8.12 Dielectric Test Subcommittee – Loren Wagenaar, Chair; Thang Hochanh, Vice-Chair; Dennis Marlow, Secretary

The Dielectric Test Subcommittee (DISC) met on Wednesday, October 28, 2009 at 11:00 am in Lombard IL, with 58 of 122 members, and 76 guests present. 5 of the guests who requested membership will have their participation status reviewed prior to acceptance

8.12.1 Chair's Remarks

1) Loren Wagenaar was again unable to attend for personal reasons. Thang Hochanh. Chaired the meeting

2) The Chair briefly reviewed highlights of the Administrative Subcommittee meeting held on Sunday:

   a) The next meetings:
      1) Spring 2009, March 7-11 (Omni Houston $139) – Houston TX, Tulstar Products
      2) Fall 2010 , (Oct or Nov) – location to be determined in North America

3) After introductions a count showed 58 members were in attendance. The new quorum requirements were not met. The membership participation will be reviewed prior to the next meeting to include only active members

4) The minutes of the spring 2009 meeting in Miami were approved as written, and are available on the IEEE Transformers Committee Web Site.

8.12.2 Working Group Reports

8.12.2.1 Working Group on Revision of Low Frequency Tests – Bertrand Poulin, Chair; Bill Griesacker, Secretary

At 1:45 PM on October 27, 2009 the meeting was called to order by Chairman B. Poulin. The meeting was attended by 16 members and 22 guests. After introductions were made, the IEEE patent disclosure set of slides was presented. No patent issues were raised. The agenda was presented and the minutes of the March 2009 Miami meeting were accepted as issued. The next order of business was the Task Force reports:

A) TF Electrical Partial Discharge Measurements Guide C57.113

Dr. Lemke reported on the Task Force for the Revision of C57.113. A proposal for a tutorial for the Transformers Committee on technical aspects of PD measurements including a historical review was discussed. The document has been reviewed and prepared for balloting, a recirculation of the ballot will be sent out very shortly after this meeting.

B) Task Force Partial Discharge in Bushings and PTs/CTs

Thang Hochanh presented the minutes for the Task force for PD in other devices such as CTs and Bushings. The Task Force was asked to determine if we need a separate document separate from IEEE C57.113 for PD detection on devices such as PTs, bushings and CTs. Professor Lemke gave a presentation to the task force on one approach for measuring PD on these devices which has been used successfully in noisier environments. The group concluded that there are other applicable methods and that an additional document should be

prepared to cover the options for PD testing for other devices. Dr. Lemke's presentation will be made available on the Committee web site.

C) Old Business: Survey to Manufacturers re 69 kV Transformer Testing

Subash Tuli sent out a survey regarding the testing of 69 kV transformers asking if they are tested as Class I or Class II transformers. 20 manufacturers were contacted, 12 responded and the results showed that the majority of 69 kV transformers were tested as Class II transformers. This working group will recommend to the Dielectric Test Sub Committee that 69 kV transformers should be tested as a Class II transformer for the induced test.

The working group will review standards C57.12.00 and C57.12.90 to determine if there are sections that need to be added, modified or updated to help with the effort to continually revise these standards.

There was no **New Business**.

The meeting adjourned at 2:10 p.m.

8.12.2.2 Working Group on Revision of Impulse Tests –
Pierre Riffon, Chair; Peter Heinzig, Vice-Chair

The WG met on October 27, 2009, from 3:15 pm to 4:30 pm. Sixteen (16) members and thirty-seven (37) guests attended the meeting. Six (6) guests requested membership. The meeting was chaired by Pierre Riffon, chair of the WG.

The agenda has been reviewed and accepted as written.

The minutes of the Miami meeting were approved as written.

The IEEE patent disclosure requirement policy was discussed. None of the members and guests present during the meeting was aware of any patents related to the work of this WG.

The first technical item of business was to discuss the comments received on the 2nd survey made within the WG and within the Dielectric Tests SC on a revised proposal concerning the tap changer position during lightning impulse tests. The proposal was motivated by two principal reasons: testing different tap positions for reflecting service conditions and for a possible harmonization with IEC testing practices.

