Insulation Life Subcommittee - Unapproved Meeting Minutes
October 27, 2010 – Toronto, Canada

8.4 Insulation Life Subcommittee – Bruce Forsyth, Chairman

The Insulation Life Subcommittee met in Toronto, Canada on October 27, 2010 at 8:00 AM.

The minutes of our meeting in Lombard, IL on October 28, 2009 were approved as written.

The minutes of our meeting in Houston, TX on March 10, 2010 were approved with the following correction. The date on the meeting minutes will be changed from 2009 to 2010.

A roll call of the members revealed that a quorum was present. The attendance roosters show that the meeting was attended by 184 people, 54 of 75 members and 130 guests. 26 guests requested membership.

8.4.1 Chair's Report

The Spring 2011 IEEE Transformers Committee Meeting will be held in San Diego, CA in March. The Fall 2011 meeting location has not been announced.

All of the Working Groups and Task Force Chairs are encouraged to utilize the following Attendance/Membership process. The membership should be open for the first two meetings. After that time, membership should be at the discretion of the Chair. If a member does not attend for two consecutive meetings, they should be removed as a member.

The IEEE patent disclosure policy was discussed. None of the members or guests present identified any patents associated with the work of the Subcommittee.

8.4.2 Project Status Reports

8.4.2.1 C57.91 Loading Guide

C57.91 is currently in ballot. The PAR was modified so it matched the document being balloted. In addition to the modification, a PAR extension has been requested to allow for the resolution of any ballot comments.

8.4.2.2 C57.100 Thermal Evaluation Guide

C57.100 has been balloted. Currently, comments are being resolved. A PAR extension has been requested to allow for the resolution of these comments.

8.4.2.3 1538 Guide for the Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer

1538 expires at the end of 2010. We have three options for this standard. We can let the standard expire, we can re-affirm it or we can revise it.

At this time, a re-affirmation ballot for 1538 has been initiated. A one year extension of the standard has been requested to allow for the re-affirmation ballot.

During the last re-affirmation ballot several comments were received. Bill Chiu will help review these comments to determine if any are significant. If we have significant comments, a PAR to revise it will be submitted. In this case the standard will be valid for an additional four years.

8.4.3 Working Group and Task Force Reports

8.4.3.1 Working Group for the Revision to C57.91 Loading Guide – Don Duckett

The working group was called to order by Chair Don Duckett at 9:35 am. Vice Chair Carlo Arpino and Secretary Susan McNelly were also present.

There were 26 of 55 members present (quorum was not achieved). New requests for membership will not be entertained due to the Guide having gone to ballot.

Agenda:

1. **Roll Call/Introductions**
2. **Patent disclosure announcement**
3. **Previous meeting minutes approval**
4. **Status of the present Guide**
5. **Adjournment**

A roll call of members present and introductions of members and guests were made.

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Approval of minutes from the Spring 2009 meeting in Houston, Texas was not done due to a lack of quorum.

Status of the present Loading Guide:

The Guide was set to expire and be withdrawn at the end of this year. A PAR extension was requested before the October deadline for the December NESCOM meeting.

Updates to the guide were made and the document is presently out for ballot. The ballot will close October 30th. Minimal modification were done to insert the voltage regulation section,

items such as gas bubble generation, and incorporation of the corrigenda and errata documents. In addition, the Guide was brought up to present IEEE requirements regarding style, metrification, equation presentation, etc.

Don indicated that the next step will be to form a ballot resolution group to review the comments that are received during the ballot process. A request for a ballot resolution group was made at the Spring 2010 meeting and the following had volunteered: Dave Wallach, Juan Castellanos, Don Platts, Tom Prevost, and Roger Verdolin. Tim Raymond volunteered to also help with the ballot resolution.

One of the comments was that even though the guide supposedly indicated that voltage regulators was added, there was no actual content added regarding voltage regulators. Tim Raymond commented that there was an old document that covered voltage regulators that has been retired. This was the reason behind adding voltage regulators into the C57.91 Guide. Robert Tillman indicated that he had written some sections covering voltage regulators a couple years ago and will reprovide that information to Don Duckett for possible addition for the recirculation ballot that will need to be submitted.

The meeting was adjourned at 10:00 AM.

