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Letter from the Chairman of the Board

For over 20 years, NCCER has developed craft training curricula based on industry needs. Whether it is new curricula, revisions, code updates, international translations or instructor resources, NCCER is committed to providing the most comprehensive and up-to-date training materials for the construction and maintenance industries. Recognizing the ever-growing role technology plays in industry and education, one of NCCER’s five-year strategic initiatives is to lead technology, innovation and state-of-the-art craft workforce development delivery in the construction industry. As part of this initiative, NCCER released its new Registry System in the third quarter of 2016 and more recently, a mobile-friendly website.

In 2017, NCCER is set to release phase two of the new Registry System and a new, progressive testing platform. In addition, the ongoing expansion of NCCERconnect, an enhanced Instructor Resource Center and a new mobile credentialing system coming at the end of the year will cap-off our evolving innovative additions. NCCER will continue to leverage technology to bring state-of-the-art credentialing, products and services to all our stakeholders faster and more efficiently.

The 2017 catalog includes revisions to Electrical, Fundamentals of Crew Leadership and Mechanical Insulating, with Electrical being NCCER’s first curriculum to release all four levels at the same time. In response to international demand, 32 more titles have been translated into Spanish and all translated titles will be available domestically this year beginning in March.

NCCER is also pleased to announce the release of a completely revamped pipeline program that simplifies the process for operator qualification through focused covered task training modules. The updated pipeline program starts on page 73 and includes 127 covered task e-books and a new career pathways diagram for those seeking skills development.

Finally, as NCCER continues to listen to the needs of the industry, two new programs were released to assist in areas of high demand, Construction Workforce Development Professional and Mentoring for Craft Professionals. Both titles are available at shop.nccer.org.

Throughout the years, NCCER has excelled at serving the industry and its workforce development needs. By continuously adapting and evolving, NCCER has become one of the most highly sought after and trusted training programs in the construction industry. I look forward to serving as NCCER chairman and continuing the legacy of providing superior workforce development resources.

Charles P. Reid
CEO of Current Builders
2017 Chairman of the NCCER Board of Trustees

NCCER is a not-for-profit education foundation created to help address the critical workforce shortage facing the construction industry and to develop industry-driven standardized craft training programs with portable credentials. With the support of its publishing partner Pearson, NCCER leads the industry in building a safe, productive and sustainable workforce of craft professionals.
Workforce Development Leaders Wanted
The need for workforce development professionals and mentors is at an all-time high. In response, NCCER released two new training programs: Construction Workforce Development Professional and Mentoring for Craft Professionals. Both titles were developed by teams of subject matter experts and can be ordered directly from shop.nccer.org.

SPRING 2017

NCCER’s Enhanced Pipeline Program
This new program allows one easy way to train, test and qualify your workforce. Check out page 79 to see a list of the covered task training modules and the newly developed Pipeline Career Pathway with a full curriculum to support it.

Also Coming in Spring 2017
NCCER is expanding the selection of domestic Spanish titles. Check out the updated Spanish titles and available tests under the Updates section on the Online Bookstore at www.nccer.org/bookstore.

SUMMER 2017

All Four Levels Releasing at the Same Time!
For the first time ever, all four levels of a curriculum will release at the same time! The NCCER Electrical program has been completely revised and updated to the 2017 NEC.

Next Step for Craft Professionals on their Career Path to Success!
Prepare your craft professionals for foreman and crew leader positions with the updated Fundamentals of Crew Leadership. This program has been updated and revised to assist in training the next generation of project leaders.
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 National
ABC Northern California Chapter
ABC Pelican Chapter
Alaska Training Center
American Petroleum Institute
Bay LTD
Bishop State Community College
Bo-Mac Contractors, Ltd.
Brace Industrial Group
Brock Services LLC
Carolina Bridge Company, Inc.
Central Louisiana Technical Community College
Central NDT
Claddagh Enterprises
Construction Craft Academy
CP Masters
EMS USA, Inc.
Enbridge Pipelines, Inc.
Enhance Co.
Enterprise
Exelon Generation
Faith Technologies, Inc.
Flint Energy Services, Inc.
Gaylor Electric, Inc.
Industrial Construction & Engineering Co.
Insulation Specialties, Inc.
Jacobs Field Services
Jomax Construction
KBR Industrial Services
Kelley Construction, Inc.
Kinder Morgan, Inc.
L&C Insulation
L.E. Bell Construction Co., Inc.
Lauren Engineers & Constructors, Inc.
Lee College
Lincoln Electric Company
LPR Construction
Marathon Pipe Line
MasTec, Inc.
Midwestern Contractors
National Insulation Association
North American Crane Bureau, Inc.
Northeast Community College
Northern Industrial Training LLC
OneOK
Orion Marine Group
Petrin Corporation
Pittsburg State University
Plains All-American Pipeline
Praxair Services
Protech EIS
Safety Advantage, LLC
Safety Council of Texas City
SCE, Inc.
Southern Tier Insulations
Southland Safety, LLC
Spec-Weld Technologies
Starcon
Sunoco Logistics, L.P.
Sunoco Pipeline
The Haskell Company
Thorco Holdings, LLC
TIC - The Industrial Company
Toledo Refining Co. LLC
Tri-City Electrical Contractors
University of Florida, M.E. Rinker, Sr. School of Construction Management
URS/Flint Energy
Zachry Group
The NCCER Program

WHAT IS NCCER?

NCCER is a not-for-profit 501(c)(3) education foundation that was created in 1996 as The National Center for Construction Education and Research. More than 125 construction CEOs and various association and academic leaders united to revolutionize training for the construction industry. Sharing the common goal of developing a safe and productive workforce, these companies created NCCER as a standardized training and credentialing program. NCCER provides a consistent program of accreditation, instructor certification, standardized curricula, assessments and certifications with industry-recognized, globally portable credentials.

WHAT WE OFFER

Accreditation

As the accrediting body for the industry, NCCER establishes the benchmark for quality training and assessments. By partnering with industry and academia, NCCER provides a system for accreditation that is similar to those found in institutions of higher learning. The accreditation process assures that students receive training based on uniform standards and criteria.

NCCER’s instructor certification training program is an integral part of the accreditation process and ensures consistent delivery of training. Through this process, NCCER certifies the Master Trainer, who in turn certifies the local craft instructor. Craft instructors are journey-level craft professionals or career and technical educators who are trained and certified to teach NCCER curricula. There are currently more than 6,400 Master Trainers and over 66,000 craft instructors within NCCER’s network.

Standardized Curricula

NCCER develops and publishes its curricula in partnership with Pearson, a leading textbook publisher. These competency-based curricula have measurable objectives and are taught by a broad range of accredited NCCER providers worldwide. NCCER uses teams of Subject Matter Experts from contractors and schools to ensure the training curricula meet or exceed industry standards. NCCER curricula meet the Department of Labor’s office in apprenticeship requirements for time-based training and are modular in format, allowing for flexibility and custom task training.

Industry-Recognized Credentials

The NCCER Registry System is a credentialing and certification system that assures portability of skills. It provides transcripts, certificates and wallet cards for individuals who successfully complete any NCCER standardized training program conducted by an NCCER accredited organization. These valuable industry credentials benefit students as they seek employment and build their careers. Nearly 14 million module completions have been delivered to students and craft professionals internationally.

Image Enhancement and Recruitment

Build Your Future (BYF) is NCCER’s national image enhancement and recruitment initiative for the construction industry. Its mission is to recruit the next generation of craft professionals through its three primary goals: 1) Make career and technical education a priority in secondary schools. 2) Shift negative public perception about careers in the construction industry. 3) Provide a path from ambition, to training, to job placement as a craft professional.

BYF provides a number of resources to assist industry, education and military organizations in achieving these goals. Free interactive and downloadable resources are available on byf.org.

In addition, a full array of resources for classrooms and career days is available on BYF’s online store at byfstore.nccer.org.
Assessments and Certification

Assessments

NCCER offers a complete series of journey-level assessments. These assessments evaluate the knowledge and skill level of an individual in a specific craft area. All assessments are based on NCCER curricula and have been developed in conjunction with Prov™, NCCER’s test development partner. An individual’s certification is documented through the NCCER Registry System. For additional assessment information, visit www.nccer.org.

Journey Level
• Boilermaker:
  - Pressure Vessel
• Commercial Carpenter
• Commercial Electrician
• Concrete Finisher*
• Drywall Mechanic*
• Heavy Equipment Operator:
  - Backhoe
  - Dozer
  - Dump Truck
  - Excavator
  - Forklift
  - Loader
  - Motor Grader
  - Roller
  - Scraper
  - Skid Steer
• HVAC Technician
• Industrial Boilermaker:
  - Maintenance
  - Exchanger
  - Tower
• Industrial Carpenter*
• Industrial Coating and Lining Application Specialist:
  - Level 1
  - Level 2
• Industrial Electrician*
• Industrial Insulator*
• Industrial Ironworker
• Industrial Maintenance Electrical and Instrumentation Technician
• Industrial Maintenance Mechanic
• Industrial Maintenance Support Mechanic
• Industrial Millwright
• Industrial Painter
• Industrial Pipefitter*
• Instrumentation Fitter
• Instrument Technician
• Masonry
• Plumber
• Power Generation:
  - Maintenance Electrician
  - Maintenance Mechanic
• Power Line Worker:
  - Substation
  - Distribution
  - Transmission
• Reinforcing Ironworker*
• Scaffold Builder*

Management
• Foreman
• Supervisor
• Sustainable Construction Supervisor

Other
• Hydroblasting Technician
• Core
• Maritime Core

*These assessments are also available in Spanish.

NCCER certifications for Mobile Crane Operator, Tower Crane Operator, Rigger & Signal Person

NCCER’s certification programs offer:
• Assessment and practical examination results available within 15 minutes of submission
• No rush fees
• Real-time online verification
• Portable, industry-recognized credentials

Find out more at nccer.org/crane.

Mobile Crane Operator
• 13 equipment-specific certifications (including capacity)

Tower Crane Operator
• Three equipment-specific certifications

Rigger
• Three-level certification program

Signal Person
• Certification program

Officially Recognized by Federal OSHA

www.nccer.org/bookstore
NCCER Program Features

NCCER’s curriculum offers several features to make tailoring your craft training program to your needs easy and efficient:

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.

Online Bookstore
Visit the online bookstore to browse our catalog, access help and support, find how-to videos and much more. For the most up-to-date information on print and digital solutions, select the Updates tab on the top navigation bar.

Explore the online bookstore now at www.nccer.org/bookstore.

Instructor Resources
The printed Instructor’s Package includes lesson plans and an instructor’s copy of the Trainee Guide with an access code to download TestGen software, module exams, PowerPoint® presentations and Performance Profile Sheet from www.nccerirc.com. To order instructor resources, contact your Pearson NCCER Executive Director.

Visit our Instructor Resource Center at www.nccerirc.com for more information.
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 include email, document uploading, announcements, gradebook and instructor tools.

Contact your Pearson representative for details or visit www.nccerconnect.com.
New Registry System
The new system is up, running and ready for the New Year! Visit registry.nccer.org to log in and access the new features like the easy to use dashboard and real-time records management. Stay up-to-date with continued improvements to NCCER’s Registry System by joining NCCER’s mailing list at nccer.org.

Thank you for your support and patience during the transition to the new system.

Enhanced Website
Check out the big changes to nccer.org! Several key features on the website include:

- Improved Find a Training and Assessment Center
- New Workforce Development Program Resources section with all-inclusive Title and Discipline pages
- Integrated mobile responsiveness to improve accessibility on your smartphone or tablet
- And much more!

For more information on how to make the most of the redesigned website, visit the nccer.org and click “Support” on the top right. Training videos and documents will be available on NCCER’s support webpage.

NCCER Testing System
You asked and we listened. Coming Spring 2017, NCCER will launch an all new online testing system. The new system will allow instructors to distribute, grade and submit exams quickly and easily. To find out more about this service, visit nccer.org/myNCCER and click on NCCER Testing System.

Have a question? We want to help!
If you have questions or need assistance utilizing NCCER’s services, we have a variety of customer service options:

- **24/7**: Visit NCCER’s Support page at support.nccer.org to view How-To documents, videos and self-help resources.
- **Monday – Friday, 8:30 am – 5:30 pm EST**:
  - Use the chat feature on nccer.org to talk with a live representative.
  - Call 888.622.3720 to speak with NCCER’s customer service department.
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 curriculum section at 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

Here's an easy way to read NCCER's Module ID numbers:

29102-17

The two-digit prefix (29) indicates the craft identifier (Welding).
The three digits before the hyphen are unique module identifiers.
The two-digit suffix (15) indicates the year of publication.

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.

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Core Curriculum: Introductory Craft Skills

**Introduction to Hand Tools (10 Hours)**
(Module ID 00103-15) Introduces common hand tools used in a variety of construction crafts. Identifies tools and how to safely use them. Also presents proper hand tool maintenance.

**Introduction to Power Tools (10 Hours)**
Instructor S20  ISBN 978-0-13-412902-0
(Module ID 00104-15) Identifies and describes the operation of many power tools common in the construction environment. Provides instruction on proper use, as well as safe-handling guidelines and basic maintenance.

**Introduction to Construction Drawings (10 Hours)**
Instructor S20  ISBN 978-0-13-412904-4
(Module ID 00105-15) Introduces the basic terms, components, and symbols of construction drawings, as well as the most common drawing types. Also covers the interpretation and use of drawing dimensions.

**Introduction to Basic Rigging (7.5 Elective Hours)**
Instructor S20  ISBN 978-0-13-412906-8
(Module ID 00106-15) Provides basic information related to rigging and rigging hardware, such as slings, rigging hitches, and hoists. Emphasizes safe working habits in the vicinity of rigging operations.

**Basic Communication Skills (7.5 Hours)**
Instructor S20  ISBN 978-0-13-412898-6
(Module ID 00107-15) Provides techniques for effective communication on the job. Includes examples that emphasize the importance of both written and verbal communication skills. Describes the importance of reading skills in the construction industry and discusses effective telephone and email communication skills.

**Basic Employability Skills (7.5 Hours)**
(Module ID 00108-15) Describes the opportunities offered by the construction trades. Discusses critical thinking and essential problem-solving skills. Also identifies and discusses social skills and presents information on computer systems and their industry applications.

**Introduction to Material Handling (5 Hours)**
Trainee S20  ISBN 978-0-13-412892-4
Instructor S20  ISBN 978-0-13-412887-0
(Module ID 00109-15) Describes the hazards associated with handling materials and provides techniques to avoid both injury and property damage. Also introduces common material-handling equipment.

**Applied Construction Math: A Novel Approach**
Published: 2006
Includes Resource CD

**Basic Safety**
(Construction Site Safety Orientation)
12.5 Hours
Revised: 2015
Module ID 00101-15
This module, from Core Curriculum, replaces the Safety Orientation book. See see the module description located in the left column of this page for more information.

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**Curriculum Notes**
- Core Curriculum is a prerequisite to most Level 1 completions and must be purchased separately.
- 72.5 Hours (plus 7.5 Elective/Optional Hours)
- Revised: 2015, Fifth Edition
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with access code to download TestGen software, module exams, PowerPoint®es, and performance profile sheets from www.nccerinc.com.
- A Spanish translation of the fifth edition is available. Please see NCCER’s online catalog for more information.
- A basic construction math workbook with practice problems is included with the Instructor's Package.

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

**Basic Safety (Construction Site Safety Orientation)** (12.5 Hours)
(Module ID 00101-15) Introduces basic safety information to prepare workers for the construction environment. Describes the common causes of workplace incidents and accidents and how to avoid them. Introduces common personal protective equipment, including equipment required for work at height, and its proper use. Information related to safety in other specific environments, including welding areas and confined spaces, is also provided.

**Introduction to Construction Math** (10 Hours)
(Module ID 00102-15) Reviews basic math skills related to the construction trades and demonstrates how they apply to the trades. Covers multiple systems of measurement, decimals, fractions, and basic geometry.

**Introduction to Hand Tools** (10 Hours)
(Module ID 00103-15) Introduces common hand tools used in a variety of construction crafts. Identifies tools and how to safely use them. Also presents proper hand tool maintenance.

**Introduction to Power Tools** (10 Hours)
Instructor S20  ISBN 978-0-13-412902-0
(Module ID 00104-15) Identifies and describes the operation of many power tools common in the construction environment. Provides instruction on proper use, as well as safe-handling guidelines and basic maintenance.

**Introduction to Construction Drawings** (10 Hours)
Instructor S20  ISBN 978-0-13-412904-4
(Module ID 00105-15) Introduces the basic terms, components, and symbols of construction drawings, as well as the most common drawing types. Also covers the interpretation and use of drawing dimensions.

**Introduction to Basic Rigging** (7.5 Elective Hours)
Instructor S20  ISBN 978-0-13-412906-8
(Module ID 00106-15) Provides basic information related to rigging and rigging hardware, such as slings, rigging hitches, and hoists. Emphasizes safe working habits in the vicinity of rigging operations.

**Basic Communication Skills** (7.5 Hours)
Instructor S20  ISBN 978-0-13-412898-6
(Module ID 00107-15) Provides techniques for effective communication on the job. Includes examples that emphasize the importance of both written and verbal communication skills. Describes the importance of reading skills in the construction industry and discusses effective telephone and email communication skills.

**Basic Employability Skills** (7.5 Hours)
(Module ID 00108-15) Describes the opportunities offered by the construction trades. Discusses critical thinking and essential problem-solving skills. Also identifies and discusses social skills and presents information on computer systems and their industry applications.

**Introduction to Material Handling** (5 Hours)
Trainee S20  ISBN 978-0-13-412892-4
Instructor S20  ISBN 978-0-13-412887-0
(Module ID 00109-15) Describes the hazards associated with handling materials and provides techniques to avoid both injury and property damage. Also introduces common material-handling equipment.

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

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Stay Connected: www.nccer.org/bookstore
Boilermaking

Core Curriculum (continued)

**Tools for Success**

**Your Role in the Green Environment**

**Boilermaking**

**MODULES**

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Introduction to Boilermaking** (10 Hours)

**Boilermaking Tools** (15 Hours)

**Boilermaking Safety** (12.5 Hours)

**Oxyfuel Cutting** (17.5 Hours)

**Cutting and Fitting Gaskets** (12.5 Hours)

**Base Metal Preparation** (10 Hours)

**Welding Basics** (22.5 Hours)

**Boiler Systems and Components** (22.5 Hours)

**Identifying and Installing Valves** (20 Hours)

**LEVEL 1**

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**LEVEL 2**

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**Curriculum Notes**

- 182.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- Revised: 2010, Second Edition
- Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.

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**MODULES**

- **Critical Skills for the Construction Industry**
  - Revised: 2009, Third Edition
  - PAPERBACK ISBN
  - Trainee Workbook: $32 978-0-13-610649-4
  - Instructor’s Handbook: $32 978-0-13-610650-0
  - 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.

- **Boilermaking Safety** (Module ID 34102-10)
  - Provides an overview of the boilermaker profession and related equipment. Includes filler metals, joint design, and the codes that govern welding practices.

- **Boilermaking** (Module ID 34101-10)
  - Describes welding and cutting processes and related equipment. Includes filler metals, joint design, and the codes that govern welding practices.

- **Basic Materials** (10 Hours)
  - Trainee $20
  - Instructor $20
  - (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)
  - Trainee $20
  - Instructor $20
  - (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)
  - Trainee $20
  - Instructor $20
  - (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)
  - Trainee $20
  - Instructor $20
  - (Module ID 34107-10) Describes how to clean and prepare base metals for cutting and welding.

- **Welding Basics** (22.5 Hours)
  - Trainee $20
  - Instructor $20
  - (Module ID 34108-10) Describes welding and cutting processes and related equipment. Includes filler metals, joint design, and the codes that govern welding practices.

- **Identifying and Installing Valves** (20 Hours)
  - Trainee $20
  - Instructor $20
  - (Module ID 34201-11) Introduces boiler configurations and applications. Identifies boiler components and explains their functions.

- **Boiler Systems and Components** (22.5 Hours)
  - Trainee $20
  - Instructor $20
  - (Module ID 34201-11) Introduces boiler configurations and applications. Identifies boiler components and explains their functions.

- **Identifying and Installing Valves** (20 Hours)
  - Trainee $20
  - Instructor $20
  - (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.

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Boilermaking Level 2 (continued)

Pipe Hangers and Supports (25 Hours)
Trainee $20  
Instructor $20  
(Module ID 34203-11) Identifies pipe hangers and supports and explains how to install pipe support drawings and symbols. Explains how to select, store, handle, install, and maintain spring supports.

Drawings and Detail Sheets (15 Hours)
Trainee $20  
Instructor $20  
ISBN 978-0-13-257800-4
(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)
Trainee $20  
Instructor $20  
(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)
Trainee $20  
Instructor $20  
(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)
Trainee $20  
Instructor $20  
(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)
Trainee $20  
Instructor $20  
(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)
Trainee $20  
Instructor $20  
(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 fabricate 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 (22.5 Hours)
Trainee $20  
ISBN 978-0-13-257796-0
Instructor $20  
(Module ID 34210-11) Describes air carbon arc cutting (CACA) equipment and processes. Explains how to select and install CACA electrodes, and how to prepare the work area and CACA equipment for safe operation. Provides instructions for using CACA equipment for washing and gouging activities.

