

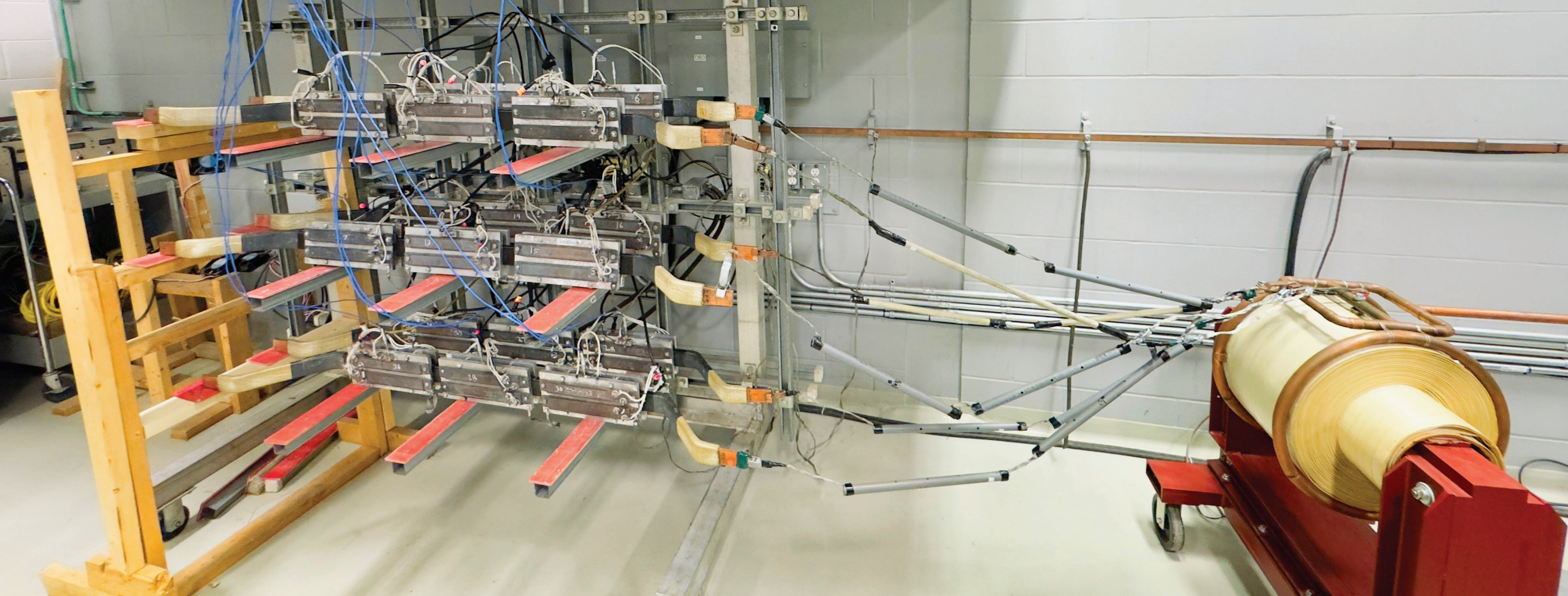
## Tested & Proven at Manitoba Hydro – High Voltage Test Facility

Our coils have passed the world-class testing  
at Manitoba Hydro's High Voltage Test Facility, Canada.

**CORAL**

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## Test Information

Test Location: High Voltage Test Facility, 110 Newmarket Blvd,  
Winnipeg, Manitoba, Canada. R3T1Y6

