ಕರ್ನಾಟಕ ಸರ್ಕಾರ

ಸಂಖ್ಯೆ: ಇಎನ್ 65 ವಿಎಸ್‌ಸಿ 2014

ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ಸಚಿವಾಲಯ
2ನೇ ಮಹಡಿ, ವಿಕಾಸ ಸೌಧ,
ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 01–10–2014

ಇಂದ,
ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು,
ಇಂಧನ ಇಲಾಖೆ, ವಿಕಾಸ ಸೌಧ,
ಬೆಂಗಳೂರು.

ಇವರಿಗೆ,
ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು,
ಬೆಸ್ಕಾಂ/ಸೆಸ್ಕ್/ಮೆಸ್ಕಾಂ/ಹೆಸ್ಕಾಂ/ಜೆಸ್ಕಾಂ.

M. D. HESCOM.

Corporate Office, HESCOM
Navanagar, HUBLI.

F. A.	
G.M.(A)	
G.M.(T)	
SEE T&P	
SEE PM	
PS to MD	
PS to DT	
TA to DT	
AE (C)	
H.C.	
	D (T)

ಮಾನ್ಯರೆ,

ವಿಷಯ : ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ಪರಿಷ್ಕೃತ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳ ಕುರಿತು.

ಉಲ್ಲೇಖ : ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳ ಸಮಿತಿಯ ವರದಿ ದಿನಾಂಕ: 25–09–2014.

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1. ವಿದ್ಯುತ್ ಸರಬರಾಜು ಕಂಪನಿಗಳಲ್ಲಿ ಖರೀದಿಸುತ್ತಿರುವ ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ಗುಣಮಟ್ಟವನ್ನು ಕಾಯ್ದುಕೊಳ್ಳಲು ಮತ್ತು ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳ ಏಕರೂಪತೆಯನ್ನು ಕಾಪಾಡುವ ದೃಷ್ಟಿಯಿಂದ ಇಂಧನ ಇಲಾಖೆಯು ನಿರ್ದೇಶಕರು (ಪ್ರಸರಣ), ಕ.ವಿ.ಪ್ರ.ನಿ.ನಿ ರವರ ಅಧ್ಯಕ್ಷತೆಯಲ್ಲಿ ಎಲ್ಲಾ ವಿದ್ಯುತ್ ಸರಬರಾಜು ಕಂಪನಿಗಳ ಪ್ರಾತಿನಿಧ್ಯವನ್ನೊಳಗೊಂಡಂತೆ ಒಂದು ಸಮಿತಿಯನ್ನು ದಿನಾಂಕ 05–08–2014 ರಂದು ರಚಿಸಿತ್ತು.

2. ಸದರಿ ಸಮಿತಿಯು ಸಭೆಗಳನ್ನು ನಡೆಸಿ, KAVIKA ಮತ್ತು CPRI ರವರ ಸಲಹೆಗಳನ್ನು ಹಾಗೂ ಇತ್ತೀಚಿನ IS 1180 (Part 1):2014 ನಲ್ಲಿ ಪ್ರಕಟಿಸಲಾಗಿರುವ ತಾಂತ್ರಿಕ ಮಾನದಂಡಗಳನ್ನು ಪರಿಗಣಿಸಿ, ಪರಿಷ್ಕೃತ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳನ್ನು ಸಿದ್ದಪಡಿಸಿ, ಅಂತಿಮ ವರದಿಯನ್ನು ದಿನಾಂಕ 25–09–2014 ರಂದು ಸಲ್ಲಿಸಿರುತ್ತದೆ. ವರದಿಯನ್ನು ಸರ್ಕಾರವು ಒಪ್ಪಿಕೊಂಡಿರುತ್ತದೆ.

