Annex H Insulation Life Subcommittee

October 26, 2016 Vancouver, BC Meeting Minutes

Revised and Approved April 5, 2017

Chair: Sheldon Kennedy
Vice-Chair: Barry Beaster
Secretary: Sam Sharpless

The Insulation Life Subcommittee was called to order by the Chair in Vancouver, BC on October 26, 2016 at 8:11 AM. Due to the size of the group, general introductions were not made. The chair requested that each person state their name and affiliation when addressing the subcommittee.

The secretary reported that according to the electronic check-in system, 59 of 106 members were present at the start of the meeting and that a quorum had been achieved.

The chair presented the Spring 2016 meeting minutes. Gary Hoffman made a motion to approve the minutes as written. Phil McClure seconded the motion and there was unanimous approval.

The chair presented the agenda for the current meeting. Stephen Antosz noted that a representative the Chinese Society of Electrical Engineers desired to address the group and requested that they be placed on the agenda as new business and the Chair agreed to do so. Sanjib Som made a motion to approve the amended agenda. Don Ayers seconded the motion and there was unanimous approval.

Consolidation of the electronic check-in records and the written attendance rosters after the meeting provided the following final attendance totals;

Total Present	224
Members	76
Guests	148

11 guests requested membership

H.1 Chair's Report

The chair provided the dates of upcoming TC meetings as follows;

2017 Spring Meeting; April 2 – 6, 2017, New Orleans, Louisiana, USA

2017 Fall Meeting; October 29-30, 2017, location TBD

2018 Spring Meeting; March 25-29, 2018, Pittsburgh, Pennsylvania, USA

The chair requested that any person with knowledge of a patent essential to meet the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

The chair requested the following items be included in all activity group minutes;

- The name of the activity
- The date and time of the meeting
- The number of members and guests in attendance. Full attendance should be recorded in the AMS system
- The presence or absence of a quorum
- Any essential patent issues raised during the meeting.
- A summary of discussion. Intricate detail not required. Use a separate document to explain decisions that are made.
- A record of the decisions made in the meeting
- If there will be another meeting. If so, state the time and place.
- Submit minutes as soon as possible, but no more than 15 days after the meeting.

The chair discussed the membership requirements and recognized the following new members; Hamid Abdelkamel, Dieter Dohnal, Don Dorris, Attila Gyore, Kurt Kaineder, Sam Ojeda, Rakesh Rathi, Alwyn VanderWalt, Matthew Weisensee, Trenton Williams, and Kwasi Yeboah

The chair discussed the requirements for continued membership and noted that the following members had been placed on guest status; RajAhuja, Tauhid Haque Ansari, Julio Caldeira, Jose Izquierdo, Tamyres Machado Junior, Emilio Morales-Cruz, Ali Naderian, Leslie Recksiedler, Michael Shannon, James Thompson, and Peter Zhao.

H.1.1 Project Status Reports

H.1.1.1 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until 2021.

H.1.1.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers

C57.100 is valid until 2021.

H.1.1.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

C57.119 is valid until 2018 and is Chaired by Gael Kennedy.

H.1.1.4 C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until 2022.

H.1.1.5 C57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

The C57.162 PAR expires December 31, 2017. The standard is valid until 2018 and is Chaired by Tom Prevost

H.1.1.6 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

The 1276 PAR expires December 31, 2016 and an extension has been requeseted. The standard is valid until 2018 and is Chaired by Roger C. Wicks.

H.1.1.7 1538 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformer

1538 is valid until 2021 and is Chaired by Richard Marek. An amendment was approved in September 2015.

H.1.2 Working Group and Task Force Reports

H.1.2.1 Working group on PC57.162 – Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

A meeting was held on October 24, 2016 for the working group on PC57.162 – Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors (Moisture in insulation systems)

Tom Prevost - Chair
Valery Davydov- Vice Chair
Deanna Woods – Secretary
Stephanie Denzer – Secretary for this meeting

Attendance: Members: 39 of 88
Guests: 49 guests with 8 requesting membership

The following guests requested membership

Roger Hayes	Marcos Ferreira
Shane Goydich	Kiran Vedante
Sheldon Kennedy	Kevin Sullivan
Jeffrey Ray	

The meeting was called to order at 11:00 am. Introductions of the Vice Chair and (temporary) Secretary were made.

Members of the working group present at the meeting were asked to stand and be counted to assess whether there was a quorum. We had 39 of 88 members present so we did not have a quorum. The chair noted that since we did not have a quorum, we could not do any official business.

The agenda of the meeting was presented for comment. No additional agenda items were suggested.

