UNIT 1
Construction Drawing Organization

TECHNICAL TERMS

blueprint
building information modeling (BIM)
computer-aided design and drafting (CADD)
construction drawings
details
electrical plans
elevations
engineering copier
floor plan
HVAC
interior elevations
interpretation
longitudinal sections
mechanical plans
orthographic projection
pictorial drawing
plan drawing
plans
plumbing plan
polyester film
print
print reading
rendering
schedules
sections
structural framing plans
title sheet
transverse sections
Uniform Drawing System (UDS)
vellum
visualization
working drawings

LEARNING OBJECTIVES

After completing this unit, you will be able to:

- Explain why drawings are important in the construction industry.
- Identify what is included in a set of construction drawings.
- Describe how drawings and prints are made.
- Handle prints properly.

Construction drawings are used to communicate the architectural and engineering design of a construction project. Along with specifications, construction drawings detail the building components, materials, and methods of construction. All persons involved in the planning, supplying, or constructing of a structure must be able to read construction drawings.

A ***print*** is a copy of a drawing. For many years, the only type of reproduction used was the ***blueprint***, which consists of white lines on a blue background. Today, the term *blueprint* is used interchangeably with *print*. Most prints have dark lines on a light background.

Prints are sometimes referred to as *working drawings* or ***plans***. The term *plan* also refers to a view that shows the features of a building from directly above, such as the floor plan, the site plan, or the foundation plan.

The terms *print*, *drawing*, and *plan* are used interchangeably throughout this text. This text will teach you how to read and interpret the technical information communicated on these drawings.

Construction Prints

Most drawings used in construction are created as orthographic drawings. Orthographic drawings are made

using orthographic projection. ***Orthographic projection*** is a method in which different views of an object (a building, for instance) are shown. Each view is taken from a different reference point. These reference points are selected so the views are perpendicular to one another. This allows all of the details of the structure or project to be shown. Orthographic projection is discussed in more detail in Unit 5.

The orthographic views used in construction drawings are the top, front, side, and back views. The top view is called a ***plan drawing***. Front, side, and back views are called *elevations*. A view of the interior of the building is called an *interior elevation*. Elevations are discussed later in this unit.

Other views are used in addition to plan views and elevations to clarify construction of a building. A view that shows the interior construction of a building feature, such as a wall, is called a *section*. An enlarged view of a section or a plan view is called a *detail*. Sections and details provide information that cannot be clearly shown on other drawings and are discussed later in this unit.

Another type of drawing used in building projects is a pictorial drawing. A ***pictorial drawing*** is used to help the viewer visualize the structure or the project in its entirety. This type of drawing is enhanced with trees, shrubs, shading, and other materials to make it appear more realistic. A ***rendering*** is a pictorial drawing that shows what a structure will look like when the project is finished, **Figure 1-1**. Pictorial drawings typically do not show any construction details and are primarily used for presentation purposes.

Identifying Information in a Set of Prints

Small construction projects usually include all necessary information on a single plan drawing, an elevation, and a few details. Larger construction projects that are more complicated require many plans, elevations, sections, and details, collectively called ***working drawings***. Working drawings are divided into sections according to the types of construction being performed. A letter classification identifies the drawings in each section. The following letter classifications are specified in the Uniform Drawing System (UDS), discussed later in this unit. The letter classifications in **bold** type are the ones most commonly used in building construction.

- **G—General.** Project phasing, contractor staging areas, schedules, fencing, photographs, code summary, symbol legends, and site maps.
- H—Hazardous Materials. Handling, removal, and storage of hazardous materials.
- V—Survey/Mapping. Surveyed and digitized points and features.
- B—Geotechnical. User defined.
- **C—Civil.** Structure removal, site clearing, excavation, site grading, roads, waterways, sanitary and storm sewer, pavers, plot plans, and details. (See Figure 1-3.)
- **L—Landscape.** Landscaping, planting, site hardscapes, and irrigation.
- **S—Structural.** Concrete, steel and wood structure, and details. (See Figure 1-4.)
- **A—Architectural.** Floor plans, elevations, finishes, building sections, schedules, and details. (See Figures 1-5, 1-6, 1-7, 1-8, 1-9, and 1-10.)
- I—Interiors. Interior demolition, furnishings, graphics, and interior design.
- Q—Equipment. Equipment installed inside and outside of the building, such as athletic, bank, dry cleaning, kitchen, medical, and playground equipment.
- **F—Fire Protection.** Fire alarm and suppression systems.
- **P—Plumbing.** Waste and water supply systems.

Slavun/Shutterstock.com

Figure 1-1. A rendering shows how the finished structure will appear.

- D—Process. Process piping systems, equipment, and instrumentation.
- **M—Mechanical.** Heating, ventilation, and cooling systems.
- **E—Electrical.** Power and lighting systems.
- W—Distributed Energy. Distributed energy systems and structures, such as electrical substations.
- T—Telecommunications. Audio and visual systems, security systems, and network cabling.
- R—Resource. Existing drawings, such as architectural, structural, and real estate drawings.
- X—Other Disciplines. User defined.
- **Z—Contractor/Shop Drawings.** Drawings made by subcontractors. Shop drawings are used by the tradeworker to install the work and are trade and supplier specific. For instance, when fabricating reinforcing steel, the supplier will make detailed diagrams for each portion of the footing, walls, and columns to show how the reinforcing steel is to be installed. These are different from the structural engineer's design drawings. This additional detail will help the tradeworker install the reinforcing steel correctly.
- O—Operations. User defined.

Note that there is some crossover between letter identifications. For example, all drawing content that is part of the (C) Civil, (L) Landscape, and (G) Geotechnical drawings could be on (C) Civil drawings. All drawing content that is part of the (P) Plumbing and (D) Process drawings could be on (P) Plumbing drawings. This depends on the complexity of the building and how much the information needs to be separated out from other trades.

Additional Drawing Identification Methods

Although working drawings are typically identified using the letter classifications previously discussed, some architects and engineers employ a numbered system without the use of letters. For example, each drawing in a project may be identified simply as Sheet *n*, where *n* represents the number assigned to the drawing.

When letter classifications are used, it is common to employ a sheet numbering system that uses a series of numbers to identify the drawing type and sheet number. These numbers follow the letter classification. The first number following the letter classification identifies the drawing type. This number is a single digit:

- 0—General
- 1—Plans
- 2—Elevations
- 3—Sections
- 4—Large-scale views
- 5—Details
- 6—Schedules and diagrams
- 7—User defined
- 8—User defined
- 9—3D views

The next number identifies the sheet number. For example, using this system, sheet C101 indicates a plan view drawing (1) in the civil drawings section (C) assigned sheet number 01. Sheet C102 indicates a plan view drawing (1) in the civil drawings section (C) assigned sheet number 02, and so on. Sheet A202 indicates an elevation (2) in the architectural drawings section (A) assigned sheet number 02.

