C37.62 – Fault Interrupters

April 25, 2016 – Hilton Head, SC – Sonesta Resort

Chair: Antone Bonner
Secretary: Frank DeCesaro

Meeting Minutes

1. **Call to order and introduction:**
   - Meeting was called to order at 1:33 PM.
   - Roster sheet was started and each person introduced themselves and identified their affiliation.
2. **Roster Check:**
   - 26 Attendees, 18 of which are members. Quorum was met.
3. **Previous Meeting Minutes:**
   - Minutes are on the PES website. No comments made regarding them.
4. **Meeting Highlights:**
   - Ballot pool is formed with 76 balloters. 14% Utility, 28% Manufacturer, 24% consultant, 14% Individuals. 47% of WG members are in the ballot pool.
     - Questioned why members did not join the ballot pool. It appears not everyone received an invitation. Antone will see how we can get the members into the ballot pool by talking with Erin Spewing sp?
   - 169 comments were made with the internal balloting. 161 have been incorporated into the new version. The other 8 will be discussed today.
   - Work to be done: 1) add overhead parts of C37.60 that was dropped; 2) add clause 101 – field testing; 3) Review sub clause 6.101 applicability to all pad mount; 4) Editorial – Antone will cover.
     - Nenad Uzelac will take on clause 101.
     - David Beseda will take on the overhead work.
     - Scott Reed will take 6.101
     - Antone will cover the Editorial work.
   - Significant issues in addition to ballot comments
     - Table 2:
       - Preferred voltage ratings and related test requirements.
       - Numbers are right out of the tables from C37.60 therefore nothing technically changed.
     - Numbering of clauses – differences between standards on how they are numbered.
       - Reviewed how C37.62-draft 3, C37.60-2012, and C37.60-2003 are numbered shown on a table.
       - We have found that IEEE will be requiring that we use the IEEE template which is along the lines of what we already have. There will be some changes that will need to be made.
         - Question, IEEE is mandating that all IEEE stadards follow the IEEE style manual format. We are close to it but need changes. rather than the IEC

format, which was a non-standard IEC format, for the dual logo of it. Yes, we need to conform to the IEEE format.

- Presently, C37.100.1 draft is uses the IEC 62271-1 format. It likewise will need to change to IEEE. This will help our clause numbering line up with C37.100.1 much better.

- Short time/peak withstand test
  - Added in the 2012 Version of C37.60. Not in the 2003 version.
  - We will keep this in because of work done at the last meeting.
- Standard operating duty changes E1/E2
  - Last time we took a straw poll at the last meeting and 14 members wanted to retain the requirements of C37.60. E2 is presently specified and E1 as a reduced duty.
  - Scott Reed made a presentation regarding this.
    - We were not inclined to go with a basic and extended operating duty for fault interrupters last time.
    - The device protecting an underground tap will be a fault interrupter or something that mimics that type of operation (recloser with one shot to lockout). You will have one interrupter for one short circuit and that underground tap will get less operations. Also, underground circuits have fewer faults than overhead circuits.
      - Operating duty of the underground can be about ¼ of the operations of the overhead line.
      - Since we are going to interrupt fewer times it should result in a total operating duty of the recloser which will see more operating duty on the overhead line.
      - Comments –
        - Some users suggested that faults are not as rare as suggested because utilities will "chase" faults on their underground systems by closing in multiple times to find a fault. Several users agreed.
        - Another user stated overhead reclosers are usually provided with a means to by-pass them when service is required. Very few users install without one.
        - The recloser microprocessor control tracks the fault duty and provides information on when to service units.
        - Underground equipment, in general does not have bypassing capability making it more difficult to remove from service than overhead and meaning that it will be in service much longer than overhead gear.
        - Underground equipment usually does not have a microprocessor controller. Therefore, fault occurrences and fault levels are not tracked in underground equipment. It is difficult to know when to service it.
        - Therefore, the user wants a padmounted device to be more robust than overhead switchgear.
        - Again, the original statement was that it could be ¼ of the overhead duty. It does not have to be ¼. It can be something else but it will be less than the overhead device.

