

Amendment Slip No. 1  
effective from 10th June 1994  
to CEB Standard 022:1994:

Specification for 36 kV Voltage  
Transformers (Outdoor Type)

REVISED TEXT

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June 1994

Clause 5.0 BASIC FEATURES

5.2 Manufacture

5.2.1 General

Add the following Clause to read as,

" (vi) The Secondary Terminal Box of the Voltage Transformers shall be provided with sealing facilities to prevent access to the unauthorised persons. "

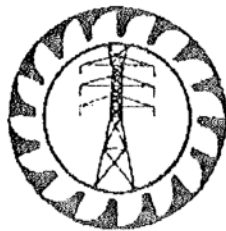
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CEB STANDARD 022 : 1994

*Specification*

*for*

**36kV VOLTAGE TRANSFORMERS  
(OUTDOOR TYPE)**



CEYLON ELECTRICITY BOARD

SRI LANKA

*Specification*

*for*

**36kV VOLTAGE TRANSFORMERS  
(OUTDOOR TYPE)**

**CEB Standard 022 : 1994**

**CEYLON ELECTRICITY BOARD**

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## SPECIFICATION FOR 36 KV VOLTAGE TRANSFORMERS (OUTDOOR TYPE )

### 1.0 SCOPE

This specification covers the design, manufacture and testing of outdoor 36kV Voltage Transformers which are to be installed on 36kV overhead lines for protection as well as for measuring purposes .

### 2.0 SYSTEM PARAMETERS

(a)	Nominal Voltage	:	33kV
(b)	System highest voltage	:	36kV
(c)	System frequency	:	50 Hz
(d)	Number of phases	:	03
(e)	Method of earthing	:	Resonant earthed/Non effectively earthed Neutral system
(f)	System fault level	:	25 KA

### 3.0 SERVICE CONDITIONS

(a)	Annual average ambient temperature	:	30°C
(b)	Maximum ambient temperature	:	40°C
(c)	Maximum relative humidity	:	90%
(d)	Environmental conditions	:	Humid tropical climate of high pollution level.
(e)	Operational altitude	:	Upto 1500M above MSL.

### 4.0 APPLICABLE STANDARDS

The equipment and components supplied shall be in accordance with the standards specified below or subsequent editions and / or amendments thereof.

(a)	IEC 186	(1987)	Voltage Transformer
-----	---------	--------	---------------------

- |     |         |        |  |
|-----|---------|--------|--|
| (b) | BS 729  | (1971) | Hot dip galvanised coating on iron and steel articles. |
| (c) | IEC 296 | (1982) | Insulating Oil for Transformer and Switchgear.         |
| (d) | BS 4190 | (1957) | Hexagnol Bolts and Nuts.                               |

## 5.0 BASIC FEATURES

### 5.1 Design

- 5.1.1 The outdoor post-type Single Phase Voltage Transformers shall be designed for the system highest voltage (Rated Voltage) stipulated in clause 2.0
- 5.1.2 It shall be suitable for mounting on steel structures and necessary fixing bolts and nuts shall be supplied with the equipment.
- 5.1.3 Its windings shall be housed either in a high impact resistance porcelain insulator where normal mineral transformer oil will be the insulating medium or in a high impact resistance Cast Epoxy Resin .

### 5.2 Manufacture

#### 5.2.1 General

- (i) The primary and the secondary windings shall be made of high grade copper.
- (ii) The secondary terminals shall be enclosed in a weather proof terminal box with gland plates at the base of the Voltage Transformers. Lifting tackles shall be provided for lifting and positioning the transformers.
- (iii) The withstand ability of the primary, the saturation of the magnetic core and the secondary characteristic shall not be less than that requested in the Minimum Technical Requirements (Clause No. 5.2.5 )
- (iv) For oil filled type Voltage Transformers, oil level indicator, earth lug etc. shall also be provided. The Voltage Transformers shall be hermetically sealed type and the insulator shall be made of glazed porcelain.
- (v) The cast resin type Voltage Transformers shall have the core and coil assemblies cast in Epoxy Resin, which shall be suitable to withstand high thermal and dynamic stresses due to system and climatic fluctuations. Earth lug etc. shall also be provided.

### 5.2.2 Bolts and nuts

All steel bolts and nuts shall conform to BS 4190 : 1957 the standard specified and the nuts and heads of all bolts to be hexagonal type.

### 5.2.3 Galvanizing

Except where specified to the contrary all iron and steel parts shall be galvanized after sawing, shearing, drilling punching, filing, bending, and machining etc., are completed. Galvanizing shall be by the hot-dip process to comply with the BS 729.

### 5.2.4 Creepage Distance

The Voltage Transformer insulator creepage distance shall not be less than 900 mm and the protected creepage distance shall not be less than 315mm.

### 5.2.5 Minimum Technical Requirements

(a)	Transformations ratio	:	33kV / 110V
(b)	Rated output	:	25VA
(c)	Class of Accuracy	:	Cl. 1
(d)	Rated Voltage Factor and Rated time	: :	1.2 Continuous
(e)	Markings	:	Conforming to IEC 186
(f)	Insulation level		
	i) Impulse withstand voltage	:	170 kV.
	ii) Power frequency wet withstand voltage (1min.)	: :	70 kV.

## 6.0 ADDITIONAL REQUIREMENTS

### 6.1 Terminal Markings

The Primary and Secondary winding terminals shall be marked clearly and indelibly on their surface or in their immediate vicinity conforming to IEC 186.

## 6.2 Rating Plate markings

Ratings and data of the Voltage Transformers shall be provided in the name plate which shall be weather and corrosion proof. The Name plate shall be securely attached to the side of the (lower part) Voltage Transformers so that it could be easily read from the ground level when it is installed at a height of 2.5 m from the ground level.