3. ಪರಿಷ್ಕೃತ ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳನ್ನು ಪತ್ರದೊಡನೆ ಲಗತ್ತಿಸಲಾಗಿದೆ. ವಿದ್ಯುತ್ ಸರಬರಾಜು ಕಂಪನಿಗಳು ತಾವು ಹಾಲಿ ಪಾಲಿಸುತ್ತಿರುವ ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳ ಮಾನದಂಡಗಳನ್ನು ಪರಿಷ್ಕೃತ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳಲ್ಲಿ ಸೂಚಿಸಿರುವ

ಮಾನದಂಡಗಳಿಗೆ ಅಳವಡಿಸಿಕೊಂಡು ಪಾಲಿಸತಕ್ಕದ್ದು. ಪರಿಷ್ಕೃತ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳ ಪಾಲನೆಯಲ್ಲಿ ಯಾವುದೇ ಸಮಸ್ಯೆ ಕಂಡುಬಂದಲ್ಲಿ, ಸಮಿತಿ ಅಧ್ಯಕ್ಷರನ್ನು ಸಂಪರ್ಕಿಸಲು ಕೋರಲಾಗಿದೆ.

4. ರಾಜ್ಯದ ಎಲ್ಲಾ ವಿದ್ಯುತ್ ಸರಬರಾಜು ಕಂಪನಿಗಳಲ್ಲಿ ವಿತರಣಾ ಪರಿವರ್ತಕಗಳ ಪರಿಷ್ಕೃತ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳನ್ನು ಏಕರೂಪವಾಗಿರಿಸಲು ಕ್ರಮ ಕೈಗೊಂಡಿರುವುದರಿಂದ ಯಾವುದೇ ವಿದ್ಯುತ್ ಸರಬರಾಜು ಕಂಪನಿಯೂ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳನ್ನು ಸಮಿತಿಯ ಗಮನಕ್ಕೆ ತರದೇ ಅನುಕೂಲಕ್ಕೆ ತಕ್ಕಂತೆ ಬದಲಾಯಿಸಿಕೊಳ್ಳಬಾರದೆಂದು ಸೂಚಿಸಲಾಗಿದೆ.

ಪರಿಷ್ಕೃತ ಪರಿವರ್ತಕ ತಾಂತ್ರಿಕ ವಿವರಣೆಗಳು ತಕ್ಷಣದ ಮುಂದಿನ ಖರೀದಿ ಆದೇಶದಿಂದಲೇ ಜಾರಿಗೆ ತರಬೇಕೆಂದು ಕೋರಲು ನಿರ್ದೇಶಿಸಲ್ಪಟ್ಟಿದ್ದೇನೆ.

ತಮ್ಮ ವಿಶ್ವಾಸಿ

(ಕೆ.ಎಲ್. ರಾಮಚಂದ್ರ)
ಸರ್ಕಾರದ ಉಪ ಕಾರ್ಯದರ್ಶಿ
ಇಂಧನ ಇಲಾಖೆ

COMMITTEE REPORT

The Committee deliberated the various points mentioned in the four meeting proceedings and has come up with suggestions to be included in the Technical Specifications already in use. The committee has come up with 30 points to be adopted as changes in the specifications presently used by the ESCOMS's.

SPECIFICATION CHANGES RECOMMENDED

Common Distribution Transformer Specification for Energy Efficiency Level-1 (3 Star Rated) as per IS 1180(Part-1): 2014 Transformers that can be adopted in all ESCOMs are as follows.

Sl. No.	Parameters	Technical Specifications as recommended by the committee
1	**Standards**	The materials shall conform in all respects to the relevant Indian/International Standards, with latest amendments thereof unless otherwise specified.
2	**Service Condition**	**Min/Max Ambient air temperature**: +5°C to +50°C **Altitude:** A height above sea-level not exceeding 1000 m (3300 ft).
3	**Nominal System voltage**	HV - 11000V LV - 415 V
4	**No Load Voltage Ratio**	11000/433V
5	**Rated Frequency**	50 Hz
6	**System Details**	Voltage variation upto +12.5% at a Rated Frequency of 50 Hz

