9.2.3 Dielectric voltage withstand test

9.2.3.1 A switchboard section or interior shall be subjected for 1 minute to the application of a 60 Hz essentially sinusoidal potential of 1 000 V plus twice the rated voltage under the following conditions. A transformer, coil, or other device connected between lines of opposite polarity shall be disconnected from one side of the line during the test in (b). The results are acceptable if there is no dielectric breakdown between:

a) a live part and a grounded metal part with all switching devices closed; and

b) live parts of opposite polarity, with all switching devices closed.

9.2.3.1.1 If a watthour meter socket base incorporates through-air spacings less than those shown in Table 6, the test potential applied to it shall be 10 times the voltage rating of the switchboard section or interior, but not less than 5 000 volts.

9.2.3.1.2 Where a neutral is involved, the dielectric strength test between the neutral and the other current-carrying parts and the neutral and grounded metal shall be permitted to be based on the lower voltage that normally exists between them.

9.2.3.2 If the overcurrent devices, such as fuses or interchangeable trip units, are not in place during the tests described in 9.2.3.1(a) and 9.2.3.1(b), it is necessary to repeat these tests on the load side of the switching devices or to install shorting links in place of the missing fuses or trip units during the tests.

9.2.3.3 The test potential shall be supplied from a 500 volt ampere or larger capacity testing transformer, the output voltage of which can be varied. The applied potential shall be increased from zero at an essentially uniform rate and as rapidly as is consistent with its value being correctly indicated by the voltmeter until the required test value is reached; it shall be held at that level for 1 minute.

9.2.3.3.1 A 500 volt ampere or larger capacity transformer need not be used if the transformer is provided with a voltmeter to measure directly the applied output potential.

9.2.3.4 Clamped insulating joint dielectric

9.2.3.4.1 A clamped joint between two insulators shall be tested using two samples.

a) The first sample shall have the clamped joint opened up to produce a space 3.2 mm (1/8 inch) wide. This may be accomplished by loosening the clamping means or by drilling a 3.2 mm (1/8 inch) diameter hole at the joint between the insulators at a point of minimum spacing between the metal parts on the opposite sides of the joint. The drilled hole shall not decrease spacings between the opposite polarity parts as measured through the crack between the insulators. The 60 Hz dielectric breakdown voltage through this hole is then determined by applying a gradually increasing voltage (500 V per second) until breakdown occurs.

b) The second sample with the clamped joint intact shall be subjected to a gradually increasing 60 Hz voltage until 110 percent of the breakdown voltage of (a) has been reached. If the breakdown voltage of (a) was less than 4 600 V rms, the voltage applied to the second sample shall be further increased to 5 000 V rms and held for 1 second. The clamped joint is acceptable if there is no dielectric breakdown of the second sample.

9.2.3.5 After short circuit dielectric

9.2.3.5.1 In accordance with 9.2.3.3 and with every switching device closed, a switchboard that has been subjected to a short-circuit test shall be subjected for 1 minute to the application of a 60 Hz essentially

sinusoidal potential of twice the maximum rated voltage, plus 1 000 V as follows. The results are acceptable if there is no dielectric breakdown:

a) between wiring terminals of opposite polarity; and

b) between an uninsulated live part and the enclosure.

9.2.3.5.1.1 If breakdown occurs within a switching device, the device may be removed and the test repeated.

9.2.3.6 Insulating barrier dielectric

9.2.3.6.1 With regard to 8.1.17.2 and 8.1.17.3, the barrier material shall be placed between two metal electrodes. The electrodes shall be cylindrical brass or stainless steel rods 6.4 mm (1/4 inch) in diameter with edges rounded to a 0.8 mm (1/32 inch) radius. The test potential shall be increased to the test value and shall be maintained for 1 second. The result is acceptable if there is no dielectric breakdown.

9.2.4 Short circuit

9.2.4.1 General

9.2.4.1.1 Sample Selection

9.2.4.1.1.1 The switchboard sections selected for tests are to represent:

a) the weakest bus bar and bracing structure; and

b) the stiffest bus structure most likely to transmit the greatest force to the bus support for the rating and bus configuration being tested.