Respectfully Submitted

Don Duckett
WG Chair

Carlo Arpino
WG Vice Chair

Susan McNelly
WG Secretary

8.4.3.2 Working Group On Thermal Evaluation Of Power And Distribution Transformers (C57.100) – Roger Wicks

8.4.3.2.1 Introduction and Rosters and Quorum Call

The working group met on Monday, October 25, 2010 at 11:00 AM with 16 members and 41 guests attending, with 5 guests requesting membership. As we are currently in the IEEE Balloting process for this document (ballot resolution stage), we are not adding any new members at this time.

As there were only 16 members of the 34 on our roster, we could not conduct official business during this meeting.

8.4.3.2.2 Approval of minutes from March 8, 2010 meeting

The minutes of the March 8, 2010 meeting in Houston, Texas had no issues, but could not be formally approved due to the lack of a quorum. They will be circulated to the working group electronically for approval.

8.4.3.2.3 Patent Disclosure

The chairman asked if anyone knew of any patents that could pertain to this project. There were none.

8.4.3.2.4 Discussion

As a result of discussion of our working group minutes at the Insulation Life Subcommittee meeting, a straw ballot of the working group was conducted prior to balloting our document in the my-ballot system. During the working group survey ballot as well, questions were asked of the working group key questions for which the chair anticipated negative ballots. As a result of the working group survey ballot and the questionnaire, a Draft 3 was developed and used for the official IEEE ballot.

This Draft 3 document provided a successful ballot, and negative comments are in the process of being resolved, using the ballot resolution group identified at our last working group meeting. Once the ballot resolution group has completed their work, the document will be recirculated to allow completion of the revision work.

A PAR Extension has been requested as we have missed the opportunity to have a completed document submitted to the IEEE Standards board by mid-October.

8.4.3.2.5 The meeting adjourned at 11:15 AM.

8.4.3.3 Task Force on High Temperature Liquid-Immersed Transformers (PC54.154) – Richard Marek

The fifth meeting took place on Monday, October 25, 2010 in the Jackson/Carmichael Meeting Room at 1:45 pm, at the Hilton Downtown Toronto Hotel, Toronto, Ontario, Canada. Introductions were made and attendance sheets were circulated. The IEEE patent policy was discussed and there were no concerns regarding patents. At 36 members, a quorum was established with 22 members and 56 guests present. The minutes from the Houston meeting were approved as submitted.

A series of comments to draft 4 were continued from the previous meeting and the first comment concerned Fig.3. The chair noted that he had discovered an error in the curves where the labels for the axes were reversed. The floor was then given to Ziomek and Krishnamurthy who presented an alternative set of curves to illustrate the temperature distribution for different materials used in three of the insulation systems. The chair stated that the new curves would not match the text, but a search could not determine the reference. A task force was then formed to determine the need for the original curves and also to

determine if the three new curves were needed for clarification. The members of the task force are: Ziomek, Szewczyk, Vijayan, Lopez-Fernandez, Sauzay and Jaroszewski.

The next comment was submitted by Nordman and concerned Table 1 and the average winding temperature rise for the hybrid insulation system which is shown as a range of 70-95°C with 5°C increments in draft 4. However, he stated that draft 5 satisfied his concerns by showing only the maximum temperature.

Nordman then requested an additonal column to this table to establish a higher temperature limit for celulose when used in ester liquid. The chair declined this addition, expressing his opinion that establishing the temperature limits of a specific material or combination of materials in liquids was beyond the scope of this working group. He also stated that while he could imagine that insulation in different liquids could improve the thermal capability, there is no accepted test procedure available to define such capability. This is in contrast to the many different thermal classes available for dry-type insulations.

The chair suggested the Transformers Committee should be surveyed to determine the concensus opinion and asked Bruce Forsyth, chair of the Insulation Life SC if this working group could do this. He thought the group could not, but they could request the SC to make a proposal to the Committee. However, Asano protested that most would just vote "no" since they had no interest and were not participating in this working group.

It was proposed that many in the industry were looking to the standards to provide guidance. And who should define these limits? This was countered by the statement that this made it even more important to make sure the standards were developed on a strong technical base. The chair then stated that acceptability was often determined by customer acceptance and then eventually this acceptance becomes a part of the standard. But how long should this process take?

The chair then challenged the proponents to develop an annex that presents a convincing technical argument to support the higher temperature limits proposed. This annex would be included in the document even if a Committee survey did not support the proposal. The members of the task force are: Asano, Corkran and Cherry.

