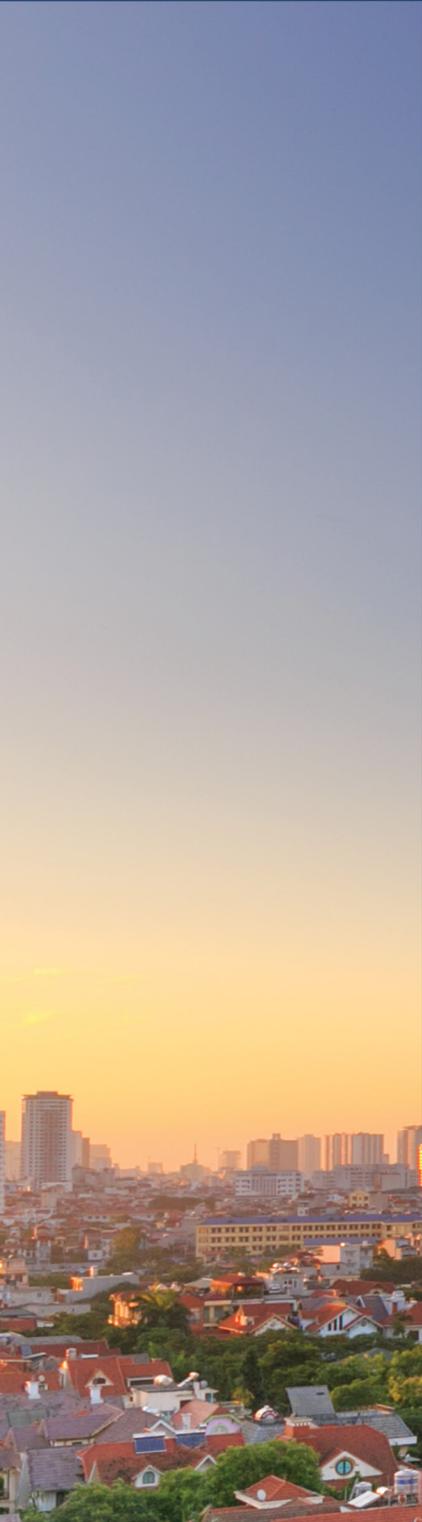




Drawings in Roofing



Lesson Plans for Instructors

Module 16103

16103

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Roofing

Lesson Plans for Instructors

Trainees with successful module completions may be eligible for credentialing through the NCCER Registry. To learn more, go to www.nccer.org or contact us at 1.888.622.3720. Our website, www.nccer.org, has information on the latest product releases and training.

Your feedback is welcome. You may email your comments to curriculum@nccer.org, send general comments and inquiries to info@nccer.org, or fill in the User Update form at the back of this module.

This information is general in nature and intended for training purposes only. Actual performance of activities described in this manual requires compliance with all applicable operating, service, maintenance, and safety procedures under the direction of qualified personnel. References in this manual to patented or proprietary devices do not constitute a recommendation of their use.

Overview

Construction drawings are used to represent a building and its components. Drawings provide specific information about the layout and parts of a structure and types of materials to be used. Roofers must be able to interpret construction drawings and documents and identify information needed to install a roof system.

Learning Objective 1

Successful completion of this module prepares trainees to:

Identify drawings found in a drawing set, including their fundamental components and features, and describe how construction documents are used in a roofing project.

- a. Identify various types of construction drawings.
- b. Identify and describe the basic components of construction drawings.
- c. Identify and describe various drawing elements and explain the use of dimensions and drawing scales.
- d. Explain how to find roof details and information about a roofing project using construction documents.

Performance Tasks

This is a knowledge-based module. There are no Performance Tasks.

Recommended Teaching Time: 10 hours

Interim Credentials: This curriculum provides the opportunity to earn interim credentials, which offer multiple training pathways in a specific occupational area of roofing.

This Lesson Plan (LP) is divided into sections that correspond to the sections in the Trainee Guide module. As you plan your class times, review the objectives, content, and lesson plan outline for the section you plan to teach. Allow sufficient class time for demonstrations, laboratories, field trips, and testing. Each class period should also include time for administrative tasks and periodic breaks.