L3 BOILERMAKING

Curriculum Notes
- 162.5 Hours
- Revised: 2011, Second Edition

PAPERBACK  
Trainee Guide: $97  
Instructor’s Guide: $97  

MODELS
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Plasma Arc Cutting (7.5 Hours)  
(Module ID 29103-09; from Welding Level One)
Trainee $20  
Instructor $20  

Boiler Pressure Components (25 Hours)  
(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.
Trainee $20  
Instructor $20  

Boiler Nonpressure Components (12.5 Hours)  
(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.
Trainee $20  
Instructor $20  

Boiler Auxiliaries (25 Hours)  
(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.
Trainee $20  
Instructor $20  

Advanced Rigging (20 Hours)  
(Module ID 34410-12) Covers the use of cranes, derricks, hoists, and other lifting equipment. Explains how to determine the center of gravity for objects to be lifted 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.
Trainee $20  
Instructor $20  

Advanced Boilermaking Construction Drawings (20 Hours)  
(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.
Trainee $20  
Instructor $20  

Advanced Pipe Fabrication (20 Hours)  
(Module ID 08402-07; from Pipefitting Level Four)
Trainee $20  
Instructor $20  
Advanced Exchangers (25 Hours)
Instructor $20  ISBN 978-0-13-292253-1
(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)
Instructor $20  ISBN 978-0-13-292254-8
(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.

Carpentry

Orientation to the Trade (5 Hours)
(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 (7.5 Hours)
(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 (7.5 Hours)
Instructor $20  ISBN 978-0-13-340312-1
(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 (20 Hours)
(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.

Fundamentals of Crew Leadership (20 Hours)
(Module ID 46101-11; see p. 69)
LEVEL 2  
CARPENTRY FRAMING & FINISHING  

**Curriculum Notes**  
- 210 Hours  
- Optional Residential Path: 170 Hours  
- Optional Commercial Path: 150 Hours  
- Revised: 2013, Fifth Edition  
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with access code to download TestGen software, module exams, PowerPoint®es, and performance profile sheets from www.nccerirc.com.

**Hardcopy**  
Trainee Guide: $97  

**Paperback**  
Trainee Guide: $97  

NCCERconnect + Hardcover Trainee Guide: $124  

NCCERconnect + Paperback Trainee Guide: $122  

**Modules**  
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

**Commercial Drawings**  
Elective for Residential Path  
(25 Hours)  
Trainee $20  

**Cold-Formed Steel Framing**  
(15 Hours)  
Trainee $20  

**Exterior Finishing**  
Elective for Commercial Path  
(35 Hours)  
Trainee $20  

**Thermal and Moisture Protection**  
(7.5 Hours)  
Trainee $20  

**Roofing Applications**  
Elective for Commercial Path  
(25 Hours)  
Trainee $20  

**Doors and Door Hardware**  
(20 Hours)  
Trainee $20  

**Drywall Installation**  
(15 Hours)  
Trainee $20  
ISBN 978-0-13-377913-4

**Drywall Finishing**  
(17.5 Hours)  
Trainee $20  

**Suspended Ceilings**  
Elective for Residential Path  
(15 Hours)  
Trainee $20  

**Window, Door, Floor, and Ceiling Trim**  
(25 Hours)  
Trainee $20  

**Cabinet Installation**  
(10 Hours)  
Trainee $20  

**Level 3  CARPENTRY FORMS**  

**Curriculum Notes**  
- 160 Hours  
- Revised: 2014, Fifth Edition  
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with access code to download TestGen software, module exams, PowerPoint®es, and performance profile sheets from www.nccerirc.com.

**Modules**  
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

**Properties of Concrete**  
(10 Hours)  
Trainee $20  

**Rigging Equipment**  
(10 Hours)  
Trainee $20  
ISBN 978-0-13-378667-0

**Rigging Practices**  
(15 Hours)  
Trainee $20  
ISBN 978-0-13-378668-0

**Trenching and Excavating**  
(15 Hours)  
Trainee $20  

**Reinforcing Concrete**  
(15 Hours)  
Trainee $20  

**Foundations and Slabs-On-Grade**  
(20 Hours)  
Trainee $20  

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Cabinetmaking

35 Hours
Revised: 2016, Third Edition
Module ID 27501-15

PAPERBACK                ISBN
Trainee Guide: $22        978-0-13-428854-3
Instructor’s Guide: $22   978-0-13-428857-4

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.

From the Ground Up

Revised: 2006, Second Edition

PAPERBACK                ISBN
Workbook: $22             978-0-13-229164-4
Instructor’s Package: $22  978-0-13-229165-1

Instructor’s Package includes workbook plus Instructor’s Module with answers to review questions and exercises, cross-references to NCCER performance tests, and numerous teaching tips.

Vertical Formwork (22.5 Hours)
(Module ID 27308-14) Covers the applications and construction methods for forms 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)
Instructor $20            ISBN 978-0-13-378693-4
(Module ID 27309-14) Describes elevated decks and formwork systems and methods used in their construction. Covers post, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the use of flying deck, as well as scaffolding and reconditioning systems.

Handling and Placing Concrete (20 Hours)
Instructor $20            ISBN 978-0-13-378694-1
(Module ID 27305-14) Covers tools, equipment, and procedures for safely handling, placing, and finishing concrete. Describes points made in concrete structures and the use of joint sealants.

Tilt-Up Wall Systems (17.5 Hours)
(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.

Site Layout One: Differential Leveling (20 Hours)
(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)
(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)
(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)
(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)
(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)
Instructor $20            ISBN 978-0-13-378718-4
(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)
Instructor $20            ISBN 978-0-13-378719-1
(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)
(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)
Instructor $43            ISBN 978-0-13-378722-1
(Module ID 46101-11; see p. 69)

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Carpentry Level 3 (continued)
Concrete Finishing

L1 CONCRETE FINISHING

Curriculum Notes

- 160 Hours (Includes 75.2 Hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- Published: 1998
- A Spanish translation is available. Please see NCCER’s online catalog for more information.
- Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $67 978-0-13-010246-1

MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Introduction to Concrete Construction and Finishing (10 Hours)
Trainee S20 Instructor S20
(Module ID 23101) Provides an introduction to the methods and procedures used in concrete finishing. Introduces terms of the trade and tools and equipment used to place, finish, and cure concrete. Explains methods and techniques for constructing concrete structures.

Safety Requirements (5 Hours)
Trainee S20 Instructor S20
(Module ID 23102) Explains safety requirements for concrete construction and finishing. Provides information on OSHA requirements with regard to hazard communication, fall protection, and use of personal protective equipment. Covers topics such as general work site safety, use of chemicals, and safe use of hand and power tools.

Properties of Concrete (10 Hours)
Trainee S20 Instructor S20
(Module ID 23103) Introduces the properties of concrete and the components that make up the concrete mix. Describes physical and chemical properties of cement, aggregate, and admixtures. Explains basic tests used to determine properties such as slump and ultimate strength.

Tools and Equipment (7.5 Hours)
Trainee S20 Instructor S20
(Module ID 23104) Describes tools and equipment used in the production, placing, and curing of concrete. Explains safe operation and maintenance requirements. Provides opportunities for hand tool operation and demonstration of larger pieces of power equipment.

Preparing for Placement (12.5 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-010258-4
(Module ID 23105) Details the methods and procedures used to prepare for placing concrete. Covers site layout, forms requirements, and subgrade preparation. Describes requirements for joints and reinforcement. Explains how to order concrete from a mixing or batch plant.

Placing Concrete (12.5 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-010269-0
(Module ID 23106) Presents requirements and methods for properly placing concrete. Includes information on conveying and placing fresh concrete using equipment such as wheelbarrows, pumps, and conveyors. Describes techniques for spreading, consolidating, and striking off concrete.

Finishing, Part One (20 Hours)
Trainee S20 Instructor S20
(Module ID 23107) Describes basic finishing techniques for slabs and other horizontal structures. Explains the proper use of floats, trowels, edges, and groovers. Discusses requirements for jointing concrete using different types of saws. Provides hands-on practice for finishing concrete slabs.

Curing and Protecting Concrete (5 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-010261-4
(Module ID 23108) Introduces methods and procedures used in curing and protecting concrete. Covers curing commonly performed for both horizontal and vertical placement. Describes techniques for protecting concrete during hot and cold weather.

Introduction to Troubleshooting (5 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-010272-0
(Module ID 23109) Describes problems of placing, finishing, and curing. Defines symptoms of problems and discusses their causes. Presents ways to reduce or eliminate these problems.

L2 CONCRETE FINISHING

Curriculum Notes

- 167.5 Hours
- Published: 1999
- Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Instructor’s Guide: $97 978-0-13-014872-8

MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Properties of Concrete, Part Two (10 Hours)
Trainee S20 Instructor S20
(Module ID 23201) Describes the physical and chemical properties of materials used in concrete mix. Includes descriptions of chemical and mineral admixtures, lightweight concrete, high strength concrete, flowable fill, and types of paving materials. Discusses expected results of the use of admixtures.

Estimating Concrete Quantities (10 Hours)
Trainee S20 Instructor S20
(Module ID 23202) Covers the methods and techniques used in estimating materials quantities for concrete construction. Explains the use of plans and drawings as well as math calculations. Gives example calculations for estimating quantities of concrete for curb and gutter, stairs, slab, wall footings, and columns.

Forming (20 Hours)
Trainee S20 Instructor S20
(Module ID 23203) Describes forming requirements. Includes types of forms, forming materials, use of release agents, form accessories, placement of anchors and embedments, and form removal. Highlights safety requirements with emphasis on reshoring precautions and procedures.

Site Concrete (30 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-015040-0
(Module ID 23204) Describes forms and methods of forming, constructing, and finishing steps and stairs, curbs and gutters, sidewalks and driveways, and low vertical structures.

Industrial Floors (22.5 Hours)
Trainee S20 Instructor S20
(Module ID 23206) Describes the construction and finishing of this special class of concrete work, including special tools and finishing techniques. Explains procedures for preparation, joint layout, placing, finishing, and curing.

Superflat Floors (22.5 Hours)
Trainee S20 Instructor S20
ISBN 978-0-13-015053-0
(Module ID 23207) Presents requirements for constructing superflat floors and techniques used to achieve required results. Explains procedures for preparation, placing, finishing, and curing. Describes techniques for measuring tolerances of slabs and methods for troubleshooting during placement and finishing. Explains repair procedures.

Surface Treatments (12.5 Hours)
Trainee S20 Instructor S20
(Module ID 23208) Provides an overview of surface treatments applied to concrete structures. Includes the requirements for and application of dry shaves, self-leveling topping, epoxies, and shotcrete.

Quality Control (10 Hours)
Trainee S20 Instructor S20
(Module ID 23209) Introduces the ideas and tasks related to sampling, testing, and inspecting concrete and its component materials. Describes types of specifications, along with the standard procedures for sampling and testing concrete mix. Covers inspection procedures for forms, construction methods, and finishing.

Making Repairs (10 Hours)
Trainee S20 Instructor S20
(Module ID 23210) Explains the requirements for making repairs to concrete based on specific problems. Explains and demonstrates repair methods. Describes the use of special tools and materials.

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Construction Craft Laborer

**CORE CURRICULUM**

**Basic Safety** (12.5 Hours)
(Module ID 00101-15; from Core Curriculum)

**Introduction to Construction Math** (10 Hours)
(Module ID 00102-15; from Core Curriculum)

**Introduction to Hand Tools** (10 Hours)
(Module ID 00103-15; from Core Curriculum)

**Introduction to Power Tools** (10 Hours)
(Module ID 00104-15; from Core Curriculum)

**Introduction to Construction Drawings** (10 Hours)
(Module ID 00105-15; from Core Curriculum)

**Introduction to Basic Rigging** (7.5 Hours)
(Module ID 00106-15; from Core Curriculum)

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**LEVEL 1**

**CONSTRUCTION CRAFT LABORER**

**L1**

**Introduction to Basic Rigging** (7.5 Hours)
(Module ID 00106-15; from Core Curriculum)

**Basic Employability Skills** (7.5 Hours)
(Module ID 00108-15; from Core Curriculum)

**Orientation to the Trade** (2.5 Hours)
(Module ID 27101-13; from Core Curriculum)

**Building Materials, Fasteners, and Adhesives** (20 Hours)
(Module ID 27102-13; from Carpenter Level One)

**Properties of Concrete** (10 Hours)
(Module ID 27303-14; from Carpenter Level Three)

**Site Layout One: Differential Leveling** (20 Hours)
(Module ID 27401-14; from Carpenter Level Four)

**Handling and Placing Concrete** (20 Hours)
(Module ID 27305-14; from Carpenter Level Three)

**Foundations and Slabs-On-Grade** (20 Hours)
(Module ID 27307-14; from Carpenter Level Three)

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**LEVEL 2**

**CONSTRUCTION CRAFT LABORER**

**L2**

**Curriculum Notes**
- 147.5 Hours
- Updated: 2015, Third Edition

**PAPERBACK**

Trainee Guide: $105 978-0-13-430262-1
Instructor’s Package: $105 978-0-13-430261-4

**CORE CURRICULUM**

**Masonry Level One**
(Module ID 28101-13; from Masonry Level One)

**Masonry Units and Installation Techniques** (20 Hours)
(Module ID 28105-13; from Masonry Level One)

**Steel Erection** (2.5 Hours)
(Module ID 75112-13; from Field Safety)

**Electrical Safety** (5 Hours)
(Module ID 75121-13; from Core Curriculum)

**Your Role in the Green Environment** (LEED V4)
(15 Hours)
(Module ID 70101-15)

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**Construction Technology**

**HARDCOVER**


**PAPERBACK**

Instructor’s Guide: $140 978-0-13-454300-0

NCCERconnect Access Card: $140 978-0-13-448193-7

NCCERconnect + Hardcover Trainee Guide: $165 978-0-13-453976-8

**MODULES**

**Introduction to Masonry** (12.5 Hours)
(Module ID 28101-13; from Masonry Level One)

**Masonry Units and Installation Techniques** (60 Hours)
(Module ID 28105-13; from Masonry Level One)

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**Floor Systems** (27.5 Hours)
(Module ID 27105-13; from Carpentry Level One)

**Ceiling Joist and Roof Framing** (20 Hours)
(Module ID 27112-13; Carpenter Level One)

**Roofing Applications** (25 Hours)
(Module ID 27202-13; from Carpenter Level Two)

**Wall Systems** (20 Hours)
(Module ID 27111-13; Carpenter Level One)

**Exterior Finishing** (35 Hours)
(Module ID 27204-13; from Carpenter Level Two)

**Basic Stair Layout** (12.5 Hours)
(Module ID 27110-13; from Carpenter Level One)

**Electrical Safety** (10 Hours)
(Module ID 26102-14; from Electrical Level One)

**Residential Electrical Services** (15 Hours)
(Module ID 26111-14; from Electrical Level One)
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Construction Technology (continued)

Introduction to HVAC (7.5 Hours)  
(Module ID 03101-13; from HVAC Level One)

Introduction to Drain, Waste, and Vent (DWV) Systems (10 Hours)  
(Module ID 02111-12; from Plumbing Level One)

Plastic Pipe and Fittings (12.5 Hours)  
(Module ID 02106-12; from Plumbing Level One)

Copper Tube and Fittings (12.5 Hours)  
(Module ID 02107-12; from Plumbing Level One)

Cabinetmaking (35 Hours)  
(Module ID 27501-15)

Cabinet Installation (10 Hours)  
(Module ID 27211-13; from Carpentry Level Two)

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(ISN 978-0-13-604853-4)

Drywall Finishing (25 Hours)  
Trainee $20  
Instructor $20  
(ISN 978-0-13-604848-0  
(ISN 978-0-13-604854-1)

Commercial Drawings (25 Hours)  
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Instructor $20  
(ISN 978-0-13-604855-8  
(ISN 978-0-13-604861-9)

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Instructor $20  
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(ISN 978-0-13-604862-6)

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Trainee $20  
Instructor $20  
(ISN 978-0-13-604857-2  
(ISN 978-0-13-604863-3)

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Trainee $20  
Instructor $20  
(ISN 978-0-13-604858-9  
(ISN 978-0-13-604864-0)

Exterior Cladding (20 hours)  
Trainee $20  
Instructor $20  
(ISN 978-0-13-604859-6  
(ISN 978-0-13-604880-5)

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Trainee $20  
Instructor $20  
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Introduction to the National Electrical Code®
(7.5 Hours)
Trainee $20
Instructor $20
(Module ID 26105-17) Provides a road map for using the NEC®. Introduces the layout and the types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

Device Boxes (10 Hours)
Trainee $20
Instructor $20
(Module ID 26106-17) Covers the hardware and systems used by an electrician to mount and support boxes, receptacles, and other electrical components. Also covers NEC® fill and pull requirements for device, pull, and junction boxes under 100 cubic inches.

Hand Bending (10 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-480488-0
(Module ID 26107-17) Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

Raceways and Fittings (20 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-480491-0
(Module ID 26108-17) Introduces the types and applications of raceways, wireways, and ducts. Stresses the applicable NEC® requirements.

Conductors and Cables (10 Hours)
Trainee $20
Instructor $20
(Module ID 26109-17) Focuses on the types and applications of conductors and covers proper wiring techniques. Stresses the applicable NEC® requirements.

Basic Electrical Construction Drawings (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 26110-17) Describes electrical prints, drawings, and symbols, and the types of information that can be found on schematics, one-lines, and wiring diagrams.

Residential Electrical Services (15 Hours)
Trainee $20
Instructor $20
(Module ID 26111-17) 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.

Electrical Test Equipment (5 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-478339-0
(Module ID 26112-17) 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.

Ordering information for Electrical Level 1, Eighth Edition:

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PAPERBACK
Trainee Guide: $67

Instructor’s Guide: $67

NCCERconnect Access Card: $67

NCCERconnect + Hardcover Trainee Guide: $94

NCCERconnect + Paperback Trainee Guide: $92

Electrical Level 2

Curriculum Notes

• 145 Hours
• For Online Instructor Resources visit www.nccerirc.com

Modules
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Orientation to the Electrical Trade (2.5 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-480475-0
(Module ID 26101-17) Provides an overview of the electrical trade and discusses the career paths available to electricians.

Electrical Safety (10 Hours)
Trainee $20
Instructor $20
(Module ID 26102-17) Covers safety rules and regulations for electricians, including precautions for electrical hazards found on the job. Also covers the OSHA-mandated lockout/tagout procedure.

Introduction to Electrical Circuits (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 26103-17) Introduces electrical concepts used in Ohio’s law applied to DC series circuits. Covers atomic theory, electromotive force, resistance, and electric power equations.

Electrical Theory (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 26104-17) Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff’s voltage and current laws, and circuit analysis.

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Pull and Junction Boxes (12.5 Hours)
(Module ID 26205-17) Explains how to select and size pull boxes, junction boxes, and handholes.

Conductor Installations (10 Hours)
(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.

Cable Tray (7.5 Hours)
Instructor $20 ISBN 978-0-13-480503-0
(Module ID 26207-17) Focuses on NEC® installation requirements for cable tray, including cable installations.

Conductor Terminations and Splices (7.5 Hours)
Instructor $20 ISBN 978-0-13-480505-4
(Module ID 26208-17) Describes methods of terminating and splicing conductors, including preparing and taping conductors.

Grounding and Bonding (15 Hours)
(Module ID 26209-17) Focuses on the purpose of grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

Circuit Breakers and Fuses (12.5 Hours)
(Module ID 26210-17) Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

Control Systems and Fundamental Concepts (12.5 Hours)
(Module ID 26211-17) Gives basic descriptions of various types of contactors and relays along with their practical applications.

Ordering information for Electrical Level 2, Eighth Edition:

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Trainee Guide: $97
Instructor’s Guide: $97
NCCERconnect Access Card: $97
NCCERconnect + Hardcover Trainee Guide: $124
NCCERconnect + Paperback Trainee Guide: $122

L3 ELECTRICAL
LEVEL 3

Curriculum Notes
• 155 Hours

Motor Calculations (12.5 Hours)
Instructor $20 ISBN 978-0-13-480532-0
(Module ID 26309-17) Covers calculations required to size conductors and overcurrent protection for motor applications.

Voice, Data, and Video (10 Hours)
(Module ID 26310-17) Covers installation, termination, and testing of voice, data, and video cabling systems.

Motor Controls (12.5 Hours)
(Module ID 26311-14) Provides information on selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

Ordering information for Electrical Level 3, Eighth Edition:

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Trainee Guide: $97
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NCCERconnect Access Card: $97
NCCERconnect + Trainee Guide: $122

L4 ELECTRICAL
LEVEL 4

Curriculum Notes
• 180 Hours
• For Online Instructor Resources visit www.nccerirc.com

Ordering information for Electrical Level 3, Eighth Edition:

PAPERBACK
Trainee Guide: $97
Instructor’s Guide: $97
NCCERconnect Access Card: $97
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MODULES
• For Online Instructor Resources visit www.nccerirc.com

PAPERBACK ISBN
Trainee Guide: $97 978-0-13-473823-9
Instructor’s Guide: $97 978-0-13-480625-9
NCCERconnect is available for this edition; visit www.nccer.org/onlinesolutions for more information

Load Calculations — Branch and Feeder Circuits (17.5 Hours)
(Module ID 26301-17) Explains how to calculate branch circuit and feeder loads for residential and commercial applications.

Conductor Selection and Calculations (15 Hours)
Instructor $20 ISBN 978-0-13-480521-4
(Module ID 26302-17) Covers the factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

Practical Applications of Lighting (12.5 Hours)
Instructor $20 ISBN 978-0-13-480516-0
(Module ID 26303-17) Describes specific types of incandescent, fluorescent, and HID lamps, as well as ballasts. Also covers troubleshooting and various types of lighting controls.

