

**SPECIFICATION FOR 11 KV HIGH VOLTAGE RING-MAIN UNIT  
DISTRIBUTION SWITCHGEAR**

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## 1.0 SCOPE OF SPECIFICATION

This specification applies to the design, manufacture, inspection, testing, delivery to site, unloading, complete installation, wiring, connections, final testing and putting into commission, handing over in approved working order and maintenance during the defects liability period as stated in the Conditions of Contract.

The distribution switchgear included in this specification covers:

- a. Oil-switch unit suitable for feeder cables up to 300 sq. mm. 3 core 11 KV aluminium or copper.
- b. Switchfuse unit suitable for transformers up to 1,500 KVA 11/.4 KV.

Unless otherwise specification the switchgear units must be of extensible type which can be arranged in various combinations to form ring-main switchboards, or used as single units.

This specification should be read in conjunction with the Tender Forms, Schedule of Rates and Prices and Drawings which bear reference to this specification.

## 2.0 STANDARDS

All equipment covered by this specification shall comply with the relevant British Standards Current at the time of tendering and with the clauses of this specification. If any Tenderer offers equipment which conform to standards other than those published by the British Standards Institution, full details of the differences between the proposed standard and the equivalent British Standard, in so far as they affect the design and performance of the equipment, shall be submitted with the Tender.

### **3.0 APPROVAL OF EQUIPMENT**

All equipment offered by the Tenderer shall be approved by the Jabatan Bekalan Elektrik for use in Peninsular Malaysia. However, approval of equipment by the Jabatan Bekalan Elektrik shall not prejudice the right of the Superintending Officer to reject the equipment.

### **4.0 PARTICULARS AND GUARANTEES**

Tenderers shall submit at the time of tendering detailed technical Particulars and Guarantees in respect of the equipment offered, which shall be binding. No departure from these Particulars and Guarantees will be permitted except with the written approval of the Superintending Officer. Notwithstanding any description, drawing, illustrations or pamphlets which may be submitted with the Tender, all details other than those stated by the Tenderer in the Schedule of Departures from specification, at the time of tendering, will be deemed to be in full conformity with the specification.

The successful Tenderer shall guarantee the plant and equipment to be supplied under this Tender against faulty design, materials and workmanship at the manufacturer's works, for the period stated in the Condition of Contract commencing from the date of handing over in approved working order of the complete installation under the Contract.

### **5.0 RATING OF SWITCHGEAR**

- a. Each distribution switchgear equipment specified shall be suitable for continuous service on a 11 KV, 3 phase, 50 HZ, neutral earthed system.

- b. The fixed and moving portions of each oil-switch equipment specified including the integral earthing switch contacts shall be insulated for 11 KV throughout and shall have a continuous normal current capacity of 400 Amperes, a short time (3 seconds duration) current carrying capacity of 13.1 KA R.M.S. and a making capacity of 33.4 KA peak corresponding to an equivalent rating of 250 MVA at 11 KV. An A.S.T.A. or other approved type test certificate shall be submitted with the Tender.
- c. The fixed and moving portions of each switchfuse equipment specified including the integral earthing switch contacts shall be insulated for 11 KV throughout. The fixed bus-bar portion shall be suitable for a continuous normal rating of 400 Amperes, and a short time (3 seconds duration) current of 13.1 KA R.M.S.

The air-insulated switchfuse unit shall have a continuous normal rating of at least 150 Amperes, a rated fault making and breaking capacity of 33.4 KA peak, corresponding to 250 KVA at 11 KV, when used in conjunction with HRC 11 KV fuses. The integral earthing switch should have a fault making capacity not less than 250 MVA at 11 KV. An A.S.T.A. or other approved type test certificate shall be submitted with the Tender.

## 6.0 TYPE OF SWITCHGEAR

The extensible ring main distribution switchgear comprising of oilswitch and switchfuse equipment shall be of the single bus-bar, tropicalised, metalclad, extensible type, with integral earthing and testing terminals fitted with one of the operating and integral earthing mechanism specified in Clauses 7(b) and 8(b). The units shall be extensible both to the right and left and it should be possible to couple different combinations of oil switch and switchfuse units in the approve manner to form

different patterns of combination switchboards. Unless otherwise specified the units shall be suitable for outdoor use although they may be used indoors.

## 7.0 OIL SWITCH EQUIPMENT

### a. Type

Each oil-switch shall be of the triple pole, gang operated, non-automatic type with quick break contacts under a good head of oil, with integral feeder earthing equipment without the use of loose accessories.

