Identifier	Poplar - Apprentice - Metal Working		Introduced	Completed
A MW 1	**SAFETY AND EQUIPMENT**			
A MW 1.1.01	General Rules	Read safety requirements found in the metalworking lab.		
A MW 1.1.02	General Rules	Identify safety procedures of machines, tools, and equipment.		
A MW 1.1.03	General Rules	Identify safe behaviors/attitudes.		
A MW 1.1.04	General Rules	List different types of hearing protection.		
A MW 1.2.01	Fire Rules	Read fire safety requirements found in the metalworking lab.		
A MW 1.2.02	Fire Rules	Identify fire evacuation procedures.		
A MW 1.2.03	Fire Rules	Identify all locations of fire extinguishers, safety blankets, and exit routes.		
A MW 2	**MEASUREMENT AND LAYOUT**			
A MW 2.1.01	Measuring	Identify semi-precision measuring devices.		
A MW 2.1.02	Measuring	Identify precision measuring devices.		
A MW 2.2.01	Layout	Identify common layout tools.		
A MW 2.2.02	Layout	Observe a video and/or demonstration on layout tools and techniques.		
A MW 2.3.01	Drawings	Differentiate between a working drawing and an orthographic projection.		
A MW 2.4.01	Mathematics	Identify whole numbers, fractions, and decimals.		
A MW 3	**METALLURGY**			
A MW 3.1.01	Types	Describe metal-making processes.		
A MW 3.1.02	Types	Observe a metal-making process video.		
A MW 3.2.01	Hardening/ Annealing	Explain the difference between tempering, hardening, and the annealing processes.		
A MW 3.3.01	Heating/ Cooling	Recognize hot materials in the metalworking lab.		
A MW 4	**TOOLS AND MACHINES**			
A MW 4.1.01	Stationary	Identify basic stationary power machines such as grinders, buffers, sanders, band saws, chop saws, shears, and presses.		
A MW 4.1.02	Stationary	Identify safety features of basic stationary power machines such as grinders, buffers, sanders, band saws, chop saws, shears, and presses.		
A MW 4.1.03	Stationary	Observe safety video and demonstration.		
A MW 4.2.01	Portable	Identify basic portable power machines such as grinders, buffers, sanders, band saws, shears, and drills.		
A MW 4.2.02	Portable	Identify safety features of basic portable power machines such as grinders, buffers, sanders, band saws, shears, and drills.		
A MW 4.2.03	Portable	Observe safety video and demonstration.		
A MW 4.3.01	Hand Tools	Identify basic hand tools such as pliers, files, chisels, punches, hard face and soft face, hammers, hacksaw, vises, and brushes.		
A MW 4.3.02	Hand Tools	Identify safety features of basic hand tools such as pliers, files, chisels, punches, hard face and soft face, hammers, hacksaw, vises, and brushes.		
A MW 5	**WELDING TECHNIQUES**			
A MW 5.1.01	Safety	Observe a safety video and/or demonstration.		
A MW 5.1.02	Safety	List personal protective safety equipment.		
A MW 5.2.01	Oxy-Fuel	List oxy-fuel welding and cutting equipment used to complete assigned projects.		
A MW 5.2.02	Oxy-Fuel	Identify the various types of gas cylinders.		
A MW 5.3.01	Shielded Metal Arc	List SMAW equipment.		
A MW 5.3.02	Shielded Metal Arc	Observe SMAW video and/or demonstration.		
A MW 5.4.01	Gas Metal Arc	List GMAW / FCAW equipment.		
A MW 5.4.02	Gas Metal Arc	Observe GMAW video and/or demonstration.		
A MW 5.5.01	Gas Tungsten Arc	List GTAW equipment.		
A MW 5.5.02	Gas Tungsten Arc	Observe GTAW video and/or demonstration.		
A MW 5.6.01	Plasma Arc	List plasma arc cutting equipment.		
A MW 5.6.02	Plasma Arc	Observe a plasma arc cutting demonstration.		
A MW 6	**SHEET METAL**			
A MW 6.1.01	Patterns	Identify sheet metal layout tools.		
A MW 6.1.02	Patterns	Observe a demonstration(s).		
A MW 6.2.01	Forming	Identify the various types of shears, breaks, and folders.		
