L1 WELDING

LEVEL 1

Curriculum Notes

- 365 Hours (includes Core)
- Revised: 2022, Sixth Edition
- Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E school requirements. When combined with NCCER *Welding Level 2*, the content aligns with the key indicators specified in *AWS EG2.0:2008 Level 1-Entry Welder.*
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $74.99	978-0-13-792453-0
DIGITAL	**ISBN**
NCCERconnect with Pearson eText: $102.99	978-0-13-792477-6
Trainee Guide + NCCERconnect with Pearson e-text: $104.99	978-0-13-792478-3
Core + Welding L1: $137.98	978-0-13-821270-4

MODULES

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

Welding Safety *(5 Hours)*
ISBN 978-0-13-792455-4
(Module ID 29101) Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

Oxyfuel Cutting *(17.5 Hours)*
ISBN 978-0-13-792457-8
(Module ID 29102) Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

Plasma Arc Cutting *(7.5 Hours)*
ISBN 978-0-13-792459-2
(Module ID 29103) Introduces plasma arc cutting equipment and safe work area preparation. Identifies correct amperage, gas pressures, and flow rates. Covers plasma-arc cutting methods for piercing, slotting, squaring, and beveling metals. Explains how to store equipment and clean the work area.

Air-Carbon Arc Cutting and Gouging *(10 Hours)*
ISBN 978-0-13-792460-8
(Module ID 29104) Introduces air-carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air-carbon arc washing and gouging activities.

Base Metal Preparation *(12.5 Hours)*
ISBN 978-0-13-792463-9
(Module ID 29105) Describes how to clean and prepare all types of base metals for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

Weld Quality *(10 Hours)*
ISBN 978-0-13-792464-6
(Module ID 29106) Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive testing, visual inspection criteria, welder qualification tests, and the importance of quality workmanship

SMAW – Equipment and Setup *(5 Hours)*
ISBN 978-0-13-792467-7
(Module ID 29107) Describes SMAW welding and welding safety. Explains how to connect welding current and set up arc welding equipment. Also explains how to use tools for cleaning welds.

SMAW Electrodes *(2.5 Hours)*
ISBN 978-0-13-792468-4
(Module ID 29108) Describes electrode characteristics and different types of filler metals. Reviews the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

ALIGNS WITH AWS SENSE STANDARDS AND GUIDELINES

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

SMAW – Beads and Fillet Welds *(100 Hours)*
ISBN 978-0-13-792469-1
(Module ID 29109) Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

Joint Fit-Up and Alignment *(5 Hours)*
ISBN 978-0-13-792471-4
(Module ID 29110) Describes job code specifications. Explains how to use fit-up gauges and measuring devices to check fit-up and alignment and use plate and pipe fit-up and alignment tools to properly prepare joists. Explains how to check for joint misalignment and poor fit.

SMAW – Groove Welds with Backing *(50 Hours)*
ISBN 978-0-13-792473-8
(Module ID 29111) Introduces groove welds and explains how to set up welding equipment for making groove welds. Describes how to make groove welds with backing. Provides procedures for making flat, horizontal, vertical, and overhead groove welds.

SMAW – Open-Root Groove Welds – Plate *(60 Hours)*
ISBN 978-0-13-792476-9
(Module ID 29112) Introduces various types of groove welds and describes how to prepare for groove welding. Describes the techniques required to produce various open V-groove welds.

Continued on following page

L2 WELDING

LEVEL 2

Curriculum Notes

Curriculum Notes

- 227.5 Hours
- Revised: 2024, Sixth Edition
- Sequenced in accordance with the American Welding Society's (AWS) S.E.N.S.E school requirements. When combined with NCCER *Welding Level 1*, the content aligns with the key indicators specified in *AWS EG2.0:2008 Level 1-Entry Welder.*
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $102.99	978-0-13-821616-0
DIGITAL	**ISBN**
NCCERconnect Access Card: $74.99	978-0-13-821605-4
NCCERconnect + Trainee Guide: $129.99	978-0-13-821623-8

MODULES

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

Welding Symbols *(5 Hours)*
ISBN 978-0-13-836597-4
(Module ID 29201) Identifies and explains the different types of fillet weld, groove weld, and non destructive examination symbols. Explains how to read welding symbols on drawings, specifications, and Welding Procedure Specifications (WPS).

Reading Welding Detail Drawings *(10 Hours)*
ISBN 978-0-13-836598-1
(Module ID 29202) Identifies and explains welding detail drawings. Describes lines, fills, object views, and dimensioning on drawings. Explains how to use notes on drawings and the bill of materials. Explains how to sketch and draw basic welding drawings.

Physical Characteristics and Mechanical Properties of Metals *(7.5 Hours)*
ISBN 978-0-13-836579-0
(Module ID 29203) Explains physical characteristics, mechanical properties, composition, and classification of common ferrous and nonferrous metals. Identifies the various standard metal forms and structural shapes. Shows how to extract metal information from Welding Procedure Specification (WPS) sheets and Procedure Qualification Records (PQRs). Covers visual inspection, magnetic testing, and X-ray fluorescent spectrometry methods used to identify metals.

Preheating and Postheating of Metals *(5 Hours)*
ISBN 978-0-13-836583-7
(Module ID 29204) Explains preheating, interpass temperature control, and postheating procedures that sometimes need to be done to preserve weldment strength, ductility, and weld quality. Covers the equipment used for heat treating metals.

GMAW and FCAW – Equipment and Filler Metals *(10 Hours)*
ISBN 978-0-13-836584-4
(Module ID 29205) Describes general safety procedures for GMAW and FCAW. Identifies GMAW and FCAW equipment and explains the filler metals and shielding gases used to perform GMAW and FCAW. Explains how to set up and use GMAW and FCAW equipment and how to clean GMAW and FCAW welds.

GMAW – Plate *(60 Hours)*
ISBN 978-0-13-836587-5
(Module ID 29209) Explains how to set up and use GMAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

FCAW – Plate *(60 Hours)*
ISBN 978-0-13836589-9
(Module ID 29210) Explains how to set up and use FCAW equipment and how to select and use different filler metals and shielding gases. Describes how to make multiple-pass fillet and V-groove welds on carbon steel plate in various positions.

GTAW – Equipment and Filler Metals *(10 Hours)*
ISBN 978-0-13-836592-9
(Module ID 29207) Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

GTAW – Plate *(60 Hours)*
ISBN 978-0-13-836593-6
(Module ID 29208) Describes how to build pads on carbon steel plate using GTAW and carbon steel filler metal. Also explains how to make multiple-pass GTAW fillet welds on carbon steel plate coupons in the 1F, 2F, 3F, and 4F positions, and how to make GTAW V-groove welds in the 1G, 2G, 3G, and 4G positions.

L3 WELDING

LEVEL 3

Curriculum Notes

- 470 Hours (370 Required; 100 Elective/Optional)
- Revised: 2024, Sixth Edition
- Downloadable instructor resources are available.

PAPERBACK	ISBN
Trainee Guide: $102.99	978-0-13-821882-9
DIGITAL	**ISBN**
NCCERconnect Access Card: $102.99	978-0-13-821878-2
NCCERconnect + Trainee Guide: $129.99	978-0-13-821871-3

MODULES

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

SMAW – Open-Root Pipe Welds *(100 Hours)*
ISBN 978-0-13-535080-5
(Module ID 29301) This module describes how to prepare and perform open-root V-groove welds on pipe in all positions using SMAW equipment and electrodes. Shielded metal arc welding (SMAW), also known as manual metal arc welding or stick welding, is a well-established form of welding used extensively in commercial and industrial applications around the world.

GMAW – Pipe *(60 Hours)*
ISBN 978-0-13-535081-2
(Module ID 29302) This module covers basic concepts of open-root GMAW with pipe and describes how to prepare and perform open-root V-groove welds on medium- and thick-walled pipe. Gas metal arc welding (GMAW), also known as metal inert gas (MIG) welding, is a form of welding that joins two metals together using a filler metal wire electrode and a shielding gas. MIG welding is an effective method for making high-quality, open-root V-groove welds on pipe.

FCAW – Pipe *(60 Hours)*
ISBN 978-0-13-535082-9
(Module ID 29303) This module describes two primary approaches to FCAW and provides guidance for practicing the techniques. Flux-core arc welding (FCAW), also known as dual-shield welding, is excellent for pipe welding, although the root pass is seldom applied using FCAW. FCAW is a versatile process than can be performed with or without a shielding gas, depending upon the wire electrode used.

