Annex H Insulation Life Subcommittee

October 17, 2018
Hyatt Regency Jacksonville Riverfront, Jacksonville, FL, USA

Chair: Sheldon Kennedy
Vice-Chair: Barry Beaster
Secretary: Jinesh Malde

The Insulation Life Subcommittee (ILSC) was called to order by the Chair in Jacksonville, FL on October 17, 2018 at 8:00 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.

H.1 Chair's Report/Remarks

The chair provided the dates of upcoming Transformer Committee meetings as follows;

2019 Spring Meeting; March 24-28, 2019, Anaheim, California, USA

2019 Fall Meeting; October 27-31, 2019, Columbus, Ohio, 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 informed that going forward, groups that works on comments from the ballot will be called "Comments Resolution Committee" and not "Ballot Resolution Committee"

The Chair reminded everyone that working groups must achieve a two-thirds majority to submit a document for Sponsor Ballot. The subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

The Chair discussed the membership requirements and recognized the following new members: Stuart Chambers, Everton De Oliveira, Pugazhenthi Selvaraj, Robert Stinson and Janusz Szczechowski.

The Chair stated that the following members had been moved to guest status due to lack of attendance; Jonathan Cheatham, Donald Chu, Craig Colopy, Victor Garcia, Thomas Holifield, Amitav Mukerji, Devki Sharma, Kwasi Yeboah and Waldemar Ziomek.

The Chair also noted that no new guests were removed by request.

H.2 Secretary's Report

The Chair reported that according to the electronic check-in system, 78 out of 121 members were present in the meeting and that a quorum had thus been achieved.

The Spring 2018 subcommittee meeting minutes had been provided to participants in advance of the meeting for review. Wallace Binder made a motion to approve the minutes and the motion was seconded by Craig Stiegemeier. Hearing no objections or abstentions, the motion carried by acclamation.

The Fall 2018 subcommittee meeting agenda was provided to participants in advance of the meeting for review and they were also presented on a screen at the meeting. John John made a motion to approve the agenda and the motion was seconded by Phil McClure. Hearing no objections or abstentions, the motion carried by acclamation.

Consolidation of the final electronic check-in records and written attendance rosters after the meeting indicated that 80 total members and 123 guests were present at the meeting.

26 guests requested for membership via the membership roster and 7 met the membership criterion; Bill Griesacker, Akash Joshi, Jose Salva, Brad Staley, Babanna Suresh, Alan Traut, William Whitehead,

H.3 Project Status Reports. The Chair reported the status of each project as follows;

H.3.1.1 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until 2021. The Working Group Chair is David Wallach.

H.3.1.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers

C57.100 is valid until 2021. The Working Group Chair is Roger Wicks.

H.3.1.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

New revised standard published on October 18th 2018

H.3.1.4 C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until 2022. The Working Group Chair is Richard Marek.

H.3.1.5 C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

C57.162 is a new document. The PAR for creating this document expires December 31, 2021. The working group Chair is Thomas Prevost.

H.3.1.6 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

C57.165 is a new standard and the PAR expires December 31, 2021. The working group Chair is Phil McClure.

H.3.1.7 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

1276 expires Dec 31, 2018. PAR extension has been filed. The working group Chair for this document is Roger C. Wicks.

H.3.1.8 1538 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformer

1538 guide is valid until 2021. A task force met in Spring 2018 conference to formulate a PAR for document revision. The taskforce did not meet in Fall 2018. The working group Chair Donald Platts resigned.and transferred duties to Scott Digby

H.3.2 Working Group and Task Force Reports

H.3.2.1 Working Group on C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

Working group met on Monday Oct 15. 40 out of 106 members were present in the meeting. 3 attendees requested membership. Quorum was not met so the group could not conduct official business. Minutes from Spring 2018 and Agenda for Fall 2018 could not be approved

The chair informed the group that the officers will review the attendance at recent meetings so that members who have not attended the last three meetings will be changed to guest status in order to reach quorum.
The chairman then asked for any patents that prohibits work in progress. No one had any to bring up.
The chairman briefing described the agenda.
The meeting started with the review of the purpose and scope of the WG.
The chairman proposed a change to the scope of the project.
The new scope will remove dry and gas insulated transformer. This would eliminate Task Force 2.
This will require a change to the PAR. Since quorum was not met at the meeting the Chair stated that this would be done by email ballot.

