

# **DIVISION 26 – ELECTRICAL**

## **26 05 73 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY**

### **PART 1 - GENERAL**

#### 1.01 SUMMARY

##### A. Section Includes:

1. System coordination study
2. Arc Flash analysis
3. Short circuit study
4. Protective device calibration and setting

#### 1.02 SCOPE

- A. A coordination study shall be prepared for the specific electrical overcurrent devices and feeder lengths, to be installed under this project, from the primary overcurrent protective device to the branch circuit breaker panels to assure proper equipment and personnel protection.
1. The study shall present an organized time-current analysis of each protective device in series from the individual device back to the source serving the campus substation. The study shall reflect the operation of each device during normal and abnormal current conditions, and confirm that devices are coordinated.
- B. The Contractor shall provide documentation that a certified technician or licensed electrical engineer has calibrated the breakers to meet the coordination study requirements.

#### 1.03 SUBMITTALS

##### A. Submit the following:

1. Protective equipment shop drawings with labels to coincide with the protective device study.
2. Two hard copies and an electronic copy of a written report detailing all parameters at each point along the one-line diagram. Provide an index which cross-references the file names on these disks to the specific pieces of equipment or system.

##### B. Certifications: Two weeks prior to final inspection, the Contractor shall deliver four copies of the following certifications to the WSU Construction Manager.

1. That the protective devices have been adjusted and set in accordance with the approved protective device study by a Certified Representative of the manufacturer of the switchgear, and or licensed Electrical Engineer.

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2. The study shall show fault currents available at key points in the system down to a fault current of 7000A. The purpose of this submittal is to verify the fault current ratings of the panelboards.

### **PART 2 - EXECUTION**

#### **2.01 REQUIREMENTS**

- A. The complete study shall include a system one-line diagram, short circuit and ground fault analysis, protective coordination plots, and Arc Flash Hazard Study.
- B. One-Line Diagram:
  1. Show, on the one line diagram, all electrical equipment wiring to be protected by the overcurrent devices installed under this project. Clearly show, on the one line, the schematic wiring of the electrical distribution system.
  2. Show reference nodes on the one-line diagram referring to a formal report, to include the following specific information:
    - i. X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at the bus of the main switchboard, and all downstream equipment containing overcurrent devices
    - ii. Breaker and fuse ratings
    - iii. Transformer KVA and voltage ratings, percent impedance, X/R ratios and wiring connections
    - iv. Voltage at each bus
    - v. Identifications of each bus
    - vi. Conduit material, feeder sizes, and length
    - vii. Calculated short circuit current
  3. Short Circuit Study: Determine the available 3 phase short circuit and ground fault currents at each bus. Incorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices.
  4. Present the data determined by the short circuit study in a table or report format. Include:
    - i. Device identification
    - ii. Operating voltage
    - iii. Protective device
    - iv. Device rating
    - v. Calculated 3 phase short circuit current (asymmetrical and symmetrical), and ground fault current
  5. Coordination Curves:

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- i. Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination. Graphically illustrate on log-log paper that adequate time separation exists between existing and supplied series devices. Plot the specific time-current characteristics of each protective device in such a manner that all upstream devices will be clearly depicted on one sheet.
- ii. The following specific information shall also be shown on the coordination curves:
  - 1) Device identifications
  - 2) Time and current ratio for curves
  - 3) ANSI damage points for each transformer
  - 4) Complete fuse curves
  - 5) Cable damage curves
  - 6) Transformer inrush points
  - 7) Maximum short circuit cutoff point
- iii. Develop a table to summarize the settings selected for the protective devices. Include in the table the following:
  - 1) Device identification
  - 2) Tap, time delay, and instantaneous pickup
  - 3) Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands
  - 4) Fuse rating and type
  - 5) Ground fault pickup and time delay

**C. Arc Flash Hazard Study/Analysis:**

1. Prepare an Arc Flash Study for all switchboards, panel boards, motor control centers and disconnects being provided in the contract. Study/Analysis and label to indicate energy, flash hazard boundary, equipment name, study date and category of personnel protective equipment (PPE). This information shall be provided on a pre-printed label on each Switchboard, Switchgear, panelboard, motor control center and disconnect being provided in the contract. Account for Arc Flash Hazard when laying out Electrical Switch Gear within Electrical Room.

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2.02 ANALYSIS

- A. After developing the coordination curves, highlight areas lacking coordination. Present a technical evaluation explaining logical compromises for best coordination.
- B. Study to indicate switchboard components are selectively coordinated for all levels of short circuit current. Submit settings and trip curves of all components.

**END OF SECTION**