

23 00 00.02 – Additional Requirements for Engineering Drawings

1. Introduction

- A. This Design Guideline outlines the basic requirements for developing construction documents for design and engineering services. This Guideline does **not** include detailed descriptions of expected document management and turnover or standard practices relating to computer-aided design (CAD) and/or building information modeling (BIM).
- B. These guidelines may be applied to all building plumbing, mechanical and electrical systems. Separate design guidelines may address architecture, fire protection, telecommunications and other design disciplines.
- C. Consultants are expected to adhere to industry standards and best practices for the use of CAD and BIM modeling tools. For more information on BIM requirements, contact FMD.

2. Standards

- A. Duke FMD recognizes that construction documents are generally part of a dynamic design effort with a specific, achievable goal expected at the completion of a project. With this concept in mind, general requirements for various stages of design development are given below:
 - a. 100% Schematic Design (overall design 50% complete)
 - i. Beginning phases of life-cycle cost analysis (LCCA)
 - ii. Single-line diagrams showing system plan layout of all building systems
 - iii. Basic elevation drawings necessary for interdisciplinary coordination
 - iv. Paths of ingress and egress for mechanical equipment rooms
 - b. 100% Design Development (overall design 80% complete)
 - i. Completed Life-Cycle Cost Analysis calculations
 - ii. Demonstration of compliance with Duke High Performance Building Framework (HPBF) requirements
 - iii. Construction specifications as needed per project requirements
 - iv. Points of connection to utility services
 - v. Developed plumbing, mechanical and electrical system design (Show all piping and ductwork in “double-line.” Show all equipment at properly scaled size)
 - vi. Developed automated control schematic diagram and written sequences of operation
 - vii. Major mechanical room plan and elevation drawings
 - viii. Single line drawings for all applicable Mechanical, Electrical and Plumbing systems.
 - ix. Flow and instrumentation diagrams of mechanical, electrical, and plumbing systems. Diagrams must graphically represent physical building location (floor/elevation) and indicate piping and ductwork sizes.
 - x. Schedules of proposed, submitted equipment
 - c. 100% Construction Documents (overall design 100% complete) – Conforming Set

- i. Completed building systems design incorporating comments received in Design Development review
 - ii. Completed construction specifications incorporating comments received in DD review
 - iii. Full schematic diagrams/process and instrumentation system diagrams for all building systems
 - iv. Final single line drawings for all applicable Mechanical, Electrical and Plumbing systems
 - v. Necessary construction/installation details
 - vi. Coordination drawings as required for field use (coordination drawings must be reviewed by Duke FMD prior to commencement of work)
- d. As-Built Documentation
- i. Drawings representing physical locations of all major equipment, piping, ductwork, conduit and associated minor equipment.
 - ii. Updated schedules and identifying marks for all equipment (e.g. AHU-xxx, P-xx, SWGR-xxx)
 - iii. Revised process flow and piping and instrumentation diagrams (P&IDs)
 - iv. Confirmation that documentation is accurate from both Engineer of Record **and** responsible installing Contractor.