Be sure to gather the required equipment, materials, visual aids, and answer keys. Using your access code, download the PowerPoint® presentations and Performance Sheets for this module from NCCER's Instructor Resource Center at www.nccerirc.com.

It is advisable to assign the reading of a module section prior to the classroom instruction. The Section Review and Module Review questions may be assigned as homework. At their discretion, instructors may assign additional homework to meet the teaching objectives.

Performance Testing may be administered at any suitable time in the course of the module training. Tasks are graded pass/fail. Trainee performance and proficiency during practice sessions that meets or exceeds the standards for a task can be accepted as Performance Task completion. Complete the Performance Profile Sheet for each trainee.

The final class is generally reserved for a brief review and the Module Examination. For information and updates about accessing the Module Examinations, visit www.nccer.org/testing. The passing score for submission into NCCER's Registry is 70 percent or above for the Module Exam. Record the testing results for each trainee on the Registration of Training Modules form and submit the form to the Training Program Sponsor.

Prerequisites

Core

Safety Considerations

This module will likely be taught exclusively in the classroom environment. However, instructors may teach or demonstrate portions of it in the shop or in the vicinity of functioning equipment. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to the hazards of energized and operating systems. Any work performed on functioning equipment must be completed under the direct supervision of the instructor.

Classroom Equipment and Materials

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 16103
- A variety of standard marker sizes

- Poster board
- Flip chart
- LCD projector and screen
- Computer with internet access
- Module Review answer key
- Module Examinations

Instructional Methods

Instructional methods research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The PowerPoint® presentation that you received with this lesson plan is keyed to the sections of the Trainee Guide indicated below and has been designed for use with this Lesson Plan.

Additional Resources

This module presents thorough resources for task training. The following reference materials are recommended for further study.

National Roofing Contractors Association (NRCA), www.nrca.net.

NCCER Module 00105, *Introduction to Construction Drawings*.

There are a number of online resources available for trainees who would like more information about the module topic. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide examples of both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Numerous videos related to the topic are available on the Internet. These can be located by using various search terms relevant to the topic, then selecting the Video tab on the results page of your preferred search engine.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.

Section One

Construction Documents and Drawings

Objective

Successful completion of this module prepares you to do the following:

Identify drawings found in a drawing set, including their fundamental components and features, and describe how construction documents are used in a roofing project.

- a. Identify various types of construction drawings.
- b. Identify and describe the basic components of construction drawings.
- c. Identify and describe various drawing elements and explain the use of dimensions and drawing scales.
- d. Explain how to find roof details and information about a roofing project using construction documents.

Kickoff Activities

Ask the trainees what kind of information they would expect to find on a set of construction drawings. Create a list containing all the items mentioned, as well as any important items the trainees may have missed. Use the list to highlight the importance of having an accurate and comprehensive set of plans before beginning construction. Point out the obvious problems that would occur if the contractors responsible for different portions of the construction project were not all using the same plans.

Sections 1.0.0–1.1.5

Introduce the topic of construction documents and drawings. Discuss the use of CAD to generate 3D virtual models and review the Trade Terms.

Refer to *Figure 1* and describe the layout of a typical set of drawings. Review the letter designations for each type of drawing in a set.

Refer to *Figure 3* and discuss the information typically found on civil plans.

Discuss the information typically found on architectural plans. Using *Figures 5–7*, explain how the information found on the roofing plan is used by the roofing contractor to ensure the roof is constructed according to specifications.

Discuss the information found on structural plans. Emphasize the information pertinent to a roofing project.

Discuss the information typically found on MEP plans. Explain how mechanical and electrical systems may affect a roofing project.

Discuss the information found on fire protection plans.

Sections 1.2.0–1.2.4

Briefly discuss the basic components contained in a set of drawings.

Discuss the information found on title sheets, title blocks, and revision blocks. Stress the importance of checking to make sure you are always using the most recent revision.

Explain how section and detail drawings are used to clarify particulars.

Discuss the information typically found on schedules.

Discuss the information typically found in the notes, abbreviations, and legends.

