unit, including the switchgear, busbars, disconnecting links, connections, joints, terminals etc. shall be capable of carrying their specified rated current continuously under UAE climatic conditions and the temperature rise in any part shall comply with relevant specification. Tenderers shall state the standard rating as well as the site rating in each case. RMU shall be tested for impulse withstands voltage of 95KV. The ring main unit shall be rated at 11KV, with making and breaking capacities corresponding to a fault level of 350 MVA and the ring main switches shall have a normal continuous rating of 400 Amps. in the climatic conditions of UAE.

1.5.1 NAME PLATE:

Each R.M.U. shall be provided with a name plate mentioning details such as rated voltage, rated current, type, Sr. No., year of manufacture, name of manufacturer, weight etc. Also separate plates, if necessary, reading 'Property of FEWA, UAE' and a danger plate both in Arabic and English duly approved by FEWA shall be fixed on each R.M.U.

1.6 TYPE AND CONSTRUCTION:

It shall be of the metal clad outdoor type with the operating mechanism arranged for spring assisted hand operation whereby the speeds of make and break are independent of the operator. The components shall withstand the short circuit level of 350 MVA, at 11KV for 3 sec. The R.M.U. shall be enclosed with at least 3 mm thick mild steel sheet.

1.6.1 The ring main unit shall be of non-extensible, load break, fault make, oil immersed type.

1.6.2 RING MAIN SWITCH UNITS:

The switch unit shall have a normal continuous current rating of 400 amps in UAE temperature conditions. Integral means shall be provided for cable earthing. Also cable test provision shall be available on oil switches and fuse switches. Making capacity and short time current rating shall be the same for main contacts and the earth contacts.

Positive mechanical interlocks shall be included to prevent mal-operation. It should be impossible to move the switch direct from the ON to the EARTH or from the EARTH to the ON position. Further it should be impossible to insert or remove test plugs except with the switch in the EARTH position nor should it be possible to move the switch to the ON position with the test plugs inserted. Provision for locking the switch in the EARTH, ISOLATED or ON position by pad lock must be available. The cable boxes in the ring main unit shall be suitable for termination of cross linked polyethylene insulated, PVC sheaths galvanized steel wire armoured and PVC served cable. The cable box shall be complete with gland, armour, wire clamps, lugs, etc. except the heat shrinkable termination.

The cable box for termination of the ring main cables shall be designed for air insulated dry type (without compound filling) preformed heat shrinkable terminations, suitable for XLPE insulated cables and design shall provide sufficient space for crossing of core without damage to core insulation.

The lugs shall be bimetallic suitable for 300 sq.mm aluminium cable conductors. All necessary adequate materials, e.g. glands, bimetallic lugs, armour clamps, etc. shall be supplied by the contractor except the heat shrinkable termination itself.

Sufficient height must be provided from the bottom gland plate of the cable box to the ground level considering the bending radius of the cable, as directed by cable manufacturer.

1.6.3 TRANSFORMER CONTROL UNIT:

The transformer 11KV control unit shall be of the oil fuse switch type and shall comply with the requirements of IEC 420. The unit shall have adequate making and breaking capacities corresponding to a prospective symmetrical level of 350MVA.

The operating mechanism shall be arranged for spring assisted hand operation. The normal continuous current rating with the fuse shall be not less than 175 amps under the climatic conditions of UAE. The high rupturing capacity cartridge fuses shall be non-deteriorating and oil tight and fitted with a striker pin to actuate a common trip bar for simultaneous tripping of fuses. The rating and quantity of fuses to be supplied shall be as per bill of quantity. Any additional fuses, which may be required, as sub items shall also be supplied.

Integral means for earthing the transformer shall be provided and arranged for locking in the EARTH position.

Positive mechanical interlocks similar to the interlocks specified for the ring main switches shall be incorporated. Provision for locking the switch in the EARTH, ISOLATED or ON position by pad lock must be available. The Transformer Control Unit shall include a cable box, suitable for accommodating 95 sq.mm XLPE insulated Aluminium cable designed for air insulated preformed heat shrinkable terminations.

The cable box shall be complete with gland plate with gland, tape, armour clamps and bimetallic lugs etc. except termination itself.

1.6.4.A TESTING AT MANUFACTURER'S WORKS:

The RMUs shall be subjected to all type and routine tests in accordance with relevant standards. Certified copies of the type test reports not older than seven years shall be supplied along with the offer. If acceptable type tests reports are not enclosed along with the offer, Authority reserves its right to ask the tenderer to conduct all or any of the type test as per the relevant standard in presence of FEWA representative at no extra cost to FEWA.

The type tests shall include but not limited to the following tests as per IEC 298, 420, 265 & 129.

1. Power frequency voltage dry withstand test.
2. Impulse voltage tests.
3. Temperature rise tests.
4. Short circuit tests.
5. Verification of making and breaking capacities.
6. Mechanical operation tests.

