

## ARC FLASH ANALYSIS

The Arc Flash Analysis shall include the following as agreed between Critical Power Resource and customer:

- Evaluation of applicable OSHA, NFPA, and IEEE requirements that pertain to customer facilities.
- Report on any NEC code violations observed, and recommend solution to correct.
- One-line diagram of existing electrical distribution.
- Short Circuit Study.
- Protection/Coordination Study.
- Arc Flash Evaluation using IEEE 1584 Method. Protection Boundary Distance Calculations.
- Report with recommendations.
- Printing labels and assisting with their installation.

The study report and labels shall be similar to a sample provided by Critical Power Resource.

### SCOPE OF SERVICES

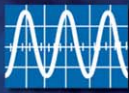
The following services shall be provided by Critical Power Resource:

#### 1. Initial Meeting and data collection

- Critical Power Resource technician will travel to the project site to conduct a kick-off meeting and gather information.
- Receive existing electrical distribution equipment information and diagrams (if any) from the customer.
- Review plant operation, operation experience, and performance requirements of the power system.
- Discuss any special protection or coordination requirements (adjustments to prevent ground fault tripping, load vs transformer size, etc.).
- Review the approach, methodology, and objectives for this study.
- Review the proposed short circuit, and coordination cases to be studied.
- Review safety procedures to be followed during this study.

#### 2. One-line diagram

- Critical Power Resource technician will verify the data on the existing electrical distribution equipment drawings (if any) and draw one-line drawings by field investigation of the existing equipment. The final one-line diagram shall meet ANSI/IEEE Standard 141-1993-PARA 2.4.7, - Red Book pages 50-53, and DOA/DSF electrical guidelines.
- Critical Power Resource technician will open distribution equipment to verify cable sizes, circuit breaker mfg. and model no., and fuse size and model no.
- The one-line drawing will be used as the basis for the study and calculations.
- Take infrared, thermal imaging photographs of switchboards and/or panelboards. Report on any observed deficiencies and perform appropriate corrective measure as may be directed by customer at additional agreed costs.
- Take load reading on all feeders, 100 amps and larger, with a clamp-on ammeter.



3. Short Circuit Study

- ❑ Critical Power Resource technician shall contact local utility company to determine available fault current at the service point.
- ❑ The information will be entered into the SKM DAPPER program by the Critical Power Resource technician.
- ❑ Critical Power Resource technician will run the SKM DAPPER program to evaluate the available fault current at each fault bus (each change of impedance) including all three-phase panels/loadcenters and all three phase motors.
- ❑ Critical Power Resource technician will evaluate the results of the SKM DAPPER program.
- ❑ Critical Power Resource technician will produce a report (including computerized printouts) showing the results and any recommendations. All data and files will be given to the customer on hard copy and disk.
- ❑ The study will be run at normal operations.

4. Protection/Coordination Study:

- ❑ Critical Power Resource technician will gather information on existing settings (including ground fault settings) with the assistance of a qualified maintenance person familiar with the power distribution equipment.
- ❑ Critical Power Resource technician will enter the information into the SKM CAPTOR program.
- ❑ Critical Power Resource technician will run the SKM CAPTOR program and develop time-current curves.
- ❑ Critical Power Resource technician will evaluate the results of the SKM CAPTOR program.
- ❑ Critical Power Resource technician will produce a report showing the results of the study (protective device vs ampacity; existing vs recommended relay settings, motor protection settings, circuit breaker settings, etc.) and any other recommendations. This information will be used in the Flash Protection Boundary Distance Calculations.
- ❑ Critical Power Resource technician will provide a list of recommendations to improve coordination and/or load distribution as well as ground fault requirements.

5. Arc Flash Evaluation:

- ❑ Critical Power Resource technician will use the short circuit information, protection/coordination information, and the data collected to perform arc flash and shock hazard evaluations using IEEE 1584 method for all three-phase distribution equipment, MCC loads, motors, transformers, and power circuit breakers.
- ❑ The Flash Protection Boundary Calculations and PPE Requirements will be determined using the SKM Power Tools program.
- ❑ Critical Power Resource technician will review the results and make recommendations to reduce the Arc Flash Incident Energy in all areas that require Class 2 and higher PPE.
- ❑ Critical Power Resource technician will provide the results in a spreadsheet format.
- ❑ Critical Power Resource technician will provide the arc flash labels for this project and assist the site personnel with the installation of the labels.

6. Summary of Recommendations

- ❑ Critical Power Resource technician will prepare a prioritized report summarizing all recommendations from the study. This shall include observed NEC code violations, and their recommended corrective action.

7. Final Report.

- ❑ Critical Power Resource technician will meet with the customer representative to review the final report and explain the use of the tables included in the report.
- ❑ Critical Power Resource technician will review as to how the study results are used to interact with the NFPA 70E Arc Flash requirements.
- ❑ Critical Power Resource technician will provide two (2) copies of the one-line diagram and comprehensive report in hardback binders.
- ❑ Critical Power Resource technician will provide one (1) copy of the one-line diagram and comprehensive report on CD in PDF format.
- ❑ Critical Power Resource technician will provide one (1) copy of the report on CD in MS Word, and one (1) copy of the one-line diagram in CAD format.
- ❑ Critical Power Resource technician will provide one-line diagram mounted on Styrofoam backboard for each building or campus MV distribution location. Contractor shall mount this diagram at each building (in owner-designated electrical room) and MV distribution location.

**ASSUMPTIONS**

The following assumptions can be made in the preparation of the proposal:

- ❑ Critical Power Resource technician will have access to any available building drawing and equipment files for the electrical equipment being studied.
- ❑ The customer will provide one technician to work with the Critical Power Resource technician personnel to assist with identifying equipment and feeders.
- ❑ The customer will provide any lifts or other specialized equipment needed to access the electrical panels and breakers.
- ❑ The customer will assist the Critical Power Resource technician in identifying motor HPs.
- ❑ Critical Power Resource technician will comply with all OSHA regulations during the site investigation.

**SCHEDULE**

Work on this project shall start immediately after award of contract by the customer. The schedule for data collection and reviews will be worked out at the project kick off meeting.