

# **Distribution Transformer Subcommittee**

## **Task force / Working Group Report**

### **Annex C Distribution Subcommittee – Chair: Jerry Murphy**

**October 30, 2024**  
**St. Louis, MO USA**

**Chair: Jerry Murphy**  
**Vice-Chair: Josh Verdell**  
**Secretary: Martin Rave**

#### **C.1 General Opening**

Jerry opened the meeting welcoming everyone to the meeting and provided a Standards Report. To establish a quorum, a list of members was displayed, and a count of members was taken. We did have a quorum with 64 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 167 in attendance and 64 of 92 members. List of attendees and affiliation attached below.

The agenda was reviewed and revised to include a WG report on C57.15, Step-Voltage Regulators. Dan Sauer made a motion and seconded by Jeremy Van Horn to approve the revised agenda. The revised agenda was unanimously approved.

The Spring 2024 meeting minutes were reviewed. A motion was made to approve by John John and seconded by Dan Mulkey to approve the meeting minutes. The meeting minutes were unanimously approved.

At this time, Josh Verdell reviewed the membership changes. A slide was presented welcoming the new member of the subcommittee before proceeding with the working group and task force reports.

#### **C.2 Working Group and Task Force Reports**

##### **██████ C57.12.20 – Overhead Distribution Transformers – Al Traut**

This working group did not meet.

##### **██████ C57.12.28, .29, .30, .31 & C57.12.32 – Enclosure Integrity – Dan Mulkey**

Dan Mulkey presented the following minutes from the working group meeting on October 29, 2024, at 8:00 AM CDT with 84 in attendance.

1. Dan Mulkey called the meeting to order at 8:02 AM CST.
2. Opening remarks and announcements
  - a. Paper rosters were circulated.
3. Dan Mulkey reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
  - a. Added: Jeffrey Brooks, Noah Chesser, Miguel Plascencia, Daniel Posadas

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**b. Removed: John Crotty, William Elliott, Brad Kittrell, Maria Lamorey, Juan Ramirez, Jeffrey Schneider**

5. Quorum was verified. The working group consisted of **64** members, requiring **33** for quorum. 41 members were counted at the start of the meeting. Attendance records later confirmed **44** members attended.
6. Dan Mulkey requested approval of the Fall 2024 Agenda. Mike Thibault made a motion, second by Jerry Murphy. Agenda was unanimously approved.
7. Dan Mulkey requested approval of the Spring 2024 Minutes. Justin Minikel made a motion, second by Mike Thibault for approval of the minutes. Minutes were unanimously approved.
8. Status of Standards:
  - a. C57.12.28 Standard for Pad-Mounted Equipment – Enclosure Integrity, Approved 2014
    - i. Expires: 12/31/2034
    - ii. Status: **Published May 7, 2024**
  - b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Approved 2014
    - i. Expires: 12/31/2034
    - ii. Status: **Published May 7, 2024**
  - c. C57.12.30 Standard for Pole-Mounted Equipment – Enclosure Integrity for Coastal Environments, Approved 2020
    - i. Expires: 12/31/2030
    - ii. Status: Plan to request PAR Dec 2026
  - d. C57.12.31 Standard for Pole-Mounted Equipment – Enclosure Integrity, Approved 2020
    - i. Expires: 12/31/2030
    - ii. Status: Plan to request PAR Dec 2026
  - e. C57.12.32 Standard for Submersible Equipment – Enclosure Integrity, Approved 2019
    - i. Expires: 12/31/2029
    - ii. Par Expires: 12/31/2027
    - iii. Status: Draft 1.4
9. Old business:
  - a. *C57.12.32 Clause 1.3 Word Usage* – Dan Mulkey presented suggested changes to include Clause 1.3 “Word Usage” as mandated by IEEE.

Jerry Murphy made a **motion** seconded by Steve Shull to adopt the clause 1.3 “Word Usage” as presented by Dan Mulkey. The motion passed unanimously.
  - b. *C57.12.32 Definitions Clause* – Dan Mulkey presented suggested three changes to the clause:
    - i. Swap the order of UL 94 and UL 746V in the Standard so they are in alphabetical order
    - ii. Include the statement “Transformer terminology found in IEEE C57.12.80 shall apply unless modified in this standard.”
    - iii. Add “SCAB – Simulated corrosive atmospheric breakdown” to the definitions and abbreviations clause.

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Jerry Murphy made a **motion** seconded by Steve Shull to approve the language related to references as presented by Dan Mulkey. The motion passed unanimously.

- c. *C57.12.32 Clauses 4.2.1 and 4.2.5* – Dan Mulkey, presented a suggested change to replace the word “what” with “which” in clause 4.2.1. Dan also entertained discussion around clause 4.2.5 around “external sharp corners shall be minimized”. The group discussed the verbiage “using best engineering judgment, external sharp corners shall be minimized.”

Tom Dauzat made a **motion** seconded by Mike Thibault to accept Clause 4.2.1 as proposed and change clause 4.2.5 to “External sharp corners and projections shall be minimized to maintain paint adherence”. During discussion, Carlos Gaytan commented that minimizing sharp corners does not just apply to paint adherence, but also safety, in the case that somebody falls into a pad-mount transformer. The motion was not modified and passed unanimously.

- d. *C57.12.32 Clauses 4.2.8* – Dan Mulkey presented a suggested addition of a new clause 4.2.8 as follows:

#### “4.2.8 Galling

Steps must be taken in the design and manufacture of the enclosures to prevent galling. Galling is known to occur with threaded fasteners where the mating surfaces are both made of the same stainless-steel alloy, aluminum alloy, or titanium alloy. Two commonly used methods to mitigate galling are listed below but are not specifically required separately or in combination. Alternative methods may be used if proven to be equally effective:

- Use anti-seize compounds or materials in the threaded joints
- Use dissimilar materials in threaded joints (e.g. silicon-bronze with stainless steel, brass with stainless steel,)

Note: Manufacturers and users should be aware that the use of dissimilar metals may lead to galvanic corrosion in some service environments. The use of dielectric unions or physical isolation of the materials is known to mitigate corrosion potential.”

Marty Rave made a **motion** seconded by Tom Dauzat to modify Section 4.2.8 Galling as approved in previous standards. The motion passed unanimously.

- e. *C57.12.32 Clause 4.2.9* – Dan Mulkey presented a suggested addition of a new clause 4.2.9 as follows:

“The enclosure shall be constructed of fire-resistant material. Non-metallic enclosures shall be made from material having a 5V classification per UL 94, or the enclosure shall comply with the 127 mm (5 inch) flame test specified in UL 746C.”

There was prolonged discussion around the definition of UL5V classification. Dan explained in approximate terms how the test functions. Bruce Webb and Fernando Mesa provided further clarification on the test procedure outlined by UL.

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Tom Dauzat made a motion, to accept the changes as presented by Dan. The motion was not seconded.

A **Task Force** was formed, chaired by Bruce Webb, to propose verbiage for a change to the clause. The Task force consists of Bruce Webb, Fernando Mesa, Tom Dauzat and Mike Thibault.

Mike Thibault made a **motion**, seconded by Justin Minikel, to table further discussion on 4.2.9 until the next meeting. The motion was approved unanimously.

- f. *C57.12.32 Clause F* – Dan Mulkey presented a suggested addition to section 5.3 as follows:

“5.3 Enclosure color

The exterior enclosure color shall be as agreed upon. Most commonly, enclosures are black or gray, but a referenced color standard is not specified in this document.”

Dan Mulkey also presented a suggested change to section 5.4 by replacing the word “in” with “during” and replacing “system” with “system(s)”

The group discussed the suggested changes. Jerry Murphy asked if “holiday” is defined anywhere. Justin suggested adding it to the definition sections.

A **task force** was formed chaired by Justin Minikel to propose a definition of “Holiday” for the definitions sections.

Al Traut made a **motion**, seconded by Jerry Murphy, to accept the proposed changes to sections 5.3 and 5.4 as presented by Dan Mulkey. The motion passed unanimously.

- g. *C57.12.32 clause 5.6.1.2* – Dan Mulkey presented suggested changes to 5.6.1.2 and 5.6.2 as follows:

Clause 5.6.1.2:

- i. Change clause to “shall be fabricated in accordance with” after “Three coated panels,”
- ii. Change clause to “to create an approximately 102 mm (4inch) long scribe across the weld,” after “ASTM D1654-05”.

Clause 5.6.2:

- iii. Add “This test requirement shall apply to all coating systems applied to the enclosure.” after the first sentence.

A **motion** was made by Justin Minikel, seconded by Al Traut to accept the changes as presented by Dan. The Motion passed unanimously.

- h. *C57.12.32 Clause 5.6.3 and 5.6.4* – Dan Mulkey presented suggested changes to 5.6.3 and 5.6.4 as follows:

Clause 5.6.3 Soak Test:

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- i. Revise the first sentence to “This test demonstrates proper pretreatment of the substrate and subsequent coating adhesion.”

#### Clause 5.6.4 Impact Test

- ii. Added “This test requirement shall apply to all coating systems applied to the enclosure.” after the first sentence.

A **motion** was made by Tom Dauzat, seconded by Mike Zarnowski, to accept the changes as presented. The motion passed unanimously.

- i. *C57.12.32 Clause 5.6.5* – Dan Mulkey presented suggested changes to clause 5.6.5 as follows;

Revised the second paragraph to: “This test requirement shall apply only for coated surfaces on the interior of the enclosure and that come into direct contact with insulating fluids.”

A **motion** was made by Tiffany Lukas, seconded by Al Traut, to accept the changes as proposed. The motion passed unanimously.

- j. *C57.12.32 Clause 5.6.7 and 5.6.8* – Dan Mulkey presented suggested changes to clauses 5.6.7 and 5.6.8 as follows:

Clause 5.6.7 Simulated corrosive atmospheric breakdown: added the sentence “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a new paragraph after the current sentence.

Clause 5.6.8 Abrasion resistance: added “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a new paragraph after the first paragraph.

A **motion** was made by Tom Dauzat, seconded by Martin Bachand, to accept the changes as shown. The motion passed unanimously.

- k. *C57.12.32 Clause 5.6.9 Chipping resistance test* – Dan Mulkey presented suggested changes to clause 5.6.9 as follows:

Added “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a separate paragraph after the first paragraph.

A **motion** was made by Tiffany Lukas, seconded by Martin Bachand, to accept the changes as shown. The motion passed unanimously.

- l. *C57.12.32 Annex B* – Dan Mulkey presented suggested changes to formatting throughout the Annex.

Tom Dauzat made a **motion**, seconded by Mike Zarnowski, to accept the changes as presented. The motion passed unanimously.

- m. *C57.12.32 Annex C* – Dan Mulkey presented suggested changes to the document to include a informative new Annex C on Substrate Surface Preparation.

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The group discussed and a comment was made that the NACE standard which is referenced in the document has been replaced by the AMPP standard and the reference should be updated.

A **motion** was made by Tom Dauzat, seconded by Martin Bachand, to accept the annex as presented with the change of the AMPP standard in place of the NACE standard. The motion passed unanimously.

#### 10. New Business

##### a. *Impact Testing* –

Justin Minikel reviewed Impact Testing with the group including

- i. The impact test method per ASTM D2794 and example images of failures
- ii. Areas where further clarification could be provided in Section 5.1 and 5.5 and 5.6.4 of the standard

Justin Minikel presented suggested changes to clauses 5.1 and 5.6.4 in a “Draft 1.5” as follows:

##### Clause 5.1 General

- i. Reword the second sentence in the paragraph to read “Each different combination of substrate(s) and coating(s) shall meet these design tests.”

##### Clause 5.6.4

- ii. Revised “If cracking is not evident...” to “If wrinkling or cracking is not evident...”

Justin Minikel made a **motion**, seconded by Tom Dauzat, to change the language and update the formatting of section 5.6.4 as presented in “draft 1.5”. There was discussion about the motion. Martin Bachand commented that we should further consider material thickness in this test. Dan Mulkey asked whether it made sense to run the 24h salt spray test on stainless steel material substrates. Justin commented that this test is primarily testing the coatings process more than the material itself. Jerry Murphy asked if we should come back and address crushing at a later date. The motion was not changed and passed unanimously.