Whether or not drawings in a set are identified with a letter classification and numbered system, individual drawings in a project are typically identified on a ***title sheet***. See **Figure 1-2**. Generally, the title sheet provides a detailed list of drawings and other information about the project. In the example shown, a detailed list identifies each drawing by sheet number and name. This type of list may also identify the most recent issue date and revision information. This is helpful when identifying changes to drawings for change orders or determining the scope of work related to an estimate, proposal, and contract.

A title sheet also typically lists names of the professionals involved in the project, such as the architect, landscape architect, structural engineer, mechanical engineer, electrical engineer, and owner of the project. Other items included on title sheets include abbreviation lists, material and symbol legends, a rendering of the completed building, and a site map locating the project.

Typical Prints

Prints are usually arranged in the approximate order of construction. A set of prints consists of a title sheet and general (G-1, G-2, etc.), civil engineering (C-1, C-2, etc.), structural engineering (S-1, S-2, etc.), architectural (A-1, A-2, etc.), electrical (E-1, E-2, etc.), mechanical (M-1, M-2, etc.), and plumbing (P-1, P-2, etc.) prints.

General (**G**) prints identify overall information about a project. They show items such as project phasing, contractor staging areas for construction materials and equipment, contractor parking, and project fencing.

Civil engineering (**C**) prints include site plans and show items such as utilities, easements, grading, landscaping, and site details. A typical site plan for a commercial building is shown in **Figure 1-3**. The site plan can also include grade contour lines, walks, and driveways. Property lines, building setbacks, and utility locations are also shown.

Structural (**S**) prints include foundation plans and above-grade framing plans. Structural prints show items such as structural concrete and structural steel and the building support system. See **Figure 1-4**. Structural prints include sections and details to show construction requirements.

PROPOSED GARAGE AND OFFICE BUILDING FOR:

CINCINNATI MANOR PARKING AND OFFICE BUILDING

CINCINNATI, OHIO

DRAWING INDEX

● ISSUED AS PART OF SET
□ ISSUED FOR INFORMATION ONLY

		GARAGE FRAME PERMIT	FIRE DEPARTMENT REVISIONS	GARAGE PERMIT SET	BLDG. DEPT. COMMENTS	OFFICE CORE & SHELL PERMIT	BLDG DEPT COMMENTS
TITLE SHEET							
TS 001	TITLE SHEET	●	●	●	●	●	●
A 002	CODE SHEET	●		●	◆	●	
A 003	LIFE SAFETY PLANS	●		●		●	
A 011	UL INFORMATION					●	
A 012	UL INFORMATION					●	
A 013	UL INFORMATION					●	
A 014	UL INFORMATION					●	
A 015	PERIMETER FIRE BARRIERS					◆	
CIVIL							
C1.0	EXISTING CONDITIONS AND DEMOLITION PLAN	●		●		●	
C1.1	SITE DIMENSION PLAN	●		●		●	
C1.2	MASS EXCAVATION PLAN			●		●	
C1.3	SITE GRADING PLAN	●		●		●	
C1.4	SITE UTILITY PLAN	●	●	●	●	●	
C1.5	DETAILS	●		●		●	
C1.6	DETAILS	●		●		●	
C1.7	EROSION PREVENT. & SEDIMENT CONTROL NOTES	●		●		●	
C1.8	EROSION PREVENT. & SEDIMENT CONTROL DETAILS	●		●		●	
C1.9	EROSION PREVENT. & SEDIMENT CONTROL PHS. 1	●		●		●	
C2.0	EROSION PREVENT. & SEDIMENT CONTROL PHS. 2	●		●		●	
C2.1	EROSION PREVENT. & SEDIMENT CONTROL PHS. 3	●		●		●	
1/2	GCWW WATER SERVICE PLAN	●	●	●		●	

● ISSUED AS PART OF SET
○ ISSUED FOR INFORMATION ONLY

		GARAGE FRAME PERMIT	FIRE DEPARTMENT REVISIONS	GARAGE PERMIT SET	BLDG. DEPT. COMMENTS	OFFICE CORE & SHELL PERMIT	BLDG DEPT COMMENTS
ARCHITECTURAL							
A 101	PARKING LEVEL P1 FLOOR PLAN	○		●	●	●	
A 102	PARKING LEVEL P2 FLOOR PLAN	○		●	●	●	
A 103	PARKING LEVEL P3 FLOOR PLAN	○		●	●	●	
A 104	PARKING LEVEL P4 FLOOR PLAN	○		●	●	●	
A 105	PARKING LEVEL P5 FLOOR PLAN	○		●	●	●	
A 106	PARKING LEVEL P6/OFFICE LEVEL 1 FLOOR PLAN	○		●		●	●
A 107	OFFICE LEVEL 2 FLOOR PLAN	○		●		●	●
A 108	OFFICE LEVEL 3 FLOOR PLAN	○		●		●	●
A 109	OFFICE LEVEL 4 FLOOR PLAN	○		●		●	●
A 110	ROOF PLAN	○		●		●	
A 201	ENLARGED PLANS			●		●	●
A 202	ENLARGED PLANS			●		●	●
A 203	ENLARGED PLANS			●		●	
A 204	ENLARGED PLANS			●		●	●
A 211	PLAN DETAILS			●		●	
A 212	PLAN DETAILS					●	
A 213	PLAN DETAILS					●	
A 302	GARAGE LEVEL P2 CEILING PLAN			●		●	
A 303	GARAGE LEVEL P3 CEILING PLAN			●		●	
A 304	GARAGE LEVEL P4 CEILING PLAN						●
A 305	GARAGE LEVEL P5 CEILING PLAN			●		●	
A 306	OFFICE LEVEL CEILING PLANS			●		●	
A 401	EXTERIOR ELEVATIONS	○		●		●	●
A 402	EXTERIOR ELEVATIONS	○		●		●	●
A 403	PARTIAL EXTERIOR ELEVATIONS / PLANS			●		●	●
A 501	STAIR & ELEVATOR SECTIONS	○		●		●	●
A 502	STAIR & ELEVATOR SECTIONS	○		●		●	●
A 503	STAIR SECTIONS	○		●		●	
A 504	ELEVATOR SECTION						●
A 601	WALL SECTIONS	○		●		●	
A 602	WALL SECTIONS	○		●		●	
A 603	WALL SECTIONS	○		●		●	●
A 604	WALL SECTIONS	○		●		●	
A 611	SECTION DETAILS			●		●	
A 612	SECTION DETAILS			●		●	
A 613	SECTION DETAILS			●		●	
A 614	SECTION DETAILS			●		●	
A 615	SECTION DETAILS					●	
A 616	SECTION DETAILS					●	
A 617	SECTION DETAILS					●	
A 701	INTERIOR PARTITION TYPES			●		●	
A 801	SCHEDULES			●	■	●	
A 802	SCHEDULES					●	●

NOTE: SHEETS A301 INTENTIONALLY OMITTED FROM SET AS THERE IS NO CEILING SCOPE ON LEVELS P1.

