

Annex D Dry Type Transformers Subcommittee

November 17, 2021

Virtual Meeting

Chair: Casey Ballard

Vice-Chair: David Walker

Secretary: Dave Stankes

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

The Dry-type Transformers Subcommittee (DTS) met virtually on November 17, 2021 at 12:55 PM (CST).

No individual introductions were made, but Chair reminded participants to announce one's name and affiliation prior to speaking at this virtual meeting.

Chair welcomed David Walker as the new DTSC Vice-Chair as well as four new members to the DTSC. Chair also described the requirements to become a member as well as best process for requesting membership with considerations for doing this electronically as we meet less frequently in person.

Chair reminded WG and TF Chairs that copyright slides must be shown at the beginning of each meeting. We can openly share inside of the IEEE Transformers Committee, but we cannot share or display any other documents without first getting written approval.

It was encouraged to hold TF/WG meetings between our Spring/Fall sessions to accelerate progress. If a WG or TF Chair would like to hold a meeting, information regarding the meeting should be shared in advance via AMS and posted on the IEEE Transformer Committee website (facilitated by Sue McNelly). Reminded leaders that attendance and meeting minutes must be documented. These could be part of the following Fall/Spring SC submittal for approval.

The Chair reminded leaders the need for maintaining an accurate roster to ensure quorums are reached and business can be conducted. Reviewed guidelines for maintaining membership including regular attendance as well as participation at meetings. Recommended that if a chair is considering changing a member's status to "guest" that he/she reach out the individual to consider any extenuating circumstances.

Chair reviewed the requirements and content expected to be included into WG/TF minutes. Due to the decision to conduct the Fall meeting virtually and the resulting rescheduling to November, the Chair reminded WG/TF leaders there was less time to prepare and submit minutes. As the AMS system is scheduled no longer be available after December 31, 2021 he encouraged leaders to enter attendance into the system prior to that date.

The meeting was convened with 47 people in attendance 25 of the 33 members of the DTS were present, so quorum was reached. Two guests requested membership. Qualifications for those requesting membership will be reviewed by the Chair and Secretary. Notification e-mails will be sent to those who meet membership requirements The attendance roster will be recorded in the AMS.

Motions to entertain the approval of the Agenda and the Spring 2021 DTSC Meeting minutes was proposed by Chair. Both Agenda (Motion to Approve – Tim-Felix Mai, 2nd – Chuck Johnson) and Spring 2021 minutes (Motion to Approve - Joe Tedesco, 2nd – David Walker) were unanimously approved.

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 PC57.16 – Dry Type Reactors Chair Art Del Rio

The working group for the revision of C57.16 met virtually in WebEx on Monday November 15, 2021, at 9:25 AM.

1. Introductions and Call for Patents

- The meeting was called to order at 9:25 AM by the WG Chair Art Del Rio.
- The meeting was opened with the introduction of participants.
- The WG Chair, Art Del Rio, did a call for potentially essential patents. None was reported.

2. Verification of Quorum

- The attendance was checked with a Poll.
- There was a total of 27 participants: 8 Members and 20 Guests out of which no guest requested membership.
- 8 of the current 15 WG Members were present and quorum to carry out business was met.
- The meeting agenda, which was circulated by email among members and guests on November 9, 2021, by email, was presented to the participants.
- There were no objections or comments, and the agenda was approved unanimously.

3. Approval of the minutes of the April 26, 2021, virtual meeting

- The minutes from the S21 virtual meeting, which were circulated on November 9, 2021, by email, were presented to the participants.
- Dave Caverly has provided a changed text regarding sync with IEC. With that change, the agenda was approved unanimously.

4. Continue to discuss and review

- Dave Caverly gave a presentation regarding the latest update/clean-up status with Annex B, Annex B-1 and Annex F.
- A week ago, the chair Art Del Rio distributed the latest versions of these Annexes.
- At the spring meeting it was concluded, after recommendations from the Switchgear Committee, that with a little bit of “clean-up” the Annexes would then be ready to go to Ballot. Dave Caverly has done the clean-up.

4.a Annex F – Informative, Circuit Breaker Transient Recovery Voltage Implications of Series Reactors

- Dave Caverly presented the latest draft.
- The changes have been mostly editorial and not so much technical.
- The title of Annex F has been changed to better reflect its content

- The format of Table F1, model values for PI model, has been changed to fit better in the text. Some units have been changed to be more convenient, e.g., H changed to mH, and F changed to pF.
- Most of clause F.3, TRV study, has been removed as this information is covered in IEEE C37.011 which is referenced in this Annex.
- Figure F.2 has been updated to show the current limiting reactor on both sides of the breaker. The text has been updated to also cover reactor on both sides of the breaker. This is after comment from Pierre Riffon.
- Alexander Gaun, commented that the capacitance calculation, shown in Clause F.2, is seldom used. Normally the capacitance to ground is simulated, e.g., with finite element simulations. The text will be updated to also state that simulations can be used to define the capacitance to ground.
- With these modifications, Annex F is ready to be balloted as part of the standard.
- Klaus Pointner made a motion to copy this updated Annex F into the draft standard. This motion was seconded by Ulf Radbrandt.

4.b Annex B - Normative, Specific requirements for dry-type air-core shunt capacitor reactors

- Dave Caverly presented the latest draft.
- There have been few changes since the spring meeting.
- The plan at the beginning was to change Annex B as little as possible and to put new information in the newly created informative Annex B-1 instead.
- The text addresses the benefits of putting the TLI, paralleled by an arrester, on the neutral side of the capacitor. As worded, it unintentionally implies that the arrester is applied to reduce the required short circuit rating of the reactor. This was discussed. That would require very high energy of the arrester to withstand the fault current. Alternatively, and more likely, the arrester would be sacrificed in the event of bank flashover. Dave Caverly will develop revised text regarding the fault current aspect and review it with Pierre Riffon and Mike Sharp in advance of copying this updated Annex B into the draft standard.
- Klaus Pointner made a motion to copy this updated Annex B into the draft standard. This motion was seconded by Mike Sharp.

4.c Annex B1 – Informative. Application and Rating Aspects of Shunt Capacitor Reactors (TLI's)

- Dave Caverly presented the latest draft.
- Equation numbers must be corrected before inclusion into the draft standard.
- The text related to Figure 3c will be corrected regarding difference in cost to refer to only 3a instead of 3a and 3b.
- The text regarding the neutral side TLI and parallel arrester will be modified to be more clear (same as mentioned above regarding the similar text in Annex B). Dave Caverly, Mike Sharp and Pierre Riffon will together modify the text. modify the text (same as new text for Annex B).
- The overall factors in Table 1 were originally shown as 1.25 and 1.35 but were modified in the version of the document shown in the meeting to 1.24 and 1.36. Further checking after the meeting found that Annex B shows 1.25 and 1.35 and also that this is consistent with IEEE 1036-2010 and also IEEE C37.012 - 2014. Accordingly, after the meeting, the factors have

been changed back to 1.25 and 1.35. If needed this can be discussed again at the interim virtual meeting in December.

- The text regarding mechanical forces has been rewritten
- Figures and text are added to show components of inrush TLI fault current for different timings of fault occurrence, i.e., time (in electrical degrees) from voltage zero crossing until fault occurrence. Pierre Riffon provided these from simulations.
- Ulf Radbrandt made a motion to do the modifications and to copy Annex B-1 into the draft standard. This motion was seconded by Klaus Pointner.