7	**Winding Connection**	The primary winding shall be connected in delta and the secondary winding in star [vector symbol, Dyn11, so as to produce, a positive phase displacement of 30 degrees from the primary to the secondary vectors of the same phase. The neutral of the secondary winding shall be brought out to a separate insulated terminal.
8	**Standard Materials**	1. Cold rolled grain oriented electrical steel - IS 3024. 2. Copper/Aluminium conductor - IS 191, IS 1897, IS 7404, IS 12444, IS 13730/ IS 6162 series. 3. Kraft paper - IS 9335 series. 4. Press board - IS 1576. 5. Mineral Oil- IS 335
9	**Oil**	As per IS 335
10	**Percentage Impedance**	4.5 % @ 75°C, Tolerance as per relevant IS.
11	**Temperature Rise**	**Upto 200KVA:** The permissible temperature-rise shall not exceed the limits of 40 °C when measured by resistance method for transformer winding and 35 °C measured by thermometer for top oil when tested in accordance with IS 2026 (Part 2). **Above 200KVA:** The permissible temperature-rise shall not exceed the limits of 45 °C when measured by resistance method for transformer winding and 40 °C measured by thermometer for top oil when tested in accordance with IS 2026 (Part 2).
12	**Basic Insulation Level**	75 kV
13	**Losses at 50% Load with 4.5% Impedance**	**25KVA** - 210 W **63KVA** - 380 W **100KVA** - 520 W **250KVA** - 1050 W **500KVA** – 1600 W **1000KVA** –3000 W (At 5% Impedance)

14	**Losses at 100% Load with 4.5% Impedance**	**25KVA** - 695 W **63KVA** - 1250 W **100KVA** - 1800 W **250KVA** - 3150 W **500KVA** – 4750 W **1000KVA** –9000 W (At 5% Impedance)
15	**Tapping Range**	1. No taps are normally required to be provided upto 100 kVA rating, unless specifically specified by the user. 2. **Above 100KVA** - 4 Taps with +2.5% to -5% of HV in steps of 2.5%. 3. **Above 200KVA** - 7 Taps with + 5 percent to -10 percent in steps of 2.5 percent for variation of HV
16	**Conservator**	Transformers of ratings 63 kVA and above with plain tank construction, the provision of conservator is mandatory. When a conservator is provided, oil gauge and the plain or dehydrating breathing device shall be fixed to the conservator which shall also be provided with a drain plug and a filling hole (1¼" normal size thread) with cover.
17	**Permissible Flux density & Over Fluxing**	The maximum flux density in any part of the core and yoke at rated voltage and frequency shall be such that the flux density with + 12.5 percent combined voltage and frequency variation from rated voltage and frequency shall not exceed 1.9 Tesla.
18	**Type of Cooling**	ONAN as per IS 2026
19	**Gaskets**	Synthetic rubber or synthetic rubberized cork resistant to hot transformer oil
20	**Terminal Arrangements**	The transformers shall be fitted on high voltage and low voltage sides with outdoor type bushings of appropriate voltage and current ratings. The high voltage bushings (3 Nos.) shall conform to IS 2099. The low voltage bushings (4 Nos.) shall conform to IS 7421. Alternatively, the low voltage side may be made suitable for adoption of PVC / XLPE cables of suitable size.