Meeting Agenda:
- Introduction of attendees
- Establishment of Quorum
- Approval of Agenda
- Approval of Minutes from March, 2016
- Call for Patent Claims
- Review of PAR
  - Project Scope
  - Project Purpose
  - Project Timeline
- Chair's Remarks
- Presentation, "Case Study: Investigation into High Risk Associated with Wet Oil Resulted in Transformer Failure", Valery Davydov
- Update on Task Force Activity

The following call for patents was shown to the members and guests. No one responded.

> If any individual believes that Patent Claims might be Essential Patent Claims, that fact should be made known to the entire working group and duly recorded in the minutes of the working group meeting.

The scope and purpose of the project were reviewed by the chair.

A request for volunteers to edit the document once the TF reports have provided their drafts was made. If anyone is interested, please contact Tom Prevost.

Valery Davydov gave a presentation "Case Study: Investigation into Transformer Failure and Positioning of On-Line Moisture Probes" for Task force 6. A question was presented by Roger Fenton and a response for follow up offline was given.

Task Force Reports;

Task Force 1 – Terminology and Definitions
Task Force Leader (Jeff Golarz)
Tom Prevost presented as Jeff was not present. Jeff has compiled all of the terminology and definitions that have been submitted by the task forces. This is ready to be included in the main document.

Task Force 2 – Measurement and evaluation of moisture-in-gas insulation parameters.
Task Force Leader – Tom Melle
Progress is being made, a presentation summary is available on the transformer committee website. The first draft of the chapter was requested to be completed by the end of January 2017.

Task Force 3 – Measurement and evaluation of moisture in – liquid insulation parameters.
Task Force Leader – Claude Beauchemin
CIGRE is currently working on this effort and should be completed 1Q or 2Q 2017 – we are hoping to utilize this information. A draft was requested by end of January 2017.

Task Force 4 – Measurement of moisture in solid insulation.
Task Force Leader – Ron Hernandez
The task force has completed its work and the chapter has been submitted to the WG chair for inclusion in the document. The chair complimented the members of the task force for completing their assignment.

Task Force 5 – Estimation of moisture in solid insulation using dielectric response methods
Task Force Leader George Frimpong
The task force has completed its work and the chapter has been submitted to the WG chair for inclusion in the document. The chair complimented the members of the task force for completing their assignment.

Task Force 6 – Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium.
Task Force Leader – Valery Davydov
A presentation was given on the position of moisture sensors. It was suggested that the TF considers including into a draft a discussion on the issue of positioning of moisture sensors in the

main oil circulation and away from it. A draft of this section should be ready by the end of January 2017.

Task Force 7 – Evaluation of aging and end of life of solid insulation parameters
Task Force leader – Roger Wicks
No update – draft to be completed by the end of January 2017.

Task Force 8 – Factory/workshop application of knowledge on moisture; establishing baselines
Task Force leader – Poorvi Patel
The task force has completed its work and the chapter has been submitted to the WG chair for inclusion in the document. The chair complimented the members of the task force for completing their assignment.

Task Force 9 – Field application of knowledge on moisture * Note: This section lists the risks associated with moisture
Task Force leader – Jim Thompson
The chair presented TF chair Thompson's summary of progress to date;

> "I am reviewing papers and guides on moisture risks including bubble evolution in oil, dielectric failure, and premature aging of paper. I authored the Cold Start VDE response curve in the C57.106-2015 Annex and can provide more details. Other guides already have bubble evolution risk information. I will search the IEEE Explore site for aging vs moisture in paper/oil systems. I hope to have a draft in two weeks. I still don't have e current C57.91 but will get a new C57 series CD after this meeting. Most of the text regarding risks will be discussion and references to C57 guides. I will also add a bibliography."

It was suggested that this document must include moisture levels associated with known risks. The chair commented that this should be included in the work of TF 9. Rough Draft of this section to be completed by end of January 2017.

Task Force 10 –Moisture Migration, Distribution and Moisture Equilibrium Charts
Task Force leader – Bruce Forsyth
The task force received additional volunteers since last meeting and a scope has been developed.
TF 10 Scope:

> This chapter presents the best known information related to
> a) Moisture migration in insulation systems;
> b) How moisture distributes throughout an insulation system;
> c) Moisture equilibrium charts applicable to transformer insulation systems.

The initial focus will be on liquid-filled insulation systems, but an effort will be made to provide similar information for gas-filled insulation systems.

Oleg Roizman commented that basic adsorption isotherm curves for cellulose were developed in 1960 and came from the textile industry. He asked a question on whether or not to use these existing "Jeffries" curves or create new ones. The chair commented that the development of new adsorption curves, although preferred, may take too long for inclusion in this document. (Task force is looking for input from material suppliers)

A draft as was asked to be completed by the end of Jan 2017.

