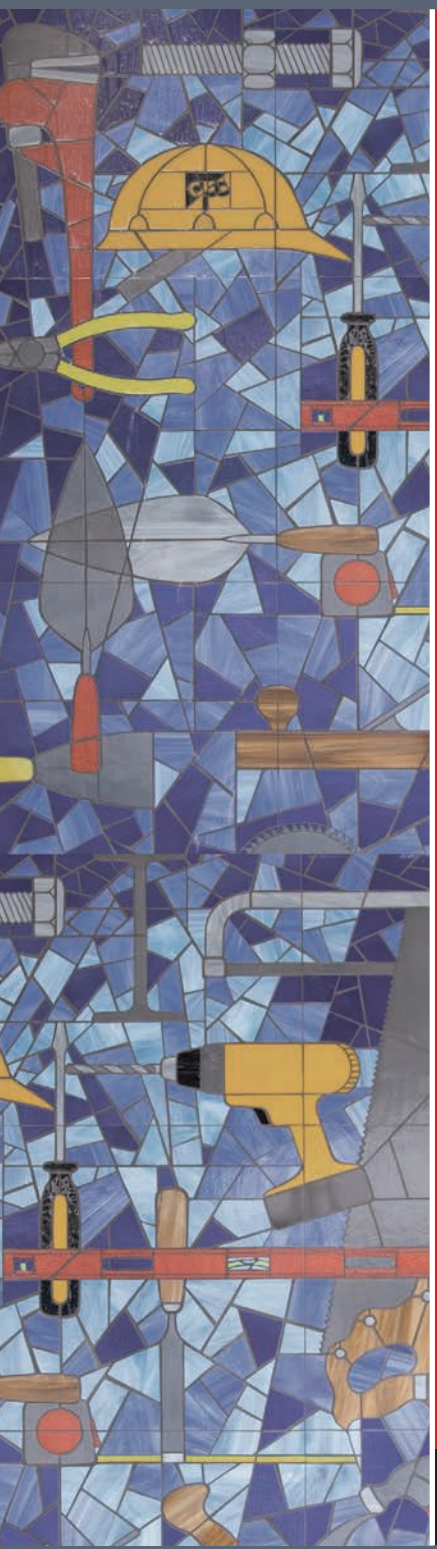
00105-15

Introduction to Construction Drawings





Core Curriculum

Lesson Plans for Instructors

Module Five

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 has information on the latest product releases and training, as well as online versions of our *Cornerstone* magazine and Pearson's product catalog.

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.

Copyright © 2015 by NCCER, Alachua, FL 32615, and published by Pearson Education, Inc., New York, NY 10013. All rights reserved. Printed in the United States of America. This publication is protected by Copyright, and permission should be obtained from NCCER prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise. To obtain permission(s) to use material from this work, please submit a written request to NCCER Product Development, 13614 Progress Blvd., Alachua, FL 32615.



From *Core Curriculum,* Fifth Edition. NCCER.
Copyright © 2015 by NCCER. Published by Pearson Education. All rights reserved.

Lesson Plans for Module 00105-15

Introduction to Construction Drawings

Module Five (00105-15) provides trainees with the information and skills needed to read and understand construction drawings. This module includes a set of four oversize drawings, which is included as an *Appendix* in the Trainee Guide. The drawings are also available for download from **www.nccerirc.com**.

Objective

Learning Objective 1

- Identify and describe various types of construction drawings, including their fundamental components and features.
  a. Identify various types of construction drawings.
  b. Identify and describe the purpose of the five basic construction drawing components.
  c. Identify and explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.
  d. Identify and explain the use of dimensions and various drawing scales.
  e. Identify and describe how to use engineer's and architect's scales.

Performance Task

Performance Task 1

(Learning Objective 1)

- Using the floor plan supplied with this module:
  – Locate the wall common to both interview rooms.
  – Determine the overall width of the structure studio.
  – Determine the distance from the outside east wall to the center of the beam in the structure studio.
  – Determine the elevation of the slab.

Teaching Time: 10 hours

(Four 2.5-Hour Classroom Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites

Core Curriculum Modules 00101-15; 00102-15; 00103-15; and 00104-15.

Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the written examinations and performance profile sheets from **www.nccerirc.com**. The passing score for submission into NCCER's Registry is 70% or above for the written examination; performance testing is graded pass or fail.

Safety Considerations

There are no safety considerations for this module.

Classroom Equipment and Materials

Whiteboard/chalkboard

Markers/chalk

Pencils and paper

Core Curriculum PowerPoint® Presentations

DVD player

LCD projector and screen

Computer

Internet access during class (*optional*)

Copies of the Module Examination and Performance Profile Sheets

Equipment and Materials for Laboratories and Performance Testing

Drawing set supplied with this module

Complete drawing package for a typical residence or similar simple structure

Calculators

Architect's scales

Engineer's scales

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.

Blueprint Reading for Construction, James Fatzinger. 2003. Upper Saddle River, NJ: Prentice Hall.

Blueprint Reading for the Construction Trades, Peter A. Mann. 2005. Ontario, Canada: Micro-press.com.

Construction Blueprint Reading. 1985. Robert Putnam. Upper Saddle River, NJ: Prentice Hall.

Reading Architectural Plans for Residential and Commercial Construction, Ernest R. Weidhaas. 2001. Englewood Cliffs, NJ: Prentice Hall Career & Technology.

Reading Architectural Work Drawings, Edward J. Muller; Phillip A. Grau III. 2003. Upper Saddle River, NJ: Prentice Hall.

Autodesk, 1 Market St, Suite 500, San Francisco, CA 94105, USA; 3D design, engineering and entertainment software and parent company of the AutoCAD software suite. **www.autodesk.com**.

Datacad, P.O. Box 815, Simsbury, CT 06070, USA. Windows-based CADD solutions. **www.datacad.com**.

There are a number of on-line resources available for trainees who would like to learn more about construction drawings. 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 teachable moments in 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.

Instructors are 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.

Session Outline for 00105-15

Introduction to Construction Drawings

The Lesson Plan for this module is divided into four 2.5-hour sessions.
This time includes 10 minutes for administrative tasks and a 10-minute break per session.

Session One

Session One identifies and describes fundamental components and features of construction drawings.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to familiarize trainees with a complete set of construction drawings.
3. Introduce the different types of construction drawings.
4. Present and discuss the five basic components of construction drawings.

Session Two

Session Two presents drawing elements such as lines and symbols. Various measuring scales are also introduced.

1. Show the Session Two PowerPoint® presentation.
2. Emphasize the significance of drawing elements in accurately interpreting construction drawings.
3. Discuss the use of dimensions and drawing scales.
4. Explain how to use engineer's and architect's scales to measure size and distance on construction drawings.

Session Three

Session Three is a laboratory devoted to practicing the use of construction drawings and the completion of Performance Task 1.

1. Note that there is no PowerPoint® presentation associated with this session.
2. Demonstrate how to use and interpret construction drawings to locate walls and determine width, distance, and elevation of various structures.
3. Trainees practice and/or complete the tasks associated with Performance Task 1 in this hands-on session.

Session Four

Session Four is a review and testing session. Have trainees complete the Module Review and Trade Terms Quiz. Alternatively, if the Module Review and Trade Terms Quiz were assigned as homework, review the correct answers in class prior to the exam and answer any questions that the trainees may have.

1. Have trainees complete the written examination. Any outstanding performance testing must be completed during this session as well.
2. Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.

Materials Checklist for Module 00105-15, Introduction to Construction Drawings

Equipment and Materials					
Personal protective equipment:		Calculators			
None		Architect's scales			
Whiteboard/chalkboard		Engineer's scales			
Markers/chalk		Drawing package supplied with the Trainee Guide module			
Pencils and paper					
Core Curriculum PowerPoint® Presentation Slides		Complete drawing package for a typical residence or similar simple structure			
DVD player					
LCD projector and screen					
Computer					
Internet access during class (*optional*)					
Copies of the Module Examination and Performance Profile sheets					

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.

Safety Considerations

No safety considerations are in order for this session.

Safety Equipment

The use of specific safety equipment is not anticipated during this session.

