

## 7. INSPECTION AND TEST PROCEDURES

### 7.3.3 Cables, Medium- and High-Voltage

#### 1. Visual and Mechanical Inspection

1. Compare cable data with drawings and specifications.
2. Inspect exposed sections of cables for physical damage.
3. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.3.3.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 100.12.
  3. Perform thermographic survey in accordance with Section 9.
4. Inspect compression-applied connectors for correct cable match and indentation.
5. Inspect shield grounding, cable support, and termination.
6. Verify that visible cable bends meet or exceed ICEA and/or manufacturer's minimum allowable bending radius.
- \*7. Inspect fireproofing in common cable areas.
8. If cables are terminated through window-type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices.
9. Inspect for correct identification and arrangements.
10. Inspect jacket and insulation condition.

\* Optional



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#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.3.3.1.
2. Perform an insulation-resistance test utilizing a megohmmeter with a voltage output of at least 2500 volts. Individually test each conductor with all other conductors and shields grounded. Test duration shall be one minute.
3. Perform a shield-continuity test on each power cable by ohmmeter method.
4. Perform an acceptance test on cables, including terminations and joints, after cable system installation and before the cable system is placed into service. In accordance with ANSI/IEEE 400, ICEA S-93-639/NEMA WC 74, ICEA S-94-649 and ICEA S-97-682, testing can be performed by means of direct voltage (dc), alternating voltage (ac), partial discharge (pd), or very low frequency (VLF). The selection can be made only after an evaluation of the alternative methods. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. Test voltages shall not exceed 80 percent of cable manufacturer's factory test value or the maximum test voltage in Table 100.6.
  1. Insure that the input voltage to the test set is regulated.
  2. Current-sensing circuits in test equipment, when available, shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.
  3. Record wet- and dry-bulb temperatures or relative humidity and temperature.
  4. Test each cable section individually.
  5. Test each conductor individually with all other conductors grounded. Ground all shields.
  6. Terminations shall be adequately corona-suppressed by guard ring, field reduction sphere, or other suitable method, as necessary.
  7. Insure that the maximum test voltage does not exceed the limits for terminators specified in ANSI/IEEE 48, IEEE 386, or manufacturer's specifications.

\* Optional



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8. Raise the conductor to the specified maximum test voltage and hold for 15 minutes. Refer to Table 100.6.
9. If performed by means of direct voltage (dc), reduce the test set potential to zero and measure residual voltage at discrete intervals.
10. Apply grounds for a time period adequate to drain all insulation stored charge.
11. Spliced cables (new to existing)
  1. When new cables are spliced into existing cables, the acceptance test shall be performed on the new cable prior to splicing in accordance with Section 7.3.3.2.
  2. After test results are approved for new cable and the splice is completed, an insulation-resistance test and a shield-continuity test shall be performed on the length of new and existing cable including the splice.
  - \*3. After a satisfactory insulation-resistance test, a test in accordance with the types listed in section 7.3.3.2.4 may be performed on the cable utilizing a test voltage acceptable to owner and not exceeding 60 percent of factory test value.

\* Optional



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#### 3. Test Values

1. The values associated with the testing methods shall be in accordance with the applicable Table 100.6.
2. Compare bolted connection resistances to values of similar connections.
3. Bolt-torque levels should be in accordance with Table 100.12 unless otherwise specified by the manufacturer.
4. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
5. Shielding shall exhibit continuity. Investigate resistance values in excess of ten ohms per 1000 feet of cable.
6. If test is performed by means of direct voltage (dc), graphic plots may be made of leakage current versus step voltage at each increment and leakage current versus time at final test voltages.
7. Residual voltage at the end of each interval should be approximately the same for each phase and/or parallel conductor.

\* Optional

