

# PC57.154

## Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems

IEEE/PES Transformers Committee  
Insulation Systems Subcommittee

October 28, 2019  
Columbus, Ohio USA

# Working Group Agenda

- **Welcome & chair's remarks**
- **Call for patents & Copyright statement**
- Introduction of attendees & roster circulation
- Establish quorum
- Approval of agenda
- Approval of previous meeting minutes
- Task Force 1 report on status
- Comments on Draft 1
- Comments on IEC 60076-14 Annex D
- Suggestions for revision activities
- Adjourn

## Participants have a duty to inform the IEEE

- Participants shall inform the IEEE (or cause the IEEE to be informed) of the **identity of each holder of any potential Essential Patent Claims** of which they are personally aware if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents
- Participants should inform the IEEE (or cause the IEEE to be informed) of the identity of any other holders of potential Essential Patent Claims

**Early identification of holders of potential  
Essential Patent Claims is encouraged**

# Ways to inform IEEE

- Cause an LOA to be submitted to the IEEE-SA (patcom@ieee.org); or
- Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or
- **Speak up now and respond to this Call for Potentially Essential Patents**

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair

# Other guidelines for IEEE WG meetings

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs of different technical approaches that include relative costs of patent licensing terms may be discussed in standards development meetings.
      - **Technical considerations remain the primary focus**
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed ... do formally object.**

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For more details, see *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and *Antitrust and Competition Policy: What You Need to Know* at <http://standards.ieee.org/develop/policies/antitrust.pdf>

# Patent-related information

The patent policy and the procedures used to execute that policy are documented in the:

- ***IEEE-SA Standards Board Bylaws***  
(<http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6>)
- ***IEEE-SA Standards Board Operations Manual***  
(<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>)

Material about the patent policy is available at  
<http://standards.ieee.org/about/sasb/patcom/materials.html>

**If you have questions, contact the IEEE-SA  
Standards Board Patent Committee  
Administrator at [patcom@ieee.org](mailto:patcom@ieee.org)**

# IEEE-SA Copyright Policy

By participating in this activity, you agree to comply with the IEEE Code of Ethics, all applicable laws, and all IEEE policies and procedures including, but not limited to, the IEEE-SA Copyright Policy.

- Previously Published material (copyright assertion indicated) shall not be presented/submitted to the Working Group nor incorporated into a Working Group draft unless permission is granted.
- Prior to presentation or submission, you shall notify the Working Group Chair of previously Published material and should assist the Chair in obtaining copyright permission acceptable to IEEE-SA.
- For material that is not previously Published, IEEE is automatically granted a license to use any material that is presented or submitted.
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# IEEE-SA Copyright Policy

- The **IEEE-SA Copyright Policy** is described in the *IEEE-SA Standards Board Bylaws* and *IEEE-SA Standards Board Operations Manual*
  - IEEE-SA Copyright Policy, see
    - Clause 7 of the *IEEE-SA Standards Board Bylaws*  
<https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7>
    - Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*  
<https://standards.ieee.org/about/policies/opman/sect6.html>
- IEEE-SA Copyright Permission
  - ◻ <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/permissionltrs.zip>
- IEEE-SA Copyright FAQs
  - <http://standards.ieee.org/faqs/copyrights.html/>
- IEEE-SA Best Practices for IEEE Standards Development
  - [http://standards.ieee.org/develop/policies/best\\_practices\\_for\\_ieee\\_standards\\_development\\_051215.pdf](http://standards.ieee.org/develop/policies/best_practices_for_ieee_standards_development_051215.pdf)
- Distribution of Draft Standards (see 6.1.3 of the SASB Operations Manual)
  - <https://standards.ieee.org/about/policies/opman/sect6.html>



## Instructions for Chairs of standards development activities

- **At the beginning of each standards development meeting the chair or a designee is to:**
- **Show the following slides (or provide them beforehand)**
- **Advise the standards development group participants that:**
  - IEEE-SA's copyright policy is described in Clause 7 of the *IEEE-SA Standards Board Bylaws* and Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*;
  - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE-SA Copyright Policy;
- **Instruct the Secretary to record in the minutes of the relevant meeting:**
  - That the foregoing information was provided and that the copyright slides were shown (or provided beforehand).