Each and every unit of ring main equipment shall be subjected to the following routine tests as per IEC 298, 420, 265 & 129.

1. Visual examination and dimensional checks.
2. Mechanical operation tests.
3. Power frequency voltage dry withstand tests.
4. Voltage drop measurements or circuit resistance measurement in various configurations of main and earth switches.
5. Oil leak test as mentioned above shall be carried out on all units.

B. TESTING AT MANUFACTURER'S WORKS IN THE PRESENCE OF FEWA REPRESENTATIVES

Routine tests including sampling test for oil leakage at twice the working pressure for at least 24 hours will be carried out on 10% of the RMUs to be supplied in the presence of FEWA representatives at the manufacturer's works.

The supplier shall make provision in his offer to bear all costs that are incurred in carrying out these tests to the satisfaction of the FEWA. However, costs towards travel, accommodation, etc. of FEWA representative shall not be included in quoted price.

1.6.5 TOOLS :

Each 11KV RMU shall be provided with a complete set of special tools required for operation and maintenance of the gear. Built-in test spikes shall be supplied alongwith the RMU's. If built-in test spikes are not provided in the unit then separate price for the same shall be given as per bill of quantity.

1.6.6 PAINTING AND FINISH:

The process of painting of mild steel parts shall ensure that no corrosion take place for a period not less than 5 years under severe climatic conditions prevailing in U.A.E. Evidence of having applied the particular painting process successfully in the past shall be furnished.

All the metal parts of the RMU shall be sand blasted to class SA 2.5 or blast cleaned. The body shall be degreased with an alkalic spray wash and zinc phosphates. The first coat shall be zinc epoxy primer of 30 microns thickness when dry. The second shall be an undercoat of epoxy high build of 100 microns thickness when dry and final topcoat shall be of epoxy of 50 microns thickness when dry.

The final colour shall be light grey in shade.

The painting shall satisfactorily resist a salt spray test in accordance with ASTM 117.

Any other painting equivalent to the above shall also be considered provided the same was found to be trouble free against corrosion for at least 5 years under similar climatic conditions as in U.A.E. Suitable evidence for the same shall be submitted.

The quality of protection, in addition to the above, shall be at least equal to that recommended in the latest Edition of BS: CP 1014.

1.6.7 DRAWINGS :

Detailed drawings showing the internal arrangements of the RMU, overall dimensions, clearances, cable boxes on Ring and Tee off side, distance of the gland plate to the skid base frame etc. shall be submitted along with the offer.

**

1.07/7
SCHEDULE 'A'

SUB-MANUFACTURERS

The Tenderer shall state below the names of the sub-manufacturers to the main manufacturer and details of the equipment proposed to be manufactured or supplied by them:

Name & Address of the Sub-Manufacturer	Description of Equipment

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

1.07/8
SCHEDULE 'B'

PLACE OF MANUFACTURE, TESTING AND INSPECTION

The Tenderer to complete the following schedule for all materials he proposes to supply

Item No.	Description	Manufacturer	Place of manufacture	Place of testing and inspection

Signature : _____

Designation : _____

Name of Tenderer ; _____

Date : _____

1.07/9
SCHEDULE 'C'

DEVIATION FROM TENDER SPECIFICATION

The Tenderer to state in the following schedule the deviations from the tender specifications proposed in his offer. Deviations other than those specifically listed below will not be taken note of:

Item No.	Description	Precise Details of the Deviations

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

SCHEDULE 'D'**GUARANTEED PARTICULARS OF R.M.U.**

Tenderer to fill in below the technical particulars of the 11KV Ring Main Units offered. All ratings shall be under site service conditions of 100% humidity and 50 Deg. C. ambient temperature.

Sl. No.	Description	Unit	Ring Main Unit	Transformer Control Unit
1.	Name of Manufacturer			
2.	Applicable Standards			
3.	Type			
4.	Service Voltage	KV		
5.	Normal continuous rating at normal voltage and frequency under UAE climatic conditions	Amps		
6.	Standard continuous rating at normal voltage, frequency and temperature	Amps		
7.	Ambient temperature for standard rating	Deg. C		
8.	Type and material of contacts			
9.	Maximum temperature rise of contacts at normal rating and frequency	Deg. C		
10.	Method of closing			
11.	Load breaking capacity at normal voltage and frequency	Amps		
12.	Making capacity under fault conditions	KA		
13.	Short time withstand currents for main and earth contacts : (fuses replaced by solid link)			
	a) 1 Second	KA		
	b) 2 Seconds	KA		
	c) 3 Seconds	KA		
14.	Voltage drop across main contacts at normal full load current	Volts		

Signature of Tenderer :

SCHEDULE 'D' (Ctontd....)

