

## ALIGNS WITH AWS SENSE STANDARDS AND GUIDELINES



NCCER is pleased to support the American Welding Society's Schools Excelling through National Skills Education (SENSE) Entry Welder program with Levels 1 and 2 of its *Welding* curriculum. This curriculum supports the key learning indicators and performance accreditation tasks required to complete the current SENSE program.

### L1 WELDING



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 EG2.0:2008 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](http://www.nccerirc.com).

#### HARDCOVER

ISBN

Trainee Guide: \$69 **978-0-13-413110-8**

#### PAPERBACK

ISBN

Trainee Guide: \$67 **978-0-13-416311-6**

Instructor's Package: \$67 **978-0-13-428575-7**

NCCERconnect Access Card: \$67 **978-0-13-452916-5**

NCCERconnect +

Hardcover Trainee Guide: \$94 **978-0-13-457828-6**

NCCERconnect +

Paperback Trainee Guide: \$92 **978-0-13-457833-0**

#### 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)

Trainee \$20 **ISBN 978-0-13-416580-6**

Instructor \$20 **ISBN 978-0-13-414189-3**

(Module ID 29101-15) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

#### Oxyfuel Cutting (17.5 Hours)

Trainee \$20 **ISBN 978-0-13-418268-1**

Instructor \$20 **ISBN 978-0-13-414193-0**

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

#### Plasma Arc Cutting (7.5 Hours)

Trainee \$20 **ISBN 978-0-13-418269-8**

Instructor \$20 **ISBN 978-0-13-414190-9**

(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)

Trainee \$20 **ISBN 978-0-13-418270-4**

Instructor \$20 **ISBN 978-0-13-414195-4**

(Module ID 29104-15) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

#### Base Metal Preparation (12.5 Hours)

Trainee \$20 **ISBN 978-0-13-414043-8**

Instructor \$20 **ISBN 978-0-13-414191-6**

(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)

Trainee \$20 **ISBN 978-0-13-414044-5**

Instructor \$20 **ISBN 978-0-13-414196-1**

(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)

Trainee \$20 **ISBN 978-0-13-418027-4**

Instructor \$20 **ISBN 978-0-13-414197-8**

(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 978-0-13-418026-7**

Instructor \$20 **ISBN 978-0-13-414198-5**

(Module ID 29108-15) Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

#### SMAW – Beads and Fillet Welds (100 Hours)

Trainee \$20 **ISBN 978-0-13-418025-0**

Instructor \$20 **ISBN 978-0-13-414199-2**

(Module ID 29109-15) Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

#### Joint Fit-Up and Alignment (5 Hours)

Trainee \$20 **ISBN 978-0-13-418024-3**

Instructor \$20 **ISBN 978-0-13-414200-5**

(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)

Trainee \$20 **ISBN 978-0-13-418023-6**

Instructor \$20 **ISBN 978-0-13-414201-2**

(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)

Trainee \$20 **ISBN 978-0-13-418022-9**

Instructor \$20 **ISBN 978-0-13-414206-7**

(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.

### L2 WELDING

LEVEL 2

#### Curriculum Notes

- 227.5 Hours
- Revised: 2015, Fifth Edition
- Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E school requirements. When combined with NCCER *Welding Level 1*, the content aligns with the key indicators specified in *AWS EG2.0:2008 Level 1-Entry Welder*.
- 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](http://www.nccerirc.com).

#### HARDCOVER

ISBN

Trainee Guide: \$99 **978-0-13-431110-4**

#### PAPERBACK

ISBN

Trainee Guide: \$97 **978-0-13-416310-9**

Instructor's Package: \$97 **978-0-13-438525-9**

NCCERconnect Access Card: \$97 **978-0-13-452907-3**

NCCERconnect +

Hardcover Trainee Guide: \$124 **978-0-13-460120-5**

NCCERconnect +

Paperback Trainee Guide: \$122 **978-0-13-457831-6**

#### 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)

Trainee \$20 **ISBN 978-0-13-417950-6**

Instructor \$20 **ISBN 978-0-13-415273-8**

(Module ID 29201-15) Identifies and explains the different types of fillet weld, groove weld, and non-destructive examination symbols. Explains how to read welding symbols on drawings, specifications, and Welding Procedure Specifications (WPS).

## Welding Level 2 (continued)

### Reading Welding Detail Drawings (10 Hours)

Trainee \$20 ISBN 978-0-13-417953-7  
 Instructor \$20 ISBN 978-0-13-415275-2  
 (Module ID 29202-15) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

### Physical Characteristics and Mechanical Properties of Metals (7.5 Hours)

Trainee \$20 ISBN 978-0-13-417954-4  
 Instructor \$20 ISBN 978-0-13-415276-9  
 (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)

Trainee \$20 ISBN 978-0-13-418019-9  
 Instructor \$20 ISBN 978-0-13-415278-3  
 (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)

Trainee \$20 ISBN 978-0-13-418018-2  
 Instructor \$20 ISBN 978-0-13-414185-5  
 (Module ID 29205-15) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

### GMAW – Plate (60 Hours)

Trainee \$20 ISBN 978-0-13-417970-4  
 Instructor \$20 ISBN 978-0-13-414187-9  
 (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)

Trainee \$20 ISBN 978-0-13-420171-9  
 Instructor \$20 ISBN 978-0-13-420170-2  
 (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)

Trainee \$20 ISBN 978-0-13-417969-8  
 Instructor \$20 ISBN 978-0-13-414188-6  
 (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)

Trainee \$20 ISBN 978-0-13-417968-1  
 Instructor \$20 ISBN 978-0-13-414192-3  
 (Module ID 29208-15) Describes how to build pads on carbon steel plate using GTAW and carbon steel filler metal. Also explains how to make multiple-pass GTAW fillet welds on carbon steel plate coupons in the 1F, 2F, 3F, and 4F positions, and how to make GTAW V-groove welds in the 1G, 2G, 3G, and 4G positions.

