Test Laboratory Capabilities

BURNDY®

Connecting Power to Your World®

HUBBELL®

Laboratory Mission Statement

"We are committed to total customer satisfaction by developing, and continuously improving, quality processes that are implemented by quality people. We provide independent, unbiased, complete and accurate test services to all of our customers. We will maintain an awareness of all relevant domestic, international, industry, and agency test standards and procedures. We shall actively monitor advancements in the test and measurements field in order to provide our customers with a state of the art test facility for the testing of electrical connectors and installation tooling. We will continue to be a dedicated resource to all of the units of Hubbell, Inc., providing expertise and recommendations in the development and testing of our products."

Certification

ISO 9001 as of March 1993
ISO 17025 as of November 2007 (through UL CTDP)

The BURNDY® laboratory at Manchester certifies and tests tools and connector products to the following standards:

- ANCE
- ANSI
- ASTM
- CSA Category Program for Certification (CPC)
- IEC
- IEEE
- Military
- NBR9326
- NEMA
- NUPIC
- OSHA
- SAE
- UL Client Test Data Program (CTDP)
- UL 2703 - Flat Plate Photovoltaic Modules and Panels

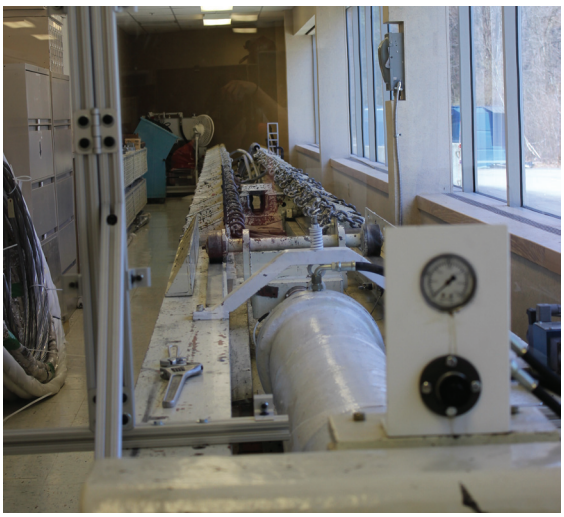
Mechanical Testing

Baldwin Tensile/Compression Machine

The tensile/compression machine is used to test the integrity of connectors and materials. This machine is capable of applying a force or compression up to 534 kN (120,000 lbs).

Satec Tensile/Compression Machine

The tensile compression machine is used for testing smaller gauge wire connectors and materials. This machine is capable of applying a force or compression up to 22.2 kN (5,000 lbs).



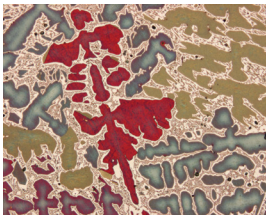
Horizontal Tensile Machine

The horizontal tensile machine is used for testing high tension overhead splices. This machine is capable of applying a force up to 445 kN (100,000 lbs) and of pulling test samples up to 15.2 m (50 ft) in length.

Metallurgy Testing and Imaging Analysis

Metallurgy Lab

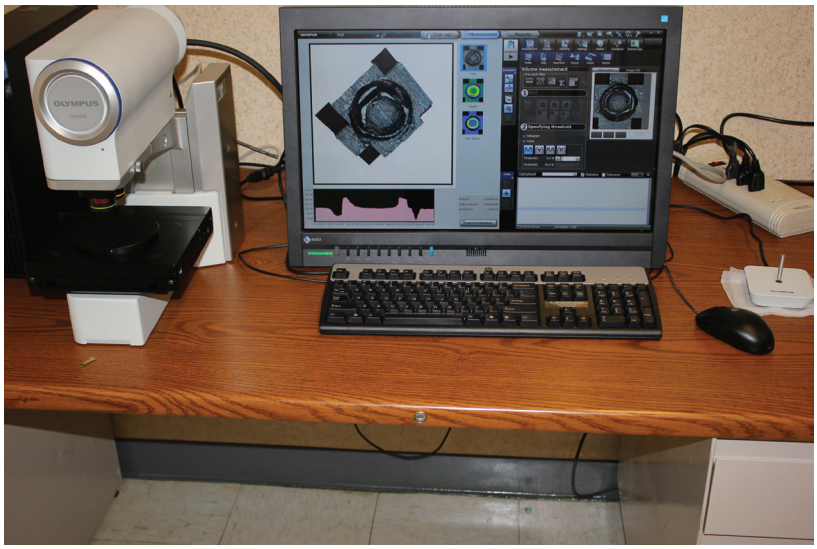
Metallography is the art and science of preparing relevant samples and interpreting these microstructural changes related to the specific manufacturing processes the material has been through. Sample preparation includes sectioning, grinding, polishing, and etching.

