Minutes of Meeting

WG: C37.09 Standard Test Procedure for AC High-Voltage Circuit Breakers with Rated Maximum Voltage above 1000V

Chair: Xi Zhu
Vice Chair: Victor Hermosillo
Secretary: Mike Skidmore

First Session (1:30 PM – 3:15 PM) - October 10, 2016

Location: Pittsburgh, PA
Participants: 29 Members
43 Guests
(56 total members in WG - Quorum requirement met)

All members and guests introduced themselves

Session #1 attendance list circulated and the chair asked all attendees to sign the roster and provide affiliation if not noted on the roster.

Chair presented the agenda (Document 149) in central desktop

Chair said that MOM (meeting of minutes) are posted and sent out via email after the Spring meeting. There were no comments received for corrections to the Spring 2016 MOM. The meeting minutes approved as posted in the IEEE PES switchgear website.

The first ballot made (July 25, 2016 to August 24, 2016)

114 returned on first ballot
84 approved
22 negative
8 abstained
88% voted
80% approval rate
492 comments

A comment resolution committee was created and committee viewed 492 comments and preliminary dispositions proposed.

CRC preliminary disposition on all comments sent to the WG members and guest on Oct.3. Foreseeing the time constraint in the fall meeting, the chair requested the whole

group to review the preliminary dispositions and let him know if one wants to discuss a particular comment in the meeting. Based on the CRC's recommendation and feedback of above email, 42 comments were decided to be discussed in three sessions in Pittsburgh, including the comments not registered in the initial ballot

All documents are available in central desktop

Key Documents:
Document 144 is Draft 2.5 sent out for ballot.
Document 148 is for preliminary dispositions.
(Document 148 will be updated based on discussions from meetings in Pittsburgh)

WG (Working Group) member list reviewed and updated based upon requirements and contributions to WG

Project outlook

First ballot done as scheduled
PAR expires December of 2017
Submit to RevCom after recirculation
Target December 2017 for completion

Chair estimates that the WG revised approximately 50% of the document.
Disposition status can only be three alternatives. Definitions of accepted, rejected, revised and TBD (still up to further discussion).

Total comments = 492
Accepted 224
Revised 137
Rejected 105
TBD 26
No disposition 0

When we go to recirculation. The Chair suggested that balloters should provide very specific comments with a clear direction to update the document.

The chair moved to discuss listed comments:

Comments Resolution Discussion

i-24 Helmut Heiermeier, Line 407

Definition of conditions to obtain correct condition of the last half wave. Definition is correct but only considers lab condition matching requirement. Denis proposed to reject the comment since definition is correct but testing should reproduce the conditions with correct major loop and duration. Values given in tables. Depend on minimum clearing time calculated by standard or other DC time constant. Clarification in Annex C is possible. The intent of the definition is that it is evident that the DC time constant is the standard value. We can add that specifically the time constant used is 45 ms. More wording could be added to Annex C.

Change disposition as revised. Add to the existing note line 410-411 “in a circuit with a time constant of 45 ms.”

i-478 Mauricio Ariztizabal, Line 412

“initiation of the opening operation” not properly defined.

Anne Bosma, some breakers do not have releases. Count the time from initiation of the operation signal.

KEMA some breakers start with no delay. We know when we initiate the signal, this is the measurable quantity.

Chairman, accept this comment. Reword the definition and simplify.

i-479 Mauricio Aristizabal, Line 544

There is no pass/fail for acceptable constant resistance value after test.

Mauricio, what is the limit for continuous current? I suggest to use 20% which is in IEC.

Anne Bosma, IEEE C37.100.1 has a clause limiting to 20%. He suggested we reference C37100.1 standard. Sets a limit for production testing.

Leslie Falkingham, if you make and pass a continuous current test, you have passed regardless of the final resistance value.

Denis Dufournet, good idea to refer to IEEE C37.100.1.

Steve Cary, This is a test method C37.04 does not have requirement. This is a tight tolerance in medium voltage breakers.

C37.09 should have this requirement, C37.04 will have the required continuous current rating.

Sushil Shinde, first sentence in section discusses this, resistance measurement should be used for the production criteria not as a pass/fail criteria.

Ted Burse, you can simply establish the margin based on the temperature results that were measured and calculate what is the maximum resistance that would still pass the test. In C37.100.1 pass fail is based on the temperature rise values, this standard suggests +100% for fault test, 20% for continuous current test.

Ken Edwards, reason is not to pass/fail breaker but to measure in order to establish maximum for field.

Conclusion: change the disposition status of REVISED, add a note stating that resistance measurement is not pass/fail criteria, but is only important for establishing the production and field limits for this parameter.

i-37 Helmut Heiermeier, Line 750

Maximum contact opening time. Helmut accepts, no need to change.

i-186 Steven Chen, Lines 790

Denis Dufournet Same value but different thing. There are two 18 degrees 778 is alpha, difference when min arcing time you delay by 18 degrees to obtain demonstration.

Determine interrupting time is reduced by 18 degree to consider the precision in determining minimum arcing time (d alpha). Equation is all in degrees. Tw should be given in electrical degrees.

Conclusion: Change status to REVISED, Denis to make corrections to equation and check that units are consistent in time (ms).

i-328 robert Cohn, line 874

Went through document and seemed to be suitable to move graphs to annex. Graphs appear to show examples, move to annex?

