

## *PCS Working Group on General Requirements C57.12.00*

### **WG Item 82**

#### **C57.12.00 - 2000 Section 7.1.4.4 Stabilizing windings**

**Change Requested by :** V. Sankar 5/07/2005 & 10/23/2006

**Requested Change :** Request to form a task force to discuss the following on buried tertiary and to modify the clause of 7.1.4.4 of C57.12.00 based upon the recommendations of the task force :

- 1) Guidelines to determine MVA rating of buried tertiary.
- 2) To define the conditions under which this MVA is applicable ;
  - (i) is it when the HV or LV is delivering top MVA,
  - (ii) should transformer MVA be vectorial sum or arithmetic sum of buried TV MVA with HV or LV MVA,
  - (iii) is the above applicable for step-down operation or for step-up operation or for both.
- 3) Tests to prove buried TV MVA rating :
  - (i) what should be losses to determine mean oil and top oil rise,
  - (ii) is shut-down needed to determine TV winding gradient.

#### **Section 7.1.4.4 Stabilizing Windings**

Stabilizing windings in three-phase transformers (delta-connected windings with no external terminals) shall be capable of withstanding the current resulting from any of the system faults specified in 7.1.1, recognizing the system grounding conditions. An appropriate stabilizing winding kVA, voltage, and impedance shall be provided.

#### **WG Proposal :**

Chair Comment - This request would be a better fit in the section on “**Rating Data**”, possibly clause “**5.4.2.x Preferred Continuous Kilovolt ampere Ratings**”.

A Task Force has been working on this issue since the Spring 2008 meeting, and the TF chairman will report at the Spring 2011 meeting.

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**WG Item 87**

**C57.12.00 -2002 Table 18 Short-circuit apparent power of the system to be used unless otherwise specified.**

**Change Requested by :** Pierre Riffon – 2006 Ballot Comment

**Requested Change :** Most of the values given are not realistic and are leading to unnecessary over designs. Except for very rare cases, the short-circuit current never exceeds 63 kA r.m.s. and this should be the ultimate standardized value. Specifying values which are higher than that lead to uneconomical designs.

**Section 7.1.5.3 System characteristics**

For Categories III and IV, the characteristics of the system on each set of terminals of the transformer (system fault capacity and the ratio of  $X_0/X_1$ ) should be specified. For terminals connected to rotating machines, the impedance of the connected equipment should be specified. In lieu of specified system fault capacities and rotating machine impedances, values shall be selected for each source from Table 18 and Table 19. In lieu of a specified  $X_0/X_1$  ratio, a value of 2.0\* shall be used. *\*(Changed to 1.0 in 2008 Rev.)*

**Table 18 - Short-circuit apparent power of the system to be used unless otherwise specified.**

| Maximum system Voltage (kV) | System fault capacity |       |
|-----------------------------|-----------------------|-------|
|                             | (kA rms)              | (MVA) |
| Below 48.3                  | ---                   | 4300  |
| 48.3                        | 54                    | 4300  |
| 72.5                        | 82                    | 9800  |
| 121.0                       | 126                   | 25100 |
| 145.0                       | 160                   | 38200 |
| 169.0                       | 100                   | 27900 |
| 242.0                       | 126                   | 50200 |
| 362.0                       | 84                    | 50200 |
| 550.0                       | 80                    | 69300 |
| 800.0                       | 80                    | 97000 |

**WG Discussion :**

A Task Force was formed at the Fall 2010 meeting to thoroughly review this issue, and the TF chairman will report at the Spring 2011 meeting.

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**WG Item 92**

**C57.12.00 -2010 Table 7 Nameplate Information**

**Change Requested by :** Malcolm Thaden – 2009 Ballot Comment

**Requested Change :** There is an interest in knowing how much oil would be spilled before the liquid level gauge would reach the low level and alarm. Add liquid level volumes from 25°C and 65°C levels to low oil liquid gauge level.

**Note “k” to nameplate entry row 22 “Tank, pressure, and liquid data” :**

<sup>k</sup> The following tank, pressure, and liquid data for transformers larger than 500 kVA shall be provided:

- a) Maximum operating pressures of liquid preservation system \_\_\_\_\_ kPa (lbf/in<sup>2</sup>) positive and \_\_\_\_\_ kPa (lbf/in<sup>2</sup>) negative.
- b) Tank designed for \_\_\_ kPa (lbf/in<sup>2</sup>) vacuum filling. The manufacturer shall identify any portion of the transformer that can not withstand the stated vacuum level (i.e., conservator, LTC boards, radiators).
- c) Liquid level below top surface of the highest point of the highest manhole flange at 25 °C \_\_\_\_\_ mm (in). Liquid level changes \_\_\_\_\_ mm (in) per 10 °C change in liquid temperature. (This applies only to transformers that have a gas cushion above the liquid in the transformer.)
- d) The volume of insulating liquid, in liters (gallons), and type shall be shown for the main tank and for each liquid-filled compartment.

**WG Discussion :**

The chairman contacted Mr. Thaden in an attempt to better understand his comment. His response follows :

“The information would be useful to the user in accounting for spilled oil in the resulting clean up. Users have lived without this information and have depended upon their oil containment practices, so I do not view it as critical, but it would be useful.”

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**WG Item 89**

**C57.12.00/D2C – 9/2008 Sections 5.9, 7.4, 8.4, 8.7**

**Change Requested by :** Rick Marek – May 2009 Email

**Requested Change :** The term “reference temperature” appears eight times with five different definitions (in standard C57.12.00). The request is to define the two terms “Core Reference Temperature” and “Reference Temperature” in C57.12.80 and then modify the standards which refer to those definitions accordingly. For C57.12.00 it would be the sections cited above.

**WG Discussion :**

**C57.12.80-2010 IEEE Standard Terminology for Power and Distribution Transformers** defines reference temperature as follows :

**3.368 reference temperature:** Unless otherwise stated, the reference temperature shall be defined as 20°C plus the rated average winding rise. For multiple winding transformers that have more than one base rated average winding rise, the highest average winding rise shall be used to determine the reference temperature.

**3.369 reference temperature for no-load losses:** The no-load losses of power and distribution transformers shall be determined based on a reference temperature of 20 °C.

**(1) C57.12.00 Section 5.9 (total losses) states :**

“The standard reference temperature for the load losses of power and distribution transformers shall be 85°C. The standard reference temperature for the no-load losses of power and distribution transformers shall be 20°C.”

**Chair remarks – make no changes to this section.**

**(2) C57.12.00 Section 7.4 (calculation of winding temperature during short circuit) :**

“ $T_r$  is the reference temperature, which is 20°C ambient plus the rated average winding rise”

**Chair remarks – make no changes to this section.**

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**(3) C57.12.00 Section 8.4 (determination of transformer regulation) states :**

“When specified, transformer regulation shall be determined for the rated voltage, kVA, and frequency by means of calculations based on the tested impedance and load loss in accordance with IEEE Std C57.12.90. Regulation calculations shall be based on a reference temperature equal to the rated average winding temperature rise, plus 20°C.”

Chair remarks – change the last sentence to state “Regulation calculations shall be based on the reference temperature.”

**(4) C57.12.00 Section 8.7 (certified test data), note 3, states :**

“All temperature sensitive data should be reported after correcting to reference temperature (defined in 14.1 of IEEE Std C57.12.90-2010) except no-load losses (see 8.4 of IEEE Std C57.12.90-2010).”

Chair remarks – change note 3 to state “All temperature sensitive data shall be reported after correcting to the reference temperature as defined by IEEE Std. C57.12.80 and section 5.9 of this standard.”

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**WG Item 93**

**C57.12.00 -2010 Section 4.3.3 Other unusual service conditions, note q)**

**Change Requested by :** Pierre Riffon – 2009 Ballot Comment

**Requested Change :** Parallel operation is quite a common practice. Review the clause by saying that this is a normal practice and that the user shall advise the manufacturer if this is effectively the case.

**Section 4.3.3 Other unusual service conditions :**

Other unusual service conditions include the following :

q) Parallel operation. It should be noted that while parallel operation is not unusual, it is desirable that users advise the manufacturer when paralleling with other transformers is planned and identify the transformers involved.

**WG Discussion :**

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**WG Item 94**

**C57.12.00 -2010 Section 5.1 Table 2 Cooling class designation**

**Change Requested by :** David Harris – 2009 Ballot Comment

**Requested Change :** This data has been in the last two revisions and should not be needed in the main body any longer. Move lines 7, 8, 9 and table 2 to the annex.

**Section 5.1 Table 2 :**

Examples of the cooling class designations used in IEEE Std C57.12.00-2006 and in previous revisions, and the corresponding new designations, are provided in Table 2.

**Table 2 – Cooling class designation**

| <b>Present designations</b> | <b>Previous designations</b>          |
|-----------------------------|---------------------------------------|
| ONAN                        | OA                                    |
| ONAF                        | FA                                    |
| ONAN/ONAF/ONAF              | OA/FA/FA                              |
| ONAN/ONAF/OFAF              | OA/FA/FOA                             |
| ONAN/OFAF                   | OA/FOA                                |
| ONAN/ODAF/ODAF              | OA/FOA <sup>a</sup> /FOA <sup>a</sup> |
| OFAF                        | FOA                                   |
| OFWF                        | FOW                                   |
| ODAF                        | FOA <sup>a</sup>                      |
| ODWF                        | FOW <sup>a</sup>                      |

<sup>a</sup> Indicates directed oil flow per preceding NOTE 2.

**WG Discussion :**

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**WG Item 95**

**C57.12.00 -2010 Section 5.5.3 Ratings of transformer taps**

**Change Requested by :** David Harris – 2009 Ballot Comment

**Requested Change :** Change definition of reduced capacity to match C57.12.10.

Transformers with load tap-changing equipment may have reduced capacity taps, unless specified otherwise, for taps below rated winding voltage. The transformer shall be capable of delivering rated kilovolt amperes at the rated low-voltage position and on all positions above rated low voltage. The transformer shall be capable of delivering low-voltage current corresponding to rated low voltage at all positions below rated voltage. When required by the user, the transformer may be designed to deliver rated kilovolt ampere output on all tap positions.

**C57.12.00 Section 5.5.3 :**

“Whenever a transformer is provided with taps from a winding for de-energized operation, they shall be full-capacity taps. Transformers with load tap-changing equipment may have reduced capacity taps, unless specified otherwise, for taps below rated winding voltage. When specified, other capacity taps may be provided. In all cases, the capacity shall be stated on the nameplate.”

**WG Discussion :**