

Standards Subcommittee

March 30 2022 Denver, CO

Standards Subcommittee		
Chair: Daniel Sauer	Vice-Chair: Marcos Ferreira	Secretary: Ajith Varghese
Standards Coordinator: Steve Shull		
Room: Centennial F-G	Date: Mar 30th, 2022	Time: 4:30 PM to 05:45 pm
Total Members: 69	Present at time of quorum check: 35	Attended per Record: 36
Guests present: 36	Membership requested: 9	Membership accepted: 6

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; Mar 30th, 2022 at 4:30 PM (CST).

35 members were in attendance at the beginning of the meeting, which met the quorum requirement. Couple of the guests who were present reported that they believed they are members. Secretary reassured that their concern will be reviewed and status will be updated.

Based on attendance roster and after correction to membership, it was confirmed that **36 of 69** members were present. 36 guests were also present of which **9** guests requested membership of which **6** met attendance requirement and will be granted membership.

L.2 Chair's Remarks

The Chair welcomed members and guests to the S22 meeting. Chair briefly highlighted the requirement that while introducing one need to state their affiliation.

The Agenda was moved by Jason Varnell and seconded by Steve Antosz. The motion was carried with unanimous consent. The Minutes for Fall 2021 was moved by Steve Snyder and seconded by Sanjib Som. The motion was carried with unanimous consent

Chair presented the IEEE requirement for patent and copyrights. The Chair reminded WGs that call of the patent is required a during every WG meetings including on-line/Teleconference meeting. If there are any patent claim, it shall be noted but not discussed at the working group meetings

The Chair reminded the WG and TF leaders to submit their minutes from the meetings within **15 days** to the SC secretary. The SC Secretary then must submit the SC minutes within 45 days of the SC meeting. The Chair welcomed members and guests to the virtual meeting.

Chair briefly highlighted the requirement that while introducing one need to state their affiliation.

WG on C57.12.00, C57.12.90, C57.12.80, C57.152 and C57.13 provided an update on status of their standards. WG reports are included as part of this report.

Steve Antosz informed that Jason Varnell will be the new Vice-Chair/Secretary for WG C57.12.90. Chair informed that he is looking for new chair for WG C57.12.00 to take over from Steve Snyder, who will be stepping down. Steve will continue to support till new chair will take over

L.3 Working Group and Task Force Reports

L.3.1 Standards Working Group on the Continuous Revision of C57.12.00

Standards Working Group on the Continuous Revision of C57.12.00

Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Steven L. Snyder
March 30, 2022

The purpose of this WG is to compile all the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.00 in a consistent manner. This WG coordinates efforts with the companion standard C57.12.90 so that they publish together.

Standard C57.12.00 was approved by IEEE SA Standards Board on 11-9-2021 and published January 2022. It will be good for 10 years.

A Project Authorization Request (PAR) for Revision of PC57.12.00 has been submitted to NesCom for consideration at the April 27, 2022 meeting, to allow the continuous revision of this standard.

Respectfully submitted,
Steven L. Snyder, WG Chair C57.12.00
March 30, 2022

L.3.2 WG Standard Terminal Markings and Connections for Transformers C57.12.70

WG on C57.12.70 did not meet during Spring 22 TC Meeting.

L.3.3 WG Standard Transformer Terminology for Transformers C57.12.80

L.3.3.1 2022 Mar 28th Meeting

Document #: C57.12.80

Document Title:

Standard Terminology for Distribution and Power Transformers
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Chair: James Graham Vice-Chair Open

Secretary Richard vonGemmingen)

Current Draft Being Worked On: 1.0 Dated: NA

Meeting Date: 2028-03-28 Time: 9:30 AM – 10:45 AM

Attendance:	Members	<u>11</u>
	Guests:	<u>13</u>
	Total	<u>24</u>

Meeting Minutes / Significant Issues / Comments:

Dan Sauer, Acting Chair opened the meeting at 9:30 a.m. on Monday 28 March, 2022.

- 1) Quorum Check
Quorum was achieved with 11 of 14 members present. 13 non-voting participants also attended. No new members have been added.
- 2) Approval of the Agenda
Jeff Wright moved to approve Agenda, Lee Matthews second and motion was unanimously approved.
- 3) Approval of the Fall 2020 minutes
Sankar Nambi moved to approve the fall 2021 minutes, Lee Matthews seconded, and motion was unanimously approved.
- 4) Call for Essential Patents
A call for essential patents was made. No essential patents or issues were reported.
- 5) Copyright policy
The IEEE copyright policy was displayed and quickly reviewed. No issues were reported.