The task force leaders then updated the WG on the progress of their respective task forces. The chairman asked for all the information from the Task Force leaders so the Secretary could start to assemble the document.

Task Force 1 Terminology and Definitions
Task Force Leader - Jeff Golarz
Jeff Golarz has a list compiled from TF chairs that have sent terms to him.

Task Force 2 Measurement and evaluation of moisture-in-gas insulation parameters
Task Force Leaders- Tom Melle
This task force will be discontinued. The chair thanked Tom for his efforts.

Task Force 3 Measurement and evaluation of moisture-in-liquid insulation parameters
Task Force Leader- Ron Hernandez
Ron gave an update on task force activities. They plan to meet later on Monday in next meeting. The plan is to have a draft complete before the next WG meeting. The chair mentioned that there will be a tutorial at the next ASTM meeting to include evaporative stripping technique to determine water in oil. This was already planned to be incorporated in the draft because it is covered by an IEC standard.

Task Force 4 – Measurement of moisture in solid insulation.
Task Force Leader – Ron Hernandez
The first draft of this chapter is complete.

Task Force 5 Evaluation of moisture in solid insulation using dielectric response methods
Task Force Leader - George Frimpong
The first draft of this chapter is complete.

Task Force 6 Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium
Task Force Leader - Valery Davydov
The first draft of this chapter is complete.

Task Force 7 Evaluation of aging and end of life of solid insulation parameters
Task Force Leader- Bob Raser
Bob reported that he has formed a task force and that they plan to have a draft complete before the next WG meeting in Anaheim.

Task Force 8 Factory/workshop application of knowledge on moisture; establishing baselines
Task Force Leader - Poorvi Patel
The first draft of this chapter is complete.

Task Force 9 Field application of knowledge on moisture
Task Force Leader – Jim Thompson
*** Note:** ***This section lists the risks associated with moisture***
The task force still needs some work. The chair suggested that the impact of moisture on the dielectric strength of solid insulation should be included as well. There was some discussion about mitigation techniques. Bob Raser stated that he submitted some information on field drying of transformers to include in this chapter. The Chair suggested that the WG coordinate with C57.93.

Task Force 10 Moisture Migration, Distribution and Moisture Equilibrium Charts

Leader – Tom Prevost
The chair of TF 10 asked for volunteers to join this task force. Several individuals volunteered to help on this Task Force. The plan is to have a draft complete before the next meeting.

Meeting adjourned at 12:05 PM

H.3.2.2 Working Group for Application of High-Temperature Materials IEEE P-1276 – Roger Wicks

Meeting took place at 3:15 on October 16th afternoon. 23 members attended the meeting and met the quorum (minimum of 21 members). 50 guests were registered by the RFID check in, but only 41 signed the roster.

A. Approval of Fall 2018 Meeting Minutes – Pittsburgh, PA J. Arteaga

Marion Jaroszewski made a motion to approve the minutes and Alan Sbravati seconded it. The group unanimously approved the minutes.

B. Approval of agenda

Marion Jaroszewski made the motion to approve the agenda and Kevin Biggie seconded it. The group unanimously approved the agenda.

C. Patent Disclosure R. Wicks

There were not issues related to Patent Assurance brought up by attendees in the meeting.

D. Discussion R. Wicks

In April 2018, a working group ballot was conducted to determine the suitability of draft 2.0 to go to IEEE-SA ballot. Our procedures require a super-majority (2/3 vote) at the working group level to allow the document to proceed to ballot. With this super-majority, the Insulation Life Subcommittee would then approve the vote (by a majority vote) confirming that the balloting process was conducted correctly.

The working group ballot was successful, with a 70% affirmative vote and a quorum was met. The Insulation Life Subcommittee approved the vote as well.

However, because it was agreed to resolve negatives at the working group level (in our fall and spring meeting minutes), a Comment Resolution Group was selected for the IEEE-SA ballot to help resolve technical comments related to this document. The members of the Comment Resolution Group were Clair Claiborne, Marion Jaroszewski, Alan Sbravati and Roger Wicks.

The chair started work on the comments to the document by accepting, unless there were conflicts, all editorial comments proposed in the document.

The Comments Resolution Group held numerous conference calls to confirm these editorial changes and to then deal with the technical recommendations in the document. Finally, a document was completed with the final changes for which a consensus was reached.