Hazardous Locations (15 Hours)
(Module ID 26304-17) Presents the NEC® requirements for equipment installed in hazardous locations.

Overcurrent Protection (25 Hours)
Instructor $20 ISBN 978-0-13-480519-1
(Module ID 26305-17) Explains how to size and select circuit breakers and fuses for various applications. Also covers short circuit calculations and troubleshooting.

Distribution Equipment (12.5 Hours)
(Module ID 26306-17) Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. Includes a set of drawings.

Transformers (12.5 Hours)
(Module ID 26307-17) Discusses transformer types, construction, connections, protection, and grounding.

Commercial Electrical Services (10 Hours)
Instructor $20 ISBN 978-0-13-480529-0
(Module ID 26308-17) Covers the components, installation considerations, and NEC® requirements for commercial services.
Standby and Emergency Systems (10 Hours)
(Module ID 26403-17) Explains the NEC® requirements for electric generators and storage batteries.

Basic Electronic Theory (10 Hours)
Instructor $20  ISBN 978-0-13-480545-0
(Module ID 26404-17) Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

Fire Alarm Systems (15 Hours)
Instructor $20  ISBN 978-0-13-480548-1
(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.

Specialty Transformers (10 Hours)
Instructor $20  ISBN 978-0-13-480550-4
(Module ID 26406-17) Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

Advanced Controls (20 Hours)
(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.

HVAC Controls (15 Hours)
(Module ID 26408-17) Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

Heat Tracing and Freeze Protection (10 Hours)
(Module ID 26409-17) Covers heat tracing systems along with their applications and installation requirements.

Motor Operation and Maintenance (10 Hours)
Instructor $20  ISBN 978-0-13-480558-0
(Module ID 26410-17) Covers motor cleaning, testing, and preventive maintenance. Also describes basic troubleshooting procedures.

Medium-Voltage Terminations/Splices (10 Hours)
(Module ID 26411-17) Offers an overview of the NEC® and cable manufacturers’ requirements for medium-voltage terminations and splices.

Special Locations (20 Hours)
Instructor $20  ISBN 978-0-13-480563-4
(Module ID 26412-17) Describes NEC® requirements for selecting and installing equipment, enclosures, and devices in special locations including places of assembly, theaters, carnivals, agricultural buildings, marinas, temporary installations, wired partitions, and swimming pools.

Fundamentals of Crew Leadership (20 Hours)

Ordering information for Electrical Level 4, Eighth Edition:

PAPERBACK  ISBN
Trainee Guide: $97  978-0-13-382315-8
NCCERconnect Access Card: $97  978-0-13-415702-3
NCCERconnect + Trainee Guide: $122  978-0-13-427454-6

Electronic Systems Technician

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PAPERBACK  ISBN
NCCERconnect Access Card: $67  978-0-13-424371-9
NCCERconnect + Trainee Guide: $92  978-0-13-427459-1

Managing Electrical Hazards

12.5 Hours
Updated: 2015, Third Edition
Module ID 26501-15

PAPERBACK  ISBN

• A copy of NFPA 70®, Standard for Electrical Safety in the Workplace, 2015 Edition, is required material for this course. To order, contact NFPA at www.nfpa.org or 1-800-344-3555.

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.

Advanced Electrical Topics

Cable Selection  33208-11
Wire and Cable Terminations  33209-11
CCTV Systems  33410-12
Access Control Systems  33411-12
Buses and Networks  33301-11
Fiber Optics  33302-11
Programmable Logic Controllers  12406-03
Broadband Systems  33403-12
Distributed Control Systems  12407-03
Intrusion Detection Systems  33407-12
Audio Systems  33408-12
Overview of Nurse Call and Signaling Systems  33409-12

Electronic Systems Technician

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NCCERconnect Access Card: $67  978-0-13-424371-9
NCCERconnect + Trainee Guide: $92  978-0-13-427459-1

Managing Electrical Hazards

12.5 Hours
Updated: 2015, Third Edition
Module ID 26501-15

PAPERBACK  ISBN

• A copy of NFPA 70®, Standard for Electrical Safety in the Workplace, 2015 Edition, is required material for this course. To order, contact NFPA at www.nfpa.org or 1-800-344-3555.

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.
Wood and Masonry Construction Methods (12.5 Hours)
(Module ID 33102-10) Describes 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.

Concrete and Steel Construction Methods (12.5 Hours)
Instructor $20  ISBN 978-0-13-213758-4
(Module ID 33103-10) 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.

Pathways and Spaces (12.5 Hours)
Instructor $20  ISBN 978-0-13-213759-1
(Module ID 33104-10) Introduces conduits and wireways used in low-voltage applications, along with their supporting hardware and fittings. Covers telecommunications cable pathways from the source to the destination, including maintenance holes, ducts, equipment rooms, and telecommunications closets.

Craft-Related Mathematics (12.5 Hours)
Instructor $20  ISBN 978-0-13-213762-1
(Module ID 33105-10) Expands on the Core Curriculum module Introduction to Construction Math with an emphasis on the metric system, including how to convert between English and metric units. Also covers the use of scientific notation, powers and roots, and the basic concepts of algebra, geometry, and right-angle trigonometry.

Hand Bending of Conduit (7.5 Hours)
(Module ID 33106-10) Introduces conduit bending and installation. Covers techniques for using hand-operated conduit benders, as well as cutting, reaming, and threading conduit.

Introduction to the National Electrical Code® (7.5 Hours)
(Module ID 33107-10) Provides a road map for using the NEC® by introducing the layout and the types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

Low-Voltage Cabling (20 Hours)
Instructor $20  ISBN 978-0-13-213730-0
(Module ID 33108-10) Covers the makeup, identification, and applications of conductors and cables used in telecommunications and security systems. Describes the tools, materials, and procedures for pulling cables through conduit and raceways.

Introduction to Electrical Drawings (10 Hours)
(Module ID 33206-10) Describes electrical prints, drawings, and symbols and the types of information that can be found on schematics, one-line drawings, and wiring diagrams.

Introduction to Codes and Standards (10 Hours)
(Module ID 33207-10) Describes the scope and content of the major codes and standards that apply to telecommunications, life safety, security, and other low-voltage systems. Emphasis on familiarization with and use of the NEC®.

Cable Selection (10 Hours)
(Module ID 33208-10) Provides an overview of the types of cable used for low-voltage installations. Also covers the methods used to select the proper size and type of cable for a typical installation.

Wire and Cable Terminations (25 Hours)
Instructor $20  ISBN 978-0-13-266174-4
(Module ID 33209-10) Provides information and instructions for selecting, installing, and testing connectors and other terminating devices on cables used in low-voltage work, including telecommunications, video and audio, and fiber optics.

Power Quality and Grounding (20 Hours)
Instructor $20  ISBN 978-0-13-266175-1
(Module ID 33210-10) Covers grounding and bonding of electrical systems. Discusses NEC® regulations pertaining to grounding and bonding. Covers equipment and devices used for grounding and bonding, including their methods of installation. Explains power quality, along with the causes and effects of poor power quality.
Electronic Systems Technician Level 3 (continued)

Buses and Networks (25 Hours)
Instructor $20  ISBN 978-0-13-266387-4
(Module ID 33301-11) Details procedures for connecting computers and components, including network connections. Provides information on connecting controls and equipment in a control system, and explains how data is transferred between the nodes in a network.

Fiber Optics (25 Hours)
(Module ID 33302-11) Introduces the types of equipment and methods used in fiber-optic cable installation.

Wireless Communication (10 Hours)
Instructor $20  ISBN 978-0-13-266385-4
(Module ID 33303-11) Introduces operating principles and equipment used in radio frequency (RF) and infrared (IR) wireless communication systems. Covers RF communication systems, IR-controlled systems, power line carrier (PLC) systems, RF and IR wireless computer networks, and satellite communication systems. Discusses the equipment used for testing and troubleshooting wireless communication systems.

Site Survey, Project Planning, and Documentation (15 Hours)
Instructor $20  ISBN 978-0-13-266386-1
(Module ID 46101-11) Describes best practices for assembling electronic system enclosures, including applications, door locking systems, readers, and other documents commonly used.

Fundamentals of Crew Leadership (20 Hours)
(Module ID 46301-12; see p. 69) Focuses on industry best practices and user-required training.

Rack Assembly (17.5 Hours)
(Module ID 33305-11) Describes rack systems and best practices for assembling electronic system enclosures, including power sequencing, grounding, weight distribution, and heat dissipation. Explains electrical power distribution and load calculations for equipment housed within racks.

System Commissioning and User Training (20 Hours)
(Module ID 33306-11) Covers the final testing and checkout procedures and how to build these activities into projects. Describes customer satisfaction levels and expectations and how to meet them during the cut-over phase of any project. Focuses on industry best practices and user-required training.

Maintenance and Repair (20 Hours)
(Module ID 33307-11) Introduces tasks involved in the maintenance and repair of low-voltage systems and equipment. Presents a systematic approach to system and component-level troubleshooting and methods of identifying common types of repairs.

Telecommunications Systems (20 Hours)
(Module ID 33405-12) Describes the history and current use of basic subscriber systems. Also covers PBX systems used in business applications and Central office services used to interface to the public switched telephone network (PSTN).

Residential and Commercial Building Networks (25 Hours)
(Module ID 33406-12) Describes how home and business systems such as fire alarms, security, energy, and entertainment can be integrated using specialized smart home and building management software and controllers. Describes best practices for system interoperability and performance. Discusses various interconnection options and integration protocols.

Intrusion Detection Systems (30 Hours)
(Module ID 33407-12) 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.

Fire Alarm Systems (40 Hours)
(Module ID 33408-12) Covers the basics of fire alarm systems, including devices, circuits, system design and installation guidelines, power requirements, control panel programming, testing, and troubleshooting. Explores integration of fire alarms with other systems. Examines both residential and commercial fire alarm applications, emphasizing NEC® requirements.

Overview of Nurse Call and Signaling Systems (15 Hours)
Instructor $20  ISBN 978-0-13-292276-0
(Module ID 33409-12) Presents an overview of nurse call and signaling systems as found in hospitals and other health-care facilities. Covers basic emergency call and duress system requirements based on facility type. Identifies installation requirements based on UL and other building code specifications.

CCTV Systems (30 Hours)
Instructor $20  ISBN 978-0-13-292278-4
(Module ID 33410-12) Describes the installation and configuration of closed circuit TV systems for small, medium, and large facilities. Explains various equipment, including cameras, lenses, remote-positioning, video recording, and transmission. Covers the roles of the internet and digital technologies. Introduces test and troubleshooting equipment.

Access Control Systems (35 Hours)
Instructor $20  ISBN 978-0-13-292279-1
(Module ID 33411-12) Introduces access control systems, including applications, door locking systems, readers, biometrics, and controllers. Emphasizes installation practices as well as building and electrical codes.
Heavy Equipment Operations

**L1 HEAVY EQUIPMENT OPERATIONS**

**MODULES**

- **Orientation to the Trade** (5 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22101-12) Provides an overview of heavy equipment terminology, operations, operator responsibilities, career opportunities, and basic principles of safety.

- **Heavy Equipment Safety** (10 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22102-12) 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)
  - Trainee S20
  - Instructor S20
  - (Module ID 22103-12) Introduces the eleven most used pieces of heavy equipment. Describes the functional operation and uses for each piece of equipment, along with a general description of heavy equipment drive and hydraulic systems.

- **Basic Operational Techniques** (22.5 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22104-12) 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.

**Curriculum Notes**

- 165 Total hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for completion and must be purchased separately. See p. 11 for ordering information.)
- Revised: 2012, Third Edition

**PAPERBACK ISBN**

|-------------------|------------------------|-----------------------------|-------------------------------|

**Trainee $20**

**Instructor $20**

**Excavation Math (17.5 Hours)**

**L2 HEAVY EQUIPMENT OPERATIONS**

**MODULES**

- **Utility Tractors** (17.5 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22105-12) 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)
  - Trainee S20
  - Instructor S20
  - (Module ID 22101-12) 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)
  - Trainee S20
  - Instructor S20
  - (Module ID 22106-12) 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.

- **On-Road Dump Trucks** (20 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22201-13) 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)
  - Trainee S20
  - Instructor S20
  - (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)
  - Trainee S20
  - Instructor S20
  - (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)
  - Trainee S20
  - Instructor S20
  - (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.

- **Soils** (10 Hours)
  - Trainee S20
  - Instructor S20
  - (Module ID 22308-13) 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.

- **Skid Steers** (22.5 Hours)
  - Trainee S20
  - Instructor S20
  - (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)
  - Trainee S20
  - Instructor S20
  - (Module ID 22209-13) 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)
  - Trainee S20
  - Instructor S20
  - (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.

**Curriculum Notes**

- 167.5 Hours
- Revised: 2013, Third Edition
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

**PAPERBACK ISBN**

|-------------------|------------------------|-----------------------------|-------------------------------|

**Trainee $20**

**Instructor $20**

**Trainee $20**

**Instructor $20**

**Trainee $20**

**Trainee $20**

**Trainee $20**

**Trainee $20**

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## Heavy Equipment Operations Level 3

### Curriculum Notes

+ 215 Hours
+ Revised: 2014, Third Edition
+ New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

### Modules

All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

#### Finishing and Grading (25 Hours)

- **Trainee** $20
- **Instructor** $20

  (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 types of construction.

#### Compaction Equipment (25 Hours)

- **Trainee** $20
- **Instructor** $20

  (Module ID 2203-14) 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)

- **Trainee** $20
- **Instructor** $20

  (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)

- **Trainee** $20
- **Instructor** $20

  (Module ID 22310-14) Identifies and describes the common uses, types, 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)

- **Trainee** $20
- **Instructor** $20

  (Module ID 22305-14) Identifies and describes the common types, uses, 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.

### Heavy Highway Construction

#### Orientation to the Trade (7.5 Hours)

- **Trainee** $20
- **Instructor** $20

  (Module ID 22001-17; from Heavy Equipment Operations Level 2) Provides an overview of the trade: grading, paving, and structures and their purposes. Covers opportunities in the trades, and includes a description of NCCER training programs and apprenticeships.

#### Safety (5 Hours)

- **Trainee** $20
- **Instructor** $20

  (Module ID 36110-17) Expands on the safety coverage in the Core Curriculum, focusing on issues specific to highway and bridge work such as traffic safety, fall protection, working above or around water, confined spaces, and environmental hazards.

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

- **Trainee** $20
- **Instructor** $20

  (Module ID 36111-17) Identifies the various types of heavy equipment used on highway and bridge job sites, including excavators, bulldozers, cranes, and backhoes. Also covers utility equipment such as generators, air compressors, and compacting equipment.

### Excavation Math (17.5 Hours)

- **Trainee** $20
- **Instructor** $20

  (Module ID 22003-17; from Heavy Equipment Operations Level 2) Covers the mathematical principles and concepts necessary to perform the job of equipment operator in the highway/bridge trades.

### Ordering Information

- **Trainee Guide**: $67
- **Instructor’s Guide + Trainee Guide**: $97
- **Trainee Guide with NCCERconnect Access Card**: $122
- **Instructor’s Package**: $67
- **Trainee Guide + NCCERconnect Access Card**: $97

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Heavy Highway Level 2

**L2 HEAVY HIGHWAY CONSTRUCTION**

**Curriculum Notes**
- NEW!
- Revised: 2017
- NATE-Recognized Training Provider
- For more information, visit www.nccerirc.com.

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

- **Introduction to Earthmoving** (12.5 Hours)
  - (Module ID 22201-12; from Heavy Equipment Operations Level 2)
  - Trainee $20
  - Instructor $20

- **Site Work** (20 Hours)
  - (Module ID 22210-13; from Heavy Equipment Operations Level 2)
  - Trainee $20
  - Instructor $20

- **Interpreting Civil Drawings** (20 Hours)
  - (Module ID 22209-13; from Heavy Equipment Operations Level 2)
  - Trainee $20
  - Instructor $20

- **Work-Zone Safety** (5 hours)
  - (Module ID 75104-13; from Field Safety)
  - Trainee $20
  - Instructor $20

- **Plant Operations** (7.5 Hours)
  - Trainee $20
  - Instructor $20

- **Paving** (7.5 Hours)
  - Trainee $20
  - Instructor $20
  - ISBN 978-0-13-448585-0

- **Bridge Construction** (20 Hours)
  - Trainee $20
  - Instructor $20
  - ISBN 978-0-13-340353-0

- **Deep Foundations** (10 Hours)
  - Trainee $20
  - Instructor $20

**Deep Foundations**
- (Module ID 36202-17) Describes the various types of foundations used in bridge construction and how they are installed. Covers, piles and pile installation, footings, caissons, pile driving equipment, and the environmental issues associated with pile driving.

**Bridge Formwork** (22.5 Hours)
- Trainee $20
- Instructor $20

**Plant Operations**
- (Module ID 36108-17) Explains the equipment and methods used in performing hot-mix asphalt and concrete paving. Discusses concrete paving equipment, such as slipform pavers and texture and curing machines.

**Paving**
- (Module ID 36107-17) Describes the materials used in making concrete and asphalt, as well as the methods by which these materials are obtained. Covers the methods and facilities used to produce concrete and asphalt.

**Bridge Construction**
- (Module ID 36201-17) Describes the various types and major components of bridges. Includes basic surveying equipment and principles, and describes the structure and content of bridge plans.

**Hydroblasting**
- (Module ID 43101-12)
- Revised: 2012, Second Edition
- Trainee $25
- Instructor’s Guide: $25

**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. For more information regarding NATE recertification, please contact NCCER Customer Service at 1-888-622-3720.
HVAC Level 1 (continued)

Trade Mathematics (10 Hours)
Trainee $20
Instructor $20
(Module ID 03102-13) 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.

Basic Electricity (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 03106-13) 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)
Trainee $20
Instructor $20
(Module ID 03108-13) 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)
Trainee $20
Instructor $20
ISBN 978-0-13-340353-4
(Module ID 03107-13) 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 Air Distribution Systems (15 Hours)
Trainee $20
Instructor $20
(Module ID 03109-13) 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)
Trainee $20
Instructor $20
(Module ID 03103-13) Explains how to identify types of copper tubing and fittings used in the HVAC/R 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)
Trainee $20
Instructor $20
(Module ID 03104-13) 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)
Trainee $20
Instructor $20
ISBN 978-0-13-340348-0
(Module ID 03105-13) 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.

Curriculum Notes
- 170 Hours
- Revised: 2013, Fourth Edition
- NATE-Recognized Training Provider
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK
Trainee Guide: $97
Instructor’s Package: $97
NCCERconnect Access Card: $97
NCCERconnect + Trainee Guide: $122

MATERIALS
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

Alternating Current (10 Hours)
Trainee $20
Instructor $20
(Module ID 03206-13) Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

Compressors (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 03302-13) Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

Refrigerants and Oils (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 03301-13) Covers characteristics and applications of pure and blended refrigerants, and provides extensive coverage of lubricating oils used in refrigeration systems.

Leak Detection, Vacuuming, Charging (30 Hours)
Trainee $20
Instructor $20
(Module ID 03205-13) Covers refrigerant handling and equipment servicing procedures for HVAC systems in an environmentally safe manner.

Metering Devices (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 03303-13) Covers the operating principles, applications, installation, and adjustment of fixed and adjustable expansion devices used in air conditioning equipment.

Heat Pumps (20 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-378013-0
(Module ID 03211-13) 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.

Basic Maintenance (20 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-378002-4
(Module ID 03215-13) 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)
Trainee $20
Instructor $20
ISBN 978-0-13-382270-0
(Module ID 03202-13) 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)
Trainee $20
Instructor $20
(Module ID 03214-13) Covers the 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)
Trainee $20
Instructor $20
(Module ID 03214-13) 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)
Trainee $20
Instructor $20
(Module ID 03201-13) 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)
Trainee $20
Instructor $20
(Module ID 03204-13) 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 (12.5 Hours)
(Module ID 03203-13) Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems in residential applications.

Troubleshooting Oil Heating (12.5 Hours)
(Module ID 03310-13) 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)
(Module ID 03312-13) Delivers information and skills needed to troubleshoot various air treatment accessories used with heating and cooling equipment.

Zoning, Ductless, and Variable Refrigerant Flow Systems (12.5 Hours)
(Module ID 03313-13) Introduces the information and skills needed to troubleshoot and repair zoned, ductless, and variable refrigerant flow systems.

Commercial Hydronic Systems (10 Hours)
Instructor $20  ISBN 978-0-13-378138-0
(Module ID 03305-13) 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)
Trainee $20  ISBN 978-0-13-378112-0
(Module ID 03306-13) 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/feederwater system; steam and condensate pipe sizing; and pressure-reducing valves and thermostatic valves.

Retail Refrigeration System (15 Hours)
(Module ID 03304-13) Covers the applications, principles, and troubleshooting of retail refrigeration systems.

Customer Relations (5 Hours)
(Module ID 03316-13) 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.

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HVAC Level 4 (continued)

System Startup and Shutdown (15 Hours)
Trainee $20  Instructor $20
(Module ID 03406-13) Presents the procedures for the startup and shutdown of hot water, steam heating, chilled water, and air handling systems. Also covers the startup 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)
Trainee $20  Instructor $20
(Module ID 03401-13) 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)
Trainee $20  Instructor $20
(Module ID 03407-13) 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.

Instructor $20
(Module ID 03409-13) 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 (20 Hours)
Trainee $43  Instructor $43
(Module ID 46101-11; see p. 69)  Provides an introduction to the fundamentals of leadership for HVAC teams. Includes topics such as communication, teamwork, and motivation.