● ISSUED AS PART OF SET
□ ISSUED FOR INFORMATION ONLY

		GARAGE FRAME PERMIT	FIRE DEPARTMENT REVISIONS	GARAGE PERMIT SET	BLDG. DEPT. COMMENTS	OFFICE CORE & SHELL PERMIT	BLDG DEPT COMMENTS
STRUCTURAL							
S001	STRUCTURAL GENERAL NOTES	●		●		●	
S002	TYPICAL DETAILS	◆		◆		●	
S003	TYPICAL DETAILS	◆		◆		●	
S004	TYPICAL STEEL FRAMING NOTES					■	
S101	LEVEL P1 FOUNDATION PLAN	●		●		●	
S102	LEVEL P2 FRAMING PLAN	◆		◆		●	
S103	LEVEL P3 FRAMING PLAN	◆		◆		●	
S104	LEVEL P4 FRAMING PLAN	◆		◆		●	
S105	LEVEL P5 FRAMING PLAN	◆		◆		●	
S106	LEVEL P6 AND OFFICE LEVEL 1 FRAMING PLAN	●		●		●	
S107	OFFICE LEVEL 2 FRAMING PLAN					●	
S108	OFFICE LEVEL 3 FRAMING PLAN					●	
S109	OFFICE LEVEL 4 FRAMING PLAN					●	
S110	OFFICE LEVEL 5 (ROOF) FRAMING PLAN					●	
S111	UPPER ROOF FRAMING PLAN					●	
S131	PARTIAL PLANS	●		●		●	
S132	PARTIAL PLANS	◆		◆		●	
S201	FOUNDATION DETAILS	●		●		●	
S202	FOUNDATION DETAILS	◆		◆		●	
S301	GARAGE FRAMING DETAILS	●		●		●	
S302	GARAGE FRAMING DETAILS	◆		◆		●	
S303	GARAGE FRAMING DETAILS	●		●		●	
S304	GARAGE FRAMING DETAILS	◆		◆		●	
S321	OFFICE FRAMING DETAILS					●	
S401	GARAGE COLUMN SCHEDULE AND DETAILS	●		●		●	
S403	OFFICE COLUMN SCHEDULE AND DETAILS					◆	
S404	STEEL BRACING DETAILS					◆	
S501	TYPICAL PT DETAILS	●		●		●	
S502	TYPICAL PT DETAILS	◆		◆		◆	
S503	MISCELLANEOUS BEAMS AND SLAB DESIGN	◆		◆		◆	
S504	TYPICAL PT BEAM DIAGRAMS	◆		◆		◆	
S505	PT BEAM SCHEDULE	◆		◆		◆	
MECHANICAL							
M001	OFFICE MECHANICAL COVER					●	
H101	OFFICE LEVEL 1 HVAC PLAN					●	◆
H102	OFFICE LEVEL 2 HVAC PLAN					◆	◆
H103	OFFICE LEVEL 3 HVAC PLAN					◆	◆
H104	OFFICE LEVEL 4 HVAC PLAN					◆	◆
H105	OFFICE HVAC ROOF PLAN					◆	◆
H201	ENLARGED HVAC PLANS					●	
H301	HVAC DETAILS					●	
H401	OUTDOOR SCHEMATIC					●	◆
H402	HVAC SCHEMATICS					◆	
H501	HVAC SCHEDULES					●	

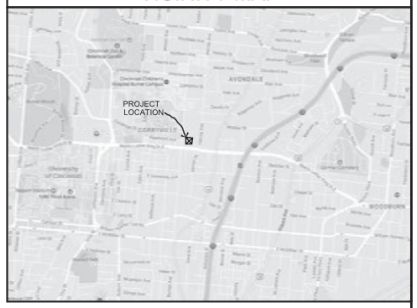
CORE AND SHELL ARCHITECT
DORFMUELLER ARCHITECTURE & BUILDERS, LLC
LEBANON, OHIO

STRUCTURAL
DPD LIMITED, INC.
CINCINNATI, OHIO

CIVIL
AB&C ENGINEERING, INC.
CINCINNATI, OHIO

CONTRACTOR
DORFMUELLER ARCHITECTURE & BUILDERS, LLC
LEBANON, OHIO

VICINITY MAP



mueller architecture & builders, llc
Lebanon, Ohio

ISSUE 1 GARAGE FRAME PERMIT
ISSUE 2 FIRE DEPARTMENT REVISIONS
ISSUE 3 GARAGE PERMIT SET
ISSUE 4 BLDG. DEPT. COMMENTS
ISSUE 5 OFFICE SHELL PERMIT

CINCINNATI MANOR
PARKING AND OFFICE BUILDING
CINCINNATI, OHIO

TITLE SHEET

DRAWN BY:
COMM. NO:
DATE:
DRAWING NO:

