Appendix P

ARCHITECTURE AND CONSTRUCTION
YOUTH APPRENTICESHIP

DESIGN/PRE-CONSTRUCTION PATHWAY
ARCHITECTURAL DRAFTING (UNIT 9)

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
1. Interpret technical drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Interpret technical drawings accurately as needed for job task
- Use appropriate terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:
- Discuss different types of architectural technical drawings
- Define the basic types of lines
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Demonstrate standard view placement practices
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Discuss the ANSI and AIA standards for architectural document lines
- Describe the standard usage of metric (SI) linear units in architectural drafting

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
2. Use measuring devices accurately

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Choose appropriate instrument or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Record measurements using proper symbols
- Clean and maintain instrument(s) as required
- Store instrument(s) properly

Learning Objectives:
- List drafting aids and measuring devices commonly used by architects
- List common measurements used by architects
- Add and subtract measurements
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Predict the effect of error propagation in calculations
- Explain the link between measurement, calculation and data with the correct number of significant digits

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
3. Organize databases, files and drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Select appropriate documents
- Code documents as required
- Save and store drawings and files to appropriate database
- Sort and retrieve drawings and data from databases
- Enter data and edit fields and documents
- Query to extract information from files and documents
- Create reports from queries
- Use appropriate computer codes, formatting, macros, charts, spreadsheets, etc.
- Verify data prior to entry/storage

Learning Objectives:
- Define basic database terms such as database, field, record, query, table, etc.
- Identify the various types of data and documents stored in your companies database management system
- Discuss the access and responsibilities you will have for managing architectural records and documents

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
4. Reproduce documents and plans

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain documents or plans
- Remove any staples if hard copy
- Save copies to computer storage devices
- Operate copy machines
- Operate printers, plotters, and scanners
- Number copies as required
- Document copies made

Learning Objectives:
- Explain the purpose of copy control and plan numbering systems
- Explain the size of drawings to standards
- Define U.S. customary architectural drawing sizes
- Define aspect ratio and how it applies to drawing sizes and copying
- Describe how to operate the computer database storage system, copy machine, printer, scanner, etc. at your facility

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
5. Compile site measurements and other date

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain survey information on building site from documented resources and survey measurements for architectural plans, specifications, cost estimates, reports, etc.
- ***Assist to research codes and site requirements***
- Identify the boundaries of a property based on its legal description
- Visit site to gather information pertinent to the viability of a project on the site
- Assist to measure building or lot if required
  - Take measurements of structures, distances, length, width, height, perimeter, and area
  - Determine elevations and contour lines
  - Establish a point of known elevation for a project
  - Read gauges and measurement instruments accurately
  - Document measurements accurately
- Identify measurements and elevations
- Use and report measurements correctly
- Schedule or conduct land/utility surveys
  - Arrange for evaluation of basic service and utility systems available including service capacity, service entrance, meter base, and distribution panel locations
  - Arrange for geological and geophysical investigations
  - Obtain soil samples and send for analysis
  - Arrange studies of water and utility needs
  - Arrange studies of air, water and solid waste pollution impact
  - Conduct studies of traffic patterns or environmental conditions to assess the potential impact of projects
  - Arrange for plant location surveys
  - Arrange for topographical surveys

Learning Objectives:
- Explain how to identify the boundaries of a property based on legal description
- Discuss the impact of zoning in site selection
- Explain how maps and aerial photos are used in site determination and measurement
- Explain how property lines, utilities, building line, setback, building corners, and elevation are indicated in land maps
- Explain general survey methods used to obtain site measurements
- Describe how elevation reference points and footing grades are established
- Discuss how GIS (Geographic Information Systems), GPS (Global Positioning Systems), and lasers are used to measure sites
- Describe criteria for building site selection
- List soil characteristics important to the design and construction of a building according

to the United Soil Classification System designation
- Describe the impact of passive energy, sustainability and landscaping on site selection
- Discuss hazards specific to building sites
- Discuss common methods for site preparation
- Explain the process for demolition of old structures prior to repair or new construction

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
6. Use architectural drafting software