Denis Dufournet, to be decided. These graphs came from IEC with the same format. Time irrelevant, just a graphic representation. IEC kept these graphs on purpose to illustrate current waveform change. Proposal is to rewrite 910 stating, “the graphs are Figures XX are for illustration only.”

Arben Bufi, numbers are not readable, add note-stating scale or remove.

Anne Bosma, frequency is irrelevant; it is just showing how the currents behave.

Chairman, propose to keep graphs in place. This is a new procedure, maintain graphs in place to keep clear representation/illustration of description. Idea is to demonstrate how current behaves. Change to revised. Figure 1 to Figure 8 should include clarification.

Additional comments, Line 840, add words for clarification “example is provided for illustration only”.

i-72 Anne Bosma, line 1072

Paragraph removed together with Figure 9.

Chairman, if the circuit breaker has internal components that will modify the TRV (resistors, capacitors). Test equivalent if effect of component is included in TRV.

Anne Bosma, breaker is a black box, this clarification is unnecessary. Apply required TRV and the effect occur with components inside breaker.

Sushil Shinde - If any of the breaker components are modifying TRV then these are considered to be part of a circuit breaker. And anything which is part of the breaker should be treated as a black box. If the TRV is modified by this black box then it should not be modified. Once the prospective TRV is set as per the standard then it should not be modified based on breaker response.

Denis Dufournet, if the breaker has an opening resistor, the circuit breaker will modify the TRV. IEC 62271-100 has annex R. Refer to this standard and remove this paragraph. It is rare to test breakers with opening resistors. There is not enough detail, in some cases you may have an incorrect test in which the test parameters are not correct. Would need to add 15 pages to cover this aspect. Better to add reference.

Helmut Heiermeier. In direct test you can see the breaker as a black box. In synthetic testing you cannot use this approach. Prefer reference to IEC standards, it is a question on test procedure.

John Webb, withdraw comment and keep IEC 62271-100 as a normative reference.

Conclusion: change status to REVISED. Remove line 1072 to 1080 and Figure 9, add reference to Annex R of 62271-100 and make 62271-100 normative reference.

i435 John Webb, Line 1078

Discussed and rejected

i122 Ted Olsen , Line 1081

Discussed and rejected since the Figure will be removed from the document.

i14 Roy Alexander, line 1187

Roy Alexander, Some tests should be conducted at maximum pressure. Perform a test to demonstrate that lockout pressure is worst case. In some cases, higher pressure can be worst condition. For example, if there is significant reduction in speed or flow dynamics change.

Denis, it has been demonstrated that worst case test condition is lockout pressure. In 30 years it has always been a better condition to have the maximum possible pressure, so lockout pressure is the most stringent condition. Higher density is critical for both thermal and dielectric interrupting phases. No evidence in testing that rated pressure is a worse condition than lockout pressure.

Chairman, we need to show evidence to the contrary in order to prove a case in which rated pressure is the worst condition. No evidence is being presented.

Comment rejected unless there is evidence

i436 John Webb, line 1188

Measurement of opening time in 4.9.2.9. This is again in 4.9.6.3 line 1620. No harm if included in two places. You can reject, I think it is redundant.

This will go into definitions dictionary.

Denis Dufournet, minimum clearing time is included in definitions.

Anne Bosma, measure closing time for making tests. Closing time should be added. Need to determine pre-arcing time.

Conclusion: , delete 4.9.2.9 and add closing time to 1627. Speed/travel if applicable. John Webb to prepare and send text. Modify disposition to revised.

i77 Anne Bosma, line 1188

Comment set to revise

Closing time will be added to c). Also, “if applicable” to be added to speed/travel.

Second Session (3:45 PM – 5:30 PM) - October 10, 2016

Location: Pittsburgh, PA
Participants: 17 Members
30 Guests
(56 total members in WG - Quorum requirement not met)

Chair asked if there were any introductions of new members or guests that were not present in Session #1.

Session #2 attendance list circulated and the chair asked all attendees to sign the roster and provide affiliation if not noted on the roster.

The chair moved to continue discussion on selected comments:

Comments Resolution Discussion Continued

i266 to i270 Terry Woodyard, line 1477, 1484, 1495, 1501, 1516

Add cross-reference interrupting test duty nomenclature from 1999.

Kirk Smith, do not change the table, add an informative note.

John Webb, just explanatory.

Anne Bosma, it is not new, no need to change it was already done on C37.09b-2010. It would be a step back.

Already introduced seven year ago. Proposal to reject.

Conclusion: this nomenclature is not new, they appeared before (7 years ago) it would confuse people. Comments i266 to i270 are rejected. In addition, clarification notes are already in Document page 30 lines 1101 to 1105.

i441 John Webb, line 1556

Service capability uses combination of T60, T100s and T100a. Is the text clear to everyone?

Denis Dufournet, idea was to at least require one T100a or T100s combined with T60. Originally it was to combine a full T100a/s test sequence and a full T60 test sequence. Alternatively, an extended T100a/s can be performed.

Ted Burse, in line 1570 it is clear that no more than 5 x T60 should be made, so it forces a full test of T100a/s.

Conclusion: it is clear as written, reject comment. John Webb agrees.

i345 Edgar Dullni, line 1557

Denis Dufournet this comment should be rejected. This comment is requesting to perform T100a and T100s. The standard is only requiring the minimum. It is acceptable to do more.