Alternative and Specialized Heating and Cooling Systems (10 Hours)
Trainee $20  Instructor $20
(Module ID 03408-13) 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.

Commercial/Industrial Refrigeration Systems (20 Hours)
Trainee $20  Instructor $20
(Module ID 03407-13) 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 Heating and Cooling Systems (15 Hours)
Trainee $20  Instructor $20
(Module ID 03408-13) 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.

Fundamentals of Crew Leadership (20 Hours)
Trainee $43  Instructor $43
(Module ID 46101-11; see p. 69)  Provides an introduction to the fundamentals of leadership for HVAC teams. Includes topics such as communication, teamwork, and motivation.

Coating Application (105 Hours)
Trainee $20  Instructor $20
(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)
Trainee $20  Instructor $20
(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.

Training Modules

Industrial Coating and Lining Application Specialist

L1 INDUSTRIAL COATING AND LINING APPLICATION SPECIALIST

LEVEL 1

Curriculum Notes
- 150 Hours
- Published: 2009
- Core Curriculum is not a prerequisite for Industrial Coatings and Lining Application Specialist.

PAPERBACK
ISBN
Trainee Guide: S103
Instructor’s Guide: S103
978-0-13-604508-3
978-0-13-604509-0

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Basic Safety (15 Hours)
(Module ID 00101-04; from Core Curriculum)
Trainee $20  Instructor $20

Coating Application (105 Hours)
Trainee $20  Instructor $20
(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)
Trainee $20  Instructor $20
(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.

Basic Rigging (20 Hours)
(Module ID 00106-04; from Core Curriculum)
Trainee $20  Instructor $20

Introduction to the Trade (5 Hours)
Trainee $20  Instructor $20
(Module ID 69101-09) Provides an introduction to the coatings industry, including career opportunities and an introduction to coatings safety.

Surface Preparation (100 Hours)
Trainee $20  Instructor $20
(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)
Trainee $20  Instructor $20
(Module ID 69103-09) Describes types of coatings, their advantages and disadvantages, applications, and specific preparations required.
MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Industrial Coating Safety** (30 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Tools of the Trade** (5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Surface Preparation Two** (80 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Coating Applications Two** (100 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Oxyfuel Cutting** (17.5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Fasteners and Anchors** (5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Craft-Related Mathematics** (15 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Construction Drawings** (12.5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Pumps and Drivers** (5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Orientation to the Trade** (2.5 Hours)
- **Trainee:** $20
- **Instructor:** $20

**Gaskets and Packing** (10 Hours)
- **Trainee:** $20
- **Instructor:** $20

**To Order Call:** 1-800-922-0579 www.nccer.org/bookstore
Industrial Maintenance Electrical & Instrumentation Technician Level 1 (continued)

Valves (5 Hours)
Trainee $20
Instructor $20
(Module ID 40109-07) Identifies different types of valves and describes their installation, storage, and handling.

Introduction to Test Instruments (7.5 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 40112-07) Introduces the safety precautions and methods of operation for motorized support equipment, including forklifts, manlifts, compressors, and generators.

Lubrication (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 40113-07) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

Introduction to the National Electrical Code® (5 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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&T Test Equipment (10 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 40206-08) Presents devices used to measure flow, pressure, level, and temperature, along with their principles of operation.

Process Mathematics (15 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 40213-08) Describes methods of terminating and splicing conductors of all types and sizes, including preparing and tapping conductors.

L2 INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

Curriculum Notes

• 160 Hours
• Revised: 2009, Third Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $97
Instructor’s Guide: $97
978-0-13-614390-1
978-0-13-614391-8

LECTURES

• 182.5 Hours
• Revised: 2009, Third Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $97
Instructor’s Guide: $97
978-0-13-604499-4
978-0-13-604500-7

INDUSTRIAL MAINTENANCE ELECTRICAL & INSTRUMENTATION TECHNICIAN

MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Industrial Safety for E&I Technicians (12.5 Hours)
Trainee $20
Instructor $20
(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.

Hazardous Locations (10 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 40302-09) Introduces the principles of electronics and semiconductor theory, components, and applications.
Pneumatic Controls (15 Hours)
Trainee $20  Instructor $20  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)
(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.

Troubleshooting and Commissioning a Loop (20 Hours)
(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.

Data Networks (15 Hours)
(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.

Pneumatic Control Valves, Actuators, and Positioners (40 Hours)
(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.

Machine Bending of Conduit (15 Hours)
(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.

To Order Call: 1-800-922-0579  www.nccer.org/bookstore
Craft-Related Mathematics (15 Hours)
Instructor S20 ISBN 978-0-13-614568-4
(Module ID 32106-07) 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)
(Module ID 32107-07) 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)
(Module ID 32108-07) 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)
(Module ID 32109-07) Identifies different types of valves and describes their installation as well as valve storage and handling.

Introduction to Test Equipment (7.5 Hours)
Instructor S20 ISBN 978-0-13-614607-0
(Module ID 32110-07) Introduces test equipment for industrial maintenance, including tachometers, pyrometers, stroboscopes, voltage meters, and automated diagnostic tools.

Material Handling and Hand Rigging (15 Hours)
(Module ID 32111-07) Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

Mobile and Support Equipment (10 Hours)
Trainee S20 ISBN 978-0-13-614609-8
(Module ID 32112-07) Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, personnel lifts, compressors, and generators.

Lubrication (12.5 Hours)
(Module ID 32113-07) Explains lubrication safety, storage, and classifications. Also explains selecting lubricants, additives, lubrication equipment, and lubricating charts.

Gaskets and Packing (10 Hours)
(Module ID 32105-07) Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Describes the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

L2 INDUSTRIAL MAINTENANCE MECHANIC LEVEL 2

Curriculum Notes
- 160 Hours
- Revised: 2007, Third Edition

PAPERBACK ISBN
Trainee Guide: $67 978-0-13-228608-4
Instructor’s Guide: $67 978-0-13-228609-1

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Basic Layout (20 Hours)
Instructor S20 ISBN 978-0-13-604668-4
(Module ID 32201-07) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

Introduction to Piping Components (5 Hours)
Instructor S20 ISBN 978-0-13-604669-1
(Module ID 32202-07) Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

Introduction to Ferrous Metal Piping Practices (5 Hours)
Instructor S20 ISBN 978-0-13-604676-4
(Module ID 32204-07) Covers iron and steel pipe and fittings and provides step-by-step instructions for cutting, threading, and joining ferrous piping.

Introduction to Piping Components (5 Hours)
Instructor S20 ISBN 978-0-13-604670-7
(Module ID 32203-07) Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

Low-Pressure Steam Systems (10 Hours)
Trainee S20 ISBN 978-0-13-604672-1
(Module ID 32205-07) Explains how to remove and install threaded and flanged valves, how to replace valve stem O-rings and bonnet gaskets, and how to repack a valve stuffing box. Also discusses the purpose of valve packing.

Hydrostatic and Pneumatic Testing (10 Hours)
Instructor S20 ISBN 978-0-13-604673-8
(Module ID 32206-07) Describes non-destructive and pressure testing of systems and equipment.

Introduction to Bearings (15 Hours)
Trainee S20 ISBN 978-0-13-604627-1
Instructor S20 ISBN 978-0-13-604675-4
(Module ID 32207-07) Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and takeup bearings. Discusses bearing materials and designations.

High-Pressure Steam Systems and Auxiliaries (20 Hours)
(Module ID 32209-07) Explains the functioning of high-pressure steam systems used in industry.

To Order Call: 1-800-922-0579 Stay Connected: www.nccer.org/bookstore
### Industrial Maintenance Mechanic Level 2 (continued)

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<td>compressed air treatment equipment, as well as compressed air use and safety.</td>
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### Advanced Topics

### Advanced Towers and Vessels (15 Hours)

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<td>(Module ID 32501-09) Introduces the basics of reactor and refinery processes,</td>
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<td>including cat crackers, vacuum, and distillation. Also teaches the use of</td>
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<td>hydraulic torqueing and tensioning equipment.</td>
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### Troubleshooting and Repairing Pumps (10 Hours)

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<td>install and maintain gearboxes.</td>
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### Troubleshooting and Repairing Gearboxes (20 Hours)

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Instrumentation

**Electrical Systems for Instrumentation**
(12.5 Hours)
Trainee $20
Instructor $20

(Module ID 12116-14) Covers basic electrical concepts and terms, DC circuit calculations, electrical measuring instruments, and electrical wiring.

**Fasteners**
(7.5 Hours)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20
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)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20

(Module ID 12117-14) Covers both carbon steel and stainless steel piping measuring 2" or less. Includes instructions for calculating pipe cut length, cutting, deburring, reaming, and threading pipe.

**Hoses**
(7.5 Hours)
Trainee $20
Instructor $20

(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.

**MODELS**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

**Temperature, Pressure, Level, and Flow**
(15 Hours)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20
ISBN 978-0-13-448259-0

(Module ID 12202-15) Teaches 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)
Trainee $20
Instructor $20

(Module ID 33205-10; from Electronic Systems Technician Level 2)

**Panel-Mounted Instruments**
(10 Hours)
Trainee $20
Instructor $20

(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)
Trainee $20
Instructor $20

(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.

**Raceways for Instrumentation**
(17.5 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-448264-4

(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)
Trainee $20
Instructor $20

(Module ID 12303-15) Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in instrumentation.

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**Curriculum Notes**
- 187.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.
Instrumentation Level 2 (continued)

Protective Measures for Instrumentation (20 Hours)
(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)
(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)
(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.

Instrumentation Electrical Circuitry (25 Hours)
(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)
(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)
(Module ID 12209-16) Covers the principles of operation and applications of switches and photoelectric devices in the instrumentation environment.

Terminating Conductors (20 Hours)
(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)
Trainee $20 ISBN 978-0-13-448291-0
Instructor $20 ISBN 978-0-13-448293-4
(Module ID 12206-16) 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)
(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)
(Module ID 12206-16) Covers the theory of operation and the application of common process controllers, including both pneumatic and electronic devices.

Instrument Calibration and Configuration (20 Hours)
(Module ID 12207-16) Introduces the principles of operation and applications of various relays and timers. Also reviews the selection process for these devices.

Proving, Commissioning, and Troubleshooting a Loop (17.5 Hours)
(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.

Digital Logic Circuits (15 Hours)
(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)
(Module ID 12406-16) Introduces PLCs and their uses in industrial control. Includes hardware components, applications, communications, number systems, and programming methods.

To Order Call: 1-800-922-0579 www.nccer.org/bookstore
Distributed Control Systems (15 Hours)
(Module ID 12407-16) Surveys DCS technologies, including fieldbuses, servers, and human-machine interfaces. Also introduces maintenance and the increasingly important aspect of DCS security.

Analyzers and Monitors (30 Hours)
(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.

Ironworking

Tools and Equipment of the Trade (10 Hours)
(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)
Instructor $20  ISBN 978-0-13-215116-0
(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)
(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)
Instructor $20  ISBN 978-0-13-215118-4
(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 blocks and tackles, chain hoists, come-alongs, jacks, and tuggers.

Rigging Practices (15 Hours)
Instructor $20  ISBN 978-0-13-215119-1
(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)
Instructor $20  ISBN 978-0-13-215121-4
(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)
Instructor $20  ISBN 978-0-13-215122-1
(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)
(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)
(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 SAW welding equipment and explains the governing welding codes.

Bar Joists and Girders (5 Hours)
(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)
(Module ID 30114-11) Identifies deck 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.
Ironworking Level 1 (continued)

Field Fabrication (15 Hours)
Instructor $20  ISBN 978-0-13-215093-4
(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.

Structural Ironworking Two (30 Hours)
(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)
Instructor $20  ISBN 978-0-13-266466-0
(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)
(Module ID 30207-11) Describes safe practices when erecting steel using tower cranes. Examines 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)
Instructor $20  ISBN 978-0-13-266468-4
(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.

Stud Welding (10 Hours)
Instructor $20  ISBN 978-0-13-292295-1
(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.

Stud Welding (10 Hours)
Instructor $20  ISBN 978-0-13-292295-1
(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)
(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)

Precast/Tilt-Up Erection (12.5 Hours)
(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)
(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, catapiller dollies, rollers. Also covers special cranes, including derricks, gantries, HLDs, trolley cranes, and jacking frames.

Survey Equipment Use and Care Two (15 Hours)
(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)
(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)
Trainee $20  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.

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Ironworking Level 3 (continued)

Grating and Checkered Plate (5 Hours)
(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 gratings and checker plate.

Air Carbon Arc Cutting and Gouging (12.5 Hours)
Instructor $20  ISBN 978-0-13-610508-4
(Module ID 29104-09; from Welding Level One) 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.

Demolition (10 Hours)
Instructor $20  ISBN 978-0-13-292304-0
(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.

Masonry

Masonry Tools & Equipment (15 Hours)
Instructor $20  ISBN 978-0-13-377939-4
(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)
Instructor $20  ISBN 978-0-13-377940-0
(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)
(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)
Instructor $20  ISBN 978-0-13-377942-4
(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 down block and brick professionally and safely.

Residential Plans and Drawing Interpretation (25 Hours)
(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)
(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.

Reinforced Masonry (20 Hours)
(Module ID 28204-14) Introduces types of metal components, including metal rods, joint reinforcements, plates, anchor, fasteners, and hollow metal frames for doors and windows, and explains how they are installed.

Masonry Openings and Metalwork (20 Hours)
Instructor $20  ISBN 978-0-13-382751-4
(Module ID 28205-14) Describes 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.

Advanced Laying Techniques (40 Hours)
Instructor $20  ISBN 978-0-13-382752-1
(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.

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Construction Inspection and Quality Control
(15 Hours)
Trainee $20
Instructor $20
(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.

Masonry Level 2 (continued)

L3 MASONRY

Curriculum Notes
- 200 Hours
- Updated: 2014, Fourth Edition
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

Elevated Masonry (15 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
ISBN 978-0-13-409850-0
(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)
Trainee $20
Instructor $20
(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.

Fundamentals of Crew Leadership (20 Hours)
Trainee $43
Instructor $43
(Module ID 46101-11; see p. 69)

Material Handling, Storage, and Distribution (25 Hours)
Trainee $20
Instructor $20
(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.

L1 MECHANICAL INSULATING

Curriculum Notes
- 167.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- Updated: 1999

PAPERBACK
ISBN
Trainee Guide: $67
Instructor Guide: $67
978-0-13-909359-3
978-0-13-909383-8

MODULES
All of the modules listed below are included in the Trainee and Instructor Guide(s) listed above. The following ISBN and pricing information is for ordering individual modules only.

Orientation (5 Hours)
Trainee $19
Instructor $19
ISBN 978-0-13-909235-0
(Module ID 19101) Provides an overview of the insulation industry. Factors to consider when selecting insulation in the insulation industry, and why insulation is used.

Trade Relations (7.5 Hours)
Trainee $19
Instructor $19
(Module ID 19102) Discusses the importance of contracts, relationships with other members of the construction team, and effective communication.

Tools of the Trade (7.5 Hours)
Trainee $19
Instructor $19
(Module ID 19103) Identifies tools of the insulation trade, their proper use and care, and safety procedures for each.

Installing Fiberglass Pipe Insulation (30 Hours)
Trainee $19
Instructor $19
ISBN 978-0-13-909219-0
(Module ID 19106) Describes characteristics of fiberglass pipe insulation and sizing requirements, as well as characteristics of ASJ jacketing.

Material Handling, Storage, and Distribution (2.5 Hours)
Trainee $19
Instructor $19
(Module ID 19104) Covers receiving,stocking, and storage of insulation materials, as well as material movement.

Characteristics of Pipe Insulation (5 Hours)
Trainee $19
Instructor $19
(Module ID 19105) Covers identification of types, sizes, and uses of pipe and insulation thickness. explains the relationship between pipe size and insulation size.

Mechanical Insulating

To Order Call: 1-800-922-0579
Stay Connected: www.nccer.org/bookstore
Installing Pipe Fittings, Valves, and Flanges (40 Hours)
Trainee $19
Instructor $19
(Module ID 19107) Explains insulation requirements for basic types of fittings, valves, and flanges; cutting and installing mitered segments to pipe elbows; cutting for application to flanged pipe valves and insulating pipe flanges; and cutting and installing plug 90-degree els.

Installing Calcium Silicate/Expanded Perlite Pipe Insulation (15 Hours)
Trainee $20
Instructor $20
(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.

Installing Mineral Wool Insulation (12.5 Hours)
Trainee $20
Instructor $20
(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.

Installing Rigid Foam Insulation (12.5 Hours)
Trainee $20
Instructor $20
(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.

Installing Board and Block Insulation (17.5 Hours)
Trainee $20
Instructor $20
(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.

Installing Blanket Insulation for Ducts (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 19202) Covers fiberglass blanket installation to ducts and apparatus and discusses vapor-sealed blanket insulation facings.

Installing Board Insulation for Ducts (20 Hours)
Trainee $20
Instructor $20
(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.

Installing Calcium Silicate/Expanded Perlite Pipe Insulation (15 Hours)
Trainee $20
Instructor $20
(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.

Installing Mineral Wool Insulation (12.5 Hours)
Trainee $20
Instructor $20
(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.

Installing Rigid Foam Insulation (12.5 Hours)
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Instructor $20
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Installing Calcium Silicate/Expanded Perlite Pipe Insulation (15 Hours)
Trainee $20
Instructor $20
(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.

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Trainee $20
Instructor $20
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Installing Rigid Foam Insulation (12.5 Hours)
Trainee $20
Instructor $20
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Installing Board and Block Insulation (17.5 Hours)
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Instructor $20
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Trainee $20
Instructor $20
(Module ID 19202) Covers fiberglass blanket installation to ducts and apparatus and discusses vapor-sealed blanket insulation facings.

Installing Board Insulation for Ducts (20 Hours)
Trainee $20
Instructor $20
(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.
Refrigeration and Cryogenic Systems (2.5 Hours)
Trainee $20 
Instructor $20 
(Module ID 19307) Introduces air conditioning and refrigeration systems and their insulation requirements. Also describes the special insulation requirements of extremely low-temperature cryogenic systems.

Specialized Insulation Systems (5 Hours)
Trainee $20 
Instructor $20 
(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.

Blueprints and Specifications (12.5 Hours)
Trainee $20 
Instructor $20 
(Module ID 19309) Describes how to determine the insulation requirements of a project by interpreting construction drawings. Includes a set of blueprints with the Trainee module.

Jacketing Fabrication — Piping and Fittings (40 Hours)
Trainee $20 
Instructor $20 
(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.

Heating, Ventilation, and Air Conditioning Systems (5 Hours)
Trainee $20 
Instructor $20 
(ISBN 978-0-13-910563-0)
(Module ID 19311) Covers the identification of vessel and equipment jacketing, along with layout, fabrication, installation procedures, and securements.

Sheet Metal Lagging (12.5 Hours)
Trainee $20 
Instructor $20 
(Module ID 19312) Describes the identification and application of common sheet metal tools, discusses fabrication and installation methods, and covers flashing and sealing techniques.

Basic Layout (20 Hours)
Trainee $20 
Instructor $20 
(Module ID 15104-06) Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

Oxyfuel Cutting (15 Hours)
Trainee $20 
Instructor $20 
(Module ID 15106-06) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Describes how to perform straight line cutting, piercing, beveling, washing, and gouging.

Intermediate Trade Math (20 Hours)
Trainee $20 
Instructor $20 
(Module ID 15201-07) Explains how to use tables of equivalents and conversion tables, figure ratios and proportions, perform right angle trigonometry, calculate takeouts using trigonometry, and calculate volumes and weights of objects.

Field Sketching (10 Hours)
Trainee $20 
Instructor $20 
(Module ID 15202-07) Teaches the basic skills needed to make a good field sketch to convey information about how parts should be made or assembled.

Intermediate Blueprint Reading (20 Hours)
Trainee $20 
Instructor $20 
(Module ID 15203-07) Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

Specialty Tools (10 Hours)
Trainee $20 
Instructor $20 
(Module ID 15204-07) Explains how to select, inspect, and maintain torque multipliers, cable cutters, nut splitters, keyseat rules, zero-to-one micrometers, and various gauges.

Millwright Power Tools (20 Hours)
Trainee $20 
Instructor $20 
(Module ID 15205-07) Introduces power tools used by millwrights and procedures for using, caring for, and maintaining these tools.

Rigging (20 Hours)
Trainee $20 
Instructor $20 
(Module ID 15206-07) Explains how to select, inspect and use rigging equipment, how to determine requirements and plan lifts, and how to communicate with crane operators.

L1 MILLWRIGHT

LEVEL 1

Curriculum Notes
• 147.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
• Revised: 2006, Third Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK
Trainee Guide: $67
Instructor’s Guide: $67

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Orientation to the Trade (5 Hours)
Trainee $20 
Instructor $20 
(Module ID 15101-06) 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 (15 Hours)
Trainee $20 
Instructor $20 
(Module ID 15102-06) 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 (10 Hours)
Trainee $20 
Instructor $20 
(Module ID 15103-06) Identifies fasteners and anchors used by millwrights, including their applications and installation procedures.

L2 MILLWRIGHT

LEVEL 2

Curriculum Notes
• 150 Hours
• Revised: 2007, Third Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK
Trainee Guide: $97
Instructor’s Guide: $97

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.
Setting Baseplates and Soleplates (15 Hours)
Trainee $20
Instructor $20
(Module ID 15207-07) Explains how to safely select and use lubricants. Describes types of lubricants and lubrication devices.

Introduction to Bearings (15 Hours)
Trainee $20
Instructor $20
(Module ID 15208-07) 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.