After the changes had been completed, the revised document was recirculated within the working group, and the supermajority approval was maintained.

At this point it was agreed that the ballot could be initiated, and draft 2.3 was submitted to the IEEE SA to initiate a ballot pool, which was open until October 25th. Draft 2.3 had also been submitted to IEEE-SA for the required editorial review, which was completed and minor revisions will be completed when the ballot pool is finalized.

The Comments Resolution Group will help to resolve any negative ballot issues, and following this a recirculation will be required.

The PAR expires by the end of 2018, and an extension has been filed to allow the completion of this work.

The significant changes made by the Ballot Resolution Group were:

- Clause 3: definitions were reviewed including original IEEE 1276 and latest version of C57.154, avoiding conflicts and duplications.

- Clause 5: modifications to the tables taken from IEEE C57.154.

- Clause 7: addition of distribution transformers. Clause 8: removal of redundant features, but also addition of technical comment (from original IEEE 1276) on bubbling.

- Clause 9: very significant work in the area of loading guidelines. This was the area where the most work was required for the document.

- Annex A: very significant editorial changes were made, as well as some improvement in technical information.

- Annex B: an addition was made to this section providing a loading guide example for natural esters based on the procedure outlined in Section 9 and the aging data provided in Annex B.

In Clause 9 it shown now how a loading guide could be developed using A and B constants from Arrhenius reaction rate theory derived from aging experiments conducted per IEEE C57.100. A table modeled after the dry type loading guide was developed which shows examples of A and B constants under different scenarios – similar HIC to the industry proven system of TUK and mineral oil, as well as scenarios with B constants (slope of the line) ranging from 12,000 to 18,000 (plus or minus 25% of the current slope of 15,000).

For ester fluids a specific example was included was made to show how to generate the factor A and B.

Special recognition was made to John Luksich whose original draft loading guide for natural esters formed the basis of this revision, as well as its inclusion in Annex B.

E. Adjournment

The meeting adjourned at 3:49 PM

H.3.2.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Gael Kennedy

New revised standard published on October 18th 2018

H.3.2.4 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach

23 out of 51 members were present in the meeting. Quorum was not met for two consecutive meeting. On call for patents, there were no applicable patents identified. The PAR expires in 2021.

There was great deal of discussion and it was agreed to form sub-groups for revising the guide: Proposed subgroups for revision:

- Distribution transformer loading; Generation of a possible survey was brought up at a past meeting. The suggestion was made to contact TF Transformer Efficiency and Loss Evaluation led by Phil Hopkinson. Phil reported that there may be some information from the TF that could be useful for the C57.91 guide. Phil has data from several utilities now. Dan Mulkey is working through the data. This WG will stay in contact with TF Transformer Efficiency and Loss Evaluation.

- Don Platts presented a summary of his findings related to IEC 60076-6. He mentioned that the limits in C57.91 was based upon the operating philosophy of PG&E and was designed to be a guide. IEC limits were very similar to IEEE ones. GMD standard C57.167 temperature limits were also similar to C57.91. IEC designs were based upon Kraft paper that allowed more ageing of paper as compared with IEEE's upgraded paper. Shibao Zhang pointed out that there is no time limit like IEC to which Don explained that the time duration is implied in IEEE standards.

- For condition based risks, it was suggested we coordinate with the TF Bushing Overload. Shibao Zhang mentioned that the bushing temperature limits in Section 3.1 were taken from C57.19.100 which has since been deleted from that standard. Shibao agree to review Section 3.1 and suggest revisions.

- Ancillary Component loading: More guidance needed to work on enhancements to Clause 9.2.2. Weijun Li offered to help in suggesting updates to this section.

- Work related to fiber optics is already going on in the C57.165 Guide for Temperature Measurement WG. It was agreed that we will make a reference to this guide in C57.91 depending on the status of C57.165 when C57.91 final draft is prepared.

- Oleg Roizman asked if we need to provide differential equations in Section 7 and Annex G like what the IEC standard has. Oleg agreed to make a presentation during the next WG meeting on this topic. Weijun Li felt that differential equations do not belong in this guide.

- David Wallach mentioned that we do not expect other major changes to be made to this guide other than those we have been discussing. Robert Thompson agreed with David's assessment.

No other topics were discussed

During the ILSC meeting, ILSC Chair suggested sending an email out to the members to get approval for prior meeting minutes.

