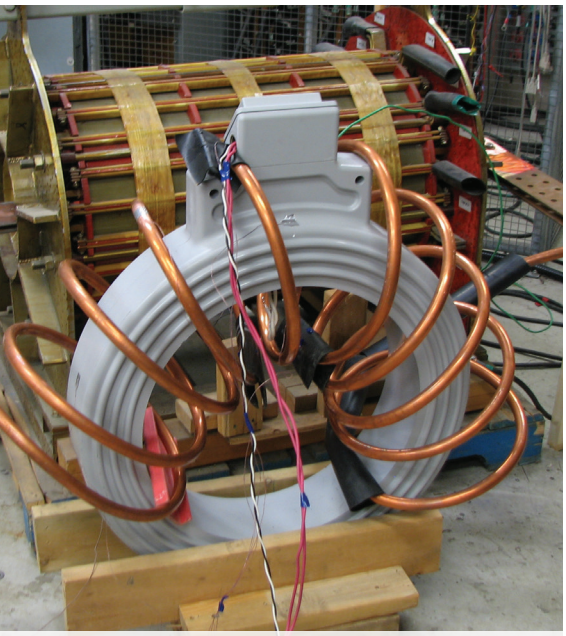
HIGH CURRENT TECHNOLOGY & TESTING

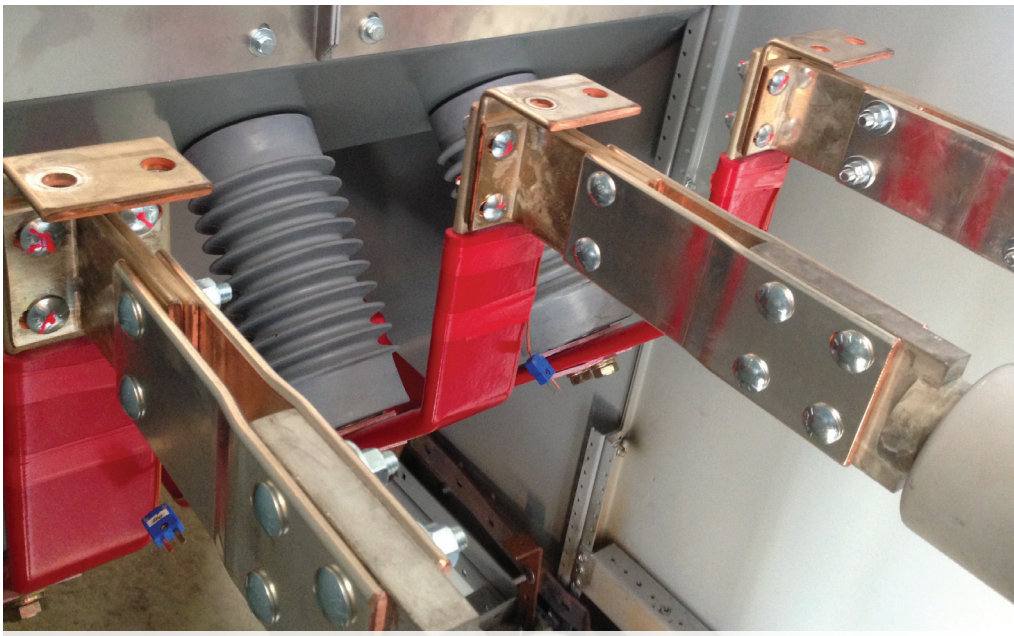
Powertech

The Power of Trust. **The Future of Energy.**

HIGH CURRENT TESTING



Current transformer temperature rise



Metal-clad switchgear temperature rise

Manufacturers need to ensure that their newly designed current-carrying components meet industry standards and quality assurance testing before installation so that they will perform reliably throughout their service life.

For example, to avoid machine insulation failure in electric generators and motors, new or rewound stator coils/bars must be manufactured to a high quality level and meet the design specification and expected performance requirements prior to installation. Similarly, high-current connectors and conductors can be the cause of expensive outages and a serious fire hazard if they are incorrectly designed, sized, and installed.

Ensuring current-carrying components meet industry standards.