Installing Mechanical Seals (20 Hours)
Trainee $20
Instructor $20
(Module ID 15305-08) Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

Removing and Installing Bearings (20 Hours)
Trainee $20
Instructor $20
(Module ID 15306-08) Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

Couplings (15 Hours)
Trainee $20
Instructor $20
(Module ID 15308-08) Identifies types of couplings and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

Fabricating Shims (5 Hours)
Trainee $20
Instructor $20
(Module ID 15308-08) Describes types of shim stock and materials and explains the procedures for fabricating shims.

Alignment Fixtures and Specialty Jigs (10 Hours)
Trainee $20
Instructor $20
(Module ID 15309-08) Explains the applications and fabrication procedures for angle iron, chain, complex reverse-indicator, Christmas tree, and piano wire jigs.

Prealignment for Equipment Installation (15 Hours)
Trainee $20
Instructor $20
(Module ID 15310-08) Explains how to level equipment using jack bolts, wedges, and shims. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

Installing Belt and Chain Drives (10 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-60747-4
(Module ID 15311-08) Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

Installing Fans and Blowers (10 Hours)
Trainee $20
Instructor $20
(Module ID 15312-08) Explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Conveyors (5 Hours)
Trainee $20
Instructor $20
(Module ID 15401-08) Describes conveyor systems and their principles of operation.

Troubleshooting and Repairing Conveyors (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 15402-08) Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

Conventional Alignment (30 Hours)
Trainee $20
Instructor $20
ISBN 978-0-13-610481-0
(Module ID 15403-08) Explains the procedures involved in aligning shafts, first with a straightedge and feeler gauges, then with dial indicators.

Pumps (20 Hours)
Trainee $20
Instructor $20
(Module ID 15404-08) 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 (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 15405-08) 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.

Compressors and Compressor Maintenance (20 Hours)
Trainee $20
Instructor $20
(Module ID 15406-08) Introduces compressors and the troubleshooting and maintenance procedures associated with compressors.

Basic Pneumatic Systems (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 15407-08) Explains pneumatic system components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

Troubleshooting and Repairing Pneumatic Equipment (10 Hours)
Trainee $20
Instructor $20
(Module ID 15408-08) Explains repair and maintenance of pneumatic system components. Describes troubleshooting processes and methods, including pressure sensors and flow sensors.
Millwright Level 4 (continued)

Basic Hydraulic Systems (10 Hours)
(Module ID 15409-08) Describes principles and types of hydraulic equipment and related safety procedures. Describes applications of hydraulic equipment.

Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)
(Module ID 15410-08) Explains inspecting hydraulic systems, diagnosing problems, and repairing these systems. Shows how to read hydraulic schematic symbols.

Troubleshooting and Repairing Gearboxes (20 Hours)
(Module ID 15411-08) 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.

Troubleshooting and Repairing Hydraulics (25 Hours)
(Module ID 15409-08) Describes principles and types of hydraulic equipment and related safety procedures. Describes equipment.

Advanced Blueprint Reading (25 Hours)
(Module ID 15503-09) Using one example system, describes the principles of using alignment systems to perform alignments.

Optical Alignment (25 Hours)
Instructor $20  ISBN 978-0-13-610470-4
(Module ID 15504-09) Explains how to use theodolites, optical levels, auto levels, and total stations to place and align equipment.

Painting

Careers in the Painting Trade (5 Hours)
Instructor $20  ISBN 978-0-13-874256-0
(Module ID 07101) Presents a brief history of the painting trade. Covers career opportunities, from apprenticeship to help to professional to 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)
Instructor $20  ISBN 978-0-13-793159-0
(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)
Instructor $20  ISBN 978-0-13-874355-0
(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.

Identifying Surface/Substrate Materials and Conditions (5 Hours)
Instructor $20  ISBN 978-0-13-874397-0
(Module ID 07105) Describes the tools, materials, and methods used for protecting adjacent surfaces and areas prior to surface preparation, paint spraying, etc.

Identifying Surface/Substrate Materials and Conditions (5 Hours)
Instructor $20  ISBN 978-0-13-793175-0
(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)  
Trainee $20  
Instructor $20  
(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)  
Trainee $20  
Instructor $20  
(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 alkyl paints and coatings.

Brushing and Rolling Paints and Coatings  (15 Hours)  
Trainee $20  
Instructor $20  
(Module ID 07109) Covers the types and selection of brushes, rollers, pads, mops, 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.

Low-Pressure Water Cleaning  (7.5 Hours)  
Trainee $20  
Instructor $20  
(Module ID 07204) Covers the design and function of low-pressure water washing equipment, including procedures for the safe operation and maintenance of typical equipment.

Abrasive Blasting  (7.5 Hours)  
Trainee $20  
Instructor $20  
(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)  
Trainee $20  
Instructor $20  
(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)  
Trainee $20  
Instructor $20  
(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)  
Trainee $20  
Instructor $20  
(Module ID 07208) Introduces the composition, uses, and application of clear finishes, including varnishes, lacquers, shellacs, and urethanes.

Wood Finishing  (22.5 Hours)  
Trainee $20  
Instructor $20  
(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.

Color and Tinting  (10 Hours)  
Trainee $20  
Instructor $20  
ModuleName ID 07304) Describes procedures for mixing, tinting, and matching colors. The use of the color wheel and the Munsell, Federal Standard 5958, and other color systems are also explained.

Decorative (Faux) Finishes  (22.5 Hours)  
Trainee $20  
Instructor $20  
ModuleName ID 07305) Describes techniques for glazing, antiquing, stippling, motling, gilding, marbling, and graining decorative finishes.

Wallcovering  (40 Hours)  
Trainee $20  
Instructor $20  
ModuleName 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)  
Trainee $20  
Instructor $20  
ModuleName 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.

To Order Call: 1-800-922-0579  
www.nccer.org/bookstore
Painting Level 3 (continued)

Texturing (10 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 08103-06) Covers power tool safety as well as procedures for selecting, inspecting, using, and maintaining typical equipment.

Oxyfuel Cutting (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 08104-06) 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.

Ladders and Scaffolds (12.5 Hours)
Trainee $20
Instructor $20
(Module ID 08105-06) 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 (10 Hours)
Trainee $20
Instructor $20
(Module ID 08106-06) Describes the materials used in motorized equipment used on job sites, including electrical generators, air compressors, aerial lifts, pumps, fork lifts, and hydraulic cranes.

Pipefitting (17.5 Hours)
Trainee $20
Instructor $20
(Module ID 08201-06) Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, spool sheets, and detail sheets.

Drawings and Detail Sheets (15 Hours)
Trainee $20
Instructor $20
(Module ID 08202-06) 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.

Pipefitting Trade Math (15 Hours)
Trainee $20
Instructor $20
(Module ID 08203-06) Describes the materials used in socket weld piping systems. Explains how to determine pipe lengths between socket weld fittings, prepare the pipe and fittings for fit-up, and fabricate socket weld fittings.

Butt Weld Pipe Fabrication (37.5 Hours)
Trainee $20
Instructor $20
(Module ID 08204-06) Describes the materials used in butt weld piping systems. Explains how to determine pipe lengths between butt weld fittings, prepare the pipe and fittings for fit-up, and fabricate butt weld fittings. Also describes how to select and install backing rings, fabricate channel iron welding jigs, and use and care for welding clamps.

Excavations (10 Hours)
Trainee $20
Instructor $20
(Module ID 08207-06) Describes the materials used in excavation systems, determining the overall fall of a sewer line, setting the grade and elevation of a trench, and backfilling.
Pipefitting Level 2 (continued)

Underground Pipe Installation (20 Hours)
(Module ID 08209-06) 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.

Motorized Equipment Two (10 Hours)
(Module ID 08305-07) Covers the applications and safety requirements of drain cleaners, personnel lifts, and cable lifts.

Introduction to Aboveground Pipe Installation (20 Hours)
(Module ID 08306-07) Identifies various types of pipe, flanges, gaskets, and bolts. Includes step-by-step procedures for installing pipe sleeves and floor penetrations.

Field Routing and Vessel Trim (15 Hours)
(Module ID 08307-07) Explains how to secure the work area and determine field run specifications, load weights for erection equipment, and support needs. Describes how to erect vessel trim.

Pipe Hangers and Supports (25 Hours)
(Module ID 08308-07) Explains how to identify, select, and install pipe hangers and supports, including spring can supports.

Testing Piping Systems and Equipment (20 Hours)
Instructor $20  ISBN 978-0-13-614681-0
(Module ID 08309-07) Explains how to perform pretests, service flow tests, head pressure tests, hydrostatic tests, and steam blow tests.

Advanced Pipe Fabrication (50 Hours)
(Module ID 08402-07) Discusses how to lay out and fabricate mitered bends, laterals, wyes, and ninety-degree intersections using tables of ordinates or a calculator. This knowledge is required in order to fabricate specialty bends and intersections.

Stress Relieving and Aligning (10 Hours)
(Module ID 08403-07) Explains the nature of misalignment and methods of correcting it. Includes terminology that will help pipelayers communicate with millwrights who perform pump setup.

Steam Traps (10 Hours)
Instructor $20  ISBN 978-0-13-604765-0
(Module ID 08404-07) Describes types of steam traps, how they function, and the basic methods for troubleshooting them.

In-Line Specialties (10 Hours)
(Module ID 08405-07) Describes specialty devices used in pipelines, including: bleed rings; ball and expansion joints; measuring devices for temperature, level, flow rate, and pressure; steam traps; drip legs; and desuperheaters. The purpose and function of each type is explained.

Special Piping (25 Hours)
Instructor $20  ISBN 978-0-13-604767-4
(Module ID 08406-07) Discusses methods of assembling copper and plastic pipe and tubing. Introduces brazing and soldering, and explains the differences between these two procedures. Also describes compression and flared fittings, and grooved and compression formed joining methods.

Hot Taps (10 Hours)
Instructor $20  ISBN 978-0-13-604768-1
(Module ID 08407-07) Explains the mechanics of attaching fittings to the pipeline while the line is under pressure. Covers line stopping, freeze stopping, and adding connections to the line.

Maintaining Valves (10 Hours)
Trainee $20  ISBN 978-0-13-604794-0
(Module ID 08408-07) 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.

Introduction to Supervisory Roles (7.5 Hours)
(Module ID 08409-07) Offers basic information for pipelayers who have a desire to move into supervisory roles. Provides information on issues related to cultural differences, gender-based social behaviors, and legal and ethical situations that a supervisor is likely to encounter.
Pipelayer

**MODULES**

- **185 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)**
- **Published: 1999**
- **Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.**

**PAPERBACK ISBN**
- **Trainee Guide: $67**
- **Instructor’s Guide: $67**
- **NCCERconnect Access Card: $67**

**Trainee $20**
- **Instructor $20**

**Tools and Equipment (22.5 Hours)**

| Instructor S20 | ISBN 978-0-13-015265-4 |

(Module ID 24100) 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)**

| Instructor S20 | ISBN 978-0-13-015305-0 |

(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 aperturances.

**Cutting Pipe (12.5 Hours)**

| Instructor S20 | ISBN 978-0-13-015309-4 |

(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)**


(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)**

| Instructor S20 | ISBN 978-0-13-015309-4 |

(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)**


(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)**

| Instructor S20 | ISBN 978-0-13-015318-0 |

(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)**

| Trainee S20 | ISBN 978-0-13-015312-8 |

(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.

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Plumbing

**MODULES**

- **217.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for completion and must be purchased separately. See p. 11 for ordering information.)**
- **Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint®es, and performance profile sheets from www.nccerirc.com.**

**PAPERBACK ISBN**
- **Trainee Guide: $67**
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**Trainee $20**
- **Instructor $20**

**Introduction to the Plumbing Profession (5 Hours)**

| Trainee S20 | ISBN 978-0-13-292320-0 |
| Instructor S20 | ISBN 978-0-13-292333-0 |

(Module ID 02101-12) Introduces trainees to career options in the plumbing profession. Provides a history of plumbing and also discusses the current technology, industries, and associations of the plumbing profession. Reviews human relations and safety skills.

**Plumbing Safety (22.5 Hours)**

| Instructor S20 | ISBN 978-0-13-292334-7 |

(Module ID 02102-12) Discusses the causes of accidents and their consequences including delays, increased expenses, injury, and loss of life. Reviews the types and proper use of personal protective equipment (PPE). Explains the use of critical safety information including 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)**

| Trainee S20 | ISBN 978-0-13-292322-4 |
| Instructor S20 | ISBN 978-0-13-292336-1 |

(Module ID 02103-12) Describes the care and use of hand and power tools trainees will use on the job. Explains how to select the appropriate tools for different tasks, and reviews tool maintenance and safety issues.

**Introduction to Plumbing Math (12.5 Hours)**


(Module ID 02104-12) Reviews basic math concepts, such as whole numbers, fractions, decimals, and squares, and demonstrates how they apply to on-the-job situations. Explains how to measure pipe using fitting tables and framing squares and how to calculate 45-degree offsets.

**Introduction to Plumbing Drawings (17.5 Hours)**


(Module ID 02105-12) Introduces different types of plumbing drawings and discusses how to interpret and apply them when laying out and installing plumbing systems. Explains the symbols used in plumbing and mechanical drawings, and reviews isometric, oblique, orthographic, and schematic drawings. Requires trainees to render plumbing drawings and to recognize how code requirements apply to plumbing drawings.
Plumbing Level 1 (continued)

**Plastic Pipe and Fittings** (12.5 Hours)
(Module ID 02106-12) Introduces different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Discusses 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 Tube and Fittings** (12.5 Hours)
(Module ID 02108-12) 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.

**Cast-Iron Pipe and Fittings** (12.5 Hours)
(Module ID 02109-12) Discusses threading, labeling, and sizing of cast-iron pipe and reviews the differences between domestic and imported pipe. Covers the proper techniques for measuring, cutting, threading, joining, and hanging cast-iron pipe. Also reviews corrugated stainless steel tubing.

**Carbon Steel Pipe and Fittings** (12.5 Hours)
(Module ID 02110-12) Discusses the proper applications of code-approved fittings in plumbing installations. Reviews the different types of fixtures and the materials used in them. Covers storage, handling, and code requirements.

**Introduction to Plumbing Fixtures** (7.5 Hours)
(Module ID 02111-12) Introduces techniques for isolating, building, and installing DWV systems. Reviews the different types of fixtures and the materials used in them. Covers storage, handling, and code requirements.

**Introduction to Drain, Waste, and Vent (DWV) Systems** (10 Hours)
(Module ID 02111-12) 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.

**Introduction to Water Distribution Systems** (10 Hours)
Instructor $20  ISBN 978-0-13-292346-0
(Module ID 02112-12) 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**

**Curriculum Notes**
- 170 Hours
- Revised: 2013, Fourth Edition
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

Traine Guide: $97  978-0-13-340278-9
Instructor Package: $97  978-0-13-340288-8
NCCEConnect Access Card: $97  978-0-13-422666-8
NCCEConnect + Trainee Guide: $122  978-0-13-427458-4

**Installing Roof, Floor, and Area Drains** (5 Hours)
(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)
(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)
(Module ID 02207-13) Reviews types of valves, their components, and applications. Also covers valve servicing.

**Installing Fixtures and Valves** (20 Hours)
(Module ID 02208-13) 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)
(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)
Instructor $20  ISBN 978-0-13-340298-8
(Module ID 02211-13) Introduces techniques for safe handling of natural gas, liquified petroleum gas, and fuel oil. Reviews fuel gas and fuel oil safety precautions and potential hazards, applications, systems installation, and testing.

**L3 PLUMBING**

**Curriculum Notes**
- 160 Hours
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.
Compressed Air (10 Hours)
(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)
(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.

L4 PLUMBING

Compressed Air (10 Hours)
(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)
(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.

Hydronic and Solar Heating Systems (17.5 Hours)
(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)
Instructor $20  ISBN 978-0-13-378659-0
(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)
(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)
(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)
Instructor $20  ISBN 978-0-13-378665-7
(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)
Instructor $20  ISBN 978-0-13-378664-4
(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)
(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

• 17.5 Hours
• Published: 2005
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.
• A Spanish translation is available. Please see NCCER’s online catalog for more information.

PAPERBACK  ISBN
Trainee Guide: $67  978-0-13-228220-8

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Concrete Reinforcement  (40 Hours)
Trainee $20  ISBN 978-0-13-228987-0
Instructor $20  ISBN 978-0-13-228993-1
(Module ID 39100-05) 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)
(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)
(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)
(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.

Curriculum Notes
• 117.5 Hours
• Published: 2005
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

To Order Call: 1-800-922-0579  www.nccer.org/bookstore

L2  REINFORCING IRONWORK  LEVEL 2

• 100 Hours
• Published: 2005
• Instructor’s Guide includes access code to download TestGen software, module exams, and performance profile sheets from www.nccerirc.com.

PAPERBACK  ISBN
Trainee Guide: $97  978-0-13-227294-0
Instructor’s Guide: $97  978-0-13-227295-7

MODULES
Reinforcing Ironwork Level Two comprises modules from NCCER’s Carpentry and Ironworking curricula. All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Foundations and Flatwork  (15 Hours)
(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)
(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)
(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.

Metal Decking  (10 Hours)
Instructor $20  ISBN 978-0-13-015446-0
(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.

Curriculum Notes

Introductory Skills for the Crew Leader  (16 Hours)
(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.

Military curricula. All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.
# Scaffolding

## Modules

All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

### Introduction to the Trade (7.5 Hours)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(Module ID 31101-15) Introduces the scaffolding program, describes the duties of a scaffold, and identifies scaffold types and scaffolding terms.

### Trade Safety (7.5 Hours)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(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)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(Module ID 31103-15) Covers the safe use and applications of hand and power tools used in the trade.

### Trade Math (7.5 Hours)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(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)

- **Trainee**
  - $20 (PAPERBACK)
- **Instructor**
  - $20 (PAPERBACK)

(Module ID 31106-15) Identifies the different types of powered and manually propelled mobile scaffolds and describes their erection and operation.

## Mobile Scaffolds (10 Hours)

- **Trainee**
  - $20 (PAPERBACK)
- **Instructor**
  - $20 (PAPERBACK)

(Module ID 31107-15) Identifies the types of equipment used with suspension scaffolds. Describes the rigging of suspension scaffolds.

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# Sheet Metal

## Modules

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

### Introduction to the Sheet Metal Trade (5 Hours)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(Module ID 04101-08) Summarizes the history and development of the sheet metal trade. Explains the benefits of apprenticeship training, and identifies career opportunities in the trade.

### Tools of the Trade (5 Hours)

- **Trainee**
  - $67 (PAPERBACK)
- **Instructor**
  - $67 (PAPERBACK)

(Module ID 04102-08) Describes the hand and power tools used in the sheet metal trade, including layout tools and cutting, bending, and forming machines. Includes safety and maintenance guidelines.

### Introduction to Sheet Metal Layout and Processes (7.5 Hours)

- **Trainee**
  - $20 (PAPERBACK)
- **Instructor**
  - $20 (PAPERBACK)

(Module ID 04103-08) 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.

### Trade Math One (20 Hours)

- **Trainee**
  - ISBN 978-0-13-604835-0
  - $20 (PAPERBACK)
- **Instructor**
  - $20 (PAPERBACK)

(Module ID 04104-08) Builds on trainees’ basic math skills to solve trade-related problems. Covers calculations using denominate numbers, area and volume calculations, English-metric system conversions, basic geometry, and calculation of stretchouts.

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## 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. For more information regarding NATE recertification, please contact NCCER Customer Service at 1-888-622-3720.
**Sheet Metal Level 1 (continued)**

**Fabrication One – Parallel Line Development** (22.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04105-08) 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)

- **Trainee** $20
- **Instructor** $20

(Module ID 04106-08) 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** (5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04107-08) 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.

**Architectural Sheet Metal** (7.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04109-08) 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.

**Insulation** (7.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04108-08) Describes how to install fiberglass blanket, foam, and pipe insulation using approved adhesives and fastening techniques. Also includes the fabrication and installation of fitting covers and preformed fitting covers.

**Bend Allowances** (5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04206-08) 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)

- **Trainee** $20
- **Instructor** $20

(Module ID 04207-08) Identifies soldering tools, materials, and techniques. Also provides a wide range of soldering tasks for practice.

**Basic Piping Practices** (7.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04208-08) Reviews the methods for measuring, cutting, and joining selected types of pipe using fittings, hangers, and supports. Also reviews pipe materials and applications.

**Trade Math Two** (20 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04201-08) Demonstrates how to apply formulas to solve a variety of mathematical problems. Covers linear, area, volume, and angle measurement and percentage, ratio, and proportion. Provides practical instruction in using protractors, vennier calipers, and micrometers and in solving field measuring problems.

**Plans and Specifications** (20 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04202-08) Reviews how to read and interpret section, elevation, and detail drawings. Also covers other specifications and other sources of project information. Includes 17 construction drawings.

**Fabrication Two – Radical Line Development** (55 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04203-08) 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.

**Sheet Metal Duct Fabrication Standards** (7.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04204-08) 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.

**Air Properties and Distribution** (15 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04302-09) Reviews the operating principles, components, and applications of common air systems. Discusses constant volume systems, variable volume systems, variable air volume (VAV) systems, and dual VAV systems.

**Principles of Airflow** (22.5 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04303-09) 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.

**Louvres, Dampers, and Access Doors** (20 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04304-09) Discusses the different types of louvers, dampers, and access doors used in air distribution systems and reviews the standards that apply to them.