Sl. No.	Description	Unit	Ring Main Unit	Transformer Control Unit
15.	Three phase breaking capacity (Transformer Control Unit) :	MVA		
16.	Type & details of HRC Fuse (Transformer Control Unit) :			
	a) Type			
	b) Applicable international standard			
17.	Minimum Clearance :			
	a) Between phases	mm		
	b) Between phase and earth	mm		
	c) Between fixed and moving contacts in the open position	mm		
18.	Thickness of steel enclosure	mm		
19.	Anti-rust treatment of enclosure :	Nos.		
20.	Type of paint			
21.	No. of coats of paint	Nos.		
22.	Colour of paint			
23.	Quantity of oil	Ltrs.		
24.	Weight of unit complete with oil			
25.	Earth Fault Indicator:			
	a) C.T. Ratio			
	b) Minimum earth fault operating current	A		
	c) Minimum secondary operating current	A		
26.	Material of busbar : copper/aluminium			

Signature of Tenderer :

Designation :

Name of Tenderer :

1.07/12
SCHEDULE 'E'

DETAILS OF PAST EXPERIENCE OF MANUFACTURER

Name and address	Quantity Supplied	Year of supply	Remarks

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

SPECIFICATION NO. 1.07.1
(Revised in March, 2010)

SPECIFICATION FOR 11KV EXTENSIBLE RING MAIN UNITS AND
METERING UNITS FOR OUTDOOR USE

1.1 Standard Specification:

The ring main units and busbar metering units shall be designed to meet the requirements of the latest edition of the following B.S and IEC and any other International Standard which shall be subject to the approval of the Ministry.

- | | | | |
|----|-------------|---|--|
| a) | B.S. 5463 | - | AC switchgear of rated voltages above 1 kv |
| b) | B.S. 148 | - | Insulating oil |
| c) | B.S. 2631 | - | Oil switches for alternating current systems |
| d) | IEC 265-1 | - | High voltage switches Part 1. |
| e) | IEC 298 | - | AC metal enclosed switchgear and controlgear. |
| f) | IEC 129 | - | Alternating current disconnectors (isolators) and earthing switch. |
| g) | IEC 420 | - | High voltage alternating current fuse-switch combination and fuse circuit breaker combination. |
| h) | British ESI | - | 41-12 |
| i) | IEC 185 | - | Current Transformers |
| j) | IEC 186 | - | Voltage Transformers |
| k) | IEC 211 | - | Maximum demand indicators, Class 1.0 |
| l) | IEC 521 | - | Class 0.5, 1 and 2 AC watt-hour meters. |

One copy each of the standard specification to which the RMUs/Metering Units are manufactured and tested are to be forwarded with the offer.

1.2 Site conditions:

The ring main units shall be installed in open and salt laden dusty atmosphere in UAE where maximum humidity of 100% and maximum ambient temperature of 50 deg.C. can be experienced. The RMUs/Metering Units shall be suitable for continuous operation at the above site conditions.

1.3 Scope and nature of work:

1.3.1 The specification provides for the design, manufacture, test at manufacturer's works in presence of two FEWA inspectors, suitable packing, transportation and off loading at site of works or FEWA stores in satisfactory condition and proper stacking as directed by the FEWA. The ring main units/metering units shall be suitable for free standing outdoor applications and shall be bolted on a level foundation with suitable grouting bolts. Necessary grouting bolts, nuts and washers shall be supplied with the R.M.Us/Metering Units.

1.3.2 SF-6 Insulated R.M.Us/Metering Units:

Whereas the following specification gives detailed requirements of RMUs and Metering Units with oil switches, RMUs/Metering Units with gas insulated (SF6) switches shall also be considered provided the tenderers submit along with the offers the experience certificate from public utilities from the Gulf countries to the effect that the offered SF-6 insulated RMUs/Metering Units have been satisfactorily in operation for at least 3 years in their outdoor system.

As specified elsewhere 11KV XLPE insulated cables and heat shrinkable terminations are used in the system. The terminal arrangement shall be suitable for terminating the cables by heat shrinkable terminations. Terminal arrangements shall provide sufficient space for crossing the cores without damage to the core insulation.

1.07.1/2

All accessories, such as gland plate with glands, bimetallic lugs, armour clamps etc. except heat shrinkable terminations shall be included in the scope of supply. The successful tenderer shall be in a position to demonstrate the installation and site testing of SF-6 insulated RMUs/Metering Units to maximum of 10 Nos. of the actual quantities ordered of RMUs/Metering Units at different locations in the Northern Emirates as directed by FEWA. The tendered price shall include all expenses for demonstration. The offer should also include two sets of exhaustive erection, operation and maintenance manuals along with the detailed list of recommended spares for three years of operation and their prices.

The manufacturer shall provide detailed information of requirement of filters and SF6 gas pressure indicators and a pressure VS temperature curve and purity detector. They will also provide one set of gas filling device with a spare gas cylinder of minimum 40 kg capacity and one leakage detection instrument with their literature and catalogues clearly describing their operational procedure on every supply of twenty nos. of equipments or part of.

