Insulation Life Subcommittee - Unapproved Meeting Minutes
October 28, 2009 – Lombard, IL

8.4 Insulation Life Subcommittee – Don Platts, Chairman

The Insulation Life Subcommittee met in Lombard, IL on October 28, 2009 at 8:00 AM.

The minutes of our meeting in Miami, FL on April 22, 2008 were approved as written.

The meeting was attended by 164 people, 58 of 111 members and 106 guests.

8.4.1 Chair's Report

The Spring 2010 IEEE Transformers Committee Meeting will be held in Houston, TX in March. The Fall 2010 meeting location has not been announced.

The Transformers Committee's Operations and Procedure Manual was approved by the PES Technical Committee in September. This manual is posted on the web site.

When clearing ballot comments, the Working Group Chairs need to make sure they provide the resolution and details of the resolution for each item on the spreadsheet.

Our subcommittee has three special publications in process. The Operations and Procedures Manual contains the process for publishing these documents. This process takes about a year to complete.

8.4.2 Project Status Reports

8.4.2.1 C57.91 Loading Guide

C57.91 and its PAR expire at the end of this year. A PAR extension has been requested.

8.4.2.2 C57.100 Thermal Evaluation Guide

The PAR for C57.100 expires the end of 2010.

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 and Vice Chair Carlo Arpino at 9:30 am on Tuesday, October 27, 2009. Secretary Susan McNelly was also present.

There were 31 of 55 members present and 63 guests with 4 guests requesting membership to the WG. Guests requesting membership were:

Rick Dong	Jerry Kazmierczak
Jow Ortiz	Kiran Vendant

Agenda:

1. **Roll Call**
2. **Patent disclosure announcement**
3. **Previous meeting minutes approval**
4. **Comments to latest revision**
5. **Plans for Completion**
6. **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 Miami, Florida was requested. There was one correction to the mention of the former Chair Tim Raymond whose name was incorrectly shown. The minutes were approved as modified.

Action items:

Juan Castellanos indicated that he is working on his review of Annex G and should have something soon.

Kurt Robbins volunteered at the last meeting to review the Clause 7 equations. Kurt was not present at the meeting for an update report.

Barry Beaster, Jin Sim, Rick Marek, and Dave Wallach volunteered at the last meeting to help go through comments received to resolve any issues identified. Barry Beaster indicated that he found two mathematical errors in the tables that will need to be corrected. No comments have yet been identified for review by the group.

PAR extension: The existing PAR expires at the end of 2009. A PAR modification was submitted requesting a two year extension to the existing PAR. A decision will be received from REVCOM in December.

Chair's Comments – Three options for consideration:

1. Set the current work aside and work for reaffirmation of the present Guide.

2. Get the current work ready to go before Houston. If this option is chosen, what is needed to get the present work ready for a successful ballot attempt.

3. A third option would be to do minimal modification to insert the voltage regulation section and any other critical items such as gas bubble generation.

A straw vote indicated interest in getting the existing document reaffirmed. Discussion indicated that this could still be used as a fall back position if attempts to get the present work in shape.

A question was asked what items would need to be revised for the option of minor modifications?

TV Ooommen idicated the changes that were made to the gas bubble generation portion which is in Annex E of the present working version of the Guide. Equation E.2 was modified. The gas bubble generation portion is presently Annex A in the existing Guide.

Jin Sim recommended that for a minimal modification option, that the existing Annex A be replaced with the new version.

There was discussion whether the existing Annex G equations should or should not be moved to section 7.

A motion was made and seconded to replace the existing Annex A bubble section in the existing drafts Annex E containing TV's layer models and leave the balance of the document as is. A request to modify the motion to include the corrigenda items that have already been previously approved into the document. Jin Sim approved the amended motion. The motion passed.

Don Platts made a motion and it was seconded that the modified version of the document include voltage regulators since the present PAR indicates that voltage regulators are included. Bill Chui indicated that it would not be recommended that the PAR be amended, so they would need to be included. After discussion the motion was put to a vote and was passed.