5. Discussion

- Why do we have an Annex named B-1? Should it get its own letter, e.g., Annex G? There was some discussion but no clear consensus. No vote was taken (we were under time pressure to end the meeting). The reason to name it B-1 is that it is so tightly connected to Annex B. The Chair suggested that we keep the name Annex B-1 but we probably must correct names of clause, equations, figures, and tables to include “B-1”. It is also unsure if this will pass the MEC review. The Chair will investigate further with IEEE as we start the process of merging the revised and new Annexes back into the master document.
- We will try to have the document ready for Ballot before the spring 2022 meeting. Then it might be higher possibility to get a necessary PAR extension. To achieve this, we will need to have at least one virtual working meeting (and possibly two) before the spring meeting. We should have the timeline for the Ballot when we request the PAR extension.
- The rest of the standard will be distributed for review among WG members.
- The next working meeting is scheduled for December 14. Art Del Rio will send an invitation. All members should try to attend the extra working meetings in order to get quorum.

5. New Business

- There was no new business.

6. Adjournment

- The meeting was adjourned at 10:48 AM.

Next meeting:

Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

F21 Attendance list and membership status.

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Energy
Guest	Edmundo	Arevalo	Bonneville Power Administration
Vice-Chair	David	Caverly	Trench Limited
Chair	J. Arturo	Del Rio	Siemens Energy
Member	Alexander	Gaun	Coil Innovation GMBH
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Solomon	Chiang	The Gund Company
Member	Sylvain	Plante	Hydro-Quebec
Guest	Sami	Debass	Electric Power Research Institute (EPRI)

Guest	Thomas	Falkenburger	Coil Innovation USA, Inc.
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Rob	Ghosh	General Electric
Secretary	Ulf	Radbrandt	Hitachi Energy
Guest	Andrea	Glynn	Xcel Energy
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Guest	Kurt	Kaineder	Siemens Energy
Guest	Ken	Klein	Grand Power Systems
Guest	Aniruddha	Narawane	EATON Corporation
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Livia	Neeson	Entergy
Guest	Paulette	Payne-Powell	Retired
Guest	Caroline	Peterson	Xcel Energy
Guest	Patrick	Rock	American Transmission Co.
Guest	Ullises	Rodriguez	Grand Power Systems
Member	Michael	Sharp	Trench Limited
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Michael	Warntjes	American Transmission Co.
Guest	Helena	Wilhelm	Vegoor Tecnologia Aplicada
Guest	Terry	Wong	Trench Limited

Respectfully submitted,
 Chairman: Art Del Rio (a.delrio@ieee.org)
 Secretary: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Chair Casey Ballard reminded the WG that the current PAR expires at the end of this year. Art explained that the WG plans to accelerate work, with a planned meeting for December 14th in order to get document ready for SA Ballot. Once the document is in SA ballot a PAR extension will entered. Chair reminded the team that the SC must approve the request for PAR extension but this most likely not be a problem if good progress continues to be made.

D.2.2 Revision of IEEE C57.12.52 Sealed Dry-type Chair Joe Tedesco

The Working Group met virtually over Webex on November 15, 2021. The meeting was called to order at 10:51 AM CST by Chair Joseph Tedesco.

Patent call was given. Slides were sent out before the meeting. Nobody responded to patent call. Copyright policy info was shown.

Membership List was shown, and a poll was taken to determine attendance. Poll Results were: Members- 9 of 13 were present. Quorum achieved. 12 guests present. 3 other guests arrived after the poll was taken.

Chuck Johnson moved to accept the agenda as written. Tim-Felix Mai Seconded. No discussion and unanimous approval. David Walker moved to accept the minutes as written, Chuck Johnson seconded. No discussion and unanimous approval.

Old Business:

Review of Bibliography- Joe retitled standards whose name has changed (ANSI to IEEE for example) since the last revision. Discussion around whether the references add useful information to the reader of the standard, and suggested that if references are not useful, they should be deleted. Casey Ballard mentioned that C57.12.50 was withdrawn and should be removed from the bibliography. Mentioned that references that are not normative should be in the bibliography only, but that editorial review should fix any errors. David Walker moved to accept the changes to the bibliography as marked up on screen (see screenshot below). Chuck Johnson seconded. No discussion and unanimous approval.

The screenshot shows a document with a 'Bibliography' section. The text is as follows:

3 **Bibliography**

4 Bibliographical references are resources that provide additional or helpful material but do not need to be
5 understood or used to implement this standard. Reference to these resources is made for informational use
6 only.

7 [B1]—ANSI C57.12.50, American National Standard Requirements for Ventilated Dry-Type Distribution
8 Transformers 1 to 500 kVA, Single-Phase, and 15 to 500 kVA, Three-Phase with High-Voltage 601–34500
9 Volts, Low-Voltage 120–600 Volts⁷

10 [B2]—ANSI C57.12.51, American National Standard Requirements for Ventilated Dry-Type Distribution
11 Transformers, 501 kVA and Larger, Three-Phase with High-Voltage 601 to 34500 Volts, Low-Voltage
12 208Y-120 to 4160 Volts, General Requirements

13 [B4][B1]—ANSI/NEMA C84.1, Electric Power Systems and Equipment—Voltage Ratings (90
14 Hertz)³

15 [B4]—ANSI/ASME B1.1, American National Standard for Unified Inch Screw Threads (UN and UNR
16 Thread Form)⁶

17 [B2] [ANSI B2.1], American National Standard for Basic Standard for Steel Pipe Threads.

18 [B4][B3]—IEEE Std C57.12.51™, IEEE Guide for Mechanical Interchangeability of Ventilated Dry-
19 Type Transformers.

20 [B4][B4]—IEEE Std C57.94™, IEEE Recommended Practice for Installation, Application,
21 Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers.¹²

22 [B7][B5]—IEEE Std C57.105™, IEEE Guide for Application of Transformer Connections in Three-
23 Phase Electrical Distribution Systems.

24 [B4][B6]—IEEE Std C62.2™, IEEE Guide for Application of Gapped Silicon-Carbide Surge
25 Arresters for Alternating-Current Systems.

26 [B4][B7]—IEEE Std C62.22™, IEEE Guide for the Application of Metal-Oxide Surge Arresters for
27 Alternating-Current Systems.

A comment from Joseph L. Tedesco is visible on the right side of the page, stating: "Joseph L. Tedesco: 3 minutes ago. Move to normative references." There are 'Reply' and 'Revoke' buttons below the comment.

New Business

Tim-Felix Mai suggested that the definitions for BIL and GNAN be removed from the definitions in this standard because they are already defined in C57.12.80. Roger Wicks mentioned he had a negative ballot comment because he didn't define terms already in C57.12.80. Chuck Johnson mentioned that C57.12.01 also gives full definition of cooling classes. Question was brought up about what happens if C57.12.80 conflicts C57.12.01. Tim-Felix Mai mentioned that these acronyms in C57.12.80 were owned by the Dry-Type Subcommittee going forward. C57.12.80 will probably be revised in 2022. Could we establish precedence of C57.12.01 over C57.12.80? David Walker moved to remove section 3.2. Tim-Felix Mai seconded. No discussion and unanimously approved.

Why are pad-mounted transformers excluded from the scope of the standard? Only known reason is that it was previously excluded. Chuck Johnson mentioned that pad-mounted sealed transformers had already been built. The only downside to removing the pad mount exception is the need to update the PAR. Can remove the exception without adding discussion to the standard of pad mounts. Casey Ballard moved to remove Section 1.1(d) (pad-mounted transformers) from exception list and revise the PAR. David Walker seconded. Not required to be DOE compliant. Removal would require approval of the Dry-Type Subcommittee. Discussion about the requirements of C57.12.34 such as tank construction, etc. Poll for vote on this motion: 10 for, 0 against, 1 abstain. Motion passed. Tim-Felix Mai moved to remove exclusion 1.1(e) (liquid immersed transformer) from the exclusion list. David Walker seconded. 7 approve, 2 against, 0 abstain. Motion passed.

