November 2020

TECHNICAL DESCRIPTION TD- 79/2
24KV 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 20kV, 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 and air core reactor support at the 20kV voltage level at the 150/20kV air insulated substations.

V. OPERATING CONDITIONS

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

VI. 20kV ELECTRICAL SYSTEM CHARACTERISTICS

1. Nominal Voltage	: 20KV
2. Maximum Operating Voltage	: 24KV
3. Lightning impulse withstand voltage	: 150KV
4. Short circuit level	: 10KA

5. Number of phases	: 3
6. Nominal frequency	: 50Hz
7. Earthing (grounding method)	: The 20KV is earthed (grounded) via a 12Ω resistor.

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	: C8-150
5. Power frequency withstand voltage wet	: 50KV rms
6. Lightning impulse voltage withstand	: 150KV peak
7. Height of the insulators	: 355mm ± 1mm
8. Creepage distance	: 600mm
9. Failing load	
a. Bending	: 8000N
b. Torsion	: 1500Nm
10. Maximum nominal diameter of the insulating part	: 195mm
11. Bottom metal fitting pitch circle diameter	: 76mm
12. Top metal fitting pitch circle diameter	: 76mm
13. Material of all metal fittings	: hot-dip galvanized cast iron or equivalent
14. Method of mounting of the insulators	: Upright
15. Number of units of which the insulators consist of	: One (1)
16. Number of bolts and thread for the top metal fitting	: Four (4) M12
17. Number of bolts and thread for the bottoms metal fitting	: Four (4) M12
18. Nominal maximum diameter of mounting face of all fittings	: 115mm
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 $100+\frac{DxF}{2000} mm2$
- The area of any single glaze defect shall not exceed $50+\frac{DxF}{20000} mm2$
- The maximum area without glaze shall not exceed $20mm^2$

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 50mm × 10mm, the number of pinholes ≤ 15
- The total number of pinholes on the insulator $\leq 50+\frac{DxF}{1500} mm2$

B. <u>Sample tests</u>

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) post insulator
For $101 < n \leq 300$ - on two (2) post insulators
For $301 < n \leq 500$ - on three (3) post insulators
For $n \geq 501$ - on four (4) post 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 85μm and for the bolts, nuts and washers 54μm).

C. <u>Type tests</u>

1. Dry lightning impulse withstand voltage test. Test voltage 150kV
2. Wet power frequency withstand voltage test. Test voltage 50kV rms
3. Mechanical failing load test (bending, tensile, torsion and compression).
   With Bending withstand : 8000N
   and Torsion withstand : 1500Nm

IX. <u>DATA WHICH MUST BE SUBMITTED BY ALL BIDDERS</u>

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 shall be delivered inside robust wooden boxes, three (3) per box.

ATTACHMENT "A"

24KV 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. Power frequency 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 thread for the bottom metal fitting :.....

20. Nominal maximum diameter of mounting face of all metal fittings :.....

21. Are all connecting parts such as bolts, nuts and washers part of the supply? :.....

22. Are all connecting parts such as bolts, nuts and washers of hot-dip galvanized steel? :.....

23. Weight of each insulator :.....