

7.6 POWER TRANSFORMERS – TOM LUNDQUIST, CHAIRMAN

The Power Transformers Subcommittee met on Wednesday, March 14th, 2012 at 1:30 p.m. with sufficient attendance to reach a quorum.

The minutes from the Fall 2011 meeting in Boston, Massachusetts were approved.

7.6.1 WORKING GROUP AND TASK FORCE REPORTS

7.6.1.1 WORKING GROUP FOR REVISION OF C57.17, REQUIREMENTS FOR ARC FURNACE TRANSFORMERS – Robert Ganser, Chairman

No meeting was held.

7.6.1.2 WORKING GROUP FOR REVISION OF PC57.116, GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS – Gary Hoffman, Chairman

1. Roster & Membership

Members – 14 of 18 in attendance.

Guests – 33

Guests requesting membership – 9

Total attendance – 56

2. Minutes of Boston Meeting Were Approved

5. Draft D1.1 Review & Recommendation

- a. Clause 2 – Approve
- b. Clause 6 – Motion to approve with amendment withdrawn. Chair has approved a Task Force Chaired by Mark Baldwin with members Peter Balma and Wally Binder to review and make additional changes for review by the WG at our Fall 2012 meeting.
- c. Clause 8 – Motion to accept with restoration of lines 2-3 on page 23 and strike lines 3-6 was Approved
- d. Clause 10 – Motion to accept with deletion of “is not” on line 10 of page 29 was Approved. A second motion to accept Clause 10 with first motion and change of line 18 from 100 deg C to 140 deg C was Approved.
- e. Appendix A, Informative Bibliographical References – Motion to accept with amendment to add C37.102 and Power System Relay Committee, Rotating Machinery Subcommittee, J-5 Working Group, "Coordination of Generator Protection with Generator Excitation Control and Generator Capability" Approved. These references will be added as part of the Clause 6 TF.

6. Backfeed TF report provided by Chair: Work will continue with a goal to have a revised Backfeed Clause by our Fall 2012 Meeting.
Peter Balma made a brief presentation to the WG on the history and issues on Backfeed of UT's and UAT's.
7. A change in Title from Tom Lundquist was discussed and the Chair did not receive a motion to change therefore the Title remains as is.
8. New Business – None

Motion Approved to Adjourn at 5:57 PM

7.6.1.3 WORKING GROUP FOR REVISION OF PC57.125, GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION, ANALYSIS AND REPORTING FOR POWER TRANSFORMERS AND SHUNT REACTORS – Wally Binder, Chairman

1. Quorum was established - 17 working group members were present.
2. Minutes were approved for the Fall 2011 meeting.
3. Chairman's Remarks – (Wallace Binder) Chairman presented a proposed schedule and discussed key dates of the schedule: Fall 2012 – proposed C57.117 merged document be completed. Fall 2014 – C57.125 document work completed by the working group. Ballot Resolution Committee will be developed at a later meeting.
4. CIGRE Coordination Activities – (John Roach) Working with Christoph Kuen, conveyor of A.2.45. Christoph has interest in sharing information between groups and some information has been exchanged. Currently trying to setup conference call with Christoph.
5. TF Report on Merger of C57.117 – (John Roach) Work to Date - Definitions clause content is acceptable, Figure 2 has been updated, updating Clause 6.5. and converting to table format, numerous minor comments agreed to. Work to be Completed - Incorporate numerous individual proposed modifications to C57.117, update Fig 1, completion of Clause 6.5 update, determine how best to merge into C57.125.
6. TF Report on New Work – (Tom Melle) General work plan for new work was proposed and discussed. References: remove obsolete/dated references. Proofread: contribute to identification of typos, formatting issues, etc. Duplication between guides: study C57.93 and C57.152 for contradictions and overlap. Add references to digital pictures/video. Add reference to IR photos / IR temp gauge. Add measuring/monitoring references. Add new test technology.
7. Execution of Work Plan: Discussed and requested suggestions to improve document flow. Bruce Farris will take the lead on the bibliography review and update.
8. Meeting was adjourned.