Classroom and/or Lab Equipment

Drawing package supplied with this module
Complete drawing package for a typical residence or similar simple structure

Resources

No specific resources are required for this session

Kickoff Activity

Spend some time reviewing a complete set of construction drawings to familiarize trainees with the topic and build interest. The set of plans should be complete but for a relatively simple structure, such as a home. The goal of this exercise is to help trainees better understand the layers of construction drawings.

Session Objective

When trainees have completed this session, they should be able to do the following:

1. Identify and describe various types of construction drawings, including their fundamental components and features.
   a. Identify various types of construction drawings.
   b. Identify and describe the purpose of the five basic construction drawing components.

Session Performance Requirements

Trainees will not complete a Performance Task during this session.

Instructional Outline

Research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The *Core Curriculum* 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.

Classroom: Sections 1.0.0–1.1.0

Discuss the history of plans, such as the origin of blueprints and the development of CAD. Explain what construction drawings are and how they work together with specifications.

Review the figure and discuss the various categories of plans.

Classroom: Section 1.1.1

Discuss the different names for a civil plan. Explain that a site must be considered practical for a structure before construction can begin. Using the figure, point out the contour lines and explain their purpose. Discuss the information found on a landscape plan.

Classroom: Section 1.1.2

Explain what an architectural plan is. Have the trainees examine *Drawing 1*, First Floor Plan, in the drawing package during the discussion. Explain that there are various types of architectural plans. Discuss the components of the roof plan. Using the figure, point out the elements of an exterior elevation plan. Display the figure of the section drawing and compare the information contained in the exterior elevation figure. Define a detail drawing and describe where they can often be found. Discuss the information found in finish schedules. Point out that while schedules are not drawings, they are still part of a complete package.

Classroom: Section 1.1.3

Explain the purpose of structural plans. Describe the information found on a foundation plan. Have trainees refer to *Drawing 2*, Roof Framing Plan, in the drawing package as you talk about the information found on this type of drawing. Talk about the various building elements that are part of its supportive structure and are therefore part of the structural drawing package.

Classroom: Section 1.1.4

Explain the purpose of mechanical plans. Review the information found on a mechanical legend and list of abbreviations. Explain the purpose and content of P&IDs. Point out they are not drawn to scale and do not indicate compass directions. Discuss what information HVAC plans provide. Present the HVAC drawings and discuss the information they contain. Discuss the information provided by a mechanical detail drawing.

Classroom: Section 1.1.5

Discuss the information found on plumbing plans. Explain how plumbing isometric drawings work in conjunction with other plumbing plans.

Classroom: Section 1.1.6

Describe the contents of electrical plans. Discuss when separate plans are used and describe their level of detail. Point out the information found in the general notes. Use the figures to show the information found on lighting, power, and panel plans. Review the information found on an electrical legend and electrical list of abbreviations.

Classroom: Section 1.1.7

Have trainees refer to *Drawing 4*, First Floor Fire Protection Plan in the drawing package and discuss the contents. Describe the different types of fire protection plans that are generally required.

Classroom: Sections 1.2.0–1.2.3

Briefly review the common components of a construction drawing.

Point out the location of the title block and what it contains. Review the contents of a typical title block. Point out that title blocks may differ somewhat from company to company.

Explain the purpose of the drawing border.

Explain the purpose of the drawing area.

Classroom: Sections 1.2.4–1.2.5

Discuss the purpose of a revision block. Emphasize that the current revision must always be used. Ask the trainees to give examples of how using an earlier revision could affect the project.

Explain the purpose of a legend. Point out that a legend is drawing-specific.

Wrap Up

Review the Trade Terms covered in this session. Each definition will appear on the accompanying PowerPoint® slide. Have the trainees provide the proper term for each definition. The terms will appear one at a time as you advance the presentation.

Homework

Assign the reading of Sections 1.3.0 through 1.5.3. Have trainees complete the 1.0.0 Section Review.

Safety Considerations

No safety considerations are required for this session.

Safety Equipment

The use of specific safety equipment is not anticipated during this session.

Classroom and/or Lab Equipment

Drawing package supplied with this module

Resources

No specific resources are required for this session.

Session Objective

When trainees have completed this session, they should be able to do the following:

1. Identify and describe various types of construction drawings, including their fundamental components and features.
   c. Identify and explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.
   d. Identify and explain the use of dimensions and various drawing scales.
   e. Identify and describe how to use engineer's and architect's scales.

