

Wisconsin Technical College System Curriculum Standards Model & Program Design Summary

50-432-9 Sheet Metal Construction Apprenticeship (ABC)

Program Information

Program Description

Sheet metal workers make, install, and maintain heating, ventilation, and air-conditioning duct systems; roofs; siding; rain gutters; downspouts; skylights; restaurant equipment; outdoor signs; railroad cars; tailgates; customized precision equipment; and many other products made from metal sheets. They also may work with fiberglass and plastic materials. Although some workers specialize in fabrication, installation, or maintenance, most do all three jobs. Sheet metal workers do both construction-related work and mass production of sheet metal products in manufacturing. Sheet metal workers first study plans and specifications to determine the kind and quantity of materials they will need. They measure, cut, bend, shape, and fasten pieces of sheet metal to make ductwork, countertops, and other custom products. Sheet metal workers program and operate computerized metalworking equipment. They cut, drill, and form parts with computer-controlled saws, lasers, shears, and presses.

External Requirements

Associated Builders and Contractors (ABC)

National Center for Construction Education & Research (NCCER)

5 year on-the-job training program which includes 8,000 hours on-the-job training, 500 hours paid related instruction, and unpaid related instruction

Apprentice must in his/her final year complete the Transition-To-Trainer Course

Wisconsin Department of Workforce Development, Bureau of Apprenticeship Standards

OSHA Construction Safety 29CFR 1910, 1926, and related regulations.

Entry Requirements

Must be 17 years of age

HS Diploma or equivalent

Meet required norms on aptitude test

Personal interview (or other requirements determined by local committees)

Physically able to perform trade

Registered sheet metal apprentice in the state of Wisconsin

Valid driver's license or reliable transportation

Program Outcomes

- 1 Work safely in a variety of work situations.
- 2 Demonstrate proficiency in welding.
- 3 Plan for installing sheet metal components according to industry standards.
- 4 Layout sheet metal components according to specification.
- 5 Fabricate sheet metal components using a variety of metal fabricating machinery.
- 6 Interpret trade related documents.
- 7 Demonstrate proficiency using oxy/fuel and hand plasma cutting (OPTIONAL)

Program Configurations for Related Instruction

50-432-9 WTCS Sheet Metal Apprenticeship (ABC Wisconsin)

Description

This program configuration provides a model for Sheet Metal Apprenticeship related instruction that covers 8 semesters and 576 total hours (with the equivalent of 72 hours per semester). Course designations I through VIII differentiate course content and learning outcomes throughout related instruction. This model assumes a "Lazy Susan" approach - in other words, an apprentice can start in any of the 8 terms and progress through the program.

Many of the competencies in the various courses are cross-referenced to week number. This is meant to guide apprentices and instructors. Local colleges may work with local committees to coordinate day and night school and plan regional options that serve the trade and employer needs. Several courses have incomplete course outcome summaries at this point (September 2013), and this a work plan to complete the work started in the past is recommended by the WIDS consultant at this time.

Credits

Total Credits= 16.00

Total Hours= 576 (8 semesters x 72 hours) plus Transition to Trainer

Terms 1-8

Course #	Course Title	Credits Hours	Course Description
50-432-701	Sheet Metal-- Apprentice I (PRI)	2.00 72 Hours	Sheet metal workers plan and lay out work from blueprints and sketches, fabricate parts using hand and power equipment, assemble HVAC (Heating, Ventilation, and Air Conditioning) and architectural units, and install the assembled units in the final structure. The Sheet Metal Apprenticeship program is an employer-sponsored, hands-on training program. If you like to work on projects from start to finish, using a variety of skills, check out a career as a journey level sheet metal worker.

			In this course the Apprentice is introduced to the sheet metal industry by learning about craftsmanship, use of drafting equipment and materials, proper use of lettering, basic geometric construction, architectural scales, orthographic project, shop safety, use and maintenance of hand tools and shop equipment, seams and locks, soldering techniques, and mathematics. [Weeks 1-9]
50-432-702	Sheet Metal-- Apprentice II (PRI)	2.00 72 Hours	In this course the Apprentice is introduced to parallel line, radial line, and triangulation pattern development; general materials, gages, and fasteners; selecting hoisting materials; installation procedures; emergency procedures; welding safety; fire hazards; architectural sheet metal; basic ventilation; heating and air conditioning; service work; recognition of industrial specialties; and mathematic equations. [Weeks 10-18]
50-432-703	Sheet Metal-- Apprentice III (PRI)	2.00 72 Hours	In this course the Apprentice is introduced to the basics of organizing time; computers; the use of scientific calculators for trigonometry and everyday equations; industry organizations; use and interpretation of freehand sketches and pictorial drawings in the development of triangulation, parallel line, and radial line patterns and in-depth use of shop equipment such as the slip rolls, rotary machines, brake, shear, and related hand tools. [Weeks 19-27]
50-432-704	Sheet Metal-- Apprentice IV (PRI)	2.00 72 Hours	In this course the Apprentice's ability is expanded to read and interpret plans and specifications as well as understand the symbols, abbreviations, and details in blueprints; identify and use materials for architectural sheet metal applications such as seams, gutters, conductor pipes, flashings, siding, and roofing; and understand airflow and basic duct design in an HVAC system with an introduction to the basics in electricity. [Weeks 28-36]
50-432-705	Sheet Metal-- Apprentice V (PRI)	2.00 72 Hours	In the course the Apprentice develops occupational skills which includes mathematics, calculator, drafting and sketching shop drawings, shop work, power squaring shears, press brakes, roll forming machines, layout and pattern development, off-center tapers, miters, round tapers on a pitch, square-to-rounds, two-way Y branches, materials, stainless, aluminum, field installation, fire and smoke dampers, central HVAC equipment, rooftop units, pressure testing, problem solving, and asbestos safety. [Weeks 37-45]
50-432-706	Sheet Metal-- Apprentice VI (PRI)	2.00 72 Hours	In this course the Apprentice is introduced to advanced mechanical, architectural, and electrical blueprint reading; drafting and fabrication of

			architectural fittings such as coping, flashing, counter flashing, gravel stops, cornices, and louvers; duct design; basic control in pneumatics; energy; heat transfer; and service work with start-up. [Weeks 46-54]
50-432-707	Sheet Metal-- Apprentice VII (PRI)	2.00 72 Hours	In this course the Apprentice is introduced to advanced pattern development; special power equipment, ironwork, heavy materials, service, mixing boxes, advanced mathematics, heat pumps field installation, fire dampers, boiler breeching and lagging; and the theory of refrigeration and air conditioning. [Weeks 55-63]
50-432-708	Sheet Metal-- Apprentice VIII (PRI)	2.00 72 Hours	In this course the Apprentice develops occupational skills to layout and fabricate fittings for architectural applications, metal buildings, and metal ceilings and the dangers involved when installing on high-rise buildings; supervisory training; in depth knowledge on dust collection, cyclones, separators, filters, and bag houses; and knowledge of specialty materials such as plastics and fiberglass and the sign industry. [Weeks 64-72]
47-455-455	Transition to Trainer: Your Role as a Journey Worker	0.00 8 hours	Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade. You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job.

Wisconsin Technical College System

50-432-701 Sheet Metal--Apprentice I (PRI)

Course Outcome Summary

Course Information

Description Sheet metal workers plan and lay out work from blueprints and sketches, fabricate parts using hand and power equipment, assemble HVAC (Heating, Ventilation, and Air Conditioning) and architectural units, and install the assembled units in the final structure. The Sheet Metal Apprenticeship program is an employer-sponsored, hands-on training program. If you like to work on projects from start to finish, using a variety of skills, check out a career as a journey level sheet metal worker.

In this course the Apprentice is introduced to the sheet metal industry by learning about craftsmanship, use of drafting equipment and materials, proper use of lettering, basic geometric construction, architectural scales, orthographic project, shop safety, use and maintenance of hand tools and shop equipment, seams and locks, soldering techniques, and mathematics.