This meeting was adjourned at 12:15pm

H.1.2.2 Working Group for Application of High-Temperature Materials IEEE P-1276 – Roger Wicks

Sheraton Hotel – Vancouver, BC Canada
Room – Grand Ballroom AB
October 25, 2016, 3:15 - 4:30pm

A. Welcome & Chairman's Remarks — R. Wicks

Roger opened the meeting at 3:15pm with a brief description of the scope of the Working Group. The chair reviewed the patent topic and there were no essential patented described for work in the area of this standard.

B. Circulation of Attendance Rosters — J. Arteaga

Circulated

C. Attendance for Quorum — J. Arteaga

19 members were in attendance meeting the quorum requirement of 18 members. The attendance will be reviewed and new members will be added if they meet current attendance requirements. The attendance will be recorded in the AMS system. The automated attendance records (scanning system) recorded 19 members and 60 guests.

D. Approval of Spring 2016 Meeting Minutes – Atlanta, GA — J. Arteaga

Mike Shannon made a motion to approve the minutes as written, John Luksich seconded it and these were unanimously approved without changes.

E. Approval of Meeting Agenda — R. Wicks

Eduardo Tolcachir made a motion to approve the agenda as written, Mike Shannon seconded it and these were unanimously approved without changes.

F. Status of PAR/Document — R. Wicks

The PAR of this standard was requested for extension for 2 year. The standard expires at the end of 2018.

G. Assignments from Last Meeting — R. Wicks

The assignments for the elaboration of the draft are as follows. Chair requested groups to complete the draft work before the end of year.

Section 5 – Insulation-system temperature ratings, test procedures, and material aging qualification:
Chair - Roger Wicks

Volunteers – Mike Franchek, Ken McNeish, Tom Golner, David Stankes, Solomon Chiang, Joshua Verdell, Dave Sundin, Jinesh Malde, and Mohamed Diaby.

Section 6 – Insulating Materials.
Chair – Javier Arteaga
Volunteers – Clair Claiborne, Julio Caldeira, Patrick McShane, Dave Sundin, Attila Gyore, Chuck Stevens, Shane Goydich, Jinesh Malde, Dustin Davis, and Mike Shannon.

Section 7 – Description of high-temperature transformers.
Chair – Mike Franchek
Volunteers – Kurt Kaineder, Arup Chakraborty and Evan Langran.

Section 8 – Loading guidelines for high-temperature transformers.
Chair – John Luksich
Volunteers - Arup Chakraborty and Jinesh Malde

Section 10 – Heat run test and average winding temperature.
Chair – Juan Castellanos
Volunteers – Mike Franchek, Alan Sbravati

H.1.2.3 Working Group on C57-119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Gael Kennedy

The document is undergoing ballot resolution. It is still on track to be completed prior to the end of 2018. This working group did not meet during the Vancouver Conference.

Submitted by: Gael R Kennedy

H.2 Old Business

The PAR for the Proposed WG – PC57.165 "IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors" has been submitted and should be considered in December. The activity chair is Phil McClure.

A study group was formed to address comments related to C57.91, "Guide for Loading Mineral Oil-Immersed Transformers and Step-Voltage Regulators" consisting of Gary Hoffman and Bruce Forsyth.

A C57.12.00 Ballot Comment was addressed. The comment concerned clause 4.3.1 and was raised by Mark Perkins; operation at high altitude also affects the cooling performance, and this should be addressed in addition to dielectrics.

- C57.12.00 clause 4.3.1 refers the reader to C57.91.

- Reviewer Response: The balloter is correct that high altitude affects cooling performance, however IEEE Std. C57.91 is cited in Clause 4.3.1. In IEEE Std. C57.91-2010, the normative Annex E, titled "Unusual temperature and altitude conditions" the text of sub-clause E.2 specifically addresses the balloter's concern as follows: "The effect of the decreased air density due to high altitude is to increase the temperature rise of transformers since they are dependent upon air for the dissipation of heat losses." Hence it is the judgment of the reviewers that no change is required to C57.12.00-2015 to address this concern as it is referenced in Clause 4.3.1 of IEEE Std. C57.12.00-2015 by referencing IEEE Std. C57.91 and IEEE Std. C57.91-2010 adequately explaining the consideration of air density on air circulation as noted above.

H.3 New Business

Jeff Ray expressed a concern about the temperature rise test procedure found in C57.12.90-2010 Section 11.2.2 Hot-Resistance Method. He has noted variations in the way that these tests are performed among various manufacturers and plants. He spoke in favor of a task force to survey owners and manufacturers to determine the current methods and expectations from all sides. The survey information would be published without identifying the individual responses from each party. Mr. Ray then made a formal motion to produce and publish such a survey. The motion was seconded by Matt Weisensee. Stephen Antosz noted that a 2015 version of this standard has been published and there were changes to the subject section. The chair asked Mr. Antosz about the workability of a confidential survey and Mr. Antosz said that it could be done. Gary Hoffman stated that the standard is clear and that the owners should ensure that it is followed. Mr. Antosz suggested that Mr. Ray may want to perform a review of the standard instead of a survey. The motion failed with a vote of 2 for and 57 against.