John Webb, performing one shot of T100a only counts as 100%, it is not more favorable than T100s.

Conclusion: reject this comment.

i128 Ted Olsen, line 1560

Comment accepted change all “Irated” to “I”.

i419 Helmut Heiermeier, line 1583

Helmut, Why are two different tests specified for voltage withstand? Prefer only one but can accept as is.

Conclusion: allow dielectric check with TRV application or alternatively dielectric test. Comment is rejected.

i421 Helmut Heiermeier, line 1569

Denis Dufournet, IEC made comparison between switching impulse and T10 TRV, this is why 60% value was used. It is not 90% of BIL it is 60% of BIL.

Conclusion: agree disposition and revise text to reflect 60% in line 1598 instead of 90% and to reflect 80% in line 1605 instead of 90%.

i435, Anne Bosma, line 1609

Suggestion to move 4.9.6 to beginning of 4.9. It would become 4.9.2. No problem to keep as is.

Chair, Clause 9.6 contains tests of both before and after short circuit tests.

Conclusion: comment rejected change disposition.

i438, Ted Burse, line 1615

Refer to IEEE C.37.100.1 or IEC 62271-1.

Dave Stone C37.100.1 has eliminated grouping. Cannot make this reference. More tests are required in the equipment.

Ted Burse, you still need to keep the grouping for the service capability. Will draft wording to replace existing text.

Conclusion: status will be marked as revised and modify text. Ted Burse to provide wording.

i346, Edgar Dullni, line 1642

IEC 62271-1 allows +10 degrees C rise after short circuit breaking tests.

Denis Dufournet, it makes sense to allow a higher temperature rise in a breaker that has gone through short-circuit testing.

John Webb No correlation between +10 K and 200% increase in resistance.

There may be practical difficulties running temperature rise test that requires mounting thermal couples to the current path which could alter the initial condition of the current path.

David Stone 4.8.5.5 version from 2005 allowed +10K this was removed

No unanimous consensus can be reached after 30 minutes of discussion. Chair suggested further comments to be submitted when this standard is out for recirculation.

Conclusion" : remove the second part of b) and only "...rated maximum voltage in the open position." Make a contact resistance measurement, if less than 200% then pass. If it exceeds 200%, test is failed.

i5 Denis Dufournet, line 1648

200% is too stringent and does not provide indication of the condition inside.

David Stone discussed in the past. Thermal runaway test to check. Breaker is approaching the end of life. It is not expected to meet temperature rise. Important thing is that it is stable and will not go into thermal runaway.

Conclusion: proposal accepted, increase to 250%.

i303 Ted Burse, line 1723

Line up with C37.100.2, why have two versions?

John Webb asked for two years PAR extension, but will go to ballot soon. There will be an amendment to C37.09 after C37.04 is finished. A reference can be made to documents that are in ballot.

Roy Alexander, it will then depend on another document. Leave it as it is and deal with it down the road.

CRC review comments:

> Denis: it should be done when C37.100.2 is approved. At this stage it represents too much work and delay the project.
>
> Ted Olsen: as we cannot wait for C37.100.2 to get completed

Conclusion:, comment rejected, will revise C37.09 if necessary after publication of C37.04 and C37.100.2.

Third Session (2:00 PM – 3:45 PM) - October 11, 2016

Location: Pittsburgh, PA
Participants: 27 Members
32 Guests
(56 total members in WG - Quorum requirement not met)

Chair asked if there were any introductions of new members or guests that were not present in Session #1 or Session #2.

Session #3 attendance list circulated and the chair asked all attendees to sign the roster and provide affiliation if not noted on the roster.

The chair moved to continue discussion on selected comments:

Comments Resolution Discussion Continued

i- 347 Edgar Dullni, Line 1818

Comment:
Why is the designation of test duties by CS1 and CS2 necessary? This could give some confusion with LC1, CC2 etc.

Proposed Changes:
Reconsider the use of CS1 and CS2. If these terms are used, they need to be defined under the definitions clause.

Preliminary Disposition:
Revised (Denis/Ted).

Anne Bosma, Denis Dufournet, simplify the description of the test duty.

Conclusion: comment accepted, remove CS1 and CS2, LC1, LC2, CC1, CC2, BC1 and BC2 will be used.

i- 460 John Webb, Line 1946
Comment:
"For practical reasons" ... It doesn't really matter, we either allow preconditioning in excess of 3x T60 or not; similarly I can't think of a reason to only permit extra operations for breakers less than 72.5 kV. (I can think of why, based on technology it might be desirable or not, but that isn't the business of the standard). I am in favor of allowing but there should be some limit I think. How about 50% of the electrical endurance capability as required and computed in accordance with 4.9.5.4.

Proposed Changes:
The manufacturer may choose to add other test duties to the test duty T60 preconditioning tests. Except by agreement between manufacturer and user, the accumulated interrupted current by these preconditioning tests shall not exceed 50% of the electrical endurance capability required by and computed in accordance with 4.9.5.4.
Preliminary Disposition:
TBD (Denis/Ted)

Disposition Details:
Denis: the text should be taken as it is. It is the choice of the manufacturer to add or not other interruptions. He takes risk by adding more and is responsible if the circuit breaker fails.

Hermosillo, you may want to perform a full T60 test and then test LC, CC or BC. It allows combination of both tests.

