Unit 4: Soldering, Brazing and Welding

Content Area: **Industrial Technology**
Course(s): **Manufacturing Technology I**
Time Period: **1 marking period**
Length: **5 Weeks**
Status: **Published**

Unit Overview

SWBAT operate equipment to solder, braze or weld to assemble their projects.

Transfer

Students will be able to independently use their learning to...

Find jobs in the HVAC, Electronics or Welding Industry.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

The skills they are learning can lead to careers in the Welding, HVAC area.

Metals can be joined by soldering , brazing and welding.

Essential Questions

Students will keep considering...

Explain how soldering differs from brazing?

What is the difference between soldering and brazing equipment?

What type of conditions are required to produce a sound solder joint?

How are solders classified?

Why is flux necessary?

How do you tin a soldering iron?

Describe the basic weiding processes?

What are the basic parts of an oxyacetylene gas welding outfit?

What are the various types of weld joints?

How do you safely light, adjust oxyacetylene gas torch?

What is the difference between brazing and welding?

What is Shielded Metal arc welding process?

How do you select the proper welding rod for arc welding?

What type welding glass filter should be used for different type of welding?

What is harmful when arc welding?

Application of Knowledge and Skill

Students will be able to safely solder projects they have selected to work on.

Students will be able to safely perform brazing assignment welding a washer to a piece of pipe that will be used as an assessment.

Students will be able to safely braze projects together that they have selected to work on.

Students will be able to safely weld butt welds with oxy acetylene and arc welding for assessments.

Students will be able to safely oxy acetylene and arc welding projects together that they have selected to work on.

Students will know...

Students will know...

How to safely tin soldering iron and use flux to soft solder?

How to safely set up oxyacetylene welder to braze, weld and cut using torch and cutting torch.

How to select arc welding electrodes, arc welding current selection and weld assessment and weld projects.

Students will be skilled at...

Students will be skilled at...

Students will be skilled at performing a soft solder joint that holds metal together and is done correctly.

Students will be skilled at performing a brazing joint that holds 2 pieces of metal together and is done correctly.

Students will be skilled at performing a butt joint that holds 2 pieces of metal together and is done correctly with oxyacetylene welding.

Students will be skilled at performing a butt joint that holds 2 pieces of metal together and is done correctly with arc welding.

Students will be skilled at using soldering, brazing, arc welding to assemble projects that they have been assigned or selected.

Academic Vocabulary

Backhand welding, braze welding, brazing, capillary action, flux, forehand welding, fusion welding, gas weldin, oxyacetylene welding, weld pool, alternating current, arc welding, direct current, direct current electrode negative, direct current electrode positive, electrode, scratch method, shielded metal arc welding, stick welding, tap method.

Learning Goal 1

Students will be able to solder two pieces of metal together.

- Students will be able to solder two pieces of metal together.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
MANU.9-12.9.4.12.M.(1).6	Assess and select a variety of techniques and solutions to ensure safe production of products as well as safe and productive workplaces.
MANU.9-12.9.4.12.M.(2).6	Research the safe use of manufacturing process equipment in order to protect personal well-being in the work environment.
MANU.9-12.9.4.12.M.(3).5	Develop hands-on knowledge of equipment operation to identify maintenance needs and maximize performance.
MANU.9-12.9.4.12.M.(6).1	Evaluate procedures used to plan for safety in a new production process in order to ensure health, safety, and environmental well-being.
MANU.9-12.9.4.12.M.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
MANU.9-12.9.4.12.M.7	Evaluate and use information resources to accomplish specific occupational tasks.
MANU.9-12.9.4.12.M.8	Use correct grammar, punctuation, and terminology to write and edit documents.
MANU.9-12.9.4.12.M.11	Apply active listening skills to obtain and clarify information.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.21	Operate Internet applications to perform tasks.
MANU.9-12.9.4.12.M.30	Describe and use quality control systems and practices to ensure quality products and services.
MANU.9-12.9.4.12.M.33	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
MANU.9-12.9.4.12.M.34	Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health.
MANU.9-12.9.4.12.M.35	Identify emergency procedures that are necessary to provide aid in workplace accidents.
MANU.9-12.9.4.12.M.42	Demonstrate understanding of how to control workplace hazards in manufacturing business environments in order to maintain safe working conditions.
MANU.9-12.9.4.12.M.44	Employ leadership skills to accomplish goals and objectives.
MANU.9-12.9.4.12.M.46	Employ teamwork skills to achieve collective goals and use team members' talents