1.4 General Requirements:

The RMU/Metering Units shall withstand the short circuit level of 350 MVA, at 11KV for 3 sec. The R.M.U. shall be enclosed with at least 3 mm thick mild steel sheet.

Each Ring Main Unit assembly shall be provided with:

- 1 set of floor fixing pedestals with fixing bolts, nuts and washers.
- 1 extensible Busbar chamber, complete with set of 3 copper/aluminium busbars of 400A continuous rating.

Each Ring Main Switch assembly shall be provided with:

- 1 400A rating, triple pole, oil or gas immersed switch, rated for a symmetrical short circuit capacity of 350 MVA at 11KV.
- 1 spring operated, manual closing mechanism, with mechanically linked 'ON', 'OFF' and 'CABLE EARTH' position indicators.
- 1 Fully interlocked cable test access.
- 1 Set of 3 phase cable earthing contacts.
- Oil Level Indicator (for oil type).
- Sufficient quantity of new oil for first filling (for oil type)

Each fuse tee-off switch assembly shall be provided with:

- 1 triple pole oil immersed fuse switch with a continuous rating shall not be less than 175A.
- 1 spring operated manual closing mechanism with mechanically linked 'ON' 'OFF' and 'Earth' position indicator.
- 1 fully interlocked cable test access.
- 1 set of three phase earthing contacts.
- Oil level indicator.
- Sufficient quantity of new oil.

Fuse switch shall be having either push button release or other mechanical device to trip all three phases.

Two separate earth terminals shall be provided for connecting to the station earthing.

The material used for busbar will be either copper or aluminium. The manufacturer will produce sufficient documentary evidence and reasons/justifications along with catalogues for using either of the metals to the Authority for approval. The acceptance and rejection of the same is entirely dependent on Authority's discretion.

● Please note the followings :-

-All switches of the RMU shall have facility to be motorized at the site in the future

- Marshalling box shall be provided in each type of RMU along with all accessories and

Any connections required to enable us to monitor all conditions of the RMU

(i.e. all switches , earth fault indicators , etc.....)

-Facility to show the voltage such as (lamp , voltmeter ,.....) or any other suitable arrangement approved by FEWA should be provided in each switch of the unit.

1.5 Rating:

All current carrying parts of the unit shall be capable of carrying their specified rated current continuously under UAE climate conditions, and the temperature rise in any part shall comply with relevant specification. Tenderers shall state the specified rating as well as the site rating in each case. RMU/Metering Units shall be tested for impulse withstands voltage of 95 KV.

The RMU/Metering Units shall be rated at 11KV, with making and breaking capacities corresponding to a fault level of 350 MVA and the ring main switches shall have a normal continuous rating of 400 Amps. in the climatic conditions of UAE.

It shall be of the metal clad outdoor type with the operating mechanism arranged for spring assisted hand operation whereby the speeds of make and break are independent of the operator.

1.5.1 Name Plate:

Each R.M.U/Metering Units shall be provided with a name plate mentioning details such as rated voltage, rated current, type, serial No., year of manufacture, name of manufacturers, weight etc. Also separate plates, if necessary, reading "Property of FEWA, UAE" and a danger plate both in Arabic and English duly approved by FEWA shall be fixed on each R.M.U/Metering Units.

1.6 Type & Design:

The extensible RMU shall be designed and manufactured as per the following types.

- | | |
|---------|--|
| Type 1: | Extensible single oil/gas switch type RMU. |
| Type 2: | Extensible double oil/gas ring switch type RMU. |
| Type 3: | Extensible fuse switch type RMU. |
| Type 4: | Extensible fuse switch and double oil/gas ring switch with provision for extension of ring main busbars. |
| Type 5: | Busbar metering unit. |

Required combinations of these types are mentioned in the bill of quantities. The above types of RMU are specified in FEWA drawing No. MEW/E/GEN/179/94-A.

1.7 Type 1 & 2:

The equipments shall be of extensible type load breaking under normal conditions and closing under fault conditions and of oil or gas immersed switch type having a normal continuous current rating of 400 amps in UAE temperature conditions. Integral means shall be provided for cable earthing. Also cable test provision shall be available. Making capacity and short time current rating shall be the same for main contacts and the earth contacts.

1.07.1/4

Positive mechanical interlocks shall be included to prevent mal-operation. It should be impossible to move the switch direct from the ON to the EARTH or from the EARTH to the ON position. Further it should be impossible to insert or remove test plugs except with the switch in the EARTH position nor should it be possible to move the switch to the ON position with the test plugs inserted. Provision for locking the switch in the EARTH, ISOLATE or ON position by padlock must be available. The cable boxes shall be suitable for terminating cross linked poly- ethylene insulated galvanized steel wire armoured and PVC served cable. The cable box shall be complete with gland, wire armour clamps, lugs, etc. except the indoor termination.

