

## ICEA standard S-97-682-97 hyperbaric accelerated water treeing test (AWTT) performed at 250 and 310 bar

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The Accelerated Water Treeing Test (AWTT) of ICEA standard S-97-682-97 has been performed on tree-retardant crosslinked polyethylene (TRXLPE) insulated cables having blocked and unblocked conductor strands, at 1 (ambient), 250 and 310 bar hydrostatic water pressure for up to 450 days. Minimum residual dielectric AC breakdown strength requirements of the ICEA standard after AWTT via a step-rise high voltage time test (HVTT) at 120, 180 and 360 days were met at all three (3) test pressures, and were statistically equivalent at all test pressures. Degradation rates of AC breakdown strength were also identical at all test pressures. The number of bow-tie trees observed at or near HVTT failure sites as a result of AWTT being performed at 250 and 310 bars were higher than at ambient pressure (1 bar). The bow-tie tree density (#/.in<sup>3</sup>) growth rates at 250 and 310 bar are also greater than at 1 bar. Vented treeing (either at the conductor shield or insulation shield interfaces) at 250 and 310 bar was essentially non-existent. AWTT performed at 250 bar for 270 days, followed by an additional 180 days at 310 bar, also showed equivalency (with regard to levels and degradation rates for breakdown strength and treeing) results at 1 and 310 bar testing. These test results indicate that this TRXLPE insulation system can be expected to operate reliably at its intended operating voltage in sea water depths of up to 10,000 feet for its projected 40-year life.

### Key words

Accelerated Water Treeing Test, AWTT, AC breakdown strength, bow-tie trees, vented trees, hyperbaric pressure, TRXLPE, degradation rates, high voltage time test, HVTT