Denis, Ted: If manufacturer chooses to “overtest” why should he be prevented from doing so?

Conclusion: disposition is comment rejected.

i- 45 Helmut , Line 2226

The test circuit used to demonstrate class C0 shall be capable of producing multiple restrikes, and shall provide sufficient energy for each restrike to *charge the load capacitor to 3.0 per unit voltage.*

Comment:
The recovery voltage appears across the breaker needs to reach three times of the peak test voltage after initial interruption in order to produce sufficient stress to test if the breaker would restrike. The original wording is fine but needs to clarify the ‘per unit voltage’.

Conclusion: change wording to “3.0 times the phase to ground peak test voltage” instead of “3.0 per unit voltage”. Change status to REVISED.

i-187 Terry Woodyard, Line 2580

Comment:
M1 and M2 class breakers are not defined anywhere in this document, C37.06-2009 nor in PC37.04 draft 2.7

Proposed Changes:
Delete all references to M1 and M2 class circuit breakers

Preliminary Disposition:
Revised (Dan Schiffbauer/Victor)

Discussion

Steve Cary, C37.04 will revised to include definitions of M1 and M2 classes.
John Webb, it is possible to reference C37.04 if it is in ballot. The definition can be kept in C37.09 for completeness and then a decision is made as the other standard progresses.

Disposition Details:

Comment rejected: No changes for now. To check again as C37.04 goes to ballot.

Note: Chair asked if he could have draft document of C37.04 to post in C37.09 in central desktop. Steve Cary to send draft document of C37.04 to Xi.

i275 Steven Chen, Line 2580

Comment:
1. M1 and M2 classes are not defined and rated in C37.04.
2. When low and high control voltages are considered, it is not necessary to run mechanical endurance test at these abnormal voltages. The operational conformance should only need to be verified between endurance test cycles and at the end of the test, with including sufficient operations at low and high voltages.
3. It can be an unnecessary burden on manufacturers and labs to follow this new test sequences.

Proposed Changes:
In general, similar to the requirements in current C37.09, with including more specific operational conformance tests.

Preliminary Disposition:
Revised (Dan Schiffbauer/Victor)

Dan Schiffbauer, the additional initial pre-test and final after-test operations can be counted for the 2,000 and 10,000 operations.

Disposition Details:
1. Agree to replace M1/M2 as indicated in disposition i-275

2. Operation at minimum, rated and maximum control voltage is possible in the substation. Inclusion of these voltages during type testing demonstrates not only operational stability but also accumulates electrical stresses consistent with the entire range of possible supply voltage and therefore should be part of the mechanical endurance test.
3. Allow for pre- and post-test operations to count for total number of tests.

Conclusion:, Dan Schiffbauer to change table to reflect IEC requirements, simplify test duties, clarify operation count in Table 11 and M1 and M2 classes counts to be 2000 and 10000 totals.

i87 Anne Bosma line 2588 (added to agenda)

This comment was not included initially in presentation, will be added to discussion. Remove 4.14.5. “Remove the entire subclause, information is already in the last subclause.”

Conclusion: Dan Schiffbauer, will remove 4.14.5 and make necessary changes in above clause to capture all the requirements. Operating sequence should replace operating cycles in Table 11.

i470 John, Line 2650

Comment:
C37.09-1999 removed the exemption for "indoor" (at the time) circuit breakers from the low temperature test. We should allow for "indoor" circuit breakers to be tested separately from the switchgear structure.

Proposed Changes:
New subclause g): Circuit breakers intended for use in enclosures may be tested in a single complete vertical structure, equipped with space heaters if normally provided, or at the option of the manufacturer may be tested without the enclosure however in such a case, no space heaters other than those which may be normally supplied with the circuit breaker may be employed, and a suitable arrangement to simulate the load of any MOC switches must be present.

John Webb, possibility to have breaker tested without the enclosure. OK for draw-out circuit breaker intended for use in metal-clad or metal enclosed switchgear.

Preliminary Disposition:
TBD (Dan Schiffbauer/Victor/Ted Olsen)

Disposition Details:

Dan/Victor: Would like to hear from the group. Cold test without the enclosure should be more severe from the standpoint of thermal time constant. However, are there any other issues related to the enclosure which will be missed due to its absence?
Ted: should be rejected, at least in part that a circuit breaker does not necessarily occupy a “single vertical structure” and because this modification would needlessly cause repetition of tests when the same circuit breaker operator is applied in multiple types of equipment.

Disposition: revise and make changes

Allow for testing of circuit breakers intended for use in metal-clad or metal enclosed switchgear.
John Webb to send wording.

i-373 Robert Goodin, Line 2714
Comment:
Don't agree with complete BOM in test report

Proposed Changes:
Catalog number with major parts identified (VI, MECH contact fingers)

Preliminary Disposition:
Revised (Dan Schiffbauer/Victor/Ted Olsen)

Disposition Details:
Revise test to require traceability to the complete BOM of test object.
Ted: detail is itself not sufficiently precise. Further what is the meaning of “traceability to the complete BOM”?

Identification of the test object. Need to find better place to include for all tests.

Sushil Shinde - The test object should be identified by list of major components and not by complete BOM. The labs typically verify list of BOM or major component list only if the test is requested to be performed as per relevant standard and certification is needed. In the case of development test and tests performed per client request labs are typically do not include the list of BOM in to the test report issued to the client. However the labs can include major components and include note stating that the relevant drawings have not been verified.

