



Fundamentals of HVAC

Introduction to Plans and Specifications



What you will Learn in this Lesson

- Introduction: Why plans & specs?
- Form
- Details
- Symbols
- Navigation
- 3-part specifications
- Substitutions
- CSI

Why Plans and Specs

- A building load is calculated from a series of equations
- But the actual load on the primary equipment depends upon what is shown on the drawings, what is written in the specs, and how the building is operated.
- Plans and specifications must describe the location and design features and the construction requirements in sufficient detail to allow for the construction of the building.
- The operation of the building can be determined from the specifications: controls section.

Introduction: Why Plans and Specs

- Code review
 - Code officials need to know what is being built before granting a building permit
- Contracts
 - Plans and Specs become the contract between various parties
- Construction
 - Plans and specifications must describe the location and design features and the construction requirements in sufficient detail to allow for accurate bids and to provide for the construction of the project without significant change orders and claims.

Code Review Drawings

- Requirements for Title Blocks
 - The name and location of the project.
 - The name of the design firm.
 - A date, printed name, signature, and seal of the one who prepared or approved the documents in accordance with the code of the appropriate jurisdiction.
 - A certification statement:

I certify that these documents were prepared or approved by me, and that I am a duly licensed architect [or engineer] under the laws of the State of [fill in state name], license number _____, expiration date _____."

Jurisdictions have different certification statements, but all are similar to this.

Contract

- A construction drawing is a legal document (that is, a [legal instrument](#)), because it communicates all the needed information about "what is wanted" to the people who will expend resources turning the idea into a reality. It is thus a part of a [contract](#); the [purchase order](#) and the drawing together, as well as any ancillary documents (change orders [COs], specifications), constitute the contract.

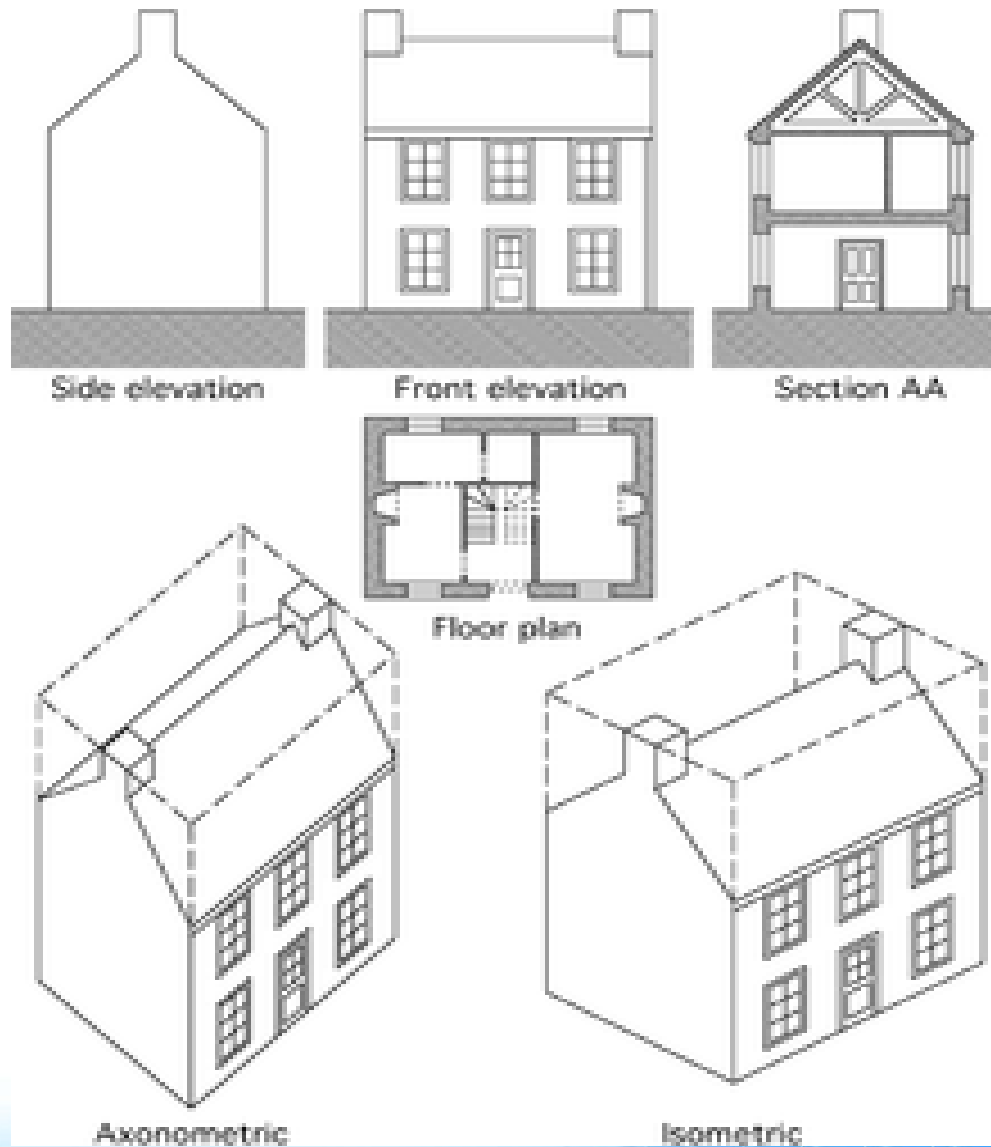
Drawing Sizes

ISO A Drawing Sizes (mm)	
A4	210 X 297
A3	297 X 420
A2	420 X 594
A1	594 X 841
A0	841 X 1189

Other U.S. Drawing Sizes	
D1	24" X 36"
E1	30" X 42"
H	larger still [intracompany standards]
I	larger still [intracompany standards]
J	larger still [intracompany standards]

ANSI/ASME Drawing Sizes (inches)	
A	8.5" X 11"
B	11" X 17"
C	17" X 22"
D	22" X 34"
E	34" X 44"

Views



Interpretation: Bidder Beware

- **1.3 DRAWING INTERPRETATION AND COORDINATION**
 - Drawings are diagrammatic and indicate the general arrangement of systems and equipment, unless indicated otherwise by dimensions or Detail Drawings.
 - Plans are intended to show size, capacity, approximate location, direction, and general relationship of one work phase to another, but not the exact detail or arrangement.
 - For locations of building elements, refer to dimensioned Architectural and Structural Drawings and perform field measurements to verify exact locations.
 - Equipment outlines shown on Detail Drawings, or dimensions indicated anywhere on the Drawings, are limiting dimensions. Equipment exceeding approximate dimensions indicated by equipment outlines on Detail Drawings and any equipment or arrangements that reduce indicated clearances or exceed specific equipment dimensions may not be used.

Drawings

- Title Sheets
- Site Drawings (C sheets, and/or L sheets)
- Demo Drawings (D sheets)
- Structural Drawings (S sheets)
- Architectural Drawings (A sheets)
- Mechanical Sheets (M sheets)
- Electrical Sheets (E sheets)

Form of 2-D Plans

- All drawings need a Title Block
 - Can be along the right edge of the sheet
 - Contains
 - Name, address, phone of the designer
 - Stamp of the designer of record with a date, number and signature
 - The name and address of the project
 - A key plan of the project
 - Revision history
 - Page name, number, date, who drawn and who approved
 - A north arrow and a grid system
- There may be a separate title sheet for each discipline

Form of 2-D Plans

- Title Sheets
 - A list of all the other sheets with some name and number
 - A symbol index
 - Name and address of the owner
 - Name and address of the designers
 - Abbreviations

Navigation through the Drawings

- Building drawings are a road map
- The path leads to understanding
- Sheet index tells you what sheet are in the set
- The sheet number and name gives a clue about content
 - T for title
 - S for structural
 - C for civil or site
 - A for architectural
 - M for mechanical (sometimes there is P for plumbing)
 - E for electrical

Navigation through the Drawings

- Within the Mechanical there are paths:
 - Demolition plans; sometimes labeled MD
 - Ventilation plans
 - Piping plans
 - Plumbing plans including underground
 - Mechanical room plans
 - Roof plans
 - Fire protection plans
 - Mechanical details
 - Mechanical schedules
 - Mechanical flow diagrams or schematics

Navigation through the Drawings

- There are keys to navigation
 - Grid system is set up by structural to identify columns
 - Key Plan is a small outline of the building with areas marked with letters

Detailing, Flow Diagrams and Schematics

- There are additional sheets in any plan set that give important information to the contractor
- Details provide information on how to construct component assemblies
 - They can be 2D or isometric
 - They will use symbols for pipe and duct fittings
 - They indicate work that is not manufactured but field installed
- The detail is expected to be used many times in a project

Flow Diagrams

- Flow diagrams can be flat 2D schematics or isometric

3-Part Specifications

- Format & Purpose
 - First and foremost, Specifications and the accompanying drawings are a formal, legally binding contract.
 - The Specifications are divided up into Divisions which have specific purposes.
- Division 0: Procurement and Contracting Requirements
- Division 1 General Requirements
- Division 20 Mechanical System Requirements
- Division 23 HVAC
- Division 24 Controls
- Division 26 Electrical

MasterFormat 2010 Structure

Facility Services Subgroup:

20 Reserved

21 Fire Suppression

22 Plumbing

23 Heating, Ventilating and Air
Conditioning

24 Reserved

25 Integrated Automation

26 Electrical

27 Communications

28 Electronic Safety and Security

29 Reserved

Each Division is Subdivided into Sections

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC) Sections

DivisionSection

- **23 73 00 Indoor Central-Station Air-Handling Units**
 - 23 73 13 Modular Indoor Central-Station Air-Handling Units
 - 23 73 23 Custom Indoor Central-Station Air-Handling Units
 - 23 73 33 Indoor Indirect Fuel-Fired Heating and Ventilating Units
 - 23 73 33.13 Indoor Indirect Oil-Fired Heating and Ventilating Units
 - 23 73 33.16 Indoor Indirect Gas-Fired Heating and Ventilating Units
 - 23 73 39 Indoor, Direct Gas-Fired Heating and Ventilating Units

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC)

- **23 74 00 Packaged Outdoor HVAC Equipment**
 - 23 74 13 Packaged, Outdoor, Central-Station Air-Handling Units
 - 23 74 23 Packaged, Outdoor, Heating-Only Makeup-Air Units
 - 23 74 23.13 Packaged, Direct-Fired, Outdoor, Heating-Only Makeup-Air Units
 - 23 74 23.16 Packaged, Indirect-Fired, Outdoor, Heating-Only Makeup-Air Units
 - 23 74 33 Dedicated Outdoor-Air Units

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC)

- **23 75 00 Custom-Packaged Outdoor HVAC Equipment**
 - 23 75 13 Custom-Packaged, Outdoor, Central-Station Air-Handling Units
 - 23 75 23 Custom-Packaged, Outdoor, Heating and Ventilating Makeup-Air Units
 - 23 75 33 Custom-Packaged, Outdoor, Heating and Cooling Makeup Air-Conditioners

3-Part Specifications

- Each Section has 3 Parts
 - Part 1: General
 - Summarizes the Section
 - Describes Submittals
 - Specifies Quality Assurance
 - Part 2: Products
 - Lists Manufacturers – (make sure McQuay appears here)
 - Describes all the requirements of the product
 - Part 3: Execution
 - Directs the contractor to do specific things
 - Uses action verbs like: install, use, repair, test, etc.

Substitutions

- Will be found in Division 0 as part of Instructions to Bidders.
- Describes the process to request the use of an alternate product or material other than the one listed in the Part 2 of the Section.
- Usually requires some Pre-Bid submittal, evaluation and approval.
- If accepted, an Addendum is issued prior to the bid date.

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End of Lesson

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