The next comment concerned a request by Jaroszewski to require a temperature rise test as a routine test for units that are rated as only OD or OF to prevent catastrophic damage to the transformer. Krishnamurthy commented that collection of DGA data should also be required, not just desirable. He proposed a minimum duration of the temperature rise test such as 12 hours to make sure enough time elapsed to capture gas from abnormal heating. However, a show of hands did not support this motion.

The meeting adjourned at 3:05 pm.

8.4.3.4 Working Group for Temperature Rise Test Procedures Section 11 of C57.12.90 - Paulette Powell

The Working Group met at 11:00 AM October 26, 2010 in Toronto III room of the Hilton Downtown Toronto Canada. A roll call of members was done. In attendance there were 14 members and 62 guests, 5 members requested in advanced and were granted to be excused for their absence. Total membership stands at 31, therefore and considering excused members we had a quorum. Four guests requested membership. All the participants introduced themselves.

There were no patents disclosures.

The minutes from the previous meeting March 9, 2010 from Houston Texas were distributed prior the meeting, posted on the SC website and also displayed at the meeting. The minutes were approved as written.

Projects
The discussion was centered on revision of a proposal made by the TF –Sub-clause 11.2.2e addressing scenarios wherein hot-resistance time data not being suited to fit an exponential decay curve.

Marcel Fortin proposal for distribution transformers modified the sub-clauses as follows:

- *Add to 11.2.2.c - At least one resistance measurement shall be taken on all terminal pairs within a time less than half the coils shortest time constant after shutdown.*
- *Add to 11.2.2d:*
  Alternate 1 - A series of at least 10 resistance measurements shall be made on one terminal pair corresponding to a phase of a winding in less than 10% of the bulk oil time constant.
  Alternate 2 - At least 10 resistance measurements shall be made on one terminal pair corresponding to a phase of a winding. All resistance data points shall be recorded at no longer than 30 second intervals and no less than 10 second intervals.
- *11.2.2f: Modify to agree with timeframe specified in 11.2.2c.*

The first point was compared to what it is now in the last WG approved document, that calls for the first resistance data point to be taken as quick as possible and no later than 4 minutes after shutdown.

There was concern over the lack of definition to distinguish distribution from power transformers or whether the same rules would apply to both types. There was a clarification made that the difference between power and distribution transformers is not by KVA or voltage, but by application as described per C57.12.80.

Also, there were comments that the proposal would need of a standard calculation method for thermal time constants of distribution transformers. The group concurred there is not an easy single method of calculation.

A motion was passed to consult the distribution subcommittee on acceptance of the proposal, and get comments from them.

Another motion was passed and voted on by the working group in order to accept the proposal as presented. The WG passed the motion by 5 positive to 1 negative votes. The proposal will be sent to the Insulation Life SC for circulation among members.

Unfinished Business
There was no unfinished business discussed

New Business
There was no new business discussed

Due to lack of time for another activity, the meeting adjourned at 12:03 PM.

Respectfully Submitted,

Juan Castellanos, Vice-chair
Marnie Roussell, Acting Secretary

8.4.3.5 Task Force on Furan Testing – Shuzhen Xu

Attendance: 22 members, total attendance was 52 and 3 requested membership

(1) Reviewed the status of the position paper.
6 webinars since last meeting with task force subset group.
The draft paper is completed with the contribution from 4 major participants: Shuzhen XU, Luiz Chin, Tom Prevot, Don Platt.

(2) Discussed how we want to publish the paper
Difference options to publish the paper were discussed: including publish it in serial papers in IEEE transaction, or insulation magazine.

(3) Discussed future plan for the task force
Based on the discussion, the task force decided the following two actions:

- Recommend to gather data for meaningful statistic analysis
- The task force will wait the user's comments and feedback on the paper to decide whether there is need to develop a guide.

(4) Discussions and questions session
Various issues on how to use the furan analysis were raised by the participants: for example: what is the effect of oil processing on furan level, what is limit of furan? All the issues are covered in the position paper. So the answer from the task force is highly recommending participants read the paper and providing your comments to the task force. The task force group plans to review the received comments around in the end of Nov.