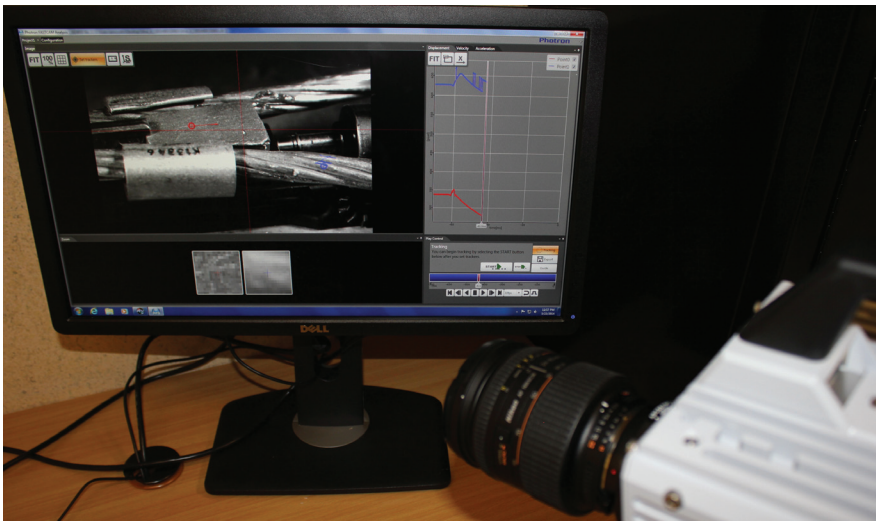


Metallography of Bronze

Microscopes

A light microscope is used for microstructural examination. We utilize multiple microscopes including two Olympus microscopes with magnification capabilities of up to 1000 X, and a 3-D Olympus microscope with magnification up to 50000 X; digital imaging and image processing/analysis software. Rockwell hardness (ASTM E18) and Knoop Microhardness (ASTM E384)





High Speed Imaging Camera

The high speed camera is used for capturing slow-motion video and precise still images during fast event testing. It is capable of recording at 500,000 frames per second and 1 micro second of shutter speed.

