

# **KARNATAKA POWER TRANSMISSION CORPORATION LIMITED**

**TECHNICAL**

**SPECIFICATION-**

**A.C.OUTDOOR**

**DISTRIBUTION**

**BOX**

# TECHNICAL

# SPECIFICATION

Section - A. C. OUTDOOR DISTRIBUTION BOX

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## Section 5.3 (A.C.Outdoor Distribution Box)

### **TECHNICAL SPECIFICATIONS FOR OUTDOOR DISTRIBUTION BOX (A.C.) FOR POWER & LIGHTING CIRCUITS**

#### **1.0 SCOPE:**

This specification covers the manufacture, testing at manufacturer' works, Supply & delivery of outdoor type distribution fuse boards for lighting & power circuits at 220 kV & 110 kV Receiving stations.

#### **2.0 STANDARDS**

- 2.01 The distribution boards shall generally conform to IS:2675/1966 (with latest amendments) - specification for enclosed distribution fuse boards & courts for voltages not exceeding 1000 Volts.

#### **3.0 GENERAL REQUIREMENTS**

3.01 Irrespective of anything said or omitted in this specification, the distribution box shall be suitable for the purpose they are intended be used. Each distribution box shall be complete with accessories such as bus-bars, fuses, lock & key etc.,

3.02 The distribution fuse boards are required for distribution of  $415V \pm 10\%$ , 3Phase, 4 wire /  $240V \pm 10\%$  single phase AC with phase AC neutral earthed, required for power supply to group operating switches, CB, lighting of - outdoor yard, cable duct fighting & emergency lighting.

3.03 The A. C. distribution fuse boards shall be 500 V grade. The distribution boxes shall be double front or single front type, as specified with provision for incomers & outgoing feeders in each section of the box as shown in the drawing The general arrangement of the AC/DC distribution boxes are shown in the following drawings

1. Drawing No.KF-B/TECIVSub-Station/220/168/9.9.92 - detailed arrangement

of distribution box "Type - A" - Single front type.

2. Drawing No. KEB/TECIVSub-Station/220/168/9-9.92 - detailed arrangement of distribution box "Type - B" - Double front type.

3.04 The distribution fuse boards shall be fabricated out of 2.5mm thick- M.S. sheets of tested quality for body & shutters with 40x40x4mm M.S. and iron frame. The shutters & body shall be suitably ribbed to give light but strong structure.

3.05 The A.C. distribution fuse boards shall have hinged double doors at front & at back for double front type. Each door shall have independent type door lock & shall be capable of being opened & closed independently. The doors shall be so fitted as to provide the interior with maximum protection from atmospheric condition. The hinges shall be of such construction that the doors can swing open by not less than 150° and in addition hinges shall permit doors being completely removed when necessary.

3.06 The distribution boxes shall be provided with suitable aprons/canopy as shown in the drawing enclosed. The un-drilled sides, bottom & top covers shall be detachable. The distribution fuse boards shall be designed in such a way that when closed they are perfectly water tight dust & vermin proof. Special arrangement to prevent ingress of moisture into the interior of the distribution boxes shall be made. All bolts nuts & washers used shall be galvanized mild steel. All the doors of the distribution box shall be fitted with dust proof gaskets. The louver type ventilators shall be provided on the front as shown in drawing & wire nets shall be provided on the back of the ventilator for prevention of entry of dust, insects etc., into the boxes.

3.07 The cable entry & exit are the sides through the extended box at the top on both sides & the design of the box must be such as to facilitate for housing of 100A, MCCB for incoming & 100 A HRC fuse link, for outgoing. The clearance inside the box must be such as to afford fair working facilities during erection & maintenance.

There shall be provision for easy removal of cable during erection & repairs, by suitably bolting the box cover & preferably sliding the bottom plates. A front hinged door with lock arrangement shall be provided for each of the side box for operation of MCCB & HRC fuse links. However, the entry of the cable at the extended box is to be through a 50mm G.I. pipe & projecting 50mm inside the box through suitable gland. The extended box must be provided with suitable gland & clamp for fixing the cable rigidly. The box shall be suitably ribbed to give a light but strong structure.

3.08 The distribution boxes shall be mounted on, a suitable angle iron mounting structure. 2 Nos of rust proof grounding lugs shall be provided on the angle iron framework of box with terminals suitable for M.S. flat. The earthing terminal shall be identified by means of the sign marked legibly & indelibly adjacent to the earthing terminals.

### 3.09 FINISH:

All steel surface shall be sand blasted, grounded, pickled as required to produce a smooth, clean surface free of scale, grease & rust. After cleaning, the surfaces shall be given a phosphate coating followed by quality primer & stowed after each coat

The finishing coat on the exterior of the distribution' box shall be light Grey corresponding to shade No. 631 of IS-5 with two coats of synthetic enamel paint & colour to the interior surface shall be finished stowed enamel white. A small quantity of finishing paint shall be supplied with each consignment of distribution box to enable to restore at site any finish, which may get damaged during transit.

