

**BILLINGS PUBLIC SCHOOLS  
METALS MANUFACTURING  
Adoption Date March 31, 2001**

**MISSION STATEMENT**

The Career Center is dedicated to providing Billings area students with an education that explores and enhances vocational and academic skills to promote critical thinking, self-discipline, and responsible citizenship.

**BELIEF STATEMENTS**

1. We believe in an environment that fosters mutual respect and dignity.
2. We believe that students and faculty should maintain pride in their work to improve their performance.
3. We believe that academic skills lay the foundation for critical thinking, problem solving, mathematical and communication skills.
4. We believe in the integration of academic and career areas.
5. We believe in the importance of current technology and its impact t on the future.
6. We believe that students who are encouraged to set goals will gain confidence in their potential and ability to contribute to society.
7. We believe mutual support between school and community is an integral part of a students learning experience.

**PHILOSOPHY**

This course is designed to provide students with basic knowledge in the welding and metals manufacturing areas. It is our goal to expose students to as many appropriate applications and techniques in the manufacturing domain so they can become successful productive citizens upon graduating from high school.

A strong emphasis will be placed on helping students develop appropriate work skills and ethics as well as guiding them in a direction of interest for their future. Students will have available to them information concerning school to work opportunities, articulation agreements between the Career Center and various Post Secondary Schools as well as have the opportunity to listen to experts and professionals from the manufacturing areas.

**LEARNING DOMAINS**

- I. Students will demonstrate an understanding of basic manufacturing and welding skills.**
- II. Students will demonstrate an understanding of appropriate work place skills.**
- III. The learner will apply basic skills in math and measuring to complete various required tasks.**
- IV. Students will demonstrate a basic understanding of the operation of the metal working lathe.**
- V. The learner will apply basic skills in manufacturing techniques for appropriate applications.**
- VI. Students will apply acquired skills to an experience that applies to school to careers.**

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**Learners Objectives**

- I. Students will demonstrate an understanding of basic manufacturing and welding skills.**
- 1. The learner will complete all safety tests that involve welding and manufacturing processes. (E)**
    - a. Complete written tests, demonstrate proficiency, and report (orally) all aspects of safety tool and machine operations.**
    - b. Discuss and report to a group of peers various safety procedures.**
  - 2. The learner will demonstrate welding proficiency in the arc welding areas. (E)**
    - a. Identify the properties of various welding electrodes (welding rods).**
    - b. Understand the appropriate machine settings for various metal thicknesses.**
    - c. Utilize correct positioning of 6013 & 6011 & 7018 welding electrodes.**
    - d. Identify correct weldments by visual inspection as well as tensile strength tests.**
    - e. Complete a series of weldments consisting of a multitude of positions and types.**
    - f. Complete a weekly test that requires proficiency of previous weldments.**
  - 3. The learner will demonstrate knowledge and an understanding of Oxy-Acetylene welding procedures. (E)**
    - a. Identify all components related to the cutting process.**
    - b. Demonstrate an understanding of safety procedures.**
    - c. Set regulators to appropriate PSI for various cutting applications.**
    - d. Understand positioning and travel speeds necessary to make proper cuts.**
    - e. Demonstrate the appropriate shut down methods for the Oxy-Acetylene tank system.**
  - 4. The learner will demonstrate an understanding of the appropriate methods for welding with an Oxy-Acetylene system. (E)**
    - a. Identify all components of the welding system.**
    - b. Demonstrate proper start up and shut down procedures.**
    - c. Identify the difference between an oxidized, carbonized and neutral flames to insure proper penetration.**
    - d. Complete a set of required weldments to demonstrate proficiency.**
    - e. Complete a weekly test based on previous experiences.**
    - f. Follow basic blue readings.**
  - 5. The learner will demonstrate a basic understanding of the appropriate methods for MIG welding. (E)**
    - a. View an instructional video concerning safety and proper MIG welding techniques.**
    - b. Participate in a instructor based demonstration concerning proper techniques.**
    - c. Understand how the MIG welder operates by setting appropriate gas PSI, wire speeds and correct amperage settings.**
    - d. Demonstrate proficiency in basic MIG welding processes by completing required weldments.**

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**I. Students will demonstrate an understanding of basic manufacturing and welding skills. (cont.)**