To meet these needs, Powertech's High Current Laboratory offers independent, third-party evaluation of the thermal performance and fault withstand of electrical equipment. The lab performs long-term aging tests to simulate lifetime performance. Assessments are made through heat run, current cycle, and short-circuit testing at high-current levels and low voltages.

The laboratory specializes in evaluation and failure analysis of high-current components including connectors and fuses, utilization testing of energy meters and storage batteries, and machine insulation testing of stator bars and coils.

In conjunction with Powertech's High Voltage Laboratory and High Power Laboratory, and with on-site access to mechanical, chemical, and materials testing labs, the High Current Lab offers complete test packages according to CSA, IEEE, ANSI, and other standards as well as non-standard tests.

The lab also has the experience and capabilities to conduct R&D involving advanced new equipment and novel diagnostic tools and methods.

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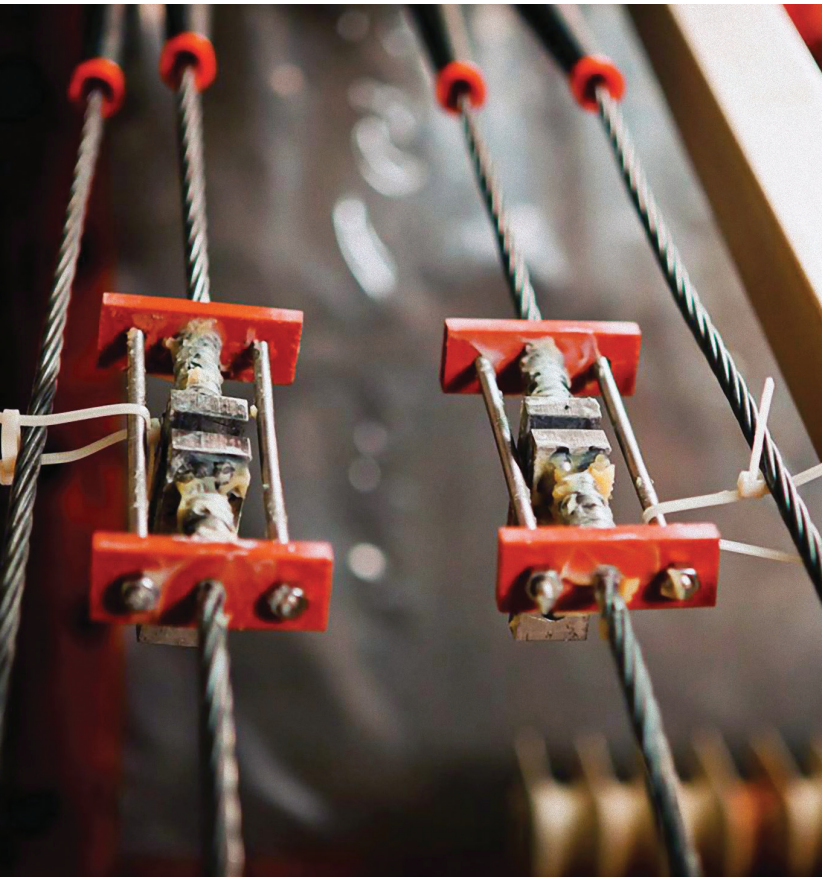
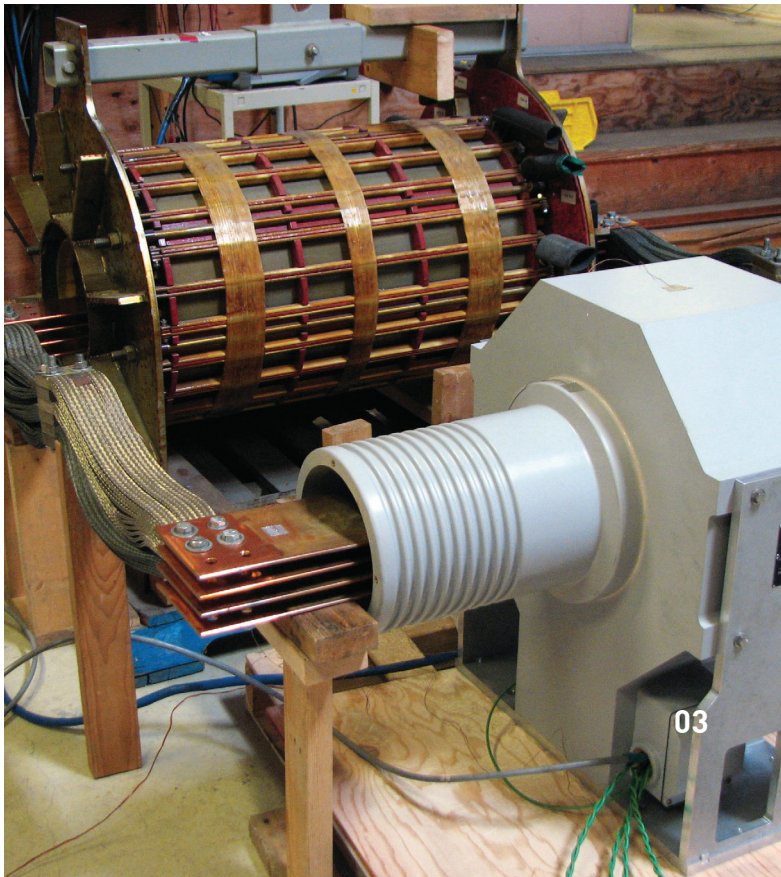
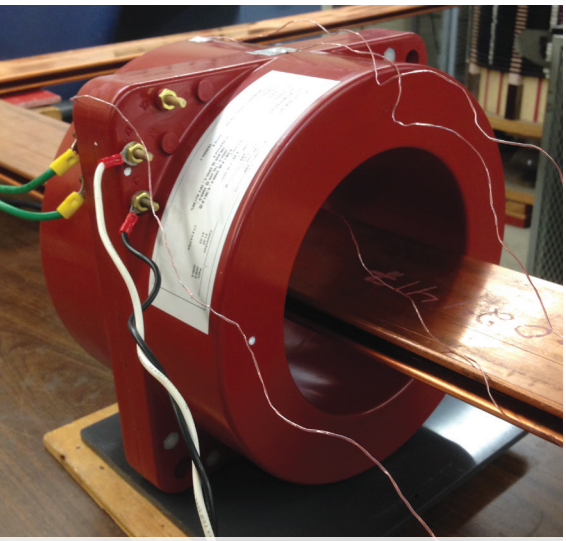
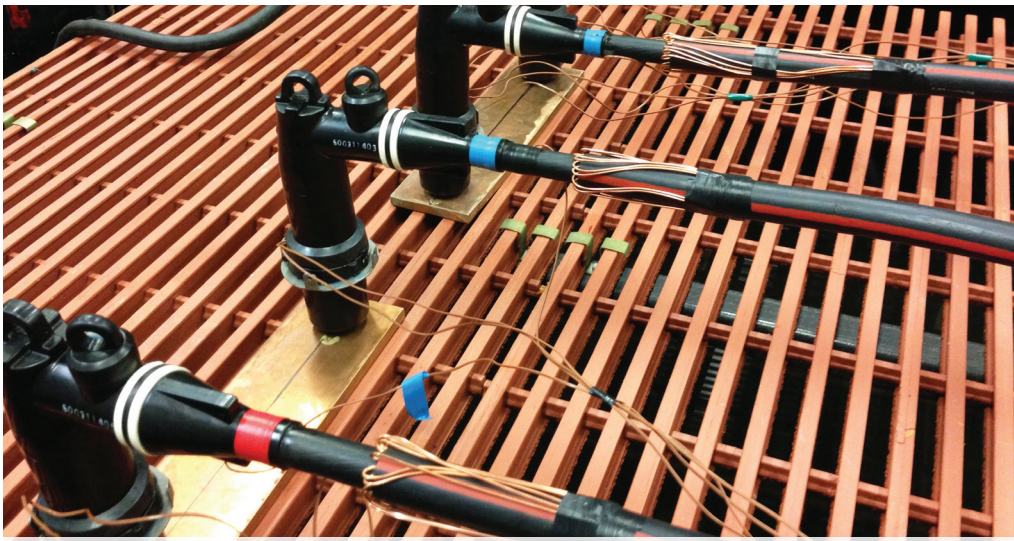




CAPABILITIES



Current transformer temperature rise



Load break elbow temperature cycle

The High Current Laboratory has extensive capabilities for testing a wide range of current-carrying components, including conductors, connectors, cable accessories, switchgear, fuses, transformers, bushings, reclosers, and revenue meters.

