8.1 DRY TYPE TRANSFORMERS SC CHAIRMAN C. W. JOHNSON, JR.

8.1.1 Introductions and Approval of Minutes

The Dry Type Transformer Subcommittee met in Jackson, MS on March 16, 2005 with 16 members and 6 guests present; 1 guest requested membership. Introductions were made and the attendance roster was circulated. Minutes from the October 8, 2003 meeting were reviewed and approved.

Prior to any other activities, IEEE patent policy was discussed. Attendees were asked if they know of any patents that were essential to the implementation of any of the standards related topics under current control of the subcommittee. None were noted.

The chair reminded the attendees that the minutes posted after each meeting were unapproved and would not be approved until the next meeting.

8.1.2 Working Group Reports

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

8.1.2.1 WG Dry Type Test Code C57.12.91 Chairman Derek Foster

1. The working group met at 3:15 pm with 13 members and 4 guests present.
2. There were no comments regarding the minutes from the October 26, 2004 meeting in Las Vegas.
3. The Chairman reviewed the IEEE information on patents and asked if anyone present had any reason to believe the work we were assigned would have any patent implications.
4. Old Business

   At the last meeting the Chairman presented a voting form for members to vote to either revise or to leave as written, the various clauses of the standard objected to by Nigel McQuin during the last ballot. Seven members returned completed voting forms. The results of members' votes were presented during the meeting.

   Also included on the voting form was a question to be answered as to whether the member desires to have a PAR initiated for complete review of the standard. The voting form replies were inconclusive on this question, but by a show of hands during the meeting, it was decided not to review the complete standard but to amend only parts of the standard.

   Since Nigel McQuin's original negative ballot, he has agreed to withdraw some of his objections completely and to withdraw others subject to minor changes. These minor changes will be dealt with in the forthcoming amendment.

   The clause of the standard relating to resistance measurements, where Nigel McQuin had made a number of comments, was considered by the members to

require revision and volunteers were requested to review this section. Three members, Jerry Murphy, Carl Bush and Chuck Johnson agreed to undertake this task. The section of the liquid filled transformer test code relating to resistance measurement is also being reviewed at this time and the Chairman will liaison with the liquid filled test code working group to obtain input which may be useful and to maintain consistency with this test code.

It was agreed to also review various clauses of section 10 (Dielectric tests) and section 11 (Temperature test) during the amendment process.

Jeewan Puri has submitted a copy of the re-write of Clause 13 of C57.12.90, on sound level measurement with a view to also include this in C57.12.91. The Chairman sent this to the members for review and comment. No comments have so far been received so this section will also be reviewed during the amendment process.

Bill Chiu had advised that the expiration date of this standard is December 31, 2006. A PAR for an amendment will be prepared and submitted immediately.

5. There being no new business, the meeting was adjourned at 4:30 pm.

8.1.2.2 WG Dry Type Thermal Evaluation C57.12.56/60 Co-Chairman Roger Wicks

The working group met in Jackson, MS at the Jackson Hilton at 9:30 AM on Tuesday, March 15, 2005 with 13 members and 8 guests present. Attendees introduced themselves and signed a roster.

The Chair reviewed the minutes from the last meeting which were approved as read. The chair reviewed the patent documents for our meeting, and no patent related issues were noted for the work of this working group.

We briefly discussed the definitions provided by Martin Navarro, and it was agreed to form a task force of J. Puri, D. Patel and T. Jonatti to provide simplified definitions for types of dry-type transformers covered under this document. These definitions will be used to guide the work in this document, but may ultimately be forwarded to C57.12.01 or C57.12.80. These definitions may cover the purpose for the different winding types (in a non-commercial manner).

The working group then discussed the models required for this combined document, and a task force of J. Puri, C. Johnson and D. Foster agreed to take input from the two original documents and other sources (such as HV-1, HV-2, HV-3) to propose simplified models the types of dry-type transformers covered under this document. This proposal will cover the principles for developing the model, and potential examples which meet the principles.

The working group felt that there definitely is a need for both full coil and simplified model testing, as each offers advantages. The full coils represent the best simulation of the actual transformer, but as only a small number of coils are built, this can create statistical issues; whereas the models can be built in larger quantities that provide better statistical analysis.

Finally, we discussed the test methods, and agreed that a small group of folks (M. Haas, R. Marek, R. Provost and W. Simpson) will look at these methods and make a proposal for the next meeting.

As an example, the current draft only requires cold shock for solid-cast and resin encapsulated coils, and it should likely be included for all dry-type transformers covered under this document.

Chuck Johnson noted that the PAR date for this document runs through the end of 2007. The Chair noted a conflict with the next meeting date, and John Sullivan agreed to swap times. The Chair will contact Greg Anderson to have the swap done for this next meeting only and send information to all parties once completed.

Meeting adjourned at 10:50AM.

8.1.2.3 Dry Type Reactor TF **Chairman Richard Dudley**

The Dry Type Reactors T.F. met in the Amphitheater Meeting Room of the Hilton Jackson Hotel in Jackson, Mississippi on Mar. 14, 2005 at 8:00 a.m. There were 10 members and 3 guests present. The following are the highlights of the meeting.

1. The minutes of the Dry Type Reactors T.F. meeting in Las Vegas were approved.

   NOTE: The minutes of the Jackson meeting of the T.F. will not be approved until the meeting in Memphis, Tennessee.

2. IEEE patent policy was reviewed; details on the IEEE Transformers Committee website. Attendees were asked if they knew of any patents that were essential to the implementation of any of the standards related topics under current consideration by the T.F. None were noted.

3. Input, re sound generation and measurement for dry type reactors, provided by RFD to the W.G. producing the IEEE sound measurement guide was discussed. The section covering sound generation in dry-type air-core reactors was deemed satisfactory. The section covering 60 Hz to 50 Hz conversion of sound measurements could be improved; review section on sound measurement in IEEE C57.12.00, include 50 Hz to 60 Hz conversion of sound measurements (Lars-Erik Juhlin will provide some background information; including information submitted by Ramsis Girgis during the revision of IEEE C57.12.00 and IEEE C57.12.90), add a NOTE stressing that the "breathing mode" resonance should be verified to be sufficiently far away from the 120 Hz and 100 Hz mechanical forcing functions.

4. Proposed revisions to IEEE C57.16 were discussed. The following are the important aspects / considerations.

   (i) The concept of reduced BIL in Table 5 was reviewed. It was deemed appropriate based on utility insulation co-ordination and protection practice. Reduced BILs have been eliminated from the dielectric test level table in the revision of IEEE C57.21 now in process due to the dominance of the switching duty seen by SRs. A NOTE will be added to Table 5 stating that terminal-to-terminal BIL may be different from terminal to ground. A clause to this effect, including background information, will be added at a suitable location in the text of the standard. Table 5 content will also be co-coordinated with work being carried out in Phil Hopkinson's W.G.; BIL and dielectric test levels for power transformers.

(ii) Pierre Riffon produced a revised draft of the proposed annex on circuit breaker TRV issues associated with the application of series reactors. This revised draft was discussed at length and the following are the highlights.

- Consistency / compatibility between IEEE and IEC re CB classification has now been achieved; IEEE indoor vs. IEC cable systems and IEEE outdoor vs. IEC overhead line systems. The appropriate IEC documents will be referenced. The CB S.C. of the IEEE Switchgear Committee will essentially adopt the IEC performance rationale and terminology.

- IEEE C37.06 (preferred ratings of CBs) currently in the revision process will utilize IEC CB application criteria to define CBs for cable systems and overhead line systems.

- RFD will make editorial corrections to Pierre Riffon's draft and then send by e-mail to T.F. members; it will be designated Draft #2.

- The addition of capacitance, in shunt or across the reactor, may not be sufficient to ensure that the TRV is within the CB capability. Damping may have to be added to reduce the TRV peak if the Q factor of the reactor at the TRV frequency is not low enough. High frequency Q of the reactor is important.