6) Unfinished Business

a) **Thermally Upgraded Paper definition revision**

Kevin Biggie with Weidmann Electrical Technology presented proposed revisions to Thermally Upgraded Paper definition. Proposed revisions are shown **in red**.

1. When tested in accordance with IEEE C57.100, Annex H, “Standard Test Procedure for Qualification of Thermally Upgraded **Kraft** Paper,” it retains a minimum of 50% of initial tensile strength for a time/temperature combination given by the equation:

Time (h) = $e^{(15,000/(T+273)-28.082)}$ Where:

T = test temperature in °C,

2. The **unaged unused** paper has a minimum nitrogen content of 1.3 %,
3. The **aged** paper retains a minimum of 50% of initial nitrogen content after performing the IEEE C57.100, Annex H test.

Note 1 - **A typical** The test time/temperature combination **is shall be** 476 hours at 165 °C

Note 2 - The criterion to retain 50% tensile strength should be considered only as a qualification criterion to determine if a kraft paper can be considered thermally upgraded. The actual expected life of the paper in equipment is longer than given by the formula. Decades of operating equipment manufactured using the Industry Proven System (IPS) including thermally upgraded kraft paper, cellulose pressboard, Polyvinyl Formal (PVF) coated magnet wire, and mineral oil, has shown that a minimum life expectancy of at least 180 000 hours may be assumed, if the hottest-spot temperature of 110 °C, at rated load as defined in IEEE Std C57.12.00 or IEC 60076-1, is maintained.

Note 3 - Because the thermal upgrading chemicals used today contain nitrogen, which is not present in **kraft cellulose** pulp, the degree of chemical modification is determined by testing for the amount of nitrogen present in the treated paper in accordance with ASTM D-982.

Following the presentation was some short discussion.

Shankar Nambi questioned formula for test and reason for 165 C temperature selection. Kevin responded that testing benchmarks are done against industry proven systems which include three tag temperatures of 165 °C, 170 °C and 180°C, which is where the 165 °C temperature was derived.

Gary Hoffman asked if this detail of definition is in C57.100 Annex H why would this need to be in C57.12.80? Discussion amongst membership concluded this was a special situation with existing precedent.

Shankar Nambi brought up discussion that the New Annex H of C57.100 was in draft revision ballot status.

A motion to accept changes to Thermally Upgraded Paper definition was made by Shankar Nambi and seconded by Jeff Wright. Motion was unanimously approved.

b) Stray Gassing Definition

There was no one to present the topic or speak to the proposed definition. A motion to accept definition as written was made by Kyle Heiden. Jeff Wright seconded the motion. Discussion amongst the members followed.

Weijun Li asked if the Note accompanying the definition will be included with the definition. Conclusion was Yes

Ryan Musgrove stated that stray gassing usually had a source such as Floating bolts, core through bolts etc., and he did not see the definition of stray gassing had any ties to possible causes such as designs, construction or manufacturing. Further discussion indicated that definition implies that Stray Gassing is normal and does not encourage user to consider any actions.

Richard von Gemmingen added to possible causes with experiences due to improperly cured catalyzed coatings inside the transformer tank as well as a situation where a specific type of stainless steel was determined to have caused stray gassing.

Shankar Nambi suggested that more information on the phenomena should be included in the definition.

Weijun Li suggested that the Note should be removed from the proposed definition.

Jeff Wright added experiences of stray or leaching gasses occurring from residual gasses trapped in previously failed transformers which had been repaired.

A vote was taken on the motion to accept definition as written. Motion passed with 2 yes, 0 no, 9 abstentions. Due to the high number of abstentions a re-vote will be taken after further discussion.

7) New Business

- a. Weijun Li brought up Time Line questions concerning ability to complete revisions and asked when Par expires. Par expires December of 2023.
- b. Several Members who had their status indicated as Guest on the Attendance Roster asked how they can have this corrected. Acting Chair indicated this will have to be resolved by the subcommittee Chair. Question will be forwarded to James Graham, WG chair.
- c. Question was brought up as to how Members can get access to latest copy of the standard draft revision? The standard draft will be posted before the next WG meeting.