- b. *Impact test in C57.12.29* – Justin Minikel commented that C57.12.29 does not have an impact test and asked the group if it should be considered. Conversation was tabled for a future meeting.

#### 11. Next meeting: March 25, 2025, in Denver, Colorado, USA.

- a. The following attendees requested membership and will be added to membership for the Fall 2023 meeting: **Jared Bates, David Rohrer, Tim Menter, Fernando Meza**

#### 12. The meeting was adjourned at 9:15 AM CST.

Submitted by: Jeremy Van Horn

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Date: Oct 29, 2024

### **List of Members:**

|  |
|--|
| <i>Alex Ayala (Power Partners)</i>                         |
| <i>Martin Bachand (Cloverdale Paint Inc.)</i>              |
| <i>Jeffrey Brooks (POWER Engineers)</i>                    |
| <i>Darren Brown (Howard Industries)</i>                    |
| <i>Noah Chesser (Oncor Electric Delivery)</i>              |
| <i>John Chisholm (IFD Technologies)</i>                    |
| <i>Douglas Craig (Richards Manufacturing Co.)</i>          |
| <i>Thomas Dauzat (AEP)</i>                                 |
| <i>Craig Derouen (ERMCO)</i>                               |
| <i>James Gardner (Prolec GE)</i>                           |
| <i>Carlos Gaytan (Prolec GE)</i>                           |
| <i>Ali Ghafourian (H-J Enterprises, Inc.)</i>              |
| <i>Ramadan Issack (American Electric Power)</i>            |
| <i>Gary King (Howard Industries)</i>                       |
| <i>Gilbert Kozar (Northeast Transformer Services, LLC)</i> |
| <i>Patrick Kozar (Northeast Transformer Services, LLC)</i> |
| <i>Andrew Larison (Hitachi Energy)</i>                     |
| <i>Tiffany Lucas (Prolec GE)</i>                           |
| <i>Alejandro Macias (CenterPoint Energy)</i>               |
| <i>Justin Minikel (EATON Corporation)</i>                  |
| <i>Michael Morgan (Duke Energy)</i>                        |
| <i>Daniel Mulkey (Mulkey Engineering Inc.)</i>             |
| <i>Jerry Murphy (Reedy Creek Energy Services)</i>          |
| <i>Dwight Parkinson (EATON Corporation)</i>                |
| <i>Vinay Patel (Consolidated Edison Co. of NY)</i>         |
| <i>Miguel Plascencia (Pacific Gas &amp; Electric)</i>      |
| <i>Ion Radu (Hitachi Energy)</i>                           |
| <i>James Ratty (Electronic Technology Inc.)</i>            |
| <i>Martin Rave (IFD Technologies)</i>                      |
| <i>Robert Reepe (Georgia Power Co.)</i>                    |
| <i>Mason Rush (Central Moloney Inc)</i>                    |
| <i>Pedro Salgado (Electronic Technology Inc.)</i>          |
| <i>Stephen Shull (BBC Electrical Services, Inc.)</i>       |
| <i>Igor Simonov (Toronto Hydro)</i>                        |
| <i>Edward Smith (H-J Family of Companies)</i>              |
| <i>James Spaulding (Fort Collins Utilities)</i>            |
| <i>Michael Thibault (Pacific Gas &amp; Electric)</i>       |
| <i>Alan Traut (Howard Industries)</i>                      |
| <i>Reinaldo Valentin (Duke Energy)</i>                     |

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| <i>Jeremy Van Horn (IFD Technologies)</i>      |
| <i>Joshua Verdell (ERMCO)</i>                  |
| <i>Shelby Walters (Howard Industries)</i>      |
| <i>Alan Wilks (Consultant)</i>                 |
| <i>Michael Zarnowski (Carte International)</i> |

#### **List of Guests:**

|  |
|--|
| <i>Jared Bates (Oncor Electric Delivery)</i>         |
| <i>Matthew Chisholm (IFD Technologies)</i>           |
| <i>Janet Crockett (Fayetteville PWC)</i>             |
| <i>John Crotty (Ameren)</i>                          |
| <i>Rohrer David (First Energy)</i>                   |
| <i>Huan Dinh (Hitachi Energy)</i>                    |
| <i>Jake Draxton (Sherwin-Williams)</i>               |
| <i>Sanford Fong (Georgia Power Co.)</i>              |
| <i>Kevin Frye (Central Moloney Inc.)</i>             |
| <i>Luke Grandbois (IFD Technologies)</i>             |
| <i>Garza Hector (Orto de Mexico)</i>                 |
| <i>Jason Lambert (JST Power)</i>                     |
| <i>Nicholas Manske (Oncor Electric Delivery)</i>     |
| <i>Timothy Menter (Lincoln Electric System)</i>      |
| <i>Fernando Meza (Power Partners)</i>                |
| <i>Charles Morgan (Eversource Energy)</i>            |
| <i>Martin Munoz (Orto de Mexico)</i>                 |
| <i>Stefan Schindler (Maschinenfabrik Reinhausen)</i> |
| <i>Fernando Tirado (Prolec)</i>                      |
| <i>Bruce Webb (Knoxville Utilities Board)</i>        |
| <i>Kangjin Lee (Cheryong Electric)</i>               |
| <i>Rebecca Kim (Cheryong Electric)</i>               |
| <i>Jim Cai (JSHP Transformers)</i>                   |
| <i>Nicholas Post (WEC Energy Group)</i>              |
| <i>Joel Pacas (IFD Technologies)</i>                 |
| <i>Brian Conneighton (Cleveland-Cliffs)</i>          |
| <i>Bryan Marquardt (Cleveland-Cliffs)</i>            |
| <i>Fernando Duarte (EPRI)</i>                        |
| <i>Pragnesh Vyas (Sunbelt Solomon)</i>               |
| <i>Juan Velasquez (Magnetron SAS)</i>                |
| <i>Hugo Murillo (The H-J Family)</i>                 |
| <i>Joel Schumack (Ameren)</i>                        |
| <i>Gilberto Garza (Prolec GE)</i>                    |
| <i>Miguel Garcia (Hitachi Energy)</i>                |
| <i>Qasim Khan (NEETRAC - Georgia Tech)</i>           |



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|---|
| <i>Vedrana Starcevic Prebeg (Koncar-DFST)</i>   |
| <i>David Cordova (Maddox Industrial XFMR)</i>   |
| <i>Robert Mennonna (Maddox Industrial XFMR)</i> |
| <i>Holly Wassall (JST Power)</i>                |
| <i>Megan Bereswill (JST Power)</i>              |

#### **C57.12.34 – Three Phase Pad-Mount Transformers – Steve Shull**

Steve Shull presented the following minutes from the working group meeting on October 28, 2024, at 3:15 PM CDT with 100 in attendance.

The Chair called the meeting to order at 3:15 P.M. CDT on October 28, 2024. Attendees verbally identified themselves by name and affiliation.

1. IEEE Privacy Policy  
The Chair verbally stated and explained in detail all the information according to IEEE Privacy Policy.
2. Meeting Quorum  
The Chair displayed the members of the WG and a quorum was established.
3. Agenda Approval  
The Chair displayed the agenda for this meeting. A motion was made by Tom Dauzat and seconded by Lee Matthews to “Approve the Agenda as displayed”. The Chair asked any opposition to the displayed Agenda to which no opposition was observed. The Agenda was approved as displayed.
4. Minutes Approval  
The Chair stated the Last Meeting Minutes were available online. A motion was made by Jerry Murphy and seconded by Mike Thibault to “approve the Last Meeting Minutes as shown online”. The Chair asked any opposition to approved these minutes as posted to which no opposition was observed. The Last Meeting Minutes were approved.
5. Confirmation of IEEE SA Essential Patent Statement  
The patent information request was displayed. The chair provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or if a participant is personally aware of patent claim(s)/patent application claim(s) that may be essential for the use of this standard. There were no responses to this request so no patent claim(s)/patent application claim(s) were identified.
6. IEEE SA Copyright Policy Statement and Participant Behavior Policy were shown without any discussion or objection.
7. Old Business

#### **Task Force Reports**

- TF #2 – The Task Force reported that “Although we are seeing higher kVA units for the voltages listed in Table 3, these requests are tied specifically to projects customized to the site, including the special short circuit current designs to accommodate these requirements.

As such, the TF did not feel it would be appropriate for an IEEE standard to increase the kVA ratings in Table 3.

However, the TF did recommend that the addition of voltages of 416Y/240 and 690Y/398.”

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A motion was made by Igor Simonov and seconded by Gary King to accept these changes. The Chair asked if there was any opposition to approved this motion as presented to which no opposition was observed.

- TF #5 – Update bushing drawings to reference C57.19.02 and make them consistence with a common labeling practice, i.e.  $X_3$  and not  $X3$ . Since this was editorial, no motion or vote was taken.

This taskforce also made modification to the standard to incorporate the reference to C57.19.02. This resulted in the removal of Figure 19 and 20 since these are reflected in C57.19.02. The tables in these figures were moved to Article 8.7.3 *600 V and below terminals*. This also resulted in modification of this section which is reflected in the current draft.

- TF #4 Test Review – A presentation was made by Michael Zarnowski and Andrew Larison related to Article 7.2 *Dielectric Tests*. The issue that was seen was using an induced test voltage of 3.46X rated + 1000 which at the 125 kV BIL and 150 kV BIL Voltage Test Limits exceeded induced test limits exceed voltage ratings for certain accessories such as dual voltage switches and underoil load break switches and exceeds the interphase insulation levels and under oil lead spacing. This had resulted in advertent failures. The recommendation of the task force was to change the value to 2X rated voltage. After considerable discussion, a motion was made by Gary King to use the 2X rated induced test voltage. The motion was seconded by Rhett Chrysler and the motion passed. The article will eb changed to:

*Dielectric test levels shall be in accordance with the distribution transformer test levels in IEEE Std C57.12.00.*

Having run out of meeting time, the meeting adjourned at 4:30 P.M. CDT.

Submitted by: Alan Wilks

Date: 10/28/2024

#### Attendance:

| First Name | Last Name  | Company                             | Role   |
|------------|------------|-------------------------------------|--------|
| Rehan      | Ali        | Siemens Energy                      | Member |
| Jared      | Bates      | Oncor Electric Delivery             | Member |
| Noah       | Chesser    | Oncor Electric Delivery             | Member |
| Rhett      | Chrysler   | ERMCO                               | Member |
| Thomas     | Dauzat     | AEP-SWEPCO                          | Member |
| Miguel     | Garcia     | Hitachi Energy                      | Member |
| Carlos     | Gaytan     | Prolec GE                           | Member |
| Ali        | Ghafourian | H-J Enterprises, Inc.               | Member |
| Giovanni   | Hernandez  | Virginia Transformer Corp.          | Member |
| Ramadan    | Issack     | American Electric Power             | Member |
| Gary       | King       | Consultant                          | Member |
| Brian      | Klaponski  | Carte International Inc.            | Member |
| Gilbert    | Kozer      | Northeast Transformer Services, LLC | Member |
| Patrick    | Kozer      | Northeast Transformer Services, LLC | Member |

| First Name | Last Name | Company                             | Role   |
|------------|-----------|-------------------------------------|--------|
| Daniel     | Mulkey    | Mulkey Engineering Inc.             | Member |
| Jerry      | Murphy    | Reedy Creek Energy Services-Retired | Member |
| Dwight     | Parkinson | EATON Corporation                   | Member |
| Martin     | Rave      | IFD Technologies                    | Member |
| Robert     | Reepe     | Georgia Power Co.                   | Member |
| Mason      | Rush      | Central Moloney, Inc.               | Member |
| Jaber      | Shalabi   | VanTran Industries, Inc.            | Member |
| Michael    | Shannon   | Rea Magnet Wire                     | Member |
| Stephen    | Shull     | BBC Electrical Services, Inc.       | Member |
| Igor       | Simonov   | Toronto Hydro                       | Member |
| James      | Spaulding | Fort Collins Utilities              | Member |
| Chris      | Talbert   | JST Power Equipment                 | Member |
| Reinaldo   | Valentin  | Duke Energy                         | Member |
| Jeremy     | Van Horn  | IFD Technologies Inc.               | Member |