3-10 The distribution fuse boards shall be provided with high purity electrolytic aluminum bus bars. The side of aluminium, bus-bars phase to phase spacing should be consistent with the currents & voltage rating of the incoming / outgoing feeders. The bus bars shall be fixed on the Hylam sheets 10mm thick & of suitable width using 30mm brass bolt & nuts. Exposed portion of the bus-bar shall be provided with insulated sleeves, red for top phase, yellow for the mid phase, blue for the bottom phase & black for the neutral. The overhung portion shall be suitably supported- AD current carrying parts shall be rigidly supported to withstand short circuit stresses. The fuse carrier shall be easily withdrawable. The short circuit will be about 20 KA at 400V.

3.11 All the terminals used for 'interconnection shall be made out of solid drawn copper tubing having suitable conductivity. The interior & exterior surface of tubular sockets shall be tinned by electroplating or by hot dip tinning. After final connections of the bus bars, the bus-bars shall be completely insulated with the approved quality insulation tapes.

3.12 In the A.C. distribution boxes there will be 2 independent circuits each with an incomer & outgoing is provided with removable HRC fuse links for positive isolation of the circuit & also from the point of high fault level on the sub-station. The general arrangement of the circuits is shown in the drawing referred earlier.

There should be insulated barrier of hylam sheets between the front & back portion of the distribution boxes carrying different circuits & it should be possible to work on one side of the box (say front ) with circuit in another side (back 'in energised condition The moulded case CB & HRC fuses shall be of stranded make, ISI mark. Suitable cable gland should be provided for the main incomer/outgoing to the distribution boxes.

3.13 The outgoing feeders should be provide with HRC fuses front connected type, & MCB of adequate rating. The MCB, MCCB & the HRC fuse links shall be rated for rupturing capacity of 25 KV at 400 V & they shall be of reputed & standard make. The 'OFF' & 'ON' position of the MCB & MCCB shall be clearly visible when the doors is open- MCB &

MCCBs used shall be of ISI approved make. All the outgoing circuits should be brought to terminal blocks of adequate rating from which outgoing cables will be taken out. The inter connecting wires shall be of copper & suitable bimetallic connections for connections with the bus-bars should be used. Cable glands should be provided for the outgoing feeders of the distribution box.

3.14 The drawing of distribution box shows the typical arrangement. The current ratings etc., are also specified in the drawings.

3.15 All the fuse cutouts & cable terminals shall be so arranged that they shall not cause them to come in contact with one-another or with the enclosure by the movement of the cable after insulation & the fixed connections shall be such that the necessary contact pressure is maintained under the conditions of service & operation. The terminal shall be such that they shall not turn or get displaced when the connecting screws are tightened & such that the conductors shall not be displaced. The wiring inside the distribution fuse boards shall be arranged neatly by grouping the leads properly.

#### **4.0 TERMINAL**

#### **BLOCKS:**

4.1 Terminal blocks shall be 600V grade box clamp type with marking strips similar to ENGLISH / ELECTRIC / JOHNSON / ELMEX type, of stud & bolt type, not more than two wires shall be connected to any terminal. Terminals equal in number to 20% of active terminals shall be finished as spares. Terminal block shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

#### **5.0 SMALL**

#### **WIRING:**

The AC distribution box shall be labeled wired at the factory to ensure proper functioning & control of protection scheme. Wiring shall be done, using 660V Grade PVC insulated with stranded tinned annealed copper conductor. The size of the wire shall be 25 sq mm for 100 Amps circuits & 4sq mm for outgoing 15 Amps circuits. Each wire shall be identified at both ends with permanent markers bearing Wire numbers as per contractors wiring diagram. Wire terminals shall be made with crimping type lugs with insulating sleeves. Wires shall not be spliced between terminals. For each circuit the neutral wire to be connected from neutral bus to terminal block. The colour of the wires used shall be Red for phase. Yellow for 'Y' phase, blue for 'B' phase & black for neutral.

#### **6.0 CIRCUIT**

#### **LABELLING:**

6.01 Each outgoing & incoming circuits shall be labeled both near the MCCBs / HRC fuse, MCBs and also near the terminal blocks, provision shall be made by

means of a label (which is preferably of the renewable type & protected by transparent material) for recording the circuit title, cable size etc.

## 7.0 RATING

## PLATE:

7.01 The following information shall be clearly & indelibly marked on all the distribution fuse boards

1. Rated Voltage.
2. Total number/current rating of incoming fuse ways. going fuse ways.
3. Total number/current of out'.
4. Manufacture's name.
5. P.O. reference & date.