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CS7.154 – IEEE Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems

Monday, October 15, 2018  
Jacksonville, FL, USA  
Minutes of WG Meeting

The meeting was called to order at 4:45PM by Chair Richard Marek. Vice-Chair Anastasia O'Malley and Secretary Ewald Schweiger (writer of Minutes) were also present.

This is the first meeting as a WG. The participants who requested membership at the last TF meeting have been carried over as members of the WG.

There were 44 of the total 113 attendees that requested membership. There were a total of 111 people that signed in on the paper roster and 106 on the RFID list that were on the paper roster.

List of Meeting Attendees is provided below. Those identified with an asterisk are WG Members in attendance. Those granted membership at this meeting are noted with two asterisks (\*\*)

Robert Ballard **	Marion Jaroszewski **	Ion Radu **
Giles Bargone **	Anirudhdhishin Jhala **	Ziaur Rahman **
Jeff Barnes	Kurt Kaineder *	Jimmy Rasco *
Claude Beauchemin	Jon Karas **	Rakesh Rathi **
Jean-Noel Berube	Darren Keegan	Jeffrey Ray
Kevin Biggie *	Sheldon Kennedy **	Clemens Reiss IV **
Piotr Blaszczyk	Neil Kranich	Hossein Rezaei
William Boettger *	Krzysztof Kulasek *	Rodrigo Ronchi **
Mike Bonn **	Michael Lau	Jose Salva *
David Calitz	Antoine Lecomte	Surinder Sandhu **
Thomas Callisen **	Moonhee Lee **	Daniel Sauer
Edward Casserly **	Aleksandr Levin *	Alan Sbravati *
Juan Castellanos *	A. Pedro Lima	Ewald Schweiger *
Alonso Castillo	Antony Lin	Jaber Shalabi **
Stuart Chambers *	Jacky Lin **	Michael Shannon *
Muhammad Ali Masood Cheema *	Alex Lizaro **	Masoud Sharifi
Solomon Chiang **	Ricardo Lopes	Samuel Sharpless *
Rhett Chrysler	Nikola Lukenda *	Nathan Sherwood
C. Clair Claiborne *	Jinesh Maide *	Brad Staley *
Domenico Corsi	Kumar Mani	David Stankes *
Charles Culver	Richard Marek *	Paul Su **
Piotr Dargiel	Luke Maucione	Radoslaw Szweczyk
Craig DeRouen **	Vijay McBride *	Vijay Tendulkar
Mohamed Diaby **	Douglas McCullough **	Giuseppe Termini **
Dieter Dohnal	Barry McGlew **	Michael Thibault **
William Elliott **	James McIver *	Juan Luis Thierry
Florin Faur **	Paul Morakinyo **	Robert Thompson *
Ken Fedor	Emilio Morales-Cruz	Jeff Valmus *

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# Task Force 1

## Thermal Class of Liquids

- Scope:
  - Consider the background and historical applications
  - Consider options to prove (or develop) the temperature limits for transformer liquids
  - Propose tentative test procedure(s)
- Status of the activities



Microsoft Excel  
Worksheet



Adobe Acrobat  
Document

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PC57.154/D1, October 2019  
Draft Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems

## 6.4 Loading beyond nameplate rating

The general principles and equations of IEEE Std C57.91 apply. As with all transformers, loading above nameplate rating will result in accelerated loss of insulation life. Suggested temperature limits which give reasonable loss of life for different loading conditions are given in Table 4 and Table 5. Any other overload requirements shall be specified.

Table 4— Suggested maximum temperature limits for transformers with hybrid insulation systems loaded beyond nameplate rating

	Hybrid insulation system				
	Conventional insulation system	Mixed hybrid insulation winding	Full hybrid insulation winding *		
Minimum required high-temperature solid insulation thermal class	120	130	130	140	155
Maximum top liquid temperature with normal life expectancy, (°C)	105	105	105	105	105
Maximum top liquid temperature with loading above nameplate rating, (°C)	110	110	110	110	110
Maximum solid insulation hottest spot temperature with normal life expectancy, (°C)	120	130	130	140	155
Maximum solid insulation hottest spot temperature with planned loading beyond nameplate rating, (°C)	130	140	140	150	165
Maximum solid insulation hottest spot temperature with long-time emergency loading, (°C)	140	150	150	160	175
Maximum solid insulation hottest spot temperature with short-time emergency loading, (°C)	180	180	180	180	195

NOTE 1: See IEEE Std C57.91 for information about the risks associated with loading above nameplate rating.

