5.11. Underground Transformers and Network Protectors – Carl G. Niemann (Chair), Dan Mulkey (Vice-Chair)

Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met on Wednesday, October 24, 2012, in the Regency room of the Hilton Milwaukee City Center Hotel in Milwaukee, Wisconsin, at 11:00 AM with 10 members and 18 guests present.

Membership

Quorum was achieved with 10 out of the 13 members attending; 2 guests requested membership.

Approval of Minutes

The minutes of the March 14, 2012, meeting in Nashville, Tennessee, were approved as submitted. Al Trout motioned; Rich Graham seconded; vote was unanimous.

Working Group Reports

5.11.1. Underground Single Phase Transformers (C57.12.23) – A. Traut, Chairman

The WG did not meet. The document was published in April 2009 and is valid until 2018. After the WG on Tank Pressure Coordination lead by Carlos Gaytan, concludes this standard will need to be revised and it is planed that this group will alternate revision cycles with C57.12.24, starting Spring of 2014

5.11.2. Three-Phase Underground-Type Transformers (C57.12.24) – Giuseppe Termini, Chairman

The chairman welcomed members and guests to the meeting which was called to order at 9:45 AM in the Oak Room at the Hilton Milwaukee City Center Hotel in Milwaukee on October 22, 2012. George Payerle acted as the recording secretary. Introductions were made and an agenda was presented. It was noted that consultants should identify who they consult for. The meeting was attended by 9 members and 26 guests. There was a quorum present at this meeting. The minutes from the previous meeting in Nashville were reviewed and approved. Libin Mao, Paul Chisholm, Adam Bromley and Ibrahim Shteyh requested membership.

Bob Kinner of First Power Group gave an excellent presentation on corrosion considerations for underground transformer design. This presentation will be posted in the IEEE Transformers Committee website and will also be sent to the working group guests and members.

After the last meeting the survey was sent out to the Underground Network Forum Group managed by Bob Landman to solicit input from additional end-users of three-phase, submersible transformers. George Payerle compiled the results received from 10 additional end-users. The updated results of the survey include responses from 23 utilities that are summarized in the table attached to the minutes. The Chairman presented the results of the survey. The rest of the meeting consisted of reviewing and discussing the results of the survey. As a result of these discussions, the requirements for the components listed below will be included in the next standard revision:

- Loadbreak switch – Dan Mulkey volunteered to write a section on the requirements for a loadbreak switch.

- Tank material. The Chairman will work with Bob Kenner and other end-users to write a section to identify the minimum requirements for tank material. Ed Bertolini indicated that selection of tank material may change the size of the tank. The Chairman will work with manufacturers to address this concern.
- Fuses - The Chairman will work with Dan Mulkey to write a section to determine fusing requirements.
- Pressure Relief Valve (PRV) - The Chairman will work with Christopher Sullivan, Bill Wimmer and Cory Morgan to write a section to determine PRV requirements.
- Protective covers for the high voltage bushings - The Chairman will work with manufacturers to include requirements for protective covers that do not degrade due to weather exposure.

The inclusion of the above components in the next standard revision were voted on and approved by the members present at this meeting.

There was a discussion related to the effectiveness of the cathodic protection installed inside manholes to minimize tank corrosion when the anodes are subjected to wet and dry "cycling" conditions. Brian Klaponski stated that there is not enough information on cathodic protection to minimize tank corrosion. He suggested that the standard should include, perhaps in the appendix, a section to address cathodic protection. Libin Mao of ConEd and Tas Taousakis of Pepco volunteered to provide construction standards used in their company that show the installation of cathodic protection inside manholes. It was also suggested that the cathodic protection requirements be addressed by the UG Transformers and Network Protectors Sub Committee (SC) since they will impact the other standards within the SC. The Chairman will bring this suggestion at the SC meeting.

The meeting was adjourned at 11:30 a.m. with the next meeting set for Munich, Germany on March 18, 2013.

5.11.3. Liquid Filled Secondary Network Transformers (C57.12.40) – Brian Klaponski, Chairman

The WG met on Monday, October 22, 2012 at 11:15 am with 10 members and 11 guests.

The minutes of the March 22, 2012 meeting in Nashville, TN, were reviewed and approved. Carl Niemann made a motion to approve the Meeting Minutes and Rich Graham seconded the motion and they were approved.

Four guests (Libin Mao, Charles Morgan, Liz Sullivan and Tas Taousakis) requested membership.

The Chair stated that the PAR has been approved with the title change as discussed at the last meeting. Work on the standard can now proceed.

