

Issue No. 42

December 19, 1975

## ABOVE GRADE APPLICATIONS

The "Cyclic Aging" Test is the most comprehensive laboratory method in common use today for simulating performance reliability and cable construction integrity of Medium Voltage Power Cables installed in a combined environment above grade. The sample length is too short to appraise the effects of conductor expansion, but a reasonable estimate of field performance can be obtained if the condition of the cable after cyclic aging is properly evaluated, in addition to seeing whether the three pass/fail criteria have been met.

As tabulated below, test conditions approximate above grade conditions with acceleration being obtained by higher voltages and higher than normal rating temperatures:

Actual Environment	Simulated Test Environment
1.0 Electrical	
1.1 Rated Voltage to ground	2 x and 3 x rated voltage to ground.
1.2 Proximity to other cables	Current induced.
2.0 Thermal	
2.1 Cyclic current loading	Cyclic current loading at 10°C above rated temperature and to 5°C above emergency conductor temperature.
2.2 Cyclic ambient	Ambient room temperature.
3.0 Mechanical	
3.1 Installation	Installation
3.2 Permanent Bends	Permanent Bends
3.3 Pressure points at supports	Pressure points at supports
3.4 Expansion effects from long conductors	Expansion from 22-30 ft. test cables

## TEST METHOD (FOR 15 kV XLP or EP CABLE)

Conductor current loaded to 100°C (10°C above rated) and 135°C (5°C above emergency rating) conductor temperature, 8 hours each work day for 21 days in each temperature cycle. AC voltage to 2 X rated to ground for 21 days (17.4 kV) and 3 X rated to ground for 21 days (26 kV) applied continuously throughout the duration of test. Electrical properties monitored at the beginning of each work day and prior to current loading.

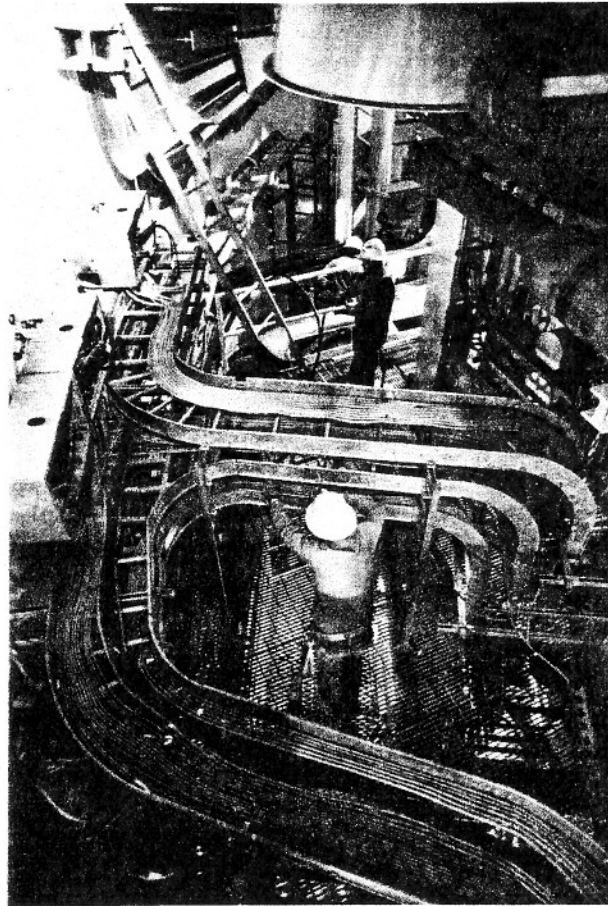
### TEST RESULTS

Property	EP	XLP (unfilled)	Criteria
Power Factor Retention	Excellent 0.38 - 0.41%	Excellent 0.04 - 0.06%	Power Factor Stability 1.5% for EP, 0.1% for XLP
SIC Retention (No AEIC Requirement)	Excellent 3.08 - 3.10	Excellent 2.34 - 2.36	No significant deterioration.
Corona Level	Good working level maintained. Corona free at 35 kV.	Good working level maintained. Corona free at 35 kV.	At 2 X rated voltage pc discharge not to exceed 20. At 3 X rated voltage pc discharge not to exceed 50.

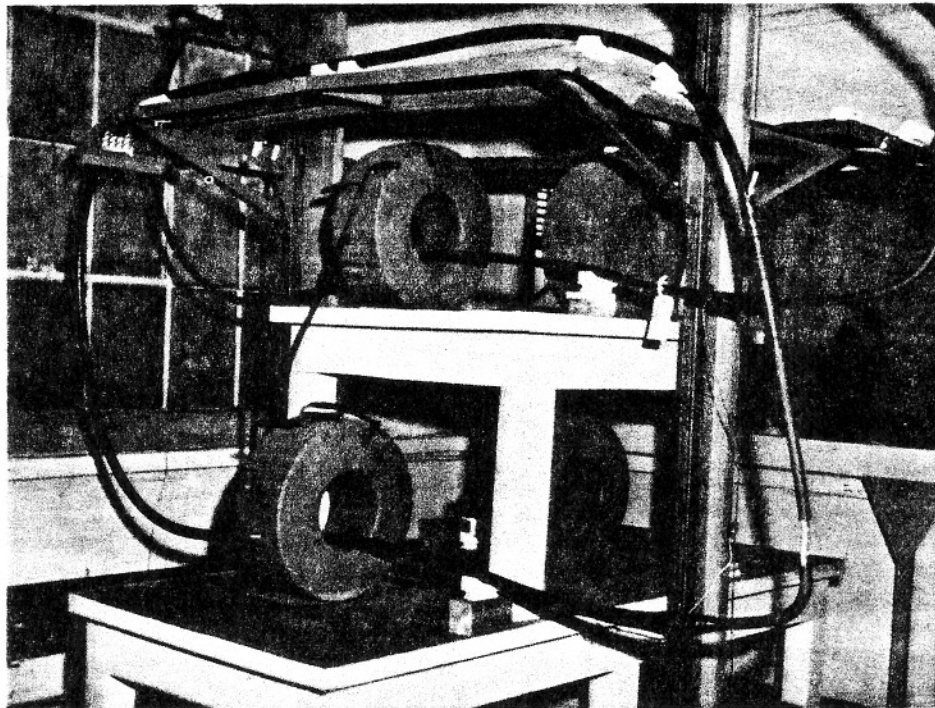
NOTE: At the end of the test period, the cable shall be dissected and the component parts examined to determine whether the cyclic loading has produced any physical changes. No criteria have been set, but XLP is subject to three problems which insulated cables avoid.

Property	EP	XLP	Comments
Dimensional stability or "shrink-back"	Superior - No measurable shrink-back even at 135°C.	Characteristically shrinks 9/32" at each end of 25 ft. specimen at 135°C.	Potential trouble spot with XLP - especially at splices and terminations.
Thermal Expansion	No significant expansion.	Thermal expansion up to 5% of original O.D.	Potential trouble spot with XLP - especially with prefabricated or premolded splices and terminations.
Deformation	No significant deformation even at emergency temperatures.	Not uncommon to find a reduction of more than 5% overall O.D. of XLP at tight fittings. Insulation flows decreasing wall thickness.	Potential problem with XLP. Conductor migration in large AWG sizes - and with prefabricated or premolded splices or terminations.

Steve Bunish



ACTUAL ENVIRONMENT



SIMULATED ENVIRONMENT