A MW 6.3.01	Fastening	Identify types of rivets and seams.		
A MW 7	**MACHINE TOOLS**			
A MW 7.1.01	Cutting Lathe	List the basic components of lathes.		
A MW 7.1.02	Cutting Lathe	List the different cutting tools.		
A MW 7.1.03	Cutting Lathe	Observe a demonstration(s).		
A MW 7.2.01	Milling	List the components of the vertical milling machine.		
A MW 7.2.02	Milling	List the different cutting tools used in the milling process.		
A MW 7.3.01	Drill Press	List the components of the drill press.		
A MW 7.3.02	Drill Press	Observe demonstration.		
A MW 8	**EMPLOYABILITY SKILLS**			
A MW 8.1.01	Problem Solving	Identify the basic steps in the problem-solving process.		
A MW 8.1.02	Problem Solving	Identify alternative solutions to solve a problem.		
A MW 8.1.03	Problem Solving	Identify the basic components of an action plan.		

Identifier	**Poplar - Apprentice - Metal Working**		Introduced	Completed
A MW 8.2.01	Critical Thinking	State the importance of critical thinking in identifying, analyzing, and solving a metalworking problem.		
A MW 8.2.02	Critical Thinking	Identify the essential steps of critical thinking.		
A MW 8.2.03	Critical Thinking	Define emotional and logical thinking.		
A MW 8.2.04	Critical Thinking	Identify the difference between opinions and statements of fact.		
A MW 8.3.01	Speak, Write, Listen	Define communications.		
A MW 8.3.02	Speak, Write, Listen	Explain the benefits of effective communication in the metalworking trade.		
A MW 8.3.03	Speak, Write, Listen	Explain how cultural and physical diversity affect communication.		
A MW 8.3.04	Speak, Write, Listen	Identify applicable medium for conveying messages.		
A MW 8.4.01	Technology	Recognize technology used in the metalworking trade.		
A MW 8.4.02	Technology	Use an Internet browser to locate specific Websites related to metalworking trades.		
A MW 8.5.01	Leadership and Teamwork	Explain the importance of groups.		
A MW 8.5.02	Leadership and Teamwork	Explain how to organize groups.		
A MW 8.5.03	Leadership and Teamwork	Wear appropriate attire.		
A MW 8.6.01	Ethics	List the important ethics in the workplace.		
A MW 8.6.02	Ethics	Meet attendance standards.		
A MW 8.6.03	Ethics	Describe an organized workplace.		
A MW 8.6.04	Ethics	Identify appropriate responses to unethical actions.		
A MW 8.7.01	Workplace	List effective time management skills.		
A MW 8.7.02	Workplace	Use technology to complete assignments.		
A MW 8.7.03	Workplace	Utilize materials, tools, and processes to complete a task related to a career selection.		
A MW 8.7.04	Workplace	Read and follow instructions from manuals on the use and care of materials, tools, and equipment.		
A MW 8.7.05	Workplace	Maintain a clean, organized, and safe job site.		
A MW 8.7.06	Workplace	Identify traits needed for cooperation and leadership in a team at school or in a workplace setting.		
A MW 8.7.07	Workplace	Identify the material resources and space requirements needed to complete an assignment.		
A MW 8.8.01	Career	Locate employment opportunities.		
A MW 8.8.02	Career	Identify job requirements for entry-level positions in the metalworking industry.		
A MW 8.8.03	Career	Identify general conditions for employment.		
A MW 8.8.04	Career	Identify educational/training requirements for related metalworking fields.		
A MW 8.8.05	Career	Identify the elements of goal setting.		
A MW 8.8.06	Career	Identify metalworking related careers.		
A MW 8.8.07	Career	Describe essential job interview skills.		
A MW 8.8.08	Career	Identify the components of a career portfolio.		
A MW 8.9.01	Retention	Describe the importance of a portfolio.		
A MW 8.9.02	Retention	Identify options for lifelong learning.		
A MW 8.9.03	Retention	Identify interpersonal skills needed for job retention.		
A MW 8.9.04	Retention	Identify jobs with opportunity for advancement.		
A MW 8.9.05	Retention	Describe the importance of career planning.		