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|-----------|----------|--------------------------------|--------|
| Andrew    | Larison  | Hitachi Energy                 | Member |
| Weijun    | Li       | Braintree Electric Light Dept. | Member |
| Alejandro | Macias   | CenterPoint Energy             | Member |
| Lee       | Matthews | Howard Industries              | Member |
| Michael   | Morgan   | Duke Energy                    | Member |
|           |          |                                |        |

|          |           |                            |        |
|----------|-----------|----------------------------|--------|
| Pragnesh | Vyas      | Sunbelt-Solomon Solutions  | Member |
| Bruce    | Webb      | Knoxville Utilities Board  | Member |
| Zachery  | Weiss     | WEG Transformers USA Inc.  | Member |
| Alan     | Wilks     | Consultant                 | Member |
| Joshua   | Yun       | Virginia Transformer Corp. | Member |
| Michael  | Zarnowski | Carte International        | Member |

| First Name | Last Name  | Company                        | Role  |
|------------|------------|--------------------------------|-------|
| Nabi       | Almeida    | Prolec GE                      | Guest |
| Alejandro  | Ayala      | Power Partners                 | Guest |
| Hugo       | Bayong     | H-J Family of Companies        | Guest |
| Megan      | Bereswill  | JST Power Equipment            | Guest |
| Kevin      | Biggie     | Weidmann Electrical Technology | Guest |
| Jeffrey    | Brooks     | Asplunda Engineering Services  | Guest |
| Jim        | Cai        | JSHP Transformer               | Guest |
| Alonso     | Castillo   | Kaedi Energy                   | Guest |
| Matthew    | Chisholm   | IFD Corporation                | Guest |
| Brian      | Connelgton | Cleveland-Cliffs               | Guest |
| Janet      | Crockett   | Fayetteville PWC               | Guest |
| John       | Crotty     | Ameren                         | Guest |
| Craig      | DeRouen    | ERMCO                          | Guest |
| Jeff       | Door       | H-J Family of Companies        | Guest |
| Fernando   | Duarte     | EPRI                           | Guest |
| Roger      | Dugan      | EPRI Retired                   | Guest |
| Qusai      | Elnimri    | Vantran Transformer            | Guest |
| Kevin      | Frye       | Central Moloney, Inc.          | Guest |
| Jose       | Gamboa     | H-J Family of Companies        | Guest |
| Luke       | Grandbois  | IFD Technologies               | Guest |
| Kyle       | Heiden     | EATON Corporation              | Guest |
| John       | Hipchen    | Copper Development ASSN.       | Guest |
| Thomas     | Holifield  | Howard Industries              | Guest |
| Mohammad   | Iman       | MGM Transformer Co.            | Guest |
| John       | John       | Virginia Transformer Corp.     | Guest |
| Braxton    | Jones      | SD Meyers                      | Guest |
| Qasin      | Khan       | NEETRAC - Georgia Tech         | Guest |
| Rebecca    | Kim        | Cheryong Electric              | Guest |
| Evan       | Knapp      | EATON Corporation              | Guest |
| Kang Jin   | Lee        | Cheryong Electric              | Guest |
| Nicholas   | Manske     | Oncor Electric Delivery        | Guest |

| First Name | Last Name       | Company                 | Role  |
|------------|-----------------|-------------------------|-------|
| Bryan      | Marquardt       | Cleveland-Cliffs        | Guest |
| Katherine  | Marulanda       | Magnetron               | Guest |
| Nader      | Masoud          | Central Moloney, Inc.   | Guest |
| Brian      | McBride         | Cargill, Inc.           | Guest |
| Johnny     | Meng            | Alpha Plottex NC Inc    | Guest |
| Tim        | Menter          | Lincoln Electric System | Guest |
| Fernando   | Meza            | Power Partners          | Guest |
| Justin     | Minikel         | EATON Corporation       | Guest |
| Humberto   | Moreno          | Siemens Energy          | Guest |
| Charles    | Morgan          | Eversource Energy       | Guest |
| Fredy      | Murcia          | Siemens Energy          | Guest |
| Hugo       | Murillo         | H-J Family of Companies | Guest |
| Joel       | Pacas           | IFD Technologies        | Guest |
| Nicholas   | Post            | WEC Energy Group        | Guest |
| Ion        | Radu            | Hitachi Energy          | Guest |
| David      | Rohrer          | First Energy            | Guest |
| Stefano    | Schindler       | Reinhausen              | Guest |
| Joseph     | Schumack        | Ameren                  | Guest |
| Masoud     | Sharifi         | SGRE                    | Guest |
| Mochande   | Shiv            | Siemens Energy          | Guest |
| Mohammad   | Sohail          | Trench Limited          | Guest |
| Vedrana    | Starcevicprebeg | Koncar Dfst             | Guest |
| Tim        | Tillery         | Howard Industries       | Guest |
| Fernando   | Tirado          | Prolec GE               | Guest |
| Alan       | Traut           | Howard Industries       | Guest |
| Joshua     | Verdell         | ERMCO                   | Guest |
| David      | Walker          | MGM Transformer Co.     | Guest |
| Shelby     | Walters         | Howard Industries       | Guest |
| Koray      | Yavuz           | Norak Electric          | Guest |
| Malia      | Zaman           | IEEE SA                 | Guest |
| Bryan      | Marquardt       | Cleveland-Cliffs        | Guest |

### ■ C57.12.35 – Bar Coding for Transformers and Regulators– Rhett Chrysler

This working group did not meet.

### ■ C57.12.36 – Distribution Substation Transformers – Jerry Murphy

Jerry Murphy presented the following minutes from the working group meeting on October 29, 2024, at 9:30 AM CDT in with 65 in attendance.

## **Distribution Transformer Subcommittee**

### **Task force / Working Group Report**

Jerry Murphy called the meeting to order at 9:30 AM. Introductions were made. By a show of hands, the quorum was reached by having 16 out of the 29 members present.

A motion for approval of the agenda was made by Mike Shannon and seconded by Dwight Parkinson, and the motion was approved without opposition. A motion for approval of the past meeting minutes in Vancouver, BC was made by Dwight Parkinson, seconded by Mike Shannon, and the motion was approved with no opposition.

Essential patent claims and IEEE SA and participant behavior slides were presented.

In old business, Jerry Murphy raised the topic of thermal identifications (ONAN/KNAN) in the standard. No further comments on this topic were discussed.

Jerry Murphy said that Draft 2 of the standard is published on the website with password protected access.

Jerry Murphy asked the WG about considering moving Draft 2 to ballot as the current standard is two years from expiring. Bruce Webb motioned to go to ballot. Miguel Garcia seconded, and there were no objections.

Al Traut made a motion to form a ballot comment resolution task force with editorial power. Dwight Parkinson seconded, and there was no objection. Conversation on the motion included reviewing and addressing editorial and technical comments and to bring comments back to WG for approval at the Spring 2025 Denver WG meeting.

Comment resolution TF to include Bruce Webb, Noah Chesser, Miguel Garcia, Dwight Parkinson, Hector Garza, Jaber Shalabi, Carlos Gaytan, Jerry Murphy, and Angela Leigl.

Meeting adjourned at 9:46AM.

Submitted by: J. Murphy/C. Gaytan/A. Leigl

Date: 10/29/2024

Attendance:

| <b>First Name</b> | <b>Last Name</b> | <b>Company</b>          | <b>Member/Guest</b> |
|-------------------|------------------|-------------------------|---------------------|
| Rehan             | Ali              | Siemens Energy Inc      | Guest               |
| Nabi              | Almeida          | Prolec GE               | Guest               |
| Jared             | Bates            | Oncor Electric Delivery | Guest               |
| Megan             | Bereswill        | JST Power Transformers  | Guest               |
| Noah              | Chesser          | Oncor Electric Delivery | Member              |
| Matthew           | Chisholm         | IFD Technologies        | Guest               |
| Rhett             | Chrysler         | ERMCO                   | Guest               |
| Craig             | Colopy           | Retired                 | Member              |
| Brian             | Conneighton      | Cleveland Cliffs        | Guest               |
| Janet             | Crockett         | Fayetteville PWC        | Guest               |
| John              | Crotty           | Ameren                  | Guest               |

**Distribution Transformer Subcommittee**  
**Task force / Working Group Report**

|             |             |                             |            |
|-------------|-------------|-----------------------------|------------|
| Tim         | Dappen      | Cargill                     | Guest      |
| Thomas      | Dauzat      | AEP SWEPCO                  | Guest      |
| Sanford     | Fong        | Georgia Power Co            | Guest      |
| Chris       | Franklin    | MG Power Associates         | Guest      |
| Kevin       | Frye        | Central Moloney Inc         | Guest      |
| Miguel      | Garcia      | Hitachi Energy              | Member     |
| Gilberto    | Garza       | Prolec GE                   | Guest      |
| Hector      | Garza       | Orto de Mexico              | Guest      |
| Carlos      | Gaytan      | Prolec GE                   | Vice-Chair |
| Luke        | Grandbois   | IFD Technologies            | Guest      |
| Brad        | Grooms      | NTS                         | Guest      |
| Jovani      | Gutierrez   | JST Power Transformers      | Guest      |
| Benjamin    | Hershberger | Midwest Transformer         | Guest      |
| Rebecca     | Kim         | Cheryong electric           | Guest      |
| Gary        | King        | Consultant                  | Guest      |
| Andrew      | Larison     | Hitachi Energy              | Member     |
| Kang Jin    | Lee         | Cheryong Electric           | Guest      |
| Angela      | Leigl       | Eaton Corp                  | Secretary  |
| Nicholas    | Manske      | Oncor Electric Delivery     | Guest      |
| Lee         | Matthews    | Howard Industries           | Guest      |
| Luis Felipe | Mendez      | JST Power Transformers      | Guest      |
| Justin      | Minikel     | Eaton Corp                  | Guest      |
| Tyler       | Morgan      | Duke Energy                 | Guest      |
| Dan         | Mulkey      | Mulkey Engineering Inc.     | Member     |
| Martin      | Muñoz       | Orto de Mexico              | Member     |
| Fredy       | Murcia      | Siemens Energy Inc          | Guest      |
| Jerry       | Murphy      | Reedy Creek Energy Services | Chair      |
| Nurudeen    | Olayiwola   | PECO                        | Guest      |
| Dwight      | Parkinson   | Eaton Corp                  | Member     |
| Joel        | Pacas       | IFD Technologies            | Guest      |
| Ion         | Radu        | Hitachi Energy              | Member     |
| Martin      | Rave        | IFD Technologies            | Guest      |
| Perry       | Reedee      | PA Transformer              | Guest      |

## Distribution Transformer Subcommittee

### Task force / Working Group Report

|          |                  |                              |        |
|----------|------------------|------------------------------|--------|
| Robert   | Reepe            | Georgia Power Co             | Guest  |
| David    | Rohrer           | First Energy                 | Guest  |
| Mason    | Rush             | Central Moloney Inc          | Guest  |
| Stefan   | Schindler        | Maschinenfabrik Reinhausen   | Member |
| Joseph   | Schumack         | Ameren                       | Guest  |
| Jaber    | Shalabi          | Vantran Transformers         | Member |
| Mike     | Shannon          | REA Magnet Wire              | Member |
| Stephen  | Shull            | BBC Electrical Services Inc. | Member |
| Ed       | Smith            | The H-J Family of companies  | Guest  |
| Vedrana  | Starcevic Prebeg | Koncar D&ST                  | Guest  |
| Kerwin   | Stretch          | Siemens Energy Inc           | Guest  |
| Chris    | Talbert          | JST Power Transformers       | Guest  |
| Mike     | Thibault         | Pacific Gas & Electric       | Member |
| Tim      | Tillery          | Howard Industries            | Guest  |
| Fernando | Tirado           | Prolec GE                    | Guest  |
| Alan     | Traut            | Howard Industries            | Member |
| Reinaldo | Valentin         | Duke Energy                  | Guest  |
| Josh     | Verdell          | ERMCO                        | Guest  |
| Holly    | Wassall          | JST Power Transformers       | Guest  |
| Bruce    | Webb             | Knoxville Utilities Board    | Member |
| Zach     | Weiss            | WEG Transformers             | Guest  |

#### ██████ C57.12.37 – Electronic Reporting of Dist Tr Test Data – Alan Traut

Alan Traut presented the following minutes from the working group meeting on October 29, 2024, at 1:45 PM CDT with 55 in attendance.

