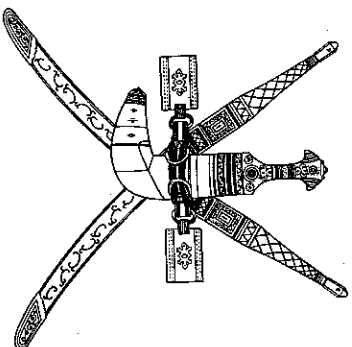


SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



L.T. EQUIPMENT AND MATERIAL STANDARD - OES 7, 21A, B AND C 22A, B AND C, 23, 28 AND 31

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

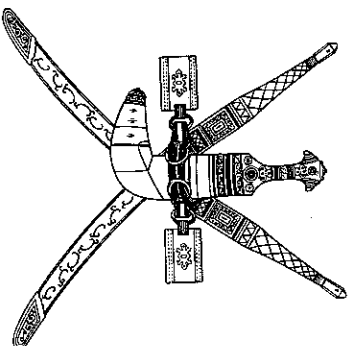
L.T. EQUIPMENT AND MATERIAL
BRIEF SPECIFICATIONS

TABLE OF CONTENTS

Standard	Description
OES-7	Consumer Service Unit Brief Specifications & Standard Drawings Drawing No. MEW OH-GA 22A – Single phase Consumer Unit - 100A Drawing No. MEW OH-GA 22B – 3 phase Consumer Unit - 100A
OES-21A	415/240V 800 Amps Feeder Pillar Brief Specifications
OES-21B	415/240V 1600 Amps Feeder Pillar Brief Specifications
OES-21C	415/240V 400 Amps Mini Feeder Pillar Brief Specifications
OES-22A	Single phase Kilowatthour meters for service connections Brief Specifications
OES-22B	Three phase Kilowatthour meters with current Transformers for service connections Brief Specifications
OES-23	KVAH Meters Brief Specifications
OES-28	400 Amps Metalclad Cutout Box Brief Specifications Drawing No. MEW/OH-GA/42 400 Amps metal clad cutout box
OES-31	Single/Three phase and Neutral Cutouts for Service connections Brief Specifications

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD - OES - 7 CONSUMER SERVICE UNIT

BRIEF SPECIFICATIONS AND STANDARD DRAWINGS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 7
CONSUMER SERVICE UNIT

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Construction	2
3 A	Single Phase and Neutral Cutout	
3 B	Three Phase and Neutral Cutout	3
4	Kilowathour Meters	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD OES - 7

CONSUMER SERVICE UNIT

1. GENERAL

The consumer service unit is for providing electrical power service connection to individual consumers with necessary close excess current protection and metering.

It shall be suitable for installation indoor or outdoor.

It shall be in two types :

- Type A for single phase service - Drg. No. MEW/OH-GA/22A
- Type B for three phase service - Drg. No. MEW/OH-GA/22B

It shall comprise the following :

- 1) Box of toughened synthetic material with lockable hinged door.
- 2) Single phase and neutral or three phase and neutral cutout.
- 3) Single phase or three phase kilowatt hour meter.

The cutout and kilowatt hour meter shall be neatly fitted and laid out inside the box. The cutout shall be placed vertically below the meter with ample space in between for neat wiring and termination of consumer's main leads to the meter. Also, adequate space shall be provided below the cutout for crossover of bottom entry incoming supply cable cores.

The unit shall be complete with PVC insulated tinned copper links between the cutout and meter.

The cutout and meter shall be suitable for operation of mains system, the characteristics are as follows :

Rated service voltage	415/240 volts + or - 6%
Neutral	Solidly earthed
Frequency	50 Hertz
Design Fault level	43KA
Fault duration	1 sec.

2. CONSTRUCTION

The box to accommodate the cutout and kilowatt hour meter shall be of toughened synthetic material of substantial wall thickness lockable door fitted to the box with concealed hinges. Lock shall be cylinder type, master keyed to open only with a master key. In addition, there shall be provision for sealing with sealing wire and lead seals.

Holes shall be provided at the four corners of the box for wall or panel mounting. The box with the door closed shall have degree of protection IP55.

A vandal proof perspex window shall be provided on the front for meter reading without opening the door.

The box shall have two holes at the bottom for entry of supply and consumer cables, one fitted with compression type cable gland of brass, complete with earth tag and PVC shroud :

- For type A : Holes shall be of 25mm dia, with cable glands suitable for 2 core 35 sq.mm copper XLPE/PVC/SWA/PVC cable.

- For type B : Holes shall be 40mm dia, and cable glands for 4 core 35 sq.mm copper XLPE/PVC/SWA/PVC cable.

The box shall be finished with aesthetically pleasing appearance.

The box shall be vandal proof and immune to effects of exposure to sun and grey white in colour.

3.A) SINGLE PHASE AND NEUTRAL CUTOUT

Single phase and neutral cutout shall be all insulated of phenolic mouldings (case, fuse carrier, neutral cover and earth block cover).

The cutout shall comprise :

- 100 Amps fuse unit per phase
- Neutral Block
- Earth Block

The fuse unit shall incorporate a cartridge barrel type fuse link 100 Amps to BSS 88, 77.2 mm long 30.2 mm dia. The fuse carrier shall be interlocked such that no components can be exposed or removed unless the fuse carrier is withdrawn. The fuse carrier shall have facilities for sealing with sealing wire and lead seal.

Terminals shall comprise substantial tinned brass terminal blocks with large diameter punching screws, two per conductor on phase, neutral and earth blocks with fixing studs screws.

3.B THREE PHASE AND NEUTRAL CUTOUT

Three phase and neutral cutout shall be similar to the single phase and neutral cutout specified in 3A above except that it shall include three phase units complete with 100 Amps HRC cartridge barrel type fuse links.

4. KILOWATT-HOUR METERS

- a) The KWH meters shall be enclosed in a damp proof robust black phenolic moulded case with an integral terminal mechanically strong front connection block. The cover shall be of the same black phenolic moulding with a large glass window properly fixed with clips and adhesive compound on the inside.

An area inside the case is to be provided to facilitate inspection of the magnetic gap. The terminals are to be of heavy brass section tin plated to resist corrosion or electrolytic action.

- b) Current and voltage electromagnet cores shall be formed in such a way as to ensure very accurate dimensions and unstressed magnetic circuit. The cores shall be mounted on the frame and so designed that to minimize strains which can lead to long term instability.

Current and voltage coil shall be from high conductivity wire with high quality insulation. The current coil shall have a low loss and a low VA burden at high current.

The KWh meter shall have the following adjustment facilities.

