

**DISCOUNT  
PROGRAM PRICING**  
Details Page 4

# Testing and Troubleshooting Problems In Electric Power Systems

Complete Program Details [www.electricityforum.com/forums/electrical-troubleshooting-2009.html](http://www.electricityforum.com/forums/electrical-troubleshooting-2009.html)



**ST. JOHN'S, NL - November 17-18, 2009**  
**HALIFAX, NS - November 19-20, 2009**  
**OTTAWA, ON - November 23-24, 2009**  
**TORONTO, ON - November 25-26, 2009**  
**EDMONTON, AB - December 7-8, 2009**  
**VANCOUVER, BC - December 9-10, 2009**

**Testing and Troubleshooting Problems In Electric Power Systems course will help to maximize industrial productivity and help to solve problems faster and reduce electrical equipment downtime.**



#### **DELEGATES RECEIVE:**

- Our Latest Electrical Testing and Maintenance Handbook (Value \$35.00)
- 1.4 Continuing Education Unit (CEU) Credits
- FREE Magazine Subscription (Value \$50)
- \$100 Coupon toward any future 2010 Electricity Forum event (restrictions apply)
- Forum Presentations in Paper Format
- Register Three, Get One FREE (Details Page 4)

#### **THIS COURSE WILL TEACH YOU HOW TO:**

- Perform insulation tests, insulation voltages, plus a wide range of DMM tasks with confidence and ease. Necessary for work on motors, cables and switchgear.
- Learn how to accurately measure AC current without breaking the circuit.
- Check for hot spots and measure temperature with the Mini non-contact thermometers.
- Measure voltage level, current balance, harmonics, power, energy, power factor, displacement power factor, determine bad or marginal circuit breakers, "K" factor, Crest factor.



Earn Continuing Education Units (CEUs)



*More than 25,000 Satisfied Students*

## COURSE DESCRIPTION

This course will help to maximize industrial productivity and help to solve problems faster and reduce electrical equipment downtime.

Establishing preventative maintenance programs is becoming critical to maintaining the uptime of electrical equipment and can significantly reduce both planned and unplanned downtime. Unplanned downtime costs are difficult to calculate, but often significant. For some industries, they can represent 1 to 3 per cent of revenue (potentially 30 per cent to - 40 per cent of profits) annually.

The course will review equipment necessary to perform a Site Survey, such as industry oscilloscopes and Multi-meters, Power Quality Analyzers, Current Clamp meters, and Mini Infrared Thermometers.

- Learn how to perform insulation tests, insulation voltages, plus a wide range of DMM tasks with confidence and ease. Necessary for work on motors, cables and switchgear.
- Learn how to accurately measure AC current without breaking the circuit
- Check for hot spots and measure temperature with the Mini non-contact thermometers.
- Measure voltage level, current balance, harmonics, power, energy, power factor, displacement power factor, determine bad or marginal circuit breakers, “K” factor, Crest factor.

## PREVENTIVE MAINTENANCE

Basic power quality measurements to production equipment maintenance procedures allows to determine unexpected failures on both production equipment and power system.

Insurance claims data in the NFPA 70B maintenance standard shows that roughly half of the cost associated with electrical failures could be prevented by regular maintenance. To determine the cost of a failure, it helps to consider three key categories: Loss of income due to downtime, cost of labor to troubleshoot, repair and restart and cost of damage equipment.

## LEARN HOW TO CONDUCT AN ENERGY STUDY

The rising cost of energy means that optimal use of energy has become even more critical. The first step in managing energy is understanding how much and when energy is being used. Learn how to conduct an energy study at the main utility power supply service entrance, and profile individual loads and estimate the effects on your electricity bill.

The course will include several case studies including:

- Troubleshooting lighting loads
- Motor failures
- Transformer failures
- Medical equipment failures
- Electrical noise and transient overvoltages

## COURSE TIMETABLE FOR BOTH DAYS

Welcome and Opening Remarks: 8:00AM	Lunch: 12:00PM
Start: 8:05AM	Refreshment Break: 2:30PM
Coffee Break: 10:00AM	Finish: 4:30PM approx.