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain and use appropriate reference materials
- Access and use appropriate file management to search, create, copy, edit, and save drawing files
- Execute application software
- Demonstrate view use in CAD
- Retrieve or create
  - Access predefined drawing setup
  - Import/export drawings from/to various graphic formats
  - Convert an existing hard copy drawing to an electronic format
- Draw or modify drawings
  - Utilize drawing management standards
  - Set up plot parameter
  - Select appropriate scale
  - Utilize various coordinate systems
  - Apply appropriate naming conventions, line types, and object management to drawing
  - Apply appropriate notes and/or leaders to drawing
  - Apply appropriate lettering, fonts, line thickness and type
- Check drawing
- Maintain drawings in appropriate project family in the file management system

Learning Objectives:
- Explain the purpose, principle, and advantages of Computer-Aided Drawing (CAD)
- Compare cost, advantages, and disadvantages of CAD versus Manual drawing
- Compare types of CAD used in Architecture, such as Revit
- Identify drafting references, handbooks, vendor's product catalog, and other related appropriate standards and how they are used in architectural drafting
- List appropriate architectural design standards used by your facility
- Describe the hardware components commonly found in a CAD workstation- the computer, the digitizer, and plotters and printers
- Compare architectural symbols, text based information, and libraries in the CAD software used in your facility
- Describe the feature manager design tree schematic for the CAD software you will use
- Discuss CAD plotting guidelines
- Define BIM and BIM features in architectural software, such as Revit

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
7. Develop 2D (orthographic) view drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain & use appropriate reference materials
- ***Use architectural drafting software*** OR draw manually
- Select proper views
- Identify types of lines to be used
- Determine and utilize line precedence
- Draw geometric shapes such as circles, polygons, ellipses, parabola, triangles of various angles, tangent lines, and arcs as needed
- Construct an orthographic drawing
- Show hidden features and centerlines as required
- Complete title block by selecting lettering style and size
- Apply proper thickness to all lines
- Check drawing
- Label and save to appropriate project family

Learning Objectives:
- Explain the alphabet of lines for drawing
- Explain the three dimensions and how they are represented for width, depth, and height
- Describe projection rules to create 2D sketches of 3D objects
- Define orthographic view
- Explain the purpose of orthographic views
- Compare types of 2D views
- Discuss the line types used in orthographic views
- Explain how orthographic projections are used in architecture
- Explain how to draw orthographic views and geometric constructions
- Identify common geometric shapes and forms by name
- List formulas used in geometric constructions

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
8. Develop 3D view models

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain & use appropriate reference materials
- ***Use architectural drafting software*** OR draw manually
- Select proper view
- Lay out view corner
- Identify types of lines to be used
- Determine and utilize line precedence
- Draw 3D view models
- Show hidden features and centerlines as required
- Complete title block by selecting lettering style and size
- Apply proper thickness to all lines
- Check drawing
- Label and save to appropriate project family

Learning Objectives:
- Compare 2D (orthographic) views to 3D model views
- Explain how the viewing direction for a 3D model is chosen
- Explain how to draw 3D models
- Explain the purpose of 3D model views
- Discuss the line types used in 3D model views

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
9. Dimension drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain & use appropriate reference materials
- ***Use architectural drafting software*** OR draw manually
- Select views to be dimensioned
- Dimension views
  - Draw dimension lines
  - Dimension views using appropriate style of dimensioning
- Continue until all features have been dimensioned
- Dimension complex shapes when appropriate (e.g., spheres, cylinders, tapers, pyramids)
- Apply appropriate line thickness and type to dimension, extension, and center lines
- Check drawing

Learning Objectives:
- Define proportion
- Explain architectural scale
- Describe how scales are indicated on technical drawings
- Define dimensioning in architecture
- Discuss the common rules for architectural dimensioning
- Discuss the basic parts of a dimension
- List common symbols used in dimensioning
- State the standard height of dimension numerals
- Specify common metric scales used in architectural drafting