1. Chair called the meeting to order at 1:45pm CDT. Members introduced themselves with their affiliation. Paper rosters were circulated to record attendance.
2. Chair called for identification of essential patents pertaining to the work of this WG. None brought forward. Copyright policy presented. No issues identified.
3. Chair Report
  - a. PAR for revision of C57.12.37 approved on 2/15/2024 with an expiration date of 12/31/2028.
  - b. The current published document C57.12.37-2015 expires 12/31/2025.

## **Distribution Transformer Subcommittee**

### **Task force / Working Group Report**

4. Total attendance was 55. 19 of 31 members were present and a quorum was declared. 18 of the 36 guests attending requested membership.
5. Motion to approve the meeting agenda (Rhett Chrysler/Shelby Walters). Meeting agenda was unanimously approved.
6. Motion to approve the meeting minutes from Spring 2024 Vancouver meeting (Dan Mulkey/Shelby Walters). Meeting minutes were unanimously approved.
7. The Chair reviewed the changes made to the document approved at the Spring 2024 meeting. No new comments or issues were identified.
8. Bruce Webb requesting follow-up on Auxiliary document to identify existing and new vendor identifications. The list of manufacturer codes is maintained under IEEE Std C57.12.35. IEEE SA Josh Gay administers the Open Source documents. Rhett Chrysler to contact Josh for further work on the matter. The link to the download is:  
[https://standards.ieee.org/wp-content/uploads/2024/07/C57.12.35-2024\\_downloads.zip](https://standards.ieee.org/wp-content/uploads/2024/07/C57.12.35-2024_downloads.zip)
9. The Chair will do an editorial scrub of the document in preparation for initiating the ballot process. Dan Mulkey volunteered to help. The Chair will also conduct a straw ballot among the active participants of this working group to identify any potential technical issues.
10. Next meeting – Denver, CO March 23-27 2025.
11. Meeting adjourned at 3:00pm CDT.

Submitted by: Bruce Webb, Acting Secretary

Date: 10/29/2024

Attendance:

## Distribution Transformer Subcommittee

### Task force / Working Group Report

| First Name      | Last Name | Company or Affiliation  | Role      | First Name | Last Name | Company or Affiliation        | Role       |
|-----------------|-----------|-------------------------|-----------|------------|-----------|-------------------------------|------------|
| Alex            | Ayala     | Power Partners          | Guest (R) | Jerry      | Murphy    | Reedy Creek Energy Services   | Member     |
| Jared           | Bates     | Oncor Electric Delivery | Member    | Joel       | Pacas     | IFD Corporation               | Guest      |
| Megan           | Bercswill | JST Power               | Guest (R) | Dwight     | Parkinson | Eaton                         | Guest (R)  |
| Darren          | Brown     | Howard Industries       | Guest (R) | Homer      | Portillo  | Advanced Power Tech           | Guest (R)  |
| Noah            | Chesser   | Oncor Electric Delivery | Member    | Nicholas   | Post      | WEC Energy Group              | Guest      |
| Rhett           | Chrysler  | ERMCO                   | Member    | Martin     | Rave      | IFD Technologies              | Guest      |
| Janet           | Crockett  | Fayetteville PWC        | Member    | Robert     | Reepe     | Georgia Power Co.             | Member     |
| John            | Crotty    | Ameren                  | Guest (R) | Kevin      | Rusch     | Russard Monitoring            | Guest      |
| Craig           | DeRouen   | ERMCO                   | Guest (R) | Mason      | Rush      | Central Moloney Inc           | Guest (R)  |
| Fernando        | Duarte    | EPRI                    | Guest (R) | Paul       | Salvato   | Intellirent                   | Guest      |
| Roger           | Duran     | RCDugan                 | Guest     | Joe        | Schumack  | Ameren                        | Guest (R)  |
| Kevin           | Frye      | Central Moloney Inc     | Guest     | Mike       | Shannon   | REA Maget Wire                | Guest      |
| Ramadan         | Issack    | American Electric Power | Member    | Stephen    | Shull     | BBC Electrical Services, Inc. | Member     |
| Jose            | Izquierdo | Siemens Energy          | Guest (R) | Ed         | Smith     | H-J Family of Companies       | Guest (R)  |
| Gary            | King      | Consultant              | Guest     | James      | Spaulding | Fort Collins Utilities        | Guest      |
| Jason           | Lambert   | JST Power               | Guest     | Chris      | Talbert   | JST Power                     | Guest      |
| Andrew          | Larison   | Hitachi ABB Power Grids | Member    | Michael    | Thibault  | Pacific Gas & Electric        | Vice Chair |
| Angela          | Leigl     | EATON Corporation       | Member    | Fernando   | Tirado    | Prolec GE                     | Guest      |
| Alejandro       | Macias    | Centerpoint Energy      | Guest (R) | Alan       | Traut     | Howard Industries             | Chair      |
| Nicholas        | Manske    | Oncor Electric Delivery | Guest (R) | Reinaldo   | Valentin  | Duke Energy                   | Member     |
| Nader           | Masoud    | Central Moloney Inc     | Guest (R) | Joshua     | Verdell   | ERMCO                         | Member     |
| Lee             | Matthews  | Howard Industries       | Guest     | Shelby     | Walters   | Howard Industries             | Member     |
| Johnny          | Meng      | Alpha Plotter NC inc    | Guest     | Holly      | Wassall   | JST Power                     | Guest (R)  |
| Tim             | Menter    | Lincoln Electric System | Guest (R) | Bruce      | Webb      | Knoxville Utilities Board     | Member     |
| Fernando        | Meza      | ERMCO                   | Guest     | Paul       | Weyandt   | Schneider Electric            | Guest (R)  |
| Michael (Tyler) | Morgan    | Duke Energy             | Member    | Alan       | Wilks     | Consultant                    | Member     |
| Shiv            | Morkhanda | Siemens Energy          | Guest     | Malia      | Zaman     | IEEE SA                       | Guest      |
| Daniel          | Mulkey    | Mulkey Engineering Inc. | Member    |            |           |                               |            |

#### ██████ C57.12.38 – Single-Phase Pad-Mounted Transformers – Ali Ghafourian

This working group did not meet.

#### ██████ C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

Carlos Gaytan presented the following minutes from the working group meeting on October 29, 2024, at 3:15 PM CDT with 42 in attendance.

1. Carlos Gaytan called the meeting to order at 3:15 PM PST. Group introductions were made.
2. Carlos Gaytan reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
3. Quorum was verified. The working group consisted of **38** members, requiring **19** for quorum. Attendance records later confirmed **20** members attended.
4. Carlos Gaytan requested approval of the Fall 2024 Agenda. Al Traut made a motion, second by Nabi Almeida. Agenda was unanimously approved.
5. Carlos Gaytan requested approval of the Spring 2024 Minutes. Luke Grandbois made a motion, second by Alex Macias for approval of the minutes. Minutes were unanimously approved.
6. Old Business



## **Distribution Transformer Subcommittee**

### **Task force / Working Group Report**

a. *Task force report: Negative pressure requirements* – Luke Grandbois

Luke Grandbois presented the findings of the task force, which fit into three categories:

i. Clause 4.1 Liquid Preservation

The Task Force found there is ambiguity in the link between the pressure range in the second paragraph to the operating conditions described in the first paragraph, which may lead to misinterpretation of the clause.

The Task Force recommended modifying Clause 4.1 by adding a footnote with the following text:

“The pressure limits described shall be built into the design of the sealed-tank system (without relying upon pressure regulating devices), which involves manipulating the tank size, oil volume and air space while operating within the conditions described in the first paragraph of Clause 4.1.”

The working group discussed the proposal. Al Traut made the comment that the footnote is phrased using normative verbiage (“shall”) and may be better as part of the clause instead of a footnote.

The **task force** will revise the footnote into the clause for proposal at next meeting.

ii. Clause 4.2.1. Tank Integrity

The Task Force presented a suggested change to Clause 4.2.1:

Replace the following “an internal pressure of 49 kPa (gauge) (7 psig)” with “a range of internal pressures between -35 kPa (gauge) (-5 psig) to 49 kPa (gauge) (7 psig)” in both paragraphs of the clause.

A lengthy discussion followed. Tom Dauzat mentioned many factors influence the pressure differential, for example, elevation. Carlos Gaytan clarified that the standard currently only covers negative pressure for sealing requirements, not mechanical strength. The group discussed the rationale behind the value of -5 psi, and Carlos Gaytan clarified that this is a value seen in the field, and considers a couple of parameters, including ambient temperatures and cyclic loads. The group discussed and agreed there are tools available that could be used for measuring negative pressure in transformers.

Luke Grandbois made a **motion**, seconded by Jerry Murphy, to accept the proposal as presented. Nicholas Manske suggested a friendly amendment to change the word “to” to “and”, which was accepted by Luke and Jerry. The motion as amended passed unanimously.

iii. Term: compromising definition

## Distribution Transformer Subcommittee

### Task force / Working Group Report

The Task Force presented a suggested change to the term “permanent deformation”, as it relates to the transformer tank, throughout the document. The Task Force suggested that the term “permanent deformation” is problematic because it is hard to measure in the field, could lead to over-designed transformers, and could allow for compromised functionality in some instances.

The Task force proposed replacing the terms “permanent deformation” and “permanent tank deformation” with “compromising deformation” and “compromising tank deformation”, respectively, in 4 instances in the standard: the Abstract (x1), the Purpose (x1), and Clause 4.1 Tank Integrity (x2).

The Task force also proposed adding the following definition of ‘compromising deformation’ to the definitions section:

**“compromising deformation:** elastic or plastic deformation that interferes with either transformer sealing, cabinet security, mechanical operation of covers and doors, electrical clearances, thermal operation, the tank’s ability to shed water, or creates areas where corrosive elements can accumulate.”

The Task Force clarified that the use of the term “permanent deformation” in clause 4.2.2.3 Pressure relief valve (PRV) is used in relation to the PRV pull ring and not the tank, and should be left as-is.

The group discussed the proposed changes. Jerry Murphy commented that a change to the purpose may require a PAR change. It was later clarified this would not be required since the purpose was not part of the PAR.

Huan Dinh commented that the term “in the field” is ambiguous and may need clarification. It was also agreed that it is important to have more definitive language than “interferes” in the definition. Joe Schumack commented that the language we need may be “precludes normal operation” in the definition. Marty Rave commented that the requirement that a transformer remain effectively sealed to -5C does not align with the minimum temperature requirements defined in C57.12.00 and may not be sufficiently low.

The **Task Force** will revise the language of permanent deformation per the discussion for proposal at the next meeting.

b. *Clarification of applicability of fault current capability test* – Carlos Gaytan

Carlos led a discussion on the fault current capability test and its applicability to rectangular tank construction. This is being discussed in another working group. No follow action will be taken by the C57.12.39 Working Group at this time.

c. *Review overall structure of the sections of the document for clarification* – Carlos Gaytan

Carlos presented an alternative structure of the document organized by tank construction geometry (round vs. rectangular). The recommendation was not to change the structure of the document.

## Distribution Transformer Subcommittee

### Task force / Working Group Report

The group discussed and agreed that no change to the structure would be best. No motion was required.

d. *Scope of transformer fault current capability test* – Jim Cai

Jim Cai asked the group whether the scope of the Transformer Enclosure Fault Current Capability test should be expanded to include rectangular tank transformers. For example, there have been tests performed on 8 and 12 MVA transformers up to 69 kVA and 34.5 kV network transformers.

The group discussed the question. Jeremy Van Horn mentioned he believes the C57.156 standard does not currently address this test. Carlos Gaytan mentioned the C57.12.23 Working Group is currently exploring including rectangular tank construction, and it may make sense to wait until they decide before proceeding.