Identifier	Poplar - Journeyman - Metal Working		Introduced	Completed
J MW 1	**SAFETY AND EQUIPMENT**			
J MW 1.1.01	General Rules	Pass safety test.		
J MW 1.1.02	General Rules	Identify and utilize proper storage for flammables.		
J MW 1.1.03	General Rules	Identify ventilation hazards and take corrective action.		
J MW 1.1.04	General Rules	Demonstrate the ability to keep a clean, orderly, and safe work area.		
J MW 1.1.05	General Rules	Demonstrate safe use of personal protective equipment.		
J MW 1.1.06	General Rules	Demonstrate safe use of machines, tools, and equipment.		
J MW 1.1.07	General Rules	Portray safe behaviors/attitudes while in the working environment.		
J MW 1.1.08	General Rules	Explain proper steps in reporting an injury/accident or emergency.		
J MW 1.1.09	General Rules	Demonstrate proper lifting techniques.		
J MW 1.1.10	General Rules	Identify and use hearing protection when needed.		
J MW 1.1.11	General Rules	Explain the purpose of OSHA.		
J MW 1.1.12	General Rules	Demonstrate the safe handling of compressed gases under the direct supervision of the instructor.		
J MW 1.2.01	Fire Rules	Describe the use of fire extinguishers / blankets.		
J MW 1.2.02	Fire Rules	Discuss the various types of fires Class A, B, C and D.		
J MW 1.2.03	Fire Rules	Demonstrate fire evacuation procedures.		
J MW 1.2.04	Fire Rules	Discuss and list potential fire hazards related to metalworking.		
J MW 1.2.05	Fire Rules	Demonstrate use of ventilation system controls in the metalworking lab.		
J MW 1.2.06	Fire Rules	Demonstrate proper storage of flammable materials.		
J MW 2	**MEASUREMENT AND LAYOUT**			
J MW 2.1.01	Measuring	Demonstrate the use of semi-precision measuring devices to 1/64".		
J MW 2.1.02	Measuring	Demonstrate the use of precision measuring devices to include micrometers and vernier calipers to 0.001".		
J MW 2.2.01	Layout	Demonstrate use of a combination square set, dividers, scratch awls, layout dye, soap stone, framing square, levels, trammel points and center punch.		
J MW 2.2.02	Layout	Demonstrate use of bar and c-clamps, jigs, and fixtures.		
J MW 2.2.03	Layout	Layout basic shapes and angles.		
J MW 2.3.01	Drawings	Develop a paper pattern as it applies to a sheet metal project.		
J MW 2.3.02	Drawings	Interpret symbols as they apply to working drawings.		
J MW 2.3.03	Drawings	Use orthographic projections to complete a working drawing.		
J MW 2.4.01	Mathematics	Apply math solutions using whole numbers, fractions, and decimals as they relate to metalworking lab projects.		
J MW 2.4.02	Mathematics	Solve mathematical problems using handbooks, tables, charts, and graphs.		
J MW 3	**METALLURGY**			
J MW 3.1.01	Types	Perform a spark test to determine ferrous or non-ferrous metals.		
J MW 3.1.02	Types	Identify metals such as steel, cast iron, aluminum, stainless steel, copper, brass, and zinc.		
J MW 3.1.03	Types	Define properties used to identify common metals (i.e., tensile strength, hardness, malleability, ductility).		
J MW 3.1.04	Types	List the five most common shapes of metal.		
J MW 3.1.05	Types	Identify thickness by using a wire gauge.		
J MW 3.2.01	Hardening/ Annealing	Demonstrate the hardening process.		
J MW 3.2.02	Hardening/ Annealing	Demonstrate the annealing process.		
J MW 3.2.03	Hardening/ Annealing	Demonstrate safe methods of handling hot metals.		
J MW 3.3.01	Heating/ Cooling	Describe expansion and contraction as a result of heating and cooling metals.		
J MW 3.3.02	Heating/ Cooling	Demonstrate safe methods of handling hot metals.		
J MW 4	**TOOLS AND MACHINES**			
J MW 4.1.01	Stationary	Demonstrate safe work practices for stationary power machines, including but not limited to: grinders, buffers, sanders, band saws, chop saws, shears, and presses.		
