

## **NCCER SHEET METAL CURRICULUM**

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

*This curriculum is for sheet metal apprentices and assumes you are already employed by a sheet metal firm! If that is not the case you may apply to become an apprentice with the Cornhusker Training Trust by clicking on this link <http://www.abcnebraska.org/Graduation/Education.aspx>*

### **CORE CURRICULUM**

*The core curricula provides a basic introduction to construction work for all crafts. The core curricula is an internet based self-study course and is not taught in the class room like sheet metal levels 1-4.*

#### **Basic Safety**

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

#### **Introduction to Construction Math**

Reviews basic mathematical functions such as adding, subtracting, dividing, and multiplying whole numbers, fraction, and decimals, and explains their applications to the construction trades. Explains decimal-fraction conversions and the metric system using practical examples. Also reviews basic geometry as applied to common shapes and forms.

#### **Introduction to Hand Tools**

Introduces trainees to hand tools that are widely used in the construction industry, such as hammers, saws, levels, pullers, vises and clamps. Explains the specific applications of each tool and shows how to use them properly. Also discusses important safety and maintenance issues related to hand tools.

#### **Introduction to Power Tools**

Provides detailed descriptions of commonly used power tools such as drills, saws, grinders, and sanders. Reviews applications, proper use, safety, and maintenance. Many illustrations show power tools used in on-the-job settings.

#### **Introduction to Construction Drawings**

Covers construction drawings, components, and symbols. Discusses different types of drawings and describes how to interpret and use drawing dimensions.

#### **Basic Rigging**

Explains how ropes, chains, hoist, loaders, and cranes are used to move material and equipment from one location to another on a job site. Describes inspection techniques and load-handling safety practices. Also reviews American National Standards Institutes (ANSI) hand signals.

#### **Basic Communication Skills**

Provides trainees with techniques for communicating effectively with co-workers and supervisors. Includes practical examples that emphasize the importance of verbal and written information and instructions on the job. Also discusses effective telephone and e-mail communication skills.

#### **Basic Employability Skills**

Identifies the roles of individuals and companies in the construction industry. Introduces trainees to critical thinking and problem solving skills and computer systems and their industry applications. Also review effective relationship skills, effective self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.

## **SHEET METAL LEVEL ONE**

### **Introduction to the Sheet Metal Trade**

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**

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**

Introduces parallel line development, radial line development, and triangulation. Covers 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**

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 stretch outs.

### **Fabrication One – Parallel Line Development**

Covers the steps involved in using the parallel line development method to lay out fittings and includes step-by-step procedures for selected fittings.

### **Installation of Ductwork**

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**

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**

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.

### **Architectural Sheet Metal**

Provides instruction in how to lie out and fabricate sheet metal components of a roof drainage system. Includes flashing, gutters, and downspouts.

## **SHEET METAL LEVEL TWO**

### **Trade Math Two**

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, vernier calipers, and micrometers and in solving field-measuring problems.

### **Plans and Specifications**

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 – Radial Line Development**

Introduces trainees to radial line development principles that are 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**

Explains how to determine the various 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**

Explains the properties of air and how these properties relate to one another. Teaches how to use the gas laws, psychometric charts, and measuring instruments to evaluate air properties in an air distribution system.

### **Bend Allowances**

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**

Identifies soldering tools, materials, and techniques. Also provides trainees with a wide range of soldering tasks for practice.

### **Basic Piping Practices**

Reviews the methods for measuring, cutting, and joining selected types of pipe using fittings, hangers, and supports. Also, reviews pipe materials and applications.

### **Fiberglass Duct**

Reviews fiberglass duct as well as layout and fabrication methods. Also discusses closure, hanging and support methods and how to repair major and minor damage to fiberglass duct.

## **SHEET METAL LEVEL THREE**

### **Trade Math Three – Field Measuring and Fitting**

Describes the techniques used for field measuring and layout of duct runs and fittings. Also provides practice in solving field-measuring problems.

### **Air Systems**

Reviews the operating principles, components and applications of common air systems. Discusses constant volume systems, variable volume systems, variable temperature (VVT) systems, variable air volume (VAV) systems, and dual VAV systems.

### **Principles of Airflow**

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.

### **Louvers, Dampers, and Access Doors**

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**

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.

### **Fabrication Three – Triangulation**

Describes the principles of triangulation and how it can be used to measure duct run fittings. Provides trainees with a variety of tasks to practice developing, laying out, and fabricating selected duct run fittings.

### **Advanced Architectural Sheet Metal**

Provides the opportunity to practice layout, fabrication, and installation of various architectural pieces. Makes use of items built in Fabrication Three – Radial Line Development.

## **SHEET METAL LEVEL FOUR**

### **Shop Production and Organization**

Introduces trainees to the important 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 relationships of shop personnel.

### **Air Testing and Balancing**

Trainees learn 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**

Introduces trainees to the important techniques and proper operation of equipment used for welding, brazing and cutting. Emphasizes safety and awareness of hazards involved. Students practice welds in a variety of positions and perform a basic braze.

### **Fume and Exhaust System Design**

Reviews the codes and specifications pertaining to fume and exhaust system design for safe workspaces. Instructs trainees 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**

Provides a comprehensive 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**

Teaches the basic 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.

*Updated 07/14*



## **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 classes in each semester and requires your Social Security # and your signature.

NCCER has developed a consistent program of accreditation, instructor certification, standardized curriculum, registry, assessment and certification, which is a key element 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. Dept. of Labor - Office of Apprenticeship.