Casey Ballard suggested using an email vote to go to ballot in the Working Group and the referral to the Subcommittee.

Joe Tedesco adjourned the meeting at 12:02 pm CST.

Chair: Joseph Tedesco

Secretary: David Walker

Following the presentation of the meeting minutes, Joe Tedesco proposed a motion requesting DTSC approval to submit a PAR revision reflecting the agreed upon change in scope approved during the WG meeting. (Not change

to the Title and Purpose.) The motion was seconded by Chuck Johnson. No comment or discussion was heard, and the motion passed unanimously.

The revised scope that will be submitted in the PAR revision is shown below.

<u>CURRENT APPROVED PAR SCOPE</u>	<u>PROPOSED REVISED PAR SCOPE</u>
<p>1. Scope</p> <p>This standard describes electrical and mechanical requirements of single and polyphase sealed dry-type distribution and power with a voltage of 601 V or higher in the highest voltage winding.</p> <p>This standard applies to all sealed dry-type transformers, including those with solid cast and/or resin-encapsulated windings except as follows:</p> <p>a) Transformers described as exceptions in IEEE Std. C57.12.01</p> <p>b) Ventilated transformers</p> <p>c) Nonventilated transformers</p> <p>d) Pad-mounted transformers</p> <p>e) Liquid-immersed transformers</p>	<p>1. Scope</p> <p>This standard describes electrical and mechanical requirements of single and polyphase sealed dry-type distribution and power with a voltage of 601 V or higher in the highest voltage winding.</p> <p>This standard applies to all sealed dry-type transformers, including those with solid cast and/or resin-encapsulated windings except as follows:</p> <p>a) Transformers described as exceptions in IEEE Std. C57.12.01</p> <p>b) Ventilated transformers</p> <p>c) Nonventilated transformers</p>

d) and e) will be deleted

Attendance on November 15th meeting:

Role	First Name	Last Name	Company
Member	Robert	Ballard	DuPont
Guest	Larry	Dix	Quality Switch, Inc.
Guest	Derek	Foster	Magnetics Design, LLC
Guest	Rob	Ghosh	General Electric
Guest	Michael	Gonzales	Southern California Edison
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Member	Charles	Johnson	Hitachi Energy
Guest	Ken	Klein	Grand Power Systems
Guest	Deepak	Kumaria	Applied Materials
Member	Colby	Lovins	Federal Pacific
Member	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Guest	Richard	Marek	Retired
Guest	Manoj Kumar	Mishra	ASAssoft (Canada) Inc
Guest	Aniruddha	Narawane	EATON Corporation
Member	Shawn	Nunn	Hitachi Energy
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Ullises	Rodriguez	Grand Power Systems
Guest	Manish	Saraf	Hammond Power Solutions
Guest	Justin	Shrewsbury	AMR PEMCO
Member	David	Stankes	3M
Chair	Joseph	Tedesco	Hitachi Energy
Secretary	David	Walker	MGM Transformer Company
Guest	Roger	Wicks	DuPont

D.2.3 Revision of IEEE PC57.134 Hottest Spot Temp in Dry Type Trans. Chair Colby Lovins

Chair: Colby Lovins

Vice-Chair/Secretary: Juan Pablo Medina (absent)

Acting Secretary: Joseph Tedesco

This was the first meeting of the IEEE C57.134 Working Group. The meeting was held virtually on November 15th via Webex and Colby Lovins called the meeting to order at 2:21 PM.

While there were 24 people present in the meeting, only 20 were present at the time of the quorum poll. 15 of the attendees requested membership. With this being the first meeting of the Working Group, there was automatically a quorum, and business could proceed.

There was no objection to unanimous approval of the agenda. The patent slides were shown, and the copyright policy was discussed. There were no essential patent claims.

Old Business:

- Colby Lovins reviewed the PAR that had been approved.

New Business:

- Colby discussed the plan to split up the work amongst task forces to handle different sections and asked for volunteers.
 - Normative references/definitions/bibliography: Dave Stankes, Tim-Felix Mai
 - Temperature measurement: Shawn Nunn
 - Determination of the winding hottest spot temperature: Joe Tedesco
 - Temperature measurement methodology: Chuck Johnson
- Colby began reviewing Draft 1.
 - Section 3
 - Colby would confirm with Malia Zaman that mention of C57.12.80 could be added to boilerplate text in Definitions section.
 - Roger Wicks asked if the average winding rise method was the same in dry as in liquid, and Chuck Johnson described his experiences with sealed dry transformer. Tim-Felix Mai confirmed that the definition in C57.12.80 would be adjusted to include both types. Further discussion would be tabled until after the task force had recommendations.
 - Section 4
 - Chuck Johnson disagreed with the statements about the accuracy of the thermocouples and suggested changing the wording to highlight that some thermocouples were less susceptible to negative effects. Manish Saraf discussed the need to include insulation on temperature sensors or highlight optical sensors. Chuck Johnson agreed and pointed out that there were ways to mitigate problems. Manish and Chuck also discussed how the height must be considered, as well as different constructions.
 - Section 5

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- There was a short discussion about the factors that affect the temperature measurement. Joe Tedesco pointed out that the surrounding ambient affected the winding temperature rise, with Casey Ballard questioning how the list compared to C57.12.01. His stance was that the list should be more extreme than that for production units.
- Manish Saraf and Chuck Johnson discussed models, with Chuck adding the history and intent of the section on models (the intent was not about simulations, but by ensuring that test models reflect actual production units, so that thermal models were accurate).
- Manish also mentioned how the values of n used in calculations showed inconsistencies in usage (between IEEE and IEC standards and between IEEE standards). It was decided to let the C57.12.91 Working Group eventually deal with this.

Colby stated his desire to go to ballot prior to the expiration of the standard, which is at the end of 2023. There would be virtual meetings in between the larger meetings to help make this possible.

The next meeting will be an interim meeting, with the date TBD. However, the date but will be prior to the Spring Meeting on March 28, 2022. This meeting will be held virtually.

The meeting was adjourned at 3:32 PM CST.

Attendance

Role	First Name	Last Name	Company
Member	Robert	Ballard	DuPont
Guest	Solomon	Chiang	The Gund Company
Member	Rob	Ghosh	General Electric
Member	Charles	Johnson	Hitachi Energy
Member	Ken	Klein	Grand Power Systems
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Chair	Colby	Lovins	Federal Pacific
Member	Tim-Felix	Mai	Siemens Energy
Member	Shawn	Nunn	Hitachi Energy
Member	Caroline	Peterson	Xcel Energy
Guest	Chris	Powell	Intermountain Electronics
Member	Afshin	Rezaei-Zare	York University
Guest	Ullises	Rodriguez	Grand Power Systems
Member	Manish	Saraf	Hammond Power Solutions
Guest	Peter	Sheridan	SGB USA, Inc.
Member	David	Stankes	3M
Member	Joseph	Tedesco	Hitachi Energy
Guest	Kiran	Vedante	Ritz Instrument Transformers
Member	Roger	Wicks	DuPont

Chair: David Stankes

Vice-Chair/Secretary: Joseph Tedesco

This was the second meeting of the IEEE 259 Working Group. The meeting was held virtually via Webex and Dave Stankes called the meeting to order at 3:45 PM.

Dave advertised the open position of Secretary. There were no immediate volunteers, but Dave invited anyone interested to contact him.

There were 23 people present in the meeting. There were 13 members and 10 guests. No one requested membership. The Working Group had 17 members; therefore, a quorum was reached, and business could proceed.

