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Arc Flash Evaluation Poster

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Arc Flash Evaluation

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What is an Arc Flash

An arc flash occurs when a short circuit in a medium or high voltage system results in thousands of amps of current suddenly flowing through the circuit. This current produces enough heat to vaporize the metal conductor leading to an explosion of little bits of molten metal, shrapnel, and plasma. The severity is described by the incident energy which is the thermal energy measured in calories per square centimeter.

Arc Flash Basics

- A short circuit leads to thousands of amps of current
- Large amounts of current lead to extreme heat
- Heat causes the conductor to vaporize and explode

Image from ecmag.com

Sources of a Short Circuit

- Cracked and deteriorating cable insulation
- Tools and equipment touching energized conductors
- Temporary grounding left in place after doing work

Modeling an Arc Flash

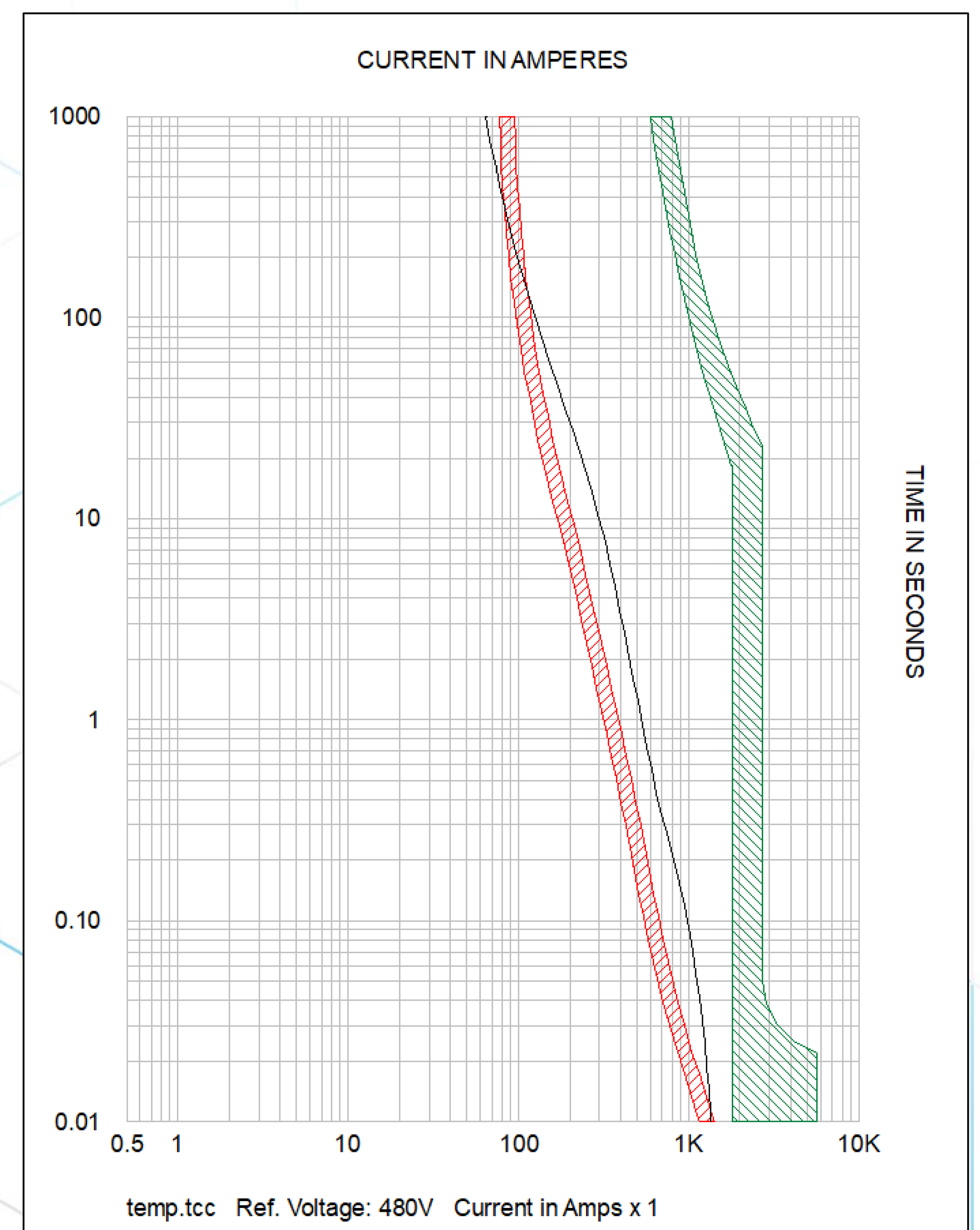
The incident energy can be found using a series of empirically derived equations. When working on systems of more than a handful of components the math quickly becomes much too extensive to be reasonably done by hand, so computer models are used instead.

Unpredictability

The amount of energy in an arc flash can vary dramatically among systems that on the surface seem very similar. Small changes in a circuit can significantly change the amount of time it takes for protective devices such as breakers and fuses to interrupt the flow of current.

