Annex M Underground Transformers & Network Protectors Subcommittee

October 26, 2016

Vancouver, BC, Canada

Chair: Dan Mulkey

Vice Chair: George Payerle

M.1 Meeting Administration

Introductions – The meeting was called to order at 11:00 AM in the Jr Ballroom of the Sheraton Vancouver Wall Centre Hotel in Vancouver, BC, Canada. Introductions were made and sign-in sheets were routed.

Quorum – The members were listed on the screen and by a show of hands, it was determined that there was a quorum with 19 of the 24 members in attendance.

Approval of Minutes – The minutes from the Spring 2016 meeting in Atlanta, Georgia were approved with the changes noted in the working group reports below. They were motioned for approval by Brian Klaponski and seconded by Jeremy Sewell. The subcommittee approved these without opposition.

Members and Guests --There were 19 members and 28 guests in attendance. Their names can be found in the AM system.

The chair stated that persons must attend 2 meetings in a row and request membership to become a member. If you miss 3 or 4 meetings in a row, you may be dropped from the member list. Introductions were made and minutes from the previous meeting in Atlanta were presented. Brian Klaponski moved to accept the minutes as presented and Jeremy Sewell seconded the motion. The motion was carried unanimously.

In addition to presenting his minutes, Alan Traut reported that his vice-chair Adam Bromley has been promoted at his company and will no longer be attending. He thanked him for his service and announced that Jermaine Clonts will be taking over as secretary of C57.12.23.

Membership Changes – Jermaine Clonts, Mark Faulkner, and Kwasi Yeboah requested and were accepted as members.

M.2 Working Group and Task Force Reports

M.2.1 C57.12.23 Working Group Report – Single-Phase Submersible Transformer

Alan Traut, Chairman, Adam Bromley, Vice-Chair.
Revision Due Date**: 3/19/2019**
PAR Approval Date: **8/21/2014**
PAR Expiration Date: **12/31/2018**

Call to order - The meeting was called to order on Tuesday 10/25/2016 at 9:30am and everyone was asked to introduce themselves. Rosters were circulated. Electronic check-in was available for this

meeting. Al introduced Jermaine Clonts as secretary and notified the WG of Adams Bromley's departure in his role as vice chair.

Essential Patent Claims - At the start of the meeting the working group was asked to disclose of any essential patent claims. No essential patent claims were disclosed

Quorum – We had 68 attendees, 26 members present out of 34 active members, 42 guests with 9 of those requesting membership, which gave us enough members to establish a quorum. Attendance is recorded in the AM system.

Approval of agenda - Motion: Ronald Stahara Second: Fredric Friend Unanimous approval of agenda.

Approval of meeting minutes- Motion: Said Hachichi Second: Ronald Stahara. Unanimous approval of S16 Atlanta meeting minutes

Chair Report – Al talked about when the PAR expires and how long we have to complete our work. PAR expires December 31, 2018. 10-year life cycle of the standard is December 31, 2019. Al informed the working group of his desire to send to the ballot in the fall meeting of 2017, which would give us two more meetings.

Old Business

Low Voltage terminals 7.2.2

Al discussed the revision to the low voltage table that was presented in the spring 2016 meeting by the low voltage terminal task force. The primary changes were the addition of a voltage component to the table, updated the cable standard reference to the most recent version and added the statement "The connection between the secondary bushings and the cable shall be fully insulated and sealed to prevent the entrance of moisture."

Al asked for comments and/or discussion in regards to the data presented in the table. No comments were made.

Dan Mulkey made a motion to approve the table as presented below. Ronald Stahara seconded the motion. The table and text were unanimously approved.

Table 4 – Low-Voltage Terminal Sizes

Low-Voltage Terminals	Low-Voltage Ratings (V)	kVA Ratings
2/0 AWG Copper Cable	120/240, 240/120, 240	25 - 37.5
	240/480, 480/240, 480	25 - 75
	120	-
	277, 347	25 - 50
	600	25 - 100
4/0 AWG Copper Cable	120/240, 240/120, 240	50
	240/480, 480/240, 480	100
	120	25
	277	-
	347	75
	600	-
500 kcmil copper	120/240, 240/120, 240, 277	75-100
	240/480, 480/240 ,480	167

	120	37.5 – 50
	347	100
	600	167-250
H Spade	120/240, 240/120, 240, 277, 347	167-250
	240/480, 480/240, 480	250
	120	75-167
	600	-

When low-voltage cable leads are specified, they shall extend 350 mm (14 in) above the top of the cover and shall be arranged for vertical takeoff. Cable insulation shall be in accordance with ~~NEMA WC7 1998/~~ICEA S 65 658 or functional equivalent for continuous operation at a minimum of 90°C and 600 V. Cable flexibility shall be such that bending it into an arc having a radius of 300 mm (12 in) can be accomplished without overstressing the low-voltage bushing. The connection between the low-voltage bushings and the cable shall be fully insulated and sealed to prevent the entrance of moisture into the cable.

