SECTION 16900

SHORT-CIRCUIT/COORDINATION STUDY

PART 1 - GENERAL

1.1 SCOPE

The study shall update the existing Short-Circuit and Coordination of this facility to include the new equipment/system to be furnished under this Contract. Normal system conditions and those, which result in maximum fault conditions, shall be adequately covered in the Study.

In addition, the Contractor shall prepare arc flash analysis and assessment for all new equipment furnished and installed under this Contract.

The Study shall be done by qualified Engineering Personnel, who are involved in high and low voltage distribution system evaluation for a minimum of five (5) years.

1.2 DATA COLLECTION FOR THE STUDY

The CONTRACTOR shall be responsible to field verify and collect all data pertaining to the existing system as required for preparation of this study.

PART 2 - PRODUCTS

2.1 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND COORDINATION STUDY

The short-circuit study update shall be performed using EDSA software and shall be in accordance with the latest applicable IEEE and ANSI standards.

In the short-circuit study, provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, tabulations of calculation quantities and results, conclusions, and recommendations. Calculate short-circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup, unit substation primary and secondary terminals, low-voltage switchgear lineup, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboard, and other significant overcurrent

protective device locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor fault contribution, short circuit kVA, and symmetrical and asymmetrical fault currents.

In the protective device coordination study, provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

Include on the curve sheets power company relay and fuse characteristics, medium-voltage equipment protective relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. In addition, include all devices down to the largest branch circuit and largest feeder circuit breaker in each motor control center, and main breaker in branch panel boards.

Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical fault current to which the device is exposed.

Select each primary protective device required for a delta-wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58 percent of the ANSI withstand point to provide secondary line-to-ground fault protection. Separate the transformer primary protective device characteristic curves from associated secondary device characteristics by a 16 percent current margin to provide proper coordination and protection in the event of secondary line-to-line faults. Separate medium-voltage relay characteristic curves from curves for other devices by at least a 0.4-second time margin.

Include complete fault calculations as specified herein based on contract documents.

2.2 ARC FLASH ANALYSIS/ASSESMENTS

The Contractor, in conjunction with Short Circuit Coordination Study, shall perform Arc Flash Analysis/Assessment in compliance with the NFPA-70E requirements for all new equipment/systems furnished and installed by the Contractor under this Contract. Submit to the Engineer Six (6) copies and two (2) CD-ROM of the final Arc Flash Analysis Report with PPE recommendations.

The assessment shall include:

- Personal Protection Equipment (PPE) recommendation based on NFPA-70E 2000, IEEE Standard 1584-2002, Guide for Performing Arc Flash Hazard Calculations.
- Personal Protection Equipment (PPE) Labels
- PPE recommendations presented in tabular format including arc flash incident energy levels and flash protection boundary distances.
- Single line diagram (color coded) showing PPE recommendations for posting in the Electrical Room where new equipment are to be installed.

The CONTRACTOR shall also furnish and install the recommended PPE labels on the individual equipment furnished under this Contract.

2.3 STUDY REPORT

The results of the Short Circuit/Coordination Study shall be summarized in a final report. Six (6) bound copies and two (2) CD-ROM of the final report shall be submitted.

The report shall include the following sections:

- Descriptions, purpose, basis, and scope of the study
- Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same
- Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same

- Fault current calculations including a definition of terms and guide for interpretation of computer printout.

PART 3 - EXECUTION

3.1 UTILITY COMPANY APPROVAL

Where required, copies of the final report shall be submitted to the utility company for their review and approval. Approved copies of the report shall be submitted to the ENGINEER.

3.2 FIELD SETTINGS

The CONTRACTOR shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study, and protective device coordination study.

Necessary field settings of devices and adjustments and minor modifications to the existing equipment to accomplish the conformance with the approved short-circuit and protective device coordination study shall be carried out by the CONTRACTOR at no additional cost.

End of Supplemental Section