### b. Operating Mechanism:

Each oil-switch shall be fitted with a direct manually operated mechanism having three operating positions `ON', `OFF' and `EARTH'. Inadvertent operation from `ON' direct to `EARTH' or vice-versa shall be prevented by a manually operated gate type mechanical interlocking arrangement of a fool-proof design. The interlocks may operate either in conjunction with the re-location of a single operating handle or with two separate operating handles. It shall be possible to lock the operating mechanism in any of the three positions when the contacts have fully homed, and also to independently lock off the `ON' and `EARTH' positions. The positions `ON', `OFF' and `EARTH' of the switch shall be clearly indicated such that the direction of movement of the operating handle(s) from one position to another is readily apparent.

The switch mechanism shall give a quick-make and quick-break operation to all positions by the use of one set of springs. The speeds of make and break shall be independent of the rate of movement of the operating handle.

The switch mechanism shall be housed in a separate air-filled compartment to enable inspection or maintenance of the mechanism while the equipment is still in service, without the danger of contacting live parts.

c. Testing Facilities

Each oil-switch shall be provided with facilities for carrying out applied high voltage tests and injected-current tests on the circuit connected to the switch. These may be effected by the insertion of a 3 phase testing device when the switch is in the `EARTH' position, to become effective only when the main contacts are in the `OFF' position. Alternatively these may take the form of a 3 phase built-in test/earth bushing terminals enclosed within a cover which shall be fully interlocked with the operating handle(s) to prevent access until the switch is in the `EARTH' position. A full complement of fool-proof mechanical interlocking shall be provided to prevent the following operations:

- 1) The opening of the testing access when the switch is in any other than the `EARTH' position.
- 2) The testing device being inserted or withdrawn when the switch is in any other than `EARTH' position.
- 3) The movement of the switch to the `ON' position when the testing access is open, whether or not the testing device has been inserted.
- 4) The movement of the switch away from the `EARTH' position,

in cases where testing entails the removal of an earth connection from a built-in test/earth bushing, until the earth connection is restored.

The testing facilities shall provide for the attachment of test connections external to the switch for applied voltage and injected current tests. The test connections shall be capable of withstanding 20 KV DC to earth for 15 minutes and capable of carrying 400 Amperes continuously.

A 3 phase testing device suitable for use with each type of oil-switch(es) offered under this Tender shall be provided by the Electrical Contractor whether or not this item is separately itemised in the Schedule of Rates and Prices of the tender document.

## **8.0 SWITCHFUSE EQUIPMENT**

### **a. Type**

Each switchfuse shall be of the triple pole, gang operated, fully automatic type using striker pin plunger type HRC fuses, with quick break contacts under a good head of oil, and with integral feeder earthing equipment without the use of loose accessories. The fuses shall be contained in an air-insulate fuse chamber preferably at the front of the unit. Access to the fuses shall be by means of a door which is fully interlocked to ensure that it can be opened only after all conductors within the fuse-chamber have been earthed.

### **b. Operating Mechanism:**

Each switchfuse shall be fitted with either a spring assisted or a free handle operating mechanism together with a cable earthing operating mechanism, duly interlocked with each other via a robust mechanical, duly inter-locking arrangement of a fool-proof design, to prevent inadvertent mal-operation from `ON' position direct to `EARTH' position or vice-versa. It shall be possible to lock the operating mechanism in any of the `ON', `OFF' or `EARTH' positions. A visible `ON', `OFF' and `EARTH' indicator shall be provided to indicate the position of the switchfuse. Further, the various positions shall be clearly marked such that the movement of the operating handle(s) from one position to another is readily apparent. The switchfuse shall also be provided with an automatic tripping device such that the blowing of any one fuse and consequently the actuation of any one of the striker pins of the three H.R.C. fuses shall trip all three phases simultaneously, and the mechanical indicator shall then indicate `OFF'. Conversely, if any one fuse is blown, it should not be possible to close the switch contacts.

**c. Testing Facilities**

Each switchfuse unit shall be provided with facilities for carrying out applied high voltage tests and injected-current tests on the circuit side of the switchfuse. These may be effected by the insertion of a 3 phase testing device when the switch is in the `EARTH' position to become effective only when the main contacts are in the `OFF' position. Alternatively these may take the form of a 3 phase built-in test/earth bushing terminals enclosed within a cover which shall be fully interlocked with operating handle(s) to prevent access until the switch is in the `EARTH' position. a full complement of fool-proof mechanical interlocking shall be provided to prevent the following operations:.

- 1) The opening of the testing access when switch is in any other than `EARTH' position.

- 2) The testing device being inserted or withdrawn when the switch is in any other than `EARTH' position.
- 3) The movement of the switch to the `ON' position when the testing access is open whether or not the testing device has been inserted.
- 4) The movement of the switch away from `EARTH' position, in cases where testing entails the removal of an earth connection from a built-in test/earth bushings, until the earth connection is restored.

