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