- 1) Full load adjustment
- 2) Low load adjustment
- 3) Inductive load adjustment

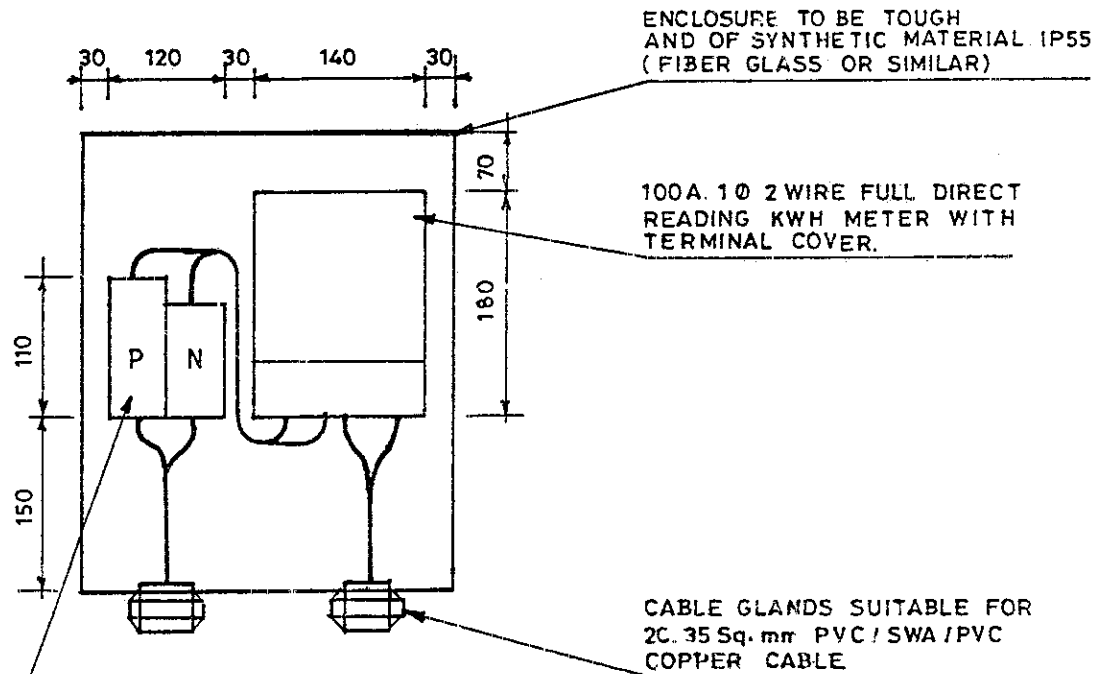
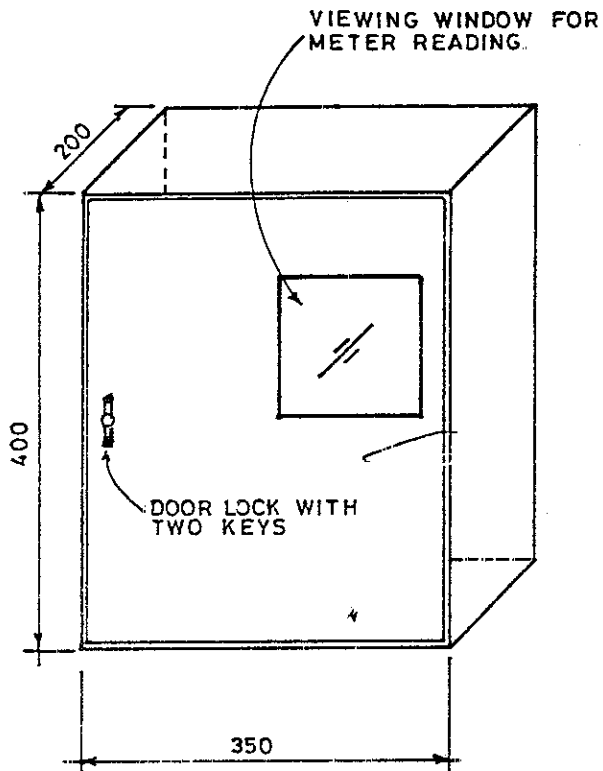
- c) The rotor shall be of non-ferrous metal and constrained against lateral movement. The suspension of magnets shall be in such a manner to give minimum drag against rotation and maximum stiffness against disturbance in vertical direction. The bearing shall be of magnetic repulsion type.

- d) The meter shall be provided with cyclometer register with five wheels for single and six wheels for three phase. The numbers are in white on a black background.

- e) Meters shall comply with BSS 5685 IEC 521 and shall be fully tropicalised to suit the climatic conditions of Oman.

- f.i) Single phase meters shall be long range 20 - 100 amps.

- f.ii) Three phase 4 wire meters for unbalanced load shall be either 50 amps or 100 amps.