- 5. The learner will demonstrate a basic understanding of the appropriate methods for MIG welding. (E)**
  - e. Identify correct and appropriate weldments by sight which would include weave width and penetration of welds.**
  - f. Demonstrate proper and safe machine start up and shut down procedures.**
  - g. Complete a battery of weldments in the flat, vertical and horizontal positions.**
  - h. Complete a weekly test that demonstrates proficiencies in weldments completed during the week.**
  - i. Follow basic blue print readings.**
- 6. The learner will apply basic welding skills to a variety of learning activities and required projects. (R)**
  - a. Design basic blue prints and plans to specifications.
  - b. Estimate costs and amounts of materials.
  - c. Follow basic print readings to meet required specifications.
  - d. Utilize a variety of welding and cutting techniques to meet required specifications.
  - e. Complete basic projects that require a collective knowledge base concerning completion of prerequisite learning activities.
  - f. Understand proper procedures for completing a project such as grinding, sanding, cleaning, priming and painting.
- 7. The learner will demonstrate basic proficiencies. (R)**
  - a. Complete basic required and self designed projects.

**II. Students will demonstrate an understanding of appropriate work place skills. (I)**

- 8. The learner will demonstrate proper safe procedures while working with tools/apparatuses/equipment/systems/and materials. (E)**
  - a. Follow all safety rules and procedures.**
  - b. Maintain a safe, clean work environment.**
  - c. Conduct shop activities and equipment operations in a safe manner.**
- 9. The learner will demonstrate an understanding concerning OSHA, state and federal agency safety procedures and applications.**
  - a. Listen to guest speakers.**
  - b. View videos on safety procedures.**
  - c. Use internet applications for said safety regulations.**
- 10. The learner will display an understanding and appreciation for dignity and worth of honest labor. (I)**
  - a. Form and understand an appreciation for behaviors, attitudes, and work ethics needed in the real world of work.
  - b. Develop personal qualities, individual responsibilities, self esteem, self management, sociability and integrity.

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**II. Students will demonstrate an understanding of appropriate work place skills. (I) (cont.)**

10. The learner will display an understanding and appreciation for dignity and worth of honest labor. (I)
  - c. Understand the importance of time allocation, materials, and quality of workmanship.
  - d. Consistently select, use and evaluate appropriate work place skills for learning, trouble shooting and productivity.
11. The learner will explore various aspects of workplace readiness. (I)
  - a. Understand that skills developed in academic and occupational programs relate to career goals.
  - b. Demonstrate critical and analytical thinking skills.
  - c. Discuss and demonstrate strategies to overcome bias and stereotyping in the work place.
  - d. Evaluate and adjust personal career goals.
12. The learner will develop an understanding of the importance of work place competencies. (R)
  - a. Discuss the importance of resources: identify and organize plans and allocate resources.
  - b. Discuss the importance of interpersonal skills while working with others.
  - c. Explore the importance of acquiring and using information.
  - d. Understand the importance of technology and its implications in the world of work.
  - e. Understand the importance of developing thinking skills that permits creativity, decision making, problem solving, and critical thinking skills.
  - f. Identify skills that promote negotiating, exercising leadership skills, working with diversity, teaching others new skills and participating as a team member.
  - g. Understand the importance of reading, writing, speaking, listening and knowing arithmetic and math skills.
  - h. Demonstrate the importance of problem solving and decision making by specifying goals and constraints generating alternatives.
13. The learner will develop an understanding of available options after High School. (I)
  - a. Discuss post-secondary education opportunities.
  - b. Understand articulation agreements available.
  - c. Listen to guest speakers.
  - d. Explore options via internet.
  - e. Participate in job shadowing and school to career alternatives.

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- III. The learner will apply basic mathematics to complete various tasks dealing with manufacturing applications. (E)**
- 13. The learner will understand the importance of learning to read various measuring devices.**
    - a. Read a tape measure to within 1/16” of an inch.**
    - b. Take a pre measuring test to determine strengths and weaknesses.**
    - c. Utilize a hands on approach to better understand fractions and decimals.**
    - d. Gain a better understanding of how to add and subtract simple fractions.**
    - e. Change fractions to decimals and decimals to fractions.**
  - 15. The learner will develop an understanding of basic geometry and how it applies to the manufacturing industries. (I)**
    - a. Utilize various tools of the trade.**
    - b. Apply basic geometry to figure angles, arches, and distances.**
  - 16. The learner will follow basic blue print readings. (I)**
    - a. Utilize various videos and text books related to print reading.**
    - b. Understand the importance of following a set of plans.**
    - c. Develop basic self design plans and blue prints.**
  - 17. The learner will calculate the costs of materials. (E)**
    - a. Figure the amount needed to complete a project.**
    - b. Communicate with suppliers and distributors.**
    - c. Utilize material for best cost effective purposes.**
    - d. Add the appropriate amount to develop an understanding of profit and loss margins.**
  - 18. The learner will develop an understanding of the essential requirements for being self employed.**
    - a. Discuss such things as overhead, taxes, workmans compensation requirements, and insurances.**
    - b. Listen to guest speakers.**
    - c. Explore via the internet requirements for loans and small business procedures.**
- IV. Students will demonstrate a basic understanding of the operation of the metal working lathe. (E)**
- 19. The learner will display an understanding of a manual metal lathe.**
    - a. Identify and realize all safety aspects of the working lathe.**
    - b. Define terms related to the machining of various types of metals.**
    - c. Identify all parts, components, and operational aspects of the lathe.**
    - d. Demonstrate proper and appropriate machine settings.**
    - e. Correctly manipulate all necessary machine parts to various turning operations.**
  - 20. The learner will demonstrate an understanding of grinding cutter bits. (R)**
    - a. View video on appropriate grinding methods.**
    - b. View instructor demonstrations.**
    - c. Identify appropriate angles for keenness and strength.**

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**IV. Students will demonstrate a basic understanding of the operation of the metal working lathe. (E) (cont.)**

20. The learner will demonstrate an understanding of grinding cutter bits. (R) (cont.)
  - d. Demonstrate an understanding concerning side and top rakes.
  - e. Use a blank bit to create a right and left hand cutting bit.
  - f. Demonstrate appropriate sharpening techniques.
21. The learner will apply proper machining techniques for locating, drilling, and countersinking centers in preparation for metal turning. (R)
  - a. View video on centering, drilling and countersinking.
  - b. View instructor demonstrations.
  - c. Use correct layout devices.
  - d. Marking, punching and chucking for centering applications.
22. The learner will demonstrate an understanding of how to turn between centers. (I)
  - a. View video on proper procedures.
  - b. Participate in instructor demonstrations.
  - c. Demonstrate correct mounting procedure.
  - d. Centering bit for accurate cutting.
  - e. Marking stock for correct safety distances.
  - f. Demonstrate rough and fine cutting procedures.
  - g. Turning a cylindrical piece of metal to various specifications.
  - h. Complete various required basic projects on the metal lathe.
- 23. The learner will demonstrate an understanding of the use for various measuring devices. (E)**
  - a. Use a machinist rule.**
  - b. Utilize a micrometer.**
  - c. Understand how to use various calipers.**
  - d. Calculate mathematically lengths, widths, and metal thicknesses.**
  - e. Understand the importance of tolerances and specifications.**
  - f. Matching turned metal pieces to required specifications.**

**V. The learner will apply acquired skills to more advanced manufacturing techniques and applications. (R)**

24. The learner will implement skills acquired through in class experiences to more challenging and difficult learning experiences.
  - a. Demonstrate safety proficiencies.
  - b. Complete and sharpen skills in welding areas.
  - c. Participate in more advanced team work projects.
  - d. Take on leadership roles.
  - e. Instruct fellow students.
  - f. Understand the importance of community and school partnerships.

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**V. The learner will apply acquired skills to more advanced manufacturing techniques and applications. (R) (cont.)**

25. The learner will participate in more advanced type projects that require the use of more intricate and advanced math skills.
  - a. Calculate costs of materials.
  - b. Realize time lines for completing requested jobs.
  - c. Understand the importance of customer satisfaction.
  - d. Communicate with community members.

**VI. Students will display an understanding and appreciation for the importance of preparing for Post Secondary School or employment. (I)**

26. The learner will investigate options and alternatives that are available after completing High School.
  - a. Know how social, organizational and technological systems and operate effectively for them.
  - b. Work with a variety of technologies.
  - c. Understand basic computations, use of basic numerical concepts such as whole numbers and percents in practical situations.