There was no objection to unanimous approval of the agenda and there was no objection to unanimous approval of the minutes from the Spring 2021 Working Group meeting. The patent slides were shown, and the copyright policy was discussed. There were no essential patent claims.

Old Business:

- Dave Stankes briefly discussed the Task Force structure of the working groups and reviewed who had volunteered.
- Colby Lovins (TF Lead) discussed Normative References, stating that they were waiting for more work to be done on the standard.
- Tim-Felix Mai (TF Lead) recommended that a Definitions section be added and reference C57.12.80, using the boilerplate text from other standards.
- Casey Ballard (TF Lead) discussed the Insulation Test Specimens, including the plan to include circulating current aging in addition to oven aging. Sasha Levin inquired why actual LV transformers which are typically smaller in size should not be used. Ed Van Vooren and Solomon Chiang joined the discussion and Ed commented on how the use of different types of test specimens would not affect how the overall test method is conducted and that models needed to remain part of the standard to avoid invalidating decades of LV insulation system test data and approvals.
- Ed Van Vooren (Provided update due to TF Lead Juan Medina not being able to attend) gave a review of the current status for context before discussing the Test Methodology and detailed identification of areas in need of improvement. Casey Ballard asked whether model test objects can adequately evaluate wrapped conductor as the ability to evaluate LV Electrical Insulation systems incorporating this type of insulation. Solomon Chiang remarked that most units that would use these systems are Class B (135°C) or F (155°C) or possibly H (180°C), which is why enameled conductors is sufficient.
- Roger Wicks gave a short update on the Interpretation of Data and the plan to incorporate some of the information in other Electrical Insulation System standards into IEEE 259

New Business:

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- Dave Stankes stated that his plan was for the individual Task Forces to meet (hopefully) twice between now and the Spring Meeting with the intent of preparing a new working draft incorporating many of the needed changes already identified by the TF's that can be shared with larger WG at the Spring 2022 meeting.

The date of the next meeting for the whole Working Group will be either March 28 or March 29, 2022. That meeting will be in either Denver, Colorado or virtually.

The meeting was adjourned at 4:57 PM CST.

Joseph Tedesco – Secretary (Prepared meeting minutes)

Dave Stankes - Chair

First

Name	Last Name	Affiliation
Robert	Ballard	DuPont
Solomon	Chiang	The Gund Company
Derek	Foster	Magnetics Design, LLC
Rob	Ghosh	General Electric
Charles	Johnson	Hitachi Energy
Ken	Klein	Grand Power Systems
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Colby	Lovins	Federal Pacific
Tim-Felix	Mai	Siemens Energy
Aniruddha	Narawane	EATON Corporation
Chris	Powell	Intermountain Electronics
David	Stankes	3M
Joseph	Tedesco	Hitachi Energy
Edward	Van Vooren	ELTEK International Laboratories
Roger	Wicks	DuPont
Malia	Zaman	IEEE
Ullises	Rodriguez	Grand Power systems
Kurt	Carlson	V&F Transformer
Dan	Sauer	EATON Corporation
Caroline	Peterson	Xcel Energy
Feras	Fattal	Manitoba Hydro
Rhea	Montpool	Schneider Electric

D.2.5 Revision for IEEE C57.96 Loading Guide

Vice Chair Mike Iman

- Meeting called to order 11/16/21 at 12:55 by the Chair
- All participants were notified that the meeting was being recorded for the purpose of taking notes but would be deleted after the meeting minutes are completed.

- 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 16 members present.
 - A small number of attendees stated that they had requested membership in the previous meeting but were not shown in the membership roster. The Secretary will investigate this discrepancy and correct any errors.
- The chair shared the WG Meeting Agenda. The agenda was approved unanimously without discussion.
- The chair shared the Meeting Minutes from the Spring 2021. The minutes were approved unanimously without discussion.
- The framework for evaluating the Draft that was created in the Spring 2021 meeting was reused to guide the discussions:

TF or Subgroups for review of Draft D1

	Clause to Review	Sections	Volunteer
1	Normative Reference, Definitions and Overview	2, 3, 4	Joe Tedesco, Tim-Felix Mai, Colby Lovins, Dave Stankes, Aleksandr Levin
2	Loading Equations	5	David Walker, Ryan Hoog, Manish Saraf, Justin Shrewsberry
3	Loading Based on Life Expectancy	6	Roger Wicks, Chuck Johnson
4	Annex B (Update programming to latest platform)	Annex B	Chuck Johnson
5	Annex C (Example Calculations)	Annex C	Hemchandra Shertukde

- Draft D1 was shared on screen with the membership.
- It was suggested to remove definitions as this is already covered by C57.12.80. Further it was decided to re-use the wording from C57.12.01 regarding definitions which reads –

“For the purposes of this document, the following terms and definitions apply. The IEEE Standards Dictionary Online should be consulted for terms not defined in this clause.11 Standard transformer terminology, which is available in IEEE Std C57.12.80,12 shall also apply.
- This proposal was accepted by the participants without discussion.
- In section 4.1 “General Information” the question was raised if C57.12.56-1986 should be kept in Draft due to its age and status. Main discussion points were –
 - C57.12.60 (already mentioned in draft) is the replacement
 - C57.12.56 still contains valid data and is widely used \ referenced in industry
 - C57.12.56 was the basis for several 3rd Party certification bodies

- Mike Iman (MGM) made a motion that the reference to C57.12.56 remain in the Draft as is the current status quo. The motion was seconded by Chuck Johnson (Hitachi) and passed with 10 voting “FOR”, 1 “AGAINST” and 1 “ABSTAIN”

- Section 4.2 “Transformer Life Expectancy” was shown and reviewed with no comments or discussion.

- Section 4.3 “Transformer Rated Output” was shown and reviewed with no comments or discussion.

- Section 4.4 “Aging of Insulation” was shown and had several points of discussion –
 - It was questioned if “Loading” should be added to line 15 along with time and temperature?
 - It was noted the plot of transformer life only uses the two axis of time and temperature
 - At a basic level the temperature is (mostly) a function of the load
 - It was mentioned that other factors – dielectric, mechanical, harmonic, environmental, etc.can influence the the aging of the materials. The group agreed that these are important influencers but are out of scope for a “Loading Guide”
 - It was decided that current text, referencing only time and temperature as factors should be left as is.

- Section 4.5 “Ambient Temperature” was shown and reviewed with no comments or discussion.

- Section 5 “Loading Equations” and a lengthy discussion regarding the variable and definition for the temperature rise took place. This was compared against several other standards (C57.12.91, C57.134). In the end it was agreed that no changes were necessary.
 - It was suggested that the exponent “K” be reviewed and compared against C57.12.91 and aligned if feasible. Specifically the allowance for other constants to be used based on manufacturer data. Group 2 will take this task and report at the next meeting.
 - Further, it was suggested to take a look at IEC 60076-12 for “inspiration” on how the wording and descriptions for the variables could be shortened \ simplified.

- A motion to adjourn was made at 21:16 by Roger Wicks and seconded by Tim-Felix Mai. Motion passed and the Chair adjourned the meeting.

