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CHAPTER 2

The CAD Technician's Role in Office Practice and Procedure

TEST SOLUTIONS

2.1 Statement of the problem, mathematical solution, and solution to be placed on the drawing.

2.2 Using the Construction Specifications Institute *MasterFormat.*

2.3 The four national building codes are *IBC*, *BCCI*, *BOCA*, and *SBC*.

2.4 Small details and notes should be placed on the right side of the drawing sheet when possible so that they are not lost in the binding and they are easily seen when skimming through the drawings.

2.5 Details should be labeled with a title that describes the general intent of the detail, along with the scale used to create the drawings, a detail number, and the number of the page showing the detail.

2.6 Details are often placed in boxes to add clarity to the page. Several details relating to the same component should be placed in the order in which they will appear in the assembled component.

2.7 Placing all of the required drawings in a logical order based on NCS recommendations, assigning page and detail references, and then placing detail references in every occurrence of the detail.

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2.8 The most common method is to list the section and specific page number such as A-6, S-4, or M-3. This method is typically used with larger jobs, and no attempt is made to refer to the total number of pages. The second method is often used with smaller projects and lists the total number of sheets contained in the drawing set. Page numbers such as 1 of 30 or 5 of 30 would be used with this system.

2.9 Use a squiggly line to enclose the revised portion of the drawing or place a number in a triangle that is referenced to a note to explain the change.

2.10 An addendum is a written notification of changes and a drawing showing the new design requirements.

2.11 Use (2)-5/8" Ø machine bolts.

2.12 Use (4)-5/8" Ø machine bolts.

2.13 A CC88 can resist 7440 lbs.

2.14 A CCO can be welded to a steel column and is used to connect a wood beam to the column.

2.15 An ECC106 can support 29,260 lbs.

2.16 The beam will be 18.5 feet long.

2.17 The beam will support the following loads: $P_1 = 4800$; $P_2 = 3380$.

2.18 Sizes of the beams to be supported are 5 1/8 × 24 and 6 × 16.

2.19 The three connectors are CC5 1/4-8, an L50 or A35, and 2-MST27 straps.

2.20 The bolts will be (4)-3/4" Ø M.B. through the beam and (2)-3/4" Ø M.B. through the post, each placed in the predrilled holes of the column cap.

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Chapter

2

The CAD Technician's Role in Office Practice and Procedure

This column contains references to corresponding subject matter in the PowerPoint slides:

Upon completion of this chapter, the student will have explored:


Slides 2-1 and 2-2

- Common office procedures you're likely to encounter as a new technician
- Types of drawings you're likely to encounter in an architect's or structural engineer's office
- Common drawing set organization
- Using the engineer's calculations, vendor catalogs, and codes
- Common drawing page layout and project coordination

INTRODUCTION

The office that your students work in, the size of the staff, and the type of project being drawn will all affect the role of the drafter. This chapter explores common roles of a drafter and common types of drawings included in a set of plans. Because most graduates of two-year technical and junior college programs work for architectural and engineering firms, these will be the only types of drawings explored in this text.

LESSON PLAN


Slide 2-3

I. Common Office Practice

A. Design of structures s starts with selection of design team

1. Relationships with previous clients and ability to meet design requirements are important factors

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B. The architectural team can provide valuable assistance
   1. Selection of construction site
   2. Refinement of design criteria

Slide 2-4

C. The Role of the CAD Technician
   1. When the CAD technician will become involved in the project is dictated by:
      a. Experience of CAD drafter
      b. Number of drafters assigned to project
      c. Complexity of project
   2. The technician may be directed to clean up the drawings
      a. After the designer develops concept site plan, floor plan, and exterior elevations

Slide 2-5

D. Design Development
   1. Technician
      a. Refines drawings; gets input from consultants
      b. Checks exit path
      c. Reviews requirements for firewalls
      d. Prepares background drawings
   2. Consultants
      a. Add to drawings from technician
      b. Incorporate technician's drawings into their projects
   3. Design is returned to architect for adjustments

Slide 2-6

E. Construction Documents
   1. After consultants' drawings are distributed
      a. Technician can continue developing architectural working drawing sheets
   2. A structural engineering firm might work in conjunction with architectural firm
   3. Structural engineer might provide:
      a. Calculations, framing plans, structural elevations and sections, details
      b. Complete set of structural drawings

Slide 2-7

F. Permit and Bidding Stages
   1. Working/consultants' drawings are assembled, printed, and submitted to building department
      a. Building department checks drawings; frequently requires corrections
      b. Technician makes corrections
      c. Project is resubmitted
      d. Drawings are rechecked by building department
      e. Building permit issued
   2. Plans are issued to contractors for bid preparation

Slide 2-8

G. Construction Phase
   1. General contractor submits shop drawings to architect's office
   3. Shop drawings are prepared by subcontractors
      a. Show level of detail beyond working drawings
      b. Technician may be asked to check shop drawings to verify compliance with working drawings

Slide 2-9

II. Types of Drawings

A. Five major types
   1. *Procurement drawings* for bidding/negotiating before agreement is signed
   2. *Contract drawings* describe work to complete project
   3. *Resource drawings* show conditions/new work not included in project

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4. *Addenda drawings/modification drawings*
    a. Addenda: amend work during bidding
    b. Modification: alter working drawings after release for construction


Slide 2-10

B. Drawing Organization
    1. National CAD Standards (NCS): drawing groups/order within drawing set include:
        a. G—General
        b. H—Hazardous Materials
        c. V—Survey Mapping
        d. B—Geotechnical
        e. C—Civil
        f. L—Landscape
        g. S—Structural
        h. A—Architectural
        i. I—Interiors
        j. Q—Equipment
        a. F—Fire Protection
        b. P—Plumbing
        c. D—Process
        d. M—Mechanical
        e. E—Electrical
        f. W—Distributed Energy
        g. T—Telecommunications
        h. R—Resource
        i. X—Other Disciplines
        j. Z— Contractor/Shop Drawings
        k. O—Operations


Slide 2-11

C. Drawing Set Organization
    1. Title page: first page of most commercial plans
        a. Table of contents
        b. Name/contact information of project owner
        c. Name, logo, contact information for architect /consulting firms
        d. Rendering or photograph of project
        e. List of abbreviations, project data, location map, general notes
    2. Drawing set page designators: A-1, A-2, etc.


