

WELCOMING



Welding

Direct inquiries to

Ministry of Labor and Social Affairs
Attn: Manager of Vocational and Training Department
Baghdad, Iraq

Management & Training Corporation
500 North Marketplace Drive
P.O. Box 10
Centerville, Utah 84014
U.S.A.

Jill L. Elkins – 801- 693 – 2714 (USA)

Michael Roberts – 801 – 691 – 2600 (USA)

Acknowledgments

Standards in this document are based on information from the following organizations:

U.S. Office of Job Corps

U.S. Department of Labor
Employment and Training Administration
Office of Youth Services and Job Corps Standards

Contren Learning Series Best Practices

Reprinted with permission from *Contren Learning Series*,
Copyright © 2002, National Center for Construction
Education and Research, (352) 334-0920,
<http://www.nccer.org/>

Workplace Skills for the 21st Century

Secretary's Commission on Achieving Necessary Skills

Curriculum development, training and translation in Iraq were provided by the following team:

Timothy Mizen-England
Deputy Chief of Party
Iraq Vocational Training Project.

Osama A. Issa - Jordan
Microsoft Certified Trainer (MCT).

Daniel Costelloe-Australia
Electrical Contracting Consultant.

Leslie Alexander Lawrence-Indonesia
Engineering Management Consultant.

Robert R. Caldwell-United States
Automotive Training Consultant.

The Managers and Vocational Trainers
for the Iraq Ministry of Labor and Social Affairs (MOLSA).

The Iraqi Staff of Iraq Vocational Training and Employment Services Project

Overview

Vocational training programs in Iraq are faced with many challenges. Iraq needs a speedy reconstruction and the Iraqi people need a future with the promise of employment and prosperity.

This training will combine occupational skills with technical knowledge and will be competency based. We will customize training to meet employer demands, cultural differences, geographic location, and needs of the trainees. The technical approach is modeled after the U.S. Department of Labor, Employment and Training Administration, Office of Job Corps training model. This curricula is competency-based, meaning that the student actually demonstrates a competency in practice and assessments. The Job Corps vocational training curricula consist of competency objectives with corresponding lessons and tasks or skill assignments. Following completion of each level of difficulty or assigned task, assessment tools determine competency and will help with evaluation and remediation. The competency-based instructional programs will:

- ▶ Assess the trainee's needs, including strengths and weaknesses
- ▶ Select appropriate instructional goals based on the needs assessment
- ▶ Provide trainee-centered instruction aimed at the instructional goals
- ▶ Evaluate to determine if the trainee has mastered the goals and can apply them

The instructional design (competency-based) will let the trainees demonstrate competency for the skills they already have and then begin instruction at the point where competency is not demonstrated. From there, the trainee will progress through the competencies listed on a Training Achievement Record until they complete training and are prepared to work.

These instructional materials include a Training Achievement Record (TAR). TARs list each competency required for the trade grouped by skill type. The curricula also include sample lesson plans. The curricula will provide for development in general areas prior to competency in more specific trade areas. This allows those who are not able to complete an entire program to develop skills suitable for lower levels of employment.

This curriculum has been developed in collaboration with MOLSA instructors, Job Corps training experts, and other technical professionals. It was created for use in all MOLSA vocational technical training centers that educate and train students to become competent, entry-level welding. This curriculum will provide instructors with the necessary ingredients for a complete welding technician program. The purpose of this guide is to establish a common language of proficiency standards so that both the Vocational Technical Training Centers and industry have a universal set of standards for welding programs.

This curriculum has been developed for use by all Iraq Vocational Technical Training Centers that offer programs in welding technology. Because of the great diversity among the different regions of the country, this curriculum was designed, to be a flexible document that allows for the differences in instructor methodology. There are also differences in the length of programs and differences in equipment at some of the MOLSA centers. All content areas and competencies must be integrated into the training center welding curricula so that students become competent in those areas.

This curriculum does not offer a step-by-step formula for teaching an welding course. This guide is designed to facilitate the classroom work of welding instructors but not to replace the decision-maker.