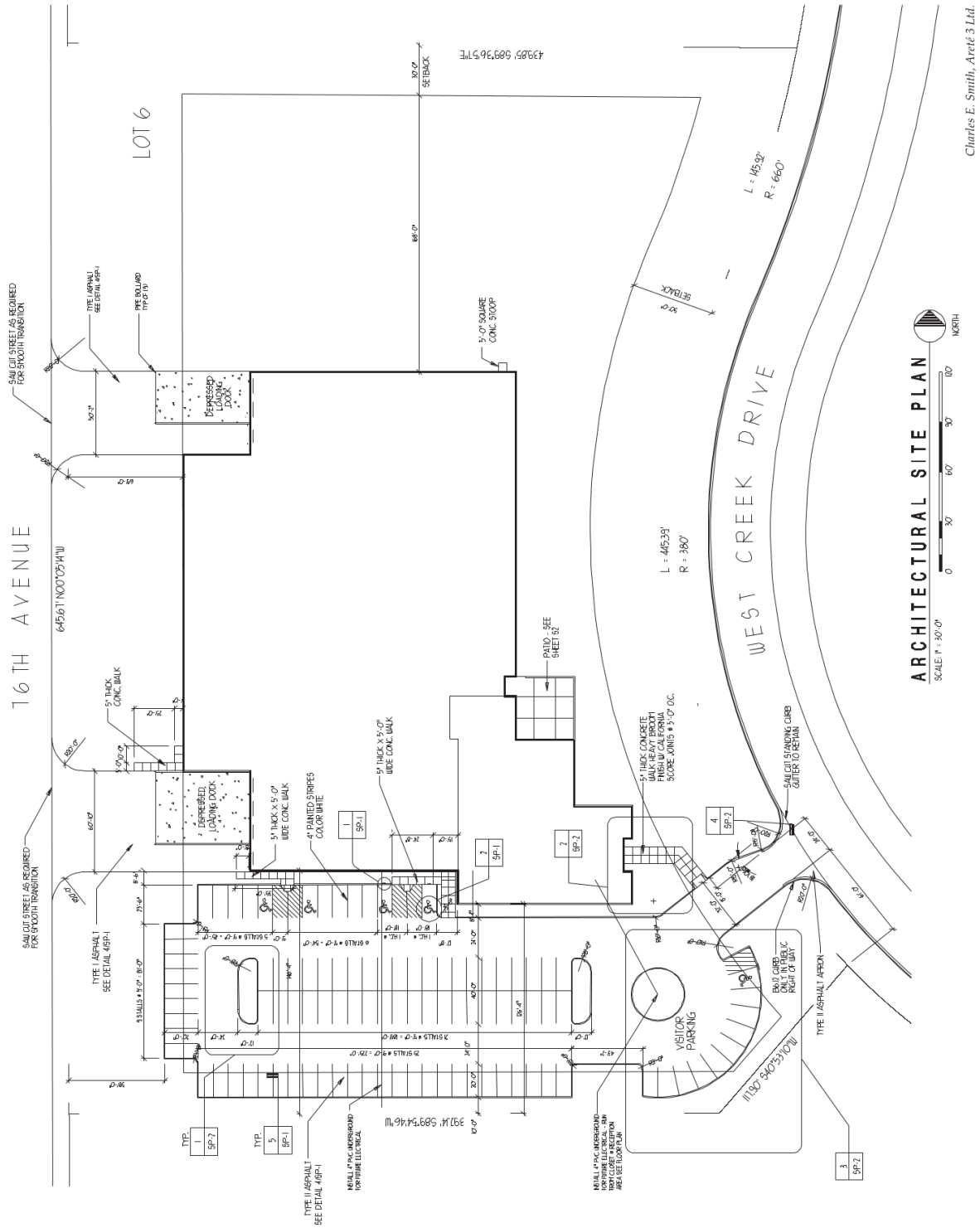
TS 001

Neyer Architects, Inc.

Figure 1-2. A title sheet for a set of drawings for a commercial building project.

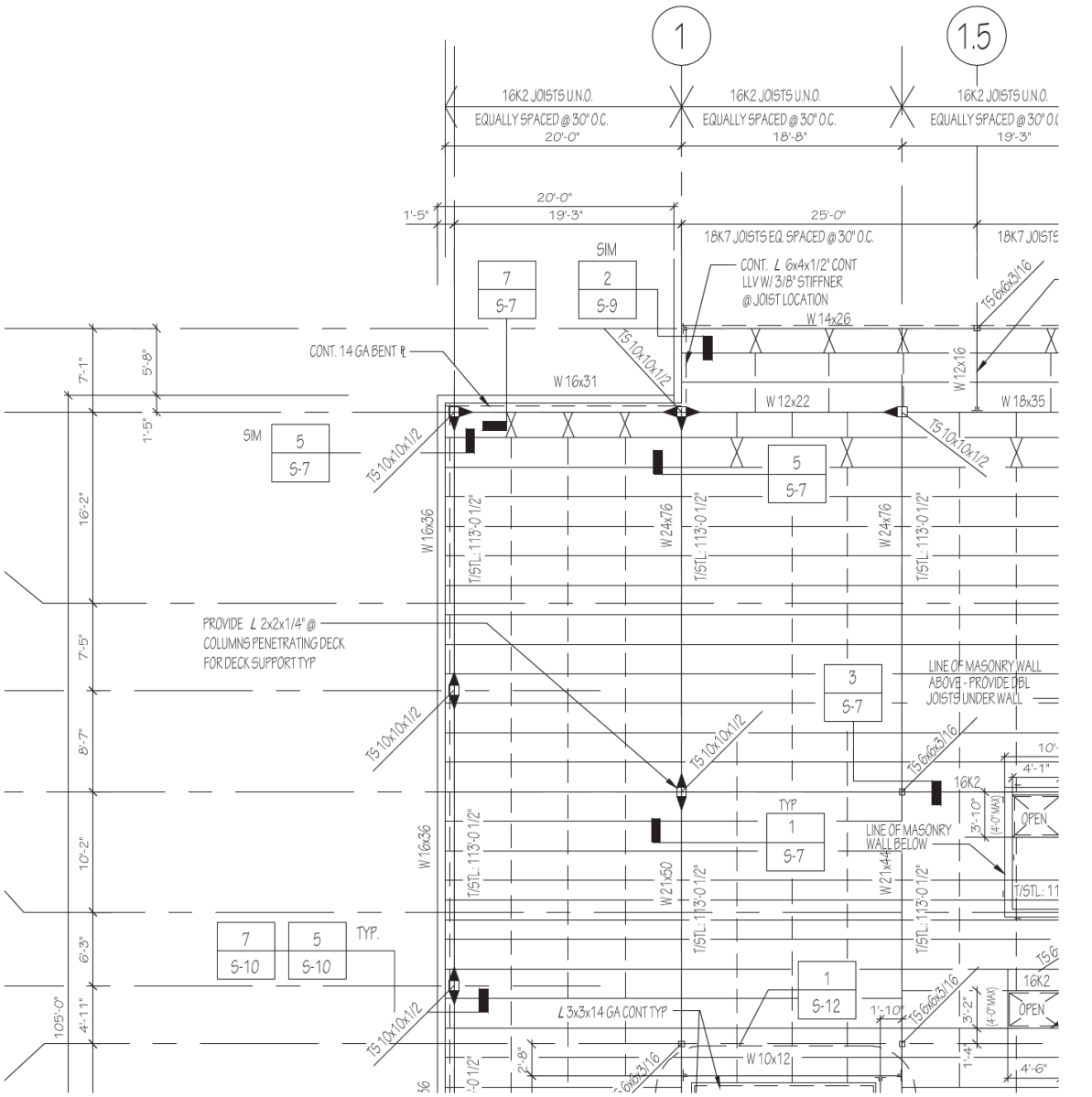
For simple residential buildings, the foundation and basement plans are usually included on the same drawing. This plan is used to show the foundation walls, footings, piers, and fireplaces.

Architectural (**A**) prints include floor plans, elevations, building sections, wall sections and detail sections, door and window schedules, and room finish schedules. In residential construction, the architectural prints usually make up the majority of working drawings.



Charles E. Smith, Arete 3 Ltd.

Figure 1-3. A site plan for an office building, warehouse, and parking lot. This type of drawing will assist the print reader in understanding how the facility is laid out on the property.



Charles E. Smith, Areté 3 Ltd.

Figure 1-4. A partial structural steel floor framing plan for a commercial building. This type of drawing would be part of the S series of prints (Structural prints).

The ***floor plan*** provides a great deal of information and acts as a reference for the location of additional enlarged plans, sections, elevations, and details, **Figure 1-5**. The floor plan is actually a horizontal section view taken 42" to 48" above the floor looking down. The section plane may be offset (change levels) if the building involves a split-level floor. The floor plan shows floor finishes, walls, doors, stairways, fireplaces, built-in cabinets, and some mechanical equipment. Drawings for multistory buildings include a floor plan for each building level. When reviewing prints, most people begin with the floor plans. The floor plans provide the overview needed to establish the visualization that will assist in future project interpretation.