J MW 4.2.01	Portable	Demonstrate safe work practices for portable power machines, including but not limited to: grinders, buffers, sanders, band saws, shears, and drills.		
J MW 4.3.01	Hand Tools	Demonstrate safe work practices for hand tools, including but not limited to: pliers, files, chisels, punches, hard face and soft face hammers, hacksaw, vises, and brushes.		
J MW 5	**WELDING TECHNIQUES**			
J MW 5.1.01	Safety	Identify and list personal safety equipment in the metalworking lab.		
J MW 5.1.02	Safety	Demonstrate appropriate use of personal safety equipment necessary to complete assigned projects.		
J MW 5.1.03	Safety	Demonstrate the proper use of ventilation.		
J MW 5.1.04	Safety	Demonstrate the proper use of personal respiration equipment.		
J MW 5.2.01	Oxy-Fuel	Identify, select, and set-up oxy-fuel welding and cutting equipment.		
J MW 5.2.02	Oxy-Fuel	Select and safely operate oxy-fuel welding and cutting equipment used to complete assigned projects.		
J MW 5.2.03	Oxy-Fuel	Layout, cut, and fit materials (such as pipe, plate, and structural shapes).		
J MW 5.2.04	Oxy-Fuel	Identify safe handling procedures of cylinders according to OSHA standards.		
J MW 5.2.05	Oxy-Fuel	Demonstrate proper methods of cleaning and care of oxy-fuel welding and cutting tips.		
J MW 5.2.06	Oxy-Fuel	Identify, select, and use proper filler materials.		
J MW 5.3.01	Shielded Metal Arc	Identify, select, and set-up SMAW equipment.		

Identifier	Poplar - Journeyman - Metal Working		Introduced	Completed
J MW 5.3.02	Shielded Metal Arc	Select and safely operate SMAW equipment used to complete assigned projects.		
J MW 5.3.03	Shielded Metal Arc	Select appropriate electrodes to complete assignments.		
J MW 5.4.01	Gas Metal Arc	Identify, select, and set-up GMAW equipment.		
J MW 5.4.02	Gas Metal Arc	Select and safely operate GMAW equipment used to complete assigned projects.		
J MW 5.4.03	Gas Metal Arc	Select appropriate wire and gas to complete assignments.		
J MW 5.4.04	Gas Metal Arc	Select, set-up, and safely operate Flux Core Arc Welding (FCAW) equipment.		
J MW 5.5.01	Gas Tungsten Arc	Identify, select, and set-up GTAW equipment.		
J MW 5.5.02	Gas Tungsten Arc	Select and safely operate GTAW equipment used to complete assigned projects.		
J MW 5.5.03	Gas Tungsten Arc	Select appropriate electrodes and filler materials to complete assignments.		
J MW 5.5.04	Gas Tungsten Arc	Select appropriate gas to complete GTAW assignments.		
J MW 5.6.01	Plasma Arc	Set-up and safely operate plasma arc cutting equipment used to complete assigned projects.		
J MW 5.6.02	Plasma Arc	Use appropriate ventilation or personal respirator to complete assignments.		
J MW 6	**SHEET METAL**			
J MW 6.1.01	Patterns	Construct paper patterns for a simple sheet metal project.		
J MW 6.1.02	Patterns	Layout directly on metal using dyes, scribes, dividers, trammel points, and edge gauges.		
J MW 6.1.03	Patterns	Identify edges and seams used in typical sheet metal layout.		
J MW 6.1.04	Patterns	Demonstrate the use of a sheet metal gauge.		
J MW 6.2.01	Forming	Form sheet metal using a box and pan break, bar folder, slip roll, and a rotary machine for an assigned project.		
J MW 6.2.02	Forming	Cut sheet metal using foot shears, hand shears, Beverly shears, and Whitney punches for an assigned project.		
J MW 6.2.03	Forming	Use appropriate cutting and folding techniques to complete assigned project.		
J MW 6.3.01	Fastening	Demonstrate the ability to join sheet metal together with rivets, resistance welding, and seaming techniques.		
J MW 6.3.02	Fastening	Identify and list the various sheet metal fastening techniques.		
J MW 7	**MACHINE TOOLS**			
J MW 7.1.01	Cutting Lathe	Identify basic components of lathes.		