8) The meeting was adjourned at 10:45 a.m. (MDT)

Next meeting – April 2022 via Webex, tentative

Submitted by: Dan Sauer, Acting Chair

Date: 03/28/2022

Meeting Attendance List

Role	Last Name	First Name	Affiliation	3/28/2022
Chair	Graham	James	Weidmann Electrical Technology	
Secretary	vonGemmingen	Richard	Dominion Energy	X
Member	Betancourt	Enrique	Prolec GE	
Member	Heiden	Kyle	EATON Corporation	X
Member	Hoffman	Gary	Advanced Power Technologies	X
Member	Li	Weijun	Braintree Electric Light Dept.	X
Member	Mai	Tim-Felix	Siemens Energy	X
Member	Matthews	Lee	Howard Industries	X
Member	Murphy	Jerry	Reedy Creek Energy Services	
Member	Musgrove	Ryan	Oklahoma Gas & Electric	X
Member	Nambi	Shankar	Bechtel	X
Member	Sauer	Daniel	EATON Corporation	X
Member	Wright	Jeffrey	Duquesne Light Co.	X
Member	Zibert	Kris	Allgeier, Martin and Associates	X
Guest	Bernesjo	Mats	Hitachi Energy	X
Guest	Biggie	Kevin	Weidmann Electrical Technology	X
Guest	Brannen	Randy	Southern Company Services	X
Guest	Chorzepa	Jaroslaw	ABB Inc.	X
Guest	Downey	Andy	Prolec-Waukesha	X
Guest	Eastman	John	ZTZ Services International	X
Guest	Girgis	Ramsis	Hitachi Energy	X
Guest	Hoffman	Saramma	PPL Electric Utilities	X
Guest	Hogg	Ryan	Bureau of Reclamation	X
Guest	Roussell	Marnie	Entergy	X
Guest	Sot	Msunab	Hitachi Energy	X
Guest	Steele	Hampton	TVA	X
Guest	Webb	Matthew	SPX Transformer Solutions, Inc.	X

L.3.4 WG Standards Transformer on Continuous Revision for C57.12.90

Standards Working Group on the Continuous Revision of C57.12.90
Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Stephen Antosz
Vice-Chair/Secretary: Jason Varnell
Spring 2022 Denver; March 30, 2022

INTRODUCTION

This is a working group by committee of task forces, for continuous revision of C57.12.90. The purpose of the WG is to keep track of the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.90 in a consistent manner.

Currently there are five Task Forces in three different Subcommittees, as follows:

1. PCS – Cont Rev to Test Code C57.12.90 Clauses 5-9, & 12, TF Chair: Hakan Sahin
2. PCS – Audible Sound Revision Clause 13, TF Chair: Ramsis Girgis
3. Dielectric Test – Cont Rev to Impulse Tests in Clause 10, TF Chair: Pierre Riffon
4. Dielectric Test – Cont Rev to LowFrequency Tests Clause 10, TF Chair: Bill Griesacker
5. Dielectric Test –Insulation Power Factor and Resistance, 10.10 and 10.11, TF Chair: Diego Robalino
6. Insulation Life – Cont Rev to Temperature Test Clause 11, TF Chair: Dinesh Sankarakurup

SUMMARY

C57.12.90-2021 was approved as a revised standard by the IEEE SA Standards Board on November 9, 2021. It was published on February 4, 2022. The WG Chair took out a new PAR on February 28, 2022, and submitted to NESCOM for consideration at their next meeting on April 27, 2022.

FUTURE REVISIONS AND PENDING WORK

Any new material provided by the various Task Forces to this WG Chair for inclusion in the next revision, will first be approved by the responsible technical subcommittee (Diel Test, PCS, Dist, IL, etc.) and then presented to the Standards Subcommittee for the “official” vote of approval.

Changes already approved for the next revision:

1. Hakan Sahin's PCS TF for Revision of C57.12.90.

- a. Changes to subclause 7.3, Ratio test methods to “modernize” it,. Final survey approved in the Spring 2021 virtual meeting.

Insert a new subclause 7.3.1 as follows:

7.3.1 Electronic ratio and phase measurement meters

An electronic meter that determines the transformer turns ratio, polarity and phase angle may be used for the measurement of these parameters.

The existing 7.3.1 Voltmeter method should be renumbered to be 7.3.2, and there are no changes to the text.

The existing 7.3.2 Comparison method should be renumbered to be 7.3.3, and there are no changes to the text or the figures 10 & 11.

The existing 7.3.3 Ratio meter clause and figure 12 is to be deleted.

- b. Ratio test voltage and frequency under subclause 7.1.2. Request to change frequency bandwidth.

7.0 Ratio test

Current Version:

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and rated or higher frequency.

Proposed Version

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and be such that the ratio of test voltage to test frequency is less than or equal to the ratio of rated voltage to rated frequency.

- c. Load Tap Changer performance test with rated voltage. New subclause 8.7.

8.7 Load Tap Changer Voltage Test

8.7.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer energized at rated voltage.

8.7.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

8.7.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

8.7.4 Procedure

Either the high or low voltage winding of the transformer under test shall be energized at rated voltage and frequency, unless otherwise specified. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the

original tap position. The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the rated voltage of the tap position, but it is a requirement that the transformer be energized at no less than rated voltage corresponding to each tap to be changed.