[Weeks 1-9]

Total Credits 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

- 1 Describe the history and trends of the Sheet Metal apprenticeship and industry
- 2 Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]
- 3 Use hand tools
- 4 Adhere to shop rules and safety procedures
- 5 Use shop equipment for specific tasks
- 6 Fabricate seams, locks, and edges
- 7 Use drafting tools
- 8 Use lines and lettering in drawings
- 9 Develop orthographic projections
- 10 Construct geometric figures commonly used in sheet metal jobs
- 11 Apply layout techniques to metal
- 12 Fabricate fittings for radius elbow
- 13 Fabricate fittings for change elbow

Wisconsin Technical College System

50-432-702 Sheet Metal--Apprentice II (PRI)

Course Outcome Summary

Course Information

Description In this course the Apprentice is introduced to parallel line, radial line, and triangulation pattern development; general materials, gages, and fasteners; selecting hoisting materials; installation procedures; emergency procedures; welding safety; fire hazards; architectural sheet metal; basic ventilation; heating and air conditioning; service work; recognition of industrial specialties; and mathematic equations.
[Weeks 10-18]

Total Credits 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

- 1 Fabricate fittings for Duct S offsets [Ogee offset, change Ogee offset]
- 2 Fabricate fittings for parallel line layout [round roof jack]
- 3 Fabricate fittings for radial line layout [round taper]
- 4 Fabricate triangulation layout [Transition, Square to Round]
- 5 Solder seams and joints
- 6 Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]
- 7 Use shop equipment for specific tasks [safe use, maintain]
- 8 Adhere to shop rules and safety procedures [safe use, maintain]

Wisconsin Technical College System

50-432-703 Sheet Metal--Apprentice III (PRI)

Course Outcome Summary

Course Information

Description	In this course the Apprentice is introduced to the basics of organizing time; computers; the use of scientific calculators for trigonometry and everyday equations; industry organizations; use and interpretation of freehand sketches and pictorial drawings in the development of triangulation, parallel line, and radial line patterns and in-depth use of shop equipment such as the slip rolls, rotary machines, brake, shear, and related hand tools. [Weeks 19-27]
Total Credits	2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice requirements met.

Course Competencies

- 1 Wk19 - Plan for a job [introduced to what is done to plan, spec, and cost]
- 2 Wk20 - [continue Unit 5 projects 1-18 Fabrication?] MORE ADVANCED JOBS THIS CYCLE-- INCREASED DIFFICULTY--MORE COMPLEX
- 3 Wk21 - Fabricate ____ [Round Tees]
- 4 Wk22 - Fabricate round elbows
- 5 Wk23 - Fabricate round tapers
- 6 Wk24 - Fabricate roof jacks
- 7 Wk25 - Fabricate offset square to rounds
- 8 Wk26 - Fabricate transitions
- 9 Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]
- 10 Use shop equipment for specific tasks [safe use, maintain]
- 11 Adhere to shop rules and safety procedures [safe use, maintain]

Wisconsin Technical College System

50-432-704 Sheet Metal--Apprentice IV (PRI)

Course Outcome Summary

Course Information

Description In this course the Apprentice's ability is expanded to read and interpret plans and specifications as well as understand the symbols, abbreviations, and details in blueprints; identify and use materials for architectural sheet metal applications such as seams, gutters, conductor pipes, flashings, siding, and roofing; and understand airflow and basic duct design in an HVAC system with an introduction to the basics in electricity.

[Weeks 28-36]

Total Credits 2.00 (72 hours)

Course Competencies

- 1 Wk27 - Fabricate duct change elbows
- 2 Wk28 - Fabricate regular and change Ogee offsets
- 3 Wk29-30 - Fabricate round Y-branch layouts
- 4 Wk31 - Fabricate gutters and ventilators
- 5 Wk32 - Evaluate compliance with job-site safety guidelines [respond to case studies]
- 6 Wk33 - Recommend action to reduce exposure to risk on the job site [confined spaces, blood borne pathogens, forklift]
- 7 Wk 34 - Recommend actions to eliminate or reduce risk when operating a motor vehicle [motor vehicle, Hazmat]
- 8 Adhere to shop rules and safety procedures [safe use, maintain]
- 9 Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]
- 10 Use shop equipment for specific tasks [safe use, maintain]
- 11 Wk 36 - Recommend actions to eliminate or reduce risk involving welding hazardous materials