Ways to Control Incident Energy

- Shortening the time that current is flowing will decrease the duration of the arc
- The resistance of elements in the circuit will impact how much current a short circuit produces



Time current curves (TCC) are used to determine how long it will take a protective device to stop current flow given a certain amount of current. By either adjusting device settings or using a different model of device it is possible to change the amount of time that the fault current is able to flow. This will shorten the duration of the arc which can greatly reduce the total incident energy. When an arc flash evaluation shows that a certain point in the circuit has a high incident energy a TCC can help show how changes to protective device timing can reduce the duration of the fault current and as a result reduce the incident energy. Small changes in current can cause significant differences in the opening time of a device which is part of why arc flashes are hard to predict without modeling them.

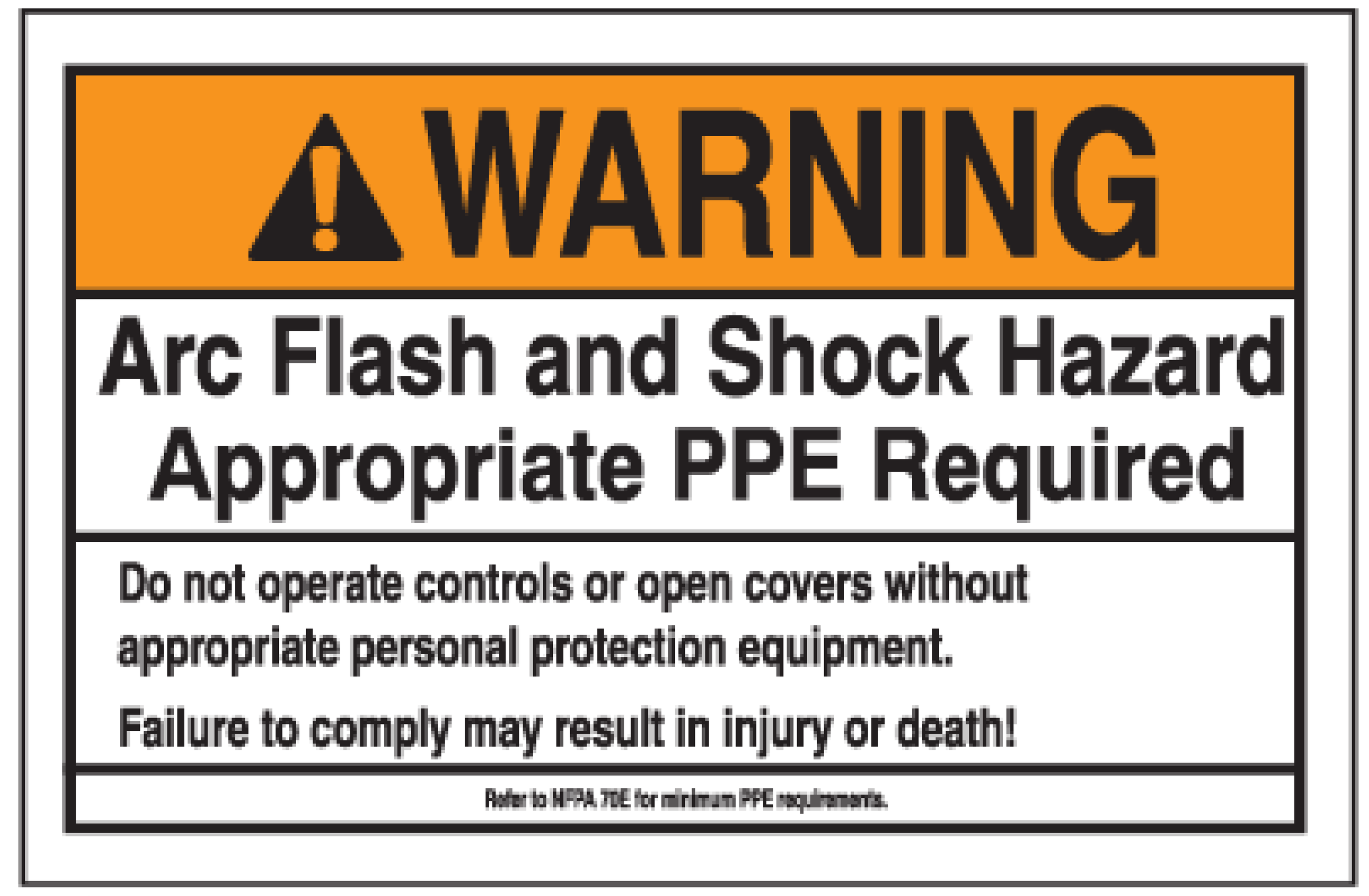


Image from seton.com

All electrical equipment capable of producing an arc flash is required to have a warning label which contains information on the incident energy and what level of protective equipment is needed to preform work.

Safety Benefits

Arc flash evaluations are done while designing a system in order to catch and eliminate areas with high incident energy before they are built. On existing systems, a computer model can be used to find the incident energy where the gear will be accessed. This allows for PPE to be chosen so someone exposed to an arc flash will survive with minor injuries. Incident energy above 30 cal/cm^2 shows locations where improvements are needed since the required PPE starts to be too bulky and can make it hard to do work. A model can be used to test adjustments to the settings of protective devices to potentially find ways to reduce the incident energy.

Key Benefits

- Helps engineers design systems with the goal of minimizing arc flash hazard
- Determines what level of PPE will protect electricians working on the equipment
- Helps show where the current incident energy is too high, and improvements are needed
- Simulations allow for testing possible ways to reduce the incident energy at a certain location