



# Curriculum Catalog

2025

Standardized, competency-based  
curricula for construction professionals

Built For Industry, **By Industry.**



## NCCER's catalog is digital!

A compiled PDF of all crafts is available on the Instructor Portal at [www.nccer.org/instructors](http://www.nccer.org/instructors). In addition, craft listings with modules for each level are available as downloadable PDFs on each of the individual craft webpages, found at [www.nccer.org/crafts](http://www.nccer.org/crafts).

Stay up-to-date with all NCCER news  
by signing up for our mailing list at  
**[WWW.NCCER.ORG/JOIN-MAILING-LIST](http://WWW.NCCER.ORG/JOIN-MAILING-LIST)**

**Check pages 2-3 for ordering information.**

Pearson Education Directors' contact information can be found on page 4.

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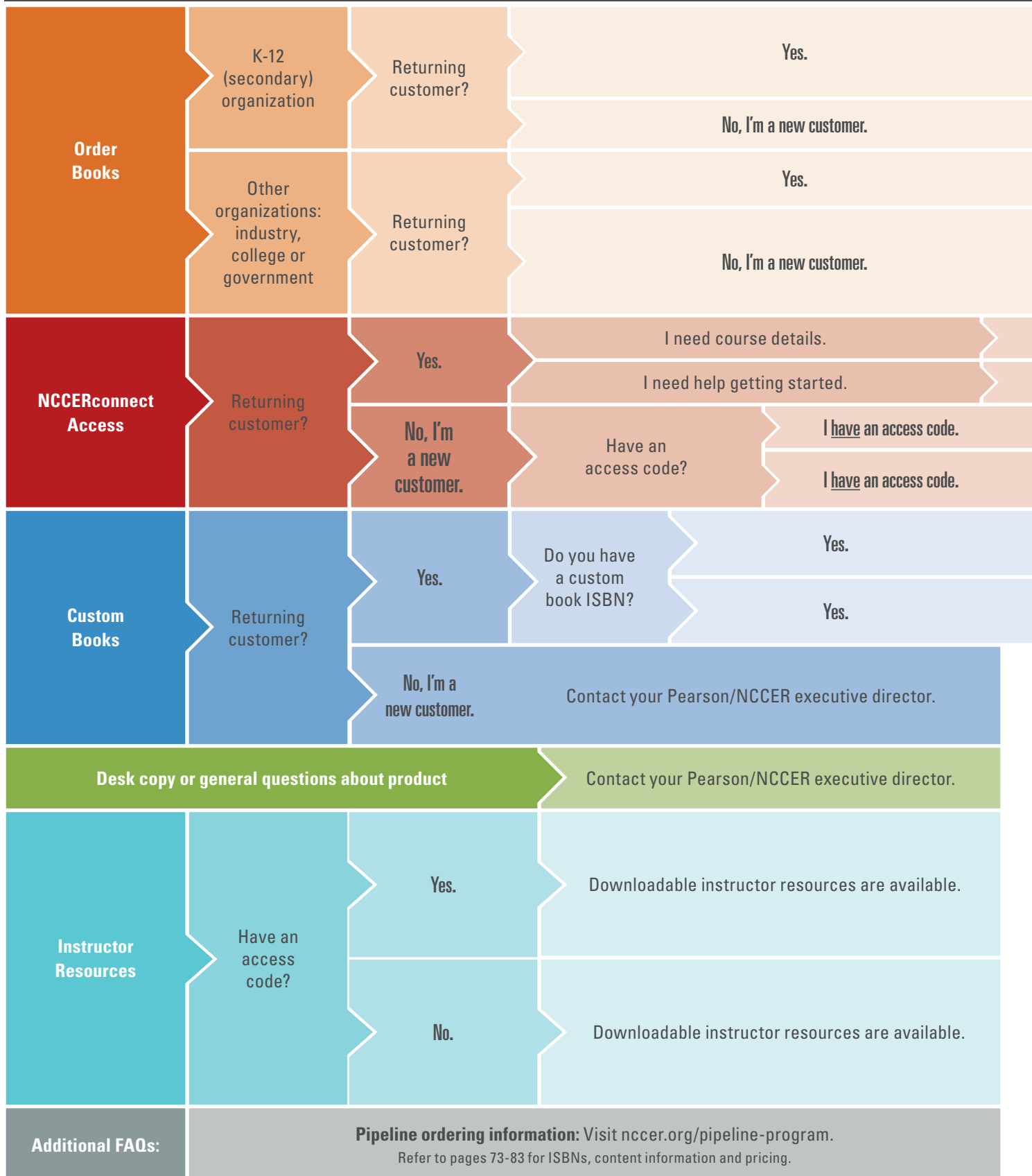
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# HOW TO ORDER





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**Note:** First time business customers need to provide information to verify the business they work for and fill out a credit application. You will receive your 11-digit Pearson account number and order confirmation via email within 48-72 hours of the call. **An account can only be opened when placing an order.**

Visit [nccerconnect.com](http://nccerconnect.com) and sign in. Click the gear button on your active courses to get course details.

Visit [nccerconnect.com](http://nccerconnect.com) and click the Get Support button located in the light green bar.

Visit [nccerconnect.com](http://nccerconnect.com) and click register.

Contact your Pearson/NCCER executive director.

See orange section above for ordering information, you will need to provide the custom book ISBN.

Visit [pearsonhighered.com/collections](http://pearsonhighered.com/collections) to create a custom book. A custom book ISBN will be created and sent to you via email within 48-72 hours of creating your book.

## Ordering and Customer Service

### Module Orders

Individual modules are printed on demand. Please allow two to three weeks for fulfillment and delivery. Modules are not returnable.

### Pricing

All prices listed in this catalog reflect net pricing available to schools, government, business and industry accounts. No additional discounts are available. Prices are subject to change without notice.

### Shipping and Postage

Shipping costs are based on a number of factors including weight, destination and type of service. All orders are subject to approximately 8%-10% shipping cost on total order. State and local taxes will be added where they apply.

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Invoices are generated only after items have shipped. You may receive multiple invoices on one purchase order if items are backordered and/or not yet published. Drop shipments to other locations are accompanied by a packing slip. This is not an invoice and should not be paid. Only the "Bill to" account will be invoiced.

### Returns Policy

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Check out the online catalog at [www.nccer.org/bookstore](http://www.nccer.org/bookstore)

### Pearson Credit Department

For payment inquiries call: 800-232-6556

### NCCERconnect Support

<https://www.pearson.com/us/higher-education/products-services-teaching/distance-learning-solutions/nccerconnect/support.html>

### International Orders

Phone: 800-635-3889

Email: [intlcs@pearsoned.com](mailto:intlcs@pearsoned.com)



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## Thank You

NCCER would like to thank the Subject Matter Experts from the following companies who provided their expertise and assistance in developing and revising this year's curricula.

ABC Anaheim  
ABC Eastern Pennsylvania-Lehigh Valley  
ABC Florida Gulf Coast  
ABC Greater Baltimore  
ABC Keystone  
ABC of Iowa  
ABC of the Carolinas  
ABC of Western Pennsylvania  
ABC Pelican  
ABC San Diego  
Bay Alarm Co.  
Beacon Electrical Contractors  
Brian Cox Mechanical  
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University of Florida, ME Rinker Sr. School of Construction Management  
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## Your NCCER Online Solution!

NCCERconnect fosters learning within and beyond the classroom through a media rich eText and a course management system.

Learning no longer needs to take place between the front and back covers of the textbook. Students are online—on their smartphones, tablets and laptops—from the instant they roll out of bed until the minute they turn in each night. Every moment is an opportunity to connect, experience and learn.

### Highlights of this fully integrated learning program:

- **Gradebook:** A robust gradebook allows you to see multiple views of your classes' progress. Completely customizable and exportable, the gradebook can be adapted to meet your specific needs.
- **Multimedia Library:** Students and instructors can quickly search through resources and find supporting media.
- **Pearson eText:** Rich media options let students watch example videos as they read or do homework.
- **Course Management:** A full suite of course management features including email, document uploading, announcements, gradebook and instructor tools.

## NCCERconnect

NCCERconnect is currently available with eText for the following crafts:

- Carpentry
- Construction Technology
- Core
- Electrical
- Electronic Systems Technician
- Fundamentals of Crew Leadership
- Heavy Equipment Operator
- HVAC
- Intro to Solar Photovoltaics
- Masonry
- Plumbing
- Welding

For the most up-to-date information, including ordering information, visit

[www.nccer.org/onlineolutions](http://www.nccer.org/onlineolutions)

## Pearson Collections

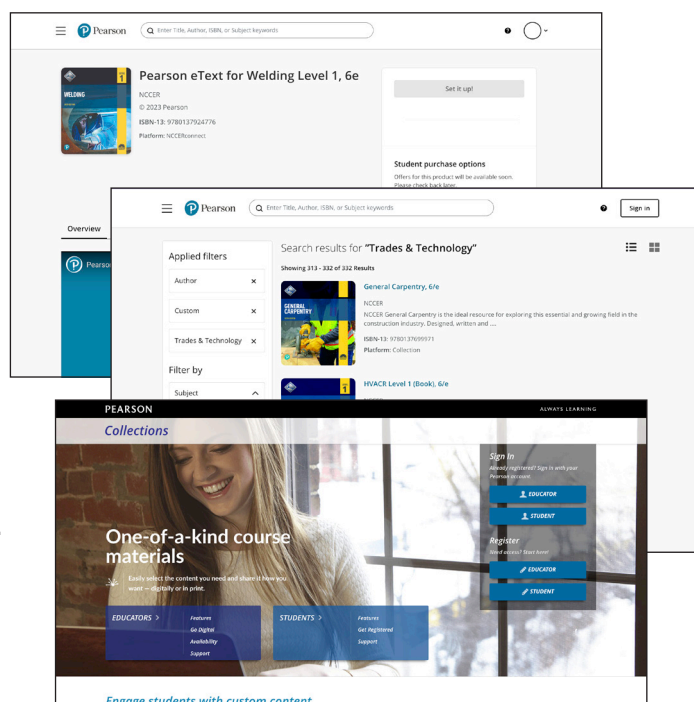
Select your ideal content, align it with your syllabus, then publish and share with your students.

**Search:** Collections, the Pearson custom library, includes all of our NCCER titles. You can freely mix and match between any craft areas.

**Create:** Select modules from any of our NCCER titles and add them to a customized book that meets your needs.

**Preview:** You can preview your Collection online at any time. Review the content and either make edits yourself or contact our team to help with the changes.

For more information on this service, visit [www.nccer.org/collections](http://www.nccer.org/collections).



## Product Design and Supplements

Each craft area comprises successive levels, and each level comprises individual units of study called modules. Modules can be treated as separate task-training units because each one contains objectives as well as knowledge and performance tests. Instructors may teach a single module or the entire craft level and even customize their own training programs by combining modules across various craft areas. Customization is easy and cost-effective.

### Course Planning Tools

The following product supplements are available at no cost in the Program Resources - Crafts/Titles section at [www.nccer.org](http://www.nccer.org):

- **Competencies/Objective Lists** — Includes all competencies and comprehensive learning objectives for each craft.
- **Performance Profiles** — Correlates to the performance tasks of NCCER curricula and can be used to provide record keeping where documentation of training is required.
- **Equipment and Material Lists** — Includes all of the equipment and materials required to teach each module.
- **Course Maps** — Tracks revised modules, records new module numbers and shows how modules may have been incorporated into revisions or indicates if they have been deleted.

## Module ID Numbers

**29102**

The two-digit prefix (29) indicates the craft identifier (Welding).

The last three digits are the unique module identifiers.

*Titles older than 2018 will have an additional two-digit date suffix.*

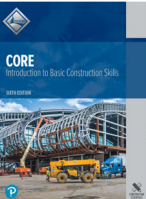
## Craft Identifiers

The first two digits of the Module Identification Number indicate the “parent” or source craft of that module. All NCCER Craft Identifiers are listed below.

Alternative Energy.....74	Hydroblasting .....43	Pipeline Control Center Operations.....65	Plumbing.....02
Boilermaking.....34	Industrial Coatings .....69	Pipeline Core .....66	Project Management .....44
Carpentry .....27	Industrial Maintenance Mechanic .....32	Pipeline Corrosion Control.....61	Project Supervision..... MT200
Concrete Construction.....23	Industrial Maintenance E & I .....40	Pipeline Electrical & Instrumentation .64	Reinforcing Ironwork.....39
Construction Craft Laborer.....35	Instrumentation.....12	Pipeline Field Operations, Gas.....67	Roofing.....16
Construction Technology.....68	Ironworking .....30	Pipeline Field Operations, Liquid .....60	Rigging.....38
Control Center Abnormal Operating Conditions .....71	Maritime Industry Fundamentals.....84	Pipeline Maintenance.....62	Safety.....75
Core.....00	Maritime Pipefitting .....85	Pipeline Mechanical.....63	Scaffolding .....31
O.....45	Maritime Structural Fitter .....86	Power Industry Fundamentals .....49	Sheet Metal .....04
Electrical.....26	Masonry .....28	Power Generation Maintenance Electrician.....50	Signal Person .....53
Electronic Systems Technician .....33	Mechanical Insulating.....19	Power Generation I&C Maintenance Technician .....51	Site Layout .....78
Field Abnormal Operating Conditions.....71	Millwright.....15	Power Generation Maintenance Mechanic.....52	Solar Photovoltaic Installation.....57
Fundamentals of Crew Leadership.....46	Mobile Crane Operations .....21	Power Line Worker Level One .....49	Sprinkler Fitting .....18
Green/Sustainable Construction.....70	Painting (Commercial/Residential) ....07	Power Line Worker: Distribution .....80	Tower Crane.....48
Heavy Equipment Operations .....22	Pipefitting .....08	Power Line Worker: Substation .....82	Weatherization.....59
Heavy Highway Construction .....36	Pipelayer .....24	Power Line Worker: Transmission .....81	Welding.....29
HVAC.....03	Pipeline Abnormal Operating Conditions .....71		Wind Turbine Maintenance Technician .....58



# Core: Introduction to Basic Construction Skills



**CORE**

**INTRODUCTION TO BASIC CONSTRUCTION SKILLS**

**Curriculum Notes**

- Revised: 2021, Sixth Edition
- Downloadable instructor resources are available.
- A Spanish translation of the sixth edition is available. Please see NCCER's online catalog for more information.

HARDCOVER	ISBN
Trainee Guide: \$62.99	978-0-13-748335-8
PAPERBACK	ISBN
Trainee Guide: \$62.99	978-0-13-748334-1
SPANISH (Sixth Edition)	ISBN
Trainee Guide: \$62.99	978-0-13-783751-9
DIGITAL	ISBN
NCCERconnect Access Card: \$62.99	978-0-13-748313-6
NCCERconnect + Hardcover Trainee Guide: \$92.99	978-0-13-747462-2
NCCERconnect + Paperback Trainee Guide: \$92.99	978-0-13-747459-2

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Build Your Future in Construction (2.5 Elective Hours)

ISBN 978-0-13-748338-9

(Module ID 00100) Construction is an exciting, well-paying industry that offers an abundance of career opportunities. With a growing need for individuals who are ready to learn while getting paid, it provides a great fit for people of all backgrounds, skills, and strengths. Carpenter, pipefitter, welder, electrician, and crane operator are just a few of the construction professions in high demand. This module will help you understand the state of the industry, the job opportunities that currently exist, and the training options that will lead you on a path to your new construction career.

### Basic Safety (Construction Site Safety Orientation)

(12.5 Hours)

ISBN 978-0-13-748353-2

(Module ID 00101) Work at construction and industrial job sites can be hazardous. Most job-site incidents are caused by at-risk behavior, poor planning, lack of training, or failure to recognize the hazards. To help prevent incidents, every company must have a proactive safety program. Safety must be incorporated into all phases of the job and involve employees at every level, including management.

### Introduction to Construction Math (10 Hours)

ISBN 978-0-13-748343-3

(Module ID 00102) Craft professionals rely on math to do their jobs accurately and efficiently. Plumbers calculate pipe lengths, plan drain slopes, and interpret dimensioned plans. Carpenters meet code requirements by using math to frame walls and ceilings properly. HVAC professionals develop ductwork and calculate airflow with practical geometry. Whichever craft lies in your future, math will play a role in it. This module reviews the math that you will need and sharpens the skills that you will be using in the exciting modules ahead.

### Introduction to Hand Tools (12.5 Hours)

ISBN 978-0-13-748345-7

(Module ID 00103) Every profession has its tools. A surgeon uses a scalpel, an instructor uses a whiteboard, and an accountant uses a calculator. The construction crafts require a broad array of hand tools. Even if you are familiar with some of the tools, all craftworkers need to learn how to select, maintain, and use them safely. A quality hand tool may cost more up front, but if it is properly used and maintained, it will last for years. A true craft professional invests wisely in hand tools, and uses, maintains, and stores them with the same wisdom.

### Introduction to Power Tools (10 Hours)

ISBN 978-0-13-748348-8

(Module ID 00104) Power tools play an important role in the construction industry. Thousands of construction workers across the world use power tools every day to make holes, cut different types of materials, smooth rough surfaces, and shape a variety of products. Regardless of their specialization, all construction workers eventually use power tools on their job. This module provides an overview of the common types of power tools and how they function. It also describes the proper techniques required to ensure their safe and efficient operation.

### Introduction to Construction Drawings (10 Hours)

ISBN 978-0-13-748352-5

(Module ID 00105) Various types of construction drawings are used to represent actual components of a building project. The drawings provide specific information about the locations of the parts of a structure, the types of materials to be used, and the correct layout of the building. Knowing the purposes of the different types of drawings and interpreting the drawings correctly are important skills for anyone who works in the construction trades. This module introduces common types of construction drawings, their basic components, standard drawing elements, and measurement tools that are typically used when working with construction drawings.

### Introduction to Basic Rigging (7.5 Elective Hours)

ISBN 978-0-13-766173-2

(Module ID 00106) A common activity at nearly every construction site is the movement of material and equipment from one place to another using various types of lifting gear. The procedures involved in performing this task are known as rigging. Not every worker will participate in rigging operations, but nearly all will be exposed to it at one time or another. This module provides an overview of the various types of rigging equipment, common hitches used during a rigging operation, and the related Emergency Stop hand signal.

### Basic Communication Skills (7.5 Hours)

ISBN 978-0-13-766174-9

(Module ID 00107) The construction professional communicates constantly. The ability to communicate skillfully will help to make you a better worker and a more effective leader. This module provides guidance in listening to understand, and speaking with clarity. It explains how to use and understand written materials, and it also provides techniques and guidelines that will help you to improve your writing skills.

### Basic Employability Skills (7.5 Hours)

ISBN 978-0-13-766175-6

(Module ID 00108) Becoming gainfully employed in the construction industry takes more preparation than simply filling out a job application. It is essential to understand how the construction industry and potential employers operate. Your trade skills are extremely important, but all employers are also looking for those who are eager to advance and demonstrate positive personal characteristics. This module discusses the skills needed to pursue employment successfully.

### Introduction to Materials Handling (5 Hours)

ISBN 978-0-13-766177-0

(Module ID 00109) Lifting, stacking, transporting, and unloading materials such as brick, pipe, and various supplies are routine tasks on a job site. Whether performing these tasks manually or with the aid of specialized equipment, workers must follow basic safety guidelines to keep themselves and their co-workers safe. This module provides guidelines for using the appropriate PPE for the material being handled and using proper procedures and techniques to carry out the job.

Continued on following page

## Applied Construction Math



### A Novel Approach

Published: 2006

#### PAPERBACK

#### ISBN

Trainee Guide: \$34.99

978-0-13-227298-8

*Applied Construction Math: A Novel Approach* features a story that students can relate to and math skills they never thought they could grasp. Its innovative style motivates students to follow the lessons by associating math with events they may encounter in their own lives. Students will see that learning math can be exciting as they follow along with Mr. Whyte and his construction class while they build the perfect house. Thirteen chapters teach basic math skills, including:

- Division
- Decimals/Percentages
- Reading Measurements
- Calculating Area
- Powers of Ten
- Linear Measure, Angles, Volumes, Pressure, and Slopes
- Solving for Unknowns
- Square Inches, Feet, and Yards
- Volume

Enhance your construction training with these supplemental *Core* companions. The following titles are excellent resources for your existing program. They can be used on a standalone basis or in combination with *Core*.

## Basic Safety

### Construction Site Safety Orientation

12.5 Hours

Revised: 2021

Module ID 00101

#### PAPERBACK

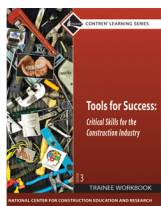
#### ISBN

Trainee Guide: \$24.99

978-0-13-748353-2

This module, from *Core*, replaces the *Safety Orientation* book. See the module description above for more information.

## Tools for Success



### Critical Skills for the Construction Industry

Revised: 2009,  
Third Edition

#### PAPERBACK

#### ISBN

Trainee Workbook: \$34.99

978-0-13-610649-4

This workbook is designed for employees entering the construction industry and has been reviewed and updated with input from construction and training professionals. The Instructor's Handbook includes an annotated instructor's outline, recommended teaching schedules, answers to quizzes, and tips and ideas for enhancing class activities.

## Your Role in the Green Environment



15 Hours

Updated: 2019

Module ID 70101

#### PAPERBACK

#### ISBN

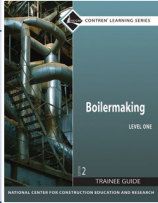
Trainee Guide: \$34.99

978-0-13-670120-0

- Downloadable instructor resources are available.

## L1 BOILERMAKING

LEVEL 1



### Curriculum Notes

- 185 Hours (includes Core)
- Revised: 2010, Second Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-213702-7

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Boilermaking (10 Hours)

ISBN 978-0-13-213693-8

(Module ID 34101-10) Provides an overview of the boilermaker craft, including a description of career opportunities.

### Boilermaking Safety (12.5 Hours)

ISBN 978-0-13-213694-5

(Module ID 34102-10) Covers safety issues specific to boilermakers on the job.

### Boilermaking Tools (15 Hours)

ISBN 978-0-13-213696-9

(Module ID 34103-10) Introduces the hand and power tools used by boilermakers, and the associated safety concerns.

### Basic Materials (10 Hours)

ISBN 978-0-13-213697-6

(Module ID 34104-10) Identifies materials used in the construction of boilers, including material properties, standards and codes, and material markings.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-213698-3

(Module ID 34105-10) Explains the safety requirements associated with oxyfuel cutting. Describes straight line, bevel, piercing, and washing techniques.

### Cutting and Fitting Gaskets (12.5 Hours)

ISBN 978-0-13-213699-0

(Module ID 34106-10) Describes gasket materials used in mating flanges and procedures for laying out and cutting a flange gasket.

### Base Metal Preparation (10 Hours)

ISBN 978-0-13-213700-3

(Module ID 34107-10) Describes how to clean and prepare base metals for cutting and welding.

### Welding Basics (22.5 Hours)

ISBN 978-0-13-213701-0

(Module ID 34108-10) Describes welding and cutting processes and related equipment. Includes filler metals, joint design, and the codes that govern welding practices.

## L2 BOILERMAKING

LEVEL 2

### Curriculum Notes

- 185 Hours
- Revised: 2011, Second Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-213705-8

### Pipe Hangers and Supports (25 Hours)

ISBN 978-0-13-257788-5

(Module ID 34203-11) Identifies pipe hangers and supports and explains how to interpret pipe support drawings and symbols. Explains how to select, store, handle, install, and maintain spring can supports.

### Drawings and Detail Sheets (15 Hours)

ISBN 978-0-13-257789-2

(Module ID 34204-11) Explains how to read drawings and their symbols. Covers plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, piping and instrumentation drawings, isometric drawings, spool sheets, detail sheets, and orthographic drawings.

### Fasteners and Anchors (5 Hours)

ISBN 978-0-13-257790-8

(Module ID 34205-11) Covers threaded and non-threaded fasteners and anchoring devices. Explains how to select fasteners and anchors for given applications. Describes how to install threaded, non-threaded, and insulated fasteners and anchors.

### Welding Symbols (5 Hours)

ISBN 978-0-13-257792-2

(Module ID 34206-11) Explains how to read symbols on welding drawings, specifications, and welding procedure specifications. Describes the symbols for fillet welds, groove welds, miscellaneous other welds, and non-destructive tests.

### Socket Weld Pipe Fabrication (25 Hours)

ISBN 978-0-13-257793-9

(Module ID 34207-11) Describes different types of socket weld piping materials and fittings and how to read socket weld piping drawings. Explains how to determine pipe lengths between socket weld fittings, as well as how to mate socket weld fittings to pipe.

### Butt Weld Pipe Fabrication (40 Hours)

ISBN 978-0-13-257794-6

(Module ID 34208-11) Covers preparing pipe ends for butt welding; determining pipe lengths between butt weld fittings; and using welding jigs to align pipe and butt weld fittings for welding. Explains how to select and install backing rings.

### Tube Weld Preparation and Fitting (15 Hours)

ISBN 978-0-13-257795-3

(Module ID 34209-11) Describes methods used to gain access to boiler tubes needing repair, and to prepare boiler tubes for replacement. Explains how to fit-up a section of boiler tube. Describes welding procedures for making butt welds on standard carbon steel tubes and composite tubes.

### Air Carbon Arc Cutting and Gouging (12.5 Hours)

ISBN 978-0-13-257796-0

(Module ID 34210-11) Describes air carbon arc cutting (CAC-A) equipment and processes. Explains how to select and install CAC-A electrodes, and how to prepare the work area and CAC-A equipment for safe operation. Provides instructions for using CAC-A equipment for washing and gouging activities.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Boiler Systems and Components (22.5 Hours)

ISBN 978-0-13-257786-1

(Module ID 34201-11) Introduces boiler configurations and applications. Identifies boiler components and explains their functions.

### Identifying and Installing Valves (20 Hours)

ISBN 978-0-13-257787-8

(Module ID 34202-11) Identifies valves found in boiler systems. Describes valve components and explains their functions. Explains how to select, store, handle, and install valves, and describes valve markings and nameplate information.

Continued on following page

## Boilermaking Level 3

### L3 BOILERMAKING

#### LEVEL 3

##### Curriculum Notes

- 165 Hours
- Revised: 2011, Second Edition
- Downloadable instructor resources are available.

##### PAPERBACK

Trainee Guide: \$102.99

##### ISBN

978-0-13-257824-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Plasma Arc Cutting (7.5 Hours)

(Module ID 29103-09; from *Welding Level One, Fourth Edition*)

ISBN 978-0-13-266355-7

#### Boiler Pressure Components (25 Hours)

ISBN 978-0-13-266356-4

(Module ID 34301-11) Describes the pressure components of a boiler system and their locations. Explains the procedures required to repair pressure components of a boiler.

#### Boiler Nonpressure Components (15 Hours)

ISBN 978-0-13-266357-1

(Module ID 34302-11) Describes the nonpressure components of a boiler system and their locations. Explains the procedures required to repair nonpressure components of a boiler.

#### Boiler Auxiliaries (25 Hours)

ISBN 978-0-13-266358-8

(Module ID 34306-11) Describes the air flow systems within a boiler system and the different fuels used to fire boiler system furnaces. Describes ash removal systems and the equipment used to protect the environment. Covers the feed water system into a boiler and the blow down from a boiler system.

#### Brick, Refractory, Insulation, and Lagging (BRIL)

(5 Hours)

ISBN 978-0-13-266359-5

(Module ID 34305-11) Describes types of BRIL and explains their functions. Also addresses hazards associated with BRIL.

#### Advanced Tube Work (20 Hours)

ISBN 978-0-13-266360-1

(Module ID 34303-11) Explains the methods used to identify problem tubes and extract them. Also describes the methods used for replacing and plugging tubes.

#### Testing Piping Systems and Equipment

(20 Hours)

ISBN 978-0-13-266361-8

(Module ID 34308-11) Lists pretest requirements for boiler system piping systems and equipment. Describes service and flow tests, head pressure tests, and hydrostatic tests performed on boiler system piping systems and equipment.

#### Rigging (22.5 Hours)

(Module ID 15206-07; from *Millwright Level Two*)

ISBN 978-0-13-266363-2

#### Towers and Exchangers (25 Hours)

ISBN 978-0-13-266364-9

(Module ID 34307-11) Explains the functions of towers and exchangers and the basic distillation process. Describes various types of towers and exchangers and their components.

### L4 BOILERMAKING

#### LEVEL 4

##### Curriculum Notes

- 165 Hours
- Revised: 2012, Second Edition
- Downloadable instructor resources are available.

##### PAPERBACK

Trainee Guide: \$102.99

##### ISBN

978-0-13-292141-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Advanced Mechanical Trade Math (15 Hours)

ISBN 978-0-13-292236-4

(Module ID 34401-12) Covers tables of equivalents and units of conversion. Explains the basics of trigonometry and how to apply them to the installation of pipe. Explains how to calculate the weight of objects.

#### Advanced Rigging (20 Hours)

ISBN 978-0-13-292237-1

(Module ID 34410-12) Explains how to determine the center of gravity for objects to be rigged and how a load's weight and center of gravity affect lifting devices such as cranes. Describes how to use cribbing to support lifted loads. Covers the use of slings and spreader or equalizer bars to lift loads. Describes the tools used to move loads laterally. Explains how to determine the center of gravity of asymmetrical loads.

#### Advanced Boilermaking Construction Drawings

(20 Hours)

ISBN 978-0-13-292238-8

(Module ID 34402-12) Covers symbols and abbreviations used on piping and instrumentation drawings and piping arrangement drawings. Explains how to read and interpret different types of construction drawings. Explains how to sketch an isometric drawing from a plan view drawing, and how to calculate line lengths from isometric drawings.

#### Advanced Pipe Fabrication (50 Hours)

(Module ID 08402-07; from *Pipefitting Level Four*)

ISBN 978-0-13-292239-5

#### Stress Relieving (10 Hours)

ISBN 978-0-13-292240-1

(Module ID 34406-12) Covers metal distortion and ways to prevent it. Explains thermal growth in metals, and how to calculate thermal growth in given metals. Explains how misalignment creates stress in metals. Describes ways to relieve stress in piping that is experiencing distortion due to welding, thermal growth, or misalignment.

#### Quality Assurance (10 Hours)

ISBN 978-0-13-292241-8

(Module ID 34407-12) Covers codes governing welding and boilers. Describes weld imperfections and their causes. Identifies and explains different nondestructive and destructive testing methods. Explains how to make visual inspections of fillet welds. Describes welder qualification testing, and stresses the importance of quality workmanship.

#### Advanced Exchangers (25 Hours)

ISBN 978-0-13-292242-5

(Module ID 34411-12) Identifies different types of heat exchangers and their components. Describes methods used to test exchangers, and how to pull exchanger bundles. Explains how to replace a flange and a nozzle on an exchanger.

#### Advanced Towers (25 Hours)

ISBN 978-0-13-292244-9

(Module ID 34412-12) Identifies different types of towers and their components. Explains how to remove and replace different types of packing used in towers. Describes methods used to make field repairs to tower trays. Explains how to remove a tower distributor for maintenance.

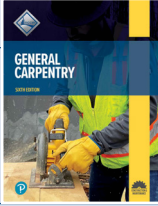
#### Fundamentals of Crew Leadership (20 Hours)

ISBN 978-0-13-292245-6

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

# General Carpentry

## GENERAL CARPENTRY



### GENERAL CARPENTRY

#### Curriculum Notes

- 247.5 Hours (includes Core)
- Revised: 2022, Sixth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-769997-1

#### DIGITAL

NCCERconnect Access Code: \$74.99

#### ISBN

978-0-13-787624-2

Trainee Guide + NCCERconnect

with Pearson e-text \$104.99

978-0-13-793351-8

Core + General Carpentry: \$137.98

978-0-13-821263-6

#### HARDCOVER

Trainee Guide: \$74.99

#### ISBN

978-0-13-769996-4

Trainee Guide + NCCERconnect

Access Code \$104.99

978-0-13-793355-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to Carpentry (2.5 Hours)

ISBN 978-0-13-787637-2

(Module ID 27101) Reviews the carpentry profession, describes the apprentice program, identifies career opportunities for carpenters, and lists the skills, responsibilities, and characteristics a carpenter should possess. Emphasizes the importance of site-specific safety and occupational safety relevant to the craft.

### Building Materials and Fasteners (20 Hours)

ISBN 978-0-13-787638-9

(Module ID 27102) Introduces building materials used in construction, including lumber, engineered wood products, concrete materials, steel framing, and a variety of fasteners and anchors. Also describes material handling and storage techniques, and basic calculations used to determine needed framing and concrete quantities.

### Construction Plans & Documents (20 Hours)

ISBN 978-0-13-787633-4

(Module ID 27113) Describes construction plans and documents used by carpenters, including drawings found in commercial and residential plans. Focuses on information included in civil, architectural, and structural drawings. Also covers the importance of specifications, and reviews building codes used by carpenters.

### Principles of Site and Building Layout (20 hours)

ISBN 978-0-13-787635-8

(Module ID 27114) Explains how carpenters use specific construction drawings, as well as measuring tools and leveling instruments to perform basic site and building layout activities. Along with providing step-by-step instructions, this module describes the use of construction drawings and math to guarantee the accuracy of the building site.

### Floor Systems (25 Hours)

ISBN 978-0-13-787628-0

(Module ID 27105) Introduces carpenters to drawings used to construct flooring systems. Defines framing basics and the procedures for laying out and constructing a wood floor using common lumber, as well as engineered building materials. Covers the installation of floor components including sill plates, beams, girders, joists, and subfloors.

### Wall Systems (10 Hours)

ISBN 978-0-13-787629-7

(Module ID 27111) Describes basic wall systems and provides step-by-step instructions for laying out and framing both wood and steel components. Explains the process for laying out and framing walls. Includes instructions for assembling, erecting, and verifying plumb for wall systems.

### Roof Framing (47.5 Hours)

ISBN 978-0-13-787629-7

(Module ID 27112) Describes the most common roof types and introduces basic roof framing components. Includes instructions for laying out rafters for gable roofs, hip roofs, and valley intersections. Covers stick-built and truss-built roofs, and includes the basics of roof sheathing installation.

### Basic Stair Layout (12.5 Hours)

ISBN 978-0-13-787626-6

(Module ID 27110) Introduces stair types, basic stair system components, and common codes associated with stairway construction. Explains essential stairway construction techniques, including how to construct stringers, measure and calculate rise and run, and build concrete stairway forms.

### Building Envelope Systems (12.5 Hours)

ISBN 978-0-13-787639-6

(Module ID 27109) Introduces the concepts of moisture and insulation control from the ground up. Describes types of building wrap, windows, skylights and doors, while providing instructions for installation.



## ADVANCED CARPENTRY FRAME AND FINISH

NCCER

Advanced Carpentry:  
Frame and Finish



## ADVANCED CARPENTRY FRAME AND FINISH

### Curriculum Notes

- 297.5 Hours
- Revised: 2024, Sixth Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-817241-1

### DIGITAL

NCCERconnect Access Code: \$102.99

ISBN

978-0-13-817257-2

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### The Building Process (5 Hours)

ISBN 978-0-13-832364-6

(Module ID 27213) Provides an overview of the stages in the building process and the roles of people involved, as well as the codes and standards that apply to construction projects.

### Site Preparation (7.5 Hours)

ISBN 978-0-13-832365-3

(Module ID 27409) Covers the planning process that precedes the start of work on a construction site, including environmental considerations, personnel issues, access roads, traffic control, permits, site safety, utilities, and crane-related concerns.

### Wall Systems and Installation (25 Hours)

ISBN 978-0-13-832369-1

(Module ID 27404) Covers installation of a variety of finishing materials, including concrete masonry units and brick. Also covers installation of curtain walls, structural insulated panels, and fire-rated commercial construction.

### Roofing Applications (35 hours)

ISBN 978-0-13-832372-1

(Module ID 27202) Covers residential and commercial roofing materials and structures and describes the procedures for installing commercial roofing such as lap seam, standing seam, and built-up roofs.

### Steel Framing Systems (15 Hours)

ISBN 978-0-13-832373-8

(Module ID 27205) Describes the types and grades of steel framing materials, and includes instructions for selecting and installing metal framing for interior and exterior walls, loadbearing and nonbearing walls, partitions, and other applications.

### Thermal and Moisture Protection (7.5 Hours)

ISBN 978-0-13-832377-6

(Module ID 27203) Covers the selection and installation of various types of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for sound insulation, vapor barriers, and waterproofing materials.

### Drywall Installation (25 Hours)

ISBN 978-0-13-819610-3

(Module ID 45104) Discusses types of gypsum drywall, their uses, and the fastening devices and methods used to install them. Describes installing drywall on walls and ceilings using nails, drywall screws, and adhesives. Also covers fire- and sound-rated walls.

### Interior Finish, Trim, and Cabinets (30 Hours)

ISBN 978-0-13-832380-6

(Module ID 27215) Describes the different types of trim used in finish work and focuses on the proper methods for selecting, cutting, and fastening trim to achieve a professional finished appearance. Provides detailed instructions for the selection and installation of base and wall cabinets and countertops.

### Doors and Door Hardware (25 Hours)

ISBN 978-0-13-830246-7

(Module ID 27208) Describes the installation of metal doors and related hardware in steel-framed, wood-framed, and masonry walls, along with their related hardware, such as locksets and door closers. Also discusses the installation of wood doors, folding doors, and pocket doors.

### Suspended and Acoustical Ceilings (15 Hours)

ISBN 978-0-13-830247-4

(Module ID 27209) Describes the materials, layout, and installation procedures for suspended ceilings used in commercial construction. Also covers ceiling tiles, drywall suspension systems, and pan-type ceilings.

### Finished Stairs (25 Hours)

ISBN 978-0-13-832382-0

(Module ID 27405) Provides extensive coverage of the materials and techniques used in finishing wooden staircases. Also covers a variety of stair systems used in commercial construction.

### Exterior Finish and Trim (35 Hours)

ISBN 978-0-13-832390-5

(Module ID 27204) Covers the various types of exterior finish materials and their installation procedures, including wood, metal, vinyl, and fiber-cement siding.

### Mass Timber Construction (25 Hours)

ISBN 978-0-13-832367-7

(Module ID 27214) Describes the various types of mass timber, including the tools and building techniques needed for mass timber projects. Provides an overview of the mass timber building process.

### Introduction to Leadership (22.5 Hours)

ISBN 978-0-13-828931-7

(Module ID 46100) Introduces leadership skills and different leadership styles, as well as communication and problem solving techniques. Jobsite safety and safety leadership are also discussed. Introduces business topics that are important to understand for construction projects.

## L1 CARPENTRY

### LEVEL 1



#### Curriculum Notes

- 237.5 Hours (includes Core)
- Revised: 2013, Fifth Edition
- Downloadable instructor resources are available..
- A Spanish translation of the fourth edition is available. Please see NCCER's online catalog for more information.

#### HARDCOVER

Trainee Guide: \$74.99

#### ISBN

978-0-13-340380-0

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-340237-7

#### DIGITAL

NCCERconnect Access Card: \$74.99

#### ISBN

978-0-13-420508-3

NCCERconnect + Hardcover Trainee Guide: \$104.99

978-0-13-427462-1

NCCERconnect + Paperback Trainee Guide: \$104.99

978-0-13-429856-6

## MODULES

The modules listed below are all included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (2.5 Hours)

ISBN 978-0-13-340299-5

(Module ID 27101-13) Reviews the history of the trade, describes the apprentice program, identifies career opportunities for carpenters and construction workers, and lists the skills, responsibilities, and characteristics a worker should possess. Emphasizes the importance of safety in the construction industry.

### Building Materials, Fasteners, and Adhesives

(20 Hours)

ISBN 978-0-13-340300-8

(Module ID 27102-13) Introduces the building materials used in construction work, including lumber, sheet materials, engineered wood products, structural concrete, and structural steel. Also describes the fasteners and adhesives used in construction work. Discusses the methods of squaring a building.

### Hand and Power Tools (10 Hours)

ISBN 978-0-13-340301-5

(Module ID 27103-13) Provides descriptions of hand tools and power tools used by carpenters. Emphasizes safe and proper operation, as well as care and maintenance.

### Introduction to Construction Drawings, Specifications, and Layout (22.5 Hours)

ISBN 978-0-13-340302-2

(Module ID 27104-13) Covers the techniques for reading and using construction drawings and specifications, with an emphasis on drawings and information relevant to the carpentry trade. Introduces quantity takeoffs.

### Floor Systems (25 Hours)

ISBN 978-0-13-340303-9

(Module ID 27105-13) Covers framing basics and the procedures for laying out and constructing a wood floor using common lumber, as well as engineered building materials.

### Wall Systems (10 Hours)

ISBN 978-0-13-340304-6

(Module ID 27111-13) Describes procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners, partition Ts, and bracing walls. Includes the procedure to estimate the materials required to frame walls.

### Ceiling Joist and Roof Framing (47.5 Hours)

ISBN 978-0-13-340305-3

(Module ID 27112-13) Describes types of roofs and provides instructions for laying out rafters for gable roofs, hip roofs, and valley intersections. Covers stick-built and truss-built roofs. Includes the basics of roof sheathing installation.

### Introduction to Building Envelope Systems

(12.5 Hours)

ISBN 978-0-13-340307-7

(Module ID 27109-13) Introduces the concept of the building envelope and explains its components. Describes types of windows, skylights, and exterior doors, and provides instructions for installation.

### Basic Stair Layout (12.5 Hours)

ISBN 978-0-13-340306-0

(Module ID 27110-13) Introduces types of stairs and common building code requirements related to stairs. Focuses on techniques for measuring and calculating rise, run, and stairwell openings, laying out stringers, and fabricating basic stairways.

## L2 CARPENTRY FRAMING & FINISHING

### LEVEL 2

#### Curriculum Notes

- 210 Hours
- Optional Residential Path: 170 Hours
- Optional Commercial Path: 150 Hours
- Revised: 2013, Fifth Edition
- Downloadable instructor resources are available.

#### HARDCOVER

Trainee Guide: \$102.99

#### ISBN

978-0-13-340465-4

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-340430-2

#### DIGITAL

NCCERconnect Access Card: \$102.99

978-0-13-442808-6

NCCERconnect + Hardcover Trainee Guide: \$129.99

978-0-13-466737-9

NCCERconnect + Paperback Trainee Guide: \$129.99

978-0-13-453972-0

## MODULES

All of the modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Commercial Drawings Elective for Residential Path

(25 Hours)

ISBN 978-0-13-377929-5

(Module ID 27201-13) Describes how to read and interpret a set of commercial drawings and specifications.

### Cold-Formed Steel Framing (15 Hours)

ISBN 978-0-13-377910-3

(Module ID 27205-13) Describes the types and grades of steel framing materials, and includes instructions for selecting and installing metal framing for interior and exterior walls, loadbearing and nonbearing walls, partitions, and other applications.

### Exterior Finishing Elective for Commercial Path

(35 Hours)

ISBN 978-0-13-377909-7

(Module ID 27204-13) Covers the various types of exterior finish materials and their installation procedures, including wood, metal, vinyl, and fiber-cement siding.

### Thermal and Moisture Protection (7.5 Hours)

ISBN 978-0-13-377903-5

(Module ID 27203-13) Covers the selection and installation of various types of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for vapor barriers and waterproofing materials.

### Roofing Applications Elective for Commercial Path

(25 Hours)

ISBN 978-0-13-377902-8

(Module ID 27202-13) Describes how to properly prepare the roof deck and install roofing for residential and commercial buildings.

### Doors and Door Hardware (20 Hours)

ISBN 978-0-13-377914-1

(Module ID 27208-13) Describes the installation of metal doors and related hardware in steel-framed, wood-framed, and masonry walls, along with their related hardware, such as locksets and door closers. Also discusses the installation of wood doors, folding doors, and pocket doors.

Continued on following page

## Carpentry Level 2 (continued)

### Drywall Installation (15 Hours)

ISBN 978-0-13-377911-0

(Module ID 27206-13) Describes the various types of gypsum drywall, their uses, and the fastening devices and methods used to install them. Contains detailed instructions for installing drywall on walls and ceilings using nails, drywall screws, and adhesives. Also discusses fire- and sound-rated walls.

### Drywall Finishing (17.5 Hours)

ISBN 978-0-13-377913-4

(Module ID 27207-13) Describes the materials, tools, and methods used to finish and patch gypsum drywall. Also discussed automatic and manual taping and finishing tools.

### Suspended Ceilings *Elective for Residential Path*

(15 Hours)

ISBN 978-0-13-377915-8

(Module ID 27209-13) Describes the materials, layout, and installation procedures for many types of suspended ceilings used in commercial construction, as well as ceiling tiles, drywall suspension systems, and pan-type ceilings.

### Window, Door, Floor, and Ceiling Trim

(25 Hours)

ISBN 978-0-13-377916-5

(Module ID 27210-13) Describes the different types of trim used in finish work and focuses on the proper methods for selecting, cutting, and fastening trim to achieve a professional finished appearance.

### Cabinet Installation (10 Hours)

ISBN 978-0-13-377917-2

(Module ID 27211-13) Provides detailed instructions for the selection and installation of base and wall cabinets and countertops.

## L3 CARPENTRY FORMS

### LEVEL 3

#### Curriculum Notes

- 160 Hours
- Revised: 2014, Fifth Edition
- Downloadable instructor resources are available.
- A Spanish translation of the fourth edition is available. Please see NCCER's online catalog for more information.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN 978-0-13-382305-9

#### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN 978-0-13-442809-3

NCCERconnect +

Trainee Guide: \$129.99

ISBN 978-0-13-453970-6

### Rigging Equipment (10 Hours)

ISBN 978-0-13-378675-0

(Module ID 38101-11; from *Basic Rigger, Second Edition*) Describes the use and inspection of basic equipment and hardware used in rigging, including slings, wire rope, and chains. Discusses attaching hardware such as shackles, eyebolts, and hooks, as well as rigging knots. Explains sling angles. Covers tuggers, jacks, hoists, and ratchet-lever hoists.

### Rigging Practices (15 Hours)

ISBN 978-0-13-378676-7

(Module ID 38102-11; from *Basic Rigger, Second Edition*) Describes basic rigging and crane hazards as well as safety practices related to general rigging activities, working around power lines, and emergency response. Covers procedures for using slings and rigging pipes and valves.

### Trenching and Excavating (15 Hours)

ISBN 978-0-13-378678-1

(Module ID 27306-14) Provides an introduction to working in and around excavations, particularly in preparing building foundations. Describes types and bearing capacities of soils; procedures used in shoring, shielding, and sloping trenches and excavations; trenching safety requirements, including recognition of unsafe conditions; and mitigation of groundwater and rock when excavating foundations.

### Reinforcing Concrete (15 Hours)

ISBN 978-0-13-378679-8

(Module ID 27304-14) Explains the selection and uses of different types of reinforcing materials. Describes requirements for bending, cutting, splicing, and tying reinforcing steel and the placement of steel in footings and foundations, walls, columns, and beams and girders.

### Foundations and Slabs-On-Grade (20 Hours)

ISBN 978-0-13-378680-4

(Module ID 27307-14) Covers basic site layout safety, tools, and methods; layout and construction of deep and shallow foundations; types of foundation forms; layout and formation of slabs-on-grade; and forms used for curbing and paving.

### Vertical Formwork (22.5 Hours)

ISBN 978-0-13-378681-1

(Module ID 27308-14) Covers the applications and construction methods for types of forming and form hardware systems for walls, columns, and stairs, as well as slip and climbing forms. Provides an overview of the assembly, erection, and stripping of gang forms.

### Horizontal Formwork (15 Hours)

ISBN 978-0-13-378682-8

(Module ID 27309-14) Describes elevated decks and formwork systems and methods used in their construction. Covers joist, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the use of flying decks, as well as shoring and reshoring systems.

### Handling and Placing Concrete (20 Hours)

ISBN 978-0-13-378683-5

(Module ID 27305-14) Covers tools, equipment, and procedures for safely handling, placing, and finishing concrete. Describes joints made in concrete structures and the use of joint sealants.

### Tilt-Up Wall Systems (17.5 Hours)

ISBN 978-0-13-378684-2

(Module ID 27310-14) Describes how tilt-up concrete construction is used and how tilt-up panels are formed, erected, and braced. Covers the installation of rebar and types of embedments used to lift and brace the panels. Also covers methods used to create architectural and decorative treatments.

## MODULES

The modules listed below are all included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Properties of Concrete (10 Hours)

ISBN 978-0-13-378674-3

(Module ID 27303-14) Describes the properties, characteristics, and uses of cement, aggregates, and other materials used in different types of concrete. Covers procedures for estimating concrete volume and testing freshly mixed concrete, as well as methods and materials for curing concrete.

Continued on following page

**L4 CARPENTRY ADVANCED****LEVEL 4****Curriculum Notes**

- 182.5 Hours (162.5 Required, 20 Elective)
- Revised 2014, Fifth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-382314-1****DIGITAL**

NCCERconnect Access Card: \$102.99

**978-0-13-442810-9**

NCCERconnect +

Trainee Guide: \$129.99

**978-0-13-453969-0****MODULES**

All of the modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Site Layout One: Differential Leveling** (20 Hours)**ISBN 978-0-13-378698-9**

(Module ID 27401-14) Covers the principles, equipment, and methods used to perform differential leveling. Also covers the layout responsibilities of surveyors, field engineers, and carpenters; interpretation and use of site/plot plan drawings; use of laser instruments; and methods used for on-site communication.

**Site Layout Two: Angular and Distance Measurement** (37.5 Hours)**ISBN 978-0-13-378700-9**

(Module ID 27402-14) Covers the principles, equipment, and methods used to perform site layout tasks that require angular and distance measurements. Tasks include laying out building lines and determining elevations by trigonometric leveling. Covers the use of transits, theodolites, electronic distance measurement, and total stations. Reviews trade mathematics needed to perform calculations related to angular measurements.

**Advanced Roof Systems** (20 Hours)**ISBN 978-0-13-378702-3**

(Module ID 27403-14) Covers commercial roofing materials and structures and describes the procedures for installing commercial roofing such as lap seam, standing seam, and built-up roofs.

**Advanced Wall Systems** (25 Hours)**ISBN 978-0-13-378704-7**

(Module ID 27404-14) Covers installation of a variety of finishing materials, including concrete masonry units and brick. Also covers installation of curtain walls and fire-rated commercial construction.

**Advanced Stair Systems** (25 Hours)**ISBN 978-0-13-378705-4**

(Module ID 27405-14) Provides extensive coverage of the materials and techniques used in finishing wooden staircases. Also covers a variety of stair systems used in commercial construction.

**Introduction to Construction Equipment**

(7.5 Hours)

**ISBN 978-0-13-378706-1**

(Module ID 27406-14) Introduces construction equipment, including the aerial lift, skid steer loader, electric power generator, compressor, compactor, and forklift. An overview of general safety, operation, and maintenance procedures is provided.

**Introduction to Oxyfuel Cutting and Arc Welding**

(20 Elective Hours)

**ISBN 978-0-13-378707-8**

(Module ID 27407-14) Introduces the equipment, procedures, and safety practices used in cutting steel with oxyfuel equipment, as well as shielded metal arc welding, gas-tungsten arc welding, and gas metal arc welding. Labs include practice in cutting and welding techniques.

**Site Preparation** (7.5 Hours)**ISBN 978-0-13-378697-2**

(Module ID 27409-14) Covers the planning process that precedes the start of work on a construction site, including environmental considerations, personnel issues, access roads, traffic control, permits, site safety, utilities, and crane-related concerns.

**Fundamentals of Crew Leadership** (20 Hours)**ISBN 978-0-13-378708-5**

(Module 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

**Cabinetmaking**

35 Hours  
Revised: 2015, Third Edition  
Module ID 27501-15

**PAPERBACK****ISBN**

Trainee Guide: \$24.99

**978-0-13-428854-3****DIGITAL**

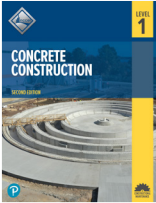
NCCERconnect Access Card: \$24.99

**9780135215562**

This module expands on the knowledge and skills gained through the Carpentry Curriculum and provides the basic information needed to construct and apply finishes to custom cabinetry. It identifies and discusses various types of wood products, wood-joining techniques, power tools, cabinet doors, shelves, and hardware. Specific guidance is also provided for the installation of laminated countertops.

## L1 CONCRETE CONSTRUCTION

LEVEL 1



### Curriculum Notes

- 265.5 Hours (includes Core)
- Published: 2020
- A Spanish translation is available. Please see NCCER's online catalog for more information.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-686828-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Concrete Construction

(10 Hours)

ISBN 978-0-13-686837-8

(Module ID 23101) Introduces the role of concrete in construction and identifies basic concrete properties and characteristics. Provides an overview of the concrete construction process, identifies opportunities available to concrete craftworkers, and describes the purpose and structure of apprenticeship programs.

### Concrete Safety (7.5 Hours)

ISBN 978-0-13-686836-1

(Module ID 23102) Describes the role of OSHA in the workplace and presents safety hazards unique to the concrete construction environment, including the control of silica dust. Identifies and describes the PPE concrete craftworkers commonly require.

### Fall Protection Orientation (8 Hours)

ISBN 978-0-13-530500-3

(Module ID 75901; from *Fall Protection Orientation*) Covers fundamental safety and hazard recognition concepts. Introduces the role of OSHA in regulating elevated work on the jobsite and the causes, costs, and consequences of falls. Presents proper use of fall protection equipment; safe use of stairs, ladders, and scaffolds; and guidelines for use of aerial lifts.

### Concrete Tools and Equipment (12.5 Hours)

ISBN 978-0-13-686814-9

(Module ID 23104) Introduces trainees to a wide variety of both hand tools and powered equipment used in concrete construction, including screeds, floats, trowels, saws, grinders, and mixing equipment. Tips for the safe use of tools and equipment are also provided.

### Preparing for Placement (15 Hours)

ISBN 978-0-13-686813-2

(Module ID 23105) Provides an overview of common concrete-construction tasks that take place before placement begins. Covers elevations and subgrade preparation, as well as basic form types, joints, and pre-placement inspections.

### Reinforcing Concrete (15 Hours)

ISBN 978-0-13-378679-8

(Module ID 27304; from *Carpentry Level Three*) Explains the selection and uses of different types of reinforcing materials. Describes requirements for bending, cutting, splicing, and tying reinforcing steel and the placement of steel in footings and foundations, walls, columns, and beams and girders.

### Foundations and Slabs-On-Grade (20 Hours)

ISBN 978-0-13-378680-4

(Module ID 27307; from *Carpentry Level Three*) Covers basic site layout safety, tools, and methods; layout and construction of deep and shallow foundations; types of foundation forms; layout and formation of slabs-on-grade; and forms used for curbing and paving.

### Vertical Formwork (22.5 Hours)

ISBN 978-0-13-378681-1

(Module ID 27308; from *Carpentry Level Three*) Covers the applications and construction methods for types of forming and form hardware systems for walls, columns, and stairs, as well as slip and climbing forms. Provides an overview of the assembly, erection, and stripping of gang forms.

### Horizontal Formwork (15 Hours)

ISBN 978-0-13-378682-8

(Module ID 27309; from *Carpentry Level Three*) Describes elevated decks and formwork systems and methods used in their construction. Covers joist, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the use of flying decks, as well as shoring and reshoring systems.

### Site Concrete (35 Hours)

ISBN 978-0-13-686806-4

(Module ID 23204) Describes the construction of various placements that are common to many building construction projects, including curbs and gutters, stairways and steps, walks, driveways, and patios.

### Finishing Concrete (20 Hours)

ISBN 978-0-13-686809-5

(Module ID 23120) Identifies and describes how to apply basic concrete finishing techniques. Includes coverage of floating and troweling, edging, jointing, and various surface finishes.

### Curing and Protecting Concrete (10 Hours)

ISBN 978-0-13-686827-9

(Module ID 23108) Describes the essential concrete curing and protection process. Introduces various approaches to curing and the primary factors that significantly affect the resulting strength and durability of the placement.

## L2 CONCRETE CONSTRUCTION

LEVEL 2

### Curriculum Notes

- 147.5 Hours
  - 177.5 hours with electives
- Published: 2020
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-689832-0

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Properties of Concrete (15 Hours)

ISBN 978-0-13-689826-9

(Module ID 23212) Presents the many possible components of concrete, including the desirable properties of the chosen aggregate and water. Includes a review of chemical and mineral admixtures, fibers, and special types of concrete. Also covers the basics of concrete testing.

### Estimating Concrete Quantities (12.5 Hours)

ISBN 978-0-13-689821-4

(Module ID 23202) Reviews basic mathematical calculations for area and volume as well as metric conversions to prepare trainees for the module topic. A review of drawings and their interpretation is also provided, along with guidance for estimating the volume of concrete needed in placements of various shapes.

### Tilt-Up Wall Systems (17.5 Hours, Elective)

ISBN 978-0-13-378684-2

(Module ID 27310; from *Carpentry Level Three*) Describes how tilt-up concrete construction is used and how tilt-up panels are formed, erected, and braced. Covers the installation of rebar and types of embedments used to lift and brace the panels. Also covers methods used to create architectural and decorative treatments.

### Paving (12.5 Hours, Elective)

ISBN 978-0-13-448586-7

(Module ID 36108; from *Heavy Highway Level Two*) Describes paving operations, paving equipment, recycling processes, and quality control requirements for both concrete and hot-mix asphalt paving.

### Architectural Finishes (22.5 Hours)

ISBN 978-0-13-689831-3

(Module ID 23205) Identifies and describes various architectural finishes and how they are applied. Covers the coloration of concrete surfaces and how to use form liners and stamps to create texture. Provides detailed guidance on the creation of exposed aggregate finishes.

### Industrial Floors (27.5 Hours)

ISBN 978-0-13-689822-1

(Module ID 23206) Presents this key segment of concrete flatwork and the characteristics of industrial floors while explaining how industrial-class floors are created, including pre-placement considerations.

Continued on following page



## Concrete Construction Level 2 (Continued)

### **Superflat Floors** (20 Hours)

**ISBN 978-0-13-689825-2**

(Module ID 23207) Describes random-traffic and defined-traffic superflat floors and the flat and level characteristics that set them apart from other slabs. Provides insight into the finishing process and describes how various floor-measurement instruments are used to document the results.

### **Surface Treatments** (15 Hours)

**ISBN 978-0-13-730570-4**

(Module ID 23208) Provides detailed coverage of the many methods used to prepare a concrete surface to meet a specific surface profile, from detergent scrubbing to rotomilling. Also identifies and describes how to apply shakes, protective sealants and coatings, and self-leveling toppings and underlayments.

### **Troubleshooting and Quality Control** (15 Hours)

**ISBN 978-0-13-689843-6**

(Module ID 23211) Defines quality control and discusses fresh-concrete troubleshooting and problem resolution. Provides detailed coverage of concrete field tests and specimen preparation according to ASTM standards.

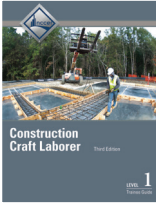
### **Concrete Repair** (20 Hours)

**ISBN 978-0-13-689836-8**

(Module ID 23210) Provides an overview of the concrete repair process, focusing on repairing concrete with concrete. Explains how hidden concrete faults and embedments are located and how to properly prepare reinforced concrete for placement of the repair material. Coverage of pre-placement and post-placements inspections is also provided.

## L1 CONSTRUCTION CRAFT LABORER

LEVEL 1



### Curriculum Notes

- 175 Hours (includes Core)
- Updated: 2015, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-413094-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Orientation to the Trade (2.5 Hours)

ISBN 978-0-13-340299-5

(Module ID 27101-13; from *Carpentry Level One*) Reviews the history of the trade, describes the apprentice program, identifies career opportunities for carpenters and construction workers, and lists the skills, responsibilities, and characteristics a worker should possess. Emphasizes the importance of safety in the construction industry.

#### Building Materials, Fasteners, and Adhesives

(20 Hours)

ISBN 978-0-13-340300-8

(Module ID 27102-13; from *Carpentry Level One*) Introduces the building materials used in construction work, including lumber, sheet materials, engineered wood products, structural concrete, and structural steel. Also describes the fasteners and adhesives used in construction work. Discusses the methods of squaring a building.

#### Properties of Concrete (10 Hours)

ISBN 978-0-13-378674-3

(Module ID 27303-14; from *Carpentry Level Three*) Describes the properties, characteristics, and uses of cement, aggregates, and other materials used in different types of concrete. Covers procedures for estimating concrete volume and testing freshly mixed concrete, as well as methods and materials for curing concrete.

#### Site Layout One: Differential Leveling

(20 Hours)

ISBN 978-0-13-378698-9

(Module ID 27401-14; from *Carpentry Level Four*) Covers the principles, equipment, and methods used to perform differential leveling. Also covers the layout responsibilities of surveyors, field engineers, and carpenters; interpretation and use of site/plot plan drawings; use of laser instruments; and methods used for on-site communication.

#### Handling and Placing Concrete (20 Hours)

ISBN 978-0-13-378683-5

(Module ID 27305-14; from *Carpentry Level Three*) Covers tools, equipment, and procedures for safely handling, placing, and finishing concrete. Describes joints made in concrete structures and the use of joint sealants.

#### Foundations and Slabs-On-Grade (20 Hours)

ISBN 978-0-13-378680-4

(Module ID 27307-14; from *Carpentry Level Three*) Covers basic site layout safety, tools, and methods; layout and construction of deep and shallow foundations; types of foundation forms; layout and formation of slabs-on-grade; and forms used for curbing and paving.

Continued on following page

L2 CONSTRUCTION CRAFT LABORER	
LEVEL 2	
Curriculum Notes	
<ul style="list-style-type: none"> <li>147.5 Hours</li> <li>Updated: 2015, Third Edition</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-413096-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Reinforcing Concrete (15 Hours)

ISBN 978-0-13-378679-8

(Module ID 27304-14; from *Carpentry Level Three*) Explains the selection and uses of different types of reinforcing materials. Describes requirements for bending, cutting, splicing, and tying reinforcing steel and the placement of steel in footings and foundations, walls, columns, and beams and girders.

### Vertical Formwork (22.5 Hours)

ISBN 978-0-13-378681-1

(Module ID 27308-14; from *Carpentry Level Three*) Covers the applications and construction methods for types of forming and form hardware systems for walls, columns, and stairs, as well as slip and climbing forms. Provides an overview of the assembly, erection, and stripping of gang forms.

### Horizontal Formwork (15 Hours)

ISBN 978-0-13-378682-8

(Module ID 27309-14; from *Carpentry Level Three*) Describes elevated decks and formwork systems and methods used in their construction. Covers joist, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the

use of flying decks, as well as shoring and reshoring systems.

### Heavy Equipment, Forklift, and Crane Safety (5 Hours)

ISBN 978-0-13-340366-4

(Module ID 75123-13; from *Field Safety*) Covers the safety hazards and precautions necessary when working near heavy equipment. Presents general safety requirements for the use of forklifts and cranes.

### Steel Erection (2.5 Hours)

ISBN 978-0-13-340364-0

(Module ID 75110-13; from *Field Safety*) Covers common safety precautions related to steel-erection work, including controlled decking zones, hazardous materials and equipment precautions, tool safety, and appropriate personal protective equipment.

### Electrical Safety (5 Hours)

ISBN 978-0-13-340362-6

(Module ID 75121-13; from *Field Safety*) Describes the basic precautions necessary to avoid electrical shock, arc, and blast hazards. It also describes the lockout/tagout procedure.

### Introduction to Construction Equipment (7.5 Hours)

ISBN 978-0-13-378706-1

(Module ID 27406-14; from *Carpentry Level Four*) Introduces construction equipment, including the aerial lift, skid steer loader, electric power generator, compressor, compactor, and forklift. An overview of general safety, operation, and maintenance procedures is provided.

### Rough Terrain Forklifts (22.5 Hours)

ISBN 978-0-13-340322-0

(Module ID 22206-13; from *Heavy Equipment Operations Level Two*) Covers the uses of forklifts on construction sites. Includes instructions for lifting, transporting, and placing various types of loads, as well as safety, operation, and

maintenance procedures.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102-15; from *Welding Level One*) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

### Elevated Masonry (15 Hours)

ISBN 978-0-13-409845-6

(Module ID 28301-14; from *Masonry Level Three*) Describes how to work safely and efficiently on elevated structures. Explains how to maintain a safe work environment, ensure protection from falls, how to brace walls from outside forces, and how to identify common types of elevated walls. Stresses safety around equipment such as cranes and hoists.

### Working from Elevations (5 Hours)

ISBN 978-0-13-340363-3

(Module ID 75122-13; from *Field Safety*) Explains the use of fall-protection equipment. Covers safety precautions related to elevated work surfaces, including ladders, scaffolding, and aerial lifts.

### Your Role in the Green Environment (LEED V4) (15 Hours)

ISBN 978-0-13-294863-0

(Module ID 70101-15) Geared to entry-level craft workers, *Your Role in the Green Environment* provides pertinent information concerning the green environment, construction practices, and building rating systems. This edition has been updated to reflect LEED v4 with emphasis on standards for building design and construction. The updated content features contemporary issues such as net zero buildings and an expanded focus on issues relevant to international construction.

## CONSTRUCTION TECHNOLOGY



### Curriculum Notes

- This curriculum is ideal for programs formatted as Construction Cluster or Building Trades. It consists of modules compiled from five existing NCCER programs.
- 427.5 Hours (includes Core)
- Revised: 2016, Fourth Edition
- Downloadable instructor resources are available.

#### HARDCOVER

Trainee Guide: \$144.99

ISBN

978-0-13-413039-2

#### DIGITAL

NCCERconnect Access Card: \$144.99

ISBN

978-0-13-481687-6

NCCERconnect +

Hardcover Trainee Guide: \$169.99

978-0-13-516939-1

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Masonry (12.5 Hours)

ISBN 978-0-13-377930-1

(Module ID 28101-13; from *Masonry Level One*) Covers basic masonry materials, tools, techniques, and safety precautions. Explains how to mix mortar by hand and lay masonry units. Also describes the skills, attitudes, and abilities of successful masons.

### Masonry Units and Installation Techniques

(60 Hours)

ISBN 978-0-13-377935-6

(Module ID 28105-13; from *Masonry Level One*) Covers characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. Describes masonry reinforcements and accessories used to lay block and brick professionally and safely.

### Floor Systems (27.5 Hours)

ISBN 978-0-13-340303-9

(Module ID 27105-13; from *Carpentry Level One*) Covers framing basics and the procedures for laying out and constructing a wood floor using common lumber, as well as engineered building materials.

### Ceiling Joist and Roof Framing (40 Hours)

ISBN 978-0-13-340305-3

(Module ID 27112-13; from *Carpentry Level One*) Describes types of roofs and provides instructions for laying out rafters for gable roofs, hip roofs, and valley intersections. Covers stick-built and truss-built roofs. Includes the basics of roof sheathing installation.

### Roofing Applications (25 Hours)

ISBN 978-0-13-377902-8

(Module ID 27202-13; from *Carpentry Level Two*) Describes how to properly prepare the roof deck and install roofing for residential and commercial buildings.

### Wall Systems (20 Hours)

ISBN 978-0-13-340304-6

(Module ID 27111-13; from *Carpentry Level One*) Describes procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners, partition Ts, and bracing walls. Includes the procedure to estimate the materials required to frame walls.

### Exterior Finishing (35 Hours)

ISBN 978-0-13-377909-7

(Module ID 27204-13; from *Carpentry Level Two*) Covers the various types of exterior finish materials and their installation procedures, including wood, metal, vinyl, and fiber-cement siding.

### Basic Stair Layout (12.5 Hours)

ISBN 978-0-13-340306-0

(Module ID 27110-13; from *Carpentry Level One*) Introduces types of stairs and common building code requirements related to stairs. Focuses on techniques for measuring and calculating rise, run, and stairwell openings, laying out stringers, and fabricating basic stairways.

### Electrical Safety (10 Hours)

ISBN 978-0-13-378775-7

(Module ID 26102-14; from *Electrical Level One*) Covers safety rules and regulations for electricians, including precautions for electrical hazards found on the job. Also covers the OSHA-mandated lockout/tagout procedure.

### Residential Electrical Services (15 Hours)

ISBN 978-0-13-384190-9

(Module ID 26111-14; from *Electrical Level One*) Covers the electrical devices and wiring techniques common to residential construction and maintenance. Allows trainees to practice making service calculations. Stresses the applicable NEC® requirements.

### Introduction to HVAC (7.5 Hours)

ISBN 978-0-13-340339-8

(Module ID 03101-13; from *HVAC Level One*) Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and how apprenticeship programs are constructed. Basic safety principles, as well as trade licensure and EPA guidelines, are also introduced.

### Introduction to Drain, Waste, and Vent (DWV) Systems (10 Hours)

ISBN 978-0-13-292331-6

(Module ID 02111-12; from *Plumbing Level One*) Explains how DWV systems remove waste safely and effectively. Discusses how system components, such as pipe, drains, traps, and vents work. Reviews drain and vent sizing, grade, and waste treatment. Discusses how building sewers and sewer drains connect the DWV system to the public sewer system.

### Plastic Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-292325-5

(Module ID 02106-12; from *Plumbing Level One*) Introduces different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Describes how to measure, cut, join, and support plastic pipe according to the manufacturer's instructions and applicable codes. Discusses pressure testing of plastic pipe once installed.

### Copper Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-292327-9

(Module ID 02107-12; from *Plumbing Level One*) Discusses sizing, labeling, and applications of copper pipe and fittings, and reviews the types of valves that can be used on copper pipe systems. Explains proper methods for cutting, joining, and installing copper pipe. Addresses insulation, pressure testing, seismic codes, and handling and storage requirements.

### Cabinetmaking (35 Hours)

ISBN 978-0-13-428854-3

(Module ID 27501-15) This module expands on the knowledge and skills gained through the Carpentry Curriculum and provides the basic information needed to construct and apply finishes to custom cabinetry. It identifies and discusses various types of wood products, wood-joining techniques, power tools, cabinet doors, shelves, and hardware. Specific guidance is also provided for the installation of laminated countertops.

### Cabinet Installation (10 Hours)

ISBN 978-0-13-377917-2

(Module ID 27211-13; from *Carpentry Level Two*) Provides detailed instructions for the selection and installation of base and wall cabinets and countertops.

### Introduction to Construction Equipment

(7.5 Hours)

ISBN 978-0-13-378706-1

(Module ID 27406-14; from *Carpentry Level Four*) Introduces construction equipment, including the aerial lift, skid steer loader, electric power generator, compressor, compactor, and forklift. An overview of general safety, operation, and maintenance procedures is provided.

Continued on following page

## L1 DRYWALL

LEVEL 1



### Curriculum Notes

- 149.5 Hours (includes Core)
- Revised: 2023, Second Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-817535-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to Drywall (5 Hours)

ISBN 978-0-13-817535-1

(Module ID 45101) Reviews the history of the craft and provides modern examples of drywall work, including descriptions of the training process and career opportunities in the wall and ceiling industry. Also identifies the responsibilities and characteristics a drywall technician should possess, as well as safety precautions associated with the industry.

#### Construction Materials and Methods (12 Hours)

ISBN 978-0-13-817535-1

(Module ID 45102) Provides an overview of the materials and techniques used in building and finishing walls and ceilings in residential and commercial buildings, including wood- and steel-framed structures, masonry construction, and concrete-formed structures. Also explains fire- and sound-rated construction.

#### Thermal and Moisture Protection (7.5 Hours)

ISBN 978-0-13-817535-1

(Module ID 45103) Covers the selection and installation of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for ventilation and vapor retarders, water-resistant barriers, and air infiltration control.

#### Drywall Installation (25 Hours)

ISBN 978-0-13-817535-1

(Module ID 45104) Discusses the uses for different types of gypsum board and the fastening devices, adhesives, and methods used to install them. Describes single- and multi-ply installations along with drywall trim. Also covers guidelines for moisture control and fire- and sound-rated walls.

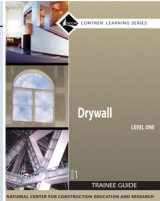
#### Drywall Finishing (25 Hours)

ISBN 978-0-13-817535-1

(Module ID 45105) Covers the materials, tools, and methods used to achieve the various drywall finishing levels. Also describes the process for repairing finished joints, problems with compound, fastener-related damage, and common problems with gypsum drywall sheets.

## L1 DRYWALL

LEVEL 1



### Curriculum Notes

- 149.5 Hours (includes Core)
- Published: 2007
- Downloadable instructor resources are available.
- A Spanish translation is available. Please see NCCER's online catalog for more information.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-604512-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Orientation to the Trade (5 Hours)

ISBN 978-0-13-604843-5

(Module ID 45101-07) Reviews the history of the trade, shows examples of the work involved, describes the apprentice program, identifies career opportunities for construction workers, and lists the responsibilities and characteristics a worker should possess.

#### Construction Materials and Methods (12 Hours)

ISBN 978-0-13-604845-9

(Module ID 45102-07) Provides an overview of the materials and techniques used in building and finishing residential and commercial buildings, including wood- and steel-framed structures, masonry construction, and concrete-formed structures.

#### Thermal and Moisture Protection (7.5 Hours)

ISBN 978-0-13-604846-6

(Module ID 45103-07) Covers the selection and installation of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for vapor barriers and waterproofing materials.

#### Drywall Installation (25 Hours)

ISBN 978-0-13-604847-3

(Module ID 45104-07) Discusses types of gypsum drywall, their uses, and the fastening devices and methods used to install them. Describes installing drywall on walls and ceilings using nails, drywall screws, and adhesives. Also covers fire- and sound-rated walls.

#### Drywall Finishing (25 Hours)


ISBN 978-0-13-604848-0

(Module ID 45105-07) Covers the materials, tools, and methods used to finish and patch gypsum drywall, including automatic and manual taping tools.

Continued on following page



## L2 DRYWALL



**LEVEL 2**

**Curriculum Notes**

- 145 Hours
- Revised: 2024, Second Edition
- Downloadable instructor resources are available.

**PAPERBACK** **ISBN**

Trainee Guide: \$133.32 **978-0-13-821061-8**

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Commercial Drawings (27.5 Hours)

ISBN 978-0-13-830684-7

(Module ID 45201) Focuses on techniques for reading and using architectural and structural drawings and specifications.

#### Steel Framing (52.5 Hours)

ISBN 978-0-13-604856-5

(Module ID 27209) Describes the types and grades of steel framing and provides instructions for selecting and installing steel framing for interior walls, exterior nonbearing walls, and partitions. Also covers engineered framing systems.

#### Suspended and Acoustical Ceilings (15 Hours)

ISBN 978-0-13-830693-9

(Module ID 45203-09) From Advanced Carpentry: Frame and Finish. Describes the materials, layout, and installation procedures for suspended ceilings used in commercial construction. Also covers ceiling tiles, drywall suspension systems, and pan-type ceilings.

#### Interior Specialties (15 Hours)

ISBN 978-0-13-830697-7

(Module ID 45204-09) Covers the composition and use of specialty interior finishing products, such as vinyl- and fabric-covered panels, wood wall and ceiling panels, and glass fiber-reinforced gypsum (GFRG) panels.

#### Exterior Cladding (20 hours)

ISBN 978-0-13-830705-9

(Module ID 45205-09) Covers a variety of specialized exterior finish products, including EIFS, stucco, synthetic veneer stone, panelized cladding, and glass fiber-reinforced concrete (GFRG) panels.

#### Interior Finishes (15 Hours)

ISBN 978-0-13-830710-3

(Module ID 45206-09) Covers the materials, tools, and application methods used for specialized interior finishes, such as sand, marble, clay, and Venetian plaster.

## L2 DRYWALL

**LEVEL 2**

**Curriculum Notes**

- 145 Hours
- Published: 2009
- Downloadable instructor resources are available.

**PAPERBACK** **ISBN**

Trainee Guide: \$102.99 **978-0-13-604480-2**

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Commercial Drawings (27.5 Hours)

ISBN 978-0-13-830684-7

(Module ID 45201-09) Focuses on techniques for reading and using architectural and structural drawings and specifications.

#### Steel Framing (52.5 Hours)

ISBN 978-0-13-604856-5

(Module ID 45202-09) Describes the types and grades of steel framing and provides instructions for selecting and installing steel framing for interior walls, exterior nonbearing walls, and partitions. Also covers engineered framing systems.

#### Suspended and Acoustical Ceilings (15 Hours)

ISBN 978-0-13-830693-9

(Module ID 45203-09) From Advanced Carpentry: Frame and Finish. Describes the materials, layout, and installation procedures for suspended ceilings used in commercial construction. Also covers ceiling tiles, drywall suspension systems, and pan-type ceilings.

#### Interior Specialties (15 Hours)

ISBN 978-0-13-830697-7

(Module ID 45204-09) Covers the composition and use of specialty interior finishing products, such as vinyl- and fabric-covered panels, wood wall and ceiling panels, and glass fiber-reinforced gypsum (GFRG) panels.

#### Exterior Cladding (20 hours)

ISBN 978-0-13-830705-9

(Module ID 45205-09) Covers a variety of specialized exterior finish products, including EIFS, stucco, synthetic veneer stone, panelized cladding, and glass fiber-reinforced concrete (GFRG) panels.

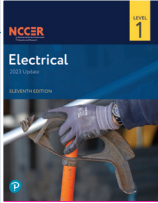
#### Specialty Finishes (15 Hours)

ISBN 978-0-13-830710-3

(Module ID 45206-09) Covers the materials, tools, and application methods used for specialized interior finishes, such as sand, marble, clay, and Venetian plaster.

## L1 ELECTRICAL

### LEVEL 1



#### Curriculum Notes

- 190 Hours (includes Core)
- Revised: 2023, Eleventh Edition, to reflect 2023 NEC®
- Downloadable instructor resources are available.
- A Spanish translation of the 2008 NEC® version is available. Please see NCCER's online catalog for more information.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-793486-7

#### DIGITAL

NCCERconnect Access Card: \$74.99

#### ISBN

978-0-13-793497-3

NCCERconnect +

Paperback Trainee Guide: \$104.99

978-0-13-793501-7

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Occupational Overview: The Electrical Industry (2.5 Hours)

ISBN 978-0-13-817449-1

(Module ID 26101-23) Provides an overview of the electrical craft and discusses the career paths available to electricians, including apprenticeship requirements.

Now Available! Journeyman Electrician Exam Prep — NCCER is releasing online practice exams through NCCER's learning platform to prepare trainees for taking the electrical licensing exam. The practice exams will consist of 300 questions based on the trainee's choice of either 2020 or 2023 NEC®. Learn more at [www.nccer.org/electrician-prep](http://www.nccer.org/electrician-prep).

#### Safety For Electricians (10 Hours)

ISBN 978-0-13-817451-4

(Module ID 26102-23) Discusses hazards and describes the various types of personal protective equipment (PPE) used to reduce injuries. Covers the standards related to electrical safety and the OSHA-mandated lockout/tagout rule.

#### Introduction to Electrical Circuits (7.5 Hours)

ISBN 978-0-13-817454-5

(Module ID 26103-23) Discusses basic atomic and electrical theory and electrical units of measurement. Explains how Ohm's law and the power equation can be used to determine unknown values, and introduces electrical schematic diagrams.

#### Electrical Theory (7.5 Hours)

ISBN 978-0-13-817456-9

(Module ID 26104-23) Introduces basic circuits, as well as the methods for calculating the electrical energy within them. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

#### Introduction to the National Electrical Code® (7.5 Hours)

ISBN 978-0-13-817458-3

(Module ID 26105-23) Introduces the NEC® and explains how to use it to find the installation requirements. Provides an overview of the National Electrical Manufacturers Association and Nationally Recognized Testing Laboratories.

#### Outlet, Device, Pull, and Junction Boxes (10 Hours)

ISBN 978-0-13-817460-0

(Module ID 26106-23) Describes the various types of boxes and explains how to calculate the NEC® fill requirements for outlet and junction boxes under 100 cubic inches (1,650 cubic centimeters).

#### Hand Bending (10 Hours)

ISBN 978-0-13-817466-8

(Module ID 26107-23) Covers methods for hand bending conduit, including 90-degree bends, back-to-back bends, offsets, and saddle bends. Describes how to cut, ream, and thread conduit.

#### Wireways, Raceways, and Fittings (20 Hours)

ISBN 978-0-13-817467-5

(Module ID 26108-23) Introduces various types of raceway systems, along with their installation and NEC® requirements. Describes the use of various conduit bodies.

#### Conductors and Cables (10 Hours)

ISBN 978-0-13-817469-9

(Module ID 26109-23) Discusses conductor types, cable markings, color codes, and ampacity derating. Describes how to install conductors using fish tape and power conduit fishing systems.

#### Basic Electrical Construction Documents (7.5 Hours)

ISBN 978-0-13-817471-2

(Module ID 26110-23) Describes how to interpret electrical drawings, including the use of architect's and engineer's scales.

#### Residential Wiring (15 Hours)

ISBN 978-0-13-817474-3

(Module ID 26111-23) Covers basic load calculations and NEC® requirements for residential electrical systems. Describes how to lay out branch circuits, install wiring, size outlet boxes, and install wiring devices.

#### Electrical Test Equipment (5 Hours)

ISBN 978-0-13-817475-0

(Module ID 26112-23) Covers the applications of various types of electrical test equipment. Describes meter safety precautions and category ratings.

## L2 ELECTRICAL

### LEVEL 2

#### Curriculum Notes

- 145 Hours
- Revised: 2023, Eleventh Edition, to reflect 2023 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-823167-5

#### DIGITAL

NCCERconnect Access Card: \$102.99

#### ISBN

978-0-13-823155-2

NCCERconnect +

Paperback Trainee Guide: \$129.99

978-0-13-823141-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Alternating Current (17.5 Hours)

ISBN 978-0-13-825278-6

(Module ID 26201-23) Describes AC circuits and explains how to apply Ohm's law to solve for unknown circuit values.

#### Motors: Theory and Application (20 Hours)

ISBN 978-0-13-825281-6

(Module ID 26202-23) Covers AC and DC motors, including the main components, circuits, and connections.

#### Electric Lighting (15 Hours)

ISBN 978-0-13-825284-7

(Module ID 26203-23) Introduces the principles of human vision and the characteristics of light. Covers different types of light sources and the operating characteristics and installation requirements of various lighting fixtures.

#### Conduit Bending (15 Hours)

ISBN 978-0-13-825286-1

(Module ID 26204-23) Describes how to make conduit bends using mechanical, hydraulic, and electric benders.

#### Pull and Junction Boxes (12.5 Hours)

ISBN 978-0-13-825288-5

(Module ID 26205-23) Explains how to size and install pull and junction boxes. Identifies various specialty enclosures, including conduit bodies, FS and FD boxes, and handholes.

#### Conductor Installations (10 Hours)

ISBN 978-0-13-825291-5

(Module ID 26206-23) Describes how to prepare conduit for conductors. Explains how to set up and complete a cable-pulling operation.

#### Cable Tray (7.5 Hours)

ISBN 978-0-13-825292-2

(Module ID 26207-23) Discusses various types of cable tray, supports, and associated fittings. Explains how to determine the loads on a cable tray and calculate fill per NEC® requirements.

#### Conductor Terminations and Splices (7.5 Hours)

ISBN 978-0-13-825295-3

(Module ID 26208-23) Explains how to prepare cable ends for terminations and splices. Describes how to train cable at termination points and describes crimping techniques.

Continued on following page

## Electrical Level 2 (continued)

### Grounding and Bonding (15 Hours)

ISBN 978-0-13-825297-7

(Module ID 26209-23) Explains the grounding and bonding requirements of NEC Article 250. Covers how to size the main and system bonding jumpers and the grounding electrode conductor for various AC systems.

### Circuit Breakers and Fuses (12.5 Hours)

ISBN 978-0-13-825299-1

(Module ID 26210-23) Describes the operating principles of circuit breakers and fuses, and explains how to select and install overcurrent devices.

### Control Systems and Fundamental Concepts

(12.5 Hours)

ISBN 978-0-13-825304-2

(Module ID 26211-23) Describes the operating principles of contactors and relays, including both mechanical and solid-state devices. Explains how to select and install relays and troubleshoot control circuits.

## L3 ELECTRICAL

### LEVEL 3

#### Curriculum Notes

- 155 Hours
- Revised: 2023, Eleventh Edition, to reflect 2023 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-817488-0

#### DIGITAL

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-817498-9

NCCERconnect +

Paperback Trainee Guide: \$129.99

978-0-13-817477-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Load Calculations — Branch and Feeder Circuits

(17.5 Hours)

ISBN 978-0-13-825305-9

(Module ID 26301-23) Explains how to calculate branch circuit and feeder loads for residential and commercial applications. Covers various derating factors.

#### Conductor Selection and Calculations (15 Hours)

ISBN 978-0-13-825307-3

(Module ID 26302-23) Explains how to make conductor calculations. Covers other factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

#### Practical Applications of Lighting (12.5 Hours)

ISBN 978-0-13-825310-3

(Module ID 26303-20) Describes various luminaires and the types of luminaires suited for various applications. Covers dimming, lighting controls, and energy management systems.

#### Hazardous Locations (15 Hours)

ISBN 978-0-13-825312-7

(Module ID 26304-23) Presents the NEC® requirements for equipment installed in hazardous locations.

#### Overcurrent Protection (25 Hours)

ISBN 978-0-13-825314-1

(Module ID 26305-23) Explains how to size and select circuit breakers and fuses for various applications. Covers short circuit calculations and troubleshooting.

#### Distribution Equipment (12.5 Hours)

ISBN 978-0-13-825317-2

(Module ID 26306-23) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Covers ground fault relay testing.

#### Transformers (12.5 Hours)

ISBN 978-0-13-825319-6

(Module ID 26307-23) Describes the construction, operation, and applications of various transformers. Covers transformer connections and grounding requirements.

#### Commercial Electrical Services (10 Hours)

ISBN 978-0-13-825321-9

(Module ID 26308-23) Covers the components, installation considerations, and NEC® requirements for commercial services.

#### Motor Calculations (12.5 Hours)

ISBN 978-0-13-825322-6

(Module ID 26309-23) Covers the calculations required to size the conductors and overcurrent protection required for motor applications.

#### Voice, Data, & Video (10 Hours)

ISBN 978-0-13-825327-1

(Module ID 26310-23) Covers the installation, termination, and testing of these systems.

#### Motor Controls (12.5 Hours)

ISBN 978-0-13-825328-8

(Module ID 26311-23) Provides information on selecting, sizing, and installing motor controllers, as well as control circuit pilot devices and basic relay logic.

## L4 ELECTRICAL

### LEVEL 4

#### Curriculum Notes

- 182.5 Hours
- Revised: 2023, Eleventh Edition, to reflect 2023 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-817621-1

#### DIGITAL

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-817629-7

NCCERconnect +

Paperback Trainee Guide: \$129.99

978-0-13-817620-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Load Calculations — Feeders & Services (20 Hours)

ISBN 978-0-13-828909-6

(Module ID 26401-23) Covers basic calculations for commercial and residential applications, including raceway fill, conductor derating, and voltage drop.

#### Health Care Facilities (10 Hours)

ISBN 978-0-13-828910-2

(Module ID 26402-23) Covers the installation, alarm system, and backup system requirements of electrical systems in health care facilities, including the requirements for life safety and critical circuits.

#### Standby and Emergency Systems (10 Hours)

ISBN 978-0-13-828913-3

(Module ID 26403-23) Explains the NEC® installation requirements for electric generators and storage batteries used during such emergency situations.

#### Basic Electronic Theory (10 Hours)

ISBN 978-0-13-828915-7

(Module ID 26404-23) Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

#### Fire Alarm Systems (15 Hours)

ISBN 978-0-13-828917-1

(Module ID 26405-23) Explores the technologies, codes, and wiring approaches used to assemble a fire alarm system. Examines installation and troubleshooting techniques.

#### Specialty Transformers (10 Hours)

ISBN 978-0-13-828918-8

(Module ID 26406-23) Covers various types of transformers, and provides information on selecting, sizing, and installing them.

Continued on following page

## Electrical Level 4 (continued)

### **Advanced Controls** (20 Hours)

ISBN 978-0-13-828919-5

(Module ID 26407-23) Discusses applications and operating principles of various control system components, such as solid-state relays, reduced-voltage starters, and adjustable-frequency drives. Covers basic troubleshooting procedures.

### **HVAC Controls** (15 Hours)

ISBN 978-0-13-828921-8

(Module ID 26408-23) Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

### **Heat Tracing and Freeze Protection** (10 Hours)

ISBN 978-0-13-828924-9

(Module ID 26409-23) Presents heat-tracing and freeze-protection systems along with various applications and installation requirements.

### **Motor Operation and Maintenance** (10 Hours)

ISBN 978-0-13-828926-3

(Module ID 26410-23) Covers motor care procedures, including cleaning, testing, and preventive maintenance. Describes basic troubleshooting procedures.

### **Medium-Voltage Terminations/Splices** (10 Hours)

ISBN 978-0-13-828927-0

(Module ID 26411-23) Identifies types of medium-voltage cable and describes how to make various splices and terminations. Covers hi-pot testing.

### **Special Locations** (20 Hours)

ISBN 978-0-13-828928-7

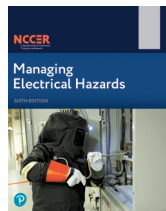
(Module ID 26412-23) Describes the NEC® requirements for selecting and installing equipment, enclosures, and devices for special locations that require unique attention. Locations include places of public assembly, theaters, carnivals, agricultural and livestock facilities, marinas, swimming pools, and temporary facilities.

### **Introduction to Leadership** (22.5 Hours)

ISBN 978-0-13-828931-7

(Module ID 46100) (Lockdown) Introduces leadership skills and different leadership styles, as well as communication and problem solving techniques. Jobsite safety and safety leadership are also discussed. Introduces business topics that are important to understand for construction projects.

## Managing Electrical Hazards



12.5 Hours  
Revised: 2024, Sixth Edition  
Module ID 26501-24

**PAPERBACK**

Trainee Guide: \$39.99

**ISBN**

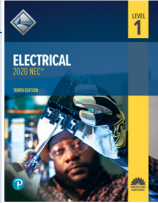
**978-0-13-831869-7**

- A copy of NFPA 70E®, *Standard for Electrical Safety in the Workplace*, 2024 Edition, is required material for this course. To order, contact NFPA at [www.nfpa.org](http://www.nfpa.org) or 1-800-344-3555.

Describes how to assess and eliminate shock, arc blast, and arc flash hazards using the practical safe working requirements detailed in NFPA 70E: *Standard for Electrical Safety in the Workplace*®. Where it is not possible to eliminate a hazard, an energized electrical work permit must be completed, and workers must be protected by appropriate safety procedures and personal protective equipment.

## L1 ELECTRICAL

LEVEL 1



### Curriculum Notes

- 187.5 Hours (includes Core)
- Revised: 2020, Tenth Edition, to reflect 2020 NEC®
- Downloadable instructor resources are available.
- A Spanish translation of the 2008 NEC® version is available. Please see NCCER's online catalog for more information.

#### PAPERBACK

Trainee Guide: \$74.99

ISBN

978-0-13-690853-1

#### DIGITAL

NCCERconnect Access Card: \$74.99

ISBN

978-0-13-690852-4

NCCERconnect +

Hardcover Trainee Guide: \$104.99

978-0-13-731057-9

NCCERconnect +

Paperback Trainee Guide: \$104.99

978-0-13-731062-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Occupational Overview: The Electrical Industry (2.5 Hours)

ISBN 978-0-13-690875-3

(Module ID 26101-20) Provides an overview of the electrical craft and discusses the career paths available to electricians, including apprenticeship requirements.

Now Available! Journeyman Electrician Exam Prep — NCCER is releasing online practice exams through NCCER's learning platform to prepare trainees for taking the electrical licensing exam. The practice exams will consist of 300 questions based on the trainee's choice of either 2020 or 2017 NEC®. Learn more at [www.nccer.org/electrician-prep](http://www.nccer.org/electrician-prep).

#### Safety For Electricians (10 Hours)

ISBN 978-0-13-690864-7

(Module ID 26102-20) Discusses hazards and describes the various types of personal protective equipment (PPE) used to reduce injuries. Covers the standards related to electrical safety and the OSHA-mandated lockout/tagout rule.

#### Introduction to Electrical Circuits (7.5 Hours)

ISBN 978-0-13-690893-7

(Module ID 26103-20) Introduces electrical concepts used in Ohm's law and how the power equation can be used to determine unknown values. Covers basic atomic theory and electrical theory, electrical schematic diagrams, and electric power equations.

#### Electrical Theory (7.5 Hours)

ISBN 978-0-13-69089-20

(Module ID 26104-20) Introduces basic circuits, as well as the methods for calculating the electrical energy within them. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

#### Introduction to the National Electrical Code (7.5 Hours)

ISBN 978-0-13-690888-3

(Module ID 26105-20) Introduces the NEC® and explains how to use it to find the installation requirements. Provides an overview of the National Electrical Manufacturers Association and Nationally Recognized Testing Laboratories.

#### Device Boxes (10 Hours)

ISBN 978-0-13-690874-6

(Module ID 26106-20) Describes the various types of boxes and explains how to calculate the NEC® fill requirements for outlet adjunction boxes under 100 cubic inches (1,650 cubic centimeters).

#### Hand Bending (10 Hours)

ISBN 978-0-13-690873-9

(Module ID 26107-20) Covers methods for hand bending conduit, including 90-degree bends, back-to-back bends, offsets, and saddle bends. Describes how to cut, ream, and thread conduit.

#### Wireways, Raceways, and Fittings (20 Hours)

ISBN 978-0-13-690887-6

(Module ID 26108-20) Introduces various types of raceway systems, along with their installation and NEC® requirements. Describes the use of various conduit bodies.

#### Conductors and Cables (10 Hours)

ISBN 978-0-13-690862-3

(Module ID 26109-20) Discusses conductor types, cable markings, color codes, and ampacity derating. Describes how to install conductors using fish tape and power conduit fishing systems.

#### Basic Electrical Construction Documents (7.5 Hours)

ISBN 978-0-13-690884-5

(Module ID 26110-20) Describes how to interpret electrical drawings, including the use of architect's and engineer's scales.

#### Residential Wiring (15 Hours)

ISBN 978-0-13-690885-2

(Module ID 26111-20) Covers basic load calculations and NEC® requirements for residential electrical systems. Describes how to lay out branch circuits, install wiring, size outlet boxes, and install wiring devices.

#### Electrical Test Equipment (5 Hours)

ISBN 978-0-13-690866-1

(Module ID 26112-20) Covers the applications of various types of electrical test equipment. Describes meter safety precautions and category ratings.

## L2 ELECTRICAL

LEVEL 2

### Curriculum Notes

- 145 Hours
- Revised: 2020, Tenth Edition, to reflect 2020 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-013-689782-8

#### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN

978-0-13-689771-2

NCCERconnect +

Hardcover Trainee Guide: \$129.99

978-0-13-731058-6

NCCERconnect +

Paperback Trainee Guide: \$129.99

978-0-13-731065-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Alternating Current (17.5 Hours)

ISBN 978-0-13-689729-3

(Module ID 26201-20) Describes AC circuits and explains how to apply Ohm's law to solve for unknown circuit values.

#### Motors: Theory and Application (20 Hours)

ISBN 978-0-13-689718-7

(Module ID 26202-20) Covers AC and DC motors, including the main components, circuits, and connections.

#### Electric Lighting (15 Hours)

ISBN 978-0-13-689723-1

(Module ID 26203-20) Introduces the principles of human vision and the characteristics of light. Covers different types of light sources and the operating characteristics and installation requirements of various lighting fixtures.

#### Conduit Bending (15 Hours)

ISBN 978-0-13-689760-6

(Module ID 26204-20) Describes how to make conduit bends using mechanical, hydraulic, and electric benders.

#### Pull and Junction Boxes (12.5 Hours)

ISBN 978-0-13-689752-1

(Module ID 26205-20) Explains how to size and install pull and junction boxes. Identifies various specialty enclosures, including conduit bodies, FS and FD boxes, and handholes.

#### Conductor Installations (10 Hours)

ISBN 978-0-13-689717-0

(Module ID 26206-20) Describes how to prepare conduit for conductors. Explains how to set up and complete a cable-pulling operation.

Continued on following page



## Electrical Level 2 (continued)

### Cable Tray (7.5 Hours)

ISBN 978-0-13-689749-1

(Module ID 26207-20) Discusses various types of cable tray, supports, and associated fittings. Explains how to determine the loads on a cable tray and calculate fill per NEC® requirements.

### Conductor Terminations and Splices (7.5 Hours)

ISBN 978-0-13-689711-8

(Module ID 26208-20) Explains how to prepare cable ends for terminations and splices. Describes how to train cable at termination points and describes crimping techniques.

### Grounding and Bonding (15 Hours)

ISBN 978-0-13-689735-4

(Module ID 26209-20) Explains the grounding and bonding requirements of NEC Article 250. Covers how to size the main and system bonding jumpers and the grounding electrode conductor for various AC systems.

### Circuit Breakers and Fuses (12.5 Hours)

ISBN 978-0-13-689766-8

(Module ID 26210-20) Describes the operating principles of circuit breakers and fuses, and explains how to select and install overcurrent devices.

### Control Systems and Fundamental Concepts

(12.5 Hours)

ISBN 978-0-13-689762-0

(Module ID 26211-20) Describes the operating principles of contactors and relays, including both mechanical and solid-state devices. Explains how to select and install relays and troubleshoot control circuits.

## L3 ELECTRICAL

### LEVEL 3

#### Curriculum Notes

- 155 Hours
- Revised: 2020, Tenth Edition, to reflect 2020 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-690480-9

#### DIGITAL

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-690502-8

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-731066-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Load Calculations — Branch and Feeder Circuits

(17.5 Hours)

ISBN 978-0-13-690543-1

(Module ID 26301-20) Explains how to calculate branch circuit and feeder loads for residential and commercial applications. Covers various derating factors.

#### Conductor Selection and Calculations (15 Hours)

ISBN 978-0-13-690549-3

(Module ID 26302-20) Explains how to make conductor calculations. Covers other factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

#### Practical Applications of Lighting (12.5 Hours)

ISBN 978-0-13-690514-1

(Module ID 26303-20) Describes various luminaires and the types of luminaires suited for various applications. Covers dimming, lighting controls, and energy management systems.

#### Hazardous Locations (15 Hours)

ISBN 978-0-13-690493-9

(Module ID 26304-20) Presents the NEC® requirements for equipment installed in hazardous locations.

#### Overcurrent Protection (25 Hours)

ISBN 978-0-13-690490-8

(Module ID 26305-20) Explains how to size and select circuit breakers and fuses for various applications. Covers short circuit calculations and troubleshooting.

#### Distribution Equipment (12.5 Hours)

ISBN 978-0-13-690513-4

(Module ID 26306-20) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Covers ground fault relay testing.

#### Transformers (12.5 Hours)

ISBN 978-0-13-690500-4

(Module ID 26307-20) Describes the construction, operation, and applications of various transformers. Covers transformer connections and grounding requirements.

#### Commercial Electrical Services (10 Hours)

ISBN 978-0-13-690526-4

(Module ID 26308-20) Covers the components, installation considerations, and NEC® requirements for commercial services.

#### Motor Calculations (12.5 Hours)

ISBN 978-0-13-690498-4

(Module ID 26309-20) Covers the calculations required to size the conductors and overcurrent protection required for motor applications.

#### Voice, Data, & Video (10 Hours)

ISBN 978-0-13-690537-0

(Module ID 26310-20) Covers the installation, termination, and testing of these systems.

#### Motor Controls (12.5 Hours)

ISBN 978-0-13-690522-6

(Module ID 26311-20) Provides information on selecting, sizing, and installing motor controllers, as well as control circuit pilot devices and basic relay logic.

## L4 ELECTRICAL

### LEVEL 4

#### Curriculum Notes

- 182.5 Hours
- Revised: 2020, Tenth Edition, to reflect 2020 NEC®
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-691078-7

#### DIGITAL

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-691108-1

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-731069-2

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Load Calculations — Feeders & Services (20 Hours)

ISBN 978-0-13-691126-5

(Module ID 26401-20) Covers basic calculations for commercial and residential applications, including raceway fill, conductor derating, and voltage drop.

#### Health Care Facilities (10 Hours)

ISBN 978-0-13-691132-6

(Module ID 26402-20) Covers the installation, alarm system, and backup system requirements of electrical systems in health care facilities, including the requirements for life safety and critical circuits.

#### Standby and Emergency Systems (10 Hours)

ISBN 978-0-13-691103-6

(Module ID 26403-20) Explains the NEC® installation requirements for electric generators and storage batteries used during such emergency situations.

#### Basic Electronic Theory (10 Hours)

ISBN 978-0-13-691092-3

(Module ID 26404-20) Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

#### Fire Alarm Systems (15 Hours)

ISBN 978-0-13-691131-9

(Module ID 26405-20) Explores the technologies, codes, and wiring approaches used to assemble a fire alarm system. Examines installation and troubleshooting techniques.

#### Specialty Transformers (10 Hours)

ISBN 978-0-13-691087-9

(Module ID 26406-20) Covers various types of transformers, and provides information on selecting, sizing, and installing them.

Continued on following page



## Electrical Level 4 (continued)

### **Advanced Controls** (20 Hours)

**ISBN 978-0-13-691100-5**

(Module ID 26407-20) Discusses applications and operating principles of various control system components, such as solid-state relays, reduced-voltage starters, and adjustable-frequency drives. Covers basic troubleshooting procedures.

### **HVAC Controls** (15 Hours)

**ISBN 978-0-13-691124-1**

(Module ID 26408-20) Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

### **Heat Tracing and Freeze Protection** (10 Hours)

**ISBN 978-0-13-691095-4**

(Module ID 26409-20) Presents heat-tracing and freeze-protection systems along with various applications and installation requirements.

### **Motor Operation and Maintenance** (10 Hours)

**ISBN 978-0-13-691121-0**

(Module ID 26410-20) Covers motor care procedures, including cleaning, testing, and preventive maintenance. Describes basic troubleshooting procedures.

### **Medium-Voltage Terminations/Splices** (10 Hours)

**ISBN 978-0-13-691127-2**

(Module ID 26411-20) Identifies types of medium-voltage cable and describes how to make various splices and terminations. Covers hi-pot testing.

### **Special Locations** (20 Hours)

**ISBN 978-0-13-691118-0**

(Module ID 26412-20) Describes the NEC® requirements for selecting and installing equipment, enclosures, and devices for special locations that require unique attention. Locations include places of public assembly, theaters, carnivals, agricultural and livestock facilities, marinas, swimming pools, and temporary facilities.


### **Fundamentals of Crew Leadership** (22.5 Hours)

**ISBN 978-0-13-487188-2**

(Module ID 46101) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

# Electronic Systems Technician

## L3 ELECTRONIC SYSTEMS TECHNICIAN



**LEVEL 3**

**Curriculum Notes**

- 192.5 Hours
- Revised: 2021, Fourth Edition
- Downloadable instructor resources are available.

<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-684451-8</b>
<b>DIGITAL</b>	<b>ISBN</b>
NCCERconnect Access Card: \$102.99	<b>978-0-13-684435-8</b>
NCCERconnect + Trainee Guide: \$129.99	<b>978-0-13-768322-2</b>

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Limited-Energy Cabling (20 Hours)

ISBN 978-0-13-689799-6

(Module ID 33108) Covers the makeup, identification, and applications of conductors and cables used in limited-energy applications. Describes the tools, materials, and procedures for pulling limited-energy cabling through conduit and raceways.

### Limited-Energy Cable Selection (10 Hours)

ISBN 978-0-13-690840-1

(Module ID 33208) Provides an overview of the types of cable used for limited-energy installations. Also covers methods used to select the proper size and type of cable for a typical low-voltage installations.

### Limited-Energy Cable Termination (25 Hours)

ISBN 978-0-13-690834-0

(Module ID 33209) Provides information and instructions for selecting, installing, and testing connectors and other terminating devices on cables used in limited-energy work, including telecommunications, video, audio, and fiber optic installations.

### Limited-Energy Network Installations (25 Hours)

ISBN 978-0-13-681283-8

(Module ID 33301) Details procedures for connecting computers and other devices using both wired and wireless network connections. Describes components and architecture of ethernet, LAN, and powerline carrier networks.

### Fiber Optics (25 Hours)

ISBN 978-0-13-681292-0

(Module ID 33302) Introduces the types of equipment and methods used in fiber-optic cable installation.

### Wireless Communication (15 Hours)

ISBN 978-0-13-684443-3

(Module ID 33303) Introduces wireless communications and discusses current technologies transforming the market to include 5G, various residential and wireless networks, and a variety of mobile devices. Covers updated technologies and their implications. Emphasizes growing relevance of network security.

### Site Survey, Project Planning, and Documentation (15 Hours)

ISBN 978-0-13-681282-1

(Module ID 33304) Explains planning a job from start to finish, including how to perform site surveys for new and retrofit construction projects. Covers drawings, specifications, and current software applications used on the construction site.

### Rack Assembly (17.5 Hours)

ISBN 978-0-13-684438-9

(Module ID 33305) Describes rack systems and best practices for assembling electronic system enclosures, including power sequencing, grounding, bonding, weight distribution, and heat dissipation. Explains electrical power distribution and load calculations for equipment housed within racks.

### System Commissioning and User Training (20 Hours)

ISBN 978-0-13-684446-4

(Module ID 33306) Covers basic steps in the commission process including development of the plan and user-required training approach. Describes customer satisfaction levels and meeting expectations during the cut-over phase of a project.


### Maintenance and Repair (20 Hours)

ISBN 978-0-13-681276-0

(Module ID 33307) Introduces tasks involved in the maintenance and repair of limited-energy systems and equipment. Presents a systematic approach to system and component-level troubleshooting and methods of identifying common repair types.

Electronic Systems Technician (EST) has been combined with NCCER's Electrical series to provide additional career pathways. After completing Electrical Levels 1 and 2, trainees can choose to advance into Electrical Levels 3-4 or EST Levels 3-4.

## L4 ELECTRONIC SYSTEMS TECHNICIAN



**LEVEL 4**

**Curriculum Notes**

- 315 Hours
- Revised: 2021, Fourth Edition
- Downloadable instructor resources are available.

<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-684415-0</b>
<b>DIGITAL</b>	<b>ISBN</b>
NCCERconnect Access Code: \$102.99	<b>978-0-13-684421-1</b>
NCCERconnect + Trainee Guide: \$129.99	<b>978-0-13-768323-9</b>

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Audio Systems (30 Hours)

ISBN 978-0-13-684414-3

(Module ID 33401) Introduces and explains audio system components, including input sources, amplifiers, signal processing equipment, and output equipment. Describes power requirements, cabling options, system configuration, and basic design considerations. Reviews common test equipment used for installation and troubleshooting.

### Video Systems (40 Hours)

ISBN 978-0-13-684402-0

(Module ID 33402) Describes the types of equipment used in various video systems and equipment, including both analog and digital video, video signaling, display devices, HDTV, reality technologies, and videoprocessing and distribution.

### Broadband (25 Hours)

ISBN 978-0-13-684350-4

(Module ID 33403) Explains the history of broadband and explores the primary delivery methods, including telephone lines, DSL, ADSL, BPL, cable and fiber optics, satellite, cellular, Wi-Fi®, and emerging technologies such as low earth orbit satellites.

### Media Management Systems (25 Hours)

ISBN 978-0-13-684408-2

(Module ID 33404) Explains the basic principles behind shared media resources and their access via computer networks, wireless systems, and hardwired applications. Describes media types for both analog and digital platforms. Explores cabling options including fiber optic interfaces.

### Telecommunications Systems (20 Hours)

ISBN 978-0-13-684403-7

(Module ID 33405) Describes the history and updates of basic subscriber systems. Identifies types of telephone technologies, compares multiplexing and modulation, and covers Voice over Internet Protocol (VoIP).

### Residential and Commercial Networks (15 Hours)

ISBN 978-0-13-684372-6

(Module ID 33406) Explains the integration of current and diverse low-voltage systems and the trend toward their singular hub control (or star topology connectivity). Covers implications of user-interfacing technologies. Updated to 2020 NEC® codes as well as future outlook of building networks.

### Intrusion Detection Systems (30 Hours)

ISBN 978-0-13-684339-9

(Module ID 33407) Describes devices such as sensors, notification, control panels, and programming used in intrusion detection security systems. Covers system design and installation guidelines, wiring, testing, and troubleshooting. Emphasizes codes and standards.

Continued on following page

## Electronic Systems Technician Level 4 (continued)

### **Fire Alarm Systems** (40 Hours)

**ISBN 978-0-13-684394-8**

(Module ID 33408) Covers the basics of fire alarm systems, including devices, circuits, system design and installation guidelines, power requirements, control unit programming, testing, and troubleshooting. Explores integration of fire alarms with other systems. Examines both residential and commercial fire alarm applications, emphasizing NEC® requirements and those found in NFPA 72.

### **Nurse Call and Signaling Systems** (15 Hours)

**ISBN 978-0-13-684382-5**

(Module ID 33409) Presents an overview of nurse call and signaling systems as found in hospitals and other healthcare facilities. Covers basic emergency call and duress system requirements based on facility type. Identifies installation requirements based on UL and other building code specifications.

### **Closed Circuit Television (CCTV)** (30 Hours)

**ISBN 978-0-13-684362-7**

(Module ID 33410) Describes the installation and configuration of closed circuit TV systems for small, medium, and large facilities. Explains various equipment and concepts, including cameras, lenses, remote positioning, video recording, cloud storage, and transmission. Covers the roles of the internet and digital technologies. Introduces test and troubleshooting equipment.

### **Access Control Systems** (35 Hours)

**ISBN 978-0-13-684388-7**

(Module ID 33411) Introduces access control systems and applications including, door security and locking devices, card and biometric readers, and current ingress/egress technologies. Emphasizes installation practices as well as building and electrical codes.

### **EST and Internet of Things (IoT)** (10 Hours)

**ISBN 978-0-13-684363-4**

(Module ID 33412) Introduces the history, development, and application of integrated Internet of Things (IoT) technologies as well as their influences on contemporary electronics. Addresses the increased need for component integration and introduces basic IoT devices involved today's systems. Presents an outlook on the future of IoT and its increased demand for ESTs.

# Heavy Equipment Operations

## L1 HEAVY EQUIPMENT OPERATIONS

LEVEL 1



### Curriculum Notes

- 185 Total Hours (including 77.5 hours of Core)
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$69.99

ISBN

978-0-13-830422-5

### DIGITAL (2013, Third Edition Only)

NCCERconnect Access Card: \$74.99

ISBN

978-0-13-830408-9

NCCERconnect + Trainee Guide: \$104.99

978-0-13-830424-9

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Heavy Equipment (5 Hours)

ISBN 978-0-13-532282-6

(Module ID 22101) Provides an overview of heavy equipment terminology, operations, operator responsibilities, career opportunities, and basic principles of safety.

### Classification of Heavy Equipment (5 Hours)

ISBN 978-0-13-532286-4

(Module ID 22103) Introduces the most used pieces of heavy equipment in construction and mining. Describes the functional operation and uses for each piece of equipment, along with a general description of heavy equipment drive and hydraulic systems.

### Heavy Equipment Operation Safety (15 Hours)

ISBN 978-0-13-532292-2

(Module ID 22102) Provides a comprehensive overview of safety requirements on jobsites with emphasis on OSHA, MSHA, and NIOSH requirements. Presents basic requirements for personal protection, safe equipment operations and maintenance, excavations, and HAZCOM.

### Equipment Inspection, Operation, and Readiness (25 Hours)

ISBN 978-0-13-532287-1

(Module ID 22108) Describes prestart inspection, operating, and shutdown procedures for heavy equipment. Covers engine systems and preoperational check procedures for hybrid and electrically powered equipment.

### Introduction to Earthmoving (12.5 Hours)

ISBN 978-0-13-532288-8

(Module ID 22201) Provides a broad introduction to the process of planning and executing earthmoving activities on various types of construction projects. Explains types of heavy equipment used in excavating and methods of stabilizing soils.

### Introduction to GPS/GNSS (5 Hours)

ISBN 978-0-13-532291-8

(Module ID 22109) Describes types of equipment and GPS and laser instruments used in finish grading. Covers processes for site planning for use with GNSS and autonomous equipment utilizing GPS/GNSS.

### Utility Tractors (17.5 Hours)

ISBN 978-0-13-532294-9

(Module ID 22105) Covers operation of general utility tractors in the construction industry. Describes duties and responsibilities of the operator, safety rules for operation, the attachment of implements, and basic preventive maintenance practices.

### Skid Steers (22.5 Hours)

ISBN 978-0-13-532296-3

(Module ID 22212) Describes the many uses of skid steers and the attachments available for these machines. Covers safety practices, as well as inspection, startup, shutdown, and operation of skid steers.

## L1 HEAVY EQUIPMENT OPERATIONS (REVISED)

LEVEL 1



### Curriculum Notes

- 175 Total Hours (includes Core)
- Revised: 2020, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$69.99

ISBN

978-0-13-663897-1

### DIGITAL (2013, Third Edition Only)

NCCERconnect Access Card: \$74.99

ISBN

978-0-13-448249-1

NCCERconnect + Trainee Guide: \$104.99

978-0-13-723965-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (5 Hours)

ISBN 978-0-13-663915-2

(Module ID 22101) Provides an overview of heavy equipment terminology, operations, operator responsibilities, career opportunities, and basic principles of safety.

### Heavy Equipment Safety (10 Hours)

ISBN 978-0-13-663907-7

(Module ID 22102) Provides a comprehensive overview of safety requirements on job sites with emphasis on OSHA, MSHA, and NIOSH requirements. Presents basic requirements for personal protection, safe equipment operations and maintenance, and HAZCOM.

### Identification of Heavy Equipment (5 Hours)

ISBN 978-0-13-663920-6

(Module ID 22103) Instructs trainees in the care and use of the different types of hand and power tools they will use on the job. Gives trainees the information they need to select the appropriate tools for different tasks, and reviews tool maintenance and safety issues.

### Basic Operational Techniques (27.5 Hours)

ISBN 978-0-13-663916-9

(Module ID 22104) Covers prestart checks of a machine's hardware (frame, body panels, tires or tracks, and safety equipment), driveline components, hydraulic system components, electrical components, and controls. Reviews machine safety issues. Explains how to safely start, move, steer, stop, and shut down different types of machines.

### Utility Tractors (17.5 Hours)

ISBN 978-0-13-663910-7

(Module ID 22105) Covers operation of general utility tractors in the construction industry. Describes duties and responsibilities of the operator, safety rules for operation, the attachment of implements, and basic preventive maintenance practices.

### Introduction to Earthmoving (12.5 Hours)

ISBN 978-0-13-663924-4

(Module ID 22201) Provides a broad introduction to the process of planning and executing earthmoving activities on various types of construction projects. The use of heavy equipment such as bulldozers, scrapers, excavators, and loaders is explained.

### Grades (15 Hours)

ISBN 978-0-13-663918-3

(Module ID 22106) Introduces the concept of preparing graded surfaces using heavy equipment. Covers identification of construction stakes and interpretation of marks on each type of stake. Describes the process for grading slopes.

### Vertical-Mast Sit-Down Counterbalance Forklifts (7.5 Hours)

ISBN 978-0-13-663909-1

(Module ID 22107) Covers operation of vertical-mast Sit-Down Counterbalance (SDCB) forklifts, commonly known as conventional forklifts. Describes duties and responsibilities of the operator, safety rules for operation, and distinguishing features. Includes operation for both indoor and outdoor environments.

Continued on following page

## L2 HEAVY EQUIPMENT OPERATIONS (REVISED)

### LEVEL 2



#### Curriculum Notes

- 200 Total Hours
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-138304-53-9

#### DIGITAL (2013, Third Edition Only)

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-830444-7

NCCERconnect + Trainee Guide: \$129.99

978-0-13-830435-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Excavation Math (7.5 Hours)

ISBN 978-0-13-532297-0

(Module ID 22207) Covers basic math skills required for site excavation work. Includes methods and practice in calculating the areas and volumes of various geometric shapes, as well as formulas and methods used to calculate cut and fill requirements on a job.

#### Interpreting Civil Drawings (20 Hours)

ISBN 978-0-13-532298-7

(Module ID 22209) Explains how to read site plans to calculate cut and fill requirements. Provides instruction and practice in interpreting both roadway and construction site drawings used for excavation and grading work.

#### Soils (10 Hours)

ISBN 978-0-13-532299-4

(Module ID 22308) Describes soil classification systems and explains how shrink and swell factors affect equipment selection. Discusses how soil conditions affect equipment performance and explains techniques for working with various types of soils.

#### Site Work (25 Hours)

ISBN 978-0-13-532301-4

(Module ID 22210) Expands on information covered in Level 1 in relation to setting and interpreting grade stakes. Also provides information and instructions on controlling surface water and groundwater on a jobsite, as well as the layout of foundations and laying of pipe.

#### Grades and Grading (15 Hours)

ISBN 978-0-13-532304-5

(Module ID 22106) Introduces the concept of preparing graded surfaces using heavy equipment. Covers identification of

construction stakes and interpretation of marks on each type of stake. Describes the process for grading slopes.

#### Backhoes (30 Hours)

ISBN 978-0-13-532305-2

(Module ID 22303) Identifies and describes the common uses, types, components, instruments, controls, and attachments of backhoes. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with backhoes.

#### Loaders (17.5 Hours)

ISBN 978-0-13-532307-6

(Module ID 22205) Covers the uses of wheel and track loaders, as well as operator maintenance, loader safety, and operating procedures. Includes procedures for using loaders in excavation, grading, and demolition work.

#### Dozers (30 Hours)

ISBN 978-0-13-532308-3

(Module ID 22302) Identifies and describes the common uses, types, and components of dozers. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with dozers.

#### Excavators (35 Hours)

ISBN 978-0-13-532309-0

(Module ID 22304) Identifies and describes the common types, uses, and components of excavators. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with excavators.

## L2 HEAVY EQUIPMENT OPERATIONS

### LEVEL 2

#### Curriculum Notes

- 167.5 Hours
- Revised: 2013, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-340251-3

#### DIGITAL

#### ISBN

NCCERconnect Access Card: \$102.99

978-0-13-448252-1

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-453963-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Rough Terrain Forklifts (22.5 Hours)

ISBN 978-0-13-340322-0

(Module ID 22206-13) Covers the uses of forklifts on construction sites. Includes instructions for lifting, transporting, and placing various types of loads, as well as safety, operation, and maintenance procedures.

#### On-Road Dump Trucks (20 Hours)

ISBN 978-0-13-340319-0

(Module ID 22202-13) Covers uses, inspection, startup, shutdown, operator maintenance, and operation of dump trucks used to carry loads on public highways. Includes operation of dump trucks in normal and emergency situations.

#### Excavation Math (17.5 Hours)

ISBN 978-0-13-340323-7

(Module ID 22207-13) Covers basic math skills required for site excavation work. Includes methods and practice in calculating the areas and volumes of various geometric shapes, as well as formulas and methods used to calculate cut and fill requirements on a job.

#### Interpreting Civil Drawings (20 Hours)

ISBN 978-0-13-340325-1

(Module ID 22209-13) Explains how to read site plans to calculate cut and fill requirements. Provides instruction and practice in interpreting both roadway and construction site drawings used for excavation and grading work.

#### Site Work (20 Hours)

ISBN 978-0-13-340326-8

(Module ID 22210-13) Expands on information covered in Level 1 in relation to setting and interpreting grade stakes. Also provides information and instructions on controlling surface water and ground water on a job site, as well as the layout of foundations and laying of pipe.

#### Soils (10 Hours)

ISBN 978-0-13-340328-2

(Module ID 22308-13) Describes soil classification systems and explains how shrink and swell factors affect equipment selection. Discusses how soil conditions affect equipment performance and explains techniques for working with various types of soils.

#### Skid Steers (22.5 Hours)

ISBN 978-0-13-340327-5

(Module ID 22212-13) Describes the many uses of skid steers and the attachments available for these machines. Covers safety practices, as well as inspection, startup, shutdown, and operation of skid steers.

#### Loaders (17.5 Hours)

ISBN 978-0-13-340321-3

(Module ID 22205-13) Covers the uses of wheel and track loaders, as well as operator maintenance, loader safety, and operating procedures. Includes procedures for using loaders in excavation, grading, and demolition work.

#### Scrapers (17.5 Hours)

ISBN 978-0-13-340320-6

(Module ID 22204-13) Describes the types of scrapers used in site preparation, as well as the safe practices associated with the operation of scrapers. Covers operator inspection and maintenance requirements, along with startup, shutdown, and operating techniques.

L3

HEAVY EQUIPMENT OPERATIONS (REVISED)

LEVEL 3

Curriculum Notes

- 145 Total Hours
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-830237-5

DIGITAL (2013, Third Edition Only)

ISBN

NCCERconnect Access Card: \$102.99

978-0-13-830229-0

NCCERconnect + Trainee Guide: \$129.99

978-0-13-830236-8

**Rough Terrain Forklifts** (25 Hours)  
**ISBN 978-0-13-532542-1**  
 (Module ID 22206) Covers the uses of forklifts on construction sites. Includes instructions for lifting, transporting, and placing various types of loads, as well as safety, operation, and maintenance procedures.

**Conventional Forklifts** (10 Hours)  
**ISBN 978-0-13-532544-5**  
 (Module ID 22107) Covers operation of vertical-mast Sit-Down Counterbalance (SDCB) forklifts, commonly known as conventional forklifts. Describes duties and responsibilities of the operator, safety rules for operation, and distinguishing features. Includes operation for both indoor and outdoor environments.

**Compaction Equipment** (25 Hours)  
**ISBN 978-0-13-532546-9**  
 (Module ID 22203) Provides training on common types of compaction equipment; the primary instruments, controls, and attachments of a roller; safety guidelines associated with compaction equipment; and prestart inspections, preventive maintenance, and proper operating procedures. Presents factors involved in work activities associated with a roller.

**Scrapers** (20 Hours)  
**ISBN 978-0-13-532547-6**  
 (Module ID 22204) Describes the types of scrapers used in site preparation, as well as the safe practices associated with the operation of scrapers. Covers operator inspection and maintenance requirements, along with startup, shutdown, and operating techniques.

**Dump Trucks** (25 Hours)  
**ISBN 978-0-13-532548-3**  
 (Module ID 22311) Identifies the types of on-road and off-road dump trucks and common instruments and control systems. Describes operator inspection and maintenance, safe driving practices for both on-road and within a jobsite, and startup and shutdown procedures.

**Motor Graders** (40 Hours)  
**ISBN 978-0-13-532308-3**  
 (Module ID 22305) Identifies and describes the common uses and types of motor graders. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with motor graders.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

L3

HEAVY EQUIPMENT OPERATIONS

LEVEL 2

Curriculum Notes

- 215 Hours
- Revised: 2014, Third Edition
- Downloadable instructor resources are available.

PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-340256-8

DIGITAL

ISBN

NCCERconnect Access Card: \$102.99

978-0-13-448244-6

NCCERconnect + Trainee Guide: \$129.99

978-0-13-453962-1

**Compaction Equipment** (25 Hours)  
**ISBN 978-0-13-377956-1**  
 (Module ID 22203-14) Provides training on common types of compaction equipment; the primary instruments, controls, and attachments of a roller; safety guidelines associated with compaction equipment; and prestart inspections, preventive maintenance, and proper operating procedures. Presents factors involved in work activities associated with a roller.

**Backhoes** (30 Hours)  
**ISBN 978-0-13-377957-8**  
 (Module ID 22303-14) Identifies and describes the common uses, types, components, instruments, controls, and attachments of backhoes. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with backhoes.

**Off-Road Dump Trucks** (30 Hours)  
**ISBN 978-0-13-377958-5**  
 (Module ID 22310-14) Identifies and describes the common types, uses, and components of off-road dump trucks. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Covers basic startup, driving maneuvers, loading, and dumping procedures for off-road dump trucks.

**Dozers** (30 Hours)  
**ISBN 978-0-13-382759-0**  
 (Module ID 22302-14) Identifies and describes the common uses, types, and components of dozers. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with dozers.

**Excavators** (35 Hours)  
**ISBN 978-0-13-377959-2**  
 (Module ID 22304-14) Identifies and describes the common types, uses, and components of excavators. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with excavators.

**Motor Graders** (40 Hours)  
**ISBN 978-0-13-377962-2**  
 (Module ID 22305-14) Identifies and describes the common uses and types of motor graders. Presents safety guidelines, prestart inspection procedures, and preventive maintenance requirements. Describes basic startup and operation, and covers common work activities associated with motor graders.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Finishing and Grading** (25 Hours)  
**ISBN 978-0-13-377955-4**  
 (Module ID 22307-14) Provides training on common types of equipment and instruments used for finish grading; materials and methods used to stabilize soils and control soil erosion; and finishing and grading methods used for various applications.

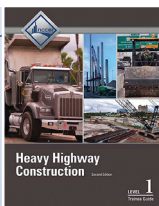
Continued on following page



# Heavy Highway Construction

## L1 HEAVY HIGHWAY CONSTRUCTION

LEVEL 1



### Curriculum Notes

- 232.5 Hours (includes Core)
- Revised: 2017, Second Edition
- Introduction to Basic Rigging (Module ID 00106) from Core is required for Level 1 completion.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-498617-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (7.5 Hours)

ISBN 978-0-13-448575-1

(Module ID 36101-17) Introduces the trainees to careers, equipment, and processes used in the construction of highways and bridges.

### Identification of Equipment Used in Heavy Highway Construction (10 Hours)

ISBN 978-0-13-448579-9

(Module ID 36111-17) Describes the types of heavy equipment, utility equipment, and cranes used in the construction of bridges and highways. Trainees will be expected to recognize the equipment and describe its use.

### Heavy Highway Construction Safety (5 Hours)

ISBN 978-0-13-448577-5

(Module ID 36110-17) Reviews the safety hazards and precautions associated with construction of highways and bridges. It also emphasizes the importance of following safety procedures in order to prevent accidents and injuries associated with working in hazardous places/conditions.

### Work-Zone Safety (5 hours)

ISBN 978-0-13-340361-9

(Module ID 75104-13; from *Field Safety*) Introduces the signs, signals, and barricades found on various job sites, and covers highway work-zone safety requirements.

### Soils (10 Hours)

ISBN 978-0-13-340328-2

(Module ID 22308-13; from *Heavy Equipment Operations Level Two*) Describes soil classification systems and explains how shrink and swell factors affect equipment selection. Discusses how soil conditions affect equipment performance and explains techniques for working with various types of soils.

### Site Work (20 Hours)

ISBN 978-0-13-340326-8

(Module ID 22210-13; from *Heavy Equipment Operations Level Two*) Expands on information covered in Level 1 in relation to setting and interpreting grade stakes. Also provides information and instructions on controlling surface water and ground water on a job site, as well as the layout of foundations and laying of pipe.

### Excavation Math (17.5 Hours)

ISBN 978-0-13-340323-7

(Module ID 22207-13; from *Heavy Equipment Operations Level Two*) Covers basic math skills required for site excavation work. Includes methods and practice in calculating the areas and volumes of various geometric shapes, as well as formulas and methods used to calculate cut and fill requirements on a job.

### Interpreting Civil Drawings (20 Hours)

ISBN 978-0-13-340325-1

(Module ID 22209-13; from *Heavy Equipment Operations Level Two*) Explains how to read site plans to calculate cut and fill requirements. Provides instruction and practice in interpreting both roadway and construction site drawings used for excavation and grading work.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102; from *Basic Rigger*) Describes basic rigging and safety practices related to rigging activities. Describes the use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches. Covers jacks and hoisting equipment.

### Crane Safety and Emergency Procedures (25 Hours)

ISBN 978-0-13-498819-1

(Module ID 21106; from *Mobile Crane Operations, Level One*) Covers safety standards and best safety practices relevant to the operation of cranes. Describes safety considerations related to power lines, weather conditions, and specific crane functions.

### Basic Principles of Cranes (15 Hours)

ISBN 978-0-13-498816-0

(Module ID 21102 from *Mobile Crane Operations, Level One*) Introduces mobile crane equipment with an in-depth discussion of terminology and nomenclature. Explains the basic scientific principles associated with mobile crane operation.

### Crane Communications (10 Hours)

ISBN 978-0-13-498800-9

(Module ID 53101; from *Signal Person*) Describes the communication process between the signal person and the crane operator. Covers electronic communications as well as the standard hand signals in 29 CFR 1926.

## L2 HEAVY HIGHWAY CONSTRUCTION

LEVEL 2

### Curriculum Notes

- 207.5 Hours
- Published: 2017
- Downloadable instructor resources are available.
- For more information, visit [www.nccer.org/book-updates](http://www.nccer.org/book-updates).

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-498811-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Earthmoving (12.5 Hours)

ISBN 978-0-13-292310-1

(Module ID 22201-12; from *Heavy Equipment Operations Level One*) Provides a broad introduction to the process of planning and executing earthmoving activities on various types of construction projects. The use of heavy equipment such as bulldozers, scrapers, excavators, and loaders is explained.

### Finishing and Grading (25 Hours)

ISBN 978-0-13-377955-4

(Module ID 22307-14; from *Heavy Equipment Operations Level Three*) Provides training on common types of equipment and instruments used for finish grading; materials and methods used to stabilize soils and control soil erosion; and finishing and grading methods used for various applications.

### Trenching and Excavating (15 Hours)

ISBN 978-0-13-378678-1

(Module ID 27306-14; from *Carpentry Level Three*) Provides an introduction to working in and around excavations, particularly in preparing building foundations. Describes types and bearing capacities of soils; procedures used in shoring, shielding, and sloping trenches and excavations; trenching safety requirements, including recognition of unsafe conditions; and mitigation of groundwater and rock when excavating foundations.

### Plant Operations (7.5 Hours)

ISBN 978-0-13-448584-3

(Module ID 36107-17) Explains the operation of plants used to manufacture concrete and asphalt paving and describes the different types aggregates.

Continued on following page

## Heavy Highway Construction Level 2 (continued)

### **Paving** (12.5 Hours)

ISBN 978-0-13-448586-7

(Module ID 36108-17) Describes paving operations, paving equipment, recycling processes, and quality control requirements for both concrete and hot-mix asphalt paving.

### **Horizontal Formwork** (15 Hours)

ISBN 978-0-13-378682-8

(Module ID 27309-14; from *Carpentry Level Three*) Describes elevated decks and formwork systems and methods used in their construction. Covers joist, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the use of flying decks, as well as shoring and reshoring systems.

### **Vertical Formwork** (22.5 Hours)

ISBN 978-0-13-378681-1

(Module ID 27308-14; from *Carpentry Level Three*) Covers the applications and construction methods for types of forming and form hardware systems for walls, columns, and stairs, as well as slip and climbing forms. Provides an overview of the assembly, erection, and stripping of gang forms.

### **Reinforcing Concrete** (15 Hours)

ISBN 978-0-13-378679-8

(Module ID 27304-14; from *Carpentry Level Three*) Explains the selection and uses of different types of reinforcing materials. Describes requirements for bending, cutting, splicing, and tying reinforcing steel and the placement of steel in footings and foundations, walls, columns, and beams and girders.

### **Working with Concrete** (15 Hours)

ISBN 978-0-13-448582-9

(Module ID 36112-17) Introduces the trainees to the safety concerns associated with concrete, as well as concrete testing, concrete admixtures, and the proper procedure for placing concrete.

### **Trade Drawings One** (12.5 Hours)

ISBN 978-0-13-215103-0

(Module ID 30108-11; from *Ironworking Level One*) Identifies the materials used in steel-framed buildings. Explains how to read basic structural blueprints.

### **Structural Ironworking One** (7.5 Hours)

ISBN 978-0-13-215104-7

(Module ID 30109-11; from *Ironworking Level One*) Identifies the types of construction that utilize structural steel, the components of the structures, and the process involved in erecting a steel structure. Explains the principles of structural stresses and the requirements of bolted connections.

### **Bridge Construction** (20 Hours)

ISBN 978-0-13-448588-1

(Module ID 36201-17) Describes the common types of bridges, along with the components that make up the substructure and superstructure of a bridge. The module also discusses the types of materials used in bridge construction, presents basic surveying equipment and practices, and explains how to interpret bridge drawings.

### **Bridge Foundations** (10 Hours)

ISBN 978-0-13-448591-1

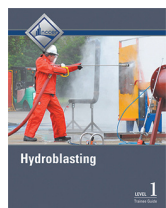
(Module ID 36202-17) Describes the types of footings used to support bridges, as well as various types of piles and pile-driving methods. Safety practices associated with pile driving on land and in marine environments are also covered, along with environmental protection issues.

### **Bridge Formwork** (22.5 Hours)

ISBN 978-0-13-448593-5

(Module ID 36203-17) Describes the forms used to fabricate concrete walls, columns, footings, pile caps, and other bridge structures. This module covers site-built and manufactured forming systems and includes instructions for cleaning and storing forms.

## Hydroblasting



20 Hours  
Revised: 2012, Second Edition  
Module ID 43101-12

**PAPERBACK**

**ISBN**

Trainee Guide: \$29.99

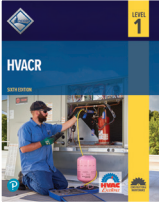
**978-0-13-294870-8**

- Downloadable instructor resources are available.

Includes the newest waterjet safety technologies, methods, and equipment. Also provides expanded information on shrouds, shielding, chocking, and grounding.

## L1 HVACR

LEVEL 1



### Curriculum Notes

- 200 Hours (includes Core)
- Revised: 2022, Sixth Edition, in partnership with HVAC Excellence to provide comprehensive educational resources.
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.
- A Spanish translation of the sixth edition is available. Please see NCCER's online catalog for more information.

### PAPERBACK

ISBN

Trainee Guide: \$74.99

978-0-13-794984-7

Trainee Guide + NCCERconnect

Access Card \$104.99

978-0-13-799521-9

### SPANISH

ISBN

Trainee Guide: \$74.99

978-0-13-817447-7

### DIGITAL

ISBN

NCCERconnect Access Card: \$74.99

978-0-13-795006-5

Core + HVACR L1: \$137.98

978-0-13-816916-9

### Introduction to HVACR (5 Hours)

ISBN 978-0-13-794996-0

(Module ID 03101) ECovers the basic principles of heating, ventilating, air conditioning, and refrigeration, career opportunities in HVACR, and how apprenticeship programs are constructed. Basic safety principles, trade licensure, EPA guidelines, and the Laws of Thermodynamics are also introduced.

### Trade Mathematics (10 Hours)

ISBN 978-0-13-794997-7

(Module ID 03102) Explains how to solve HVACR trade-related problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also includes a review of scientific notation, powers, roots, and basic algebra and geometry.

### Basic Electricity (15 Hours)

ISBN 978-0-13-795000-3

(Module ID 03106) Introduces the concept of power generation and distribution, common electrical components, AC and DC circuits, electrical safety as it relates to the HVACR field, and reading and interpreting wiring diagrams.

### Introduction to Heating (15 Hours)

ISBN 978-0-13-794987-8

(Module ID 03108) Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service. Introduces temperature measurement calculations.

### Introduction to Cooling (30 Hours)

ISBN 978-0-13-794989-2

(Module ID 03107) Explains the fundamental operating concepts of the refrigeration cycle and introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Discusses major components of cooling systems as well as their controls, including temperature switches.

### Air Distribution Systems (15 Hours)

ISBN 978-0-13-794992-2

(Module ID 03109) Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

### Basic Copper and Plastic Piping Practices

(12.5 Hours)

ISBN 978-0-13-794993-9

(Module ID 03103) Explains how to identify types of copper tubing and fittings used in the HVACR industry and how they are mechanically joined. Introduces push-to-connect and press-to-connect fittings. Also presents the identification and application of various types of plastic piping including PEX tubing, along with their common assembly and installation practices. Introduces pressure testing refrigerant lines.

### Soldering and Brazing (10 Hours)

ISBN 978-0-13-794994-6

(Module ID 03104) Introduces the equipment, techniques, and materials used to safely join copper tubing through both soldering and brazing. Covers the required personal protective equipment, preparation, and work processes in detail. Also provides the procedures for brazing copper to dissimilar materials.

### Basic Carbon Steel Piping Practices (10 Hours)

ISBN 978-0-13-794985-4


(Module ID 03105) Explains how to identify various carbon steel piping materials and fittings. Covers the joining and installation of threaded and grooved carbon steel piping systems, including detailed descriptions of threading and grooving techniques.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Continued on following page

**L2 HVACR**



**LEVEL 2**

**Curriculum Notes**

- 162.5 Hours
- Revised: 2024, Sixth Edition, in partnership with HVAC Excellence to provide comprehensive educational resources.
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.

<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-821016-8</b>
<b>DIGITAL</b>	<b>ISBN</b>
NCCERconnect Access Card: \$102.99	<b>978-0-13-821004-5</b>
Trainee Guide + NCCERconnect Access Card \$129.99	<b>978-0-13-820994-0</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Customer Relations (7.5 Hours)

**ISBN 978-0-13-829260-7**

(Module ID 03316) Presents the importance of establishing good relations with customers and provides guidance on how to achieve that goal. Focuses on ways for a technician to make a good first impression and describes how to communicate in a positive manner with customers. The elements of a service call and dealing with different types of problem customers are also covered.

### Basic Maintenance (20 Hours)

**ISBN 978-0-13-829264-5**

(Module ID 03215) Covers information related to maintenance-oriented materials, as well as guidelines for the inspection and periodic maintenance of various systems and accessories. Also covers the application of gaskets and seals, as well as the adjustment of different types of belt drives. Includes information on inspection and maintenance requirements for selected equipment.

### Fasteners and Hardware (10 Hours)

**ISBN 978-0-13-829271-3**

(Module ID 03313) Covers a variety of fasteners, hardware, and wiring terminations used in HVAC systems, including the installation of these components.

### Alternating Current (12.5 Hours)

**ISBN 978-0-13-829272-0**

(Module ID 03206) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

### Compressors (12.5 Hours)

**ISBN 978-0-13-829277-5**

(Module ID 03302) Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

### Metering Devices (12.5 Hours)

**ISBN 978-0-13-829281-2**

(Module ID 03303) Covers the operating principles, applications, installation, and adjustment of fixed and adjustable expansion devices used in air conditioning equipment.

### Refrigerants and Oils (15 Hours)

**ISBN 978-0-13-829287-4**

(Module ID 03301) Covers characteristics and applications of pure and blended refrigerants, and provides extensive coverage of lubricating oils used in refrigeration systems.

### Leak Detection, Evacuation, Recovery, and Charging (30 Hours)

**ISBN 978-0-13-829289-8**

(Module ID 03205) Covers refrigerant handling and equipment servicing procedures for HVAC systems in an environmentally safe manner.

### Heat Pumps (20 Hours)

**ISBN 978-0-13-829290-4**

(Module ID 03211) Covers the principles of reverse cycle heating. Describes the operation of heat pumps and explains how to analyze

heat pump control circuits. Includes heat pump installation and service procedures.

### Indoor Air Quality (12.5 Hours)

**ISBN 978-0-13-829299-7**

(Module ID 03403) Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

### Air Quality Equipment (5 Hours)

**ISBN 978-0-13-829301-7**

(Module ID 03204) Covers principles, processes, and devices used to control humidity and air cleanliness, as well as devices used to conserve energy in HVAC systems.

### Chimneys, Vents, and Flues (5 Hours)

**ISBN 978-0-13-829303-1**

(Module ID 03202) Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

L3 HVAC	
LEVEL 3	
Curriculum Notes	
<ul style="list-style-type: none"><li>• 175 Hours</li><li>• Revised 2024. Sixth Edition</li><li>• NATE-Recognized Training Provider</li><li>• Downloadable instructor resources are available.</li></ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-013-820974-2
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-013-820964-3
NCCERconnect + Trainee Guide: \$129.99	978-0-13-539376-5

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Control Circuit Troubleshooting (20 Hours)

ISBN 978-013-534663-1

(Module ID 03317) Many problems that occur in HVACR systems are caused by a failure in the control circuits or in the electrical loads they serve. Technicians must understand how various control components function and interpret equipment schematics, wiring diagrams, and other service literature.

Motor Testing and Troubleshooting (12.5 Hours)

ISBN 978-013-534664-8

(Module ID 03318) Motors are the workhorses in HVACR systems. Motors also represent the most significant electrical loads in most systems. As a technician, your ability to test and troubleshoot motors will play a significant role in your success. New technologies such as variable-frequency speed control and electronically commutated motors have improved system performance and efficiency, but these products also require a different approach to testing and troubleshooting.

Troubleshooting Cooling (20 Hours)

ISBN 978-013-534665-5

(Module ID 03210) The refrigerant circuit is a closed-loop system, so identifying the source of a problem is not always easy. Because the operation of a refrigerant circuit is affected by external conditions, it can also be challenging to determine if a problem is inside the system or the result of an external influence.

Troubleshooting Heat Pumps (12.5 Hours)

ISBN 978-0-13-546186-0

(Module ID 03311) This module reviews the operation of heat pumps and presents methods and procedures for their troubleshooting and repair.

Troubleshooting Gas Heating (12.5 Hours)

ISBN 978-0-13-546181-5

(Module ID 03209) Gas furnaces have advanced a great deal in the last 25 years in the pursuit of safety and higher efficiency. Today's furnaces are controlled by printed circuit boards that integrate the various safety controls with the operating and ignition controls. HVACR service technicians must understand how to test the various inputs and outputs to identify problems.

Troubleshooting Oil Heating (15 Hours)

ISBN 978-013-534669-3

(Module ID 03310) Oil-fired furnaces and boilers are often used in homes in northern sections of the United States that have limited access to other reliable fuels. Oil-fired heating systems have provided reliable comfort to homes and businesses for many years, and are relatively simple to maintain and repair.

Troubleshooting Accessories (10 Hours)

ISBN 978-013-534670-9

(Module ID 03312) HVAC systems, especially in cold, dry climates, are often equipped with humidifiers to maintain a healthy moisture level indoors. Electronic air cleaners may also be installed in both residential and commercial environments. Economizers, which take advantage of cool outside air to provide free cooling indoors, are common in commercial rooftop systems. Energy and heat recovery ventilators are another important indoor air quality (IAQ) accessory that are applied in both residential and commercial systems.

Sheet Metal Duct Systems (10 Hours)

ISBN 978-013-534672-3

(Module ID 03213) HVAC ductwork can be made of sheet metal or fiberglass ductboard. Because the interior surfaces of sheet metal ducts are smooth, metal offers less resistance to airflow than fiberglass ductboard. However, in most cases, metal duct must be insulated to reduce noise transmission, minimize heat transfer, and prevent condensation.

Introduction to Hydronic Systems (15 Hours)

ISBN 978-013-534673-0

(Module ID 03203) A hydronic system uses water as a medium to provide heating and cooling for comfort or processes. In hydronic comfort-heating systems, water travels from the boiler through pipes to terminal devices where the heat is transferred to the air.

Steam Systems (10 Hours)

ISBN 978-013-534674-7

(Module ID 03306) Steam has a wide variety of uses in commercial and industrial sectors. It can carry large quantities of stored energy and be applied in comfort heating, process heating, and even power generation.

Fiberglass and Fabric Duct Systems (10 Hours)

ISBN 978-013-534676-1

(Module ID 03214) Fiberglass ductboard has been applied successfully in both residential and commercial installations for many years. It is lightweight, easy to handle, and creates a very quiet air distribution system.

Retail Refrigeration System (15 Hours)

ISBN 978-013-534679-2

(Module ID 03304) Retail refrigeration systems are found everywhere. Various refrigerated coolers, freezers, cases, and dispensers are used wherever food and beverages are served. Out of public view, much larger refrigeration systems protect stored products used to replenish the retail systems.

Zoning, Ductless, and Variable Refrigerant Flow Systems (15 Hours)

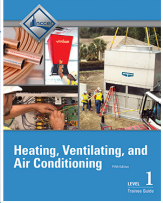
ISBN 978-0-13-546191-4

(Module ID 03315) Installing a zoning system that distributes air throughout a conditioned space in a more controlled manner makes a standard HVAC system more effective. The popularity of zoning systems has dramatically increased over the years as a result. Ductless systems may be single zone or multizone, with both cooling-only and heat pump systems available. This module describes innovative approaches to comfort and prepares you to install and service the related systems.



## L1 HVAC

## LEVEL 1



## Curriculum Notes

- 195 Hours (includes Core)
- Updated in 2018.
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.

## PAPERBACK

Trainee Guide: \$74.99

## ISBN

978-0-13-518509-4

## DIGITAL

NCCERconnect Access Card: \$74.99

## ISBN

978-0-13-518703-6

NCCERconnect + Trainee Guide: \$104.99

978-0-13-539387-1

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Introduction to HVAC (7.5 Hours)

ISBN 978-0-13-545834-1

(Module ID 03101) Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and how apprenticeship programs are constructed. Basic safety principles, as well as trade licensure and EPA guidelines, are also introduced.

## Trade Mathematics (10 Hours)

ISBN 978-0-13-545825-9

(Module ID 03102) Explains how to solve HVACR trade-related problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also includes a review of scientific notation, powers, roots, and basic algebra and geometry.

## Basic Electricity (12.5 Hours)

ISBN 978-0-13-545837-2

(Module ID 03106) Introduces the concept of power generation and distribution, common electrical components, AC and DC circuits, and electrical safety as it relates to the HVAC field. Introduces reading and interpreting wiring diagrams.

## Introduction to Heating (15 Hours)

ISBN 978-0-13-545838-9

(Module ID 03108) Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service.

## Introduction to Cooling (30 Hours)

ISBN 978-0-13-545836-5

(Module ID 03107) Explains the fundamental operating concepts of the refrigeration cycle and identifies both primary and secondary components found in typical HVACR systems. Also introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Introduces basic control concepts for simple systems.

## Introduction to Air Distribution Systems

(15 Hours)

ISBN 978-0-13-545827-3

(Module ID 03109) Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

## Basic Copper and Plastic Piping Practices

(10 Hours)

ISBN 978-0-13-545832-7

(Module ID 03103) Explains how to identify types of copper tubing and fittings used in the HVACR industry and how they are mechanically joined. Also presents the identification and application of various types of plastic piping, along with their common assembly and installation practices.

## Soldering and Brazing (10 Hours)

ISBN 978-0-13-545829-7

(Module ID 03104) Introduces the equipment, techniques, and materials used to safely join copper tubing through both soldering and brazing. Covers the required personal protective equipment, preparation, and work processes in detail. Also provides the procedures for brazing copper to dissimilar materials.

## Basic Carbon Steel Piping Practices (10 Hours)

ISBN 978-0-13-545828-0

(Module ID 03105) Explains how to identify various carbon steel piping materials and fittings. Covers the joining and installation of threaded and grooved carbon steel piping systems, including detailed descriptions of threading and grooving techniques.

## L2 HVAC

## LEVEL 2

## Curriculum Notes

- 175 Hours
- Updated in 2018.
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.

## PAPERBACK

Trainee Guide: \$102.99

## ISBN

978-0-13-518512-4

## DIGITAL

NCCERconnect Access Card: \$102.99

## ISBN

978-0-13-518715-9

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-539391-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Alternating Current (10 Hours)

ISBN 978-0-13-546036-8

(Module ID 03206) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

## Compressors (12.5 Hours)

ISBN 978-0-13-546031-3

(Module ID 03302) Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

## Refrigerants and Oils (15 Hours)

ISBN 978-0-13-546027-6

(Module ID 03301) Covers characteristics and applications of pure and blended refrigerants, and provides extensive coverage of lubricating oils used in refrigeration systems.

## Leak Detection, Evacuation, Recovery, and Charging (30 Hours)

ISBN 978-0-13-546053-5

(Module ID 03205) Covers refrigerant handling and equipment servicing procedures for HVAC systems in an environmentally safe manner.

## Metering Devices (12.5 Hours)

ISBN 978-0-13-546039-9

(Module ID 03303) Covers the operating principles, applications, installation, and adjustment of fixed and adjustable expansion devices used in air conditioning equipment.

## Heat Pumps (20 Hours)

ISBN 978-0-13-546026-9

(Module ID 03211) Covers the principles of reverse cycle heating. Describes the operation of heat pumps and explains how to analyze heat pump control circuits. Includes heat pump installation and service procedures.

Continued on following page



## HVAC Level 2 (continued)

### Basic Maintenance (20 Hours)

ISBN 978-0-13-546054-2

(Module ID 03215) Covers information related to maintenance-oriented materials, as well as guidelines for the inspection and periodic maintenance of various systems and accessories. Also covers the application of gaskets and seals, as well as the adjustment of different types of belt drives. Includes information on inspection and maintenance requirements for selected equipment.

### Chimneys, Vents, and Flues (5 Hours)

ISBN 978-0-13-546049-8

(Module ID 03202) Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

### Sheet Metal Duct Systems (10 Hours)

ISBN 978-0-13-546058-0

(Module ID 03213) Covers layout, fabrication, installation, and insulation of sheet metal ductwork. Also includes selection and installation of registers, diffusers, dampers, and other duct accessories.

### Fiberglass and Flexible Duct Systems (7.5 Hours)

ISBN 978-0-13-546050-4

(Module ID 03214) Covers the layout, fabrication, installation, and joining of fiberglass ductwork and fittings. Describes the proper methods for attaching and supporting flex duct.

### Commercial Airside Systems (12.5 Hours)

ISBN 978-0-13-546046-7

(Module ID 03201) Describes the systems, equipment, and operating sequences commercial airside system configurations such as constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

### Air Quality Equipment (5 Hours)

ISBN 978-0-13-546030-6

(Module ID 03204) Covers principles, processes, and devices used to control humidity and air cleanliness, as well as devices used to conserve energy in HVAC systems.

### Introduction to Hydronic Systems (15 Hours)

ISBN 978-0-13-546041-2

(Module ID 03203) Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems in residential applications.

### Commercial Hydronic Systems (12.5 Hours)

ISBN 978-0-13-546194-5

(Module ID 03305) Reviews basic properties of water and describes how water pressure is related to the movement of water through piping systems. Describes various types and components of commercial hot-water heating and chilled-water cooling systems, and examines how those systems function.

### Steam Systems (10 Hours)

ISBN 978-0-13-546196-9

(Module ID 03306) Focuses on the use of steam for storing and moving energy in HVAC systems. Reviews the fundamentals of water that relate to steam and describes the basic steam system cycle. Discusses a steam system's operational components—steam boilers and their accessories and controls; steam system loads, including heat exchangers/converters; and terminal devices. Steam system valves and piping are covered in detail, including common types of piping arrangements; the components of a condensate return/feedwater system; steam and condensate pipe sizing; and pressure-reducing valves and thermostatic valves.

### Retail Refrigeration System (15 Hours)

ISBN 978-0-13-546187-7

(Module ID 03304) Covers the applications, principles, and troubleshooting of retail refrigeration systems.

### Customer Relations (5 Hours)

ISBN 978-0-13-546198-3

(Module ID 03316) Presents the importance of establishing good relations with customers and provides guidance on how to achieve that goal. Focuses on ways for a technician to make a good first impression and describes how to communicate in a positive manner with customers. The elements of a service call and dealing with different types of problem customers are also covered.

## L3 HVAC

### LEVEL 3

#### Curriculum Notes

- 167.5 Hours
- Updated in 2018.
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$99.99

ISBN 978-0-13-518510-0

#### DIGITAL

NCCERconnect Access Card: \$99.99

ISBN 978-0-13-518722-7

NCCERconnect +

Trainee Guide: \$129.99

ISBN 978-0-13-539376-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Fasteners, Hardware, and Wiring Terminations (10 Hours)

ISBN 978-0-13-546190-7

(Module ID 03313) Covers a variety of fasteners, hardware, and wiring terminations used in HVAC systems including the installation of these components.

#### Control Circuit and Motor Troubleshooting (30 Hours)

ISBN 978-0-13-546189-1

(Module ID 03314) Provides information and skills to troubleshoot control circuits and electric motors found in heating and cooling equipment.

### Troubleshooting Cooling (20 Hours)

ISBN 978-0-13-546179-2

(Module ID 03210) Provides guidance related to troubleshooting cooling systems.

### Troubleshooting Heat Pumps (12.5 Hours)

ISBN 978-0-13-546186-0

(Module ID 03311) Provides a thorough review of the heat pump operating cycle, and presents troubleshooting procedures for components.

### Troubleshooting Gas Heating (15 Hours)

ISBN 978-0-13-546181-5

(Module ID 03209) Covers information and skills needed to troubleshoot gas-fired furnaces and boilers.

### Troubleshooting Oil Heating (15 Hours)

ISBN 978-0-13-546199-0

(Module ID 03310) Describes the construction and operation of oil-fired heating systems and their components. Includes servicing and testing of oil furnaces and procedures for isolating and correcting oil furnace malfunctions.

### Troubleshooting Accessories (7.5 Hours)

ISBN 978-0-13-546182-2

(Module ID 03312) Delivers information and skills needed to troubleshoot various air treatment accessories used with heating and cooling equipment.

### Zoning, Ductless, and Variable Refrigerant Flow Systems (15 Hours)

ISBN 978-0-13-546191-4

(Module ID 03315) Introduces the information and skills needed to troubleshoot and repair zoned, ductless, and variable refrigerant flow systems.

Continued on following page

L4 HVAC	
LEVEL 4	
Curriculum Notes	
<ul style="list-style-type: none"> <li>157.5 Hours</li> <li>Updated in 2018.</li> <li>NATE-Recognized Training Provider</li> <li>Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-518506-3
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-0-13-518719-7
NCCERconnect + Trainee Guide: \$129.99	978-0-13-539377-2

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Water Treatment (10 Hours)

ISBN 978-0-13-546229-4

(Module ID 03308) Explains water problems encountered in heating and cooling systems and identifies water treatment methods and equipment. Covers basic water testing procedures and chemistry.

### Indoor Air Quality (12.5 Hours)

ISBN 978-0-13-546221-8

(Module ID 03403) Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

### Energy Conservation Equipment (7.5 Hours)

ISBN 978-0-13-546214-0

(Module ID 03404) Covers heat recovery/reclaim devices, as well as other energy recovery equipment used to reduce energy consumption in HVAC systems.

### Building Management Systems (12.5 Hours)

ISBN 978-0-13-546220-1

(Module ID 03405) Explains how computers and microprocessors are used to manage zoned HVAC systems. Provides coverage of various network protocols and systems controllers, and introduces trainees to the various means of connection and system interface.

### System Air Balancing (15 Hours)

ISBN 978-0-13-546213-3

(Module ID 03402) Covers air properties and gas laws, as well as the use of psychrometric charts. Describes the tools, instruments, and procedures used to balance an air distribution system.

### System Startup and Shutdown (15 Hours)

ISBN 978-0-13-546217-1

(Module ID 03406) Presents the procedures for the startup and shutdown of hot water, steam heating, chilled water, and air handling systems. Also covers the start-up and shutdown of typical cooling towers and packaged HVAC units. The procedures for both short- and long-term shutdowns are included.

### Construction Drawings and Specifications

(12.5 Hours)

ISBN 978-0-13-546209-6

(Module ID 03401) Teaches how to interpret drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-builts. Explains how to perform takeoff procedures for equipment, fittings, ductwork, and other components.

### Heating and Cooling System Design (22.5 Hours)

ISBN 978-0-13-546226-3

(Module ID 03407) Identifies factors that affect heating and cooling loads. Explains the process by which heating and cooling loads are calculated, and how load calculations are used in the selection of heating and cooling equipment. Covers basic types of duct systems and their selection, sizing, and installation requirements.

### Commercial/Industrial Refrigeration Systems (20 Hours)

ISBN 978-0-13-546212-6

(Module ID 03408) Expands on the study of product and process refrigeration equipment by describing systems used in cold storage and food processing applications, as well as transportation refrigeration. Various types of defrost systems are covered in detail.

### Alternative and Specialized Heating and Cooling Systems (10 Hours)

ISBN 978-0-13-546222-5

(Module ID 03409) Describes alternative devices used to reduce energy consumption, including wood, coal, and pellet-fired systems, waste-oil heaters, geothermal heat pumps, solar heating, in-floor radiant heating, and direct-fired makeup units. Also introduces application-specific computer room environmental and air turnover systems.


### Fundamentals of Crew Leadership (22.5 Hours)

ISBN 978-0-13-409855-5

(Module ID 46101) While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

# Industrial Coating and Lining Application Specialist

## L1 INDUSTRIAL COATING AND LINING APPLICATION SPECIALIST

	
LEVEL 1	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"><li>• 307.5 Hours</li><li>• Published: 2009</li><li>• Downloadable instructor resources are available.</li></ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$104.99	978-0-13-604508-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

NCCER and AMPP, two leading providers of industry education, training, and certification, have joined forces to deliver a comprehensive industrial coating applicator training and certification program. The NCCER/AMPP Industrial Coating Applicator Training and Certification Program follows the standard on Industrial Coating and Lining Application Specialist Qualification available from AMPP.

### Basic Safety (15 Hours)

ISBN 978-0-13-160004-1

(Module ID 00101-04; from *Core, Third Edition*) Explains the safety obligations of workers, supervisors, and managers to ensure a safe workplace. Discusses the causes and results of accidents and the dangers of rationalizing risk. Reviews the role of company policies and OSHA regulations in maintaining a safe workplace. Introduces common job-site hazards and protections such as lockout/tagout, personal protective equipment (PPE), and HazCom.

### Basic Rigging (20 Hours)

ISBN 978-0-13-160009-6

(Module ID 00106-04; from *Core, Third Edition*) Explains how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site. Describes inspection techniques and load-handling safety practices. Also reviews American National Standards Institute (ANSI) hand signals.

### Introduction to the Trade (5 Hours)

ISBN 978-0-13-604816-9

(Module ID 69101-09) Provides an introduction to the coatings industry, including career opportunities and an introduction to coatings safety.

### Surface Preparation (100 Hours)

ISBN 978-0-13-604818-3

(Module ID 69102-09) Explains reasons for surface preparation, standards of preparation, and methods of preparing surfaces. Describes the use of basic equipment as well as cleaning procedures.

### Industrial Coatings (15 Hours)

ISBN 978-0-13-604820-6

(Module ID 69103-09) Describes types of coatings, their advantages and disadvantages, applications, and specific preparations required.

### Coating Application (105 Hours)

ISBN 978-0-13-604821-3

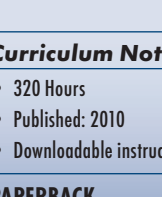
(Module ID 69104-09) Covers the application of various coatings, including equipment setup, mixing, and preparation of coatings.

### Health and Safety, Debris Management, Containment, and Ventilation (47.5 Hours)

ISBN 978-0-13-604817-6

(Module ID 69105-09) Teaches proper health and safety procedures for operators applying coatings in an industrial workplace. The use of personal protection equipment, debris management, and proper containment and ventilation procedures are discussed.

## L2 INDUSTRIAL COATING AND LINING APPLICATION SPECIALIST

	
LEVEL 2	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"><li>• 320 Hours</li><li>• Published: 2010</li><li>• Downloadable instructor resources are available.</li></ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$104.99	978-0-13-604510-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Industrial Coating Safety (30 Hours)

ISBN 978-0-13-604827-5

(Module ID 69201-10) Describes safety standards and regulations, access control, and personal safety equipment and training requirements. Covers safety decision-making procedures.

### Corrosion Protection (5 Hours)

ISBN 978-0-13-604828-2

(Module ID 69202-10) Teaches the elements of corrosion in concrete and metals and describes the chemistry of corrosion.

### Work Planning and Quality Control (25 Hours)

ISBN 978-0-13-604796-4

(Module ID 69203-10) Explains how to follow and execute a work plan. Covers area and ratio calculations and explains how to determine VOC ratios when adding thinners. Explains the effects of pressure, volume, and temperature on surface preparation and application.

### Containment (60 Hours)

ISBN 978-0-13-604795-7

(Module ID 69204-10) Describes the types of containment appropriate to various coating and surface preparation applications, including standards and verification. Also covers containment erection and repair.

### Surface Preparation Two (80 Hours)

ISBN 978-0-13-604797-1

(Module ID 69205-10) Explains how to identify the surface condition of common substrates. Provides specific training in surface-preparation equipment. Describes inspection and documentation of test equipment, and processes.

### Industrial Coatings Two (20 Hours)

ISBN 978-0-13-604798-8

(Module ID 69206-10) Discusses the physical properties of various coatings, including convertible and nonconvertible types. Also covers basic curing mechanisms and methods of film formation.

### Coating Applications Two (100 Hours)

ISBN 978-0-13-604799-5

(Module ID 69207-10) Covers the setup, maintenance, and disassembly of conventional air spray, airless spray, air-assisted airless spray, and HVLP spraying equipment, including testing and documentation. Also covers overcoating and explains how to use wet and dry film thickness gauges.

# Industrial Maintenance Electrical & Instrumentation Technician

## L1 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN



LEVEL 1

### Curriculum Notes

- 197.5 Hours (includes Core)
- Revised: 2007, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-228606-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Orientation to the Trade (2.5 Hours)

ISBN 978-0-13-614612-4

(Module ID 40101-07) Covers the history of the trade, and provides an overview of the industrial maintenance craft. Describes apprenticeship and training programs, as well as career opportunities. Also describes the responsibilities and characteristics of successful workers.

#### Tools of the Trade (5 Hours)

ISBN 978-0-13-614613-1

(Module ID 40102-07) Introduces the hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

#### Fasteners and Anchors (5 Hours)

ISBN 978-0-13-614614-8

(Module ID 40103-07) Covers hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-614615-5

(Module ID 40104-07) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

#### Gaskets and Packing (10 Hours)

ISBN 978-0-13-614616-2

(Module ID 40105-07) Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

#### Craft-Related Mathematics (15 Hours)

ISBN 978-0-13-614617-9

(Module ID 40106-07) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

#### Construction Drawings (12.5 Hours)

ISBN 978-0-13-614618-6

(Module ID 40107-07) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

#### Pumps and Drivers (5 Hours)

ISBN 978-0-13-614619-3

(Module ID 40108-07) Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

#### Valves (5 Hours)

ISBN 978-0-13-614620-9

(Module ID 40109-07) Identifies different types of valves and describes their installation, storage, and handling.

#### Introduction to Test Instruments (7.5 Hours)

ISBN 978-0-13-614621-6

(Module ID 40110-07) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

#### Material Handling and Hand Rigging (15 Hours)

ISBN 978-0-13-614622-3

(Module ID 40111-07) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

#### Mobile and Support Equipment (10 Hours)

ISBN 978-0-13-614623-0

(Module ID 40112-07) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

#### Lubrication (12.5 Hours)

ISBN 978-0-13-614624-7

(Module ID 40113-07) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

## L2 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

LEVEL 2

### Curriculum Notes

- 160 Hours
- Revised: 2008, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-614390-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Industrial Safety for E&I Technicians

(12.5 Hours)

ISBN 978-0-13-604701-8

(Module ID 40201-08) Covers safety rules and regulations for electrical workers, precautions for electrical hazards on the job, and the OSHA-mandated lockout/tagout procedure.

#### Introduction to the National Electrical Code®

(5 Hours)

ISBN 978-0-13-604702-5

(Module ID 40202-08) Provides a road map for using the NEC®. Introduces the layout and types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

#### Electrical Theory (15 Hours)

ISBN 978-0-13-604704-9

(Module ID 40203-08) Introduces electrical concepts used in Ohm's law as applied to DC series circuits. Includes atomic theory, electromotive force, resistance, and electric power equations. Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

#### Alternating Current (20 Hours)

ISBN 978-0-13-604705-6

(Module ID 40204-08) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components.

#### E&I Test Equipment (10 Hours)

ISBN 978-0-13-604706-3

(Module ID 40205-08) Focuses on proper selection, inspection, and use of common electrical and instrumentation test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, data recording equipment, field communicators, pressure testers, and dead weight testers. Also covers safety precautions and meter category ratings.

#### Flow, Pressure, Level, and Temperature

(15 Hours)

ISBN 978-0-13-604707-0

(Module ID 40206-08) Presents devices used to measure flow, pressure, level, and temperature, along with their principles of operation.

Continued on following page

## Industrial Maintenance Electrical & Instrumentation Technician Level 2 (continued)

### Process Mathematics (15 Hours)

ISBN 978-0-13-604708-7

(Module ID 40207-08) Covers measurement of mass, weight, pressure, temperature, and flow, conversion of units, and their application to industrial maintenance.

### Hand Bending (10 Hours)

ISBN 978-0-13-604709-4

(Module ID 40208-08) Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

### Tubing (15 Hours)

ISBN 978-0-13-604710-0

(Module ID 40209-08) Introduces a variety of tubing, tubing materials, tools, and work practices. Covers proper storage and handling, cutting, deburring, reaming, bending, and flaring of tubing.

### Clean, Purge, and Test Tubing and Piping Systems

(7.5 Hours)

ISBN 978-0-13-604711-7

(Module ID 40210-08) Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in industrial maintenance.

### Instrument Drawings and Documents,

#### Part One (15 Hours)

ISBN 978-0-13-604713-1

(Module ID 40211-08) Introduces instrument symbols, abbreviations, and drawings and documents, including instrument indexes, installation detail drawings, location drawings, and control loops.

### Conductors and Cables (10 Hours)

ISBN 978-0-13-604714-8

(Module ID 40212-08) Focuses on the types and applications of conductors and electrical cabling and covers proper wiring techniques. Stresses the applicable NEC® requirements.

### Conductor Terminations and Splices (10 Hours)

ISBN 978-0-13-604715-5

(Module ID 40213-08) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

## L3 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

### LEVEL 3

#### Curriculum Notes

- 182.5 Hours
- Revised: 2009, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-604499-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Hazardous Locations (10 Hours)

ISBN 978-0-13-604694-3

(Module ID 40301-09) Covers all classes of hazardous locations, including seals, components, and equipment approved for use in various hazardous locations.

### Electronic Components (10 Hours)

ISBN 978-0-13-604696-7

(Module ID 40302-09) Introduces the principles of electronics and semiconductor theory, components, and applications.

### E & I Drawings (10 Hours)

ISBN 978-0-13-604697-4

(Module ID 40303-09) Explains how to read and interpret piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics, in order to identify types of instrumentation and the specifications for installation.

### Motor Controls (15 Hours)

ISBN 978-0-13-604698-1

(Module ID 40304-09) Describes selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

### Distribution Equipment (17.5 Hours)

ISBN 978-0-13-604734-6

(Module ID 40305-09) Explains distribution equipment, including grounding, switchboard and ground fault maintenance, transformers, and electrical drawing identification.

### Transformer Applications (7.5 Hours)

ISBN 978-0-13-604735-3

(Module ID 40306-09) Discusses transformer types, construction, connections, protection, and grounding along with capacitors and rectifiers.

### Conductor Selection and Calculation (15 Hours)

ISBN 978-0-13-604736-0

(Module ID 40307-09) Covers the types of conductors used in wiring systems, including insulation, current-carrying capacity, and temperature ratings.

### Temporary Grounding (15 Hours)

ISBN 978-0-13-604738-4

(Module ID 40308-09) Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

### Layout and Installation of Tubing and Piping

#### Systems (22.5 Hours)

ISBN 978-0-13-604740-7

(Module ID 40309-09) Introduces piping and tubing layout procedures. Explains the steps for creating a hand-sketched isometric drawing that can be applied to a piping and tubing installation. Introduces methods and procedures used to measure, cut, bend, and support piping and tubing.

### Machine Bending of Conduit (15 Hours)

ISBN 978-0-13-604741-4

(Module ID 40310-09) Covers bends in conduit up to six inches. Focuses on mechanical, hydraulic, and electrical benders.

### Hydraulic Controls (15 Hours)

ISBN 978-0-13-604742-1

(Module ID 40311-09) Introduces hydraulic principles and fluids, functions and controls of system devices, hydraulic symbols, and drawings. Covers safety considerations for hydraulic systems, as well as troubleshooting.

### Pneumatic Controls (15 Hours)

ISBN 978-0-13-604739-1

(Module ID 40312-09) Describes principles of atmospheric and compressed air gases, and how compressors transmit and treat compressed (pneumatic) air. Covers pneumatic system symbols, drawings, and system safety. Addresses the functions and control of pneumatic system components and provides guidelines for troubleshooting.

### Motor-Operated Valves (15 Hours)

ISBN 978-0-13-604743-8

(Module ID 40313-09) Covers motor-driven valves, ranging from small, servo-mechanical actuators to large valves that could only be operated by several people if they were not motor driven. Includes electrical, pneumatic, and hydraulic operators.

Continued on following page



<b>L4 INDUSTRIAL MAINTENANCE ELECTRICAL &amp; INSTRUMENTATION TECHNICIAN</b>	
<b>LEVEL 4</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 165 Hours</li> <li>• Revised: 2009, Third Edition</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-609955-0</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Standby and Emergency Systems (12.5 Hours)

**ISBN 978-0-13-609163-9**

(Module ID 40401-09) Explains the installation, utilization, and maintenance requirements for standby and emergency electrical systems.

### Basic Process Control Elements, Transducers, and Transmitters (15 Hours)

**ISBN 978-0-13-609165-3**

(Module ID 40402-09) Discusses sensing and transmitting devices used in an instrumentation loop, along with the process variables measured by the detectors or sensors. Gives examples of technical manuals and specification sheets. Explains how control devices are selected, and how to draw basic control loop diagrams that include a measuring element, a transducer, and a transmitter.

### Instrumentation Calibration and Configuration

(10 Hours)

**ISBN 978-0-13-609166-0**

(Module ID 40403-09) Introduces methods of instrumentation calibration, including the three- and five-point methods. Covers components that require calibration in pneumatic, analog, and smart loops, as well as methods used to calibrate these components.

### Pneumatic Control Valves, Actuators, and Positioners (40 Hours)

**ISBN 978-0-13-609167-7**

(Module ID 40404-09) Covers the construction, operation, and uses of control valves, actuators, and positioners that are driven, and in some cases controlled by, compressed air. Explains the installation and maintenance of these devices, and includes alignment and troubleshooting procedures.

### Performing Loop Checks (7.5 Hours)

**ISBN 978-0-13-609168-4**

(Module ID 40405-09) Covers loop check steps, including verifying mechanical installation, validating that the loop has correct tag numbers, performing loop checks, and proving the loop.

### Troubleshooting and Commissioning a Loop

(10 Hours)

**ISBN 978-0-13-609169-1**

(Module ID 40406-09) Teaches troubleshooting techniques used to locate problems in control loops, and how to isolate a loop in order to troubleshoot it. Covers commissioning of a loop once it is repaired, loop checked, and calibrated.

### Process Control Loops and Tuning (20 Hours)

**ISBN 978-0-13-609135-6**

(Module ID 40407-09) Describes control loops, devices, and terms. Introduces formulas and their applications to PID control. Offers a theory-based approach to PID control and its application in industrial process control. Addresses open, closed, and visual loop tuning.

### Data Networks (15 Hours)

**ISBN 978-0-13-609138-7**

(Module ID 40408-09) Introduces terms associated with data network devices and computers used in industrial facilities. Explains how data network devices and computers are interconnected for communication purposes. Describes how open connectivity is used in industrial data networks, and explores the hardware devices used in a data highway system.

### Programmable Logic Controllers (17.5 Hours)

**ISBN 978-0-13-609136-3**

(Module ID 40409-09) Introduces the application of PLCs in industrial process control, as well as the binary numbering system used in computer-based control. Covers components of PLCs, including power supplies, I/O modules, processor modules, types of communication bus, and memory.

### Distributed Control Systems (17.5 Hours)

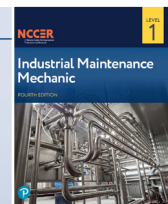
**ISBN 978-0-13-609137-0**

(Module ID 40410-09) Describes how DCS was developed by combining the technologies of single loop control, direct digital control, and supervisory control. Covers DCS hardware requirements, how control loops are implemented into a DCS, types of data transmission used in DCS, communication protocols, and human interfaces.



## L1 INDUSTRIAL MAINTENANCE MECHANIC

LEVEL 1



### Curriculum Notes

- 277.5 Hours (includes Core)
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-538348-3

### DIGITAL

NCCERconnect Access Card: \$74.99

### ISBN

978-0-13-538361-2

NCCERconnect +

Trainee Guide: \$104.99

978-0-13-538347-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Industrial Maintenance (5 Hours)

ISBN 978-0-13-539267-6

(Module ID 32101) This module reviews career choices available to skilled industrial craftworkers. Industrial maintenance mechanics who perform their tasks safely, communicate effectively, and behave responsibly earn respect within the industry, and pave the way for career growth, increased pay, and better advancement opportunities.

### Millwright Hand Tools (17.5 Hours)

ISBN 978-0-13-765387-4

(Module ID 15102) Introduces hand tools used by millwrights. Explains hand tool safety and covers the methods for selecting, inspecting, using, and maintaining these tools.

### Millwright Power Tools (22.5 Hours)

ISBN 978-0-13-765440-6

(Module ID 15205) Introduces power tools used by millwrights and procedures for using, caring for, and maintaining these tools.

### Fasteners and Anchors (12.5 Hours)

ISBN 978-0-13-765394-2

(Module ID 15103) Identifies fasteners and anchors used by millwrights, including their applications and installation procedures.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment.

### Gaskets and Packing (15 Hours)

ISBN 978-0-13-765450-5

(Module ID 15107) Describes gaskets and packing and their applications, while also providing instructions for laying out, cutting, and installing gaskets.

### Craft-Related Mathematics (20 Hours)

ISBN 978-0-13-765434-5

(Module ID 15201) This module introduces the use of equivalents and conversion tables, figure ratios, and proportions. Explains basic use of trigonometry in calculating takeouts, volumes, and weights of objects, and performing right-angle trigonometry.

### Reading Mechanical Drawings (20 Hours)

ISBN 978-0-13-748352-5

(Module ID 15203) Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

### Pumps and Drivers (5 Hours)

ISBN 978-0-13-539264-5

(Module ID 32108) This module introduces common pumps found in commercial and industrial settings and explains how they work to effectively move fluids. It also covers the types of engines that drive the pumps, including basic installation methods.

### Identifying and Installing Valves (20 Hours)

ISBN 978-0-13-581131-3

(Module ID 08203) Identifies different types of valves, including those that start and stop flow, regulate flow, regulate flow direction, and relieve pressure, and describes their installation as well as proper storage and handling procedures. Covers common valve operators and actuators.

### Electrical Test Equipment (5 Hours)

ISBN 978-0-13-817475-0

(Module ID 26112-23) Covers the applications of various types of electrical test equipment. Describes meter safety precautions and category ratings.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Teaches use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches.

### Motorized Equipment (10 Hours)

ISBN 978-0-13-580999-0

(Module ID 08106) Explains the safety factors, operator maintenance, and operating procedures associated with motorized equipment used on job sites. Covers electrical generators, air compressors, aerial lifts, forklifts, trenchers, backhoes, mobile cranes, and portable equipment including welding machines, pumps, and compactors.

### Lubrication (15 Hours)

ISBN 978-0-13-812112-9

(Module ID 15208) Explains how to safely select and use lubricants. Describes types of lubricants and lubrication devices.

### Maintaining Valves (10 Hours)

ISBN 978-0-13-748754-7

(Module ID 08408) Explains how to replace packing and O-rings, and how to open and close a valve's bonnet. Discusses how to safely troubleshoot and maintain several types of valves.

### Testing Piping Systems and Equipment (20 Hours)

ISBN 978-0-13-748734-9

(Module ID 08309) Discusses the importance of safety and following procedures with testing and inspections. Topics include pretest requirements, visual weld inspections, service flow tests, hard pressure tests, hydrostatic tests, and steam blow tests.

### Introduction to Bearings (15 Hours)

ISBN 978-0-13-765463-5

(Module ID 15209) Describes the types and applications of bearings, including plain, roller, ball, thrust, and guide bearings, as well as pillow block, flanged, and takeup bearings. Also explains bearing designation systems.

### Introduction to Conveyors (10 Hours)

ISBN 978-0-13-817582-5

(Module ID 15401) Describes conveyor systems and their principles of operation. Introduces several approaches to belt conveyor drive options. Introduces drum motors and servomotors for belt and roller conveyor systems.

## L2 INDUSTRIAL MAINTENANCE MECHANIC

LEVEL 2

### Curriculum Notes

- 192.5 Hours
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-538721-4

### DIGITAL

NCCERconnect Access Card: \$102.99

### ISBN

978-0-13-538714-6

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-538723-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Basic Layout (20 Hours)

ISBN 978-0-13-765399-7

(Module ID 15104) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

### Piping Systems (5 Hours)

ISBN 978-0-13-581129-0

(Module ID 08201) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes, the effects of thermal expansion, and the purpose of pipe insulation.

### Basic Copper and Plastic Piping Practices (12.5 Hours)

ISBN 978-0-13-794993-9

(Module ID 03103) Explains how to identify types of copper tubing and fittings used in the HVACR industry and how they are mechanically joined. Introduces push-to-connect and press-to-connect fittings. Also presents the identification and application of various types of plastic piping including PEX tubing, along with their common assembly and installation practices. Introduces pressure testing refrigerant lines.

### Basic Carbon Steel Piping Practices (10 Hours)

ISBN 978-0-13-794985-4

(Module ID 03105) Explains how to identify various carbon steel piping materials and fittings. Covers the joining and installation of threaded and grooved carbon steel piping systems, including detailed descriptions of threading and grooving techniques.

Continued on following page

**Low-Pressure Steam Systems** (10 Hours)

ISBN 978-0-13-539285-0

(Module ID 32208) This module introduces the properties of water and fundamentals of steam, followed by a detailed review of low-pressure steam systems and components. Maintaining these systems includes the repair, monitoring and troubleshooting all the components of these systems, such as boilers, control valves, heat exchangers, condensate traps, and vacuum pumps.

**High-Pressure Steam Generation Systems**

(20 Hours)

ISBN 978-0-13-539287-4

(Module ID 32209) This module explains the functioning of high-pressure steam systems used in industry. To support a boiler operation, maintenance craftworkers must be proficient in the use, repair, and maintenance of the auxiliary equipment needed to generate and manage high pressure steam, such as pulverizers, evaporators, soot blowers, and precipitators.

**Distillation Towers and Vessels** (20 Hours)

ISBN 978-0-13-539288-1

(Module ID 32210) Introduces the various types and functioning of distillation towers and vessels, including recovery vessels and condensate processing. The operation, maintenance, and repair of distillation towers and vessels is described in this module. Various types of towers and their components are discussed, as well as an overview of refinery processes.

**Industrial Heat Transfer Equipment** (30 Hours)

ISBN 978-0-13-539290-4

(Module ID 32211) This module reviews the fundamental principles behind heat transfer. It explores uses of heat transfer within numerous industries and outlines the different types of heat exchange equipment. By reviewing the module, the maintenance craftworker is prepared to maintain heat exchange equipment safely, knowledgeable in its operation, servicing, and uses.

**Introduction to Tube Work** (10 Hours)

ISBN 978-0-13-539291-1

(Module ID 32212) Introduces the basics of working with heat exchanger and furnace tubing and tube sheets. By employing a detailed boiler inspection program and applying the proper tools and techniques, forced outages and downtime can be reduced and boiler efficiency can be restored.

L3

INDUSTRIAL MAINTENANCE  
MECHANIC

LEVEL 3

Curriculum Notes

- 210 Hours
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

PAPERBACKISBN

Trainee Guide: \$102.99978-0-13-538171-7

DIGITALISBN

NCCERconnect Access Card: \$102.99978-0-13-538188-5

NCCERconnect + Trainee Guide: \$129.99978-0-13-538178-6

**MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Advanced Pipefitting Math** (25 Hours)

ISBN 978-0-13-583245-5

(Module ID 08304) Covers the role of trigonometry in pipefitting, including the use of trigonometric functions, triangle calculations, determining angles, interpolation, and calculating takeouts and odd angles.

**Precision Measuring Tools** (20 Hours)

ISBN 978-0-13-765435-2

(Module ID 15302) Explains how to select, inspect, use, and care for measuring tools of the millwright craft. Now includes tools such as keyseat rules, telescoping gauges, ultrasonic thickness detector and hardness tester.

**Removing and Installing Bearings** (22.5 Hours)

ISBN 978-0-13-765464-2

(Module ID 15306) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

**Couplings and Alignment Fundamentals** (15 Hours)

ISBN 978-0-13-812122-8

(Module ID 15307) Identifies types of couplings and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

**Setting Baseplates and Soleplates** (20 Hours)

ISBN 978-0-13-765441-3

(Module ID 15207) Describes how to set a machine baseplate and soleplate while guaranteeing alignment with other equipment.

**Prealignment and Shim Fabrication** (20 Hours)

ISBN 978-0-13-812123-5

(Module ID 15313) Covers procedures for fabricating shims. Explains how to level equipment using jack bolts, wedges and shims. Guides the checking for soft foot and other coupling stresses addressed during rough alignment.

**Dial Indicator Alignment** (45 Hours)

ISBN 978-0-13-812127-3

(Module ID 15314) Explains the procedures involved in aligning shafts, first with a straightedge and feeler gauges, then with dial indicators. Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment, based on reverse dial indicator measurements.

**Installing Belt and Chain Drives** (15 Hours)

ISBN 978-0-13-817577-1

(Module ID 15311) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

**Mechanical Seals** (15 Hours)

ISBN 978-0-13-765453-6

(Module ID 15305) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

**Troubleshooting and Repairing Conveyors**

(12.5 Hours)

ISBN 978-0-13-817584-9

(Module ID 15402) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors. Covers conveyor belt tracking problems and correction methods.

Continued on following page

**Curriculum Notes**

- 150 Hours
- Revised: 2024, Fourth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-538781-8****DIGITAL****ISBN**

NCCERconnect Access Card: \$102.99

**978-0-13-538774-0**

NCCERconnect +

Trainee Guide: \$129.99

**978-0-13-538766-5****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Preventive and Predictive Maintenance***(10 Hours)***ISBN 978-0-13-817605-1**

(Module ID 15508) Explains preventive and predictive maintenance programs. Provides information on nondestructive testing, and introduces the basic techniques for nondestructive evaluation. Discusses lubricant analysis, and acoustic, infrared, and vibration testing.

**Advanced Mechanical Drawings** *(17.5 Hours)***ISBN 978-0-13-812135-8**

(Module ID 15503) Describes the use of drawing sets to obtain information about a system. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

**Basic Pneumatic Systems** *(7.5 Hours)***ISBN 978-0-13-812105-1**

(Module ID 15407) Explains pneumatic system components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

**Compressors and Compressor Maintenance***(20 Hours)***ISBN 978-0-13-812110-5**

(Module ID 15406) Introduces compressors and the troubleshooting and maintenance procedures associated with compressors.

**Laser Alignment** *(25 Hours)***ISBN 978-0-13-817589-4**

(Module ID 15502) Describes the operation of laser alignment instruments. Covers step-by-step vertical and horizontal alignment.

**Introduction to Leadership** *(22.5 Hours)***ISBN 978-0-13-828931-7**

(Module ID 46100) Introduces leadership skills and different leadership styles, as well as communication and problem solving techniques. Jobsite safety and safety leadership are also discussed. Introduces business topics that are important to understand for construction projects.

**Troubleshooting and Repairing Pumps***(17.5 Hours)***ISBN 978-0-13-812118-1**

(Module ID 15405) Describes inspecting, troubleshooting, assembling, and disassembling pumps. Explains installing pumps, and preparing them for startup. Discusses shutdown, repair, and removal of pumps from the system.

**Troubleshooting and Repairing Gearboxes***(15 Hours)***ISBN 978-0-13-817596-2**

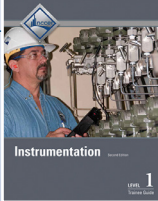
(Module ID 15411) Explains how to troubleshoot, remove, and disassemble gearboxes; how to identify gear wear patterns; and how to install and maintain gearboxes.

**Advanced Towers and Vessels** *(15 Hours)***ISBN 978-0-13-539268-3***(Module ID 32501)*

This module addresses different types of distillation towers and the components found inside them, including the different types of trays and packing used in the distillation process. On the maintenance side, it covers removing, replacing, and troubleshooting tower components, torquing and tensioning, as well as safety when working on distillation towers.

## L1 INSTRUMENTATION

LEVEL 1



### Curriculum Notes

- 190 Hours (includes Core)
- Revised: 2014, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-383080-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Instrumentation Safety Practices (12.5 Hours)

ISBN 978-0-13-378832-7

(Module ID 12115-14) Covers precautions for electrical hazards found on the job and teaches the OSHA-mandated lockout/tagout procedure. Identifies safety practices related to potentially hazardous tools and materials.

#### Hand and Power Tools for Instrumentation

(12.5 Hours)

ISBN 978-0-13-378834-1

(Module ID 12114-14) Explains how to identify, inspect, use, and maintain the various hand and power tools used by instrument fitters and technicians.

#### Craft-Related Mathematics (10 Hours)

ISBN 978-0-13-378838-9

(Module ID 12119-14) Covers basic concepts of the metric system and the conversion of English units to metric units. Also reviews basic algebra, geometric figures, and calculations associated with triangles.

#### Instrument Drawings and Documents Part One

(7.5 Hours)

ISBN 978-0-13-378839-6

(Module ID 12107-14) Identifies and describes the types of drawings used in instrumentation work and familiarizes trainees with basic instrument symbols, lines, and abbreviations used on drawings.

#### Inspect, Handle, and Store Instrumentation Materials (2.5 Hours)

ISBN 978-0-13-378840-2

(Module ID 12304-14) Covers the methods used in receiving, inspecting, handling, and storing project-related instrumentation equipment.

#### Electrical Systems for Instrumentation

(12.5 Hours)

ISBN 978-0-13-378841-9

(Module ID 12116-14) Covers basic electrical concepts and terms, DC circuit calculations, electrical measuring instruments, and electrical wiring.

#### Fasteners (7.5 Hours)

ISBN 978-0-13-378842-6

(Module ID 12106-14) Explains how to properly identify, select, and install threaded and non-threaded fasteners and anchors used in instrumentation work.

#### Gaskets, O-Rings, and Packing (10 Hours)

ISBN 978-0-13-378843-3

(Module ID 12108-14) Teaches how to recognize, select, and properly install gaskets, packing, and O-rings. Covers the various materials used in gaskets and O-rings, along with their applications and limitations.

#### Lubricants, Sealants, and Cleaners (7.5 Hours)

ISBN 978-0-13-378844-0

(Module ID 12109-14) Covers the proper use, storage, handling, and safety practices associated with various lubricants, cutting fluids, sealants, and cleaners. Includes coverage of the tools and materials used in applying lubricants and cleaning products.

#### Tubing (15 Hours)

ISBN 978-0-13-378853-2

(Module ID 12111-14) Introduces types of tubing, tubing materials, fittings, and tools. Covers proper storage and handling, cutting, deburring, reaming, bending, and joining of tubing.

#### Steel Piping Practices (10 Hours)

ISBN 978-0-13-378854-9

(Module ID 12117-14) Covers both carbon steel and stainless steel piping measuring 2" as it applies to instrumentation work. Includes instructions for calculating pipe cut length, cutting, deburring, reaming, and threading pipe.

#### Hoses (7.5 Hours)

ISBN 978-0-13-378856-3

(Module ID 12113-14) Describes different types of hoses and related fittings, along with proper storage and handling. Includes instructions for cutting hoses and installing standard reusable fittings.

## L2 INSTRUMENTATION

LEVEL 2

### Curriculum Notes

- 182.5 Hours
- Revised: 2016, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-413101-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Temperature, Pressure, Level, and Flow

(15 Hours)

ISBN 978-0-13-448255-2

(Module ID 12110-15) Examines the characteristics of temperature, pressure, level, and flow, and describes the units of measure for each variable. Introduces common devices used to measure these process variables and the basic principles of operation for each device.

#### Instrument Fitter's Math (15 Hours)

ISBN 978-0-13-448257-6

(Module ID 12301-15) Discusses the application of right triangles in bending and installing tubing and conduit as it applies to instrumentation. Shows how to use a scientific calculator in applying instrumentation piping and fitting math.

#### Instrument Drawings and Documents, Part Two

(17.5 Hours)

ISBN 978-0-13-448260-6

(Module ID 12202-15) Covers reading and interpreting piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics to enable the identification of types of instrumentation and the specifications for installation.

#### Test Equipment (10 Hours)

ISBN 978-0-13-266158-4

(Module ID 33205-10; from *Electronic Systems Technician Level Two*) Covers the selection, inspection, use, and maintenance of basic test equipment used in low-voltage work. Also covers specialized test equipment such as signal generators, wattmeters, cable testers, and RF analyzers.

#### Panel-Mounted Instruments (10 Hours)

ISBN 978-0-13-448261-3

(Module ID 12212-15) Explains the selection of instruments to be panel-mounted, locating the instruments using drawings, and procedures for installing the instruments in the panels.

#### Installing Field-Mounted Instruments (25 Hours)

ISBN 978-0-13-448263-7

(Module ID 12213-15) Covers selection and mounting of instruments at locations other than panels, including stand mounting, in-line mounting, structure mounting, strap mounting, and insertion mounting.

Continued on following page

## Instrumentation Level 2 (continued)

### Raceways for Instrumentation (17.5 Hours)

ISBN 978-0-13-448267-5

(Module ID 12214-15) Introduces raceways. Also covers identification and selection of conduit, raceways, wireways, cable trays, fittings, and NEC® requirements for installation.

### Clean, Purge, and Test Tubing and Piping Systems

(10 Hours)

ISBN 978-0-13-448269-9

(Module ID 12303-15) Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in instrumentation.

### Protective Measures for Instrumentation

(20 Hours)

ISBN 978-0-13-448270-5

(Module ID 12308-15) Covers protective measures applied in instrumentation installations, including heat tracing, chemical treatment, and insulation.

### Layout and Installation of Tubing and Piping Systems

(35 Hours)

ISBN 978-0-13-448272-9

(Module ID 12302-15) Introduces piping and tubing layout procedures. Explains the steps in creating a hand-sketched isometric drawing that can be applied in the piping and tubing installation. Introduces methods and procedures used to measure, cut, and bend and support piping and tubing.

### Instrument Air Filters, Regulators, and Dryers

(7.5 Hours)

ISBN 978-0-13-448274-3

(Module ID 12210-15) Presents the construction, operation, and uses of filters, regulators, and dryers. Covers identification and selection of the correct component for installation using applicable specifications and schematics.

## L3 INSTRUMENTATION

### LEVEL 3

#### Curriculum Notes

- 150 Hours
- Revised: 2016, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-413095-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Control Valves, Actuators, and Positioners (15 Hours)

ISBN 978-0-13-448277-4

(Module ID 12207-16) Covers the construction and operation of various piping-system valves and actuators. Discusses the application and operation of valve positioners. Presents valve selection criteria and explains how to interpret valve and actuator markings and nameplate information.

#### Detectors, Secondary Elements, Transducers, and Transmitters (25 Hours)

ISBN 978-0-13-448278-1

(Module ID 12205-16) Introduces instrumentation devices that detect different process variables, devices that change the variable into a transmittable form, and devices that transmit the information to another device for control or informational purposes. Covers devices that sense flow, level, temperature, and pressure, along with various types of transducers and transmitters.

#### Instrumentation Electrical Circuitry (25 Hours)

ISBN 978-0-13-448281-1

(Module ID 12305-16) Describes various types of series and parallel circuits; resistance, inductance, and capacitance in AC circuits; DC power supplies; analog and digital signals; and common applications of electrical and electronic circuitry.

#### Relays and Timers (10 Hours)

ISBN 978-0-13-448283-5

(Module ID 12208-16) Presents the principles of operation and applications of various relays and timers. Also reviews the selection process for these devices.

#### Switches and Photoelectric Devices (10 Hours)

ISBN 978-0-13-448286-6

(Module ID 12209-16) Covers the principles of operation and applications of switches and photoelectric devices in the instrumentation environment.

#### Terminating Conductors (20 Hours)

ISBN 978-0-13-448288-0

(Module ID 12307-16) Explains the methods, procedures, and standards used to terminate and test common types of conductors utilized in electrical and electronic wiring applications.

#### Grounding and Shielding of Instrumentation Wiring (10 Hours)

ISBN 978-0-13-448291-0

(Module ID 12306-16) Teaches the basic concepts of grounding and shielding, including wire and cable identification. Defines various types of noise that can be induced into instrumentation wiring and describes the methods used to reduce or eliminate it.

#### Process Control Theory (25 Hours)

ISBN 978-0-13-448294-1

(Module ID 12204-16) Describes the principles of process control and how various types of control loops are applied. Discusses ON-OFF and modulating control schemes. Explains how process control principles are applied to flow, level, temperature, and pressure control loops.

#### Controllers (10 Hours)

ISBN 978-0-13-448296-5

(Module ID 12206-16) Covers the theory of operation and the application of common process controllers, including both pneumatic and electronic devices.

## L4 INSTRUMENTATION

### LEVEL 4

#### Curriculum Notes

- 165 Hours
- Revised: 2016, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-449532-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Instrument Calibration and Configuration (60 Hours)

ISBN 978-0-13-448298-9

(Module ID 12402-16) Introduces the basic concepts of calibration, including the three- and five-point methods. Addresses pneumatic, analog, and smart instrumentation calibration methods. Also covers other process control devices that require calibration.

#### Proving, Commissioning, and Troubleshooting a Loop (17.5 Hours)

ISBN 978-0-13-448300-9

(Module ID 12410-16) Explains the three stages in readying a loop for operation: checking, proving, and commissioning. Examines the key ideas behind each step and stresses the differences. Explores troubleshooting techniques and methodologies, with an emphasis on their use during the three stages of readying a loop.

#### Tuning Loops (15 hours)

ISBN 978-0-13-448303-0

(Module ID 12405-16) Introduces the techniques used in tuning loops employing PID control. Includes basic tuning theory and formulas. Examines open, closed, and visual loop tuning methods.

Continued on following page

## Instrumentation Level 4 (continued)

### **Digital Logic Circuits** (15 Hours)

ISBN 978-0-13-448305-4

(Module ID 12401-16) Introduces the basic ideas of digital electronics. Presents gates, combination logic, and truth tables. Addresses memory devices, counters, and arithmetic circuits as well as the numbering systems commonly used in digital systems.

### **Programmable Logic Controllers** (12.5 Hours)

ISBN 978-0-13-448306-1

(Module ID 12406-16) Introduces PLCs and their uses in industrial control. Includes hardware components, applications, communications, number systems, and programming methods.

### **Distributed Control Systems** (15 Hours)

ISBN 978-0-13-448308-5

(Module ID 12407-16) Surveys DCS technologies, including an overview of their development. Discusses key components, fieldbuses, servers, and human-machine interfaces. Also introduces maintenance and the increasingly important aspect of DCS security.

### **Analyzers and Monitors** (30 Hours)

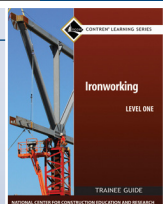
ISBN 978-0-13-448311-5

(Module ID 12409-16) Introduces the key concepts of chemistry, with an emphasis on their application in instrumentation. Explains crucial physical and chemical properties of matter. Discusses the different analytical methods used in industry to assess processes. Includes pH, conductivity, ORP, gas analysis, and particulate counts. Explores specific instruments and techniques.



## L1 IRONWORKING

LEVEL 1



### Curriculum Notes

- 237.5 Hours (includes Core)
- Revised: 2011, Second Edition
- Downloadable instructor resources are available.
- A Spanish translation is available. Please see NCCER's online catalog for more information.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-213714-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to the Trade (5 Hours)

ISBN 978-0-13-213800-0

(Module ID 30101-11) Discusses the historical development of the ironworking trade. Explains personal qualities that contribute to successful employment. Describes the organization and purpose of apprenticeship training, and the safety obligations of the employer and employee.

#### Trade Safety (12.5 Hours)

ISBN 978-0-13-213801-7

(Module ID 30102-11) Describes the consequences of on-the-job accidents and the responsibilities of OSHA. Identifies potential ironworker health and safety hazards and safe work practices around cranes. Explains the safe use of personnel lifts. Discusses the safe use and operation of aerial platforms, hoists, and fall protection systems.

#### Tools and Equipment of the Trade (10 Hours)

ISBN 978-0-13-213803-1

(Module ID 30103-11) Identifies safety tools and equipment. Describes the proper use of hand and power tools. Identifies power sources for ironworking tools.

#### Fastening (5 Hours)

ISBN 978-0-13-213804-8

(Module ID 30104-11) Explains how to recognize A-325 and A-490 bolts, washers, and nuts. Describes how to correctly tension bolts and explains procedures for calibrated wrench and turn-of-nut tightening methods.

#### Mobile Construction Cranes (10 Hours)

ISBN 978-0-13-213805-5

(Module ID 30105-11) Identifies common lifting equipment and construction cranes. Describes how to use crane manuals, perform record keeping, and follow safety requirements. Provides procedures for assembling construction cranes.

#### Rigging Equipment (10 Hours)

ISBN 978-0-13-213806-2

(Module ID 30106-11) Describes the use and inspection of equipment and hardware used in rigging. Describes slings and explains how to determine sling capacities and angles. Covers the selection and inspection of rigging equipment, including block and tackles, chain hoists, come-alongs, jacks, and tuggers.

#### Rigging Practices (15 Hours)

ISBN 978-0-13-215102-3

(Module ID 30107-11) Identifies the site and environmental hazards associated with rigging. Explains how to attach rigging hardware for routine lifts and identify the components of a lift plan. Describes how to perform sling tension calculations and determine the weight of beams and basic weight estimation.

#### Trade Drawings One (12.5 Hours)

ISBN 978-0-13-215103-0

(Module ID 30108-11) Identifies the materials used in steel-framed buildings. Explains how to read basic structural blueprints.

#### Structural Ironworking One (7.5 Hours)

ISBN 978-0-13-215104-7

(Module ID 30109-11) Identifies the types of construction that utilize structural steel, the components of the structures, and the process involved in erecting a steel structure. Explains the principles of structural stresses and the requirements of bolted connections.

#### Plumbing, Aligning, and Guying (5 Hours)

ISBN 978-0-13-215106-1

(Module ID 30110-11) Describes the purpose and function of aligning and plumbing steel structures, the tools that are used, and the procedures for performing the plumbing and aligning. Identifies and explains column base and baseplate components and foundation failures.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-215107-8

(Module ID 29102-09; from *Welding Level One, Fourth Edition*) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

#### Introduction to Arc Welding (22.5 Hours)

ISBN 978-0-13-215108-5

(Module ID 30112-11) Identifies welding equipment and processes. Describes safety precautions associated with arc welding. Explains how to identify weld joints, their dimensions, and applications from welding symbols and drawings. Describes how to set up and use SMAW equipment and explains the governing welding codes.

#### Bar Joists and Girders (5 Hours)

ISBN 978-0-13-215109-2

(Module ID 30113-11) Explains how to recognize types of bar joists and how they are designated. Describes the proper procedures for rigging and storing steel joists. Explains the use of joist girders in steel joist construction systems and the proper erection procedures for bar joists. Includes *OSHA Subpart R*.

#### Metal Decking (10 Hours)

ISBN 978-0-13-215110-8

(Module ID 30114-11) Identifies decking types and profiles and how decking is packaged, shipped, and stored. Describes erecting decking and job-site safety. Discusses the effects of deck penetrations and damage. Includes *OSHA Subpart R*.

#### Field Fabrication (15 Hours)

ISBN 978-0-13-215111-5

(Module ID 30115-11) Identifies the safety hazards associated with field fabrication. Describes how to use common layout tools. Explains how to fabricate angle iron, channel, T-shapes, and W-shapes to given dimensions.

## L2 IRONWORKING

LEVEL 2

### Curriculum Notes

- 162.5 Hours
- Revised: 2011, Second Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-257822-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Trade Math (25 Hours)

ISBN 978-0-13-266447-9

(Module ID 30201-11) Explains fractions and basic math, and includes multiple opportunities for practical applications.

#### Weld Quality (10 Hours)

ISBN 978-0-13-275109-4

(Module ID 29106-09; from *Welding Level One, Fourth Edition*) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

#### Position Arc Welding (20 Hours)

ISBN 978-0-13-266448-6

(Module ID 30202-11) Identifies and explains weld joints, weld positions, and open V-butt welds. Describes how to prepare arc welding equipment and how to make flat welds, horizontal welds, vertical welds, and overhead welds.

#### Forklifts (17.5 Hours)

ISBN 978-0-13-266449-3

(Module ID 30203-11) Identifies the basic components of forklifts and the corresponding hand signals. Explains safe practices and how to perform inspections. Covers how to read load charts and how to operate forklifts.

Continued on following page

## Ironworking Level 2 (continued)

### Trade Drawings Two (10 Hours)

ISBN 978-0-13-266451-6

(Module ID 30204-11) Introduces types of structural plans and describes the information included on each type. Presents the sequences of erection plans for each step of construction and identifies the symbols and abbreviations used on drawings.

### Intermediate Rigging (10 Hours)

ISBN 978-0-13-266181-2

(Module ID 38201-11; from *Intermediate Rigging, First Edition*) Describes basic procedures for using various slings in hitches and calculating sling stress. Introduces tools and equipment used for the lateral movement of loads without a crane. Trainees learn how to reeve block and tackle, invert loads with hoists, and drift a load between two hoists.

### Structural Ironworking Two (30 Hours)

ISBN 978-0-13-266454-7

(Module ID 30205-11) Describes pre-erection activities for structural steel. Provides procedures for erecting bearing devices, columns, beams, girders, joists, bracing, and bridging.

### Steel Joists and Joist Girders (15 Hours)

ISBN 978-0-13-266455-4

(Module ID 30206-11) Identifies the types of joists, methods of end support, and the types of bridging available. Explains how to locate the ironworking information on framing plans and describes steel joist installation procedures. Describes the conditions necessary and the benefits of panelizing bar joist.

### Tower Cranes (15 Hours)

ISBN 978-0-13-266456-1

(Module ID 30207-11) Describes safe practices when erecting steel using tower cranes. Explains the difference between erecting steel with a mobile crane versus a tower crane. Describes tower crane hand and verbal signals.

### Survey Equipment Use and Care One (10 Hours)

ISBN 978-0-13-266457-8

(Module ID 30208-11) Identifies survey equipment and uses. Explains the proper set up and use of a builder's level and a theodolite. Covers how to shoot elevations, sweep a column for plumb, and set up over a point and back sight to another point.

## L3 IRONWORKING

### LEVEL 3

#### Curriculum Notes

- 150 Hours
- Revised: 2012, Second Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-257785-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Applied Trade Math (5 Hours)

ISBN 978-0-13-292280-7

(Module ID 30313-12) Explains the math needed to calculate the size of cribbing or blocking needed for a load; parts of line, maximum load, and line pull for lifting operations; sling capacities; and load distribution for two-crane lifts.

#### Flux Core for Ironworking (40 Hours)

ISBN 978-0-13-292281-4

(Module ID 30314-12) Describes the equipment and methods used in flux core arc welding (FCAW). Includes proper selection and use of filler metals and shielding gases, as well as techniques for performing fillet and V-groove welding in various positions.

#### Stud Welding (10 Hours)

ISBN 978-0-13-292282-1

(Module ID 30304-12) Introduces the stud welding process, stud welding safety, and identifies the equipment used to weld studs. Provides step-by-step procedures to set up welding equipment and guidelines to make acceptable stud welds with proper stud placement. Explains testing of stud welds.

### Structural Ironworking Three (10 Hours)

ISBN 978-0-13-292283-8

(Module ID 30312-12) Explains the techniques used to plumb, align and guy steel structures, including the associated hazards and risks. Provides information and procedures related to the installation of trusses and curtain walls.

### Advanced Rigging (10 Hours)

ISBN 978-0-13-266189-8

(Module ID 38301-11; from *Advanced Rigging, First Edition*) Explains how load weight and center of gravity affect lifting and crane stability. Load calculations for multi-crane lifts are presented, along with the application of equalizer beams. The movement of loads up an inclined plane and the line pull required are examined in detail. The module concludes with guidance in the rigging and handling of rebar bundles.

### Precast/Tilt-Up Erection (12.5 Hours)

ISBN 978-0-13-292285-2

(Module ID 30311-12) Describes the fabrication and uses of precast concrete elements and cast-in-place tilt-up wall systems. Focuses on rigging practices associated with these two distinct construction methods and the role of ironworkers in their installation.

### Special Application Hoisting Devices (10 Hours)

ISBN 978-0-13-292286-9

(Module ID 30307-12) Explains techniques for rigging and moving equipment using a variety of hoisting devices, including gin poles, Chicago booms, A-frames, davits, balance beams, pump handles, high lines, caterpillar dollies, rollers. Also covers special cranes, including derricks, gantries, HLDs, trolley cranes, and jacking frames.

### Survey Equipment Use and Care Two (15 Hours)

ISBN 978-0-13-292287-6

(Module ID 30315-12) Focuses on the total station and its uses, including setup and controls. It includes information on primary and secondary control points and procedures for turning horizontal angles and plumbing columns and wall panels.

### Pre-Engineered Systems (5 Hours)

ISBN 978-0-13-292288-3

(Module ID 30302-12) Identifies the structural components and accessories of metal buildings and describes their installation. Describes the pre-erection and erection procedures that apply to their installation and the safety precautions associated with their installation.

### Miscellaneous/Ornamental Ironworking

(5 Hours)

ISBN 978-0-13-292289-0

(Module ID 30303-12) Identifies the types of ornamental metal and describes the different types of components used in ornamental ironworking. Explains the skills required to fabricate and install ornamental components safely.

### Grating and Checkered Plate (5 Hours)

ISBN 978-0-13-292290-6

(Module ID 30316-12) Provides general information and procedures for the installation and attachment of gratings and checker plate. Describes the rigging methods associated with grating and checkered plate.

### Air Carbon Arc Cutting and Gouging (12.5 Hours)

ISBN 978-0-13-610530-5

(Module ID 29104-09; from *Welding Level One, Fourth Edition*) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

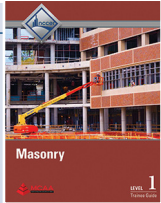
### Demolition (10 Hours)

ISBN 978-0-13-292291-3

(Module ID 30310-12) Identifies the tools used to remove rivets and explains the demolition skills required to safely remove structural steel beams, steel columns, and steel reinforced concrete columns.

## L1 MASONRY

LEVEL 1



### Curriculum Notes

- 197.5 Hours (includes Core)
- Revised: 2013, Fourth Edition
- Downloadable instructor resources are available.
- A Spanish translation of the third edition is available. Please see NCCER's online catalog for more information.

### HARDCOVER

Trainee Guide: \$74.99

ISBN 978-0-13-375402-5

### PAPERBACK

Trainee Guide: \$74.99

ISBN 978-0-13-340248-3

### DIGITAL

NCCERconnect Access Card: \$74.99

ISBN 978-0-13-684934-6

NCCERconnect + Trainee Guide: \$104.99 ISBN 978-0-13-731061-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Masonry (12.5 Hours)

ISBN 978-0-13-377930-1

(Module ID 28101-13) Covers basic masonry materials, tools, techniques, and safety precautions. Explains how to mix mortar by hand and lay masonry units. Also describes the skills, attitudes, and abilities of successful masons.

### Masonry Safety (15 Hours)

ISBN 978-0-13-377931-8

(Module ID 28106-13) Describes how to identify the common causes of accidents and the hazards associated with masonry tools, equipment, mortar, and concrete. Focuses on using personal protective equipment, working safely from elevated surfaces, properly using masonry tools and equipment, and handling masonry materials safely.

### Masonry Tools & Equipment (15 Hours)

ISBN 978-0-13-377932-5

(Module ID 28102-13) Describes a variety of hand tools, measuring tools, mortar equipment, power tools and equipment, and lifting equipment that masons use on the job, and explains how to use these tools correctly and safely. Provides instructions for assembling and disassembling scaffolds.

## Measurements, Drawings, and Specifications

(10 Hours)

ISBN 978-0-13-377933-2

(Module ID 28103-13) Reviews the calculation of distances and areas common in masonry work; describes the information found on residential construction drawings; and explains the role of specifications, standards, and codes.

## Mortar (10 Hours)

ISBN 978-0-13-377934-9

(Module ID 28104-13) Explains the types and properties of mortar and the materials used in the mixture, including admixtures; provides instructions for mixing mortar by machine; and describes how to properly apply and store mortar.

## Masonry Units and Installation Techniques

(60 Hours)

ISBN 978-0-13-377935-6

(Module ID 28105-13) Covers characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. Describes masonry reinforcements and accessories used to lay block and brick professionally and safely.

## L2 MASONRY

LEVEL 2

### Curriculum Notes

- 152.5 Hours
- Revised: 2014, Fourth Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

ISBN 978-0-13-377970-7

### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN 978-0-13-690757-2

NCCERconnect +

Trainee Guide \$129.99:

ISBN 978-0-13-787908-3

## Residential Plans and Drawing Interpretation

(12.5 Hours)

ISBN 978-0-13-378178-6

(Module ID 28201-14) Explains how to work with residential plans and construction drawings and convert that information into action on the job. Describes the organization and format of plans, dimensioning and scaling, and estimating materials quantities from information on the plans.

## Residential Masonry (25 Hours)

ISBN 978-0-13-378179-3

(Module ID 28202-14) Covers the construction techniques for residential and small structure foundations, steps, patios, decks, chimneys, and fireplaces. Describes work activities that the mason must perform, as well as those that tie into the masonry work.

## Reinforced Masonry (20 Hours)

ISBN 978-0-13-378180-9

(Module ID 28203-14) Focuses on the use of grout and other types of reinforcement, such as reinforcing steel, to strengthen and support masonry structures. Describes the locations where grout can be used and the techniques for placement. Discusses the use and application of various types of reinforced masonry elements, such as rebar and bond beam lintels.

## Masonry Openings and Metalwork (20 Hours)

ISBN 978-0-13-378181-6

(Module ID 28204-14) Introduces types of metal components, including metal rods, joint reinforcements, plates, anchors, fasteners, and hollow metal frames for doors and windows, and explains how they are installed.

## Advanced Laying Techniques (40 Hours)

ISBN 978-0-13-378182-3

(Module ID 28205-14) Describes the construction of masonry wall systems, weep vents, and joints. Includes safety requirements and interaction with structural components.

## Effects of Climate on Masonry (20 Hours)

ISBN 978-0-13-378184-7

(Module ID 28206-14) Describes materials and techniques used to apply insulation and methods of moisture control as they relate to the mason's trade. Includes hot- and cold-weather considerations.

## Construction Inspection and Quality Control

(15 Hours)

ISBN 978-0-13-382523-7

(Module ID 28207-14) Introduces the quality control requirements for masonry construction. Presents procedures for inspection and testing of masonry materials and finished masonry construction.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

Continued on following page

L3 MASONRY	
LEVEL 3	
Curriculum Notes	
<ul style="list-style-type: none"> <li>• 200 Hours</li> <li>• Revised: 2014, Fourth Edition</li> <li>• Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-375045-4
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-0-13-684941-4
NCCERconnect + Trainee Guide \$129.99:	978-0-13-787914-4

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Elevated Masonry (15 Hours)

ISBN 978-0-13-409845-6

(Module ID 28301-14) Describes how to work safely and efficiently on elevated structures. Explains how to maintain a safe work environment, ensure protection from falls, how to brace walls from outside forces, and how to identify common types of elevated walls. Stresses safety around equipment such as cranes and hoists.

### Specialized Materials and Techniques (60 Hours)

ISBN 978-0-13-409844-9

(Module ID 28302-14) Introduces unique types of masonry situations that won't be encountered on every job, including sound-barrier walls, arches, and the use of acid brick, refractory brick, and glass block. Describes the handling and construction of these materials, and introduces the intricacies of each.

### Repair and Restoration (20 Hours)

ISBN 978-0-13-409843-2

(Module ID 28303-14) Details techniques for identifying and repairing common masonry problems of weathering, settling, stain, etc. Explains tuckpointing, the removal of efflorescence and stains, and crack repair. Includes sections on how to repair foundation walls, water intrusion, and localized problems, as well as fireplace and chimney repair.

### Commercial Drawings (25 Hours)

ISBN 978-0-13-409842-5

(Module ID 28304-14) Explains how to read and identify drawings for commercial structures using previous experience from structural drawings as a baseline. Describes requirements for these drawings, as well as how to interpret and create plans for architectural, structural, and shop drawings.

### Estimating (25 Hours)

ISBN 978-0-13-409841-8

(Module ID 28305-14) Describes how to estimate building materials, such as brick, block, grout, mortar, joint reinforcement, and masonry ties. Details multiple methods for estimating, as well as how to estimate for masonry elements such as openings and lintels.

### Site Layout – Distance Measurement and Leveling

(20 Hours)

ISBN 978-0-13-409857-9

(Module ID 28306-14) Covers the techniques needed to produce and read site plans and topographic maps. Describes the use of measuring devices such as tapes, range poles, plumb bobs, total stations, leveling instruments, and field notes. Also discusses the construction of batter boards and how to ensure correct measurements.

### Stone Masonry (15 Hours)

ISBN 978-0-13-409856-2

(Module ID 28308-14) Focuses on the application of natural stone in masonry construction. Describes types of stone and how stone is cut, finished, and stored. Discusses equipment and tools for handling stone. Details how to estimate and install stone using anchors and mortars and explains how to install stone veneers.

### Fundamentals of Crew Leadership (20 Hours)

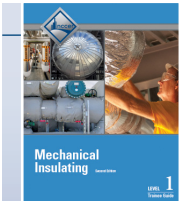
ISBN 978-0-13-409855-5

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

# Mechanical Insulating

## L1 MECHANICAL INSULATING

LEVEL 1



### Curriculum Notes

- 170 Hours (includes Core)
- Revised: 2018, Second Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

ISBN

978-0-13-413099-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (5 Hours)

ISBN 978-0-13-448313-9

(Module ID 19101-18) Provides an overview of the insulation industry, including how and why insulation is used, safety factors related to insulation, and common insulation-specific tools.

### Material Handling, Storage, and Distribution

(2.5 Hours)

ISBN 978-0-13-448314-6

(Module ID 19104-18) Covers receiving, stacking, and storage of insulation materials, as well as material movement on the jobsite.

### Characteristics of Pipe (5 Hours)

ISBN 978-0-13-448318-4

(Module ID 19105-18) Provides an overview of different pipe types and their uses, pipe sizing methodology, and the relationship between pipe sizes and insulation sizes.

### Plumbing Systems (7.5 Hours)

ISBN 978-0-13-448319-1

(Module ID 19209-18) Covers cold and hot water plumbing systems and insulation requirements for different types of plumbing systems.

## Chilled and Hot Water Heating Systems

(5 Hours)

ISBN 978-0-13-448321-4

(Module ID 19210-18) Covers chilled and hot water heating and dual temperature systems, including the types of pipe and equipment common to each type of system. Explains the types of insulation required by each type of system.

## Installing Fiberglass Pipe Insulation (30 Hours)

ISBN 978-0-13-448323-8

(Module ID 19106-18) Describes the characteristics of fiberglass pipe insulation and the characteristics of ASJ jacketing.

## Insulating Pipe Fittings, Valves, and Flanges

(40 Hours)

ISBN 978-0-13-448326-9

(Module ID 19107-18) Explains insulation requirements for fittings, valves, and flanges. Provides tips for professional and economical installation.

## L2 MECHANICAL INSULATING

LEVEL 2

### Curriculum Notes

- 170 Hours
- Updated in 2018.

### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-416315-4

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Construction Drawings and Specifications

(12.5 Hours)

ISBN 978-0-13-498783-5

(Module ID 19309) Describes how to determine the insulation requirements of a project by interpreting construction drawings.

### Trade Math and Layout (7.5 Hours)

ISBN 978-0-13-498780-4

(Module ID 19212) Reviews some basic arithmetic and geometric concepts applicable to the mechanical insulating craft. Building on these basic skills, trainees then learn drafting and layout methods that they will frequently use throughout their careers.

### Heat Transfer (2.5 Hours)

ISBN 978-0-13-489682-3

(Module ID 19303) Describes methods of heat transfer and moisture migration and discusses the application of various types of insulation to slow or prevent these processes.

### Flexible Foam Insulation (25 Hours)

ISBN 978-0-13-489680-9

(Module ID 19201) Covers proper tool use and procedures for installing flexible foam insulation, including how to cut and install flexible foam insulation on pipe fittings, valves, flanges, equipment, and air ducts.

### Air Duct Systems (7.5 Hours)

ISBN 978-0-13-489678-6

(Module ID 19302) Covers the identification of various duct systems and their associated components.

### Blanket Insulation for Ducts (7.5 Hours)

ISBN 978-0-13-498777-4

(Module ID 19202) Covers fiberglass blanket installation to ducts and apparatus and discusses vapor-sealed blanket insulation facings.

### Board Insulation for Ducts (20 Hours)

ISBN 978-0-13-498775-0

(Module ID 19203) Covers fiberglass board insulation applications, such as cutting fiberglass board insulation to fit over standing seams and stiffeners, vapor-seal applications, and cutting and installing fiberglass board insulation on round or oval ducts.

### Cements and Fabric Finishes (10 Hours)

ISBN 978-0-13-498772-9

(Module ID 19208) Covers the proper use of finishing tools, cleanup and protection procedures, and the limitations of cements, fabric finishes, and mastics.

### Insulation Adhesives (5 Hours)

ISBN 978-0-13-498770-5

(Module ID 19304) Covers the identification, application, and use of adhesives.

## Vapor Retarders and Insulation Coatings

(10 Hours)

ISBN 978-0-13-498767-5

(Module ID 19211) Addresses the need to avoid the intrusion of water vapor into porous insulation and vapor retardant materials available to mechanical insulators. Trainees will also learn how to apply vapor-retardant mastics and membranes for common insulating scenarios.

## Steam and Process Water Systems (10 Hours)

ISBN 978-0-13-498764-4

(Module ID 19305) Covers the identification of steam and condensate piping and describes steam and process water systems and their components.

## Calcium Silicate/Expanded Perlite Pipe Insulation

(20 Hours)

ISBN 978-0-13-498762-0

(Module ID 19204) Discusses the safe handling and storage of calcium silicate pipe insulation, how to make accurate cuts, and how to install single- and double-layers of calcium silicate pipe insulation.

## Rigid Foam and Cellular Glass Insulation

(12.5 Hours)

ISBN 978-0-13-498760-6

(Module ID 19206) Covers the proper use of tools; handling and storage of rigid foam insulation; measuring, cutting, installing, and sealing rigid foam plastic and cellular glass insulation; cryogenic installation; expansion joints; contraction joints; and vapor stops.

Continued on following page



## Mechanical Insulating Level 2 (continued)

### Industrial Boiler Systems (7.5 Hours)

ISBN 978-0-13-498757-6

(Module ID 19306) Describes boilers and related equipment, and their insulation requirements.

### Mineral Wool Insulation (12.5 Hours)

ISBN 978-0-13-498755-2

(Module ID 19205) Describes how to measure, cut, and score mineral wool insulation. Discusses attachments used on mineral wool, installation methods, sealing requirements, and how to use pin welding equipment.

L3 MECHANICAL INSULATING	
LEVEL 3	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"><li>• 152.5 Hours</li><li>• Updated in 2018.</li></ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	978-0-13-483379-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Board and Block Insulation (17.5 Hours)

ISBN 978-0-13-498753-8

(Module ID 19207) Covers the measuring requirements of board and block insulation; scoring, beveling, and cutting methods; and how to install board and block insulation on flat or curved surfaces and on large diameter tanks.

#### Sheet-Metal Lagging (15 Hours)

ISBN 978-0-13-498752-1

(Module ID 19312) Describes the identification and application of common sheet metal tools, discusses fabrication and installation methods, and covers flashing and sealing techniques.

#### Jacketing Systems (12.5 Hours)

ISBN 978-0-13-498749-1

(Module ID 19313) Describes the purposes and the types of insulation jacketing available for mechanical systems. This module also explains how to work with various kinds of organic, polymeric, and other types of jacket not made from rigid sheet metal.

#### Jacketing Fabrication – Pipe and Fittings

(42.5 Hours)

ISBN 978-0-13-498747-7

(Module ID 19310) Covers the identification and applications of pipes and pipe fittings and describes types of pipe and fitting jacketing, along with layout installation procedures and securements.

#### Jacketing Fabrication – Vessels and Equipment (25

Hours)

ISBN 978-0-13-498743-9

(Module ID 19311) Covers the identification of vessel and equipment jacketing, along with layout, fabrication, installation procedures, and securements.

#### Removable and Reusable Flexible Insulation Covers (12.5 Hours)

ISBN 978-0-13-498740-8

(Module ID 19314) Provides a detailed introduction to removable and reusable flexible insulation covers, and explains the construction and installation of commercially-fabricated and kit insulation covers.

#### Specialized Insulation Systems (5 Hours)

ISBN 978-0-13-498739-2

(Module ID 19308) Describes special-application insulation systems, including low-temperature and prefabricated panels; refractory insulation; soft pads and pre-shaped removable covers; preinsulated systems; spray, foam, and pour-in-place insulation; fire stops; noise and sound control systems; and cryogenic applications.

#### Fundamentals of Crew Leadership (22.5 Hours)

ISBN 978-0-13-487188-2

(Module ID 46101) The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating.



## L1 MILLWRIGHT

### LEVEL 1



#### Curriculum Notes

- 162.5 Hours (includes Core)
- Revised: 2021, Fourth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-765382-9

#### DIGITAL

NCCERconnect Access Card: \$74.99

#### ISBN

978-0-13-821167-7

NCCERconnect +

Trainee Guide: \$104.99

978-0-13-821178-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to the Millwright Craft (5 Hours)

ISBN 978-0-13-765386-7

(Module ID 15101) Presents the history of the trade and discusses career paths for millwrights. Describes environments and types of work associated with the millwright trade.

### Millwright Hand Tools (17.5 Hours)

ISBN 978-0-13-765387-4

(Module ID 15102) Introduces hand tools used by millwrights. Explains hand tool safety and covers the methods for selecting, inspecting, using, and maintaining these tools.

### Fasteners and Anchors (12.5 Hours)

ISBN 978-0-13-765394-2

(Module ID 15103) Identifies fasteners and anchors used by millwrights, including their applications and installation procedures.

### Basic Layout (20 Hours)

ISBN 978-0-13-765399-7

(Module ID 15104) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

### Reading Mechanical Drawings (20 Hours)

ISBN 978-0-13-765403-1

(Module ID 15203) Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

### Field Sketching (10 Hours)

ISBN 978-0-13-765400-0

(Module ID 15202) Elective - Teaches the basic skills needed to make a good field sketch to convey information about how parts should be made or assembled.

## L2 MILLWRIGHT

### LEVEL 2

#### Curriculum Notes

- 175 Hours (required); 37.5 Hours (elective)
- Revised: 2021, Fourth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-765428-4

#### DIGITAL

NCCERconnect Access Card: \$102.99

#### ISBN

978-0-13-821190-5

NCCERconnect +

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Craft-Related Mathematics (20 Hours)

ISBN 978-0-13-765434-5

(Module ID 15201) This module introduces the use of equivalents and conversion tables, figure ratios, and proportions. Explains basic use of trigonometry in calculating takeouts, volumes, and weights of objects, and performing right-angle trigonometry.

### Precision Measuring Tools (20 Hours)

ISBN 978-0-13-765435-2

(Module ID 15302) Explains how to select, inspect, use, and care for measuring tools of the millwright craft. Now includes tools such as keyseat rules, telescoping gauges, ultrasonic thickness detector and hardness tester.

### Millwright Power Tools (22.5 Hours)

ISBN 978-0-13-765440-6

(Module ID 15205) Introduces power tools used by millwrights and procedures for using, caring for, and maintaining these tools.

### Setting Baseplates and Soleplates (20 Hours)

ISBN 978-0-13-765441-3

(Module ID 15207) Describes how to set a machine baseplate and soleplate while guaranteeing alignment with other equipment.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Teaches use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102) Explains the safety requirements for oxyfuelcutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment.

### Gaskets and Packing (15 Hours)

ISBN 978-0-13-765450-5

(Module ID 15107) Describes gaskets and packing and their applications, while also providing instructions for laying out, cutting, and installing gaskets.

### O-Rings and Non-Mechanical Seals (7.5 Hours)

ISBN 978-0-13-765452-9

(Module ID 15304) Enhanced coverage of dynamic and static seals, including their applications, tools used, installation procedures, and removal. Also covers lip, cup, oil, and labyrinth seals.

### Introduction to Bearings (15 Hours)

ISBN 978-0-13-765463-5

(Module ID 15209) Describes the types and applications of bearings, including plain, roller, ball, thrust, and guide bearings, as well as pillow block, flanged, and takeup bearings. Also explains bearing designation systems.

### Removing and Installing Bearings (22.5 Hours)

ISBN 978-0-13-765464-2

(Module ID 15306) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-418269-8

(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

### Craft-Related Algebra and Trigonometry (30 Hours)

ISBN 978-0-13-765466-6

(Module ID 15301) Explains right-triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles, and the laws of acute triangles.

Continued on following page

L3

MILLWRIGHT

LEVEL 3

Curriculum Notes

- 175 Hours (required); 37.5 Hours (elective)
- Revised: 2022, Fourth Edition
- Downloadable instructor resources are available.

PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-803136-7

DIGITAL

ISBN

NCCERconnect Access Card: \$102.99

978-0-13-821218-6

NCCERconnect +

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Basic Pneumatic Systems (7.5 Hours)

ISBN 978-0-13-812105-1

(Module ID 15407) Explains pneumatic system components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

### Compressors and Compressor Maintenance

(20 Hours)

ISBN 978-0-13-812110-5

(Module ID 15406) Introduces compressors and the troubleshooting and maintenance procedures associated with compressors.

### Lubrication (15 Hours)

ISBN 978-0-13-812112-9

(Module ID 15208) Explains how to safely select and use lubricants. Describes types of lubricants and lubrication devices.

### Introduction to Pumps (20 Hours)

ISBN 978-0-13-812114-3

(Module ID 15404) Describes common pumps and their principles of operation. Explains centrifugal, rotary, reciprocating and metering pumps. Describes net positive suction head and cavitation.

### Troubleshooting and Repairing Pumps (17.5 Hours)

ISBN 978-0-13-812118-1

(Module ID 15405) Describes inspecting, troubleshooting, assembling, and disassembling pumps. Explains installing pumps, and preparing them for startup. Discusses shutdown, repair, and removal of pumps from the system.

### Mechanical Seals (15 Hours)

ISBN 978-0-13-765453-6

(Module ID 15305) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

### Couplings and Alignment Fundamentals (15 Hours)

ISBN 978-0-13-812122-8

(Module ID 15307) Identifies types of couplings and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

### Prealignment and Shim Fabrication (20 Hours)

ISBN 978-0-13-812123-5

(Module ID 15313) Covers procedures for fabricating shims. Explains how to level equipment using jack bolts, wedges and shims. Guides the checking for soft foot and other coupling stresses addressed during rough alignment.

### Dial Indicator Alignment (45 Hours)

ISBN 978-0-13-812127-3

(Module ID 15314) Explains the procedures involved in aligning shafts, first with a straightedge and feeler gauges, then with dial indicators. Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment, based on reverse dial indicator measurements.

### Troubleshooting and Repairing

#### Pneumatic Equipment (10 Hours)

ISBN 978-0-13-812133-4

(Module ID 15408) Explains repair and maintenance of pneumatic system components. Describes troubleshooting processes and methods, including pressure sensors and flow sensors.

### Advanced Mechanical Drawings (17.5 Hours)

ISBN 978-0-13-812135-8

(Module ID 15503) Describes the use of drawing sets to obtain information about a system. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

### Vibration Analysis (10 Hours)

ISBN 978-0-13-812136-5

(Module ID 15509) Explains the causes of vibration and the procedures and types of equipment used in vibration analysis. Describes the equipment used for vibration testing and monitoring. Describes field machine balancing.

L4

MILLWRIGHT

LEVEL 4

Curriculum Notes

- 160 Hours (required); 47.5 Hours (elective)
- Revised: 2023, Fourth Edition
- Downloadable instructor resources are available.

PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-817567-2

DIGITAL

ISBN

NCCERconnect Access Card: \$102.99

978-0-13-821230-8

NCCERconnect +

Trainee Guide: \$129.99

978-0-13-821234-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Basic Hydraulic Systems (15 Hours)

ISBN 978-0-13-817575-7

(Module ID 15409) Describes principles and types of hydraulic equipment and related safety procedures. Describes applications of hydraulic equipment.

### Troubleshooting and Repairing Hydraulic

#### Equipment (12.5 Hours)

ISBN 978-0-13-817576-4

(Module ID 15410) Explains inspecting hydraulic systems, diagnosing problems, and repairing these systems. Shows how to read hydraulic schematic symbols.

### Installing Belt and Chain Drives (15 Hours)

ISBN 978-0-13-817577-1

(Module ID 15311) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

### Introduction to Conveyors (10 Hours)

ISBN 978-0-13-817582-5

(Module ID 15401) Describes conveyor systems and their principles of operation. Introduces several approaches to belt conveyor drive options. Introduces drum motors and servomotors for belt and roller conveyor systems.

### Troubleshooting and Repairing Conveyors

(12.5 Hours)

ISBN 978-0-13-817584-9

(Module ID 15402) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors. Covers conveyor belt tracking problems and correction methods.

### Laser Alignment (25 Hours)

ISBN 978-0-13-817589-4

(Module ID 15502) Describes the operation of laser alignment instruments. Covers step-by-step vertical and horizontal alignment.

### Optical Layout and Alignment (15 Hours)

ISBN 978-0-13-817590-0

(Module ID 15504) Explains how to use theodolites, optical levels, auto levels, and total stations to place and align equipment.

### Gearboxes (15 Hours)

ISBN 978-0-13-817595-5

(Module ID 15412) Describes types and operation of gearboxes, and gearbox diagnostics. Covers power transmission principles.

### Troubleshooting and Repairing Gearboxes (15 Hours)

ISBN 978-0-13-817596-2

(Module ID 15411) Explains how to troubleshoot, remove, and disassemble gearboxes; how to identify gear wear patterns; and how to install and maintain gearboxes.

### Turbines (15 Hours)

ISBN 978-0-13-817599-3

(Module ID 15505) Describes types of turbines and their components. Describes the operation and common applications of particular types, including gas, steam, and water turbines.

### Preventive and Predictive Maintenance (10 Hours)

ISBN 978-0-13-817605-1

(Module ID 15508) Explains preventive and predictive maintenance programs. Provides information on nondestructive testing, and introduces the basic techniques for nondestructive evaluation. Discusses lubricant analysis, and acoustic, infrared, and vibration testing.

Continued on following page

## Millwright Level 4 (continued)

### **Maintaining and Repairing Turbine Components**

*(12.5 Elective Hours)*

**ISBN 978-0-13-817565-8**

(Module ID 15506) Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.

### **Crane Safety and Emergency Procedures**

*(25 Elective Hours)*

**ISBN 978-0-13-498800-9**

(Module ID 21106) Describes the communication process between the signal person and the crane operator. Covers electronic communications as well as the standard hand signals in 29 CFR 1926.

### **Crane Communications** *(10 Elective Hours)*

**ISBN 978-0-13-498819-1**

(Module ID 53101) Covers safety standards and best safety practices relevant to the operation of cranes. Describes safety considerations related to power lines, weather conditions, and specific crane functions.

L1

## PAINTING - COMMERCIAL & RESIDENTIAL

LEVEL 1

### Curriculum Notes

- 155 Hours (includes Core)
- Revised: 1997

ISBN

978-0-13-771239-7

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Careers in the Painting Trade (5 Hours)

(Module ID 07101) Presents a brief history of the painting trade. Covers career opportunities, from apprenticeship/helper to managerial/business-related work. Describes the characteristics of the successful tradesperson, including productivity, appearance, personal hygiene, and dependability.

#### Safety (10 Hours)

(Module ID 07102) Provides an overview of construction site hazards and safety precautions for those in the painting trade. Covers methods of rigging and care of ladders, scaffolds, swing devices, and other equipment.

#### Ladders, Scaffolds, Lifts, and Fall Protection

(10 Hours)

(Module ID 07103) Covers methods of erecting, using and maintaining ladders, scaffolds, and lifts. Discusses fall protection equipment and safety practices used when working on ladders, scaffolds, and lifts.

#### Identifying Surface/Substrate Materials and Conditions (5 Hours)

(Module ID 07104) Explains how to identify types of surfaces used in construction including wood, metal, masonry/concrete, plaster/drywall and synthetic substrates. Also discusses how to identify new, aged, or previously coated surface conditions of substrates and coatings.

#### Protecting Adjacent Surfaces (5 Hours)

(Module ID 07105) Describes the tools, materials, and methods used for protecting adjacent surfaces and areas prior to surface preparation, paint spraying, etc.

#### Basic Surface Preparation (15 Hours)

(Module ID 07106) Covers the tools, materials, and methods used for cleaning, repairing, and penetrating surfaces/substrates in preparation for coating. Describes basic methods used for surface preparation of wood, metal, plaster/drywall, cementitious, and synthetic surfaces/substrates.

#### Sealants and Repair/Fillers (5 Hours)

(Module ID 07107) Describes the characteristics of common sealants and fillers. Covers guidelines for selecting sealants/fillers and the tools and methods used to apply them to substrates.

#### Introduction to Paints and Coatings (10 Hours)

(Module ID 07108) Describes the basic ingredients and film-forming processes common to all paints and coatings. Covers paint systems and functional categories of paints and coatings. Focuses on water-based alkyd paints and coatings.

#### Brushing and Rolling Paints and Coatings

(15 Hours)

(Module ID 07109) Covers the types and selection of brushes, rollers, pads, mitts, and related accessories used for applying paints and coatings. Includes techniques used for brushing and rolling paints and coatings on interior and exterior surfaces. Also recommends maintenance and storage methods.

L2

## PAINTING - COMMERCIAL & RESIDENTIAL

LEVEL 2

### Curriculum Notes

- 145 Hours
- Revised: 1997

ISBN

978-0-13-771296-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Painting Failures and Remedies (7.5 Hours)

(Module ID 07201) Describes failures of paints/coatings on exterior and interior substrates, causes of these failures, and their remedies. Focuses on the nature of the substrates, application procedures, and surface preparation.

#### Job Planning and Completion (10 Hours)

(Module ID 07202) Explains the process for estimating a job to submit a bid. Also covers the processes for planning and accomplishing a job from start to finish with emphasis placed on the importance and use of drawings, specifications, schedules, and other instructions.

#### Chemical Cleaning and Stripping (7.5 Hours)

(Module ID 07203) Describes chemical cleaners and strippers and how they are used to clean and/or remove unwanted material from substrates.

#### Low-Pressure Water Cleaning (7.5 Hours)

(Module ID 07204) Covers the design and function of low-pressure washing equipment, including procedures for the safe operation and maintenance of typical equipment.

#### Abrasive Blasting (7.5 Hours)

(Module ID 07205) Covers the basic design and function of abrasive blasting equipment, including general procedures for its use, related industry standards, and safety and health considerations.

#### Drywall Finishing and Patching (25 Hours)

(Module ID 07206) Covers the materials and procedures used for drywall finishing and patching. Emphasizes techniques for finishing and patching drywall, including the use and care of tools, equipment and supplies, and safety.

#### Stains (7.5 Hours)

(Module ID 07207) Describes the different classes and/or kinds of stains, including their composition, selection for use, and application considerations.

#### Clear Finishes (7.5 Hours)

(Module ID 07208) Introduces the composition, uses, and application of clear finishes, including varnishes, lacquers, shellacs, and urethanes.

#### Wood Finishing (22.5 Hours)

(Module ID 07209) Presents the science and technology of wood and wood products. Provides procedures and techniques for wood surface preparation and the application of clear finishes to various kinds of wood.

#### Coatings Two (10 Hours)

(Module ID 07210) Introduces the unique properties of high-performance coatings. Includes safety and health considerations, surface preparation, application, testing, and inspection.

#### Spray Painting (Conventional, Airless and HVLP)

(32.5 Hours)

(Module ID 07211) Covers the design and function of conventional, airless, and HVLP spraying equipment, including procedures for the safe operation and maintenance of typical equipment.

Continued on following page

L3	PAINTING - COMMERCIAL & RESIDENTIAL
LEVEL 3	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 152.5 Hours</li> <li>• Revised: 1998</li> </ul>	
ISBN	978-0-13-949041-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Painting Failures and Remedies Two (7.5 Hours)

(Module ID 07301) Explains how to recognize and remedy paint/coating failures caused by improper preparation and application of coatings, as well as coating discoloration.

### Job Supervision, Planning, and Control (15 Hours)

(Module ID 07302) Covers skills and leadership traits associated with the successful supervisor, including how to supervise and motivate employees, how to estimate a job, the use of contract documents, and methods for controlling materials and tools/equipment.

### Coatings Three (15 Hours)

(Module ID 07303) Describes unique properties, safety and health considerations, surface preparation, application, and testing, and inspection of high-performance coatings used primarily to protect substrates for commercial or light industrial applications.

### Color and Tinting (10 Hours)

(Module ID 07304) Presents the theory and definition of color. Describes procedures for mixing, tinting, and matching colors. The use of the color wheel and the Munsell, Federal Standard 595B, and other color systems are also explained.

### Decorative (Faux) Finishes (22.5 Hours)

(Module ID 07305) Describes techniques for glazing, antiquing, stippling, mottling, gilding, marbling, and graining decorative finishes.

### Wallcovering (40 Hours)

(Module ID 07306) Covers the wallcovering process from start to finish. Includes equipment and materials, estimating methods, surface preparation, adhesives and installation, and failures and remedies.

### Graphics (12.5 Hours)

(Module ID 07307) Describes types of graphics and their uses, methods of transferring graphic patterns to a surface, building code regulations, and other factors in the use of graphics.

### Texturing (10 Hours)

(Module ID 07308) Explains the characteristics of various texturing materials, surface preparation procedures, and techniques for producing different patterns.

### Spraying with Special Devices (20 Hours)

(Module ID 07309) Covers the design and function of texture, cold roof coating, electrostatic, and plural component spraying equipment. Includes procedures for the safe operation and maintenance of typical equipment.

L4	PAINTING - INDUSTRIAL
LEVEL 4	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 152.5 Hours</li> <li>• Revised: 1998</li> </ul>	
ISBN	978-0-13-910100-7

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Safety (10 Hours)

(Module ID 07401) Provides an overview of the safety hazards and precautions for working on construction sites, with a focus on the industrial painting trade and applications.

### Ladders, Scaffolds, Lifts, and Fall Protection (15 Hours)

(Module ID 07402) Describes methods for erecting, using, and maintaining ladders, scaffolds, and lifts. Covers fall protection equipment and safety practices for working on ladders, scaffolds, and lifts.

### Containment/Ventilation (7.5 Hours)

(Module ID 07403) Introduces methods for limiting dust, debris, hazardous material, etc., from contaminating the environment and injuring people. Bases content on the monitoring components and methods recommended in SSPCGuide 6 (CON). Covers ventilation methods used for the control of emissions released to the atmosphere and to protect the worker within a containment enclosure.

### Surface Preparation One (15 Hours)

(Module ID 07404) Covers the tools, materials, and methods used for cleaning and preparing surfaces/substrates by solvent cleaning, hand tool cleaning, and power tool cleaning methods. Bases content on the methods and procedures specified by the following SSPC/NACE standards: SSPC-SP1, SSPC-SP2, SSPC-SP3, SSPC-SP11, and SSPC-SP13/NACE 6.

### Surface Preparation Two (20 Hours)

(Module ID 07405) Covers the tools, materials, and methods used for cleaning and preparing surfaces/substrates using various types of abrasive blasting equipment. Bases content on the methods and procedures specified by the following SSPC/NACE standards: SSPC-SP5/NACE 1, SSPC-SP10/NACE 2, SSPC-SP6/NACE 3, SSPC-SP7/NACE 4.

### Surface Preparation Three (7.5 Hours)

(Module ID 07406) Covers the tools, materials, and methods used for cleaning and preparing surfaces/substrates by chemical stripping, pickling, high-pressure water-jetting, and ultra high-pressure water jetting. Bases content on the methods and procedures specified by the following SSPC/NACE standards: SSPC-SP8 and SSPC-SP12/NACE 5.

### Industrial Coatings (12.5 Hours)

(Module ID 07407) Covers the basic ingredients and filmforming processes common to all paints and coatings and describes paint systems and the different functional categories of paints and coatings. Introduces the unique properties, safety and health considerations, and surface preparation and application of high-performance coatings used to protect substrates for industrial applications.

### Coating Application and Equipment (25 Hours)

(Module ID 07408) Covers equipment and methods used to apply coatings by the following methods: brushes and rollers, conventional sprayers, airless and air-assisted sprayers, highvolume low pressure (HVLV) sprayers, electrostatic sprayers, plural component proportioning equipment, wire flame and wire arc sprayers, and dry powder coating application process.

### Quality Inspections (15 Hours)

(Module ID 07409) Introduces formal quality control tasks and procedures used to govern the quality and acceptance of work performed by those in the industrial painting industry. Also describes the methods, equipment, and test instruments used to perform tasks in accordance with the requirements of ASTM and SSPC/NACE standards governing quality control and quality assurance.

### Coatings Failures and Analysis (7.5 Hours)

(Module ID 07410) Explains how to recognize failures of paints/coatings on exterior and interior substrates, causes of these failures, and their remedies. Focuses on the nature of the substrates, application procedures, and surface preparation.

### Specialty Materials (7.5 Hours)

(Module ID 07411) Describes the characteristics and types of sealants and fillers commonly used in industrial application. Covers sealers and putties used in conjunction with tank and vessel reinforced lining systems, as well as fire resistant and fire retardant sealing materials. Gives guidelines for selecting the materials covered, along with the tools and methods used for applying them on steel, concrete, and other construction substrates.



## L1 PIPEFITTING

LEVEL 1



### Curriculum Notes

- 155 Hours (includes Core)
- Core Introduction to Basic Rigging module is required for the Level 3 credential.
- Updated in 2019.
- Downloadable instructor resources are available.
- A Spanish translation is available. Please see NCCER's online catalog for more information.

### PAPERBACK

Trainee Guide: \$74.99

ISBN

978-0-13-580941-9

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Pipefitting Craft (5 Hours)

ISBN 978-0-13-581005-7

(Module ID 08101) Provides an overview of work performed by the pipefitter, as well as the responsibilities, career opportunities, safety principles associated with the pipefitting trade, and the types of pipes and tools pipefitters will encounter.

### Pipefitting Hand Tools (20 Hours)

ISBN 978-0-13-580989-1

(Module ID 08102) Covers hand tool safety as well as procedures for selecting, inspecting, using, and maintaining hand tools used by pipefitters. Introduces the most common hand tools used in pipefitting, including pipe wrenches, pipe stands, pipe vises, levels, pipe fabrication tools, pipe bending tools, and pipe joining tools.

### Pipefitting Power Tools (15 Hours)

ISBN 978-0-13-581003-3

(Module ID 08103) Covers the safe operation of power tools used to cut, grind, thread, and shape all types of materials, and includes procedures for selecting, inspecting, using, and maintaining power tools used by pipefitters. Provides guidelines for using electrical and pneumatic tools, including pipe threading machines.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-581001-9

(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

### Ladders and Scaffolds (12.5 Hours)

ISBN 978-0-13-580990-7

(Module ID 08105) Describes hazards and safety procedures governing the use of stepladders, extension ladders, fixed scaffolds, and rolling scaffolds. Includes general procedures for scaffold assembly and use.

### Motorized Equipment One (10 Hours)

ISBN 978-0-13-580999-0

(Module ID 08106) Explains the safety factors, operator maintenance, and operating procedures associated with motorized equipment used on job sites. Covers electrical generators, air compressors, aerial lifts, forklifts, trenchers, backhoes, mobile cranes, and portable equipment including welding machines, pumps, and compactors.

## L2 PIPEFITTING

LEVEL 2

### Curriculum Notes

- 162.5 Hours
- Updated in 2019.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-581811-4

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Piping Systems (5 Hours)

ISBN 978-0-13-581129-0

(Module ID 08201) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes, the effects of thermal expansion, and the purpose of pipe insulation.

### Drawings and Detail Sheets (15 Hours)

ISBN 978-0-13-581123-8

(Module ID 08202) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, spool drawings, detail sheets, and orthographic drawings. Explains how to read and interpret various types of drawings as well as the symbology used to convey information.

### Identifying and Installing Valves (20 Hours)

ISBN 978-0-13-581131-3

(Module ID 08203) Identifies different types of valves, including those that start and stop flow, regulate flow, regulate flow direction, and relieve pressure, and describes their installation as well as proper storage and handling procedures. Covers common valve operators and actuators.

### Pipefitting Trade Math (15 Hours)

ISBN 978-0-13-581128-3

(Module ID 08204) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

### Threaded Pipe Fabrication (15 Hours)

ISBN 978-0-13-581127-6

(Module ID 08205) Describes the materials used in threaded piping systems. Explains how to determine pipe lengths between threaded pipe fittings, prepare the pipe and fittings for fit-up, and assemble the piping system. Includes how to calculate simple and rolling offsets.

### Socket-Weld Pipe Fabrication (25 Hours)

ISBN 978-0-13-581125-2

(Module ID 08206) Describes the fittings and materials involved in socket-welds, interpreting drawings, determining pipe lengths between fittings, aligning pipe and fittings, and cutting out a socket weld to save the structure.

### Butt-Weld Pipe Fabrication (37.5 Hours)

ISBN 978-0-13-581138-2

(Module ID 08207) Describes materials, fittings, drawings, calculating takeouts, determining pipe lengths between fittings, beveling pipe, aligning components for welding, performing alignments, and cutting a butt weld to save the structure.

### Excavations (10 Hours)

ISBN 978-0-13-581134-4

(Module ID 08208) Explains soil and trenching hazards involved in excavations, as well as the use of shoring and shielding systems per OSHA standards, sloping requirements by soil type, and combined systems for trench reinforcement. Covers how to determine grade and elevation, how to use a laser level, and how to backfill.

### Underground Pipe Installation (20 Hours)

ISBN 978-0-13-581127-0

(Module ID 08209) Explains pipe installation procedures and guidelines, including the procedures for cast iron, ductile iron, concrete, carbon steel, fiberglass, and thermoplastic pipe. Includes an introduction to horizontal directional drilling for pipe installation, and the use of a weak link for plastic pipe.

Continued on following page



L3 PIPEFITTING	
LEVEL 3	
Curriculum Notes	
<ul style="list-style-type: none"> <li>152.5 Hours</li> <li>Revised: 2021, Fourth Edition</li> <li>Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-748728-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Basic Rigging (7.5 Hours)

ISBN 978-0-13-412905-1

(Module ID 00106) A common activity at nearly every construction site is the movement of material and equipment from one place to another using various types of lifting gear. The procedures involved in performing this task are known as rigging. Not every worker will participate in rigging operations, but nearly all will be exposed to it at one time or another. This module provides an overview of the various types of rigging equipment, common hitches used during a rigging operation, and the related Emergency Stop hand signal.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Describes the use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches. Covers jacks and jolting equipment.

### Standards and Specifications (10 Hours)

ISBN 978-0-13-748737-0

(Module ID 08303) Discusses the meaning and importance of operating within the standards outlined and specifications. Explains commonly used codes, welding procedure specifications, and the identification of pipe and components.

### Advanced Trade Math (25 Hours)

ISBN 978-0-13-748729-5

(Module ID 08304) Covers the role of trigonometry in pipefitting, including the use of trigonometric functions, triangle calculations, determining angles, interpolation, and calculating takeouts and odd angles.

### Motorized Equipment Two (10 Hours)

ISBN 978-0-13-748741-7

(Module ID 08305) Discusses the safe and proper use of scissors lifts, telescoping boom lifts, cable lifts, drain cleaners, and hydraulic torque tools.

### Introduction to Aboveground Pipe Installation

(25 Hours)

ISBN 978-0-13-748745-5

(Module ID 08306) Identifies various types of pipe, flanges, gaskets, and bolts. Covers the fabrication of gaskets, assembling and installing flanged and grooved pipe, fabricating and installing pipe spools, and installing pipe sleeves and floor penetrations.

### Field Routing and Vessel Trim (15 Hours)

ISBN 978-0-13-748742-4

(Module ID 08307) Explains how to secure the work area and determine field run specifications, load weights for erection equipment, and support needs. Provides details on evaluating the run, assembling the field run, installing test blinds, working with instruments, and how to erect vessel trim.

### Pipe Hangers and Supports (25 Hours)

ISBN 978-0-13-748736-3

(Module ID 08308) Explains the roles of pipe hangers and supports, with details on clevises, saddles, U-bolts, clamps, turnbuckles, rods, welded beam attachments, spring can supports, travel stops, and snubbers.

### Testing Piping Systems and Equipment (20 Hours)

ISBN 978-0-13-748734-9

(Module ID 08309) Discusses the importance of safety and following procedures with testing and inspections. Topics include pretest requirements, visual weld inspections, service flow tests, hard pressure tests, hydrostatic tests, and steam blow tests.

L4 PIPEFITTING	
LEVEL 4	
Curriculum Notes	
<ul style="list-style-type: none"> <li>175 Hours (required); 197.5 Hours (with Fundamentals of Crew Leadership elective)</li> <li>Revised: 2021, Fourth Edition</li> <li>Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-748749-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Advanced Blueprint Reading (50 Hours)

ISBN 978-0-13-748750-9

(Module ID 08401) Introduces drawings used by pipefitters in the shop and in the field. Explains how to read and interpret P&IDs, general arrangement drawings, isometric drawings, and spool sheets. Discusses symbols, coordinates, control points, elevations, and step-by-step instructions for following a line of pipe through a set of drawings.

### Advanced Pipe Fabrication (50 Hours)

ISBN 978-0-13-748751-6

(Module ID 08402) Explains the use of ordinate tables and trigonometry in creating fittings and pipe assemblies for process applications. Details are provided on calculating piping offsets, fabricating miter turns, laying out and fabricating saddles and supports made out of pipe, and laying out laterals, wyes, ninety-degree intersections, and supports without using references.

### Stress Relieving and Aligning (10 Hours)

ISBN 978-0-13-748759-2

(Module ID 08403) Discusses the purpose of stress relieving and covers thermal expansion in piping, temperature and metal structure, and stress relief for aligning pipe to rotating equipment.

### In-Line Specialties (20 Hours)

ISBN 978-0-13-748760-8

(Module ID 08405) Presents methods of safely working with specialty devices used in pipelines, including: snubbers, ball joints, bleed rings, drip legs, steam traps, expansion joints, filters, strainers, flowmeters, level measurement devices, flow pressure switches, rupture discs, thermowells, and desuperheaters.

### Special Piping (25 Hours)

ISBN 978-0-13-748758-5

(Module ID 08406) Discusses methods of assembling copper tubing with flared and compression joints. Introduces brazing and soldering and explains the differences between these two procedures. Also describes bending pipe, working with glass-lined piping, handling hydraulic compression joints, and managing grooved piping systems.

### Hot Taps (10 Hours)

ISBN 978-0-13-748755-4

(Module ID 08407) Provides details on environmental and other concerns associated with hot tapping. Discusses the installation of fittings, the operation of hot tap machines, working with line stop plugs, and identifying and mitigating known and potential hazards.

### Maintaining Valves (10 Hours)

ISBN 978-0-13-748754-7

(Module ID 08408) Explains how to replace packing and O-rings, and how to open and close a valve's bonnet. Discusses how to safely troubleshoot and maintain several types of valves.

### Fundamentals of Crew Leadership (22.5 Hours)

ISBN 978-0-13-487188-2

(Module ID 46101) The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

**L1**
**PIPELAYER**

**LEVEL 1**

**Curriculum Notes**

- 187.5 Hours (includes Core)
- Published: 1999
- Downloadable instructor resources are available.

**PAPERBACK**
**ISBN**

Trainee Guide: \$74.99
 978-0-13-014258-0

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Job Site Safety (17.5 Hours)

**ISBN 978-0-13-015304-3**

(Module ID 24101) Describes appropriate personal protective equipment commonly used on the job site and the impact of housekeeping on safety and project completion. Describes common indicators of existing utilities and recommends safe methods for locating and working around existing utilities.

### Tools and Equipment (22.5 Hours)

**ISBN 978-0-13-015305-0**

(Module ID 24102) Describes the safe use, care, and maintenance of pipelayer hand and power tools. Discusses methods for operating and maintaining dewatering equipment, generators, and compressors. Contains an introduction to drilling and tapping machines.

### Rigging and Delivering Pipe and Associated Structures (7.5 Hours)

**ISBN 978-0-13-015307-4**

(Module ID 24103) Describes methods for receipt inspection, storage, and delivery to the trench of PVC, ductile iron, corrugated steel, and concrete pipe. Identifies the hand signals used by pipelayers when rigging pipe, and piping components, including manholes and appurtenances.

### Cutting Pipe (12.5 Hours)

**ISBN 978-0-13-015308-1**

(Module ID 24104) Discusses practical methods for safely cutting common pipe materials. Describes pipe materials and standard sizes for thermoplastic, concrete, ductile iron, and corrugated steel pipe.

### Gaskets, Joints, and Fittings (20 Hours)

**ISBN 978-0-13-015309-8**

(Module ID 24105) Describes methods for joining PVC, ductile iron, and concrete pipe, including O-ring pipe, slip joints, mechanical joints, and restraint joints. Discusses methods for joining pipe to pipe, pipe to appurtenances, and pipe to manhole connections, including transition couplings.

### Introduction to Elevations (5 Hours)

**ISBN 978-0-13-015300-5**

(Module ID 24106) Discusses the use, care, and maintenance of the optical level, transit, and the pipe laser. Contains a brief introduction to elevations as it relates to the setup of these instruments. Describes common causes and solutions to laser problems in the field.

### Trench Safety (7.5 Hours)

**ISBN 978-0-13-015311-1**

(Module ID 24107) Discusses soil behavior as it relates to trench failures, including common indications of an unstable trench. Introduces typical shoring, shielding, and sloping methods. Identifies characteristics that may make a trench a confined space and describes the safety measures needed to work in the trench.

### Foundation Stabilization, Bedding, and

### Dewatering (7.5 Hours)

**ISBN 978-0-13-015312-8**

(Module ID 24108) Discusses methods for preparing the trench for pipe installation, including stabilization, bedding, and initial backfill. Describes effective methods for dewatering a trench and includes a section on troubleshooting dewatering equipment.

### Testing Pipe (12.5 Hours)

**ISBN 978-0-13-015313-5**

(Module ID 24109) Discusses methods for preparing pressure and gravity systems for testing, including cleaning and inspecting pipe systems. Describes methods for testing pressure and gravity systems, including vacuum testing of concrete manholes.

## L1 PLUMBING

LEVEL 1



### Curriculum Notes

- 222.5 Hours (includes Core)
- Revised: 2022, Fifth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

ISBN 978-0-13-793383-9

#### DIGITAL

NCCERconnect Access Card: \$74.99

ISBN 978-0-13-793380-8

Trainee Guide + NCCERconnect

with Pearson e-text \$104.99

ISBN 978-0-13-793367-9

Core + Plumbing L1: \$137.98

ISBN 978-0-13-821255-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to the Plumbing Profession (5 Hours)

ISBN 978-0-13-793392-1

(Module ID 02101) In this module, trainees are introduced to the opportunities awaiting well-trained plumbers. Provides a brief history of plumbing and a review of the trade's current technologies, industries, and associations that make up the modern plumbing profession. Also reviews human relations and safety skills needed to be a successful plumber.

#### Plumbing Safety (22.5 Hours)

ISBN 978-0-13-793393-8

(Module ID 02102) Introduces plumbing hazards that can lead to serious accidents or injuries. Reviews direct and indirect costs of delays, increased expenses, and loss of life. Provides instruction regarding the proper use of personal protective equipment (PPE) and lists techniques designed to reduce safety risks and workplace injuries. Covers confined-space safety topics, and reviews describes safety hazards related to hand and power tools.

#### Tools of the Plumbing Trade (10 Hours)

ISBN 978-0-13-793396-9

(Module ID 02103) This module describes hand and power tools used by plumbers to measure, lay out, level, cut, drill, and join different pipe. Along with teaching trainees how to select the appropriate tools for the task, this module teaches them how to avoid some of the most dangerous hazards associated with power tools. Trainees are also instructed in the proper care of different types of hand and power tools.

#### Introduction to Plumbing Math (12.5 Hours)

ISBN 978-0-13-793404-1

(Module ID 02104) Reviews basic math concepts, such as whole numbers, fractions, decimals, and squares, and demonstrates how they apply to on-the-job situations. Teaches trainees how to recognize the type of math necessary for each job, and illustrates methods for measuring pipe length using a variety of tables and illustrations.

#### Introduction to Plumbing Drawings (17.5 Hours)

ISBN 978-0-13-793405-8

(Module ID 02105) Introduces trainees to the types of plumbing drawings they will encounter, and teaches them how to interpret and apply the information when laying out and installing plumbing systems. Reviews symbols used in plumbing and mechanical drawings and provides examples of isometric, oblique, orthographic, and schematic drawings. Requires trainees to interpret plumbing drawings and to understand the relationship between code requirements and plumbing drawings.

#### Plastic Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-793410-2

(Module ID 02106) Introduces trainees to the different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Describes how to measure, cut, join, and support plastic pipe according to manufacturer's instructions and applicable codes. Also discusses pressure testing of plastic pipe after it is installed.

#### Copper Tube and Fittings (12.5 Hours)

ISBN 978-0-13-793416-4

(Module ID 02107) Explains sizing, labeling, and applications related to copper tube and fittings. Reviews valves used with copper tube systems, and describes methods for cutting, joining, and installing copper tube. Insulation, pressure testing, seismic codes, and handling and storage requirements are also addressed.

#### Cast Iron Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-793427-0

(Module ID 02108) Describes how hub-and-spigot and no-hub cast iron pipe and fittings are used in DWV systems. Reviews related sizing and labeling standards, types of fittings, and techniques for measuring and cutting cast iron pipe. Also provides instructions for joining, hanging, and testing pipe installations.

#### Steel Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-793433-1

(Module ID 02109) Presents concepts related to threading, labeling, and sizing of steel pipe and fittings. Different types of elbows, couplings, and valves are described. Provides instructions for measuring, cutting, threading, joining, and hanging steel pipe, and reviews corrugated stainless steel tubing.

#### Introduction to Plumbing Fixtures (7.5 Hours)

ISBN 978-0-13-793434-8

(Module ID 02110) Introduces trainees to the primary types of plumbing fixtures, the materials from which they are made, and how they function in typical applications. Also reviews the functionality of specific bathroom and kitchen fixtures, including compression and non-compression faucets, shower and bath fixtures, and exterior utility faucets.

#### Introduction to Drain, Waste, and Vent (DWV) Systems (10 Hours)

ISBN 978-0-13-793438-6

(Module ID 02111) Explains how DWV systems remove liquid and solid waste safely and effectively. Identifies DWV components, including pipe, drains, traps, and vents. Also describes how plumbers connect these components to municipal and private sewer systems.

#### Introduction to Water Distribution Systems (10 Hours)

ISBN 978-0-13-793444-7

(Module ID 02112) Identifies the major features and functions of components used in water distribution systems, including pipe and fittings, valves, and water heating and treatment equipment. Reviews private and public water sources, and describes how plumbers connect service lines to both types of systems.

## L2 PLUMBING

LEVEL 2

### Curriculum Notes

- 175 Hours
- Revised: 2023, Fifth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN 978-0-13-818119-2

#### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN 978-0-13-818113-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Plumbing Math Two (15 Hours)

ISBN 978-0-13-819444-4

(Module ID 02201) Explains the Pythagorean theorem and reviews methods for laying out square corners. Discusses the techniques used to calculate simple and rolling offsets, as well as offsets on parallel runs of pipe.

#### Reading Commercial Drawings (25 Hours)

ISBN 978-0-13-819446-8

(Module ID 02202) Explains how to identify and interpret civil, architectural, structural, HVAC/mechanical, plumbing, and electrical drawings. Discusses how to ensure accurate dimensions, generate RFIs, and locate plumbing entry points, as well as how to establish piping routes and fixture locations. Isometric drawings, material takeoffs, approved submittal data, and Building Information Management (BIM), are also covered.

#### Structural Penetrations, Insulation, and Fire-Stopping (15 Hours)

ISBN 978-0-13-819451-2

(Module ID 02203) Introduces methods for adjusting structural members, insulating pipe, and installing fire-stopping. Covers reinforcement techniques for modified structural members; how to measure, cut, and install fiberglass and flexible foam insulation; and how to identify walls, floors, and ceilings that require fire-stopping.

#### Installing and Testing DWV Piping (30 Hours)

ISBN 978-0-13-819456-7

(Module ID 02204-13) Explains how to locate, install, connect, and test a complete drain, waste, and vent (DWV) system. Discusses how to develop material takeoffs, set up and use levels, locate building sewers and building drains, locate fixtures, and test a DWV system.

Continued on following page

### Installing Roof, Floor, and Area Drains (5 Hours)

ISBN 978-0-13-819459-8

(Module ID 02205) Covers the proper techniques for locating, installing, and connecting roof, floor, and area drains and floor sinks according to code. Discusses waterproof membranes and flashing, drain components, shower pans, trap primers, and proper drain applications.

### Installing and Testing Water Supply Piping

(20 Hours)

ISBN 978-0-13-819463-5

(Module ID 02206) Explores the proper techniques for locating, installing, and testing complete water service and distribution systems, including meters, water heaters, water softeners, and hose bibbs. Introduces basic backflow and water hammer prevention, and discusses the installation of shower and tub valves, ice maker and washing machine boxes, and pipe stubouts and supports.

### Types of Valves (5 Hours)

ISBN 978-0-13-819464-2

(Module ID 02207) Reviews types of valves, their components, and applications. Also covers valve servicing.

### Installing Fixtures and Valves (20 Hours)

ISBN 978-0-13-819468-0

(Module ID 02208) Covers the installation of basic plumbing fixtures, including bathtubs, shower stalls, lavatories, sinks, water closets, and urinals. Reviews the installation of associated valves, faucets, and components. Explains how to connect appliances such as dishwashers, food-waste disposers, refrigerators and ice makers, and washing machines.

### Installing Water Heaters (10 Hours)

ISBN 978-0-13-819473-4

(Module ID 02209) Discusses gas-fired, electric, tankless, heat pump, solar thermal, and indirect water heaters, components, and applications. Reviews proper installation and testing techniques and covers the latest code requirements for water heaters.

### Basic Electricity (10 Hours)

ISBN 978-0-13-819475-8

(Module ID 02210) Introduces electrical safety and the principles of electricity needed by plumbers including voltage, current, resistance, and power. Includes important electrical formulas, circuitry, and common plumbing-related electrical applications.

### Fuel Gas and Fuel Oil Systems (20 Hours)

ISBN 978-0-13-819477-2

(Module ID 02211) Introduces techniques for safe handling of natural gas, liquefied petroleum gas, and fuel oil. Reviews fuel gas and fuel oil safety precautions and potential hazards, applications, systems installation, and testing.

## L3 PLUMBING

### LEVEL 3

#### Curriculum Notes

- 157.5 Hours
- Revised: 2024, Fifth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN 978-0-13-821526-2

#### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN 978-0-13-821530-9

NCCERconnect +

Trainee Guide: \$129.99

ISBN 978-0-13-821525-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Applied Math (15 Hours)

ISBN 978-0-13-833973-9

(Module ID 02301) Reviews math concepts, including weights and measures, area and volume, temperature, pressure, and force. Describes the six simple machines: inclined planes, levers, pulleys, wedges, screws, and wheels and axles.

### Service Plumbing (27.5 Hours)

ISBN 978-0-13-832259-5

(Module ID 02311) Covers the troubleshooting and repair of fixtures, valves, and faucets in accordance with code and safety guidelines. Explains how to diagnose and repair water supply and drainage piping, water heaters, and other appliances and fixtures. Describes the effects of corrosion, freezing, and hard water on plumbing systems.

### Sizing and Protecting the Water Supply System

(30 Hours)

ISBN 978-0-13-832261-8

(Module ID 02312) Teaches techniques for sizing water supply systems, including calculating system requirements and demand, developed lengths, and pressure drops. Reviews the factors that can reduce efficiency of water supply piping. Introduces different backflow prevention devices and explains how they work, where they are used, and how they are installed in water supply systems.

### Potable Water Supply Treatment (15 Hours)

ISBN 978-0-13-832263-2

(Module ID 02303) Explains how to disinfect, filter, and soften water supply systems. Discusses how to troubleshoot water supply problems, flush out visible contaminants from a plumbing system, and disinfect a potable water plumbing system.

### Types of Venting (20 Hours)

ISBN 978-0-13-832267-0

(Module ID 02305) Reviews the different types of vents that can be installed in a DWV system and explains how they work. Teaches design and installation techniques.

### Sizing DWV and Storm Systems (20 Hours)

ISBN 978-0-13-832272-4

(Module ID 02306) Explains how to calculate drainage fixture units for waste systems. Reviews how to size drain, waste, and vent (DWV) systems; storm drainage systems; and roof storage and drainage systems.

### Sewage Pumps and Sump Pumps (12.5 Hours)

ISBN 978-0-13-832273-1

(Module ID 02307) Discusses the installation, diagnosis, and repair of pumps, controls, and sumps in sewage and storm water removal systems.

### Corrosive-Resistant Waste Piping (7.5 Hours)

ISBN 978-0-13-832250-2

(Module ID 02308) Discusses corrosive wastes and reviews related safety issues and hazard communications. Explains how to determine when corrosive-resistant waste piping needs to be installed, as well as how to correctly select and properly connect different types of piping.

### Compressed Air (10 Hours)

ISBN 978-0-13-832253-3

(Module ID 02309) Explains the principles of compressed air systems and describes their components and accessories. Reviews installation and periodic servicing of air compressor systems.

Continued on following page

## Plumbing Level 4 (continued)

L4 PLUMBING	
LEVEL 4	
Curriculum Notes	
<ul style="list-style-type: none"> <li>147.5 Hours</li> <li>Revised: 2024, Sixth Edition</li> <li>Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-821472-2
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-0-13-422667-5
NCCERconnect + Trainee Guide: \$129.99	978-0-13-427913-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Business Principles for Plumbers (15 Hours)

ISBN 82078398

(Module ID 02401) Covers basic business accounting and effective techniques for bidding jobs, controlling costs, and organizing projects. Explains task-planning skills enable plumbers to complete work on time and within budget, as well as what is involved in keeping control of orders, purchases, and deliveries.

#### Introduction to Leadership (22.5 Hours)

ISBN 82072356

(Module ID 46100) Covers troubleshooting and repair of fixtures, valves, and faucets in accordance with code and safety guidelines. Explains how to diagnose and repair water supply and drainage piping, water heaters, and other appliances and fixtures.

#### Water Pressure Booster and Recirculation Systems

(12.5 Hours)

ISBN 82078398

(Module ID 02403) Describes techniques for sizing water supply systems, including calculating system requirements and demand, developed lengths, and pressure drops. Explains factors that can reduce efficiency of water supply piping, and introduces different backflow prevention devices.

#### Indirect and Special Waste (17.5 Hours)

ISBN 82078398

(Module ID 02404) Describes how to disinfect, filter, and soften water supply systems. Explains how to troubleshoot water supply problems, flush out visible contaminants from a plumbing system, and disinfect a potable water plumbing system.

#### Hydronic and Solar Heating Systems (17.5 Hours)

ISBN 82078398

(Module ID 02405) Covers the different types of vents that can be installed in a DWV system and explains how they work. Describes a variety of design and installation techniques.

#### Codes (12.5 Hours)

ISBN 82078398

(Module ID 02406) Explains how to calculate drainage fixture units for waste systems. Describes how to size drain, waste, and vent (DWV) systems; storm drainage systems; and roof storage and drainage systems.

#### Private Water Supply Well Systems (10 Hours)

ISBN 82078398

(Module ID 02408) Describes the installation, diagnosis, and repair of pumps, controls, and sumps in sewage and storm water removal systems.

#### Private Waste-Disposal Systems (10 Hours)

ISBN 82078398

(Module ID 02409) Describes corrosive wastes and reviews related safety issues and hazard communications. Explains how to determine when corrosive-resistant waste piping needs to be installed, as well as how to correctly select and properly connect different types of piping.

#### Swimming Pools and Hot Tubs (7.5 Hours)

ISBN 82078398

(Module ID 02410) Explains the principles of compressed air systems and describes their components and accessories. Also covers installation and periodic servicing of air compressor systems.

#### Plumbing for Mobile Homes and Travel Trailer

Parks (7.5 Hours)

ISBN 82078398

(Module ID 02411) Describes water supply and DWV systems used in parks that serve mobile homes and travel trailers.

#### Introduction to Medical Gas and Vacuum Systems

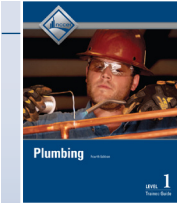
(15 Hours)

ISBN 82078398

(Module ID 02412) Describes system requirements and professional qualifications stipulated by building codes. Explains common types of medical gas and vacuum systems, and introduces the safety requirements for installing, testing, and servicing these systems. Also described are special requirements for storing and preparing system components, labeling and identification requirements, and techniques for joining copper tubing and fittings.

Continued on following page



**L1 PLUMBING (FOURTH EDITION)****LEVEL 1****Curriculum Notes**

- 220 Hours (includes Core)
- Revised: 2020, Fourth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$74.99

**978-0-13-663791-2****DIGITAL****ISBN**

NCCERconnect Access Card: \$74.99

**978-0-13-663805-6**

NCCERconnect + Trainee Guide: \$104.99

**978-0-13-731070-8****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Introduction to the Plumbing Profession (5 Hours)****ISBN 978-0-13-663866-7**

(Module ID 02101) Introduces trainees to the many career options available in today's plumbing profession. Provides a history of plumbing and also discusses the current technology, industries, and associations that make up the modern plumbing profession. Also reviews human relations and safety skills.

**Plumbing Safety (22.5 Hours)****ISBN 978-0-13-663871-1**

(Module ID 02102) Discusses the causes of accidents and their consequences and repercussions in terms of delays, increased expenses, injury, and loss of life. Reviews the types and proper use of personal protective equipment (PPE). Instructs trainees in the use of critical safety information conveyed in hazard communication (HazCom), safety signs, signals, lockout/tagout, and emergency response. Covers confined-space safety, and reviews safety issues related to hand and power tools.

**Tools of the Plumbing Trade (10 Hours)****ISBN 978-0-13-663841-4**

(Module ID 02103) Instructs trainees in the care and use of the different types of hand and power tools they will use on the job. Gives trainees the information they need to select the appropriate tools for different tasks, and reviews tool maintenance and safety issues.

**Introduction to Plumbing Math (12.5 Hours)****ISBN 978-0-13-663853-7**

(Module ID 02104) Reviews basic math concepts, such as whole numbers, fractions, decimals, and squares, and demonstrates how they apply to on-the-job situations. Teaches trainees how to measure pipe using fitting tables and framing squares and how to calculate 45-degree offsets.

**Introduction to Plumbing Drawings (17.5 Hours)****ISBN 978-0-13-663869-8**

(Module ID 02105) Introduces trainees to the different types of plumbing drawings they will encounter on the job and discusses how to interpret and apply them when laying out and installing plumbing systems. Discusses the symbols used in plumbing and mechanical drawings and reviews isometric, oblique, orthographic, as well as schematic drawings. Requires trainees to render plumbing drawings and to recognize how code requirements apply to plumbing drawings.

**Plastic Pipe and Fittings (12.5 Hours)****ISBN 978-0-13-663854-4**

(Module ID 02106) Introduces trainees to the different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Describes how to measure, cut, join, and support plastic pipe according to manufacturer's instructions and applicable codes. Also discusses pressure testing of plastic pipe once installed.

**Copper Tube and Fittings (12.5 Hours)****ISBN 978-0-13-663864-3**

(Module ID 02107) Discusses sizing, labeling, and applications of copper tube and fittings and reviews the types of valves that can be used on copper tube systems. Explains proper methods for cutting, joining, and installing copper tube. Also addresses insulation, pressure testing, seismic codes, and handling and storage requirements.

**Cast-Iron Pipe and Fittings (12.5 Hours)****ISBN 978-0-13-663862-9**

(Module ID 02108) Introduces trainees to hub-and-spigot and no-hubcast-iron pipe and fittings and their applications in DWV systems. Reviews material properties, storage and handling requirements, and fittings and valves. Covers joining methods, installation, and testing.

**Steel Pipe and Fittings (12.5 Hours)****ISBN 978-0-13-663844-5**

(Module ID 02109) Discusses threading, labeling, and sizing of steel pipe and reviews the differences between domestic and imported pipe. Covers the proper techniques for measuring, cutting, threading, joining, and hanging steel pipe. Also reviews corrugated stainless steel tubing.

**Introduction to Plumbing Fixtures (7.5 Hours)****ISBN 978-0-13-663843-8**

(Module ID 02110) Discusses the proper applications of code-approved fixtures in plumbing installations. Reviews the different types of fixtures and the materials used in them. Also covers storage, handling, and code requirements.

**Introduction to Drain, Waste, and Vent (DWV) Systems (10 Hours)****ISBN 978-0-13-663856-8**

(Module ID 02111) Explains how DWV systems remove waste safely and effectively. Discusses how system components, such as pipe, drains, traps, and vents work. Reviews drain and vent sizing, grade, and waste treatment. Also discusses how building sewers and sewer drains connect the DWV system to the public sewer system.

**Introduction to Water Distribution Systems (10 Hours)****ISBN 978-0-13-663861-2**

(Module ID 02112) Identifies the major components of water distribution systems and describes their functions. Reviews water sources and treatment methods and covers supply and distribution for the different types of systems that trainees will install on the job.

**L2 PLUMBING****LEVEL 2****Curriculum Notes**

- 175 Hours
- Revised: 2013, Fourth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-314850-3****DIGITAL****ISBN**

NCCERconnect Access Card: \$102.99

**978-0-13-422666-8**

NCCERconnect +

Trainee Guide: \$129.99

**978-0-13-427458-4****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Plumbing Math Two (15 Hours)****ISBN 978-0-13-340275-9**

(Module ID 02201-13) Explains the Pythagorean theorem and reviews methods for laying out square corners. Discusses the techniques used to calculate simple and rolling offsets, as well as offsets on parallel runs of pipe.

**Reading Commercial Drawings (25 Hours)****ISBN 978-0-13-340276-6**

(Module ID 02202-13) Explains how to identify and interpret civil, architectural, structural, HVAC/mechanical, plumbing, and electrical drawings. Discusses how to ensure accurate dimensions, generate RFIs, and locate plumbing entry points, as well as how to establish piping routes and fixture locations. Isometric drawings, material takeoffs, approved submittal data, and Building Information Management (BIM), are also covered.

**Structural Penetrations, Insulation, and Fire-Stopping (15 Hours)****ISBN 978-0-13-340277-3**

(Module ID 02203-13) Introduces methods for adjusting structural members, insulating pipe, and installing fire-stopping. Covers reinforcement techniques for modified structural members; how to measure, cut, and install fiberglass and flexible foam insulation; and how to identify walls, floors, and ceilings that require fire-stopping.

**Installing and Testing DWV Piping (30 Hours)****ISBN 978-0-13-340278-0**

(Module ID 02204-13) Explains how to locate, install, connect, and test a complete drain, waste, and vent (DWV) system. Discusses how to develop material takeoffs, set up and use levels, locate building sewers and building drains, locate fixtures, and test a DWV system.

Continued on following page



## Plumbing Level 2 (continued)

### Installing Roof, Floor, and Area Drains (5 Hours)

ISBN 978-0-13-340279-7

(Module ID 02205-13) Covers the proper techniques for locating, installing, and connecting roof, floor, and area drains and floor sinks according to code. Discusses waterproof membranes and flashing, drain components, shower pans, trap primers, and proper drain applications.

### Installing and Testing Water Supply Piping

(20 Hours)

ISBN 978-0-13-340280-3

(Module ID 02206-13) Explores the proper techniques for locating, installing, and testing complete water service and distribution systems, including meters, water heaters, water softeners, and hose bibbs. Introduces basic backflow and water hammer prevention, and discusses the installation of shower and tub valves, ice maker and washing machine boxes, and pipe stubouts and supports.

### Types of Valves (5 Hours)

ISBN 978-0-13-340281-0

(Module ID 02207-13) Reviews types of valves, their components, and applications. Also covers valve servicing.

### Installing Fixtures and Valves (20 Hours)

ISBN 978-0-13-340283-4

(Module ID 02208-13) Covers the installation of basic plumbing fixtures, including bathtubs, shower stalls, lavatories, sinks, water closets, and urinals. Reviews the installation of associated valves, faucets, and components. Explains how to connect appliances such as dishwashers, food-waste disposers, refrigerators and ice makers, and washing machines.

### Installing Water Heaters (10 Hours)

ISBN 978-0-13-340284-1

(Module ID 02209-13) Discusses gas-fired, electric, tankless, heat pump, and indirect water heaters, components, and applications. Reviews proper installation and testing techniques and covers the latest code requirements for water heaters.

### Basic Electricity (10 Hours)

ISBN 978-0-13-340285-8

(Module ID 02210-13) Introduces electrical safety and the principles of electricity including voltage, current, resistance, and power. Includes important electrical formulas, circuitry, and common plumbing-related electrical applications.

### Fuel Gas and Fuel Oil Systems (20 Hours)

ISBN 978-0-13-340286-5

(Module ID 02211-13) Introduces techniques for safe handling of natural gas, liquefied petroleum gas, and fuel oil. Reviews fuel gas and fuel oil safety precautions and potential hazards, applications, systems installation, and testing.

## L3 PLUMBING

### LEVEL 3

#### Curriculum Notes

- 160 Hours
- Revised: 2014, Fourth Edition
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN 978-0-13-340424-1

#### DIGITAL

NCCERconnect Access Card: \$102.99

ISBN 978-0-13-422670-5

NCCERconnect +

Trainee Guide: \$129.99

ISBN 978-0-13-427914-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Applied Math (17.5 Hours)

ISBN 978-0-13-378271-4

(Module ID 02301-14) Reviews math concepts, including weights and measures, area and volume, temperature, pressure, and force. Describes the six simple machines: inclined planes, levers, pulleys, wedges, screws, and wheels and axles.

### Sizing and Protecting the Water Supply System (30 Hours)

ISBN 978-0-13-378272-1

(Module ID 02312-14) Teaches techniques for sizing water supply systems, including calculating system requirements and demand, developed lengths, and pressure drops. Reviews the factors that can reduce efficiency of water supply piping. Introduces different backflow prevention devices and explains how they work, where they are used, and how they are installed in water supply systems.

### Potable Water Supply Treatment (15 Hours)

ISBN 978-0-13-378273-8

(Module ID 02303-14) Explains how to disinfect, filter, and soften water supply systems. Discusses how to troubleshoot water supply problems, flush out visible contaminants from a plumbing system, and disinfect a potable water plumbing system.

### Types of Venting (20 Hours)

ISBN 978-0-13-378275-2

(Module ID 02305-14) Reviews the different types of vents that can be installed in a DWV system and explains how they work. Teaches design and installation techniques.

### Sizing DWV and Storm Systems (20 Hours)

ISBN 978-0-13-378433-6

(Module ID 02306-14) Explains how to calculate drainage fixture units for waste systems. Reviews how to size drain, waste, and vent (DWV) systems; storm drainage systems; and roof storage and drainage systems.

### Sewage Pumps and Sump Pumps (12.5 Hours)

ISBN 978-0-13-378276-9

(Module ID 02307-14) Discusses the installation, diagnosis, and repair of pumps, controls, and sumps in sewage and storm water removal systems.

### Corrosive-Resistant Waste Piping (7.5 Hours)

ISBN 978-0-13-378277-6

(Module ID 02308-14) Discusses corrosive wastes and reviews related safety issues and hazard communications. Explains how to determine when corrosive-resistant waste piping needs to be installed, as well as how to correctly select and properly connect different types of piping.

### Compressed Air (10 Hours)

ISBN 978-0-13-378278-3

(Module ID 02309-14) Explains the principles of compressed air systems and describes their components and accessories. Reviews installation and periodic servicing of air compressor systems.

### Service Plumbing (27.5 Hours)

ISBN 978-0-13-378279-0

(Module ID 02311-14) Covers the troubleshooting and repair of fixtures, valves, and faucets in accordance with code and safety guidelines. Explains how to diagnose and repair water supply and drainage piping, water heaters, and other appliances and fixtures. Describes the effects of corrosion, freezing, and hard water on plumbing systems.

Continued on following page

L4 PLUMBING	
LEVEL 4	
Curriculum Notes	
<ul style="list-style-type: none"> <li>• 145 Hours</li> <li>• Revised: 2014, Fourth Edition</li> <li>• Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-382422-3
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-0-13-422667-5
NCCERconnect + Trainee Guide: \$129.99	978-0-13-427913-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Business Principles for Plumbers (15 Hours)

ISBN 978-0-13-378599-9

(Module ID 02401-14) Introduces concepts and practices that are essential for competitive, successful plumbing businesses. Also covers basic business accounting and project estimating, as well as techniques for cost control and task organization.

### Fundamentals of Crew Leadership (20 Hours)

ISBN 978-0-13-378601-9

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

### Water Pressure Booster and Recirculation Systems

(12.5 Hours)

ISBN 978-0-13-378602-6

(Module ID 02403-14) Builds on trainees' previous experience with pumps, storage tanks, controls, and pipes and fittings by teaching how to assemble those components into systems that boost water pressure and provide hot water.

### Indirect and Special Waste (17.5 Hours)

ISBN 978-0-13-378603-3

(Module ID 02404-14) Describes the code requirements and installation procedures for systems that protect against contamination from indirect and special waste.

### Hydronic and Solar Heating Systems (17.5 Hours)

ISBN 978-0-13-378605-7

(Module ID 02405-14) Introduces the basic types of hydronic and solar heating systems and their components. Reviews hydronic and solar heating system layout, installation, testing, and balancing, and also discusses methods that inhibit corrosion in hydronic or solar heating systems.

### Codes (12.5 Hours)

ISBN 978-0-13-378606-4

(Module ID 02406-14) Discusses the different codes used by plumbers across the country and explains how those codes are written, adopted, modified, and implemented.

### Private Water Supply Well Systems (10 Hours)

ISBN 978-0-13-378611-8

(Module ID 02408-14) Describes the operation of pumps and well components. Reviews the qualities of good wells and how to assemble and disassemble pumps and components.

### Private Waste-Disposal Systems (10 Hours)

ISBN 978-0-13-378635-4

(Module ID 02409-14) Describes the types of private waste-disposal systems, discusses the maintenance and installation of these systems, and explains how to determine the local code requirements for these systems. Covers percolation tests and sewage system planning and layout.

### Swimming Pools and Hot Tubs (7.5 Hours)

ISBN 978-0-13-378637-8

(Module ID 02410-14) Introduces trainees to plumbing systems in swimming pools, hot tubs, and spas.

### Plumbing for Mobile Homes and Travel Trailer Parks (7.5 Hours)

ISBN 978-0-13-378641-5

(Module ID 02411-14) Describes the location and layout of plumbing systems for mobile home and travel trailer parks. Reviews how to design and lay out a system, how to connect water and sewer lines to a mobile home, and how to estimate materials for the park.

### Introduction to Medical Gas and Vacuum Systems

(15 Hours)

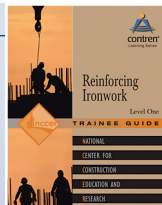
ISBN 978-0-13-409858-6

(Module ID 02412-14) Introduces the various types of medical gas and vacuum systems used in health care facilities. Covers the system requirements and professional qualifications required by code, describes common types of medical gas and vacuum systems, and introduces the safety requirements for installing, testing, and servicing these systems.

# Reinforcing Ironwork

## L1 REINFORCING IRONWORK

### LEVEL 1



#### Curriculum Notes

- 192.5 Hours (includes Core)
- Published: 2005
- Downloadable instructor resources are available.
- A Spanish translation is available. Please see NCCER's online catalog for more information.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-228220-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Concrete Reinforcement (40 Hours)

ISBN 978-0-13-228987-0

(Module ID 39101-05) Describes the selection and use of rebar, bar supports, and welded-wire fabric. Presents general procedures for cutting, bending, splicing, and tying rebar, and placement of steel in various types of footings, columns, walls, and slabs.

#### Concrete Reinforcement Safety (15 Hours)

ISBN 978-0-13-228988-7

(Module ID 39102-05) Focuses on safety topics of particular concern to the reinforcing ironworker, including rebar-related hazards, fall protection, use of positioning devices, PPE, excavations, and lifting/carrying techniques.

#### Rigging Equipment (10 Hours)

ISBN 978-0-13-228989-4

(Module ID 39103-05) Describes the use and inspection of basic equipment and hardware used in rigging, including slings, wire rope, chains, and attaching hardware such as shackles, eyebolts, and hooks, as well as rigging knots.

#### Rigging Practices (15 Hours)

ISBN 978-0-13-228991-7

(Module ID 39104-05) Describes basic rigging and crane hazards and related safety procedures. Provides an overview of personnel lifting and lift planning, and introduces crane load charts and load balancing. Includes instructions for rigging and lifting pipe.

#### Commercial Blueprints (20 Hours)

ISBN 978-0-13-228992-4

(Module ID 39105-05) Explains the format and content of drawings typically found in a commercial drawings package.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-229379-2

(Module ID 39106-05) Explains the safety requirements for oxyfuel cutting. Identifies equipment and setup requirements and explains how to light, adjust, and shut down oxyfuel equipment. Explains how to perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

## L2 REINFORCING IRONWORK

### LEVEL 2

#### Curriculum Notes

- 118.5 Hours
- Published: 2005
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-227294-0

### MODULES

Reinforcing Ironwork Level Two comprises modules from NCCER's Carpentry and Ironworking curricula. The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Foundations and Flatwork (15 Hours)

ISBN 978-0-13-015017-2

(Module ID 27204-01) Covers the construction of forms for continuous, stepped continuous, pier and grade beam concrete footings. Describes the edge forms used for on-grade concrete slabs and similar structures. Forming terms, parts of forms and procedures for constructing basic footing and edge forms are included.

#### Concrete Forms (32.5 Hours)

ISBN 978-0-13-015018-9

(Module ID 27205-01) Covers the applications and construction methods for various types of job-built forms, including wall, column, slab-and-beam, and stair forms. Instructor's Guide includes instruction sheets for construction of various forms.

#### Handling and Placing Concrete (22.5 Hours)

ISBN 978-0-13-015010-3

(Module ID 27207-01) Covers the tools, equipment and procedures required for handling, placing, and finishing concrete at the job site. Describes joints made in concrete structures, the use of joint sealants, and form removal procedures. Safety procedures for handling, placing, and finishing concrete are emphasized.

#### Manufactured Forms (22.5 Hours)

ISBN 978-0-13-015021-9

(Module ID 27208-01) Covers the types of manufactured forms and form hardware systems used in the construction of walls, columns, deck and roof slabs, beams and girders, culverts, and highways. Includes information on flying forms, slipforms, shoring, and architectural finishes.

#### Metal Decking (10 Hours)

ISBN 978-0-13-015428-6

(Module ID 30116) Identifies decking types and profiles and how decking is packaged, shipped, and stored. Describes erecting decking and placing concrete safely. Explains the effects of deck penetrations and damage.

#### Introductory Skills for the Crew Leader

(16 Hours)

Trainee

ISBN 978-0-13-103593-5

(Module ID MT101) Teaches leadership skills required to supervise personnel. Discusses principles of project planning, scheduling, estimating, and management. Presents several case studies for student participation.

## L1 ROOFING



### Curriculum Notes

- 178 Hours (includes Core)
- Revised: 2021, Second Edition, in conjunction with NRCA®
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-749099-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Roofing (2.5 Hours)

ISBN 978-0-13-749100-1

(Module ID 16101) Introduces the roofing craft and describes types of roofs and roof systems. Overviews basic concepts of safety, describes apprenticeship programs, and lists skills, responsibilities, and characteristics a worker should possess.

### Roofing Safety (7.5 Hours)

ISBN 978-0-13-749109-4

(Module ID 16102) Discusses the best safety practices for roofing and educates about potential dangers on the job. Reviews risk mitigation, hazard control, safety-related resources, fall protection, and ladder safety.

### Fall Protection Orientation (8 Hours)

ISBN 978-0-13-530500-3

(Module ID 75901) Covers fundamental safety and hazard recognition concepts. Introduces the role of OSHA in regulating elevated work on the jobsite and the causes, costs, and consequences of falls. Presents proper use of fall protection equipment; safe use of stairs, ladders, and scaffolds; and guidelines for use of aerial lifts.

### Drawings in Roofing (10 Hours)

ISBN 978-0-13-749111-7

(Module ID 16103) Describes types of construction documents and explains how to navigate a drawing set to find roofing information. Explains the role of the project manual and specifications. Introduces the concept of building information modeling (BIM).

### Introduction to Steep-Slope Roofing (12.5 Hours)

ISBN 978-0-13-749114-8

(Module ID 16105) Introduces steep-slope roof systems and discusses common types of decks and underlayments. Describes types and styles of steep-slope roof systems. Explains the purpose of various types of flashings.

### Introduction to Low-Slope Roofing (10 Hours)

ISBN 978-0-13-749118-6

(Module ID 16106) Introduces important concepts about low-slope roof systems and their design, components, and installation. Outlines common types of roof decks, insulation, and cover boards. Describes attachment methods and reviews types of flashings.

### Substrates, Decks, and Roof Insulation (12.5 Hours)

ISBN 978-0-13-749113-1

(Module ID 16104) Overviews common types of roof decks and insulation and related considerations. Explains basic principles of heat transfer, vapor movement, and deck movement and how roofs are designed to accommodate them. Describes general procedures for installing vapor retarders, insulation, cover boards, and tapered insulation.

### Sheet Metal in Roofing (25 Hours)

ISBN 978-0-13-749121-6

(Module ID 16107) Describes the properties of different types of metal that impact the way sheet metal is used in construction. Overviews the tools used to measure, layout, and install sheet-metal components in roof systems. Outlines commonly used sheet-metal roofing components and basic procedures used to prepare and install them.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Describes the use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches. Covers jacks and hoisting materials.

## L2 ROOFING

### LEVEL 2

### Curriculum Notes

- 145 Hours
- Revised: 2022, Second Edition, in conjunction with NRCA®
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-749131-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Asphalt Shingle Roof Systems (15 Hours)

ISBN 978-0-13-749133-9

(Module ID 16201) Discusses asphalt shingles as well as the tools and procedures used in the application of these systems. Describes appropriate attachment techniques and safety precautions involved in asphalt shingles installation and repair.

### Clay and Concrete Tile Roof Systems (12.5 Hours)

ISBN 978-0-13-749134-6

(Module ID 16202) Introduces tile roof systems as well as the components and tools unique to their installation. Describes tile roof application procedures, safety considerations, and flashing techniques. Discusses tile repair methods.

### Wood Roof Systems (12.5 Hours)

ISBN 978-0-13-749138-4

(Module ID 16203) Outlines the components, tools, and installation methods used for wood roof systems. Distinguishes between wood shingles and wood shakes. Identifies common mistakes in the installation of wood roof systems and introduces basic repair methods.

### Slate Roof Systems (12.5 Hours)

ISBN 978-0-13-749140-7

(Module ID 16204) Describes slate roof system components, styles, tools, and safety considerations. Details appropriate procedures for the installation and repair of these systems.

### Metal Roof Systems (15 Hours)

ISBN 978-0-13-749142-1

(Module ID 16205) Describes the various types of metal roofs, including architectural, structural, and metal shingle systems. Discusses the seam types, methods, and tools used in metal roof installation. Details the proper tools and techniques used for the installation of these features.

### Thermoplastic Roof Systems (10 Hours)

ISBN 978-0-13-749143-8

(Module ID 16206) Describes types of thermoplastic roof systems and outlines their installation and repair. Identifies types of field membranes, pre-manufactured flashing accessories, attachment components, and related tools.

### EPDM Roof Systems (10 Hours)

ISBN 978-0-13-749148-3

(Module ID 16207) Describes types of EPDM roof systems and their components. Identifies field membrane types, pre-manufactured flashing accessories, attachment methods, and components of EPDM roof systems. Describes installation and repair of these systems.

### Built-Up Roof Systems (15 Hours)

ISBN 978-0-13-749149-0

(Module ID 16208) Introduces types of built-up roof (BUR) systems and their components. Outlines basic installation and repair methods associated with BUR system, as well as related tools.

### Modified Bitumen Roof Systems (15 Hours)

ISBN 978-0-13-749152-0

(Module ID 16209) Describes types and characteristics of modified bitumen (mod-bit) roof systems. Discusses the components, installation procedure, basic repair methods, and tools used for mod-bit systems.

### Liquid-Applied Roofing (12.5 Hours)

ISBN 978-0-13-749154-4

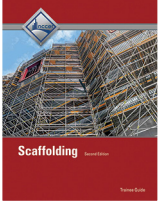
(Module ID 16210) Describes liquid-applied roofing products and explains the difference between roof coatings and liquid-applied roof membranes. Outlines procedures and tools used to install and repair liquid-applied roofing.

### Roofing Service and Repair (15 Hours)

ISBN 978-0-13-749158-2

(Module ID 16212) Introduces service and repair in the roofing industry and related career opportunities for roofers. Describes the general process of repair as well as specific repairs for specific steep- and low-slope roof systems.

## SCAFFOLDING



### Curriculum Notes

- 155 Hours (includes Core)
- Revised: 2015, Second Edition
- Downloadable instructor resources are available.
- A Spanish translation is available. Please see NCCER's online catalog for more information.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-383081-1

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to the Trade (7.5 Hours)

ISBN 978-0-13-378895-2

(Module ID 31101-15) Introduces the scaffolding program, describes the duties of a scaffolder, and identifies scaffold types and scaffolding terms.

### Trade Safety (7.5 Hours)

ISBN 978-0-13-378896-9

(Module ID 31102-15) Provides a comprehensive overview of the safety regulations and guidelines in the scaffolding industry.

### Trade Tools and Equipment (7.5 Hours)

ISBN 978-0-13-378897-6

(Module ID 31103-15) Covers the safe use and applications of hand and power tools used in the trade.

### Trade Math (7.5 Hours)

ISBN 978-0-13-378898-3

(Module ID 31104-15) Explains and gives examples of math calculations of scaffold loads, including area loads, concentrated loads, live loads, cantilevered loads, and wind loads.

## Supported Scaffolds (32.5 Hours)

ISBN 978-0-13-378899-0

(Module ID 31105-15) Identifies the equipment used with supported scaffolds. Describes the procedures for erecting supported scaffolds.

## Mobile Scaffolds (10 Hours)

ISBN 978-0-13-378900-3

(Module ID 31106-15) Identifies the different types of powered and manually propelled mobile scaffolds and describes their erection and operation.

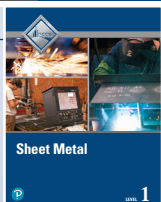
## Suspension Scaffolds (7.5 Hours)

ISBN 978-0-13-378901-0

(Module ID 31107-15) Identifies the types of equipment used with suspension scaffolds. Describes the rigging of suspension scaffolds.

## L1 SHEET METAL

LEVEL 1



### Curriculum Notes



- 192.5 Hours (includes Core)
- Updated: 2019
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-662951-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Occupational Overview: The Sheet Metal Industry (7.5 Hours)

ISBN 978-0-13-662995-5

(Module ID 04101) Summarizes the history and development of the sheet metal craft. Explains the benefits of apprenticeship training, and identifies career opportunities in the trade.



### NATE CERTIFICATION

NCCER is an officially recognized training provider for North American Technician Excellence (NATE), an independent, third-party certification body for HVAC/R technicians. NATE-certified technicians can use module completions through NCCER-accredited training providers for the continuing education hours required for recertification through NATE. For details and lists of available NATE-recognized training, visit [www.natex.org](http://www.natex.org). For more information regarding NATE recertification, please contact NCCER Customer Service at 1-888-622-3720.

#### Sheet Metal Tools and Equipment (10 Hours)

ISBN 978-0-13-662993-1

(Module ID 04102) Describes the hand and power tools used in the sheet metal craft, including layout tools and cutting, bending, and forming machines. Includes safety and maintenance guidelines.

#### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-418269-8

(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

#### Sheet Metal Math and Measurements (20 Hours)

ISBN 978-0-13-662952-8

(Module ID 04104) Covers calculations using denominate numbers, area and volume calculations, English-metric system conversions, basic geometry, percentages, and calculation of stretchouts.

#### Sheet Metal Layout and Processes (17.5 Hours)

ISBN 978-0-13-663008-1

(Module ID 04103) Introduces parallel line development, radial line development, and triangulation. Covers the selection and use of layout, hand, and machine tools. Discusses how to transfer patterns, and how to cut, form, and assemble parts.

#### Parallel Line Development (27.5 Hours)

ISBN 978-0-13-663005-0

(Module ID 04105) Covers the steps involved in using the parallel line development method to lay out fittings. Includes step-by-step procedures for selected fittings.

#### Installation of Ductwork (15 Hours)

ISBN 978-0-13-662972-6

(Module ID 04106) Addresses ductwork assembly, use of different types of sealants, using lifts, and installation of ductwork. Describes the types of fasteners (screws, nuts, bolts, and rivets), and supports used in an air distribution system. Discusses proper spacing of hangers, load ratings, and installation of hangers and support systems.

#### Installation of Air Distribution Accessories (12.5 Hours)

ISBN 978-0-13-662996-2

(Module ID 04107) Describes how air distribution accessories such as louvers, dampers, and access doors function as part of an air distribution system. Includes installation guidelines and checklists.

## L2 SHEET METAL

LEVEL 2

### Curriculum Notes

- 147.5 Hours
- Updated: 2019
- NATE-Recognized Training Provider
- Downloadable instructor resources are available.



### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-663023-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Field Measurements, Calculations, and Fittings (25 Hours)

ISBN 978-0-13-663044-9

(Module ID 04301) Describes the techniques used for field measuring and layout of ductruns and fittings. Covers the math involved in creating various offsets and seam allowances, based on field measurements to fit unique and specific situations.

#### Construction and Sheet Metal Drawings (17.5 Hours)

ISBN 978-0-13-663047-0

(Module ID 04202) Reviews how to read and interpret section, elevation, and detail drawings. Also covers the drawings used by a variety of crafts. Includes practice using drawings with a large drawing package.

#### Radial Line Development (20 Hours)

ISBN 978-0-13-663043-2

(Module ID 04203) Introduces radial line development principles used to determine layouts for sheet metal fittings. Includes practice layout and fabrication tasks that allow trainees to develop and demonstrate their skills.

#### Triangulation (40 Hours)

ISBN 978-0-13-663038-8

(Module ID 04306) Describes the principles of triangulation and how it can be used to measure ductrun fittings. Provides a variety of tasks to practice developing, laying out, and fabricating selected ductrun fittings.

#### Sheet Metal Duct Fabrication Standards (7.5 Hours)

ISBN 978-0-13-663046-3

(Module ID 04204) Explains how to determine the requirements for a duct system, including operating pressures, metal gauges, connectors, reinforcements, tie rods, and seams. Also reviews how to use standards, codes, and ordinances to design a duct system.

#### Bend Allowances (7.5 Hours)

ISBN 978-0-13-663039-5

(Module ID 04206) Provides instruction and practice in determining proper bend allowances in sheet metal. Also reviews the interplay of different factors that affect the amount of bend allowance needed and the methods for calculating allowance.

#### Soldering (15 Hours)

ISBN 978-0-13-663053-1

(Module ID 04207) Identifies soldering tools, materials, and techniques. Also provides a wide range of soldering tasks for practice.

#### Air Distribution Systems (15 Hours)

ISBN 978-0-13-340345-9

(Module ID 03109) Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

Continued on following page



<b>L3 SHEET METAL</b>	
<b>LEVEL 3</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 145 Hours</li> <li>• Updated: 2019</li> <li>• NATE-Recognized Training Provider</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-663060-9</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Commercial Airside Systems (12.5 Hours)

ISBN 978-0-13-546046-7

(Module ID 03201) Describes the systems, equipment, and operating sequences commercial airside system configurations such as constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

### Principles of Airflow (25 Hours)

ISBN 978-0-13-663106-4

(Module ID 04303) Explains the basic principles of airflow and reviews how airflow is affected by duct size, shape, and fittings. Also reviews the components of an air distribution system.

### Using Construction Drawings in Sheet Metal (30 Hours)

ISBN 978-0-13-663101-9

(Module ID 04308) Covers equipment schedules, material takeoffs, and craft scheduling. Explains how to put knowledge of construction drawings and documents to work as a sheet metal fabricator or installer.

### Sheet Metal Job Specifications (20 Hours)

ISBN 978-0-13-663098-2

(Module ID 04305) Explains how to balance an air distribution system so that the right amount of air is correctly distributed at the proper velocities and returned to the heating and cooling units. Reviews the tools and techniques used for adjusting fans, volume dampers, registers, and grilles. Provides proper techniques for duct leakage testing.

### Air Testing and Balancing (30 Hours)

ISBN 978-0-13-663091-3

(Module ID 04402) Describes the use of project specifications and submittals. Covers how specifications and submittals are applied when working on a specific job. Covers the coordination of crafts.

### Blanket Insulation for Ducts (7.5 Hours)

ISBN 978-0-13-498777-4

(Module ID 19202) Covers fiberglass blanket installation to ducts and apparatus and discusses vapor-sealed blanket insulation facings.

### Board Insulation For Ducts (20 Hours)

ISBN 978-0-13-498775-0

(Module ID 19203) Covers fiberglass board insulation applications, such as cutting fiberglass board insulation to fit over standing seams and stiffeners, vapor-seal applications, and cutting and installing fiberglass board insulation on round or oval ducts.

<b>L4 SHEET METAL</b>	
<b>LEVEL 4</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 147.5 Hours</li> <li>• Updated: 2019</li> <li>• NATE-Recognized Training Provider</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-663222-1</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Fume and Exhaust System Design (25 Hours)

ISBN 978-0-13-663208-5

(Module ID 04404) Reviews the codes and specifications pertaining to fume and exhaust system design for safe workspaces. Provides instruction in selecting the appropriate materials for fume or exhaust system components and to identify the different types of hoods and applications for each.

### Welding and Brazing (25 Hours)

ISBN 978-0-13-663221-4

(Module ID 04403) Introduces the techniques and proper operation of equipment used for welding and brazing. Emphasizes safety and awareness of hazards involved. Trainees practice welds in a variety of positions and perform a basic braze.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

### Architectural Sheet Metal (25 Hours)

ISBN 978-0-13-663213-9

(Module ID 04307) Teaches how to lay out and fabricate sheet metal components of a roof drainage system, including flashing, gutters, and downspouts.

### Shop Production and Organization (25 Hours)

ISBN 978-0-13-663207-8

(Module ID 04401) Introduces the production, organization, planning, and control functions that occur in a sheet metal shop. Emphasizes optimization of processes and accurate estimating for competitive bidding. Discusses project planning techniques, principles of efficient shop layout and materials flow, as well as the roles and relationships of shop personnel.

### Sheet Metal Business and Technology (7.5 Hours)

ISBN 978-0-13-663226-9

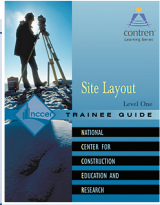
(Module ID 04407) Covers advancements in software and technology as it pertains to sheet metal workflow. Covers tools to enhance design, estimation, fabrication, installation, and project documentation.

### Fundamentals of Crew Leadership (22.5 Hours)

ISBN 978-0-13-487188-2

(Module ID 46101) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

## L1 SITE LAYOUT



LEVEL 1

### Curriculum Notes

- 165 Hours (includes Core)
- Published: 2004
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-109173-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Site Layout (10 Hours)

ISBN 978-0-13-109882-4

(Module ID 78101-04) Provides an overview of the site layout trade and related tasks. Covers the use of the builder's level and leveling rods, as well as the equipment and procedures for making distance measurements by taping (chaining). Also covers the elements of professional conduct, safety, and communications. Briefly describes the aspects of an apprenticeship program and the career path and professional opportunities related to the site layout trade.

### Surveying Math (30 Hours)

ISBN 978-0-13-109883-1

(Module ID 78102-04) Expands on the Core module, *Introduction to Construction Math*, with emphasis on the metric system, including how to convert between English and metric system units. Covers basic concepts for working with formulas and equations, as well as basic geometry and right-angle trigonometry.

### Survey Equipment Use and Care One (30 Hours)

ISBN 978-0-13-109884-8

(Module ID 78103-04) Covers the use and care of tools and instruments commonly used to perform site survey work. Introduces the instruments and procedures used for making distance measurements electronically and for performing differential leveling and basic horizontal and vertical angular measurements. Includes guidelines for recording surveying measurement data in field notes.

### Blueprint Reading for Surveyors (20 Hours)

ISBN 978-0-13-109886-2

(Module ID 78104-04) Expands on the Core module, *Introduction to Construction Drawings*, and provides techniques for reading and using drawings and specifications. Emphasis is placed on drawings and types of information that are relevant to the site layout trade.

## L2 SITE LAYOUT

LEVEL 2

### Curriculum Notes

- 145 Hours
- Published: 2004
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-109176-4

### Survey Equipment Use and Care Two, EDMs and Total Stations (10 Hours)

ISBN 978-0-13-160022-5

(Module ID 78202-04) Covers the setup, use, calibration, and care of electronic distance measuring instruments and total stations.

### Control Setup (30 Hours)

ISBN 978-0-13-160023-2

(Module ID 78203-04) Contains information and instructions for setting up, running, recording, and closing a horizontal traverse and a level loop. Also covers primary and secondary control plans, as well as vertical control for multilevel structures.

### Boundary and Topography Surveys (10 Hours)

ISBN 978-0-13-160024-9

(Module ID 78204-04) Contains information and instructions for gathering, recording, and plotting profile and cross-section leveling data. Includes plot and site plans to identify rights-of-way, utilities, setbacks, boundaries, and tie-in locations.

### Data Collection and Basic Computer Skills

(10 Hours)

ISBN 978-0-13-160025-6

(Module ID 78205-04) Covers the use of integrated total station systems and GPS surveying systems. Explains the use of integrated field and office software to collect and manage data.

### Concrete Properties and Quality Control

(15 Hours)

ISBN 978-0-13-160026-3

(Module ID 78206-04) Covers the chemical and physical properties of concrete and the components, such as cement, aggregates, and admixtures, that make up the concrete mixture. Explains the various methods and equipment used to sample, test, and inspect concrete.

### Means and Methods (40 Hours)

ISBN 978-0-13-160027-0

(Module ID 78207-04) Provides extensive coverage of soils and their classifications and explains how various soils behave in excavations. Covers the safety procedures and equipment used when working in or near trenches. Provides layout procedures for footings, piers, building corners, columns, walls, embedments, and stairs.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Advanced Surveying Math (30 Hours)

ISBN 978-0-13-160021-8

(Module ID 78201-04) Covers the advanced math needed for site layout, including area and volume of solids, use of the Pythagorean Theorem to solve for distances and angles, and use of polar and rectangular coordinates. Covers common coordinate and grid systems.

# Sprinkler Fitting

## L1 SPRINKLER FITTING

LEVEL 1



### Curriculum Notes

- 155 Hours (includes Core)
- Revised: 2021, Fourth Edition to reflect NFPA 13
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-747549-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Occupational Overview: The Sprinkler Industry

(5 Hours)

ISBN 978-0-13-747554-4

(Module ID 18101) Describes the basic types of sprinkler systems, the tools used to install them, and the codes and standards that apply to these systems. Covers the apprenticeship requirements for sprinkler fitters, employer and employee responsibilities, and career paths in the sprinkler industry.

## Introduction to Components and Systems

(10 Hours)

ISBN 978-0-13-747556-8

(Module ID 18102) Provides an overview of the four main types of sprinkler systems. Describes testing laboratories and Listing requirements. Covers sprinkler characteristics, including thermal response, spray pattern and coverage area, orientation, K-factors, and temperature ratings. Describes various types of piping, valves, and pumps.

## Steel Pipe and Fittings (20 Hours)

ISBN 978-0-13-747560-5

(Module ID 18103) Describes the steel pipe used in sprinkler systems, including pipe types, schedules, and sizes. Covers common methods of end preparation, including cutting, reaming, grooving, and threading pipe. Describes various types of grooved, threaded, flanged, and plain-end fittings, along with the installation methods and applications of each type.

## CPVC Pipe and Fittings (12.5 Hours)

ISBN 978-0-13-747561-2

(Module ID 18104) Covers the special type of chlorinated polyvinyl chloride (CPVC) pipe and fittings used in sprinkler systems. Describes the procedures for cutting, beveling, cleaning, and joining CPVC pipe and fittings. Provides an overview of how to test the installed sprinkler system.

## Copper Tubing and Fittings (10 Hours)

ISBN 978-0-13-747564-3

(Module ID 18105) Copper tubing and fittings are introduced along with cutting and bending tools. The soldering process is described, including techniques for measuring, cutting, reaming, and cleaning tubing. Brazing is described, as are brazing metals, fluxes, and brazing equipment. Also covers grooved couplings and compression connections.

## Underground Pipe (12.5 Hours)

ISBN 978-0-13-747582-7

(Module ID 18106) Describes the installation of underground piping systems. Covers ductile iron and PVC piping and components, including risers, backflow preventer assemblies, hydrants, and restraints. Also covers trench safety requirements, backfilling, and testing.

## L2 SPRINKLER FITTING

LEVEL 2

### Curriculum Notes

- 152.5 Hours
- Revised: 2022, Fourth Edition to reflect NFPA 13
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-747571-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Hangers, Supports, and Restraints (17.5 Hours)

ISBN 978-0-13-747573-5

(Module ID 18201) This module identifies strength/spacing requirements, types, and installation of pipe hangers, supports, and restraints. It also covers the installation of firestopping.

## General Purpose Valves (15 Hours)

ISBN 978-0-13-747575-9

(Module ID 18202) This module explains the valves used to start, stop, direct, and regulate water flow in sprinkler systems. It covers the operation, applications, and basic maintenance of various valves, including indicating control valves, trim valves, check valves, hose valves, pressure control valves, and air venting valves.

## Math for Sprinkler Fitters (20 Hours)

ISBN 978-0-13-747570-4

(Module ID 18203) This module reviews basic mathematical principles and explains how to apply them to various sprinkler fitting calculations, including floor areas, pitch, offsets, sprinkler spacing, pressure, and volume.

## Shop Drawings (30 Hours)

ISBN 978-0-13-747583-4

(Module ID 18204) This module covers the shop drawings used in sprinkler fitting. It describes the symbols used for various sprinkler system components and explains how to use a shop drawing to identify the types and locations of piping and components. It also provides an overview of Building Information Modeling (BIM).

## Standard Spray Sprinklers (20 Hours)

ISBN 978-0-13-747584-1

(Module ID 18205) This module describes the characteristics of standard spray sprinklers. It also covers types of construction, NFPA 13 light and ordinary hazard occupancy classifications, and installation considerations.

## Wet Pipe Sprinkler Systems (25 Hours)

ISBN 978-0-13-747589-6

(Module ID 18206) This module describes the operation and installation of wet pipe sprinkler systems. It covers various system controls and switches and explains how they operate. It also describes how to complete a Contractor's Material and Test Certificate for Aboveground Piping and provides an overview of basic system troubleshooting procedures.

## Dry Pipe Sprinkler Systems (25 Hours)

ISBN 978-0-13-747591-9

(Module ID 18207) This module describes the operation and installation of dry pipe sprinkler systems. It covers differential and mechanical dry pipe valves and trim, including switches, gauges, air sources, accelerators, and drains. It also provides an overview of basic system troubleshooting and acceptance testing procedures, including the completion of a Contractor's Material and Test Certificate for Aboveground Piping for a dry pipe sprinkler system.

Continued on following page

## Sprinkler Fitting Level 3

### L3 SPRINKLER FITTING

#### LEVEL 3

##### Curriculum Notes

- 150 Hours
- Revised: 2022, Fourth Edition to reflect NFPA 13
- Downloadable instructor resources are available.

##### PAPERBACK

Trainee Guide: \$102.99

##### ISBN

978-0-13-793458-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Water Supplies (15 Hours)

ISBN 978-0-13-803121-3

(Module ID 18303) Identifies the chemical and physical properties of water. Covers the water supplies available for sprinkler systems, including tanks and municipal water supply systems. Describes the procedures and NFPA requirements for waterflow testing.

#### Fire Pump Systems (35 Hours)

ISBN 978-0-13-803125-1

(Module ID 18304) Identifies various types of fire pump systems and their components, including pumps, drivers, controllers, and sensing lines. Describes fire pump system pre-checks and start-up/acceptance testing.

#### Standpipes (25 Hours)

ISBN 978-0-13-803126-8

(Module ID 18302) Identifies different types and classifications of standpipe systems. Covers hose valves and adapters used with these systems. Describes procedures and NFPA requirements for acceptance testing.

#### Deluge and Preaction Sprinkler Systems (35 Hours)

ISBN 978-0-13-803127-5

(Module ID 18301) Describes the operation, installation, and NFPA 13 requirements for deluge and preaction sprinkler systems. Covers initiating and notification devices. Provides an overview of acceptance testing, including completing a Contractor's Material and Test Certificate for Aboveground Piping for these systems.

#### Application-Specific and Special Sprinklers

(40 Hours)

ISBN 978-0-13-803129-9

(Module ID 18305) Covers application-specific sprinklers, including extended coverage sprinklers, residential sprinklers, control mode specific application (CMSA) sprinklers, and early suppression fast-response (ESFR) sprinklers. Describes the area of coverage, positioning, and obstruction requirements for each type. Covers special sprinklers and their uses.

### L4 SPRINKLER FITTING

#### LEVEL 4

##### Curriculum Notes

- 145 Hours
- Revised: 2023, Fourth Edition to reflect NFPA 13
- Downloadable instructor resources are available.

##### PAPERBACK

Trainee Guide: \$102.99

##### ISBN

978-0-13-806535-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### System Layout (27.5 Hours)

ISBN 978-0-13-817413-2

(Module ID 18401) Identifies three types of system configurations and a variety of occupancy and storage classifications. Covers the basics of sprinkler system layout and design methods. Describes flow characteristics and pressure loss.

#### Inspection, Testing, and Maintenance (37.5 Hours)

ISBN 978-0-13-817414-9

(Module ID 18402) Covers inspection, testing, and maintenance requirements for sprinkler systems, standpipe and hose systems, fire pumps, and other systems.

#### Special Extinguishing Systems (27.5 Hours)

ISBN 978-0-13-817416-3

(Module ID 18403) Describes water spray, water mist, foam, carbon dioxide, and clean agent extinguishing systems. Covers all of the appropriate system components, including pipe and fittings, nozzles, alarms, detectors, and control equipment.

#### Fundamentals of Crew Leadership (22.5 Hours)

ISBN 978-0-13-803097-1

(Module ID 46101) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are also discussed. Explains details and procedures for project planning, scheduling, and estimating.

#### Procedures and Documentation (30 Hours)

ISBN 978-0-13-817417-0

(Module ID 18405) Explains the various ways sprinkler projects are documented. Reviews daily reports, materials documentation, and documentation of safety policies and incidents. Covers responses to water damage, including documentation and investigation.

## L1 WELDING

LEVEL 1



### Curriculum Notes

- 365 Hours (includes Core)
- Revised: 2022, Sixth Edition
- Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E. school requirements. When combined with NCCER *Welding Level 2*, the content aligns with the key indicators specified in AWS EG2.0:2008 *Level 1-Entry Welder*.
- Downloadable instructor resources are available.

### PAPERBACK

ISBN

Trainee Guide: \$74.99

978-0-13-792453-0

### DIGITAL

ISBN

NCCERconnect with  
Pearson eText: \$102.99

978-0-13-792477-6

Trainee Guide + NCCERconnect  
with Pearson e-text: \$104.99

978-0-13-792478-3

Core + Welding L1: \$137.98

978-0-13-821270-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Welding Safety (5 Hours)

ISBN 978-0-13-792455-4

(Module ID 29101) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-792457-8

(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

#### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-792459-2

(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

#### Air-Carbon Arc Cutting and Gouging (10 Hours)

ISBN 978-0-13-792460-8

(Module ID 29104) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

#### Base Metal Preparation (12.5 Hours)

ISBN 978-0-13-792463-9

(Module ID 29105) Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

#### Weld Quality (10 Hours)

ISBN 978-0-13-792464-6

(Module ID 29106) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

#### SMAW – Equipment and Setup (5 Hours)

ISBN 978-0-13-792467-7

(Module ID 29107) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

#### SMAW Electrodes (2.5 Hours)

ISBN 978-0-13-792468-4

(Module ID 29108) Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

## ALIGNS WITH AWS SENSE STANDARDS AND GUIDELINES



NCCER is pleased to support the American Welding Society's Schools Excelling through National

Skills Education (SENSE) Entry Welder program with Levels 1 and 2 of its *Welding* curriculum. This curriculum supports the key learning indicators and performance accreditation tasks required to complete the current SENSE program.

#### SMAW – Beads and Fillet Welds (100 Hours)

ISBN 978-0-13-792469-1

(Module ID 29109) Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

#### Joint Fit-Up and Alignment (5 Hours)

ISBN 978-0-13-792471-4

(Module ID 29110) Describes job code specifications. Explains how to use fit-up gauges and measuring devices to check fit-up and alignment and use plate and pipe fit-up and alignment tools to properly prepare joints. Explains how to check for joint misalignment and poor fit.

#### SMAW – Groove Welds with Backing (50 Hours)

ISBN 978-0-13-792473-8

(Module ID 29111) Introduces groove welds and explains how to set up welding equipment for making groove welds. Describes how to make groove welds with backing. Provides procedures for making flat, horizontal, vertical, and overhead groove welds.


#### SMAW – Open-Root Groove Welds – Plate (60 Hours)

ISBN 978-0-13-792476-9

(Module ID 29112) Introduces various types of groove welds and describes how to prepare for groove welding. Describes the techniques required to produce various open V-groove welds.

Continued on following page



L2 WELDING	
LEVEL 2	
	Curriculum Notes
<b>Curriculum Notes</b> <ul style="list-style-type: none"> <li>• 227.5 Hours</li> <li>• Revised: 2024, Sixth Edition</li> <li>• Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E. school requirements. When combined with NCCER <i>Welding Level 1</i>, the content aligns with the key indicators specified in AWS E62.0:2008 <i>Level 1-Entry Welder</i>.</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<b>PAPERBACK</b> Trainee Guide: \$102.99	<b>ISBN</b> <b>978-0-13-821616-0</b>
<b>DIGITAL</b> NCCERconnect Access Card: \$102.99 NCCERconnect + Trainee Guide: \$129.99	<b>ISBN</b> <b>978-0-13-821605-4</b> <b>978-0-13-821623-8</b>

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Welding Symbols (5 Hours)

ISBN 978-0-13-836597-4

(Module ID 29201) Identifies and explains the different types of fillet weld, groove weld, and non destructive examination symbols. Explains how to read welding symbols on drawings, specifications, and Welding Procedure Specifications (WPS).

### Reading Welding Detail Drawings (10 Hours)

ISBN 978-0-13-836598-1

(Module ID 29202) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

### Physical Characteristics and Mechanical Properties of Metals (7.5 Hours)

ISBN 978-0-13-836579-0

(Module ID 29203) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

### Preheating and Postheating of Metals (5 Hours)

ISBN 978-0-13-836583-7

(Module ID 29204) Explains preheating, interpass temperature control, and postheating procedures that sometimes need to be done to preserve weldment strength, ductility, and weld quality. Covers the equipment used for heat treating metals.

### GMAW and FCAW – Equipment and Filler Metals

(10 Hours)

ISBN 978-0-13-836584-4

(Module ID 29205) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

### GMAW – Plate (60 Hours)

ISBN 978-0-13-836587-5

(Module ID 29209) Explains how to set up and use GMAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

### FCAW – Plate (60 Hours)

ISBN 978-0-13836589-9

(Module ID 29210) Explains how to set up and use FCAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

### GTAW – Equipment and Filler Metals (10 Hours)

ISBN 978-0-13-836592-9

(Module ID 29207) Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

### GTAW – Plate (60 Hours)

ISBN 978-0-13-836593-6

(Module ID 29208) Describes how to build pads on carbon steel plate using GTAW and carbon steel filler metal. Also explains how to make multiple-pass GTAW fillet welds on carbon steel plate coupons in the 1F, 2F, 3F, and 4F positions, and how to make GTAW V-groove welds in the 1G, 2G, 3G, and 4G positions.

L3 WELDING	
LEVEL 3	
<b>Curriculum Notes</b> <ul style="list-style-type: none"> <li>• 470 Hours (370 Required; 100 Elective/Optional)</li> <li>• Revised: 2024, Sixth Edition</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<b>PAPERBACK</b> Trainee Guide: \$102.99	<b>ISBN</b> <b>978-0-13-821882-9</b>
<b>DIGITAL</b> NCCERconnect Access Card: \$102.99 NCCERconnect + Trainee Guide: \$129.99	<b>ISBN</b> <b>978-0-13-821878-2</b> <b>978-0-13-821871-3</b>

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### SMAW – Open-Root Pipe Welds (100 Hours)

ISBN 978-0-13-535080-5

(Module ID 29301) This module describes how to prepare and perform open-root V-groove welds on pipe in all positions using SMAW equipment and electrodes. Shielded metal arc welding (SMAW), also known as manual metal arc welding or stick welding, is a well-established form of welding used extensively in commercial and industrial applications around the world.

### GMAW – Pipe (60 Hours)

ISBN 978-0-13-535081-2

(Module ID 29302) This module covers basic concepts of open-root GMAW with pipe and describes how to prepare and perform open-root V-groove welds on medium- and thick-walled pipe. Gas metal arc welding (GMAW), also known as metal inert gas (MIG) welding, is a form of welding that joins two metals together using a filler metal wire electrode and a shielding gas. MIG welding is an effective method for making high-quality, open-root V-groove welds on pipe.

### FCAW – Pipe (60 Hours)

ISBN 978-0-13-535082-9

(Module ID 29303) This module describes two primary approaches to FCAW and provides guidance for practicing the techniques. Flux-core arc welding (FCAW), also known as dual-shield welding, is excellent for pipe welding, although the root pass is seldom applied using FCAW. FCAW is a versatile process that can be performed with or without a shielding gas, depending upon the wire electrode used.

### GTAW – Carbon Steel Pipe (80 Hours)

ISBN 978-0-13-535084-3

(Module ID 29304) This module provides instruction and guided practice in the use of GTAW for carbon steel pipe welding. Gas tungsten arc welding (GTAW), also known as tungsten inert gas welding, is a unique welding process that requires the welder to use of both hands in the welding process. GTAW can be used on critical piping and may sometimes be used for the root pass on pipe welds when other processes have been directed for the remaining passes. GTAW is excellent for welding thin materials, such as auto bodies.

### GTAW – Low Alloy and Stainless Steel Pipe

(70 Hours)

ISBN 978-0-13-535086-7

(Module ID 29305) This module provides information about working with low alloy and stainless steel pipe and highlights many of their unique characteristics. It also describes GTAW techniques and processes for welding these materials. Safe welding practices are emphasized.

### SMAW – Stainless Steel Plate and Pipe

Groove Welds (100 Elective Hours)

ISBN 978-0-13-535087-4

(Module ID 29306) This module covers stainless steel metallurgy, the required SMAW electrodes and processes, and the techniques and equipment used to make open-root V-groove welds on stainless steel plate and pipe. Welders working on stainless steel must understand the differences between welding this type of steel and other types. The various grades of stainless steel require different welding techniques, filler metal composition, and heat treatments.



L4 WELDING

Curriculum Notes

- 172.5 Hours
- Revised: 2024, Sixth Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-821304-6
DIGITAL	ISBN
NCCERconnect Access Card: \$102.99	978-0-13-821317-6
NCCERconnect + Trainee Guide: \$129.99	978-0-13-821323-7

1G-ROTATED, 2G, 5G, and 6G positions.

MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

GMAW – Aluminum Plate (30 Hours)

ISBN 978-0-13-535070-6

(Module ID 29401) This module describes how GMAW equipment is used to weld aluminum plate and examines different techniques used to produce fillet and V-groove plate welds. Gas metal arc welding (GMAW) is one of the more common welding processes now used. As with most welding systems, GMAW equipment is available in many different sizes and varieties. However, the basic operating principles of GMAW apply to all makes and models of equipment.

GMAW – Aluminum Pipe (50 Hours)

ISBN 978-0-13-535074-4

(Module ID 29404) This module describes how GMAW equipment is used to weld aluminum pipe and presents the techniques used to produce V-groove pipe welds with backing. Gas metal arc welding (GMAW) is one of the more common welding processes. GMAW equipment is available in many different sizes and types—however, the basic operating principles of GMAW apply to all makes and models of equipment.

GTAW – Aluminum Plate (30 Hours)

ISBN 978-0-13-535076-8

(Module ID 29402) This module provides insight into welding aluminum using the GTAW process and an opportunity to hone the necessary skills. The GTAW process is unique in that the welder must add the filler metal using the opposite hand. The process is well-suited for welding aluminum, using the freehand or walking-the-cup technique and both stringer and weave beads.

GTAW – Aluminum Pipe (50 Hours)

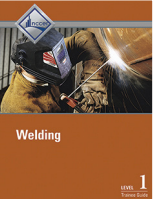
ISBN 978-0-13-535078-2

(Module ID 29403) This module provides insight into welding aluminum pipe using the GTAW process and the modified U-groove joint, which does not require a metal backing or a backing gas. The GTAW process is unique in that the welder must add the filler metal using the opposite hand. The process is well-suited for welding aluminum, using the freehand or walking-the-cup technique. Welders must understand that a significant amount of welding current is required for welding aluminum, especially when working with thick materials.

Soldering and Brazing of Copper (12.5 Hours)

ISBN 978-0-13-535079-9

(Module ID 29405) This module provides insight into soldering and brazing of copper. Soldering and brazing are welding processes that use nonferrous filler metal to form the weld joint. Soldering uses filler metal with a relatively low-temperature melting point. For joints that need to be mechanically stronger and more pressure-resistant, higher-temperature silver or copper alloy brazing filler metal is used. Oxygen/acetylene or air-acetylene fuel gases are typically used for brazing. Both soldering and brazing demand careful attention to safety due to the hazards associated with extreme heat, flammable gases and open flames.

L1 WELDING (FIFTH EDITION)	
 <p>Welding</p> <p>1</p>	<p>LEVEL 1</p> <p><b>Curriculum Notes</b></p>
<ul style="list-style-type: none"> <li>• 362.5 Hours</li> <li>• Includes 75 hours of Core, which is a prerequisite for Level 1 completion and must be purchased separately. For more information, please refer to page 9 of the full Curriculum Catalog or visit <a href="http://www.nccer.org/catalog">www.nccer.org/catalog</a>.</li> <li>• Revised: 2015, Fifth Edition</li> <li>• Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E. school requirements. When combined with NCCER Welding Level 2, the content aligns with the key indicators specified in AWS EG2.0:2008 Level 1-Entry Welder.</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<p><b>HARDCOVER</b></p> <p>Trainee Guide: \$74.99</p>	<p><b>ISBN</b></p> <p><b>978-0-13-413110-8</b></p>
<p><b>PAPERBACK</b></p> <p>Trainee Guide: \$74.99</p>	<p><b>ISBN</b></p> <p><b>978-0-13-416311-6</b></p>
<p><b>DIGITAL</b></p> <p>NCCERconnect Access Card: \$74.99</p> <p>NCCERconnect + Hardcover Trainee Guide: \$104.99</p> <p>NCCERconnect + Paperback Trainee Guide: \$104.99</p>	<p><b>ISBN</b></p> <p><b>978-0-13-452916-5</b></p> <p><b>978-0-13-457828-6</b></p> <p><b>978-0-13-457833-0</b></p>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Welding Safety (5 Hours)

ISBN 978-0-13-416580-6

(Module ID 29101-15) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102-15) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-418269-8

(Module ID 29103-15) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

### Air-Carbon Arc Cutting and Gouging (10 Hours)

ISBN 978-0-13-418270-4

(Module ID 29104-15) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

### Base Metal Preparation (12.5 Hours)

ISBN 978-0-13-414043-8

(Module ID 29105-15) Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

### Weld Quality (10 Hours)

ISBN 978-0-13-414044-5

(Module ID 29106-15) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

### SMAW – Equipment and Setup (5 Hours)

ISBN 978-0-13-418027-4

(Module ID 29107-15) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

### SMAW Electrodes (2.5 Hours)

ISBN 978-0-13-418026-7

(Module ID 29108-15) Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

## ALIGNS WITH AWS SENSE STANDARDS AND GUIDELINES



NCCER is pleased to support the American Welding Society's Schools Excelling

through National Skills Education (SENSE) Entry Welder program with Levels 1 and 2 of its Welding curriculum. This curriculum supports the key learning indicators and performance accreditation tasks required to complete the current SENSE program.

### SMAW – Beads and Fillet Welds (100 Hours)

ISBN 978-0-13-418025-0

(Module ID 29109-15) Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

### Joint Fit-Up and Alignment (5 Hours)

ISBN 978-0-13-418024-3

(Module ID 29110-15) Describes job code specifications. Explains how to use fit-up gauges and measuring devices to check fit-up and alignment and use plate and pipe fit-up and alignment tools to properly prepare joints. Explains how to check for joint misalignment and poor fit.

### SMAW – Groove Welds with Backing (50 Hours)

ISBN 978-0-13-418023-6

(Module ID 29111-15) Introduces groove welds and explains how to set up welding equipment for making groove welds. Describes how to make groove welds with backing. Provides procedures for making flat, horizontal, vertical, and overhead groove welds.

### SMAW – Open-Root Groove Welds – Plate

(60 Hours)

ISBN 978-0-13-418022-9

(Module ID 29112-15) Introduces various types of groove welds and describes how to prepare for groove welding. Describes the techniques required to produce various open V-groove welds.

Continued on following page

**L2 WELDING****LEVEL 2****Curriculum Notes**

- 227.5 Hours
- Revised: 2015, Fifth Edition
- Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E. school requirements. When combined with NCCER *Welding Level 1*, the content aligns with the key indicators specified in AWS EG2.0:2008 *Level 1-Entry Welder*.
- Downloadable instructor resources are available.

**HARDCOVER****ISBN**

Trainee Guide: \$102.99

**978-0-13-431110-4****PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-416310-9****DIGITAL****ISBN**

NCCERconnect Access Card: \$102.99

**978-0-13-452907-3**NCCERconnect +  
Hardcover Trainee Guide: \$129.99**978-0-13-460120-5**NCCERconnect +  
Paperback Trainee Guide: \$129.99**978-0-13-457831-6****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Welding Symbols (5 Hours)****ISBN 978-0-13-417950-6**

(Module ID 29201-15) Identifies and explains the different types of fillet weld, groove weld, and non-destructive examination symbols. Explains how to read welding symbols on drawings, specifications, and Welding Procedure Specifications (WPS).

**Reading Welding Detail Drawings (10 Hours)****ISBN 978-0-13-417953-7**

(Module ID 29202-15) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

**Physical Characteristics and Mechanical Properties of Metals (7.5 Hours)****ISBN 978-0-13-417954-4**

(Module ID 29203-15) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

**Preheating and Postheating of Metals (5 Hours)****ISBN 978-0-13-418019-9**

(Module ID 29204-15) Explains preheating, interpass temperature control, and postheating procedures that sometimes need to be done to preserve weldment strength, ductility, and weld quality. Covers the equipment used for heat treating metals.

**GMAW and FCAW – Equipment and Filler Metals (10 Hours)****ISBN 978-0-13-418018-2**

(Module ID 29205-15) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

**GMAW – Plate (60 Hours)****ISBN 978-0-13-417970-4**

(Module ID 29209-15) Explains how to set up and use GMAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

**FCAW – Plate (60 Hours)****ISBN 978-0-13-420171-9**

(Module ID 29210-15) Explains how to set up and use FCAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

**GTAW – Equipment and Filler Metals (10 Hours)****ISBN 978-0-13-417969-8**

(Module ID 29207-15) Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

**GTAW – Plate (60 Hours)****ISBN 978-0-13-417968-1**

(Module ID 29208-15) Describes how to build pads on carbon steel plate using GTAW and carbon steel filler metal. Also explains how to make multiple-pass GTAW fillet welds on carbon steel plate coupons in the 1F, 2F, 3F, and 4F positions, and how to make GTAW V-groove welds in the 1G, 2G, 3G, and 4G positions.

**L3 WELDING****LEVEL 3****Curriculum Notes**

- 470 Hours (370 Required; 100 Elective/Optional)
- Revised: 2016, Fifth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-448245-3****DIGITAL****ISBN**

NCCERconnect Access Card: \$102.99

**978-0-13-452913-4**NCCERconnect +  
Trainee Guide: \$129.99**978-0-13-471945-0****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**SMAW – Open-Root Pipe Welds (100 Hours)****ISBN 978-0-13-448560-7**

(Module ID 29301-16) Explains how to set up SMAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with SMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

**GMAW – Pipe (60 Hours)****ISBN 978-0-13-448564-5**

(Module ID 29302-16) Explains how to set up GMAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with GMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

**FCAW – Pipe (60 Hours)****ISBN 978-0-13-448566-9**

(Module ID 29303-16) Explains how to set up FCAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with FCAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

**GTAW – Carbon Steel Pipe (80 Hours)****ISBN 978-0-13-448568-3**

(Module ID 29304-16) Explains how to set up GTAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with GTAW equipment on pipe in the 2G, 5G, and 6G positions.

**GTAW – Low Alloy and Stainless Steel Pipe (70 Hours)****ISBN 978-0-13-448570-6**

(Module ID 29305-16) Explains how to set up GTAW equipment for open-root V-groove welds on low-alloy and stainless steel pipe, and explains how to prepare for and make open-root V-groove welds on low-alloy and stainless steel pipe. Provides procedures for making open-root V-groove welds with GTAW equipment on low-alloy and stainless steel pipe in the 2G, 5G, and 6G positions.

**SMAW – Stainless Steel Plate and Pipe Groove Welds (100 Elective Hours)****ISBN 978-0-13-448573-7**

(Module ID 29306-16) Explains stainless steel metallurgy; how to select SMAW electrodes for stainless steel welds; and how to weld different types of stainless steels. Covers safety issues associated with welding on stainless steels; how to prepare weld coupons; and how to set up SMAW equipment for welding stainless steel. Provides procedures for making open-root V-groove welds with SMAW equipment on stainless steel plate in the 1G, 2G, 3G, and 4G positions. Includes procedures for making open-root V-groove welds with SMAW equipment on stainless steel pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

Continued on following page

**L4 WELDING****Curriculum Notes**

- 172.5 Hours
- Revised: 2016, Fifth Edition
- Downloadable instructor resources are available.

**PAPERBACK****ISBN**

Trainee Guide: \$102.99

**978-0-13-451422-2****DIGITAL****ISBN**

NCCERconnect Access Card: \$102.99

**978-0-13-452915-8**

NCCERconnect +

Trainee Guide: \$129.99

**978-0-13-469255-5****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**GMAW – Aluminum Plate (30 Hours)****ISBN 978-0-13-467767-5**

(Module ID 29401-16) Covers the setup of GMAW equipment for welding aluminum plate. Explains aluminum metallurgy and the characteristics of aluminum welding; how to clean and prepare aluminum plate coupons for welding; and problems often encountered in aluminum welds. Explains GMAW techniques used in aluminum welding. Provides GMAW procedures on how to build weld pads on aluminum plate; how to make fillet welds on aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

**GMAW – Aluminum Pipe (50 Hours)****ISBN 978-0-13-467760-6**

(Module ID 29404-16) Covers the setup of GMAW equipment for welding aluminum pipe. Addresses GMAW techniques used to make V-groove welds on aluminum pipe with and without backing. Explains how to clean and prepare aluminum pipe coupons for welding. Provides GMAW procedures on how to make V-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

**GTAW – Aluminum Plate (30 Hours)****ISBN 978-0-13-467765-1**

(Module ID 29402-16) Covers the setup of GTAW equipment for welding aluminum plate. Explains how to clean and prepare aluminum plate coupons for welding, and how to select the aluminum filler metals and shielding gases used in the GTAW process. Explains GTAW techniques used in aluminum welding. Provides GTAW procedures on how to build weld pads on aluminum plate; how to make fillet welds on aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

**GTAW – Aluminum Pipe (50 Hours)****ISBN 978-0-13-467763-7**

(Module ID 29403-16) Covers the setup of GTAW equipment for welding aluminum pipe. Explains how to clean and prepare aluminum pipe coupons for welding. Addresses GTAW techniques used to make V-groove and modified U-groove welds on aluminum pipe with and without backing. Provides GTAW procedures on how to make V-groove or modified U-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

**Soldering and Brazing (12.5 Hours)****ISBN 978-0-13-467757-6**

(Module ID 29405-16) Introduces the equipment, techniques, and materials used to safely join copper tubing through both brazing and soldering processes. Covers the required PPE, preparation, and work processes in detail. Also presents procedures for brazing copper to dissimilar materials such as steel.

# Mobile Crane Operations

## L1 MOBILE CRANE OPERATIONS

### LEVEL 1



#### Curriculum Notes

- 170 Hours (includes Core)
- Updated in 2018.
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-473825-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (5 Hours)

ISBN 978-0-13-518809-5

(Module ID 21101) Provides an overview of the entire course and highlights the duties and responsibilities of a mobile crane operator. Discusses ASME B30.5 and 29 CFR 1926, Subpart CC, as well as crane operator certification.

### Basic Principles of Cranes (15 Hours)

ISBN 978-0-13-498816-0

(Module ID 21102) Introduces mobile crane equipment with an in-depth discussion of terminology and nomenclature. Explains the basic scientific principles associated with mobile crane operation.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102; from *Basic Rigger*) Describes basic rigging and safety practices related to rigging activities. Describes the use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches. Covers jacks and hoisting equipment.

### Crane Communications (10 Hours)

ISBN 978-0-13-498800-9

(Module ID 53101; from *Signal Person*) Describes the communication process between the signal person and the crane operator. Covers electronic communications as well as the standard hand signals in 29 CFR 1926.

### Crane Safety and Emergency Procedures (25 Hours)

ISBN 978-0-13-498819-1

(Module ID 21106) Covers safety standards and best safety practices relevant to the operation of cranes. Describes safety considerations related to power lines, weather conditions, and specific crane functions.

### Operating a Crane (25 Hours)

ISBN 978-0-13-498736-1

(Module ID 21105) Describes preparations and considerations prior to lifting operations. Provides an opportunity to become familiar with the operation of a crane and the functions of its controls.

## L2 MOBILE CRANE OPERATIONS

### LEVEL 2

#### Curriculum Notes

- 145 Hours
- Updated in 2018.
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-473824-6

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Machine Power Flow (15 Hours)

ISBN 978-0-13-498798-9

(Module ID 21202) Discusses the power systems that enable cranes to perform. Discusses diesel and gasoline/propane engines and electrical/motor-generator, as well as mechanical, electrical, pneumatic, and hydraulic power systems.

### Computer Aids/Operator Aids (20 Hours)

ISBN 978-0-13-498796-5

(Module ID 21205) Provides information on load moment indicators, anti-two-block devices, load indicators, and other operator aids that are installed in cranes. Describes input devices associated with these operator aids and the information they provide.

### Wire Rope (25 Hours)

ISBN 978-0-13-498794-1

(Module ID 21204) Covers the components of wire rope and inspection requirements and procedures for wire rope, load blocks, and sheaves. Explains proper installation of wire rope, maintenance guidelines, and end terminations and preparations.

### Mobile Crane Maintenance and Inspections

(25 Hours)

ISBN 978-0-13-498792-7

(Module ID 21203) Covers the types of inspections typically performed on mobile cranes. Describes service requirements for crane maintenance.

### Load Dynamics (17.5 Hours)

ISBN 978-0-13-498789-7

(Module ID 21206) Covers leverage, forward and backward stability, operational quadrants, submerged lifts, non-centered lifts, and other forces that affect stability.

### Transporting Requirements (17.5 Hours)

ISBN 978-0-13-498787-3

(Module ID 21308) Discusses the proper handling, loading and unloading, and securing procedures for mobile cranes and their components. Presents information on driver requirements and procedures for securing the mobile crane for transporting.

### On-Site Equipment Movement (25 Hours)

ISBN 978-0-13-498785-9

(Module ID 21207) Covers site hazards and restrictions that could hinder on-site crane movement; safety considerations involved in crane movement over uneven ground; pick-and-carry operations; and power line contact. Also addresses flotation capacity.

Continued on following page

L3

MOBILE CRANE OPERATIONS

LEVEL 3

Curriculum Notes

- 145 Hours
- Updated in 2018.
- Downloadable instructor resources are available.

PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-518502-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Load Charts (35 Hours)

ISBN 978-0-13-518590-2

(Module ID 21301) Discusses the importance of load charts and charts that apply to different configurations. Includes on-rubber, on-outrigger, jib, and deduction charts, as well as range diagrams and operational notes. Covers parts of line and capacity calculations.

### Lift Planning (30 Hours)

ISBN 978-0-13-518591-9

(Module ID 21304) Discusses lift plan implementation, including reference information, calculations, single- and multiple-crane lifting, critical lifts, and engineering considerations.

### Telescopic Boom Attachment Setup and Assembly (20 Hours)

ISBN 978-0-13-518668-8

(Module ID 21302) Covers the setup and stowing of swing-away extensions and various jibs, as well as the assembly of intermediate boom sections, on telescopic cranes. Includes the description and operating characteristics of manual and power luffing jibs.

### Lattice Boom Assembly and Disassembly

(20 Hours)

ISBN 978-0-13-518670-1

(Module ID 21306) Identifies lattice-boom components and provides pre-/post-assembly considerations. Provides step-by-step guidance in the assembly and disassembly of lattice booms.

### Hoisting Personnel (20 Hours)

ISBN 978-0-13-518673-2

(Module ID 21305) Examines ASME B30.23 and 29 CFR 1926.550(g) requirements while presenting advanced operation techniques for hoisting personnel.

### Advanced Operational Techniques (20 Hours)

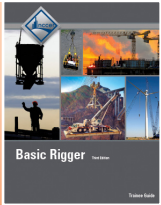
ISBN 978-0-13-518675-6

(Module ID 21303) Covers multi-crane lifts, critical lifts, blind lifts, and demolition. Includes sections on how to use magnet and vacuum lifting devices and how to operate a mobile crane in cold weather.



# Rigger/Signal Person

## BASIC RIGGER



### Curriculum Notes

- 140 Hours (includes Core)
- Updated in 2018.
- Downloadable instructor resources are available.
- A Spanish translation of Rigging Fundamentals is available. Please see NCCER's online catalog for more information.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-518508-7

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Describes basic rigging and safety practices related to rigging activities. Describes the use and inspection of equipment and hardware used in rigging. Explains how to apply common hitches. Covers jacks and hoisting equipment.

### Crane Safety and Emergency Procedures

(25 Hours)

ISBN 978-0-13-498819-1

(Module ID 21106; from *Mobile Crane Operations Level One*) Covers safety standards and best safety practices relevant to the operation of cranes. Describes safety considerations related to power lines, weather conditions, and specific crane functions.

### Basic Principles of Cranes (15 Hours)

ISBN 978-0-13-498816-0

(Module ID 21102; from *Mobile Crane Operations Level One*) Introduces mobile crane equipment with an in-depth discussion of terminology and nomenclature. Explains the basic scientific principles associated with mobile crane operation.

### Crane Communications (10 Hours)

ISBN 978-0-13-498800-9

(Module ID 53101) Describes the communication process between the signal person and the crane operator. Covers electronic communications as well as the standard hand signals in 29 CFR 1926.

## INTERMEDIATE RIGGER

### Curriculum Notes

- 105 Hours
- Updated in 2018.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-518320-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Intermediate Rigging (17.5 Hours)

ISBN 978-0-13-498820-7

(Module ID 38201) Describes basic procedures for using various slings in hitches and calculating sling stress. Introduces tools and equipment used for the lateral movement of loads without a crane. Trainees learn how to reeve block and tackle, invert loads with hoists, and drift a load between two hoists.

### Load Dynamics (17.5 Hours)

ISBN 978-0-13-498789-7

(Module ID 21206; from *Mobile Crane Operations Level Two*) Covers leverage, forward and backward stability, operational quadrants, submerged lifts, non-centered lifts, and other forces that affect stability.

### Wire Rope (25 Hours)

ISBN 978-0-13-498794-1

(Module ID 21204; from *Mobile Crane Operations Level Two*) Covers the components of wire rope and inspection requirements and procedures for wire rope, load blocks, and sheaves. Explains proper installation of wire rope, maintenance guidelines, and end terminations and preparations.

### Telescopic Boom Attachment Setup and Assembly

(20 Hours)

ISBN 978-0-13-518668-8

(Module ID 21302; from *Mobile Crane Operations Level Three*) Covers the setup and stowing of swing-away extensions and various jibs, as well as the assembly of intermediate boom sections, on telescopic cranes. Includes the description and operating characteristics of manual and power luffing jibs.

### Lattice Boom Assembly and Disassembly

(25 Hours)

ISBN 978-0-13-518670-1

(Module ID 21306; from *Mobile Crane Operations Level Three*) Identifies lattice-boom components and provides pre-/post-assembly considerations. Provides step-by-step guidance in the assembly and disassembly of lattice booms.

Continued on following page

## ADVANCED RIGGER

### Curriculum Notes

- 95 Hours
- Updated in 2018.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-518321-2

### Advanced Rigging (20 Hours)

ISBN 978-0-13-518807-1

(Module ID 38301) Explains how load weight and center of gravity affect lifting and crane stability. Load calculations for multi-crane lifts are presented, along with the application of equalizer beams. The movement of loads up an inclined plane and the line pull required are examined in detail. The module concludes with guidance in the rigging and handling of rebar bundles.

### Load Charts (35 Hours)

ISBN 978-0-13-518590-2

(Module ID 21301; from *Mobile Crane Operations Level Three*) Discusses the importance of load charts and charts that apply to different configurations. Includes on-rubber, on-outrigger, jib, and deduction charts, as well as range diagrams and operational notes. Covers parts of line and capacity calculations.

### Lift Planning (20 Hours)

ISBN 978-0-13-518591-9

(Module ID 21304; from *Mobile Crane Operations Level 3*) Discusses lift plan implementation, including reference information, calculations, single- and multiple-crane lifting, critical lifts, and engineering considerations.

### Hoisting Personnel (20 Hours)

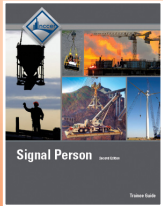
ISBN 978-0-13-518673-2

(Module ID 21305; from *Mobile Crane Operations Level Three*) Examines ASME B30.23 and 29 CFR 1926.550(g) requirements while presenting advanced operation techniques for hoisting personnel.

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## SIGNAL PERSON



### Curriculum Notes

- 50 Hours
- Updated in 2018.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$49.99

### ISBN

978-0-13-518800-2

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Crane Communications (10 Hours)

ISBN 978-0-13-498800-9

(Module ID 53101) Describes the communication process between the signal person and the crane operator. Covers electronic communications as well as the standard hand signals in 29 CFR 1926.

### Basic Principles of Cranes (15 Hours)

ISBN 978-0-13-498816-0

(Module ID 21102; from *Mobile Crane Operations Level One*) Introduces mobile crane equipment with an in-depth discussion of terminology and nomenclature. Explains the basic scientific principles associated with mobile crane operation.

### Crane Safety and Emergency Procedures

(25 Hours)

ISBN 978-0-13-498819-1

(Module ID 21106; from *Mobile Crane Operations Level One*) Covers safety standards and best safety practices relevant to the operation of cranes. Describes safety considerations related to power lines, weather conditions, and specific crane functions.

# Tower Crane Operator

## L1 TOWER CRANE OPERATOR



LEVEL 1

### Curriculum Notes

- 180 Hours (includes Core)
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-213720-1

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Trade (5 Hours)

ISBN 978-0-13-213820-8

(Module ID 48101-10) Provides an overview of the tower crane industry and highlights the duties and responsibilities of a tower crane operator. Discusses ASME and OSHA standards, as well as career opportunities and operator requirements.

### Basic Principles of Tower Cranes (20 Hours)

ISBN 978-0-13-213821-5

(Module ID 48102-10) Identifies the three main types of tower cranes and their components, including operator aids and base support systems. Explains the basic scientific principles associated with tower crane operation. Discusses the factors that affect lifting capacities.

### Tower Crane Safety (15 Hours)

ISBN 978-0-13-213822-2

(Module ID 48103-10) Introduces various safety aspects of tower crane operation, including equipment inspection, rigging, swing paths, and site hazard identification.

### Rigging Practices (15 Hours)

ISBN 978-0-13-213823-9

(Module ID 48104-10) Describes the use and inspection of basic equipment and hardware used in rigging, including slings, wire rope, chains, lifting beams, and attaching hardware such as shackles, eyebolts, and hooks. Explains sling capacities and sling angles.

## Load Charts (15 Hours)

ISBN 978-0-13-213824-6

(Module ID 48105-10) Explains how to use load charts to calculate safe lifting capacities for self-erecting, luffing boom, and hammerhead tower cranes. Also covers parts of line and counterweight configurations.

## Communications (10 Hours)

ISBN 978-0-13-213825-3

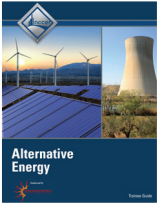
(Module ID 48106-10) Covers the fundamentals of the communication process, including verbal and nonverbal methods of communication. Also presents the ASME B30.3 hand signals, including the appropriate operator action when the signal is given.

## Operating a Tower Crane (25 Hours)

ISBN 978-0-13-213826-0

(Module ID 48107-10) Describes the basic functions of a tower crane, as well as standard procedures for starting up and shutting down self-erecting, luffing boom, and hammerhead tower cranes. Provides an opportunity for trainees to become familiar with the actual operation of a tower crane and the functions of its controls.

## ALTERNATIVE ENERGY



### Curriculum Notes

- *Introduction to the Power Industry* is a prerequisite for completion and must be purchased separately.
  - Paperback: \$24.99, ISBN 978-0-13-215413-0
- 132.5 Hours
- Published: 2011
- Endorsed by the Florida Energy Workforce Consortium in support of the 17th Career Cluster developed for Energy, *Alternative Energy* investigates the viability and value of fossil fuel alternatives, such as biomass/biofuel, nuclear, solar, and wind.
- The intended audience is secondary and post-secondary programs, as well as any programs designed to articulate into a green career track.
- *Introduction to Alternative Energy* (Module ID 74101-11) has been approved for 25 general continuing education hours under GBCI's Credential Maintenance Program.
- This craft requires additional instructor qualifications. For more information, contact NCCER Customer Service at 1-888-622-3720 or visit the craft page at [nccer.org](http://nccer.org).
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-266625-1

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Alternative Energy (25 Hours)

ISBN 978-0-13-272935-2

(Module ID 74101-11) Identifies the need for alternative energy development. Describes the contributions and potential of individual alternative energy sources. Also covers the present U.S. electrical grid and issues affecting specific alternative energy source tie-in and reliability.

### Biomass and Biofuels (22.5 Hours)

ISBN 978-0-13-272936-9

(Module ID 74102-11) Defines potential sources of biomass and biofuels and discusses their advantages and disadvantages for energy production. Discusses the future of biomass as well as biomass energy applications.

### Nuclear Power (25 Hours)

ISBN 978-0-13-272937-6

(Module ID 74103-11) Describes nuclear power and its sources. Discusses the advantages and disadvantages of nuclear power, the future of nuclear energy, and nuclear power generation.

### Solar Power (25 Hours)

ISBN 978-0-13-272938-3

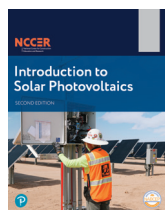
(Module ID 74104-11) Describes solar photovoltaic (PV) power and how it is harnessed. Identifies the advantages and disadvantages of solar energy. Discusses the past, present, and future of solar energy, as well as solar PV applications.

### Wind Power (22.5 Hours)

ISBN 978-0-13-272939-0

(Module ID 74105-11) Describes wind power and how it is harnessed. Identifies the advantages and disadvantages of wind energy. Discusses the past, present, and future of wind energy, as well as wind energy applications.

## Introduction to Solar Photovoltaics



**40 Hours**  
Revised: 2023, Sixth Edition  
Module ID 57101

### PAPERBACK

Trainee Guide: \$24.99

NCCERconnect Access Card: \$24.99

NCCERconnect +

Hardcover Trainee Guide: \$49.99

### ISBN

**978-0-13-818595-4**

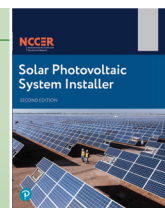
**978-0-13-818638-8**

**978-0-13-818598-5**

- Downloadable instructor resources are available.

Solar photovoltaic (PV) modules transform solar energy, sunlight, into electrical energy that powers an electrical load, such as your computer or refrigerator. Using PV modules, the United States and other nations around the world can harness solar energy. Solar energy is being used to reach 2030 and 2050 global climate change initiatives to reduce carbon emissions and decrease the reliance on fossil fuels. Completion of this module helps prepare solar PV trainees for the North American Board of Certified Energy Practitioners (NABCEP) PV Associates Exam and an exciting career in the solar PV industry.

## L1 SOLAR PHOTOVOLTAIC SYSTEMS INSTALLER



**LEVEL 1**



### Curriculum Notes

- 297.5 Hours (includes Core)
- Published: 2024, Second Edition
- Developed using NABCEP's PV Task Analysis and aligned with NABCEP's PV Associate Certification.
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

**978-0-13-820810-3**

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Solar Photovoltaics (40 Hours)

**ISBN 978-0-13-818595-4**

(Module ID 57101) Welcome to Solar Photovoltaics training! In this program, you will learn about solar energy and how it is harnessed to provide electricity for residential, commercial, and utility installations. Along with reviewing a Solar PV system's primary component, this program addresses system installation, site assessment, system design, maintenance, and troubleshooting. You'll also learn about Solar PV installation safety considerations.

### Site Assessment (10 Hours)

**ISBN 978-0-13-821291-9**

(Module ID 57102) Site assessment is one of the first steps in solar PV installation. As a site assessor, it's your job to gather customer and site information to help determine the proper size, configuration, and location of the solar PV system. Interviewing the customer helps you establish energy needs, and a thorough site assessment ensures the system is positioned properly on the location. In addition to reviewing site assessment steps, this module prepares the trainee for different career paths associated with solar PV installation.

### System Design (25 Hours)

**ISBN 978-0-13-821292-6**

(Module ID 57103) Effective solar PV system designers work closely with owners to determine the appropriate configuration of a PV system. An experienced designer will recommend a particular approach based on site assessment data, the electrical load, budget, and other relevant conditions. It is the duty of the designer to fully discuss all aspects of the possible configurations to help the owner make an informed choice. A successful solar PV system design and installation must meet the owner's expectations. This module focuses on component selection and wiring for stand-alone and grid-tied solar PV systems.

### System Installation and Inspection (60 Hours)

**ISBN 978-0-13-821294-0**

(Module ID 57104) After the jobsite has been assessed and a system designed, it's time to install solar PV components. Prior to installation, it's important to understand jobsite hazards, the appropriate PPE, and proper tool safety. This module reviews these topics, along with summaries of basic installation requirements, ground- and roof-mounted systems, a variety of solar PV components, and system commissioning activities.

### Maintenance and Troubleshooting (10 Hours)

**ISBN 978-0-13-821295-7**

(Module ID 57105) PV equipment requires regular inspection and maintenance. PV system maintenance begins by locating and reviewing the system records and the manufacturer's instructions for the equipment. Next, the system is inspected, and all required maintenance performed. If the system is not producing the expected output, a systematic process of troubleshooting must be followed. Finally, records must be prepared of all system maintenance activities, test results, and repairs. This module explains how to make operational checks, maintain, and troubleshoot PV equipment to help it last longer and operate more efficiently. It also examines how to prepare the system before a natural disaster and how best to recover after storm damage occurs.

### Roofing Fundamentals (17.5 Hours)

**ISBN 978-0-13-821296-4**

(Module ID 57106) All roofs are designed to perform two major tasks: insulate a building and keep water from entering through the top of the structure. A roof is made up of several basic components that each contribute to these tasks, including a roof deck, an insulation or underlayment layer, a primary covering, such as a membrane or shingles, and flashing or drainage. A roof can also serve as a support structure for solar PV systems. As a solar PV installer, it is important to be familiar with some basic concepts of roofing. This module covers the function of

the deck, steep- and low-slope roofing systems, how slope is measured, and load types.

### Roof-Mounted Solar PV Installation (20 Hours)

**ISBN 978-0-13-821300-8**

(Module ID 57107) After having mastered fundamental concepts in roofing, you will be ready to take on solar PV installations on various types of roofs. Installing a solar PV system on both steep- and low-slope roofs is a very involved process that requires coordination of multiple crew members.

In this module, you will learn how to install a solar PV system on both steep- and low-slope roofs. The material covers the mechanical installation of the mounting hardware and the electrical installation of the wiring, PV modules, and any auxiliary electrical equipment. Jobsite safety is also addressed, as is the process of reviewing a job packet to gather important manufacturer-specific information.

### Ground-Mounted Solar PV Installation (20 Hours)

**ISBN 978-0-13-821301-5**

(Module ID 57108) As with roof-mounted solar installations, the goal of ground-mounted solar PV systems is to generate as much electricity as possible by maximizing module Sun exposure. Ground-mounted solar PV systems can be constructed almost anywhere, so engineers can select sites that aren't obstructed by surrounding buildings and shade to maximize a system's electrical output. Additionally, they can be designed with tracking capabilities that allow the modules to rotate and follow the Sun. This module lists investigative steps, such as soil sampling to help determine the best foundation type and site surveying to develop the best layout and tracking system. It also examines how certain factors influence the design of a ground-mounted PV system, such as use of heavy equipment to prepare the site, laying the conduit, and setting the foundation.

### Safety and Awareness: Utility-Scale PV Projects

(17.5 Hours)

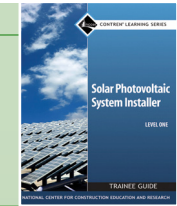
**ISBN 978-0-13-821303-9**

(Module ID 57109) Utility-scale solar PV jobsites pose many risks to workers. Serious injury may result from electrocution, falls, pinch points, lacerations, and burns. Given that solar modules are energized when exposed to light, electrical safety is particularly important in solar PV projects.

This module introduces general safety concepts, hazard communication, and standards set by the US Occupational Safety and Health Administration (OSHA). It explores site awareness topics including signage, barricades and barriers, working safely from elevations and near heavy equipment, lockout/tagout procedures, and concludes with a thorough review of electrical safety.



## L1 SOLAR PHOTOVOLTAIC SYSTEMS INSTALLER



LEVEL 1



### Curriculum Notes

- 220 Hours (includes Core)
- Published: 2011, First Edition
- Developed using NABCEP's PV Task Analysis and aligned with NABCEP's PV Installer Certification.
- Downloadable instructor resources are available.
- *Introduction to Solar Photovoltaics* (Module ID 57101) has been approved for 40 general continuing education hours under GBCI's Credential Maintenance Program.
- NCCER is a recognized accrediting body for institutions to become providers of the NABCEP Entry Level Exam.
- This craft requires additional instructor qualifications. For more information, contact NCCER Customer Service at 1-888-622-3720 or visit the craft page at [nccer.org](http://nccer.org).

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-257110-4

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Solar Photovoltaics (40 Hours)

ISBN 978-0-13-818595-4

(Module ID 57101) Solar photovoltaic (PV) modules transform solar energy, sunlight, into electrical energy that powers an electrical load, such as your computer or refrigerator. Using PV modules, the United States and other nations around the world can harness solar energy. Solar energy is being used to reach 2030 and 2050 global climate change initiatives to reduce carbon emissions and decrease the reliance on fossil fuels. Completion of this module helps prepare solar PV trainees for the North American Board of Certified Energy Practitioners (NABCEP) PV Associates Exam and an exciting career in the solar PV industry.

### Site Assessment (10 Hours)

ISBN 978-0-13-266202-4

(Module ID 57102-11) Explains how to determine customer needs, assess site-specific safety hazards, conduct a site survey, and identify a suitable location for the PV array and other system components. Also explains how to acquire and interpret site solar radiation and temperature data.

### System Design (25 Hours)

ISBN 978-0-13-266203-1

(Module ID 57103-11) Describes system design considerations, including array configurations, component selection, and wire sizing. Covers bonding, grounding, and the selection of overcurrent protection and disconnects.

### System Installation and Inspection (60 Hours)

ISBN 978-0-13-266204-8

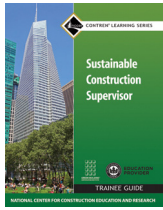
(Module ID 57104-11) Explains how to use the information from the site assessment and system design documents to safely install a photovoltaic array and other system components.

### Maintenance and Troubleshooting (10 Hours)

ISBN 978-0-13-266205-5

(Module ID 57105-11) Covers basic system performance monitoring and troubleshooting procedures, including record-keeping requirements.

## Sustainable Construction Supervisor



**20 Hours**  
**Published: 2011**  
**Module ID 70201-11**

**PAPERBACK**

**ISBN**

Trainee Guide: \$54.99

**978-0-13-215415-4**

- Downloadable instructor resources are available.

*Sustainable Construction Supervisor* provides front-line supervisors with sustainable construction management techniques as they relate to targeted construction-phase LEED points for their projects. Topics include project sustainability goals, Green building materials and technologies, Green building methods and processes, and more. This module has been endorsed and approved by GBCI for 20 general and LEED-specific continuing education hours for credential maintenance.



A related assessment certification exam, developed by NCCER and endorsed by GBCI, is available. For more information, contact NCCER Customer Service at 1-888-622-3720.

This craft requires additional instructor qualifications. For more information, contact NCCER Customer Service at 1-888-622-3720 or visit the craft page at [nccer.org](http://nccer.org).

## Your Role in the Green Environment



**15 Hours**  
**Updated: 2019**  
**Module ID 70101**

**PAPERBACK**

**ISBN**

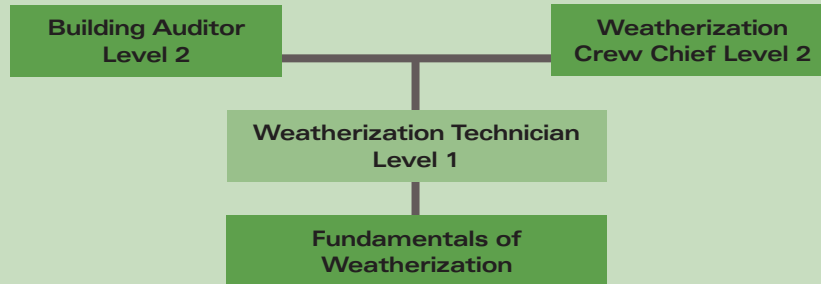
Trainee Guide: \$34.99

**978-0-13-670120-0**

- Downloadable instructor resources are available.

Provides pertinent information concerning the green environment, construction practices, and building rating systems. Updated to reflect LEED v4.1 with emphasis on standards for building design and construction.

As energy efficiency is becoming a priority for homeowners across America, many are turning to the weatherization industry to assist in their efforts. NCCER's *Weatherization* program offers training that exceeds the existing standards for weatherization technicians, crew chiefs, and building auditors. This program combines existing NCCER curricula with new building science modules that address the specific needs of this industry. Dual credentials are available within this program. *Note: Instructors wishing to teach NCCER's Weatherization program must meet specific qualifications. For more information, contact NCCER Customer Service at 1-888-622-3720.*



## Introduction to Weatherization



17.5 Hours  
Published: 2010  
Module ID 59101-10

### PAPERBACK

Trainee Guide: \$24.99

### ISBN

978-0-13-216699-7



Introduces the purpose and benefits of the weatherization program. Explains how weatherization goals are met by reducing heating and cooling losses and how infiltration points are located. Approved for 17.5 continuing education hours under GBCI's credential maintenance program.

- Downloadable instructor resources are available.

## FUNDAMENTALS OF WEATHERIZATION



### Curriculum Notes

- 95 Hours
- Published: 2010
- *Introduction to Weatherization*, combined with NCCER's *Core*, makes up *Fundamentals of Weatherization* and is intended to introduce trainees to the concepts and skills they will need to successfully complete *Weatherization Technician Level One*.

### PAPERBACK

Trainee Guide: \$74.99

Individual Modules: \$24.99


### ISBN

978-0-13-535751-4

see module list

Continued on following page

**L1 WEATHERIZATION TECHNICIAN**



**LEVEL 1**

**Curriculum Notes**

- 150 Hours
  - Includes 95 hours of *Fundamentals of Weatherization* which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$74.99, ISBN 978-0-13-237661-7
  - Published: 2010
  - Downloadable instructor resources are available.

**PAPERBACK** **ISBN**  
 Trainee Guide: \$74.99 **978-0-13-256957-6**

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Wood and Masonry Construction Methods

(12.5 Hours)

ISBN 978-0-13-257038-1

(Module ID **33102-10**; from *Electronic Systems Technician Level One*) Reviews the materials and techniques used in constructing and finishing residential and commercial buildings, including wood frame, brick and block, and post and beam. Covers common drills, bits, and techniques used to drill through wood and masonry. Also describes types of fasteners used with these materials.

### Thermal & Moisture Protection (7.5 Hours)

ISBN 978-0-13-257040-4

(Module ID **27203-07**; from *Carpentry Level Two, Fourth Edition*) Covers the selection and installation of various types of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for vapor barriers and waterproofing materials.

### Sealing the Building Envelope (25 Hours)

ISBN 978-0-13-256068-9

(Module ID 59102-10) Describes how to correct heat losses and gains by applying insulating materials to uninsulated areas of the building envelope. Describes how to reduce air infiltration by applying caulks and other materials. Also explains how to patch drywall and install weatherstripping.

### Insulating Pipes, Ducts, and Water Heaters

(10 Hours)

ISBN 978-0-13-256070-2

(Module ID 59103-10) Describes how to insulate water pipes and water heaters, and explains how to make simple duct system repairs, seal air leaks in a duct system, and insulate ducts to reduce heat loss.

**L2 WEATHERIZATION CREW CHIEF**

**LEVEL 2**

**Curriculum Notes**

- 162.5 Hours
- Published: 2011
- Downloadable instructor resources are available.

**PAPERBACK** **ISBN**  
 Trainee Guide: \$102.99 **978-0-13-257674-1**

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Concrete and Steel Construction Methods (12.5 Hours)

ISBN 978-0-13-266284-0

(Module ID 33103-10; from *Electronic Systems Technician Level One*) Describes the materials and techniques used in constructing and finishing residential and commercial buildings, including poured and prefabricated concrete and structural steel. Covers common drills, bits, and techniques used to drill through concrete and steel. Also describes types of fasteners used with these materials.

### Commercial Drawings (25 Hours)

ISBN 978-0-13-266285-7

(Module ID 27201-07; from *Carpentry Level Two, Fourth Edition*) Describes how to read and interpret a set of commercial drawings and specifications.

### Introduction to Supervisory Skills (15 Hours)

ISBN 978-0-13-266286-4

(Module ID 03410-09; from *HVAC Level Four, Third Edition*) Describes the skills that must be learned for the craftsman who plans to move into leadership roles. Introduces human resource criteria and concepts for the first time in the series.

### Introduction to Cooling (30 Hours)

ISBN 978-0-13-266287-1

(Module ID 03107-07; from *HVAC Level One, Third Edition*) Explains the fundamental operating concepts of the refrigeration cycle and identifies both primary and secondary components found in typical HVAC/R systems. Also introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Introduces basic control concepts for simple systems.

### Introduction to Heating (15 Hours)

ISBN 978-0-13-266288-8

(Module ID 03108-07; from *HVAC Level One, Third Edition*) Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service.

### Chimneys, Vents, and Flues (5 Hours)

ISBN 978-0-13-266292-5

(Module ID 03202-07; from *HVAC Level Two, Third Edition*) Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

### Air Distribution Systems (10 Hours)

ISBN 978-0-13-266291-8

(Module ID 03109-07; from *HVAC Level One, Third Edition*) Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

### Air Quality Equipment (5 Hours)

ISBN 978-0-13-266314-4

(Module ID 03204-07; from *HVAC Level Two, Third Edition*) Covers principles, processes, and devices used to control humidity and air cleanliness, as well as devices used to conserve energy in HVAC systems.

### Indoor Air Quality (15 Hours)

ISBN 978-0-13-266293-2

(Module ID 03403-09; from *HVAC Level Four, Third Edition*) Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

### Diagnostics and Management Practices

(30 Hours)

ISBN 978-0-13-266294-9

(Module ID 59201-10) Explains how to interpret energy audit reports and how to prioritize and schedule air sealing. Describes how to perform the following tests: blower door, pressure pan, burner efficiency, carbon monoxide, draft, and spillage. Also covers lead-safe work practices and how to perform quality inspections on completed work.

Continued on following page

L2 BUILDING AUDITOR	
LEVEL 2	
Curriculum Notes	
<ul style="list-style-type: none"> <li>• 172.5 Hours</li> <li>• Published: 2011</li> <li>• Downloadable instructor resources are available.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-257675-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Trade Mathematics (10 Hours)

ISBN 978-0-13-266307-6

(Module ID 03102-07; from HVAC Level One, Third Edition) Explains how to solve HVAC/R trade-related problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also includes a review of scientific notation, powers, roots, and basic algebra and geometry.

### Introduction to Cooling (30 Hours)

ISBN 978-0-13-266287-1

(Module ID 03107-07; from HVAC Level One, Third Edition) Explains the fundamental operating concepts of the refrigeration cycle and identifies both primary and secondary components found in typical HVAC/R systems. Also introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Introduces basic control concepts for simple systems.

### Introduction to Heating (15 Hours)

ISBN 978-0-13-266288-8

(Module ID 03108-07; from HVAC Level One, Third Edition) Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service.

### Chimneys, Vents, and Flues (5 Hours)

ISBN 978-0-13-266292-5

(Module ID 03202-07; from HVAC Level Two, Third Edition) Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

### Introduction to Hydronic Systems (10 Hours)

ISBN 978-0-13-266312-0

(Module ID 03203-07; from HVAC Level Two, Third Edition) Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems in residential applications.

### Heating and Cooling System Design (25 Hours)

ISBN 978-0-13-266311-3

(Module ID 03407-09; from HVAC Level Four, Third Edition) Identifies factors that affect heating and cooling loads. Explains the process by which heating and cooling loads are calculated, and how load calculations are used in the selection of heating and cooling equipment. Covers basic types of duct systems and their selection, sizing, and installation requirements.

### Energy Conservation Equipment (10 Hours)

ISBN 978-0-13-266290-1

(Module ID 03404-09; from HVAC Level Four, Third Edition) Covers heat recovery/reclaim devices, as well as other energy recovery equipment used to reduce energy consumption in HVAC systems.

### Indoor Air Quality (15 Hours)

ISBN 978-0-13-266293-2

(Module ID 03403-09; from HVAC Level Four, Third Edition) Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

### Alternative Heating and Cooling Systems (10 Hours)

ISBN 978-0-13-266316-8

(Module ID 03409-09; from HVAC Level Four, Third Edition) Describes alternative devices used to reduce energy consumption, including wood, coal, and pellet-fired systems, waste-oil heaters, geothermal heat pumps, solar heating, in-floor radiant heating, and direct-fired makeup units. Also introduces application-specific computer room environmental and air turnover systems.

### Performing a Building Audit (42.5 hours)

ISBN 978-0-13-266309-0

(Module ID 59202-10) Explains how to interview homeowners and educate them about saving energy in their homes. Explains how to inspect and evaluate the building envelope and HVAC systems. Describes how to perform the following tests: blower door, pressure pan, burner efficiency, carbon monoxide, draft, and spillage. Also covers lead-safe work practices, baseload energy use, and the purpose of the forms and reports a building auditor is responsible for completing.

## L1 WIND TURBINE MAINTENANCE TECHNICIAN

LEVEL 1



### Curriculum Notes

- Volume 1: 195 Hours
  - Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Volume 2: 110 Hours
- Published: 2011
- Downloadable instructor resources are available.
- *Introduction to Wind Energy* (Module ID 58101-11) has been approved for 15 general continuing education hours under GBCI's Credential Maintenance Program.

### PAPERBACK

ISBN

#### VOLUME 1

Trainee Guide: \$34.99

978-0-13-271895-0

#### VOLUME 2

Trainee Guide: \$34.99

978-0-13-271896-7

## VOLUME 1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to Wind Energy (15 Hours)

Trainee \$22

ISBN 978-0-13-215452-9

(Module ID 58101-11) Introduces the fundamentals of generating electrical power from wind energy. A brief history of wind energy is included as well as wind science, the interception of wind energy through a rotor, and an identification of major wind turbine generator components.

#### Introduction to Wind Turbine Safety (12.5 Hours)

ISBN 978-0-13-272945-1

(Module ID 58102-11) Introduces safety concerns of working inside the wind turbine and in the wind farm environment. Expands on earlier safety training and provides coverage of electrical arc flash safety.

#### Climbing Wind Towers (40 Hours)

ISBN 978-0-13-272946-8

(Module ID 58103-11) Covers all aspects of climbing wind turbine lattice towers and tubular towers. Discusses proper climbing equipment and equipment inspection, environmental hazards, proper climbing techniques, and common wind turbine safe climbing guidelines.

#### Introduction to Electrical Circuits (7.5 Hours)

ISBN 978-0-13-257810-3

(Module ID 26103-11; from *Electrical Level One, Seventh Edition*) Introduces electrical concepts used in Ohm's law applied to DC series circuits. Covers atomic theory, electromotive force, resistance, and electric power equations.

#### Electrical Theory (7.5 Hours)

ISBN 978-0-13-257811-0

(Module ID 26104-11; from *Electrical Level One, Seventh Edition*)

Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

#### Electrical Test Equipment (5 Hours)

ISBN 978-0-13-257820-2

(Module ID 26112-11; from *Electrical Level One, Seventh Edition*)

Covers proper selection, inspection, and use of common electrical test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, and data recording equipment. Also covers safety precautions and meter category ratings.

#### Electrical Wiring (10 Hours)

ISBN 978-0-13-272947-5

(Module ID 58104-11) Describes types and applications of conductors as well as their installation techniques. Also describes the technique and components used for terminating and splicing conductors.

## V2 VOLUME 2

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Alternating Current and Three-Phase Systems (17.5 Hours)

ISBN 978-0-13-272425-7

(Module ID 80201-11; from *Power Line Worker, Distribution Level Two*)

Introduces the development of both single- and three-phase alternating current. Analyzes the relationship of AC phases and introduces key components used to refine AC power. Discusses the operation of transformers and introduces advanced AC concepts such as reactive power and the power factor.

#### Circuit Breakers and Fuses (10 Hours)

ISBN 978-0-13-272948-2

(Module ID 58105-11) Explains the necessity of overcurrent protection and the way it is applied in the wind turbine environment. Explores the operation of common circuit breakers and the differences in various fuse types. Overcurrent device terminology is presented, along with a review of the information found on such devices.

#### Switching Devices (12.5 Hours)

ISBN 978-0-13-272950-5

(Module ID 58106-11) Provides coverage of switching devices related to the power distribution and control of wind turbines. Mechanical and solid-state relay types are presented, as well as typical wind turbine control wiring diagrams. Explains various time delay schemes and how they can be applied.

#### Wind Turbine Power Distribution Systems (12.5 Hours)

ISBN 978-0-13-272951-2

(Module ID 58107-11) Discusses the basics of power generation and the generators used in wind turbines. Reviews how power is distributed and controlled during various modes of wind turbine operation. Simple one-line diagrams are also covered.

#### Fasteners and Torquing (20 Hours)

ISBN 978-0-13-272952-9

(Module ID 58108-11) Presents comprehensive coverage of wind turbine fasteners and their required characteristics. Covers torque theory, torquing, tensioning, and hydraulic torquing equipment. Presents the use and care of all significant torquing and tensioning tools. The use of taps and dies is also introduced.

#### Introduction to Bearings (15 Hours)

ISBN 978-0-13-272954-3

(Module ID 32207-07; from *Industrial Maintenance Mechanic Level Two*)

Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Discusses bearing materials and designations.

#### Lubrication (12.5 Hours)

ISBN 978-0-13-272953-6

(Module ID 58109-11) Explores basic lubrication theory and related equipment. Includes the different applications and types of lubricants used in the wind turbine environment. Reviews OSHA's hazard communication program and the EPA's hazardous waste control program. Includes in-depth coverage of material safety data sheets.

#### Introduction to Hydraulic Systems (10 Hours)

ISBN 978-0-13-272957-4

(Module ID 58110-11) Covers all aspects of common hydraulic systems, including fluids, system components, and pumps.

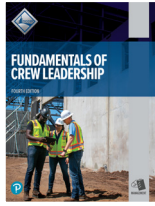
Presents the principles of hydraulic system operation and the related components. Simple hydraulic system maintenance is also introduced.



## Management Learning Series

The Management Learning Series provides companies with the tools to develop qualified management personnel. From *Fundamentals of Crew Leadership* to *Project Supervision* to *Project Management*, these programs provide an answer to the management shortage crisis impacting companies today and expected to continue for the foreseeable future.

## Fundamentals of Crew Leadership



22.5 Hours  
Module ID 46101

### PAPERBACK

Trainee Guide: \$49.99

NCCERconnect Access Card: \$49.99

NCCERconnect + Trainee Guide): \$79.99

### ISBN

**978-0-13-803097-1**

**978-0-13-803102-2**

**978-0-13-803100-8**

- Downloadable instructor resources are available.

While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

## PROJECT MANAGEMENT



### Curriculum Notes

- 115 Hours
- Updated in 2019.
- Downloadable instructor resources are available.

#### PAPERBACK

Participant Guide: \$102.99

#### ISBN

978-0-13-474426-1

### MODULES

The modules listed below are included in the Participant Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to Project Management (2.5 Hours)

ISBN 978-0-13-580436-0

(Module ID 44101) Introduces the role and responsibilities of project management, including technical and management skills. Presents an overview of the phases in a construction project and describes alternate project delivery methods.

#### Safety (15 Hours)

ISBN 978-0-13-580450-6

(Module ID 44102) Stresses the importance of job-site safety and identifies the project manager's duties and responsibilities regarding safety. Covers loss prevention and creating a zero-accident work environment. Presents several checklists as references.

#### Interpersonal Skills (12.5 Hours)

ISBN 978-0-13-580448-3

(Module ID 44103) Discusses the values and expectations of the workforce, building relationships, and satisfying stakeholders. Describes the principles of effective communication, applying the management grid, and using relationship skills to create a leadership environment. Discusses behavioral and non-discriminatory interviewing, and professional development of personnel. Covers issues surrounding disabled workers, sexual harassment, gender and minority discrimination, child labor laws, antitrust laws, and copyright infringement.

#### Issues and Resolutions (15 Hours)

ISBN 978-0-13-580432-2

(Module ID 44104) Describes the key elements of successful negotiations and negotiating techniques. Explains how to recognize nonverbal signals, use negotiating tools, and apply conflict resolution strategies. Identifies symptoms and barriers to solving project-related problems and applying problem-solving techniques, brainstorming, and identifying root cause consequences.

#### Construction Documents (10 Hours)

ISBN 978-0-13-580430-8

(Module ID 44105) Emphasizes the importance of documentation and explains the types of documents, drawings, and specifications used on a project, and the best practices regarding revisions, obsolete drawings, and safeguarding drawing sets. Explains methods of obtaining work in the industry and types of contracts and insurance requirements. Describes the change order process and the documents required to close out a project.

#### Construction Planning (10 Hours)

ISBN 978-0-13-580446-9

(Module ID 44106) Discusses the importance of formal job planning and creating a performance-based work environment. Discusses the Work Breakdown Structure (WBS) as the foundation that identifies deliverables, tasks, and time. Introduces the basics of quality control and defines the roles and responsibilities of an effective team and how to allocate resources.

#### Estimating and Cost Control (15 Hours)

ISBN 978-0-13-580428-5

(Module ID 44107) Emphasizes the importance of accurate estimating and summarizes the estimating process and the steps in developing an estimate, and the difference between parametric estimating and analogous estimating. Defines the purpose of a cost control methodology, explains how to perform simple cost analysis, and covers the project manager's role in controlling cost and tracking rework cost.

#### Scheduling (15 Hours)

ISBN 978-0-13-580437-7

(Module ID 44108) Explains the basics of scheduling from simple to-do lists through bar charts, network diagrams, and methods of managing resources. Discusses the importance of formal schedules, job planning, and establishing priorities. Describes alternative scheduling methods.

#### Resource Control (10 Hours)

ISBN 978-0-13-580445-2

(Module ID 44109) Identifies resources that must be controlled, factors that affect production control, and production control standards. Explains the project manager's role in the process. Defines production and productivity, and describes how to evaluate and improve production control and productivity.

#### Quality Control (5 Hours)

ISBN 978-0-13-580439-1

(Module ID 44110) Defines quality control and quality assurance, and stresses management's concerns about quality. Explains project quality management and how to develop an effective quality control plan. Discusses how to identify, assess, and measure weaknesses to avoid rework.

#### Continuous Improvement (5 Hours)

ISBN 978-0-13-580440-7

(Module ID 44111) Describes the project manager's role in creating a culture of continuous improvement. Explains the fundamentals of a continuous improvement program and how to identify the critical problems and processes that require improvement, implement a continuous improvement process, and measure results. Emphasizes the importance of satisfying internal and external stakeholders.

## PROJECT SUPERVISION

### Curriculum Notes

- 85 Hours
- Published: 2001

### PAPERBACK

Participant Guide: \$102.99

### ISBN

978-0-13-103595-9

## MODULES

The modules listed below are included in the Participant Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Job (5 Hours)

ISBN 978-0-13-103666-6

(Module ID MT201-01) Introduces the history of the construction industry and construction organization. Covers the phases of a construction project and the role and duties of the supervisor.

### Human Relations and Problem Solving

(20 Hours)

ISBN 978-0-13-103667-3

(Module ID MT202-01) Focuses on the communication process and developing effective communication and leadership skills. Compares problem solving to decision making. Discusses potential human relations difficulties and how to resolve them.

### Safety (7.5 Hours)

ISBN 978-0-13-103668-0

(Module ID MT203-01) Describes the supervisor's role in job-site safety, the true cost of accidents, and how to train and involve all employees in job safety. Includes OSHA safety inspections.

### Quality Control (5 Hours)

ISBN 978-0-13-103669-7

(Module ID MT204-01) Defines different types of quality control. Explains how to incorporate quality and safety through effective communication, document control, and inspections.

### Contract and Construction Documents (5 Hours)

ISBN 978-0-13-103670-3

(Module ID MT205-01) Teaches how to understand and interpret construction drawings, technical specifications, and as-built drawings. Includes different types of bidding, contracts, change orders, closeout documents, and more.

### Document Control and Estimating (10 Hours)

ISBN 978-0-13-103671-0

(Module ID MT206-01) Provides an introduction to using and maintaining document control. Defines the elements of material, labor, and equipment estimates and how to develop, organize, and look for errors in an estimate.

### Planning and Scheduling (17.5 Hours)

ISBN 978-0-13-103673-4

(Module ID MT207-01) Introduces stages of planning, how to implement a plan, and how to coordinate with other contractors. Includes planning resources, materials, equipment, tools, and labor. Discusses short- and long-term schedules.

### Resource Control and Cost Awareness (15 Hours)

ISBN 978-0-13-103674-1

(Module ID MT208-01) Explains how to measure job-site productivity and how to increase it. Discusses resources, materials, tools, equipment, labor, quality, and cost and resource control. Introduces cost awareness and types of reports.

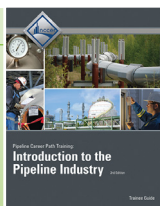
## Sustainable Construction Supervisor

*Sustainable Construction Supervisor* has been developed to instruct construction managers on sustainable construction management, the LEED rating system as it would apply to oversight of their projects and crews, and how to supervise and train their subcontractors and crews so that LEED points aren't unintentionally sacrificed.

This module is published in full color and is competency-based. An assessment is also available.

# Introduction to the Pipeline Industry

## INTRODUCTION TO THE PIPELINE INDUSTRY



### Curriculum Notes

- 175 Hours (includes Core)
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$104.99

### ISBN

978-0-13-480566-5

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to the Pipeline Industry (15 Hours)

ISBN 978-0-13-038223-8

(Module ID 66101-02) Introduces the pipeline industry, including pipeline products and flow paths, maps and drawings used in the industry, and basic pipeline operations. Also covers hydraulics, pipeline equipment, electrical power systems, and corrosion control. Regulations, documentation, and pipeline industry occupations are also described.

### Tools of the Trade (7.5 Hours)

ISBN 978-0-13-415137-3

(Module ID 62104-02) Explains use and care of hand and power tools used in the pipeline industry. Describes the use of welding equipment and meters and testers. Also discusses nondestructive testing and the uses of hydraulic cranes and heavy excavating equipment.

### Pipeline Documentation (5 Hours)

ISBN 978-0-13-415138-0

(Module ID 62105-02) Identifies alignment sheets used in the pipeline industry including maps, P&IDs, and electrical drawings. Also describes the types of documentation and document management required in the industry.

### Basic Pipeline Pneumatics and Equipment

(10 Hours)

ISBN 978-0-13-038244-3

(Module ID 67102-02) Introduces the basics of pneumatic equipment. Topics include pneumatic safety and the physical characteristics of gas. A discussion of compressors, valves, meters, and other pipeline equipment and an overview on pipeline design also are included.

### Basic Pipeline Hydraulics and Equipment

(10 Hours)

ISBN 978-0-13-038226-9

(Module ID 60102-02) Explains pipeline hydraulics safety, basic principles of hydraulic systems, hydraulic properties of petroleum products, pipeline design factors, and basic pipeline equipment.

### Pipeline Communications (7.5 Hours)

ISBN 978-0-13-038227-6

(Module ID 60103-02) Introduces channels of communications that must exist in pipeline operations, including internal communications with scheduling, operations, and maintenance; and external communications with contractors, the general public, regulatory agencies, and local, state, and federal government.

### Pipeline Operations (40 Hours)

ISBN 978-0-13-038370-9

(Module ID 64106-02) Describes pipeline system hydraulics and ASME ratings and standards. Discusses station control systems and recognizing and responding to AOCs. Also covers pigging operations and proving process meters.

### Release Identification and Response (5 Hours)

ISBN 978-0-13-415136-6

(Module ID 62103-02) Describes company environmental manuals and the DNR and EPA regulations. Explains the NRC and Coast Guard responsibilities and spill prevention. Covers soil contamination, release reporting and containment, hydrostatic testing, flaring/venting, and trash handling.

## Abnormal Operating Conditions Field and Gas



5 Hours  
Revised: 2017, Third Edition  
Module ID AOCFG-17

Trainee

ISBN 978-0-13-472784-4

Print: \$24.99

Digital also available through VitalSource:

- For information on how to order through VitalSource, visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program).

Provides an overview of the types of abnormal operating conditions (AOCs) that may occur on the pipeline or in company facilities. Appropriate responses to AOCs are covered with a focus on following company policy to protect lives and pipeline equipment. Also covered are the reports required by federal law.

or

## Abnormal Operating Conditions Control Center



5 Hours  
Revised: 2017, Third Edition  
Module ID AOCCC-17

Trainee

ISBN 978-0-13-472782-0

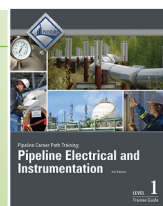
Print: \$24.99

Digital also available through VitalSource:

- For information on how to order through VitalSource, visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program).

Introduces the abnormal operating conditions that can occur on a pipeline or in a pipeline facility. Explains how to recognize and react to abnormal operating conditions from the control center and the necessary documentation and notifications that must be completed when responding to these conditions.

## L1 PIPELINE ELECTRICAL AND INSTRUMENTATION



LEVEL 1

### Curriculum Notes

- Volume 1: 272.5 Hours
- Volume 2: 240 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

ISBN

#### VOLUME 1

Trainee Guide: \$104.99

978-0-13-480564-1

#### VOLUME 2

Trainee Guide: \$104.99

978-0-13-480565-8

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## V1 VOLUME 1

### Pipeline E&I Safety (15 Hours)

ISBN 978-0-13-038376-1

(Module ID 64102-02) Describes the types and uses of personal protective equipment and covers hazard communications. Covers lockout/tagout and MSDS requirements; safety rules, regulations, and tools; and worksite hazards.

### Trade Math (40 Hours)

ISBN 978-0-13-038377-8

(Module ID 64103-02) Presents instrumentation formulas and equations. Explains how to calculate load and ampacity, and perform pipeline-specific E&I calculations. Also provides a description of conductors.

### Electrical Theory (40 Hours)

ISBN 978-0-13-038378-5

(Module ID 64104-02) Introduces the electrical concepts used in Ohm's law as applied to DC series circuits. Discusses atomic theory, electromotive force, resistance, and electric power equations. Also introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

### Tools of the Trade (15 Hours)

ISBN 978-0-13-038379-2

(Module ID 64105-02) Identifies hand tools used in the pipeline E&I trade. Also explains trade-specific power tools, test equipment, and communication equipment.

### Pipeline E&I Drawings (30 Hours)

ISBN 978-0-13-038382-2

(Module ID 64107-02) Identifies drawing classifications and written specifications. Describes the uses of electrical drawings and piping and instrumentation drawings. Also covers special drawings and documentation as well as pipeline maps and alignment sheets.

### Understanding the National Electrical Code®

(7.5 Hours)

ISBN 978-0-13-038383-9

(Module ID 64108-02) Provides a map for using the NEC®. Introduces the layout and the types of information found within the code book. Presents an easy-to-follow procedure for finding information in the NEC®.

### Fasteners and Anchors (7.5 Hours)

ISBN 978-0-13-038384-6

(Module ID 64109-02) Introduces hardware and systems used to mount and support boxes, receptacles, and other electrical components. Covers types of anchors and supports, their applications, and their safe installation.

### Electrical Installations in Classified Areas

(40 Hours)

ISBN 978-0-13-038393-8

(Module ID 64201-02) Explains Class I, II, III, and IV pipeline areas. Describes intrinsically safe devices and systems and their ratings. Also covers allowable conduits and fittings, and explosion-proof enclosures. Explains safe work practices in classified areas, including barriers, PPE, monitoring requirements, and gas detectors.

### Use of Meters and Test Equipment (15 Hours)

ISBN 978-0-13-038394-5

(Module ID 64202-02) Explains general, personal, and test equipment for E&I safety. Covers measuring current, voltage, and resistance and the types of meters used. Includes specialty instruments such as calibrators, simulators, and gauges. Includes sections on oscilloscope operation, waveform characteristics, and measurement techniques.

### Grounding (30 Hours)

ISBN 978-0-13-038395-2

(Module ID 64203-02) Explains grounding basics, system types, NEC® requirements, equipment grounding, and how to bond service equipment. Includes discussion of effective grounding paths, conductors, separately derived systems, grounding at more than one building, and systems over 1,000 volts. Describes how to test grounding and measure earth resistance, three-point testing, and tank grounding.

## V2 VOLUME 2

### Process Control Theory (40 Hours)

ISBN 978-0-13-038396-9

(Module ID 64204-02) Explains process characteristics and control systems. Describes control loop components and control loops and modes. Discusses types of control applications, including temperature, pressure, flow, and level control.

### Supervisory Control Systems (15 Hours)

ISBN 978-0-13-038397-6

(Module ID 64205-02) Explains pipeline supervisory control systems, PLCs, HMIs, and RTUs. Describes data highways and protocols, including data transfer methods, and SCADA-related communications, including transfer media, wireless radios, and Ethernet, and transmission and interface methods.

### Transformers (25 Hours)

ISBN 978-0-13-103140-1

(Module ID 64301-02) Describes power systems and explains transformer construction, taps, installation requirements, and connections. Describes power distribution, instruments, control, and isolation transformer types. Also covers transformer maintenance and testing.

### Switchgear and MCCs (25 Hours)

ISBN 978-0-13-103141-8

(Module ID 64302-02) Explains power factor and medium versus low-voltage cable and MCCs. Describes types of switchgear and cables, feeders, bussing, and bracing. Includes testing and maintenance on switchgear and MCCs and associated components.

### Low-Voltage and Standby Power (25 Hours)

ISBN 978-0-13-103142-5

(Module ID 64303-02) Explains pipeline system standby generators, batteries, chargers, inverters, converters, and rotary and static UPSs. Also addresses the maintenance and testing of each.

### Power Quality (25 Hours)

ISBN 978-0-13-103143-2

(Module ID 64304-02) Explains power quality and types of defects, power systems, protection, and conditioning equipment. Discusses types of electrical noise and related problems, and possible solutions. Describes static electricity and its effect, system verification testing, and equipment maintenance.

### Prime Movers (32.5 Hours)

ISBN 978-0-13-103145-6

(Module ID 64305-02) Describes various electric motors and drives and their components. Discusses their maintenance and testing. Explains engine types, cooling and lubrication systems, turbine operation, fuel sources, and controls.

### Facility Auxiliary Systems (22.5 Hours)

ISBN 978-0-13-103146-3

(Module ID 64306-02) Includes information on pipeline facility buildings and related systems, including fire, security, vapor recovery, injection, water treatment, cathodic protection, and blending systems.

### SCADA (30 Hours)

ISBN 978-0-13-103147-0

(Module ID 64307-02) Explains pipeline operations systems, including control, communications, SCADA, and PLCs. Explains redundant systems and control system troubleshooting.

Continued on following page



## L2 PIPELINE ELECTRICAL AND INSTRUMENTATION

### LEVEL 2

#### Curriculum Notes

- 122.5 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.
- Available as print on demand
- To purchase individual covered task modules, please visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program)

#### PAPERBACK

Trainee Guide: \$104.99

#### ISBN

978-0-13-471650-3

#### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Abnormal Operating Conditions - Control Center (5 Hours)

ISBN 978-0-13-472782-0

(Module ID AOCCC-17) Introduces the abnormal operating conditions that can occur on a pipeline or in a pipeline facility. Explains how to recognize and react to abnormal operating conditions from the control center and the necessary documentation and notifications that must be completed when responding to these conditions.

#### Abnormal Operating Conditions - Field and Gas (5 Hours)

ISBN 978-0-13-472784-4

(Module ID AOFCG-17) Provides an overview of the types of abnormal operating conditions (AOCs) that may occur on the pipeline or in company facilities. Appropriate responses to AOCs are covered with a focus on following company policy to protect lives and pipeline equipment. Also covered are the reports required by federal law.

#### Inspect, Test and Calibrate Pressure Switches (7.5 Hours)

ISBN 978-0-13-471694-7

(Module ID CT25\_1-17)

#### Inspect, Test and Calibrate Pressure Transmitters (7.5 Hours)

ISBN 978-0-13-471696-1

(Module ID CT25\_2-17)

#### Verify or Set Protection Parameters for Programmable Controllers and/or Other Instrumentation Control Loops (15 Hours)

ISBN 978-0-13-470632-0

(Module ID CT26\_0-17)

#### Test Overfill Protective Devices (5 Hours)

ISBN 978-0-13-470636-8

(Module ID CT30\_0-17)

#### Inspect and Calibrate Overfill Protective Devices (7.5 Hours)

ISBN 978-0-13-470637-5

(Module ID CT31\_0-17)

#### Inspect, Test, and Maintain Flow Computer for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470640-5

(Module ID CT44\_3-17)

#### Inspection, Testing, and Perform Corrective and Preventative Maintenance of Tank Gauging for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470643-6

(Module ID CT44\_4-17)

#### Prove Flow Meters for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470644-3

(Module ID CT44\_5-17)

#### Maintain Flow Meters for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470652-8

(Module ID CT44\_6-17)

#### Inspect, Test and Maintain Gravimeters/Densitometers for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470648-1

(Module ID CT44\_7-17)

#### Inspect, Test and Maintain Temperature Transmitters for Hazardous Liquid Leak Detection (7.5 Hours)

ISBN 978-0-13-470653-5

(Module ID CT44\_8-17)

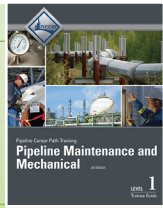
#### Maintain Fixed Gas Detection Equipment (25 Hours)

ISBN 978-0-13-470656-6

(Module ID CT55\_0-17)

# Pipeline Maintenance and Mechanical

## L1 PIPELINE MAINTENANCE AND MECHANICAL



LEVEL 1

### Curriculum Notes

- Volume 1: 140 Hours
- Volume 2: 205 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.

#### PAPERBACK

ISBN

#### VOLUME 1

Trainee Guide: \$104.99

978-0-13-480568-9

#### VOLUME 2

Trainee Guide: \$104.99

978-0-13-480569-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### VOLUME 1

#### Pipeline Mechanic Hand and Power Tools

(10 Hours)

ISBN 978-0-13-038336-5

(Module ID 63103-02) Introduces hand and power tools used to maintain and install pipeline equipment. Discusses tool safety and procedures for selecting, inspecting, using, and maintaining the tools.

#### Piping and Mechanical Blueprint Reading

(15 Hours)

ISBN 978-0-13-038337-2

(Module ID 63104-02) Explains how to read plot plans, P&IDs, piping isometric drawings, detail sheets, and machine drawings. Describes common components and symbols used in various drawings.

#### Tubing, Threaded Pipe, and Hoses

(30 Hours)

ISBN 978-0-13-038338-9

(Module ID 63105-02) Introduces a variety of tubing, tubing materials, tools, and work practices used in the pipeline industry. Identifies the materials used in threaded piping systems. Describes the types and uses of screwed fittings.

#### Fasteners

(10 Hours)

ISBN 978-0-13-038339-6

(Module ID 63106-02) Covers installation procedures for threaded, nonthreaded, and insulation fasteners used in the pipeline industry.

#### Identify Types of Valve Actuators/Operators

(15 Hours)

ISBN 978-0-13-038341-9

(Module ID 63108-02) Identifies types of manual, electric, hydraulic, and pneumatic valve actuators used in the pipeline industry. Covers storage and handling, installation, and preventive maintenance procedures for these actuators.

#### Installing Seals and Gaskets

(10 Hours)

ISBN 978-0-13-038342-6

(Module ID 63109-02) Covers the applications, removal procedures, and installation procedures for dynamic and static seals and O-rings. Also identifies gaskets and gasket materials and explains the procedures for laying out, cutting, and installing gaskets.

#### Introduction to Pneumatic Systems

(10 Hours)

ISBN 978-0-13-038351-8

(Module ID 63201-02) Discusses pneumatic system safety, characteristics of gases and how they are compressed, pneumatic transmission of energy, and compressor operation.

#### Introduction to Hydraulic Systems

(10 Hours)

ISBN 978-0-13-038352-5

(Module ID 63202-02) Discusses hydraulic system safety and the basic principles of hydraulics, including Pascal's law and Bernoulli's principle. Explains the function of fluids, parts, pumps, and motors.

#### Specialty and Precision Tools

(15 Hours)

ISBN 978-0-13-038353-2

(Module ID 63203-02) Introduces specialty tools and precision measuring tools and explains how to select, inspect, use, and care for these tools.

#### Introduction to Metering Devices and Provers

(10 Hours)

ISBN 978-0-13-038357-0

(Module ID 63206-02) Identifies and explains the use of pipeline meters including positive displacement, turbine, ultrasonic, mass-flow, vortex, and orifice. Identifies and explains the use of provers including tank provers, traditional pipe provers, and small volume pipe provers.

#### Introduction to Pumps

(10 Hours)

ISBN 978-0-13-038358-7

(Module ID 63207-02) Identifies main-line and feeder line pumps including centrifugal, rotary, reciprocating, and metering pumps. Explains net positive suction head and cavitation. Outlines general procedures for pump installation.

#### Introduction to Gas Compressors

(10 Hours)

ISBN 978-0-13-038359-4

(Module ID 63208-02) Identifies gas compressors used in the transmission of gas through pipelines. Also explains the function and operation of compressors and identifies the auxiliary equipment used with compressors.

### General Maintenance and Winterizing Pipeline Equipment

(7.5 Hours)

ISBN 978-0-13-103156-2

(Module ID 62301-02) Explains preventive and predictive maintenance and general maintenance on rotating machinery. Discusses gas compressors and maintaining pumps and prime movers.

#### VOLUME 2

#### Tank Repair

(40 Hours)

ISBN 978-0-13-103162-3

(Module ID 62307-02) Explains complete tank repair, including flange tightening, nondestructive testing, electrically insulated fittings and flanges, welding, bottom repair, bottom replacement, moving, arc burn and weld repair, roof installation, shell plate replacement, aluminum and steel floating roof demolition, building a floating roof, floating roof in-service seal replacement, and nozzles, manways, and sumps.

#### Install and Maintain Bearings

(15 Hours)

ISBN 978-0-13-038350-1

(Module ID 63209-02) Identifies friction and antifriction bearings, bearing materials, and bearing designation. Gives procedures to remove, troubleshoot, and install bearings.

#### Install Mechanical Seals

(20 Hours)

ISBN 978-0-13-038361-7

(Module ID 63210-02) Explains the function and advantages of mechanical seals. Identifies parts and types of mechanical seals. Includes procedures for removing, inspecting, and installing mechanical seals.

#### Maintain and Repair Drivers

(15 Hours)

ISBN 978-0-13-038362-4

(Module ID 63211-02) Identifies types of drivers that provide power to rotating equipment on pipelines. Explains how to inspect and replace drivers, replace bearings and seals, and perform preventive maintenance.

#### Install Rotating Equipment

(25 Hours)

ISBN 978-0-13-103178-4

(Module ID 63301-02) Identifies inspection requirements for an equipment pad, requirements for equipment base preparation, and procedures for inspecting equipment prior to installation. Also explains how to prepare equipment prior to installation, the installation process for rotating equipment, and the procedures used to relieve pipe stress from rotating equipment.

#### Unit Alignment

(40 Hours)

ISBN 978-0-13-103179-1

(Module ID 63302-02) Describes types of equipment misalignment and how to identify and correct them. Explains how to perform conventional, rim and face indicator, reverse dial indicator, and laser alignments. Also identifies other laser alignment procedures that may be completed on the machinery trains depending on equipment needs.

Continued on following page

### **Vibration Analysis** (5 Hours)

**ISBN 978-0-13-103180-7**

(Module ID 63303-02) Covers common causes of vibration and how to minimize them. Includes vibration monitoring techniques, vibration analysis techniques, vibration test equipment, and how to field balance machines.

### **Maintain, Troubleshoot, and Repair Pumps** (10 Hours)

**ISBN 978-0-13-103181-4**

(Module ID 63304-02) Identifies the preventive maintenance requirements, inspection requirements, and common troubleshooting techniques for pumps used in the pipeline industry. Also gives general guidelines for preparing a pump for shutdown, removing a pump from a pipeline system, disassembling a pump, installing the pump after the pump has been reassembled, and preparing the pump for startup and operational check after maintenance or repair has been completed.

### **Maintain, Troubleshoot, and Repair Gas Compressors** (15 Hours)

**ISBN 978-0-13-103182-1**

(Module ID 63305-02) Identifies the typical lubrication system components, preventive maintenance requirements, and common troubleshooting techniques for a gas compressor. Also gives general guidelines for preparing a gas compressor for shutdown and repair, isolating a gas compressor from a pipeline system, repairing rotary and reciprocating gas compressors, and preparing a gas compressor for startup and operational check after maintenance has been completed.

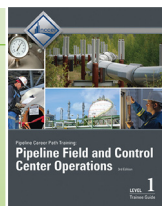
### **Maintain, Troubleshoot, and Repair Metering Devices and Provers** (20 Hours)

**ISBN 978-0-13-103187-6**

(Module ID 63309-02) Explains how to inspect, maintain, and repair metering devices and prover systems. Also describes the waterdraw calibration procedures used to calibrate and verify the reliability of prover systems.

# Pipeline Field and Control Center Operations

## L1 PIPELINE FIELD AND CONTROL CENTER OPERATIONS



LEVEL 1

### Curriculum Notes

- 115 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$104.99

### ISBN

978-0-13-480570-2

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Quality Control and Measurement (20 Hours)

ISBN 978-0-13-038240-5

(Module ID 67106-02) Focuses on the importance of quality control and accurate measurement as they affect safety, customer service, and the company's reputation. Topics include taking samples, performing product testing, and product testing and measurement tools.

### Product Batch and Pig Tracking (10 Hours)

ISBN 978-0-13-038228-3

(Module ID 60104-02) Describes how to track pipeline product line inventories; handle scheduled pipeline shipments; identify product interface changes; and launch, receive, and track pigs through the pipeline and facility.

### Field Quality Control (15 Hours)

ISBN 978-0-13-038231-3

(Module ID 60107-02) Introduces field quality control procedures including activation of tank mixing devices, collection of product samples, product testing, pipeline switching, product blending operations, and injection of appropriate additives.

### Field Measurement (20 Hours)

ISBN 978-0-13-038232-0

(Module ID 60108-02) Introduces techniques used in field measurement of products in the pipeline, including measurement components, types of meters, measurement of custody transfers and receipts, verification of meter accuracy, waterdraw calibration techniques, and utilization of tank strappings.

### Liquid Pipeline Measurement and Quality Control (20 Hours)

ISBN 978-0-13-038264-1

(Module ID 65107-02) Explains how to activate tank mixing devices, perform product testing, and perform pipeline grade changes and tank capacity operations. Also explains how to use and inject appropriate additives, identify types of meters, maintain accurate measurement on all custody receipts, and the processes and techniques used to prove meters.

### SCADA (30 Hours)

ISBN 978-0-13-103147-0

(Module ID 64307-02) Explains pipeline operations systems, including control, communications, SCADA, and PLCs. Explains redundant systems and control system troubleshooting.

## L2 PIPELINE OPERATIONS (CONTROL CENTER/GAS/LIQUID)

LEVEL 2

### Curriculum Notes

- 110 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.
- Available as print on demand
- To purchase individual covered task modules, please visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program)

### PAPERBACK

Trainee Guide: \$104.99

### ISBN

978-0-13-472539-0

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Abnormal Operating Conditions - Control Center (5 Hours)

ISBN 978-0-13-472782-0

(Module ID AOCCC-17) Introduces the abnormal operating conditions that can occur on a pipeline or in a pipeline facility. Explains how to recognize and react to abnormal operating conditions from the control center and the necessary documentation and notifications that must be completed when responding to these conditions.

### Abnormal Operating Conditions - Field and Gas (5 Hours)

ISBN 978-0-13-472784-4

(Module ID AOCFG-17) Provides an overview of the types of abnormal operating conditions (AOCs) that may occur on the pipeline or in company facilities. Appropriate responses to AOCs are covered with a focus on following company policy to protect lives and pipeline equipment. Also covered are the reports required by federal law.

### Purge Gas from a Pipeline (5 Hours)

ISBN 978-0-13-472786-8

(Module ID CT50\_0-17)

### Purge Air from a Gas Pipeline (5 Hours)

ISBN 978-0-13-472789-9

(Module ID CT51\_0-17)

### Test Remotely Controlled Shutdown Devices (5 Hours)

ISBN 978-0-13-472790-5

(Module ID CT54\_0-17)

### Perform Incremental Pressure Increases to Uprate the MAOP (5 Hours)

ISBN 978-0-13-472791-2

(Module ID CT56\_0-17)

### Operate Odorant Equipment (5 Hours)

ISBN 978-0-13-472795-0

(Module ID CT57\_0-17)

### Monitor Odorant Level (5 Hours)

ISBN 978-0-13-472798-1

(Module ID CT58\_0-17)

### Start-up of a Liquid Pipeline (Field) (5 Hours)

ISBN 978-0-13-472800-1

(Module ID CT63\_1-17)

### Shutdown of a Liquid Pipeline (Field) (5 Hours)

ISBN 978-0-13-472801-8

(Module ID CT63\_2-17)

### Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Field) (15 Hours)

ISBN 978-0-13-472803-2

(Module ID CT63\_3-17)

### Locally Operate Valves on a Liquid Pipeline System (5 Hours)

ISBN 978-0-13-472806-3

(Module ID CT63\_4-17)

### Start-up of a Liquid Pipeline (Control Center) (5 Hours)

ISBN 978-0-13-472809-4

(Module ID CT64\_1-17)

### Shutdown of a Liquid Pipeline (Control Center) (5 Hours)

ISBN 978-0-13-472811-7

(Module ID CT64\_2-17)

### Monitor Pressures, Flows, Communications, and Line Integrity and Maintain Them Within Allowable Limits on a Liquid Pipeline System (Control Center) (5 Hours)

ISBN 978-0-13-472814-8

(Module ID CT64\_3-17)

### Remotely Operate Valves on a Liquid Pipeline System (5 Hours)

ISBN 978-0-13-472816-2

(Module ID CT64\_4-17)

Continued on following page

## Pipeline Operations (Control Center/Gas/Liquid) (continued)

### **Start-up of a Gas Pipeline** *(5 Hours)*

ISBN 978-0-13-472818-6

(Module ID CT65\_1-17)

### **Shutdown of a Gas Pipeline** *(5 Hours)*

ISBN 978-0-13-472821-6

(Module ID CT65\_2-17)

### **Monitor Pressures, Flows, Communications and Line Integrity and Maintain Them Within Allowable Limits (Gas)** *(5 Hours)*

ISBN 978-0-13-472823-0

(Module ID CT65\_3-17)

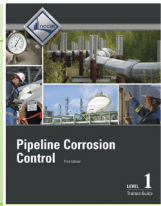
### **Manually or Remotely Open or Close Valves or Other Equipment** *(5 Hours)*

ISBN 978-0-13-472825-4

(Module ID CT65\_4-17)

# Pipeline Corrosion Control

## L1 PIPELINE CORROSION CONTROL



LEVEL 1

### Curriculum Notes

- 105 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.
- Available as print on demand
- To purchase individual covered task Modules, please visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program)

### PAPERBACK

Trainee Guide: \$104.99

### ISBN

978-0-13-470520-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Abnormal Operating Conditions - Control Center (5 Hours)

ISBN 978-0-13-472782-0

(Module ID AOCCC-17) Introduces the abnormal operating conditions that can occur on a pipeline or in a pipeline facility. Explains how to recognize and react to abnormal operating conditions from the control center and the necessary documentation and notifications that must be completed when responding to these conditions.

#### Abnormal Operating Conditions - Field and Gas (5 Hours)

ISBN 978-0-13-472784-4

(Module ID AOFCG-17) Provides an overview of the types of abnormal operating conditions (AOCs) that may occur on the pipeline or in company facilities. Appropriate responses to AOCs are covered with a focus on following company policy to protect lives and pipeline equipment. Also covered are the reports required by federal law.

#### Verify Test Lead Continuity (5 Hours)

ISBN 978-0-13-472094-4

(Module ID CT2\_1-17)

#### Repair Damaged Test Leads (5 Hours)

ISBN 978-0-13-472091-3

(Module ID CT2\_2-17)

#### Install Test Leads by Non-Exothermic Welding Methods (5 Hours)

ISBN 978-0-13-472089-0

(Module ID CT2\_3-17)

#### Install Test Leads by Exothermic Welding Methods (5 Hours)

ISBN 978-0-13-472087-6

(Module ID CT2\_4-17)

#### Obtain a Voltage and Current Output Reading from a Rectifier to Verify Proper Performance (5 Hours)

ISBN 978-0-13-472086-9

(Module ID CT3\_0-17)

#### Troubleshoot Rectifier (5 Hours)

ISBN 978-0-13-472083-8

(Module ID CT4\_1-17)

#### Repair or Replace Defective Rectifier Components (5 Hours)

ISBN 978-0-13-472081-4

(Module ID CT4\_2-17)

#### Adjustment of Rectifier (5 Hours)

ISBN 978-0-13-472080-7

(Module ID CT4\_3-17)

#### Examine for Mechanical Damage on Buried or Submerged Pipe (5 Hours)

ISBN 978-0-13-472076-0

(Module ID CT5\_1-17)

#### Examine for External Corrosion on Buried or Submerged Pipe (5 Hours)

ISBN 978-0-13-472074-6

(Module ID CT5\_2-17)

#### Inspect the Condition of External Coating on Buried or Submerged Pipe (5 Hours)

ISBN 978-0-13-472072-2

(Module ID CT5\_3-17)

#### Visual Inspection of Atmospheric Coatings (5 Hours)

ISBN 978-0-13-472070-8

(Module ID CT7\_1-17)

#### Prepare Surface for Atmospheric Coating Using Hand and Power Tools (5 Hours)

ISBN 978-0-13-472067-8

(Module ID CT7\_2-17)

#### Prepare Surface for Coating by Abrasive Water Blasting (5 Hours)

ISBN 978-0-13-472065-4

(Module ID CT7\_3-17)

#### Prepare Surface for Coating by Abrasive Blasting Media Other Than Water (5 Hours)

ISBN 978-0-13-472063-0

(Module ID CT7\_4-17)

#### Apply Coating Using Hand Application Methods (5 Hours)

ISBN 978-0-13-472059-3

(Module ID CT7\_5-17)

#### Apply Coating Using Spray Application (5 Hours)

ISBN 978-0-13-472060-9

(Module ID CT7\_6-17)

#### Perform Coating Inspection (5 Hours)

ISBN 978-0-13-471021-1

(Module ID CT7\_7-17)

#### Visually Inspect Internal Pipe Surface (5 Hours)

ISBN 978-0-13-472096-8

(Module ID CT12\_0-17)

## L2 PIPELINE CORROSION CONTROL

LEVEL 2

### Curriculum Notes

- 90 Hours
- Revised: 2017, Third Edition
- Downloadable instructor resources are available.
- Available as print on demand
- To purchase individual covered task modules, please visit [www.nccer.org/pipeline-program](http://www.nccer.org/pipeline-program)

### PAPERBACK

Trainee Guide: \$104.99

### ISBN

978-0-13-471651-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Abnormal Operating Conditions - Field and Gas (5 Hours)

ISBN 978-0-13-472784-4

(Module ID AOFCG-17)

#### Measure Structure-to-Soil Potentials (5 Hours)

ISBN 978-0-13-471023-5

(Module ID CT1\_1-17)

#### Conduct Close Interval Survey (5 Hours)

ISBN 978-0-13-471024-2

(Module ID CT1\_2-17)

#### Test and Detect Interference (5 Hours)

ISBN 978-0-13-471026-6

(Module ID CT1\_3-17)

#### Inspect and Perform Electrical Test of Bonds (5 Hours)

ISBN 978-0-13-471028-0

(Module ID CT1\_4-17)

#### Inspect and Test Electrical Isolation (5 Hours)

ISBN 978-0-13-471030-3

(Module ID CT1\_5-17)

#### Measure Pit Depth with Pit Gauge (5 Hours)

ISBN 978-0-13-471040-2

(Module ID CT8\_1-17)

Continued on following page



## Pipeline Corrosion Control Level 2 (continued)

### **Measure Wall Thickness with Ultrasonic Meter**

*(5 Hours)*

ISBN 978-0-13-471042-6

(Module ID CT8\_2-17)

### **Measure Corroded Area** *(5 Hours)*

ISBN 978-0-13-471044-0

(Module ID CT8\_3-17)

### **Install Bonds** *(5 Hours)*

ISBN 978-0-13-471045-7

(Module ID CT9\_1-17)

### **Install Galvanic Anodes** *(5 Hours)*

ISBN 978-0-13-472108-8

(Module ID CT9\_2-17)

### **Install Rectifiers** *(5 Hours)*

ISBN 978-0-13-472110-1

(Module ID CT9\_3-17)

### **Install Impressed Current Groundbeds** *(5 Hours)*

ISBN 978-0-13-472116-3

(Module ID CT9\_4-17)

### **Repair Shorted Casings** *(5 Hours)*

ISBN 978-0-13-472114-9

(Module ID CT9\_5-17)

### **Install Electrical Insulating Device** *(5 Hours)*

ISBN 978-0-13-472117-0

(Module ID CT9\_6-17)

### **Insert and Remove Coupons** *(5 Hours)*

ISBN 978-0-13-471033-4

(Module ID CT10\_1-17)

### **Monitor Probes (Online)** *(5 Hours)*

ISBN 978-0-13-471034-1

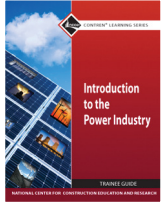
(Module ID CT10\_2-17)

### **Monitoring and Controlling the Injection Rate of the Corrosion Inhibitor** *(5 Hours)*

ISBN 978-0-13-471037-2

(Module ID CT11\_0-17)

## Introduction to the Power Industry



12.5 Hours  
Published: 2010  
Module ID 49101-10

### PAPERBACK

Trainee Guide: \$24.99

### ISBN

978-0-13-215413-0

- Downloadable instructor resources are available.

This module sets the stage for trainees entering the electrical energy production and distribution field. It describes the many ways in which electricity can be produced, from burning fossil fuels such as coal and natural gas, to harnessing nuclear energy, and using renewable energy sources such as wind, geothermal, and solar energy.

## POWER INDUSTRY FUNDAMENTALS



### Curriculum Notes

- 97.5 Hours
- Published: 2010
- The Trainee Guide is shrinkwrapped with *Core* and the *Introduction to the Power Industry* module.
- Prerequisite for *Power Generation*, *Power Line Worker*, and *Wind Turbine Maintenance Technician* programs.
- Basic Rigging (Module ID 00106-09 or 00106-15) is required to complete *Power Industry Fundamentals*.
- Either 2009 or 2015 *Core* can be used for the *Power Industry Fundamentals* package.

### PAPERBACK

Trainee Guide: \$79.99

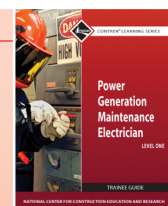
### ISBN

978-0-13-466829-1

# Power Generation Maintenance Electrician

## L1 POWER GENERATION MAINTENANCE ELECTRICIAN

### LEVEL 1



#### Curriculum Notes

- 232.5 Hours
  - Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Published: 2010
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-215421-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Tools of the Trade (5 Hours)

ISBN 978-0-13-614613-1

(Module ID 40102-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

#### Fasteners and Anchors (5 Hours)

ISBN 978-0-13-614614-8

(Module ID 40103-07; from *Industrial Maintenance E&I Technician Level One*) Covers hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-614615-5

(Module ID 40104-07; from *Industrial Maintenance E&I Technician Level One*) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

#### Gaskets and Packing (10 Hours)

ISBN 978-0-13-614616-2

(Module ID 40105-07; from *Industrial Maintenance E&I Technician Level One*) Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

#### Craft-Related Mathematics (15 Hours)

ISBN 978-0-13-614617-9

(Module ID 40106-07; from *Industrial Maintenance E&I Technician Level One*) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

#### Construction Drawings (12.5 Hours)

ISBN 978-0-13-614618-6

(Module ID 40107-07; from *Industrial Maintenance E&I Technician Level One*) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

#### Pumps and Drivers (5 Hours)

ISBN 978-0-13-614619-3

(Module ID 40108-07; from *Industrial Maintenance E&I Technician Level One*) Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

#### Valves (5 Hours)

ISBN 978-0-13-614620-9

(Module ID 40109-07; from *Industrial Maintenance E&I Technician Level One*) Identifies different types of valves and describes their installation, storage, and handling.

#### Introduction to Test Instruments (7.5 Hours)

ISBN 978-0-13-614621-6

(Module ID 40110-07; from *Industrial Maintenance E&I Technician Level One*) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

#### Material Handling and Hand Rigging (15 Hours)

ISBN 978-0-13-614622-3

(Module ID 40111-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

#### Mobile and Support Equipment (10 Hours)

ISBN 978-0-13-614623-0

(Module ID 40112-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

#### Lubrication (12.5 Hours)

ISBN 978-0-13-614624-7

(Module ID 40113-07; from *Industrial Maintenance E&I Technician Level One*) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

#### SMAW Equipment and Setup (5 Hours)

ISBN 978-0-13-610533-6

(Module ID 29107-09; from *Welding Level One, Fourth Edition*) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

## L2 POWER GENERATION MAINTENANCE ELECTRICIAN

### LEVEL 2

#### Curriculum Notes

- 167.5 Hours
- Published: 2010
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-215423-9

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Industrial Safety for E&I Technicians

(12.5 Hours)

ISBN 978-0-13-604701-8

(Module ID 40201-08; from *Industrial Maintenance E&I Technician Level Two*) Covers safety rules and regulations for electrical workers, precautions for electrical hazards on the job, and the OSHA-mandated lockout/tagout procedure.

#### Managing Electrical Hazards (12.5 Hours)

ISBN 978-0-13-608661-1

(Module ID 26501-09; from *Electrical, First Edition*) Introduces electrical hazards in the workplace and describes how to avoid them. Explains how to analyze and document shock and arc flash hazards, and how to plan and conduct work around them. Includes examples of how to complete an energized electrical work permit, and how to select the specialized personal protective equipment required for electrical work.

#### Introduction to the National Electrical Code®

(5 Hours)

ISBN 978-0-13-604702-5

(Module ID 40202-08; from *Industrial Maintenance E&I Technician Level Two*) Provides a road map for using the NEC®. Introduces the layout and types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

#### Electrical Theory (15 Hours)

ISBN 978-0-13-604704-9

(Module ID 40203-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces electrical concepts used in Ohm's law as applied to DC series circuits. Includes atomic theory, electromotive force, resistance, and electric power equations. Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

Continued on following page

## Power Generation Maintenance Electrician Level 2 (continued)

### Alternating Current (20 Hours)

ISBN 978-0-13-604705-6

(Module ID 40204-08; from *Industrial Maintenance E&I Technician Level Two*) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components.

### E&I Drawings (10 Hours)

ISBN 978-0-13-604697-4

(Module ID 40303-09; from *Industrial Maintenance E&I Technician Level Three*) Explains how to read and interpret piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics, in order to identify types of instrumentation and the specifications for installation.

### E&I Test Equipment (10 Hours)

ISBN 978-0-13-604706-3

(Module ID 40205-08; from *Industrial Maintenance E&I Technician Level Two*) Focuses on proper selection, inspection, and use of common electrical and instrumentation test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, data recording equipment, field communicators, pressure testers, and dead weight testers. Also covers safety precautions and meter category ratings.

### Conductors and Cables (10 Hours)

ISBN 978-0-13-604714-8

(Module ID 40212-08; from *Industrial Maintenance E&I Technician Level Two*) Focuses on the types and applications of conductors and electrical cabling and covers proper wiring techniques. Stresses the applicable NEC® requirements.

### Conductor Terminations and Splices (10 Hours)

ISBN 978-0-13-604715-5

(Module ID 40213-08; from *Industrial Maintenance E&I Technician Level Two*) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

### Motor Controls (15 Hours)

ISBN 978-0-13-604698-1

(Module ID 40304-09; from *Industrial Maintenance E&I Technician Level Three*) Describes selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

### Hydraulic Controls (15 Hours)

ISBN 978-0-13-604742-1

(Module ID 40311-09; from *Industrial Maintenance E&I Technician Level Three*) Introduces hydraulic principles and fluids, functions and controls of system devices, hydraulic symbols, and drawings. Covers safety considerations for hydraulic systems, as well as troubleshooting.

### Pneumatic Controls (15 Hours)

ISBN 978-0-13-604739-1

(Module ID 40312-09; from *Industrial Maintenance E&I Technician Level Three*) Describes principles of atmospheric and compressed air gases, and how compressors transmit and treat compressed (pneumatic) air. Covers pneumatic system symbols, drawings, and system safety. Addresses the functions and control of pneumatic system components and provides guidelines for troubleshooting.

### Programmable Logic Controllers (17.5 Hours)

ISBN 978-0-13-609136-3

(Module ID 40409-09; from *Industrial Maintenance E&I Technician Level Four*) Introduces the application of PLCs in industrial process control, as well as the binary numbering system used in computer-based control. Covers components of PLCs, including power supplies, I/O modules, processor modules, types of communication bus, and memory.

## L3 POWER GENERATION MAINTENANCE ELECTRICIAN

### LEVEL 3

#### Curriculum Notes

- 222.5 Hours
- Published: 2010
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-215425-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Conductor Installations (10 Hours)

ISBN 978-0-13-266135-5

(Module ID 26206-08; from *Electrical Level Two, Sixth Edition*) Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

#### Cable Tray (7.5 Hours)

ISBN 978-0-13-266136-2

(Module ID 26207-08; from *Electrical Level Two, Sixth Edition*) Focuses on NEC® installation requirements for cable tray, including cable installations.

#### Grounding and Bonding (15 Hours)

ISBN 978-0-13-266138-6

(Module ID 26209-08; from *Electrical Level Two, Sixth Edition*) Focuses on the purpose of grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

#### Hand Bending (10 Hours)

ISBN 978-0-13-604709-4

(Module ID 40208-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

#### Machine Bending of Conduit (15 Hours)

ISBN 978-0-13-604741-4

(Module ID 40310-09; from *Industrial Maintenance E&I Technician Level Three*) Covers bends in conduit up to six inches. Focuses on mechanical, hydraulic, and electrical benders.

#### Electric Lighting (15 Hours)

ISBN 978-0-13-266132-4

(Module ID 26203-08; from *Electrical Level Two, Sixth Edition*) Introduces principles of human vision and the characteristics of light. Focuses on the handling and installation of various types of lamps and lighting fixtures.

#### Practical Applications of Lighting (12.5 Hours)

ISBN 978-0-13-293676-7

(Module ID 26303-08; from *Electrical Level Three, Sixth Edition*) Describes specific types of incandescent, fluorescent, and HID lamps, as well as ballasts. Also covers troubleshooting and various types of lighting controls.

#### Hazardous Locations (10 Hours)

ISBN 978-0-13-604694-3

(Module ID 40301-09; from *Industrial Maintenance E&I Technician Level Three*) Covers all classes of hazardous locations, including seals, components, and equipment approved for use in various hazardous locations.

#### Circuit Breakers and Fuses (12.5 Hours)

ISBN 978-0-13-266139-3

(Module ID 26210-08; from *Electrical Level Two, Sixth Edition*) Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

#### Transformer Applications (7.5 Hours)

ISBN 978-0-13-604735-3

(Module ID 40306-09; from *Industrial Maintenance E&I Technician Level Three*) Discusses transformer types, construction, connections, protection, and grounding along with capacitors and rectifiers.

#### Distribution Equipment (17.5 Hours)

ISBN 978-0-13-604734-6

(Module ID 40305-09; from *Industrial Maintenance E&I Technician Level Three*) Explains distribution equipment, including grounding, switchboard and ground fault maintenance, transformers, and electrical drawing identification.

Continued on following page

## Power Generation Maintenance Electrician Level 3 (continued)

### Power Plant Electrical Systems (12.5 Hours)

ISBN 978-0-13-272106-6

(Module ID 50301-11) Describes how the electrical power to operate a power station is developed and distributed in normal, shutdown, and emergency situations. Covers equipment used in power stations, including circuit breakers, switchgear, and motor control centers.

### Conductor Selection and Calculations (15 Hours)

ISBN 978-0-13-604736-0

(Module ID 40307-09; from *Industrial Maintenance E&I Technician Level Three*) Covers the types of conductors used in wiring systems, including insulation, current-carrying capacity, and temperature ratings.

### Motors: Theory and Application (20 Hours)

ISBN 978-0-13-266131-7

(Module ID 26202-08; from *Electrical Level Two, Sixth Edition*) Covers AC and DC motors, including the main components, circuits, and connections.

### Motor-Operated Valves (15 Hours)

ISBN 978-0-13-604743-8

(Module ID 40313-09; from *Industrial Maintenance E&I Technician Level Three*) Covers motor-driven valves, ranging from small, servo-mechanical actuators to large valves that could only be operated by several people if they were not motor driven. Includes electrical, pneumatic, and hydraulic operators.

### Control Systems and Fundamental Concepts (12.5 Hours)

ISBN 978-0-13-266140-9

(Module ID 26211-08; from *Electrical Level Two, Sixth Edition*) Gives basic descriptions of various types of contactors and relays along with their practical applications.

### Temporary Grounding (15 Hours)

ISBN 978-0-13-604738-4

(Module ID 40308-09; from *Industrial Maintenance E&I Technician Level Three*) Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

## L4 POWER GENERATION MAINTENANCE ELECTRICIAN

### LEVEL 4

#### Curriculum Notes

- 197.5 Hours
- Published: 2011
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-215428-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Load Calculations – Branch and Feeder Circuits

(17.5 Hours)

ISBN 978-0-13-609290-2

(Module ID 26301-08; from *Electrical Level Three, Sixth Edition*) Explains how to calculate branch circuit and feeder loads for residential and commercial applications.

#### Motor Calculations (12.5 Hours)

ISBN 978-0-13-609299-5

(Module ID 26309-08; from *Electrical Level Three, Sixth Edition*) Covers calculations required to size conductors and overcurrent protection for motor applications.

#### Overcurrent Protection (25 Hours)

ISBN 978-0-13-609294-0

(Module ID 26305-08; from *Electrical Level Three, Sixth Edition*) Explains how to size and select circuit breakers and fuses for various applications. Also covers short circuit calculations and troubleshooting.

#### Specialty Transformers (10 Hours)

ISBN 978-0-13-609319-0

(Module ID 26406-08; from *Electrical Level Four, Sixth Edition*) Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

#### Advanced Controls (20 Hours)

ISBN 978-0-13-609320-6

(Module ID 26407-08; from *Electrical Level Four, Sixth Edition*) Discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable frequency drives. Also covers basic troubleshooting procedures.

#### Motor Operation and Maintenance (10 Hours)

ISBN 978-0-13-609324-4

(Module ID 26410-08; from *Electrical Level Four, Sixth Edition*) Covers motor cleaning, testing, and preventive maintenance. Also describes basic troubleshooting procedures.

#### Generator Maintenance (20 Hours)

ISBN 978-0-13-266211-6

(Module ID 50401-10) Covers the operating characteristics and major components of AC and DC generators. Topics include generator connection methods; voltage regulators; auxiliary systems; and maintenance procedures.

#### Switchgear and Breaker Maintenance (25 Hours)

ISBN 978-0-13-266212-3

(Module ID 50402-11) Reviews the safety practices associated with power station electrical work. Explains how medium-voltage and low-voltage sources are developed and used in the power station, and how the station power system functions in a blackout or shutdown situation. Also describes the circuit breakers, switchgear, and motor control centers used in power stations, and provides instructions for maintenance of these devices.

#### Preventive and Predictive Maintenance

(10 Hours)

ISBN 978-0-13-610445-2

(Module ID 32401-09; from *Industrial Maintenance Mechanic Level Four*) Explains preventive and predictive maintenance and non-destructive testing, and introduces the basic techniques for testing. Also describes lubricant analysis, and acoustic, infrared, and vibration testing.

#### Medium Voltage Terminations/Splices

(10 Hours)

ISBN 978-0-13-609325-1

(Module ID 26411-08; from *Electrical Level Four, Sixth Edition*) Offers an overview of the NEC® and cable manufacturers' requirements for medium-voltage terminations and splices.

#### Fire Alarm Systems (15 Hours)

ISBN 978-0-13-609283-4

(Module ID 26405-08; from *Electrical Level Four, Sixth Edition*) Covers fire alarm control units, Digital Alarm Communicator Systems (DACS), wiring for alarm initiating and notification devices, and alarm system maintenance.

#### Heat Tracing and Freeze Protection (10 Hours)

ISBN 978-0-13-609323-7

(Module ID 26409-08; from *Electrical Level Four, Sixth Edition*) Covers heat tracing systems along with their applications and installation requirements.

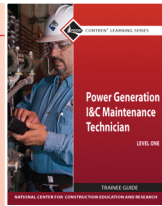
#### Standby and Emergency Systems (12.5 Hours)

ISBN 978-0-13-609163-9

(Module ID 40401-09; from *Industrial Maintenance E&I Technician Level Four*) Explains the installation, utilization, and maintenance requirements for standby and emergency electrical systems.

# Power Generation I&C Maintenance Technician

## L1 POWER GENERATION I&C MAINTENANCE TECHNICIAN



LEVEL 1

### Curriculum Notes

- 222.5 Hours
  - Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

ISBN

Trainee Guide: \$74.99

978-0-13-215430-7

### MODULES

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#### Tools of the Trade (5 Hours)

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(Module ID 40102-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

#### Fasteners and Anchors (5 Hours)

ISBN 978-0-13-614614-8

(Module ID 40103-07; from *Industrial Maintenance E&I Technician Level One*) Covers hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-614615-5

(Module ID 40104-07; from *Industrial Maintenance E&I Technician Level One*) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

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(Module ID 40106-07; from *Industrial Maintenance E&I Technician Level One*) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

#### Construction Drawings (12.5 Hours)

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(Module ID 40107-07; from *Industrial Maintenance E&I Technician Level One*) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

#### Pumps and Drivers (5 Hours)

ISBN 978-0-13-614619-3

(Module ID 40108-07; from *Industrial Maintenance E&I Technician Level One*) Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

#### Valves (5 Hours)

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(Module ID 40109-07; from *Industrial Maintenance E&I Technician Level One*) Identifies different types of valves and describes their installation, storage, and handling.

#### Introduction to Test Instruments (7.5 Hours)

ISBN 978-0-13-614621-6

(Module ID 40110-07; from *Industrial Maintenance E&I Technician Level One*) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

#### Material Handling and Hand Rigging (15 Hours)

ISBN 978-0-13-614622-3

(Module ID 40111-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

#### Mobile and Support Equipment (10 Hours)

ISBN 978-0-13-614623-0

(Module ID 40112-07; from *Industrial Maintenance E&I Technician Level One*) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

#### Lubrication (12.5 Hours)

ISBN 978-0-13-614624-7

(Module ID 40113-07; from *Industrial Maintenance E&I Technician Level One*) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

#### SMAW Equipment and Setup (5 Hours)

ISBN 978-0-13-610533-6

(Module ID 29107-09; from *Welding Level One, Fourth Edition*) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

## L2 POWER GENERATION I&C MAINTENANCE TECHNICIAN

LEVEL 2

### Curriculum Notes

- 167.5 Hours
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

ISBN

Trainee Guide: \$102.99

978-0-13-215432-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Industrial Safety for E&I Technicians

(12.5 Hours)

ISBN 978-0-13-604701-8

(Module ID 40201-08; from *Industrial Maintenance E&I Technician Level Two*) Covers safety rules and regulations for electrical workers, precautions for electrical hazards on the job, and the OSHA-mandated lockout/tagout procedure.

#### Managing Electrical Hazards (12.5 Hours)

ISBN 978-0-13-608661-1

(Module ID 26501-09; from *Electrical, First Edition*) Introduces electrical hazards in the workplace and describes how to avoid them. Explains how to analyze and document shock and arc flash hazards, and how to plan and conduct work around them. Includes examples of how to complete an energized electrical work permit, and how to select the specialized personal protective equipment required for electrical work.

#### Introduction to the National Electrical Code®

(5 Hours)

ISBN 978-0-13-604702-5

(Module ID 40202-08; from *Industrial Maintenance E&I Technician Level Two*) Provides a road map for using the NEC®. Introduces the layout and types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

#### Electrical Theory (15 Hours)

ISBN 978-0-13-604704-9

(Module ID 40203-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces electrical concepts used in Ohm's law as applied to DC series circuits. Includes atomic theory, electromotive force, resistance, and electric power equations. Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

Continued on following page



## Power Generation I&C Maintenance Technician Level 2 (continued)

### Alternating Current (20 Hours)

ISBN 978-0-13-604705-6

(Module ID 40204-08; from *Industrial Maintenance E&I Technician Level Two*) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components.

### E&I Drawings (10 Hours)

ISBN 978-0-13-604697-4

(Module ID 40303-09; from *Industrial Maintenance E&I Technician Level Three*) Explains how to read and interpret piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics, in order to identify types of instrumentation and the specifications for installation.

### E&I Test Equipment (10 Hours)

ISBN 978-0-13-604706-3

(Module ID 40205-08; from *Industrial Maintenance E&I Technician Level Two*) Focuses on proper selection, inspection, and use of common electrical and instrumentation test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, data recording equipment, field communicators, pressure testers, and dead weight testers. Also covers safety precautions and meter category ratings.

### Conductors and Cables (10 Hours)

ISBN 978-0-13-604714-8

(Module ID 40212-08; from *Industrial Maintenance E&I Technician Level Two*) Focuses on the types and applications of conductors and electrical cabling and covers proper wiring techniques. Stresses the applicable NEC® requirements.

### Conductor Terminations and Splices (10 Hours)

ISBN 978-0-13-604715-5

(Module ID 40213-08; from *Industrial Maintenance E&I Technician Level Two*) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

### Motor Controls (15 Hours)

ISBN 978-0-13-604698-1

(Module ID 40304-09; from *Industrial Maintenance E&I Technician Level Three*) Describes selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

### Hydraulic Controls (15 Hours)

ISBN 978-0-13-604742-1

(Module ID 40311-09; from *Industrial Maintenance E&I Technician Level Three*) Introduces hydraulic principles and fluids, functions and controls of system devices, hydraulic symbols, and drawings. Covers safety considerations for hydraulic systems, as well as troubleshooting.

### Pneumatic Controls (15 Hours)

ISBN 978-0-13-604739-1

(Module ID 40312-09; from *Industrial Maintenance E&I Technician Level Three*) Describes principles of atmospheric and compressed air gases, and how compressors transmit and treat compressed (pneumatic) air. Covers pneumatic system symbols, drawings, and system safety. Addresses the functions and control of pneumatic system components and provides guidelines for troubleshooting.

### Programmable Logic Controllers (17.5 Hours)

ISBN 978-0-13-609136-3

(Module ID 40409-09; from *Industrial Maintenance E&I Technician Level Four*) Introduces the application of PLCs in industrial process control, as well as the binary numbering system used in computer-based control. Covers components of PLCs, including power supplies, I/O modules, processor modules, types of communication bus, and memory.

## L3 POWER GENERATION I&C MAINTENANCE TECHNICIAN

### LEVEL 3

#### Curriculum Notes

- 225.5 Hours
- Published: 2010
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-215434-5

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Instrumentation Electrical Circuitry (25 Hours)

ISBN 978-0-13-103301-6

(Module ID 12305-03; from *Instrumentation Level Three, Second Edition*) Describes various types of series and parallel circuits; resistance, inductance, and capacitance in AC circuits; DC power supplies; analog and digital signals; and common applications of electrical and electronic circuitry.

#### Process Mathematics (15 Hours)

ISBN 978-0-13-604708-7

(Module ID 40207-08; from *Industrial Maintenance E&I Technician Level Two*) Covers measurement of mass, weight, pressure, temperature, and flow, conversion of units, and their application to industrial maintenance.

### Flow, Pressure, Level and Temperature

(15 Hours)

ISBN 978-0-13-604707-0

(Module ID 40206-08; from *Industrial Maintenance E&I Technician Level Two*) Presents devices used to measure flow, pressure, level, and temperature, along with their principles of operation.

### Instrument Drawings and Documents,

Part One (15 Hours)

ISBN 978-0-13-604713-1

(Module ID 40211-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces instrument symbols, abbreviations, and drawings and documents, including instrument indexes, installation detail drawings, location drawings, and control loops.

### Electrical Systems for Instrumentation

(22.5 Hours)

ISBN 978-0-13-868241-5

(Module ID 12104-01; from *Instrumentation Level One, Second Edition*) Covers basic electrical concepts and terms, DC circuit calculations, electrical measuring instruments, and electrical wiring.

### Relays and Timers (7.5 Hours)

ISBN 978-0-13-103272-9

(Module ID 12208-03; from *Instrumentation Level Two, Second Edition*) Presents the principles of operation and applications of various relays and timers. Also reviews the selection process for these devices.

### Switches and Photoelectric Devices (5 Hours)

ISBN 978-0-13-103273-6

(Module ID 12209-03; from *Instrumentation Level Two, Second Edition*) Covers the principles of operation and applications of switches and photoelectric devices in the instrumentation environment.

### Tubing (15 Hours)

ISBN 978-0-13-604710-0

(Module ID 40209-08; from *Industrial Maintenance E&I Technician Level Two*) Introduces a variety of tubing, tubing materials, tools, and work practices. Covers proper storage and handling, cutting, deburring, reaming, bending, and flaring of tubing.

### Clean, Purge, and Test Tubing and Piping Systems

(7.5 Hours)

ISBN 978-0-13-604711-7

(Module ID 40210-08; from *Industrial Maintenance E&I Technician Level Two*) Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in industrial maintenance.

### Layout and Installation of Tubing and Piping

Systems (22.5 Hours)

ISBN 978-0-13-604740-7

(Module ID 40309-09; from *Industrial Maintenance E&I Technician Level Three*) Introduces piping and tubing layout procedures. Explains the steps for creating a hand-sketched isometric drawing that can be applied to a piping and tubing installation. Introduces methods and procedures used to measure, cut, bend, and support piping and tubing.

### Electronic Components (10 Hours)

ISBN 978-0-13-604696-7

(Module ID 40302-09; from *Industrial Maintenance E&I Technician Level Three*) Introduces the principles of electronics and semiconductor theory, components, and applications.

### Panel-Mounted Instruments (7.5 Hours)

ISBN 978-0-13-103277-4

(Module ID 12212-03; from *Instrumentation Level Two, Second Edition*) Explains the selection of instruments to be panel-mounted, locating the instruments using drawings, and procedures for installing the instruments in the panels.

Continued on following page

## Power Generation I&C Maintenance Technician Level 3 (continued)

### Installing Field-Mounted Instruments (25 Hours)

ISBN 978-0-13-103278-1

(Module ID 12213-03; from *Instrumentation Level Two, Second Edition*) Covers selection and mounting of instruments at locations other than panels, including stand mounting, in-line mounting, structure mounting, strap mounting, and insertion mounting.

### Grounding and Shielding of Instrumentation

Wiring (10 Hours)

ISBN 978-0-13-103302-3

(Module ID 12306-03; from *Instrumentation Level Three, Second Edition*) Teaches the basic concepts of grounding and shielding, including wire and cable identification. Defines various types of noise that can be induced into instrumentation wiring and describes the methods used to reduce or eliminate it.

### Analyzers (20 Hours)

ISBN 978-0-13-109619-6

(Module ID 12408-03; from *Instrumentation Level Four, Second Edition*) Defines various types of analyzers and their applications in industrial process control. Includes a discussion of analyzers that measure or monitor variables such as density, specific gravity, viscosity, turbidity, flashpoint, oxidation-reduction potential (ORP), pH, conductivity of a liquid, oxygen, carbon monoxide, carbon dioxide, hydrogen sulfide, total hydrocarbon content (THC), and particulates in a clean room. Also defines chromatography and ultraviolet and infrared analyzers.

L4

## POWER GENERATION I&C MAINTENANCE TECHNICIAN

LEVEL 4

### Curriculum Notes

- 210 Hours
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-215437-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Standby and Emergency Systems (12.5 Hours)

ISBN 978-0-13-609163-9

(Module ID 40401-09; from *Industrial Maintenance E&I Technician Level Four*) Explains the installation, utilization, and maintenance requirements for standby and emergency electrical systems.

#### Basic Process Control Elements, Transducers and Transmitters (15 Hours)

ISBN 978-0-13-609165-3

(Module ID 40402-09; from *Industrial Maintenance E&I Technician Level Four*) Discusses sensing and transmitting devices used in an instrumentation loop, along with the process variables measured by the detectors or sensors. Gives examples of technical manuals and specification sheets. Explains how control devices are selected, and how to draw basic control loop diagrams that include a measuring element, a transducer, and a transmitter.

#### Instrument Calibration and Configuration

(10 Hours)

ISBN 978-0-13-609166-0

(Module ID 40403-09; from *Industrial Maintenance E&I Technician Level Four*) Introduces methods of instrumentation calibration, including the three- and five-point methods. Covers components that require calibration in pneumatic, analog, and smart loops, as well as methods used to calibrate these components.

#### Pneumatic Control Valves, Actuators and Positioners (40 Hours)

ISBN 978-0-13-609167-7

(Module ID 40404-09; from *Industrial Maintenance E&I Technician Level Four*) Covers the construction, operation, and uses of control valves, actuators, and positioners that are driven, and in some cases controlled by, compressed air. Explains the installation and maintenance of these devices, and includes alignment and troubleshooting procedures.

#### Performing Loop Checks (7.5 Hours)

ISBN 978-0-13-609168-4

(Module ID 40405-09; from *Industrial Maintenance E&I Technician Level Four*) Covers loop check steps, including verifying mechanical installation, validating that the loop has correct tag numbers, performing loop checks, and proving the loop.

#### Troubleshooting and Commissioning a Loop

(10 Hours)

ISBN 978-0-13-609169-1

(Module ID 40406-09; from *Industrial Maintenance E&I Technician Level Four*) Teaches troubleshooting techniques used to locate problems in control loops, and how to isolate a loop in order to troubleshoot it. Covers commissioning of a loop once it is repaired, loop checked, and calibrated.

#### Process Control Theory (20 Hours)

ISBN 978-0-13-103267-5

(Module ID 12204-03; from *Instrumentation Level Two, Second Edition*) Describes the principles of process control and how various types of control loops are applied. Discusses ON-OFF and modulating control schemes. Explains how process control principles are applied to flow, level, temperature, and pressure control loops.

#### Process Control Loops and Tuning (20 Hours)

ISBN 978-0-13-609135-6

(Module ID 40407-09; from *Industrial Maintenance E&I Technician Level Four*) Describes control loops, devices, and terms. Introduces formulas and their applications to PID control. Offers a theory-based approach to PID control and its application in industrial process control. Addresses open, closed, and visual loop tuning.

#### Data Networks (15 Hours)

ISBN 978-0-13-609138-7

(Module ID 40408-09; from *Industrial Maintenance E&I Technician Level Four*) Introduces terms associated with data network devices and computers used in industrial facilities. Explains how data network devices and computers are interconnected for communication purposes. Describes how open connectivity is used in industrial data networks, and explores the hardware devices used in a data highway system.

#### Digital Logic Circuits (10 Hours)

ISBN 978-0-13-109610-3

(Module ID 12401-03; from *Instrumentation Level Four, Second Edition*) Introduces the basic ideas of digital electronics. Presents gates, combination logic, and truth tables. Addresses memory devices, counters, and arithmetic circuits as well as the numbering systems commonly used in digital systems.

#### Calibrate Supervisory Instrumentation Elements

(10 Hours)

ISBN 978-0-13-266216-1

(Module ID 51401-10) Describes the sensing devices used to monitor key parameters, including vibration and speed sensors, eccentricity sensors, and thrust bearing wear detectors. Also covers the test instruments used to calibrate supervisory instrumentation, including shakers and Wobulators®, and explains how to use selected test instruments in the calibration process.

#### Boiler/HRSG Control (12.5 Hours)

ISBN 978-0-13-266217-8

(Module ID 51402-10) Covers the control devices, methods, and strategies used for boilers and Heat Recovery Steam Generators (HRSGs). Discusses fuel, air, oxygen, feedwater, and steam control, as well as the precautions and regulations related to burner and furnace fuel control.

#### Preventive and Predictive Maintenance (10 Hours)

ISBN 978-0-13-610445-2

(Module ID 32401-09; from *Industrial Maintenance Mechanic Level Four*) Explains preventive and predictive maintenance and non-destructive testing, and introduces the basic techniques for testing. Also describes lubricant analysis, and acoustic, infrared, and vibration testing.

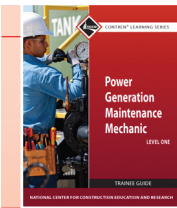
#### Distributed Control Systems (17.5 Hours)

ISBN 978-0-13-609137-0

(Module ID 40410-09; from *Industrial Maintenance E&I Technician Level Four*) Describes how DCS was developed by combining the technologies of single loop control, direct digital control, and supervisory control. Covers DCS hardware requirements, how control loops are implemented into a DCS, types of data transmission used in DCS, communication protocols, and human interfaces.

# Power Generation Maintenance Mechanic

## L1 POWER GENERATION MAINTENANCE MECHANIC



LEVEL 1

### Curriculum Notes

- 232.5 Hours
  - Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

ISBN

978-0-13-215439-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Tools of the Trade (5 Hours)

ISBN 978-0-13-614584-4

(Module ID 32102-07; from *Industrial Maintenance Mechanic Level One*) Introduces hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

#### Fasteners and Anchors (5 Hours)

ISBN 978-0-13-614585-1

(Module ID 32103-07; from *Industrial Maintenance Mechanic Level One*) Covers the hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-614586-8

(Module ID 32104-07; from *Industrial Maintenance Mechanic Level One*) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

#### Gaskets and Packing (10 Hours)

ISBN 978-0-13-614588-2

(Module ID 32105-07; from *Industrial Maintenance Mechanic Level One*) Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

#### Craft-Related Mathematics (15 Hours)

ISBN 978-0-13-614589-9

(Module ID 32106-07; from *Industrial Maintenance Mechanic Level One*) Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

#### Construction Drawings (12.5 Hours)

ISBN 978-0-13-614590-5

(Module ID 32107-07; from *Industrial Maintenance Mechanic Level One*) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

#### Pumps and Drivers (5 Hours)

ISBN 978-0-13-614591-2

(Module ID 32108-07; from *Industrial Maintenance Mechanic Level One*) Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

#### Valves (5 Hours)

ISBN 978-0-13-614592-9

(Module ID 32109-07; from *Industrial Maintenance Mechanic Level One*) Identifies different types of valves and describes their installation as well as valve storage and handling.

#### Introduction to Test Instruments (7.5 Hours)

ISBN 978-0-13-614593-6

(Module ID 32110-07; from *Industrial Maintenance Mechanic Level One*) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

#### Material Handling and Hand Rigging (15 Hours)

ISBN 978-0-13-614594-3

(Module ID 32111-07; from *Industrial Maintenance Mechanic Level One*) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

#### Mobile and Support Equipment (10 Hours)

ISBN 978-0-13-614560-8

(Module ID 32112-07; from *Industrial Maintenance Mechanic Level One*) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, personnel lifts, compressors, and generators.

#### Lubrication (12.5 Hours)

ISBN 978-0-13-614562-2

(Module ID 32113-07; from *Industrial Maintenance Mechanic Level One*) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts. Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

#### SMAW Equipment and Setup (5 Hours)

ISBN 978-0-13-610533-6

(Module ID 29107-09; from *Welding Level One, Fourth Edition*) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

## L2 POWER GENERATION MAINTENANCE MECHANIC

LEVEL 2

### Curriculum Notes

- 260 Hours
- Published: 2010
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-215441-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Basic Layout (20 Hours)

ISBN 978-0-13-604621-9

(Module ID 32201-07; from *Industrial Maintenance Mechanic Level Two*) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

#### Advanced Trade Math (30 Hours)

ISBN 978-0-13-604681-3

(Module ID 32301-08; from *Industrial Maintenance Mechanic Level Three*) Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles and the laws of acute triangles.

#### Precision Measuring Tools (20 Hours)

ISBN 978-0-13-604682-0

(Module ID 32302-08; from *Industrial Maintenance Mechanic Level Three*) Explains how to select, inspect, use and care for levels, feeler gauges, calipers, micrometers, height gauges and surface plates, dial indicators, protractors, parallels and gauge blocks, trammels, and pyrometers.

#### Introduction to Bearings (15 Hours)

ISBN 978-0-13-604627-1

(Module ID 32207-07; from *Industrial Maintenance Mechanic Level Two*) Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Discusses bearing materials and designations.

#### Installing Bearings (20 Hours)

ISBN 978-0-13-604683-7

(Module ID 32303-08; from *Industrial Maintenance Mechanic Level Three*) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

#### Installing Couplings (15 Hours)

ISBN 978-0-13-604684-4

(Module ID 32304-08; from *Industrial Maintenance Mechanic Level Three*) Identifies various types of couplings, and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

Continued on following page

## Power Generation Maintenance Mechanic Level 2 (continued)

### Installing Mechanical Seals (20 Hours)

ISBN 978-0-13-604689-9

(Module ID 32308-08; from *Industrial Maintenance Mechanic Level Three*) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting and installing mechanical seals.

### Conventional Alignment (30 Hours)

ISBN 978-0-13-604686-8

(Module ID 32306-08; from *Industrial Maintenance Mechanic Level Three*) Covers types of misalignment, aligning couplings using a straightedge and feeler gauge, adjusting parallel and angular alignment, using a dial indicator, and eliminating coupling stress.

