



**SEPTEMBER 2015**

**TECHNICAL DESCRIPTION TD- 81/3**  
**400KV OUTDOOR SOLID-CORE CYLINDRICAL POST INSULATORS WITH**  
**EXTERNAL METAL FITTINGS.**

**I. SCOPE**

This technical description covers IPTO's requirements with regard the design features, rated characteristics and testing of 400kV, outdoor cylindrical post insulators with external metal fittings.

**II. KEYWORDS**

Outdoor cylindrical post insulators, solid core cylindrical post insulators.

**III. STANDARDS**

The cylindrical post insulators shall be in accordance with IEC-60273 and IEC-60168 standards.

**IV. USE**

The outdoor cylindrical post insulators shall be used for bus support at the 400/150/30kV ehv air insulated substations.

**V. OPERATING CONDITIONS**

- |                              |  |
|------------------------------|--|
| 1. Installation              | : Outdoors                                   |
| 2. Ambient temperature range | : maximum + 45°C<br>: minimum - 25°C         |
| 3. Altitude                  | : Up to 1000m above sea level                |
| 4. Relative humidity         | : ≤ 95%                                      |
| 5. Pollution level           | : Moderate to heavy depending on<br>location |
| 6. Wind speed                | : 150Km/h                                    |
| 7. Other conditions          | : Snow, Ice (10mm) and fog                   |



## **VI. IPTO's 20kV ELECTRICAL SYSTEM CHARACTERISTICS**

1. Nominal Voltage	: 400KV
2. Maximum Operating Voltage	: 420KV
3. Lightning impulse withstand voltage	: 1550KV
4. Short circuit level	: 40KA
5. Number of phases	: 3
6. Nominal frequency	: 50Hz
7. Earthing (grounding method)	: The 400KV system is solidly earthed (grounded)

## **VII. INSULATORS REQUIRED CHARACTERISTICS**

1. Type	: Outdoor solid core cylindrical post insulators of porcelain and with external metal fittings.
2. Material of the outer housing of the insulators	: Porcelain
3. Color of porcelain	: Grey
4. Designation of the insulators as per IEC-60273	: C12,5-1550
5. Switching impulse withstand voltage wet	: 1050KV peak
6. Lightning impulse voltage withstand	: 1550KV peak
7. Height of the insulators	: 3350mm $\pm$ 4,5mm
8. Creepage distance	: 10500mm
9. Failing load	
a. Bending	: 12500N
b. Torsion	: 6000Nm
10. Maximum nominal diameter of the insulating part	: 450mm
11. Bottom metal fitting pitch circle diameter	: 325mm
12. Top metal fitting pitch circle diameter	: 127mm
13. Material of all metal fittings	: hot-dip galvanized cast iron or equivalent
14. Method of mounting of the insulators	: Upright vertically
15. Number of units of which the insulators consist of	: Three (3)
16. Number of bolts and thread for the top metal fitting	: Four (4) 16 (tapped)
17. Number of bolts and holes for the bottom metal fitting	: Eight (8) $\varnothing$ 18 (plain)
18. Nominal maximum diameter of top mounting face	: 165mm
19. Accessories	: Bolts, nuts and washers must be of hot dip galvanized steel and part of the supply



## VIII. TESTS

The insulators shall be subjected to the following tests as per IEC-60168.

### A. Routing Tests

Shall be carried out on all insulators of the order

#### 1. Visual inspection

- a. Each insulator shall be examined visually to confirm that the metallic fittings are on the insulating part in accordance with the approved drawings.
- b. The color of the post insulator shall correspond to the color specified in this hereby technical description, which is grey.
- c. The glaze defects are defined as spots without glaze, chips, inclusions in the glaze and pinholes.

Given the above definition, the visual inspection shall confirm the following.

- The total area of glaze defects shall not exceed  $100 + \frac{D \times F}{2000} \text{ mm}^2$
- The area of any single glaze defect shall not exceed  $50 + \frac{D \times F}{20000} \text{ mm}^2$
- The maximum area without glaze shall not exceed  $20 \text{ mm}^2$

Where

- D is the greatest diameter of the insulator unit in millimetres
- F is the creepage distance of the insulator unit in millimetres

- d. With regard to pinholes

- In an area of  $50 \text{ mm} \times 10 \text{ mm}$ , the number of pinholes  $\leq 15$
- The total number of pinholes on the insulator  $\leq 50 + \frac{D \times F}{1500} \text{ mm}^2$

### B. Sample tests

The following sample tests shall be performed on the following number (n) of post insulators of the order, selected at random.