The WG will pursue the minimal modifications.

The meeting was adjourned at 10:45 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

The working group met on Monday, October 26, 2009 at 11:00 AM with 28 members and 88 guests attending, with 5 guests requesting membership. At this time, we will not add these guests to our membership (see note below related to survey/questionnaire). So, at this time the membership will stay at 84 members.

8.4.3.2.2 Approval of minutes from April 20, 2009 meeting

The minutes of the April 20, 2009 meeting in Miami, Florida were approved as written.

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 Questionnaire Results and Revisions C57.100 in Draft 1

The chairmen spent the bulk of the meeting describing a questionnaire circulated to working group members and the results from that questionnaire. These were discussed sequentially, and the corresponding changes to document to create Draft 1 were discussed. The chairman noted that only 17 questionnaires were returned (16 from working group members (less than 20%).

<u>Time/Temperature Decision</u>
Extrapolation beyond 20C

- Keep existing method (5X life requirement for three points) – define range of data (how many degrees apart - **YES**/NO
- Add capability for longer extrapolation with more points – **YES**/NO
- Add capability for longer extrapolation with more points (but less than above) and 2X safety margin) – YES/**NO**
- Other Input on this requirement?

Life Curves Decision

- Add finite new life curves – each a 5X multiplier from prior curve (to enable an adjustment to the loading guides to be easier) – **YES**/NO
- Is C57.100 the place for these life curves or a different location – YES/**NO** (where?)
- Other input on life curves? **Location for new curves (if agreed to) would be C57.91. This document is method of test.**

Materials Decision

- Should we specify that the tests be conducted with "minimum allowable" products if adjustable (such as nitrogen content?) – **YES**/NO (if not – how to deal with this issue)

Test Duration Decision

- Do we need to deal with the accuracy of the test by detailing minimum number of cycles (thermo/electrical tests) – **YES**/NO (if minimum not met – what is the recourse?)
- Do we need to deal with the accuracy of the test by detailing the minimum number of tests to determine a "end of life test" for the thermal only tests – **YES**/NO

Oil Decision

- Should the top oil temperature be controlled in all tests (other than sealed tube test), and does this then dictate the top oil temperature of the approved system? **YES**/NO.
- If yes, should the temperature limit of the system be equal to the tested value, or 5C or 10C below the tested value (for safety margin). Select a value 0, 5, 10 **Mixed**

Other Issues Decision

- Should we define an Industry Proven System which by definition meets our 65C rise (110C hot spot) life curve? **YES**/NO
- If Yes – is the outline on the earlier slide the right starting point? **YES**/NO
- What conditions require a full aging curve to be validated? **New Insulation system – new temperature class**
- What conditions allow a single/two point test to be used for validation? NO
- What conditions allow sealed tube tests to be used for validation? **Screening of new systems, Change of materials – no change of system/life curve.**

Major changes to the document include a definition of an industry proven system, specification of moisture content for all testing, adding the dual-temperature test, adding the concept of a relative test (vs. a control) to allow shorter duration testing, movement of the 5X multiplier to Annex B (informative) and changing sealed tube testsn(Annex A) to informative (from Normative).

Discussion related to this presentation was good, with much of the questions related to how to determine end of life in the non-model tests (dual-temperature test and sealed tube test). John Luksich and others pointed out that in C57.91 there are different evaluation methods (200 Dp, 35% tensile and 50% tensile). Sam Mehta noted that some materials have higher start values and even at 50% tensile are stronger than some kraft materials currently used. The Chairman

(and Secretary) noted that we need a method that is standard and applicable for all materials. Since our dual-temperature test shows reasonable correlation to the current life curve (in C57.100) using 50% retained tensile, this is what was selected as the criteria for the first draft. Also noted was that other materials (such as wire enamels) will require other criteria (80% dielectric strength retention) which the draft also covers.