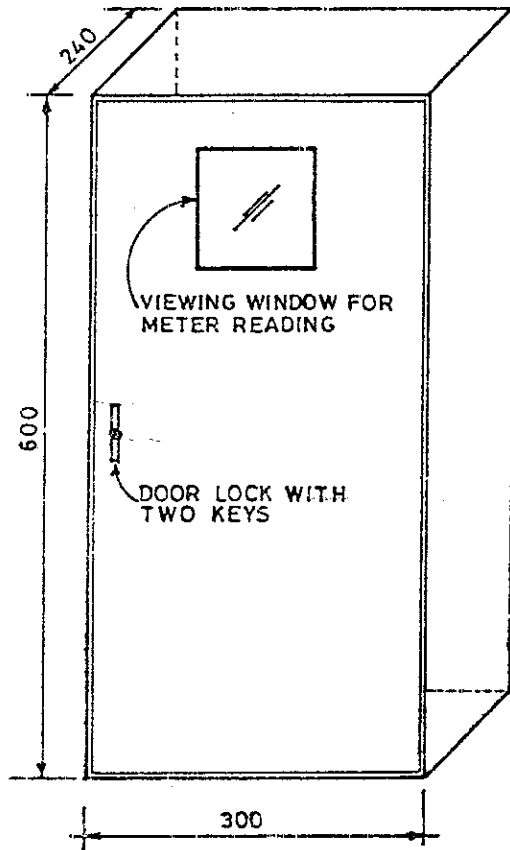


100A. 1 POLE WITH NEUTRAL HOUSE SERVICE FUSE CUTOUT WITH 100A. HRC FUSE

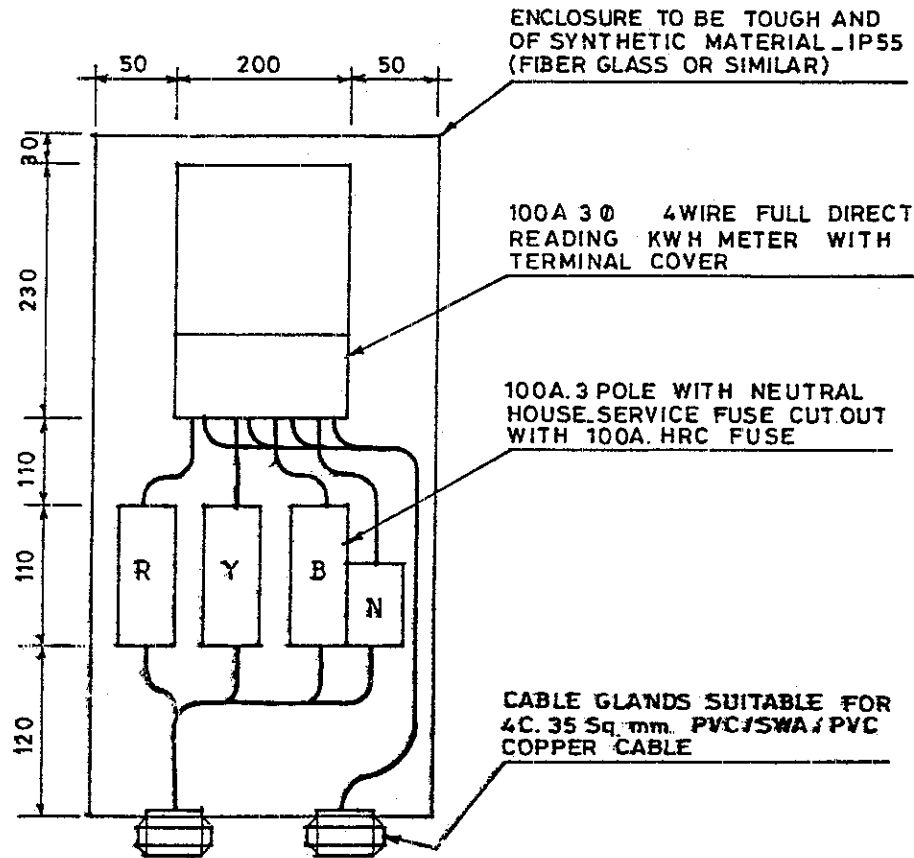
ELEVATION INSIDE

NOTE - All dimensions are in millimetres.

Sultanate of Oman Ministry of Electricity and Water		
TITLE		
SINGLE PHASE CONSUMER UNIT - 100 Amps.		
DRAWN	CHECKED	APPROVED
FRANCIS		
DRAWING NO.	SCALE	DATE
MEW/DH-GA/22A	NTS	09 01 94



ELEVATION



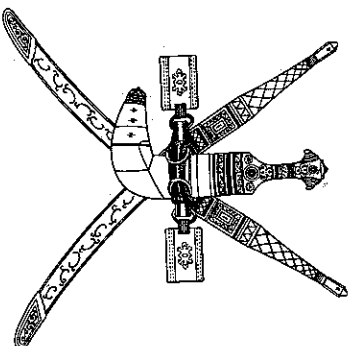
ELEVATION INSIDE

NOTE... All dimensions are in millimetres.

Sultanate of Oman Ministry of Electricity and Water		
TITLE THREE PHASE CONSUMER UNIT - 100 Amps.		
DRAWN FRANCIS.	CHECKED	APPROVED
DRAWING NO MEW/OH_GA/22B	SCALE NTS	DATE 08 01 1994

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 21A
415/240V 800 AMPS FEEDER PILLAR

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES . 21A
415/240V 800 AMPS FEEDING PILLAR

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Details of Equipment	2
3	Painting and Finish	3

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER
STANDARD : OES - 21A
415/240V 800 AMPS FEEDER PILLAR

1. GENERAL

The feeder pillars shall be metal clad, lockable, weather proof, free standing for installation on concrete base, complete with foundation frame and bolts.

The incoming and outgoing cable entries shall be from the bottom of the feeder pillar.

The feeder pillar in general shall comply with British Electricity Board specifications S8 and S13 and shall be suitable for the following site conditions :

1) Mean annual rain fall	:	100 mm
2) Maximum ambient temperature	:	50 Deg. C
3) Minimum ambient temperature	:	5 Deg. C
4) Maximum temperature of metal surfaces in direct sunlight	:	80 Deg. C
Relative humidity	maximum	100%
	Annual average	40%

Dust and sand storms can occur at any time.

The equipment offered shall have been tested at a recognised testing station upto 46 KA RMS for 0.5 sec, short circuit test certificate should be submitted with the offer.

Double doors with brass or gun metal hinges arranged to open through 180 Deg. shall be provided to give maximum access for cabling and maintenance. Doors are to be fitted with vertical wedges connected to the handle which should have provision for pad locking in closed position.

A tray for spare fuse links and isolator operating rod shall be included together with holders for maintenance record cards. Adequate ventilations shall be provided by means of vermin and dust proof openings without compromising on degree of protection (IP55).

Adequate clearance shall be provided between the doors and the incoming and outgoing units inside, such that it shall be possible to leave the incoming link open, alive with the door closed.

The feeder pillars shall be fabricated with high quality electro zinc coated sheet steel of 2mm thickness, painted and finished as per clause 3 of this specification, grey paint from outside and inside. The degree of protection shall be IP55 according to IEC standard. The bottom base plate shall be of nonmagnetic metal for incoming single core aluminium strip armour cables and of galvanised steel for outgoing 4 core cablings removable type with adequate fixings to the panel and with knockout holes for easy on site cable gland fixing.

Enamelled danger plate in Arabic and English with danger sings shall be fitted on the front of the feeder pillar door.

Internal light with door operated switch and 13A socket outlet shall be provided.

Feeder pillar shall be provided with lifting lugs. Two 12mm withworth earthing terminals shall provided on the sides of feeder pillar one on each side.

2. DETAILS OF EQUIPMENT

i) Incoming Units

One incoming unit having a current rating of 800 amps (site rating) with gang operated off load isolating links manually operated by insulated operating rod or handle.

The unit to include :

- Three current transformers 800/5A one of each phase accuracy class 1 moulded type complying with IEC 185/BS 3938.
 - Three maximum demand indicators, one for each phase the maximum demand element to be calibrated for 55 Deg. C ambient temperature complying to IEC 51/BS 89 size 96 x 96 tropicalised with time lag 15 min. calibrated 20% - 120%.
 - One kilowatt hour meter for 3 phase 4 wire unbalanced load conforming to IEC 521/BS 5685 tropicalised 6 digit cyclometer type with minimum reading of 1 kwtr. Direct reading type without multiplication factor.
 - Three potential circuits fuses.
 - Terminals for four single core cables 630 sq.mm copper XLPE PVC aluminium armoured PVC complete with cable glands and crimping type lugs.
- The minimum spacing between the termination and bottom plate shall be 400mm.

ii) Outgoing Units

Six outgoing units rated for 400 amps (site rating). The units to be fitted with HRC cartridge fuses. The units shall be suitable for termination of and connection to 600/1000V grade cross linked polyethylene insulated cable PVC sheathed single wire armoured. PVC served for the following sizes of cables :

4C x 240mm ²	2 Nos.
4C x 185mm ²	2 Nos.
4C x 120mm ²	2 Nos.

and units shall be provided with fuse links of rating 2 Nos. of 400 amps, 2 Nos. - 300 amps, 2 Nos. - 200 amps. The units to be complete with cable glands and all necessary fittings.

Glands shall be complete with earth tag and plastic shroud.

The clearance between outgoing fuse ways shall be 45mm (min.).

Fuse grip handle with protection shield shall be provided for removal/replacement of fuses.

Phase barriers shall be provided. Minimum spacing of 450mm shall be provided between termination and bottom plate.

iii) Bus Bars

The bus bars shall be high conductivity tinned copper and shall have the following minimum sizes :

1) Phase	-	50 x 10 mm
2) Neutral	-	50 x 5 mm
3) Earth bar	-	25 x 5 mm

Neutral bar and earth bar to be connected by link and earth bar to be connected by 70 sq.mm stranded copper earth wire to earth terminals on the pillar. The bus bar shall be covered with insulated material suitable for site condition. Indelible bus bar identification marks shall be provided.

