

NCCER WELDING CURRICULUM

The following is a brief description of subjects contained in all four levels of the welding program as well as the core curricula that all level one students are expected to pass.

CORE CURRICULUM

The core curricula provides a basic introduction to construction work for all crafts. The core curriculum consists of 9 modules taught through in-person instruction and supplemented by online programming.

Basic Safety

Presents basic jobsite 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 (PPE), including equipment required for work at height, and its proper use. Information related to safety in several specific environments, including welding areas and confined spaces, is also provided.

Introduction to Construction Math

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

Introduces common hand tools used in a variety of construction crafts. Identifies tools and how to safely use them. Proper hand tool maintenance is also presented.

Introduction to Power Tools

Identifies and describes the operation of many power tools common in the construction environment. Provides instruction on proper use, as well as on safe-handling guidelines and basic maintenance.

Introduction to Construction Drawings

Introduces the basic elements of construction drawings. The common components of drawings are presented, as well as the most common drawing types. The use of drawing scales and how to measure drawings is also covered.

Basic Rigging

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

Provides good 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 covers proper techniques to use in a variety of different written communication formats.

Basic Employability Skills

Describes the opportunities offered by the construction trades. Discusses critical thinking and essential problem-solving skills for the construction industry. Also identifies and discusses positive social skills and their value in the workplace.

Introduction to Material Handling

Describes the hazards associated with handling materials and provides techniques to avoid both injury and property damage. Common material-handling equipment is also introduced.

WELDING – LEVEL ONE

Welding Safety

Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

Oxyfuel Cutting

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

Explains 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

Describes 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

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

Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive examination practices, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

SMAW – Equipment and Setup

Describes SMAW welding and welding safety. Explains how to connect the welding current and setup arc welding equipment. Identifies and explains using tools for cleaning welds.

SMAW – Electrodes

Explains electrode characteristics and different types of filler metals. Describes 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

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

Identifies and explains job code specifications. Describes the use of fit-up gauges and measuring devices to check fit-up and alignment and the use of plate and pipe fit-up alignment tools to properly prepare joists. Explains how to check for joint misalignment and poor fit.

SMAW – Groove Welds with Backing

Explains groove welds and 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 V-Groove Welds – Plate

Explains open V-groove welds and how to set up welding equipment for making open V-groove welds. Provides procedures for making flat, horizontal, vertical, and overhead open V-groove welds.

WELDING – LEVEL TWO

Welding Symbols

Identifies and explains the different types of a 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

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

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

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

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

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

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

Explains GTAW safety. Identifies and explains the use of GTAW equipment, filler metals, and shielding gases. Covers the setup of GTAW equipment.

GTAW – Plate

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.

WELDING – LEVEL THREE

SMAW – Open Root Pipe Welds

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

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

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

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

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

Explains stainless steel metallurgy, how to select SMAW electrodes for stainless steel welds, and how to weld different types of stainless steel. Covers safety issues associated with welding on stainless steel, 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.

WELDING – LEVEL FOUR

GMAW – Aluminum Plate

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 an aluminum plate; how to make fillet welds on an aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on an aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

GTAW – Aluminum Plate

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 an aluminum plate in the 1F, 2F, 3F, and 4F positions; and how to make V-groove welds on an aluminum plate with backing in the 1G, 2G, 3G, and 4G positions.

GTAW – Aluminum Pipe

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 an 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

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.



THE NCCER PROGRAM

NCCER (National Center for Construction Education & Research) maintains a portable and widely recognized credentialing and certification system through its Registry. This Registry assures portability of skills by providing transcripts, certificates and wallet cards to students who successfully complete the NCCER

Curriculum through an accredited sponsor. These valuable industry credentials benefit students as they seek employment and build their careers. To be entered in NCCER's Automated National Registry, you must complete and sign a Registration and Release Form. This form will be completed on the first night of class in each semester and requires your Social Security Number and your signature.

NCCER has developed a consistent program of accreditation, instructor certification, standardized curriculum, registry, assessment and certification, which are key elements in developing a skilled workforce of craft professionals.

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

The NCCER Curriculum, in cooperation with publishing partner Pearson, has developed and publishes a world-class curriculum created by "Subject Matter Experts" representing contractors and schools from around the country. "Subject Matter Experts" ensure exceptional training programs that meet or exceed national industry standards. The NCCER Curriculum, which includes more than 60 craft areas, is taught worldwide by contractors, associations, construction users, and secondary and post-secondary schools. In addition, multiple State Departments of Education recognize the curriculum along with the U.S. Department of Labor - Office of Apprenticeship.