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Testing Times

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Coordination: Selectivity and Protection

After a Short Circuit Study has indicated the magnitudes of short-circuit current that would attend a failure on the system, the next appropriate step is to perform a Coordination Study. There are two objectives that can be achieved with a coordination study.

Selectivity

The most generally recognized is to determine the correct selection, ratings, and adjustments of protective devices so that if an overload or short-circuit were to occur, the protective device nearest the problem would operate, leaving the rest of the power system undisturbed. This is also known as "selectivity", when a minimum portion of the system is affected. Without selectivity, large and important portions of the system would unnecessarily suffer a loss of electric power. The least impact of this occurrence would be an inconvenience to users of the system. The greater impacts might be the loss of power to vital operations such as computer systems, elevators, air conditioning, refrigeration or manufacturing processes where a delay can cause a product or equipment to be damaged.

Even the simplest and smallest electrical distribution system usually has some degree of coordination that should be considered.

Protection

A second objective of a coordination study can be to minimize damage to the electrical system or building if an arcing short-circuit were to occur.

A coordinated system will minimize the portion of the electrical system that is affected during a fault.

This benefit is not often recognized by designers because of a general unawareness of the way in which a protective device can be adjusted to minimize damage.

If the energy in an arcing short-circuit is limited to less than 10,000 kilowatt-cycles, (on a 480 volt system) the arc will not burn through the steel enclosure. A graphical method of determining the "go" or "no-go" limits of arc energy has been developed and is used to assure that ground fault and circuit breaker settings are correct for selectivity and also limit the arc energy to less than 10,000 kilowatt-cycles. Obviously, it is necessary to first perform a short-circuit study in order to know the magnitude of short-circuit currents to consider in a coordination study. For this reason, it is usually advantageous to perform both types of studies together; a **Short Circuit and Coordination Study**.❖

Electrical Testing Specifications

There are few testing resources available to most people. Those that do exist include NETA Acceptance and Maintenance Testing Specs and NFPA 70B Maintenance Specs, along with scattered references in IEEE books and specific manufacturer's recommendations. We have attempted to assimilate all this information along with our explanations and commentary based on experience. We are pleased to offer this information at no charge either as a manual or on a 3.5" disk (Microsoft Word 7). Please fill out the information on the right hand side of this page and FAX your request to us. ❖

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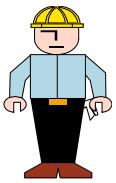
Testing Terms...



Primary Current Injection

The purpose of a primary injection test is to subject a device to simulated fault conditions in order to activate and time its response. Circuit breakers are given primary injection tests to assess their performance under simulated fault conditions. This test checks the monitor, control, and interfacing functions of the breaker. It is a system verification test that requires each component of the protective system to perform. All power circuit breakers should be given both initial and routine maintenance primary injection tests. The recommended frequency for maintenance testing of these breakers is a maximum of three years.

Secondary Current Injection

Another form of circuit breaker testing is secondary current injection testing. Secondary current injection is a testing technique that has been possible for the last twenty years or so and involves testing the circuit breaker's trip unit. Most modern, large circuit breakers are equipped with a microprocessor-based trip unit. The trip unit receives signals from current sensors mounted on the circuit breaker and issues a trip signal to the circuit breaker when appropriate. In other words, the trip unit is the "brain" of the circuit breaker. By testing the function of the trip unit, the tripping logic of the circuit breaker can be verified.

Although both circuit breaker test techniques are performed by Hood-Patterson & Dewar, it is our opinion that the primary injection test is the most thorough and comprehensive test. By performing primary injection testing, you check not only the trip unit, but also the primary current sensors and the direct tripping of the circuit breaker. The primary injection test simulates an actual short circuit and overload current, thus verifying the entire circuit breaker's tripping system. On the other hand, the secondary injection method is a much easier test to perform and tests only the functions of a breaker's trip unit. We recommend primary current injection testing be performed on **all** power circuit breakers. ❖

FaxBack

Hood-Patterson & Dewar is pleased to offer our "**Electrical Testing Specifications**".

_____ Specification Manual
_____ Specifications on 3.5" disk (Microsoft Word 7)

Fax this page to:

404-299-3542

Your name and address will appear on the label below. If you have any questions, please contact Ms. Lyn Cosby at 404-296-5990.

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inside:

Coordination study
Testing specs manual
Testing terms