7.6.1.4 WORKING GROUP FOR DEVELOPMENT OF PC57.131, STANDARD REQUIREMENTS FOR TAP CHANGERS - William Henning, Chairman

The Working Group on Tap Changer Performance did not meet at this session. The PC57.131/D1.8 document was submitted to RevCom and is on the agenda for its March 28 meeting.

7.6.1.5 WORKING GROUP FOR THE REVISION OF PC57.140, GUIDE FOR EVALUATION AND RECONDITIONING OF LIQUID-IMMERSED POWER TRANSFORMERS – Roland James, Chairman

Chair Rowland James called the WG meeting to order at 1:50 pm November 1, 2011.

Vice Chair Paul Boman and WG Secretary Saurabh Ghosh were also present. There were 31 members and 42 guests with 13 guests requesting membership.

The Working Group did not have a quorum and thus no official resolution could be passed.

Vice Chair Paul Boman gave a presentation on CIGRE Working Group A2.34 – “Guide for Transformer Maintenance”.

Discussions on the presentations led to topics on “Asset Management”, minimum amount of maintenance with maximum returns, “Optimization on maintenance practices”, “best practice and common practice”, “condition assessment”, DGA and in service oil testing.

There was a discussion on load levels while performing infrared testing as described in sub clause 5.7 “Infrared Inspection”. It was proposed that transformers be loaded higher than 40% of maximum nameplate rating. One argument against this was that transformers may not normally operate at this level and increasing load may not be practical. Further study of this matter will ensue.

The chair requested volunteers for sections of the guide not yet reviewed. He also requested the working group to review section six “Condition assessment and reconditioning” with intent to determine if this section is philosophically meeting the purpose of this guide.

The meeting was adjourned at 3:01 p.m.

7.6.1.6 WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS – Donald Chu and Andre Lux, Co-Chairmen

No meeting held.

7.6.1.7 WORKING GROUP FOR DEVELOPMENT OF PC57.148, STANDARD FOR CONTROL CABINETS FOR TRANSFORMERS – Joe Watson, Chairman

No meeting held.

7.6.1.8 WORKING GROUP FOR DEVELOPMENT OF PC57.150, GUIDE FOR THE TRANSPORTATION OF TRANSFORMERS AND REACTORS RATED 10,000 KVA OR LARGER –Greg Anderson, Chairman

No meeting held.

7.6.1.9 WORKING GROUP FOR DEVELOPMENT OF PC57.153, GUIDE FOR PARALLELING TRANSFORMERS – Tom Jauch, Chairman

65 total attendees, 23 of 31 members were present (1 corresponding), 42 Guests (21 new)

1 attendee requesting membership had attended the last two meetings and will be upgraded to member status, 3 attendees requesting membership were attending their first meeting and will be added as guests, 1 attendee requested to be moved from member to guest status.

- Minutes from Boston were reviewed and approved
- Jim Harlow – made a motion to revise the definition of “paralleling” to only consider paralleling applications with common source side buses, where both the high side and low side breakers were closed. Applications with separate source buses were proposed to be addressed in a later version of the guide.
- Second for his motion was received
- Motion was discussed.
 - Several utilities present indicated an open high side breaker is a valid operating condition that needs to be addressed.
 - Motion was only to postpone addressing this configuration to a later version of the guide.
 - Following additional discussion amongst members, the working group agreed to form a task force to compare modeling technique results for paralleling operations when operating in a separate source bus configuration.

- A request will be sent to WG to participate on this task force. Tentative meeting date for this task force is May 4, 2012 prior to the IEEE T&D show.
- Following the discussion, Jim Harlow withdrew his motion.
- Motion was made to only consider 2 methods – Master Follower and Circulating Current –all paralleling methods would be considered a subset of these two methods. Motion did not receive a second.
- A few minor comments received on the latest draft were shown to the working group but no decisions were made to accept or decline the proposed revisions.
- Presentation by Dr. Murty Yalla listed on the agenda was not made due to time constraints

Meeting was adjourned at 4:30pm

7.6.1.10 WORKING GROUP FOR DEVELOPMENT OF PC57.156, GUIDE FOR TRANSFORMER TANK RUPTURE MITIGATION OF LIQUID-IMMERSED POWER TRANSFORMERS AND REACTORS– Peter Zhao, Chairman

Meeting of the Task Force for Tank Rupture & Mitigation convened Monday morning at 11:00am. Chairman Peter Zhao presided.