## 8.0 EQUIPMENT

## DETAILS:

8.1 One set of AC distribution box complete with all the equipments listed below with 3 pole electrolyte aluminium bus-bar system & neutral, completely wired, painted, with MCB, MCCB, HRC fuse units, Circuit labels as indicated in the drawing shall be supplied.

8.2 Single & double front AC distribution box shall comprise of the following equipments.

Sl No.	ITEM	SINGLE FRONT	DOUBLE FRONT
1	Free standing sheet steel clad outdoor type, MS cubicle of dimension	750 x 1350 x 300 mm	1200 x 1350 x 600 mm
2	Two independent circuits a) incomer -415V, 3pole, 100 A MCCB with rupturing capacity of 20 KA for 1 sec with separate neutral line b) outgoing 100 A, removable HRC fuse links with fuse base of rating 100A & rupturing capacity of 25KA for 1 sec, with separate neutral line	1 No.         3 No.	2 Nos.         6 Nos.
3	Outgoing feeders : a) 415V, 15/16A, 3 pole MCB b) 10A, HRC fuse links ( for 3 phase ) with suitable base (rupturing capacity 25 KA	6 Nos.   18 Nos.	24 Nos.   72 Nos.

	for 1 sec)		
4	a) 240V, 5/15 A, multi pin industries socket & plug b) 240V, 15A, 2 pole, ON/OFF switch c) 10A, HRC fuse link with suitable fuse base, of rupturing capacity 25 KA for 1 sec with separate neutral link.	1 No.  1 No.  1 No.	2 Nos.  2 Nos.  2 Nos.
5	Electrolytic aluminium bus-bars a) for phases & neutral 20 x 6 mm	As required	As required
6	10 mm thick 100 grade HYLEM sheet for bus-bar mounting 7 installation	As required	As required
7	a) 50/70 sq. mm shrouded terminals for 100 A incoming & outgoing circuits b) 4 sq. mm shrouded terminals for 10A outgoing feeders.	If required  As required	If required  As required
8	Indication lamp for hive bus indication	4 numbers	-----

9.0

**Test:**

Tests for rust protection: This shall be mad-, on a representative sample of the material used for enclosure. The test shall be carried out either on a sample cut from a complete enclosure or metal identical in all respects to the metal used for the enclosure & given an identical protective finish. The same shall be first cleared with a piece of wadding soaked in Benzons & then dried. Then it shall be totally immersed in a solution prepared as detailed below:  
 Solution for use in test for rust protection (13S 214-1973):  
 Prepare a solution of 7.5 grams potassium femicyanide (K3PC Cns) & 2.5 grams of ammonium per sulphate (NHS) 2 (S2013) in I liter of water. Add a quantity of about 1 gram of suitable wetting agent for instance a sodium salt of alkaline naphthalene sulphuric acid to each-liter of the solution. The solution & the sample being maintained. at a temperature of  $20 \pm 1^{\circ}$  C. After immersion for 5 minutes, the sample shall be removed from the solution & left dry in air at room temperature. After the test the sample shall should, no more than two blue colour red spots in any area of 100 sq mm & no spot shall-have a dimension larger than 1.5 mm. Traces of rust on sharp edges & screw threads & any yellowish film removable



by rubbing shall be ignored.

## 9.2 TESTS&TEST

## CERTIFICATES:

All the other type & routine tests prescribed in IS 2675 shall be conducted on all complete distribution box assembled & completed in all respects & the copies of the certificates shall be submitted.

The type test reports shall not be older than Ten (10) years as on the last date of submission of bid.

### **a) For AC outdoor distribution box manufactured in India:**

- i. The type tests on indigenous equipment for which testing facility is available in India, should have been conducted in any independent laboratories approved by the Government or the laboratories accredited by the National accreditation body of the country like Central Power Research Institute (CPRI), Electrical Research and Development Association (ERDA), etc.
- ii. The type tests on indigenous equipment, for which testing facility is not available in India, should have been conducted in a laboratory of foreign country accredited by National accreditation body of that country.
- iii. The type tests conducted in-house by a manufacturer shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests has been conducted in the presence of a representative of NABL accredited laboratory or any of the purchasing utilities or CEA in that order. Such type test reports shall record the details of such witness including the signature/authentication in the type test report.

### **b) For AC outdoor distribution box manufactured Abroad:**

- i. Type tests on imported equipment should have been conducted in an Indian Laboratory or foreign laboratory accredited by National accreditation body of the country where the Type test has been conducted.
- ii. The type tests conducted in-house by a manufacturer shall also be acceptable provided the laboratory is accredited by National accreditation body of the country and the tests has been conducted in the presence of a representative of accredited laboratory or any of the purchasing utilities or CEA in th
- iii. at order. Such type test reports shall record the details of such witness including the signature/authentication in the type test report.

In case of in-house type tested imported equipment of foreign OEM, the term “Purchasing Utility” covers the foreign Utility who has purchased that equipment