H.3.2.5 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Phil McClure

The Chair called the meeting to order at 9:30 am and welcomed the attendees to the 2018-02 meeting of the working group.
The patent slides were displayed and the attendees were asked if any of them were aware of any patents that may be essential to any aspect of the work we will be doing and if so, that they must inform at least one of the officers in order that IEEE may be notified. There were no responses to the inquiry.
The attendees introduced themselves and the attendance rosters were circulated. There were 16 members, 6 previous guests and 24 new guests attending. No guests requested membership.
16 of 34 members were present and a quorum was not achieved.
The minutes from the Spring 2018 meeting were circulated among the members prior to the meeting however, because of the lack of a quorum the minutes could not be approved. The minutes will be recirculated to the members by email and approval shall be requested using that media.
Old business - none
New business :
Reviewed draft 2 of the guide

- Greg Anderson and Gary Hoffman collaborated on and submitted two sections covering Ambient Temperature Measurement and Liquid Temperature Measurement. These sections were reviewed and commented by the group and the authors were asked to review the comments and revise the content as they deemed appropriate.
    - In the Ambient Temperature Measurement Section 4.1.3 Purpose of Ambient Temperature Measurement the following modification was suggested:
        - Std C57.12.00 states that the temperature of the cooling air (ambient temperature) shall not exceed 40°C above ambient temperature, and the average temperature of the cooling air (ambient temperature) for any 24 h period shall not exceed 30°C.

  - In the Liquid Temperature Measurement Section 4.2.2.2 Bottom oil temperature sensor locations the following comment and suggestion for modification was made:
    - The thermal sensing element shall be mounted on the tank wall in a closed well at a level of no less than ~~150~~ 15 mm (~~6~~ 0.591 inch) above the tank drain valve.
    - The authors were requested to check and verify the suggested mounting position.
- Phil McClure submitted the section covering Tank Wall Temperature Measurement. This section was reviewed but no comments were made.
- Annex A, "Sensors", which was a section imported from work done by the Task Force on Winding Temperature Indicators was edited by Phil McClure. No comments were made due to extent of the section.

The Chair asked for volunteers to author other sections with the following results:

- Oleg Roizman volunteered to manage the definitions section. This involves checking our definitions against IEEE definitions and highlighting differences accordingly.
- Shamaun Hakim volunteered to help other authors write section 4.4 Core Temperature Measurement
- Shamaun Hakim volunteered to help other authors write section 4.5 Tap and Tie Temperature Measurement.
- Section 4.8 Bushing Temperature Measurement is still without an author.
- Section 4.9 Tie Plate Temperature Measurement is still without an author.
- Section 4.10 Tap Changer Lead & Contact Temperature Measurement is still without an author.
- Section 4.11 Bolted Connection Temperature Measurement is still without an author.

It was agreed to place Draft 2 of the guide on the Transformers Committee website.

The next scheduled meeting was announced:

- March 24th -29th in Anaheim, California

With no more business and time running out, the Chair asked for a motion to adjourn.

- Gilles Bargone motioned for adjournment
- Mark Shem-tov seconded the motion
- There were no objections and the meeting was adjourned.

Meeting was adjourned at 10:30.

H.3.2.6 Task Force to develop PAR for IEEE 1538 Maximum Winding Temperature Rise in Liquid-Filled Transformers – Don Platts

The taskforce did not get a PAR approved for this document. The taskforce did not meet in Jacksonville. The PAR will be approved by the next meeting. The Chair for the taskforce requested for new leadership. Scott Digby agreed to be the Chair for this taskforce

H.3.2.7 Task force to develop PAR for revision of C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers – Roger Wicks

Taskforce will become a working group (WG) by Spring 2019 meeting.

The Chair called the meeting to order at 9:15 AM and welcomed attendees to this second meeting of the task force. The Chair noted members of the previous Working Group on C57.100 have been added as guests on the rosters. As we are still a task force, attendees requesting membership will be added to the total number of members in addition to the 18 previously listed from the prior meeting.

The Chair reviewed the proposed meeting agenda, and heard no objection to the agenda (no vote taken as a task force), and no approval of the last meeting's minutes for the same meeting. The bulk of the agenda was spent with presentations related to experiences in testing to IEEE C57.100-2011 as well as a presentation on magnet wire testing. The chair also quickly reviewed the previously agreed title, scope and purpose and notified the taskforce of the status of the PAR submission (waiting on approval).

