IEEE C37.100.1 Common Requirements Standard

Why, How, and What's Next

September 29, 2009

IEEE C37.100.1

- Why Common Requirements?
- How is the standard used?
- What is next for the standard?

Product standards or publications

Publication covering a specific product or group of related products

Examples:

- C37.04, -06, -09 of power circuit breakers
- C37.30 high voltage switches
- C37.40 high voltage fuses and related equipment

Horizontal standards

- Standards whose importance is to ensure the coherence of the [body] of standardization documents
- Subjects include:
  - fundamental principles
  - concepts, terminology
  - technical characteristics
- Relevance to a number of WG or products

Reference IEC Guide 108

Examples of horizontal st'ds

- IEEE 4 – Techniques for High Voltage Testing
- IEEE 1313 -Insulation coordination
- IEEE Std 280 - Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering

Quasi Horizontal Standards

- ANSI Z535.3 Criteria for Safety Symbols
- ANSI C37.85 Safety requirements for X-radiation in power interrupters
- ASTM D 2472 Standard Specification for Sulfur Hexafluoride

➢ **IEEE C37.100.1 Common Requirements for High Voltage Power Switchgear Rated Above 1000 V**

IEEE Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000 V

- Published in 2007
- Key words:
  - IEEE Standard
  - HV Power Switchgear
  - Common requirements (or specifications)
- What is common?

What is common?

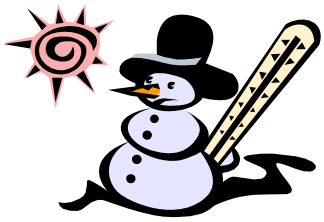
- Is a “common requirement” a universal requirement?
  - Not likely
- Common implies: (from Webster)
  - shared
  - regular
  - familiar

C37.100.1 Described

- A collection of requirements (or specs) that are:
  - Shared or used by two or more HV switchgear product standards
  - Use is “encouraged” but is not mandatory.
  - May be applied to LV switchgear product standards
- Standard includes a wide range of topics including:
  - Service conditions
  - Rating information
  - Test procedures
  - Construction requirements

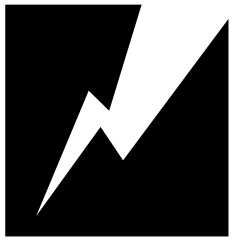
Service Conditions
Sample

- Normal service conditions
  - **The ambient air temperature does not exceed 40 °C.**
  - **The minimum ambient air temperature is −30 °C for class “minus 30 outdoor.”**
- **Special service conditions**
  - **Altitude above 1000 m**
  - **Exposure to excessive pollution**
  - **Very high or very low temperatures**



Test Procedures
Sample

- Dielectric withstand
  - **Procedures IEEE 4**
  - **Criteria to pass**
- **Temperature rise**
  - **Measurement of ambient**
  - **Allowable temp rise**



Review:

- Horizontal Standards
  - ✓ Ensure the coherence of the body of standardization documents
  - ✓ Avoid duplication of work and contradictory requirements
- Purpose of C37.100.1 is to avoid:
  - ✓ **duplication of work and**
  - ✓ **contradictory requirements**

  within the switchgear body of standards

A bit of History

Task Force began in 1998
Objectives: Service Conditions and Temp Rise
Key members of this early effort included

- **Larry McCall * Chairman**
- **Alan Storms**
- **Bill Bergman**
- **Hugh Ross**
- **Bill Long**
- **Ted Burse**
- **Pete Dwyer**
- **Mel Smith**
- **Chuck Wagner**
- **Jim Ransom**

*deceased

Initial Project Authorization Request (PAR) dated May 1, 2000

Scope:

- "To collect and publish in one document the clauses which are common in Switchgear Standards"
- "IEC 60694 will be used as a guide in development of this standard, and as a means of promoting IEC harmonization."

IEC Common specifications standard

- Cited from the start as a guide for the project
- IEC 60694 first published in 1980
- Serves same purpose for IEC Swgr standards
  - Quasi horizontal standard
  - Now numbered 62271-1

The Task

- Some were overwhelmed
- Develop a standard “after the fact”
- Serious technical questions
  - **Altitude corrections factors above 1000 m**
  - **BIL Test methods e.g.**
    - **3 x 3 vs.**
    - **3 x 9 vs.**
    - **2 x 15 methods**

IEC Option

Adoption of the IEC standard “as-is”

- Pro: Would not be re-inventing the wheel
- Pro: Ideal harmonization

- Con: Many IEC normative references
- Con: Acceptability to the IEEE community was in doubt

C37.100.1 Final Format
a compromise

- Used the IEC Standard as “model”
- Adopted the IEC clause numbering system
- Adopted the IEC topics

Actual specifications:

- Adopted the IEC specifications where there was close agreement
- Used traditional IEEE specifications where there was a significant difference
- Decline specifications if topic might be controversial to IEEE tradition

Example of “No specifications”

5.17 **Flammability**

At the present time, there are no common requirements defined for this subject. Refer to the relevant equipment standards.