**Comprehensive Plan and Specification Reading** (30 Hours)

- **Trainee** $20
- **Instructor** $20

(Module ID 04305-09) Provides a case-study approach to learning how to use building plans and specifications to lay out, fabricate, and install HVAC systems. Allows trainees to proceed through the module as if they were working on an actual building project. Includes construction drawings.

**Sheet Metal Level 2**

- **Trainee** $20
- **Instructor** $20

(Module ID 04208-08) Describes fiberglass duct layout and fabrication methods. Also discusses closure, hanging, and support methods. Explains how to repair major and minor damage to fiberglass duct.

**Curriculum Notes**

- NATE Recognized Training Provider

**MODULES**

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.
Fabrication Three – Triangulation (47.5 Hours)
Instructor $20  ISBN 978-0-13-610524-4
(Module ID 04306-09) Describes the principles of triangulation and how it can be used to measure ductfitting. Provides a variety of tasks to practice developing, laying out, and fabricating selected ductfitting.

Advanced Architectural Sheet Metal (12.5 Hours)
Instructor $20  ISBN 978-0-13-610525-1
(Module ID 04307-09) Provides trainees with the opportunity to practice layout, fabrication, and installation of various architectural pieces.

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Shop Production and Organization (15 Hours)
(Module ID 04401-09) 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, the critical path method, and the roles and responsibilities of shop personnel.

Air Testing and Balancing (25 Hours)
(Module ID 04402-09) 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.

Introduction to Welding, Brazing and Cutting (25 Hours)
(Module ID 04403-09) Introduces the techniques and proper operation of equipment used for welding, brazing, and cutting. Emphasizes safety and awareness of hazards involved. Trainees practice welds in a variety of positions and perform a basic braze.

Fume and Exhaust System Design (25 Hours)
(Module ID 04404-09) 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.

Fabrication Four – Comprehensive Review (40 Hours)
(Module ID 04405-09) Provides a review of parallel line, radial line, and triangulation development methods for laying out sheet metal patterns. Trainees practice laying out and fabricating selected sheet metal fittings using these methods.

Introductory Supervisory Skills (20 Hours)
Instructor $20  ISBN 978-0-13-214238-0
(Module ID 04406-09) Teaches skills required to supervise personnel, including leadership, team building, communication and motivation. Discusses gender and cultural issues. Emphasizes principles of project planning and management, including problem solving and decision making. Presents case studies for student participation.

Survey Equipment Use and Care One (30 Hours)
(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 differentially leveling and basic horizontal and vertical angular measurements. Includes guidelines for recording surveying measurement data in field notes.

Blueprint Reading for Surveyors (20 Hours)
(Module ID 78104-09) Expands on the Core Curriculum 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.
Survey Equipment Use and Care Two, EDMs and Total Stations (10 Hours)
Instructor S20 ISBN 978-0-13-160030-0
(Module ID 78202-04) Covers the setup, use, calibration, and care of electronic distance measuring instruments and total stations.

Control Setup (30 Hours)
(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)
Instructor S20 ISBN 978-0-13-160032-4
(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.

Sprinkler Fitting

Introduction to Components and Systems (7.5 Hours)
Trainee S20 ISBN 978-0-13-378240-0
(Module ID 18102-13) Introduces testing laboratories and listing agencies. Provides an overview of the major types of sprinkler systems including wet pipe, dry pipe, preaction, and deluge systems. Defines sprinkler-head types, orifice size, and K-Factor. Underground and aboveground pipe and tubes are discussed, including hangers, bracing, and restraints. Also covers valves, alarms, and fire department connections.

Steel Pipe (22.5 Hours)
Instructor S20 ISBN 978-0-13-378251-6
(Module ID 18103-13) Identifies steel piping materials along with tools used to cut and thread steel pipe. Describes methods for threading, cutting, and grooving pipe, including how to determine pipe length between fittings (takeouts). Discusses threaded, plain-end, and flanged fittings.

CPVC Pipe and Fittings (10 Hours)
(Module ID 18104-13) Describes handling and storage of CPVC pipe. Identifies CPVC safety concerns and cautions. Outlines methods and tools for cutting, chamfering, and cleaning CPVC pipe, including calculating takeouts. Joining techniques are described, particularly the solvent-cement (one-step) method. Rules for using plastic pipe hangers are explained.

Copper Tube Systems (10 Hours)
Trainee S20 ISBN 978-0-13-378435-0
(Module ID 18105-13) Introduces copper tubing and fittings along with cutting and bending tools. Describes the soldering process and techniques for measuring, cutting, reaming, and cleaning. Brazing is described as are brazing metals, fluxes, and brazing equipment. Support bracing for copper tube and grooved couplings for copper pipe are also discussed.

Underground Pipe (17.5 Hours)
(Module ID 18106-13) Details underground piping installations for various types of pipe. Explains thrust blocks and restraints. In-building risers, hydrants, yard valves, and hydrant houses are discussed as are testing, inspection, flushing, and chlorinating. The underground test certificate is also covered.

Concrete Properties and Quality Control (15 Hours)
Trainee S20 ISBN 978-0-13-160027-0
(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)
Trainee S20 ISBN 978-0-13-160029-4
Instructor S20 ISBN 978-0-13-160038-6
(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, embankments, and stairs.

To Order Call: 1-800-922-0579 www.nccer.org/bookstore
Sprinkler Fitting Level 2 (continued)

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

#### Hangers, Supports, Restraints, and Guides

(15 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18201-13) Identifies strength/capacity requirements, types, and installation of pipe hangers, supports, restraints, and guides. Covers types and installation of earthquake bracing and explains sleeving and fire-stopping.

#### General Purpose Valves

(15 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18202-13) Covers types of valves and valve applications, including service procedures for standard valves. Also covers installation of OS&Y valves, butterfly grooved valves, and tamper switches. Outlines procedures for disassembling, servicing, and reassembling check valves.

#### General Trade Math

(20 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18203-13) Reviews math principles used to solve everyday problems, including unit conversion from the English system to the metric system and vice versa. Includes sprinkler fitting problems such as calculating 45-degree offsets and tank volume, centering sprinkler heads using geometric methods, and problems relating to hanger sizing.

#### Shop Drawings

(32.5 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18204-13) Explains how to read drawings to identify materials, calculate square footage and number of sprinklers required, lay out sprinkler hanger locations, and identify sprinkler orifice sizes.

#### Standard Spray Fire Sprinklers

(20 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18205-13) Discusses standard spray sprinklers relative to occupancies and to maximum coverage calculations. Explains how to identify sprinkler manufacturer and type using the Sprinkler Identification Number (SIN).

#### Wet Fire Sprinkler Systems

(25 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18206-13) Explains the purpose, function, and operation of wet pipe system components. Describes riser check valves, alarm check valves, and trim; flow, tamper, and pressure switches; fire department connections and hose stations; antifreeze systems; faulty pressure gauges; inspector’s test connections and auxiliary drains; and hydrostatic testing and test pumps.

#### Dry-Pipe Systems

(25 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18207-13) Explains the purpose, function, and operation of components used in a dry-pipe system. Describes how to install pressure gauges on alarm valves and accelerators, how to set and adjust an air maintenance device, and how to reset and troubleshoot dry-pipe systems.

### L3 SPRINKLER FITTING

**LEVEL 3**

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<th>Curriculum Notes</th>
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#### Modules

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. Also covers installation of OS&Y valves, butterfly grooved valves, and tamper switches. Outlines procedures for disassembling, servicing, and reassembling check valves.

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#### Water Supplies

(15 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18207-13) Covers fire pump categories and components. Describes fire pump controller requirements and fire pump performance and alignment. Explains pump and driver characteristics and performance curves as well as controllers, sensing lines, supervision, and starting methods. Outlines project requirements, installation, maintenance, and troubleshooting.

#### System Layout

(45 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18208-13) Describes deluge and preaction systems and explains installation techniques and troubleshooting. Covers hydraulic and pneumatic release mechanisms, non-interlocked and interlocked preaction systems and FireCyl® Systems.

#### Sprinkler Fitting Level 2 (continued)

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#### Application-Specific Sprinklers and Nozzles

(27.5 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18209-13) Describes application-specific sprinkler types and requirements. Discusses area of coverage, positioning, and obstruction requirements and explains system selection.

### L4 SPRINKLER FITTING

**LEVEL 4**

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#### Modules

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. Also covers installation of OS&Y valves, butterfly grooved valves, and tamper switches. Outlines procedures for disassembling, servicing, and reassembling check valves.

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#### System Layout

(45 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18210-13) Describes deluge and preaction systems and explains installation techniques and troubleshooting. Covers hydraulic and pneumatic release mechanisms, non-interlocked and interlocked preaction systems and FireCyl® Systems.

#### Inspection, Testing, and Maintenance

(17.5 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18211-13) Introduces the role of foremanship and project documentation and reports related to materials tracking and labor tracking.

#### Special Extinguishing Systems

(42.5 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18212-13) Identifies the following extinguishing exposure systems: water spray, foam, carbon dioxide, Halon, auxiliary and local alarm. Limited water systems, fire extinguishers, and water mist suppression systems are also covered.

#### Introductory Skills for the Foreman

(20 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18213-13) Introduces the role of foremanship and covers responsibilities, leadership, and safety. Also explains project documentation and reports related to materials tracking and labor tracking.

#### Procedures and Documentation

(20 Hours)

- **Trainee**: $20
- **Instructor**: $20

  (Module ID 18214-13) Explains the importance of proper documentation to ensure correct installation and avoid future rework and possible unintentional releases. Emphasizes the need to properly document the actual installation using written reports and photographs. Includes causes of and responses to water damage, and provides a case history of an unintentional release.
**Joint Fit-Up and Alignment (5 Hours)**


(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)**


(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)**


(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.

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**L1 WELDING**

**LEVEL 1**

**Curriculum Notes**

- 357.5 Hours (Includes 72.5 Hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- 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 2, the content aligns with the key indicators specified in AWS EGE.0.2008 Level 1-Entry Welder.
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

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**NCCERconnect + Paperback Trainee Guide**


**MODULES**

- All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

  **Welding Safety** (5 Hours)

  (Module ID 29100) Covers safety requirements applicable to the cutting and welding of metals.

  **Oxyfuel Cutting** (17.5 Hours)

  Instructor $20  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)

  (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 welding and gouging activities.

  **Base Metal Preparation** (12.5 Hours)

  (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)

  (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)

  (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)

  Trainee $20  ISBN 978-0-13-418278-0
  (Module ID 29108-15) Describes SMAW equipment and processes. Identifies 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)

  (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 a single/multiple pass, weave, overlapping beads, and fillet welds.

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**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 EGE.0.2008 Level 1-Entry Welder.
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

**Hardcover**


**Paperback**


**NCCERconnect Access Card**


**NCCERconnect + Hardcover Trainee Guide**


**NCCERconnect + Paperback Trainee Guide**


**MODULES**

- All of the modules listed below are included in the Trainee Guide and the Instructor’s Package. The following ISBN and pricing information is for ordering individual modules only.

  **Welding Symbols** (5 Hours)

  (Module ID 29110-15) Identifies the different types of groove welds and explains how to make flat, horizontal, vertical, and overhead groove welds.
Welding Level 2 (continued)

Reading Welding Detail Drawings (10 Hours)
(Module ID 29202-15) Identifies and explains welding detail drawings. Describes lines, hatching, 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 details.

Physical Characteristics and Mechanical Properties of Metals (7.5 Hours)
(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)
(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)
(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 TCAW welds.

GMAW – Plate (60 Hours)
(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)
(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)
(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)
(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.

GTAW – Low Alloy and Stainless Steel Pipe (80 Hours)
(Module ID 29303-16) 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 – Carbon Steel Pipe (80 Hours)
Instructor $20  ISBN 978-0-13-448569-0

SMAW – Stainless Steel Plate and Pipe Groove Welds (100 Elective Hours)
Instructor $20  ISBN 978-0-13-448572-0
(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 pipe 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.

Curriculum Notes

- 470 Hours (370 Required; 100 Elective/Optional)
- Revised: 2016, Fifth Edition
- New printed Instructor’s Package includes lesson plans and instructor’s copy of Trainee Guide with access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com

To Order Call: 1-800-922-0579  www.nccer.org/bookstore
Welding Level 4 (continued)

**GMAW – Aluminum Plate** (30 Hours)
(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 welding. 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)
Instructor $20  ISBN 978-0-13-467764-4
(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.

**Soldering and Brazing** (12.5 Hours)
(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

• 147.5 Hours (Includes 72.5 hours of Core Curriculum, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
• Revised: 2004, Second Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $67 978-0-13-109864-0
Instructor’s Guide: $67 978-0-13-109865-7

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Orientation to the Trade (5 Hours)
(Module ID 21101-04) Provides an overview of the entire course and highlights the duties and responsibilities of a mobile crane operator. Discusses ASME B30.5 and OSHA 550, as well as career opportunities and operator requirements.

Basic Principles of Cranes (15 Hours)
Instructor $20 ISBN 978-0-13-160072-0
(Module ID 21102-04) 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)
Instructor $20 ISBN 978-0-13-160073-7
(Module ID 21103-04) Presents the fundamentals of rigging. Discusses a variety of rigging gear, components, and configurations and their applications within the mobile crane industry.

Crane Safety (15 Hours)
Instructor $20 ISBN 978-0-13-160074-4
(Module ID 21104-04) Introduces various safety aspects of mobile crane operation, including equipment inspection, site hazard identification, and required personal protective equipment. Explains how to work with site plans and specifications.

Operating a Crane (25 Hours)
Instructor $20 ISBN 978-0-13-160075-1
(Module ID 21105-04) Describes the basic functions of a crane, as well as standard procedures for starting up and shutting down a crane. Provides an opportunity to become familiar with the actual operation of a crane and the functions of its controls.

L2 MOBILE CRANE OPERATIONS

• 145 Hours
• Revised: 2004, Second Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $97 978-0-13-109866-4
Instructor’s Guide: $97 978-0-13-109867-1

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Communication (10 Hours)
(Module ID 21201-04) Examines the communication process, addressing obstacles such as abstractions, fear, and lack of experience as well as environmental factors. Covers methods of communication. Presents at the ASME B30.5 hand signals, including the appropriate operator action when the signal is given and the expected machine movement.

Machine Power Flow (27.5 Hours)
Instructor $20 ISBN 978-0-13-160088-1
(Module ID 21202-04) 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.

Preventive Maintenance (22.5 Hours)
(Module ID 21203-04) Covers crane preventive maintenance and compliance inspections. Presents safety procedures and equipment/material considerations for inspections.

L3 MOBILE CRANE OPERATIONS

• 155 Hours (145 Required; 10 Elective/Optional)
• Revised: 2005, Second Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK ISBN
Trainee Guide: $97 978-0-13-109868-8
Instructor’s Guide: $97 978-0-13-109870-1

MODULES
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Computer Aids/Operator Aids (20 Hours)
Instructor $20 ISBN 978-0-13-160091-1
(Module ID 21205-04) 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.

On-Site Equipment Movement (25 Hours)
(Module ID 21207-04) Covers site hazards and restrictions that could hinder on-site crane movement; safety considerations involved in crane movement over unlevel ground; pick-and-carry operations; and power line contact. Also addresses flotation capacity.

Load Dynamics (15 Hours)
Instructor $20 ISBN 978-0-13-160092-8
(Module ID 21206-04) Covers leverage and stability, operational quadrants, submerged lifts, non-centered lifts, and other factors that affect stability.

Load Charts (25 Hours)
(Module ID 21201-05) 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.
Mobile Crane Operations Level 3 (continued)

Telescopic Boom Attachment Assembly and Disassembly (20 Hours)
Instructor $20  ISBN 978-0-13-168292-4
(Module ID 21302-05) Covers the stowing and erection of the swing-away extension, A-frame jib, and auxiliary single-sheave boom head, as well as the assembly and removal of intermediate boom sections.

Advanced Operational Techniques (20 Hours)
Instructor $20  ISBN 978-0-13-168293-1
(Module ID 21303-05) 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.

Mobile Crane Operations Level 3 (continued)

Lift Planning (20 Hours)
(Module ID 21304-05) Discusses lift plan implementation, including reference information, calculations, single- and multiple-crane lifting, critical lifts, and engineering considerations.

Hoisting Personnel (20 Hours)
(Module ID 21305-05) Examines ASME B30.23 and 29 CFR 1926.550(g) requirements while presenting advanced operation techniques for hoisting personnel.

Lattice Boom Assembly and Disassembly (25 Hours)
(Module ID 21306-05) Provides a step-by-step look at short- and long-lattice boom assembly and disassembly.

Emergency Procedures (15 Hours)
Instructor $20  ISBN 978-0-13-168294-8
(Module ID 21307-05) Provides information on incident prevention and investigation, the hazards of power line contact, and failures that may occur during lifting operations.

Transporting Requirements (10 Elective Hours)
Trainee $20  ISBN 978-0-13-168290-0
(Module ID 21308-05) 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.

Rigger/Signal Person

BASIC RIGGER

Curriculum Notes

• 40 Hours
• Revised: 2011, Second Edition
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.
• A Spanish translation of Rigging Fundamentals is available. Please see NCCER’s online catalog for more information.

PAPERBACK  ISBN
Trainee Guide: $49  978-0-13-215456-7
Instructor’s Guide: $49  978-0-13-215457-4

MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Basic Rigging (15 Hours)
(Module ID 38201-11) From Core Curriculum
Instructor $20  ISBN 978-0-13-266200-0

INTERMEDIATE RIGGER

Curriculum Notes

• 55 Hours
• Revised: 2011
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com.

PAPERBACK  ISBN
Trainee Guide: $49  978-0-13-215458-1
Instructor’s Guide: $49  978-0-13-215460-4

MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Rigging Equipment (10 Hours)
(Module ID 38201-11) 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)
(Module ID 38201-11) 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.

Intermediate Rigging (10 Hours)
Instructor $20  ISBN 978-0-13-266185-0
(Module ID 38201-11) Describes the basic procedures for using the various types of slings and for determining sling stress. Introduces lift plans, crane load charts, determining the center of gravity of a load, and using cranes to lift personnel. Describes sling selection and the use of jacks, hoists, and rollers to move loads.

Wire Rope (10 Hours)
(Module ID 38202-11) Covers the components of wire rope, as well as inspection requirements and procedures for using wire rope, load blocks, and sheaves. Explains the proper installation of wire rope, as well as maintenance guidelines and end terminations and preparation.

Boom Assembly and Disassembly (20 Hours)
Instructor $20  ISBN 978-0-13-266187-4
(Module ID 38203-11) Provides step-by-step instructions for the assembly and disassembly of long and short lattice booms as well as the extension and stowing of swing-away lattice booms for telescopic booms. Covers the installation and stowing of A-frame jibs.

Basic Principles of Cranes (15 Hours)
Instructor $20  ISBN 978-0-13-266188-1
(Module ID 38204-11) Introduces mobile crane equipment with an in-depth discussion of terminology and nomenclature. Explains the basic scientific principles associated with mobile crane operation.
**ADVANCED RIGGER**

**Curriculum Notes**
- 65 Hours
- Published: 2011

**PAPERBACK**
- ISBN
- Trainee Guide: $49 978-0-13-215461-1
- Instructor’s Guide: $49 978-0-13-215462-8

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Advanced Rigging** (20 Hours)
- (Module ID 38301-11) Discusses ASME B30.23 and 29CFR 1926.550(q) and various recommendations governing the safe hoisting of personnel. Covers platform and crane requirements, as well as inspection and test lifting.

**Lift Planning** (40 Hours)
- (Module ID 38302-11) Provides an in-depth look at the development of a lift plan. Topics include reference information, load calculations, planning for multiple-crane lifts, engineering considerations, and application of load charts.

**Personnel Lifts** (5 Hours)
- (Module ID 38303-11) Discusses ASME B30.23 and 29CFR 1926.550(q) and various recommendations governing the safe hoisting of personnel. Covers platform and crane requirements, as well as inspection and test lifting.

**Communication** (10 Hours)
- (Module ID 53101-11) Describes the communication process between the rigger and the crane operator. Covers electronic communication as well as ASME hand signals for mobile, tower, and overhead cranes.

**Basic Principles of Cranes** (15 Hours)
- (Module ID 21104-04; from Mobile Crane Operations Level One)

**SIGNAL PERSON**

**Curriculum Notes**
- 40 Hours
- Published: 2011

**PAPERBACK**
- ISBN
- Instructor’s Guide: $49 978-0-13-215455-0

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Personnel Lifts** (5 Hours)
- (Module ID 38303-11) Discusses ASME B30.23 and 29CFR 1926.550(q) and various recommendations governing the safe hoisting of personnel. Covers platform and crane requirements, as well as inspection and test lifting.

**Communication** (10 Hours)
- (Module ID 53101-11) Describes the communication process between the rigger and the crane operator. Covers electronic communication as well as ASME hand signals for mobile, tower, and overhead cranes.

**Basic Principles of Cranes** (15 Hours)
- (Module ID 21104-04; from Mobile Crane Operations Level One)
Tower Crane Operator

Orientation to the Trade (5 Hours)
(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)
Instructor $20 ISBN 978-0-13-213829-1
(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)
(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)
Instructor $20 ISBN 978-0-13-213831-4
(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)
Instructor $20 ISBN 978-0-13-213832-1
(Module ID 48105-10) Explores 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)
Instructor $20 ISBN 978-0-13-213798-0
(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)
(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

Nuclear Power (25 Hours)
Instructor $20 ISBN 978-0-13-272942-0
(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)
(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)
Instructor $20 ISBN 978-0-13-272944-4
(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 Alternative Energy (25 Hours)
(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)
(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.
Sustainable Construction

Sustainable Construction Supervisor

20 Hours
Published: 2011
Module ID 70201-11

PAPERBACK ISBN
Trainee Guide: $53 978-0-13-215415-4

• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com.