3. PAINTING AND FINISH

It is to be borne in mind that the atmosphere in Oman is highly corrosive. Therefore, special attention should be given to protection of enclosures. The methods proposed and the means adopted for rust proofing shall comply with any of the following methods.

The painting procedure shall be as follows :

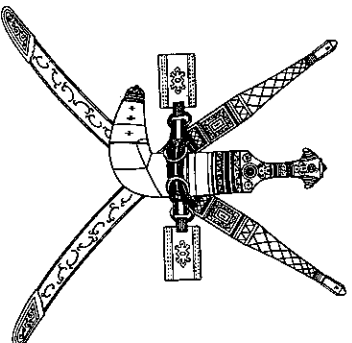
- i) After welding and grinding, cold zinc is to be applied to the affected areas.
- ii) Cleaning and passivation of the surface.
- iii) Application of zinc phosphate coat approximately one micron thick.
- iv) Electrophoretic dip coat primary to the thickness of 25 microns.
- v) The last coat is polyester powder, electrostatically applied and baked at 180°C thickness of coating shall be 80 microns.

Colour shall be admiral grey.

The certificate shall be submitted for the guaranteed life for 5 years.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 21B

415/240V 1600 AMPS FEEDER PILLAR

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 21B
415/240V 1600 AMPS FEEDING PILLAR

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Details of Equipment	2
3	Painting and Finish	3

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 21-B
415/240V 1600 AMPS FEEDER PILLAR

I. GENERAL

The feeder pillars shall be metal clad, lockable, weather proof, free standing for installation on concrete base, complete with foundation frame and bolts.

The incoming and outgoing cable entries shall be from the bottom of the feeder pillar.

The feeder pillar in general shall comply with British Electricity Board specifications S8 and S13 and shall be suitable for the following site conditions :

1)	Mean annual rain fall	:	100 mm
2)	Maximum ambient temperature	:	50 Deg. C
3)	Minimum ambient temperature	:	5 Deg. C
4)	Maximum temperature of metal surfaces in direct sunlight	:	80 Deg. C
	Relative humidity	maximum	100%
	Annual average	:	40%

Dust and sand storms can occur at any time.

The equipment offered shall have been tested at a recognised testing station upto 46 KA RMS for 0.5 sec, short circuit test certificate should be submitted with the offer.

Double doors with brass or gun metal hinges arranged to open through 180 Deg. shall be provided to give maximum access for cabling and maintenance. Doors are to be fitted with vertical wedges connected to the handle which should have provision for pad locking in closed position.

A tray for spare fuse links and isolator operating rod shall be included together with holders for maintenance record cards. Adequate ventilations shall be provided by means of vermin and dust proof openings without compromising on degree of protection (IP55).

Adequate clearance shall be provided between the doors and the incoming and outgoing units inside, such that it shall be possible to leave the incoming link open, alive with the door closed.

The feeder pillars shall be fabricated with high quality electro zinc coated sheet steel of 2mm thickness, painted and finished as per clause 3 of this specification, grey paint from outside and inside. The degree of protection shall be IP55 according to IEC standard. The bottom base plate shall be of nonmagnetic metal for incoming single core aluminium armour cables and of galvanised steel for outgoing 4 core cablings removable type with adequate fixings to the panel and with knockout holes for easy on site cable gland fixing.

Enamelled danger plate in Arabic and English with danger sings shall be fitted on the front of the feeder pillar door.

Internal light with door operated switch and 13A socket outlet shall be provided.

Feeder pillar shall be provided with lifting lugs. Two 12mm withworth earthing terminals shall provided on the sides of feeder pillar one on each side.

2. DETAILS OF EQUIPMENT

i) Incoming Units

One incoming unit having a current rating of 1600 amps (site rating) with gang operated off load isolating links manually operated by insulated operating rod or switch with unit on insulated handle.

The unit to include :

- Three current transformers 1600/5A accuracy class 1 moulded type burden 15VA complying with IEC 185/BS 3938 one on each phase.
- Three maximum demand indicators, one for each phase complying to IEC 51/BS 89 size 96 x 96 tropicalised with time lag 15 min. calibrated 20% - 120%.
The maximum demand element to be calibrated for 55 Deg.C ambient temperature.
- One kilowatt hour meter for 3 phase 4 wire unbalanced load conforming to IEC 521/BS 5685 tropicalised 6 digit cyclometer type with minimum 1 kw/hr. Direct reading without application of multiplication factor.
- Three potential circuits fuses.
- Terminals for seven single core cables 630 sq.mm copper XLPE aluminium armour PVC sheathed complete with cable glands and crimping type lugs minimum spacing between termination and bottom plate shall be 500 mm.

ii) Outgoing Units

Each outgoing units rated for 40 amps (site rating). The units to be fitted with HRC cartridge fuses and suitable for termination and connection to 600/1000V grade cross linked polyethylene insulated cable PVC sheathed single galvanised steel wire armoured. PVC served cables (XLPE/PVC/SWA) and complete with cable glands. Ratings of fuses and cable sizes for the required glands are as follows :

	<u>Qty</u>	<u>Cable Size</u>
400 amps fuses links	3	4C x 240mm ² XLPE cable
300 amps fuses links	3	4C x 185mm ² XLPE cable
200 amps fuses links	2	4C x 120mm ² XLPE cable

The glands shall be of brass, compression type, complete with earth tag and PVC shroud.

The clearance between outgoing fuse ways shall be 45mm (min.).

Fuse grip handle with protection shield for removal/replacement of fuses shall be provided.

Phase insulated barriers shall be provided.

Minimum spacing between termination and bottom plate shall be 80mm.

iii) Bus Bars

The bus bars shall be high conductivity tinned copper and shall have the following minimum sizes :

1) Phase	-	100 mm x 10 mm
2) Neutral	-	50 mm x 10 mm
3) Earth bar	-	50 mm x 5 mm

The bars shall be covered with insulated material suitable for site conditions and indelible bus bar identification marks shall be provided. Neutral bar and earth bar to be connected by link and earth bar to be connected by earth wire (70 sq.mm) stranded to earth terminals on the pillar.

3. PAINTING AND FINISH

It is to be borne in mind that the atmosphere in Oman is highly corrosive. Therefore, special attention should be given to protection of enclosures.

The painting procedure shall be as follows :

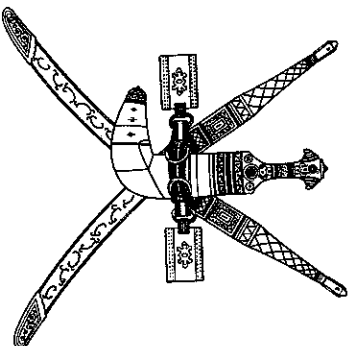
- i) After welding and grinding, cold zinc is to be applied to the affected areas.
- ii) Cleaning and passivation of the surface.
- iii) Application of zinc phosphate coat approximately one micron thick.
- iv) Electrophoretic dip coat primary to the thickness of 25 microns.
- v) The last coat is polyester powder, electrostatically applied and baked at 180°C thickness of coating shall be 80 microns.