The group decided not to explore the fault current capability test for rectangular tanks further at this time. No motion was required.

7. New business –

a. *Minimum temperature range for sealing* – Marty Rave

Marty Rave asked whether -5 °C is an appropriate minimum temperature for the temperature range specified in Clause 4.1.

A discussion followed. Nabi Almeida commented that this clause refers to liquid temperature, not ambient temperature, which may need to be considered.

The **Task Force** chaired by Luke Grandbois was assigned to consider this question and bring a proposal to the working group at the next meeting. Marty Rave agreed to join the task force.

8. Next meeting: March 25, 2025 in Denver, CO, USA

- a. No guests requested membership which meet the membership requirement, so no new members will be added for the next meeting.

9. The meeting was adjourned at 4:25 PM CDT.

Submitted by: Jeremy Van Horn

Date: October 29, 2025

#### **List of Members:**

|  |
|--|
| Alejandro Ayala (Power Partners)       |
| Darren Brown (Howard Industries)       |
| Jim Cai (JSHP Transformers)            |
| Noah Chesser (Oncor Electric Delivery) |

|  |
|--|
| Carlos Gaytan (Prolec GE)                  |
| Luke Grandbois (IFD Technologies Inc.)     |
| Didier Hamoir (Transformer Protector Corp) |
| Ramadan Issack (AEP)                       |

|   |
|---|
| Andrew Larison (Hitachi Energy)           |
| Alejandro Macias (Centerpoint Energy)     |
| Nicholas Manske (Oncor Electric Delivery) |
| Jerry Murphy (RCES)                       |

## Distribution Transformer Subcommittee

### Task force / Working Group Report

|                                |
|--------------------------------|
| Ismael Naja (Eaton Corp.)      |
| Dwight Parkinson (Eaton Corp.) |
| David Rohrer (First Energy)    |

|   |
|---|
| Fernando Tirado (Prolec GE)             |
| Alan Traut (Howard Industries)          |
| Jeremy Van Horn (IFD Technologies Inc.) |

|                               |
|-------------------------------|
| Joshua Verdell (ERMCO)        |
| Alan Wilks (Wilks Consulting) |

#### **List of Guests:**

|                                       |
|---------------------------------------|
| Huan Dinh (Hitachi Energy)            |
| Shelby Walters (Howard Industries)    |
| Joe Schumack (Ameren)                 |
| John Crotty (Ameren)                  |
| Jared Bates (Oncor Electric Delivery) |
| Marty Rave (IFD Technologies Inc.)    |
| Shiv Morkhande (Siemens Energy)       |
| Gilberto Garza (Prolec GE)            |

|                                      |
|--------------------------------------|
| Chris Talbert (JST Power)            |
| Holly Wassall (JST Power)            |
| Kang Jin Lee (Cheryong Electric)     |
| Rebecca Kim (Cheryong Electric)      |
| Craig DeRouen (ERMCO)                |
| Tom Dauzat (AEP)                     |
| Tim Menter (Lincoln Electric System) |
| Brian Conneighton (Cleveland-Cliffs) |

|   |
|---|
| Jeremy Hansman (Cleveland-Cliffs)             |
| Bryan Marquardt (Cleveland-Cliffs)            |
| Matthew Chisholm (IFD Technologies Inc.)      |
| Vedrana Starcevic Prebeg (Koncar DST)         |
| William Trenton (Advanced Power Technologies) |
| David Cordova (Maddox Industrial Transformer) |

#### **██████ C57.15 – Step-Voltage Regulators – Dan Sauer**

Dan Sauer presented the following minutes from the working group meeting on October 28, 2024, at 4:45 PM CDT with 34 in attendance.

1. Attendance – We have achieved the minimum required attendance for quorum (15 out of 25)
2. Presentation and approval of meeting Agenda – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
3. Presentation and approval of of Spring Vancouver Minutes – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
4. Presentation and approval of of June Virtual Minutes – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
5. WG documentation review – patents & copyrights – No comments from the WG attendance
6. Review of approved IEEE PAR – Dan Sauer
7. Review of IEC Maintenance Team Status – Dan Sauer
  - a) Review of IEC TC14 meeting – Rome
  - b) Review of IEC TC14 meeting - Edinburgh

## 8. Document Review

## a) Known Issues

## i) Universal Interface Issues

- a) Touch Safe – Pin orientation
- b) Connection point
- c) Connection method

Discussion: Stephen Shull brought two cabinets and cables to have a show and tell session with the WG regarding the two proposed solutions for the cable connection to the control cabinet. Option A is to use a pass-through connector and use a jam nut inside the cabinet to secure the cable. Option B is to have an external sleeve attached to the cabinet and use other means to secure the cable inside the cabinet. Stephen also reported that he had some difficulties in getting samples for the connector from the current manufacturer (Amphenol) using its SAE denomination.

David from First Energy stated that they prefer the Jam nut for the connection inside of the cabinet, but they have no preference.

Miguel from PG&E shared that need to insure that the inside access to the cabinet is protected.

Tom from AEP-Swepco shared that he was against this since the beginning and asks why we need to add another box to the regulator. Also he asks how is the means to short the CT for cases where the manufacturer do not have an auto-shortening device, using Eaton as an example.

Kile from Eaton explained that the shorting process is mentioned in the main body of the standard, item 11.1 – e.

Stephen from BBC Electrical Services mentioned that the ultimate goal is to protect the lineman.

Tom returned to the podium to request to add the SAE reference to the figures indicated in the standard (Fig 22.)

Stephen explained that the intention is to add a chart and additional figures for the control box side and also for the voltage regulator side.

Robert from Dominion stated that in their case, they will short the CT even when the unit is de-energized.

The WG mentioned that we should add a legend to the Fig. 24, using A and B (i.e.) for the two different figures.

Stephen requested the WG to hold onto a decision on the universal interface until he gets more information, this was accepted by the WG attendants.

ii) Control cable to be fire rated **UL94**? UL1581?

- a) UL94 rated? Manufacturers to check?

Universal cable part number –  
Amphenol # ACC06AMI22-14P(003)(M32)(P)(B30)  
Amerline # AEC3106PG 22-14P

Control Box Wiring harness –  
Amphenol # ACC06A22-14P(003)(B30)(F42)

Voltage Regulator End Wiring Harness –  
Amphenol # AMP# ACC070A22-14S(003)(B30)(F42)

Discussion: There was no report about the rating of the cable, the users only reported that in California their requirement is for the cable not to drip when it catches fire.

b) Is a duration specified?

c) When specified?

9. New business – To be reviewed in the Thursday, October 31<sup>st</sup>

a) Update on section review:

- i) Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy
- ii) Sections 3 & 4 – Dan Sauer
- iii) Section 5 – Lee Matthews
- iv) Section 6 – Miguel Plascencia
- v) Section 7 – Michael Gonzales/Sherif Salem
- vi) Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy
- vii) Section 10 – Kyle Heiden/Sebastian Rehkopf
- viii) Section 11 – Steve Shull
- ix) Annexes – Craig Colopy/Lee Matthews

10. Future meetings

C57 Meeting – WG Meeting Thursday, October 31, 1:00 – 5:00 PM CDT – Regency A

IEEE C57 Spring 2025 Meeting Denver, same format summary during the week and working meeting before/after – any preference?

Volunteers to host other meetings / times / places?

**The WG requested for at least one virtual meeting before the Spring 25 conference.**

11. Closing of Meeting – Meeting was adjourned at 18:00, moved by Lee Mathews and seconded by David Rohrer with unanimous approval.

## Members in attendance:

| First Name  | Last Name                    | Member/Guest |
|-------------|------------------------------|--------------|
| Rehan       | Ali                          | Member       |
| Nabi        | Almeida                      | Secretary    |
| Samragui    | Datta Roy                    | Member       |
| Richard     | Frye                         | Member       |
| Juan        | Gonzalo Castellanos Gonzales | Member       |
| Kyle        | Heiden                       | Member       |
| Yeounsoo    | Kim                          | Member       |
| Lee         | Matthews                     | Vice Chair   |
| Miguel      | Plascencia                   | Member       |
| David       | Rohrer                       | Member       |
| Dan         | Sauer                        | Chair        |
| Stephen     | Shull                        | Member       |
| Christopher | Slattery                     | Member       |
| Jimmy       | Smith                        | Member       |
| John        | Tranum                       | Member       |

## Guests in attendance:

| First Name | Last Name | Member/Guest |
|------------|-----------|--------------|
| Robert     | Allison   | Guest        |
| Noah       | Chesser   | Guest        |
| Craig      | Colopy    | Guest        |
| John       | Croty     | Guest        |
| Thomas     | Dauzat    | Guest        |
| Scott      | Digby     | Guest        |
| Ramadan    | Issack    | Guest        |
| Evan       | Knapp     | Guest        |
| Alvin      | Kopp      | Guest        |
| Tim        | Menter    | Guest        |
| Justin     | Minikel   | Guest        |
| Tyler      | Morgan    | Guest        |
| Jerry      | Murphy    | Guest        |
| Nicholas   | Post      | Guest        |
| Martin     | Rave      | Guest        |
| Joe        | Schumack  | Guest        |
| Andreas    | Thiede    | Guest        |
| Tim        | Tillery   | Guest        |
| Reinaldo   | Valentin  | Guest        |

Dan Sauer provided the following minutes from the working group meeting on October 31, 2024, at 1:00 PM CDT with 17 in attendance.

The chairman called the meeting to order at 1:00 pm.

The Patent Slides were displayed. No patents claims were brought up from the attendees.

The IEEE Copyright Policy was displayed.

Attendance – We have achieved the minimum required attendance for quorum (13 out of 25).

Motion by Steve Shull, seconded by Miguel Plascencia, to approve the agenda. Motion was approved.

Dan Sauer reviewed Clauses 3 & 4 with no recommended changes at the present time.

Steve Shull made a motion, seconded by Miguel Plascencia, to include the design ratios at each tap on the nameplate. There was considerable discussion on the motion concerning whether ratios or voltages should be used. Also discussed was whether a range should be included or the nominal ratios only.

After the discussion, Kyle Heiden made a motion to table Steve’s motion until the next meeting to allow the manufacturers to review available space on the nameplates or if a secondary nameplate would be required. John Trantum seconded the motion. This motion was approved and Steve’s motion was tabled.

Dan Sauer indicated that he would work with Rich Frye & Sam Datta Roy to review the ratio connections shown in clause 9.4.

Kyle Heiden made a motion, seconded by Miguel Plascencia, to not require the motor to be tested during the control wiring test of section 9.8.3.

There will be a meeting in Denver, CO during the Spring of 2025 Transformers Committee Meetings.

A virtual meeting will be held in January or February 2025 prior to the Transformers Committee Meetings.

Motion to adjourn by Steve Shull, seconded by Miguel Plascencia. The motion was approved.

Lee Matthews, Vice-Chair

Members in attendance:

| First Name | Last Name | Member/Guest |
|------------|-----------|--------------|
|------------|-----------|--------------|



|             |            |            |
|-------------|------------|------------|
| Rehan       | Ali        | Member     |
| Samragui    | Datta Roy  | Member     |
| Kyle        | Heiden     | Member     |
| Yeounsoo    | Kim        | Member     |
| Lee         | Matthews   | Vice Chair |
| Miguel      | Plascencia | Member     |
| David       | Rohrer     | Member     |
| Dan         | Sauer      | Chair      |
| Stephen     | Shull      | Member     |
| Christopher | Slattery   | Member     |
| Jimmy       | Smith      | Member     |
| John        | Tranum     | Member     |
| Pawel       | Klys       | Member     |

Guests in attendance:

| First Name | Last Name | Member/Guest |
|------------|-----------|--------------|
| Ramadan    | Issack    | Guest        |
| Thomas     | Dauzat    | Guest        |
| Evan       | Knapp     | Guest        |
| Reinaldo   | Valentin  | Guest        |

Dan Sauer provided the following minutes from the working group virtual meeting on June 25, 2024 at 8:00 AM CDT with 16 in attendance.