Decisions made during the meeting from the comments received are:

- A unique single-phase unit equipped with a reactor-type tap-changer shall be tested at a tap position giving a bridging position;

- Contrary to the IEC practice, a single test procedure will be required independently of the tap changer range;

- The initial wave shape adjustment shall be performed on the prescribed tap position having the lowest impedance;

- An example of possible testing combinations for transformers having tap changers on both HV and LV windings will be given in a note;

- The proposed test procedure should also apply during impulse type tests on distribution transformers. Since distribution transformer manufacturer and user representatives were not well represented during the meeting, this particular point will be highlighted in the next survey in order to get feedback from distribution transformer manufacturers and users;

- Tests in bridging position for transformers equipped with a reactor-type tap-changer apply only for cases were the bridging position can be used in continuous operation;

- A general rule will be given if more than one single-phase transformer are to be impulse tested.

The number of returns was extremely low as usual on surveys. The return rates were 31.3% from the SC membership and 17.7% from the WG membership. Approval rate were respectively 83.3% and 81.8%.

Although the proposal was well accepted by those individuals having returned their ballot and comments (83% approval rate), some of the members and guests present during the meeting were strongly against the proposal. They have proposed either to keep the actual procedure e.g. testing at the minimum effective turns or to make the impulse tests at a single tap position.

The WG chair requested these individuals to send their comments in the upcoming survey. For the upcoming meeting and to get a constructive work, the WG chair will restrict the discussion to the comments received from the survey and not those arising from the floor during the meeting. The WG chair pointed out that the responsibility of all WG and SC members is to answer surveys. A "no show" during the upcoming survey will be considered as an acceptance of the proposal.

The WG chair will prepare a third proposal and will be surveyed within the WG and Dielectric Subcommittee memberships.

Due to lack of time, the comments received were not fully discussed and the remaining subjects on the agenda were not discussed and will be postponed to the upcoming meeting in Houston.

The meeting adjourned at 4:30 pm on October 27, 2009.Submitted by Pierre Riffon P. Eng.

SC Vice Chair Note : It is notice able that there has been little participation from the Distribution Subcommittee. These proposed changes to the Impulse test will also impact their standard(s)

8.12.2.3 Working Group for Revision of the Impulse Test Guides C57.98 and C57.138 Art Molden, Chair; Joe Melanson, Co-Chair

The meeting started at 9:30 AM on Tuesday October 27, 2009, with 45 attendees present of which 11 were members and 34 were guests.

In keeping with the IEEE patent policy the members were asked if they were aware of any patent or copyright infringement issues in the present draft of the Impulse Guide. No issues were identified and the meeting proceeded with group introductions.

The last meeting held by this WG was spring of 2008 and the first order of business was to call for a motion to approve the minutes of that meeting. The motion was proposed by Jim McBride and seconded by Joe Melanson.

Draft 3 of the guide had been placed on the Transformers Committee website in March of 2008 for review by members of the Dielectric Test subcommittee. Three members responded with editorial and technical comments. The technical comments returned were reviewed and discussed at this meeting, as outlined below.

Comments by Loren Wagenaar:

- To include a sentence in a clause relating to FOW chopped waves and why they had been removed from the C57.12.00 test table
- To modify the Transformer LI Test Form by including provision to record the tap position used during the impulse test.

Comments by Jim McBride:

- To include some additional information on the Coherence Function paragraphs at the end of Annex A of the guide

Comments by Gustav Preininger:

1) To include an SI wave on the figure 1 wave shape collection.
2) To include reference to T1 and T2 time parameters on figure 1.
3) To change the wording in the guide to the same as used in C57.12.90 regarding the voltage level above which all impulse applications must be logged.
4) To propose that when low impedance windings must be tested by “alternative means”, that two tests be performed using both Method 2 and Method 3 rather than just one test based on choosing just one of those methods.
5) To include a comment in the section on chopping gaps that sphere gaps when used to produce chopped waves produce faster rates of voltage collapse than do rod gaps.
6) To point out that the example calculation of inductance in clause 7 was not correct.

Comments by Loren Wagenaar were accepted by the members and will be added to the next draft of our guide.

Jim McBride reviewed his comments at the meeting but Bertrand Poulin, the author of Annex A was not in attendance and so discussion of this item will be continued via email and the outcome included in the next draft of our guide.