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 sustainability goals, Green building materials and technologies, Green building methods and processes, and more.

Your Role in the Green Environment

15 Hours
Updated: 2015, Third Edition
Module ID 70101-15

PAPERBACK ISBN
Trainee Guide: $30 978-0-13-294863-0
Instructor’s Guide: $30 978-0-13-294930-9

• New printed Instructor’s Guide includes lesson plans and instructor’s copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com.

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.

In addition to being updated to reflect LEED v4, this edition features NCCER’s new instructional design, which includes organizing the material in a layout that mirrors the learning objectives. In addition, the PowerPoint® are more robust and detailed lesson plans are available. The lesson plans include green building laboratory exercises in carpentry, electrical, plumbing, and HVAC. The culminating project is a two-bedroom home, with kitchen, bathroom, laundry room, and open space. Material lists, construction methods, and a framing plan are included.

Your Role in the Green Environment/LEED v4, Third Edition, has been approved by GBCI 15 hours of general continuing education to support LEED professionals.

This craft requires additional instructor qualifications. For more information, contact NCCER Customer Service at 1-888-622-3720.
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.

The Weatherization Green Value Pack combines the Core Curriculum, Introduction to Weatherization, Weatherization Technician Level One, and Your Role in the Green Environment to offer a curriculum package that meets the needs of organizations implementing green initiatives within their programs. This curriculum package also meets Perkins requirements and state guidelines for contact hours within high school programs.

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| Instructor’s Guide: $67 |
| Trainee Guide: $67 |
| Published: 2010 |
| • 90 Hours |
| • Published: 2010 |
| • Introduction to Weatherization, combined with NCCER’s Core Curriculum, 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. See page 11 for detailed contents of Core Curriculum. |

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| Training: $20 |
| Training: $20 |
| Published: 2011 |
| • 162.5 Hours |
| • Published: 2011 |
| • Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com. |

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| Training: $20 |
| Training: $20 |
| PAPERBACK ISBN 978-0-13-256767-4 |
| Published: 2011 |
| • 162.5 Hours |
| • Published: 2011 |
| • Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com. |

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| • Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com. |

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| Published: 2011 |
| • 162.5 Hours |
| • Published: 2011 |
| • Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from www.nccerirc.com. |
Weatherization Level 2 (continued)

Commercial Drawings (25 Hours)
(Module ID 27201-07; from Carpentry Level Two)
Trainee $20
Instructor $20

Introduction to Supervisory Skills (15 Hours)
(Module ID 03410-09; from HVAC Level Four)
Trainee $20
Instructor $20

Introduction to Cooling (30 Hours)
(Module ID 03107-07; from HVAC Level One)
Trainee $20
Instructor $20
ISBN 978-0-13-266299-4

Introduction to Heating (15 Hours)
(Module ID 03108-07; from HVAC Level One)
Trainee $20
Instructor $20

Chimneys, Vents, and Flues (5 Hours)
(Module ID 03202-07; from HVAC Level Two)
Trainee $20
Instructor $20

Air Distribution Systems (10 Hours)
(Module ID 03109-07; from HVAC Level One)
Trainee $20
Instructor $20

Air Quality Equipment (5 Hours)
(Module ID 03204-07; from HVAC Level Two)
Trainee $20
Instructor $20

Indoor Air Quality (15 Hours)
(Module ID 03403-09; from HVAC Level Four)
Trainee $20
Instructor $20

Diagnostics and Management Practices
(30 Hours)
Trainee $20
Instructor $20
(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.

L2 BUILDING AUDITOR

Level 2

Curriculum Notes
- 172.5 Hours
- Published: 2011

PAPERBACK
Instructor’s Guide: $97

Modules
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Trade Mathematics (10 Hours)
(Module ID 03102-07; from HVAC Level One)
Trainee $20
Instructor $20

Introduction to Cooling (30 Hours)
(Module ID 03107-07; from HVAC Level One)
Trainee $20
Instructor $20
ISBN 978-0-13-266299-4

Introduction to Heating (15 Hours)
(Module ID 03108-07; from HVAC Level One)
Trainee $20
Instructor $20

Wind Energy

L1 WIND TURBINE MAINTENANCE TECHNICIAN

Module ID 58101-11

Volume 1: 197.5 Hours (Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 83 for ordering information.)
Volume 2: 110 Hours
Published: 2011


Introduction to Wind Energy (Module ID 58101-11) has been approved for 15 general continuing education hours under GBCI’s Credential Maintenance Program.

PAPERBACK
Instructor’s Guide: $32.50

Volume 2
Trainee $20
Instructor’s Guide: $32.50

Chimneys, Vents, and Flues (5 Hours)
(Module ID 03202-07; from HVAC Level Two)
Trainee $20
Instructor $20

Introduction to Hydronic Systems (10 Hours)
(Module ID 03203-07; from HVAC Level Two)
Trainee $20
ISBN 978-0-13-266312-0
Instructor $20

Heating and Cooling System Design (25 Hours)
(Module ID 03407-09; from HVAC Level Four)
Trainee $20
Instructor $20

Energy Conservation Equipment (10 Hours)
(Module ID 03404-09; from HVAC Level Four)
Trainee $20
Instructor $20

Indoor Air Quality (15 Hours)
(Module ID 03403-09; from HVAC Level Four)
Trainee $20
Instructor $20

Alternative Heating and Cooling Systems (10 Hours)
(Module ID 03409-09; from HVAC Level Four)
Trainee $20
Instructor $20

Performing a Building Audit (42.5 hours)
(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.

PAPERBACK
Instructor $20

To Order Call: 1-800-922-0579
Stay Connected: www.nccer.org/bookstore
Wind Energy (continued)

Introduction to Wind Turbine Safety (12.5 Hours)
(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)
(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)
(Module ID 26103-11; from Electrical Level One)

Electrical Theory (7.5 Hours)
(Module ID 26104-11; from Electrical Level One)

Electrical Test Equipment (5 Hours)
(Module ID 26112-11; from Electrical Level One)

Electrical Wiring (10 Hours)
Instructor $20  ISBN 978-0-13-272960-4
(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.

MODULES (Volume 2)
All of the modules listed below are included in the Trainee Guide and Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Alternating Current and Three-Phase Systems (17.5 Hours)
(Module ID 80201-11; from Power Line Worker, Distribution Level Two)

Circuit Breakers and Fuses (10 Hours)
Instructor $20  ISBN 978-0-13-272961-1
(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)
(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)
(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)
(Module ID 58108-11) Presents comprehensive coverage of wind turbine fasteners and their required characteristics. Covers torque theory, torquing, tensioning, and hydraulic torqueing equipment. Presents the use and care of all significant torqueing and tensioning tools. The use of taps and dies is also introduced.

Introduction to Bearings (15 Hours)
(Module ID 32207-07; from Industrial Maintenance Mechanic Level Two)

Lubrication (12.5 Hours)
(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)
(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.
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**

20 Hours
To Be Revised: 2017, Third Edition; for updates on the release status, visit www.nccer.org/book-updates Module ID 46101-11

PAPERBACK
Instructor’s Guide: $43

PAPERBACK
Participant’s Guide: $20

**PROJECT SUPERVISION**

Curriculum Notes
- 85 Hours
- Published: 2001

PAPERBACK
Participant’s Guide: $10
Instructor’s Guide: $110

All of the modules listed below are included in the Participant Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Orientation to the Job** (5 Hours)
Participant $20
Instructor $20
(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)
Participant $20
Instructor $20
(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)
Participant $20
Instructor $20
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)
Participant $20
Instructor $20
(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)
Participant $20
Instructor $20
(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)
Participant $20
Instructor $20
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)
Participant $20
Instructor $20
(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)
Participant $20
Instructor $20
(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. For more information, see p. 65.
Project Management

Curriculum Notes

- 115 Hours
- A companion DVD with scenarios and a user’s guide is available for purchase. See “Management DVD” for ordering details.

PAPERBACK
ISBN
Participant Guide: $98 978-0-13-604486-4
Instructor’s Guide: $98 978-0-13-604487-1

Product Supplements

Instructor’s Guide + Management DVD
ISBN 978-0-13-610624-1 $95

MODULES

All of the modules listed below are included in the Participant Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

Introduction to Project Management (2.5 Hours)
Instructor $20 ISBN 978-0-13-603821-4
(Module ID 44101-08) 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)
(Module ID 44102-08) 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)
(Module ID 44103-08) 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. Also discusses behavioral interviewing and professional development of personnel.

Issues and Resolutions (15 Hours)
(Module ID 44104-08) 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)
Instructor $20 ISBN 978-0-13-603861-0
(Module ID 44105-08) Emphasizes the importance of documentation and explains the types of documents, drawings, and specifications used on a project. 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)
(Module ID 44106-08) 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)
Instructor $20 ISBN 978-0-13-603863-4
(Module ID 44107-08) Emphasizes the importance of accurate estimating and summarizes the estimating process and the steps in developing an estimate. 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)
Instructor $20 ISBN 978-0-13-603864-1
(Module ID 44108-08) 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)
(Module ID 44109-08) 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 and Assurance (5 Hours)
(Module ID 44110-08) 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)
(Module ID 44111-08) 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.

Management DVD

Minor Decisions: Major Impact; How to Deal with Real Issues in Project Management
Published: 2009
Looking for a way to stimulate class discussions about management topics? NCCER’s DVD, Minor Decisions: Major Impact, provides example scenarios of issues commonly encountered by construction managers. Participants are prompted to consider how they would apply techniques they’re learning in the classroom to these real-life, on-the-job situations. Instructional materials and recommended solutions are included.
For more information or to see a clip of the video, visit www.nccer.org.
Maritime Industry Fundamentals

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: $22 978-0-13-295443-3
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint® slides, performance profile sheets from www.nccerirc.com.

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 Pipefitting

Orientation to the Maritime Pipefitting Trade (5 hours)
Instructor S20  ISBN 978-0-13-340606-1
(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)
Trainee S20  ISBN 978-0-13-340591-0
Instructor S20  ISBN 978-0-13-340607-8
(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)
(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)
Trainee S20  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)
Trainee S20  ISBN 978-0-13-340594-1
Instructor S20  ISBN 978-0-13-340610-8
(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)
(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.
Maritime Pipefitting Level 2

**L2 MARITIME PIPEFITTING**

**LEVEL 2**

**Curriculum Notes**
- 147.5 Hours
- Published: 2013
- Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint® slides, and performance profile sheets from www.nccerirc.com.

**PAPERBACK ISBN**
- Trainee Guide: $97 978-0-13-340478-4
- Instructor’s Guide: $97 978-0-13-340479-1

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Piping Systems** (5 hours)
- Trainee S20 978-0-13-340596-5
- Instructor S20 978-0-13-340612-2
  (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.

**Butt Weld Pipe Fabrication** (37.5 hours)
- Trainee S20 978-0-13-340598-9
- Instructor S20 978-0-13-340614-6
  (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)
- Trainee S20 978-0-13-340599-6
- Instructor S20 978-0-13-340615-3
  (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.

**Fiberglass and Plastic Pipe** (12.5 hours)
- Trainee S20 978-0-13-340600-9
- Instructor S20 978-0-13-340616-0
  (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)
- Trainee S20 978-0-13-340601-6
- Instructor S20 978-0-13-340617-7
  (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.

**Welding Level One**

**L1 MARITIME STRUCTURAL FITTER**

**LEVEL 1**

**Curriculum Notes**
- 240 hours (Includes 100 hours of Maritime Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 71 for ordering information.)
- Published: 2014
- Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint® slides, and performance profile sheets from www.nccerirc.com.

**PAPERBACK ISBN**

**MODULES**
All of the modules listed below are included in the Trainee Guide and the Instructor’s Guide. The following ISBN and pricing information is for ordering individual modules only.

**Drawings and Detail Sheets** (20 hours)
- Trainee S20 978-0-13-340604-7
- Instructor S20 978-0-13-340620-7
  (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.

**Maritime Structural Fitter**

**Welding Safety** (2.5 Hours)
- Trainee S20 978-0-13-610526-8
- Instructor S20 978-0-13-610505-3
  (Module ID 29101-09; from Welding Level One) 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.

**Oxyfuel Cutting** (17.5 Hours)
- Trainee S20 978-0-13-610528-2
- Instructor S20 978-0-13-610506-0
  (Module ID 29102-09; from Welding Level One) Describes how to prepare and fit both pipe and fittings, and how to assemble threaded pipe components.

**Base Metal Preparation** (12.5 Hours)
- Trainee S20 978-0-13-610531-2
- Instructor S20 978-0-13-610545-9
  (Module ID 29105-09; from Welding Level One) 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.

**Weld Quality** (10 Hours)
- Trainee S20 978-0-13-610532-9
- Instructor S20 978-0-13-610546-6
  (Module ID 29106-09; from Welding Level One) Describes how to prepare and fit both pipe and fittings, and how to assemble threaded pipe components.

**Shielded Metal Arc Welding – Electrodes** (2.5 Hours)
- Trainee S20 978-0-13-610543-3
- Instructor S20 978-0-13-610548-0
  (Module ID 29108-09; from Welding Level One) Describes how to prepare and fit both pipe and fittings, and how to assemble threaded pipe components.

**Tack Welding** (40 Hours)
- Trainee S20 978-0-13-377945-5
- Instructor S20 978-0-13-377950-9
  (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)
- Trainee S20 978-0-13-377947-9
- Instructor S20 978-0-13-377951-6
  (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)
- Trainee S20 978-0-13-377948-6
- Instructor S20 978-0-13-377953-0
  (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)
- Trainee $20
- Instructor $20
- (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
- Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint® slides, and performance profile sheets from www.nccerirc.com.

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<td>Trainee Guide: $97</td>
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<td>Instructor</td>
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Intermediate Structural Print Reading (40 Hours)
- Trainee $20
- Instructor $20
- (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)
- Trainee $20
- Instructor $20
- (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
- 237.5 Hours
- Published: 2016
- Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint® slides, and performance profile sheets from www.nccerirc.com.

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<td>Instructor’s Guide: $97</td>
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Advanced Structural Print Reading (40 Hours)
- Trainee $20
- Instructor $20
- (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.

### NCCER Pipeline Program

NCCER is excited to present its enhanced pipeline program to be released on March 30, 2017. The NCCER Pipeline Program is designed to meet the diverse needs of the industry. Whether you are looking for covered task modules with knowledge and performance exams to meet operator qualifications, or you are looking for a comprehensive training program for your classes, NCCER has it all.

The following pages make it easy for you to order exactly what you need:

- The full training program is listed on pages 74 – 79 showing the printed books you can order. These books consist of modules compiled together to provide levels of training for pipeline professionals.
- Individual covered task modules to train for Operator Qualification (OQ) begin on page 79 and can be ordered individually as online ebooks through the VitalSource website or can be ordered in print when purchased as full books. Lesson plans, PowerPoints® and Performance Profiles are accessible through the Instructor Resource Center (Pipeline Covered Task Instructor Access Code Card, ISBN 978-0-13-471655-8)."

All ISBNs and further ordering information are available on the NCCER Bookstore at www.nccer.org/pipeline-program.
The newly established pipeline career pathway represented on this page provides the recognition pipeline professionals deserve through standardized training and industry-recognized credentials.

Levels of training have been established by combining training modules into specific focus areas within the industry. This allows trainees to progress through a standardized program and earn a professional credential.

In addition, Levels Two and Three are comprised of covered task training modules that can lead to operator qualifications. Pipeline Corrosion Control is the only exception, providing covered task training beginning in Level One.

The blue boxes denote the professional credential that can be earned with the successful completion of each program.

*A trained workforce is a safe and qualified workforce!*
Level 2: Craft-Specific Training with Operator Qualification*

Pipeline Operations (Control Center/Gas/Liquid)

Level 3: Craft-Specific Training with Operator Qualification*

Pipeline Mechanical

Pipeline Mechanical

Pipeline Maintenance

Pipeline Maintenance

Pipeline Electrical and Instrumentation

Pipeline Electrical and Instrumentation

Pipeline Corrosion Control

Trained and Qualified Pipeline Professional Credential

Pipeline Operations Technician

Pipeline Mechanical Technician

Pipeline Maintenance Technician

Pipeline Electrical and Instrumentation Technician

Pipeline Corrosion Technician

*Each of these titles have corresponding operator qualifications. The Covered Task list begins on page 79.
Abnormal Operating Conditions

**Field & Gas**

10 Hours  
Revised: 2017, 2nd Edition  
Module ID AOCFG-17

**Basic Pipeline Hydraulics and Equipment**

10 Hours  
Trainee S20  
Instructor S20  

(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  
Trainee S20  
Instructor S20  

(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.

**Tools of the Trade**

7.5 Hours  
Trainee S20  
Instructor Package S20  
(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.

**Release Identification and Response**

5 Hours  
Trainee S20  
Instructor Package S20  
(ISBN 978-0-13-415138-0)

(Module ID 61003-02) 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.

**Basic Pipeline Pneumatics and Equipment**

10 Hours  
Trainee S20  
Instructor S20  

(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 are also included.

**Introduction to the Pipeline Industry**

15 Hours  
Trainee S20  
Instructor S20  

(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.

**Introduction to Pipeline Documents**

5 Hours  
Trainee S20  
Instructor Package S20  

(Module ID 66101-02) Introduces the pipeline industry, pipeline products, flow paths, maps and drawings, and the Documentation required in the industry.

**Introduction to the Pipeline Documents**

5 Hours  
Trainee S20  
Instructor Package S20  
(ISBN 978-0-13-415138-0)

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Pipeline Electrical and Instrumentation

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MODULES (Volume 1)

All of the modules listed below are included in the Trainee and Instructor Guide(s) listed above. The following pricing information is for ordering individual modules which can be purchased through the online bookstore at www.nccer.org/bookstore.

- **Pipeline E&I Safety (15 Hours)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64012-02) 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)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64003-02) 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)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64004-02) Introduces the electrical concepts used in Ohm’s law as applied to DC series circuits. Discusses atomic theory, electromagnetic force, resistance, and electric power equations. Also includes series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff’s voltage and current laws, and circuit analysis.

- **Tools of the Trade (15 Hours)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64005-02) Identifies hand tools used in the pipeline E&I trade. Also explains trade-specific power tools, test equipment, and communication equipment.

- **Electrical Installations in Classified Areas (40 Hours)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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.

- **Process Control Theory (40 Hours)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64301-02) Describes power systems and explains transformer construction, taps, installation requirements, and connections. Discusses power distribution, instruments, control, and isolation transformer types. Also covers transformer maintenance and testing.

- **Switchgear and MCCs (25 Hours)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64302-02) Explains power factor and medium versus low-voltage cable and MCCs. Describes types of switchgear and cables, feeders, busing, and bracing. Includes testing and maintenance on switchgear and MCCs and associated components.

- **Low-Voltage and Standby Power (25 Hours)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (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)**
  - Trainee $20
  - Instructor $20
  - (Module ID 64307-02) Explains pipeline operations systems, including control, communications, SCADA, and PLCs. Explains redundant systems and control system troubleshooting.

To Order Call: 1-800-922-0579  Stay Connected:  www.nccer.org/bookstore
Pipeline Maintenance and Mechanical

MODULES (Volume 1)

- All of the modules listed below are included in the Trainee and Instructor Guide(s) listed above. The following pricing information is for ordering individual modules which can be purchased through the online bookstore at www.nccer.org/bookstore.

**Pipeless, threaded, and insulation fasteners used in the pipeline industry. Identifies the materials used in threaded piping materials, tools, and work practices used in the pipeline industry.**

**Introduction to Hydraulic Systems (10 Hours)**

**Introduction to Pneumatic Systems (10 Hours)**

**Specialty and Precision Tools (15 Hours)**

**Introduction to Metering Devices and Provers (10 Hours)**

**Introduction to Gas Compressors (10 Hours)**

**Tubing, Threaded Pipe, and Hoses (30 Hours)**

**Fasteners (10 Hours)**

**Tank Repair (40 Hours)**

**Install and Maintain Bearings (15 Hours)**

**Install Mechanical Seals (20 Hours)**

**Maintain and Repair Drives (15 Hours)**

**Install Rotating Equipment (25 Hours)**

**Unit Alignment (40 Hours)**

**Vibration Analysis (5 Hours)**

**Maintain, Troubleshoot, and Repair Pumps (10 Hours)**

**Trainee**

- V1: Pipeline Maintenance and Mechanical
- VOLUME 1
- PAPERBACK
- ISBN
  - VOLUME 1
  - Trainee Guide: $100
  - Instructor’s Guide: $100

**Instructor**

- Trainee $20
- Instructor $20
- (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.

- Trainee $20
- Instructor $20
- (Module ID 63201-02) Discusses pneumatic system safety, characteristics of gases and how they are compressed, pneumatic transmission of energy, and compressor operation.

- Trainee $20
- Instructor $20
- (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, ports, pumps, and motors.

- Trainee $20
- Instructor $20
- (Module ID 63206-02) 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.

- Trainee $20
- Instructor $20
- (Module ID 63105-02) Describes the types and uses of screwed fittings.

- Trainee $20
- Instructor $20
- (Module ID 63106-02) Covers installations procedures for threaded, nonthreaded, and insulation fasteners used in the pipeline industry.
Pipeline Maintenance and Mechanical Volume 2 (continued)

Maintain, Troubleshoot, and Repair Gas Compressors (15 Hours)
Trainee $20
Instructor $20
(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 startup 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)
Trainee $20
Instructor $20
(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

Quality Control and Measurement (20 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 65108-02) 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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(Module ID 64307-02) Explains pipeline operations systems, including control, communications, SCADA, and PLCs. Explains redundant systems and control system troubleshooting.