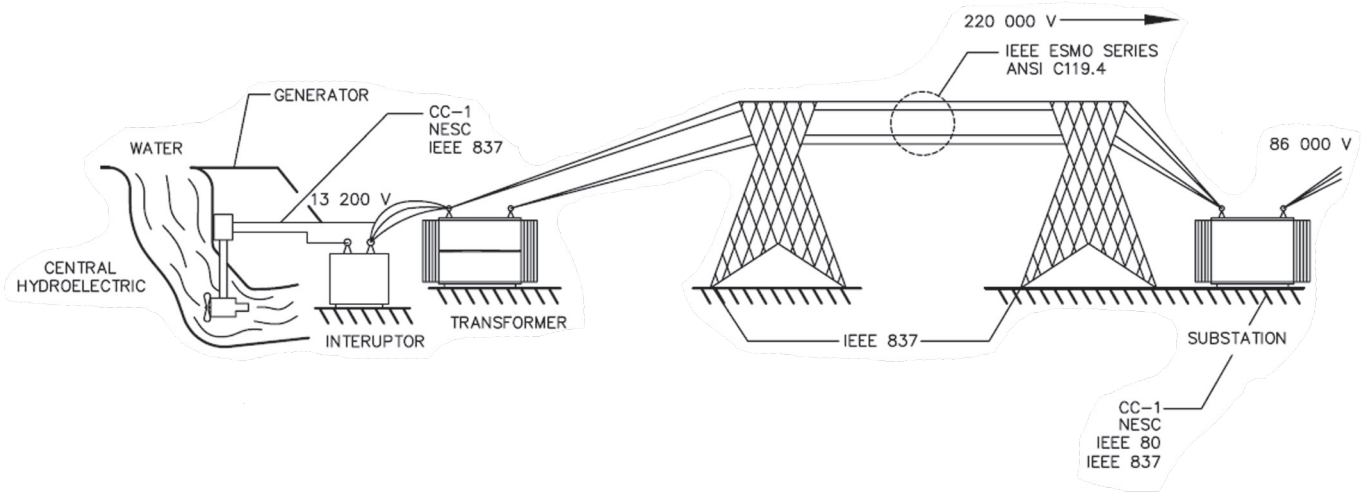
Tooling and Prototyping

Hydraulic Test Machine

The hydraulic test machine conducts life cycle testing of new and existing tool heads by applying pressures between 68.9 MPa (10,000 lb/in^2) and 186.2 MPa (27,000 lb/in^2).

Model Shop and CAM

The Model Shop is where test fixtures and prototypes of new product designs are machined. Prototypes are made from Pro-Engineer solid models electronically transferred to the equipment.


220 000 V
IEEE ESMO SERIES
ANSI C119.4
GENERATOR
CC-1
NESC
IEEE 837
WATER
13 200 V
86 000 V
CENTRAL
HYDROELECTRIC
INTERUPTOR
TRANSFORMER
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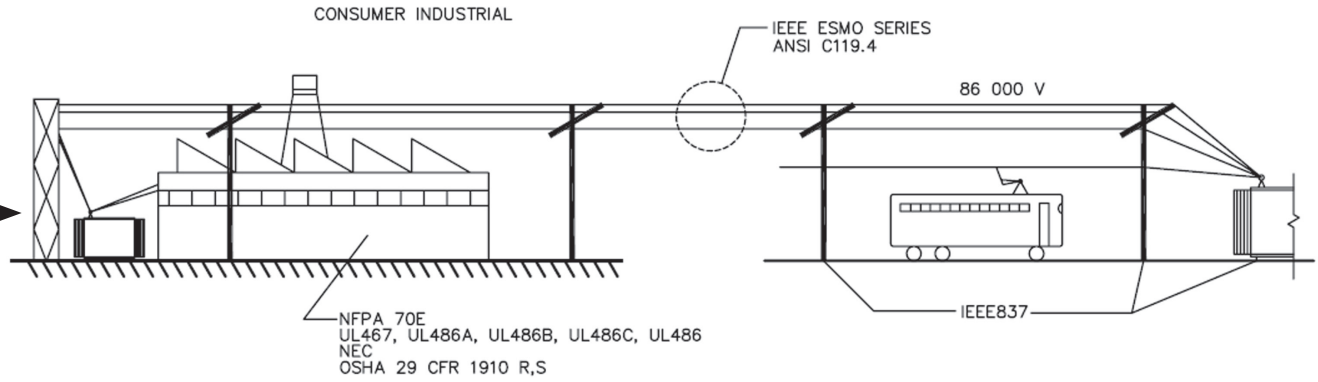
SUBSTATION
CC-1
NESC
IEEE 80
IEEE 837


CONSUMER INDUSTRIAL
IEEE ESMO SERIES
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UL467, UL486A, UL486B, UL486C, UL486
NEC
OSHA 29 CFR 1910 R,S
IEEE837