Gustav Preininger comments 1, 3, 5 and 6 were accepted by the members and, with some additional wording will be included in the next draft. Comments 2 and 4 were not favorably accepted by the members. Art Molden will pass on this outcome to Gustav and continue discussion with him.

There being no further business the meeting was adjourned at 3:45PM.

Art Molden & Joe Melanson.

8.12.2.4 Task Force on External Dielectric Clearances
Eric Davis, Chair; Dennis Marlow, Secretary

The TF met on Oct 26, 2009 at 11:00 am at the Westin Lombard. Forty-three people attended this fourth meeting, 8 members and 34 guests (12 repeat guests) were present with Peter Zhao of Hydro One accepted as a new member, bringing the total membership to 17.

The minutes from the spring 2009 meeting in Miami were approved as submitted without the attached comments.

The IEEE patent disclosure requirement policy was discussed. Reference to the package posted on the IEEE Transformers Committee Web site was made. None of the members and guests present during the meeting was aware of any patents related to the work of this TF.

The TF reviewed the progress in determining the technical basis of the clearances contained in CAN/CSA C88 and IEC 60076-3.

Roger Hayes reported he has a received some documentation from Dan Perco to support the origins of the CAN/CSA C88 clearances is indeed based on CAN/CSA C308, “The Principles and Practices of Insulation Coordination.”

A maintenance group has been established for IEC 60076-3. The TF will contact the maintenance group regarding the basis for their clearances.

The remainder of the meeting focused on clearances at 230-kV and below.

The Chair presented the old NEMA TR-1-1980 electrical clearance table which showed phase to ground, phase to phase and bushing shed to bushing shed clearances. The current Table 14 phase to phase and phase to shed values match the NEMA TR-1-1980 values. It was noted that the table 14 230-kV values correspond to the TR1 196-kV values. An attendee pointed out that at that time, 196-kV was 900–kV BIL and 230-kV was 1050-kV BIL

In general, for system voltages <=230 kV, the NEMA TR-1 phase to ground values are lower than those contained in the IEC and Canadian standards. The NEMA TR-1 phase to phase values are similar to the values contained in the IEC standard. The phase to phase values in both of these standards are lower than the values contained in the Canadian standard.

A table was presented for discussion with proposed phase to phase and phase to ground clearances which basically was based on typical BIL values used at various voltage classes. There was a good discussion about this pointing out some problems with only using BIL as a reference since the Low Frequency tests may require larger clearances.

There was also some discussion regarding the use of switching surge values at 230-kV. The IEC transformer clearances for 169 kV and below appear to be based on voltage class and BIL while higher kV classes are based on voltage class and switching surge. The CSA clearances for 230-kV and below are based on BIL with higher kV classes based on switching surge. It was suggested that we survey the TF for interest in basing the 230-kV clearances on switching surge.

A straw vote was 18 to 0 in favor of using the old TR1 table for phase to phase, phase to ground and bushing shed to bushing shed clearances.

A survey will be sent out to the members and interested guests so that comments can be obtained about the proposed clearance table with 230-kV clearances and above based on switching surge.

The proposed clearance table incorporating comments received at this meeting, the IEC and CSA clearances will be summarized and included with the survey for reference.

Meeting adjourned 12:15 pm respectfully submitted, Dennis Marlow

8.12.2.5 Task Force on Special Dielectric Test Issues – Bruce Forsyth, Chair

The Task Force on Special Dielectric Test Issues met in Lombard, IL on October 26, 2009 at 1:45 PM. There were 39 people in attendance, 17 members and 42 guests, with 9 guests requesting membership, bringing the total membership to 51.

After introductions of attendees the minutes of the spring 2009 meeting in Miami, FL were approved as written. The purpose of the TF, which is to make recommendations to the Chairman of the Dielectric Test Subcommittee regarding how to proceed with certain dielectric test issues, was reviewed before moving on to regular business.

The first item of business was to revisit to TF's recommendation from the Miami meeting regarding the issue of impulse tests on neutral terminals. Specifically, at the Miami meeting the TF recommend no further action be taken, however the SC asked that the issue be revisited in part because of low TF member attendance at the Miami meeting.