Anne Bosma: IEC 622271-100-1 proper identification of test object.

STL guide provided guidelines for identification of test object in case of certified test report.

Remove line 2714 and add major part identification as a general requirement at the beginning of test requirements. Can refer to IEC 622271-100-1 for proper identification of test object.

i- 253 Stan Billings, Line 3024

Comment:
It has been my understanding that the most severe condition at minimum voltage is with maximum pneumatic/hydraulic operating pressure because more effort may be required to release the valve when loaded at the higher pressure.

Proposed Changes:
Change "...minimum pneumatic/hydraulic..." to "...maximum pneumatic/hydraulic..."

Preliminary Disposition:
TBD (Xi Zhu)

Disposition Details:
This was changed in earlier discussions from 'maximum' to 'minimum'. Will discuss it again if the changed made earlier was current action.
Conclusion: accepted.

i-91 Anne Bosma, Line 3093

"5.13.2 Spring charged mechanisms
The charging motor of a spring-driven circuit breaker operating mechanism shall replace the spring stored kinetic energy within a maximum time of 15 s after being used during a close operation when rated control voltage is maintained at the motor terminals."

Comment:
This requirement is not applicable to circuit breakers used with auto-reclose duty cycle (i.e. O-0.3 s-CO-3 min-CO)

Proposed Changes:
Change to reflect the comment.

Preliminary Disposition:
TBD (Ted / Xi Zhu)

Disposition Details:
Xi: This clause is part of Production Test. This maximum 15 s recharge time would still meet the auto-reclosure duty. Changed word 'replace' by 'replenish' and delete 'kinetic'.

Ted: should be revised, but I still disagree that the endurance test should be done with every operation a reclosing operation – wholly unrealistic with respect to actual service!

Conclusion: 5.13.1 and 5.13.2 will be replaced with simple statement
“The production test should be done to verify that the circuit breaker can perform the required duty cycle.”. Change status to REVISED.

i-93 Anne Bosma, Line 3455

Comment:
Remove annex D. It is not related to testing nor does it contain any requirements.

Proposed Changes:
Remove Annex D

Preliminary Disposition:
TBD (Ted / Xi Zhu)

Disposition Details:

For discussion:
Ted: Should be accepted.
Xi: It relates to the conformance test clause 6.1.3, should remain in C37.09?

Should be moved to the application guide.

Line 3124
6.1.3 Method of conducting conformance tests for line closing switching surge factor on an operating system

A purchaser may perform a field test with the circuit breaker on an actual operating system in order to determine if its test performance conforms to requirements for its rated line closing switching surge factor. The circuit breaker will be considered to have passed its conformance test when the circuit breaker is closed on a random time basis into trapped line charges, if in 20 tests there are no overvoltage factors greater than the rated line closing switching surge factor; or only one such event out of 34 tests; or two out of 48 tests; or three out of 62 tests. Four factors greater than the rated factor, or any factor greater than 1.2 times the rated line closing switching surge factor, represent nonconformance.
If the actual system is not greatly different from the standard reference power system, it is expected that the field test results will not differ significantly from the results obtained from the simulated study used to establish the rated line closing switching surge factor. However, if the circuit breaker fails to meet the above criterion, and if the actual power

system is significantly different from the standard reference power system, the manufacturer may conduct a simulated study (witnessed by the user) of the actual power system and thereby determine the line closing switching surge factor for the circuit breaker on the actual system. This factor may be substituted in place of the rated factor and serve as the basis for evaluation of the conformance test.

Conclusion: Comment accepted, Section 6.1.3 and Annex D will be removed and suggestion made to add to the application guide C37.012 (Roy Alexander) in the future revision.

i-368 Robert Goodin, 4.14.4 Line 2580

Comment:

Test Procedure is over complicated. Don't see the need for many different operating duties

Comment rejected

i- 371 Robert Goodin, 4.14.9 Line 2651

Comment:

Test Procedure needlessly over complicated. Agree with voltage changes but don't need many different operating duties

Proposed Changes:

Harmonize with IEC62271-100 Section 6.101

Disposition Details:

Conclusion: Along with comment i-275, test duties will be simplify, Change status to REVISED.

i-309 Ted Burse, 6.2, Line 3141

3141 6.2 Indoor circuit breakers

3142 See ANSI C37.54 for all conformance test requirements.

Comment:

It is not required to comply with or even refer to C37.54 to fully comply with the requirements of C37.09. C37.54 is a stand-alone requirement intended solely for third-party certification of a circuit breaker that has been previously qualified to C37.09. Therefore, the inclusion of the reference to C37.54 in this document is also redundant.

Proposed Changes:

Delete 6.2 in its entirety.

Disposition Details:

Dave Stone: Make informative note move to bibliography.

Get rid of outdoor/indoor.

No need to John Webb i476 “change outdoor to free-standing” Delete heading 6.1 and 6.2 do not refer to C37.54, add C37.54 to bibliography

Conclusion: Delete Cl.6.2 and title of cl.61. Renumber 6.1.1, 6.1.2 and 6.1.3 to 6.1, 6.2 and 6.3.

Comment Added to Agenda

Dave Stone (10/5/16 email), Comment number not available, sent via email.