- 1) Welcome, Introduction and Chair's Remarks
- 2) Attendance records
  - a. We had a total of 16 people attending the meeting, our WG has 19 members, we had a total of 14 members in attendance
- 3) Approval of meeting minutes from previous meeting (motion by Chris Slattery / Seconded by Jimmy Smith) – approved without opposition.
- 4) Presentation and approval of meeting Agenda (motion by Stephen Shull / Seconded by Kyle Heiden) – approved without opposition.
- 5) Reviewed Patent and Copyrights, no concerns raised by the WG members – Dan Sauer
- 6) Reviewed Approved PAR with WG – Dan Sauer
- 7) Review of IEC Maintenance Team Status
  - a. Review of IEC TC14 meeting – Rome

The Chair commented about his participation on the IEC TC14. The IEC Committee agreed on this WG continuing with the maintenance of the standard but requested that we ensure at least 5 different countries are part of the WG. To which we do not comply now. Nabi Almeida offered to request participation from Mexico and Brazil to support our WG. The members need to be a P member country. Members need to be recognized in the professional association of that country. The Chair gave a detailed explanation on how the voting rights for the IEC works and how the USA manages the work and the recommendations for our representative to vote on these matters.

## 8) Document Review

## a. Known Issues

## i. Universal Interface Issues

It was agreed the cable will have pins and a threaded collar, and the regulator will have a socket that the pins will go into. The collar of the cable will be the opposite, where the cable will be the female and the regulator will be the male.

John Trantum Siemens – Reported the result of his survey with his customer base. His customer base is more inclined to have the connection inside the control box, pins on the control end and sockets on the cable end.

Stephen Shull proposed the use of standard cable and use tamper resistance fixture mounted to the cabinet, using an SAE connection standard, this way it would be easier for the user to procure the necessary parts.

Stephen Shull volunteered to bring an example to the next in person meeting.

Dan Sauer will bring an example from Eaton that uses jam nut and a security sleeve example.

Kyle Heiden will provide more information regarding jam nuts and security sleeves.

The WG reserved the right to continue the discussion in the next in person meeting.

## ii. Touch Safe – Pin orientation

Not addressed?

## iii. Connection point

Not addressed?

## 9) New business

## a. Update on section review:

## i. Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy

Not presented

## ii. Sections 3 &amp; 4 – Dan Sauer

Not presented

## iii. Section 5 – Lee Matthews

IEC C57.15 Clause 5.1.5 Load Current – Comparing the verbiage with C57.12.00, there is additional information referencing non sinusoidal loads (C57.110) and total harmonic distortion. It was proposed to add the information existing on the C57.12.00 as a note in the C57.15.

C57.15 Clause 5.3.4 Other Unusual Service Conditions - It was proposed to add a note to match 12.00 regarding C57.110 as well as adding this standard to the bibliography.

## iv. Section 6 – Miguel Plascencia

Not presented

## v. Section 7 – Michael Gonzales/Sherif Salem

His review was focused on the comparison between C57.15 and C57.12.20.

Table 14 have different BIL levels between the two standards, the WG.

The WG discussed whether a 125kV BIL was needed for Regulators and the consensus that it was not.

Clause 7.6 Tank construction - The comparison regarding the venting and sealing characteristics. The main point was the differences between the pressure levels. The general agreement withing the WG was that the current limits within the document are acceptable and should remain the same.

Clause 7.6.3 Cover assembly - The WG agreed to keep the current verbiage.

## vi. Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy

Not presented

- vii. Section 10 – Kyle Heiden/Sebastian Rehkopf  
Not presented
- viii. Section 11 – Steve Shull  
Not presented
- ix. Annexes – Craig Colopy/Lee Matthews
  - 1. Annex A – No comments
  - 2. Annex B – No comments
  - 3. Annex C – The WG commented that the diagrams were a bit overly simplified. The Chair commented that figures C.3 to C.5 could be improved to show that the series winding has more taps (more according to the reality) and the action to improve was assigned to Dan Sauer (Chair).  
Several members suggested that we add a note related to the floating circuit on Figure C.5, we requested suggestions on how should we write this note and will compile it for the next meeting. **“Jimmy Smith’s proposal - Note: The closed loop circuit the series transformer of Figure C.5 is shown in is floating. If implementing this circuit in a specific design, manufacturers have various means to remedy this condition.”**
  - 4. Annex D – No comments
  - 5. Annex E – No comments
  - 6. Annex F – No comments
- b. See if we can standardize on 65C AWR ratings.
  - i. The WG agreed that at this time is not ideal to change this since the standard has ways to consider 65C AWR (Item 3 on Table 2)
- c. Control cable to be fire rated UL94? UL1581?
  - i. It was shared by Miguel that Southern California Edison spec UL94. Dan Sauer took an action to investigate if UL94 is possible. Also, it was requested to the WG that the Manufacturers to give feedback whether their current practice complies with UL 94 or if they have that offering at all. Miguel will also share his company’s practice related to this topic.

#### 10) Future meetings

IEC TC14 Plenary (status) meeting – Edinburgh, October, 2024

C57 Meeting – WG Meeting Probably after C57 similar to this meeting due to timing of the TC14

Plenary meeting – Saint Louis, MO, October 2024

Look to have a WG meeting on Monday/Tuesday as well.

Volunteers to host other meetings / times / places?

- 11) Meeting adjourned (Motion by Steve Shull / Second by Jimmy Smith) – Approved without opposition.

#### Attendance

| First Name | Last Name | Member/Guest | Affiliation                  |
|------------|-----------|--------------|------------------------------|
| Dan        | Sauer     | Chair        | Eaton Corp                   |
| Stephen    | Shull     | Member       | BBC Electrical Services Inc. |
| Nabi       | Almeida   | Secretary    | Prolec GE                    |

|             |          |            |                            |
|-------------|----------|------------|----------------------------|
| Sherif      | Salem    | Member     | Eversource Energy          |
| John        | Tranum   | Member     | Siemens Energy Inc.        |
| Lee         | Matthews | Vice Chair | Howard Industries          |
| Elizabeth   | Gillian  | Guest      | Not Stated                 |
| Kyle        | Heiden   | Member     | Eaton Corp                 |
| Christopher | Slattery | Member     | First Energy               |
| Rehan       | Ali      | Member     | Siemens Energy Inc.        |
| Richard     | Frye     | Member     | Eaton Corp                 |
| Yeounsoo    | Kim      | Member     | Not Stated                 |
| Jimmy       | Smith    | Member     | Howard Industries          |
| Michael     | Gonzales | Member     | Southern California Energy |
| Santosh     | Pachpund | Guest      | Not Stated                 |
| Sunilkumar  | Singh    | Member     | Eaton India                |

Dan Sauer provided the following minutes from the working group meeting March 14, 2024, in Vancouver at 1:00 PM PDT with 20 in attendance.

- 1) Welcome and Chair's Remarks
- 2) Circulation of Attendance Sheets
  - a. A total of 20 attendees were present in person, with one additional attendee joining via Teams. 15 attendees requested membership, which was granted due to this being the first WG meeting. Three individuals requested membership after the meeting had concluded. Therefore, a total count is as follows:
    - i. 18 Members
    - ii. 6 Guests
- 3) Presentation and approval of meeting Agenda (motion by Craig Colopy / Seconded by Kyle Heiden) – approved without opposition.
- 4) Reviewed Approved PAR with WG – Dan Sauer
- 5) Review of topics to be addressed in next revision:
  - a. Universal Interface (UI)

- i. Kyle Heiden stated that the main point of contention is that Section 11 does not explicitly describe the connection type/style between control cable and control enclosure – causing OEMs to make their own interpretations.
  - ii. General agreement that the cable shall:
    - 1. Have male pins on the Regulator end
    - 2. Have female sockets at the Control end
  - iii. Question to address is around mounting style on Control end. What level of cable security do users require?
  - iv. Photos of Eaton's and Siemens' solutions were presented for discussion purposes
  - v. **Action** - SAE AS50151, referenced in section 11, latest release is "Version E". Verify cross references of A31021 and AS31061 remain unchanged – Steve Shull
  - vi. Informal poll was taken amongst users present and 5 of 6 preferred the connection at the control end of the cable be inside the control enclosure
  - vii. **Action** – Steve Shull to take Dan Sauer's working copy of changes and work on updating section 11.
  - viii. **Action** – OEMs to survey their users to understand their preference on where the connection point between the control cable and control enclosure should be (inside vs. outside cabinet). Feedback due to WG chair by end of May.
- b. IEC Changes in Short Circuit (SC) Testing
- i. Lee Matthews identified that IEC SC requirements changed in 2019 (editorial)
    - 1. Always was a single 2 second test – "2s (+/- 1 10%)"
    - 2. Changed to two 1 second tests – "2 (1s +/- 1 10%)"
    - 3. All agreed to fix error to original wording
- c. Change in Defining Rated Temps
- i. Thermally upgraded Kraft paper – max 110 °C
    - 1. IEEE includes avg. ambient of 30 °C, 65 °C rise, and 15 °C hot spot rise
    - 2. IEC has 110 °C max, but has several pages stating how average winding rise can be determined

- ii. Group discussed and is leaning towards not adopting the IEC language
    - iii. Tabled for now
  - d. Table 12 – K-Factor 6.8.1
    - i. PowerTech requested WG looked at this section
    - ii. If X/R of system is such that the K-factor described in table 12 can't be obtained then the RMS short circuit current shall be raised to obtain the required peak current value.
    - iii. PowerTech wants to know if it is ok that the resulting K-factor is lower than described by Table 12?
    - iv. Group agreed that by definition the K-factor would have to be lower in above scenario
  - e. DGA in Step-Voltage Regulators
    - i. C57.139 is looking for data to include guidance for DGA of Step-Voltage Regulators
    - ii. Action – Dan Sauer to reach out to Insulation Life SC Chair (Scott Reed) to add new business item for addressing DGA in Voltage Regulators
  - f. Equation E1 in Annex E
    - i. Uses  $I_{r1}$  in numerator but it is not defined. Change to add a definition of  $I_{r1}$
- 6) Members were assigned sections to review and recommend updates/changes. All chained references shall be checked to make sure they are updated
  - a. Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy
  - b. Sections 3 & 4 – Dan Sauer
  - c. Section 5 – Lee Matthews
  - d. Section 6 – Miguel Plascencia
  - e. Section 7 – Michael Gonzales/Sherif Salem
  - f. Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy
  - g. Section 10 – Kyle Heiden/Sebastian Rehkopf
  - h. Section 11 – Steve Shull
  - i. Annexes – Craig Colopy/Lee Matthews
- 7) New Business for next WG meeting:
  - a. Can we standardize ratings on 65 °C AWR?
  - b. UL94 – Should we include requirement for jacketed cable – more common standard for wire/jacketed cable is UL 1581

- 8) Action – Dan Sauer to coordinate next WG meeting for July 2024 (virtual)
- 9) Motion to Adjourn (motion by Steve Shull / Seconded by Kyle Heiden) – approved without opposition.

#### Attendance

| First     | Last       | Member/Guest | Affiliation                  |
|-----------|------------|--------------|------------------------------|
| Dan       | Sauer      | Chair        | Eaton Corp                   |
| Stephen   | Shull      | Member       | BBC Electrical Services Inc. |
| Kyle      | Heiden     | Member       | Eaton Corp                   |
| Janet     | Crockett   | Guest        | Fayetteville PWC             |
| Samragui  | Datta Roy  | Member       | Siemens Energy Inc.          |
| Wilson    | Tranum     | Member       | Siemens Energy Inc.          |
| Rehan     | Ali        | Member       | Siemens Energy Inc.          |
| Patrycja  | Jarosz     | Guest        | IEEE SA                      |
| Miguel    | Garcia     | Guest        | Not stated                   |
| Yeounsoo  | Kim        | Member       | Not stated                   |
| Sherif    | Salem      | Member       | Eversource Energy            |
| Sebastian | Rehkopf    | Member       | Reinhausen                   |
| Jimmy     | Smith      | Member       | Howard Industries            |
| Tim       | Tillery    | Guest        | Howard Industries            |
| Guang     | Yuan       | Guest        | Hitachi Energy               |
| Miguel    | Plascencia | Member       | PG&E                         |
| Dwight    | Parkinson  | Guest        | Eaton Corp                   |
| Richard   | Frye       | Member       | Eaton Corp                   |
| David     | Rohrer     | Member       | First Energy                 |
| Chris     | Slattery   | Member       | First Energy                 |
| Michael   | Gonzales   | Member       | Southern California Energy   |
| Lee       | Matthews   | Vice Chair   | Howard Industries            |
| Nabi      | Almeida    | Secretary    | Prolec GE                    |
| Ismael    | Naja       | Member       | Eaton Corp                   |
| Alex      | Macias     | Member       | CenterPoint Energy           |

#### PC57.167 – Guide for Monitoring Distribution Transformers – Gary Hoffman

This working group did not meet.

#### Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on October 28, 2024, at 9:30 AM CDT with 156 in attendance.

1. Welcome- Phil Hopkinson.

2. Roster

156 in attendance.

3. Approval of Agenda –  
Approved.

4. Approval of the Minutes of the Last Meeting – March 2024, Vancouver, BC  
Previous minutes approved.

5. Efficiencies for DOE General Purpose Transformers for 2029 (Hopkinson)

Energy Information Administration (EIA) an office of the DOE, projects a forecast of how energy loading will change. When they did their study, it looked like loading would increase 2% in 2022. This is the data they worked from when they provided information to draft the NOPR. 2 years later EIA said loading growth would be 3.75 % per year. Chair Hopkinson said loading will be much higher.

In the Final Rule for Liquid - Filled they call it “liquid immersed.”

Final Rule effective April 23, 2029

DOE Definition of Distribution Transformer

A transformer that –

- 1) Has an input line voltage of 35kv or less;
- 2 Has an output line voltage of 600 V or less;
- 3 Is rated for operation at a frequency of 60 Hz; and
- 4 Has a capacity of 10 kVA to 5000 kVA for liquid-immersed units and 15 kVA to 5000 kVA for dry-type units.

NOPR anticipates 25% of distribution transformers would need to be Amorphous. A step up transformer from low voltage to MV does not have to meet the DOE requirements. So, wind and solar transformers would be exempt.

It was noted that because loading is going up, DOE should have optimized on Total loss (load) not core loss (no-load). If so, GOES would have won out over Amorphous.

Summary of Designs (from ppt)

**Energy picture in 2024**



1. **Load growth increasing broadly all across the US**
2. **Three major factors in load growth**
  - a. **EV Charging**
  - b. **AI Data Centers**
  - c. **New cold weather heat pumps replacing natural gas**
3. **Distribution Transformer lead times out to 2+ years**

### **3-Phase conclusions**

3-Phase Growth rate high and increasing

GOES transformers will add 20+ % to weight

Alternative will be Amorphous Cores

An attendee commented that data centers want smaller transformers and complying with the 2029 rule will cause them to get larger also.

Another commenter stated using amorphous increased noise level (single phase).

A transformer manufacturer noted that for data centers the common request is 3000kVA to 4000kVA

### 6. Strategies for GOES (Bryan M., Cleveland Cliffs)

Bryan Marquardt presented on reducing transformer no-load losses with GOES.

### 7. Assignments for next meeting

8. Next meeting date Monday, March 24, 2025, and location Denver: CO.

9. Adjourn The meeting was adjourned at 10:46 am.

### Meeting Attendance Follows (156 people signed in):

Jerry Allen, Metglas, Inc.

Javier Arteaga, Hitachi Energy

Alex Ayala, Power Partners, Inc.

Donald Ayers, Ayers Transformer Consulting

Cheryl Basel, WEG Transformers USA Inc.

Jared Bates, Oncor Electric Delivery

Andrew Berman, S&C Electric

Edwin Betancourt, Siemens Energy

Kevin Biggie, Weidmann Electrical Technology

David Blew, Retired (PSE&G)

Dominique Bolliger, HV Technologies

Jeffrey Britton, Phenix Technologies, Inc.

Darren Brown, Howard Industries

Thomas Callsen, Weldy-Lamont Associates

Deniss Carr, GE Grid Solutions

Raymond Chapa, WEG Transformers USA Inc.

Paul Chisholm, IFD Technologies  
Eunyoung Cho, Hico-America  
Stefano Comerio, LTC Group  
Brian Conneighton, Cleveland-Cliffs  
Noah Cresser, Oncor Electric Delivery  
Janet Crockett, Fayetteville PWC  
Michael Dahlke, Central Moloney, Inc.  
Tim Dappen, Cargill  
Craig DeRouen, ERMCO  
Antonio Di Biase, Tempel  
Jeffrey Door, The H-J Family of Companies  
William Elliott, SWEPCO AEP  
William Ellis, AMEREN  
Fadi Fayad, ASD Inc  
Bruce Forsyth, Cargill  
Kevin Frye, Central Moloney, Inc.  
Renjie Fu, ERMCO/V&F Transformer  
Bob Fyrer, Dupont  
Jose Gamboa, H-J Family of Companies  
Carlos Gaytan, Prolec GE  
Ali Ghafourian, The H-J Family of Companies  
Rafael Grajeda, EATON Corporation  
Richard (Luke) Granbois, IFD Technologies  
Kendrick Hamilton,  
Michael Hardin, H-J Family of Companies  
Sergio Hernaidez, Hammond Power Solutions  
Giovanni Hernandez, Virginia Transformer  
Jean Hernandez, Georgia Tec NEETRAC  
John Herron, Raytech USA  
John Hipchen, Copper Development Assn.  
Thomas Holifield, Howard Industries  
Philip Hopkinson, HVOLT Inc.  
Mohammad Iman, MGM Transformer Company  
Jose Izquierdo, Siemens-Energy  
Karl Jakob, Cargill  
Sheldon Kennedy, Sheldon P. Kennedy Engineering LLC  
Vladimir Khalin, K V Consulting  
Qasim Khan, NEETRAC - Georgia Tech  
Brian Klaponski, Carte International Inc.  
Ken Klein, Johnson Coil  
Gillbert Kozer, Northeast Transformer  
Patrick Kozer, Northeast Transformer  
Jason Lambert, JST Power  
Andrew Larison, Hitachi Energy  
Andrew Lawless, Potencia Partners  
Moonhee Lee, Hammond Power Solutions  
Aleksandr Levin, Weidmann Electrical Technology  
Jacky Lin, Fortune Electric  
Parry Lively, Tempel  
Colby Lovins, Federal Pacific  
Mark Lowther, Kruger Products Inc  
Marilia Machado Riberio, GE  
Alejandro Macias, Center Point Energy  
Kushal Mahajan, EATON Corporation  
Tim-Felix Mai, Siemens Energy  
Jinesh Malde, M & I Materials

Swapnil Marathe, Megger  
 Bryan Marquardt, Cleveland-Cliffs  
 Daniel Martinez, JFE Shoji Power Canada  
 Jim McBride, JMX High Voltage  
 Joseph McBride, JMX High Voltage  
 Ken McKinney, UL Solutions  
 Tim Menter, Lincoln Electric System  
 Fernando Meza, Power Partners, Inc.  
 Rhea Montpool, Schneider Electric  
 Elena Morales, Siemens Energy  
 Andre Moreno, Siemens Energy  
 Dan Mulkey, Mulkey Engineering Inc  
 Hugo Murillo, The H-J Family of Companies  
 Ismael Naja, EATON Corporation  
 Aniruddha Narawane, EATON Corporation  
 Shawn Nun, Hitachi Energy  
 Tommy Nunn, JST Power  
 Steven Oakes, WEG Transformers USA Inc.  
 Austin Ortega, Siemens-Energy  
 Dwight Parkinson, EATON Corporation  
 George Partyka, PTI Transformers  
 George Payerle, Carte International Inc.  
 Harry Pepe, Phenix Technologies, Inc.  
 Jason Perkins, Moehn Electrical Sales  
 Daniel Posadas, Prolec S. A.  
 Jarrod Prince, ERMCO  
 Ion Radu, Hitachi Energy  
 Adnan Rashid, Measurement Canada / ISED  
 Martin Rave, COMED  
 Tony Roiss, Custom Materials Inc  
 Mason Rush, Central Moloney, Inc.  
 Fernando Salinas, Power Partners, Inc.  
 Alberto Sandoval, EATON Corporation  
 Jaber Shalabi, VanTran  
 Michael Shannon, Rea Magnet Wire  
 Masoud Sharifi, Siemens Gamesa  
 Shihey Xras Shen, GE Grid Solutions  
 Stephen Shull, BBC Electrical Services, Inc.  
 Audrey Siebert-Timmer, IFD Technologies  
 Igor Simonov, Toronto Hydro  
 Chris Slattery, First Energy  
 Jimmy Smith, Howard Industries  
 Steven Snyder, Hitachi Energy  
 Muhammad Abdullah Sohail, Trench Canada  
 Brian Sonnenberg, General Electric  
 Jim Spaulding, City of Fort Collins  
 Mike Spurlock, Spurlock Engineering Services, LLC  
 Stefan Srebert, Brockhaus  
 David Stankes, 3M  
 Kerwin Streich, Siemens Energy  
 Ali Syed, COMED  
 Dragan Tabakovic, Hubbell Power  
 Chris Talbert, JST Power  
 Erik Tarengo, ULSUN Electric  
 Val Tatu, Powersmitus  
 Joseph Tedesco, Hitachi Energy

Vijay Tendulkar, EATON Corporation  
Craig Tennant, The H-J Family of Companies  
Michael Thibault, Pacific Gas & Electric  
Andreas Thiede, Highvolt  
Ryan Thompson, Burns & McDonnell  
Tim Tillery, Howard Industries  
Fernando Tirado, Prolec GE  
Alan Traut, Howard Industries  
Lee Tyler, WARCO, Inc  
Jeremy Van Horn, IFD Technologies  
John Vartanian, National Grid  
Pragnesh Vyas, Sunbelt Soloman  
David Walker, MGM Transformer Company  
David Wallach, Duke Energy  
Shelby Walters, Howard Industries  
Bruce Webb, Knoxville Utilities Board  
Zachery Weiss, WEG Transformers USA Inc.  
Michael Wheeler, Hitachi Energy  
Joe White, Power Engineers  
Devora Wiesel, Con Edison  
Alan Wilks, Consultant  
Guang Yuan, Hitachi Energy  
Michael Zarnowski, Carte International Inc.  
Martin Rave, IFD Technologies

#### ■ Task Force Tank Touch Temperature – Bruce Webb

This task force did not meet. Our SA requested White Paper document remains in development. It is expected to be issued to our comment review and resolution Team in late January 2025 with likely issuance to our full TF group prior to our Denver, CO meeting in S25. Our TF will be requesting a Room for an in-person meeting in CO. We intend to make our report to the SC at that time to complete the effort.

Please accept this as our TF request to obtain an in-person room for the upcoming S25 Denver, CO meeting.

We would welcome a room that may accommodate up to the sixty-five (65) plus attendees matching our last meeting.

As for the time, I would welcome a similar Monday 4:45 PM slotting, if available.

### C.3 Old Business

No old business was discussed

### C.4 New Business

Discussion on TF need for guide or standard for data center OIP transformers.

Dan Sauer brought a motion with a second from Bruce Webb to go to ballot for C57.12.36. This motion was unanimously approved.

Alicia Farag discussed QR codes as part of the SCATE transformer unique ID (C57.12.35).

Kyle Heiden made a motion with a second from Dan Sauer to approve the title and scope of PAR for pad-mounted step-voltage regulators for advancement to NESCOM. This motion received unanimous approval.

Dan Mulkey brought up a topic regarding changing terminology in standards from “liquid-immersed” to “liquid-filled” along with other general English language errors that have been adopted into standards.

## **C.5 Chairman’s Closing Remarks and Announcements**

Jerry had no closing comments to the SC.

## **C.6 Adjournment**

Jerry adjourned the meeting as provided in the meeting agenda at 10:45am.

### **List of Attendees and Affiliations:**

| <b>Last Name</b> | <b>First Name</b> | <b>Company / Affiliation</b>        | <b>Role/Status</b>    |
|------------------|-------------------|-------------------------------------|-----------------------|
| Parkinson        | Dwight            | Eaton                               | Member                |
| Whitehead        | Bill              | H2scan                              | Requesting Membership |
| Crotty           | John              | Ameren                              | Requesting Membership |
| Post             | Nicholas          | WEC Energy Group                    | Guest                 |
| Kim              | Rebecca           | Cheryong Electric                   | Guest                 |
| Sauer            | Dan               | Eaton                               | Member                |
| Schwartz         | Danny             | Quality Switch                      | Guest                 |
| Shull            | Stephen           | BBC Electrical Services Inc         | Member                |
| Chisholm         | Matthew           | IFD TECHNOLOGIES                    | Guest                 |
| Naja             | Ismael            | Eaton                               | Requesting Membership |
| Rush             | Mason             | Central Moloney Inc.                | Member                |
| Leigl            | Angela            | Eaton                               | Requesting Membership |
| Shalabi          | Jaber             | VanTran Industries                  | Requesting Membership |
| Li               | Weijun            | Braintree Electric Light Department | Member                |
| Mendez           | Luis Felipe       | JST Power                           | Guest                 |
| Verdolin         | Rogério           | Verdolin Solutions                  | Member                |
| Morgan           | Charles           | Eversource Energy                   | Guest                 |
| Knapp            | Evan              | Eaton                               | Member                |
| Washburn         | Alan              | Burns and McDonnell                 | Guest                 |
| Almeida          | Nabi              | ProlecGE                            | Member                |
| Hatton           | Eric              | Tempel                              | Guest                 |
| King             | Gary              | Consultant                          | Member                |
| DAPPEN           | TIM               | Cargill                             | Requesting Membership |
| Velasquez        | Juan              | Magnetron sas                       | Guest                 |

## Annex C

|                |           |                                     |                       |
|----------------|-----------|-------------------------------------|-----------------------|
| Olayiwola      | Nurudeen  | Exelon/ PECO                        | Guest                 |
| Khan           | Qasim     | NEETRAC -Georgia Tech               | Requesting Membership |
| Pacas          | Joel      | IFD Technologies                    | Guest                 |
| Meza           | Fernando  | ERMCO                               | Requesting Membership |
| Webb           | Bruce     | Knoxville Utilities Board           | Member                |
| Greaves        | Brad      | Weidmann Electrical Technology, Inc | Guest                 |
| Farag          | Alicia    | Locusview                           | Guest                 |
| Verdell        | Joshua    | ERMCO                               | Member                |
| Panesar        | Parminder | Virginia Transformer Corp           | Requesting Membership |
| Hogg           | Ryan      | Bureau of Reclamation               | Guest                 |
| Beaudoin       | Jason     | Weidmann                            | Guest                 |
| Lee            | KangJin   | Cheryong Electric                   | Guest                 |
| RONCHI         | Rodrigo   | WEG Transformers México             | Member                |
| Masoud         | Nader     | Central Moloney                     | Guest                 |
| FOATA          | Marc      | MR                                  | Guest                 |
| Brooks         | Jeffrey   | Asplundh Engineering Services       | Guest                 |
| zhang          | Hongzhi   | Hitachi Energy                      | Guest                 |
| Bennett        | Mark      | Essex Brownell                      | Guest                 |
| Nolte          | Michael   | Kiewit                              | Requesting Membership |
| Grandbois      | Luke      | IFD Technologies Inc.               | Guest                 |
| Heiden         | Kyle      | Eaton                               | Member                |
| Blew           | David     | DS Blew Consulting LLC              | Member                |
| Minikel        | Justin    | Eaton                               | Member                |
| Yun            | Joshua    | Virginia Transformer Corp           | Member                |
| Larison        | Andrew    | Hitachi Energy                      | Member                |
| McBride        | Jim       | JMX High Voltage                    | Guest                 |
| Xu             | shuzhen   | Fm                                  | Requesting Membership |
| Garza          | Gilberto  | Prolec GE                           | Requesting Membership |
| Grooms         | Brad      | NTS                                 | Guest                 |
| Morkhande      | Shivkumar | Siemens Energy                      | Guest                 |
| Gyore          | Attila    | MIDEL and MIVOLT Fluids Ltd         | Guest                 |
| Marulanda      | Katherine | Magnetron                           | Guest                 |
| Vary           | Robert    | Reinhausen Manufacturing Inc.       | Guest                 |
| Coughlan       | William   | Metglas Inc                         | Guest                 |
| Gaytan         | Carlos    | Prolec GE                           | Member                |
| Colopy         | Craig     | Retired from EATON                  | Member                |
| Hernández Cano | Sergio    | Hammond power solutions             | Member                |
| Taylor         | Marc      | JFE Shoji Canada                    | Guest                 |
| John           | John      | Virginia Transformer Corp.          | Member                |
| Hoffman        | Saramma   | PPL                                 | Requesting Membership |

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| Van Horn   | Jeremy      | IFD Technologies                              | Member                |
| Basel      | Cheryl      | WEG Transformer                               | Guest                 |
| Blackwell  | Zack        | TCI   | Guest                 |
| Cai        | Jim         | JSHP Transformer                              | Guest                 |
| Spaulding  | James       | City of Fort Collins Utilities                | Member                |
| Weyandt    | Paul        | Schneider electric                            | Requesting Membership |
| Duarte     | Fernando    | EPRI  | Requesting Membership |
| Radu       | Ion         | Hitachi Energy                                | Member                |
| McCullough | Lynn        | Essex Brownell                                | Guest                 |
| Kim        | Yeounsoo    | MEPPI   | Requesting Membership |
| Yavuz      | Koray       | Noark Electric US                             | Guest                 |
| Tirado     | Fernando    | Prolec GE                                     | Requesting Membership |
| Vyas       | Pragnesh    | Sunbelt Solomon                               | Member                |
| Hamilton   | Kendrick    | Badger Magnetics Inc.                         | Member                |
| Megdad     | Mohammed    | Integrated Power Services                     | Requesting Membership |
| Rohrer     | David       | FirstEnergy                                   | Guest                 |
| Mennonna   | Robert      | Maddox Industrial Transformer                 | Guest                 |
| DeRouen    | Craig       | ERMCO   | Member                |
| Traut      | Alan        | Howard industries                             | Member                |
| Sewell     | Jeremy      | Quality Switch Inc.                           | Guest                 |
| Schindler  | Stefan      | Maschinenfabrik Reinhausen                    | Member                |
| Payerle    | George      | Carte   | Member                |
| Matthews   | Lee         | Howard industries                             | Member                |
| Slattery   | Christopher | FirstEnergy                                   | Guest                 |
| Plascencia | Miguel      | PG&E  | Requesting Membership |
| McBride    | Brian       | Cargill                                       | Member                |
| Thomas     | Holifield   | Holifield                                     | Guest                 |
| Katapalli  | Thrinadha   | Virginia Transformer Corp                     | Requesting Membership |
| Iqbal      | Fawax       | OMICRON                                       | Guest                 |
| Orr        | Paul        | NEMA  | Guest                 |
| Wassall    | Holly       | JST Power                                     | Requesting Membership |
| Stretch    | Kerwin      | Siemens Energy                                | Member                |
| Frye       | Richard     | Eaton   | Member                |
| Crockett   | Janet       | Fayetteville PWC                              | Guest                 |
| Schumack   | Joseph      | Ameren  | Requesting Membership |
| Tillery    | Timothy     | Howard Industries                             | Member                |
| Mulkey     | Dan         | Mulkey Engineering Inc.                       | Member                |
| Shertukde  | Hemchandra  | University of Hartford/Diagnostic-devices.com | Member                |
| Roussell   | Marnie      | Entergy                                       | Guest                 |
| Garcia     | Miguel      | Hitachi Energy                                | Requesting Membership |
| Macias     | Alejandro   | CenterPoint Energy                            | Member                |

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| Chisholm        | Paul          | IFD Technologies                     | Member                |
| Murcia          | Fredy         | Siemens Energy                       | Guest                 |
| Wilks           | Alan          | Consultant                           | Member                |
| Reepe           | Robert        | Georgia Power Company                | Member                |
| Ayers           | Donald        | Ayers Transformer Consulting         | Member                |
| Vijayan         | Krishnamurthy | Pennsylvania Transformer             | Guest                 |
| Cordova         | David         | Maddox Industrial Transformer        | Guest                 |
| Yuan            | Guang         | Hitachi Energy                       | Requesting Membership |
| Kosedagi        | Nihat         | Hitachi Energy                       | Guest                 |
| Klaponski       | Brian         | Carte International Inc              | Member                |
| Issack          | Ramadan       | AEP                                  | Member                |
| Blaszczyk       | Piotr         | Specialty Transformer Components LLC | Member                |
| Lopez-Fernandez | Xose          | Universidade de Vigo                 | Guest                 |
| Weiss           | Zachery       | WEG transformers                     | Member                |
| Patel           | Vinay         | Con Edison                           | Member                |
| Biggie          | Kevin         | Weidmann                             | Member                |
| Manske          | Nicholas      | Oncor Electric Delivery              | Requesting Membership |
| Hrkac           | Miljenko      | Hitachi Energy                       | Guest                 |
| Lee             | Moonhee       | Hammond Power Solutions              | Member                |
| Bhardwaj        | Naveen        | Trench Group                         | Guest                 |
| Ali             | Rehan         | Siemens Energy, Inc.                 | Requesting Membership |
| Da Silva        | Roberto       | Maschinenfabrik Reinhausen           | Guest                 |
| Oakes           | Stephen       | Weg                                  | Member                |
| Hoffman         | Gary          | Advanced Power Technologies          | Member                |
| Tatu            | Val           | Powersmiths                          | Member                |
| Fausch          | Reto          | RF Solutions                         | Guest                 |
| Zarnowski       | Michael       | Carte                                | Member                |
| Pepe            | Harry         | Phenix Technologies                  | Guest                 |
| Gardner         | James         | Prolec-GE Waukesha                   | Member                |
| Tostrud         | Mark          | Dynamic Ratings                      | Guest                 |
| Chesser         | Noah          | Oncor Electric Delivery              | Member                |
| Menter          | Tim           | Lincoln Electric System              | Member                |
| Ayala           | Alejandro     | Power partners                       | Member                |
| Hopkinson       | Philip        | HVOLT Inc.                           | Member                |
| Chrysler        | Rhett         | ERMCO                                | Member                |
| Rave            | Martin        | IFD Technologies                     | Member                |
| Chiang          | Solomon       | The Gund Company                     | Guest                 |
| Dauzat          | Tom           | AEP                                  | Member                |
| Snyder          | Steven        | Hitachi Energy                       | Member                |



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| Sohail    | Muhammad Abdullah | Trench Canada                       | Requesting Membership |
| Rusch     | Kevin             | Rugged Monitoring                   | Guest                 |
| Hilbert   | Matt              | D'Ewart Representatives             | Guest                 |
| Boettger  | William           | Boettger Transformer Consulting LLC | Guest                 |
| Li        | Chao              | Eaton                               | Guest                 |
| Smith     | Edward            | H-J Family of Companies             | Member                |
| Thibault  | Michael           | Pacific Gas & Electric              | Member                |
| Thiede    | Andreas           | Highvolt Dresden                    | Guest                 |
| Zaman     | Malia             | IEEE                                | Guest                 |
| Murillo   | Hugo              | H-J Family of Companies             | Requesting Membership |
| Shimpi    | Leena             | MGM Transformers                    | Guest                 |
| Nunez     | Jesus             | MGM Transformers                    | Guest                 |
| Holifield | Thomas            | Howard Industries                   | Guest                 |
| Fu        | Peng              | Chint Electric                      | Guest                 |
| Jarosz    | Patrycja          | IEEE                                | Guest                 |
| Castillo  | Alonso            | Kaedi Energy                        | Guest                 |
| Obregon   | David             | TTE Transformers                    | Guest                 |
| Zhu       | Zhaxiang          | Chint Electric                      | Guest                 |
| Zhang     | Jie               | Chint Electric                      | Guest                 |
| Portillo  | Homer             | APT                                 | Guest                 |
| Mani      | Kumar             | Duke Energy                         | Guest                 |
| Nguyen    | Nam Tran          | TT Electronics                      | Guest                 |
| Debass    | Sami              | EPRI                                | Requesting Membership |