J MW 7.1.02	Cutting Lathe	Use charts and tables to determine cutting, drilling, and knurling speeds.		
J MW 7.1.03	Cutting Lathe	Select proper cutting tool based on job requirements.		
J MW 7.1.04	Cutting Lathe	Demonstrate the ability to safely face, straight turn, shoulder turn, center drill, and knurl a work piece.		
J MW 7.1.05	Cutting Lathe	Demonstrate ability to safely sharpen cutting tools.		
J MW 7.2.01	Milling	Identify all of the components of vertical milling machines.		
J MW 7.2.02	Milling	Demonstrate the ability to safely apply work-securing devices.		
J MW 7.2.03	Milling	Use charts and tables to determine feeds and speeds.		
J MW 7.2.04	Milling	Select appropriate cutting tool based on assigned project.		
J MW 7.2.05	Milling	Demonstrate the ability to safely mill to a specified size.		
J MW 7.3.01	Drill Press	Identify components of the drill press.		
J MW 7.3.02	Drill Press	Set up and securely clamp a work piece to the drill press table.		
J MW 7.3.03	Drill Press	Use charts and tables to determine cutting speeds and feeds for drilling a specific medium.		
J MW 7.3.04	Drill Press	Select appropriate drill type based on job requirements.		
J MW 7.3.05	Drill Press	Use bench grinder to sharpen drill bits.		
J MW 7.3.06	Drill Press	Demonstrate proper dress and observe safe operating procedures while using the drill press.		
J MW 8	**EMPLOYABILITY SKILLS**			
J MW 8.1.01	Problem Solving	Solve a metalworking problem using the appropriate steps in the problem-solving process.		
J MW 8.1.02	Problem Solving	Demonstrate brainstorming techniques.		
J MW 8.1.03	Problem Solving	Examine and explain the advantages and disadvantages of alternative solutions to one or more problems.		
J MW 8.1.04	Problem Solving	Create an action plan based upon a solution to a metalworking problem.		
J MW 8.1.05	Problem Solving	Identify the benefits of solving a metalworking problem.		
J MW 8.2.01	Critical Thinking	Identify and explain the essential elements of the critical-thinking process as related to the metalworking trades.		
J MW 8.2.02	Critical Thinking	Demonstrate critical-thinking skills necessary in the metalworking trades.		
J MW 8.2.03	Critical Thinking	Explain how emotional thinking and logical thinking affect decision making in the metalworking trades.		
J MW 8.2.04	Critical Thinking	Explain the difference between reliable and unreliable observations and statements of fact.		
J MW 8.2.05	Critical Thinking	Recognize patterns or relationships through observation and discovery.		
J MW 8.3.01	Speak, Write, Listen	Explain the benefits of effective communication skills in the workplace.		
J MW 8.3.02	Speak, Write, Listen	Effectively interpret and respond to verbal and nonverbal messages.		
J MW 8.3.03	Speak, Write, Listen	Demonstrate proper telephone etiquette.		
J MW 8.3.04	Speak, Write, Listen	Effectively communicate thoughts, ideas and information in writing.		
J MW 8.3.05	Speak, Write, Listen	Organize ideas and communicate orally; is able to effectively demonstrate job skills to others.		
J MW 8.3.06	Speak, Write, Listen	Locate, understand and interpret written information in documents such as manuals, graphs and schedules.		

Identifier	Poplar - Journeyman - Metal Working		Introduced	Completed
J MW 8.3.07	Speak, Write, Listen	Select and utilize an appropriate medium for conveying messages with dignity and respect.		
J MW 8.3.08	Speak, Write, Listen	Organize information into the appropriate format in accordance with standard practices, which includes prewriting, drafting, proofreading, editing/revising, and preparing final copy.		
J MW 8.3.09	Speak, Write, Listen	Demonstrate sensitivity to cultural diversity in communication.		
J MW 8.3.10	Speak, Write, Listen	Identify common communication barriers and methods for improving communication.		
J MW 8.4.01	Technology	Demonstrate ability to utilize basic keyboarding techniques.		
J MW 8.4.02	Technology	Demonstrate ability to utilize other input devices.		
J MW 8.4.03	Technology	Demonstrate ability to utilize various electronic research methods.		
