

Annex D Dry Type Transformers Subcommittee

Wednesday, March 22, 2023

IEEE Transformer DTSC Spring 2023 Meeting Milwaukee, WI

Chair: Casey Ballard

Vice-Chair: David Walker (absent from meeting)

Secretary: Dave Stankes

D.1 Introductions, Chairs Remarks and Approval of Agenda and Minutes

The Dry-type Transformers Subcommittee (DTSC) met in the Executive Ballroom (2) at the Hyatt Regency Milwaukee, WI on March 22, 2023, at 1:30 PM (CST)

The Chair notified the attendees that the meeting would be recorded for the purpose of accurately documenting the minutes, and that recording would be erased once minutes were completed.

Introductions:

Introductions were made and Chair reminded participants to announce one's name and affiliation prior to speaking.

Roster was circulated and Chair requested any member who did not receive an e-mail invitation to this meeting to include it as they sign the roster as the e-mail the DTSC has on file is not accurate.

Chairs remarks:

Currently there is no active system to enter the required attendance for meetings as AMS has been deactivated. Members will be receiving an e-mail from Member Planet / Committee Management System (CMS) which is the system that is replacing AMS. Chair asked that members sign in and register on the CMS within the next month. Registration on the CMS is mandatory requirement for attending IEEE Transformer Committee Meeting. The CMS is expected to be operational in time for the Fall 2023 meeting. Once CMS is online it is expected that the attendance rosters from meetings that were recorded in Excel spreadsheets, etc. will be uploaded onto the new system as well as old AMS attendance data.

Working Group (WG) and Task Force (TF) minutes from Fall meeting are requested to be turned in to Dave Stankes (Secretary) by March 31st.

Copyright policy and Participant Behavior slides were reviewed with the attendees.

Chair encouraged Chairs to conduct meetings between the main Spring and Fall meetings. If a WG is planning to hold a meeting, notification to the broader Transformers Committee meeting can be made by posting to the IEEE Transformer Committee website. Requests to post invitations on the website can be sent to tc-webmaster@ieee.org. Reminded attendees that attendance and meeting minutes from these in between meetings must be taken and retained, and information from these should be rolled into the minutes you submit for the following Spring or Fall meeting. A question was raised whether or not these rules also pertain to TF meetings, and Chair confirmed that TF's should follow the same rules.

Chair introduced Patrycja Jarosz, the new IEEE Liaison who will be the main contact for the DTSC.

There is one mandatory training for all leaders of WG's and TF's, *Understanding IEEE SA's Antitrust, Competition, and Commercial Terms Policies*. Training will take less than 30 minutes. Leaders must complete the training within 90 days of being appointed or before the end of the year. The *WG Chair Fundamentals* training that had been previously described as mandatory is now optional (but highly recommended.)

Chair recognized and congratulated DTSC member Rhea Montpool who recently attained Transformer Committee Member status. Chair encouraged those interested in becoming a Committee Member to check the TC website for requirements and procedure for submitting request.

Chair also recognized and congratulated Aleksandr (Sasha) Levin for receiving Outstanding Contributor award for his many great contributions to the IEEE Transformer Committee.

Chair reviewed slide showing requirements for WG and TF minutes. Commended the group for doing a good job complying with these requirements.

Chair presented a slide with the names of all current members. There were 46 attendees. Twenty of the 31 members of the DTSC were present, so quorum was reached.

Approval of agenda and meeting minutes:

Chair entertained a motion to approve the planned agenda that was displayed at the meeting. Motion to Approve – Aniruddha Narawane. Vijay Tendulkar then seconded the motion. Agenda was approved unanimously.

Chair entertained a motion to approve the Fall 2022 DTS meeting minutes that were posted on the Transformer Committee website. Motion to Approve – Tim-Felix Mai, 2nd – Joe Tedesco. The minutes from the Spring 2021 DTSC meeting were approved unanimously.

D.2 Working Group/Task Force Reports

The next order of business was the presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

D.2.1 Revision of IEEE C57.16 Chair Art Del Rio

WG did not meet. PAR has been extended to end of 2024 allowing the WG to continue work on the document.

D.2.2 Revision of IEEE C57.12.52 Chair Joseph Tedesco

Joe noted that the WG did not meet as the document has just completed a ballot recirculation. One comment and one disapproval were received, and it is expected these can be resolved without the need for another ballot.

D.2.3 Revision for IEEE Revision of C57.12.01 Chair Casey Ballard

The meeting was called to order on Monday March 20 at 1:45 pm by Chair Casey Ballard.

The chair made opening comments and introduced the leaders of the WG.

This is the third meeting of the WG for this next round of IEEE C57.12.01 continuous revision.

Attendance was collected and the meeting was convened with 53 participants, 24 members were present out of 30 total WG members; the meeting quorum was established. The membership can be requested and will be granted if the attendance requirements are met.

The list of attendees is presented at the end of this report.

The Meeting Agenda was reviewed.

Motion: “approve the Agenda”, moved by C. Lovins, seconded by A. Narawane, approved unanimously.

The Unapproved Minutes of the Spring 2022 meeting were reviewed (Minutes were posted on the website).

Motion: “approve the Spring 2022 Meeting Minutes”, moved by T-F. Mai, seconded by J. John, approved unanimously.

Chairman requested patent disclosure, no patent claims were made.

IEEE Guidelines on WG procedure and IEEE Copyright policy have been reviewed and understood.

The chair commented that to be the most efficient all suggestions shall be provided in writing and sent to the Chair in advance of the WG meetings.

Old Business

TF Report on Environmental Conditions (Mai)

- Storage: TF presented the proposal and Tim-Felix moved to include the storage requirements in the clause of Usual Service Conditions. K. Klein seconded. After discussion, the motion was approved with 18 approval votes and 0 votes against.

Motion:

4.1.10 Storage

- *Transformers should be stored in such condition to prevent condensation, moisture absorption, and the entrance of water and other foreign material.*

- Operation: TF presented the proposal and Tim-Felix moved to include the de-energized operation requirements in the clause of Usual Service Conditions as subclause 4.1.11. D. Stankes seconded. After discussion, M. Saraf proposed to substitute the word “should” with “shall”, this friendly amendment was accepted. The motion was approved with 15 approval votes, 0 votes against and 8 abstain.