8.7.5 Observations and Analysis

8.7.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

8.7.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

8.7.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

8.7.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

d. Load Tap Changer performance test with rated current. New subclause 9.6.

9.6 Load Tap Changer Current Test

9.6.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer current flowing through the windings, corresponding to the top nameplate MVA rating.

9.6.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

9.6.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

9.6.4 Procedure

The test shall be performed by applying a short circuit either the high-voltage winding or the low-voltage winding and applying sufficient voltage across the other winding to cause a specific current to flow in the windings. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the original tap position. The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the required current of the tap position, but it is a requirement that the transformer be energized at no less than 80% of the top MVA nameplate current value for each tap change.

9.6.5 Observations and Analysis

9.6.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

9.6.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

9.6.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

9.6.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

e. Number of short-circuit tests under subclause 12.3.4.

Current Version:

12.3.4 Number of tests

Each phase of the transformer shall be subjected to a total of six tests satisfying the symmetrical current requirement specified in 12.3.1 or 12.3.2, as applicable. Two of these tests on each phase shall also satisfy the asymmetrical current requirements specified in 12.3.3.

Proposed Version

12.3.4 Number of tests

- When a three-phase transformer is tested in a three-phase test circuit or in a single-phase test circuit as given in Annex C, each phase of the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The tests shall be performed on one of the outer phases with the tap-changer in the maximum position, on the other outer phase with the tap-changer in the minimum position and on the middle phase with the tap-changer in the principal position
- When a single-phase transformer is tested in a single-phase test circuit the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The three tests shall be performed one each, with the tap-changer in the maximum, minimum and principal position.

All of these above items have been approved in Hakan's Task Force on Tues Nov 16, 2021. They have been passed up to the Performance Characteristics Subcommittee and await the subcommittee's survey and approval.

2. Changes to Insulation Power Factor test, from Diego Robalino's Diel Test SC TF for Winding Insulation Power Factor. Final survey approved in the Fall 2021 virtual meeting. Specifically with regards to Subclause 10.10.2 revising the accuracy requirements of instrumentation.

The existing text is:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within $\pm 0.25\%$ insulation power factor, and the measurement should be made at or near a frequency of 60 Hz.

The revised text will be:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The measurement should be ~~within $\pm 0.25\%$ insulation power factor, and the measurement should be~~ made at or near a frequency of 60 Hz.

The accuracy of measurement should be as follows:

- for $PF < 1\%$, $\pm 2\%$ of reading $\pm 0.05\%$ absolute
- for $PF > 1\%$, $\pm 5\%$ of reading $\pm 0.05\%$ absolute

I AM NOT SURE OF THE EXACT TEXT NOR THE EXACT CHANGES. NEED TO GET IT FROM DIEGO ROBALINO. STEVE Nov 2021

3. Other ?

PENDING WORK

Since this is a continuous revision document, there is ongoing work in the various Task Forces.

1. Possible other revisions from Hakan Sahin's PCS TF for Revision of C57.12.90.
2. Possible changes to Clause 13 sound test from Ramsis' TF. Nothing pending as of Spring 2022
3. Possible changes to Subclause 10.2 or 10.3 from Pierre Riffon's TF regarding switching and lightning impulse tests.
4. Other possible revisions to subclauses 10.5 to 10.10 from Bill Griesacker's TF for revision of low frequency tests. Ongoing work continues.
 - Revision to PD test procedure for Class II
 - Class I transformer PD test revision to the test procedure
 - Clarification of measuring voltage during low frequency tests
 - Venting bushings during PD test,
5. Possible changes to subclauses 10.10 and 10.11 from Diego Robalino's TF regarding insulation power factor and insulation resistance.
6. Changes to Clause 11 Temperature Test from Dinesh Sankarakurup's TF
 - 11.4.3 Add text that reverse correction for altitude is also allowed; i.e., when factory is located above 1000 m and transformer rating is based on <1000m.
 - 11.1.2.2.c and 11.3.2. Defining the top oil rise as the last reading at the end of the stabilization period of the total loss run, not an average.
 - Possible revision to 11.4.1 and 11.4.2, regarding K and L type insulating fluids for temperature rise test corrections.
 - Request for clarification for temp test of 3-winding transformers

Respectfully submitted,
Stephen Antosz, WG Chair
March 30, 2022

L.3.5 WG Standards Transformer on Revision for C57.152, Guide of Field Tests

*Standards Subcommittee,
Standards Subcommittee,
WG – C57.152 Revision
IEEE / PES Transformers Committee*

*March 28, 2022, 1:45PM – 3:00PM
UNAPPROVED MINUTES*

Welcome

The secretary and the acting chair due to absence of chair and vice chair, Goran Milojevic, opened the meeting at 1:45PM.