The testing facilities shall provide for the attachment of test connections external to the switchfuse for applied voltage and injected-current tests. The test connections shall be capable of withstanding 20 KV DC to earth for 15 minutes and capable of carrying at least 200 Amperes continuously.

A 3 phase testing device suitable for use with each type of switchfuse(s) offered under this Tender shall be provided by the Electrical Contractor whether or not this item is separately itemized in the Schedule of Rates and Prices of the tender document.

d. Fuses and Fuse Carrier:

Fuses used in the switchfuses shall be air-insulated, HRC type with striker pin plungers suitable for 11 KV, 3 phase, 50 HZ system and complying with BS 2692 : 1975.

It shall not be possible to gain access to any part of the fuse carrier unless the switchfuse is in the `OFF' position and the fuse terminals are fully isolated from the bus-bar as well as the circuit ends. Conversely it shall not be possible to switch `ON' when the access to the fuses or fuse carrier is possible. A full complement of fool-proof interlocks shall be provided for this purpose.

A similar quantity of fuses used in all switchfuse units for the installation shall be provided by the Electrical Contractor as spares whether or not this item is separately itemized in the Schedule of Rates and Prices of the tender document.

## 9.0 AUXILIARY SWITCHES

Auxiliary switches capable of positively driven in both directions shall be provided at all oil-switch and switchfuse units for remote as well as local indication and alarm purposes. They shall be mounted so as to be readily accessible for maintenance and shall be so designed to facilitate inspection, cleaning and adjustment.

Each oil-switch and switchfuse unit shall be fitted with a minimum of two N.O. and two N.C. auxiliary switches which shall be wired to appropriate terminal boards at the unit, weather or not these are used in the first instance.

Unless otherwise stated these auxiliary switches shall be suitable for operation on normal single phase 240 V A.C. supply.

## 10.0 OIL LEVEL INDICATOR

An oil level indicator shall be fitted to each oil-switch and switchfuse tank so as to show the oil level at normal working temperatures. The marking on the level indicator shall be preferably inside the chamber so as to render the marking indelible.

## 11.0 CABLE BOX

Each oil-switch and switchfuse unit shall be fitted with a feeder cable dividing and sealing box gland and armoured clamp suitable for 11 KV, 3 core, P.I.L.C.D.S.T.A.S. cable to BS 6480 of any conductor size up to 300 sq. mm. The cable box shall be suitable for bituminous compound filling and shall be split on the centre line of the cable or otherwise to permit horizontal insertion and removal of the cable. The cable box gland shall normally be for a cable entering vertically from below. However, due to site conditions a bottom angled entry or a vertical top entry may be

required. In such cases, the Electrical Contract shall supply the appropriate cable box and gland at no extra cost. The cable box shall be provided with large filling orifices and suitable expansion space.

#### 12.0 **PAD LOCKING**

Locking facilities specified in clauses 7(b) and 8(b) shall be suitable for 2-inch Yale padlocks which shall be supplied by the Electrical Contractor. Two master keys for all padlocks supplied for all switchgears in the whole installation shall be provided by the Electrical Contractor. Alternatively, padlocks with keys alike may be accepted.

#### 13.0 **CIRCUIT LABEL**

Each oil-switch and switchfuse unit shall be fitted with a blank label of laminated material (the inner and outer laminations being of contrasting colours) mounted on the front of the unit, of a size not less than 150 mm x 50 mm.

The label shall be suitable for being engraved upon such that the colour of the characters engraved shall have adequate contrast against the colour of the unengraved portion of the label to render the engraved inscription clearly visible from a reasonable viewing distance.

The exact wordings to be engraved on the label shall be agreed upon with the Superintending Officer.

#### 14.0 **EARTHING**

Each oil-switch and switchfuse shall be provided with a main earth bar of not less than 25 mm x 5 mm flat hard drawn copper. The earth bar shall be bolted to the main frame and located so as to provide convenient facilities for earthing cable sheaths

and for use with earthing device. Means shall be provided for coupling earth bars of adjacent units. The joints shall be tinned and bolted.

#### 15.0 PAINTING

Each oil-switch and switchfuse equipment shall have one coat of primary, one undercoat and a third finishing coat of paint applied at the manufacturer's works. The final coat applied shall be an oil resisting enamel paint of 'Light Grey' colour No. 631 in BS 381C.

#### 16.0 SPARES

The Tenderer shall submit with his Tender separate Schedule of Spares recommended by the supplier of the equipment. This Schedule should contain the price and delivery period of each item of the spares recommended. The Tenderer shall also recommend the quantity of each item to be stored for the purpose of maintenance. The prices of these spares shall not be included in the total Tender Price and the purchase of all or any of the spares listed shall be at the option of the Superintending Officer. The prices quoted shall be valid for acceptance during contract period (extended if applicable) of the project.