Test Date(s): 20250124 to 20250324

Tests Coordinated by: Flora Marques

Prepared by: Abimbola Akingba, P.Eng

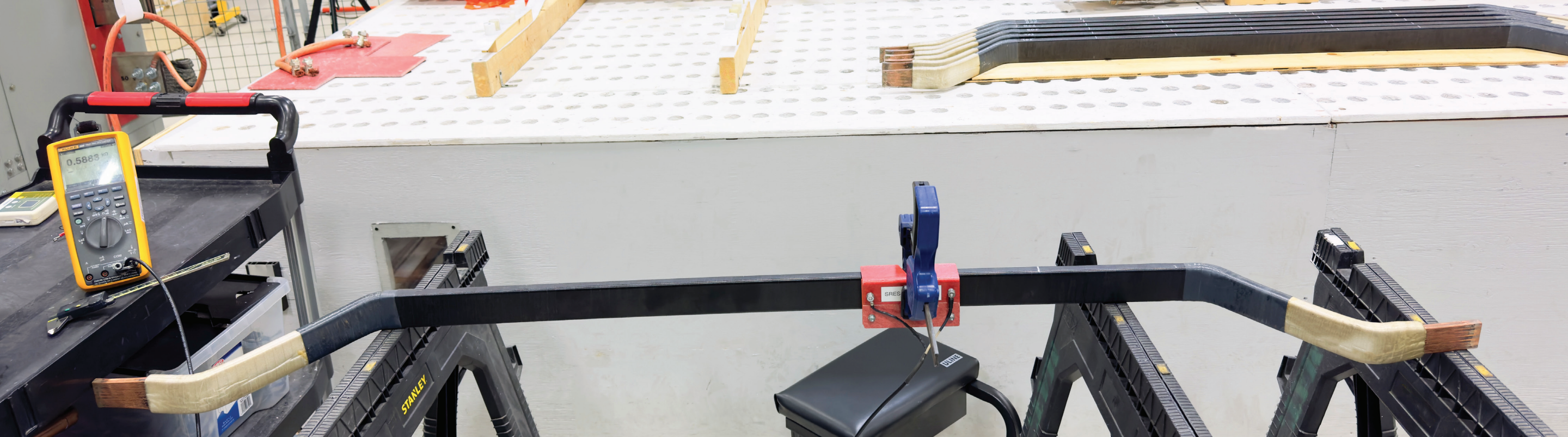
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## Summary

The Manitoba Hydro High Voltage Test Facility performed thermal cycle (TC) and voltage endurance (VE) accelerated aging tests on seven 13.8 KV stator bars manufactured and supplied by Coral Group of Companies. The bars, labeled B01, B02, B04, B05, T03, T04 and T05 were tested in accordance with IEEE Standards 1310 2012, 10431996 and 15532002.

Four stator bars underwent 500 thermal cycles from 40°C to 155°C. Prior to the thermal cycle test, diagnostic tests were conducted on all bars. Additional diagnostic tests were performed on the thermally cycled bars after 50, 100, 250 and 500 cycles to assess the rate of deterioration or the point at which delamination began.

### Diagnostic tests performed on all bars included:

- Insulation resistance
- Partial discharge (PD)
- Capacitance and dissipation factor
- Dimension measurements
- Surface resistance measurements
- Tap tests

After the thermal cycle test, all bars were subjected to a voltage endurance test at 35 KV rms (49.5 KV peak), 60 Hz and 100°C for 250 hours.

The 13.8 KV stator bars met the acceptance criteria for the voltage endurance test, successfully enduring 250 hours without failure. Also, the stator bars performed very well in all diagnostic tests, as specified in IEEE Standards 13102012, 10431996 and 15532002





## Summary of Thermal Cycle and Voltage Endurance Test Results

Tests	Reference IEEE Std.	Results	Comments
Thermal Cycle -	13102012	Pass	Completed 500 Cycles without any issues.
Capacitance and DF	286	Pass	The capacitance change after 500 cycles was less than 1%.
Tip-up	286	Pass	The maximum tip-up was within acceptable limit.
Partial Dischargea	1434 Table 3 Case 3	Pass	Low PD magnitude recorded before and after 500 cycles.
Tap Test	1310 Clause 7.5	Pass	No signs of delaminations detected.
Surface Resistanceb	1310 Clause 7.6	Pass	Change in surface resistance was within acceptable limit.
Dimensionc	1310 Clause 7.4	Pass	No changes exceeding 0.003 " were observed.
Insulation Resistance (IR)	432013	Pass	Maximum IR increased from 1.01 T $\Omega$ to 1.54T $\Omega$ after 500 cycles.
Groundwall insulation proof test	1310 Clause 8.1	Pass	Withstood 28.6 KV for 1 minute without any failure.
Voltage Endurance -	1043-1996	Pass	Withstood 250 hours without any failure.

NOTE: Result analysis was based on historical bars and coil testing experience in our lab.

- a. The positive or negative polarity pulses should typically be below 75 MV
- b. The change in surface resistance should remain under 20 %
- c. Typically, the dimensional change should be less than 0.005"