1. Attendance and Attendance for Quorum

At the time of the meeting there are 48 Members, including Chair, Vice Chair and Secretary. Charles Sweetser as the acting secretary counted 20 members as present at the meeting. 71 members and guests signed into the circulating paper roster.

27 members present of 47 mean requirements for quorum was fulfilled. The list of attendees is shown below:

Name	Affiliation	Status
Milojevic, Goran	DV Power	Secretary
Binder, Wallace	WBBinder Consultant	Member
Denzer, Stephanie	Alliant Energy	Member
Ermakov, Evgenii	Hitachi Energy	Member
Gara, Lorne	Shermco	Member
Gustavsson, Niklas	Hitachi Energy	Member
Harley, John	First Power Group LLC	Member
Heiden, Kyle	EATON Corporation	Member
Herron, John	Raytech USA	Member
Kraemer, Axel	Reinhausen Germany	Member
Lejay, Olivier	Huaming USA Corp.	Member
Murray, David	Tennessee Valley Authority	Member
Musgrove, Ryan	Oklahoma Gas & Electric	Member
Parminder, Panesar	Virginia Transformer Corporation	Member
Reed, Scott	MVA	Member
Robalino, Diego	Megger	Member
Saad, Mickel	Hitachi ABB Power Grids	Member
Servaraj, Pugal	Virginia Transformer Corp.	Member
Sweetser, Charles	OMICRON Electronics Corp USA	Member

Tanaka, Troy	Burns & McDonnell	Member
teNyenhuis, Ed	IEEE	Member
Alahmed, Alex	Evergy	Guest
Aldenlid, Jennie	Hitachi Energy	Guest
Ansari, Tauhid	Hitachi Energy	Guest
Beaudoin, Jason	Weidmann	Guest
Benzler, Olle	Megger	Guest
Bradshaw, Jeremiah	Bureau of Reclamation	Guest
Britton, Jeff	Doble Engineering	Guest
Christodoulou, Larry	EPSII	Guest
Cordova, Olivia	Bureau of Reclamation	Guest
Davis, Eric	Burns & McDonnell	Guest
Debass, Samson	EPRI	Guest
Eastman, John	ZTZ Services	Guest
Espinola, Marco	Hitachi Energy	Guest
Faur, Florin	Prolec GE Waukesha	Guest
Fong, Sanford	Georgia Power	Guest
Hoffman, Gary	Advanced Power Technologies	Guest
Hoffman, Saramma	PPL	Guest
Hutchinson, Zachary	East Kentucky Power Cooperative	Guest
Kurth, Bernard	Reinhausen	Guest
Lamontagne, Donald	Arizona Public Service Co.	Guest
Lawrence, Matthew	NASS USA	Guest
Mani, Kumar	Duke Energy	Guest
Matson, Tom	Xcel Energy	Guest
Matthews, Lee	Howard Industries	Guest
McGrail, Tony	Doble Engineering	Guest
Melle, Thomas	HIGHVOLT	Guest
Pinard, Matt	Weidmann	Guest
Pollaro, Dominic	NASS USA	Guest
Pruente, John	Prolec GE Waukesha	Guest
Ramos, Arturo	Mistras	Guest
Reeder, Perry	GE Grid Solutions	Guest
Rehlkopf, Sebastian	Maschinenfabrik Reinhausen	Guest
Sahin, Hakan	Virginia Transformer Corp.	Guest
Schrom, Wes	Carolina Dielectric Co	Guest
Skinger, Kenneth	Stituat Consulting	Guest
Spitzer, Tommy	City Transformer	Guest
Sumner, Dean	SD Myers	Guest
Swan, Phil	RESA Power	Guest
Tournoux, Dan	Prolec GE Waukesha	Guest
Trifunovski, Risto	Trench Limited	Guest
Uhlmann, Olivier	Reinhausen Canada	Guest
van Tol, Robert	Commonwealth Associates	Guest
Vanderwalt, Alwyn	Electrical Consultants, Inc.	Guest
Washburn, Alan	Burns & McDonnell	Guest

Weyer, Daniel	NPPD	Guest
Whitehead, William	HiScan	Guest
Whitten, Christopher	Hitachi Energy	Guest
Woods, Deanna	Alliant Energy	Guest
Zaman, Malia	IEEE - SA	Guest
Zemanovic, Kyle	EATON	Guest

2. Approval of Agenda

Due to a lack of quorum, the agenda could not be approved.

3. Approval of Minutes of Meeting from Fall 2021

Due to a lack of quorum, the Minutes of Meeting from Fall 2021 could not be approved.