The lab has ISO 9001 and ISO/IEC 17025 accreditation.

MAIN TEST EQUIPMENT

The laboratory is equipped to provide single-phase, continuous current testing for temperature rise and current cycling at up to 10 kA, at either 60 Hz AC or DC.

Single-phase, short-circuit-testing is available at up to 20 kA momentary. Three-phase tests can also be carried out at up to 2500 A at low voltages, or up to 400 A at 600 V.

The state-of-the-art instrumentation includes automated, computer-controlled testing, with measurement of voltage, current, power, resistance, temperature, strain, force, or position. High-speed digital recording is used for short-circuit tests, and up to 200 channels of digital data acquisition are available for longer-term tests.

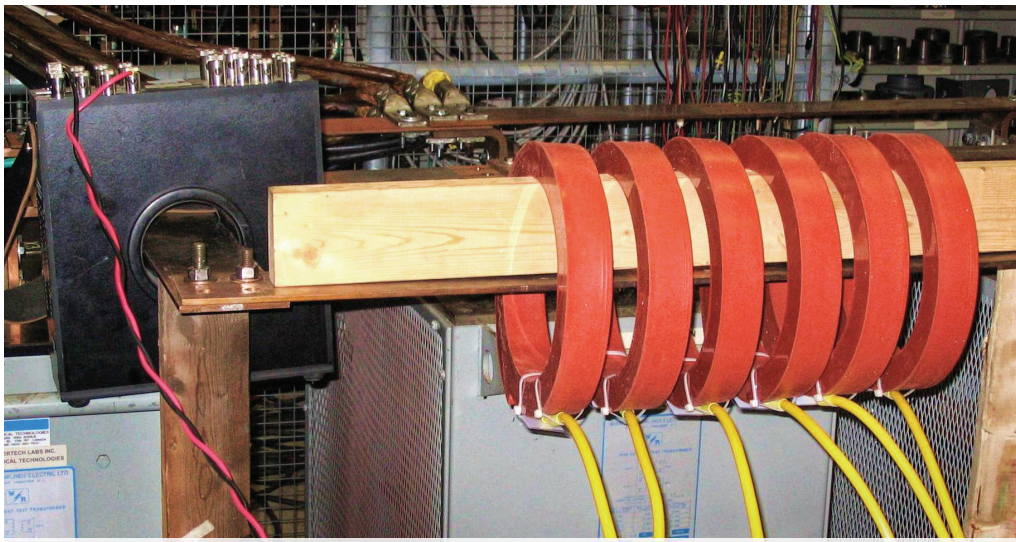
The laboratory's engineers and technicians are experienced at conducting qualification tests and investigating equipment failures. The team is skilled at designing tests to meet customer needs and available to provide expert consultation services.

HIGH CURRENT TESTING CAPABILITIES

TEST TYPE	1 PHASE (kA)	3 PHASE (kA)
60 Hz Continuous	10	2.5
60 Hz Short-Circuit	20	10
DC Continuous	10	
DC Short-Circuit	20	

SERVICES

Setting up instrumentation



Current transformer accuracy measurements

Thermal cycle test

Testing, failure analysis, and consultation for current-carrying components.