9.2.4.1.1.2 Representative samples are to be tested to determine the performance of each principal bus configuration or cable arrangement, or both. If provision is made for line cables, the sample selection and test program is to include cables of the minimum cross-sectional area that would be used for field connection for each size of wire connector used.

9.2.4.1.1.3 In choosing representative samples, the following factors shall be considered:

a) bracing structure, if different, for each rating;

b) material and cross-sectional configuration of each bus bar structure;

c) weakest bus bar structure that could result in bus bar distortion;

d) strongest bus bar structure that will transmit the maximum forces to the bracing; and

e) various incoming bus and terminal configurations provided. The bus jumper supplied to connect the switchboard bus to a busway need not be tested if the switchboard supply bus that was tested is representative of these jumpers. To be representative, the jumpers to the busway bus bars shall use the same type supports with the supports spaced along the bus bar not further apart than for the switchboard bus that was tested. The jumpers to the busway shall not be face-to-face if the tested bars were edge-to-edge. The center-to-center distance between jumpers of different polarity shall not be less than for the switchboard bus that was tested.

9.2.4.1.1.4 An alternative bus support need not be subjected to a short-circuit test if it has the same shape, and the material has mechanical strength at least equal to the support that was subjected to a short-circuit test.

9.2.4.1.1.5 The neutral bus shall be subjected to a separate short-circuit test if it has a smaller cross section, uses different supports, is face-to-face with a phase bus while the phase buses are edge-to-edge, or has the supports spaced farther apart than the line voltage buses that were tested. The neutral test may be with a 3-phase test, substituting the neutral bus for the line voltage bus farthest from the neutral, or a single phase test conducted at phase to neutral voltage using the neutral bus and the line voltage bus closest to the neutral.

9.2.4.1.1.6 A construction of the panelboard type design may be tested in accordance with the applicable requirements in Reference Item No. 1 in Annex B.

9.2.4.1.2 Through bus withstand

9.2.4.1.2.1 The sample for each through bus withstand test is to include through bus and its associated splice bus.

9.2.4.1.3 Section bus withstand – individually mounted devices

9.2.4.1.3.1 The sample for each section bus withstand test for individually mounted devices is to consist of a section with representative bus for the connection of individually mounted devices. A unit may be installed in the section in the location that will provide the least support for the section bus.

9.2.4.1.4 Branch line and load bus withstand – individually mounted devices

9.2.4.1.4.1 Each configuration of branch line and load bus for individually mounted devices shall be tested in a representative switchboard section with the maximum ampere rated section and through buses and the maximum ampere rated overcurrent device with which it is intended to be used. If fuses are used, see 9.2.4.2.8.1.

9.2.4.1.5 Branch line and load bus maximum voltage

9.2.4.1.5.1 A switchboard section having supply and section buses and having the maximum ampere rating for the construction shall be tested.

9.2.4.1.5.1.1 In the case of an individually mounted device, a maximum voltage test need not be made if a test has been made on the device in an enclosure, and if:

a) the enclosure in the switchboard has equal or greater volume than the test enclosure;

b) the distance from an arcing part to the nearest live part or grounded metal surface in the switchboard is equal to or greater than in the test enclosure; and

c) the hinges and latch or screws in the switchboard construction are equal to or stronger than those in the test enclosure, or the equivalent.

9.2.4.1.5.1.2 A construction of the panelboard type need not be tested if it has been tested in accordance with Reference Item No. 1 in Annex B, in a panelboard enclosure, and if:

a) the enclosure in the switchboard has equal or greater volume than the test enclosure;

b) the distance from any arcing part to the nearest live part or grounded metal surface in the switchboard is equal to or greater than in the test enclosure; and

c) the hinges and latch or screws in the switchboard construction are equal to or stronger than those in the test enclosure.

9.2.4.1.5.2 In determining the relative strength of hinges, latches, and screws with respect to 9.2.4.1.5.1.1(c) and 9.2.4.1.5.1.2(c), the following characteristics shall be compared:

a) metal thickness of all parts;

b) type and size of fasteners;

c) diameter of hinge pins and design of hinge joint;

d) distance between hinges, latches, and screws;

e) number of hinges, latches, and screws; and

f) size of door or cover.