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Reason: IEEE switchgear standards do not have any specifications on flammability.

How is the Standard Used?

- ADSCOM Resolution
- Scope
- Examples

ADSCOM resolution

Spring 2007 and amended Fall 2008

Paraphrased:

"The Switchgear Subcommittee Chairs are directed to instruct Working Groups

… to consider the incorporation of C37.100.1

….. during the creation or revision process where appropriate.

Process of Adoption

Step 1

List C37.100.1 as a normative reference

a) A necessary step, but
b) Not a sufficient step
c) Does not imply that all of the requirements apply as a default.
d) Should be a dated reference

Process of Adoption

Step #1:

List C37.100.1 as a normative reference

Step #2:

Application is indicated by normative reference

a) On a section or clause-by-clause basis
b) In the relevant equipment (product) standard

Process of Adoption

In case of a conflict in requirements

the relevant equipment standard prevails.

Application Process
C37.100.1

- Use of C37.100.1 is not mandatory
  - But is strongly encouraged
- Adoption requires revision of or amendment to the relevant equipment standard by the WG
- Control is in the hands of the WG

Application Process
C37.100.1

- Does not apply at all
- Adopt standard in its entirety
- Adopt at a major clause level
- Adopt at a sub-clause level

Application Process
C37.100.1

Case #1

- Common Req’ts does not apply at all
  - Do not cite in normative references clause
  - Implies that C37.100.1 is not retroactive

Application Process
C37.100.1

Case #2

- Adopt standard in its entirety
  - Not a likely scenerio, and
  - Not recommended

Suggests that WG did not really study carefully

Application Process
C37.100.1

Case #3

- Adopt and reference at major clause level
  - Possible, but more likely in the future

Adopt at major clause level
Example case #3

2. Normal (usual) and special (unusual) service conditions

Clause 2. of IEEE C37.100.1 and all if its sub–clauses are applicable.

[end of clause 2]

Application Process
C37.100.1

Case #4

- Adopt at a sub-clause level
  - Most likely situation
  - Three situations:
    a) **Adopt without change**

Adopt at a sub-clause level
Example: case #4a adopt without change

4.9 Rated supply frequency of closing and opening devices and of auxiliary circuits

Clause 4.9 of IEEE C37.100.1 is applicable.

[end of clause 4.9]

Application Process
C37.100.1

Case #4

- Adopt at a sub-clause level
  - Most likely situation
  - Three situations:
    a) Adopt without change
    b) **Adopt with addition(s)**

Adopt at a sub-clause level

Example 4b: adopt with additions

4.7 Rated duration of short-circuit (t_k)

Clause 4.7 of IEEE C37.100.1 is applicable with the following addition:

The standard rated duration of short-circuit (t_k) is 0.5 s unless otherwise stated by the manufacturer.

Application Process

C37.100.1

Case #4

- Adopt at a sub-clause level
  - Most likely situation
  - Three situations:
    a) Adopt without change
    b) Adopt with addition(s)
    c) **Adopt with modification(s)**

Adopt at a sub-clause level

Example 4c: adopt with modifications

6.4 Measurement of the resistance of circuits

6.4.1 Main circuit

Clause 6.4.1 of IEEE C37.100.1 is applicable with the following modifications:

The current during the test shall be 25% of the rated continuous (normal) current or 100 A (dc), whichever is lower.

Clarity is Important

Murphy's Law:

- If you perceive that there are four possible ways in which something can go wrong,
- and circumvent these ….

Clarity is Important

Murphy's Law:

- If you perceive that there are four possible ways in which something can go wrong,
- and circumvent these,
- then a fifth way, unprepared for, will promptly develop

Corollary:

- It will be impossible to fix the fifth fault, without breaking the fix on one or more of the others

Clarity of Intent is Important

- When a sub-clause of C37.100.1 does not apply
  - Explicit clarification is recommended
  - Leave no doubt of the intent
  - Leave no room for interpretation
- Two examples:

Hypothetical Example

Fuse St'd WG considers adopting service conditions from C37.100.1, but - -

Common Req'ts for ratings do not fit

4. Rating

Clause 4 of IEEE C37.100.1 and all of its sub-clauses are not applicable.

