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## Maintaining and Testing Low and Medium Voltage Circuit Breakers

Circuit breakers have enjoyed a very high profile since NFPA 70E and CSA Z462 have made their regular maintenance a mandated requirement. Arc flash studies and label information are based upon breakers opening up within their specifications. If a breaker is not properly maintained it will not open correctly, or perhaps at all, and whatever PPE is listed on the label is immediately under rated.

When breakers fail, the explosions are catastrophic, with injuries, damages and downtime quickly costing millions of dollars. This training course is designed to give plant maintenance personnel hands on experience with inspection, testing and maintenance of common breakers.

This Canada Training Group course is taught in one of our mobile training centers; 53' highway trailers that have been set up specifically for high voltage maintenance training of 8 students working in teams of 2. The circuit breakers are 600V, 5 kV, 15 kV and 25 kV, representing air, air-magnetic, SF6, vacuum and mini-oil arc extinguishment. Tests that can be done are insulation resistance testing, AC and DC high potential testing, step-voltage testing, contact resistance testing, primary injection, secondary injection, time travel analysis, vacuum bottle testing and PF/DF testing. Control circuit troubleshooting can also be incorporated into the training if the client requires it.

The mobile training center will be trucked to the training site and the training will be conducted in the training center. Client switch gear and breakers will be incorporated into the training if the equipment is available. This course is 60-70% hands on and will teach students to inspect, maintain, test and troubleshoot all manner of circuit breakers. If client equipment is not available for practical work then the instructor will explain the testing required for the client's equipment including examples and simple demonstrations. Although 25 kV is our highest breaker voltage, our instructors have experience with higher voltage breakers and can include that in this training.

The standards used in the course are the NETA Acceptance and Maintenance standards, the clients' acceptance and maintenance standards, NFPA 70B, the American Military Standard and other common standards.

This course will be customized to the needs of the clients, so that the important things for the clients are emphasized and concentrated on. Canada Training Group has a variety of test equipment that can be used in the training program. It is important to understand that it is financially impossible to have first generation breakers and equipment for this course. Our equipment is second and third generation that effectively teach the concept of modern maintenance. Client test equipment is incorporated into the training as well as rented test equipment. If there is test equipment that the client would like to have demonstrated but does not own, we can arrange for the client to rent this equipment from several rental equipment vendors.

Our instructors are familiar with a broad variety of manufacturers so we teach to all manufacturers' equipment, both breakers and test instruments. We have experience with a range of equipment from new to 40-50 year old equipment. We will also adjust to the client's specific needs. Our instructors are familiar with a variety of test equipment manufacturers and can speak to the pros and cons of various manufacturers test

equipment, for instance Doble versus Megger.

Canada Training Group instructors all have in excess of 40 years of high voltage maintenance, testing and troubleshooting experience and are qualified instructors. Return on investment for this course will be between 1-2 years depending upon the clients' situation.

Participants will clearly understand how to fulfill the requirements of CSA Z462 and NFPA 70E and keep their systems and companies properly protected.

**Who Should Attend:**

Engineers, Electricians, Technicians and Maintenance Managers Responsible for the care and safe operation of their electrical distribution systems.

**MOLDED CASE CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Molded Case Circuit Breakers.*

**SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

**INSULATED CASE CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Insulated Case Circuit Breakers.*

**SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

**AIR CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Air Circuit Breakers.*

**SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

**POWER CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Power Circuit Breakers.*

**SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

### **AIR MAGNETIC CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Air Magnetic Circuit Breakers.*

#### **SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

### **VACUUM CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Vacuum Circuit Breakers.*

#### **SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

### **SF6 CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot SF6 Circuit Breakers.*

#### **SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

### **OIL CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Oil Circuit Breakers.*

#### **SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing

- Troubleshooting
- Maintenance

## **AIR BLAST CIRCUIT BREAKERS**

*Objective: Maintain, test and troubleshoot Air Blast Case Circuit Breakers.*

### **SUBTOPICS:**

- Ratings
- Construction
- Operation
- Control
- Testing
- Troubleshooting
- Maintenance

"The course was enlightening on the variety of measurement tools available and I now know specifically what I need for a given task. A very informative course and an interesting and informative instructor"

- **David Bracha, SemCAMS**

"Valuable info on breaker operation and testing methods. A good introduction to high voltage equipment and safety"

- **Scott Shepherd, McCaine Electric**

"The knowledge of test instruments and the accompanying manual are of great practical value and use for field techs. The information taken from this course was well worth the cost"

- **Colin Nilson, Taqa North**