The cable box for termination of cables shall be designed for air insulated dry type (without compound filling) preformed terminations, suitable for XLPE insulated cables. The cable box design shall provide sufficient space for crossing of cores without damage to core insulation.

The lugs shall be bimetallic suitable for 300mm² Aluminium cable conductors. All necessary materials, e.g. glands and lugs shall be supplied by the contractor.

Sufficient height must be provided from the bottom gland plate of the cable box to the ground level considering the bending radius of the cable, as directed by cable manufacturer.

In Type - 2 unit one earth fault assembly complete with C.T. and manual reset system is to be provided as shown in the drawing No. MEW/E/GEN/179/94-A.

1.8 Type 3:

The transformer 11KV control unit shall be of the oil or gas fuse switch type and shall comply with the requirements of IEC 420. The unit shall have adequate making and breaking capacities corresponding to a prospective symmetrical fault level of 350 MVA.

The operating mechanism shall be arranged for spring assisted hand operation. The normal continuous current rating when the fuses are replaced by links shall be not less than 175 amps under the climate conditions of UAE. The high rupturing capacity cartridge fuses shall be non-deteriorating and oil tight and fitted with a striker pin to actuate a common trip bar for simultaneous tripping of fuses. The rating and quantity of fuses supplied shall be as per BOQ. Cable test facilities shall also be provided.

Integral means for earthing the transformer shall be provided and arranged for locking in the EARTH position.

Positive mechanical interlocks similar to the interlocks specified for Type 1 & 2 shall be incorporated. Provision for locking the switch in the EARTH, ISOLATED or ON position by padlock must be available. The Transformer Control Unit shall include a cable box, suitable for accommodating 95 sq.mm XLPE insulated Aluminium cable designed for air insulated preformed heat shrinkable terminations.

The cable box shall be complete with gland, tape, armour clamps and bimetallic lugs etc. except for indoor termination.

Sufficient height must be provided from the bottom gland plate of the cable box to the ground level considering the bending radius of the cable, as directed by cable manufacturer.

1.9 Type 4:

The equipment shall be of extensible type for both by ring main cables from both sides as well as by busbars from both sides. It is capable of load breaking under normal conditions and closing under fault conditions and of oil or gas immersed break switch type having a normal continuous current rating of 400 amps in U.A.E. temperature conditions. The advantage and flexibility of use of this unit is that this can be used with other extensible units of type 1, 2 & 3 connected by busbars and ring main will exist through cables. The tee off connection is connected through copper busbar with another oil or gas fuse switch type either in the same chamber or separate chamber with prospective symmetrical fault level of 350 MVA.

The operating mechanism shall be arranged for spring assisted hand operation. The normal continuous current of the fuse replaced with links shall not be less than 175 A. The rating and quantity of fuses to be supplied shall be as per BOQ. Cable test facilities must also be provided. The method of earthing and provision of positive mechanical interlocks and locking facility for the switch in Earth, isolated or ON position are similar in nature to type 1,2 & 3. The cable box for termination of cables shall be complete with glands, wire armour clamps, lugs etc. except the indoor termination and shall be designed for air insulated dry type (without compound filling) terminations suitable for XLPE cables. The lugs shall be bimetallic suitable for 300mm² aluminium cable conductor for ring switches and 95 sq.mm for fuse switches, glands and lugs except the indoor termination shall be supplied by the tenderer.

Sufficient height must be provided from the bottom gland plate of the cable box to the ground level considering the bending radius of the cable, as directed by cable manufacturer.

FEWA prefer to use the busbar interconnectors between Type 1,2,3 & 4 RMU with heat shrinkable taped insulation and metallic protective cover over the insulation. Compound filled connector box is not acceptable.

Necessary materials for insulation of busbar interconnectors including end caps with mechanical shrouds are to be supplied along with the equipments.

In Type - 4 unit one earth fault assembly complete with C.T. and manual reset system is to be provided as shown in the drawing No. MEW/E/GEN/179/94-A.

1.10 Type 5 - Metering Unit :

The metering unit shall be suitable for coupling in the busbar run of extensible single switch (type-1) and extensible fuse switch (type-3) for the purpose of recording energy flowing through all the fuse switches on one side of the switchgear assembly and for indicating the maximum demand (kw). Refer to the attached drawing No. MEW/E/GEN/179/94-A.

The metering unit shall be suitable for recording energy flow (kwh) when installed and shall be provided with an externally re-settable maximum demand (kw) indicator.

The metering unit with oil insulated three phase busbar shall comprise of the following components :

2 Nos.	200-100/5 Amps current transformer.
1 No.	3 phase 11000/110V star/star voltage transformer.
3 Nos.	3 A rating HVHRC cartridge fuses for voltage transformer
3 Nos.	2 A LVHRC fuses for voltage transformer.

1.07.1/6

- 1 No. 3 phase energy meter with maximum demand indicator, wiring, terminal block, LV fuses etc.

The metering unit shall be provided with a compatible support frame.