- Next meeting: Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

FALL 2021 Meeting Attendance

Role	Last Name	First Name	Affiliation
Guest	Ante	Greg	Southern California Edison
Member	Ballard	Robert (Casey)	DuPont
Guest	Blackburn	Gene	Gene Blackburn Engineering
Guest	Chiang	Solomon	The Gund Company
Member	Debass	Sami	Electric Power Research Institute
Guest	Gonzales	Michael	Southern California Edison
Member	Hernandez	Giovanni	Virginia Transformer
Vice-Chair	Iman	Mohammad (Mike)	MGM Transformer
Member	Johnson	Charles (Chuck)	Hitachi Energy
Member	Klein	Ken	Grand Power Systems
Member	Lee	Moonhee	Hammond Power Solutions
Member	Lovins	Colby	Federal Pacific
Member	Mai	Tim-Felix	Siemens Energy
Member	Marek	Richard	Retired
Guest	Martinez	Rogelio	Georgia Transformer
Guest	Montpool	Rhea	Schneider- Electric
Chair	Narawane	Aniruddha	EATON Corporation
Member	Nunn	Shawn	Hitachi Energy
Guest	Patel	Vinay	Consolidated Edison Co. - NY
Guest	Peterson	Caroline	Xcel Energy
Member	Powell	Chris	Intermountain Electronics
Guest	Rodriguez	Ulises	Grand Power Systems
Guest	Roizman	Oleg	IntellPower Pty. Ltd.
Member	Saraf	Manish	Hammond Power Solutions
Member	Shertukde	Hemchandra	University of Hartford
Guest	Shrewsbury	Justin	PEMCO
Guest	Stankes	Dave	3M
Secretary	Stretch	Kerwin	Siemens Energy
Member	Tedesco	Joseph	Hitachi Energy
Guest	Tekin	Dervis Serhat	Hubbell Power Systems
Guest	Verdolin	Rogério	Verdolin Solutions, Inc.
Guest	Walia	Sukhdev	New Energy Power Company
Guest	Walker	David	MGM Transformer
Member	Wicks	Roger	DuPont

Chairman: Aniruddha Narawane
 Vice-Chairman: Iman Mohamed
 Secretary: Kerwin Stretch

D.2.6 Revision for IEEE C57.124 Partial Discharge**Dr. Shertukde**

Chair: Tom Prevost; absent for this meeting

Co-Chair: Rick Marek; acting as Chair for this meeting

Secretary: Hemchandra Shertukde, will take minutes and report before SC meeting November 17, 2021

- 1) Meeting started by Acting Chair at 3:20 pm and agenda for the meeting displayed to all. Co-Chair and Secretary introduced themselves as Officers of this WG.
- 2) The essential patent issues statement was displayed, and attendees were queried if anyone is aware of any such issues? None was affirmed by the participants.
- 3) IEEE Copyright policy statement slide was displayed and shared by the co-chair with all attendees.
- 4) Poll to assess 'Attendance of all participants' at the meeting was conducted at 3:26 pm. Results revealed the following:

Member: 13

Non-Member: 12

No answer: 1

Guests/No answer: 4

Total Attendees: 30

Present membership of this WG: 16

Quorum was met.

- 5) Agenda was approved
- 6) Unapproved Minutes of Virtual Meeting of this WG from Spring 2021 were approved.
- 7) Review of Draft D.1 created so far was conducted
 - a. Review of Scope and Purpose were revisited
 - b. Detlev Gross made a presentation of tutorial material to possibly be included in Annex
 - c. Task Force Chairs of TF 1, TF 3 and TF 4 were asked to wait until Draft 2 is circulated before their review
- 8) Chair queried if the WG wants to include Bushings in the document. The diagrams could be included in the Annex. He intends to create a Draft D.2 before Christmas, and he will keep the figures on bushings in the Annex as a place keeper for now. However, it was decided that in general only the coils are tested, even if the unit has bushings. The one exception is sealed dry type units which are very much like liquid immersed units, but without the liquid.
- 9) Different methods of testing were discussed and queried by J Tedesco and Sergio Cano. Appropriate answers provided by Detlev Gross.
- 10) The Chair asked about the 1991 circuit diagrams and if they were still valid. Detlev Gross said they were outdated and no longer applied. He questioned why more PD test equipment manufacturers were not present and if they could provide generic test circuits that could be included in the document. Further, several members volunteered to provide diagrams for testing.
 - a. Dan Sauer, Alex Kraeje and Sergio Cano volunteered to provide asap.
 - b. Rick Marek provided his email to send him all this information: rick.marek@gmail.com
- 11) New Business queried, no response from attendees
- 12) Meeting adjourned at 4:30 pm

Respectfully submitted

Hemchandra Shertukde, Ph.D., P.E

Secretary, WG C. 57.124

Attendance

Robert	Ballard	DuPont	Member
Alain	Bolliger	HV TECHNOLOGIES, Inc.	Guest
Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.	Member
Kurt	Carlson	V&F Transformer	Guest
Juan Alfredo	Carrizales Baaldua	Prolec	Guest
Jaroslav	Chorzepa	ABB Inc.	Guest
Feras	Fattal	Manitoba Hydro	Guest
Rob	Ghosh	General Electric	Guest
Detlev	Gross	Power Diagnostix Consult GmbH	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Guest
Mohammad	Iman	MGM Transformer Company	Member
Charles	Johnson	Hitachi Energy	Member
Ken	Klein	Grand Power Systems	Guest
Alexander	Kraetge	OMICRON electronics Deutschland GmbH	Guest
Tim-Felix	Mai	Siemens Energy	Member
Richard	Marek	Retired	Vice-Chair
Emilio	Morales-Cruz	Qualitrol Company LLC	Member
Shawn	Nunn	Hitachi Energy	Guest
Caroline	Peterson	Eaton	Guest
Chris	Powell	Intermountain Electronics	Guest
Ulises	Rodriguez	GTI Power Acquisition LLC	Guest
Dan	Sauer	Eaton	Guest
Pugal	Selvaraj	Virginia Transformer Corp.	Guest
Hemchandra	Shertukde	University of Hartford	Secretary
Fabian	Stacy	Hitachi Energy	Guest
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Member
Joseph	Tedesco	Hitachi Energy	Member
David	Walker	MGM Transformer Company	Member
Roger	Wicks	DuPont	Member
Alexander	Winter	Highvolt	Guest

D.2.7 TF IEEE C57.12.01 Dry Type General Requirements Chair Casey Ballard

The meeting was called to order at 12:55 PM CST by Chair Casey Ballard.

Chair made opening comments and leaders of the TF were introduced.

This is the second meeting of the new TF to prepare PAR request for the next round of IEEE C57.12.01 continuous revision.

The meeting was convened with 28 participants, 18 TF members and 9 guests. There are 23 members (that requested the membership at the first TF meeting) in the TF currently and meeting quorum was

established. Chair noted that, as the work of TF shall be wrapped up, we are not accepting new members at this point (of course, the WG will be open for membership applications once the PAR is approved). The list of attendees is presented at the end of this report. The attendance will be reported in the AMS.

The Meeting Agenda was reviewed.

Motion: “approve the agenda”, moved by K. Stretch, seconded by C. Lovins, approved unanimously.

The Unapproved Minutes of the Spring 2021 meeting was reviewed

Motion: “approve the Spring 2021 Meeting Minutes”, moved by A. Narawane, seconded by T-F. Mai, 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 used the attached presentation to guide the meeting:



IEEE C57-12-01 Fall
21.pptx

Old Business

- Title

- Title “Draft Standard for General Requirements for Dry Type Distribution and Power Transformers” has been approved as is during the Spring 2021 TF meeting.

The following is *Dry Type Transformers SC poll results- taken via email with a quorum of the SC (25 responses from a total of 33 members)*.

- Scope

Several aspects were brought to the Dry Type Transformers SC poll.

“Do you support the proposal that the Dry-Type Transformer Subcommittee should increase the scope of IEEE C57.12.01/IEEE C57.12.91 into the Low Voltage transformer market by covering voltages below 601V?” – poll results: No 53%, Yes 44%, Abstain 4%. **Will not be included in the Scope.**

- Drive Transformers

- Proposed definition: “A transformer that is interposed between the incoming power system and a motor drive. The input of a motor drive is typically a set of passive or active rectifiers that subject the drive transformer to significant harmonic load currents. Drive transformers also typically have multiple, phase-shifted, secondary windings to provide reduction of the harmonic load currents as seen by the input power system to minimize power system noise”.