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
10. Apply lettering and basic annotation to drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain & use appropriate reference materials
- ***Use architectural drafting software*** OR draw manually
- Add lettering
- ***Draw dimension*** and extension lines
- Apply adequate drawing notations
- Use appropriate abbreviations
- Apply finish marks
- Check drawing

Learning Objectives:
- Explain the importance of standardized lettering on architectural documents
- List types of architectural lettering
- Discuss common standards to use in lettering
- Discuss when to use dashed lines
- Describe general rules of the use of line weights
- Define annotation
- Explain the purpose of architectural annotations on technical drawings
- List common abbreviations used in annotations in architecture
- Distinguish specific (local) notes and general notes and placement in the drawing

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
11. Prepare working drawings

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain & use appropriate reference materials
- ***Compile site measurements & other data***
- ***Use architectural drafting software*** OR draw manually
- Draw required view(s) of structures, site layouts, elevations, &/or sections
- Follow guidelines for good drawing techniques
- Draw lines, angles, arcs, circles, and ellipses
- Draw in proportion
- ***Dimension drawing***
- ***Apply lettering & annotation***
- Check drawing

Learning Objectives:
- Describe the purpose of working drawings
- Compare working drawings to final drafts
- Describe the function of bubble drawings and scaled sketches
- Differentiate between the types of working drawings
- Explain the typical sequence in which drawings are created

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
12. Assist to research building codes and site requirements

Performance Standard Condition
Competence will be demonstrated
- at the worksite
- while assisting a worksite professional

Performance Standard Criteria
Performance will be successful when learners:
- Review the architectural plan with the worksite professional
- Identify site location, building systems, and structures designated in the architectural plan
- Consult with customers, engineers, construction professionals, landscape architects, environmental scientists and/or government officials
- Determine categories of applicable codes required by site, systems, and structures
- Locate resources to conduct code and site research
- Look up codes, zoning ordinances and regulations to determine the applicable requirements for a project
  - Research Land Use regulations to identify zoning designations and allowable uses of property
- Review research with worksite professional

Learning Objectives:
- Describe the resources and processes to be followed to research required codes and site restrictions at your facility
- Explain the purpose of building codes
- Recognize the potential dangers of built structures, particularly residences that do not follow code
- Identify the national codes typically used in the United States and know who is responsible for determining which code is applied to the design process
- Explain what an occupancy type is
- Classify a building according to its use, occupancy, and construction type using International Building Codes
- Discuss the Wisconsin energy code and code requirements
- Explain the general criteria for domestic light, ventilation, heating, and sanitation requirements
- Delineate the dimensional requirements for doors, halls, stairs, and rooms

Comments:

Unit 9: Design/Pre-Construction Pathway
Architectural Drafting Unit

Competency
13. Participate on an architectural design project

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Review the scope and phases of the design project with worksite professional
- Participate in the following project team activities to develop and implement the architectural plan as able
  - Identify customer requirements
  - Identify contractors and stakeholders required for the project
  - Develop preliminary sketches
  - Develop schedules
  - Investigate the legal, physical, and financial requirements of a project and consider the needs of the community to determine project viability
  - Estimate required resources and budget
  - Estimate supply quantities needed from plans
  - Estimate time requirements
  - Identify interdependencies
  - Identify critical milestones
  - Review contractor licenses
  - Establish and review contracts with contractors
  - Obtain permits and licenses
  - Coordinate work between trades
  - Track critical milestones
  - Track changes to architectural plans and costs
  - Report project status
- Periodically review architectural plan activities completed and their results

Learning Objectives:
- Explain the sequence of events for constructing buildings
- List the phases of the architectural planning process- initial contact, preliminary design studies, initial working drawings, final design considerations, completion of working drawings, permit procedures, and job supervision
- Explain the role of the engineer in an architectural planning process
- Describe how a building plan is developed from a technical drawing for schedule, materials and equipment
- Determine how construction activities interface with architectural planning
- Explain factors that need to be considered when estimating costs and budget
- Classify costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Apply basic math skills to calculate the quantity and cost of materials needed
- Explain the process for applying for a building permit
- Identify the components of building systems needed to complete a construction project

Comments: