1. Dry Type Transformers Subcommittee

November 4, 2015

Memphis, TN

Chair: Charles Johnson  
Secretary: Casey Ballard

# Introductions and Approval of Agenda and Minutes

The Subcommittee met on November 4, 2015 at 1:30 PM in the Grand Ballroom D of the Peabody Memphis Hotel.

There were 14 of 22 members present (therefore we had a quorum of 64%), and 21 guests present, 10 guests requested membership. The attendance roster will be kept in the AMS.

The agenda was approved unanimously after a motion from Sanjib Som and a second from Mike Sharp.

The minutes of the San Antonio, TX meeting were approved unanimously after a motion from Rick Marek and a second from Dave Stankes.

# Working Group/Task Force Reports

The next order of business was the presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

## IEEE PC57.12.01 - Dry Type General Requirements Chair Tim Holdway

The task force met in the Venetian Room of the Peabody Memphis Hotel

The meeting was called to order at 1:46 PM by Chairman Tim Holdway

The meeting was convened with 15 members (out of 27 – therefore a quorum was reached with 56% attending) and 18 guests present. Four guests asked to become members. The attendance will be reported in the AMS.

The agenda was approved unanimously.

Motion: Sanjib Som

Second: Roger Wicks

The minutes of the San Antonio, TX , April 13, 2015 meeting were approved unanimously.

Motion: Jim Antweiler

Second: John K. John

**Old business**

* The chair commented that this task force should be a working group in the next meeting as he planned to submit a PAR.
* The chair talked through a list of suggested topics from TF members and agreed to provide both the presentation and a red lined version of 12.01 before the next meeting.
  + May and can definitions – no comments to the proposal
  + Load Current Section 4.1.5– no comments to the proposal
  + Sinusoidal Wave Form Section 4.2.6.h– no comments to the proposal
  + Over-Excitation Section 4.2.6.l– no comments to the proposal
  + Parallel Operation Section 4.2.6.r– no comments to the proposal
  + Cooling Ratings Section 5.1– no comments to the proposal
    - Need to address sealed dry ‘GA’ –perhaps by ANAN?
  + Scott / T-Connections Section 5.3.2– no comments to the proposal
  + Power usage Section 5.4
    - Chair to confirm reason for change with 12.00 Chair
  + Transformer Taps Section 5.5.3– no comments to the proposal
  + Connections Section 5.6– no comments to the proposal
  + Maximum System Voltage – Table 5
    - Need to address how these would be applied to minimum test values
  + Mass versus Weight Table 12– no comments to the proposal
  + Country of Origin Table 12– no comments to the proposal
  + DOE Compliance Table 12
    - Should we use ‘DOE Compliant’, ‘10CFR 431.192 Compliant’, or other wording?
  + Fuzzy Figures 3-4– no comments to the proposal
  + Short Circuit Temperature Section 7.10– no comments to the proposal
  + Partial Discharge Section 5.10.3.5
    - Insert ‘measured and’ after ‘limiting values shall be’
  + Short Circuit Thermal Limits Table 15
    - 200C is too low for Aluminum
    - Review CSA values
    - Review IEC grounding transformer standard
    - Need to get metallurgical data
    - Compare results of all heat stored versus maximum insulation withstand vs tensile performance
  + Short Circuit Thermal Calculation
    - Perhaps keep both or place one in an Annex
    - Why are the constants different between 12.00 and 12.01?
  + Other topics were previously proposed, but were not discussed due to time constraints.
  + All comments and proposals will be circulated by the Chair.

**New business**

No new business as the entire time was taken with old business

Next meeting: Spring 16, Atlanta, GA, March 20-24, 2015.

With no further business, the meeting was adjourned at 3:00 PM.

Motion: John K. John

Second: Shankar Nambi

Chairman: Tim Holdway

Vice Chairman: Casey Ballard

## IEEE PC57.94 - WG Dry Type O&M Guide Chair Dave Stankes

We received confirmation from Karen Evangelista at IEEE that PC57.94 (PE/TR) Revision "Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers" will be reviewed by RevCom at its December 2015 meeting. We are not anticipating any issues at this time, and expect the document to be approved by the end of the year.

## IEEE C57.12.91 - Dry Type Test Standard Chair Derek Foster

The Task Force met in the Venetian Room of The Peabody

There were 7 members and 6 guests present, with 2 guests requesting membership. A quorum was not reached.

The minutes of the April 14, 2015 meeting in San Antonio were reviewed and no comments were received.

The agenda was reviewed and no comments were received.

**Old business**

* A discussion was held on the Scope and Purpose for the new PAR. The Scope contains four revisions from the scope in the current standard:

1. The addition of reference to the fact that this standard applies to transformers with a voltage of 601V or higher in the highest voltage winding.
2. Removal of the word “safety”
3. The products listed as exceptions have been listed as bullet points, to be consistent with C57.12.01
4. Two additional products have been listed as exceptions, Testing transformers and Welding transformers.

The purpose will remain as written in the current standard.

There was unanimous agreement that the Scope and Purpose as presented should be used for the new PAR.

* There were discussions on topics for the new revision:
* Calibration requirements – This topic was raised at a previous meeting and at that time, it was decided to see how this subject is handled in C57.12.90. No decision was reached at this meeting, so this topic will be reviewed further at future meetings.
* Sound level measurement – The task force on sound level measurement is ongoing, so their activities will be monitored and this subject will be reviewed at future meetings.
* Sound level measurement with full load, as a type test – Sanjib Som had suggested that this test be added to the standard. After some discussion on the subject, Sanjib agreed to provide a written proposal for consideration by the Working group.
* Monitoring of leakage current during the applied voltage test – Sanjib Som proposed that the procedure for the applied voltage test should include monitoring of leakage current during the test, with a tolerance set as a pass/fail criteria. Casey Ballard referred the group to the applied voltage test procedure in C57.12.90, which could also be generally used for C57.12.91. Sanjib agreed to make a written proposal for consideration by the Working Group.

**New business**

David Walker agreed to act as Vice Chairman for the Working Group for future meetings

With no further business, the meeting was adjourned at 5:55 pm.

The Working Group will meet again at the Spring 2016 meeting in Atlanta.

Chairman: Derek Foster

## IEEE PC57.12.51 - Dry Type Product Standard “> 500kVA Ventilated” Chair Sanjib Som

The working group met in the Venetian Room of The Peabody Memphis Hotel.

The meeting was called to order at 11:15 AM by Chairman Sanjib Som.

The meeting was convened with members (12 out of 18 – therefore a quorum was reached with 66.7% attending) and 6 guests present. The attendance will be reported in the AMS.

The minutes of the San Antonio TX April 13, 2015 meeting were approved unanimously.

Motion: Casey Ballard

Second: John K. John

The Chair announced that Tim Holdway would be stepping down as the Secretary of this WG and that after this meeting; Mark Gromlovits has kindly consented to replace Tim.

**Old business**

* The Chair showed a spreadsheet of the work done by the TF of the suggestions in combining the two documents, C57.12.50 and C57.12.51.
* There was extensive discussion which used up most of the meeting. During the discussion it was decided that we would first take the two documents, combine them, and then the Chair will send out the single document for the members to review and comment. The comments that were made will be sent to the Chair once the single document is sent out.
* The Chair made a comment about taking out the kVA and voltages from the title. Casey Ballard stated we need to leave them in due to differentiating the title from C57.12.01. No formal proposal was made.
* Casey stated he will send to the Chair a clean, new document of the proposed C57.12.51, with the combination of C57.12.50 and C57.12.51. He will also send the Chair a redline document of C57.12.51 with the corrections or additions. The Chair will then send out the two documents to the members of the WG.

**New business**

No new business.

With no further business, the meeting was adjourned at 12:15 PM.

Motion: Mark Gromlovits

Second: Vijay Tendulkar

Next meeting: Spring 2016, Atlanta, GA March 20-24, 2016.

Respectfully submitted,

Chairman: Sanjib Som

Secretary: Tim Holdway

## IEEE PC57.12.60 - Dry Type Thermal Aging Chair Casey Ballard

The task force met in the Venetian Room of the Peabody Hotel.

The meeting was called to order at 9:32 AM by Chairman Casey Ballard. Introductions were made and attendance sheet was circulated.

The meeting was convened with 40 people in attendance. Since this was, the first meeting of the working group 18 attendees requested membership and will be added to the roster.

The minutes from Spring 2015 TF meeting in San Antonio and agenda were approved unanimously.

The agenda was approved unanimously.

**Old business**

1. **PAR Approval**

Chair reported that the PAR that was developed at last TF meeting in San Antonio was submitted at approved, effectively changing group status from TF to Working Group.

1. **Reference Temperature Explanation – Roger Wicks**

Roger Wicks reviewed information regarding the use of Thermal Endurance test procedures used to evaluate the effect of temperature on the life of a material. The procedures, using multiple aging temperatures higher than the expected operating temperature, allow for shorter test time periods. Test results are extrapolated to determine the temperature at which a material can be operated for a finite amount of time, typically based on the life requirement for the material in the electrical equipment.

A comment from regarding the use of longer duration test times by nuclear industry in order to confidently extrapolate to long expected life times was offered. Current extrapolated reference time in C57.12.60 is 40,000 hours. Roger compared this to other extrapolation times referenced in IEC, IEEE, and UL standards ranging from 20,000 to 180,000 hours. It was noted that as extrapolation times are increased, it is difficult to ensure that results are statistically sound.

Question was raised regarding how IEC handles extrapolation hours. It was explained by Roger that IEC (for medium voltage transformers) does not have an appropriated test procedure for systems tests. IEC currently requires that the insulation materials component rating be used to assign temperature class of electrical apparatus.

Chairman reminded the group that C57.12.60 is used to specify appropriate test methods to collect data on system life, but that other standards will be used to interpret results and subsequent use.

At this time the consensus of the WG was to retain the 40,000 hour reference time

1. **Full Size Working Coil – Chuck Johnson**

Chairman displayed proposal by Chuck Johnson for definition of the Full Size Working Coil suitable for testing, as this is not well defined in the standard

Page 5 Section 4.2.1.a

*Small-scale transformer coils.* Test samples should be actual full size working coils capable of meeting the requirements of IEEE C57.12.01 and passing the testing per IEEE C57.12.91.  Coils shall be selected to represent the transformer range for commercial use. . . . . . . . .

Dhiru Patel asked if this definition would affect the use or description of “motorettes” which are also specified as acceptable for testing in the standard. It was confirmed by the Chairman that it would not affect motorettes. It was also asked what range of kVA transformer would/could the test transformer cover, and it was explained by the chair that only voltage range would be specified.

Chair explained that the size of the small scale transformer coil must be or reasonable (practical) size in order to move and place units in oven.

A motion to approve Chuck Johnson’s proposal as written above for definition of “full size working coil” was made by Roger Wicks and seconded by Mark Gromlovits. The motion was carried unanimously.

1. **Accuracy of model types – Mark Raymond**

As Mark Raymond was unable to attend this meeting, discussion on this topic was delayed until the next WG meeting.

**New business**

1. **PD Measurement as a trending test**

It was suggested by chairman to consider adding partial discharge initial/trending test for full size test coils. Initial test should ensure that all full size test coils (not motorettes) meet requirements specified in 12.01, as to eliminate coils that may be fail prematurely due to defect unrelated to thermal degradation. Roger Wicks and Ashley Reagan said this test for PD may be likened to dielectric proof testing of motorettes used in low voltage system testing. The trending test results would be conducted using 1.5 x’s values listed in 12.01 for solid cast and resin encapsulated. Trending tests would not be mandatory, and data could be mapped against “end of life” (dielectric failure) for coils, perhaps helping users better understand PD to as it relates to life of transformer in field.

Phil Hopkinson asked if the C57.12.60 would try to recommend appropriate test method for PD. Chairman confirmed that the standard would instead point to appropriate test standard for test method (C57.12.01 or C57.12.91 or C57.124)

Alexander Levin asked if it made sense to require PD test for all types of transformer types covered by this standard. Casey stated that even OVDT with poor resin saturation, air bubbles, etc. may have problems with PD, so yes, all types of transformers should be included in testing.

Dhiru Patel commented that because this type of testing will not be required, it should be instead listed in Annex.

Vijay Tendulkar proposed a motion to include information relating to PD trending test as part of the Informative Annex. Motion was seconded by Dhiru Patel and motion was carried unanimously.

1. **Major Insulation materials and method for changes**

Chairman described that 12.60 currently defines how to evaluate a new insulation system, but does not have any direction for how to modify one.

A proposal for method to approve a major insulation substitution or thickness change in previously approved system was made involving the use of a “single point test”. This method would compare average time to failure of the new system and compare to data from original system.

A proposed list of major insulations materials used in MV transformers was shown. Varnishes were listed as Major insulation, with the proposal to require single point testing for any new varnish approvals. It was described that current method of approving new varnish uses Chemical Compatibility or “Sealed Tube” test. (25C above system temperature class for 336 hours). An example of single point test for 220C temperature class major insulation substitution was shown.

Dhiru Patel asked if testing would be required if a new manufacturer of a NEMA listed enamel coated conductor is used.

Vijay reminded the groups that Cu is more chemically reactive than Al, and that this should be considered when testing and approving/modifying a MV system.

The meeting was concluded at this point due to no more time, and chairman confirmed that information presented during the meeting (powerpoint) would be posted on the IEEE website.

It was confirmed that the WG would meet again at the Spring 2016 Transformer Committee Meeting in Atlanta.

Meeting was adjourned at 10:45AM

Motion: Sanjib Som

Second: Tim Holdway

Chairman: Casey Ballard

Secretary: Dave Stankes

## IEEE PC57.12.58 - Dry Type Transient Analysis Chair Roger Wicks

Roger Wicks made a motion ‘to form a TF to review the document and then to send recommendations to the Subcommittee’. The motion was seconded by Sanjib Som and carried unanimously.

Five volunteered to work on the TF, including Derek Foster, Tim-Felix Mai, Jose Valencia, Sanjib Som, Anil Dhawan, and Tim Holdway. Roger Wicks will serve as the TF Chair.

## IEEE PC57.12.59 - Dry Type Through Fault Duration Chair Paulette Powell

The chair noted this document was approved by the SASB and should be published early next year.

# Old Business

The chair covered the status of all the standards in the Dry Type Sub Committee.

# New Business

## IEEE PC57.124 – Dry Type Partial Discharge Guide

The chair called for volunteers to serve as Chairman, Vice-Chairman, and Secretary. Graciously Tom Prevost agreed to be Chair, Rick Marek agreed to be Vice-Chair, and Jose Valencia agreed to be Secretary

Tom indicated that he would want to meet starting in the Spring 16 meeting in Atlanta.

## IEEE PC57.16 – Dry Type Reactors

Art Del Rio has agreed to be the chair of this document.

## Chair’s Comments

* The chair addressed some requirements of meeting minutes as other SC’s had been missing these according to Sue McNelly.
  + Title of WG or TF
  + When and where the meeting occurred
  + When and if the group plans to meet again
  + Attendance of members, guests, and those requesting membership. Attendance to be recorded in the AMS.
* Any WG must bring the document to the SC for approval before going to ballot
* The Transformers Committee Chair has asked all TF and WG chairs to capture the ‘why’ behind the decisions made to help out in future revisions
* The WG chair is responsible for checking all grammar and spelling \*before\* sending the document out for ballot.
* Next meeting: Spring 16, Atlanta, GA, March 20-24, 2015.

# Adjournment

With no further business, the meeting was adjourned at 2:45 PM.

Motion: John K John

Second: Shankar Nambi

Acting Chairman: Casey Ballard

Acting Secretary: Tim Holdway