Patent policy was displayed and discussed. There were no acknowledgements of patents of concern.

Attendance was 102 (17 members, 85 guests, with 8 guests requesting membership).

Chairman Zhao provided introductory remarks and previewed the agenda to be covered for the meeting. The PAR for the guide has been approved by Ad Com and now will be sent to IEEE for final approval. The objective of the meeting was to make progress on the document in anticipation of PAR approval.

Sections 4.3.1 and 4.3.2 recent additions were reviewed.

Don Chu questioned the basis for the numbers provided for arc voltage and arc energy, and stated that Owner should only be responsible for providing available fault levels and voltages.

Martin Heathcoat stated a significant value of the guide will be as a tool by which design reviews can verify adequacy of manufactures design for withstanding internal faults without rupture. The fact that relevant numbers are hard to derive is all the more reason that the Guide is needed to provide a rational basis for assuring adequate design.

It was suggested that the Guide be segmented: Most of section 4.3, since it is tutorial in nature, should be moved to an annex, to be referenced in the main body of the guide.

Don Chu predicted that a draft of the guide that includes such numbers as presently included in the main body of the document will draw strong negative opinion/ballots.

Izyaslav Polishchuk of Hydro One expressed a need for retaining the numbers as charts referenced in an annex.

Several Users agreed that numbers should reflect an assumption that first level breaker protection/isolation fails, taking more time for secondary breakers to operate. Also that a method of deriving relevant numbers must be included in the guide.

Don Chu suggested issuing the document as a 'trial use guide', with methodology and equations for deriving results. Dependence should be on formulas, and not tables, which should remain as examples of what others have derived for particular cases.

In regard to the new chart addition to 4.3.4, Martin Heathcoat explained that the unpopulated chart was included to hold the spot for numbers he expects to obtain before the next meeting.

Isy Polishchuk indicated that Hydro One derived a chart many years ago, and has recently revised the numbers.

40% margin included in section 4.3.9 was questioned. Bill Darovny indicated that margins should not be included in this document and that it is the business of manufacturers to add margins according to their own criteria.

Practicality of manufacture's testing to validate the adequacy of design was discussed and the consensus was that destructive tests for a power transformer of any significant size would be impractical and cost prohibitive. Martin Heathcoat suggested that such a test on a larger transformer may be equated to short-circuit testing. Paulo Avelino of Siemens suggested that a model should be established - then verified by testing.

Tom Lunquist inquired as to whether Hydro One has done such a test. The answer is that actual testing has been done only on distribution –class transformers.

Meeting was adjourned at 12:15pm.

7.6.1.11 WORKING GROUP FOR DEVELOPMENT OF PC57.157, GUIDE FOR CONDUCTING FUNCTIONAL LIFE TESTS FOR DE-ENERGIZED TAP CHANGER CONTACTS – Phil Hopkinson, Chairman

The Working Group on Life Tests, De-energized Tap Changers was called to order at 8:00 AM on March 13, 2012. A quorum was present.

A. Introductions

The chairman welcomed attendees and introduced the acting secretary. In reviewing the membership roster it was noted that there is confusion concerning the correct listing of members. It was further noted that an oral review of the WG roster indicated that a quorum was not present. It was noted that a new roster has been prepared and those present were requested to sign in and indicate whether or not they were attending as a member or guest. This will be reflected in the minutes..

- B. Approve Agenda for the meeting: Since quorum could not be determined, approval of the agenda was deferred.
- C. Approve the Minutes from the November 1, 2011, meeting in Boston, Massachusetts. Since a quorum could not be established, approval of the minutes from the previous meeting was deferred until the next meeting.
- D. Review of Draft 1 of the Guide for Conducting Functional Life Tests for De-Energized Tap-changer Contacts

The chairman briefly reviewed the status of the project, noting that the group was now a Working Group. A brief discussion ensued concerning using the term “draft” in the title. It was noted that it is appropriate to include the term until the IEEE SB approved the document for circulation.