Another area of spirited discussion led by Jin Sim, included the moisture content at the start of the test (draft states 0.25 to 0.50%) or to control the moisture at a given level. Valery Davydov noted they have conducted testing with a constant moisture level with good effect. The chair responded that the initial moisture content would be easier to control (for all methods) and seemed to give similar life to our existing curve. So for this first draft, that will be what is proposed.

Finally – Figure1 (our life curve) needs to be referenced to the correct document, and Tom Prevost will help the chair with this.

8.4.3.2.5 Membership Responsibilities

The chair then finished up the discussion offering clemency to the member of the working groups who did not respond to the questionnaire. He will allow working group members to stay on the list IF they respond the chairman with comments related to the draft 1. Guests will also be solicited for comment. These comments are requested by the end of the year, and the chair will then look for help in resolving major issues so a draft 2 can be completed by the end of the first quarter (and potentially balloted).

8.4.3.2.6 The meeting adjourned at 12:16 PM.

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

The Working Group met at 11:00am October 27, 2009 in Jr. Ballroom A/B of the Western Lombard Yorktown Center, Lombard, Illinois USA. In attendance there were twenty members and fifty-three guests. The meeting had quorum. Seven new members were introduced to the WG: Messrs. Stephen Antosz, Thomas Holifield, Terence Martin, Joseph Melanson, Lewis Powell, Oleg Roizman and Sanjib Som. The membership now stands at thirty-eight.

There were no patent disclosures.

The minutes of the April 20, 2009 were distributed prior to the meeting and approved as written.

Projects:

11.2.2b Straw Ballot – The WG discussed the recirculation for power transformers concerning lower capacity heat runs. There were six negatives requesting the removal of the

statement specifying the order of tests as test room logistics and energy costs may necessitate a different order. As the terminal pair used for hot resistance measurements below the maximum rating must be determined from prior testing to have the greatest winding temperature rise, the statement specifying order of test is not needed, and will be removed. Kipp Yule expressed concern for measurement of the terminal pair with the highest winding temperature to obtain the correct gradient for winding hottest spot temperature indication. Two negatives which refer to hot resistance measurements on each terminal pair at the maximum nameplate rating, request testing on only one terminal pair for harmonization with IEC. Jerry Corkran stated that the temperature rise test is a type test, not a quality control test. All three phases do not need to be tested as the results will not vary much and would be in agreement with IEC. The statement specifying order of test will be removed and the proposal re-circulated to the members.

Marcel Fortin expressed that for distribution transformers it is just as important hot resistance measurements be made on all terminal pairs. There are different cooling situations in measuring only one leg of 120/240 volt, low-high-low windings. A straw ballot was conducted on this issue with 10 responses from the WG members, 4 in favor and 6 opposed. There was much discussion in agreement with Marcel Fortin's proposal as there was against for which Jerry Corkran cited harmonization with IEC. Due to time limitations, the discussion was ended.

TF – Sub-clause 11.2.2e

The TF is addressing two scenarios that could possibly result in hot-resistance time data not being suited to fit an exponential decay curve:

1. The time constant of small distribution transformers may be short due to transformer thermal characteristics and measuring equipment
2. The mean oil temperature surrounding the winding and the actual location of the winding may result in top and bottom oil temperatures not giving the intended average winding oil temperature.

Proposals by Marcel Fortin and Steve Synder for distribution transformers were merged by the Chair and presented.

1. 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.

2. Add to 11.2.2d one of the following:

    a. Alternate 1 (Marcel Fortin) - 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.

    b. Alternate 2 (Steve Snyder) - 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.

3. 11.2.2f: Modify to agree with timeframe specified in 11.2.2c.

The Chair will prepare a draft for WG review to include these proposals along with the measurement of all terminal pairs of distribution transformers per the discussion on 11.2.2b.

Bertrand Poulin presented an exact numerical equivalent to the IEC graphical method for fitting hot resistance time data to an exponential decay curve. The IEC graphical method is currently an appendix that is to be removed from the standard altogether. Bertrand fit the data Juan Castellanos had provided last meeting (a radiator configuration not suited to exponential decay) to an exponential decay curve using the numerical equivalent to the IEC graphical method. Bertrand stated that he has many curve fitting cases and that this methodology has been used for many years.