## L3 WELDING

LEVEL 3

### Curriculum Notes

- 470 Hours (370 Required; 100 Elective/Optional)
- Revised: 2016, Fifth Edition
- 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](http://www.nccerirc.com)

### PAPERBACK

### ISBN

Trainee Guide: \$97	978-0-13-448245-3
Instructor's Package: \$97	978-0-13-454305-5
NCCERconnect Access Card: \$97	978-0-13-452913-4
NCCERconnect + Trainee Guide: \$122	978-0-13-471945-0

### 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.

### SMAW – Open-Root Pipe Welds (100 Hours)

Trainee \$20 ISBN 978-0-13-448560-7  
 Instructor \$20 ISBN 978-0-13-448561-4  
 (Module ID 29301-16) Explains how to set up SMAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with SMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

### GMAW – Pipe (60 Hours)

Trainee \$20 ISBN 978-0-13-448564-5  
 Instructor \$20 ISBN 978-0-13-448562-1  
 (Module ID 29302-16) Explains how to set up GMAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with GMAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

### FCAW – Pipe (60 Hours)

Trainee \$20 ISBN 978-0-13-448566-9  
 Instructor \$20 ISBN 978-0-13-448565-2  
 (Module ID 29303-16) Explains how to set up FCAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with FCAW equipment on pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

### GTAW – Carbon Steel Pipe (80 Hours)

Trainee \$20 ISBN 978-0-13-448568-3  
 Instructor \$20 ISBN 978-0-13-448567-6  
 (Module ID 29304-16) Explains how to set up GTAW equipment for open-root V-groove welds, and explains how to prepare for and make open-root V-groove welds on carbon steel pipe. Provides procedures for making open-root V-groove welds with GTAW equipment on pipe in the 2G, 5G, and 6G positions.

### GTAW – Low Alloy and Stainless Steel Pipe (70 Hours)

Trainee \$20 ISBN 978-0-13-448570-6  
 Instructor \$20 ISBN 978-0-13-448569-0  
 (Module ID 29305-16) Explains how to set up GTAW equipment for open-root V-groove welds on low-alloy and stainless steel pipe, and explains how to prepare for and make open-root V-groove welds on low-alloy and stainless steel pipe. Provides procedures for making open-root V-groove welds with GTAW equipment on low-alloy and stainless steel pipe in the 2G, 5G, and 6G positions.

### SMAW – Stainless Steel Plate and Pipe Groove Welds (100 Elective Hours)

Trainee \$20 ISBN 978-0-13-448573-7  
 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 plate in the 1G, 2G, 3G, and 4G positions. Includes procedures for making open-root V-groove welds with SMAW equipment on stainless steel pipe in the 1G-ROTATED, 2G, 5G, and 6G positions.

## L4 WELDING

### Curriculum Notes

- 172.5 Hours
- Revised: 2016, Fifth Edition
- Instructor's Guide includes access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from [www.nccerirc.com](http://www.nccerirc.com).

### PAPERBACK

### ISBN

Trainee Guide: \$97	978-0-13-451422-2
Instructor's Guide: \$97	978-0-13-457591-9
NCCERconnect Access Card: \$97	978-0-13-452915-8
NCCERconnect + Trainee Guide: \$122	978-0-13-469255-5

### 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.



## Welding Level 4 (continued)

### **GMAW – Aluminum Plate** (30 Hours)

Trainee \$20

ISBN 978-0-13-467767-5

Instructor \$20

ISBN 978-0-13-467766-8

(Module ID 29401-16) Covers the setup of GMAW equipment for welding aluminum plate. Explains aluminum metallurgy and the characteristics of aluminum welding; how to clean and prepare aluminum plate coupons for welding; and problems often encountered in aluminum welds. Explains GMAW techniques used in aluminum welding. Provides GMAW procedures on how to build weld pads on aluminum plate; how to make fillet welds on aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

### **GTAW – Aluminum Plate** (30 Hours)

Trainee \$20

ISBN 978-0-13-467765-1

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.

### **GTAW – Aluminum Pipe** (50 Hours)

Trainee \$20

ISBN 978-0-13-467763-7

Instructor \$20

ISBN 978-0-13-467761-3

(Module ID 29403-16) Covers the setup of GTAW equipment for welding aluminum pipe. Explains how to clean and prepare aluminum pipe coupons for welding. Addresses GTAW techniques used to make V-groove and modified U-groove welds on aluminum pipe with and without backing. Provides GTAW procedures on how to make V-groove or modified U-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

### **GMAW – Aluminum Pipe** (50 Hours)

Trainee \$20

ISBN 978-0-13-467760-6

Instructor \$20

ISBN 978-0-13-467759-0

(Module ID 29404-16) Covers the setup of GMAW equipment for welding aluminum pipe. Addresses GMAW techniques used to make V-groove welds on aluminum pipe with and without backing. Explains how to clean and prepare aluminum pipe coupons for welding. Provides GMAW procedures on how to make V-groove welds on aluminum pipe in the 2G, 5G, and 6G positions.

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

Trainee \$20

ISBN 978-0-13-467757-6

Instructor \$20

ISBN 978-0-13-467758-3

(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.