Session Performance Requirements

Trainees will not complete a Performance Task during this session.

Instructional Outline

Research has shown that varying instructional methods periodically throughout class sessions helps to engage and hold trainees' attention. The *Core Curriculum* 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.

Review

Review the answers to the 1.0.0 Section Review.

Classroom: Sections 1.3.0–1.3.1

Explain the purpose of standardized drawing elements.

Use the figure to identify the various types of drawing lines and their meaning.

Classroom: Sections 1.3.2–1.3.3

Discuss the need for abbreviations and symbols on a drawing. Review common abbreviations used on drawings. Emphasize that each trade has its own symbols. Ask the trainees why it is important to understand the symbols used by other trades. Review common symbols used on various drawing types. Describe what a key note is and how it is used.

Explain how drawing gridlines are used in the same manner as those found on larger maps. Point out why certain numbers and letters are omitted.

Classroom: Sections 1.4.0–1.4.1

Introduce the concept of dimensioning and drawing scales.

Describe how dimensions are generally shown on a drawing. Use the figure to show how two dimensions can easily be misunderstood. Stress the importance of accurate measurements.

Classroom: Section 1.4.2

Explain the purpose of a drawing scale and where that information is found. Discuss factors related to the choice of a drawing scale. Define the acronym NTS and point out the cautionary statement.

Classroom: Sections 1.5.0–1.5.1

Point out that measuring scales are used by draftsmen to create drawings, and by drawing users to determine actual distances based on the drawing scale.

Describe the use of an architect's scale. Discuss the measurements depicted on the scale. Explain how to read an architect's scale.

Classroom: Section 1.5.2

Discuss how metric architect's scales are calibrated. Explain how it is determined whether the millimeter or meter is used and when kilometers are used. Explain how to properly use the metric architect's scale.

Classroom: Section 1.5.3

Discuss the uses of an engineer's scale. Discuss how the scale is set up for measurements in comparison to the architect's scale. Explain how to read and use the engineer's scale.

Wrap Up

Review the Trade Terms associated with this session to reinforce the content. Ask trainees to identify any terms that were new to them or meant something different than they expected. Ask trainees if they have any questions about construction drawings in general. Review material as required to clear up any misunderstandings.

Homework

Have trainees review the complete module to prepare for the upcoming laboratory and practice session.

Safety Considerations

No safety considerations are required for this session.

Safety Equipment

The use of specific safety equipment is not anticipated during this session.

Classroom and/or Lab Equipment

Drawing package supplied with the Trainee Guide module
Calculators
Architect's scales
Engineer's scales

Resources

No specific resources are required for this session.

Session Objective

This session is intended to support and emphasize Learning Objective 1.

Session Performance Requirements

By the end of this session, trainees should have completed, or be able to complete, the following Performance Task under the supervision of the instructor:

Using the floor plan supplied with this module:

- Locate the wall common to both interview rooms.
- Determine the overall width of the structure studio.
- Determine the distance from the outside east wall to the center of the beam in the structure studio.
- Determine the elevation of the slab.

Instructional Outline

This laboratory is devoted to practicing the use of construction drawings and the completion of Performance Task 1 required for this module. As a result, no PowerPoint® slides have been developed for this session.

Demonstration

Using the plan set supplied with this module, demonstrate how to use the plans and a measuring scale to find out needed information, such as the dimensions of a component or the distance from one component to another. Demonstrate the importance of using the correct measuring and drawing scale to determine accurate information.

Laboratory/Performance Task

Under your direct supervision, have trainees use the plan set supplied with the Trainee Guide and demonstrate their understanding of the module through the following:

Locate the wall common to both interview rooms.

Determine the overall width of the structure studio.

Determine the distance from the outside east wall to the center of the beam in the structure studio.

Determine the elevation of the slab.

This activity corresponds to Performance Task 1.

Wrap Up

Gather the trainees together. Ask trainees if they have any questions about what they experienced during this laboratory. Review any deficiencies in procedures that were observed during the process. Also provide positive feedback for good practices that were demonstrated. Remind trainees that as they spend time on the job, they will become more comfortable using construction drawings.