Motion:

4.1.11 Operation

While the transformer is in service, humidity conditions are generally not important. In the event that a dry-type transformer is de-energized and allowed to cool to ambient temperature, particularly if atmospheric conditions are such as to cause condensation within the housing, precautions shall be taken. If such precautions are not taken the unit should be inspected for evidence of moisture and insulation resistance checked. If there is evidence of moisture or if the insulation resistance is low, the transformer should be dried.

- Environmental Classes: Tim-Felix presented one of the options for the consideration of WG. Chair asked WG whether this topic is of interest and got confirmation. The TF will continue the work and present the proposal in the next meeting. C. Lovins has joined the TF.

- Flame and Toxicity: S. Chiang presented information on the FST (Flame Spread (Burn Rate), Smoke and Toxicity Requirements applied for the components of the traction infrastructure, including transformers (on-board, trackside transformers, terminals, etc.) Solomon moved to include FST in IEEE C57.12.01, seconded by Tim-Felix; approved with 9 votes for, 2 against and 11 abstained. S. Chiang will join the existing TF on Environmental Conditions to develop and present the specific proposal on FST.

TF Report on Solid-Cast Pole-Mounted Transformers (Tedesco)

To include this type of transformers, the modification of the following sections was proposed: Normative reference, Definitions, Location, Polarity, Table 10, Subclauses 6.3, 6.5.1, Testing.

J. Tedesco made a motion to include proposed additions and changes in IEEE C57.12.01, T-F. Mai seconded. WG discussion: enclosure / no enclosure, the tests shall be developed if necessary, ice and salt deposition requirements, interchangeability with oil-type. The word “shall” will be substituted with “should” in the proposed wording of clause 6.3. W. Li asked to check the current definition in the (new) C57.12.80 – pole-type vs. pole-mounted. WG approved the motion with 17 approval votes, 1 vote against and 4 abstained.

Motion:

2 Normative references

- Add C57.12.20

3 Definitions

- *Dry-type pole-type transformer: A transformer in which the core and coils are in a dry compound insulating medium, and without an enclosure, suitable for mounting on a pole.*

4.1.7 Location

- *Pole-type transformers shall be suitable for outdoor operations without an enclosure, meeting the requirements specified in 6.3.*

5.7.1.1 Polarity of single-phase pole-type transformers

- *Polarity shall be additive for all single-phase pole-type transformers in sizes 200 kVA and smaller having high-voltage windings 8660 V and below. Polarity shall be subtractive for all other single-phase pole-type transformers.*

Table 10 (in Clause 5.12 Nameplates)

- *Enclosure designation, footnote k (addition is underlined)*
- *The preferred enclosure designations are from NEMA C57.12.55. Pole-type transformers may be labeled as “None.” If specified, other designations may be used.*

6.3 Pole-type transformer

- *These dry-type transformers are installed outdoors without an enclosure and are directly exposed to precipitation, humidity, condensation, pollution, ambient temperatures, and solar ultraviolet radiation. The external materials used in the transformer shall limit degradation and/or damage from this direct exposure. The air and creepage distances for high-voltage and low-voltage bushings shall be designed for such exposure.*
- *For maximum interchangeability, support lugs shall comply with IEEE Std C57.12.20. The maximum dimensions and weights of these transformers shall comply with IEEE Std C57.12.20.*
- *This subclause would be new. The current subclauses 6.3 through 6.7 would be incremented to 6.4 through 6.8.*

6.5.1 Terminals of single-phase pole-type transformers

- *For maximum interchangeability, bushings and terminals shall be in accordance with IEEE Std C57.12.20.*

Insulation Resistance Testing Pass/Fail Criteria (Tedesco) J. Tedesco will participate in the work of TF on insulation resistance in Test SC and monitor the development. No changes are proposed for this revision.

New Business

No New Business was discussed in the meeting.

New topics may include:

- Electric Vehicle Charging Transformers
- On-load Tap Changers
- 25 Times Limit On Short Circuit Current
- Consequences of Exceeding a Maximum System Voltage
- Inclusion of 50 Hz

Other New Business

None.

The WG will meet again during the Fall 23 IEEE TC meeting.

With no further business, the meeting was adjourned at 3:00 pm.

Chair: Casey Ballard
Secretary: Sasha Levin

WG IEEE C57.12.01 Meeting Participants List – Spring 2023

	Last name	First name	Company Name	Role
P	Amin	Mihir	EATON Corporation	Guest
p	Ballard	Robert	DuPont	Chair
p	Bratu	Lorin	Trench Group	Guest (RM)
p	Chiang	Solomon	The Gund Company	Member
p	Cole	Casey	Invenergy	Guest
p	Debass	Samson	EPRI	Guest (RM)
p	Frye	Rich	Eaton	Guest
p	Fu	Renjie	ERMCO	Guest
p	Fyrer	Bob	DuPont	Member
p	Gabriel	Delgado Zamora	Invenergy	Guest
p	Gara	Lorne	Telos	Guest
p	Chrysler	Rhett	ERMCO	Guest
p	Grajeda	Rafael	EATON Corporation	Guest (RM)
p	Gross	Detlev	Power Diagnostix	Guest
p	Guang	Yuan	Hitachi Energy	
p	Hernandez	Giovanni	Virginia Transformer Corp.	Member
p	Hernandez Cano	Sergio	Hammond Power Solutions	Member
p	Hogg	Ryan	Bureau of Reclamation	Member
p	Hopkinson	Philip	HVOLT Inc.	Guest
p	John	John	Virginia Transformer Corp.	Guest
p	Klein	Ken	Grand Power Systems	Member
p	Kushal	Mahajan	EATON Corporation	Member
p	Lee	Moonhee	Hammond Power Solutions	Member
p	Levin	Aleksandr	Weidmann Electrical Technology	Secretary
p	Li	Weijun	Braintree Electric Light Dept.	Member
p	Lovins	Colby	Federal Pacific	Member
p	Mai	Tim-Felix	Siemens Energy	Member
p	Mani	Kumar	Duke Energy	Guest (RM)
p	McKinney	Kenneth	UL	Member
p	Montpool	Rhea	Schneider Electric	Member
p	Moreno	Andre	Siemens Energy	Guest
p	Narawane	Aniruddha	EATON Corporation	Member
p	Nunn	Shawn	Hitachi Energy	Member
p	Nunn	Tommy	?	Guest
p	Peterson	Caroline	Xcel Energy	Guest (RM)

Annex D

p	Podgorski	Damian	Sargent and Lundy	Guest
p	Plante	Sylvain	Hydro Quebec	Guest
p	Powell	Chris	Intermountain Electronics	Member
p	Pugal	Servaraj	VA Transformers	Guest (RM)
p	Sandoval	Alberto	EATON Corporation	Guest (RM)
p	Saraf	Manish	Hammond Power Solutions	Member
p	Sawant	Anil	Virginia Transformer	Guest
p	Shertukde	Hemchandra	UHART	Guest (RM)
p	Sohail	Mihammad Abdullah	Trench Limited	Guest (RM)
p	Sonnenberg	Brian	Instrument Transformers, LLC	Member
p	Staley	Brad	Leeward Renewable Energy	Guest
p	Stankes	David	3M	Member
p	Stretch	Kerwin	Siemens Energy	Member
p	Szczewski	Janusz	Reinhausen	Guest
p	Sze	Matthew	Omicron Electronics	Guest
p	Tatu	Valeriu	Powersmiths	Guest (RM)
p	Tedesco	Joseph	Hitachi Energy	Member
p	Tendulkar	Vijay	Eaton Santa ana, CA	Member

D.2.4 C57.134 Chair Colby Lovins

Colby noted that the WG did not meet as the document is currently in comment resolution. Ballot achieved 94% approval response. 50 comments were received with 4 disapprovals with comments. Colby will plan to send out an invitation for addressing these comments to the Comment Resolution Team in April. Expect to complete recirculation ballot and be ready to submit to REVCOM in time for their October meeting.

D.2.5 Revision for IEEE 259**Chair Dave Stankes**

Chair: David Stankes

Vice-Chair/Secretary: Joseph Tedesco

This was the sixth meeting of the IEEE 259 Working Group. The meeting was held in the Gilpatrick Meeting Room and Dave Stankes called the meeting to order at 3:14 PM.

Quick introductions were made by everyone in attendance.

There were ultimately 39 people present in the meeting, with 12 members and 27 guests. No one requested membership. Some attendees arrived after the meeting had begun, and a quorum check was done twice. The first time a quorum check was made, there were only 7 members present. After giving people a few moments to arrive, there were 9 members. The Working Group had 17 members; therefore, a quorum was reached, and business could proceed.

Dave and asked for a motion to approve the agenda. Aniruddha Narawane moved to accept the agenda, with Vijay Tendalkar Saraf seconding the motion. There was no discussion, and approval of the agenda was unanimous.

Dave then asked for a motion to approve the minutes of the last meeting. Colby Lovins so moved, with a second from Casey Ballard. There was no discussion, and the approval of the minutes was unanimous.

Dave showed the patent and copyright slides. He asked if there were any patent or copyright concerns from those in attendance; no one had any concerns or noted any patent/copyright issues.

Old Business:

- Dave Stankes discussed finishing the standard and the results of the polls shown at the October 2022 meeting. He continued discussing the decisions made by the task force leaders to move the draft forward:
 - The outcome of the standard would allow for either a thermal index (TI) or a relative thermal index (RTI) to be assigned to an insulation system.
 - The standard would use thermal degradation as the primary aging test, instead of other multi-factor elements (vibration, moisture, etc.).
 - The maximum voltage would be 600 V, to avoid conflict with IEEE C57.12.60.
 - There would be a simplified discussion of test specimens.
 - The ability to modify an insulation system would be added.
- Dave states that IEEE 259 was developed to test insulation systems for transformers compliant with NEMA ST 1 and NEMA ST 20. The current revision of NEMA ST 20 calls for insulation system tested to UL 1446.
- Dave discusses the current structure of task forces.
 - Normative references
 - Definitions
 - Insulation test specimens
 - Test procedures and diagnostics
 - Interpretation of data
 - Modification of insulation systems (this task force will have to be created)
- The latest draft would be posted so that all members and guests would have access.
- Dave discusses the plan for holding virtual meetings between now and the meeting in the fall (~1/month), and then to meet in Kansas City.
 - These would be regular meetings, open to all members and guests.

New Business:

- Tim-Felix shared an update on the draft of IEC 61857-41 that was meant to be informative for the working group.
 - He showed a flowchart that the 61857-41 project team had developed that described the steps for insulation system testing.
 - Given that the testing was meant to be for insulation systems, no transformer-specific tests were to be performed.
 - Dave pointed out that one of the problems with IEEE 259 had been setting a correlation time, with C57.12.60 using 40,000 hours and many LV system tests using 20,000 hours.

Annex D

- Tim-Felix pointed out that the 61857-41 plan was meant to be generic, and simply refers to the relevant product standard. Dave stated that IEEE 259 would provide some guidance on this matter.
 - Though IEC 61857-41 was developed for voltages of 1000 V and up, the general principles can be applied to the test procedures in IEEE 259.
 - Casey asked how the IEC process could be used to call for a RTI if there was no way in IEC currently to have an insulation system temperature class. There was a short discussion of various IEC standards.
 - Dave stated that the overall point was how this process was similar to IEEE 259, and it was just a way for manufacturers to do the testing.
- Dave discussed the general timing he foresaw for this standard. With the monthly meetings, he hoped to be able to have a finished draft and could vote to go to the Subcommittee at the meeting in Kansas City this fall.
 - It would be likely that the PAR would need to be revised before then.
 - Furthermore, C57.12.60 would probably reopen in ~2025 (according to Casey Ballard), so perhaps IEEE 259 and C57.12.60 could align.
- There were questions regarding the connections between IEEE 259 and UL 1446.
 - Manish Saraf asked about the differences between this method and that of UL 1446.
 - Colby pointed out that IEEE 259 must somehow connect to UL 1446, because NEMA ST 20 only references UL 1446.
 - Dave stated that that connection would be determined later.