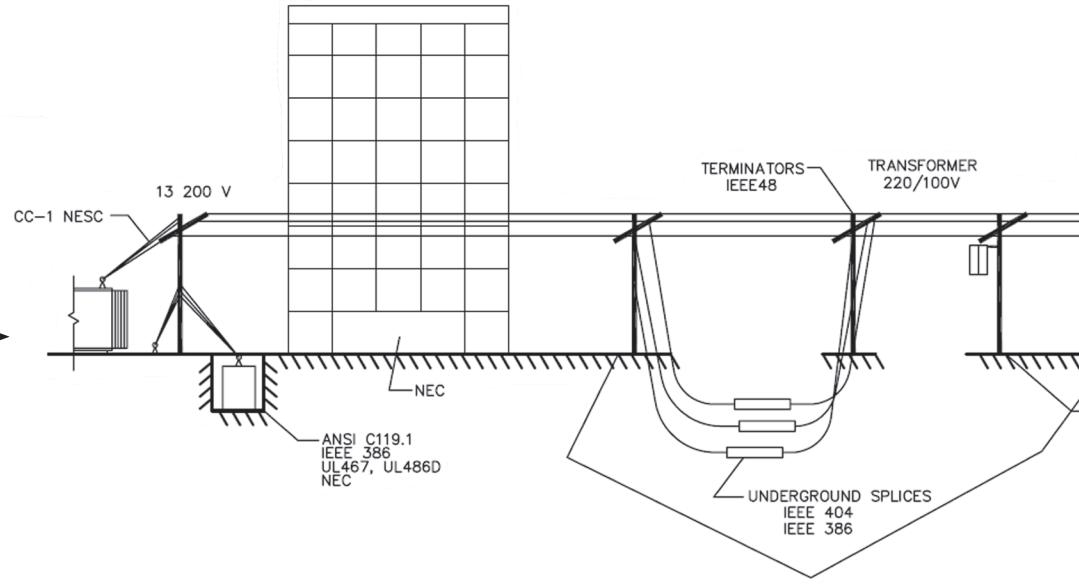
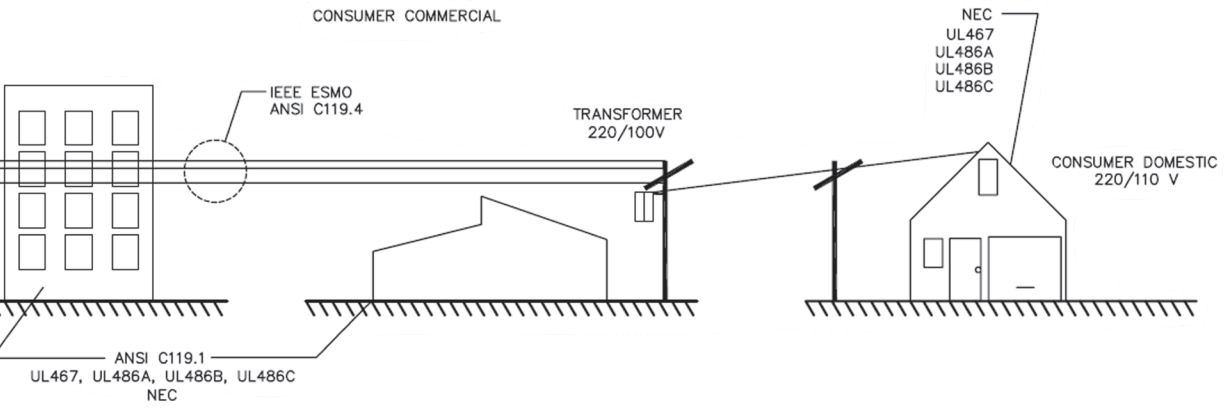

13 200 V
CC-1 NESC
TERMINATORS
IEEE48
TRANSFORMER
220/100V
NEC
ANSI C119.1
IEEE 386
UL467, UL486D
NEC
UNDERGROUND SPLICES
IEEE 404
IEEE 386

Illustration of Standard Electrical Generation Flow

Reference to some of the typical Standards testing on connectors that is necessary throughout the grid.