This curriculum has been aligned to modules in the Contren Learning Series as endorsed by the National Center for Construction Education and Research (NCCER). Students who successfully pass this course may be certified by MOLSA and will receive documentation from MOLSA.

It is the instructor who organizes instructional materials for effective and efficient learning. And **it is the instructor** who integrates the latest teaching technologies into his or her classroom. It is in support of these professionals and of their students that this curriculum has been developed.

Each vocational course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Module Number and Title (TAR Skillset)
- Suggested Time to Train on Skillset - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the module. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Outcomes
 - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a module. The student, instructor and worksite supervisor (if applicable) will evaluate and record a pre-training mastery level for all skillsets, as well as a post-training mastery level review.
 - The outcomes represent the enabling and supporting knowledge and demonstrated performances that will indicate mastery of the competency at the course level.

- Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources, however, the only required assessment is completion of the TAR checklist.
- References - A list of suggested references is provided for each unit in the appendix. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested outcomes. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Table of Contents

Acknowledgments	2
Overview	3
Program Description	7
Course Outline	8
<u>Welding I</u>		
Module 1:	Employability Skills.....	9
Module 2:	Safety (Occupational Orientation).....	11
Module 3:	Welding Mathematics.....	12
Module 4:	Drawing and Welding Symbol Interpretation.....	13
Module 5:	Cut and Shape Base Metal with Auxiliary Equipment.....	14
Module 6:	Flame Cut With Oxy-Fuel.....	15
Module 7:	Machine Oxy-Fuel Gas Cutting (Track Burner).....	16
Module 8:	Air Carbon Arc Cutting.....	17
Module 9:	Weld Base Metal with Shielded Arc Welding (SMAW) Equipment	18
Module 10:	Welding Inspection and Testing Principles.....	20
Module 11:	Employer Specific Skills	
<u>Welding II</u>		
	(not included in this handbook)	
Module 1:	Introduction and orientation, and employability Skills	
Module 2:	Basic Safety	
Module 3:	Advanced Base Metal Preparation and Weld Quality	
Module 4:	Advanced Shielded Metal Arc Welding (SMAW) Equipment	
Module 5:	Semi-Automatic Arc Welding (GTAW/FCAW)	
Module 6:	Gas Tungsten Arc Welding (GTAW)	
Appendix A:	TAR Evaluation Checklist	
Appendix B:	Workplace Skills for the 21 st Century	
Appendix C:	Suggested References	
Appendix D:	Recommended Tools and Equipment	

Program Description

The Welding Theory and Application curriculum is designed to prepare the students for entry level employment in the field of welding and fabrication. Students in Welding I complete study in occupational orientation and safety, shielded metal arc welding (SMAW), semi-automatic arc welding gas, metal arc welding and flux-cored arc welding (GMAW/FCAW) , gas tungsten arc welding (GTAW), carbon arc cutting principle and practice(CAC-A), plasma arc cutting (PAC), and employability skills.

The welding competencies required in this curriculum were from the U.S. National Job Corps standards developed to coincide with Contren Core/Welding I. The contributions of the resources are hereby acknowledged.

Course Outline

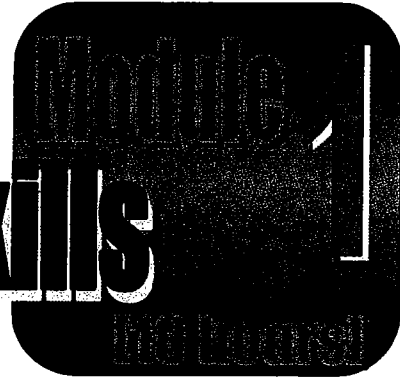
Welding I

<i>Module</i>	<i>Title</i>	<i>Hours</i>
Module 1:	Employability Skills.	10.0
Module 2:	Safety (Occupational Orientation).	24.0
Module 3:	Welding Mathematics.	40.0
Module 4:	Drawing and Welding Symbol Interpretation.	40.0
Module 5:	Cut and Shape Base Metal with Auxiliary Equipment.	20.0
Module 6:	Flame Cut With Oxy-Fuel.	30.0
Module 7:	Machine Oxy-Fuel Gas Cutting (Track Burner).	20.0
Module 8:	Air Carbon Arc Cutting.	40.0
Module 9:	Weld Base Metal with Shielded Arc Welding (SMAW) Equipment.	40.0
Module 10:	Welding Inspection and Testing Principles.	40.0
Module 11:	Employer Specific Skills.	
Total		304