Tank Materials

The table detailing the minimum tank, cover and cooler thickness from 12.24 was discussed and displayed. The objective was to identify if we should have a table detailing the minimum material thickness in 12.23 and if so what thickness should be included in the table. Giuseppe Termini and several other members commented that the table has purpose in this standard and should be included

After agreeing the table should be included in the standard, the discussion transitioned to what thickness should be considered the minimum. Said Hachichi commented on the use of copper bearing steel which is included in 12.24, however concerns were expressed in regards to the manufacturability of this type of steel. In addition, Al asked if any OEM's used copper bearing steel for production of units governed by 12.23. None of the present OEMS currently use copper bearing steel. Lee Welch commented that the steel thickness from the table in 12.24 may be overkill for this product line. After discussion, the working group concluded that the best way to address this subject would be by surveying the end users and OEM's. The survey will identify the what minimum requirements are displayed in the specs of end users, what gage steel OEM's are currently manufacturing with special consideration to the base material used.

Pressure relief requirements

The discussion started with the presentation of background information, starting with the current text in 12.23 followed by the language in 12.39 and 12.24. The objective of the discussion was to determine what language should be included in the new revision of 12.23, in particular whether we should leave the text as is with modification or adopt the language from the other standards. Mike Hardin mentioned his successful past experience with a 1/2" UNC with nylon washer. Edward Smith commented that pipe threads are more forgiving, however with pipe threads you are counting on the thread to provide the seal and with a UNC bolt you are counting on the gasket to provide the seal. Lee Welch questioned where the fitting should be located. Dan Mulkey commented that the automatic pressure relief valve should always be on the cover and the manual pressure relief can be anywhere due to the fact the manual pressure relief is always performed in the shop. Al asked the working group if any pressure relief fittings were located on the tank wall, no one confirmed this application with certainty. From the discussion, the following text from 12.24 was modified and proposed to be the new language for 12.23

Pressure relief

A fitting shall be located on the transformer cover and used for mounting a manual pressure relief plug or an automatic pressure relief valve.

Manual pressure relief

A ½ inch UNC bolt with a gasket or ½ inch NPT plug shall be provided that allows slow release of pressure without completely removing the bolt or plug.

Automatic pressure relief

If an automatic pressure relief valve is specified, a NPT fitting shall be provided and sized for the flow rate of the valve. The valve shall be operable by using a standard hot-line tool from above.

The group ran out of time and placed section 7.3 Accessories on the agenda for the next meeting.

We adjourned at 10:45 am. We will meet at the Spring 2017 meeting in New Orleans, Louisiana.

M.2.2 C57.12.24 Working Group Report – Three-Phase Submersible Transformers

Giuseppe Termini, Chairman; George Payerle Secretary
Revision Due Date: **6/17/2019**
PAR Approval Date: **11/9/2011**
PAR Expiration Date: **12/31/2017**

C57.12.24 did not meet. Giuseppe Termini reported that draft D5 of the document went out and comments came back. Those changes were incorporated as D6. Draft D6 was then recirculated. There was one change to a date and D7 is on the RevCom December 6, 2016 Agenda . C57.12.24 will probably not meet in New Orleans.

M.2.3 C57.12.40 Working Group Report – Secondary Network Transformers

Brian Klaponski, Chairman; Giuseppe Termini, Secretary
Revision Due Date: **12/31/2021**
PAR Approval Date: **8/30/2012**
PAR Expiration Date: **12/31/2017**

The WG met on Tuesday, October 25, 2016 at 11:00 am with 14 members and 30 guests.

An agenda was presented and approved; and introductions were made.

The Chairman asked if anyone in the Working Group knew or had knowledge of any existing or pending patents that may affect the work on this standard. There was one positive response. Liz Sullivan from ABB stated that ABB had a patent related to high current fault inside the network transformer tank. She said they had a LOA with the IEEE from a couple of years ago.

The minutes of the March 22, 2016, meeting in Atlanta, GA were reviewed.

