Associated Builders and Contractors, Inc.
Southern California Chapter

HVAC/SM COMBINED CURRICULA OUTLINE

(Revised 05/27/2016)

CORE CONTENTS 2015
PLUS LEVEL 1

Basic Safety (Construction Site Safety Orientation) ***(12.5 Hours)***
(Module ID 00101-15) 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, 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 ***(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)***
(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)***
(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)***
(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)***
(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 positive social skills and presents information on computer systems and their industry applications.

Introduction to Material Handling *(5 Hours)*
(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.

Your Role in the Green Environment (10 Hours):
This module brings together the expertise of industry and higher education in defining a topic of growing international importance: *green building*. Geared to entry-level craft workers or to anyone wishing to learn more about green building, this module provides fundamental instruction in the green environment, green construction practices, and green building rating systems.
Module #70101-09

HVAC/SM LEVEL ONE CONTENTS

SM Introduction to the Trade (2.55 hours):
Summarizes the history and development of the sheet metal trade, explains the benefits of apprenticeship training, and identifies career opportunities in the trade. **Module #04101-08**

SM Tools of the Trade (5 hours):
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. **Module #04102-08**

Introduction to HVAC (2.5 hours):
Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and apprenticeship programs. **Module #03101-07**

SM Trade Math One (16 hours):
Builds on a 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. **Module #04104-08**
SM Installation of Duct Work (7 hours):
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 if hangers and support systems. **Module #04106-08**

SM Installation of Air Distribution Accessories (5 hours):
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.
Module #04107-08

SM Soldering (12 hours):
Identifies soldering tools, materials, and techniques. Also provides trainees with a wide range of

soldering tasks for practice. **Module #04207-08**

SM Insulation (5 hours):
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 performed fitting covers. **Module #04108-08**

HVAC Air Distribution Systems (15 hours):
Describes air distribution systems and their components, air flow measurement, ductwork installation principles, and the use of instruments for measuring temperature, humidity, pressure, and velocity. **Module #03109-07**

HVAC Basic Electricity (12 hours):
Teaches power generation and distribution, electrical components, DC circuits, and electrical safety. **Module #03106-07**

HVAC Alternating Current (8 hours):
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, Also reviews electrical safety. **Module #03206-07**

HVAC/SM LEVEL TWO CONTENTS

SM Trade Math Two (20 Hours):
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 measurement problems. **Module #04201-08**

Introduction to Sheet Metal Layout and Processes (10 hours):
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. **Module #04103-08**

SM Fabrication One – Parallel Line Development (11 hours):
Covers the steps included in using the parallel line development methods to lay out fittings and includes step-by-step procedures for selecting fittings. **Module #04105-08**

SM Fabrication Two – Radial Line Development (11 hours):
Introduces trainees to radial line development principles that are used to determine layouts for sheet metal fitting. Includes practice layout and fabrication tasks that allow trainees to develop and demonstrate their skills. **Module #04203-08**

SM Fabrication Three – Triangulation (11 hours):
Describes the principles of triangulation and how it can be used to measure ductrun fitting. Provides trainees with a variety of tasks to practice developing, laying out, and fabricating selected ductrun fittings. **Module #04306-09**

SM Bend Allowances (5 hours):
Provides instruction and practice in determining proper bens allowances in sheetmetal. Also reviews the interplay of different factors that affect the amount of bens allowance needed and the methods for calculating allowance. **Module #04206-08**

HVAC Introduction to Cooling (12 hours):
Covers the basic principles of heat transfer, refrigeration, and pressure-temperature relationships and describes the components and accessories used in air conditioning systems. **Module # 03107-07**

HVAC Introduction to Heating (12 hours):
Covers heating fundamentals, types and designs of furnaces and their components, and basic procedures for installing and servicing furnaces. **Module #03108-07**

HVAC Basic Electronics (15 hours):
Explains the theory of solid-state electronics, as well as the operation, use, and testing of the various electronic components used in HVAC equipment. Includes an introduction to computers. **Module #03207-07**

HVAC Metering Devices (8 hours):
Covers the operating principles, applications, installation, and adjustment of the various types of fixed and adjustable expansion devices used in air conditioning equipment. **Module # 03303-08**

HVAC Compressors (15 hours):
Explains the operating principles of the different types of compressors used in comfort air conditioning and refrigeration systems, along with the basic installation, service, and repair procedures for these compressors. **Module # 03302-08**

HVAC Heat Pumps (15 hours):
Covers the principles of reverse cycle heating, describes the operation of the various types of heat pumps, and describes how to analyze heat pump control circuits. Includes heat pump installation and service procedures. **Module # 03211-07**

HVAC Leak Detection, Evacuation, Recovery and Charging (15 hours):
Covers the basic refrigerant handling and equipment servicing procedures to service HVAC systems in an environmentally safe manner. **Module #03205-07**

HVAC/SM LEVEL THREE CONTENTS

SM Plans and Specifications (27 hours):
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. **Module #04202-08**

SM Duct Fabrication Standards (11 hours):
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. **Module #04204-08**

Advanced Architectural Sheet Metal (15 hours):
Provides the opportunity to practice layout, fabrication, and installation of various architectural pieces. Makes use of items built in Fabrication Three – Radial Line Development. **Module #04307-09**

SM Principles of Airflow (27 hours):
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. **Module #04303-09**

SM Trade Math Three – Field Measuring and Fitting (15 hours):
Describes the techniques used for field measuring and layout of ductruns and fittings. Also provides practice in solving field measuring problems. **Module #04301-09**

HVAC Construction Drawings and Specifications (25 hours):
Covers how to interpret the various drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-builts and to perform takeoff procedures for equipment, fittings ductwork and other components. **Module #03401-09**

HVAC Indoor Air Quality (15 hours):
Defines the issues associated with indoor air quality and its affect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality. **Module #03403-09**

HVAC Heating and Cooling System Design (25 hours):
Identifies and explains the factors that affect heating and cooling loads, describes the process by which heating and cooling loads are calculated, and shows how load calculations are used in the selection of heating and cooling equipment. Covers types of duct systems and their selection, sizing, and installation requirements. **Module #03407-09**

HVAC/SM LEVEL FOUR CONTENTS

HVAC System Startup and Shutdown (22.5 hours):
Covers procedures for the startup of hot water, steam heating, chilled water, and forced air distribution systems. Emphasis is on startup after initial equipment installation or after and extended period of shutdown. Includes procedures for preparing these systems for extended shutdown. **Module #03406-09**

HVAC Commercial and Industrial Refrigeration Systems (22.5 hours):
This module expands on the study of product and process refrigeration begun in level 3. It deals with the type of systems used in cold storage and food processing facilities, as well as transportation refrigeration. **Module #03408-09**

HVAC Commercial Hydronic Systems (15 hours):
Covers the various types of boilers, components, and piping systems used in commercial heating applications. Also introduces chilled water systems and their components. **Module #03305-08**

SM Louvers, Dampers, and Access Doors (10 hours):
Discusses the different types of louvers, dampers, and access doors used in air distribution systems and reviews the standards that apply to them. **Module #04304-09**

SM Fume and Exhaust System Design (10 hours):
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.
Module #04404-09

HVAC Troubleshooting Gas Heating (10 hours):
Covers tools, instruments, and techniques used in troubleshooting gas heating appliances, including how to isolate and correct faults. **Module #03209-07**

HVAC Troubleshooting Cooling (20 hours):
Covers the basic techniques and equipment used in troubleshooting cooling equipment, focusing on analyzing system temperatures and pressures in order to isolate faults. **Module #03210-07**

HVAC Troubleshooting Heat Pumps (12.5 hours):
Reviews heat pump operation and heat pump control circuits, including how to isolate and correct faults in the heating, cooling, auxiliary heat, and defrost functions of heat pumps.
Module #03311-08

HVAC Troubleshooting Electronic Controls (7.5 hours):
Explains how to analyze circuit diagrams for electronic and microprocessor-based controls used in comfort heating and cooling equipment and how to troubleshoot systems that use these controls.
Module #03309-08

HVAC System Balance (20 hours):
Covers air properties and gas laws, as well as the use of psychometric charts. It covers the tools, instruments, and methods used in balancing an air distribution system. **Module #03402-09**
SM Introductory Supervisory Skills (10 hours):
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. **Module #04406-09**