Welding II

<i>Module</i>	<i>Title</i>	<i>Hours</i>
Module 1:	Introduction, Orientation, and, Employability.	
Module 2:	Basic Safety (review).	
Module 3:	Advanced Base Metal Preparation and Weld Quality.	
Module 4:	Advanced Shielded Metal Arc Welding (SMAW).	
Module 5:	Semi-Automatic Arc Welding (GMAW/FCAW).	
Module 6:	Gas Tungsten Arc Welding (GTAW).	

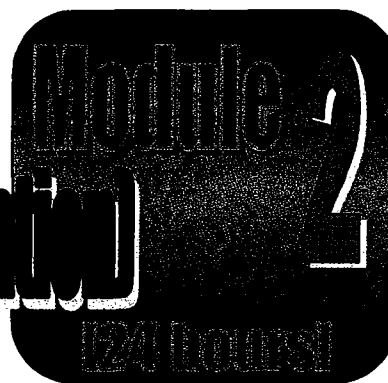
Employability Skills



Competencies and Outcomes	Strategies for Competencies
<p>1. Employability Skills.</p> <ul style="list-style-type: none"> a. Demonstrate the ability to dress appropriately for work. b. Demonstrate the ability to arrive for work on time. c. Demonstrate the ability to respond appropriately to supervision. d. Demonstrate the ability to follow directions. e. Demonstrate the ability to listen effectively. f. Demonstrate the ability to ask for clarification when further information is required. g. Demonstrate the ability to share information and explain procedures to another person. h. Demonstrate the ability to take initiative. i. Demonstrate the ability to satisfy customers. j. Demonstrate the ability to work as a member of a team. k. Demonstrate the ability to work harmoniously with diverse races, sexes, ages and cultures. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Introduce employability skills as listed on the TAR Checklist. • Define trade terms related to employability skills. • Have the students design and perform skits in front of the class to demonstrate good and bad employability skills. • Students will use available resources (collage catalogs) to research information about postsecondary educational opportunities and careers. <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist.

<ul style="list-style-type: none">l. Demonstrate the ability to troubleshoot and solve problems.m. Demonstrate the ability to access and use information from manuals and computer.n. Demonstrate the ability to maintain good Hygiene.o. Demonstrate the ability to stay on task.p. Demonstrate the ability to maintain tools and equipment properly.	
--	--

Safety (Occupational Orientation)



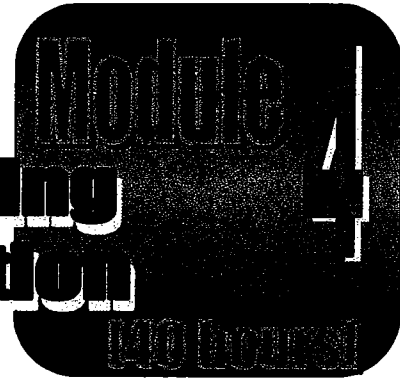
Competencies and Outcomes	Strategies for Competencies
<p>1. Safety.</p> <p>a. Demonstrate the ability to follow safe practice.</p> <p>b. Demonstrate the ability to follow written details to complete assignments.</p> <p>c. Describe the welding process.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss the history of welding and the process. • Introduce safety practice for welding and appropriate work ethics standards. Have the students list what they believe to be the most common problems in the welding profession. • Have the students perform an activity involving verbal instructions. Divide the students into groups of two and have one team be the customer and the other be the supervisor. The customer will describe the project and the supervisor will have a brief plan for the fabrication of the project. Have the groups switch roles and repeat. <p>NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE.</p> <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist.

Welding Mathematics



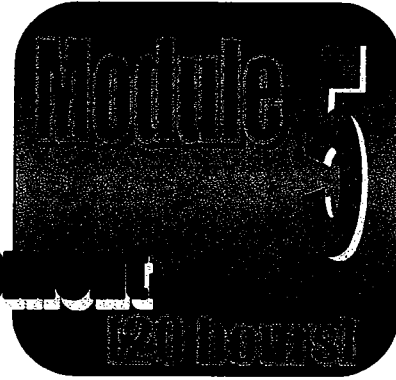
Competencies and Outcomes	Strategies for Competencies
<p>1. Welding Mathematics.</p> <p>a. Use ruler and tape measure (metric type) to perform accurate measurements to the nearest 1/16.</p> <p>b. Compute decimal equivalents.</p> <p>c. Use a decimal equivalent chart.</p> <p>d. Add and subtract decimals.</p> <p>e. Use a metric equivalent chart.</p> <p>f. Make sketches using graph paper.</p> <p>g. Estimate the cost of materials for a welding project.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Have students complete a short pre-test to apply the four basic math skills with whole numbers, fractions, and percent (may use Contren Core Text). • Provide students with additional problems to apply the four basic math skills which apply. • Discuss the metric system and its importance. • Divide students into groups and have them design a small welding project appropriate for the program, including dimensions in standard and metric measurements. <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist.

Drawing and Welding Symbol Interpretation



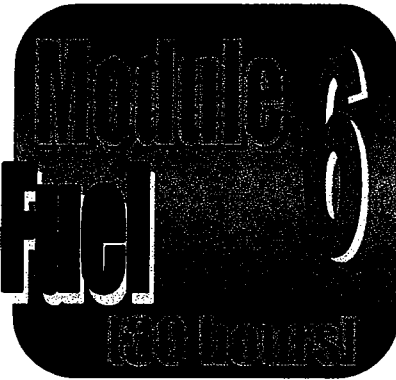
Competencies and Outcomes	Strategies for Competencies
<p>. Drawing and Welding Symbol Interpretation.</p> <p>a. Interpret basic elements of a drawing or sketch.</p> <p>b. Identify types of joints and welds.</p> <p>c. Interpret welding symbol information.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss drawing and welding symbols and sketches. • Divide students into pairs and have them quiz each other on the terms and symbols. • Have the students interpret plan specifications and drawings; match them to an actual picture of the area; and interpret the information to the class. <p>Assessment:</p> <ul style="list-style-type: none"> • Determine if each student matches the plan to the correct picture, and evaluate his or her interpretation of the information to the class, for accuracy, clarity, and presentation skills. • Validate mastery of the skillsets using the TAR Checklist.

Cut and Shape Base Metal with Auxiliary Equipment



Competencies and Outcomes	Strategies for Competencies
<p>1. Cut and Shape Base Metal with Auxiliary Equipment.</p> <p>a. Pass safety exam on items b-d.</p> <p>b. Use a grinder to prepare base metal.</p> <p>c. Cut and shape base metal with available equipment (iron water, power hacksaw, drill press, etc.).</p> <p>d. Identify and describe hand tools and their functions.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Identify and demonstrate the use of basic hand and power tools used in the welding field, (Contren Core Text Introduction to Hand Tools and Introduction to Power Tools). • Discuss safety factors, proper use and maintenance. • Describe accidents which can occur while using tools. <p>Assessment:</p> <ul style="list-style-type: none"> • Have each student complete and pass a test on grinders and hand tools. • Validate mastery of the skillsets using the TAR Checklist.