Homework

Assign a review of the complete module to prepare for the upcoming exam. It is further suggested that trainees be assigned both the Module Review and Trade Terms Quiz as homework.

Review and Testing

This session is reserved for a brief review of the module, administering the module examination, and any incomplete performance testing.

Safety Considerations

No safety considerations are required for this session.

Safety Equipment

The use of specific safety equipment is not anticipated during this session.

Classroom and/or Lab Equipment

Copies of the Performance Profile sheets and Module Examination

Have the Module Review and Trade Terms Quiz answer keys available for review prior to administering the module exam.

Resources

No specific resources are required for this session.

Review

Ask the trainees if they wish to review any particular information from the module. Have the trainees complete the Module Review and Trade Terms Quiz. Alternatively, if the Module Review and Trade Terms Quiz were assigned as homework, have them retrieve their answers. Review the answers to the Module Review and Trade Terms Quiz prior to administering the module exam. Ask again if the trainees need clarification on any particular knowledge areas.

Examination and Performance Testing

Administer the Module Exam. Allow one to two minutes per test item for the written exam. As they begin, remind trainees that they must answer at least 70 percent of the questions correctly to pass the module exam.

Administer any outstanding performance tasks and complete the Performance Profile Sheet for each trainee.

Wrap Up

Ask the trainees if there were any trouble areas on the exam and to identify a favorite and least favorite part of this module. As an alternate or if time allows, briefly introduce the next topic in your planned teaching sequence.

Homework

Assign the reading of the next module in the teaching sequence.

Instructor

Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.

SECTION REVIEW ANSWER KEY

SECTION 1.0.0

Answer		Section Reference	Objective
1.	b	1.1.1	1a
2.	c	1.2.4	1b
3.	d	1.3.2	1c
4.	a	1.4.2	1d
5.	b	1.5.1	1e

Answer Keys

ANSWERS TO REVIEW QUESTIONS

	Answer	Section Reference
1.	c	1.1.4
2.	d	1.1.6
3.	a	1.2.1
4.	c	1.2.4
5.	a	1.3.1
6.	b	1.3.3
7.	d	1.4.1
8.	c	1.4.2
9.	d	1.5.2
10.	b	1.5.3

ANSWERS TO TRADE TERMS QUIZ

1. Elevation drawing
2. Dimension line
3. Architect
4. Architectural plans
5. Structural plans
6. Civil plans
7. Computer-aided drafting (CAD)
8. Contour lines
9. Detail drawings
10. Engineer
11. Electrical plans
12. Beam
13. Piping and instrumentation drawings (P&IDs)
14. Elevation (EL)
15. Symbol
16. Floor plan
17. Schematic
18. Foundation plan
19. HVAC (heating, ventilating, and air conditioning)
20. Not to scale (NTS)
21. Hidden line
22. Plumbing isometric drawing
23. Metric scale
24. Leader
25. Specifications
26. Legend
27. Mechanical plans
28. Section drawing
29. Architect's scale
30. Roof plan
31. Scale
32. Plumbing plans
33. Title block
34. Blueprints
35. Fire protection plan
36. Engineer's scale

NCCER CURRICULA — USER UPDATE

NCCER makes every effort to keep its textbooks up-to-date and free of technical errors. We appreciate your help in this process. If you find an error, a typographical mistake, or an inaccuracy in NCCER's curricula, please fill out this form (or a photocopy), or complete the online form at **www.nccer.org/olf**. Be sure to include the exact module ID number, page number, a detailed description, and your recommended correction. Your input will be brought to the attention of the Authoring Team. Thank you for your assistance.

Instructors – If you have an idea for improving this textbook, or have found that additional materials were necessary to teach this module effectively, please let us know so that we may present your suggestions to the Authoring Team.

NCCER Product Development and Revision
13614 Progress Blvd., Alachua, FL 32615

Email: curriculum@nccer.org
Online: www.nccer.org/olf

❑ Trainee Guide ❑ Lesson Plans ❑ Exam ❑ PowerPoints Other _____

Craft / Level: Copyright Date:

Module ID Number / Title:

Section Number(s):

Description:

Recommended Correction:

Your Name:

Address:

Email: Phone: