

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:
 - 1. 100% Schematic Design (overall design 50% complete)
 - a. Beginning phases of life-cycle cost analysis (LCCA)
 - b. Single-line diagrams showing system plan layout of all building systems
 - c. Basic elevation drawings necessary for interdisciplinary coordination
 - d. Paths of ingress and egress for mechanical equipment rooms
 - 2. 100% Design Development (overall design 80% complete)
 - a. Completed Life-Cycle Cost Analysis calculations
 - b. Demonstration of compliance with Duke LEED+ requirements
 - c. Construction specifications as needed per project requirements
 - d. Points of connection to utility services
 - e. Developed plumbing, mechanical and electrical system design (Show all piping and ductwork in "double-line." Show all equipment at properly scaled size)

- f. Developed automated control schematic diagram and written sequences of operation
 - g. Major mechanical room plan and elevation drawings
 - h. 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.
 - i. Schedules of proposed, submitted equipment
3. 100% Construction Documents (overall design 100% complete) – Conforming Set
- a. Completed building systems design incorporating comments received in Design Development review
 - b. Completed construction specifications incorporating comments received in DD review
 - c. Full schematic diagrams/process and instrumentation system diagrams for all building systems
 - d. Necessary construction/installation details
 - e. Coordination drawings as required for field use (coordination drawings must be reviewed by Duke University prior to commencement of work)
4. As-Built Documentation
- a. Drawings representing physical locations of all major equipment, piping, ductwork, conduit and associated minor equipment.
 - b. Updated schedules and identifying marks for all equipment (e.g. AHU-xxx, P-xx, SWGR-xxx)
 - c. Revised process flow and piping and instrumentation diagrams (P&IDs)
 - d. Confirmation that documentation is accurate from both Engineer of Record **and** responsible installing Contractor