After discussion “also typically have” was substituted with “may have”.

- Poll results on the inclusion of the definition for drive transformers and adding them to the exclusion list in the Scope: Yes 64%, No 32%, Abstain 4%. **Definition will be included in the standard.**

- Inverter Transformers

- Proposed definition: “A transformer that is interposed between the incoming power system and an inverter or group of inverters. The inverter(s) typically provide a load to the transformer that contains harmonic currents as well as high speed, switching currents. Additionally, inverter transformers are often connected to multiple inverters with a single secondary winding per inverter. Inverter transformers may be subject to bi-directional loads on individual or multiple secondary windings”.

Discussion on the definition – **shall be refined in the WG.**

- Poll results on the inclusion of inverter transformers and adding them to the exclusion list in the Scope: Yes 68%, No 28%, Abstain 4%. **Definition will be included in the standard.**

- Note Text

Note “Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer”.

The Note has been discussed.

Motion: “keep the Note as is”, moved by D. Walker, seconded by C. Johnson, approved unanimously.

- Purpose

- “This standard is intended to serve as a basis for the establishment of performance, interchangeability requirements of equipment described, and for assistance in the proper selection of such equipment”.

The purpose was discussed.

Motion: revise as “This standard is intended to serve as a basis for the establishment of the requirements for the performance and interchangeability, and for assistance in the proper selection of the equipment described”, moved by C. Johnson, seconded by J. Tedesco, approved unanimously.

New Business

- PAR vote

Motion: “approve the Title, Scope and Purpose of the standard and submit to Dry Type Transformer Committee for PAR approval”, moved by A. Narawane, seconded by C. Johnson, approved unanimously.

Action: the Chair shall seek the Dry-Type SC approval, and if successful, submit the PAR for revision in coordination with the Chair of IEEE C57.12.91.

Following the presentation of the above meeting minutes Casey Ballard made a motion requesting the approval from Dry-Type SC for submitting the PAR for revision in coordination with the Chair of IEEE C57.12.91. The motion was seconded by Chuck Johnson. No comment or discussion was heard, and the motion passed unanimously.

- Create list of the potential new topics to be addressed in the standard revision.
 - Solid cast pole mounted transformers.

We discussed to, maybe, consider separate standards. Keep on the list for the WG consideration.

T-F. Mai and J. Tedesco will provide the proposal on the topic.

- Environmental Requirements
 - Thermal Shock
 - Salt Fog
 - Fire Performance

Consider to include IEC definitions. T-F. Mai and J. Tedesco will provide the proposal on the topic.

- Online tap changers.

This topic is, probably, more about the testing (ask C57.91 to discuss and provide the feedback).

- Thermal calculations for short circuit – any updates from IEC?

There are differences in IEC and IEEE scope on this – IEC includes oil-immersed as well. So, this topic shall be considered in connection to the s.c. test procedure (not only thermal aspect).

- 100 kV class equipment

IEC doesn't standardize anything above 72.5 kV. If we go above 72.5 kV, it would hardly be in the distribution transformer group and we will need to introduce a more clear differentiation between power and distribution dry type transformers (e.g. HV test levels and equipment, etc.). In general, the industry doesn't have many examples of such HV designs that standard can draw information from. TF doesn't support inclusion of 100 kV class at this point.

- Impulse levels pending Dielectric Test SC report.

Casey will reach out to Dielectric Test SC to learn their latest decision on the impulse levels.

- Differentiation of Power vs Distribution transformers (like liquid filled).

See above. As a separate point, we shall consider positioning alternative energy dry-type transformers in the standard (shall be separately included or better to keep them in the specific alternative energy standard groups, like solar and wind transformers currently).

- Average Ambient Temperature harmonization with IEC.

T-F. Mai will provide the proposal on the topic. It was noted that this issue is related to all IEEE standards, not only C57.12.01.

- Remove the short circuit current limitation of 25 times (from SA ballot comments).

As mentioned above, review all aspects of s.c. test, including current limitation, consider C57.12.00 and IEC.

- Include 50Hz requirements wherever 60Hz currently appears in the document (from SA ballot comments).

This is already included in C12.91 (annex), anything else needed for this standard?

T-F. Mai, J. Tedesco and R. Montpool will prepare a discussion on this topic for the WG.

- Additional topics to consider: negative impulse test and associated test voltage levels; the class of outdoor ventilated transformers for the EV charging stations.

With no further business, the meeting was adjourned at 2:10 PM CT.

Chair: Casey Ballard
Secretary: Sasha Levin

Meeting Participants List

Charles	Johnson	Hitachi ABB Power Grids
Mohammad	Iman	MGM Transformer Company
Derek	Foster	Magnetics Design, LLC
Robert	Ballard	DuPont
Aleksandr	Levin	Weidmann Electrical Technology
Shawn	Nunn	Hitachi ABB Power Grids
Rob	Ghosh	General Electric
John	John	Virginia Transformer Corp.
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Kerwin	Stretch	Siemens Energy
Solomon	Chiang	The Gund Company
David	Walker	MGM Transformer Company
Tim-Felix	Mai	Siemens Energy
Rhea	Montpool	Schneider Electric
Ken	Klein	Grand Power Systems
Joseph	Tedesco	Hitachi ABB Power Grids
Sergio	Hernandez Cano	Hammond Power Solutions
Colby	Lovins	Federal Pacific Transformer
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Moonhee	Lee	Hammond Power Solutions
Manish	Saraf	Hammond Power Solutions
Rick	Marek	Retired
Livia	Neeson	Entergy
Dave	Stankes	3M
Michael	Haas	Instrument Transformers, LLC
Ulises	Rodriquez	Grand Power Systems
Weijun	Li	Braintree Electric Light Department

D.2.8 TF IEEE C57.94 Operation and Maintenance**Chair Dave Stankes**

The Task Force met virtual via WEBEX. The meeting was called to order at 8:00 AM by Vice-Chair David Stankes.

Vice-Chair made opening comments.

Poll for membership:

A. Member	10/17 (59%)
B. Non-member	4/17 (24%)
C. I'm not sure	1/17 (6%)
No Answer	2/17 (12%)

- 15 total participants
- 10 Members / guests requesting membership
- 5 guest

As this was the first meeting of the TF, a quorum was established.

TF Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees
3. Approval of agenda
4. Call for essential Patents & IEEE SA Copyright Policy review
5. Review of IEE C57.94-2015
6. PAR review and development discussion
7. Meeting Adjournment

The agenda was approved unanimously without discussion.

The vice-chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated. Copyright policy was discussed.

New Business:

- **PAR Review**
 - o **Title**
Latest title was shown and discussed.
Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers

Motion: Keep the title as it is by Casey, second: Colby → approved unanimously

- o **Scope**
Latest scope was shown and discussed.
Joe suggested to use the same wording for the exceptions as in C57.12.52 'Transformers described as exceptions in IEEE Std. C57.12.01'
Discussion about deleting the words 'single and polyphase' from the scope. To keep the scope in line with the other dry type documents the TF decided to keep the words in the scope.
The TF agrees that the order of the words 'application, installation, operation, and maintenance' should be the same as in the title.
Discussion about adding a note to the scope as in C57.12.01 ('NOTE—Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer.')

