

Chapter 18 Feature Design Memorandums and Drawings

18-1. Design Memorandum Topics and Coverage

Following approval of the General Design Memorandum, engineering, design, and drawing preparation for the power plant proceed using Feature Design Memorandums (FDM) and accompanying drawings. A completion schedule for each of the planned memorandums and a sequence of submission is developed for the concurrence and approval of the field operating activity (FOA) and higher authority early in the process. Design memorandum sequence and submission dates should be coordinated with the power plant construction schedule and equipment procurement schedules. Timing and sequence of submission are scheduled to maximize review time and allow effective use of engineering resources of the review agency.

18-2. Feature Design Memorandums

FDMs are normally prepared for electrical equipment and systems purchased by the Government. They are also prepared for electrical systems having a significant content of Government-furnished equipment. The plans and specifications required for purchased equipment are based on the design parameters and information contained in the FDM. Typical equipment and systems requiring FDMs include generators, step-up and station service transformers, generator bus and breakers, station service switchgear, power plant energy management systems (SCADA), 480-V station service and distribution systems, station battery systems, and station lighting and distribution systems.

18-3. Engineering Documentation

The engineering documentation in FDMs should include the methods, formulas, detailed computations, and results (if results are obtained from engineering software programs) used to determine equipment and system ratings and technical design parameters. Design alternatives investigated during the equipment or system selection process should be discussed together with the rationale for choosing the selected alternative. FDMs should contain sufficient detail not only to facilitate the checking and review process, but to allow preparation of plans and specifications accurately conveying the design intent.

18-4. Design Drawings

Design drawings accompanying an FDM will conform in general to the requirements mentioned in the following paragraphs.

a. Generators. No design drawings are necessary for generators, unless needed to depict unusual generator lead arrangements, or illustrate connections to and location of excitation equipment.

b. Transformers. Design drawings for either generator step-up or station service transformers are not required with FDM submission.

c. High-voltage system. Drawings locating the switchyard with respect to the powerhouse, depicting cable tunnel or cable duct locations, and providing details on bay widths, types of structures, and phase-to-phase and phase-to-ground clearances should be furnished. A plan of the switchyard, including line bay and transformer bay sections and a switchyard one-line diagram, will adequately convey the design intent.

d. Generator-voltage system. A plan of the arrangement of the generator bus and breaker system, together with locating and limiting dimensions, equipment ratings, generator surge protection equipment, and excitation system power potential system taps, should be provided with the FDM. In addition, a plant one-line diagram should be provided.

e. Station service systems. Drawings with arrangements, locations, limiting dimensions and one-line diagrams for medium-voltage switchgear, low-voltage switchgear, and low-voltage motor control centers of the station service system should be included with the FDM.

f. Control system. Drawings included with the control system FDM should define the design of the plant energy management (SCADA) system, the plant control and relay scheme, the control and protective relay switchboards, and associated equipment. The plans should provide sufficient information regarding control and protective relay functions to convey the intended operations of the plant's control and protective relaying systems. Typically, unit one-line diagrams, unit and plant control and protective relaying schematics, station service control and protective relaying schematics, and block diagrams of the plant's energy management system adequately provide this information. In addition, a control room layout, and

a layout with control equipment locations, together with locating and limiting (if necessary) dimensions, is provided.

g. Communications systems. A drawing of the extent and composition of leased commercial telephone facilities, the code call system, and dedicated communications systems for utility communications, telemetry, and plant energy management systems (SCADA) should be provided. Drawings with locations of the commercial telephone main distribution frame, code call stations, and dedicated communication system components of either the power line carrier, microwave system, or the fiber-optic system should be provided.

h. Direct current system. In addition to the one-line and schematics described in paragraph 18-4f, a preliminary layout should be provided of the DC system equipment. The drawing should include the rating of battery chargers, inverters, and batteries; any limiting dimensions of equipment; and the arrangement of the battery cells.

i. Lighting and receptacle systems. Drawings of the plant normal and emergency lighting systems should be

provided. Information regarding connected lighting system loads, intended feeder sizes, and location of lighting distribution panels and transformers should be included. In addition, information on intended lighting intensities throughout the plant and proposed types of luminaires should be provided.

j. Grounding systems. A plan of the power plant ground mat, including taps to major equipment, should be provided. A similar plan should be provided if a separate switchyard ground mat is included in the project development.

k. Conduit and cable tray systems. Design layouts with locations and preferred methods of routing major conduit runs (including number and size of conduit) should be provided. Similar layouts should be provided for the plant's cable tray systems. These preliminary layouts form the basis for detailed drawings of these systems prepared for the powerhouse construction contract.

l. Wire and cable. Design drawings are not prepared for this phase of the work.