9.2.4.1.5.3 If a maximum voltage test is required, a circuit breaker having the maximum ampere rating for each frame size shall be tested in locations within the switchboard and in the combinations with other circuit breakers or with blank spaces that are most likely to cause unacceptable results. Such other circuit breakers are to be in the "ON" position but are not to be provided with load conductors. Filler plates shall be mounted over blank spaces. This may require more than one test.

9.2.4.1.5.4 With respect to 9.2.4.1.5.3, consideration should be given to the following:

a) the venting of a circuit breaker toward or near a live part or a grounded metal part (shortest uninsulated electrical spacing);

b) the blocking or partial blocking of a vent in a circuit breaker;

c) the location that will cause a maximum let through current in the circuit breaker under test; and

d) the mounting of a circuit breaker where its vents are directly opposite the vents in another circuit breaker.

9.2.4.2 Sample preparation

9.2.4.2.1 General

9.2.4.2.1.1 The switchboard section shall be mounted and supplied as in the intended installation. All unused openings, other than ventilation openings or as described in the 9.2.4.2.2.1.1, are to be closed.

9.2.4.2.1.2 The enclosure shall be connected through a 30 A, non-delay-type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. The fuse shall have a voltage rating not less than the rated voltage of the equipment being tested. This connection shall be made on the load side of the limiting impedance by a 5.3 mm^2 (10 AWG) copper wire 1.2 – 1.8 m (4 – 6 ft) long.

9.2.4.2.1.3 If the switchboard section has provision for a current transformer, a bus bar representative of the current transformer may be installed in its place.

9.2.4.2.2 Doors and fronts

9.2.4.2.2.1 If the switchboard is provided with a door, it shall be closed and latched in its intended manner during the test. A door, cover, or filler plate shall be installed over any unused branch circuit device space. All covers shall be in place during the test.

9.2.4.2.2.1.1 The covers may be omitted if the cover does not give access to a circuit breaker included in the test circuit and if the test does not result in movement of live parts toward the location of the covers that would result in a reduction of spacings.

9.2.4.2.3 Circuit breakers

9.2.4.2.3.1 A circuit breaker having adjustable trip features is to have all adjustments set at the maximum current and time setting.

9.2.4.2.4 Line connections

9.2.4.2.4.1 The switchboard terminals are to be supplied by means of cable having an ampacity as shown in Table 28, based on 75° C (167° F) insulation nearest to but not less than the rating of the switchboard. Separate short-circuit tests shall be conducted with copper cable and with compact aluminum cable. The cable is to enter the line end of the switchboard at a point that will provide the maximum length of unsupported cable within the switchboard enclosure. The line terminals are to be wired and tightened to the torque marked on the switchboard as specified in 6.2.7.13 and 8.8.2.3.2. There shall be no bracing of the cable inside the enclosure unless the construction includes instructions for bracing the conductors as covered in 6.3.3.1. The provision for bracing may or may not be provided with the section. Bracing hardware not provided as part of the switchboard section shall be available to the installer. A cable may be braced as it leaves the enclosure on the supply side.

9.2.4.2.4.1.1 The test sample shall be tested with copper cable if the switchboard section is restricted to use with copper cable in accordance with 6.2.7.3.

9.2.4.2.4.1.2 The test sample may be tested with aluminum or copper cable if the short-circuit current rating divided by the number of cables per phase results in a current of 50 000 A per cable or less.

9.2.4.2.4.1.3 A switchboard section that does not have provision for wire connection shall be connected to the source with bus bars of the same ampacity as the supply bus.

9.2.4.2.4.1.4 If the short-circuit test current rating is greater than 50 000 A per conductor, the test sample may be tested with either compact aluminum or copper cable if the type of cable used for the short circuit test has a lower pull-out force than the untested cable material as covered in 8.8.2.1.1.

9.2.4.2.4.1.5 The value of tightening torque specified for meter mounting equipment that is used in a switchboard shall be used if the tightening torque information appears on the switchboard.