	effectively.
MANU.9-12.9.4.12.M.49	Employ mentoring skills to assist others.
MANU.9-12.9.4.12.M.59	Examine requirements for career advancement to plan for continuing education and training.
MANU.9-12.9.4.12.M.61	Examine licensing, certification, and credentialing requirements at the national, state, and local levels to maintain compliance with industry requirements.

Target 1

Students will be introduced to soft soldering using soldering irons, plumbing torch to connect wires, electronics, and plumbing fittings and perform assessment and project assessments.

- Students will be introduced to soft soldering using soldering irons, plumbing torch to connect wires, electronics, and plumbing fittings and perform assessment and project assessments.

Target 2

Students will be introduced to safe brazing techniques and lighting of torch using an oxyacetylene welder and perform an assessment of two metals and project assessments.

- Students will be introduced to safe brazing techniques and lighting of torch using an oxyacetylene welder and perform an assessment of two metals and project assessments.

Learning Goal 2

Students will be able to weld two pieces of metal together with oxyacetylene welding using forehand or backhand method.

- Students will be able to weld two pieces of metal together with oxyacetylene welding using forehand or backhand method.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
MANU.9-12.9.4.12.M.(2).6	Research the safe use of manufacturing process equipment in order to protect personal well-being in the work environment.
MANU.9-12.9.4.12.M.(3).1	Communicate with others regarding maintenance, installation, and repair issues and trends in order to meet business needs.
MANU.9-12.9.4.12.M.(6).3	Evaluate preventive inspections of health, safety, and/or environmental hazards in order to ensure healthy and safe manufacturing work environments.

MANU.9-12.9.4.12.M.(6).4	Evaluate a job safety and health analysis of manufacturing jobs, equipment, and processes in order to identify priorities for health, safety, and environmental assurance programs.
MANU.9-12.9.4.12.M.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.7	Evaluate and use information resources to accomplish specific occupational tasks.
MANU.9-12.9.4.12.M.8	Use correct grammar, punctuation, and terminology to write and edit documents.
MANU.9-12.9.4.12.M.17	Identify, write, and monitor performance goals to guide progress in assigned areas of responsibility and accountability.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.49	Employ mentoring skills to assist others.
MANU.9-12.9.4.12.M.52	Identify and demonstrate positive work behaviors and personal qualities needed to succeed in the classroom and/or to be employable.
MANU.9-12.9.4.12.M.54	Demonstrate skills related to seeking and applying for employment in a desired job.
MANU.9-12.9.4.12.M.62	Examine employment opportunities in entrepreneurship as an option for career planning.

Target 1

Students will be able to cut out stock and deburr metal, then tack both ends using metal fill rod.

- Students will be able to cut out stock and deburr metal, then tack both ends using metal fill rod.

Learning Goal 3

SWBAT safely weld a basic butt joint utilizing arc welding equipment. Students may be required to weld all of the different types of joints. This process will also be applied when assembling future projects.

- SWBAT safely weld a basic butt joint utilizing arc welding equipment. Students may be required to weld all of the different types of joints. This process will also be applied when assembling future projects.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
MANU.9-12.9.4.12.M.(1).4	Develop a continuous improvement plan to ensure production of high quality products that meet customer expectations.
MANU.9-12.9.4.12.M.(2).5	Summarize and employ safety protocols to maintain a safe and productive production workplace.
MANU.9-12.9.4.12.M.(2).7	Identify equipment safety resources (e.g., equipment manufacturers and national safety organizations).
MANU.9-12.9.4.12.M.(2).8	Maintain equipment, tools, and workstations to provide safe work environments and meet company regulations.
MANU.9-12.9.4.12.M.(3).1	Communicate with others regarding maintenance, installation, and repair issues and trends in order to meet business needs.
MANU.9-12.9.4.12.M.(3).4	Demonstrate knowledge of the safe use of manufacturing equipment in order to ensure