Standard	Title
UL486A - UL486B	Wire Connectors
UL48C	Splicing
UL486D	Sealed Wire Connector Systems
UL467	Grounding & Bonding EQT
UL2459	Luminaire Disconnect
UL310	Quick Connect Terminals
IEEE C2	National Electrical Safety Code
IEEE 48	Cable Termination Standard
IEEE 80	Safety AC Substation Grounding
IEEE 386	Separable Insulated Connector Systems for Power Distribution Systems above 600 Volts
IEEE 404	Extruded and Laminated Dielectric Shielded Cable Joints rated 2,500 to 500,000 Volts
IEEE 837	Permanent Connections used in Substation Grounding
NFPA 70	National Electric Code
ANSI C119.1	Sealed Insulated Systems
ANSI C119.4	Connectors for use on Bare Aluminum and Copper Conductors
ANSI C119.5	Insulation Piercing Connectors
ANSI C119.6	Unsealed Multi-port Connectors
NEMA CC-1	Electric Power Connection for Substations
ANSI C119.7	Connectors for High Current Conductors



Environmental Testing

Salt Fog Chamber

The Salt Fog Chamber is used to expose material to various percentages of salt solution at elevated temperatures. Exposure will determine the corrosive effects and resistance changes to ASTM B-117.

Heat Chambers

The heat chambers are used to condition parts before testing to determine the effects of temperature to a maximum of 176° C (350° F).

Humidity/Temperature Chamber

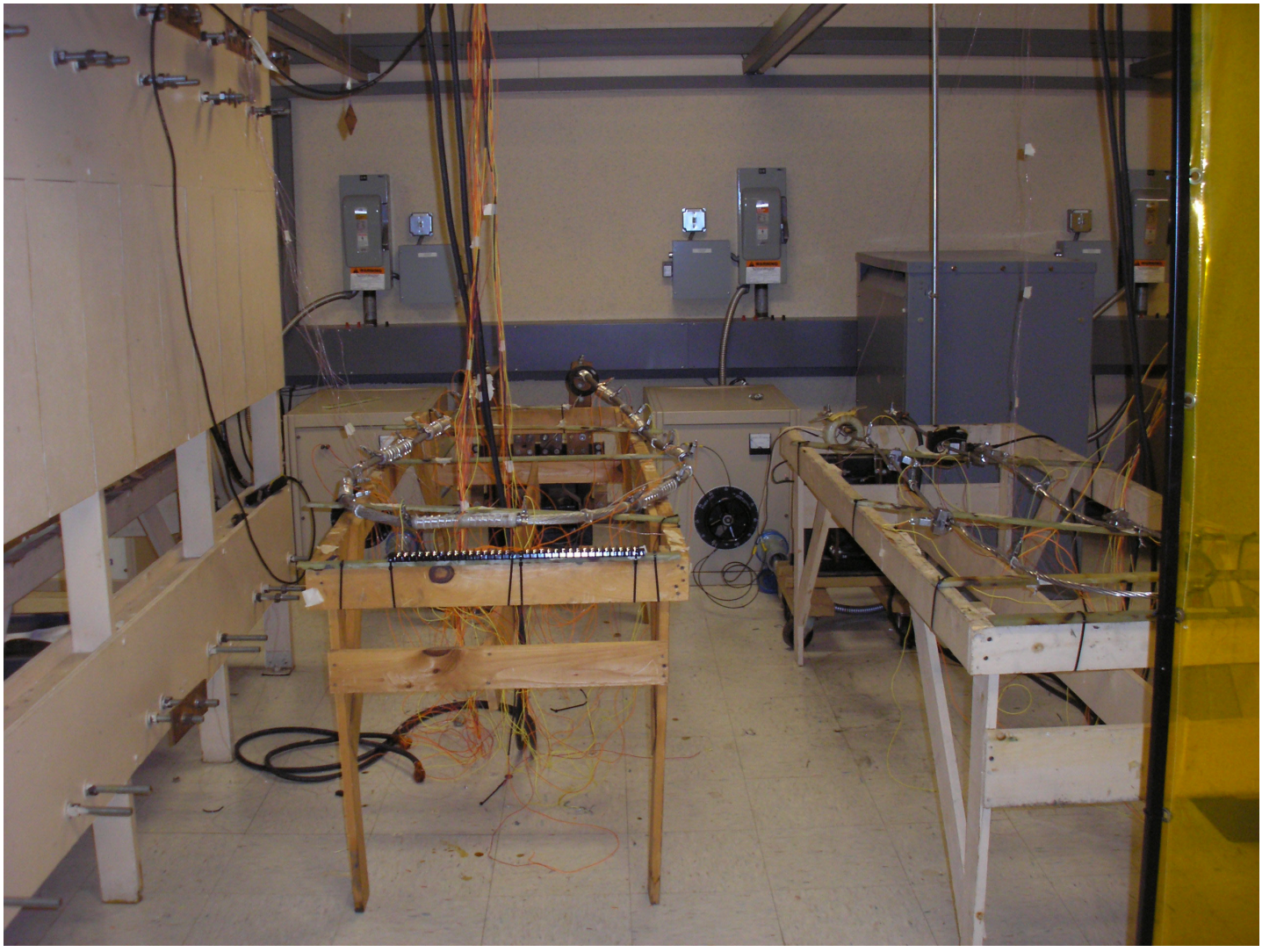
The humidity chamber is used to expose parts to moisture for predetermined periods of time. Relative humidity range is from 20% to 98%, and temperature range is from -70° C to 93° C.