TF – Modified Temperature Test

The proposed wording for the modified temperature test was presented. Kipp Yule asked if the DGA trial use guide was applicable. Mark stated that the guide will be referenced when DGA limits are approved. Noting the time period for holding the current, there was discussion on requirement for stabilization. As stabilization can take 6 to 36 hours, it could be significantly longer than the actual test. It was also mentioned that the all cooling must be present for the maximum run. The proposal will be modified as requested by Sonjib Som to include "hotspot rise" in the next to last sentence.

Report of the Task Force – Modified Temperature Test - Mark Perkins
Meeting Minutes

The task force on the modified temperature test met on Sunday October 25 at 1:30 pm with Paulette Payne Powell, Don Platts and Mark Perkins present. The group reviewed the final proposed text of the proposal for the modified temperature test.

1. The modified temperature test could be listed as an "other" test in C57.12.00 and described in a sub clause of section 11 of C57.12.90.

2. The wording for C57.12.90 would be as follows:

The modified temperature test may be used to verify the performance of the transformer when a full temperature test is not performed. Only one test is performed and that is done at the maximum nameplate MVA rating. The selection of tap changer positions, measurement points and setup parameters shall be made on the same basis as the normal temperature test at the maximum MVA position as specified in sections 11.1-11.6. The current in the transformer shall be the total loss current as defined in section 11.5, and this current shall be held for a minimum of eight hours, of which a minimum of six hours must be at a top oil temperature rise above 80% of the calculated value. After this minimum duration, the top oil rise, bottom oil rise and average oil rise shall be calculated prior to shutdown. The average winding temperatures shall then be measured after shutdown as described in clause 11.3, only at the total loss current. The average winding temperature gradients of additional windings shall be measured by circulating current corresponding to the maximum nameplate ratings of the windings for one hour followed by the average winding temperature measurement as

described in clause 11.3. The measured winding temperature rise values shall be adjusted for the maximum nameplate currents and for any other adjustments per clauses 11.2 - 11.6. Oil samples for dissolved gas in oil analysis shall be taken before and after the modified temperature test. The estimated top oil rise and average winding rise (based on readings taken immediately before the shutdown) shall be determined. If any of these values exceed the 65 degree limit, then a full temperature test is required.

This proposal will be presented at the working group on temperature rise test procedures that meets on Tuesday, October 27 at 11:00 am for discussion prior to a straw ballot being sent out. The meeting adjourned at 2:00 pm.

Other Business

As we ran out of time, Sanjib Som's presentation for TF 11.2.2e will be held at the next meeting.

The meeting adjourned at 12:15pm.

Respectfully submitted,

Paulette Payne Powell, Chair
Juan Castellanos, Co-Chair

8.4.3.4 Task Force on High Temperature Transformers – Richard Marek

The third meeting of the WG took place on Tuesday, October 27, 2009 in the Lilac B/D Meeting Room at 3:15 pm, at the Westin Lombard Yorktown Center, Lombard, IL, USA

There were 11 members and 24 guests present. Introductions were made and attendance sheets were circulated. The IEEE patent policy was discussed and there were no concerns regarding patents. Since no one had read the minutes from the Miami meeting that had been sent to all members and guests and only 11 members were present of the 34 members on record, approval was deferred to a survey to be distributed by the Chairman. The members were reminded that a response to the survey is mandatory to remain a member of the working group.

The Chairman proposed a modification to the document scope which would require a revision to the PAR. This proposal deleted the last two sentences defining specific hottest spot, average winding and top liquid temperature rises. The additional detail would be moved to another location in the document such as the purpose. Juan Castellanos made an alternate proposal further simplifying the scope. Both proposals will be added to the survey.