Scope of proposed standard:

This recommended practice covers general recommendations for the installation, application, operation, and maintenance of all single and polyphase ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers, including those with solid-cast and/or resin encapsulated windings **except transformers described as exceptions in IEEE Std. C57.12.01.** follows: a) Instrument transformers b) Step and induction voltage regulators c) Arc-furnace transformers d) Rectifier transformers e) Specialty and general purpose transformers f) Mine transformers g) Testing transformers h) Welding transformers

von Casey Ballard an alle: 3:22 PM

NOTE—Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer.

Motion: Change the scope as displayed (see above) with the note from the chat (see above) by Casey second: Colby → approved unanimously

New scope:

This recommended practice covers general recommendations for the installation, application, operation, and maintenance of all single and polyphase ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers, including those with solid-cast and/or resin encapsulated windings **except transformers described as exceptions in IEEE Std. C57.12.01.**

NOTE—Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer.

Motion: Approve the scope for the PAR by Chuck, second: Joe → approved unanimously

- Purpose

Latest purpose was shown and disused

Standards updated (change ANSI to IEEE Std, ANSI C57.12.50 was deleted)

The TF agrees that the order of the words ‘application, installation, operation, and maintenance’ should be the same as in the title.

The standards mentioned in the prose will be normative, so they be moved from the bibliography to the references

New Purpose:

TF discussed if the last sentence is needed or not. The group agreed to delete it

1. The recommended practice is intended for general use in the installation, application, operation, and maintenance of dry-type transformers manufactured in accordance with IEEE Std C57.12.01, ANSI C57.12.50 [B1], ANSI IEEE Std C57.12.51 [B2], and ANSI IEEE Std C57.12.52 [B3]. Familiarity with other standards applying to dry-type transformers and to their protection is assumed and the provisions of those standards are indicated herein only for clarity.

Motion to use the purpose for the PAR as displayed by Rob second: Chuck → approved unanimously

Motion: Approve the title scope and purpose and submit it to the Dry Type SC by Joe second: Chuck → approved unanimously

With no further business, the meeting was adjourned, without objection, at 9:15 PM.

Following the presentation of the meeting minutes, Dave Stankes made a motion requesting approval from the DTSC to submit a PAR for the revision C57.94 reflecting the agreed Title, Scope, and Purpose scope approved during the TF meeting. The motion was seconded by Colby Lovins. No comment or discussion was heard, and the motion passed unanimously.

The newly formed WG (provided PAR is approved) will meet again at the Spring 2022 meeting in Denver (Hyatt Regency, Conv. Center), Colorado USA, March 27 – 31, 2022.

Vice-Chair: David Stankes

Secretary: Tim-Felix Mai (Prepared Minutes)

Participation list:

First Name	Last Name	Company
Richard	Marek	Retired
Charles	Johnson	Hitachi Energy
Derek	Foster	Magnetics Design, LLC
David	Stankes	3M
Robert	Ballard	DuPont
Shawn	Nunn	Hitachi Energy
Rob	Ghosh	General Electric
Solomon	Chiang	The Gund Company
Tim-Felix	Mai	Siemens Energy
Ken	Klein	Grand Power Systems
Joseph	Tedesco	Hitachi Energy
Colby	Lovins	Federal Pacific
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Chris	Powell	Intermountain Electronics

D.2.9 IEEE TF C57.12.91 Dry type test code

Chair David Walker

The Working Group met virtually via WEBEX. The meeting was called to order at 3:45 PM by Chair David Walker.

Chair made opening comments.

All participants were notified that the meeting was being recorded for the purpose of taking notes but would be deleted after the meeting minutes are completed.

19 members, quorum =10

Poll for quorum:

- 35 total participants
- 18 members
- 3 no answer

A quorum was established.

The Fall 2021 agenda was approved unanimously without discussion.

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 IEEE_SA Copyright Policy. No discussion.

The Spring 2021 minutes were approved unanimously without discussion.

Mike Iman-MGM Transformers provided information that he attended the initial Task Force meeting at the Spring 2021 meeting but was not listed on the AMS member list for the Fall 2021 session. Chair added Mike as a member and will report the inaccuracy in the AMS attendance.

Old Business

- PAR DEVELOPMENT

- o C57.12.91 is currently Task Force and does not currently have a PAR.
- o TF previously agreed that C57.12.91 scope should align with C57.12.01 scope.
- o Casey Ballard, chair of C57.12.01, previously sent out a survey of proposed changes to the scope of C57.12.01.
 - Subcommittee voted to exclude Low Voltage, Inverter, and Drive transformers from the scope of C57.12.01 and C57.12.91.
- o Chair presented the previous edition of the PC57.12.91 Par for review

Discussion ensued about including a reference to C57.18.10 in the C57.12.91 standard since rectifier transformers had been removed from the PAR scope. It was determined that C57.18.10 was not currently being referenced by the standard. It was agreed that this reference should not be included in C57.12.91.

PAR SCOPE

Motion #1 was made by Colby Lovins , Second by Ken Klein

Proposal: Keep existing PAR scope wording with the addition of the following to the excluded transformers:

- i) Drive Transformers**
- j) Inverter Transformers**

Add the Note from the IEEE C57.12.01 standard—Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer.

No discussion

Vote for Motion #1 passed unanimously

20 FOR, 0 AGAINST, 0 ABSTAIN

PAR PURPOSE

Chair showed Purpose from previous par and asked for discussion.

Motion #2 was made by Ken Klein , Second by Sergio Hernandez Cano to adopt the previous PAR Purpose with no changes,.

No discussion

Vote for Motion #2 passed unanimously

19 FOR, 0 AGAINST, 0 ABSTAIN

Motion #3

Casey Ballard – motion to submit PAR to subcommittee for approval

Chuck Johnson – 2nd

Motion passed successfully

20 FOR, 0 AGAINST, 1 ABSTAIN

Chair will submit the proposed PAR to subcommittee.

Following the presentation of the above meeting minutes David Walker made a motion requesting the approval from Dry-Type SC for submitting the PAR for revision of C57.12.91 reflecting the agreed Title, Scope, and Purpose approved during the TF meeting. The motion was seconded by Colby Lovins. Roger Wicks asked for a point of clarification regarding whether the “Note” in the proposed scope should be included in the PAR. Casey Ballard

commented that a previous PAR for C57.12.01 contained a “Note” in the PAR and was approved as written. No comment or discussion was heard, and the motion passed unanimously.

New Business:

- **Topics for Consideration in new revision**
 - o **Temperature rise test**
 - Update exponents used in eqns. 25, 26, 27 and 42 (based on Hammond data)
 - Define “free from drafts”
 - AF Testing – Shut off fans or leave on
 - o **Metering phase angle correction like C57.12.90**
 - o **Add Scott-T figure to 9.3.4.3**
 - o **Impulse Test**
 - Change to match C57.12.90 (rFCCFFF waves, min-nominal-max taps)
 - Change to negative polarity to match IEC dry and IEEE liquid. This must be aligned with C57.12.01 and test levels must be adjusted.
 - Define QC with reduced and Full like C57.12.90 section 10.4.2.1 Method 1
 - o **Short Circuit Test**
Match with C57.12.90
 - o **Distribution and Power same / different**
 - o **Environmental**
Fire / climatic / environmental
 - o **AFWF Testing WF? WF/XX?**
 - o **AF testing should be done with fans on or turn the fans off?**
 - o **Insulation Resistance is a Routine Test for >300 kVA. Should Pass/Fail Criteria be developed**
 - o **Temperature Rise test cooling curve timing. It is currently open to interpretation.**

With no further business, the meeting was adjourned, without objection, at 5:00 PM.