4. Call for Patents

The acting chair presented slide 1-4, dated January 2, 2018, informing of the IEEE patent policy and participants duty to inform. There were no issues related to patent assurance brought up by attendees in the meeting.

5. IEEE Copyright Policy

The acting chair presented IEEE-SA Copyright Policy slides 1-2 informing the audience of the policy.

6. Chair’s Remarks

In the absence of the chair, Marcos Ferreira, his previously prepared remarks were read by the acting chair.

“On the behalf of Chair welcome all members of this working group to take this opportunity during this Spring meeting to finalize three task forces and two annexes by votes, so we can meet the deadline of the PAR without a need for extension.”

7. Task Forces Working Progress Report

TF-1: Section 7.2 – Main Tank Volunteers

Charles Sweetser (team leader)

The task force has attempted to put the proposed changes to an approval to the rest of the WG multiple times, but the approval was not obtained due to lack of response. The task force continued with its work, and the final version of the material will be provided to the WG by email together with the material from the other work groups.

TF2: Section 7.3 – Bushings Volunteers

Mario Locarno (team leader)

Due to absence of Mario Locarno, the team leader, the acting chair briefly reported that the work of his task force is finished and ready to be presented to the rest of the WG.

TF3: Section 7.4 – Tap Changers Volunteers

Marcos Ferreira (team leader)

Due to absence of Marcos Ferreira, the team leader, the acting chair briefly reported that the work of his task force is finished and ready to be presented to the rest of the WG.

TF4: New Annexes: Dynamic Resistance and Vibroacoustic Measurements

Goran Milojevic

The task force leader reported that the draft versions of the two new annexes are completed and ready to be presented to the rest of the WG.

8. Discussion

With the upcoming expiration of the WG PAR in the Fall of 2023, the acting chair has initiated discussion of the plan of finalizing of the WG work. Due to continued lack of centralized mass mailing system, all future materials and motions will be sent to members by direct email by the WG officers. Present members were encouraged to provide their most recent email address in the roster. The officers will revise the membership roster based on the attendance information.

All task force leaders who have not already done so will provide the final versions of their materials to the WG officers by April 15th. All materials will be sent by email to the WG members by the end of April.

The procedure of finalizing the work and putting it to a vote was discussed.

9. New Business

No new business was introduced at this time.

10. Meeting Adjournment

Due to a lack of quorum, the meeting was ended without a motion to adjourn. The meeting ended at 2:15PM

Respectfully submitted,

Marcos Ferreira – Chair Peter Werelius – Vice Chair

Goran Milojevic – Secretary

L.3.6 WG PC57.163 IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

PC57.163 - WG for the Revision of IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

3:15 PM to 4:30 PM Mountain Time, March 29, 2022 (Denver, CO)

Unapproved Meeting Minutes

The WG Chair Dan Blaydon presided over this meeting with both the Vice-Chair, Ramsis Girgis, and Secretary, Scott Digby, in attendance. This was the fourth meeting of this Working Group, the first in a face-to-face format. Meeting attendance numbers as follows:

Total Attendance	61
Members in Attendance	24 (out of 67 members, quorum not achieved)
Guests in Attendance	37
Guests Requesting Membership	8

Guests Requesting Membership (attendance at 2 out of 3 meetings required to qualify for membership):

	Membership Granted? (effective after this meeting)
Arup Chakraborty	N
Samson (Sami) Debass	N
Rogelio Martinez	Y
Matthew Pinard	Y
Homero Portillo	N
Amitabh Sarkar	N
Sanjib Som	Y
Alan Washburn	Y

Participants were advised that membership requests could be made via email requests from attendees to the WG Chair or by indicating on the rosters being circulated during the meeting.

The requisite patent and IEEE-SA copyright policy slides were reviewed, with no items noted. The agenda was reviewed by the Chair, with no changes requested by attendees. The minutes from the Fall-2021 meeting had been circulated along with the proposed agenda prior to the meeting. There were no changes to the Fall-2021 meeting minutes requested but a motion to approve could not be entertained since quorum had not been achieved.

The Chair reviewed the project milestones and status, noting the PAR expiration date of December-2024 and the published document's expiration date of December-2025. Draft Rev2 of the Guide had been posted on the website and had been distributed to the WG participants, which had incorporated all revisions and comments thus far with edits indicated by red text.

There was a discussion of the work plan, which is to have the document ready for a straw ballot after the Fall-2022 WG meeting, resolving any further comments received between now and that time prior to that meeting. The question was posed as to whether this straw ballot should include the Standards SC members, but during discussion it was pointed out that the WG is considered the technical body so would probably be most appropriate to constrain a straw ballot to the WG participants. The objective was stated as being to submit for SA ballot no later than the end of December-2023. It was noted that with the PAR expiring in December-2024 and the current published document expiring in December-2025, that the WG is proceeding on a timeline that completes its work ahead of those expiration dates.