George Payerle made a motion to approve the Meeting Minutes as amended above. Mark Faulkner seconded the motion and the minutes were approved unanimously.

The Chairman stated that the balloted standard received a 97% approval rate. The IEEE-SA requires a 75% approval rate. The Chairman also stated that there were 47 comments received with comments from 2 balloters being negative and the other comments were associated with affirmative votes.

Prior to the meeting a Comment Resolution Taskforce was formed by the Chairman to resolve the comments received from the balloting process however, since most of the comments were not negative, the Chairman decided to review and resolve the comments within the Working Group at this meeting.

The Chairman stated there were 3 changes related to the Mandatory Editorial Review required by the IEEE SA prior to the ballot. These were:

a) Introduction Subclause – These are the reasons for the new revision of the standard and they were added to the Introduction subclause.

b) Scope Subclause – For unknown reasons the scope submitted through the PAR does not match the Scope subclause. The Scope was revised to be consistent with the wording in the PAR.

c) Annex B – A comment was received from the mandatory review coordination raised a potential copyright issue regarding the equation used in this Annex. After much research it was discovered that the equation has been used in other IEEE standard and therefore the copy right issue was no longer valid.

The Chairman stated that Draft 9 was created after the Ballot to incorporate draft changes responding to the comments. The rest of the meeting was dedicated to the resolution of the comments ballot comments.

a) Subclause 3.1 – The word “ambient” was added next to “temperature” in the second sentence of this subclause.

b) Table 2 – A comment was received to make editorial changes to add lines for clarity purposes between columns and rows associated with this table. Plus there were some spacing issues in the table in the voltage numbers.

c) Table 8 – The headers of this table were changed to read “oil immersed” instead of “oil filled” and “ insulating liquid” instead of “fluid”.

d) Subclause 5.2 – The Working Group unanimously voted to leave this subclause as is and to consider the ballot comments received on corrosion in the next standard revision.

e) A suggestion was made by Lee Welsh (he had also made this comment in the ballot) to enlarge the figures in the standard so that they can be more legible. The Chairman stated that he will consider this suggestion and try to enlarge the print in the figures prior to submitting the final copy of the standard for publishing.

f) General Comment – A suggestion was made to renumber the dimensions in Figure 1 to remove inconsistencies (e.g.: H1 is used for the high side electrical connection, however H1 is also used to show the height between top and bottom of the network transformer with reference to Table 8).

Based on the above changes the new Draft 9 will be then submitted back through the final steps of the balloting process and approval processes of the IEEE SA.

The meeting was adjourned at 12:15 pm with the next meeting set for New Orleans, LA in March 2017.

M.2.4 -C57.12.44 Working Group Report – Secondary Network Protectors

Mark Faulkner, Chairman, Alex Macias, Secretary
Revision Due Date: **12/31/2024**
PAR Approval Date: **3/26/2015**
PAR Expiration Date: **12/31/2019**

Meeting Administration:
The meeting was called to order at 1:45 PM
Essential Patents Disclosure - None cited
Attendance
Rosters passed out
Roster Scanned and Sent to DHM
Introductions
Quorum Determination
A total of 24 individuals attended the meeting. Membership stands at 10; members present 5, a quorum was met on people in attendance
Guillerno Sibucao and Sophie Ndiaye have been reclassified as Guest due to lack of attendance
The following have requested membership to the WG; attendance records will be reviewed
Piotr Blaszczyk
David Blew
Robert Stinson

Approval of the Fall 2014 minutes
Mark Faulkner presented the meeting agenda to the WG for review and acceptance. Charles (Cory) Morgan motioned to approve the meeting agenda as presented, Dan Mulkey, seconded the motion, the motion was approved unanimously. No one opposed.

- Items Discussed during meeting
  - Continued review of comments from Lee Welch:
  - Table 4 Section 9.3 AC voltage ratings
    - Readdressing the max. rated design voltages
      - In response to question on voltage table, Eaton (Mark Faulkner) had commented that they design type test at 600V regardless of NP voltage classification.
      - Richards (Douglas Craig) commented that they test per voltage design.
        - A vote was taken to leave Table 4 as is; unanimously approved with no one opposed.
  - B.3 Types of Fuses (Sand filled), section D
    - Elimination of first sentence: “Fuses of this type are used primarily for 480Y/277 V application.”
      - Richards noted that sand filled are being utilized at 216Y/125 V

- Change the second sentence to read: "Fuses of this type has steep time-current characteristic and is sensitive to changes in ambient temperatures."

    - A vote was taken to leave Table 4 as is; unanimously approved with no one opposed.