Wisconsin Technical College System

50-432-705 Sheet Metal--Apprentice V (PRI)

Course Outcome Summary

Course Information

- Description** In the course the Apprentice develops occupational skills which includes mathematics, calculator, drafting and sketching shop drawings, shop work, power squaring shears, press brakes, roll forming machines, layout and pattern development, off-center tapers, miters, round tapers on a pitch, square-to-rounds, two-way Y branches, materials, stainless, aluminum, field installation, fire and smoke dampers, central HVAC equipment, rooftop units, pressure testing, problem solving, and asbestos safety.
[Weeks 37-45]
- Total Credits** 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

- 1 Wk37 - ___ HVAC
- 2 Wk38 - ___ HVAC systems and components
- 3 Wk39 - Apply heat transfer theories to sheet metal applications
- 4 Wk40-41 - Apply refrigeration theories to sheet metal applications
- 5 Wk42 - Apply electrical theories to sheet metal applications
- 6 Wk43 - ___ automatic controls
- 7 Wk44 - Prepare for field installation
- 8 Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]
- 9 Use shop equipment for specific tasks [safe use, maintain]
- 10 Adhere to shop rules and safety procedures [safe use, maintain]

Wisconsin Technical College System

50-432-706 Sheet Metal--Apprentice VI (PRI)

Course Outcome Summary

Course Information

Description In this course the Apprentice is introduced to advanced mechanical, architectural, and electrical blueprint reading; drafting and fabrication of architectural fittings such as coping, flashing, counter flashing, gravel stops, cornices, and louvers; duct design; basic control in pneumatics; energy; heat transfer; and service work with start-up.
[Weeks 46-54]

Total Credits 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

- 1 **Wk45 - Interpret plans and specs**
- 2 **Wk46 - Interpret load calculations and sizing ductwork**
- 3 **Wk47 - Apply test and balance (TAB) procedures**
- 4 **Wk48 - Clarify commissioning duties**
- 5 **Wk49 - Evaluate project manager skills and effectiveness**
- 6 **Wk50-51 - Create CAD drawings**
- 7 **Apply math principles to sheet metal tasks [operations, algebra, geometry, trig, ITI calculator]**
- 8 **Use shop equipment for specific tasks [safe use, maintain]**
- 9 **Adhere to shop rules and safety procedures [safe use, maintain]**

Wisconsin Technical College System

50-432-707 Sheet Metal--Apprentice VII (PRI)

Course Outcome Summary

Course Information

Description In this course the Apprentice is introduced to advanced pattern development; special power equipment, ironwork, heavy materials, service, mixing boxes, advanced mathematics, heat pumps field installation, fire dampers, boiler breeching and lagging; and the theory of refrigeration and air conditioning.
[Weeks 55-63]

Total Credits 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

1 Weeks 55-63

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50-432-708 Sheet Metal--Apprentice VIII (PRI)

Course Outcome Summary

Course Information

Description In this course the Apprentice develops occupational skills to layout and fabricate fittings for architectural applications, metal buildings, and metal ceilings and the dangers involved when installing on high-rise buildings; supervisory training; in depth knowledge on dust collection, cyclones, separators, filters, and bag houses; and knowledge of specialty materials such as plastics and fiberglass and the sign industry.
[Weeks 64-72]

Total Credits 2.00 (72 hours)

Prerequisites

50-432-1/50-432-2 Sheet Metal Apprentice program requirements met.

Course Competencies

1 Weeks 64-72

Wisconsin Technical College System

47-455-455 Transition to Trainer: Your Role as a Journey Worker

Course Outcome Summary

Course Information

Description Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade.

You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job. 8 Hours.

Course Competencies

- 1 Value your role as a journey worker trainer
- 2 Serve as a mentor and job coach
- 3 Foster a positive work environment by acting as an ally/advocate
- 4 Provide hands-on skills training
- 5 Provide feedback on apprentice performance