The chairman engaged in a brief technical discussion of the testing of unstable contacts with the possibility of thermal run-a-way.. It was suggested that a review of the scope of the standard be reviewed. The chairman reviewed the approved scope of the current draft. It was noted that reference should be made to “variables” and not variable since time is one factor. It was recommended that “Switch time temperatures during service life”.. should replace “service time.” It was agreed.

Normative references would include all documents that are cited in the document, so further work on this section will await completion of the first detailed draft.

Attendees engaged in a brief technical discussion of ratings on switches; it was inconclusive.

Clause 4

The chairman reviewed the proposed text in the clause 4 **Accelerated Aging**

Members engaged in a brief discussion of acceleration factor. The factor in the draft remains unchanged.

A member expressed concern with cyclical loading reference and inquired if this matter would be addressed in another clause of the document. The chairman briefly described the empirical experience with the phenomena. A brief additional discussion ensued on experience in a chemical plant and other situation involving transformer loads.

Discussion of the 10 degree rule which the chairman noted as reasonable. It was noted that in simulated testing the objective was to achieve a 150 degree C which would represent the start of the test. Bulk temperature and current would reflect super temperature and, if it stabilized, it would indicate a good value.

Discussion of testing typical daily load cycles. It was noted that variables occurred when the transformer was operating with a stable and not cyclical load.

Discussion of the proposal to add "hottest" in the last sentence of 4.4 before the words temperature of the switch contacts themselves. The proposal was accepted. It was also agree to change to references to temperature to "temperatures."

Discussion of one day of testing (1000 hours at highest temperature). It was noted that there may be a need to define 30 day cycle. The chairman noted that could be addressed when the clause of definitions is assembled.

The chairman noted Larry Dix should be applauded for the work presented thus far but noted that additional text will be developed for clauses 5 through 8.

E. Adjournment: The meeting was adjourned at 9:15 am

**7.6.1.12 WORKING GROUP FOR REVISION OF IEEE STD 638-1992, IEEE
STANDARD FOR QUALIFICATION OF CLASS 1E TRANSFORMERS FOR
NUCLEAR POWER GENERATING STATIONS – Craig Swinderman,
Chairman**

No meeting held.

7.6.2 OLD BUSINESS

None.

7.6.3 NEW BUSINESS

None.

7.6.4 STATUS OF “INACTIVE” GROUPS

WORKING GROUP FOR THE REVISION OF C57.93, INSTALLATION OF LIQUID-FILLED TRANSFORMERS - Michael Lau, Chairman

This group is not meeting; major work on this document is complete; waiting for publishing.

TASK FORCE FOR WIND FARM TRANSFORMERS – Joe Watson, Chairman

Work of this group is complete; the task force is inactive.

TASK FORCE FOR EVALUATING THE NEEDS OF TRANSFORMERS USED WITH SVC – Peter Zhao, Chairman

Fall 2009 - The work of this task force is concluded. A report was issued and it is being considered if an educational paper should be published.

TASK FORCE FOR WIND GENERATOR STEP-UP TRANSFORMERS – David Buckmaster, Chairman

This task force was moved to Performance Characteristics Subcommittee.

WORKING GROUP FOR REVISION OF C57.12.10, STANDARD REQUIREMENTS FOR LIQUID IMMERSED POWER TRANSFORMERS – Gary Hoffman, Chairman

The standard was published.

WORKING GROUP FOR REVISION OF C57.135, GUIDE FOR THE APPLICATION, SPECIFICATION AND TESTING OF PHASE-SHIFTING TRANSFORMERS – Jin Sim, Chairman

The working group completed its work and the guide was published in 2011.

TASK FORCE FOR DVP-GRID TRANSFORMERS PC57.169, – Hemchandra Shertukde, Chairman

This task force was moved to Performance Characteristics subcommittee.