

TechTopics Topic: Standards for Medium Voltage Metal-Clad Switchgear

Nearly every specification that is prepared for Medium Voltage Metal-Clad Switchgear contains a statement that requires the equipment to comply with “the applicable IEEE, ANSI, and NEMA standards”. Most users are well familiar with the major standard for Metal-Clad Switchgear, ANSI/IEEE C37.20.2. Often, I find that users do not understand the full spectrum of standards applicable to this type of equipment, and are not aware of the interrelations between the various standards.

First, a little bit of history. Where did “the standards” originate? In the early years of the electrical industry, the first standards were created by The Electric Power Club, which became NEMA as a result of a merger with the Associated Manufacturers of Electrical Supplies. Also, the AIEE (American Institute of Electrical Engineers) worked on switchgear standards. In the middle years of the century, the various standards organizations began work to consolidate the standards requirements. The focus of efforts resulted in improvements to AIEE standard 27. Years later, when AIEE and IRE merged to form IEEE, this standard became IEEE 27, which formed the basis for ANSI/IEEE C37.20. This standard covered switchgear assemblies across the voltage spectrum, including low voltage power circuit breaker switchgear (to 600 Vac), medium voltage metal-clad switchgear (above 1000Vac up to 38kVac) and metal enclosed load interrupter switchgear (above 1000Vac up to 38kVac). In 1987, C37.20 was greatly revised, to create separate standards C37.20.1, C37.20.2, and C37.20.3, one document for each of the major equipment classes.

So, today, the principle standards that apply to Medium Voltage Metal-Clad Switchgear are these:

Document	Rev	Sponsor	Title	Working Group
C37.20.2	1999	ANSI/IEEE	Metal-Clad Switchgear	IEEE
C37.04	1999	ANSI/IEEE	Rating Structure for AC High-Voltage Circuit Breakers	IEEE
C37.06	2000	ANSI	AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis— Preferred Ratings and Related Required Capabilities	NEMA
C37.09	1999	ANSI/IEEE	Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE
C37.010	1999	ANSI/IEEE	Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis	IEEE
C37.24	1986	ANSI/IEEE	Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear	IEEE
C57.13	1993	IEEE	Standard Requirements for Instrument Transformers	IEEE
C37.85	1989	ANSI	Alternating-Current High-Voltage Power Vacuum Interrupters— Safety Requirements for X-Radiation Limits	NEMA
C37.20.6	1997	ANSI/IEEE	4.76 to 38 kV Rated Grounding and Test Devices Used in Enclosures	IEEE
C37.54	1996	ANSI	Conformance Test Procedures for Indoor Alternating-Current Medium-Voltage Circuit Breakers Applied as Removable Elements in Metal-Enclosed Switchgear Assemblies.	NEMA
C37.55	1989	ANSI	Metal-Clad Switchgear Assemblies—Conformance Test Procedures	NEMA

Of these, by far the most significant are C37.20.2 for the switchgear, and C37.04/C37.06/C37.09/C37.010 for the circuit breakers. Each of these documents has been revised in the 1999-2000 time frame. A number

of other documents are in advanced stages of revision to coordinate with the other documents, including C37.24, C37.85, C37.54, and C37.55. All of these are in (or shortly will be) in balloting within ASC C37.

The last two documents, C37.54 and C37.55, are the documents used by third-party firms, such as UL. These standards are applicable only when third-party conformance (i.e., "listing") is required for the equipment.

The last column of the table indicates the organization which sponsors the working group that maintains the standard. In the ANSI Accredited Standards Committee C37, the responsibility for the maintenance of the documents is shared by IEEE and NEMA. While the working groups are sponsored by these respective organizations, the balloting and approval process for these ANSI documents within C37 is the same, regardless of the sponsorship of the working group.

The voting representation within Accredited Standards Committee C37 conforms to the ANSI requirements for balanced representation. Equal delegations represent IEEE, NEMA, and the Electric Light & Power (users) group, represented by the Edison Electric Institute. Voting representatives from other organizations include:

- Safety Group (Nationally Recognized Testing Laboratories):
 - Underwriters Laboratories
 - Electro-Test
- Tennessee Valley Authority
- US Dept of Agriculture - Rural Utilities Services (formerly Rural Electrification Administration)
- International Electrical Testing Association (NETA)
- National Electrical Contractors Association (NECA)
- US Dept of the Army - Corps of Engineers
- US Dept of the Navy - Naval Construction Battalion

The procedures of ASC C37 assure that no one interest group (producers, users, or general interest) has the ability to dominate the process of creation or approval of the standards.

The list of standards above is not all-inclusive, but does include the major standards. There are others which apply, such as those for relays, device numbers, wire, and the like. It is interesting to note that there are no NEMA standards listed. For the most part, IEEE and NEMA have cooperated over several decades to incorporate the applicable sections of the historic NEMA standards into the relevant ANSI/IEEE or ANSI documents.

Periodically, we see requirements for the circuit breakers to conform to NEMA standard SG-4. This standard covers outdoor high voltage circuit breakers, and specifically excludes circuit breakers used in Metal-Clad Switchgear. Thus, NEMA standard SG-4 is not applicable.

T. W. (Ted) Olsen
Manager, Technology