Elevations depict the exterior features of the building, **Figure 1-6**. Usually, a minimum of four elevation drawings is needed to show the design of all sides of the structure. More elevation views are required for unusual designs, such as internal courtyards, or angular buildings. ***Interior elevations*** of the building are used when additional interior wall surface detail is needed.

Sections are views showing the building as if it were cut apart, **Figure 1-7**. They show walls, stairs, and other details not clearly shown in other drawings. Sections are usually drawn in larger scale than the elevations and plan drawings. Sections taken through the narrow width of an entire building are known as ***transverse sections***. Those through the long dimension are known as ***longitudinal sections***.

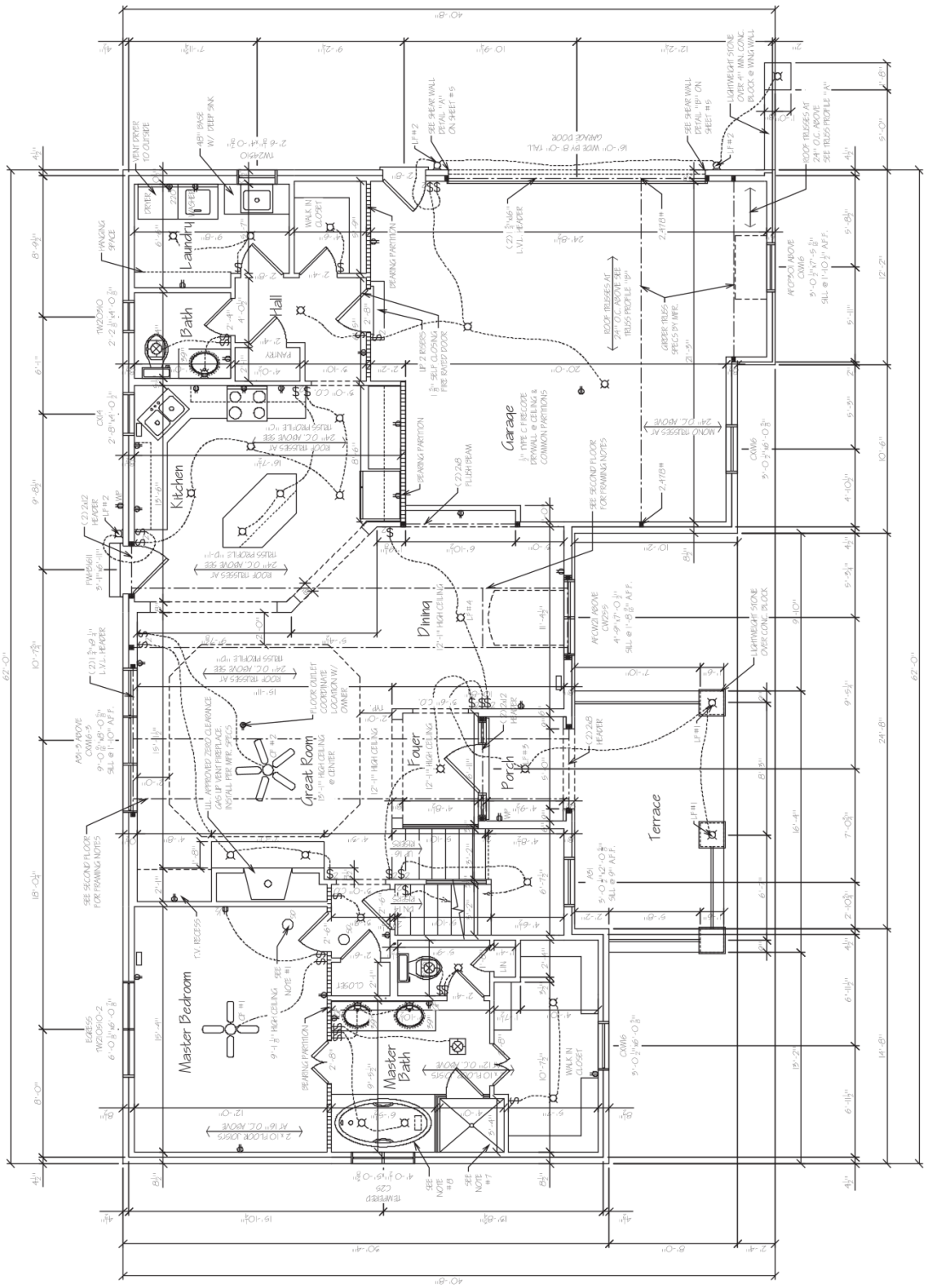
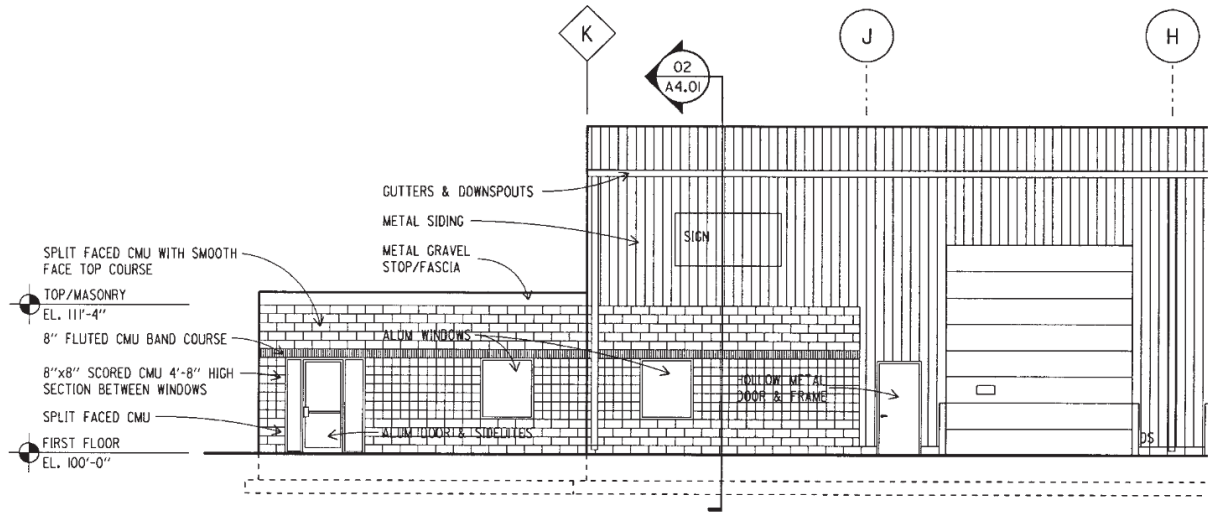
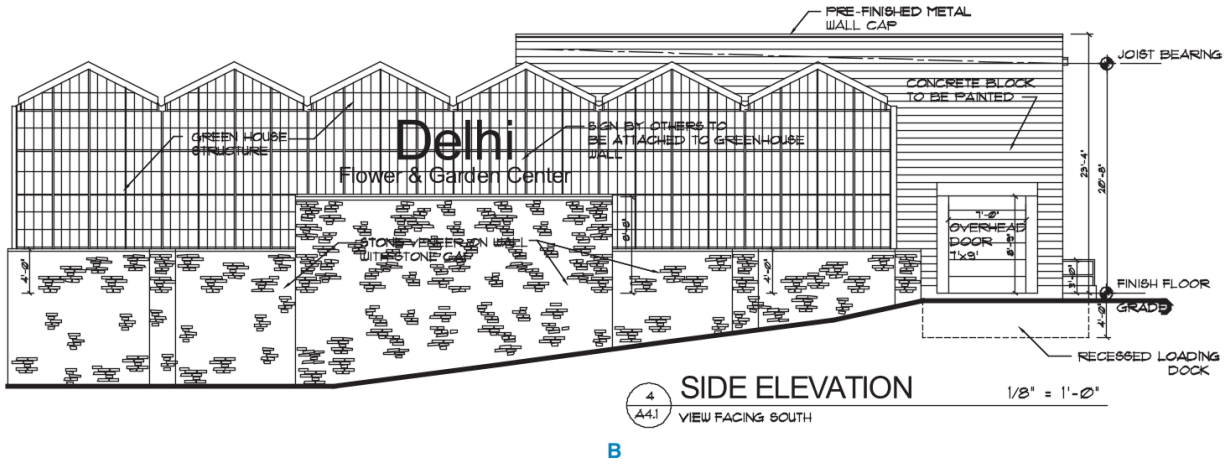


