

ELECTRICAL SUBSTATION MAINTENANCE 2019

WINNIPEG, MB

NOVEMBER 7-8, 2019

EDMONTON, AB

NOVEMBER 12-13, 2019

RICHMOND, BC

NOVEMBER 14-15, 2019

TORONTO, ON

NOVEMBER 18-19, 2019



STUDENTS RECEIVE

- FREE 100-PAGE DIGITAL ELECTRICAL TESTING AND MAINTENANCE HANDBOOK (VALUE \$20)
- \$100 COUPON TOWARD ANY FUTURE ELECTRICITY FORUM EVENT (RESTRICTIONS APPLY)
- 1.4 CONTINUING EDUCATION UNIT (CEU) CREDITS
- FREE MAGAZINE SUBSCRIPTION (VALUE \$25.00)
- COURSE MATERIALS IN PAPER FORMAT

REGISTER TODAY AND SAVE!!

2-DAY TRAINING

\$799



RECOGNIZED BY



EARN CONTINUING
EDUCATION UNITS (CEUS)

■ DAY ONE

SESSION 1: SUBSTATION OVERVIEW

- PURPOSE OF A SUBSTATION
- COMPONENTS OF A POWER SYSTEM
- TYPES OF SUBSTATIONS
- SUBSTATION SWITCHING CONFIGURATIONS
- DISTRIBUTION SUBSTATION CONFIGURATIONS
- SUBSTATION COMPONENTS
- METERING IN SUBSTATIONS
- RELAYING IN SUBSTATIONS
- SUBSTATION SCADA

SESSION 2: AIR AND DISCONNECT SWITCHES

- MAINTENANCE AND TESTING
- COMPONENTS
- INTERLOCKING
- MOTOR-OPERATED MECHANISM
- VACUUM INTERRUPTERS
- MAINTENANCE REQUIREMENTS
- TESTING

SESSION 3: CIRCUIT BREAKER MAINTENANCE AND TESTING

- OVERALL MAINTENANCE
- ELECTRICAL TESTING
- HIGH-POTENTIAL TESTING (HI-POT)
- PRINCIPLES OF POWER FACTOR TESTING
- OPERATION AND TIMING TESTS

SESSION 4: SWITCHGEAR MAINTENANCE AND TESTING

- ARRANGEMENT OF COMPONENTS
- MAINTENANCE INTERVALS
- MAINTAINING THE INSULATION SYSTEM

- MAINTAINING AUXILIARY COMPONENTS
- TORQUE REQUIREMENT FOR SWITCHGEAR ASSEMBLIES
- ELECTRICAL TESTING OF SWITCHGEAR

SESSION 5: TRANSFORMER DC AND AC TESTING

- GENERAL SAFETY PRECAUTIONS
- DC TESTING
- INSULATION RESISTANCE
- WINDING RESISTANCE TESTING
- AC TESTING
- POWER FACTOR TESTING FUNDAMENTALS
- TRANSFORMER WINDING TESTING
- TYPICAL TESTS PERFORMED USING POWER FACTOR/DISSIPATION FACTOR TEST SETS
- TRANSFORMER BUSHING TESTING
- LIQUID INSULATING POWER TESTING
- CORE EXCITATION CURRENT TESTING

■ DAY TWO

SESSION 6: TRANSFORMER OIL TESTING

- INSULATING LIQUIDS
- LIQUID SAMPLING
- SAMPLING FOR POWER FACTOR TESTING
- SAMPLING FOR GAS-IN-OIL ANALYSIS ASTM D-3613
- SILICONE INSULATING FLUID
- DIELECTRIC BREAKDOWN VOLTAGE TEST
- COLOR TESTING (ASTM D-1500)
- VISUAL EXAMINATION (ASTM D-1524)
- NEUTRALIZATION NUMBER TEST (ASTM D-1534)
- INTERFACIAL TENSION TEST
- MOISTURE CONTENT TEST (ASTM D-1533)
- EVALUATION OF TEST DATA
- OTHER INSULATING LIQUIDS

SESSION 7: TRANSFORMER GAS TESTING

- GAS DETECTION
- OXYGEN TESTING
- COMBUSTIBLE GAS TESTING
- GAS ANALYSIS INTERPRETATION

SESSION 8: CURRENT AND VOLTAGE TRANSFORMERS

- ELEMENTARY CONNECTIONS
- INSTRUMENT TRANSFORMERS
- TYPES OF CURRENT TRANSFORMERS
- UNDERSTANDING CT RATIOS
- DETERMINING CT POLARITY
- MEASURING CURRENT
- SHORTING CT SECONDARY
- CURRENT CIRCUITS
- OPERATION OF CURRENT TRANSFORMERS AT EXCESSIVE BURDEN
- OPEN-CIRCUIT VOLTAGE
- UNDERSTANDING CTS IN A SCHEMATIC
- VOLTAGE TRANSFORMERS
- COUPLING CAPACITORS VOLTAGE
- TRANSFORMER DESIGN FUNDAMENTALS
- APPLICATION: HIGH-VOLTAGE
- TRANSMISSION (115 KV – 500 KV)
- UNDERSTANDING VOLTAGE TRANSFORMERS IN A SCHEMATIC

SESSION 9: GROUND TESTING

- TYPES OF CONNECTIONS
- APPLICATIONS
- REASONS FOR SPECIAL TREATMENT
- THE HAZARD
- SURFACE RESISTIVITY
- BULK SOIL RESISTIVITY MEASUREMENT
- DESIGN OF GRID
- OPERATING HANDLES
- FENCES

- PRINCIPLES INVOLVED IN EARTH RESISTANCE TESTING
- BASIC TEST METHODS FOR EARTH RESISTANCE
- EFFECTS OF DIFFERENT REFERENCE PROBE LOCATIONS
- TESTS AT A LARGE SUBSTATION
- GENERAL COMMENTS
- OTHER TESTS
- MAINTENANCE

SESSION 10: BATTERY MAINTENANCE AND TESTING

- BATTERY IN-SERVICE OPERATION
- TEMPERATURE AND BATTERY LIFE
- BATTERY SAFETY FACTORS
- SAFETY HAZARDS
- SAFETY EQUIPMENT
- SAFETY PRECAUTIONS
- BATTERY INSPECTIONS
- CORRECTIVE ACTIONS
- EQUALIZING CHARGE (LEAD-ACID ONLY)
- BATTERY MEASUREMENT TECHNIQUES

SESSION 11: OVERVIEW OF PROTECTIVE RELAYS

- CLASSIFICATION OF RELAYS
- PROTECTIVE ZONES
- FUNDAMENTALS OF ELECTROMECHANICAL DESIGN
- RELAY CONSTRUCTION
- TIME CHARACTERISTICS
- PROTECTIVE RELAY MAINTENANCE AND TESTING
- MECHANICAL AND VISUAL INSPECTIONS
- PREVENTIVE MAINTENANCE TESTING
- ACCEPTANCE TESTING
- TESTING TECHNIQUES
- GENERAL TESTS
- RELAYS IN SUBSTATIONS
- REVIEW OF EXPECTATIONS
- QUESTIONS AND ANSWERS



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ATTENDEE INFORMATION

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The registration fee to attend the Substation Course is **\$799.00** + tax.

The fee includes forum participation, refreshments. NOTE: LUNCH IS PROVIDED WITH THIS COURSE.



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14 Days prior to course date and receive an early bird discount of \$50 off the full price.

WHEN & WHERE



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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.

The 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.