9.2.4.2.4.2 With respect to 9.2.5.1, the length of the supply conductors shall not exceed 2.4 m (8 ft) per terminal unless the excess length is included in the test circuit calibration.

9.2.4.2.4.3 In a switchboard provided with an integral main fusible switch, the supply cable shall be connected to the terminals of the switchboard. The test fuse mentioned in 9.2.4.2.8.1 shall be installed in the main fusible switch. If the size of the test fuse is such that it cannot fit in the fuseholder, an external fuseholder shall be used. The external fuseholder may be inserted:

a) between the load side of the fusible switch and the main bus bar;

b) on the load side of the branch device, section bus, or through bus being tested; or

c) on the line side of the fusible switch.

9.2.4.2.4.3.1 If external fuses are used, a copper bus or tube (dummy fuse) shall be installed in each fuseholder of the main fusible switch. The combined length of the supply cable and of all other leads, other

than the leads on the load side of a branch bus, shall be part of the calibrated circuit or shall be in accordance with 9.2.4.2.4.2.

9.2.4.2.4.4 When a separate main device is used, the method of line connection shall be as shown in Figure 17. In the case of a separate fusible main, fuses shall be installed in an external fuseholder, as shown in Figure 18. The main device terminals shall be connected by cable in accordance with 9.2.4.2.4.1, and the combined length of each cable (line, external fuseholder, and connections between the separate main device and switchboard) shall not exceed the length described in 9.2.4.2.4.2 by more than 2.4 m (8 ft).

9.2.4.2.5 Through bus connection

9.2.4.2.5.1 The through bus under test shall be short circuited to cause fault currents to pass through the splice bus and the complete through bus. Current shall not pass through the section bus unless it is necessary to feed the through bus.

9.2.4.2.5.2 The through bus shall be short circuited directly by means of bus of minimum length and of at least the ampacity of the through bus.

9.2.4.2.6 Section bus connection

9.2.4.2.6.1 The section bus under test shall be short circuited at the end farthest from the source to cause fault current to pass through the entire bus. The section bus shall be short circuited directly by means of bus of minimum length and of at least the ampacity of the section bus.

9.2.4.2.7 Branch circuit connection

9.2.4.2.7.1 If the branch circuit device used in this test is a circuit breaker, the field wiring load terminals are to be short circuited by cable having a length of 1.2 m (4 ft) per terminal and an ampacity not less than the rating of the circuit breaker. There shall be no bracing of the cable inside the enclosure unless the construction includes instructions for bracing the conductors as covered in 6.3.3.1. The provision for bracing may or may not be provided with the section. Bracing hardware not provided as part of the switchboard section shall be available to the installer. The cable may be lashed outside the enclosure to prevent whipping during the test. The load terminal cables or the instrument shunts may be short circuited by bus.

9.2.4.2.7.2 If the branch circuit device used in the test is a fusible switch, cable having a length of 1.2 m (4 ft) per terminal and an ampacity not less than the rating of the switch shall be run from each field wiring load terminal to the test fuses located outside the switchboard. There shall be no bracing of the cable inside the enclosure unless the construction includes instructions for bracing the conductors as covered in 6.3.3.1. The provision for bracing may or may not be provided with the section. Bracing hardware not provided as part of the switchboard section shall be available to the installer. The load terminals of the test fuses or the instrument shunts are to be short circuited by a bus bar. All load cables may be lashed together or braced outside the enclosure to prevent whipping during the test. A copper bus bar or tube (dummy fuse) as described in 9.2.4.2.7.3, shall be installed in each fuseholder of the switch under test.

9.2.4.2.7.3 The copper bus bar, tube, or dummy fuse shall have a cross section not less than that of the blade or ferrule of the fuse that the fuseholder is intended to accommodate. Each bar or tube may be individually reinforced to enable it to withstand the short-circuit forces. A bar, tube, for dummy fuse shall be secured in place in the same manner as a fuse in intended service.