# Testing and Troubleshooting Problems In Electric Power Systems

To see the extended course outline please visit: [www.electricityforum.com/forums/electrical-troubleshooting-2009.html](http://www.electricityforum.com/forums/electrical-troubleshooting-2009.html)

## DAY 1

*Pablo Diaz, Grounding Systems Technologies*

### PART 1 - ELECTRICAL DISTRIBUTION SYSTEMS

- Generation, Transmission & Distribution Systems
- Electrical Systems Theory
- Power Problems in Industrial Plants
- Power Problems in Telecommunications Sites
- Power Problems affecting sensitive electronic equipment
- Equipment necessary to perform a "Power System Audit"
- Industry Standards

### PART 2 - POWER SYSTEM DISTURBANCES

- Introduction
- Sine wave Disturbances
- Voltage Fluctuations
- Voltage Fluctuations Effects
- Transient Overvoltages
- Subcycle Disturbances
- Electrical Noise
- Energy Interruptions
- Harmonics
- Electromagnetic Interference (EMI)
- Electrostatic Discharge (ESD)

### PART 3 - TROUBLESHOOTING TRANSIENT OVERVOLTAGE PROBLEMS

- Technical Criteria
- Devices that depend on the frequency
- Devices that do not depend on the frequency
- Suppression Technologies against transients
- Gas tube
- Metal Oxide Varistors (MOV)
- Silicon Avalanche Diodes (SAD)
- Hybrid Circuits
- IEEE Location categories
- CBEMA Curve
- ANSI C62.41-1991

### PART 4 - TROUBLESHOOTING HARMONICS IN THE POWER SYSTEM

- DC Power Supplies
- Harmonic generators
- Full wave Rectifier
- Harmonics spectrum for a six pulse converter
- Resonance problems with capacitors
- General solutions to control harmonics

### PART 5 - CORRECTIVE MEASURES FOR POWER DISTURBANCES

- Line conditioners
- LC Filter
- Harmonics Filter
- UPS
- Interactive UPS
- UPS with Rectifier/Charger
- Redundant UPS System
- UPS with electronic static bypass
- Motor-Generator AC-DC
- Motor-generator with DC driver
- Motor-generator with AC driver
- Energy Study

### PART 6 - TROUBLESHOOTING ELECTRICAL GROUNDING SYSTEMS

- Grounding Systems
- Earth Ground
- Lightning Protection System
- Equipment/Safety Ground
- Grounded Conductor

- Signal Reference Ground
- Effective Grounding
- Grounding Electrode System
- Ground Resistance Measurement
- Computer Room Grounding

## DAY 2

### PART 7 - TROUBLESHOOTING TELECOMMUNICATIONS SITES

- Telecommunications Grounding
- Exterior Ground Ring/Interior Ground ring
- Master Ground Bar (MGB)
- Grounding for Lightning Protection
- Grounding against Electrostatic Discharge (ESD)
- Cable Shielding Grounding

### PART 8 - TROUBLESHOOTING INDUSTRIAL PLANTS (SITE SURVEY)

- Procedures to Perform a Site Audit
- Registration of Measurements Values
- Electrical Parameters Measurements on Service Equipment
- Measurement of Feeder Currents
- Measurements on Branch Circuits
- Neutral-Ground Voltage Test
- Current on the Neutral Conductor
- Solutions and Recommendations
- Commercial Lighting
- Energy Consumption

### PART 9 - TROUBLESHOOTING THREE-PHASE LOADS

- Voltage & Current Unbalance
- Transformer Load Measurement
- Transformer Harmonic Spectrum
- Power Measurements
- Harmonic Sequence
- Total Harmonic Distortion
- K Factor
- Solution to Transformer Problems

### PART 10 - TROUBLESHOOTING MOTORS

- Voltage Unbalance
- Current Unbalance
- Total Harmonic Distortion (THD)
- Loads on Three-phase Systems
- Equipment Inrush Current
- Inrush Current Effects
- Power Factor/ Displacement Power Factor

### PART 11 - MOTOR ADJUSTABLE SPEED DRIVERS (ASD)

- ASD as an Interference
- Six and Twelve Pulse Converters
- SCR Converters
- Converters with Diodes and Broad Pulse Modulation
- PWM
- Phase Displacement Transformers
- Power Factor Displacement
- Harmonics and Capacitors
- Power System Resonance

### PART 12 - TROUBLESHOOTING CASE HISTORIES

- Troubleshooting Lighting Loads
- Motor Failures
- Transformers Failures
- Medical Equipment Failures
- Electrical Noise and Transient Overvoltages

## DAY 2 WRAP-UP

# REGISTRATION

## Act Now! Limited Seating! Register Today!

### REGISTRATION FEES

The registration fee to attend the Testing and Troubleshooting Problems In Electric Power Systems course is \$699.00 + \$34.95 GST. The registration fee includes: course documentation, Electrical Maintenance Handbook Volume 9, magazine subscription, Electricity Forum \$100 coupon towards any future 2010 Electricity Forum event (Restrictions Apply), refreshments and complimentary lunch (GST #R105219976).