The metering unit shall be provided with two wound primary current transformers and three phase voltage transformers for the '2 watt meter' method of power measurement.

Current Transformers:

All metering current transformers with accuracy 0.5 for tariff metering shall be used exclusively for operating the meters and shall conform in all aspects to the highest grade of accuracy equivalent to clause of IEC 185. They shall be provided with a secondary current rating of 5 ampere and be designed to carry a burden of secondary circuit including meter at full load. Each current transformer will be mounted on red and blue phase.

Voltage Transformers:

The voltage transformers with accuracy 0.5 should comply with IEC 186 and shall be either epoxy insulated or it shall be contained in an oil filled metal case which shall be earthed. The primary winding shall be connected to the switchgear through renewable fuses, which shall be readily accessible. Secondary fuses shall be provided on each voltage transformer and the secondary windings shall be earthed at one point. All voltage transformers shall be provided with labels indicating their function and phase colour. The burden of VT shall be designed in accordance with secondary circuit including meter.

Meters:

The meters shall be housed in a moulded case and shall have a moulded cover with glass window and shall conform to IEC 521 and IEC 211.

The meters shall be fitted with a roller cyclometer register reading in kwhs. The register shall be lubrication free and shall have a minimum of 8 large digits. The register to record primary consumption (i.e. A: 2x200/100 & V: 3x11000), which will give, direct reading without multiplication factor.

The energy meter reading shall be conventional type as described above or of digital type, the manufactures must ascertain the accuracy of digital type energy meter at 50 Deg.C. ambient temperature within the acceptable limit.

The meters shall have insulated bottom front terminals. These shall be suitable for accepting PVC/PVC stranded copper wires of suitable cross section, each connection shall have two screws for ensuring adequate grip on the copper conductors. Test links shall be provided to isolate the voltage circuits and to short CT circuits. These links shall be located within the body of the meter so as to be inaccessible after the cover is secured and sealed. It shall not be located in the terminal compartment. The terminal shall have an insulated captive short cover, which shall enable wiring in a vertical run to be connected to the meter without any obstruction. The cover shall be capable of accepting the FEWA's wire seal. The sealing hole shall have a diameter of not less than 2 mm. The meters shall be of single disc type or 2 disc.type. The rotor carrying the moving disc shall have a magnetic bearing suspension and shall be of slow speed type. The speed of meter rotor shall not exceed 40 rev/kwh at full load. The meter shall be fitted with ratchet or other approved device to prevent reverse rotation. The meter shall have a carrying handle fitted on it. The current coil shall be of ample section to keep the losses to a minimum value.

1.07.1/7

The rating plate of the meter shall be rigidly mounted and shall have on it the inscription "Property of FEWA" at a suitable place.

The meters are to be used in the metering cubicles designed for coupling in the busbar run of the RMU for the purpose of recording energy flowing through the fuse switches one side of the cubicle. Meters shall be of class 1 accuracy.

1.11 Testing at Manufacturer's Works:

The RMUs/Metering Units shall be subjected to all type and routine tests in accordance with relevant standards. Certified copies of the type test certificates not older than seven years shall be supplied along with the offer. If type test certificates which are acceptable to FEWA are not enclosed along with the offer, FEWA reserves its rights to ask the tenderer to conduct all or any of the type test as per the relevant standard in presence of FEWA inspectors at no extra cost to FEWA. Routine tests will be carried out in the presence of FEWA inspectors at the manufacturer's works.

The supplier shall make provision in his offer to bear all costs that are incurred in carrying out these tests to the satisfaction of the FEWA. However costs towards travel, accommodation etc. of FEWA representatives shall not be included in the quoted price.

Routine tests including oil leakage test at twice the working pressure for at least 24 hours will be carried out on 10% of the RMUs/Metering Units to be supplied in the presence of FEWA representatives at the manufacturer's works.

The type tests shall include but not limited to the following tests as per IEC 298, 420, 265 & 129.

- a) Power frequency voltage dry withstand test.
- b) Impulse voltage tests.
- c) Temperature rise tests.
- d) Short circuit tests.
- e) Verification of making and breaking capacities.
- f) Mechanical operation tests.

Each and every unit of ring main equipment/metering unit shall be subjected to the following routine tests as per IEC 298, 420, 265 & 129.

- a) Visual examination and dimensional checks.
- b) Mechanical operation tests.
- c) Power frequency voltage dry withstand tests.
- d) Voltage drop measurements or circuit resistance measurement in various configurations of main and earth switches.
- e) Oil leak test as mentioned above shall be carried out on all units.

1.12 Tools:

Each 11KV RMU/Metering Unit shall be provided with a complete set of special tools required for operation and maintenance of the gear. Built in test spikes are to be provided with each of the RMUs. If built in test spikes are not provided in the unit then separate price for the same shall be given as per bill of quantity.