The Task Force/Working Group will meet again at the Spring 2022 meeting,

Chair: David Walker
 Vice Chair: Tim-Felix Mai
 Secretary: Rhea Montpool

Participation list:

Last Name	First Name	Company
Ballard	Robert	DuPont
Britton	Jeffrey	Phenix Technologies, Inc.
Burde	Jagdish	Virginia Transformer Corp
Carlson	Kurt	V&F Transformer
Chiang	Solomon	The Gund Company
Fattal	Feras	Manitoba Hydro
Foster	Derek	Magnetics Design, LLC
Ghosh	Rob	General Electric
Haas	Michael	Instrument Transformers, LLC
Hernandez	Giovanni	Virginia Transformer Corp.
Hernandez Cano	Sergio	Hammond Power Solutions
Iman	Mohammad	MGM Transformer Company
John	John	Virginia Transformer Corp.
Johnson	Charles	Hitachi Energy
Klein	Ken	Grand Power Systems
Kraetge	Alexander	OMICRON electronics Deutschland GmbH

Lee	Moonhee	Hammond Power Solutions
Lovins	Colby	Federal Pacific
Mai	Tim-Felix	Siemens Energy
Montpool	Rhea	Schneider Electric
Narawane	Aniruddha	EATON Corporation
Nunn	Shawn	Hitachi Energy
Pepe	Harry	Phenix Technologies, Inc.
Peterson	Caroline	Xcel Energy
Powell	Chris	Intermountain Electronics
Rodriguez	Ullises	Grand Power Systems
Saraf	Manish	Hammond Power Solutions
Sauer	Daniel	EATON Corporation
Shrewsbury	Justin	AMR PEMCO
Sonnenberg	Brian	Instrument Transformers, LLC
Stankes	David	3M
Stretch	Kerwin	Siemens Energy
Tedesco	Joseph	Hitachi Energy
Walker	David	MGM Transformer Company
Winter	Dr. Alexander	HIGHVOLT Pruftechnik Dresden

D.2.10 Liaison report for Revision of IEEE C57.12.80 WG Terminology Chair Tim-Felix Mai

Tim-Felix Mai provided update that there no new updates related to Dry type transformer in the work to revise C57.12.80.

D.3 Old Business

D.3.1 Status of Standards

Chair identified IEEE C57.12.59 Guide for Dry-Type Transformer Through-Fault Current Duration as a document the SC needed to address as it is set to expire on 12/31/25. Chair notified the SC that Derek Foster had volunteered and has been appointed Chair for revision of IEEE C57.12.59. He noted that the work to revise this standard may occur outside of the normal Spring and Fall meetings due to lack of meeting slots, but since the document was short and straight forward (only 5 sections) this may be acceptable. Derek plans to organize a virtual meeting prior to the Spring meeting and made a call for volunteers to serve as Vice Chair and Secretary. Chuck Johnson commented that having someone with background on switchgear with be an asset during the revision of the document. Chair reminded the SC that leadership positions could be given to guests (not restricted to members). David Walker volunteered for Vice Chair and Tim-Felix Mai volunteered for Secretary.

Chair commented that most of the documents currently being worked on were on schedule to meet PAR deadlines except for IEEE C57.124.

D.3.2 Survey results

Chair reviewed the results four survey questions that were sent out the DTSC members and guests that were intended to help define the Scopes of IEEE C57.12.01 and IEEE C57.12.91. 25 of 33 members responded to the survey before it was closed therefore there was a quorum. The results were shared with the IEEE C57.12.01 and IEEE C57.12.91 Chairs for use in their TF meetings to assist in developing their PARs

Results of survey:

Do you support the proposal that the Dry-Type Transformer Subcommittee should increase the scope of IEEE C57.12.01/IEEE C57.12.91 into the Low Voltage transformer market by covering voltages below 601V?

[52% NO 44% YES 4% ABSTAIN]

Do you support adding Drive Transformers to the exclusion list in the Scope of IEEE C57.12.01 or IEEE C57.12.91? A Drive transformer can be defined as: A transformer that is interposed between the incoming power system and a motor drive. The input of a motor drive is typically a set of passive or active rectifiers that subject the drive transformer to significant harmonic load currents. Drive transformers also typically have multiple, phase-shifted, secondary windings to provide reduction of the harmonic load currents as seen by the input power system to minimize power system noise.

[32% NO 64% YES 4% ABSTAIN]

Do you support adding Inverter Transformers to the exclusion list in the Scope of IEEE C57.12.01 or IEEE C57.12.91? An Inverter Transformer can be defined as: A transformer that is interposed between the incoming power system and an inverter or group of inverters. The inverter(s) typically provide a load to the transformer that contains harmonic currents as well as high speed, switching currents. Additionally, inverter transformers are often connected to multiple inverters with a single secondary winding per inverter. Inverter transformers may be subject to bi-directional loads on individual or multiple secondary windings.

[28% NO 68% YES 4% ABSTAIN]

Do you support opening ANSI C57.12.55 for Revision? Note: today the copyright to this standard is owned by IEEE, but not required to be revised as it has never been published by IEEE.

[32% NO 44% YES 24% ABSTAIN]

Votes that were cast totaled 19, as 6 of the 25 responses were abstentions. Calculation using only votes that were cast results in 58% in favor of support and 42% not in favor of support. Although there is support of opening this document the Chair recommended not picking up this work at this time. There was no opposition from the SC members present.

D.4 New Business

No new business

With no further business, the meeting was adjourned at 2:10 PM.

Chairman: Casey Ballard

Vice Chairman: David Walker

Secretary: David Stankes (prepared meeting minutes)

Attendees

First Name	Last Name	Affiliation
Mubarak	Abbas	Siemens Energy
Robert	Ballard	DuPont
Jared	Bates	Oncor Electric Delivery
David	Caverly	Trench Limited
Solomon	Chiang	The Gund Company
Sami	Debass	Electric Power Research Institute (EPRI)
J. Arturo	Del Rio	Siemens Energy
Thomas	Falkenburger	Coil Innovation USA, Inc.
Reto	Fausch	RF Solutions
Derek	Foster	Magnetics Design, LLC
Alexander	Gaun	Coil Innovation GMBH
Rob	Ghosh	General Electric
Detlev	Gross	Power Diagnostix Consult GmbH
Michael	Haas	Instrument Transformers, LLC
Giovanni	Hernandez Hernandez	Virginia Transformer Corp.
Sergio	Cano	Hammond Power Solutions
Mohammad	Iman	MGM Transformer Company
Ramadan	Issack	American Electric Power
John	John	Virginia Transformer Corp.
Charles	Johnson	Hitachi Energy
Ken	Klein	Grand Power Systems
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Colby	Lovins	Federal Pacific
Alejandro	Macias	CenterPoint Energy
Tim-Felix	Mai	Siemens Energy
Richard	Marek	Retired
Aaron	Meyers	EATON Corporation
Rhea	Montpool	Schneider Electric
Paulette	Payne-Powell	Retired
Caroline	Peterson	Xcel Energy
Klaus	Pointner	Trench Austria GmbH
Chris	Powell	Intermountain Electronics
Ullises	Rodriguez	Grand Power Systems
Manish	Saraf	Hammond Power Solutions
Hemchandra	Shertukde	University of Hartford
Avijit	Shingari	Pepco Holdings Inc.
Justin	Shrewsbury	AMR PEMCO
Brian	Sonnenberg	Instrument Transformers, LLC
David	Stankes	3M

Kerwin	Stretch	Siemens Energy
Joseph	Tedesco	Hitachi Energy
Dervis	Tekin	Meramec Instrument Transformer Co.
Eric	Theisen	Metglas, Inc.
David	Walker	MGM Transformer Company
Roger	Wicks	DuPont
Malia	Zaman	IEEE