### Discount Program Pricing

**Save \$50** ▶

Register and prepay with a credit card 14 days prior to course date and receive an early bird registration fee of \$649 + \$32.45 GST.

**Register 3 Delegates At the Full \$699 Price,  
THE 4TH REGISTRATION IS FREE**



### ON-SITE TRAINING AVAILABLE

Why not request a FREE Testing and Troubleshooting Problems In Electric Power Systems Training On-Site Training Course quotation directly for our company?? <http://www.electricityforum.com/on-site-training-feedback.htm> Our on-site training courses are tailored to meet your company's specific requirements and conducted on your own premises for your employees. Save the cost of travel and hotels and save on our regular public enrollment registration fees. Plus, our instructors can work with you in advance to determine the level of electrical training and experience of your employees and the specific applications that you would like covered. Electrical on-site training courses are best because they are delivered using the equipment your electrical technicians use every day. This maximizes the educational value of your electrical training investment. For more information, contact: Randy Hurst, President, The Electricity Forum [randy@electricityforum.com](mailto:randy@electricityforum.com)

### WHEN AND WHERE

(Please indicate where you want to attend the course)

#### Testing and Troubleshooting Problems In Electric Power Systems Course

- St. John's, NL - November 17-18, 2009**  
Battery Hotel & Conference Center, 100 Signal Hill Road, Tel: 709-576-0040
- Halifax, NS - November 19-20, 2009**  
Quality Inn & Suites, 980 Parkland Drive, Tel: 902-444-6700
- Ottawa, ON - November 23-24, 2009**  
Chimo Hotel, 1199 Joseph Cyr Street, Tel: 613-744-1060
- Toronto, ON - November 25-26, 2009**  
Crowne Plaza Toronto Airport Hotel, 33 Carlson Court, Tel: 416-675-1234
  
- Edmonton, AB - December 7-8, 2009**  
Radisson Hotel Edmonton South, 4440 Gateway Blvd., Tel: 780 437-6010
- Vancouver, BC - December 9-10, 2009**  
Delta Vancouver Airport Hotel, 3500 Cessna Drive, Tel: 604-278-1241

**Ways to register**



**PHONE : (905) 686-1040**



**FAX: (905) 686-1078**



**MAIL:**  
**The Canadian Electricity Forum**  
Unit 215, 1885 Clements Rd.  
Pickering, ON L1W 3V4



**ON-LINE:**  
[www.electricityforum.com/forums/electrical-troubleshooting-2009.html](http://www.electricityforum.com/forums/electrical-troubleshooting-2009.html)

When redeeming a \$100 coupon from a previous course, all registrations must be paid prior to the course date.

ATTENDEE INFORMATION	METHOD OF PAYMENT
Name _____	<input type="checkbox"/> Cheque enclosed *
Title _____	<input type="checkbox"/> Invoice me under PO#: _____
Company _____	<input type="checkbox"/> Send invoice attention: _____
Address _____	<input type="checkbox"/> Bill my credit card:
City _____ Province _____ Postal Code _____	<input type="checkbox"/> AMEX <input type="checkbox"/> VISA <input type="checkbox"/> MasterCard
E-mail _____	Card # _____
Tel:( ) _____ Fax:( ) _____	Exp. Date _____
	Signature _____
	Card Holder name _____ (if not registrant)

\* Payable to the Canadian Electricity Forum

**CANCELLATION AND REFUND POLICY:** Registration fees are refundable only upon receipt of written notification 10 days prior to the conference date, less a 10 per cent service charge. Substitution of participants is permissible up to and including the day of the forum. The Canadian Electricity Forum reserves the right to cancel any conference it deems necessary and will, in such event, make a full refund of the registration fees.