9.2.4.2.8 Fuses

9.2.4.2.8.1 Each test fuse shall have such characteristics that, when tested on a single-phase circuit in accordance with the requirements for the class of fuse used in the switchboard, it will permit a let-through current I_p and clearing I_2t not less than the corresponding values specified in Table 36, for the ampere rating of the largest fuse intended for use in or with the switchboard. To obtain the required values it may be necessary to employ a fuse of a different class or having a higher current rating than that of the fuse the switchboard accommodates. The values of I_2t and I_p are to be determined at the voltage rating of the fuse except that with the concurrence of those concerned the determination may be made at the voltage rating of the switchboard.

9.2.4.2.9 Meter mounting position

9.2.4.2.9.1 If a switchboard section uses meter mounting equipment, a watthour meter shall be in place during any required short-circuit test.

9.2.4.2.9.1.1 Copper bars may be used in the jaws of meter mounting equipment when such equipment is used in conjunction with current transformers. The cross sectional dimensions of such bars shall be 2.4 by 19.2 mm (3/32 by 3/4 inch).

9.2.4.3 Short-circuit procedure

9.2.4.3.1 General

9.2.4.3.1.1 A 3-phase switchboard section shall be tested on a 3-phase circuit using three overcurrent devices in the branch circuit positions as illustrated in Figure 18. These tests will qualify:

a) a 3-phase, 4-wire switchboard;

b) a single phase, 3-wire switchboard using nonadjacent main bus bars of the 3-phase construction; and

c) a DC switchboard.

9.2.4.3.1.1.1 If only single-pole or double-pole branch-circuit devices are accommodated in a 3-phase, 4-wire switchboard, the switchboard shall be tested on a single-phase circuit using adjacent main bus bars and two branch circuit poles, following the same test procedure as for the 3-phase circuit, except that the test circuit shall be controlled so that closing occurs within 10 electrical degrees of the zero point of the supply-voltage wave.

9.2.4.3.1.2 A single phase switchboard section employing adjacent main bus bars of the 3-phase construction shall be tested on a single phase circuit, controlled as specified in 9.2.4.4.2.1. The single phase test will qualify a DC switchboard.

9.2.4.3.1.3 A switchboard section having the following shall be tested with a line to neutral fault as well as a line to line fault:

a) a short-circuit current rating for a line to neutral fault higher than a phase to phase fault;

b) a neutral bus that is smaller in cross section than the line bus;

c) a neutral bus that is spaced closer to a line bus than the spacing between adjacent line buses; or

d) a different means of support for the neutral bus.

9.2.4.3.1.4 The open circuit voltage (alternating or direct current) at the supply connection shall be 100 – 105 percent of the rated voltage for the test being conducted. The supply frequency for alternating current shall be in the range of 48 – 62 Hz.

9.2.4.3.1.4.1 For a test not involving any overcurrent device in the test circuit, the voltage may be less than rated, but not less than 100 V, if the through bus withstand current is determined to be the value that would have resulted if tested at rated voltage. The method of calculating the reduced voltage test current is specified in the short-circuit test at reduced voltage, Annex F.

9.2.4.3.2 Maximum peak let-through current for switchboards containing meter sockets

9.2.4.3.2.1 The overcurrent protection and other features of a switchboard having a short-circuit-current rating in excess of 14 000 A shall limit the let through current of a direct-connected meter as specified in 9.2.4.3.2.2.

9.2.4.3.2.2 The maximum peak let-through current shall be measured during the short-circuit testing of switchboards with meter-mounting equipment. The short-circuit-current rating of the switchboard shall be such that the measured value does not exceed 30 000 A.

9.2.4.3.2.2.1 This measurement need not be made if:

a) the I_p value of the overcurrent protective device is known to be 30 000 A or less; or

b) the meter-mounting equipment is on the secondary side of current transformers.

9.2.4.3.2.2.2 This measurement need not be made if the short-circuit-current rating of the switchboard or the assumed rms symmetrical shortcircuit- current rating of the circuit containing the meter as specified in 8.5.1.2 and 8.5.1.3 is 14 000 A or less.

9.2.4.3.3 Time

9.2.4.3.3.1 The duration of a short-circuit test shall not be less than three cycles unless limited by an integral or separate overcurrent device.