[Why state this? Because fuses have a different rating structure than most other switchgear equipment]

Clarity
Example 2: Some do, some don't

2. Normal (usual) and special (unusual) service conditions

2.1 Normal (Usual) service conditions

Clause 2.1 of IEEE C37.100.1 and its sub-clauses are not applicable.

[Why state this? Because clause 2.2 and 2.3 are applicable]

IEEE C37.100.1

What is next?

#1: Implementing ADSCOM directive

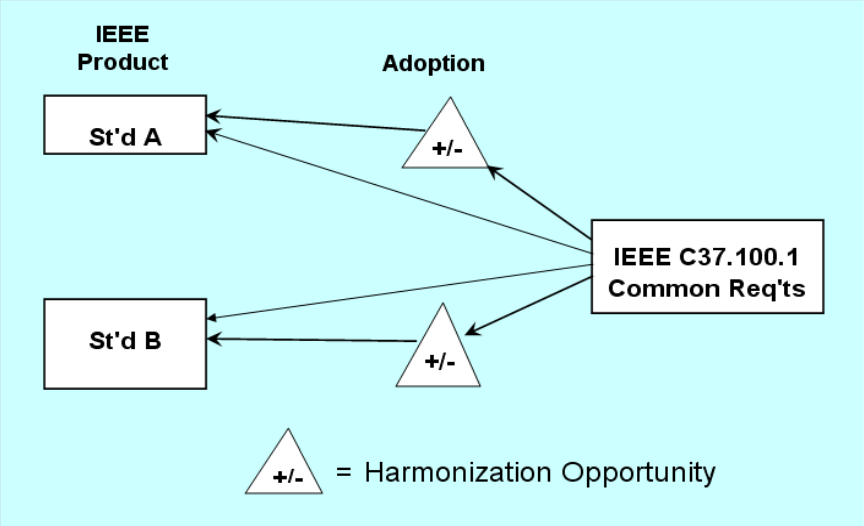
New standards or revision to existing standards shall consider if Common Requirements can be used:

- as written
- or as modified
- or simply is not applicable.

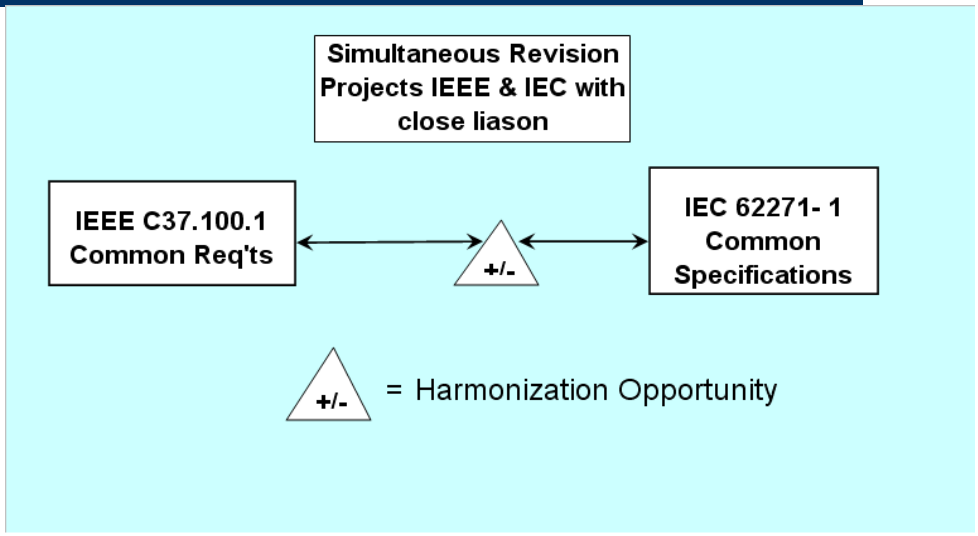
#2: Identify Harmonization Opportunities

- Within IEEE C37 Standards
- Between IEEE C37.100.1 and IEC 62271-1

Harmonization within IEEE



Harmonization Between IEEE and IEC



IEEE C37.100.1 & IEC 62271-1

How close are they?

- Technically equal 48%
  - Wording differences
  - Clarifications
- Similar but not quite technically equal 14%
- Not technically equal 19%
  - Differences in philosophy
  - Differences in test values
- Not applicable 19%

Question

We park our car
in the driveway

But

We drive our car
on the parkway

Thank you

For your
attention