J MW 8.4.04	Technology	Demonstrate knowledge of the basic technology systems currently available and how they apply to your field (i.e., word processing, spreadsheets, multimedia applications and databases).		
J MW 8.4.05	Technology	Investigate and explain the use, benefits, and costs of technological developments in the workplace and school.		
J MW 8.4.06	Technology	Identify and demonstrate the appropriate use of technology to enhance the efficiency of the workplace and school.		
J MW 8.4.07	Technology	Demonstrate routine maintenance and repair of technological equipment.		
J MW 8.5.01	Leadership and Teamwork	Work cooperatively with others when given group project.		
J MW 8.5.02	Leadership and Teamwork	Explain traits necessary to effectively lead and influence individuals and groups.		
J MW 8.5.03	Leadership and Teamwork	Demonstrate appropriate attitudes and behaviors for effective leadership.		
J MW 8.5.04	Leadership and Teamwork	Demonstrate respect for team members, team processes, and team goals.		
J MW 8.5.05	Leadership and Teamwork	Participate in the implementation of a group's decision and evaluate the results.		
J MW 8.5.06	Leadership and Teamwork	Demonstrate the qualities of an effective leader and team member.		
J MW 8.5.07	Leadership and Teamwork	Describe the importance of a proper dress code.		
J MW 8.6.01	Ethics	Develop personal work ethics through work experience.		
J MW 8.6.02	Ethics	Describe the importance of ethics practiced in the workplace.		
J MW 8.6.03	Ethics	Demonstrate regular attendance, promptness, and the willingness to follow instructions and complete an assigned task.		
J MW 8.6.04	Ethics	Demonstrate appropriate personal and professional attitudes and behaviors.		
J MW 8.6.05	Ethics	Maintain a safe, clean, and organized work area.		
J MW 8.6.06	Ethics	Demonstrate awareness of legal responsibilities related to individual performance, safety, and customer satisfaction.		
J MW 8.6.07	Ethics	Demonstrate knowledge of various types of harassment.		
J MW 8.7.01	Workplace	Develop a time schedule and prioritized task list to complete a job assignment.		
J MW 8.7.02	Workplace	Identify the resources needed to complete a job assignment.		
J MW 8.7.03	Workplace	Organize the material resources and space requirements needed to complete a job assignment.		
J MW 8.7.04	Workplace	Effectively use technology to complete a job assignment.		
J MW 8.7.05	Workplace	Demonstrate cooperation and leadership as a team at school or in a workplace setting.		
J MW 8.7.06	Workplace	Use the basic components of effective time management.		
J MW 8.7.07	Workplace	Recognize the need for management skills in the workplace with regard to stress, anger management, and substance abuse.		
J MW 8.8.01	Career	Prepare a job application.		
J MW 8.8.02	Career	Prepare a personal resume.		
J MW 8.8.03	Career	Complete a personal aptitude and interest inventory.		
J MW 8.8.04	Career	Participate in a mock job interview.		
J MW 8.8.05	Career	Establish short-term career goals.		
J MW 8.8.06	Career	Establish long-term career goals.		
J MW 8.8.07	Career	Use the Montana Career Information System (CIS) or a similar computer-based program to research careers in a chosen field.		
J MW 8.8.08	Career	Participate in an organized job-shadowing activity.		
J MW 8.8.09	Career	Participate in a community service project.		
J MW 8.8.10	Career	Construct a career portfolio.		
J MW 8.9.01	Retention	Maintain an employment/career portfolio.		
J MW 8.9.02	Retention	Explain strategies for balancing work and family roles.		
J MW 8.9.03	Retention	Demonstrate understanding of the need for lifelong learning in a rapidly changing job market.		
J MW 8.9.04	Retention	Describe strategies to maintain employment in the face of job reductions.		
J MW 8.9.05	Retention	Develop long-term career planning strategies.		
J MW 8.9.06	Retention	Describe various educational options needed for job retention.		
J MW 8.9.07	Retention	Model sound workplace ethics, such as loyalty, punctuality, and initiative.		
J MW 8.9.08	Retention	Demonstrate interpersonal skills needed for job retention.		

Identifier	Poplar - Master - Metal Working		Introduced	Completed
M MW 1	**SAFETY AND EQUIPMENT**			
M MW 1.1.01	General Rules	Customize or develop a lab safety program.		
M MW 1.1.02	General Rules	Obtains certification in First Aid/CPR.		
M MW 1.1.03	General Rules	Provide a lab safety demonstration to students.		
M MW 1.2.01	Fire Rules	Create a fire safety program.		
M MW 2	**MEASUREMENT AND LAYOUT**			
M MW 2.1.01	Measuring	Demonstrate use of metric measuring devices to one millimeter.		
M MW 2.1.02	Measuring	Demonstrate appropriate measuring techniques to peers.		
M MW 2.2.01	Layout	Layout complex shapes and angles other than 45° and 90°.		
M MW 2.3.01	Drawings	Draw orthographic projections with an isometric or oblique view.		
M MW 2.3.02	Drawings	Identify twenty blueprint acronyms and symbols.		
M MW 2.4.01	Mathematics	Apply math solutions in the metalworking lab using geometry.		
M MW 3	**METALLURGY**			
M MW 3.1.01	Types	Demonstrate magnet and file test.		
M MW 3.1.02	Types	Identify characteristics of metal alloys.		
M MW 3.2.01	Hardening/ Annealing	Demonstrate the tempering process.		
M MW 3.3.01	Heating/ Cooling	Demonstrate how metal is deformed during heating and cooling.		
M MW 4	**TOOLS AND MACHINES**			
M MW 4.1.01	Stationary	Perform non-electrical preventative maintenance on machinery to comply with safety requirements.		
M MW 4.2.01	Portable	Perform non-electrical preventative maintenance on portable power machines to comply with safety requirements.		
M MW 4.3.01	Hand Tools	Perform non-electrical preventative maintenance on chisels and punches to comply with safety requirements.		
M MW 5	**WELDING TECHNIQUES**			
M MW 5.1.01	Safety	Clean and maintain personal protective safety gear.		
M MW 5.1.02	Safety	Develop a personal safety checklist.		
M MW 5.2.01	Oxy-Fuel	Demonstrate the safe handling and storage of compressed gas cylinders under the direct supervision of the instructor.		
M MW 5.2.02	Oxy-Fuel	Demonstrate piercing, slotting, and bevel cutting techniques.		
M MW 5.2.03	Oxy-Fuel	Complete a NIOSH safety check list.		
M MW 5.3.01	Shielded Metal Arc	Demonstrate appropriate SMAW techniques to peers.		
M MW 5.3.02	Shielded Metal Arc	Identify SMAW problems, their causes, and take corrective action.		
M MW 5.4.01	Gas Metal Arc	Demonstrate appropriate GMAW techniques to peers.		
M MW 5.4.02	Gas Metal Arc	Identify GMAW problems, their causes, and take corrective action.		
M MW 5.5.01	Gas Tungsten Arc	Demonstrate appropriate GTAW techniques to peers.		
M MW 5.5.02	Gas Tungsten Arc	Identify GTAW problems, their causes, and take corrective action.		
M MW 5.5.03	Gas Tungsten Arc	Demonstrate ability to weld aluminum.		
M MW 5.6.01	Plasma Arc	Demonstrate appropriate plasma arc cutting techniques to peers.		
M MW 5.6.02	Plasma Arc	Identify plasma arc cutting problems, their causes, and take corrective action.		
M MW 6	**SHEET METAL**			
M MW 6.1.01	Patterns	Demonstrate the use of radial line, parallel line, and triangulation development.		
M MW 6.1.02	Patterns	Demonstrate how to find true length lines.		
M MW 6.2.01	Forming	Demonstrate the ability to make a Pittsburg seam by hand.		
M MW 6.2.02	Forming	Perform basic preventative non-electrical maintenance on machines and tools to comply with safety requirements for optimal performance levels.		
M MW 6.3.01	Fastening	Join metal together using a Pittsburg seam.		
M MW 6.3.02	Fastening	Join metal together using low temperature solder.		
M MW 7	**MACHINE TOOLS**			
M MW 7.1.01	Cutting Lathe	Demonstrate the ability to turn a taper using one of the three taper cutting techniques.		
M MW 7.1.02	Cutting Lathe	Demonstrate the ability to cut threads.		
M MW 7.1.03	Cutting Lathe	Demonstrate the ability to center a tailstock.		