There were 104 total attendees at the meeting, of whom 9 were members from the first task force meeting. As this meeting was also a task force meeting, any guests requesting membership at this meeting will also be added to member status.

H.3.2.7.1 Presentations Related to future work.

The bulk of the meeting was devoted to presentations related to the following subjects:

- Enamel coated wires – discussion on wire testing per ASTM, NEMA, etc. Does this help us for evaluation of new insulation systems – Mike Shannon – Rea Magnet Wire
- Experiences in testing to IEEE C57.100-2011. Sealed Tube Testing – Sasha Levin/Kevin Bigge – Weidmann, Alan Sbravati – Cargill, and Roger Wicks – DuPont
- Experiences in testing to IEEE C57.100-2011. Dual Temperature Testing – Roger Wicks

Enamel Coated Wire Testing

Mike Shannon provided a background to the testing of PVF coated wire that is typically used in industry proven systems, but is rated by NEMA as a 105°C wire. He outlined the testing protocols for this wire tested for transformers, which includes testing at either 1 or 4 weeks at 150°C and evaluating dielectric performance. Mike's presentation will be uploaded to the transformers committee website.

Shamaun Hakim asked a question related to the 105°C rating for our 120°C application, and the Chair noted this would be addressed in the Weidmann presentation. Alan Sbravati noted that they too had done wire testing, and consider that end-of-life criteria for such testing might be interesting as well.

Sealed Tube Testing

Sasha and Kevin provided a detailed review of testing conducted at Weidmann, including a number of recommendations as a result of this testing. These recommendations need to be part of our discussions as we begin work on revising this document.

Magnet Wire testing was the first subject covered, and the fixture for the wires as part of the test, as well as the method of test is key, especially if very long aging times incorporated in our current IEEE C57.100 document are used. The ratios of the materials included may need to be adapted if these wires are part of the test. The Chair noted that the fixturing for testing of the paper may be important as well. Sasha also recommended that PVF be considered as part of our Industry proven system.

The next subject was data showing results for testing at both power ratio and distribution ratio which shows a different effect. This lead to a recommendation confirming that separate tests would be needed for systems covering multiple applications. The chair's presentation showed a similar result.

A plot was shown related to testing to 135,000 hours rather than 180,000 hours. The comment related to this is that the samples are much more "testable" when aged to the shorter duration. The chair noted this 180,000 hour point was chosen to correlate aging to our life equation from C57.12.00, this obviously will be an area where thought on how to data from this procedure with a different life basis than 180,000 hours will need to be considered. Alan's presentation noted that there are multiple times temperatures (65,000, 135,000 and 150,000 hours in addition to 180,000 hours).

Sasha then presented data from two papers with different rates of aging, and with dramatically different initial (and final properties), raising the question of percent retention or absolute strength. We need to understand how to determine a minimum mechanical requirement, which may be a challenge but worth considering. Alan Sbravati concurred with this issue based on some of their testing.

He then finished his portion of the meeting with a discussion on pressboard and that all of the current transformers use pressboard (which is not thermally upgraded) as part of the insulation system without any thermal degradation issues that are unique from the TUK. His recommendation here is to include this pressboard as part of our industry proven system.

Kevin then took over related to discussion on ratios – showing the need to better clarify and suggesting use of the table from IEC 62332-2 as a possible way of doing this. He then discussed data showing laminated products (wood or pressboard) which are typically utilized in power transformers and should be included (with ratio modifications) as part of the aging protocol.

Kevin then showed data for different pressure relief devices (10 and 31 psig) which showed an effect of this level on aging. Their recommendation is to use 10 psig to be consistent with the IEEE C57.12.39 document which deals with tanks (and is consistent in level with IEC 62332-2). In Alan's presentation he noted the need to retain all degradation products to get a correct evaluation. Stuart Chambers mentioned an expansion system then use (the Chair noted this is similar to one that Weidmann uses in Switzerland), and Jinesh Malde raised concern about the complexion of such a system. Clearly this will be an area of additional discussion as our current document is not specific in this area. Alan did note that some of their testing used a 30 psig relief valve as well.