Current Cycling

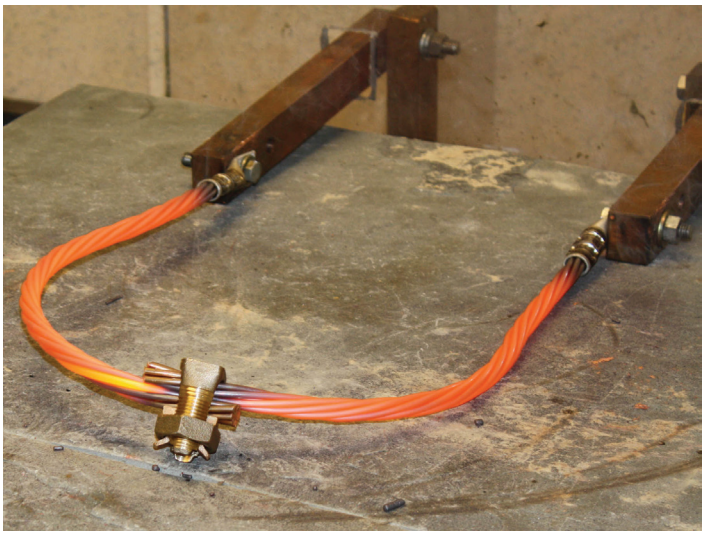
The Current Cycle Room contains 12 banks, each of which monitors temperature using thermocouplers up to 24 points and resistance up to 28 points. Capacity is 5VAC at 3,000 Amps, depending on conductor size and length.

Current cycling is the application of electrical current for the required number of cycles determined by the specifications. Each cycle consists of current on and current off periods which causes heating and material expansion or cooling and material contraction, respectively.

Current cycle testing is controlled by a data acquisition computer that is capable of controlling all 12 banks simultaneously. The computer regulates current and time duration as well as records temperature and resistance. Specific pass/fail criteria to the required test standards are evaluated.