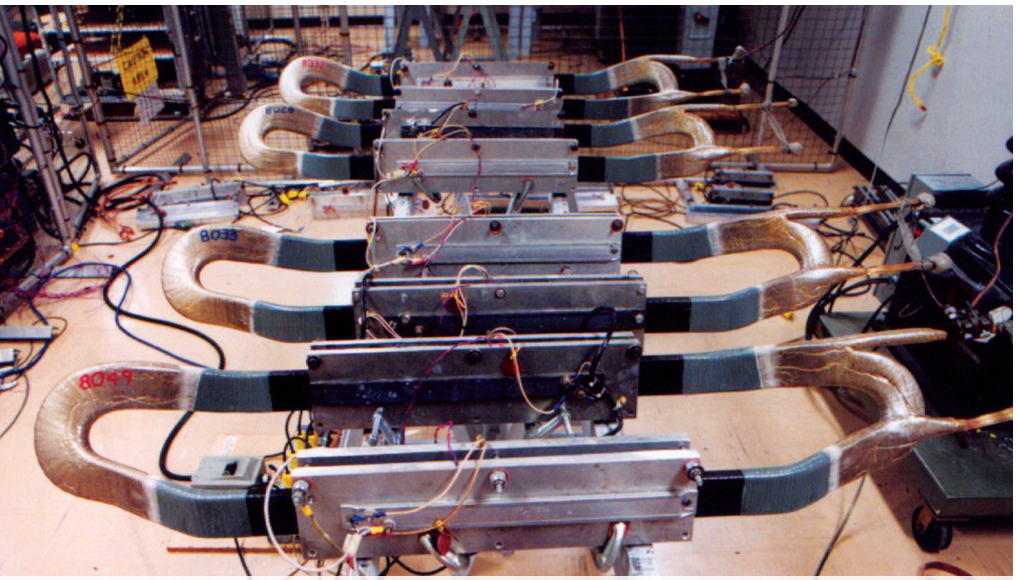
The High Current Laboratory provides testing, failure analysis, and consultation on all types of current-carrying components in electric distribution and industrial power equipment, including conductors, cables, connectors, cable splice and accessories, switchgear, fuses, transformers, bushings, and battery systems.

Testing and certification are conducted according to industry standards of CSA, IEEE, ANSI, IEC, AEIC, NEMA, and others.

SERVICES INCLUDE:

- **Temperature rise testing**—continuous current temperature rise tests on current-carrying components in accordance with relevant standards.
- **Thermal cycle testing**—current cycling tests on stator bars and coils, connectors, and instrument transformers.
- **Short-circuit testing**—short-duration current surges at low voltages to verify thermal performance during fault currents.
- **Time-current testing**—simulated short-circuit tests on reclosers to verify timing performance against standard protection curves.
- **Mechanical duty testing**—automatic and manual operation of capacitor switches and reclosers, including operating condition measurements.
- **Failure analysis and consultation**—condition assessments, root cause failure analysis, and design consultation on power equipment and accessories.

EVALUATIONS OF ELECTRICAL EQUIPMENT



Voltage endurance test

Current cycle test

Testing to industry standards and client specifications.

STATOR BARS AND COILS

For over 30 years, Powertech has performed research, development, and testing of insulation systems, including large rotating machine stator bars and coils, for a wide variety of manufacturers and utilities.

Evaluations include:

- Voltage endurance tests in accordance with IEEE standards 1043 and 1553.
- Detailed microscopic examinations of cross-sections of bars/coils to discover manufacturing defects.
- Thermal cycling tests in accordance with IEEE standard 1310.
- Diagnostic tests on insulation systems, including partial discharge, dissipation factor, insulation resistance, and turn-to-turn surge tests.

ELECTRICAL CONNECTORS

Powertech can provide complete connector testing programs in accordance with industry standards, as well as to client specifications.

Evaluations include:

- Long-term automated current cycle testing using Current Cycle Testing (CCT) and Current Cycle Submergence Testing (CCST) procedures.
- Testing per industry standards such as ANSI C119.4, IEC 61238-1, IEEE 837, and NEMA CC1.
- Fault current and electromagnetic force (EMF) tests in conjunction with Powertech's High Power Laboratory. Corrosion and freeze-thaw tests can be performed in house and in collaboration with the chemical and materials experts at Powertech.
- Current cycling and temperature rise tests on grounding connectors or distribution and transmission connector/splice assemblies at up to 400°C and under tensile loading of up to 10,000 lbs, using Powertech's High Temperature Connector testing facility.