Slide 2-12

D. Civil Drawings
    1. Drawings related to construction site follow the title page
        a. Numbered successively C-1 (Civil), L-1 (Landscape)
    2. Site drawings might include:
        a. Existing site plan, proposed site plan, grading plan, utility plan, irrigation/sprinkler plan, landscape plan


Slide 2-13

E. Architectural Drawings
    1. Placed in the working drawings subset represented by letter A
        a. Describe size/shape of structure
        b. Prepared by or under supervision of an architect
            i. Include: floor plans, enlarged floor plans, elevations, wall sections, roof plan, reflected ceiling plan, interior elevations, finish schedules, and interior details


Slide 2-14

F. Structural Drawings
    1. Used to construct structure skeleton
        a. Prepared by engineers or supervised CAD drafters

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b. Placed in subset represented by the letter S
i. Include: framing plans, foundation plan, related sections and details

Slides 2-15 through 2-17

G. Cabinet and Fixture Drawings
1. Structures with few cabinets
a. Interior details/elevations are part of architectural drawings (Figure 2.5)
2. Structures with specialty cabinets (Figure 2.6)
a. Drawings will be in their own section
i. In successive order starting with I-1 (for Interiors)

Slide 2-18

H. Electrical Drawings
1. Include:
a. Electrical plans, lighting plans, equipment plans, related schedules, details to specify electrical requirements of structure
2. Successively arranged as E-1 or E-101
3. Simple projects
a. Technicians might complete electrical drawings
4. Larger projects
a. Done by CAD drafters supervised by electrical engineers

Slide 2-19

I. Mechanical Drawings
1. Show movement of air throughout structure
2. Successively arranged as M-1 or M-101
3. Several schedules/details are instrumental to these drawings

Slide 2-20

J. Plumbing Drawings
1. Show routing of fresh water/wastewater throughout structure
2. Successively arranged as P-1 or P-101

Slide 2-21

III. Working with Calculations

A. Architects and engineers typically provide a set of calculations and sketches for drawing team
1. Signed by architect or engineer
2. Submitted to obtain building permit
3. Divided into three sections
a. Problem statement
b. Mathematical solution
c. Material to be used to meet imposed stress
4. Loads are determined from top to foundation
5. May or may not contain sketches

Slide 2-22

IV. Using Vendor Materials

A. Sources of building materials
1. Internet
a. Excellent source for materials
2. *Sweets ® Network*
a. Vendor catalogs
b. Internet download formats
3. *Architects' First Source for Products®*
a. Materials index listing descriptions/performance

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Slide 2-23

V. Working with Codes

A. Concerns of building codes
   1. Fire resistance
      a. Tendency of material to:
         i. Fail by combustion
         ii. Lose strength once a fire has broken out
         iii. Methods of fire containment
   2. Ability of materials/structure to resist loads
      a. To assure the safety of a structure, use:
         i. Working stress method
         ii. Factored load method

Slide 2-24

VI. Drawing Placement

A. CAD technicians are provided a sketch of the page layout along with sketches of each drawing
B. Key considerations
   1. Place details close to where they occur
   2. When entire sheets are filled with details it's important to have a logical order
   3. Place details in groups according to the labor force to do the work

Slide 2-25

VII. Project Coordination

A. Architectural office arranges architectural drawings
B. Consultants coordinate their drawings
   1. Provide electronic copies
C. Drawing coordination involves:
   1. Placing pages in final order within drawing set
   2. Assigning numbers to each page/detail
D. In project coordination, one works with small paper copy of each sheet

Slide 2-26

E. Assigning Page Numbers
   1. A space in the lower-right corner of the title block is generally reserved for page number
   2. Offices try to keep similar orders for their jobs
   3. Sheets containing abbreviations or symbols should be placed very early in the set

Slide 2-27

F. Assigning Detail References
   1. Details should have detail symbol showing detail number over page number
   2. Title is placed near detail symbol
      a. Should reflect contents/goal of the drawing
   3. Methods used to assign detail numbers:
      a. Assign consecutive numbers for each detail on a specific page; begin with 1 for every page
      b. Begin numbering with detail 1 on page 1; then use consecutive numbering up to the end of the set

Slide 2-28

VIII. Revisions

A. Common causes for revisions
   1. Changes in building codes before issue of building permits
   2. Changing owner/tenant requirements
   3. Changes at the job site
   4. Errors by the design team

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B. Offices have a specific portion of title block/drawing area reserved for revision references or explanations


Slides 2-29 and 2-30

IX. Summary

A. Design of structures
   1. Starts with selection of design team
B. Five major types of drawings
   1. Procurement, contract, resource, addenda, modification drawings
C. Architects/engineers
   1. Provide calculations/sketches for drawing team
D. Sources of building materials
   1. The Internet, *Sweets ® Network* catalogs, and *Architects' First Source for Products ®*
E. CAD technicians require working knowledge of building code
F. Drawing layout must be one of the first things considered in project planning
G. No matter how carefully drawings are prepared, portions of the drawing set might need revision

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