### Reverse Alignment (30 Hours)

ISBN 978-0-13-610448-3

(Module ID 32404-09; from *Industrial Maintenance Mechanic Level Four*) Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment based on reverse dial indicator measurements.

### Laser Alignment (25 Hours)

ISBN 978-0-13-610449-0

(Module ID 32405-09; from *Industrial Maintenance Mechanic Level Four*) Using one example system, describes the principles of using laser alignment systems to perform alignments.

### Installing Belt and Chain Drives (10 Hours)

ISBN 978-0-13-604688-2

(Module ID 32307-08; from *Industrial Maintenance Mechanic Level Three*) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

### Introduction to Piping Components (5 Hours)

ISBN 978-0-13-604622-6

(Module ID 32202-07; from *Industrial Maintenance Mechanic Level Two*) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

### Copper and Plastic Piping Practices (5 Hours)

ISBN 978-0-13-604623-3

(Module ID 32203-07; from *Industrial Maintenance Mechanic Level Two*) Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

### Introduction to Ferrous Metal Piping Practices (5 Hours)

ISBN 978-0-13-604624-0

(Module ID 32204-07; from *Industrial Maintenance Mechanic Level Two*) Covers iron and steel pipe and fittings and provides step-by-step instructions for cutting, threading, and joining ferrous piping.

### Identify, Install and Maintain Valves (10 Hours)

ISBN 978-0-13-604625-7

(Module ID 32205-07; from *Industrial Maintenance Mechanic Level Two*) Explains how to remove and install threaded and flanged valves, how to replace valve stem O-ring and bonnet gaskets, and how to repack a valve stuffing box. Also discusses the purpose of valve packing.

## L3 POWER GENERATION MAINTENANCE MECHANIC

### LEVEL 3

#### Curriculum Notes

- 155 Hours
- Published: 2010
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-215409-3

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Low-Pressure Steam Systems (10 Hours)

ISBN 978-0-13-604628-8

(Module ID 32208-07; from *Industrial Maintenance Mechanic Level Two*) Introduces the components and functions of basic steam systems, including boilers, steam traps, and blowdown recovery systems.

#### High-Pressure Steam Systems and Auxiliaries (20 Hours)

ISBN 978-0-13-604664-6

(Module ID 32209-07; from *Industrial Maintenance Mechanic Level Two*) Explains the functioning of high-pressure steam systems used in industry.

#### Heaters, Furnaces, Heat Exchangers, Cooling Towers and Fin Fans (30 Hours)

ISBN 978-0-13-604666-0

(Module ID 32211-07; from *Industrial Maintenance Mechanic Level Two*) Introduces equipment used to transfer and remove heat from systems in process.

#### Hydrostatic and Pneumatic Testing (10 Hours)

ISBN 978-0-13-604626-4

(Module ID 32206-07; from *Industrial Maintenance Mechanic Level Two*) Describes non-destructive and pressure testing of systems and equipment.

#### Installing Fans and Blowers (10 Hours)

ISBN 978-0-13-604771-1

(Module ID 15312-08; from *Millwright Level Three*) Explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

#### Conveyors (5 Hours)

ISBN 978-0-13-610431-5

(Module ID 15401-08; from *Millwright Level Four*) Describes conveyor systems and their principles of operation.

#### Troubleshooting and Repairing Conveyors (12.5 Hours)

ISBN 978-0-13-610432-2

(Module ID 15402-08; from *Millwright Level Four*) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

#### Basic Hydraulic Systems (10 Hours)

ISBN 978-0-13-610475-9

(Module ID 15409-08; from *Millwright Level Four*) Describes principles and types of hydraulic equipment and related safety procedures. Describes applications of hydraulic equipment.

#### Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)

ISBN 978-0-13-610476-6

(Module ID 15410-08; from *Millwright Level Four*) Explains inspecting hydraulic systems, diagnosing problems, and repairing these systems. Shows how to read hydraulic schematic symbols.

#### Motor-Operated Valves (15 Hours)

ISBN 978-0-13-604743-8

(Module ID 40313-09; from *Industrial Maintenance E&I Technician Level Three*) Covers motor-driven valves, ranging from small, servo-mechanical actuators to large valves that could only be operated by several people if they were not motor driven. Includes electrical, pneumatic, and hydraulic operators.

#### Advanced Blueprint Reading (25 Hours)

ISBN 978-0-13-610446-9

(Module ID 32402-09; from *Industrial Maintenance Mechanic Level Four*) Describes the use of drawing sets to obtain system information. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

Continued on following page



L4

**POWER GENERATION  
MAINTENANCE MECHANIC**

LEVEL 4

**Curriculum Notes**

- 187.5 Hours
- Published: 2010
- Downloadable instructor resources are available.

**PAPERBACK**

Trainee Guide: \$102.99

**ISBN****978-0-13-215411-6****MODULES**

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

**Vibration and Balancing (12.5 Hours)****ISBN 978-0-13-266220-8**

(Module ID 52401-10) Reviews machine basics and explains the causes of machine vibrations. Reviews the basics of vibration analysis and covers the devices used to detect and analyze vibration signatures. Explains how and why vibration analysis is used as part of predictive maintenance programs. Describes field machine balancing.

**Preventive and Predictive Maintenance**

(10 Hours)

**ISBN 978-0-13-610445-2**

(Module ID 32401-09; from *Industrial Maintenance Mechanic Level Four*) Explains preventive and predictive maintenance and non-destructive testing, and introduces the basic techniques for testing. Also describes lubricant analysis, and acoustic, infrared, and vibration testing.

**Fuel Preparation and Delivery Equipment**

(25 Hours)

**ISBN 978-0-13-266221-5**

(Module ID 52402-10) Explains the basic operations of a coal-fired boiler system. Describes the delivery processes from the storage yard into the coal preparation equipment, and from the equipment into the furnace. Addresses the maintenance checks that need to be made on coal delivery and preparation equipment and explains how solid fuel wastes are disposed of in coal-burning furnace systems. Describes how other solid-fuel furnaces, such as biomass furnaces, are used with boilers.

**Introduction to Tube Work (10 Hours)****ISBN 978-0-13-604667-7**

(Module ID 32212-07; from *Industrial Maintenance Mechanic Level Two*) Covers the basics of working with heat exchanger and furnace tubing and tube sheets.

**Compressors and Pneumatic Systems (35 Hours)****ISBN 978-0-13-610447-6**

(Module ID 32403-09; from *Industrial Maintenance Mechanic Level Four*) Describes the theory and practice of compressing and transporting gases. Explains the types and principles of compressors and compressed air treatment equipment, as well as compressed air use and safety.

**Troubleshooting and Repairing Pumps (10 Hours)****ISBN 978-0-13-610452-0**

(Module ID 32407-09; from *Industrial Maintenance Mechanic Level Four*) Explains how to inspect, troubleshoot, disassemble, assemble, and install a pump. Also describes the process of preparing for startup.

**Troubleshooting and Repairing Gearboxes**

(20 Hours)

**ISBN 978-0-13-610453-7**

(Module ID 32408-09; from *Industrial Maintenance Mechanic Level Four*) Describes types and operation of gearboxes, and gearbox diagnostics. Explains how to troubleshoot, remove, and disassemble gearboxes, how to identify gear wear patterns, and how to install and maintain gearboxes.

**Setting Baseplates and Prealignment (30 Hours)****ISBN 978-0-13-604685-1**

(Module ID 32305-08; from *Industrial Maintenance Mechanic Level Three*) Explains how to lay out and install baseplates and soleplates. Describes how to field-verify a plate installation. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

**Turbines (20 Hours)****ISBN 978-0-13-610496-4**

(Module ID 15505-09; from *Millwright Level Five*) Describes types of turbines and their components. Describes the operation and common applications of particular types, including gas, steam, and water turbines.

**Maintaining and Repairing Turbine Components**

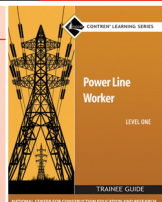
(15 Hours)

**ISBN 978-0-13-610497-1**

(Module ID 15506-09; from *Millwright Level Five*) Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.

## L1 POWER LINE WORKER

LEVEL 1



### Curriculum Notes

- 407.5 Hours
  - Includes 97.5 hours of *Power Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: \$79.99, ISBN 978-0-13-466829-1
- Published: 2011
- Downloadable instructor resources are available.

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-257109-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Power Line Worker Safety (22.5 Hours)

ISBN 978-0-13-266327-4

(Module ID 49102-11) Covers the safety equipment and safety practices associated with the special hazards of power line work, including electrical and arc flash hazards; traffic control; trenching; horizontal directional drilling; working in confined spaces; and safe entry into a substation.

#### Introduction to Electrical Circuits (7.5 Hours)

ISBN 978-0-13-266328-1

(Module ID 49103-11) Provides a general introduction to electricity and DC circuits, including theory of voltage, current and resistance, basic DC circuits, and Ohm's law. Also introduces the test equipment used in power line work.

#### Introduction to Electrical Theory (7.5 Hours)

ISBN 978-0-13-266329-8

(Module ID 49104-11) Describes how to calculate voltage, current, and resistance values in series, parallel, and combination DC circuits using Ohm's law. Also includes a basic description of grounding and bonding.

To address the need for one standardized and nationally recognized Power Line Worker curriculum, NCCER has developed *Power Line Worker Level One*. Common to transmission, distribution, and substation, *Power Line Worker Level One* addresses the fundamental aspects of power line work to include safety, electrical theory, climbing techniques, aerial framing and rigging, and operating utility service equipment. After Level One, the training program diverges into the three specialty areas (transmission, distribution, and substation) for two additional years of skills training.

#### Climbing Wooden Poles (80 Hours)

ISBN 978-0-13-266330-4

(Module ID 49105-11) Describes how to safely climb a wooden utility pole. Covers climbing equipment, inspection of equipment, pole inspection, climbing techniques, and pole-top rescue.

#### Climbing Structures Other Than Wood (40 Hours)

ISBN 978-0-13-266331-1

(Module ID 49106-11) Explains the equipment, safety practices, and climbing techniques required to climb towers. Hazards associated with the environment, such as snakes, birds, insects, and weather hazards, are also covered.

#### Tools of the Trade (10 Hours)

ISBN 978-0-13-266332-8

(Module ID 49107-11) Covers the specialized tools used by line workers, including hot sticks, as well as universal tool accessories. Also covers ladders and work platforms; crimpers; cable cutters; pneumatic tools; and powder-actuated tools.

#### Aerial Framing and Associated Hardware (80 Hours)

ISBN 978-0-13-266333-5

(Module ID 49108-11) Explains how to install guys to support a utility pole, as well as how to install the equipment on the pole to support conductors. Includes procedures for the installation of cross-arms, transformers, and conductors.

#### Utility Service Equipment (15 Hours)

ISBN 978-0-13-266334-2

(Module ID 49109-11) Provides descriptions and operations instructions for use of the digger derrick, bucket truck, crane truck, and aerial lift. Also covers safety requirements; inspection and maintenance; driving and setup operations; and emergency procedures.

#### Rigging (12.5 Hours)

ISBN 978-0-13-266335-9

(Module ID 49110-11) Explains how to select and use rigging equipment. Covers common rigging equipment and rigging methods that are likely to be used by power line workers. Also covers hand signals and other methods of communication between the rigger and the crane operator.

#### Setting and Pulling Poles (20 Hours)

ISBN 978-0-13-266336-6

(Module ID 49111-11) Provides instructions for the storage, loading, and transport of wooden utility poles. Includes use of the digger derrick to dig the hole and install the pole. Also covers pole removal using a hydraulic jacking device.

#### Trenching, Excavating, and Boring Equipment (7.5 Hours)

ISBN 978-0-13-266337-3

(Module ID 49112-11) Covers the use and maintenance of trenching equipment, backhoe/loaders, and horizontal directional drilling equipment for the installation of direct-buried power lines. Includes a review of safety guidelines related to buried utilities.

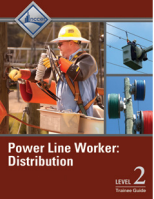
#### Introduction to Electrical Test Equipment (7.5 Hours)

ISBN 978-0-13-266338-0

(Module ID 49113-11) Introduces the basic test equipment used by electrical workers to test and troubleshoot electrical circuits. Also covers specialized line worker test equipment, including the high-voltage detector, phase rotation tester, megohmmeter, phasing stick, and hi-pot tester.

Continued on following page



<b>L2 POWER LINE WORKER: DISTRIBUTION</b>	
<b>LEVEL 2</b>	
 <p><b>Curriculum Notes</b></p> <ul style="list-style-type: none"> <li>• 157.5 Hours</li> <li>• Published: 2011</li> <li>• Downloadable instructor resources are available.</li> </ul>	<p><b>PAPERBACK</b></p> <p>Trainee Guide: \$102.99</p> <p><b>ISBN</b></p> <p><b>978-0-13-273034-1</b></p>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Alternating Current and Three-Phase Systems

(17.5 Hours)

ISBN 978-0-13-274259-7

(Module ID 80201-11) Introduces the development of both single- and three-phase alternating current. Analyzes the relationship of AC phases and introduces key components used to refine AC power. Discusses the operation of transformers and introduces advanced AC concepts such as reactive power and the power factor.

## Aerial Distribution Equipment

(25 Hours)

ISBN 978-0-13-274260-3

(Module ID 80202-11) Identifies the various equipment components found on overhead distribution system poles and describes the function of each, including transformers, reclosers, fuses, sectionalizers, capacitor banks, and voltage regulators.

## Cable and Conductor Installation and Removal

(20 Hours)

ISBN 978-0-13-274261-0

(Module ID 80203-11) Describes the types of conductors and cables used in overhead and underground residential distribution systems and the equipment and procedures used to install and remove them. Includes methods used to splice conductors.

## Underground Residential Distribution (URD) Systems

(30 Hours)

ISBN 978-0-13-274263-4

(Module ID 80204-11) Describes the methods used to distribute power in residential and commercial subdivisions, including the equipment used in the process, such as pad-mount transformers and switchgear. Covers the components and methods used to connect primary and secondary power, as well as the protective devices used in URD systems and methods used to locate and repair buried cables.

## Overhead and URD Service Installations

(15 Hours)

ISBN 978-0-13-274264-1

(Module ID 80205-11) Describes the methods and procedures used in terminating single-phase and three-phase aerial and URD systems at residential and commercial customer locations. Includes coverage of revenue meters and street light connections.

## Distribution Line Maintenance

(50 Hours)

ISBN 978-0-13-274265-8

(Module ID 80206-11) Describes the inspection process and the methods and procedures used to inspect and maintain poles, conductors, and equipment used in aerial and URD systems. Includes coverage of transformer testing; location and correction of faults in URD systems; load management systems; and protective device coordination.

<b>L3 POWER LINE WORKER: DISTRIBUTION</b>	
<b>LEVEL 3</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 145 Hours</li> <li>• Published: 2012</li> <li>• Downloadable instructor resources are available.</li> </ul>	
<p><b>PAPERBACK</b></p> <p>Trainee Guide: \$102.99</p>	<p><b>ISBN</b></p> <p><b>978-0-13-294865-4</b></p>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## Introduction to Substations

(10 Hours)

ISBN 978-0-13-296779-2

(Module ID 82201-12; from *Power Line Worker: Substation Level Two*) Provides an overview of the different types and functions of substations. Identifies the various voltage classes and introduces the primary equipment and components found in substations. Safe work practices and access issues related to substations are presented, as well as an introduction to one-line diagrams.

## Live-Line Work

(40 Hours)

ISBN 978-0-13-296759-4

(Module ID 80301-12) Covers tools such as hot sticks, shotgun sticks, and wire tongs, along with the PPE and safe work practices that are critical elements of live line and bare hand work. Includes coverage of various live-line tasks such as different methods of moving conductors and replacing insulators, cross-arms, and poles.

## Three-Phase URD Systems

(25 Hours)

ISBN 978-0-13-296760-0

(Module ID 80302-12) Covers safety practices associated with three-phase URD systems; describes vault and manhole applications; and explains different transformer configurations and sectionalizing equipment used in three-phase URD systems. Also covers three-phase cables and how cable is pulled through conduit.

## System Protection and Monitoring

(7.5 Hours)

ISBN 978-0-13-296761-7

(Module ID 80303-12) Presents an overview of monitoring and protection systems and reviews the key components that make them work. Describes feeder diagrams and their use in locating and identifying components.

## Troubleshooting

(40 Hours)

ISBN 978-0-13-296762-4

(Module ID 80304-12) Focuses on the methods used to safely locate and correct faults in aerial and URD systems. Includes troubleshooting methods as well as work site preparation.

## Introduction to Smart Grids

(2.5 Hours)

ISBN 978-0-13-296763-1

(Module ID 80305-12) Describes the network of transmission and distribution lines that delivers electricity between generating sources and consumers, and explains how the smart grid overlays this network to maintain a balance between power availability and demand.

## Fundamentals of Crew Leadership

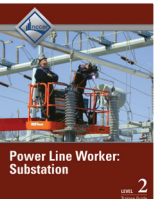
(20 Hours)

ISBN 978-0-13-292245-6

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

Continued on following page

**L2**
**POWER LINE WORKER: SUBSTATION**



**LEVEL 2**

**Curriculum Notes**

- 180 Hours
- Published: 2012
- Downloadable instructor resources are available.

**PAPERBACK**
**ISBN**

Trainee Guide: \$102.99
**978-0-13-295343-6**

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Substations (10 Hours)

ISBN 978-0-13-296779-2

(Module ID 82201-12) Provides an overview of the different types and functions of substations. Identifies the various voltage classes and introduces the primary equipment and components found in substations. Safe work practices and access issues related to substations are presented, as well as an introduction to one-line diagrams.

### Managing Electrical Hazards (12.5 Hours)

ISBN 978-0-13-294869-2

(Module ID 26501-12; from *Electrical, Second Edition*) Introduces electrical hazards in the workplace and describes how to avoid them. Explains how to analyze and document shock and arc flash hazards, and how to plan and conduct work around them. Includes examples of how to complete an energized electrical work permit, and how to select the specialized personal protective equipment required for electrical work.

## Alternating Current and Three-Phase Systems

(17.5 Hours)

ISBN 978-0-13-274259-7

(Module ID 80201-12; from *Power Line Worker: Distribution Level Two*) Introduces the development of both single- and three-phase alternating current. Analyzes the relationship of AC phases and introduces key components used to refine AC power. Discusses the operation of transformers and introduces advanced AC concepts such as reactive power and the power factor.

## Conductors and Cables (10 Hours)

ISBN 978-0-13-296780-8

(Module ID 82202-12) Identifies the many types, sizes, and applications of conductors and cables. Fiber-optic cable is also introduced. Reviews the use of cable drawings and schedules. Provides coverage of the methods of routing cables underground in the substation environment.

## Cable Tray (7.5 Hours)

ISBN 978-0-13-266136-2

(Module ID 26207-11; from *Electrical Level Two, Seventh Edition*) Focuses on NEC® installation requirements for cable tray, including cable installations.

## Conduit Bending (15 Hours)

ISBN 978-0-13-266133-1

(Module ID 26204-11; from *Electrical Level Two, Seventh Edition*) Covers bends in conduit up to 6 inches. Focuses on mechanical, hydraulic, and electrical benders.

## Conductor Installations (10 Hours)

ISBN 978-0-13-266135-5

(Module ID 26206-11; from *Electrical Level Two, Seventh Edition*) Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

## Conductor Terminations and Splicing (7.5 Hours)

ISBN 978-0-13-266137-9

(Module ID 26208-11; from *Electrical Level Two, Seventh Edition*) Describes methods of terminating and splicing conductors, including preparing and taping conductors.

## Grounding Systems (12.5 Hours)

ISBN 978-0-13-296782-2

(Module ID 82203-12) Describes the purpose and arrangement of grounding systems installed beneath a substation. Covers the materials of construction and the approaches to reliable ground system connections. Introduces safety concerns and precautions associated with substation and grounding grid expansion.

## Grades (15 Hours)

ISBN 978-0-13-292311-8

(Module ID 22106-12; from *Heavy Equipment Operations Level One*) Introduces the concept of preparing graded surfaces using heavy equipment. Covers identification of construction stakes and interpretation of marks on each type of stake. Describes the process for grading slopes.

## Concrete Work (35 Hours)

ISBN 978-0-13-296783-9

(Module ID 82204-12) Provides comprehensive coverage of concrete pouring and finishing techniques. Includes detailed information on concrete types and their uses. Form layout and construction, along with basic surveying skills, is presented. Also provides detailed coverage of rebar types and their common geometric forms.

## Mechanical Construction Methods and Materials

(17.5 Hours)

ISBN 978-0-13-296784-6

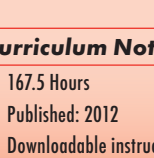
(Module ID 82205-12) Covers the diverse types of substation structures and their composition. Identifies components commonly supported by structures and the various bus forms and materials of construction. Includes thorough coverage of threaded fasteners along with mechanical torquing tools and procedures.

## Intermediate Rigging (10 Hours)

ISBN 978-0-13-266181-2

(Module ID 38201-11; from *Intermediate Rigger, Second Edition*) Describes basic procedures for using various slings in hitches and calculating sling stress. Introduces tools and equipment used for the lateral movement of loads without a crane. Trainees learn how to reeve block and tackle, invert loads with hoists, and drift a load between two hoists.

**L3**
**POWER LINE WORKER: SUBSTATION**



**LEVEL 3**

**Curriculum Notes**

- 167.5 Hours
- Published: 2012
- Downloadable instructor resources are available.

**PAPERBACK**
**ISBN**

Trainee Guide: \$102.99
**978-0-13-294866-1**

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Temporary Grounding (15 Hours)

ISBN 978-0-13-604738-4

(Module ID 40308-09; from *Industrial Maintenance E&I Level Three*) Covers the methods used to eliminate or reduce electrical shock hazards to personnel working on electrical equipment.

### Advanced Drawing Reading (20 Hours)

ISBN 978-0-13-296791-4

(Module ID 82301-12) Covers the drawings typically associated with substations and the skills needed for their interpretation. Provides detailed instruction on elementary, schematic, and general component arrangement drawings. Wiring diagrams and drawing schedules are also covered.

## Medium- and High-Voltage Equipment Installation

(25 Hours)

ISBN 978-0-13-296792-1

(Module ID 82302-12) Presents the typical installation procedures for primary substation components. Identifies the common and unique factors related to the proper installation of transformers, circuit breakers, capacitors, reactors, bus systems, and insulators. A discussion of corona and how proper installation techniques can prevent it is also included.

## Control House (20 Hours)

ISBN 978-0-13-296793-8

(Module ID 82303-12) Provides an overview of the substation control house and its function in the substation. The components and protective systems generally contained within a control house are examined, including the essential DC power systems and emergency power supplies. Coverage of racking systems and their layout is also included.

Continued on following page

## Power Line Worker: Substation Level 3 (continued)

### Connectors, Conductor Terminations, and Splicing

(25 Hours)

ISBN 978-0-13-296794-5

(Module ID 82304-12) Describes the procedures and materials required to prepare and complete terminations and splices on insulated and non-insulated conductors and cables. Coverage is provided for both medium- and high-voltage circuits. Hydraulic presses and crimpers are introduced, along with hi-pot testing procedures for terminations and splices.

### Equipment Testing and Maintenance (30 Hours)

ISBN 978-0-13-296795-2

(Module ID 82305-12) Identifies the testing procedures required and explains how to properly maintain substation components. Coverage of testing and maintenance procedures is provided for power transformers, potential devices, various circuit breakers, disconnects and switches, capacitors, and reactors.

### System Protection and Control (12.5 Hours)

ISBN 978-0-13-296796-9

(Module ID 82306-12) Describes the protective functions required in the substation environment to defend against overloads, fault currents, and other incidents that can disrupt service or damage the system. Offers coverage of the components used to provide both protection and system control. An introduction to the various protective relay schemes used in today's substations is included.

### Fundamentals of Crew Leadership (20 Hours)

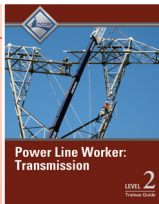
ISBN 978-0-13-292245-6

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

L2

### POWER LINE WORKER: TRANSMISSION

LEVEL 2



#### Curriculum Notes

- 175 Hours
- Published: 2011
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-273033-4

### Alternating Current and Three-Phase Systems

(17.5 Hours)

ISBN 978-0-13-274259-7

(Module ID 80201-11; from *Power Line Worker: Distribution Level Two*) Introduces the development of both single- and three-phase alternating current. Analyzes the relationship of AC phases and introduces key components used to refine AC power. Discusses the operation of transformers and introduces advanced AC concepts such as reactive power and the power factor.

### Transmission Structure Rigging (17.5 Hours)

ISBN 978-0-13-296770-9

(Module ID 81201-11) Covers rigging equipment and practices specific to transmission structures. Coverage includes slings, crane stability, and the safe use of personnel platforms.

### Transmission Structure Erection (50 Hours)

ISBN 978-0-13-274276-4

(Module ID 81202-11) Describes the erection requirements for various types of transmission structures, including steel towers, wood structures, and different types of poles. Covers general construction requirements, as well as right-of-way clearing, foundations, framing and erection, guying and anchoring, and grounding and bonding.

### Transmission Equipment Installation (50 Hours)

ISBN 978-0-13-274277-1

(Module ID 81203-11) Focuses on the safe installation of insulators and conductors. Coverage includes stringing and splicing of conductors, conductor terminations, conductor sagging, clipping in, and the installation of accessories such as vibration dampers, spacers, warning lights, and day markers.

### Transmission System Maintenance (40 Hours)

ISBN 978-0-13-274278-8

(Module ID 81204-11) Coverage includes safety practices related to working with helicopters, as well as inspection of insulators, towers, and poles. Discusses clearance procedures and environmental concerns such as protection of wetlands, waterways, and wildlife.

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

L3

### POWER LINE WORKER: TRANSMISSION

LEVEL 3

#### Curriculum Notes

- 200 Hours
- Published: 2012
- Downloadable instructor resources are available.

#### PAPERBACK

Trainee Guide: \$102.99

ISBN

978-0-13-294867-8

### Construction, Maintenance, and Repair –

Live-Line Barehand (40 Hours)

ISBN 978-0-13-296772-3

(Module ID 81301-12) Describes the methods used to work on live transmission lines by bonding to the line. Covers safety practices and PPE, and includes coverage of bonded buckets, non-conductive suits, insulated ladders, bonding jumpers, and rescue procedures.

### Reconductoring Transmission Lines (40 Hours)

ISBN 978-0-13-296775-4

(Module ID 81302-12) Describes the replacement of existing transmission conductors as contrasted with installation of new conductors. Coverage includes pulling equipment setup, guard structures, and permit requirements. Includes live-line replacement as well as use of the existing conductors to pull the replacement conductors.

### Construction, Maintenance, and Repair – Hot Stick

(80 Hours)

ISBN 978-0-13-296774-7

(Module ID 81303-12) Covers tools such as hot sticks, shotgun sticks, and wire tongs, along with the PPE and safe work practices that are critical elements of live-line and bare-hand work. Includes coverage of live-line tasks such as replacing insulators, cross-arms, and spacers.

### Lift Planning (40 Hours)

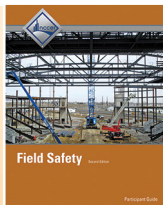
ISBN 978-0-13-266190-4

(Module ID 38302-11; from *Advanced Rigger, First Edition*) Discusses lift plan implementation, including reference information, calculations, single- and multiple-crane lifting, critical lifts, and engineering considerations.

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

## FIELD SAFETY



### Curriculum Notes

- 45 Hours
- Revised: 2013, Second Edition
- Provides the necessary safety task training to all field personnel. This manual is designed for individuals involved with completing or overseeing a specific task, from the craftsperson, crew leader, and safety supervisor to superintendent.
- Downloadable instructor resources are available.
- A Spanish translation of the first edition is available. Please see NCCER's online catalog for more information.

### PAPERBACK

Participant Guide: \$102.99

### ISBN

978-0-13-340245-2

## MODULES

The modules listed below are included in the Participant Guide. The following ISBNs are for ordering individual modules only.

### Introduction to Safety (10 hours)

ISBN 978-0-13-340359-6

(Module ID 75101-13) Presents basic safety concepts and explains the difference between regulatory compliance and best practices. Introduces OSHA and explains how accidents affect everyone on a job site. Provides an overview of common jobsite hazards, including walking and working surfaces, temperature extremes, fire prevention, and tool safety. Identifies the elements of a hazard communication system and describes the types of information found on a product's safety data sheet (SDS).

## Safety Learning Series

The Safety Learning Series consists of three separate titles comprising a suggested education path: the *Basic Safety* module from *Core*, *Field Safety*, and *Safety Technology*. The curriculum was built on industry best practices by a team of safety professionals and meets the training needs of the craft professional, safety technician, and safety manager.

The modularized structure of the curriculum enables companies to cost-effectively customize training programs and offer industry credentials through the NCCER Registry System. The Safety Learning Series has been recognized by the Board of Certified Safety Professionals (BCSP). Completion of the Safety Learning Series will help personnel prepare for the Safety Trained Supervisor Construction (STSC) and Construction Health and Safety Technologist (CHST) certification exams administered by BCSP. BCSP sets and certifies technical competency criteria for safety, health, and environmental practitioners worldwide.

### Confined Spaces and Excavations (5 hours)

ISBN 978-0-13-340360-2

(Module ID 75120-13) Covers safety precautions related to work in confined spaces, including the responsibilities and duties of each member of the confined-space entry team. It also covers the safety hazards and safeguards required when working in an excavation, including an explanation of various trenching supports and soil types.

### Work-Zone Safety (5 hours)

ISBN 978-0-13-340361-9

(Module ID 75104-13) Introduces the signs, signals, and barricades found on various job sites, and covers highway work-zone safety requirements.

### Electrical Safety (5 hours)

ISBN 978-0-13-340362-6

(Module ID 75121-13) Describes the basic precautions necessary to avoid electrical shock, arc, and blast hazards. It also describes the lockout/tagout procedure.

### Working from Elevations (5 hours)

ISBN 978-0-13-340363-3

(Module ID 75122-13) Explains the use of fall-protection equipment. Covers safety precautions related to elevated work surfaces, including ladders, scaffolding, and aerial lifts.

### Steel Erection (2.5 hours)

ISBN 978-0-13-340364-0

(Module ID 75110-13) Covers common safety precautions related to steel-erection work, including controlled decking zones, hazardous materials and equipment precautions, tool safety, and appropriate personal protective equipment.

### Heavy Equipment, Forklift, and Crane Safety (5 hours)

ISBN 978-0-13-340366-4

(Module ID 75123-13) Covers the safety hazards and precautions necessary when working near heavy equipment. Presents general safety requirements for the use of forklifts and cranes.

### Concrete and Masonry (2.5 hours)

ISBN 978-0-13-340367-1

(Module ID 75119-13) Describes the personal protective equipment that must be used when working with concrete and masonry as well as the common jobsite and health hazards associated with this type of work.

### Introduction to Materials Handling (5 hours)

ISBN 978-0-13-377943-1

(Module ID 75124-13) Explains the safety precautions required when transporting, handling, rigging, stacking, and storing various types of loads. It also covers safe lifting procedures.

Continued on following page

## Basic Safety

(Construction Site Safety Orientation)

12.5 Hours  
Revised: 2021  
Module ID 00101

**PAPERBACK**

Trainee Guide: \$24.99

**ISBN**

978-0-13-748353-2

This module, from *Core*, replaces the *Safety Orientation* book. See the module description above for more information.

## Fall Protection Orientation



8 Hours  
Module ID 75901

**PAPERBACK**

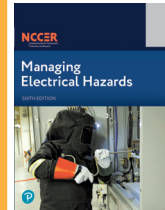
Trainee Guide: \$34.99

**ISBN**

978-0-13-530500-3

Covers fundamental safety and hazard recognition concepts. Introduces the role of OSHA in regulating elevated work on the jobsite and the causes, costs, and consequences of falls. Presents proper use of fall protection equipment; safe use of stairs, ladders, and scaffolds; and guidelines for use of aerial lifts.

## Managing Electrical Hazards



12.5 Hours  
Revised: 2024, Sixth Edition  
Module ID 26501-24

**PAPERBACK**

Trainee Guide: \$39.99

**ISBN**

978-0-13-831869-7

- A copy of NFPA 70E®, Standard for Electrical Safety in the Workplace, 2024 Edition, is required material for this course. To order, contact NFPA at [www.nfpa.org](http://www.nfpa.org) or 1-800-344-3555.

Describes how to assess and eliminate shock, arc blast, and arc flash hazards using the practical safe working requirements detailed in NFPA 70E: Standard for Electrical Safety in the Workplace®. Where it is not possible to eliminate a hazard, an energized electrical work permit must be completed, and workers must be protected by appropriate safety procedures and personal protective equipment.

Continued on following page

## SAFETY TECHNOLOGY



Safety Technology

### Curriculum Notes

- 45 Hours
- Updated in 2018.
- Provides instruction on how to implement and administer a company safety program. This manual is designed for field managers, safety directors, safety committees, owner safety representatives, and insurance/loss control representatives.
- Downloadable instructor resources are available.

#### PAPERBACK

Participant Guide: \$89

#### ISBN

978-0-13-444636-3

### MODULES

The modules listed below are included in the Participant Guide. The following ISBNs are for ordering individual modules only.

#### Introduction to Safety Technology (2.5 hours)

ISBN 978-0-13-451725-4

(Module ID 75201) Describes the responsibilities of a safety technician and identifies the basic components of a safety program. It also provides an overview of regulatory requirements.

#### Positive Safety Communication (2.5 hours)

ISBN 978-0-13-546331-4

(Module ID 75205) Explains how to support an effective safety culture on the job site, including communication techniques, motivation, and responding to behavioral issues.

#### Hazard Recognition, Environmental Awareness, and Occupational Health (5 hours)

ISBN 978-0-13-453896-9

(Module ID 75219) Covers environmental and safety hazards. It explains how to evaluate risks and identify appropriate methods of hazard control. It also discusses environmental regulations for hazardous materials and describes the elements of a medical surveillance program.

#### Job Safety Analysis and Pre-Task Planning (5 hours)

ISBN 978-0-13-453897-6

(Module ID 75220) Provides guidance on safety performance analysis and employee coaching. It also explains how to complete job and task safety planning.

#### Safety Data Tracking and Trending (5 hours)

ISBN 978-0-13-451727-8

(Module ID 75221) Covers how to conduct safety inspections, audits, and employee safety observations. It discusses both traditional and predictive methods of performance measurement, and explains how to analyze safety data in order to prevent future incidents.

#### Site-Specific Safety Plans (5 hours)

ISBN 978-0-13-453900-3

(Module ID 75222) Explains how to use pre-bid checklists to identify hazards and develop a site safety plan. It also describes how to develop an emergency action plan.

#### Safety Orientation and Safety Meetings (5 hours)

ISBN 978-0-13-451729-2

(Module ID 75223) Describes how to prepare and deliver effective training using both formal safety meetings and tailgate talks.

#### Permits and Policies (5 hours)

ISBN 978-0-13-451735-3

(Module ID 75224) Provides an overview of the various work permits required on a construction site. It also provides detailed procedures for completing a hot work permit, lockout/tagout, and confined-space entry permit.

#### Incident Investigations, Policies, and Analysis (5 hours)

ISBN 978-0-13-451734-6

(Module ID 75225) Describes how to conduct an incident investigation, including employee interviews and reporting requirements. It also explains how to analyze an incident to determine the root cause and prevent future incidents.

#### OSHA Inspections and Recordkeeping (5 hours)

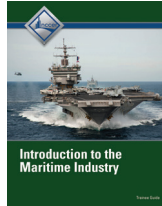
ISBN 978-0-13-451733-9

(Module ID 75226) Discusses the OSHA requirements for record-keeping and explains how to manage the safety and health records for a job site. It also covers the two main types of OSHA inspections.



250,000. That's not just a number needed to fill the jobs created by workers leaving the building and plant construction industry. It's the number of men and women leaving jobs in shipbuilding, shipyards, ship repair facilities, and offshore rigs – the maritime industry. This industry is facing a skilled workforce crisis due to an aging workforce and dwindling pool of workers from which to draw. In partnership with the NMEC (National Maritime Education Council), NCCER has developed the first ever standardized and nationally recognized Maritime curricula. This program includes training material in Maritime 'Core' and Pipefitter, and Structural Fitter, and will soon be followed by assessments to certify journey-level skills.

## Introduction to the Maritime Industry



12.5 Hours  
Published: 2013  
Module ID 84101-13

### PAPERBACK

### ISBN

Trainee Guide: \$24.99

978-0-13-295443-3

- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

Introduces the facilities, methods, and processes used in the shipbuilding and repair industry. Describes the impact the industry has on the U.S. economy and explores the various craft opportunities available to workers. Provides an overview of the safety practices specific to the industry.

## MARITIME INDUSTRY FUNDAMENTALS



### Curriculum Notes

- 97.5 Hours
- Published: 2013
- The Trainee Guide is shrinkwrapped with *Core* and the *Introduction to the Maritime Industry* module.
- Either 2009 or 2015 *Core* can be used for the Maritime Industry Fundamentals package.
- These hours are a prerequisite for Level One completion of the *Maritime* programs.
- **Basic Rigging (Module ID 00106-09) or Introduction to Basic Rigging (Module ID 00106) is required to complete Maritime Industry Fundamentals.**
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

### ISBN

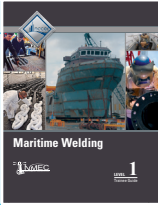
Trainee Guide

978-0-13-456850-8

# Maritime Aluminum Welding

## L1 MARITIME ALUMINUM WELDING

LEVEL 1



### Curriculum Notes

- 345 Hours
  - Includes 97.5 hours of *Maritime Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: ISBN 978-0-13-456850-1
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$134.99

### ISBN

978-0-13-560384-0

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Welding Safety (5 hours)

ISBN 978-0-13-416580-6

(Module ID 29101) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

### Plasma Arc Cutting (7.5 hours)

ISBN 978-0-13-418269-8

(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

### Base Metal Preparation (12.5 hours)

ISBN 978-0-13-414043-8

(Module ID 29105) Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

### Weld Quality (10 hours)

ISBN 978-0-13-414044-5

(Module ID 29106) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

### Joint Fit-up and Alignment (5 hours)

ISBN 978-0-13-418024-3

(Module ID 29110) Describes job code specifications. Explains how to use fit-up gauges and measuring devices to check fit-up and alignment and use plate and pipe fit-up and alignment tools to properly prepare joints. Explains how to check for joint misalignment and poor fit.

### Welding Symbols (5 hours)

ISBN 978-0-13-417950-6

(Module ID 29201) Identifies and explains the different types of fillet weld, groove weld, and non-destructive examination symbols. Explains how to read welding symbols on drawings, specifications and Welding Procedure Specifications (WPS).

### Reading Welding Detail Drawings (10 hours)

ISBN 978-0-13-417953-7

(Module ID 29202) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

### Physical Characteristics/Mechanical Properties of Metal (7.5 hours)

ISBN 978-0-13-417954-4

(Module ID 29203) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

### Preheating and Postheating of Metals (5 hours)

ISBN 978-0-13-418019-9

(Module ID 29204) Explains preheating, interpass temperature control, and postheating procedures that sometimes need to be done to preserve weldment strength, ductility, and weld quality. Covers the equipment used for heat treating metals.

### GMAW & FCAW - Equipment and Filler Metals (10 hours)

ISBN 978-0-13-418018-2

(Module ID 29205) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

### GTAW - Equipment and Filler Metals (10 hours)

ISBN 978-0-13-417969-8

(Module ID 29207) Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

### GMAW - Aluminum Plate (30 hours)

ISBN 978-0-13-467767-5

(Module ID 29401) Covers the setup of GMAW equipment for welding aluminum plate. Explains aluminum metallurgy and the characteristics of aluminum welding; how to clean and prepare aluminum plate coupons for welding; and problems often encountered in aluminum welds. Explains GMAW techniques used in aluminum welding. Provides GMAW procedures on how to build weld pads on aluminum plate; how to make fillet welds on aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

### GTAW - Aluminum Plate (30 hours)

ISBN 978-0-13-467765-1

(Module ID 29402) Covers the setup of GTAW equipment for welding aluminum plate. Explains how to clean and prepare aluminum plate coupons for welding, and how to select the aluminum filler metals and shielding gases used in the GTAW process. Explains GTAW techniques used in aluminum welding. Provides GTAW procedures on how to build weld pads on aluminum plate; how to make fillet welds on aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

### GTAW - Aluminum Pipe (50 hours)

ISBN 978-0-13-467763-7

(Module ID 29403) Covers the setup of GTAW equipment for welding aluminum pipe. Explains how to clean and prepare aluminum pipe coupons for welding. Addresses GTAW techniques used to make V-groove and modified U-groove welds on aluminum pipe with and without backing. Provides GTAW procedures on how to make V-groove or modified U-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

### GMAW - Aluminum Pipe (50 hours)

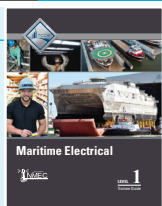
ISBN 978-0-13-467760-6

(Module ID 29404) Covers the setup of GMAW equipment for welding aluminum pipe. Addresses GMAW techniques used to make V-groove welds on aluminum pipe with and without backing. Explains how to clean and prepare aluminum pipe coupons for welding. Provides GMAW procedures on how to make V-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

Continued on following page

## L1 MARITIME ELECTRICAL

LEVEL 1



### Curriculum Notes

- 167.5 Hours
  - Includes 97.5 hours of *Maritime Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: ISBN 978-0-13-456850-1
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-569834-1

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Electrical Trade (2.5 Hours)

ISBN 978-0-13-480474-3

(Module ID 26101-17) Provides an overview of the electrical trade and discusses the career paths available to electricians.

### Electrical Safety (10 Hours)

ISBN 978-0-13-480477-4

(Module ID 26102-17) Covers safety rules and regulations for electricians. Teaches the necessary precautions to take for various electrical hazards found on the job. Also covers the OSHA-mandated lockout/tagout procedure.

### Electrical Theory (7.5 Hours)

ISBN 978-0-13-480481-1

(Module ID 26104-17) Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

### Introduction to Electrical Circuits (7.5 Hours)

ISBN 978-0-13-480479-8

(Module ID 26103-17) Offers a general introduction to the electrical concepts used in Ohm's law applied to DC circuits. Includes atomic theory, electromotive force, resistance, and electric power equations.

### Basic Electrical Construction Drawings (7.5 Hours)

ISBN 978-0-13-480496-5

(Module ID 26110-17) Focuses on electrical prints, drawings, and symbols. Teaches the types of information that can be found on schematics, one-lines, and wiring diagrams.

### Electrical Test Equipment (5 Hours)

ISBN 978-0-13-478339-0

(Module ID 26112-17) Focuses on proper selection, inspection, and use of common electrical test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, and data recording equipment. Also covers safety precautions and meter category ratings.

### Raceways & Fittings (20 Hours)

ISBN 978-0-13-480488-0

(Module ID 26108-17) Introduces the types and applications of raceways, wireways, and ducts. Stresses the appropriate NEC® requirements.

### Device Boxes (10 Hours)

ISBN 978-0-13-480491-0

(Module ID 26106-17) Covers the hardware and systems used by an electrician to mount and support boxes, receptacles, and other electrical components. Covers NEC® fill and pull requirements for device, pull, and junction boxes under 100 cubic inches.

## L2 MARITIME ELECTRICAL

LEVEL 2

### Curriculum Notes

- 100 Hours
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-569833-4

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Alternating Current (17.5 Hours)

ISBN 978-0-13-478337-6

(Module ID 26201-17) Focuses on forces that are characteristic of alternating-current systems and the application of Ohm's law to AC circuits.

### Grounding and Bonding (15 Hours)

ISBN 978-0-13-480506-1

(Module ID 26209-17) Focuses on the purpose of grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

### Conductors and Cables (10 Hours)

ISBN 978-0-13-480494-1

(Module ID 26109-17) Focuses on the types and applications of conductors and covers proper wiring techniques. Stresses the appropriate NEC® requirements.

### Conductor Installations (10 Hours)

ISBN 978-0-13-480499-6

(Module ID 26206-17) Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

### Conductor Terminations and Splices (7.5 Hours)

ISBN 978-0-13-480504-7

(Module ID 26208-17) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

### Pull and Junction Boxes (12.5 Hours)

ISBN 978-0-13-480498-9

(Module ID 26205-17) Driven by the NEC®. Explains how to select and size pull boxes, junction boxes, and handholes.

### Circuit Breakers and Fuses (12.5 Hours)

ISBN 978-0-13-480509-2

(Module ID 26210-17) Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

### Electric Lighting (15 Hours)

ISBN 978-0-13-478335-2

(Module ID 26203-17) Introduces the basic principles of human vision and the characteristics of light. Focuses on the handling and installation of various types of lamps and lighting fixtures.

Continued on following page

<b>L3 MARITIME ELECTRICAL</b>	
<b>LEVEL 3</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 97.5 Hours</li> <li>• Published: 2019</li> <li>• Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at <a href="http://www.nccer.org/irc">www.nccer.org/irc</a>.</li> </ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-569835-8</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Rigging Practices (15 Hours)

ISBN 978-0-13-498801-6

(Module ID 38102) Presents basic rigging, which refers to the preparation of a load for movement, as well as the preparation of hardware and other components used to connect the load to the crane. Rigging must be completed safely and effectively, resulting in a reliable connection to the load. An understanding of rigging fundamentals is essential to safely operate cranes and move/position heavy equipment, components, and structures.

### Distribution Equipment (12.5 Hours)

ISBN 978-0-13-480524-5

(Module ID 26306-17) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. This module also includes electrical drawings of distribution equipment.

### Motors: Theory and Application (20 Hours)

ISBN 978-0-13-478336-9

(Module ID 26202-17) Covers AC and DC motors, including the main components, circuits, and connections.

### Motor Controls (12.5 Hours)

ISBN 978-0-13-480536-8

(Module ID 26311-17) Provides information on selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

### Transformers (12.5 Hours)

ISBN 978-0-13-480527-6

(Module ID 26307-17) Discusses transformer types, construction, connections, protection, and grounding.

### Specialty Transformers (10 Hours)

ISBN 978-0-13-480549-8

(Module ID 26406-17) Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

### Hazardous Locations (15 Hours)

ISBN 978-0-13-480522-1

(Module ID 26304-17) Covers the NEC® requirements for equipment installed in various hazardous locations.

<b>L4 MARITIME ELECTRICAL</b>	
<b>LEVEL 4</b>	
<b>Curriculum Notes</b>	
<ul style="list-style-type: none"> <li>• 90 Hours</li> <li>• Published: 2019</li> <li>• Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at <a href="http://www.nccer.org/irc">www.nccer.org/irc</a>.</li> </ul>	
<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$102.99	<b>978-0-13-569830-3</b>

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Control Systems and Fundamental Concepts

(12.5 Hours)

ISBN 978-0-13-480511-5

(Module ID 26211-17) Gives basic descriptions of various types of contactors and relays along with their practical applications.

### Advanced Controls (20 Hours)

ISBN 978-0-13-480551-1

(Module ID 26407-17) Discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable frequency drives. Also covers basic troubleshooting procedures.

### Basic Electronic Theory (10 Hours)

ISBN 978-0-13-480546-7

(Module ID 26404-17) Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

### Fire Alarm Systems (15 Hours)

ISBN 978-0-13-480547-4

(Module ID 26405-17) Covers fire alarm control units, Digital Alarm Communicator Systems (DACS), wiring for alarm initiating and notification devices, and alarm system maintenance.

### Standby and Emergency Systems (10 Hours)

ISBN 978-0-13-480543-6

(Module ID 26403-17) Explains the NEC® requirements for electric generators and storage batteries.

### Fundamentals of Crew Leadership (22.5 Hours)

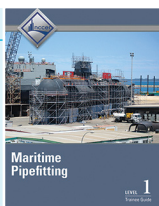
ISBN 978-0-13-292245-6

(Module ID 46101) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Job-site safety and the crew leader's role in safety are also discussed. Explains details and procedures for project planning, scheduling, and estimating.

# Maritime Pipefitting

## L1 MARITIME PIPEFITTING

### LEVEL 1



#### Curriculum Notes

- 182.5 Hours
  - Includes 97.5 hours of *Maritime Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: ISBN 978-0-13-456850-1
- Published: 2013
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

#### PAPERBACK

#### ISBN

Trainee Guide: \$74.99

978-0-13-340475-3

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Orientation to the Maritime Pipefitting Trade

(5 Hours)

ISBN 978-0-13-340590-3

(Module ID 85101-13) Provides an overview of the maritime pipefitting trade and its career opportunities. Trade safety principles are introduced, as well as the responsibilities and characteristics of a good pipefitter.

### Maritime Pipefitting Trade Math

(15 Hours)

ISBN 978-0-13-340591-0

(Module ID 85102-13) Explains how to solve a wide variety of maritime pipefitting math problems, including those related to common geometrical figures. The process of determining lengths in pipe offsets for general and rolling offsets is also presented.

### Pipefitting Hand Tools

(20 Hours)

ISBN 978-0-13-340592-7

(Module ID 85103-13) Covers hand tool safety, as well as procedures for selecting, inspecting, using, and maintaining pipefitting hand tools. Includes pipe wrenches, pipe stands, pipe vises, levels, and pipe fabrication tools and aids.

### Pipefitting Power Tools

(15 Hours)

ISBN 978-0-13-340593-4

(Module ID 85104-13) Covers power tool safety and procedures for selecting, inspecting, using, and maintaining power tools that are common in the maritime environment. Procedures for threading pipe are provided in a step-by-step format. Guidelines for both electrical and pneumatic tools are provided.

### Oxyfuel Cutting

(17.5 Hours)

ISBN 978-0-13-340594-1

(Module ID 85105-13) Describes the procedures and safety requirements related to oxyfuel cutting. Detailed instructions for setting up, lighting, and using oxyfuel cutting torches is provided. Common techniques, such as straight line cutting, beveling, washing, and gouging are reviewed. Oxyfuel gas supply arrangements from both cylinders and manifolds are also presented.

### Ladders and Scaffolds

(12.5 Hours)

ISBN 978-0-13-340595-8

(Module ID 85106-13) Explains how to identify various types of ladder and scaffold systems and describes their safe use. The pre-use inspection requirements for both ladders and scaffolds are presented.

## L2 MARITIME PIPEFITTING

### LEVEL 2

#### Curriculum Notes

- 147.5 Hours
- Published: 2013
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

#### PAPERBACK

#### ISBN

Trainee Guide: \$102.99

978-0-13-340478-4

### Butt Weld Pipe Fabrication

(37.5 Hours)

ISBN 978-0-13-340598-9

(Module ID 85202-13) Describes the pipe fittings used for maritime butt welded piping systems and how to determine the lengths of pipe between points of connection. Explains how to prepare and fit both pipe and fittings, and how to select backing rings when required.

### Socket Weld Pipe Fabrication

(25 Hours)

ISBN 978-0-13-340599-6

(Module ID 85203-13) Describes the pipe fittings used for maritime socket welded piping systems and how to determine the lengths of pipe between points of connection. Explains how to prepare and fit both pipe and fittings.

### Brazing

(12.5 Hours)

ISBN 978-0-13-340600-9

(Module ID 85204-13) Describes the procedures for preparing various types of pipe and tubing for brazing, as well as the brazing process. Discusses the selection of brazing filler metals for various applications.

### Threaded Pipe Fabrication

(15 Hours)

ISBN 978-0-13-340601-6

(Module ID 85205-13) Describes the pipe fittings used for maritime threaded piping systems and how to determine the lengths of pipe between points of connection. Explains how to prepare and fit both pipe and fittings, and how to assemble threaded pipe components.

### Fiberglass and Plastic Pipe

(12.5 Hours)

ISBN 978-0-13-340602-3

(Module ID 85206-13) Introduces various types of fiberglass and plastic pipe and their maritime applications. Explains how fiberglass and plastic piping materials are measured, cut, and joined.

### Identifying Valves, Flanges, and Gaskets

(20 Hours)

ISBN 978-0-13-340603-0

(Module ID 85207-13) Describes and identifies various types of valves, flanges, and gaskets used in the maritime environment. Factors related to valve selection as well as their storage, handling, and installation are presented. The various flange styles and related gasket materials are described, as well as their common installation procedures.

### Drawings and Detail Sheets

(20 Hours)

ISBN 978-0-13-340604-7

(Module ID 85208-13) Identifies the types and parts of drawings commonly used by maritime pipefitters. Explains how to interpret the information contained in pipe drawings to create the desired piping system.

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Piping Systems

(5 Hours)

ISBN 978-0-13-340596-5

(Module ID 85201-13) Identifies and explains basic types of piping systems found in the maritime environment and the materials used for various applications. Explains how thermal expansion in piping systems can be accommodated. Includes coverage of common insulation types and installation practices.



# Maritime Structural Fitter

## L1 MARITIME STRUCTURAL FITTER

### LEVEL 1



#### Curriculum Notes

- 237.5 Hours
  - Includes 97.5 hours of *Maritime Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: ISBN 978-0-13-456850-1
- Published: 2014
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

#### PAPERBACK

Trainee Guide: \$74.99

#### ISBN

978-0-13-294864-7

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Welding Safety (2.5 Hours)

ISBN 978-0-13-610526-8

(Module ID 29101-09; from *Welding Level One, Fourth Edition*)  
Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-610528-2

(Module ID 29102-09; from *Welding Level One, Fourth Edition*)  
Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

#### Base Metal Preparation (12.5 Hours)

ISBN 978-0-13-610531-2

(Module ID 29105-09; from *Welding Level One, Fourth Edition*)  
Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

#### Weld Quality (10 Hours)

ISBN 978-0-13-610532-9

(Module ID 29106-09; from *Welding Level One, Fourth Edition*)  
Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

#### Shielded Metal Arc Welding – Electrodes

(2.5 Hours)

ISBN 978-0-13-610534-3

(Module ID 29108-09; from *Welding Level One, Fourth Edition*)  
Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

#### Tack Welding (40 Hours)

ISBN 978-0-13-377945-5

(Module ID 86101-14) Describes how to set up welding equipment, strike an arc, and make tack welds in order to maintain proper alignment of parts in anticipation of finish welding. Covers the machines, tools, and techniques used to make tack welds in various positions.

#### Fire Watch (5 Hours)

ISBN 978-0-13-377947-9

(Module ID 86102-14) Prepares a worker to perform fire watch duties in support of welding and flame cutting activities. Describes the classes of fires and the methods used to extinguish them, as well as the responsibilities of a person assigned as a fire watch.

#### Introduction to Structural Fitter Drawings

(10 Hours)

ISBN 978-0-13-377948-6

(Module ID 86103-14) Covers fundamental skills needed to read fabrication drawings that are commonly used by structural fitters. Focuses on basic drawing elements such as title blocks, revision blocks, and drawing lines and introduces plan, elevation, and detail drawings.

#### Fitting One (40 Hours)

ISBN 978-0-13-377949-3

(Module ID 86104-14) Introduces layout tools, fitting tools, and fitting aids used to fit up and align plate joints. Incorporates hands-on tasks through which the beginning fitter will learn how to perform basic layout, alignment, and fit-up tasks.

## L2 MARITIME STRUCTURAL FITTER

### LEVEL 2

#### Curriculum Notes

- 227.5 Hours
- Published: 2014
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-383066-8

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Cutting and Burning Processes (40 Hours)

ISBN 978-0-13-378724-5

(Module ID 86201-14) Expands on flame cutting methods covered in Level 1, including laying out and cutting bevels, chamfers, and circles. Also covers the methods used to cut or split common structural components such as beams and bars.

#### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-610529-9

(Module ID 29103-09; from *Welding Level One, Fourth Edition*)  
Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

#### Intermediate Structural Print Reading (40 Hours)

ISBN 978-0-13-378725-2

(Module ID 86202-14) Covers interpretation of fabrication and installation drawings, sketching of isometric and orthographic drawings, and interpretation of welding symbols.

#### Fitting Two (140 Hours)

ISBN 978-0-13-378729-0

(Module ID 86203-14) Explains selection and application of gaskets and packings, fit-up tasks, and inspection of finished work. Also covers structural accessories, proper measuring techniques, and creating a materials list.



L3 MARITIME STRUCTURAL FITTER	
LEVEL 3	
Curriculum Notes	
<ul style="list-style-type: none"> <li>• 237.5 Hours</li> <li>• Published: 2016</li> <li>• Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at <a href="http://www.nccer.org/irc">www.nccer.org/irc</a>.</li> </ul>	
PAPERBACK	ISBN
Trainee Guide: \$102.99	978-0-13-375044-7

## MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

### Advanced Structural Print Reading (40 Hours)

ISBN 978-0-13-414487-0

(Module ID 86301-15) Focuses on learning to interpret ship construction drawings, ranging from the highest level general arrangement drawing to the lowest level piece-part drawing. Includes a set of drawings.

### Fitting Three (80 Hours)

ISBN 978-0-13-414489-4

(Module ID 86302-15) Provides an overview of the ship construction process, from the lowest subassembly to the erection of the vessel itself. Illustrates laying out the locations of equipment and structural members, installing the equipment and structural members, and the use of leveling and alignment equipment.

### GMAW and FCAW – Equipment and Filler Metals (10 Hours)

ISBN 978-0-13-214147-5

(Module ID 29205-09; from *Welding Level Two, Fourth Edition*) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

### GMAW and FCAW – Plate (80 Hours)

ISBN 978-0-13-214113-0

(Module ID 29206-09; from *Welding Level Two, Fourth Edition*) Explains how to set up and use FCAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

### Physical Characteristics and Mechanical Properties of Metals (7.5 Hours)

ISBN 978-0-13-214145-1

(Module ID 29203-09; from *Welding Level Two, Fourth Edition*) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

### Fundamentals of Crew Leadership (20 Hours)

ISBN 978-0-13-414493-1

(Module ID 46101-11, Second Edition) Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.

# Maritime Welding

## L1 MARITIME WELDING

LEVEL 1



### Curriculum Notes

- 272.5 Hours
  - Includes 97.5 hours of *Maritime Industry Fundamentals*, which is a prerequisite for Level One completion and must be purchased separately.
    - Hardcover: ISBN 978-0-13-456850-1
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$74.99

### ISBN

978-0-13-560371-0

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Welding Safety (5 Hours)

ISBN 978-0-13-416580-6

(Module ID 29101) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

#### Oxyfuel Cutting (17.5 Hours)

ISBN 978-0-13-418268-1

(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

#### Plasma Arc Cutting (7.5 Hours)

ISBN 978-0-13-418269-8

(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

#### Air Carbon Arc Cutting and Gouging (10 Hours)

ISBN 978-0-13-418270-4

(Module ID 29104) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

#### Base Metal Preparation (12.5 Hours)

ISBN 978-0-13-414043-8

(Module ID 29105) Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

#### Weld Quality (10 Hours)

ISBN 978-0-13-414044-5

(Module ID 29106) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

#### SMAW - Equipment and Setup (5 Hours)

ISBN 978-0-13-418027-4

(Module ID 29107) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

#### SMAW Electrodes (2.5 Hours)

ISBN 978-0-13-418026-7

(Module ID 29108) Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

#### SMAW - Beads and Fillet Welds (100 Hours)

ISBN 978-0-13-418025-0

(Module ID 29109) Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

#### Joint Fit-up and Alignment (5 Hours)

ISBN 978-0-13-418024-3

(Module ID 29110) Describes job code specifications. Explains how to use fit-up gauges and measuring devices to check fit-up and alignment and use plate and pipe fit-up and alignment tools to properly prepare joints. Explains how to check for joint misalignment and poor fit.

## L2 MARITIME WELDING

LEVEL 2

### Curriculum Notes

- 337.5 Hours
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

### PAPERBACK

Trainee Guide: \$102.99

### ISBN

978-0-13-560378-9

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### Welding Symbols (5 Hours)

ISBN 978-0-13-417950-6

(Module ID 29201) Identifies and explains the different types of fillet weld, groove weld, and non-destructive examination symbols. Explains how to read welding symbols on drawings, specifications and Welding Procedure Specifications (WPS).

#### Reading Welding Detail Drawings (10 Hours)

ISBN 978-0-13-417953-7

(Module ID 29202) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

#### SMAW - Groove Welds with Backing (50 Hours)

ISBN 978-0-13-418023-6

(Module ID 29111) Introduces groove welds and explains how to set up welding equipment for making groove welds. Describes how to make groove welds with backing. Provides procedures for making flat, horizontal, vertical, and overhead groove welds.

#### SMAW - Open-Root Groove Welds (60 Hours)

ISBN 978-0-13-418022-9

(Module ID 29112) Introduces various types of groove welds and describes how to prepare for groove welding. Describes the techniques required to produce various open V-groove welds.

#### GMAW & FCAW - Equipment and Filler Metals (10 Hours)

ISBN 978-0-13-418018-2

(Module ID 29205) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

#### GMAW - Plate (60 Hours)

ISBN 978-0-13-417970-4

(Module ID 29209) Explains how to set up and use GMAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

#### FCAW - Plate (60 Hours)

ISBN 978-0-13-420171-9

(Module ID 29210) Explains how to set up and use FCAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

#### GTAW - Equipment and Filler Metals (10 Hours)

ISBN 9780134179698

(Module ID 29207) Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

#### GTAW - Plate (60 Hours)

ISBN 978-0-13-417968-1

(Module ID 29208) Describes how to build pads on carbon steel plate using GTAW and carbon steel filler metal. Also explains how to make multiple-pass GTAW fillet welds on carbon steel plate coupons in the 1F, 2F, 3F, and 4F positions, and how to make GTAW V-groove welds in the 1G, 2G, 3G, and 4G positions.

Continued on following page

### Physical Characteristics/Mechanical Properties of Metal (7.5 Hours)

ISBN 978-0-13-417954-4

(Module ID 29203) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

### Preheating and Postheating of Metals (5 Hours)

ISBN 978-0-13-418019-9

(Module ID 29204) Explains preheating, interpass temperature control, and postheating procedures that sometimes need to be done to preserve weldment strength, ductility, and weld quality. Covers the equipment used for heat treating metals.

## L3 MARITIME WELDING

### LEVEL 3

#### Curriculum Notes

- 470 Hours
- Published: 2019
- Downloadable instructor resources that include module tests, PowerPoints®, and performance profile sheets are available at [www.nccer.org/irc](http://www.nccer.org/irc).

#### PAPERBACK

Trainee Guide: \$102.99

#### ISBN

978-0-13-560382-6

### MODULES

The modules listed below are included in the Trainee Guide. The following ISBNs are for ordering individual modules only.

#### SMAW - Open-Root Pipe Welds (100 Hours)

ISBN 978-0-13-448560-7

(Module ID 29301) This module explains how to set up SMAW equipment for open-root V-groove welds, and how to prepare for and make open-root V-groove welds on carbon steel pipe. It provides procedures for making open-root V-groove welds with SMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

#### GMAW - Pipe (60 Hours)

ISBN 978-0-13-448564-5

(Module ID 29302) This module explains how to set up GMAW equipment for open-root V-groove welds, and how to prepare for and make open-root V-groove welds on carbon steel pipe. It provides procedures for making open-root V-groove welds with GMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

#### FCAW - Pipe (60 Hours)

ISBN 978-0-13-448566-9

(Module ID 29303) This module explains how to set up FCAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. It provides procedures for making open-root V-groove welds with FCAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

#### GTAW - Carbon Steel Pipe (80 Hours)

ISBN 978-0-13-448568-3

(Module ID 29304) This module explains how to set up GTAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. It provides procedures for making open-root V-groove welds with GTAW equipment on pipe in the 2G, 5G, and 6G positions.

#### GTAW - Low Alloy and Stainless Steel Pipe

(70 Hours)

ISBN 978-0-13-448570-6

(Module ID 29305) This module explains how to set up GTAW equipment for open-root V-groove welds on low-alloy and stainless steel pipe, and how to prepare for and make open-root V-groove welds on low-alloy and stainless steel pipe. It provides procedures for making open-root V-groove welds with GTAW equipment on low-alloy and stainless steel pipe in the 2G, 5G, and 6G positions.

#### SMAW - Stainless Steel Plate and Pipe Groove Welds (100 Hours)

ISBN 978-0-13-448573-7

(Module ID 29306) This module explains stainless steel metallurgy, how to select SMAW electrodes for stainless steel welds, and how to weld different types of stainless steels. It covers safety issues associated with welding on stainless steels, how to prepare weld coupons, and how to set up SMAW equipment for welding stainless steel. It provides procedures for making open-root V-groove welds with SMAW equipment on stainless steel plate in the 1G, 2G, 3G, and 4G positions, and procedures for making open-root V-groove welds with SMAW equipment on stainless steel pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.