- Pierre Riffon will send Draft #2 to the Chairman of IEC WG 35 of SC 17A for his comments. Draft #2 should also be forwarded to the CB S.C. of the IEEE Switchgear Committee. Pierre Riffon will coordinate this.

5. Terminal temperature rise limits in IEEE C57.16 should be consistent with limits in IEC 694; temperature rise limits are a function of plating material, if used. Terminal preparation (contact aids) / connection practice is very important. It is preferable if terminal connection configuration is included as part of the temperature rise test so an accurate assessment of expected in-service terminal temperature rise can be made.

6. Sound measurement methodology should be modified to reflect the common use of integrating sound level meters.

7. Impulse test code should be revised to reflect the current standard practice of employing digital impulse test systems.

8. The methodology of the temperature rise design test will be revised to reflect the increasing use of fibre optic based temperature measurement systems. Other methods of temperature determination will be retained; thermometers, thermocouples, etc.

9. Average temperature rise limits will be raised; especially for higher temperature classes, to at least be consistent with those in IEEE C57.21. Hot spot rise limits are deemed satisfactory and reflect the duty that series reactors see in-service.

The meeting adjourned at 9:15 a.m. The Chairman stated that he would prepare Draft #4 prior to the Memphis meeting.

8.1.2.4 WG Dry Type General Requirements C57.12.01 Chairman John Sullivan

The working group met in the Amphitheater II meeting room of the Hilton, Jackson in Jackson, Mississippi.

Chairman John Sullivan called the meeting to order at 1:45 PM on Monday March 14, 2005.

The meeting was convened with fourteen (14) members and seven (7) guests present. Two (2) guests requested membership.

Introductions were made.

The first order of business was to ask the members if they knew of any patents or pending patents that apply to the contents of the C57.12.01 standard. No one knew of any patents that pertained to C57.12.01.

The minutes of the Las Vegas meeting were approved.

The first order of business was table 16 of draft 5. Table 16 was revised to harmonize with IEC. The table listed a final conductor temperature, after short circuit, of 200 °C for aluminum by temperature class. Proposed table 16 provided temperatures for copper and aluminum. After discussion, the consensus of the working group was that 200 °C was too low for aluminum and further study was needed before revising the table. This issue will be addressed in the next standard revision.

The second order of business was table 5. Table 5 in draft 5 combines C57.12.01 – 1998 table 4 and table 5 into one table. A column listing maximum line to line system voltages was questioned by working group members. Some table values were also questioned. After discussion, the working group voted to eliminate the maximum line to line voltage column from the table. The working group also voted to keep the table structure and the values within the table as presented.

The last order of business was to revise the introduction to include an explanation for combining table 4 and table 5 into one table. This change involved words and phrases in two paragraphs.

There being no old business or new business, the meeting was adjourned at 3:00 pm.

8.1.3 New Business

1 The chair gave a report on the activities of the Administrative Subcommittee meeting.

2 Sites for upcoming meetings were announced.

3 The Association Management System (AMS) was discussed and the chair asked that all attendees register their email address so that SC members could be added to the system.

4 The subcommittee was once again reminded that the working group members are required to participate and not just attend the meetings. A suggestion was again made for working group chairs to consider removing inactive members from the group. Several WG chairmen stated they had removed inactive members from their rosters.

5 The chair announced that two standards were due for reaffirmation in 2005, C57.134 "IEEE Guide for Determination of Hottest Spot Temperature in Dry Type Transformers" and C57.94 "IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry Type General Purpose Distribution and Power Transformers. Mike Haas agreed to lead the reaffirmation process for C57.134, and Carl Bush agreed to lead the reaffirmation process for C57.94.

6 Sheldon Kennedy asked about the status of the four (4) ANSI documents (C57.12.50, C57.12.51, C57.12.52, and C57.12.55) transferred from NEMA. The status of the documents remains in flux as we have no information on how to have the documents approved as IEEE standards. The SC chairman will request support from Bill Chiu on how we should proceed.

7 There being no further business, the subcommittee meeting adjourned at 2:45 PM.