MULTIDISCIPLINARY TESTING

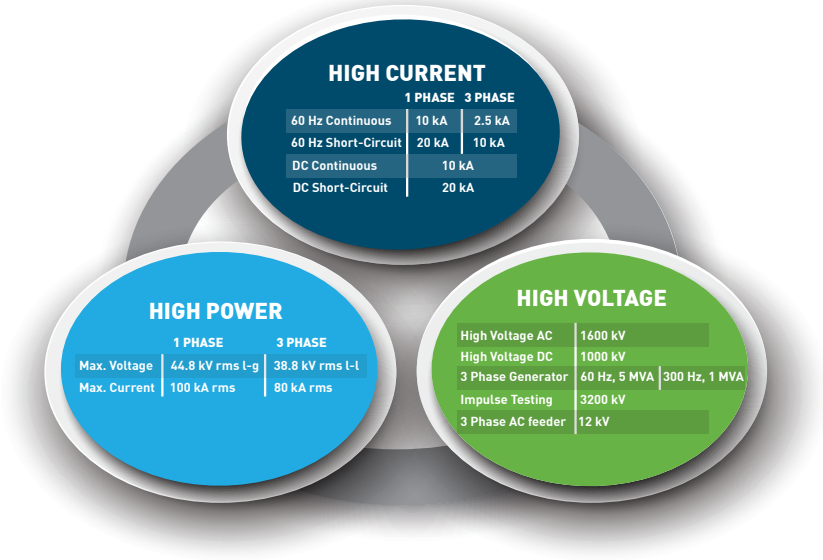
Advantages of cross-disciplinary analysis

Powertech's electrical testing labs have facilities for high-voltage, high-power, and high-current testing, as well as in-house access to labs to assist with **mechanical**, **chemical**, and **materials** testing. These labs offer unique capabilities and expertise for cross-disciplinary analysis and provide advantages for customers.

One advantage arises in projects that require across-the-board testing. Insulation condition assessment, for example, may require expertise in electrical, mechanical, chemical, and materials engineering. Powertech can conduct investigations into all aspects of equipment.

Customers may also realize time and cost efficiencies by having equipment undergo several different electrical tests at Powertech labs.

The collocation of Powertech laboratories also means that different tests can be performed efficiently in sequence while mitigating the risks of transportation and setup between tests. This is a typical scenario when testing large, expensive equipment such as switchgear cabinets.



The electrical labs also specialize in integrated test programs in areas such as transmission and distribution cables, stator winding insulation, and metering and protection devices. For example, insulators may undergo dielectric testing in the High Voltage Laboratory and power arc tests in the High Power Laboratory. A combined voltage-current instrument transformer may undergo voltage accuracy, lightning impulse withstand, temperature rise, and partial-discharge-AC withstand testing in the High Voltage Laboratory, current accuracy testing in the High Current Laboratory, and fault current testing in the High Power Laboratory.

SELECTED CLIENTS

BC Hydro Power smart · Grant PUD · Department of Water Resources State of California · ATCO · ALSTOM · ABB · GE · AFL · HUBBELL · VOITH · ERICO · POLYCAST

High
Current

THE POWERTECH ADVANTAGE

Powertech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing utility generation, transmission and distribution power systems.

Powertech is home to a broad range of scientists, engineers, and technical specialists, with capabilities in electrical testing, cable condition assessment, mechanical and materials engineering, software technologies, power system studies, chemical analysis, gas systems engineering, and smart utility services. These skilled researchers have decades of collective and real-world experience and often work in cross-departmental teams to investigate, diagnose and solve complex problems.

As an independent, third-party testing facility, we adhere to the **highest** laboratory **(ISO 17025)**, quality **(ISO 9001)** and environmental **(ISO 14001)** management standards. Many of our scientists and engineers chair or participate in various standards committees within their fields of expertise. Additionally we have the capabilities to derive and develop **non-standard testing** methods and setups required to test product prototypes and perform forensic analysis.

Outside of the utilities industry, Powertech provides routine **testing** capabilities, product **development**, research and **consulting** services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

Powertech
The Power of Trust. **The Future of Energy.**

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