For  $n \leq 100$ , on one (1) insulator

For  $101 < n \leq 299$ , on two (2) insulators

For  $n \geq 300$ , on three (3) insulators

1. Verification of dimensions
2. Temperature cycle test
3. Mechanical failing load test (bending, tensile, torsion and compression).
4. Porosity test
5. Galvanizing test (Accepted values are for the cast iron sections  $85 \mu\text{m}$  and for the bolts, nuts and washers  $54 \mu\text{m}$ ).



**C. Type tests**

1. Dry lightning impulse withstand voltage test. Test voltage 1550kV peak
2. Wet switching impulse voltage test. Test voltage 1050kV peak
3. Mechanical failing load test (bending, tensile, torsion and compression).  
With Bending withstand : 12500N  
and Torsion withstand : 6000Nm

**IX. DATA WHICH MUST BE SUBMITTED BY ALL BIDDERS**

1. Outline drawing of the insulator, in which all its physical dimensions are clearly depicted (cross section, top view, side view).
2. Brochures, technical pamphlets and any other information which is deemed necessary for the technical evaluation process.
3. All bidders are required to answer all items of Attachment "A". Failure to comply or partial filling of the attachment will constitute sufficient reason for rejection of the offer.
4. Any test certificates for the type tests specified in this hereby technical description.  
Acceptance or not of these certificates lies on IPTO's judgment.
5. A drawing indicating all metal fittings of the insulator

**X. DATA WHICH MUST BE SUBMITTED BY THE SUCCESSFUL BIDDER**

1. Complete physical drawing of the insulator (cross section, top view, side view) for approval before the construction of the insulators.
2. Complete physical drawing of all metal fittings, for approval before the construction of the insulators.
3. Maintenance and assembly instructions in detail
4. Mounting instructions for the insulators

**XI. WARRANTY**

The supplier must provide a warranty of two (2) years, beginning from the date of delivery of the insulator, for damages by faulty design, or by unreliable components, or by combination of the two.



## **XII. PACKING**

The insulators, including their fittings, shall be delivered inside robust wooden boxes, one (1) per box.



**ATTACHMENT "A"**  
**400KV OUTDOOR, SOLID-CORE, CYLINDRICAL POST INSULATORS WITH**  
**EXTERNAL METAL FITTINGS**

*All bidders must provide the following data. Failure to comply in full, shall constitute sufficient reason for rejection of the offer.*

1. Type :.....  
:.....
2. Manufacturer :.....  
:.....
3. Ambient temperature range during operation :.....
4. Material of the outer housing of the insulators :.....
5. Material on the inner part of the insulators :.....  
:.....
6. Color of the porcelain :.....
7. Designation of the insulators as per IEC-60273 :.....
8. Switching impulse withstand voltage wet :.....
9. Lightning impulse voltage withstand :.....
10. Height of the insulators :.....
11. Creepage distance of the outer housing :.....
12. Failing load :.....
  - a. Bending :.....
  - b. torsion :.....
  - c. tension :.....
  - d. compression :.....



13. Maximum nominal diameter  
of the insulating part :.....
14. Bottom metal fitting pitch circle diameter :.....
15. Top metal fitting pitch circle diameter :.....  
:.....
16. Type of material of all metal fittings :.....
17. Number of units of which the insulators consist :.....  
:.....
18. Number of bolts and thread for the top  
metal fitting :.....
19. Number of bolts and holes for the  
bottom metal fitting :.....
20. Nominal maximum diameter of top  
mounting face :.....
21. Nominal maximum diameter  
of bottom mounting face :.....
22. Are all connecting parts such as bolts,  
nuts and washers part of the supply? :.....
23. Are all connecting parts such as bolts,  
nuts and washers of hot-dip galvanized steel? :.....
24. Weight of each insulator :.....