A concern was raised at the previous meeting concerning the content of the draft and whether it should be a standard, a guide or a recommended practice. Based on revisions to the document, the chairman decided to delay this decision. Since the PAR authorization is to

develop a standard, he felt that the working group should first work toward this goal and make a decision after one or two additional drafts.

Alternate terminology was requested for the homogeneous high-temperature insulation system. It was explained that this system originated in the IEC reference document as a system composed of all high-temperature solid insulation and high-temperature liquid. However, over the several years of that document use, the description was modified to "mostly" high-temperature insulation and now the name is no longer accurate. Several suggestions were made, such as composite and thermally graded. Sam Mehta suggested that numbers be used for the systems such as 65/65 or 95/65. Vijayan Krishnamurthy agreed to work with Sam to develop a proposed numbering system. Mathieu Sauzay suggested adding additional explanation for the different systems before the detailed descriptions. He was requested to submit an example to further explain his suggestion.

Hasse Nordman suggested modifying Table 1 to include the specific reference temperature for each system. It has been his experience that a variable reference temperature is unfamiliar to customers specifying liquid-filled transformers and that specific numbers in a table would make discussions easier.

The chairman requested volunteers to review and revise six rather weak sections in the current draft. These guide-like sections should be expanded and upgraded to wording more like a standard. Even the section titles may be changed if considered necessary. The volunteers were as follows:

- Section 6 - Transformer accessories and compatibility
    - Roberto Asano
    - Gary Hoffman
- Section 7 - Special design considerations
    - Vijayan Krishnamurthy
- Section 8 – Required information & Section 10 - Testing
    - Eduardo Tolcachir
    - Marion Jaroszewski

There were no volunteers for the following sections. The membership list will be reviewed and assignments will be made.

- Section 9 – Rating plate and additional information
- Section 11 - Supervision, diagnostics, and maintenance

Under new business, Hasse Nordman requested the addition of the aramid life curve from IEEE Std 1276 as an aid in customer discussions. After some discussion it was decided to add this information to an informative annex.

John Luksich suggested adding a section on ageing studies for natural esters. It was agreed that an informative annex would be appropriate. He and Don Cherry agreed to develop an annex for the next draft.

Draft 4 is expected to be circulated before the fall meeting. The WG was requested to review the draft 3 document and make comments or suggestions which would be incorporated into draft 4.

The meeting adjourned at 4:35

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

The Task Force on Moisture Estimation in Transformer Insulation did not meet during the Spring 2009 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.

8.4.3.6 Task Force on Furan Testing – Kent Haggerty

The Task Force on Furan Testing met Monday Morning, October 26, 2008. 57 people attended the Task Force membership.

Chair, Kent Haggerty could not attend and Tom Prevost filled in to run the meeting.

The minutes of the previous Task Force meeting were not reviewed or approved.

Tom explained that a small working group has been meeting to write the position paper that is the primary function of this group. [Tom, Shushzen Xu, Luiz Chiem, Kent Haggerty, and Don Platts] There are a few issues that still need to be resolved before the paper can be completed.

Tom raised the question if measured furans produced by standard kraft paper are actually higher than those produced by thermally upgraded kraft. His analysis of the data produced during testing with DuPont that indicated there is no observable difference. Luiz Chiem presented a summary of his knowledge and review of the topic and his position is that there is definitely a significant difference between the values that are produced from testing of the 2 paper types.

There was lively discussion among those present. There was not resolution.

Tom also asked that any member or guest who has test data for furans consider providing that to the task force. As a part of the paper, a template for the database will be provided. In addition there will be some general guidance on how a testing program should be set up, including instructions for taking paper samples from failed units, so that the DP of the insulation can be correlated.

One agenda topic was "Should the task force recommend that the committee form a working group to produce a guide?" When introduced, Don Platts, the Insulation Life Subcommittee chair, asked the group to consider waiting until they have had a chance to review the published position paper before they tried to make that decision. There was general agreement, and the question regarding a guide will be reviewed in the future.

Don Platts
Acting Secretary.