Pipeline Covered Tasks

The following is a list of NCCER's 127 covered task training modules. Each of these modules focus solely on the covered task that is indicated, align to API RP 1161 (3rd edition) and provide the knowledge necessary to pass the corresponding exams.

To purchase individual covered task modules in an ebook format:
- Visit www.nccer.org/pipeline-program and select the covered task you would like to purchase. This will redirect you to the VitalSource website to complete your purchase.

To purchase printed copies:
- Purchase the entire book listed in the third column of the table starting on the next page (ISBNs available at www.nccer.org/pipeline-program), OR

All ISBNs and further ordering information are available on the NCCER Bookstore at www.nccer.org/bookstore.
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Introduction to the Power Industry

12.5 Hours  
Published: 2010  
Module ID 49101-10

PAPERBACK  
ISBN  
Trainee Guide: $22  
Instructor’s Guide: $22  
978-0-13-215413-0  
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Power Generation Maintenance Electrician

L1 POWER GENERATION MAINTENANCE ELECTRICIAN

Curriculum Notes

- 225 Hours (Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See above for more information.)
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Curriculum Notes
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Curriculum Notes
- 222.5 Hours
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Meters: Theory and Application (20 Hours; Module ID 26202-08; from Electrical Level Two)

Motor-Operated Valves (15 Hours; Module ID 40313-09; from Industrial Maintenance E&I Technician Level Three)

Control Systems and Fundamental Concepts (12.5 Hours; Module ID 26211-08; from Electrical Level Two)
Power Generation Maintenance Electrician Level 3 (continued)

Temporary Grounding (15 Hours)
(Module ID 40308-09; from Industrial Maintenance E&I Technician Level Three)
Trainee $20
Instructor $20
ISBN 978-0-13-604738-4

Overcurrent Protection (25 Hours)
(Module ID 26305-08; from Electrical Level Three)
Trainee $20
Instructor $20
ISBN 978-0-13-609294-0

Specialty Transformers (10 Hours)
(Module ID 26404-08; from Electrical Level Four)
Trainee $20
Instructor $20
ISBN 978-0-13-609319-0

Advanced Controls (20 Hours)
(Module ID 26407-08; from Electrical Level Four)
Trainee $20
Instructor $20

Motor Operation and Maintenance (10 Hours)
(Module ID 26410-08; from Electrical Level Four)
Trainee $20
Instructor $20

Generator Maintenance (20 Hours)
(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.
Trainee $20
Instructor $20
ISBN 978-0-13-626213-0

Switchgear and Breaker Maintenance (25 Hours)
(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.
Trainee $20
Instructor $20
ISBN 978-0-13-626215-4

Preventive and Predictive Maintenance
(10 Hours)
(Module ID 32401-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20
Instructor $20

Medium Voltage Terminations/Splices
(10 Hours)
(Module ID 26411-08; from Electrical Level Four)
Trainee $20
Instructor $20

Fire Alarm Systems (15 Hours)
(Module ID 26405-08; from Electrical Level Four)
Trainee $20
Instructor $20

Heat Tracing and Freeze Protection (10 Hours)
(Module ID 26408-08; from Electrical Level Four)
Trainee $20
Instructor $20

Standby and Emergency Systems (12.5 Hours)
(Module ID 40401-09; from Industrial Maintenance E&I Technician Level Four)
Trainee $20
Instructor $20

Power Generation I&C Maintenance Technician

L1 POWER GENERATION I&C MAINTENANCE TECHNICIAN

LEVEL 1

Curriculum Notes
- 225 Hours (Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 83 for more information.)
- Published: 2010
- Please note that these modules are drawn as is from other craft areas. To order modules individually, refer to the specific craft page for ISBNs.

Gaskets and Packing (10 Hours)
(Module ID 40105-07; from Industrial Maintenance E&I Technician Level One)
Trainee $20
Instructor $20

Craft-Related Mathematics (15 Hours)
(Module ID 40106-07; from Industrial Maintenance E&I Technician Level One)
Trainee $20
Instructor $20
ISBN 978-0-13-614597-4

Construction Drawings (12.5 Hours)
(Module ID 40107-07; from Industrial Maintenance E&I Technician Level One)
Trainee $20
Instructor $20
ISBN 978-0-13-614598-1

Pumps and Drivers (5 Hours)
(Module ID 40108-07; from Industrial Maintenance E&I Technician Level One)
Trainee $20
Instructor $20

L4 POWER GENERATION MAINTENANCE ELECTRICIAN

LEVEL 4

Curriculum Notes
- 197.5 Hours
- Published: 2011
- Please note that these modules are drawn as is from other craft areas. To order modules individually, refer to the specific craft page for ISBNs.

PAPERBACK
ISBN
Trainee Guide: $97
Instructor’s Guide: $97
978-0-13-215428-4
978-0-13-215429-1


PAPERBACK
ISBN
Trainee Guide: $67
Instructor’s Guide: $67
978-0-13-215430-7
978-0-13-215431-4


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## Power Generation I&C Maintenance Technician Level 1 (continued)

### Introduction to Testing Instruments (7.5 Hours)
- **Module ID**: 40110-07
- **Technician Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### Material Handling and Hand Rigging (15 Hours)
- **Module ID**: 40111-07
- **Technician Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### Mobile and Support Equipment (10 Hours)
- **Module ID**: 40112-07
- **Technician Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### Lubrication (12.5 Hours)
- **Module ID**: 40113-07
- **Technician Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### SMAW Equipment and Setup (5 Hours)
- **Module ID**: 29107-09
- **Welding Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### Elevator Terminations and Splices (5 Hours)
- **Module ID**: 40211-08
- **Technician Level Two**
  - **Trainee**: $20
  - **Instructor**: $20

### Electrical Systems for Instrumentation (22.5 Hours)
- **Module ID**: 12104-01
- **Technician Level One**
  - **Trainee**: $20
  - **Instructor**: $20

### Hydraulic Controls (15 Hours)
- **Module ID**: 40311-09
- **Technician Level Three**
  - **Trainee**: $20
  - **Instructor**: $20

### Pneumatic Controls (15 Hours)
- **Module ID**: 40312-09
- **Technician Level Three**
  - **Trainee**: $20
  - **Instructor**: $20

### Relays and Timers (7.5 Hours)
- **Module ID**: 12208-03
- **Technician Level Two**
  - **Trainee**: $20
  - **Instructor**: $20

### Switches and Photocell Devices (5 Hours)
- **Module ID**: 12209-03
- **Technician Level Two**
  - **Trainee**: $20
  - **Instructor**: $20

### Tubing (15 Hours)
- **Module ID**: 40209-08
- **Technician Level Two**
  - **Trainee**: $20
  - **Instructor**: $20
Power Generation I&C Maintenance Technician Level 3 (continued)

Clean, Purge, and Test Tubing and Piping Systems (7.5 Hours)
(Module ID 40210-08; from Industrial Maintenance E&I Technician Level Two)

Layout and Installation of Tubing and Piping Systems (22.5 Hours)
(Module ID 40309-09; from Industrial Maintenance E&I Technician Level Three)
Instructor S20  ISBN 978-0-13-604755-1

Electronic Components (10 Hours)
(Module ID 40302-09; from Industrial Maintenance E&I Technician Level Three)

Panel-Mounted Instruments (7.5 Hours)
(Module ID 12212-03; from Instrumentation Level Two)
Instructor S20  ISBN 978-0-13-103293-4

Installing Field-Mounted Instruments (25 Hours)
(Module ID 12213-03; from Instrumentation Level Two)
Trainee S20  ISBN 978-0-13-103278-1
Instructor S20  ISBN 978-0-13-103294-1

Grounding and Shielding of Instrumentation Wiring (10 Hours)
(Module ID 12304-03; from Instrumentation Level Three)
Instructor S20  ISBN 978-0-13-103310-8

Analyzers (20 Hours)
(Module ID 12408-03; from Instrumentation Level Four)

L4 POWER GENERATION I&C MAINTENANCE TECHNICIAN

Course Notes

- 210 Hours
- Published: 2010
- Please note that these modules are drawn as is from other craft areas. To order modules individually, refer to the specific craft page for ISBNs.

PAPERBACK  ISBN
Trainee Guide: S97  978-0-13-215437-6
Instructor’s Guide: S97  978-0-13-215438-3

MODULES

Standby and Emergency Systems (12.5 Hours)
(Module ID 40401-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-609139-4

Basic Process Control Elements, Transducers and Transmitters (15 Hours)
(Module ID 40402-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-609140-0

Instrument Calibration and Configuration (10 Hours)
(Module ID 40403-09; from Industrial Maintenance E&I Technician Level Four)
Trainee S20  ISBN 978-0-13-609166-0

Pneumatic Control Valves, Actuators and Positioners (40 Hours)
(Module ID 40404-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-609142-4

Performing Loop Checks (7.5 Hours)
(Module ID 40405-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-609143-1

Troubleshooting and Commissioning a Loop (10 Hours)
(Module ID 40406-09; from Industrial Maintenance E&I Technician Level Four)

Process Control Theory (20 Hours)
(Module ID 12204-03; from Instrumentation Level Two)

Process Control Loops and Tuning (20 Hours)
(Module ID 40407-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-601044-0

Data Networks (15 Hours)
(Module ID 40408-09; from Industrial Maintenance E&I Technician Level Four)
Instructor S20  ISBN 978-0-13-601044-8

Digital Logic Circuits (10 Hours)
(Module ID 12401-03; from Instrumentation Level Four)

Calibrate Supervisory Instrumentation Elements (10 Hours)

Boiler/HRSG Control (12.5 Hours)

Preventive and Predictive Maintenance (10 Hours)
(Module ID 32401-09; from Industrial Maintenance Mechanic Level Four)
Instructor S20  ISBN 978-0-13-610456-8

Distributed Control Systems (17.5 Hours)
(Module ID 40410-09; from Industrial Maintenance E&I Technician Level Four)
Trainee S20  ISBN 978-0-13-609137-0
Instructor S20  ISBN 978-0-13-610442-1
**Power Generation Maintenance Mechanic**

**L1 POWER GENERATION MAINTENANCE MECHANIC**

**LEVEL 1**

**Curriculum Notes**
- 225 Hours (Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 83 for more information.)
- Published: 2010
- Please note that these modules are drawn as is from other craft areas. To order modules individually, refer to the specific craft page for ISBNs.

**MODULES**

**Tools of the Trade** (5 Hours) (Module ID 32102-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Fasteners and Anchors** (5 Hours) (Module ID 32103-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Oxyfuel Cutting** (17.5 Hours) (Module ID 32104-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Gaskets and Packing** (10 Hours) (Module ID 32105-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Craft-Related Mathematics** (15 Hours) (Module ID 32106-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20
  - ISBN 978-0-13-614568-4

**Construction Drawings** (12.5 Hours) (Module ID 32107-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Pumps and Drivers** (5 Hours) (Module ID 32108-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Valves** (5 Hours) (Module ID 32109-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Introduction to Test Instruments** (7.5 Hours) (Module ID 32110-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Material Handling and Hand Rigging** (15 Hours) (Module ID 32111-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**Mobile and Support Equipment** (10 Hours) (Module ID 32112-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**SMAW Equipment and Setup** (5 Hours) (Module ID 29107-09; from Welding Level One)
- Trainee: $20
- Instructor: $20

**LUBRICATION** (12.5 Hours) (Module ID 32113-07; from Industrial Maintenance Mechanic Level One)
- Trainee: $20
- Instructor: $20

**SMAW Welding Level One** (7.5 Hours)
- Trainee: $20
- Instructor: $20

**Conventional Alignment** (30 Hours) (Module ID 32306-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Reverse Alignment** (30 Hours) (Module ID 32307-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Installing Belt and Chain Drives** (10 Hours) (Module ID 32308-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Precision Measuring Tools** (20 Hours) (Module ID 32302-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Introduction to Bearings** (15 Hours) (Module ID 32207-07; from Industrial Maintenance Mechanic Level Two)
- Trainee: $20
- Instructor: $20

**Installing Bearings** (20 Hours) (Module ID 32303-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Installing Couplings** (15 Hours) (Module ID 32304-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**Installing Mechanical Seals** (20 Hours) (Module ID 32308-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20

**L2 POWER GENERATION MAINTENANCE MECHANIC**

**LEVEL 2**

**Curriculum Notes**
- 260 Hours
- Published: 2010
- Please note that these modules are drawn as is from other craft areas. To order modules individually, refer to the specific craft page for ISBNs.

**MODULES**

**Basic Layout** (20 Hours) (Module ID 32201-07; from Industrial Maintenance Mechanic Level Two)
- Trainee: $20
- Instructor: $20

**Advanced Trade Math** (30 Hours) (Module ID 32301-08; from Industrial Maintenance Mechanic Level Three)
- Trainee: $20
- Instructor: $20
Power Generation Maintenance Mechanic Level 2 (continued)

**Conveyors (5 Hours)**
(Module ID 15401-08; from Millwright Level Four)
Trainee $20  
Instructor $20  
978-0-13-610479-7

**Troubleshooting and Repairing Conveyors**
(12.5 Hours)
(Module ID 15402-08; from Millwright Level Four)
Trainee $20  
Instructor $20  
978-0-13-610480-3

**Basic Hydraulic Systems (10 Hours)**
(Module ID 15409-08; from Millwright Level Four)
Trainee $20  
Instructor $20  
978-0-13-610488-9

**Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)**
(Module ID 15410-08; from Millwright Level Four)
Trainee $20  
Instructor $20  
978-0-13-610489-6

**Motor-Operated Valves (15 Hours)**
(Module ID 40313-09; from Industrial Maintenance & E/I Technician Level Three)
Trainee $20  
Instructor $20  
978-0-13-604758-2

**Advanced Blueprint Reading (25 Hours)**
(Module ID 32402-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20  
Instructor $20  
978-0-13-610457-5

**Preventive and Predictive Maintenance (10 Hours)**
(Module ID 32401-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20  
Instructor $20  
978-0-13-610456-8

**Fuel Preparation and Delivery Equipment (25 Hours)**
(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.

Trainee $20  
Instructor $20  
978-0-13-610480-6

**Compressors and Pneumatic Systems (35 Hours)**
(Module ID 32403-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20  
Instructor $20  
978-0-13-610458-2

**Troubleshooting and Repairing Pumps (10 Hours)**
(Module ID 32407-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20  
Instructor $20  
ISBN 978-0-13-610452-0  
978-0-13-610462-9

**Troubleshooting and Repairing Gearboxes (20 Hours)**
(Module ID 32408-09; from Industrial Maintenance Mechanic Level Four)
Trainee $20  
Instructor $20  
978-0-13-610463-6

**Setting Baseplates and Prealignment (30 Hours)**
(Module ID 32305-08; from Industrial Maintenance Mechanic Level Three)
Trainee $20  
Instructor $20  
978-0-13-604661-5

**Turbines (20 Hours)**
(Module ID 15505-09; from Millwright Level Five)
Trainee $20  
Instructor $20  
ISBN 978-0-13-610496-4  
978-0-13-610471-1

**Maintaining and Repairing Turbine Components (15 Hours)**
(Module ID 15506-09; from Millwright Level Five)
Trainee $20  
Instructor $20  
978-0-13-610472-8

**Vibration and Balancing (12.5 Hours)**
Trainee $20  
Instructor $20  
978-0-13-266223-9

•  Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com.

**PAPERBACK**
Trainee Guide: $97  
Instructor’s Guide: $97  

**Hydrostatic and Pneumatic Testing (10 Hours)**
(Module ID 32206-07; from Industrial Maintenance Mechanic Level Two)
Trainee $20  
Instructor $20  
978-0-13-604673-8

**Setting Baseplates and Prealignment (30 Hours)**
(Module ID 32305-08; from Industrial Maintenance Mechanic Level Three)
Trainee $20  
Instructor $20  
978-0-13-604661-5

**Turbines (20 Hours)**
(Module ID 15505-09; from Millwright Level Five)
Trainee $20  
Instructor $20  
ISBN 978-0-13-610496-4  
978-0-13-610471-1

**Maintaining and Repairing Turbine Components (15 Hours)**
(Module ID 15506-09; from Millwright Level Five)
Trainee $20  
Instructor $20  
978-0-13-610472-8

**L4 POWER GENERATION MAINTENANCE MECHANIC**

**LEVEL 4**

**Curriculum Notes**
• 165 Hours  
• Published: 2010  
• Please note that these modules are drawn as is from other specific craft areas. To order modules individually, refer to the specific craft page for ISBNs.
• Instructor’s Guide includes access code to download TestGen software, module exams, PowerPoint®, and performance profile sheets from www.nccerirc.com.

**PAPERBACK**
ISBN 978-0-13-610452-0  
978-0-13-610462-9

**Modules**

**Low-Pressure Steam Systems (10 Hours)**
(Module ID 32208-07; from Industrial Maintenance Mechanic Level Two)
Trainee $20  
Instructor $20  
978-0-13-604675-2

**High-Pressure Steam Systems and Auxiliaries**
(20 Hours)
(Module ID 32209-07; from Industrial Maintenance Mechanic Level Two)
Trainee $20  
Instructor $20  
978-0-13-604676-9

**Heaters, Furnaces, Heat Exchangers, Cooling Towers and Fin Fans (30 Hours)**
(Module ID 32211-07; from Industrial Maintenance Mechanic Level Two)
Trainee $20  
Instructor $20  
ISBN 978-0-13-604660-0  
978-0-13-604679-0

**Hydrostatic and Pneumatic Testing (10 Hours)**
(Module ID 32206-07; from Industrial Maintenance Mechanic Level Two)
Trainee $20  
Instructor $20  
978-0-13-604673-8

**Installing Fans and Blowers (10 Hours)**
(Module ID 15312-08; from Millwright Level Three)
Trainee $20  
Instructor $20  
978-0-13-604784-1
### Tools of the Trade (10 Hours)

**Trainee** $20  
**Instructor** $20  

**Tools of the Trade**
- **Instructor** ISBN 978-0-13-266345-8  

- **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**

- **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.

**Rigging**
- **Instructor** ISBN 978-0-13-266348-9  

- **Module ID 49110-11** Provides descriptions and operations instructions for the 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.

**Setting and Pulling Poles**
- **Trainee** ISBN 978-0-13-266336-6  

- **Module ID 49111-11** 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.

**Cable and Conductor Installation and Removal**
- **Instructor** ISBN 978-0-13-266351-9  

- **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**
- **Trainee** ISBN 978-0-13-266338-0  
- **Instructor** ISBN 978-0-13-266352-6  

- **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.

### Curriculum Notes
- **40.25 Hours** (Includes 100 hours of Power Industry Fundamentals, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 83 for more information.)
- **Published:** 2011

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**Power Line Worker: Level Two**

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.

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**Power Line Worker: Level Three**

Secure a placing and make the best use of it, with all the necessary tools and materials. Always follow the instructions and guidelines provided by the manufacturer or the installer. Ensure that all electrical connections are properly made and tested before using the equipment. Regular maintenance and inspection are crucial to keep the system operational and safe.
Underground Residential Distribution (URD) Systems (30 Hours)
Trainee $20
Instructor $20
(Module ID 80201-12) 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)
Trainee $20
Instructor $20
(Module ID 80205-11) 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; and protection systems and reviews the key components that make them work. Describes feeder diagrams and their use in locating and identifying components.

Distribution Line Maintenance (50 Hours)
Trainee $20
Instructor $20
(ISBN 978-0-13-294873-0)
(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; and protection systems and reviews the key components that make them work. Describes feeder diagrams and their use in locating and identifying components.

Three-Phase URD Systems (25 Hours)
Trainee $20
Instructor $20
(Module ID 80302-12) Covers safety practices associated with three-phase URD systems; describes fault and manhole applications; and explains different transformer configurations and sectionalizing equipment used in three-phase URD systems. Also covers three-phase conductors and how cable is pulled through conduit.

System Protection and Monitoring (7.5 Hours)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $20
Instructor $20
(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)
Trainee $43
Instructor $43
(Module ID 46101-11; see p. 69) Describes feeder diagrams and their use in locating and identifying components.

Introduction to Substations (10 Hours)
Trainee $20
Instructor $20
(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)
Trainee $22
Instructor $22
(Module ID 26501-12; from Electrical Level Two) Describes the methods used to safely locate and correct faults in aerial and URD systems. Includes troubleshooting methods as well as work site preparation.

Alternating Current and Three-Phase Systems (17.5 Hours)
Trainee $20
Instructor $20
(Module ID 82201-12; from Power Line Worker: Distribution Level Two) Describes the methods used to safely locate and correct faults in aerial and URD systems. Includes troubleshooting methods as well as work site preparation.

Conductors and Cables (10 Hours)
Trainee $20
Instructor $20
(ISBN 978-0-13-296786-0)
(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)
Trainee $20
Instructor $20
(Module ID 26207-11; from Electrical Level Two)

Conduit Bending (15 Hours)
Trainee $20
Instructor $20
(Module ID 26204-11; from Electrical Level Two)

Conductor Installations (10 Hours)
Trainee $20
Instructor $20
(Module ID 26206-11; from Electrical Level Two)

Conductor Terminations and Splicing (7.5 Hours)
Trainee $20
Instructor $20
(Module ID 26208-11; from Electrical Level Two)

Grounding Systems (12.5 Hours)
Trainee $20
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