

HIGH POTENTIAL CABLE TESTING



Educational Series: Why Test?

What is High Potential Testing?

High potential (hipot) cable system testing can be performed using DC, AC or Very Low Frequency AC (also known as VLF) test voltage. Such testing can be conducted as an acceptance test for new installations or as a maintenance test for existing installations.

Hipot testing involves applying an overvoltage to the cable system for a short duration to verify the dielectric integrity of the system (cable, splices, and terminations). In most cases hipot testing is applied as a pass/fail or go/no-go test. If the cable system does not fail during the test, it is considered to have passed the test and can be placed into or back into service.

DC Hipot Testing

Methods for using DC hipot testing of cables were developed in the early 1900s, primarily for testing laminated cable systems such as paper insulated lead covered cable types. A DC hipot unit is relatively easy to control, provides accurate leakage current data, and is relatively small and light weight. Current standards provide for the use of DC hipot testing for acceptance testing of cables with extruded (e.g. cross-linked polyethylene [XLP] or ethylene propylene rubber [EPR] insulation or laminated construction (such as paper insulated lead covered [PILC])). But most industry standards, especially the IEEE 400 standard, no longer recommend DC hipot testing for maintenance testing of field aged XLP or EPR cables. This standard

states that DC hipot testing of field aged XLP and EPR cables may not provide meaningful information, and in fact may cause damage. ICEA standards do not recommend testing XLP or EPR cables after they have been in service for 5 years. The IEEE 400 standard does recommend DC hipot testing of field aged PILC cable types.

VLF Hipot Testing

VLF hipot test has the same advantages as DC hipot testers – they are relatively small and light weight. But unlike DC hipot testing, the IEEE standard does not caution that VLF hipot testing may not provide meaningful information. More importantly, it does not warn that VLF hipot testing is likely to cause damage to field aged XLP or EPR cables.

AC Hipot Testing

There are no widely accepted test standards for AC hipot testing of cables, and power frequency AC hipot testing of cable systems is rarely performed. This is primarily due to the availability of other test methods and the high levels of power consumption and the large, heavy units required for AC hipot testing.

What Test Voltages?

As previously stated, industry standards regarding DC hipot maintenance testing of cables with XLP and EPR insulation have been changing. Few standards provide for DC hipot testing after such cables have been in service 5 years. Recommended acceptance and maintenance DC hipot test information can be found in ICEA standards (S-97-682, S-93-639, and S-94-649), NETA standards (MTS and ATS), and in IEEE standard 400. IEEE standard 400.1 also provides test voltage guidance. VLF hipot test voltages are provided by the IEEE 400.2 standard.