        - Comment: Duty of overhead recloser is O-C-O. Duty of fault interrupter is O. It makes sense then to rate the duty on 50% that of an overhead recloser.
        - Standard duty for IEC for non-reclosing circuit breaker is 10 operations.
        - Regarding fault duties, user added that padmounted gear is more likely to be closer to a substation and exposed to higher faults than reclosers and that recloser faults are often high impedance, low fault current events caused by tree branches, whereas cable faults are dig-ins causing a low impedance, high current fault.
        - Another concern leading to a desire for increased robustness in padmount gear is safety. Padmounted gear is operated in immediate proximity to the gear whereas overhead gear is operated through a control located some distance away from the recloser apparatus.
        - Question, why down grade FI now since they have been designed to C36.60 for many decades. Answer - Because we have an opportunity to make a standard dedicated to FI and can tailor its requirements to the actual applications now and future.
        - Question by user? What is the advantage? Cost savings? Reduced footprint?
        - Answer: getting the right way into the standard. The standard should reflect the application where the equipment is placed.
        - User: If presented with a reduced duty device versus a greater duty he will use the greater duty, especially if no price advantage or footprint reduction.
        - User: stocking of two ratings (E1 and E2) would be expensive and risky. More inventory t control and track. No guarantee that the lesser rated device won't be used in a high risk location.
    - Motion by Scott Reed: Moved that the working group reduce appropriately the number of operations required in Table 7 of draft 3.
        - Seconded by Nenad Uzelac.
            - 6 Yes
            - 9 Nays
            - 2 Abstentions
            - Motion failed
- Note 1 on contact erosion as a half-life #143
    - Note 1 refers to the half-life. It was proposed that this note be eliminated.
        - Tabled at the last meeting. At this point we need to either keep it in or note.
        - Comment having this note is confusing because it is not mentioned in the standard regarding condition of interrupter in past.
        - Comment that the note is not applicable to some vacuum interrupter technologies while it may be for others interrupter technologies.
        - Comment. It was taken out of the recloser standard. This has no teeth.
        - Vote to take this out of the standard: 11 Yes, 0 No, 6 abstentions

- Restrike limitation as a criterion for passing fault duty #160
  - C37.60 put criterion in their draft as "During the test series, only one occurrence of restrike shall be permitted. The duration of restrike shall not exceed on half-cycle of power frequency current. If the restrike occurs during the last interruption of the test series, then one additional interruption shall be made to demonstrate no further occurrence of a restrike."
    - 10 yes, 0 nays, 7 abstentions
- Limitation of precondition prior to fault duty test #161
  - Proposed wording: "The Standard operating duty test shall be performed on one specimen without any maintenance. Before the tests, the FI can be preconditioned by performing up to 4 operations at T20 current level. Preconditioning may be performed at a reduced voltage. The preconditioning method, if used, should be described in the test report."
    - A comment was made that if you take this out then put a statement in that you are not allowed any preconditioning.
      - One comment from manufacturer stated they do some before they go to the test lab to make sure it is ok
      - Another manufacturer has the test lab take shots to verify relay settings.
      - One manufacturer does not like the work pre-conditioning. They should be called system calibration shots to prove the circuit.
      - Considerable discussion regarding this subject occurred.
      - Moved by Chris Lettow that we do not include the proposed text. Seconded by Tim Royster.
        - 10 voted yes to not include. 0 voted no, and 7 abstentions
- Remove critical current test #163
  - Excerpt from the current C37.60 revision draft as a replacement to the critical current test:

    6.104 Low current tests
    6.104.1 Applicability
    These tests are in addition to the standard operating duty covered by 6.103 and are required for all reclosers…NOTE The low current tests replace the mainly active load switching test duty that was required under the 2003 and earlier revisions of this standard (IEEE C37.60) and the critical current tests specified in the 2012 edition (IEC 62271-111/IEEEC37.60). The low current tests are intended to serve as evidence that the recloser is capable of interrupting current levels throughout its operating current rating which was formerly evidenced by load current tests.
    6.104.2 Test current
    Tests shall be performed at the T5 and the T10 levels (5% and 10%) of the rated symmetrical interrupting rating on both single-phase and three-phase reclosers…
    6.104.3 Test circuit
    The T20 test circuit of the standard operating test duty shall be used with appropriate adjustments to the source impedance to adjust current level. The power frequency recovery voltage shall be maintained for at least 0,3 s after final interruption. The transient recovery voltage shall be at the highest level that can be achieved by the test laboratory but not to exceed the values specified in the tables of 6.103.5 for the T20 test circuit.
    6.104.4 Low current test-duty
    The low current test-duty shall consist of four open operations at each current level in 6.104.2. The tests may be performed in any combination of O (open) and C (close) operations as is convenient for the laboratory, e.g. O, CO, O – t – CO.

6.104.5 Criteria to pass the low current tests
The criteria to pass the low current tests shall be the same as in 6.103.5.

