SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General

1. Provide a complete incident energy analysis to help protect individuals working in Stanford facilities. These individuals may include any workers who inspect, maintain or operate energized electrical equipment. Include all equipment per the latest edition of NFPA 70E.

2. All references to codes, standards, and published material below apply to latest applicable edition.

3. The incident energy analysis is needed for compliance with the applicable standards for new system installations (California Electrical Code, CEC 110.16) and for worker safety in operating facilities (OSHA 29 CFR 1910, NFPA 70E).

4. Provide equipment labeling per NFPA70E. These labels are intended to assist technicians and others in the selection of proper Personal Protective Equipment when working around exposed and energized conductors.

B. Scope

1. Perform a field survey for data collection to develop an accurate As-Built electrical system single-line diagram as required by NFPA 70E, “Standard for Electrical Safety in the Workplace”, as referenced in OSHA 29 CFR 1910 Subpart S, Appendix A. Include the following on the single line diagram.
   a. Nameplate data for electrical components (e.g. transformers, medium voltage switchgear, panelboards, switchboards, motor control centers, etc.)
   b. Cable sizes, types and lengths between electrical equipment components.
   c. Unique characteristics of the equipment installation which may impact the magnitude of the potential hazard (e.g. open space versus enclosure).
   d. Verified overcurrent device settings.

2. Short Circuit Study in accordance with ANSI standard C37 and IEEE standard 141 (Red Book).

3. Coordination Study in accordance with IEEE 242 “Buff” to determine the proper overcurrent device settings that will balance system reliability through selective coordination while minimizing the magnitude of an electrical arc flash hazard incident.
4. Incident Energy Study in accordance with NFPA 70E utilizing the calculation methods detailed in IEEE 1584 “IEEE Guide for Performing Arc Flash Hazard Calculations” as referenced in NFPA 70, “Standard for Electrical Safety in the Workplace”, in order to quantify the hazard for selection of personal protective equipment (PPE). Tables that assume fault current levels and clearing time for proper PPE selection are not acceptable.

PART 2 - SUBMITTALS

2.1 COMPREHENSIVE REPORT THAT INCLUDES:

A. Report summary with analysis methodology, findings and recommendations.
B. Summary of input data for utility source, equipment and cables.
C. Available fault current at each equipment location with comparison to equipment rating.
D. Overcurrent device settings (e.g. pick-up, time delay, curve).
E. Incident energy level (calories/cm2) for each equipment location.
F. Overcurrent device coordination curves including related section of the single-line diagram.

2.2 LABELS

A. Installed flash labels (orange <40 cal/cm2) or danger label (red > 40 cal/cm2c) in accordance with NFPA 70E and ANSI Z535.4. The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information (see sample label, attached);

1. Arc flash boundary (inches).
2. Working distance (inches).
3. Available incident energy at the working distance (calories/cm2).
4. Nominal system voltage.
5. Limited approach distance (inches).
6. Restricted approach distance (inches)
7. Equipment/bus name.
8. Date prepared.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Provide all necessary material, equipment, labor, and technical supervision to perform the incident energy analysis.
B. Utilize engineers and technicians that are experienced and regularly perform electrical power system testing.

C. Personnel performing the arch flash analysis shall be trained and experienced in accordance with NETA Training Specifications concerning the apparatus and systems being evaluated.

### 3.2 LABELS: (REQUIRED)

#### Shock & Arc-Flash Hazards

<table>
<thead>
<tr>
<th>Voltage Rating</th>
<th>Limited Approach Boundary</th>
<th>Restricted Approach Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>208 Vac</td>
<td>3&quot; - 6&quot;</td>
<td>8&quot; * 8&quot;</td>
</tr>
<tr>
<td>23.2 cal/cm²</td>
<td>4&quot;</td>
<td>5.1 cal/cm²</td>
</tr>
</tbody>
</table>

**Arc-Rated Gear:**
- AR Arc-Flash Suit (Pants & Jacket)
- AR Arc-Flash Suit Hoed

**Other PPE:**
- Hard hat (Class E)
- Safety glasses (ANSI Z87.1)
- Hearing protection
- Heavy-duty leather work boots
- Arc-rated gloves, or rubber insulating gloves with leather protectors

*Equipment Name: 014F.BNLD (Line Side)*
### Shock & Arc-Flash Hazards

<table>
<thead>
<tr>
<th>Voltage Rating</th>
<th>Approach Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>480 Vac</td>
<td>Limited</td>
</tr>
<tr>
<td>120 Vac</td>
<td>Restricted</td>
</tr>
<tr>
<td>240 Vac</td>
<td>Restricted</td>
</tr>
<tr>
<td>347 Vac</td>
<td>Restricted</td>
</tr>
<tr>
<td>525 Vac</td>
<td>Restricted</td>
</tr>
<tr>
<td>1050 Vac</td>
<td>Restricted</td>
</tr>
</tbody>
</table>

**Shock Hazard**

250 Vac

**Arc-Flash Boundary**

- 143.2 cal/cm² Incident Energy Flash Hazard at 1' 6"

**DANGER**

- For ES2 Safety Booklet & Stanford Training

**Arc-Rated Gear:**

**Other PPE:**

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Equipment Name: B67 MSBS (Line Side)