9.2.4.4 Short-circuit operation

9.2.4.4.1 General

9.2.4.4.1.1 A switchboard shall be subjected to the applicable tests as specified in 9.2.4.4.3.1 – 9.2.4.4.6.1.

9.2.4.4.2 Closing

9.2.4.4.2.1 Controlled closing shall be used in all tests as specified in Table 37.

9.2.4.4.2.1.1 Random closing may be used:

a) in the case of a 3-phase short-circuit test involving overcurrent devices; or

b) for a single-phase test maximum voltage conducted in accordance with 9.2.4.4.6.1.

9.2.4.4.3 Through bus withstand

9.2.4.4.3.1 With the line end of the through bus connected to the test circuit and the load end short circuited by a bus bar having an ampacity not less than that of the through bus, the test circuit shall be closed on the switchboard.

9.2.4.4.3.2 If the switchboard includes main fuses or is marked for use on the load side of fuses as covered in 6.2.1.14, a through bus and section bus withstand test is not required if:

a) the same bus and support system has been previously tested with acceptable results; and

b) the peak let through current, I_p, recorded in the previous test is greater than the let through characteristics of the fuse as shown in Table 36.

9.2.4.4.4 Section bus maximum current test-individually mounted devices

9.2.4.4.4.1 With the line end of the through bus connected to the test circuit and the load end of the section bus closest to the supply short circuited by a bus bar having an ampacity not less than that of the section bus, the test circuit shall be closed on the switchboard section.

9.2.4.4.5 Branch line and load bus maximum current test-individually mounted devices

9.2.4.4.5.1 With the branch circuit device (either a fused switch or circuit breaker) and any main overcurrent protective device (integral or separate) in the fully closed position, the test circuit shall be closed on the switchboard. If the enclosure is provided with a door, it shall be closed during the test.

9.2.4.4.5.1.1 If agreeable to those concerned, the branch circuit device may be replaced by a dummy device that provides equivalent support for the branch and load buses.

9.2.4.4.6 Branch line and load bus maximum voltage

9.2.4.4.6.1 If a maximum voltage test is required as specified in 9.2.4.1.5.1, the circuit breaker shall be connected in the open position to a circuit capable of delivering rated short-circuit current corresponding to the maximum rated voltage of the switchboard, and shall be operated to the closed position.

9.2.4.5 Short-circuit investigation

9.2.4.5.1 After a switchboard section has been tested under any of the short circuit conditions described, the results are acceptable if the switchboard is effectively in the same mechanical condition as prior to the test, and if:

a) there is no permanent distortion or displacement of a bus bar or strap that would affect the intended functioning of the switchboard or reduce an electrical spacing to less than 75 percent of the values specified in Table 6;

b) a bus bar insulator or support or cable restraint has not separated into two or more pieces. Also, there shall be no cracks appearing on opposite sides of a base and no cracks, including surface cracks, running the full length or width of the support. Other cracks, chips, or the like, which are not considered to reduce the structural integrity of the support may be used if the resulting spacings are not reduced to less than 75 percent of the values specified in Table 6. The cracks may be considered acceptable if, after a repeated short-circuit test on the same sample, the switchboard complies with the Dielectric Voltage-Withstand Test, 9.2.3, and the electrical spacings are not reduced to less than 75 percent of the values specified in Table 6.

c) the ground fuse has not opened;

d) the enclosure or a part of the enclosure such as a filler plate, door, or the like, has not been damaged nor displaced to the extent that a live part is accessible to:

1) a test rod 13.2 mm (33/64 inch) in diameter for any opening less than 102 mm (4 inch) from an uninsulated live part; or

2) a test rod 19.4 mm (49/64 inch) in diameter for any opening 4 inches or more from such a part.

e) A door shall not open. A supplemental door over circuit breaker handles may open, but not more than 60 degrees from the closed position.

f) there is no evidence of arcing between live parts of opposite polarity;

g) no conductor pulls out of a terminal connector, and there is no damage to the conductor insulation or to the conductor;

h) the switchboard complies with the Dielectric Voltage-Withstand Test, 9.2.3; and

i) in the case of a plug in or draw out unit, the point of contact shall be essentially the same both mechanically and electrically as before the test.

j) in the case of a switchboard containing a direct connected meter socket, the maximum peak let-through current measured during the short circuit test did not exceed 30 000 A, when measured as required in 9.2.4.3.2.