Kevin completed his presentation with some clarity on designations (samples vs. vessels) to make sure the correct number of samples are tested, and recommended that the materials tests should be part of the main body of the document. He noted as well the need to conduct testing in parallel (rather than sequentially – in same oven if possible at same time) and that there would be a benefit to merge the best aspects of both the IEEE C57.100 and the IEC 62332 series of documents. Alan

also noted that these materials tests should also be included in the main body of the as well, which may require reorganization as well.

Alan then presented his information, some of which is noted above where it covers similar topics. He also reminded of testing related to Lockie tests being the closest to transformer testing, but that these tests typically estimate materials not transformer life. The Lockie test (first proposed in a 1955 paper) was good for distribution transformers and power models were "less effective". The chair noted this was the reason for Bill McNutt to work with DuPont on the dual temperature test – as a better model for materials testing for power applications.

The chair finished with a quick overview from some comparison tests using tables from the current draft of IEEE 1276 based on DuPont and other labs testing related to different ratios, different paper thicknesses, etc. He also provided feedback related to historical dual temperature testing which was developed as part of the working leading up to the development of this test for IEEE C57.100-2011.

The chair closed the meeting noting that the recommendations, topics raised during this meeting will likely be the bulk of the starting point for the spring 2019 meeting in California.

The meeting adjourned at 10:48 AM

H.3.2.8 Task force to develop PAR for revision of C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation – Richard Marek

The meeting was called to order at 4:45PM by Chair Richard Marek. Vice-Chair Anastasia O'Malley and Secretary Ewald Schweiger (writer of Minutes) were also present.

This was the first meeting as a WG. The participants who requested membership at the last TF meeting were carried over as members of the WG.

43 of the total 111 attendees requested membership.

Data from the RFID system: (paper roster)

Number of Members in Activity = 48
Number of Members Present = 30 (31)
Quorum Present = 62.5%
Number of attendees = 106 (111)

Introductions of the Chair, Vice Chair, and Secretary were made. Due to the large number of attendees no individual introductions were made. Attendees were asked to indicate their affiliations when making comments or asking questions.

The chair stated that the previously mailed agenda was re-arranged and some administrative additions were added, including the essential patent notice. A motion was made and seconded to approve the revised agenda. (Stuart Chambers, Robert Thompson) There were no objections. The patent slides were shown with no response.

A motion was requested to approve the Pittsburgh TF minutes, which prompted an objection to a sentence near the end of the minutes, by Alan Sbravati. He made a motion to remove the statement, but after some discussion it was decided that the statement should not be removed, but rather the

objection should be noted in the current minutes. The objection was made to the following sentence: "He (the Chair) noted that the original document was heavily criticized for too much tutorial content; so much of this material should be moved to the IEEE 1276 guide currently under revision". The motion was then made and seconded. (Alan Sbravati, Phil Hopkinson) The minutes were approved with no further objections.

The PAR was approved since the last meeting and the approved title, scope and purpose defined in the Pittsburgh meeting were quickly reviewed.

Title:
Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems

Scope:
This standard applies to all liquid-immersed transformers that are designed to operate at temperatures rise limits that exceed the normal thermal limits of IEEE Std C57.12.00 under continuous load, in the designed average ambient, and at rated conditions.

Purpose:
This standard provides specific requirements and guidance in the design, testing, and application of the transformers covered within its scope. These transformers incorporate high-temperature insulation systems or systems that use a combination of high-temperature and conventional insulation.

A member submitted a suggestion to form a task force/study group to investigate the thermal class of liquids. A motion was requested by the chair and it was made by Aleksandr Levin with a second by Phil Hopkinson**.** The motion carried with no objections. Alan Sbravati volunteered to chair the taskforce and fifteen members volunteered to join the group. The duration of the task force was established at one year and the chair was requested to report their progress to the working group at the next meeting. The following scope was accepted for the task force:

Consider the background and historical applications
Consider options to prove (or develop) the temperature limits for transformer liquids
Propose tentative test procedure(s)

Roger Wicks gave some background information on liquid thermal capability based on other existing documents, noting that the life of a liquid might not be 180,000 hours. He also noted that the standards provide target values which suggest refurbishment of the liquid when certain parameters are exceeded and that these trigger values could be used as end of life. Alan Sbravati shared some differences between mineral oil and esters.