The Chair stated that Bob Kinner gave a presentation of tank corrosion at the C57.12.24 WG meeting.

From business arising from the previous meeting Jeremy Sewell suggested that the last sentence of section 6.2.2.2 be changed to read: "The peak current value for each of the three phases shall be equal to or greater than 107 kA."

Larry Dix pointed out that test requirements shown in Table 5 of C57.12.00, 2010 do not meet the BIL test requirements for the network transformers and probably do not meet the BIL requirement for distribution transformers. Larry volunteered to revise Table 2 of C57.12.40 to reflect the BIL test requirements as shown in the old version C57.12.00 dated 2000.

A suggestion was made to review the audible sound levels shown in Table 4 of C57.12.40.

A suggestion was made to look at adding additional drawings to Figure 1 of C57.12.40 to show a transformer without a primary network switch with perhaps different primary bushing locations.

The remaining of the meeting consisted of the review of ballot comments received that were comments valid for future consideration but not incorporated in the latest revision.

a. Comment 1 – This is a valid comment to be considered to address the location of the filling plug as not to be directly above the HV windings and leads.
b. Comment 4 – This comment caused us to review if each interlock coil needed testing and we agreed that this was what was intended.
c. Comments 5 & 6 – The top oil thermometer range will be reviewed by the Chairman based on commercially available gauges.
d. Comment 8 – This comment is worthy of further discussion in the development of the next revision.
e. Comment 9 – This comment is worthy of further discussion in the development of the next revision.
f. Comment 13- This comment is a valid comment worthy of further discussion.

The meeting was adjourned at 12:30 pm with the next meeting set for Munich, Germany, in March 2013.

5.11.4. Secondary Network Protectors (C57.12.44) – Bill Wimmer, Chairman, Mark Faulkner, Secretary

- **PAR Date: 06/17/2010 PAR Expiration Date: 12/31/2014, PAR Status: Approved**
- **Current Standard Date: 06/07/2006**
- Current Draft Being Worked On: Draft 1 Dated: NA
- Meeting Date: 10/22/2012 Time: 1:45 – 3:00
- Attendance: Members 5, Guests 4, Total 9
- Guests Requesting Membership 1

The meeting was called to order and a review was made of the members present.
Introductions were made of all members and guests present.
The Nashville minutes of 3/12/12 were reviewed and approved with spelling corrections.

Discussion of Changes to the Document
Results of Draft 8 ballot:

- 91 eligible people in ballot group
- 71 votes received for a 78% returned
- 68 votes for affirmative for 98%
- 2 negatives
- 42 comments with 6 that have to be satisfied
- 21 out of 42 related to conversion format error (50%)

The remainder of the meeting was spent reviewing comments:
37 comments were reviewed during this meeting out of 42 total:
1 comment was rejected: Rejected comment regarding section 3.13 with the recommendation of "avoid referring to protectors as breakers."

Larry Dix suggested that the manufacturers of protectors look into the use of thermistors versus the use of thermocouples due to the better accuracy that Quality Switch experienced in testing. In addition, suggested changing the word "thermocouple" to a general less restrictive term relating to a component used for thermal readings in the standard. This will be considered in the next revision of the document.

5.11.5. Ventilated Dry-Type Network Transformers (C57.12.57)

This standard has been withdrawn by IEEE. There was discussion around new sealed dry type and it was reported that Siemens in Brazil has developed a submersible dry type of network transformer.

New Business

Larry Dix made a motion to express concern over applied voltage (high-pot) testing that is now in Table 5 of C57.12.00, 2010 document:

- 25 kV, 150 kV BIL applied voltage test level changed from 50 kV (2000 version) to 40 kV (2010 version)
- 34.5 kV, 200 BIL applied voltage test level changed from 70 kV (2000 version) to 50 kV (2010 version)

What is the rationale and is there any documentation around these changes as there continue to be very early life failures from insulation breakdown at the traditional levels?

How would proposed elimination of distribution class in C57.12.00 affect the induced voltage levels of distribution transformers?

Seconded by Brian Klaponski; approved unanimously

Giuseppe Termini discussed where/how should the cathodic protection be addressed? This has possible impacts to standards – subsurface transformers, pad-mounted transformers, enclosure integrity standards. Possible solutions are a guide, a new standard, or an addition to existing standards? Giuseppe will collect more information and develop the idea further for more discussion at the next meeting.

Old Business

None

Adjournment/Next Meeting

The meeting was adjourned at 12:19 PM with the next meeting set for Munich, Germany, in March 2013