1.13 Painting and Finish:

The process of painting of mild steel parts shall ensure that no corrosion takes place for a period not less than 5 years under severe climatic conditions prevailing in U.A.E. Evidence of having applied the particular painting process successfully in the past shall be furnished.

All the metal parts of the RMU/Metering Unit shall be sand blasted to class SA 2.5 or blast cleaned. The body shall be degreased with an alkalic spray wash and zinc phosphates. The first coat shall be zinc epoxy primer of 30 microns thickness when dry. The second shall be an undercoat of epoxy high build of 100 microns thickness when dry and final topcoat shall be of epoxy of 50 microns thickness when dry.

The final colour shall be light grey in shade.

The painting shall satisfactorily resist a salt spray test in accordance with ASTM 117.

Any other painting equivalent to the above shall also be considered provided the same was found to be trouble free against corrosion for at least 5 years under similar climatic conditions as in U.A.E. Suitable evidence for the same shall be submitted.

The quality of protection, in addition to the above, shall be at least equal to that recommended in the latest Edition of BS : CP 1014.

1.14 Drawings:

Detailed drawings showing the internal arrangements of the RMU/Metering Unit, overall dimensions, clearances, cable boxes on Ring and Tee off side, distance of the gland plate to the skid base frame etc. shall be submitted along with the offer.

SCHEDULE 'A'

SUB-MANUFACTURERS

The Tenderer shall state below the names of the sub-manufacturers to the main manufacturer and details of the equipment proposed to be manufactured or supplied by them:

Name & Address of the Sub-Manufacturer	Description of Equipment

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

SCHEDULE 'B'**PLACE OF MANUFACTURE, TESTING AND INSPECTION**

The Tenderer to complete the following schedule for all materials he proposes to supply

Item No.	Description	Manufacturer	Place of manufacture	Place of testing and inspection

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

SCHEDULE 'C'**DEVIATION FROM TENDER SPECIFICATION**

The Tenderer to state in the following schedule the deviations from the tender specifications proposed in his offer. Deviations other than those specifically listed below will not be taken note of:

Item No.	Description	Precise Details of the Deviations

Signature : _____

Designation : _____

Name of Tenderer : _____

Date : _____

1.07.1/12

SCHEDULE 'D'

GUARANTEED PARTICULARS OF RING MAIN UNIT

Tenderer to fill in below the technical particulars of the 11kV Ring Main Units offered. All ratings shall be under site service conditions of 100% humidity and 50 Deg. C. ambient temperature.

Sl. No.	Description	Unit	Type 1	Type 2	Type 3
1	Name of manufacturer				
2	Applicable Standards				
3	Type				
4	Service Voltage	KV			
5	Normal continuous rating at normal voltages and frequency under UAE climatic conditions	Amps			
6	Specified normal rating at normal voltage frequency and temperature	Amps			
7	Type of contact and maximum temperature rise of contacts at normal rating and frequency	Deg.C			
8	Method of closing				
9	Load beaking capacity at normal voltage and frequency	Amps			
10	Making capacity under fault conditions	KA			
11	<u>Short time currents for main and earth contacts :</u> a) 1 second b) 2 second c) 3 second	KA KA KA			
12	Voltage drop across main contacts at normal full load current	Volts			
13	Three phase breaking capacity (Transformer Control Units)	MVA			
14	<u>Type & details of HRC fuse (Transformer Control Units)</u> a) Type b) Applicable international standard				

Signature of Tenderer ; _____

1.07.1/13

SCHEDULE 'D'

GUARANTEED PARTICULARS OF RING MAIN UNIT

Sl. No.	Description	Unit	Type 1	Type 2	Type 3
15	<u>HRC Fuse rating (Transformer Control Unit) :</u> a) 1000 KVA Transformer b) 500 KVA Transformer c) 250 KVA Transformer				
16	<u>Minimum Clearance :</u> a) Between phases b) Between phase and earth c) Between fixed and moving contacts in the open position	mm mm mm			
17	Thickness of steel enclosure	mm			
18	<u>Anti rust treatment of enclosure :</u> a) No. of layers b) Type of anti-rust primer	Nos.			
19	Type of paint				
20	No. of coats of paint	Nos.			
21	Colour of paint				
22	Quantity of oil/gas	Ltrs.			
23	Weight of unitt complete	Kgs.			
24	<u>Earth Fault Indicator :</u> a) C.T. Ratio b) Minimum earth fault operating current c) Minimum secondary operating current	Amps Amps			
25	Material of busbar : Copper / Aluminium				

Signature of Tenderer : _____

Designation: _____

Name of Tenderer: _____

Date: _____

S-1-07-

SCHEDULE 'E'