Observations on comments regarding normative references

Specifically comment #’s i-239, i-10, i-381

Line 355 – IEC 62271-1 and Line 381 - IEEE C37.100.1

Dave’s email First point: The normative reference IEEE C37.100.1 MUST be a dated as it is currently under revision that will change the clause numbering throughout.

WG Conclusion: accepted. All reference to C37.100.1 will refer to the latest draft.

Dave’s email Second point: There is no reason to make a normative reference of the IEC document since only the IEEE document should be used – with modification if necessary. Citing both documents invites conflict. Delete all references to IEC 62271-1.

WG Conclusion: accepted. All references to IEC62271-1 will be removed and Iec 62271-1 will be moved to bibliography.

Dave’s email Third point: It appears that the current published edition (2007) to IEEE C37.100.1 has been used. The WG is strongly urged to adopt the newer revision (D8) that will be submitted to RevCom in the next month.

NOTE: the subclause 6.1 Grouping of Tests is being deleted in both the IEC and the IEEE Common Specification standards. See 4.9.6.2 of PC37.09 D2.5.

WG Conclusion: Accepted on the reference to C37.100.1 and noted the changes in grouping.

Dave's email Fourth point: When citing IEEE C37.100.1, the WG is encouraged to follow the guidelines in Annex A of that document. More specifically, paragraph A.3. As an example, in PC37.09/D2.5 , subclause 4.20 is written:

4.20 Radio Influence Voltage (RIV) Tests

Radio Influence voltage limits apply for circuit breakers rated 123 kV and above. For lower voltage ratings, the radio influence voltage is relatively low, and radio influence effects negligible.

Refer to C37.100.1 for test procedures for RIV test.

The preferred format according to the guideline in C37.100.1 would be as follows:

4.20 Radio Influence Voltage (RIV) Tests

Paragraph 7.3 of IEEE Std C37.100.1-201x applies with the following addition.

Radio Influence voltage limits apply for circuit breakers rated 123 kV and above. For lower voltage 2835 ratings, the radio influence voltage is relatively low, and radio influence effects negligible.

> WG Conclusion: accepted. Will check where reference to C37.100.1 is made and follow the example above.

Dave's email Fifth point: I am disappointed that the WG has not made greater use of the Common Requirements standard particularly in the case of the continuous current test and the various dielectric tests.

Dave also committed that the WG in the meeting for not being open minded enough for changes.

> Chair Comment: C37.09 WG assigned a task force to review Dave's request to refer more to C37.100.1 for several test duties a few meeting back (happened in spring 2015 meeting). The task force reviewed C37.100.1 and reported their recommendations in Fall meeting of 2015. Decisions were made following the discussions from the task force reports. The chair is regret to see this kind of comment but assure that the WG is open to good ideas.

Line 341 and 342 Editorial change, remove references to IEC standards. As a result, take IEC 62271-1 from normative references clause 3 and move to bibliography

Dave Stone: I would like this WG to consider using C37.100.1 for temperature rise test procedure. Willing to adapt if it is considered to be used as a reference. In two weeks he will review and send proposal.

Miscellaneous Discussion

i83 Anne Bosma

i83 (line 2562) was discussed at the end of the meeting.

Anne’s comment i-83:

“The use of Table 10 is too specific and does not apply to all circuit breakers. It contains undefined terms such as "dwell time" "Seal-in, slow trip" etc. It is not essential for the mechanical endurance test nor is there referred to this table anywhere in the document.”

Anne suggested the WG remove Table 10 as it does contain information stated elsewhere in the document. Comment for i-83 can be combined with several discussion items already covered. The Chair and Dan Schiffbauer will revisit this issue and consider removing the table and/or defining the terms and explore other options. In Anne’s opinion, it should be removed. i-83 fits other discussion items listed above and to possibly follow IEC 62271-100 for the mechanical endurance test.

Meeting Roster for Session #1, #2, #3 Pittsburgh, Pa

First Name	Last Name	Role	Company	Session #1 Pittsburgh PA 10/10/2016	Session #2 Pittsburgh PA 10/10/2016	Session #3 Pittsburgh PA 10/11/2016
Syed Shahab Uddin	Ahmed	Guest	Siemens Energy Inc			
Roy	Alexander	Member	RWA Engineering	X	X	X
Natasha	Alvarado	Guest	IEEE Standards Association	X		
Mauricio	Aristizabal	Member	ABB	X	X	
Koustubh	Ashtekar	Guest	Eaton Corporation			X
Aasim	Atiq	Guest	Siemens Industry	X	X	X
Roy	Ayers	Guest	Nashville Electric Service			
Katrin	Baeuml	Guest	Schneider Electric			
Paul	Barnhart	Guest	Underwriters Laboratories	X	X	
Amildo	Barrio	Guest	Parsons			
George	Becker	Guest	POWER Engineers			
Robert	Behl	Guest	ABB	X	X	X
Jean-Marc	Biasse	Guest	Schneider Electric			X
J	Billings	Member	John S Billings Consulting	X	X	X
Anne	Bosma	Member	ABB AB	X		X
Douglas	Brandt	Guest	Eaton Corporation	X		X
Cody	Brehm	Guest				
Jeffrey	Britton	Guest	Phenix Technologies, Inc.	X	X	
Jeffrey	Brogdon	Guest	Georgia Transmission			
Steven	Brown	Guest	Allen & Hoshall		X	X
Raymond	Browning	Guest	FirstEnergy Corp.			
John	Brunke	Guest	Dr. John H. Brunke, P.E.			
Arben	Bufi	Member	Hitachi T&D Solutions, Inc.	X	X	X
Ted	Burse	Guest	Powell Industries, Inc	X	X	X
Eldridge	Byron	Member	Schneider Electric	X	X	X
Donald	Cantrelle	Guest	Georgia Power			
Gilbert	Carmona	Member	Southern California Edison			
Stephen	Cary	Member	GE Energy Management	X		X
Steven	Chen	Member	Eaton Corporation	X	X	X
Wayne	Cheng	Member	B C Hydro			
Vincent	Chiodo	Guest	HICO		X	X

Jeonghwan	Cho	Guest	HICO America			
Chih	Chow	Member	PEPCO	X	X	X
Michael	Christian	Guest	ABB			
Roggero	Ciofani	Guest	Altalink			
Robert	Cohn	Guest	Powercon Corp.	X		
Lucas	Collette	Member	Mitsubishi Electric	X		X
Dave	Collette	Guest	Mitsubishi Electric			
Michael	Crawford	Member	Mitsubishi Electric			
Jason	Cunningham	Guest	Hitachi HVB, Inc.	X	X	X
David	Dart	Guest	NOJAPower			
Jerod	Day	Guest	Vacuum Interrupters, Inc.			
Patrick	Di Lillo	Member	Consolidated Edison Co. of NY, Inc.			X
Denis	Dufournet	Member	Retired	X		X
Bernie	Dwyer	Guest	PECO			
John	Eastman	Guest	INCON			
Alexander	Ebbert	Guest	HICO America		X	
Ken	Edwards	Member	Bonneville Power Administration	X		
Doug	Edwards	Guest	Siemens Industry, Inc.			
Tanner	Esco	Guest	Eaton Corporation	X		
Leslie	Falkingham	Member	Vacuum Interrupters Limited	X		
David	Feldmann	Guest	HICO America		X	
Howard	Fennell	Guest	Nashville Electric Service			
Thomas	Field	Member	Engergy			
Sergio	Flores	Guest	Schneider Electric Inc. USA	X	X	
Robert	Foster	Guest	Megger	X		X
Paul	Fox	Guest	Schneider Electric			
Richard	Frye	Guest	Eaton	X		X
Didier	Fulchiron	Guest	Schneider-Electric			
Sivakumar	Ganesh	Member	ENMAX Corporation			
Douglas	Giraud	Member	Powell Electrical Systems	X	X	X
Anne	Good	Guest	Netshape Technologies, Inc.			
Paul	Grein	Member	Circuit Breaker Sales, Co, Inc, - GroupCBS			
Martin	Greschner	Guest	HIGHVOLT Prueftechnik Dresden GmbH	X		
John	Hall	Guest	Tennessee Valley Authority			

Jeffrey	Hanson	Guest	Schneider Electric			
Helmut	Heiermeier	Member	ABB	X		X
Christian	Heinrich	Guest	Siemens AG	X		X
Charles	Hendrickson	Guest	Arizona Public Service Company			
Jeremy	Hensberger	Guest	Mitsubishi Electric Power Products Inc.			
Victor	Hermosillo	Vice-Chair	GE Grid Solutions	X	X	X
William	Higinbotham	Guest	EA Technology LLC			
Tyler	Holp	Guest	Eaton	X		X
Alexander	Hoover	Guest	Siemens Industry	X	X	X
Jingxuan (Joanne)	Hu	Member	RBJ Engineering Corporation			
Roy	Hutchins	Member	Southern Company Services			X
Todd	Irwin	Member	GE Grid Solutions	X	X	X
Anton	Janssen	Guest	Liander			
Joseph	Jasinski	Guest	ITC Holdings Corp.	X	X	
David	Johnson	Guest	Self-Employed			
Jacob	Joseph	Member	Toshiba International Corporation			
Wolfgang	Jung	Guest	Siemens AG			X
Mangu	Kang	Guest	HICO America			
Jayamali	Kasige	Guest	Crown Technical Systems			
Thomas	Keels	Guest	Salt River Project			X
Amir	Khosravi	Guest	BC Hydro			
JaeHyun	Kim	Member	HICO America/Hyosung			
Jinho	Kim	Guest	HICO America		X	X
Sandeep	Kulkarni	Guest	CG			
Carl	Kurinko	Guest	ABB Inc.			
James	Lagree	Guest	Eaton	X		
Stephen	Lambert	Guest	Shawnee Power Consulting, LLC			
Scott	Lanning	Guest	S&C Electric	X	X	X
Carl	LaPlace	Guest	GE Industrial Solutions			
Matthew	Lawrence	Guest	Doble Engineering			
Brad	Leccia	Guest	Eaton	X		
HaeKyu	Lee	Member	HICO America			
Shawn	Lee	Guest	HICO America			
David	Lemmerman	Guest	PECO/Exelon			
Werner	Lesse	Guest	Siemens AG			
Paul	Leufkens	Guest	Power Projects Leufkens			

