ARC FLASH AND DESIGN DOCUMENT REQUIREMENTS

BY: DONALD L. YATES, P.E.

ELECTRICAL DESIGN REQUIREMENTS

The electrical design of commercial, institutional or industrial buildings is a unique opportunity to provide a custom solution for the electrical requirements of a specific facility. Each design should be tailored to minimize capital costs and to provide a dependable, safe and energy efficient electrical system.

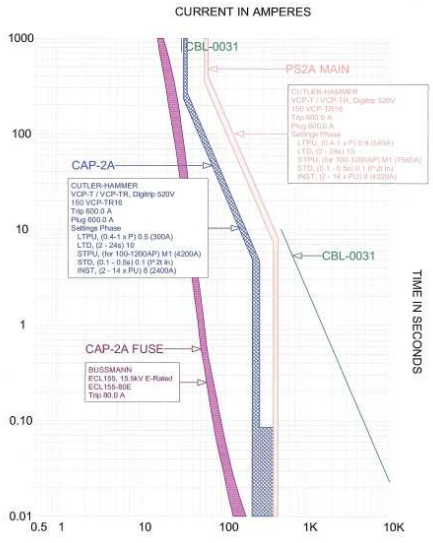
Electrical work is governed by the National Electric Code, National Electrical Safety Code, National Fire Protection Association Codes, Local and State Electrical Codes and Occupational Safety and Health Association Requirements. Thorough electrical designs will be in compliance with all of these requirements, otherwise the client is not receiving complete electrical documentation for their projects and may face liability issues arising from inadequate design and subsequently inadequate construction.

BASIC ELECTRICAL DESIGN

Design of the facility's power systems, lighting and communication systems are the core components of the basic electrical design. Facility power design includes locating the power components, providing properly sized conduit and wiring, locating and sizing panelboards, switchboards and/or motor control centers. Lighting design centers on the selection of appropriate light fixtures and their placement dictated by the lighting requirements of the area. Communications systems may include telephone, catv, computer network and intercom systems.

ADDITIONAL DESIGN REQUIREMENTS

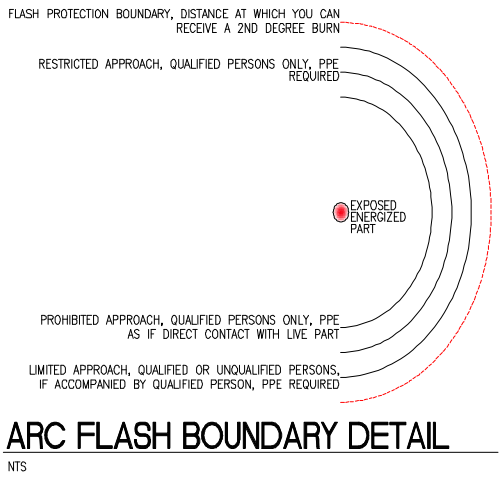
Fault-current Studies, Over-current Device Coordination Studies and Arc Flash evaluations are additional design services that should be provided by the Electrical Engineer on most design projects.



OSHA standards 29-CFR, Part 1910, Occupational Safety and Health Standards specifically addresses NFPA 70E. NFPA 70E provides guidance on implementing appropriate work practices that are required to safeguard workers from injury while working on or near exposed electrical conductors or circuit parts that may become energized. In 2007, OSHA issued several mandates

requiring employers protect their personnel and others who may be on-site from arc flashes and other electrical blasts. In addition OSHA's reference to NFPA 70E (Standard for Electrical Safety in the Workplaces) means that building owners and employers must follow these requirements also. According to NFPA 70E, owners/employers must ensure the following:

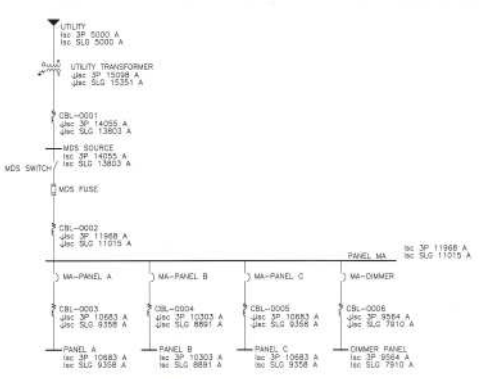
- All electrical equipment must be in safe working order
- Personal Protective Equipment (PPE) must be worn in the flash protection boundary
- Flash hazard analysis shall be performed before working on energized equipment
- Perform electrical hazard training for employees working on the electrical system



ARC FLASH BOUNDARY DETAIL
NTS

Arc flash injuries are the most common electrical injury occurring in the workplace today. With OSHA's mandates that are shown above, the goal is to lower and/or eliminate this type of electrical injury.

OSHA is enforcing the arc-flash regulations. A large brewery in Golden, Colorado was cited for safety and health violations involving the death of one and the injury of two other employees. Allegations by OSHA include that workplace conditions contributed to employees being burned by electrical arc flash. OSHA has proposed penalties of $128,500.00 against the company. In a second incident, a Norwalk, Connecticut electrical contractor is also facing OSHA sanctions. This incident occurred when two apprentice electricians were working on a 480 volt distribution panel when an electrical arc flash occurred which burned one of the workers. The panel was energized, no personal protective equipment was provided to the workers and no warning labels were installed on the equipment. OSHA is proposing $140,000.00 in penalties.



FAULT CURRENT ANALYSIS

The electrical design engineer's role in the arc flash concerns is to provide the owner/employer with an Arc Flash Hazard Analysis as part of the design documents. This

analysis must include a study detailing fault current available throughout the facility, a coordination study of all overcurrent protective devices and an arc flash study which details levels of energy which occur during an arc flash and the proper protective equipment that must be worn when working on energized equipment. The studies then need to be reviewed and adjusted when the actual equipment is selected during the submittal process.

Many electrical design documents being provided today fail to address fault currents, coordination of overcurrent devices and arc-flash hazards. Some designers totally ignore these concerns, while others try to make the contractor responsible for providing these services. From the owner's perspective, ignoring the issue will not make it go away, and the contractor generally does not have the expertise to provide this service. If these services are not provided, the owner/employer's electrical system will not meet federal requirements and they are subject to enforcement actions from OSHA.

CONSTRUCTION DOCUMENTS PROVIDED BY YATES ENGINEERING SERVICES, LTD.

An arc flash hazard analysis will be provided as part of our base design package on all industrial and medium/large commercial and institutional projects. This will include providing the arc flash labeling for the contractor to install. *SKM Power Tools* is the software being utilized in these studies and it is widely recognized as one of the premier power analysis packages available. Donald L. Yates, P.E., who will perform these studies, has more than 20 years experience in analyzing power system performance.