



## Course Information Letter ---- E315

### CIRCUIT BREAKER MAINTENANCE E315

This course is designed to present some of the more common aspects of low and medium voltage switchgear maintenance. It must be understood that there is an incredible variety of equipment used on low and medium switchgear today. Switchgears play an important role in the distribution and control of electrical power in manufacturing or power plant and in a utility distribution system. Negligent maintenance practices can lead to power system inefficiency and loss of system reliability.

This course instructs on mechanical maintenance practices and the conducting of electrical tests. Safety and the benefits of preventive maintenance is stressed throughout the course presentation.

**Topical Outline** includes: Low and Medium Voltage Switchgear, Types of Breakers, Arc Interruption, Insulation Resistance Testing, Power Factor Testing, Instrument Transformer Testing, Low Voltage Protective Devices, Circuit Breaker Construction, Air Circuit Breakers, and Vacuum Circuit Breakers.

**COURSE OBJECTIVES:** Upon completion of this course, the participant should be able to:

1. Discuss standard switchgear terminology.
2. Describe the general classifications of circuit breakers.
3. Describe circuit breaker construction.
4. Discuss circuit breaker ratings and their application.
5. Describe arcs and arc interruption.
6. Demonstrate the ability to read and interpret manufacturer trip curves.
7. Describe insulation resistance testing, related safety issues, use of equipment, and procedures.
8. Describe power factor testing
9. Describe transformer tests that are typically performed during as part of preventive maintenance packages.
10. Describe the application of protective devices to circuit breakers.
11. Discuss the operation and maintenance of air circuit breakers.
12. Discuss the operation and maintenance of vacuum circuit breakers
13. Discuss the operation and maintenance of gas circuit breakers

### COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, [www.hpcnet.com](http://www.hpcnet.com).

### COURSE OUTLINE

- I. **Introduction:** Voltage Convention, Low and Medium Voltage Switchgear, Types of Breakers, Arc Interruption
- II. **Insulation Resistance Testing:** Factors Affecting Insulation Resistance, Temperature Correction, Insulation Resistance Testing, Circuit Breaker Insulation Resistance Testing, High Potential Testing

## Circuit Breaker Maintenance– E315

www.hpcnet.com

- III. **Power Factor Testing:** Advantages, Test Procedure, Data Interpretation
- IV. **Instrument Transformer Testing:** Polarity Testing, Turns Ratio Testing, Secondary Excitation Testing
- V. **Low Voltage Protective Devices:** Requirements, Time-Current Characteristics, Tripping Devices, Maintenance and Testing
- VI. **Circuit Breaker Construction:** Components, Operating Mechanism
- VII. **Air Circuit Breakers:** Medium Voltage, Low Voltage
- VIII. **Vacuum Circuit Breaker**< Vacuum Circuit Breaker Interrupter, Maintenance
- IX. **Gas Circuit Breaker:** Discussion, Sulphur Hexafluoride Gas Interruption
- X. **Circuit Breaker Maintenance and Testing:** Maintenance Fundamentals, Initial Tests, Routine Tests, Adjustments, Insulation Resistance Testing, Contact Resistance Tests, High Potential Tests, Power Factor Tests, and Breaker Motion Analysis

### WHAT YOU WILL RECEIVE:

- HPC Technical Services' fully illustrated textbook: [Circuit Breaker Maintenance](#).
- HPC's Certificate of Completion, including 2.9 Continuing Education Units, as authorized by the International Associate of Continuing Education/Training (IACET).

### FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, [stparker@hpcnet.com](mailto:stparker@hpcnet.com) for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? No.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary and it needs to be priced on an individual need basis. You gain from the customization and price.
- Is HPC Technical Services' consultants available for "technical advise" on the evaluation of your maintenance procedures, systems, tests? Yes. Call Harold Parker, [hparker@hpcnet.com](mailto:hparker@hpcnet.com) for a rate sheet.

### INSTRUCTOR (S):



**Tom McKinney**, Mr. McKinney is an electrical engineer with over 25 years of experience in utility and industrial power systems. He earned his B.S.E.E. from the Virginia Military Institute. His experience includes the design, installation, and start-up of a wide variety of power equipment, including turbine and diesel-generators, excitation systems, protective relaying, transformers and circuit breakers. Tom worked in the corporate engineering offices of American Electric Power supporting plant operation and maintenance needs. Most recently, before joining HPC Technical Services as a consultant, he worked for First Energy at the Bayshore Plant. Mr. McKinney has a unique ability to present technically complex subjects in an understandable and simple manner. Tom resides in Ohio.

**Tom Reichle**, Mr. Reichle has a total of more than 30 years training and electrical experience. Nineteen (19) years developing and conducting courses, writing texts and outlines for AVO International Training Services. Another twelve (12) years in the US Army Nuclear, gas turbine and diesel power plants operation and maintenance including electrical, mechanical and I&C. Mr. Reichle, using his 30 years of experience, has provided customized services to clients in order to meet their individual needs. He provides training, guidance and technical expertise in the areas of circuit breakers, transformers, sub-station equipment and cable maintenance.

Circuit Breaker Maintenance– E315

www.hpcnet.com

**HPC TECHNICAL SERVICES**  
500 Tallevast Road, Suite 101, Sarasota, FL 34243  
Telephone: 941-747-7733 .... FAX: 941-746-5374  
Website: [www.hpcnet.com](http://www.hpcnet.com)

**REGISTRATION FORM**

Company: \_\_\_\_\_

Plant: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Telephone: \_\_\_\_\_ FAX: \_\_\_\_\_

Course Number/Title: \_\_\_\_\_

Course Dates: \_\_\_\_/\_\_\_\_/\_\_\_\_ Thru \_\_\_\_/\_\_\_\_/\_\_\_\_

Course Location: \_\_\_\_\_ Course Fee: \_\_\_\_\_

**Please enroll the following individual(s) listed below:**

Student #1: \_\_\_\_\_

Student #2: \_\_\_\_\_

**Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.**

Student #3: \_\_\_\_\_

**Enrolled by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**METHOD OF PAYMENT**

Check to Follow: \_\_\_\_\_

Check Enclosed #: \_\_\_\_\_

MC/Visa/AMEX #: \_\_\_\_\_

Expiration Date: \_\_\_\_\_ CV Code: \_\_\_\_\_

Purchase Order #: \_\_\_\_\_

**HOW DID YOU FIND THIS COURSE?**

Attended HPC courses before.

Received a fax

Received an email

Received HPC's update

Internet search

Other: \_\_\_\_\_