NOTE2: The conventional insulation system per IEEE Std C57.91 is shown for comparison purposes.

\* Essentially oxygen-free applications where the liquid preservation system effectively prevents the ingress of air into the tank.

Table 5— Suggested maximum temperature limits\* for transformers with high-temperature insulation system loaded beyond nameplate rating

Liquid Thermal Class	130			155		
	130	140	155	130	140	155
Minimum required high-temperature solid insulation thermal class	130	140	155	130	140	155
Maximum top liquid temperature with normal life expectancy, (°C)	130	130	130	130	155	155
Maximum top liquid temperature with loading above nameplate rating, (°C)	140	140	140	140	165	165
Maximum solid insulation hottest spot temperature with normal life expectancy, (°C)	130	140	155	130	140	155
Maximum solid insulation hottest spot temperature with planned loading beyond nameplate rating, (°C)	140	150	165	140	150	165
Maximum solid insulation hottest spot temperature with long-time emergency loading, (°C)	150	160	175	150	160	175
Maximum solid insulation hottest spot temperature with short-time emergency loading, (°C)	180	180	195	180	180	195

NOTE: See IEEE Std C57.91 for information about the risks associated with loading above nameplate rating.

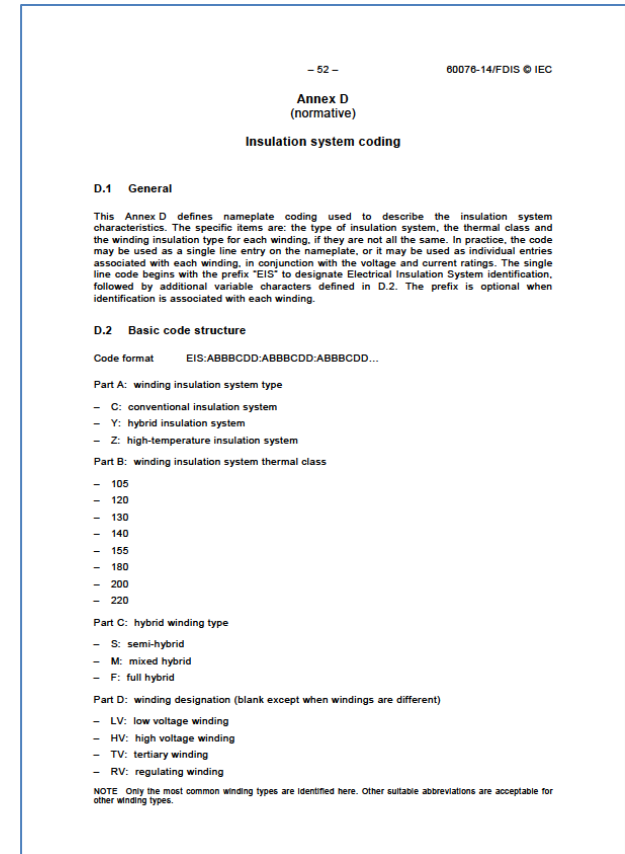
\* Essentially oxygen-free applications where the liquid preservation system effectively prevents the ingress of air into the tank.

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This is an unapproved IEEE Standards Draft, subject to change.



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  - **Definitions**
  - **Accessories**
- Adjourn

# Definitions

- I propose to use the standard term “conventional” instead of “cellulose” throughout the document.
  - “Cellulose” appears many times throughout the document, however, I think what is meant is “conventional,” in particular because the term “conventional” is in the Definitions section.
  - Perhaps there is an occasion or two where “conventional” needs to be defined / clarified as “thermally upgraded kraft paper, cellulosic pressboard, and mineral oil,” as it is in section 3.1 of IEEE C57.100 (in which case it would be appropriate to use the word “cellulose”).
- Should we write somewhere a sentence in our document about “conventional” vs “cellulose” and why we have decided to replace “cellulose” by “conventional”.

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