Figure 1-5. The floor plan is one of the most common and informative drawings used in construction. Print readers should start with the floor plans when trying to understand how a building is constructed. On a simple residential floor plan, the electrical plan can also be shown.



A

KZF Design, Inc.



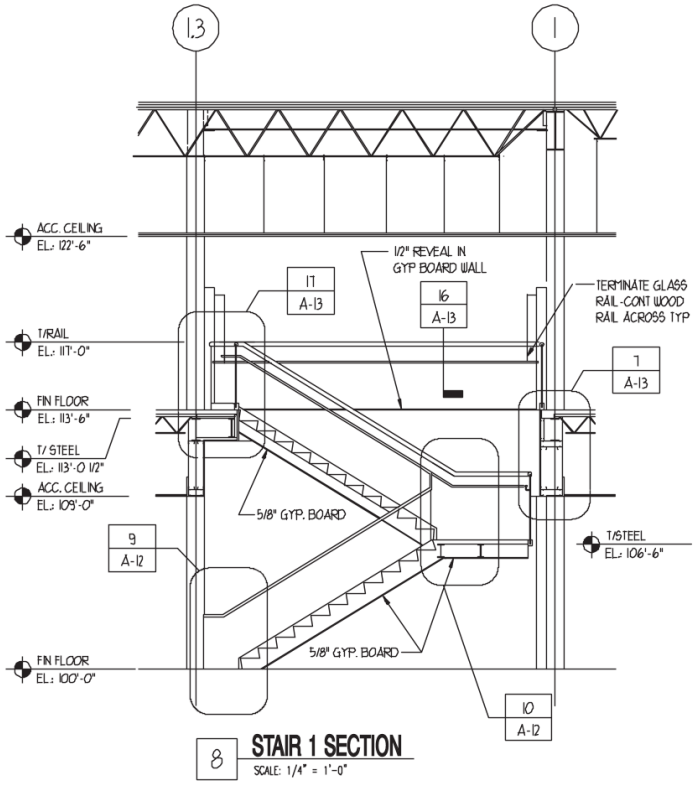
B

Arch/Image 2 Architects

Figure 1-6. Elevation drawings. Elevations are part of the A series of prints (Architectural prints). A—This elevation shows the exterior facade of a commercial building. Note the different materials that are defined on this drawing. B—An exterior elevation drawing for a flower and garden center.

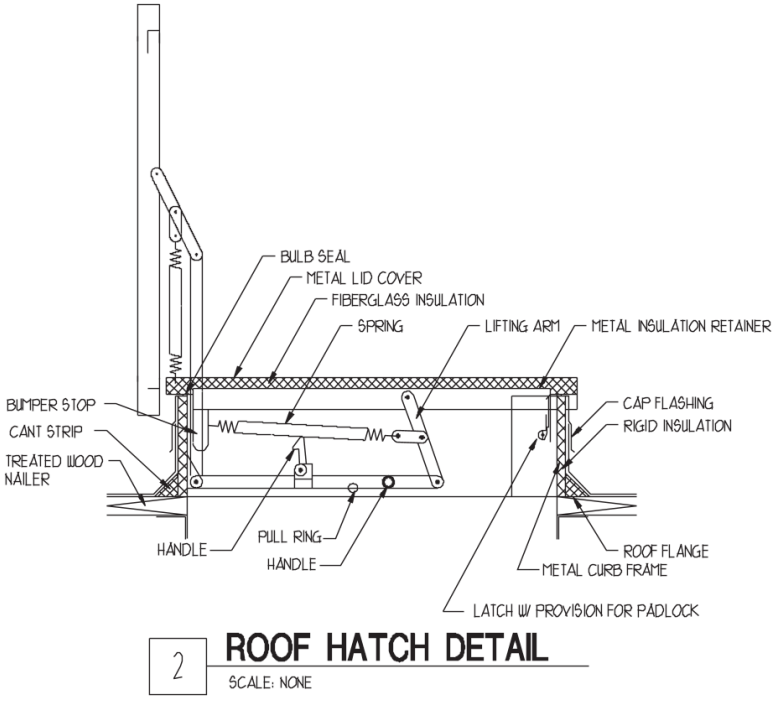
Details are required for complex building components and unusual construction, such as an arch, a cornice, a structural steel connection, or a retaining wall depicting how the architecture connects to the structure. Details are drawn to a larger scale, such as 1" = 1'-0", to clearly describe the building components and features. See **Figure 1-8**.

Schedules are lists of materials needed in the construction process. A schedule normally lists the item, an identification mark, size, number required, and any other useful information. Each item in the schedule is referenced on the plan and elevation drawings. Different types of schedules include door schedules, **Figure 1-9**, window schedules, and lighting fixture schedules. Schedules are also used for other purposes, such as showing the materials required in each room of the building. A schedule used for this purpose is called a room finish schedule, **Figure 1-10**. Almost all commercial buildings will have a room finish schedule.



Charles E. Smith, Areté 3 Ltd.

Figure 1-7. Sections indicate areas within a structure to better define how the building goes together. This section illustrates the stair construction. A section of this kind would be found in the A series of prints (Architectural prints).



Charles E. Smith, Areté 3 Ltd.

Figure 1-8. As sections are enlarged, they become details indicating more close-up detailing of a particular portion of a building. This kind of detail would be found in the A series of prints (Architectural prints).