Colour shall be admiral grey.

The certificate shall be submitted for the guaranteed life for 5 years.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 21C

415/240V 400 AMPS 6-WAY MINI FEEDER PILLAR

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 21C
415/240V 400 AMPS – 6 WAY MINI FEEDER PILLAR

TABLE OF CONTENTS

Clause No.	Description	Page No.
1.0	General	1
2.0	Details of Equipment	2
3.0	Clearances	3
4.0	Painting and Finish	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 21-C
415/240V 400A - 6 WAY MINI FEEDER PILLAR

1.0 GENERAL

Feeder Pillar shall be metal clad, lockable weather proof and of robust construction, free standing installation on concrete base, complete with foundation frame and bolts.

The incoming and outgoing cable entries shall be from the bottom of the feeder pillar.

The feeder pillar shall be suitable for site conditions and electrical system as per Clause 01 of OES - 11.

The equipment offered shall have been tested at a recognized testing station and short circuit certificate to be submitted with the offer.

Single door with brass of gun metal hinges arranged to open through 180 Deg. shall be provided to give maximum access for cabling and maintenance.

A handel and pad locking arrangement shall be provided. Door should be provided with suitable gasket for sealing.

Adequate ventilation shall be provided to permit natural circulation of air. The ventilation aperture shall be vermin and dust proof.

The degree of protection for the enclosure shall be IP55.

The feeder pillars shall be manufactured with high quality electro zinc coated sheet steel of 2mm thickness, painted and finished as given in this specification, grey paint form outside and inside.

Adequate clearance shall be provided between the door and the incoming and outgoing units inside, such that it shall be possible to leave the incoming link open, alive with the door closed.

The feeder pillar shall be fitted with removable lifting devices mounted at each end and as near as possible to the balance line.

Enameled danger plate in Arabic and English with danger signs shall be fitted on the front of the feeder pillar door.

Name plate shall be fixed on the feeder with following information engraved.

- 1) Serial Number
- 2) Year of Manufacture
- 3) Normal current rating of bus bar
- 4) Normal current of incoming unit
- 5) Gross weight
- 6) Manufacturer's name and reference number

Internal light with door operated switch shall be provided.

Two 12mm withworth earthing terminals shall be provided on the sides of feeder pillar one on each side.

2.0 DETAILS OF EQUIPMENT

i) Incoming Units

Two incoming units having a current rating of 400 Amps (site rating) with gang operated off-load isolating links manually operated in insulated handle.

The terminals shall be suitable for terminating 4C x 240 sq.mm XLPE cable.

Each unit shall be at the end of the busbar for loop-in and loop-out of incoming and outgoing to another feeder pillar.

ii) Outgoing Units

Six outgoing units rated for 100A (site rating). The units to be fitted with HRC cartridge/DIN fuse and suitable for termination and connection to 4C x 35 sq.mm 600/1000V grade in XLPE insulated PVC sheathed single galvanized steel wire armoured. PVC serve cables 4C x 35 sq.mm. Copper conductor and complete with glands.

The glands shall be of brass, compression type complete with earth tag and PVC shroud.

Generally glands for 9 single phase and 3 three phase connection shall be provided and actual number shall be decided on the requirement.

The clearance between outgoing fuse ways shall be 45mm. Fuse grip handle with protection shield for removal/replacement of fuses link shall be provided.

Phase insulated barrier shall be provided.

Also barrier between outgoing ways and between outgoing and incoming ways shall be provided.

Barrier material shall be arc and flame resistance material.

Minimum space of 400mm shall be provided between bottom plate and bottom most busbar.

iii) Bus Bars

The bus bars shall be of hard drawn high conductivity tinned copper.

Phase bus bars shall be colour marked in sequence from top to bottom - red, yellow and blue and neutral and earth bar shall be marked at the bottom. Phase identification shall be indelible. The bus bars shall be covered with insulated material suitable for site condition.

Circuit identification labels also shall be provided.

The bus bars shall have the following minimum sizes :

a)	Phase	:	25 x 10mm
b)	Neutral	:	25 x 10mm
c)	Earth	:	20 x 10mm

3.0 CLEARANCES

For all connections in air, the clearance and creepage distance shall not be less than 25mm between conductors and 20mm from conductors to earth.

4.0 PAINTING AND FINISH

It is to be borne in mind that the atmosphere in Oman is highly corrosive. Therefore, special attention should be given to protection of enclosures.

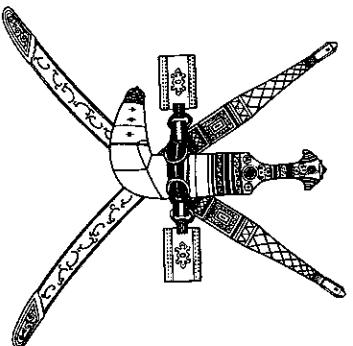
The painting procedure shall be as follows :

- i) After welding and grinding, cold zinc is to be applied to the affected areas.
- ii) Cleaning and passivation of the surface.
- iii) Application of zinc phosphate coat approximately one micron thick.
- iv) Electrophoretic dip coat primary to the thickness of 25 microns.
- v) The last coat is polyester powder, electrostatically applied and baked at 180°C thickness of coating shall be 80 microns.

Colour shall be admiral grey.

The certificate shall be submitted for the guaranteed life for 5 years.

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 22A
SINGLE PHASE KILOWATT HOUR METERS
FOR SERVICE CONNECTIONS

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 22A
SINGLE PHASE KILOWATT HOUR METERS
FOR SERVICE CONNECTIONS

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Performance Requirements	
3	Construction	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 22A
SINGLE PHASE KILOWATT HOUR METERS
FOR SERVICE CONNECTIONS

1. GENERAL

Single phase kilowatt hour meters shall generally conform to BS 5685/IEC 521 and suitable for operation in electrical system and site conditions mentioned in OES 11.

2. PERFORMANCE REQUIREMENTS

Current	20 - 100A
Voltage	240 V
Frequency	50 Hz
Accuracy	Class 2
Maximum ambient temperature	50 Deg. C

3. CONSTRUCTION

3.1 CASE

The KWh meters shall be enclosed in a damp proof robust black phenolic moulded case with an integral terminal mechanically strong front connection block. The cover shall be of the same black phenolic moulding with a large glass window properly fixed with clips and adhesive compound on the inside.

An area inside the case is to be provided to facilitate inspection of the magnetic gap. The terminals are to be of heavy brass section tin plated to resist corrosion or electrolytic action and suitable for 35 sq.mm copper conductor (8mm approx).

3.2 CURRENT AND VOLTAGE ELECTRO MAGNETS

Current and voltage electromagnet cores shall be formed in such a way as to ensure very accurate dimensions and unstressed magnetic circuit. The cores shall be mounted on the frame and so designed as to minimize strains which can lead to long term instability.

3.3 CURRENT AND VOLTAGE COIL

Current and voltage coil shall be from high conductivity wire with high quality insulation. The current coil shall have a low VA burden at high current.