21	**External (Air) Clearance between Bushings mounted on Transformers**	The minimum phase-to-phase and phase-to-earth external clearances for HV and LV bushings shall be as follows: **HV** **LV** **Phase to Phase** - 255 mm – 75 mm **Phase to Earth** - 140 mm – 40 mm
22	**Bolts/nuts/washers exposed to atmosphere**	All Bolt/ Nuts shall be steel with suitable finish like electro galvanized with passivation or hot dip galvanized.
23	**Rating Plate**	Made of Anodized aluminum/stainless steel securely fixed on the outer body
24	**Pressure &Vaccum requirements**	1) In case of transformers up to 200 kVA, plain tank shall be capable of withstanding a pressure of 80 kPa and a vacuum of 250 mm of mercury. 2) For transformers above 200 kVA plain tank shall be capable of withstanding a pressure of 80 kPa and a vacuum of 500 mm of mercury.
25	**Type Test**	1) Lightning impulse test - IS 2026:2009 Shall comply with clause 14 of IS (Chopped Wave Testing). 2) Dynamic Short circuit Test 3) Thermal Short circuit Test 4) Temperature rise test - IS 2026 (Part 2) 5) Pressure test - IS 1180 (Part 1):2014 **For every lot of 200 Transformers (or less)offered for inspection, the above Type Tests should be mandatorily conducted by choosing a random sample from the lot.** **If the offered lot is between 200 - 500 nos., atleast 2 samples shall be Type Tested.** **The entire lot shall be rejected if the sample fails the Type Tests.**
26	**Routine Test**	1) Winding Resistance test - IS 2026 (Part 1) 2) Voltage ratio & phase displacement test - IS 2026 (Part 1) 3) Short circuit impedance test - IS 2026 (Part 1) 4) No-load loss & current test - IS 2026 (Part 1) 5) Insulation resistance test - IS 2026 (Part 1) 6) Induced over-voltage withstand test - IS 2026 (Part 3) 7) Separate-source voltage withstand test - IS 2026 (Part 3)

		8) Pressure test - IS 1180 (Part 1):2014 9) Oil leakage test - IS 1180 (Part 1):2014 **One out of every consignment of Transformers received at stores, the above Routine Tests shall be conducted mandatorily (at site/ stores).** **In case of failure, all Transformers in that consignment shall be tested and Transformers which pass the test shall be accepted.**
27	**Special Test**	1) Determination of sound level - IS 2026 (Part10) 2) No load current at 112.5 % voltage - IS 1180 (Part1):2014 3) BDV & Moisture content of oil in the Transformer - IS 335.
28	**Tank**	1. The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings. 2. All joints of tank and fittings shall be oil tight and no bulging should occur during service. 3. Inside of tank shall be painted with varnished/hot oil resistant paint. 4. Top cover of the tank shall be slightly slopping to drain rain water. 5. The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle. 6. The rating and serial no's. of the transformer shall be embossed/punched/welded with the Serial Number punched sheet on the tank of transformer/ on transformer name plate fitting sheet of the transformer. In addition to name plate details of transformer fitted to the transformer tank. 7. Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure and welder performance qualification certificates to the ESCOM. 8. The transformer tank shall be of robust construction only in rectangular/ Octagonal shape and shall be built up of electrically tested welded mild steel top and bottom plates thickness of 5.00 mm (3.15mm for 25kVA) and 3.15 mm for the side wall thickness.

		9. Suitable reinforcement by welded angle shall be provided on all the outside walls on the edge of the tank. The permanent deflection shall not be more than 5mm up to 750mm length and 6mm up to 1250mm length and 8mm up to 1750mm length when transformer tank without oil is subjected to Air pressure test as per IS:1180. 10. Under operating conditions the pressure generated inside the tank should not exceed 0.4 kg/sq.cm positive or negative. There must be sufficient space from the core to the top cover to take care of oil expansion. The space above oil level in the tank shall be filled with dry air or nitrogen conforming to commercial grade of IS:1747.
29	**Tolerance**	As given in IS 2026 (Part 1)
30	**Standard Fittings**	As per IS 1180 (Part 1):2014

Also the committee suggested the following for adoption by ESCOMS:

- **Testing laboratory should be set up in each ESCOM with testing facility. The Testing Laboratory should have facility to test all Routine Tests.**
- **The usage of quality of Lightning Arrestors at Distribution Transformer Centre. The Lightning Arrestors should be subjected to "Long duration Current Impulse Withstand Test" to ensure the quality of Lightning Arrestors.**
- **Condition Monitoring, Earthing, Monitor of Hot Spots, Wiring on HT & LT Side.**

(S. Sumanth) 23/9
Director (Transmission)
& Chairman of the Committee