Short Circuit and Dielectric Testing



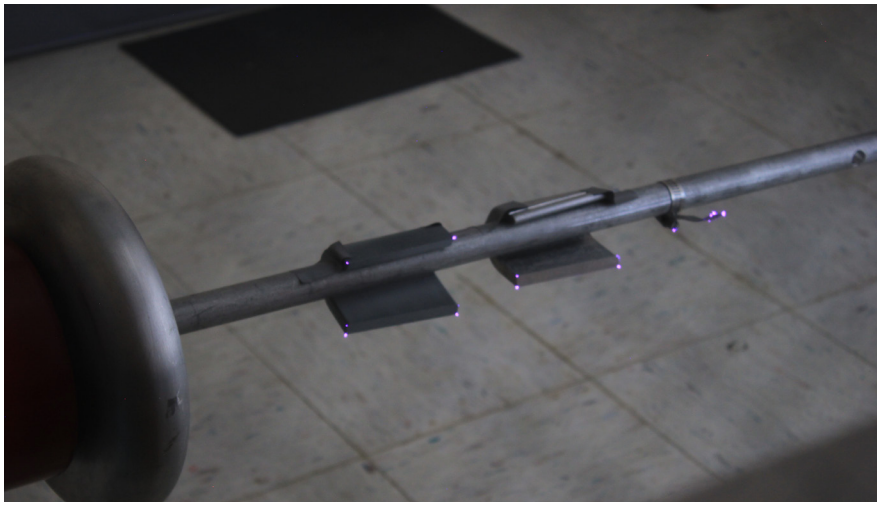
Short Circuit Testing

The short circuit tester is used to apply current to grounding connectors. The system capacity is 144 kVA with a 12 Volt maximum output at 12 000 A.

Dielectric Testing

AC dielectric testing of up to 100 kVAC at 5 KVA used to test the integrity of insulated products.

Testing for Corona Discharge



Test Lab Capabilities

Mechanical

Tensile / Compression :	Capable of tests up to 534 kN providing stress-strain curves and Young's modulus
Digital Scale :	0 - 75 lbs
Torque Wrenches :	0 - 150 lb-ft and 0 - 3600 lb-in
Transducers :	0 - 30,000 lbs
Force Gauge :	0 - 500 lbs, mechanical spring with push rod and hook
Secureness Tester :	Performs UL/CSA secureness tests

Electrical

AC Current Tests :	to 12 VAC @ 0 - 10,000A
DC Current Tests :	to 28 VDC @ 0 - 1,580 A
Oscilloscope :	Measures voltage and frequency
Current Transducers :	Several units with different turn ratios used for monitoring current
Hipot Testers :	Perform dielectric breakdown of insulating material and arc over up to 100kV
Transformers / Variacs :	Used for short circuit, heat cycle and control
Counters :	Count cycles in circuits
Timers / Relays :	Time circuits and control in counters
Data Acquisition :	Computerized collection of temperature and resistance measurements

Environmental

Heating Chambers :	Ambient to 350º F (176º C) for sample conditioning
Humidity Chamber :	Programmable chamber to test relative humidity
Hot/Cold Chamber :	Programmable temperature for automatic cycling
Cress Furnace :	Heat treating to 1093º C
Hydraulic Burst Test :	Chamber for testing hoses and fittings to failure (50,000 lb/in^2 capacity)
Hydraulic Fatigue :	Cycle tests hydraulic tool heads
Bucket Truck Simulator :	Capable of simulating hydraulic tool operation from bucket truck
Salt Spray Chamber :	Conditioning tests with salt water and temperature for accelerated aging

Metallurgy

Hardness Tester :	Rockwell and Knoop scale abilities
Grinding Bench :	Several grits of sand discs and solutions
Microscopes :	Complete range of power and eyepieces; light stereoscopic; metallurgical microscope and digital 3D microscope with up to 50,000 magnification
Fume Hoods :	Chemical containment, acid etching, and exposure

Image Analysis

High Speed Imaging Camera :	Used to record high speed imaging at various frame rates to analyze displacement, material behaviors, moving parts mechanics, and other manufacturing applications

Data Analysis

Matlab :	For data analysis and visualization, computation, and algorithm development

Trust the BURNDY® Engineered System

The BURNDY® Engineered System of coordinating dies, connectors, and tools are always designed to work together and engineered to meet stringent, accepted quality standards.

Dies and connectors

+

Tools

=

Safe, easy and inspectable connection

www.burndy.com | 1-800-346-4175

Customer Service Department
7 Aviation Park Drive
Londonderry, New Hampshire 03053
1-800-346-4175
1-603-647-5299 (International)

Canada
1-800-361-6975 (Quebec)
1-800-387-6487 (All other provinces)

Mexico
011-52-722-265-4400

Brazil
011-55-11-5515-7225

Tool Service Center
Littleton Industrial Park
Littleton, New Hampshire 03561
1-800-426-8720

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