Sections 1.3.0–1.3.1

Briefly explain how dimensions and scale are used to ensure that plans are an accurate representation of the designed structure.

Reference *Figure 14* and discuss the various ways dimensions may be indicated on a drawing. List some of the scales commonly used in drawings.

Teaching Tip

Refer trainees to the feature titled “Scaling Drawings.” Explain how to calculate the true length of an object using the scale. For a scale of $\frac{1}{4}'' = 1'$, every inch is equivalent to 4'. So, in this example, $6'' \times 4' = 24'$.

Remind trainees that they can also use an architect’s scale to measure and convert it. If possible, bring an architect’s scale to show them.

Sections 1.3.2–1.3.3

Using *Figures 15–20*, identify the common symbols appearing in a set of drawings and the materials or items they represent.

Refer to *Figure 21* and review the description of each line shown.

Teaching Tip

Conduct a short quiz. Have the trainees identify some of the symbols covered in this section. Using the figures from the text, without captions, call on different trainees to name the material or item signified by the symbol. See how many symbols the trainees can correctly identify. Consider offering a small prize to the trainee who is able to correctly identify the most.

Sections 1.4.0–1.4.3

List the items typically found in the roofing project documents and discuss the information contained in each.

Explain how construction documents are used in a new construction roofing project. Review the steps for finding the needed information in a drawing set. Discuss the information found in project specifications. Refer to *Figure 26* and discuss the layout of MasterFormat[®] groups, subgroups, and divisions.

Review the steps for creating a roof replacement plan.

Discuss the use of building information modeling (BIM) and explain the benefits of BIM.

Audiovisual

Locate and show a short YouTube video titled “What is BIM and How it is Changing the Construction Industry”. This 8:14 video, uploaded by Explorist, offers a good introduction to BIM technology. This video will help the trainees to understand what BIM is, how it is used by construction professionals, and the advantages of using BIM.

Wrap-Up Activities

Test the trainees' ability to locate and correctly identify components and information from a drawing set. Divide the trainees into groups of three or four. Provide each group with a set of drawings. Assign each group a few items and pieces of information to locate in the drawings. Examples may include specific building features/dimensions, location of mechanical equipment, and types of material to be used for specific building components. To complete this task, the trainees will need to know the correct drawing type to look in and be able to decipher symbols and lines. This activity should help to reinforce the information covered in this section.

Laboratories/Performance Tasks

This is a knowledge-based module. There are no Performance Tasks.

Review and Testing

Module Review

Have the trainees complete the Review Questions and Trade Terms Quiz at the end of the module, if applicable. Alternatively, if this was assigned as homework, have them retrieve their answers. Go over the answers prior to administering the Module Examination. Ask the trainees if they need clarification of any particular knowledge areas.

Examination

Administer the Module Examination. Remind the trainees that they must answer at least 70 percent of the questions correctly to pass the Module Examination.

Wrap-Up Activities

Ask the trainees if there were any trouble areas on the exam. Ask each trainee about their favorite and least favorite parts of the module. As an alternative or if time allows, briefly introduce the next topic in your planned teaching sequence.

Instructor

The results for exams administered through the Testing Management System are recorded automatically in the NCCER Registry System.

Answer Keys

Section Review Answer Key

Section 1.0.0

Answer	Section Reference	Objective
1. c	1.0.0	1
2. d	1.2.1	1b
3. a	1.3.3	1c
4. b	1.4.1	1d

Module Review Answer Key

Answer	Section Reference
1. a	1.1.0
2. d	1.1.1
3. c	1.1.2
4. a	1.1.5
5. b	1.2.1
6. d	1.3.1
7. a	1.3.2
8. c	1.3.3
9. a	1.4.1
10. c	1.4.1

Trade Terms Quiz Answer Key

1. Computer-aided drafting (CAD)
2. Flashings
3. Drawing set
4. Riser diagram
5. As-built drawings
6. Nominal size
7. Reroofing
8. Takeoff
9. Detail drawings
10. Project manual
11. Copings
12. Schedules
13. Purlins
14. Legend
15. Building information modeling (BIM)
16. Record drawings