The date of the next meeting for the whole Working Group was not explicitly announced but would be planned to take place before the Fall meeting in Kansas City.

The meeting was adjourned at 4:17 PM.

Role	First Name	Last Name	Affiliation
Member	Robert	Ballard	DuPont
Member	Piotr	Blaszczyk	Specialty Transformer Components, LLC
Guest	Lorin	Bratu	Trench
Guest	Camilo	Casallas	Trench Limited
Member	Solomon	Chiang	The Gund Company
Guest	Fernando	Duarte	EPRI
Guest	Renjie	Fu	ERMCO
Guest	Rob	Ghosh	GE
Guest	Rafael	Grajeda	Eaton
Guest	Saif	Hossain	Trench Limited
Guest	Ken	Klein	Johnson Electric
Guest	Jason	Lambert	JST
Member	Moonhee	Lee	Hammond Power Solutions
Member	Alexandr	Levin	Weidmann Electrical Technology
Member	Colby	Lovins	Federal Pacific
Guest	Kushal	Mahajan	Eaton
Member	Tim-Felix	Mai	Siemens Energy
Guest	Ken	McKinney	UL Solutions
Guest	Amin	Mihir	Eaton
Guest	Andre	Moreno	Siemens Energy
Member	Aniruddha	Narawane	Eaton Corporation
Guest	Shawn	Nunn	Hitachi Energy
Guest	Tommy	Nunn	JST
Guest	Vinay	Patel	Con Edison
Guest	Caroline	Petersen	Xcel Energy
Guest	Miguel	Plascencia	PG&E
Guest	Klaus	Pointer	Trench Austria
Guest	Chris	Powell	Intermountain Electronics
Guest	Alberto	Sandoval	Eaton
Member	Manish	Saraf	Hammond Power Solutions
Guest	Mike	Sharp	Trench Limited
Guest	Sam	Sharpless	Rimkus
Guest	Muhammad	Sohail	Trench Canada
Guest	Brian	Sonnenberg	ITI
Chair	David	Stankes	3M
Guest	Erik	Tarango	Olsun Electrics
Guest	Val	Tatu	Powersmiths
Secretary	Joseph	Tedesco	Hitachi Energy
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)

D.2.6 Revision of IEEE C57.94

Chair Ken Klein

The Working Group met in Regency A, Meeting room. The meeting was called to order at 8:00 AM by Chair Ken Klein.

- Chair made opening comments.
- Introductions were made by all participants. WG Roster has been distributed and signed.

Attendance:

- 29 total participants
- 9 Members
- 20 guests

There were 8 out of 15 members present. A quorum was present.

WG Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees, attendance & determination of quorum
3. Approval of agenda
4. Approval of minutes from Fall 2022 meeting
5. Call for essential Patents & IEEE SA Copyright Policy review
6. Joe Tedesco - Addition of 4.2.4
7. Tim-Felix Mai – Items for discussion

8. Review of TF sections
 - a. Normative references: Roger
 - b. Definitions: Tim-Felix (Complete)
 - c. Application: Colby & Chris (Complete)
 - d. Installation: Dave (Complete)
 - e. Testing: Kerwin & Joe
 - f. Operation: Casey
 - g. Maintenance: Ken Klein & Kerwin

9. Meeting Adjournment

The agenda was approved unanimously without discussion.

Motion: Kerwin, Second: Joe

The WG Meeting minutes of the Fall 2022 Meeting were approved unanimously without discussion.

Motion: Colby, Second: Joe

The chair presented the information on Patent Disclosures and IEEE SA Copyright Policy. He asked the group to report any relevant patent issues – None were communicated.

Old Business:

Joe Tedesco - Addition of 4.2.

4.2.4 Frequent energization

Proposal from IEC/IEEE 60076-16 clause 7.9 to be added to clause 4.2.4

Motion: Accept the text as shown – Joe, Second: Casey

Discussion:

Nothing similar in C57.12.01 maybe good to have this there, too

Motion passed, unanimously.

Tim-Felix Mai – Items for discussion

- Storage
Discussion about using the C57.12.01 proposal and add the reference in section 8.2
Reference should be included, and the wording must be corrected to match the guide.
- Operation
Discussion about using the C57.12.01 proposal and add the reference in section 7.2
Reference should be included.

Review of TF sections

1. Kerwin presented the results of the review of TF Testing
No changes to section 6.1 recommended.

Discussion on rewording section 6.2.1

Motion: Joe, Second: Casey

Change wording "...the following ~~pre-service~~ tests be made before *final connection and energizing of* placing a new or repaired transformer ~~in service~~..."

Motion passed, unanimously.

Discussion on rewording section 6.2.2

The following additional test may be performed ~~if desired, including~~ for the purposes of trending.

Discussion on rewording section 6.3.2

The following optional test ~~are optional~~ may be performed.

Discussion on adding:

b) Applied voltage test (*at reduced value – see C57.12.91*)

WG agreed to **not** adding the reference.

The other TF will present their results at the next meeting in Kansas City

New Business:
None

The meeting was adjourned, without objection, at 9:15 AM.

The WG will meet again at the Fall 2023 meeting Kansas City (Westin at Crown Center), Missouri USA, March 19 – 23, 2023.

Chair: Ken Klein
Vice-Chair: David Stankes
Secretary: Tim-Felix Mai

Participation list:

First Name	Last Name	Company	
David	Stankes	3M	Vice Chair
Robert	Ballard	DuPont	Member
Tim-Felix	Mai	Siemens Energy	Secretary
Ken	Klein	Johnson	Chair
Joseph	Tedesco	Hitachi Energy	Member
Colby	Lovins	Federal Pacific	Member
Solomon	Chiang	TGC	Member
Kerwin	Stretch	Siemens Energy	Member
Manish	Saraf	Hamond Power	Member
Vijay	Tendulkar	Eaton	Guest
David	Walker	MGM Transformer	Guest
Shawn	Nunn	Hitachi Energy	Guest
Val	Tatu	Powersmiths	Guest
Brain	Sonnenberg	ITI	Guest
Anil	Sawant	Virgina Transformer	Guest
Erik	Tarango	Olsun Electric	Guest
Jusuf	Krvavac	Sargent & Landy	Guest
Bob	Fyrer	DuPont	Guest
Mihir	Amin	Eaton	Guest
Aniruddha	Amin	Eaton	Guest
Rob	Ghosh	GE	Guest
Andre	Moreno	Siemens Energy	Guest
John	Hipchen	Copper Dev	Guest
Rafael	Garjeda	Eaton	Guest
Alberto	Sandoral	Eaton	Guest
Guang	Yuan	Hitachi Energy	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Tony	Di Biase	Temple	Guest
Samson	Debass	EPRI	Guest
Alex	Alahmed	Evergy	Guest

D.2.7 Revision of IEEE C57.96**Chair Aniruddha Narawane**

Chair: Aniruddha Narawane
Vice Chair: Iman Mohammed (Not Present)
Secretary: Kerwin Stretch

- Meeting called to order on time at 11:00 am by the Chair
- The chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.
- The chair presented the information on the IEEE Copyright – No question, comments, or concerns were raised.
- The current membership list was shown and a poll to establish a quorum was taken. A quorum was achieved with 12 of 15 members present.
- The chair shared the WG Meeting Agenda. The agenda was approved unanimously without discussion.
- The chair shared the Meeting Minutes from the Fall 2022. The minutes were approved unanimously without discussion.
- Manish Saraf (Hammond Power Systems) showed the Excel tool that he created for making load calculations based on EQ 3.
 - Several example calculations were shown
 - Weight is an optional field
 - Exponent can be changed by user if needed
 - Calculation is for ONE winding only (HV / LV must be computed separately)
- ACTION: Secretary will distribute the Excel tool to the working group for review and testing. Feedback can be shared directly with Manish or through the Secretary.
- Draft D3 was shared on screen with the membership.
- Continued discussions about the use of new vs. old cooling classes in Table 4. The proposal to use the new classes per 12.01 and prepare an annex to correlate with the old methodology. Joe Tedesco will prepare a proposal for discussion and approval in the Fall 2023 meeting.
- Sections 6.1 & 6.2 were discussed with minor changes to the text made in the draft shown on screen.
- Chair introduce a question from the NEMA regarding the inclusion of EV Charging topics in the loading guide. After a brief discussion it was the consensus of the group that this was NOT required as the intent of the Loading Guide is to be independent of the load

type. There are interesting impacts coming from the increase in e-mobility but these topics would be better served in another standard or guide.

- Meeting adjourned on time at 12:15
- Next meeting: Fall 2023 – Kansas City, MO.

WG C57.96 - MEETING ATTENDANCE

WG Meeting – Spring 2023 Tuesday, March 21, 2023

Last Name	First Name	Company	Role
Amin	Mihir	EATON Corporation	Guest
Ballard	Robert	DuPont	Member
Casallas	Camilo	Trench Ltd.	Guest
Chiang	Solomon	The Gund Company	Guest
DiBiase	Tony	Tempel Canada	Guest
Duarte	Fernando	EPRI	Guest
Fryer	Bob	DuPont	Guest
Fu	Renjie	ERMCO	Guest
Grajeda	Rafael	EATON Corporation	Guest
Hernandez	Giovanni	Virginia Transformer Corp.	Member
Hernandez	Sergio	Hammond Power Solutions	Guest
Hernandez	Ronald	Doble	Guest
Klein	Ken	Johnson Coil	Member
Kravak	Jusuf	Sargent & Lundy	Guest
Lee	Moonhee	Hammond Power Solutions	Member
Levin	Aleksandr	Weidmann Electrical Technology	Guest
Lovins	Colby	Federal Pacific	Member
Mahajan	Kushal	EATON Corporation	Member
Mai	Tim-Felix	Siemens Energy	Member
Mazzei	Kevin	Black & Veatch	Guest
McKinney	Ken	UL Solutions	Guest
Montpool	Rhea	Schneider Electric	Member
Moreno	Andre	Siemens Energy	Guest
Narawane	Aniruddha	EATON Corporation	Chair
Nunn	Shawn	Hitachi Energy	Member
Powell	Chris	Intermountain Electronics	Member
Sandoval	Alberto	EATON Corporation	Guest
Saraf	Manish	Hammond Power Solutions	Member
Selvaraj	Pugal	Virginia Transformer Corp.	Guest
Stankes	David	3M	Guest
Stretch	Kerwin	Siemens Energy	Secretary
Syed	Ali	COMED	Guest
Tatu	Val	Powersmiths	Guest
Tedesco	Joseph	Hitachi Energy	Member
Tendulkar	Vijay	EATON Corporation	Member
Torango	Erik	Olsun Electrics Corporation	Guest
Yuan	Guang	Hitachi Energy	Guest
		Members	15
		Guests	22

D.2.8 Revision of IEEE C57.124 Chair Tom Prevost

Meeting room: Gilpatrick (1)

3/21/23: 3:15-4:30 pm

Meeting was called to order by Chair Tom Prevost(TP) at 3:15 pm

Secretary H. M. Shertukde (HMS) was held up in a separate meeting elsewhere and could not attend at the start of the meeting. Chair designated Casey Ballard (CB) to assume the Secretary's position till HMS joined the meeting.

The chair made opening comments and introduced himself.

Attendance was collected and the meeting was convened with 40 participants, 10 members were present out of 20 total WG members; the meeting quorum was established.

The list of attendees is presented at the end of this report.

The Meeting Agenda was reviewed.

Motion: "approve the Agenda", moved by Dominique Bolliger, seconded by Tim-Felix Mai, approved unanimously.

The Unapproved Minutes of the Fall 2022 meeting were reviewed (Minutes were posted on the website).

Motion: "approve the Fall 2022 Meeting Minutes", moved by Detlev Gross, seconded by Tim-Felix Mai, approved unanimously.

Chair requested patent disclosure, no patent claims were made.

IEEE Guidelines on WG procedure and IEEE Copyright policy have been reviewed and understood.

The Chair covered the Scope and Purpose.

The Draft 2 document was based on IEEE C57.113 and the WG made modifications as necessary since some of the PD measurement techniques and pass/fail criteria are different between liquid filled and dry-type transformers.

These revisions were made live in the Draft 2 document and included:

- Replacement of Figure 1 with a method that uses a coupling capacitor
- Modifying the frequency ranges lower and upper limits
- Updating the calibration pC level

HMS joined meeting at 3:35 pm and assumed the duties of Secretary back from CB. Two printed rosters were recirculated for members to sign in for this meeting as attached.

After this discussion was completed and edit completed two motions were made by CB

Motion 1:

The draft D2 (with all modifications completed by TP to be presented to the Dry-Type subcommittee for permission to proceed to SA ballot. Motion moved by CB and seconded by Sergio Hernandez (SH)

Motion passed unanimously

Motion 2:

To form a Comment Resolution Group (CRG) that is empowered on behalf of the full WG to make the necessary revisions after comments are received from the balloting process.

Motion made by CB, seconded by SH

Motion passed unanimously.

CRG was formed with TP; Joe Tedesco (JT), Tm Felix(TF), Samson G Debass (SGD); Detlev Gross (DG); SH; Sergio Hernandez, Janus Szczechowski

Following presentation of minutes, **Tom Prevost made a motion to: Submit C57.124 to SA ballot**

The motion was **seconded** by **Sergio Hernandez Cano**.

Chair asked if there was any discussion needed.

Chair asked if any members objected to unanimous approval of the motion.

No abstentions were noted

As there was no objection to unanimous approval, the **motion passed**.

Meeting was adjourned at 4:30 pm

Submitted by:

CB; And; H M Shertukde, Secretary, C.57.124

Included herewith attendance report with only Name, Affiliation, and Membership Status below

Last Name	First Name	Affiliation
Ballard	Robert	DuPont
Caverly	David	Trench Limited
Chiang	Solomon	The Gund Company
Cirino	Fabiana	OMICRON
DEBASS	SAMSON	EPRI
Fyrer	Bob	DuPont
Hernandez Cano	Sergio	Hammond Power Solutions
Iman	Mohammad	MGM Transformer Company
Klein	Ken	Johnson Coil
Lachavce	Mathieu	OMICRON
Lee	Moonhee	Hammond Power Solutions
Lovins	Colby	Federal Pacific
Mai	Tim-Felix	Siemens Energy
Martinez	Joaquin	Siemens Energy
Nunn	Shawn	Hitachi Energy
Peterson	Caroline	Xcel Energy
Pointner	Klaus	Trench Austria GmbH
Prevost	Thomas	Weidmann Electrical Technology
Saraf	Manish	Hammond Power Solutions
Shertukde	Hemchandra	University of Hartford
Sonnenberg	Brian	Instrument Transformers, LLC
Stankes	Dave	3M
Stretch	Kerwin	Siemens Energy
Sze	Matthew	Omicron
Tarango	Erik	Olsun Electric
Tedesco	Joseph	Hitachi Energy
Tendulkar	Vijay	Power Distribution, Inc. (PDI)
Szczechowski	Janusz	Reinhausen
Pepe	Henry	Phenix Technology
Britton	Jeffrey	Phenix Technology
Bolliger	Dominique	HV Technologies Inc.
Morales-Cruz	Emilio	Qualitrol
Munez	Heturo	Mistras
Sze	Matthew	Omicron Electronics
Roman	Zoltan	GE
Abdullah	Ahmad	Mortenson
GROSS	DETLEV	PD CONSULTANT
ZAMAN	MALIA	IEEE SA
JAROSZ	PATRICIA	IEEE SA
MORENO	ANDRE	SIEMENS ENERGY
SAIF	HUSAIN	HV TECHNOLOGIES, INC

SHARP	MIKE	TRENCH LTD.
AMIN	MIHIR	EATON
YUAN	GUANG	HITACH ENERGY
SOELLEV	MARKUS	POWER DIAGNOSTIX SYSTEMS, GMBH

D.2.9 Revision of IEEE C57.12.91 Tim-Felix Mai

- The Working Group met at the Hyatt Regency – Regency A Conference Room. The meeting was called to order at 4:45 PM by Vice Chair, Time-Felix Mai.
- Vice Chair made opening comments.
- 12 of 16 members in attendance. Quorum was met.
- Introductions

Approval of Agenda: The Spring 2023 agenda was approved unanimously without discussion.

Motion: Casey Ballard

Second: Ken Klein

Approval of Minutes: The Fall 2022 minutes were approved unanimously without discussion.

Motion: Vijay Tendulkar

Second: Sergio Hernandez Cano

Call For Patents: The Vice-Chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.

Copyright Notice: The Vice-Chair presented the IEEE_SA Copyright Policy. No discussion.

Old Business

- Review Revisions Proposal

- **Clause 10.6.1.1** – Joe Tedesco motions for the changes below.
- Kerwin Stretch - Second
- Open commentary: Define QA impulse as Reduced Wave followed by a Full wave. Value for including reduced wave impulse to establish a baseline instead of just two full waves. Two full waves are easy to overlay, thus fast, but establishing the baseline is important.

Proposed Changes to **Clause 10.6.1.1**

- When required to be performed, the impulse test shall precede the low frequency applied voltage and induced voltage tests, with the order of impulse test waves depending on whether the impulse test is a full impulse test or a QA impulse test.
 - Full impulse tests shall consist of, in order, one reduced full wave, two chopped waves, and one full wave.
 - QA impulse tests shall consist of one reduced full wave and one full wave.
- Applicable test voltage values are listed in IEEE Std. C57.12.01.

Open Discussion:

- Number of waves needed
- IEC requirements
- Is one reduced and one full enough to stress the insulation

Vote: 12 for, 0 against, 0 abstain – unanimous approval

- **Clause 10.6.1.1:**

Proposal: Change the sequence of the impulse test (R-C-C-F -> R-F-C-C-F-F)

Current State of Clause 10.6.1.1:

When required to be performed, the impulse test shall precede the low-frequency applied voltage and induced voltage tests. Impulse tests consist of applying, in the following order, one reduced full wave, two chopped waves, and one full wave. Applicable test voltage values are listed in IEEE Std C57.12.01.

- **Proposal: No change**
- **Unanimous agreement**

○ **Clause 5.3.2 –**

Proposed by Joe Tedesco – Definition of “free from drafts”
2nd – Casey Ballard

Current state: Clause 5.3.2

- a) All internal temperatures measured by the internal temperature sensors shall not differ from ambient temperature by more than 2 °C.
- b) Enclosure surface temperatures for sealed units shall not differ from ambient temperature by more than 2 °C.
- c) Ambient temperature shall not have changed by more than 3C for at least 3h.
- d) The transformer has been in a draft-free area for 24 h, and neither voltage nor current has been applied to it for 24 h to 72 h, depending on transformer size.

Proposal: (a –c would remain the same)

Clause 5.3.2

- d) The transformer has been in an area for approximately 24 hours that is as free as is practical from forced air currents.
- e) Neither voltage nor current has been applied for a sufficient time to ensure that conditions (a), (b), and (c) are satisfied. In an environment that satisfies condition (d), this length of time is influenced by the physical size of the transformer.

After extensive discussion, Joe amended the proposal to the following:

Clause 5.3.2

- a) All temperatures measured by the temperature sensors shall not differ from ambient temperature by more than 2 °C.

Minimum Temperatures shall be measured at:

- Top and Bottom of the core
- Top of the innermost winding
- Bottom of the outermost winding
- b) Enclosure surface temperatures for sealed units shall not differ from ambient temperature by more than 2 °C. (No Change)
- c) Ambient temperature shall not have changed by more than 3 °C for 3 hours immediately preceding the measurements for a) or b)

- d) Delete.

The cold temperature shall be the average of the internal temperature sensors or, in the case of a sealed unit where the internal sensors are not available, the average of the surface temperature sensors.

Vote passed unanimously.

○ **Open Discussion: led by Joe Tedesco: Clauses 10.1.2, 10.5.1, and 10.5.4**

Current state:

- Clause 10.1.2 Requires PD to be the last test performed
- Clause 10.5.1: Intention of PD to be confirming the insulation is free of internal discharges
- Preferred arrangement is fully assembled, but testing of single coils allowed
- Clause 10.5.4: HV bus may be removed to ensure PD of the coils ONLY is measured

Discussion:

- How to satisfy Clause 10.1.2 while removing accessories, HV bus, etc. because there was severe PD when the unit was fully assembled?
- If the purpose of PD measurement is to confirm that the coils are PD-free, and this is done through testing per 10.5.1 and 10.5.4, how do you do that AND satisfy the requirement for PD to be the last test?

○ **Motion: Joe Tedesco – change 10.1.2 to the following**

Proposal:

10.1.2: If required, the partial discharge test shall be the last dielectric test performed. Otherwise, the induced voltage test shall be the last dielectric test performed. If disassembly according to 10.5.1 and 10.5.4 is required for successful PD measurement, unit applied voltage and induced voltage tests shall be repeated after reassembly of the unit.

2nd: Manish Saraf

Vote: Unanimously approved

- **Due to time constraints the remainder of the Old Business will be moved to the agenda for the Fall 2023 C57.12.91 meeting**
- **Manish Saraf provided slides for a proposal that was moved to the Fall meeting – to be circulated before Fall 2023 meeting for consideration by the members.**

Adjourned at 6:02

The Working Group will meet again at the Fall 2023 meeting,

Vice Chair: Tim-Felix Mai
Secretary: Rhea Montpool

Participation list:

Last Name	First Name	Company	Req. Membership
Amin	Mihir	Eaton	
Ballard	Robert	DuPont	
Chiang	Solomon	Gund Company	
Fryer	Bob	Dupont	
Fu	Renjie	Ermco	
Grajeda	Rafael	Eaton	
Hernandez	Giovanni	Virginia Transformer	

Hernandez Cano	Sergio	Hammond Power Solutions	
Klein	Ken	Grand Power Systems	
Lambert	Jason	JST	
Lee	Moonhee	Hammond Power Solutions	Y
Lovins	Colby	Federal Pacific Transformer	
Mahajan	Kushal	Eaton	
Mai	Tim-Felix	Siemens Energy	
McKenney	Ken	UL Solutions	
Montpool	Rhea	Schneider Electric	
Morend	Andre	Siemens Energy	
Narawane	Aniruddha	Eaton	Y
Nunn	Tommy	JST	
Nunn	Shawn	Hitachi Energy	
Pepe	Harry	Phenix Tech	
Powell	Chris	I.E.	Y
Sandoval	Alberto	Eaton	
Saraf	Manish	Hammond Power Solutions	
Sonnenberg	Brian	ITI	
Stankes	David	3M	
Stretch	Kerwin	Siemens Energy	
Tarango	Erik	Olsun	
Tatu	Valeriu	Powersmits	
Tedesco	Joseph	Hitachi ABB Power Grids	
Tendulkar	Vijay	Eaton	
Weyer	Daniel	Monolith	

D.2.10 Revision of C57.12.59 Chair Derek Foster (not present) (Casey Ballard offered comments on Derek's behalf)

Draft 1 has been sent out to the WG committee members. If you are interested in working on C57.12.59 please reach out to Derek or Casey Ballard. This WG for revision of C57.12.59 is only meeting virtually.

D .2.11 Standards Report

Chair reported that all the documents that are coming up have a PAR and are being worked on. C57.12.58 Transient Analysis will be the next document in need of volunteers, but this will not be started until next year.

The rotation of standards that started with the elimination of document reaffirmations has resulted in a heavy workload that occurs every five years, although this is beginning to spread out as documents are completed ahead of schedule.

D.3 Old Business

D.3.1 Standards Report

Chair presented slides showing DTSC standards activity and status that are part of the Standards Report found on the Transformer Committee website. Overall message is that the DTSC is good shape. Every document that is scheduled to expire within the next five years are currently being worked on.

Expect that next year we will begin to address standards that begin to approach the need of revision. Chair asked that anyone who is interested in taking on a leadership position for the revision of any of these upcoming documents to let him know.

D.4 New Business

D.4.1 Proposal for an Entity PAR Guide for Bridge-Arm Reactors for Low-Frequency (20 Hz) Power Transmission

- Chair had e-mailed a 30-page slide deck presentation to the members of the DTSC that he had received explaining the PAR proposal.
- Malia was asked by the Chair to explain to the DTSC the details of the Entity PAR including what it is, how it was received, etc. Malia reported:
 - The Entity PAR was received by the IEEE Chapter Council, which was passed on to the IEEE in the US, who in turn forwarded it to the IEEE PES Technical Council Entity Project Management Committee. This committee determines with IEEE Committee the Entity PAR best fits. They decided that this Entity PAR best fit in the Transformer Committee and our committee chair thought it best fit in the DTSC.
 - There are two types of IEEE memberships. Individual and Entity SA membership. The Entity membership is based on a corporate membership which uses a one company one vote model.
 - ONLY Entity SA members may vote on and Entity proposal.
 - A person can check to see if their company is an Entity member by going to the IEEE website. If your company is a member you can join as a designated representative and attend the Entity meetings.
 - IEEE just had one Entity PAR approved (C57.12.200).
- Casey explained that the DTRSC has been asked to become the sponsor of this Entity PAR and whether or not we should become the sponsor would be the topic of the discussion at this meeting. If we decided to be the sponsor of the Entity PAR, we would be looking for a committee representative that would have expertise on the subject. It would also require us to be included in future revision activities, effectively becoming part of the Transformer Committee ongoing duties. If we decided NOT to sponsor the Entity PAR our subcommittee would not be allowed to offer any input to the document going forward. (Entity members could still vote on the document. There is also still the ability to offer comments as part of the Public Review.)
- Malia pointed out that proposals are open to changes. The DTSC should also review and determine if the proposal will overlap on any current standard, and that the proposal is within the scope of our work.
- The Entity Par was reviewed by the Chair and determined to pertain to air core reactors. Chair then asked Art Del Rio as Chair of C57.12.16 and others to offer their opinion. Art and Klaus Pointner reported the following:
 - Current standard we have deals with 60 Hz which is very common and widely used. The standard does not address the design that must be used in a specific application
 - There is a lot of similarities to our current document, with the major difference being frequency.
 - The requirements for lower frequency can be easily calculated for lower frequencies and be incorporated into our current document, perhaps in an Annex.
 - The low frequency design described in the proposal is for a prototype application and not widely used. Standards are typically written for widely used industrial applications.
 - There is a lot of information in C57.12.16, C57.12.21, and IEEE 1277 already contain this type of information.
- Malia suggested to the Chair that the type of details described by Klaus and Art should be presented back to the Transformer Committee Chair, supporting the recommendation that the proposal is at this time not ready for standardization.

- Chair also explained that C57.12.16 has just gone to ballot, so the opportunity to address this immediately is not an option at this time.
- Art stated that if it was taken up in future revision of C57.12.16 the title, scope, and purpose would also have to be changed. Perhaps this information could be included in an Informative Annex.
- Malia suggested that the proposers of the Entity PAR be given the option of joining the C57.12.16 ballot pool so they could see the existing similar that addresses a similar topic.
- Malia suggested that it may be best for the DTSC to accept the proposal that was passed onto us, allowing us to offer suggestions on how the proposal and the information it contains may fit.
- Our Transformer Committee Chair should be given the DTSC technical assessment of the proposal, and he will respond.
- Malia stated that the EPM Committee keeps track of these and records and whether or not it accepted or rejected. If proposal is rejected it will be reviewed by the Corporate Advisory Group and they will check our response.
- **Klaus Pointner made a motion** to have the DTSC accept this Entity PAR and assign him to lead the work in preparing a formal response back to the company that had submitted this Entity PAR.

Mike Sharp seconded the motion.

The Chair asked of the members present, are there any objections to the unanimous approval of the motion. Hearing none **the motion was passed.**

With no further business, the meeting was adjourned at 2:35 PM.

Chairman: Casey Ballard

Vice Chairman: David Walker

Secretary: David Stankes (prepared meeting minutes)

Attendees

<u>Role</u>	<u>First Name</u>	<u>Last Name</u>	<u>Company</u>
Guest	Mimir	Amin	Eaton
Chair	Robert	Ballard	DuPont
Guest	Comilo	Casallas	Trench Limited
Guest	Rhett	Chrysler	ERMCO
Member	J. Arturo	Del Rio	Siemens Energy
Guest	Renjie	Fu	ERMCO
Guest	Bob	Fyrer	DuPont
Guest	Miguel	Garcia	Hitachi Energy
Guest	Rob	Ghosh	GE
Guest	Rafael	Grajeda	Eaton
Guest	Detlev	Gross	Power Diagnostix
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Saif	Hossain	Trench Limited
Member	John	John	Virginia Transformer Corp.
Member	Ken	Klein	Grand Power Systems
Guest	Jason	Lambert	JST Power
Member	Moonhee	Lee	Hammond Power Solutions

Annex D

Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Colby	Lovins	Federal Pacific Transformer
Guest	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Guest	Kenneth	McKinney	UL LLC
Member	Rhea	Montpool	Schneider Electric
Guest	Andre	Moreno	Siemens Energy
Guest	Jerry	Murphy	Reedy Creek Energy Services
Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Member	Shawn	Nunn	Hitachi ABB Power Grids
Guest	Tommy	Nunn	JST Power
Guest	Caroline	Peterson	Xcel Energy
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Chris	Powell	Intermountain Electronics
Member	Thomas	Prevost	Weidmann Electrical Technology
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Adnan	Rashid	Measurement Canada
Guest	Alberto	Sandoval Moreno	EATON Corporation
Member	Manish	Saraf	Hammond Power Solutions
Member	Michael	Sharp	Trench Limited
Member	Brian	Sonnenberg	Instrument Transformers, LLC
Secretary	David	Stankes	3M
Member	Kerwin	Stretch	Siemens Energy
Guest	Matthew	Sze	Omicron Electronics
Guest	Chris	Talbert	JST Power
Guest	Erik	Tarango	Olsun Electrics Corporation
Guest	Valeriu	Tatu	Powersmiths International
Member	Joseph	Tedesco	Hitachi ABB Power Grids
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Guest	Guang	Yuan	Hitachi Energy

