

# Testing Times

A newsletter for the electrical construction and maintenance industry

Volume 3 No. 2

## Short circuit study - a necessity

**T**he installation of electric power systems in buildings brings many conveniences. With the great reliance that we now have on electric power, it is accurate to say that our safety and welfare depend upon its availability. The benefits of having electric power at our disposal are accompanied by a risk: it can also be destructive if not properly controlled. Almost everyone is aware of the possibility of receiving an electric shock; however, not everyone is aware of the thermal and explosive power available from an electric power

*Are your protective devices capable of safely interrupting the flow of an electrical current into a short circuit?*

system if a component of the system fails to perform its intended function. In spite of the disastrous consequences of some system failures, many buildings have been built where these hazards have not been adequately addressed.

### Protection

A fuse or a circuit breaker is used in a power system to protect against two kinds of problems: an overload and a short circuit. An overloaded wire can have its insulation destroyed or the high temperature of the wire can cause ignition of flammable materials. This type of failure is almost unheard of today because of the universal application of the requirements of the

National Electrical Code in correlating the wire size with the fuse or circuit breaker rating.

### A short circuit

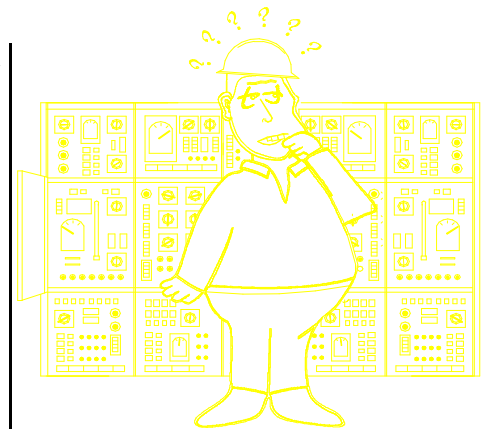
The other problem for which a fuse or circuit breaker is intended to protect against is a short circuit. If a short circuit occurs, it almost always involves an electric arc. This is the most likely and violent form of failure and is the most frequently ignored in the design and construction of an electrical distribution system. Powerful explosions can occur in the locations of arcing short circuits. In many of these failures, the electrical equipment can sustain severe damage. In some, additional property loss and loss of life can result.

### The study

These hazards are addressed by a short circuit study. If a short circuit were to occur, would the protective devices operate safely, or would they catastrophically fail and cause another location of system failure with attendant arcing and explosive release of heat, smoke and flames?

Is the protective device capable of safely interrupting the flow of an electrical current into a short circuit? This question can only be answered after the magnitude of short circuit current has been determined and compared with the manufacturer's stated interrupting rating. A short circuit study should be performed

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*Confused about what feeds what in your building?*

## One-line update

**A**lmost all facilities have an electrical one-line diagram prepared before they are built. This one-line contains essential information showing how electrical power is distributed throughout your building (i.e., what circuit breaker feeds what). Within a short period of time, that original one-line can become obsolete due to tenant finish work, new equipment, additions, etc. A current one-line diagram reflecting these changes can save valuable time when troubleshooting electrical problems, help make decisions about adding load, and act as a reference during a disaster. Laminate your updated electrical one-line, mount it on foam board, and put in your main electrical room for reference. A real time saver! ❖



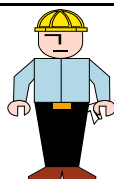
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during the construction of any new facility to insure that all protective devices are safely applied. In addition, the study should be repeated every 5 to 7 years, since electrical systems and electric utility systems change and may render a one-time safe system, unsafe. ❖

## Testing Terms...



### DC High Potential test

The purpose of high potential testing is to reveal insulation and/or installation deficiencies prior to equipment energization. This test stresses insulation to the point where voids, inadequate clearances, improper terminations, or installation damage cause a flashover or unusually high leakage current. If applied properly, a high potential test is non-destructive in that it will not cause damage to a good insulation system. This test is specified for acceptance testing of medium voltage cables, maintenance testing of critical motors and feeders, and troubleshooting after an unplanned outage.

### Test procedure

In this test, DC voltage is applied to the insulation in consecutive steps of specified magnitude to a maximum value in excess of equipment rating. At each step, the leakage current is recorded. At the final test voltage step, the voltage is held constant for an additional period of time, (15 minutes for new cable, 10 minutes for most equipment, 5 minutes for old cable), and leakage current readings are taken at 1 minute intervals. The behavior of the meter is closely observed during the entire test. The leakage current should decrease or stay constant at full voltage for good insulation. An increase in leakage current or unusually high levels indicate a problem with the insulation.

At the conclusion of all DC tests, care should be taken to apply grounds to the specimen for as long as possible on highly capacitive circuits (medium voltage cables, long cables, etc.) to remove the charge built up during the tests. Care must also be taken during this test as the applied voltages are dangerous to personnel and could damage other equipment that might be inadvertently energized. ❖

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