Wangpei	Li	Guest	Eaton			
Qian	Li	Guest	Powertech Labs INC.			
Hua Ying	Liu	Member	Southern California Edison	X	X	X
Albert	Livshitz	Member	CE Power Solutions	X		
Russell	Long	Member	Retired	X		
Antonio	Mannarino	Guest	PSE&G			
Vincent	Marshall	Guest	Southern Company Services	X	X	X
Gary	Martin	Member	Entergy			
Ricardo	Martinez	Member	CFE-LAPEM			
Peter	Marzec	Guest	S&C Electric Co.	X	X	X
Joel	Mathewson	Guest	Siemens			
Frank	Mayle	Guest	Technibus, Inc.			
James	McBride	Guest	JMX Services, Inc.	X	X	
Neil	McCord	Guest	Southern States			
Timothy	McGee	Guest	Siemens Energy			
Steven	Meiners	Guest	GE	X		
Dave	Mitchell	Guest	Dominion	X	X	X
Arthur	Molden	Guest	AMEESCO	X		
Terry	Monahan	Guest	Schneider Electric			
Oscar	Montano	Guest	Salt River Project	X		X
Tom	Mulcahy	Guest	Dominion Virginia Power	X		
Raj	Nayar	Guest	Siemens Energy Inc.		X	
Jason	Neal	Guest	HICO America			X
Jeffrey	Nelson	Member	Tennessee Valley Authority			
Joachim	Oemisch	Guest	Siemens AG	X		
T	Olsen	Guest	Siemens Industry, Inc.	X	X	
Miklos	Orosz	Member	Schneider Electric			
Molson	Parvin	Guest	CB&I			
Amit	Patel	Guest	GE			
Shawn	Patterson	Guest	US Bureau of Reclamation			
Thomas	Pellerito	Member	DTE Energy	X		X
Alan	Peterson	Guest	Utility Service Corporation			
Andrew	Peterson	Guest	ABB	X		X
Lise	Phan	Member	Parcific Gas and Electric Company			
Anton	Poeltl	Guest	ABB		X	X
Iulian	Profir	Member	Rockwell Automation			
Ahmad	Qasem	Guest	Bechtel			X

Syed	Rahman	Member	The United Illuminating Company			
Samala Santosh	Reddy	Guest	Powell Industries	X	X	X
Frank	Ricard	Member	FirstPower Group LLC			
Anthony	Ricciuti	Member	Eaton Corporation			X
Dave	Riffe	Guest	Westinghouse Electric Company			
Julian	Rizo	Guest	Xcel Energy	X	X	
Brian	Roberts	Guest	Southern States, LLC			
Jon	Rogers	Member	Siemens Energy, Inc			
Ben	Rosenkrans	Guest	Eaton Corporation			
Roderick	Sauls	Member	Southern Company Services			
Victor	Savulyak	Guest	DNV GL KEMA Laboratory	X		X
Robert	Sazanowicz	Guest	The United Illuminating Company			
Daniel	Schiffbauer	Guest	Toshiba International Corporation		X	
Carl	Schneider	Guest	Schneider Electric	X		
Carl	Schuetz	Member	American Transmission Company (ATC)	X	X	X
Jon	Schumann	Member	American Transmission Company			
Devki	Sharma	Member	Consultant	X		
Harish	Sharma	Guest	Southern Company			
Sushil	Shinde	Member	ABB Inc.	X		X
Dean	Sigmon	Member	Eaton Corporation	X		
Sunita	Singh	Guest	Bechtel OG&C			
Michael	Skidmore	Secretary	AEP	X	X	X
Robert	Smith	Member	Retired		X	
Hongbiao	Song	Guest	GE			
Erin	Spiewak	Guest	IEEE	X		
Kresimir	Starcevic	Guest	DNV GL KEMA Laboratories			
Don	Steigerwalt	Guest	Duke Energy			
David	Stone	Guest	DTS Technical Services	X	X	
Donald	Swing	Member	Powell Industries			
Dragan	Tabakovic	Guest	Hitachi HVB, Inc.			
Humayun	Tariq	Member	American Electric Power			
Jey	Thayalan	Guest	Schneider Electric			
Michael	Titus	Guest	Schneider Electric			
Jean-Marc	Torres	Guest	Eaton Corporation	X		
Vernon	Toups	Member	Siemens			X

Francois	Trichon	Guest	Schneider Electric	X		
Richard	Trussler	Guest	Schneider Electric			
James	van de Ligt	Member	CANA High Voltage Ltd.	X	X	X
Michael	Wactor	Guest	Powell Industries, Inc			
Robert	Warren	Guest	DNV GL - KEMA Laboratories	X	X	
John	Webb	Member	ABB	X		X
Casey	Weeks	Guest	Siemens Energy	X	X	X
Jan	Weisker	Guest	Siemens AG			
Jerry	Wen	Guest	BC Hydro		X	X
William	Wilkie	Guest	Eaton			
Matthew	Williford	Guest	Schneider Electric			
Barnes	Wilson	Guest	Avista Utilities			
Terry	Woodyard	Member	Siemens Industry Inc.		X	X
Larry	Yonce	Guest	Eaton Corporation			
Dong Sun	Yoon	Guest	HICO America			
Richard	york	Guest	MEPPI	X	X	X
Li	Yu	Guest	Eaton Corporation			X
Jiong	Zhang	Member	MEPPI			
Wei	Zhang	Guest	Hitachi HVB, Inc.			
Xi	Zhu	Chair	GE Energy Management	X	X	X

‘X’ - individual was at the meeting in Pittsburgh