Another suggestion was the addition of a 180 thermal class and the associated temperature limits for the full hybrid insulation systems in Table 3. The chair requested all to review this suggestion and to consider all implications of this addition before the next meeting. The chair also asked the WG to review the values in Tables 3 and 4 and to make sure they are logically defined in the document.

The Chair noted that all members should have received a copy of the current standard. For those who did not receive a copy please contact the officers of the WG. The new members will receive a copy after the meeting.

The front portion of the current version was briefly reviewed. The chair asked for volunteers to

review the Definition section. David Stankes and Jose Salva volunteered.

A question was raised by Juan Castellanos about alignment with IEC 60076-14. The chair reported that at the recent IEC Plenary meeting, the TC14 chair asked to delay revision of the document and to form an Ad Hoc group to review the thermal limits in all of the TC14 documents and make a recommendation on the possibility of consolidating this information.

Radoslaw Szewczyk asked about the validity of this Table 4. Noting that from the point of view of a manufacturer the values are theoretical because they show the material limits and not the design limits of the transformer.

Kurt Kaineder suggested higher temperature limits for the hybrid insulation system. He was asked to make a proposal to be presented to the WG at the next meeting.

Alan Sbravati asked if silicone oil was still used and whether it should be removed from the standard. Jinesh Malde noted that this topic would be discussed in PC57.166. They will determine how to handle silicone oil in this standard. It was also noted that the topic would be mentioned in the Insulation Life SC. Radoslaw Szewczyk reported that there are parts of the world still using silicone and these are using the IEEE standards as reference. The chair noted that if a more generic term such as liquid thermal class was used instead of specific liquid names, the document would be completely generic.

The chair requested that all review the whole standard and to make suggestions for revisions before the next meeting. Suggestions for improvement or for missing items were also solicited.

The meeting was adjourned at 5:55PM and the task force volunteers were asked to provide their names to the Secretary.

H.4 Old Business

There was no old business

H.5 New Business

1) Jin Sim forward the following proposal to the Chair electronically:
   C57.12.90-2015 Clause 11.1.2.2 d) and e) requires holding the current constant for 1 hour. Please consider changing the duration to 30 minutes.
   The proposal was seconded by Ajith Varghese

   Discussions:
   Tom Prevost suggested that the information should go to C57.190 and wait for directions on how to proceed. Gary Hoffman agreed with Tom, that the requests needed to go to C57.12.90. Steve Antosz who is the working group Chair of C57.12.90 agreed with Tom and Gary but suggested that a decision be made by this subcommittee as that is what he would say if the proposal would be brought up to the Standards Subcommittee. The right place to do the work is ILSC. His recommends was forming a taskforce to look into Jin's proposal since ILSC is in charge of thermal test.
   The Chair explained that the recommendation by Jim was to collect data to see if this is a valid concern and determine if the values would need to be changed.
   Shamaun Hakim mentioned that the 1 hour time was there for the oil to be stable. If the time would be reduced to 30 min, the data would become less accurate.

The agreement from the discussion was to create a taskforce to collect data based on Jin's proposal to determine if any further action would be required. The proposal was voted on with 42 positive, 3 negatives and 6 abstained. The motion carried through and taskforce was created. Ajith Varghese volunteered to be the Chair of the taskforce.

2) Alan Sbravati suggested that a taskforce be formed to determine if a guide is required for retrofilling mineral oil transformers with alternative liquids.

Discussion
He brought this topic up during the working group meeting of C57.166. Working group Chair suggested that Alan discuss this with Insulating Liquid Subcommittee Chair David Wallace. In discussing with David, Alan and David thought that this taskforce was better suited for ILSC. ILSC Chair was not sure if this taskforce would belong to ILSC or some other subcommittee.
Javier Artiega mentioned that depending on the voltage level of the transformer, the dielectric properties would change so it would be applicable to Dielectric Test Subcommittee as well.
Luis Cheim mentioned that in CIGRE group, it was common to have joint working groups from different committees. Similar may be applicable for this taskforce work.

ILSC Chair decided that the taskforce will be discussed during the Ad-Com meeting and it will be decided there under which subcommittee this taskforce will belong to.

H.6 Adjournment

With all business completed, the Chair called for a motion to adjourn. Shamaum Hakim moved for adjournment and the motion was seconded by Javier Artiega. The meeting was adjourned at 9:20 AM.

Respectfully submitted,

Jinesh Malde
Secretary, Insulation Life Subcommittee