Stephen Antosz introduced Jianbin Fan, representing the Chinese Society of Electrical Engineers. Mr. Fan provided a presentation regarding a CSEE standard for lead exits, 1000 volts and above. Mr. Fan said that the standard had been presented to IEEE for adoption. It was initially rejected, but Mr. Fan was eventually referred to the Insulation Life Subcommittee for further consideration. Mr. Gary Hoffman spoke warmly in support of working together in global initiatives. Sajib Som noted that the CSEE standard directly specifies means and methods in a way that will block development and hamper introduction of new ideas. Mr. Som suggested that the document could potentially be considered a guide, but not a standard. Tom Prevost stated that the document does not fit the scope of the ILS. He stated that the document may be more appropriate for ASTM rather than IEEE. Don Platts stated that the document fits the TC scope, but perhaps not the ILS. Mr. Platts said that IEEE standards are focused on focused on functionality but the CSEE document is focused on means and methods. Mr. Hoffman countered that construction methods were in the purview of the TS, but agreed that the ILS may not be the correct subcommittee. Mr. Fan responded to each of the comments and said that he thought that the document would be appropriate for the IEEE. The Chair thanked Mr. Fan for his presentation and agreed to consult the TC leadership for guidance on how to proceed.

Shamaun Hakim raised an issue about testing in C57.12.90. Jeff Ray, Chair of the C57.12.90 Task Force, said that he would like to study the issue further and report at the next meeting.

Based upon issues raised in the Working Group meeting for the revision of IEEE Std 1276, the chair asked for formation of a Task Force to perform a procedural evaluation C57.154, Annex B, clause B.5 and provide a recommendation regarding this data. Unfortunately, there was not enough time to organize this work during the meeting.

Mr. Patrick McShane desired to make comment about the work of the Working Group for P1276. However, he could not be heard due to a lack of time. The chair requested that Mr. McShane provide his comments in writing.

H.4 Adjournment

The meeting was adjourned at 9:15AM.

H.5 Post Meeting Notes

Following the meeting, A task force titled "C57.154 Annex B Clause B.5 Recommendation" was formed. Robert Thompson has volunteered to chair the group, and it will meet during the next Transformers Committee meeting in New Orleans. The group was organized as follows:

> Scope: This TF is tasked to evaluate the content of C57.154 Annex B, Temperature Limits and to specifically recommend the disposition of Clause B.5 to the Insulation Life Subcommittee. The TF is not authorized to make any changes to Annex B or to take any other action.
>
> Background: C57.154 Annex B Clause B.5, titled Temperature Limits, proposes equations and alternate tables to the body of the C57.154 standard based on curves composed of historical test data, which are incorporated in the annex. A presentation was made at the WG for the revision of IEEE Std 1276 in the Fall of 2016 that presented these curves without the mineral oil comparison data points. The claim was made that this data was insufficient to define such equations and alternate tables. The presentation further recommended the removal of Clause B.5 from the annex. In consideration of this request, the Chair of the Insulation Life Subcommittee requested that a task force be formed to evaluate this request and make a recommendation to the Subcommittee.
>
> Expected Result: It is expected that a small, balanced group of 5 – 8 invited members of the Insulation Life Subcommittee would form this task force to be chaired by one of these members with no ties to the ester liquid industry. It is expected that no more than two members from different companies will represent the ester liquid industry. The rest of the members will be composed of Insulation Life Subcommittee members who are relatively unrelated to the ester liquid industry. The Chair of C57.154 will serve in an advisory capacity with no vote.

Mr. McShane was recognized by the chair during the meeting, but his comments regarding issues raised at the P1276 working group meeting could not be heard due to a lack of time. Mr. McShane kindly provided his commentary following the meeting and the substance of his commentary is included here;

> 1. The bulk of the meeting time for working group P1276 related to the annex of C57.154. ~~A task force should be formed to consider modifications to this annex.~~ [Revised 4/5/2017 - SLS]
> 2. There was discussion in the working group meeting which suggested that there is confusion about the loading guide. However, there was only one comment on this issue during the voting process for the C57.154 standard.
> 3. Data that is created under the methods described in previous versions of a standard should not necessarily be invalidated by newer standard revisions.

Respectfully submitted,

Samuel L. Sharpless
Secretary, Insulation Life Subcommittee