	safety during maintenance, installation, and repair work.
MANU.9-12.9.4.12.M.(3).9	Identify and diagnose equipment problems in order to effectively repair manufacturing equipment.
MANU.9-12.9.4.12.M.(5).2	Describe and/or implement safety inspections and practices common to the pathway to maintain safe and productive classrooms and/or workplaces.
MANU.9-12.9.4.12.M.(6).9	Examine and summarize continuous improvement protocols, techniques, and practices in order to enhance the health and safety of manufacturing work environments.
MANU.9-12.9.4.12.M.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
MANU.9-12.9.4.12.M.7	Evaluate and use information resources to accomplish specific occupational tasks.
MANU.9-12.9.4.12.M.11	Apply active listening skills to obtain and clarify information.
MANU.9-12.9.4.12.M.12	Develop and interpret tables, charts, and figures to support written and oral communications.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.21	Operate Internet applications to perform tasks.
MANU.9-12.9.4.12.M.29	Describe the nature and types of business organizations to build an understanding of the scope of organizations.
MANU.9-12.9.4.12.M.33	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
MANU.9-12.9.4.12.M.34	Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health.
MANU.9-12.9.4.12.M.35	Identify emergency procedures that are necessary to provide aid in workplace accidents.
MANU.9-12.9.4.12.M.37	Explain health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
MANU.9-12.9.4.12.M.49	Employ mentoring skills to assist others.
MANU.9-12.9.4.12.M.50	Apply ethical reasoning to a variety of situations in order to make ethical decisions.
MANU.9-12.9.4.12.M.53	Develop a Personalized Student Learning Plan to meet career goals and objectives.
MANU.9-12.9.4.12.M.54	Demonstrate skills related to seeking and applying for employment in a desired job.
MANU.9-12.9.4.12.M.56	Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.
MANU.9-12.9.4.12.M.62	Examine employment opportunities in entrepreneurship as an option for career planning.

Target 1

SWBAT select proper welding rod to safely arc weld two pieces of metal together in a butt weld. The students will select the proper current and amperage to perform weld. They will use the striking method to start a weld and tack two ends. Then weld two pieces of mild steel together.

- SWBAT select proper welding rod to safely arc weld two pieces of metal together in a butt weld. The

students will select the proper current and amperage to perform weld. They will use the striking method to start a weld and tack two ends. Then weld two pieces of mild steel together.

Target 2

SWBAT practice welding techniques previously presented keeping the arc welding rod at the proper angle and length away from the work pieces.

- SWBAT practice welding techniques previously presented keeping the arc welding rod at the proper angle and length away from the work pieces.

Target 3

SWBAT turn in a butt weld or other types of joints for an assessment grade when they are satisfied with their performance. The students will also apply these skills on future projects they select.

- SWBAT turn in a butt weld or other types of joints for an assessment grade when they are satisfied with their performance. The students will also apply these skills on future projects they select.

Summative Assessment

Students will be required to pass a written safety tests on each piece of welding or soldering equipment that has been presented. This can be done using Google classroom or hand written tests.

21st Century Life and Careers

Select all applicable standards from the applicable standards

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.
CAEP.9.2.12.C.8	Assess the impact of litigation and court decisions on employment laws and practices.

Formative Assessment and Performance Opportunities

Students will be assessed by performance on required welds, brazing and soldering assignment. Students will also be assessed in the future on welds, brazing and soldering on projects they have selected for 2nd, 3rd and 4th marking period.

Accommodations/Modifications

Students that have shown talent in soldering, brazing and arc welding can move on to MIG Welding and TIG Welding per the instructor.

Unit Resources

Videos: Learn to Weld the Lincoln Way

You tube Videos on Welding, Soldering and Brazing Techniques and Safety.

Modern Metalworking Instructor's Manual by John R. Walker

Modern Metalworking Textbook by John R. Walker

Modern Metalworking Workbook by John R. Walker

Safety Hand outs from NJ and PA. Safety Tests

Interdisciplinary Connections

MA.K-12.1	Make sense of problems and persevere in solving them.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.