8.4.3.6 Task Force on Temperature Limitations on Non-current Carrying Metallic Surfaces Inside Liquid-Filled Transformers – Jeff Ray

October 27, 2009 – Chicago, Ill.
Jeffrey L. Ray, Chair
Barry Beaster, Vice chair
Sanjib Som, Secretary

The meeting was called to order by the Chair.

- Roll was taken and it was determined there were 12 of the 23 members (a quorum) present.
- 39 guests were also in attendance.
- The attendees were asked to introduce themselves.
- An attendance roster was circulated.
- Minutes of the S2010 meeting were reviewed and approved.
- The IEEE patent disclosure regulations were noted. No one had any items to bring forward.
- The subject of this TF was reviewed by the Chair for the benefit of new guests.
- The following proposed modifications to C57.12.00, section 5.11.1.3 and to Table 8 of C57.91 to clarify temperature rise limits for non-current carrying surfaces inside a liquid-filled transformer were discussed at great length. The attached suggested modifications to each were voted on and approved by the TF members.
- The meeting was then adjourned.

Recommendation No. 1

Revised wording to paragraph 5.11.1.3 of C57.12.00

Current wording:

5.11.1.3 Rises of metallic parts other than windings
Metallic parts in contact with current-carrying conductor insulation shall not attain a temperature rise in excess of the winding hottest-spot temperature rise.
Metallic parts other than those described above shall not attain excessive temperature rises at maximum rated load.

Proposed revised wording:

5.11.1.3 Rises …..

Metallic parts other than those described above shall not attain excessive temperature rises at maximum rated load. *Excessive temperature rise* shall be interpreted to mean a temperature rise that results in an operating temperature that would exceed the temperature limits of the insulation material that is in contact with the metallic part.

Recommendation No. 2
Revisions to Table 8 of C57.91

Table 8—Suggested maximum temperature limits for the four types of loading

	Normal life Expectancy °C	Planned loading beyond NP °C	Long-time emerg loading °C	Short-time emerg loading °C	Remarks
Winding hottest spot temperature	120[2]	130	140	180[3]	No change in values, changed footnote numbers
Other metallic hot-spot temperatures in contact with *non-thermally upgraded cellulosic insulation material*	105[1]	115	125	165[3]	This row added
Other metallic hot-spot temperatures in contact with *thermally upgraded cellulosic insulation material*	120[2]	130	140	180[3]	This row added
Other metallic hot-spot temperatures not in contact with insulation material	140	150[3]	160[3]	200[3]	No change in values, changed footnote numbers
Top oil temperature	105	110	110	110	No change

[1]95°C on a continuous 24hr basis.
[2]110°C on a continuous 24hr basis.
[3]Gassing may produce a potential risk to the dielectric strength of the transformer. This risk should be considered when this guide is applied refer to Annex A.

8.4.3.7 Task Force on Moisture Estimation in Transformer Insulation – Jin Sim

The Task Force on Moisture Estimation in Transformer Insulation did not meet during the Fall 2010 Transformer's Committee meeting.

The TF anticipates having a draft of the paper by the end of the year. Once complete, the draft will be circulated in the TF for comment.

8.4.3.8 Task Force on Winding Temperature Indicators - Phil McClure

This Task Force did not meet at this meeting. Please refer to New Business for a motion made during this report.

8.4.4 Old Business:

8.4.4.1 Should We Establish a 75 Degree C Rise

A motion was made to establish a Task Force to examine the technical justification for higher temperature ratings based on natural esther filled transformers.

Discussion:

- Other fluids may allow higher temperatures and should be included.
- We should have pre-established curves so that when we are evaluating other fluids we can see if the new curves are above or below the curve.
- Verified that we are discussing other fluids with thermally upgraded kraft paper.

The vote was 23 in favor of this motion and 29 against. This motion was not approved.

The allotted time ran out before we could address the issue of hot spot temperature rise with average winding temperature rise of 55 degree C.

8.4.5 New Business:

During the Report on the Task Force on Winding Temperature Indicators, there was discussion about the need to continue this Task Force until a paper had been published. A motion was made to continue the Task Force until a Task Force Report had been published. The vote was 26 for the motion and 1 against. This motion passed.

The allotted time ran out before we could address any additional new business.

8.4.6 The meeting adjourned at 9:15 AM.

Bruce Forsyth
Chair, Insulation Life Subcommittee