All spare parts shall be original and fully interchangeable with the corresponding part used in the main items of the equipment and with each other without having to resort to machining of additional fittings at site. All spares shall be finished, protected, packed and labelled in a suitable manner to prevent deterioration during prolonged storage in tropical climate.

#### 17.0 TROPICALIZATION AND VERMIN PROOFING

All oil-switch and switchfuse equipment covered by this specification shall be fully tropicalized to make them suitable for continuous operation in the extremely humid and tropical climatic conditions experienced in Malaysia.

The equipment shall also be designed to prevent ingress of vermin, accidental contact with live parts, and to minimize the ingress of dust and dirt. Materials which may be liable to attack by termites and other insects should not be used.

#### **18.0 INSULATING OIL AND COMPOUND**

The first filling of insulating oil and cable box compound shall be supplied and filled by the Electrical Contractor.

#### **19.0 TOOLS AND APPLIANCES**

This Tender shall include the supply and delivery of one set of standard tools as well as any special tools, gauges, handling appliances, etc. required for the assembly, checking, adjustment and normal maintenance of the oil-switch and switchfuse equipment weather or not these are separately itemized in the Schedule of Rates and Prices of the Tender document.

#### **20.0 TESTING AND COMMISSIONING**

On completion of the installation work on site, the Electrical Contractor shall, at his own expense, arrange for all necessary tests to be carried out on the equipment by either TNB or TNB approved testing authority as part of the tests required of him for the whole installation under his contract.

On successful testing of the complete installation, the Electrical Contractor shall arrange to commission the equipment in the presence of the Superintending Officer.

4 complete sets of test results for the equipment installation shall be supplied by the Electrical Contractor.

## **21.0 REJECTION OF PLANT**

Any item of plant or component which fails to comply with the requirements of his specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site within the defects liability period of the contract may be rejected by the Superintending Officer either in whole or in part as he considers necessary. After adjustment or modification if so directed by the Superintending Officer, the requirements of this specification cannot be fulfilled by adjustment or modification shall be replaced by the Electrical Contractor at his own expense and to the satisfaction of the Superintending Officer.

## **22.0 MANUFACTURER'S CATALOGUE AND DRAWING**

Manufacturers' catalogue and drawing giving detailed information on the general arrangement of the oil-switch and switchfuse equipment, overall dimension, general construction, position of main cable, grouting bolts, loading on foundation, minimum clearance to rear end wall, technical specification and other useful details shall be submitted together with the Tender.

### 23.0 WORKING DRAWINGS

Within 3 weeks after award of the Tender, the Electrical Contractor shall submit to the Superintending Officer for approval working drawings showing dimensional general arrangement and section drawings and schematic/wiring diagrams of the equipment offered. These drawings shall be submitted in quadruplicate. The drawings submitted shall be Officer and re-submitted for final approval. However, approval of the drawings will not exonerate the Electrical Contractor from any responsibility in connection with the work.

As soon as the installation of the equipment is completed, the Electrical Contractor shall submit one true to scale copy of negative of each drawing previously approved.

### 24.0 RECORD DRAWINGS

Within a month after practical completion of the project, the Electrical Contractor shall submit to the Superintending Officer one set of true to scale negatives (155/165 sq.m.) and four sets of prints of each of the approved working drawings deemed necessary by the Superintending Officer for record and maintenance purposes.

All drawings submitted by the Electrical Contractor shall have the following particulars at the lower right hand corner, in addition to the manufacturer's name, date, scale, drawing number and title:-

**JABATAN KERJA RAYA**  
**CAWANGAN ELEKTRIK**  
**NO KONTRAK: .....**  
**NO TENDER : .....**

## 25.0 INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

As soon as the general arrangement and details of the equipment to be supplied have been finalised and before the delivery of the equipment, the Electrical Contractor shall submit to the Superintending Officer 4 copies of detailed installation, operation and maintenance instructions in respect of the equipment to be supplied. The instructions shall cover the main as well as any associated equipment. For this purpose, manufacturers' standard brochures will be acceptable provided that they refer particularly to the equipment to be supplied and are free from extraneous matter.

The instructions shall include essential details, drawings and sketches of the equipment installation, operation and maintenance techniques, make mention of special materials where used and include schedules of recommended lubricants etc. All manuals submitted shall be properly bound with hard-covers and titles to the satisfaction of the Superintending Officer. The cost of these manuals shall be deemed to be included in the Tender Price.

After commissioning of the plant, the Electrical Contractor shall if specified provide the service of one competent person to operate and maintain the plant together with the Government's personnel who are put in charge of the daily operation and maintenance of the plant for a period specified in the Schedule of Rates and Prices. This period may be extended if required by the Superintending Officer. During this period, the Electrical Contractor shall endeavour to train up the personnel to ensure that the latter are well equipped for the proper operation of the plant after the specified period.

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