

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

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the overcurrent protective device coordination study, indicated as the study in this section. Obtain existing study from facility and update it with work of this project. Provide work using SKM PowerTools for Windows and ArcFlash computer software. Complete database and reports of study shall be submitted to the owner in electronic and hardcopy format.
- B. A short-circuit and selective coordination study shall be prepared for the electrical overcurrent devices to be installed under this project.
- C. The study shall present a well-coordinated time-current analysis of each overcurrent protective device from the individual device up to the utility source and the on-site generator sources.
- D. The study shall include arc flash analysis in accordance with and shall provide required PPE, minimum boundaries and labels.
- E. The study shall be performed by a NYS Registered Professional Engineer and the switchgear manufacturer to obtain optimum coordination per NEC 517 and minimum Arc Flash Hazard in accordance with IEEE and ANSI Standards.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- B. Section 26 23 00, LOW-VOLTAGE SWITCHGEAR: Low-voltage switchgear.
- C. Section 26 24 13, DISTRIBUTION SWITCHBOARDS: Low-voltage distribution switchboards.
- D. Section 26 24 16, PANELBOARDS: Low-voltage panelboards.
- E. Section 26 32 13, ENGINE GENERATORS: Engine generators.
- F. Section 26 36 23, AUTOMATIC TRANSFER SWITCHES: Automatic transfer switches.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. The study shall be prepared by the equipment manufacturer.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Product data on the software program to be used for the study.

Software shall be in mainstream use in the industry, shall provide device settings and ratings, and shall show selective coordination by time-current drawings.

2. Complete study as described in paragraph 1.6. Submittal of the study shall be well-coordinated with submittals of the shop drawings for equipment in related specification sections.

3. Certifications: Two weeks prior to final inspection, submit the following.

a. Certification by the Contractor that the overcurrent protective devices have been set in accordance with the approved study.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. Institute of Electrical and Electronics Engineers (IEEE):

242-01.....Protection and Coordination of Industrial and
Commercial Power Systems

399-97.....Industrial and Commercial Power Systems
Analysis

1584a-04.....Guide for Performing Arc-Flash Hazard
Calculations Amendment 1.

1584b-11.....Guide for Performing Arc-Flash Hazard
Calculations Amendment 2.

1.6 STUDY REQUIREMENTS

A. The study shall include one line diagram, short-circuit and ground fault analysis, protective coordination plots for all overcurrent protective devices and Arc flash analysis. Provide adhesive labels for application to all disconnects, transformer enclosures, switchgear, switchboards and panelboards that are work of this project. In addition, update existing labels that have revised arc flash information resulting from the work of this project.

B. One Line Diagram:

1. Show all electrical equipment and wiring to be protected by the overcurrent devices.
2. Show the following specific information:
 - a. Calculated fault impedance, X/R ratios, and short-circuit values at each feeder and branch circuit bus.
 - b. Relay, circuit breaker, and fuse ratings.
 - c. Generator kW/kVA and transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
 - d. Voltage at each bus.
 - e. Identification of each bus, matching the identification on the drawings.
 - f. Conduit, conductor, and busway material, size, length, and X/R ratios.
 - g. Obtain existing facility study database and update with new equipment.

C. Short-Circuit Study:

1. The study shall be performed using SKM PowerTools for Windows and ArcFlash computer software designed for this purpose. Pertinent data and the rationale employed in developing the calculations shall be described in the introductory remarks of the study.
2. Calculate the fault impedance to determine the available short-circuit and ground fault currents at each bus. Incorporate applicable motor and/or generator contribution in determining the momentary and interrupting ratings of the overcurrent protective devices.
3. Present the results of the short-circuit study in a table. Include the following:
 - a. Device identification.
 - b. Operating voltage.
 - c. Overcurrent protective device type and rating.
 - d. Calculated short-circuit current.

D. Coordination Curves:

1. Prepare the coordination curves to determine the required settings of overcurrent protective devices to demonstrate selective coordination. Graphically illustrate on log-log paper that adequate time separation exists between devices, including the utility company upstream device if applicable. Plot the specific

time-current characteristics of each overcurrent protective device in such a manner that all devices are clearly depicted.

2. The following specific information shall also be shown on the coordination curves:
 - a. Device identification.
 - b. Potential transformer and current transformer ratios.
 - c. Three-phase and single-phase ANSI damage points or curves for each cable, transformer, or generator.
 - d. Applicable circuit breaker or protective relay characteristic curves.
 - e. No-damage, melting, and clearing curves for fuses.
 - f. Transformer in-rush points.
3. Develop a table to summarize the settings selected for the overcurrent protective devices. Include the following in the table:
 - a. Device identification.
 - b. Protective relay or circuit breaker potential and current transformer ratios, sensor rating, and available and suggested pickup and delay settings for each available trip characteristic.
 - c. Fuse rating and type.

1.7 ANALYSIS

- A. Analyze the short-circuit calculations, and highlight any equipment determined to be underrated as specified. Propose solutions to effectively protect the underrated equipment.
- B. Analyze the coordination curves and provide settings for a coordinated system. Propose solutions to effectively coordinate miscoordinated systems.
- C. Analyze the Arc Flash calculations and where feasible, provide settings to lower Arc Flash levels without disrupting system coordination. Provide calculations for normal and maintenance modes of overcurrent protective devices. Provide adhesive labels for both modes.

1.8 ADJUSTMENTS, SETTINGS, AND MODIFICATIONS

- A. Provide initial field settings for all existing modified equipment and new low voltage and medium voltage breakers and relays in existing switchgear, paralleling gear and all new equipment for initial startup and phasing of project. Provide updated settings as applicable for each bid option of the project.

- B. Final field settings and minor modifications of the overcurrent protective devices shall be made to conform with the study, without additional cost to the Government.
- C. Arc Flash labels shall indicate normal and maintenance mode of overcurrent devices.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- A. Apply Arc Flash Protection labels for new equipment. Replace existing Arc Flash labels that are outdated due to the work of this project. Clean surfaces from label removals.

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