DETAILS OF PAST EXPERIENCE OF MANUFACTURER

Name and address of Purchaser	Quantity Supplied	Year of supply	Remarks

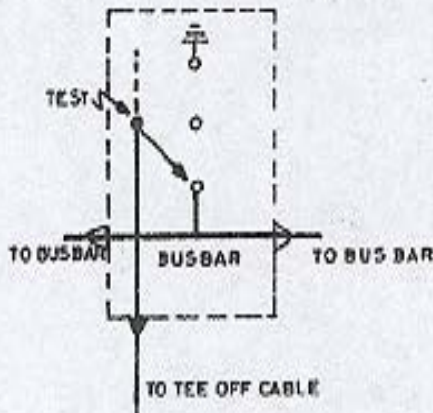
Signature : _____

Designation : _____

Name of Tenderer ; _____

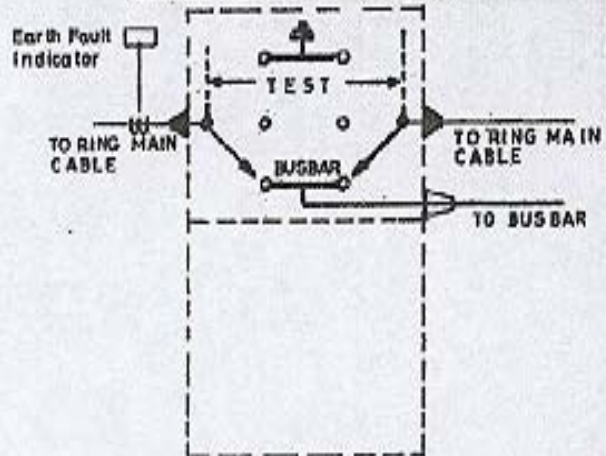
Date : _____

SINGLE EXTENSIBLE SWITCH



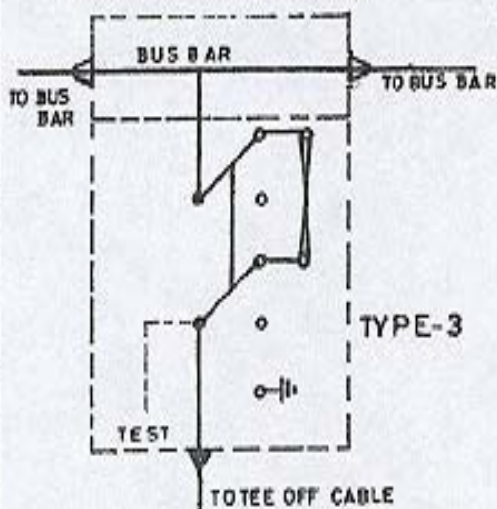
TYPE - 1

DOUBLE EXTENSIBLE UNIT COMPRISING TWO SWITCHES IN ONE TANK OR EACH SWITCH IN SEPARATE TANK



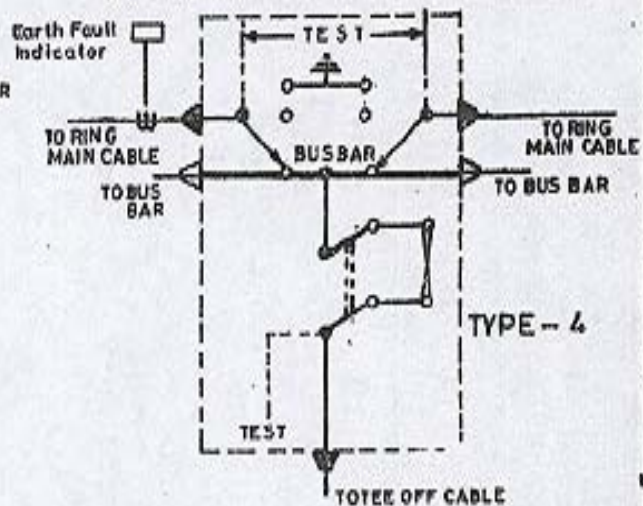
TYPE - 2

EXTENSIBLE FUSE SWITCH



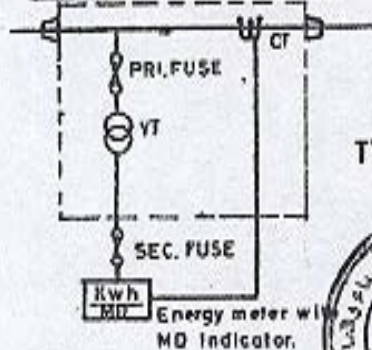
TYPE-3

DOUBLE EXTENSIBLE SWITCH FUSE BOARD



TYPE - 4

BUS BAR METERING UNIT



TYPE-5

This drg. is a part of SPEC. NO 1-07-1



United Arab Emirates
Ministry of Electricity & Water
P.O. BOX 1773 DUBAI

11KV EXTENSIBLE RING MAIN UNITS

DRAWN	Barkat Surve	DATE	20-12-84	DESIGNED	NTS
DESIGN	Narayan C.	CHECKED			
APPROVED		VENDOR NO:			
		MEMO NO:			

NOTE
This drg. supercedes NEW/E/GEN/132/84
REVISION - A 22-8-86