8.4.3.7 Task Force on Winding Temperature Indicators - Phil McClure

The Task Force on Winding Temperature Indicators did not meet during the Fall 2008 Transformer's Committee meeting.

8.4.3.8 Task Force on Metalic Surface Temperatures – 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.
- There were 57 attendees who were asked to introduce themselves.
- An attendance roster was circulated.
- The IEEE patent disclosure regulations were noted. No one had any items to bring forward.
- The subject of this meeting was introduced by the Chair, namely, whether IEEE C57 documents should be amended to included specific temperature limits for non-current-carrying metallic surfaces in contact with and not in contact with insulation materials. Such numerical limits are not presently included in C57.12.00. Section 5.11.1.3 simply states:

5.1 1.1.3 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.

- The attendees overwhelmingly agreed that there should be a task force formed to research this matter and report proposed changes to the appropriate sections of IEEE standards (C57.12.00) and guides (C57.91).

- The scope of this TF is limited to normal life expectancy loading for transformers filled with mineral oil.
- There was some discussions of the temperature limits for metallic surfaces mentioned in Table 8 of C57.91-1995 which states in column 1, "Normal Life Expectancy":

Other metallic hot-spot temperature
(in contact and not in contact with insulation)……..140C

It was generally agreed that 140C is an acceptable value for this condition as it applies to metallic surfaces NOT in contact, but not appropriate for metallic surfaces in contact with solid insulation. It was also noted that there is a task force looking into setting temperature limits for core steel hot spots and that this limit may need to be lower than 140C to prevent excessive gassing in the presence of the thin film of mineral oil next to the core.

- Action Items
  I. Chair will circulate minutes to the attendees.
  II. Chair will solicit input from a limited number of interested parties and prepare proposed wording for the additions of temperature values to C57.12.00.5.11.1.3 and distribute said wording to the attendees prior to the Spring 2010 meeting.
  III. Chair will solicit input from a limited number of interested parties and prepare proposed modifications to Table 8 of C57.91-1995 needed to coordinate with the proposed temperature limits for C57.12.00 and distribute same to the attendees prior to the Spring 2010 meeting.

8.4.4 Old Business:

There was no Old Business.

8.4.5 New Business:

8.4.5.1 Should We Establish A 75 Degree C Rise

Jerry Corkran raised a question concerning C57-100. This document originally evaluated nomex insulation. Cellulose with natural esters appear to have higher temperature limits. Should we be looking at a 75 degree C rise instead of a 65 degree C rise.

A lively discussion followed this discussion. The main points made or raised are summarized below:

- If we qualify a new temperature limit, we need to qualify it according to a standard. The standard should be a comparison with the 65 degree C system we have today.
- Do we need a finite number of life curves? A finite number made sense. C57-91 might be the best location for new curves.

- C57-91 is a guide. You cannot establish requirements in a guide.
- Sealed system should be used to run sample tests.
- We are missing a standard method for determining a maximum operating temperature.
- The EU is looking at elevated temperature rise. We should find out what they are doing.
- Papers were presented at the 1999 PES Conference that showed a 75 degree C rise using the existing guide. We should not need to wait for a new guide to qualify 75 degree C rise. If these standards are not valid, they should be withdrawn.
- If we use a higher temperature, what do we do with the iron and copper losses?
- A manufacturer has distribution model and sealed tube tests. IEEE Std-99 says the temperature should be within 20 degrees of use temperature. These tests have not gone low enough or long enough.

A final suggestion was that, if you have other data available, please provide it.

There was not a resolution to this question.

8.4.5.2 New Subcommittee Chairman

Don Platts announced that this is his last meeting as Chair of the Insulation Life Subcommittee. Bruce Forsyth was introduced as the new Chair.

Tom Prevost thanked Don for his nine years of service as the Chair. He introduced Don as the new IEEE Transformers Committee Secretary. Tom also thanked Bruce for agreeing to serve as the new Chair.

8.4.6 The meeting adjourned at 9:10 AM.

Don Platts
Chair, Insulation Life Subcommittee