Since there were only 17 members attending the meeting, the Chair suggested without opposition that the focus of the discussion be to identify specific technical issues and/or concerns related to testing neutral terminals, and that those issues be summarized in a survey of the entire TF membership after this meeting. Some of the issues raised (in no particular order of importance) included:

1. Clause 5.10.8.1 of PC57.12.00/D2c2008 states, "When required, lightning impulse tests shall be performed on line and neutral terminals for power transformers." The previous revision required impulse tests on neutral terminals neutral terminals rated 200 kV BIL and higher. It was unclear what justification went into the removal of the 200 kV limit, but it was noted that the current wording effectively requires impulse tests on all neutral terminals if impulse tests are required (based on transformer type and class). It was suggested that the removal of the 200 kV BIL limit may have been a part of recent work performed to revise the dielectric test tables.

2. Assigning a BIL designation to a terminal defines an insulation class and does not imply that the terminal will be or should be impulse tested.

3. There was some discussion related to the relative value of impulse testing neutral terminals and that in most cases, especially when the neutral is solidly grounded, the neutrals will not see the same type of impulse stresses as line terminals.

4. A participant questioned whether every neutral terminal should be tested or only those that are not solidly grounded.

5. A member commented that a neutral terminal impulse test on a terminal that will be solidly grounded in service may produce oscillatory voltage stresses that in all likelihood will never occur in service, and therefore the test should not be performed.

6. There was some discussion about factory test floor failures that have occurred on neutral terminals and whether the defect would have been discovered during an applied potential test if the impulse test did not take place. Since the impulse tests precede applied potential tests the answer to that question cannot be determined for certain, however it was pointed out that while all of the dielectric tests tend to produce electrical stresses in the entire insulation system under test, each of the dielectric tests is designed to verify different parts of the insulation system so it is not correct to assume an applied potential test will have the same result as the impulse test.

7. A member noted that a neutral terminal impulse test is a good quality control test for manufacturers to consider. The Chair expressed his opinion that quality assurance and quality control tests should be defined by each factory based on their experience and that it is not the role of the TF to define factory quality control tests.

8. It was suggested that the TF look into the IEC requirements for neutral terminal impulse tests.

The Chair brought the discussion to a close and reiterated his plan to survey the entire TF in order to ensure the TF recommendation is supported by a majority of the TF members.

The second item of business was a general discussion of the impact of eliminating the terms “Class I” and “Class II” on issues falling under the Dielectric Test Subcommittee. A brief review of definitions and discussions from previous TF meetings took place. The dielectric test tables in the most recently balloted revision of C57.12.00 were reviewed as well as a table showing the clauses in the recently balloted revisions of C57.12.00 and C57.12.90 where the terms “Class I” and “Class II” appear. Some of the comments made included:

1. Distribution transformers have a routine impulse test requirement, but Class I power transformers do not.

2. This TF previously recommended the definition of Class II be changed to include 69 kV transformers.

3. One user noted that his company routinely requires impulse testing and Class II induced potential testing on 34 kV transformers.

4. A member noted that some confusion can occur when a partial discharge test is requested on a Class I transformer. Specifically there are different opinions regarding the enhancement voltage level and the specific procedure to be followed.

As time was running out the Chair brought the discussion to and end and asked the attendees if there was a strong feeling that there was anything to be gained by eliminating the Class I and Class II definitions. There were no comments. Since a quorum did not exist there was no vote.

There was no new business raised and the meeting adjourned at 3:00 PM.

Respectfully submitted, Bruce Forsyth

8.12.3 Liaison Reports

8.12.3.1 High Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

Editorial work on the new revision of High Voltage Testing Techniques, IEEE Standard 4 continues. The latest draft document is currently in circulation for review by the active members of the working group. A Molden. 10/27/2009

8.12.4 Old Business

A tutorial on **Dielectric Frequency Response Testing** was held as scheduled. The Dielectric Test SC thanks Mark Perkins and the other presenters for their participation. The participation and feedback about this new technology was very positive. Mark Perkins indicated that there may be a need for a guide to help new users in the necessary procedures and interpretation of the results. It may be a good addition to the field testing guide C57.92.

8.12.5 New Business :None

8.12.6 Meeting adjourned 1:15 PM Respectfully submitted: Dennis Marlow