SHELL BUILDING DOOR SCHEDULE

DOOR No.	DOOR					FRAME				FIRE RATING	HARDWARE	REMARKS
	TYPE	SIZE	THICK	MATERIAL	FINISH	TYPE	MATERIAL	FINISH	DETAIL			
100A	A	6'-0"x7'-0"	1 3/4"	AL/GLASS	ENAM	-	AL	ENAM	-		R	CURTAIN WALL - SEE SHEET A-6
121A	B	3'-0"x7'-0"	1 3/4"	HM	PAINT	A	HM	PAINT	3,4/A-16		B,H,M,N,P,T	-
122A	B	3'-0"x7'-0"	1 3/4"	HM	PAINT	B	HM	PAINT	3,4/A-16	C	B,H,M,N,P,T	1 HOUR
122B	B	3'-0"x7'-0"	1 3/4"	HM	PAINT	A	HM	PAINT	-	C	B,C,H,T	1 HOUR
127A	B	3'-0"x7'-0"	1 3/4"	HM	PAINT	A	HM	PAINT	3,4/A-16		B,H,M,N,P,T	-
127B	C	10'-0"x12'-0"	1 3/4"	STEEL	PREF.	-	STEEL	PAINT	1,2/A-16		-	HI-LIFT O.H. DOOR
127C	C	9'-0"x10'-0"	1 3/4"	STEEL	PREF.	-	STEEL	PAINT	1,2/A-16		-	HI-LIFT O.H. DOOR

HM.= HOLLOW METAL, MTL.= METAL, PREF.= PREFINISHED, WD.= WOOD, AL.= ALUMINUM, ST/V.= STAIN & VARNISH, GL.= GLASS, STL.=STEEL, B. ENAM.= BAKED ENAMEL FINISH

HARDWARE SCHEDULE

A LCN SERIES 1010 CLOSER (STANDARD)
B LCN SERIES 1011 CLOSER (H.C.)
C GLYNN JOHNSON WALL STOP #60W
E VON DUPRIN SERIES 99 PANIC BAR
F 2 PAIR BUTT HINGE McKINNEY #T2714
G 1 1/2 PAIR BUTT HINGE McKINNEY #T2714
H 1 1/2 PAIR BUTT HINGE HEAVY DUTY McKINNEY #T4A3786
K HAGER #306 3 1/2"x15" PUSH PLATE
L HAGER #306 PUSH PL w/ #3G PULL
M REESE #315A POLYPRENE WEATHER STRIP
N REESE #5424A THRESHOLD
O HARDWARE PROVIDED BY MANUFACTURER
P KEYED LOCK SET
Q REESE #317C SWEEP
R MANUFACTURER TO PROVIDE PUSH BAR, PULL HANDLE H.C. CLOSER, THRESHOLD, WEATHER STRIPPING, SWEEP, THUMB TURN LOCK SET
S SCHLAGE S SERIES LATCH (MEDIUM DUTY)
T SCHLAGE L SERIES LATCH (HEAVY DUTY)
SUGGESTED HARDWARE OR EQUAL

Charles E. Smith, Areté 3 Ltd.

Figure 1-9. This schedule contains the details and detail references for all the doors in the building. This kind of schedule would be found in the A series of prints (Architectural prints).

ROOM FINISH SCHEDULE

ROOM No.	ROOM NAME	FLR.	BASE	WALLS				CL'G	CL'G HT.	REMARKS
				N	E	S	W			
100	VESTIBULE	QT	VC	PT	GL	PT	GL	ACT	9'-0"	SURF MTD PEDIMAT
101	WAITING	CPT	VC	PT	GL	PT	-	ACT	9'-0"	-
102	RECEPTION	CPT	V	-	-	PT	PT/WD	ACT	9'-0"	-
103	OFFICE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
104	VP SALES	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
105	CLASSROOM	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
106	CONFERENCE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
107	OFFICE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
108	OFFICE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
109	CONT. OFFICE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
110	ADMIN. VP	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
111	OPEN OFFICE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
112	COMPUTER	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-
113	CONFERENCE	CPT	V	PT	PT	PT	PT	ACT	9'-0"	-

QT = QUARRY TILE
CT = CERAMIC TILE
CPT = CARPET
VCT = VINYL COMPOSITE TILE
GL = GLASS
V = 4" VINYL BASE
PT = PAINT
OPEN = EXPOSED CONSTRUCTION
ACT = 2x2 ACOUSTICAL CEILING TILE
VT = VINYL TILE
BL = CONCRETE BLOCK
CS = SEALED CONCRETE
DW = DRYWALL
VC = VINYL COVE BASE

Charles E. Smith, Areté 3 Ltd.

Figure 1-10. A room finish schedule provides the builder with an easy way to find and understand the different materials used within each room in the building. This kind of schedule would be found in the A series of prints (Architectural prints).

CAREERS IN CONSTRUCTION

Construction Manager

A construction manager is an experienced professional who manages and coordinates entire construction projects. Usually, this responsibility involves management of a construction management team. The construction management team oversees construction and scheduling, changes during construction, and coordination between disciplines and trades. The team also manages the budget for the construction company and sometimes the owner's budget.

A successful construction manager not only manages the project, but also manages many people, including subcontractors and material suppliers. The size and complexity of the project determine the number of individuals required for successful project execution. In a typical project, other managers working under the supervision of the construction manager include a project engineer, a project estimator, a superintendent, and a foreman. The construction manager is involved in all phases of construction from approval of the initial design concepts to completion of the building.

Traditionally, construction managers came up through the building trades by becoming a skilled worker in a specific occupation, such as a carpenter, plumber, electrician, or surveyor. Today, however, many colleges offer construction management degree programs. In many firms, candidates are required to have a bachelor's degree in construction management as well as experience in the construction industry.

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Construction managers are responsible for managing entire building projects and coordinating the work of others on the construction management team.

Schedules are usually included as part of a set of working drawings. Door schedules frequently are included on the plan drawings. Window schedules generally appear on the elevation drawings. On larger projects, schedules are listed on their own sheet.

Structural framing plans may be included in a set of plans for the framing of floors, the roof, and various wall sections. Structural framing plans are part of the Structural (**S**) prints.

The ***plumbing plan*** shows the hot and cold water system layout, the sewage disposal system, and plumbing fixture locations. For typical residential projects, the entire plumbing plan is typically shown on one drawing, and plumbing fixtures are often shown on the architectural floor plan. For more complex structures, separate plans for each system are used.

The ***mechanical plans*** include heating, ventilating, and air-conditioning (***HVAC***) plans. These plans show the location of mechanical equipment for heating and cooling systems and ductwork in the building.

The ***electrical plans*** show electrical wiring, fixtures, and devices. The electrical plans include the lighting plan, reflected ceiling plan, and panel schedules. On larger projects, riser diagrams and load calculations may also be included. For smaller jobs and residential projects, the electrical plan may appear on the architectural floor plan.

Uniform Drawing System (UDS)

The ***Uniform Drawing System (UDS)*** is a standardization of drawing guidelines developed by the Construction Specifications Institute (CSI). The UDS consists of eight interrelated modules. These modules contain standards, guidelines, and various tools for organizing and presenting drawing information used in planning, designing, and constructing facilities.