- Why would we put this in? The standard already says if you have a device that has critical current you test.
- Proposed that we vote for all in favor of replacing the critical current test with the low current test as shown on Antone's 3 slides modified for FI's not reclosers.
    - (8) yes; (1) no; (8) abstentions

- Limit Simulated surge arrester operation test to overhead applications #164
    - This test has been in C37.60 since 1981. It is mean to simulate a surge arrester gap flashover (gapped SiC arrester) during a lightning strike and the current surge to ground through the ground wire. The switchgear control cable is usually in parallel with the ground wire. The test assesses the impact for electromagnetic coupling from the surges on the ground wire to the control cable.
    - Comment – this is not applicable to pad mounted application
    - Another comment stated that it can be seen that a surge through the ground will affect a control at a pad mount.
    - Question: C37.60 is not considering this are they? Answer no.
    - This proposal would not exclude overhead FI's.
    - Question? What if there is no control inside the padmounted unit? Good point. You can argue that it is not just overhead but a situation where the control is decoupled by a significant distance.
    - C37.100.1 has some EMC tests that C37.60 and C37.62 have said are not applicable because the SWC and simulated surge operation test which are special for these cases. There would need to be some reconsideration of those statements if this is accepted.
    - Wave shape would be different if MOV's are considered since no gap to arc.
    - A test by a friend of the chair was done where injections of the surge directly to the padmounted tank, at each of the four corners, had no significant effect. He did not know what would happen if there were external wires going out to remote operators or SCADA.
    - What would be the impact of removing this test would have? Antone suggests leaving this in and going to ballot then deal with it after the balloting.
    - Is anyone willing to work with Nenad Uzelac to draw up what this situation would look like? Ian or Antone will assist Nenad with this.
    - Are we trying to determine to take this out or trying to determine if we need to modify it?
    - We also need to look at controls outside of the gear.
    - Paul Found, Anil Dhawan, Travis Johnson, Tim Royster, Antone Bonner, and Nenad Uzelac are going to study this scenario.
- Remove gas and vacuum tightness sub clause 6.15
    - Karla Trost provided a presentation on this subject. This will be included with the minutes as an appendix
        - She reviewed C37.60, C37.62, and C37.74.
            - She found two sets of sections affect. 6.15 and 7.9. Basically everything that is in 6.15 came from the IEC dual logo. Also all of

7.9 came in with dual logo. There are similar topics to 7.9 in C37.74 but the verbiage is different. She recommends we remove 6.15 and then decided about 7.9 or copy verbiage from C37.74.
    - Group was impressed with the amount of work performed on this task.
    - Comment – when this was added to C37.60 it covered a gap that was missing. It is section 7.4 of C37.74.
    - There are some concerns in the sections she wants to replace because some feel it is not strong enough.
  - Comments back to Karla and copy Antone on this. Antone will send it out to the group also along with the spreadsheet.
- Submersible gear normal condition listed as 3 m 10 days but no test criteria has been proposed.
  - Is it enough to test a similar, say a smaller version of the switch? What are the pass fail criteria for that?
  - Would this be listed in the C57 transformer?
  - You can analyze the gas or hi-pot the device.
  - Nenad Uzelac and Karl Trost will come up with a test recommendation.

5. **New Business;**
   - None.
6. **Next meeting:**
   - Pittsburgh, PA October 9-14, 2016
7. **Meeting was adjourned at 5:29 PM**

Submitted by:

Name: Antone Bonner
Date: 4 May 2016

Annex: Member Attendance

Role	Last Name	First Name	Company
Chair	Bonner	Antone	Eaton
Secretary	DeCesaro	Frank	Eaton's Cooper Power Systems
Member	Ambrose	Chris	Federal Pacific (Div. of Electro-Mechanical Corp.)
Member	Beseda	David	S&C Electric Co.
Member	Ernst	William	Thomas & Betts
Member	Found	Paul	BC Hydro
Member	Gieger	Jeffrey	Thomas & Betts
Member	Johnson	Travis	Xcel Energy
Member	Lettow	Chris	S&C Electric Company
Member	Li	Wangpei	Eaton
Member	Martin	Donald	G&W Electric Co.
Member	Reed	Scott	S&C Electric Company
Member	Rokser	Ian	Eaton Corp
Member	Royster	Timothy	Dominion Virginia Power
Member	Soulard	Francois	Hydro-Quebec
Member	Trost	Karla	G&W Electric
Member	Uzelac	Nenad	G&W Electric
Member	Walter	William	We-Energies
Guest	Barnhart	Paul	Underwriters Laboratories
Guest	Chang	Samuel	Pacific Gas & Electric Co
Guest	Dhawan	Anil	ComEd
Guest	Glaesman	Peter	PCORE Electric Company, Inc.
Guest	Kowdley	Ryan	Pacific Gas & Electric
Guest	Pintado	Zachary	Entergy
Guest	Rogerson	Kevin	Eversource
Guest	Ruebensam	James	S&C Electric Co.