9.2.5 Test circuit calibration

9.2.5.1 The available rms symmetrical current shall be determined at the line terminals of the separate main device or, if no separate main device is used, at the line terminals of the switchboard.

9.2.5.1.1 For circuits rated 25 000 A or less, the available current may be determined at the test station terminals.

9.2.5.1.2 The available current may be determined at the test station terminals if:

a) for circuits between 25 001 – 50 000 A, the available current is determined to be 5 percent higher than the required test current; or

b) for circuits between 50 001 – 200 000 A, the available current is determined to be 10 percent higher than the required test current.

9.2.5.1.3 If the available current is determined at the test station terminal and the physical arrangement in the test station requires leads longer than specified, the additional length of leads shall be included in the circuit calibration.

9.2.5.2 The magnitude of the test current, the power factor of an alternating current circuit, and the time constant of a direct-current circuit are to be determined by the applicable requirements for Reference No. 7, Annex B. The power factor shall be in accordance with Table 17.

9.2.5.2.1 The recovery voltage need not comply with the applicable requirements for molded case circuit breakers if the calibrated circuit is only to be used in withstand tests not involving any overcurrent device.

9.2.5.3 The available short-circuit current in rms symmetrical amperes shall not be less than the short-circuit current specified for the test.

9.2.6 Investigation of ground fault protection field test instructions

9.2.6.1 Using the field test instructions provided in accordance with the field testing of ground fault protection of equipment, 6.3.4.3, a dead-front switchboard containing ground fault protection shall be investigated to determine that the ground fault protection system functions.

9.2.7 Bonding resistance test

9.2.7.1 The resistance shall not exceed 0.1 ohm between the ground bus and either an exposed dead metal part or the grounding contact of a grounding type receptacle rated 30 A or less, or shall not exceed 0.005 ohm between the ground bus and the grounding contact of a grounding type receptacle rated more than 30 A.

9.2.7.2 The resistance shall not exceed 0.005 ohm at the connection:

a) between adjacent switchboard sections; and

b) between a busway, ground bus, wireway or an auxiliary gutter and a switchboard section enclosure; and

c) between the switchboard section enclosure and a wire connector for a grounding or bonding conductor larger than 8.4 mm^2 (8 AWG) copper or 13.3 mm^2 (6 AWG) aluminum.

9.2.7.3 With regard to 9.2.7.1 and 9.2.7.2, paint shall be removed as necessary to keep the resistance within the above limits. Resistance values shall be determined in accordance with 9.2.7.2.

9.2.7.4 With regard to 9.2.7.1 and 9.2.7.2, the 0.005 and 0.10 ohm values of bonding resistance are to be determined by measuring the millivolt drop across the joint while passing a known current, usually 30 A through the joint.

9.2.7.4.1 The bonding resistance need not be determined for a bolted joint without any paint between the flat joint surfaces.

9.2.7.4.2 The bonding resistance between a conductive switch handle in contact with a metal enclosure need only be determined periodically on typical samples.

9.2.8 Mold stress relief test

9.2.8.1 Except for rigid thermosetting materials, conditioning of the equipment as described in 9.2.8.2 shall not cause softening of the material as determined by handling immediately after the conditioning, nor shall there be any shrinkage, warpage, or other distortion as judged after cooling to room temperature, that results in any of the following:

a) reduction of spacings between uninsulated live parts of opposite polarity, uninsulated live parts and accessible grounded metal, uninsulated live parts and the enclosure below the minimum acceptable values;

b) making uninsulated live parts or internal wiring accessible to contact, or defeating the integrity of the enclosure so that unacceptable mechanical protection is not afforded to internal parts of the equipment; or

c) causing interference with the intended operation or servicing of the equipment.

9.2.8.2 One representative sample of the insulating material assembled as intended shall be placed in a full draft circulating air oven maintained at a uniform temperature at least 10° C (50° F) higher than the