The Vice-Chair provided a review of the latest updates to the Guide and the work to resolve comments that had taken place since the prior WG meeting. This included results of discussions held with a commenter related to the Effective Current ($I_{\text{effective}}$) and the resultant text revisions. From discussion it was suggested and agreed to add a bracket after $IN/3$ within the equation for $I_{\text{effective}}$ to make the order of mathematical operations clearer. Also reviewed was text added to enhance the section concerning magnetizing current.

The disposition of comments related to section 10 (monitoring) had been unresolved prior to the meeting, but during the meeting Gary Hoffman shared proposed text to resolve a reviewer comment associated with the need to demagnetize Hall Effect CTs if manual and electronic zeroing is not provided. This text was to be forwarded to the WG officers after the meeting for

incorporation into the next Draft. At the conclusion of the discussion, it was noted that no further updates to section 10 were necessary at this time.

The WG Chair noted that since additional references had been added some renumbering of references had taken place. The citation of references throughout the document needs to be reviewed to confirm correlation with the renumbering in the reference section.

The WG Chair will follow up with a reminder email to the WG participants to review the latest Draft of the document and provide any further comments, such that they could be reviewed and resolved to support having a cleaned-up document in advance of the Fall-2022 WG meeting. The WG Chair also made a call for users to review the specification section of the document and comment as necessary.

There were no Old Business items to address and there were no New Business items raised.

The next planned meeting of the WG will be during the Fall-2022 Transformers Committee meetings, scheduled to be held in Charlotte, NC.

The meeting adjourned shortly prior to the 4:30 pm end time of the designated meeting time slot.

Respectfully Submitted,

Scott Digby, WG Secretary

Role	First Name	Last Name	Affiliation
Chair	Daniel	Blaydon	Baltimore Gas & Electric
Vice-Chair	Ramsis	Girgis	Hitachi ABB Power Grids
Secretary	Scott	Digby	Duke Energy
Member	Jeff	Benach	Megger
Member	Mats	Bernesjo	Hitachi Energy
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Bill	Griesacker	Duquesne Light Co.
Member	Gary	Hoffman	Advanced Power Technologies
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Zan	Kiparizoski	Howard Industries
Member	Balakrishnan	Mani	Virginia Transformer Corp.
Member	Kumar	Mani	Duke Energy
Member	Martin	Munoz Molina	Orto de Mexico
Member	Nitesh	Patel	Hyundai Power Transformers USA
Member	Sanjay	Patel	Smit Transformer
Member	Afshin	Rezaei-Zare	York University
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Markus	Schiessl	SGB
Member	Marc	Taylor	JFE Shoji Power Canada Inc.
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Member	Trenton	Williams	Advanced Power Technologies
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Alex	Alahmed	Energy - Wolf Creek
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Elise	Arnold	SGB
Guest	Gilles	Bargone	FISO Technologies Inc.
Guest	Michael	Botti	HICO America
Guest	Juan Alf..	Carrizabi	Prolec GE
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Olivia	Cordova	Bureau of Reclamation
Guest	Samson (Sami)	Debass	EPRI
Guest	Marco	Espindola	Hitachi Energy
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Hector	Garza	Orto deMexico
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Anton	Koshel	Delta Star Inc.
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Mark	Lachman	Doble Engineering Co.

Guest	Gustavo	Leal	Dominion Energy
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Guest	Rogelio	Martinez	Georgia Transformer
Guest	Lee	Matthews	Howard Industries
Guest	Tony	McGrail	Doble Engineering Co.
Guest	Brady	Nesvold	Xcel Energy
Guest	Matthew	Pinard	Weidmann Electrical Technology
Guest	Homero	Portillo	Advanced Power Technologies
Guest	Sebastian	Renkopf	MR
Guest	Amitabh	Sarkar	Virginia Transformer
Guest	Dan	Sauer	EATON Corporation
Guest	Alfons	Schrammel	Siemens Energie
Guest	Andre	Simons	JFE Shoji
Guest	Sanjib	Som	Pennsylvania Transformer
Guest	Brad	Staley	Salt River Project
Guest	Andy	Steineman	Delta Star Inc.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Jeffrey	Wright	Duquesne Light Co.

L.3.7 IEEE / IEC Continuous Cross Reference

TF did not meet during Spring 22 Transformer Committee.

L.4 Old Business

There was no old business to discuss.

L.5 New Business

No new business was brought up for discussion.

L.6 Adjournment

The meeting was adjourned at 4:53 PM CST.