It shall consist of the following information :-

- (a) Number and year of the standard adopted.
- (b) The manufacturer's identification
- (c) A serial number or type designation, preferably both.
- (d) The rated primary and secondary Voltage.
- (e) The rated frequency.
- (f) The rated output and the corresponding accuracy class.
- (g) The highest rated equipment voltage
- (h) The rated insulation level.
- (i) Rated voltage factor and the corresponding rated time.
- (i) Class of insulation.
- (J) The words "Property of CEB".

## 7.0 INFORMATION TO BE SUPPLIED WITH THE OFFER.

The following shall be furnished with the offer.

- (a) Catalogues describing the equipment and indicating the model number.
- (b) Literature describing the operational features of the equipment.
- (c) Constructional features, materials used for components and relevant technical literature.
- (d) Complete dimensional drawings.
- (e) Magnetization and core loss curves



- (f) A list of names and addresses of ten recent purchasers (of similar items only) indicating quantities supplied, delivery time and the document from such purchasers certifying satisfactory performance of the equipment.
- (g) Rating plate details.
- (h) Completed Schedule of Particulars (ANNEXURE A).
- (i) Type Test Certificates - The Test Certificates and Performance Curves of the Type Test performed conforming to the IEC 186.

The test certificates shall clearly identify the equipment concerned, showing the manufacturer's identity, type No. and basic parameters, and shall be from a recognised independent testing authority acceptable to the purchaser.

Following Type Test reports shall also be submitted .

- (a) High-voltage, power-frequency wet withstand tests
- (b) Lightning impulse voltage withstand test (dry).
- (c) Temperature rise test.
- (d) Tests for determination of errors.
- (e) Short Circuit withstand capability test.

Failure to furnish the particulars asked for in Clause 7.0 will result in the offer being rejected.

## 8.0 TECHNICAL LITERATURE AND DRAWINGS

Technical Literature in English language on the installation and operation shall be supplied with each set of equipment and they shall be descriptive and self explanatory, complete with necessary diagrams and drawings.

## 9.0 INSPECTION & TESTING

### 9.1 Inspection

The selected Bidder shall make necessary arrangements for inspection by an Engineer of the Ceylon Electricity Board to inspect the equipment and witness the routine test conforming to IEC 186.

## 9.2 Routine tests

The routine tests which shall be witnessed are given below.

- (1) Verification of terminal markings.
- (2) Power-frequency withstand tests on
  - i) Primary windings.
  - ii) Secondary windings.
  - iii) Between sections
- (3) Determination of errors.

## 10.0 ANNEXURE

A - Schedule of Particulars

## ANNEXURE - A

## SCHEDULE OF PARTICULARS

The Bidders are required to furnish the following Particulars for each type of Voltage Transformer offered.

ITEM	DESCRIPTION	DETAILS
1	Manufacturer	-
2	Type	-
3	Rated voltage	kV
4	Rated frequency	Hz
5	Rated primary voltage	kV
6	Transformation ratio.	V
7	Rated secondary burden	VA
8	Rated insulation level	
	i) Dry Impulse withstand voltage(1.2kV/50 $\mu$ s) Peak	
	Positive Wave	+kV
	Negative Wave	-kV
	ii) Power frequency withstand voltage	kV
11	Creepage distance of the insulator	mm.
12	Protected creepage distance	mm.
13	Accuracy class	-
14	Rated accuracy limit factor	-
15	Voltage factor and rated time	Sec.
16	Service conditions : Such as indoor or outdoor temperature conditions, altitude, humidity, suitability for exposure to steam, vapour, fumes, explosive gases, excessive dust, salt air etc. should be stated.	-
17	Special features (if any)	-

18	Type of secondary	
19	Volume of oil	
20	Measurement	
21	Total Weight	
22	no. of phases	
23	For non-composite capacitor voltage transformers:	
	(i) In a tapped bushing, the nominal capacitance & p.f.values of C1 and C2 and the tolerance limit	-
	(ii) The maximum permissible working voltage on C1	kV
24	Connection drawings	-

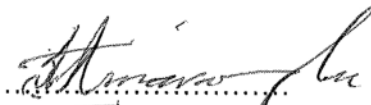
## APPROVAL OF CEB STANDARDS

CEB Standard No. : *CEB Standard 022 : 1994*

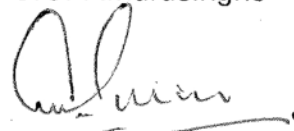
Title of the Standard : *Specification for 36kV Voltage Transformers (Outdoor Type)*

Date of Approval : *February 1994*

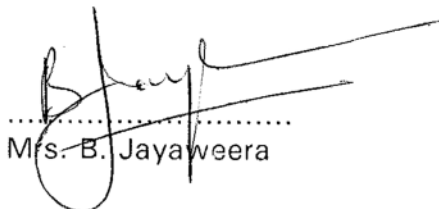
This is to certify that the above Standard has been approved by us.

  
.....  
S.C. Amarasinghe

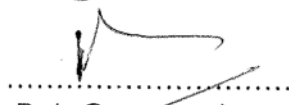
Chairman Specification Committee

  
.....  
A.M. Tissera

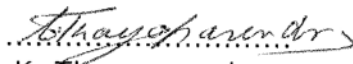
Member Specification Committee

  
.....  
Mrs. B. Jayaweera

Member Specification Committee


  
.....  
R.J. Gunawardena

Member Specification Committee

  
.....  
K. Thayaparendran

Convenor Specification Committee

**CEB Standard 022: 1994- 36kV Voltage Transformers** is approved for adoption in the CEB.

  
General Manager,  
Ceylon Electricity Board.  
General Manager  
Ceylon Electricity Board

Date : 05/05/94