M MW 7.1.04	Cutting Lathe	Demonstrate the ability to indicate a work piece in a four-jaw chuck.		
M MW 7.1.05	Cutting Lathe	Demonstrate the ability to use a boring bar.		
M MW 7.2.01	Milling	Locate an edge with edge finder.		
M MW 7.2.02	Milling	Mill an external radius with a rotary table.		
M MW 7.2.03	Milling	Mill a work piece using simple indexing operation.		
M MW 7.3.01	Drill Press	Demonstrate the ability to large hole drill.		
M MW 7.3.02	Drill Press	Demonstrate the ability to drill to depth.		
M MW 8	**EMPLOYABILITY SKILLS**			
M MW 8.1.01	Problem Solving	Develop methods to analyze the advantages and disadvantages of alternative solutions.		
M MW 8.1.02	Problem Solving	Devise an action plan for a metalworking problem based on information gained through research of alternative solutions and implement in a group decision/action.		
M MW 8.2.01	Critical Thinking	Analyze how critical-thinking skills affect work performance.		
M MW 8.2.02	Critical Thinking	Formulate, implement, and evaluate an action plan.		
M MW 8.2.03	Critical Thinking	Demonstrate the skills necessary to identify, analyze, and solve a design problem.		
M MW 8.3.01	Speak, Write, Listen	Identify, research, prepare and deliver a metalworking related presentation.		

Identifier	**Poplar - Master - Metal Working**		Introduced	Completed
M MW 8.3.02	Speak, Write, Listen	Prepare technical documents relating to bill of materials, blueprints, etc.		
M MW 8.3.03	Speak, Write, Listen	Present and defend a metalworking procedure.		
M MW 8.3.04	Speak, Write, Listen	Compete in a SkillsUSA job skill demonstration and/or public speaking contest.		
M MW 8.4.01	Technology	Critique the use, benefits and cost of technologically advanced equipment in the metalworking trade.		
M MW 8.4.02	Technology	Analyze the impact of technological changes on one or more aspects of metalworking trades by researching current literature.		
M MW 8.4.03	Technology	Compete in a state-level SkillsUSA metalworking contest.		
M MW 8.5.01	Leadership and Teamwork	Analyze the stages of group development.		
M MW 8.5.02	Leadership and Teamwork	Demonstrate leadership ability within a group or team.		
M MW 8.5.03	Leadership and Teamwork	Compromise and/or build consensus within a group and summarize the decision of the group while maintaining respect for diverse viewpoints.		
M MW 8.5.04	Leadership and Teamwork	Complete levels 1-3 of the SkillsUSA Professional Development Program.		
M MW 8.5.05	Leadership and Teamwork	Campaign for a local SkillsUSA chapter office.		
M MW 8.5.06	Leadership and Teamwork	Serve as a committee chair in a local SkillsUSA chapter.		
M MW 8.6.01	Ethics	Demonstrate time-management skills and cost-effective practices.		
M MW 8.7.01	Workplace	Recognize the individual roles of team members, delegate tasks, and provide feedback on performance.		
M MW 8.7.02	Workplace	Acknowledge and utilize the skills, abilities, and input of all members of a team.		
M MW 8.7.03	Workplace	Develop an action plan to accomplish tasks within a given time frame.		
M MW 8.8.01	Career	Develop a community service or job shadowing project.		
M MW 8.8.02	Career	Develop an education/training plan to fulfill long-term career goals.		
M MW 8.8.03	Career	Define advantages and disadvantages of self-employment or working for various sizes and types of businesses.		
M MW 8.8.04	Career	Critique results of a job interview.		
M MW 8.8.05	Career	Develop a proposal for an organized community service project.		
M MW 8.8.06	Career	Compete in a state level SkillsUSA job interview contest.		
M MW 8.9.01	Retention	Maintain an electronic portfolio.		
M MW 8.9.02	Retention	Create a plan for lifelong learning.		
M MW 8.9.03	Retention	Create a presentation illustrating interpersonal skills needed for job retention.		
M MW 8.9.04	Retention	Adapt new knowledge and skills in changing situations.		
M MW 8.9.05	Retention	Analyze how work life is affected by families and how families are affected by work life.		