- External Fuse Housing

    - Clarification from last meeting regarding external fuse enclosures.

        - The issue was the design requirements of a single enclosure for the 3 required fuses. A discussion followed and the following is to be added to Section 8 Fuses and Fuse Mounting.

            - "A single external fusing enclosure shall have fuses that are electrically and physically isolated"

                - A vote was taken to leave Table 4 as is; unanimously approved with no one opposed.

- Pressurizing the fuse enclosure
    - This was addressed in the Atlanta meeting notes
- Section 11.5.2 Spade-type terminals
    - Figure 8 (A) and (B)
        - Eaton and Richards will submit a plan view of the terminal bases for inclusion as models differ in pattern and orientation.
- External fusing clearances and heights
    - Eaton and Richards will submit their designs for inclusion in the standard. The drawings will be reviewed at the next meeting.
- Internal fusing clearances
    - Topic was not discussed
- A discussion was held on NPL and A4BY fusing and applications
    - Review to continue in next meeting
- A continued discussion from the last meeting on the different type of external fuses available was not held

- Annex A
    - Change "normative" to "informative". A vote was taken; unanimously approved with no one opposed. Motion by Lee Welch, 2nd by Dan Mulkey
- Annex B
    - Per Dan: Change "shall" to "should" under General, 3rd paragraph
    - Per Brian: Same paragraph - change last line from "Under no circumstances are fuse to be applied…" to "Under no circumstances fuses should be applied…"
        - A vote was taken; unanimously approved with no one opposed. Motion by Dan Mulkey, 2nd by Brian
    - Table B.4
        - Per Cory Morgan: change #4 from "2825 A" to "2500 A – 2825 A"
    - B.4 History
        - A suggestion was made to include 150kA rating.
- Annex C
    - C.2.1 Incorrect relay setting

- Remove "normally" from: …the phasing relay function is normally included as part of a single network relay package"
- A vote was taken; unanimously approved with no one opposed. Motion by Lee Welch, 2nd by Cory Morgan

- Annex F
  - F.3 Relay settings
    - 5th paragraph (Transformer Losses)
      - Brian volunteer to review, report findings and recommendation for next meeting
  - Last paragraph
    - Suggestion to remove "shall" was not approved from the following: "…a three-phase instantaneous overcurrent element shall also be provided to trip…"

- The following topics were again noted in the meeting; however, deferred to a possible future PAR, not considered at this time.
  - Remote Racking
    - Lee (GP) indicated that an inspection window or some means be included in the standard
    - To verify visible break of contacts
    - Design in place that do not require the door to be open
    - Include a means to provide SCADA features in relation with remote racking
    - Note: It was suggested that a new section be created specific to remote racking
  - Sections: 10.5.4.6. / 10.5.4.7 / 105.4.8 / 10.5.4.8 / 10.5.4.9
    - A discussion was held concerning the door hinges placement
    - Submersible vs. non submersible
    - Is the operating handle the determining factor
    - It was decided to not change any section
  - 10.5.14 Spare auxiliary contacts
    - Request made to define "dry contact"
    - Not addressed; however, a reference was made to include "no voltage"
    - include a means to provide contact status

Next meeting: New Orleans

M.3 Old Business

None

M.4 New Business

C57.12 57 Ventilated Dry Type Network Transformers also falls under UGTNP. The chair commented that it is currently not meeting but that if someone wanted to, they could volunteer to make it an active working group again.

Following the working group reports, there was discussion of the patent disclosure issue. Brian Klaponski related his conversation with Gary Hoffman. The conclusion seemed to be that if a WG chair asks if there are essential patent claims and if so if a letter of agreement was sent to IEEE that should be the end of the WG chair's involvement.

Lee Welch suggested that there be a check box when we sign in to the meeting where people can indicate if there are any patent issues and also can request membership at that time.

Brian pointed out that there has been a lot of conversation regarding cathodic protection. He suggested having a guide or an informative annex attached to C57.12.00 on the subject. He also said that maybe there is already a guide in existence. He pointed out that there are people in our meeting that have experience in that field including Bob Kinner from First Power and Jason Attard from Con Ed. They both indicated interest in working on the issue. Dan Mulkey said that PG&E has cathodic protection on the gas side of the business but not on the electric side. He also said that cathodic protection requires maintenance. There was general agreement that work on this area will be helpful.

M.5 Adjournment

The meeting was adjourned at 12:00 PM with the next meeting set for New Orleans, Louisiana on April 5, 2017.