Module 01—Drawing Set Organization

Establishes set content and order, sheet identification, and file naming for the set of construction drawings. The sheet identification guidelines provide a standard format based on letter classifications and a numbered system, as discussed earlier in this unit.

Module 02—Sheet Organization

Provides formats for sheets, including the sheet title block and production data areas, along with their content.

Module 03—Schedules
Standardizes schedule formats for consistency of content and terminology used for construction drawings.

Module 04—Drafting Conventions
Standardizes conventions used in drawings, such as drawing orientation, layout, symbols, material indications, line types, dimensioning standards, drawing scales, diagramming, notations, and cross-referencing systems.

Module 05—Terms and Abbreviations
Provides consistent spelling and terminology, standardizes abbreviations, and establishes common usage.

Module 06—Symbols
Addresses common symbols, classifications, graphic representation, and organization as used in creating, understanding, and fulfilling the intent of documents.

Module 07—Notations
Standardizes notation classification, use of notes, notation format, notation components, and notation terminology. Also addresses notation location and the linking of notations to specifications.

Module 08—Code Conventions
Identifies types of general regulatory information that should appear on drawings, locates code-related information in a set of drawings, and provides standard graphic conventions.

The UDS is a standardized construction document accepted throughout the building industry. It is one of the major publications included in the US National CAD Standard.

Making Prints

Most drawings today are created using ***computer-aided design and drafting (CADD)*** systems. CADD software enables the architect or engineer to develop a design relatively quickly, and in a manner that allows for changes to be made more easily. Prints of drawings created using CADD are generated on a plotter or other printing device. See **Figure 1-11**.

Drawings made in CADD are created at full size. When the drawing is plotted, the appropriate scale is specified to fit the drawing on the selected sheet size. Using a drawing scale is discussed in Unit 3. Typical sheet sizes used for construction drawings are shown in **Figure 1-12**.

Prior to the emergence of CADD, drawings were created manually by hand, directly on paper. Drawings created this way were made on translucent paper (***vellum*** or ***polyester film***). Original drawings were kept in file storage and prints were reproduced from the originals using a large-format ***engineering copier*** (a photocopier designed to handle larger sizes of paper).

Some offices continue to keep original paper drawings on file and use an engineering copier to make prints when needed. Drawings can be reduced or enlarged when photocopied. For example, a large D-size (24″ × 36″) drawing can be reduced to a smaller print for easier handling.

Hewlett-Packard Development Company

Figure 1-11. High-quality prints can be made from CADD drawings using a printing device such as this large-format inkjet printer.

It is important to note that due to the nature of copying machines and printing devices, prints may not always be exact duplicates of the original drawing. Slight enlargement or reduction may occur. Therefore, you should never scale a dimension from a print unless you have verified that the drawing has, in fact, printed to scale. This can be verified by scaling several dimensions on the print to guarantee its accuracy.

Electronic Documentation Processes

Developments in computer technology are changing the way in which prints are accessed and used in the field. Because most drawings today are created as electronic files using design software, they can be readily exchanged between design teams and contractors. In some cases, electronic files are used in place of paper prints at the job site. Files can be stored on a local

Drawing Sheet Sizes

Size Designation	Size in Inches
A	9 × 12
B	12 × 18
C	18 × 24
D	24 × 36
E	36 × 48
E1	30 × 42
E2	26 × 38
E3	27 × 39

Goodheart-Willcox Publisher

Figure 1-12. Typical drawing sheet sizes.

network or an offsite server accessed using the Internet. Many drawings today are kept in "cloud storage" on a cloud service network so that all parties involved in design and construction can retrieve the most current information online. Drawings can be opened and viewed on desktop monitors, laptops, and handheld devices such as smartphones and tablets. In some projects, the design and construction teams may use large-format display tables to view prints. See **Figure 1-13**. Computer-generated prints are typically saved to a format that does not require the design software to open files. A common format is the Adobe® portable document format (PDF).

Newer technologies are also impacting processes used in design, construction, and building management. In traditional CADD processes, two-dimensional (2D) drawings are created to represent the different views of a building. A newer practice is to design the building as a three-dimensional (3D) model using parametric modeling software. Instead of creating a set of drawings using traditional 2D CADD software, the designer uses the 3D model to generate the drawing documentation automatically. This approach is used in building information modeling. ***Building information modeling (BIM)*** is a process in which a 3D model provides a virtual representation of a building and is used in design, construction, and operation of the building. BIM offers a number of advantages to architectural designers and building contractors. Creating a 3D building model allows the designer and owner to evaluate realistic representations of a building before it is built. In addition, all information and data related to the project, including the drawing documentation, is linked to the 3D building model. When a change is made to the model, all of the drawing documentation and building data updates to reflect the change. This helps reduce design errors and simplifies change management processes traditionally used to update prints. BIM also improves coordination between designers and contractors and helps prevent conflicts in construction. Throughout the project, all parties involved in design, construction, and building management have access to the building data. This improves efficiency and helps reduce costs.

GREEN BUILDING

Distributing Prints

In traditional practice, construction drawings prepared using CADD software are transferred to paper in order to present plans to a client. To conserve paper and minimize printer use, think carefully before making paper prints for distribution. Construction drawings can be shared with other design teams and clients via e-mail or an online file sharing service.

Photo courtesy of iPlanTables

Figure 1-13. This wide-format display table has a large touchscreen monitor and is equipped with three smaller monitors for additional display.

In commercial construction, BIM offers significant advantages to building owners. Once construction is completed, a BIM model can be used for facility management tasks such as scheduling maintenance, troubleshooting, and estimating energy costs. Instead of referring to paper prints, maintenance managers use the building model and facility management system to retrieve information. This is usually more efficient because the system can be searched for the necessary data. In addition, the information is usually more accurate because the building model is kept up-to-date by engineers to reflect changes, such as new equipment or building renovations.

Reading Prints

Print reading is the gathering of information from prints or a set of drawings. It involves two principal elements: visualization and interpretation. Reading prints develops these abilities. The more experience you have, the better your skill level.

Visualization is the ability to create a mental image of a building or project from a set of working drawings. A study of print reading principles and learning to sketch will help you visualize construction drawings and details.

Interpretation is the ability to understand lines, symbols, dimensions, notes, and other information on the working drawings. Each of these areas will be discussed in this textbook.

Handling Prints

Prints and related specification sheets are as important as the tools used to build a building. With proper care, prints can be kept usable for a long period of time.

There are several guidelines for handling prints:

- Never write on a print unless you are an authorized professional to do so, such as an estimator or a project engineer noting a revision to the drawing.
- Keep prints clean. Soiled prints are difficult to read and contribute to errors.
- Do not eat or drink near prints.
- Fold or roll prints carefully. Rolling is best.
- Do not lay sharp tools or pointed objects on prints.
- Keep prints out of direct sunlight except when using them. Prints will fade and deteriorate if left in the sun.
- When prints are not in use, store them in a clean, dry place.