Respectfully submitted,
Ajith M. Varghese
Standards SC Secretary

Standards SC S22 Attendance List

Role	First Name	Last Name	Company	S22
Chair	Daniel	Sauer	EATON Corporation	X
Secretary	Ajith	Varghese	Prolec GE Waukesha	X
Member	Andrew	Larison	Hitachi ABB Power Grids	X
Member	Bill	Griesacker	Duquesne Light Co.	X
Member	Brad	Staley	Salt River Project	X
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC	X
Member	Cihangir	Sen	Duke Energy	X
Member	Daniel	Blaydon	Baltimore Gas & Electric	X
Member	Ed	teNyenhuis	Hitachi ABB Power Grids	X
Member	Eduardo	Garcia Wild	Siemens Energy	X
Member	Evgenii	Ermakov	Hitachi ABB Power Grids	X
Member	Florin	Faur	SPX Transformer Solutions, Inc.	X
Member	Gary	Hoffman	Advanced Power Technologies	X
Member	Gilles	Bargone	FISO Technologies Inc.	X
Member	Jarrod	Prince	ERMCO	X
Member	Jason	Varnell	Doble Engineering Co.	X
Member	John	Herron	Raytech USA	X
Member	Jonathan	Sinclair	PPL Electric Utilities	X
Member	Joseph	Tedesco	Hitachi ABB Power Grids	X
Member	Juan Carlos	Cruz Valdes	Prolec GE	X
Member	Kris	Zibert	Allgeier, Martin and Associates	X
Member	Kurt	Kaineder	Siemens Energy	X
Member	Larry	Christodoulou	Electric Power Systems, Inc.	X
Member	Ramadan	Issack	American Electric Power	X
Member	Robert	Ballard	DuPont	X
Member	Sanjib	Som	Pennsylvania Transformer	X
Member	Scott	Digby	Duke Energy	X
Member	Scott	Reed	MVA	X
Member	Sergio	Hernandez Cano	Hammond Power Solutions	X
Member	Shankar	Nambi	Bechtel	X
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc	X
Member	Stephen	Shull	BBC Electrical Services, Inc.	X
Member	Steven	Snyder	Hitachi ABB Power Grids	X
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids	X
Member	Thomas	Dauzat	General Electric	X
Member	Weijun	Li	Braintree Electric Light Dept.	X

Role	First Name	Last Name	Company	S22
Guest	Alwyn	Van Der Walt	Electrical Consultants, Inc.	X
Guest	Aniruddha	Narawane	Power Distribution, Inc. (PDI)	X
Guest	Cesar	Diaz	EATON Corporation	X
Guest	Daniel	Posadas	Prolec SA	X
Guest	David	Wallach	Duke Energy	X
Guest	Dwight	Parkinson	EATON Corporation	X
Guest	Eduardo	Gomez-Hennig	Siemens Energy	X
Guest	Egon	Kirchenmayer	Siemens Energy	X
Guest	Ewald	Schweiger	Siemens Energy	X
Guest	Goran	Miloevic	DV Power	X
Guest	Huan	Dinh	Hitachi ABB Power Grids	X
Guest	Javier	Arteaga	Hitachi ABB Power Grids	X
Guest	Jeffrey	Wright	Duquesne Light Co.	X
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	X
Guest	Jerzy	Kazmierczak	Hitachi Energy	X
Guest	Josh	Bohrn	Pacific Corp	X
Guest	Joshua	Verdell	ERMCO	X
Guest	Krzysztof	Kulasek	Hitachi ABB Power Grids	X
Guest	Kumar	Mani	Duke Energy	X
Guest	Marnie	Roussell	Entergy	X
Guest	Nabi	Almeida	Prolec GE	X
Guest	Nick	Jensen	Delta Star Inc.	X
Guest	Nikolaus	Dillon	Dominion Energy	X
Guest	Olivia	Cordova	Bureau of Reclamation	X
Guest	Onome	Avanoma	MJ Consulting	X
Guest	Orlando	Giraldo	H-J Family of Companies	X
Guest	Poorvi	Patel	Electric Power Research Institute (EPRI)	X
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions	X
Guest	Reto	Fausch	RF Solutions	X
Guest	Rhett	Chrysler	ERMCO	X
Guest	Richard	vonGemmingen	Dominion Energy	X
Guest	Ryan	Musgrove	Oklahoma Gas & Electric	X
Guest	Ryan	Hogg	Bureau of Reclamation	X
Guest	Samuel	Sharpless	Rimkus Consulting Group	X
Guest	Samma	Hoffman	PPL Electric Utilities	X
Guest	William	Boettger	Boettger Transformer Consulting LLC	X