GTAW – Carbon Steel Pipe *(80 Hours)*
ISBN 978-0-13-535084-3
(Module ID 29304) This module provides instruction and guided practice in the use of GTAW for carbon steel pipe welding. Gas tungsten arc welding (GTAW), also known as tungsten inert gas welding, is a unique welding process that requires the welder to use of both hands in the welding process. GTAW can be used on critical piping and may sometimes be used for the root pass on pipe welds when other processes have been directed for the remaining passes. GTAW is excellent for welding thin materials, such as auto bodies.

GTAW – Low Alloy and Stainless Steel Pipe *(70 Hours)*
ISBN 978-0-13-535086-7
(Module ID 29305) This module provides information about working with low alloy and stainless steel pipe and highlights many of their unique characteristics. It also describes GTAW techniques and processes for welding these materials. Safe welding practices are emphasized.

SMAW – Stainless Steel Plate and Pipe Groove Welds *(100 Elective Hours)*
ISBN 978-0-13-535087-4
(Module ID 29306) This module covers stainless steel metallurgy, the required SMAW electrodes and processes, and the techniques and equipment used to make open-root V-groove welds on stainless steel plate and pipe. Welders working on stainless steel must understand the differences between welding this type of steel and other types. The various grades of stainless steel require different welding techniques, filler metal composition, and heat treatments.

L4 WELDING

Curriculum Notes

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

PAPERBACK	ISBN
Trainee Guide: $102.99	978-0-13-821304-6
DIGITAL	**ISBN**
NCCERconnect Access Card: $102.99	978-0-13-821317-6
NCCERconnect + Trainee Guide: $129.99	978-0-13-821323-7

MODULES

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

GMAW – Aluminum Plate *(30 Hours)*
ISBN 978-0-13-535070-6
(Module ID 29401) This module describes how GMAW equipment is used to weld aluminum plate and examines different techniques used to produce fillet and V-groove plate welds. Gas metal arc welding (GMAW) is one of the more common welding processes now used. As with most welding systems, GMAW equipment is available in many different sizes and varieties. However, the basic operating principles of GMAW apply to all makes and models of equipment.

GMAW – Aluminum Pipe *(50 Hours)*
ISBN 978-0-13-535074-4
(Module ID 29404) This module describes how GMAW equipment is used to weld aluminum pipe and presents the techniques used to produce V-groove pipe welds with backing. Gas metal arc welding (GMAW) is one of the more common welding processes. GMAW equipment is available in many different sizes and types—however, the basic operating principles of GMAW apply to all makes and models of equipment.

GTAW – Aluminum Plate *(30 Hours)*
ISBN 978-0-13-535076-8
(Module ID 29402) This module provides insight into welding aluminum using the GTAW process and an opportunity to hone the necessary skills. The GTAW process is unique in that the welder must add the filler metal using the opposite hand. The process is well-suited for welding aluminum, using the freehand or walking-the-cup technique and both stringer and weave beads.

GTAW – Aluminum Pipe *(50 Hours)*
ISBN 978-0-13-535078-2
(Module ID 29403) This module provides insight into welding aluminum pipe using the GTAW process and the modified U-groove joint, which does not require a metal backing or a backing gas. The GTAW process is unique in that the welder must add the filler metal using the opposite hand. The process is well-suited for welding aluminum, using the freehand or walking-the-cup technique. Welders must understand that a significant amount of welding current is required for welding aluminum, especially when working with thick materials.

Soldering and Brazing of Copper *(12.5 Hours)*
ISBN 978-0-13-535079-9
(Module ID 29405) This module provides insight into soldering and brazing of copper. Soldering and brazing are welding processes that use nonferrous filler metal to form the weld joint. Soldering uses filler metal with a relatively low-temperature melting point. For joints that need to be mechanically stronger and more pressure-resistant, higher-temperature silver or copper alloy brazing filler metal is used. Oxygen/acetylene or air-acetylene fuel gases are typically used for brazing. Both soldering and brazing demand careful attention to safety due to the hazards associated with extreme heat, flammable gases and open flames.