3.4 ROTOR

The rotor shall be of non ferrous metal and constrained against lateral movement. The suspension of magnets shall be in such a manner to give minimum drag against rotation and maximum stiffness against distraction in vertical direction. The bearings shall be of magnetic repulsion type.

3.5 REGISTER

The meter shall be provided with cyclometer register with five wheels. The numbers are in white on a black background. The meter shall be direct reading type without use of multiplying factor.

3.6 ADJUSTMENT

The KWh meters shall have the following adjustment facilities :

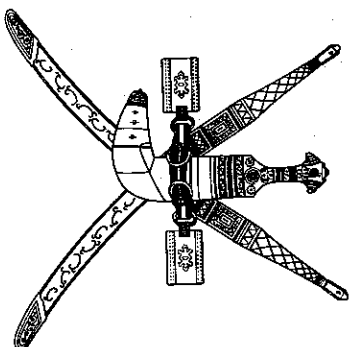
- 1) Full load adjustment
- 2) Low load adjustment
- 3) Inductive load adjustment

3.7 TESTS

The meter shall be tested as stipulated in BS/IEC, except accuracy test to be checked with respect to ambient temperature of 50 Deg. C.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 22B

**THREE PHASE KILOWATT HOUR METERS
DIRECTLY CONNECTED FOR SERVICE CONNECTIONS**

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 22B
THREE PHASE KILOWATT HOUR METERS DIRECTLY
CONNECTED FOR SERVICE CONNECTIONS

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Performance Requirements	
3	Construction	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 22B

THREE PHASE KILOWATT HOUR METERS
DIRECTLY CONNECTED FOR SERVICE CONNECTIONS

1. GENERAL

Three phase kilowatt hour meters shall generally conform to BS 5685/IEC 521 and suitable for operation in electrical system and site conditions mentioned in OES 11.

2. PERFORMANCE REQUIREMENTS

	100A	50A
Current	20 - 100A	20 - 50A
Voltage	3 phase 4 wire 415 voltage	3 phase 4 wire 415 V
Frequency	50 Hz	50 Hz
Accuracy	Class 2	Class 2
Max. ambient temperature	50 Deg. C	50 Deg. C

3. CONSTRUCTION

3.1 CASE

The KWh meters shall be enclosed in a damp proof robust black phenolic moulded case with an integral terminal mechanically strong front connection block. The cover shall be of the same black phenolic moulding with a large glass window properly fixed with clips and adhesive compound on the inside.

An area inside the case it to be provided to facilitate inspection of the magnetic gap. The terminals are to be of heavy brass section tin plated to resist corrosion or electrolytic action and suitable for 35 sq.mm copper conductor (8mm approx.).

3.2 CURRENT AND VOLTAGE COIL

Current and voltage electromagnet cores shall be formed in such a way as to ensure very accurate dimensions and unstressed magnetic circuit. The cores shall be mounted on the frame and so designed as to minimize strains which can lead to long term instability.

3.3 CURRENT AND VOLTAGE COIL

Current and voltage coil shall be from high conductivity wire high quality insulation. The current coil shall have a low loss and a low VA burden at high current.

3.4 ROTOR

The rotor shall be of non ferrous metal and constrained against lateral movement. The suspension of magnets shall be in such a manner to give minimum drag against rotation and maximum stiffness against disturbance in vertical direction. The bearings shall be of magnetic repulsion type.

3.5 REGISTER

The meter shall be provided with cyclometer register with six wheels. The numbers are in white on a black back ground. The meter shall be direct reading type without use of multiplying factor.

3.6 ADJUSTMENTS

The KWh meters shall have the following adjustment facilities :

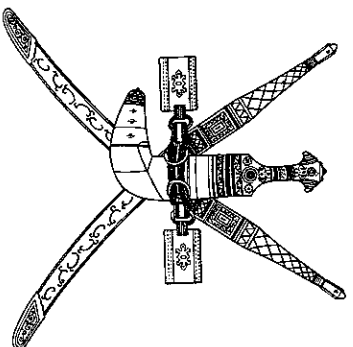
- 1) Full load adjustment
- 2) Low load adjustment
- 3) Inductive load adjustment

3.7 TESTS

The meter shall be tested as stipulated in BS/IEC accuracy being checked at 50 Deg.C.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 22C
THREE PHASE KILOWATT HOUR METERS
WITH CURRENT TRANSFORMERS FOR
SERVICE CONNECTIONS

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 22C
THREE PHASE KILOWATT HOUR METERS WITH CURRENT
TRANSFORMERS FOR SERVICE CONNECTIONS

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	General	1
2	Performance Requirements	
3	Construction	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER
STANDARD : OES - 22C
THREE PHASE KILOWATT HOUR METERS
WITH CURRENT TRANSFORMERS FOR SERVICE CONNECTIONS

1. GENERAL

Three phase kilowatt hour meters shall generally conform to BS 5685/IEC 521 and suitable for operation in electrical system and site conditions mentioned in OES 11.

2. PERFORMANCE REQUIREMENTS

Current	200, 300, 400A
Voltage	3 phase, 4 wire, 415 voltage
Frequency	50 Hz
Accuracy	Class 2
Max ambient temperature	50 Deg.C

3. CONSTRUCTION

3.1 CASE

The kWh meters shall be enclosed in a damp proof robust black phenolic moulded case with an integral terminal mechanically strong front connection block. The cover shall be of the same black phenolic moulding with a large glass window properly fixed with clips and adhesive compound on the inside.

An area inside the case it to be provided to facilitate inspection of the magnetic gap. The terminals are to be of heavy brass section tin plated to resist corrosion or electrolytic action and suitable for stranded copper wire for current transformer connection.

3.2 CURRENT AND VOLTAGE ELECTRO MAGNETS

Current and voltage electromagnet cores shall be formed in such a way as to ensure very accurate dimensions and unstressed magnetic circuit. The cores shall be mounted on the frame and so designed as to minimize strains which can lead to long term instability.

3.3 CURRENT AND VOLTAGE COIL

Current and voltage coil shall be from high conductivity wire high quality insulation. The current coil shall have a low loss and a low VA burden at high current.

3.4 **ROTOR**

The rotor shall be of non ferrous metal and constrained against lateral movement. The suspension of magnets shall be in such a manner to give minimum drag against rotation and maximum stiffness against disturbance in vertical direction. The bearings shall be of magnetic repulsion type.

3.5 **REGISTER**

The meter shall be provided with cyclometer register with six wheels. The numbers are in white on a black back ground. The meter shall be direct reading type without use of multiplying factor.

3.6 **ADJUSTMENTS**

The KWh meters shall have the following adjustment facilities :

- 1) Full load adjustment
- 2) Low load adjustment
- 3) Inductive load adjustment

3.7 **CURRENT TRANSFORMERS**

The CT's shall be ring type, moulded cast resin suitable for installation at the entry of service cable and shall conform to BS 3938/IEC.

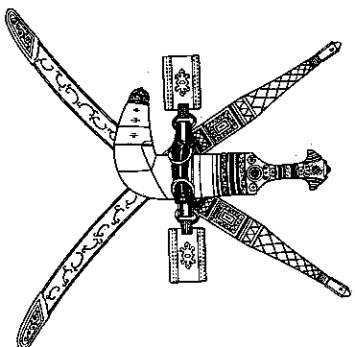
- Inner dia of CT : not less than 55 mm
- Ratio : 200/5, 300/5, or 400/5
- Burden : not less than 5 VA
- Accuracy class : 0.5

3.8 **TESTS**

The meter shall be tested as stipulated in BS/IEC accuracy being checked at 50 Deg. C.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 23 KVAH METERS

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 23
KVAH METERS

TABLE OF CONTENTS

Clause No.	Description	Page No.
1	Case	1
2	Terminals	
3	Current and Voltage Elements	
4	Rotor and Bearing	
5	Register	2

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 23
KVAH METERS

1. CASE

The KV/Ah meters shall be enclosed in a damp proof robust phenolic moulded case with an integral mechanically strong front terminal connection block. The cover shall be of the same black phenolic moulding with a large glass window properly fixed with clips and adhesive compound on the inside.

2. TERMINALS

The terminals shall be of heavy brass section tin plated to resist corrosion or electrolytic action and sized to accommodate 35 sq.mm stranded copper wire for meters upto 100 amps rating and for 4 sq.mm stranded copper with for C.T. connected meters.

3. CURRENT AND VOLTAGE ELEMENTS

Current and voltage cores shall be formed in such a way to ensure very accurate dimensions and unstressed magnetic circuits. The cores shall be mounted on the frame and so designed as to minimize strains which can lead to long term instability.

Current and voltage coils shall be from high conductivity wire with high quality insulation. The current coil shall have a low loss and low VA burden at high current.

The KVAh meter shall have the following adjustment facilities :

- 1) Full load adjustment
- 2) Low load adjustment
- 3) Inductive load adjustment

4. ROTOR AND BEARING

The rotor shall be of non-ferrous metal and constrained against lateral movement. The suspension of magnets shall be in such a manner to give minimum drag against rotation and maximum stiffness against disturbance in vertical direction. The bearing shall be of magnetic repulsion type.

5. REGISTER

The meter shall be provided with cyclometer register with six continuously driven number wheels. The numbers shall be white on black background.

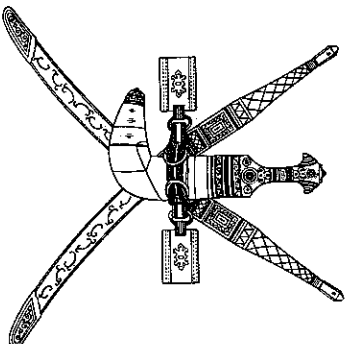
Meters shall be fully tropicalised to suit the climatic conditions of OMAN.

Three phase meters shall be for 4 wire unbalanced load, long range 20 - 100 amps.

C.T. operated meters shall be direct reading for C.T. ratios 200/5, 400/5, 800/5 and 1600/5A calibrated with the associated C.T.'s and supplied with the meters.

SULTANATE OF OMAN

MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 28 400 AMPS METACLAD CUTOFF BOX

BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 28
400 AMPS METALCLAD CUTOFF BOX

TABLE OF CONTENTS

Clause No.	Description	Page No.
1.0	General	1
2.0	Busbar and Contact Assemblies	
3.0	Barrier	2
4.0	Cable Entry	
5.0	Earthing Terminal	
6.0	Painting and Finish	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER
STANDARD : OES - 28
400A METALCLAD CUTOUT BOX

1.0 GENERAL

400A cutout box shall be suitable for outdoor use in the site condition of Oman as stipulated in Oman Electrical Standard 11 - Clause 01 and on 4 wire - 415/240V 50Hz distribution system. Cutout box shall generally as per Drawing No. MEW-OH-GA-42. The equipment offered shall have been tested at a recognized testing station upto 46KA RMS for 0.5 sec. Short circuit test certificate issued by Independent Test Authority to be submitted with the offer. Enclosure of cutout box shall be fabricated with high quality Electro zinc coated sheet steel of 2mm thickness, painted and finished as given in the specification. The degree of protection shall be IP55 according to IEC standard. The enclosure shall have a hinged (brass and gun metal) and lockable front door with pad locking arrangement. The door shall be sealed by neoprene gaskets withstanding temperature and humid site condition.

Vermyn proof ventilation inlet and outlet apertures shall be provided.

The enclosure shall be provided with suitable brackets for mounting on the channel.

Enameled danger plate in Arabic and English with danger signs shall be fitted on the front of the cutout box.

2.0 BUSBAR AND CONTACT ASSEMBLIES

Busbars of 40 x 50mm thick tinned copper shall be provided for phase and 30 x 5mm for neutral. Busbar shall be supported on insulator of synthetic material arc proof and with minimum clearance of 50mm from the rear of the enclosure. They shall be staggered for ease of termination.

"J" type fuse carrier and base rated for 400A shall be provided. Fuse carrier handles shall be arc resistance and of synthetic material or equivalent. Porcelain material is not acceptable.

There shall be one standard size of fixed contact assembly of one piece construction which shall be suitable for accommodation a fuse carrier fitted with 92mm terminal centre fuse link. Each fuse carrier shall be suitable for inserting in a phase of the unit by hinge action pivoted on lower contact and for withdrawing by snatch action. The contact shall be arranged to permit contact tightening and the contact surfaces shall be flat and accurately aligned in pairs.

Contact assemblies shall be fixed to the steel work by means of strips, rod, bars or mouldings of insulating material. The arrangement produced in service by the temperature rise of connection shall no adversely affect the alignment of contact surfaces. Gripping handle of fuse carrier shall be such that can be conveniently held without causing discomfort and injury to personnel while replacing/checking fuses.

3.0 BARRIER

Insulated dividing barrier shall be provided between phase contact assemblies and phase and neutral contact assemblies which shall make it impossible to insert a fuse link between contacts of different phases. Insulated shield shall be provided between the front door and live contacts.

Barrier material shall be arc and temperature resistance.

Indelible markings for phase and cable identification shall be provided on the top of barrier as well as inside.

Phase busbar shall be colour marked from top to bottom - red, yellow, blue.

4.0 CABLE ENTRY

Cable entry shall be with both incomer and outgoing from the bottom or Incomer from the top and outgoing from the bottom.

In the case of cable entry from the top, double compression gland shall be provided with PVC shroud to prevent ingress of water.

Glands shall be of brass with earth tag suitable for 4C x 240 sq.mm XLPE/PVC/SWA/PVC cable.

5.0 EARTHING TERMINAL

Brass earthing terminal shall be provided to accommodate an external earthing cable 70 sq.mm XLPE. Neutral to earth connection shall be provided between outgoing neutral connection and the main earth point.

6.0 PAINTING AND FINISH

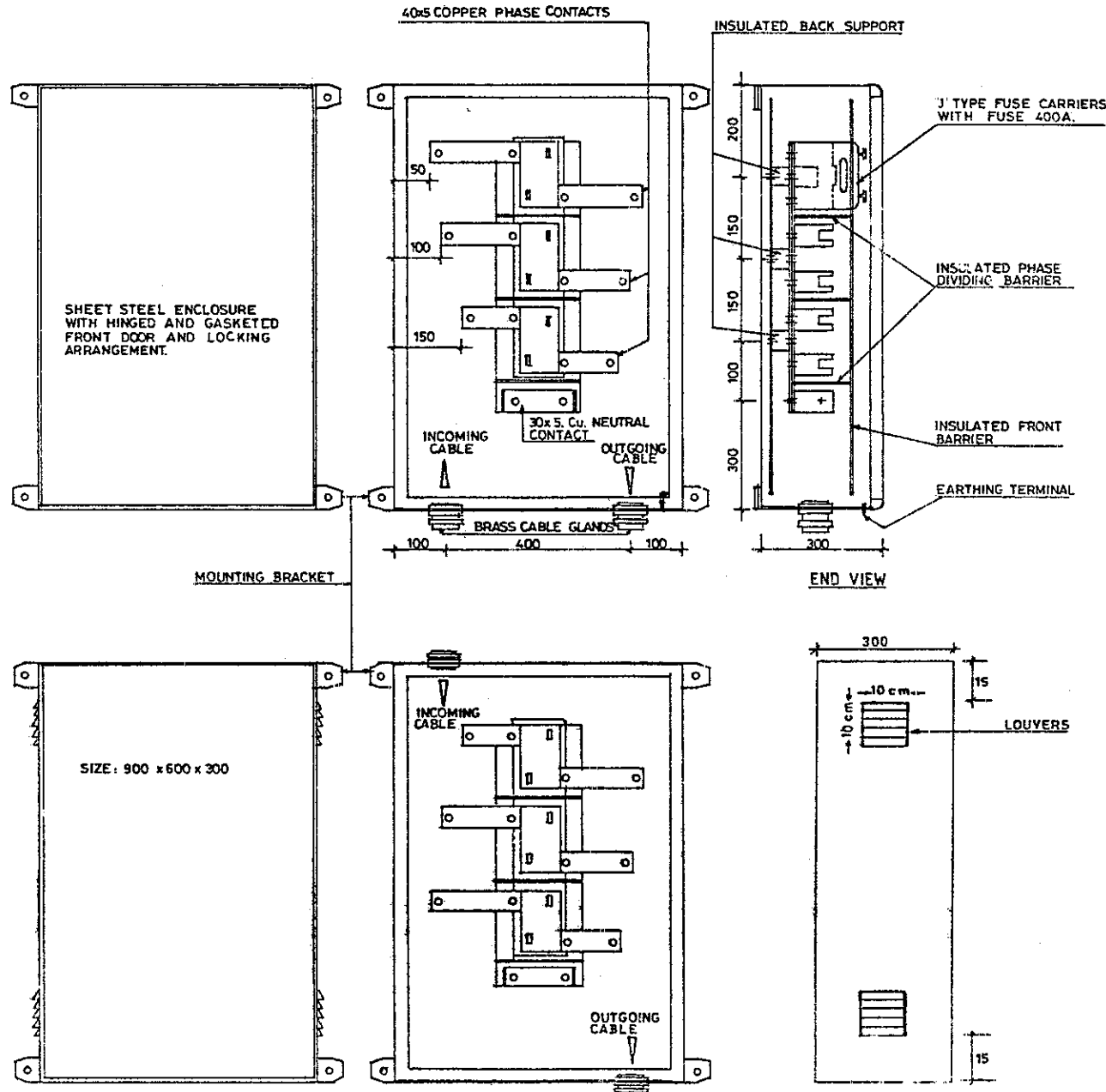
It is to be borne in mind that the atmosphere in Oman is highly corrosive. Therefore, special attention should be given to protection of enclosures.

The painting procedure shall be as follows :

- i) After welding and grinding, cold zinc is to be applied to the affected areas.
- ii) Cleaning and passivation of the surface.
- iii) Application of zinc phosphate coat approximately one micron thick.
- iv) Electrophoretic dip coat primary to the thickness of 25 microns.
- v) The last coat is polyester powder, electrostatically applied and baked at 180°C thickness of coating shall be 80 microns.

Colour shall be admiral grey.

The certificate shall be submitted for the guaranteed life for 5 years.

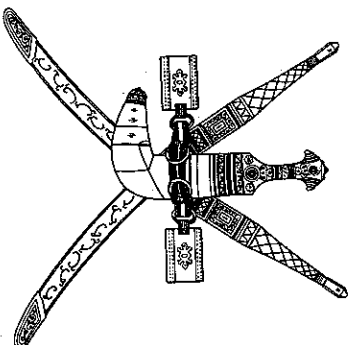


NOTE:
All dimensions in mm are minimum required and tentative.

LOUVERS
VERMIN PROOF VENTILATION INLET AND OUTLET APERTURE

REV	DATE	DESCRIPTION	CHKD	APPD
08-94		LOC. OF EARTH TERMINAL CHANGED, LOUVERS ADDED		
SULTANATE OF OMAN MINISTRY OF ELECTRICITY AND WATER				
400 Amp. METAL CLAD CUT OUT BOX.				
DRAWN		CHECKED	APPROVED	
FRANCIS		<i>[Signature]</i>	<i>[Signature]</i>	
DRAWING NO: MEW/OH-GA/42				
SCALE: N.T.S.			DATE: 13-03-1991	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER



STANDARD : OES - 31
SINGLE / THREE PHASE AND NEUTRAL
CUTOUTS FOR SERVICE CONNECTIONS
BRIEF SPECIFICATIONS

Second Edition : January 1995

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 31
SINGLE/THREE PHASE AND NEUTRAL CUTOUTS
FOR SERVICE CONNECTIONS

TABLE OF CONTENTS

Clause No.	Description	Page No.
01	General	1
02 A	Single Phase and Neutral Cutout	
02 B	Three Phase and Neutral Cutout	

SULTANATE OF OMAN
MINISTRY OF ELECTRICITY & WATER

STANDARD : OES - 31
SINGLE/THREE PHASE AND NEUTRAL CUTOUTS
FOR SERVICE CONNECTIONS

01. GENERAL

Single phase and neutral cutout shall be suitable for operations in electrical system and site conditions mentioned in OES-11.

02. A : SINGLE PHASE AND NEUTRAL CUTOUT

Single phase and neutral cutout shall be all insulated of phenolic mouldings (case, fuse carrier, neutral cover and earth block cover).

The cutout shall comprise :

- 100 amp fuse unit per phase
- Neutral block
- Earth block

The fuse unit shall incorporate a cartridge barrel type fuse link 100 amps to BS 88 - 57.2mm long, 30.2 mm dia. The fuse carrier shall be interlocked such that no components can be exposed or removed unless the fuse carrier is withdrawn. The fuse carrier shall have facilities for sealing with sealing wire and lead seal.

Terminals shall comprise substantial tinned brass terminal blocks with large diameter pinching screws, two per conductor on phase, neutral and earth blocks with fixing stud screws.

B : THREE PHASE AND NEUTRAL CUTOUT

Three phase and neutral cutout shall be similar to the single phase and neutral cutout specified in 2A above except that it shall include three phase units complete with 100 amps HRC cartridge barrel type fuse links.