Flame Cut With Oxy-Fuel



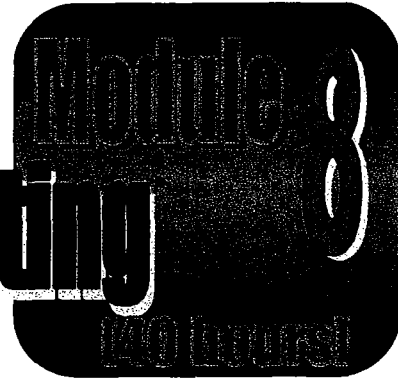
Competencies and Outcomes	Strategies for Competencies
<p>1. Flame Cut With Oxy-Fuel.</p> <ul style="list-style-type: none"> a. Pass safety exam on items b-g. b. Describe the flame cutting process. c. Perform safety inspections of equipment and accessories. d. Inspect, clean and/or replace. e. Gouge materials with a hand cutting torch. f. Cut and bevel base metal with hand torch. g. Prepare welding joints. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Identify the terminology and parts of gas cutting equipment and accessories. • Demonstrate cutting and/or welding procedures for mild steel with Oxy/Fuel equipment. • Demonstrate the use of a motorized, portable Oxy/Fuel cutting machine. <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist. .

Machine Oxy-Fuel Gas Cutting (Track Burner)



Competencies and Outcomes	Strategies for Competencies
<p>1. Machine Oxy-Fuel Gas Cutting (Track Burner).</p> <ul style="list-style-type: none"> a. Pass safety exam on items b-f. b. Perform safety inspections of equipment and accessories. c. Inspect, clean and/or replace cutting tips. d. Set up for machine oxy-fuel gas cutting operations on plain carbon steel. e. Perform straight cutting operations on plain carbon steel. f. Perform beveled cutting operations on plain carbon steel. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Describe and demonstrate the use of oxy-fuel gas cutting burners. • Have each student perform straight and beveled cutting operations using plain carbon steel. <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist.

Air Carbon Arc Cutting



Competencies and Outcomes	Strategies for Competencies
<p>1. Tire Maintenance.</p> <ul style="list-style-type: none"> a. Mount and balance. b. Inspect tires for irregular wear patterns. c. Rotate tires and properly torque lug nuts. d. Repair tubeless tires (plug and patch repairs). e. Inspect and replace wheel studs. f. Inspect hub seals and bearings. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Demonstrate the CAC-A process of washing and/or gouging. • Each student should perform air CAC gouging and cutting operations. <p>Assessment:</p> <ul style="list-style-type: none"> • Student must pass a safety exam on competencies b-f. • Validate mastery of the skillsets using the TAR Checklist.

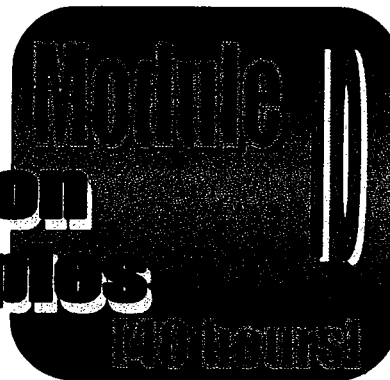
Welding Base Metal with Shielded Metal Arc Welding (SMAW) Equipment



Competencies and Outcomes	Strategies for Competencies
<p>1. Welding base metal with shielded metal arc welding (SMAW) equipment.</p> <p>a. Pass safety exam on items b-r.</p> <p>b. Perform safety inspections of equipment and accessories.</p> <p>c. Make minor repairs to equipment and accessories.</p> <p>d. Set up base metal and machine to weld SMAW materials.</p> <p>e. Weld a pad in the flat (1G) pos. w/E6013.</p> <p>f. Weld a Tee joint in the horizontal (2F) pos. w/E/6013.</p> <p>g. Weld a V-groove open butt joint in the horizontal (2G) pos. w/E6013.</p> <p>h. Weld a pad in the VU pos. w/E6013.</p> <p>i. Weld a Tee joint in the VU (3F) pos. w/E6013.</p> <p>j. Weld a V-groove butt joint in the VU (3G). pos. w/E6013.</p> <p>k. Weld a Tee joint in the OH (4F) pos. w/E6013.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Demonstrate AC/ DC welding equipment. Identify welding electrodes, their characteristics, and their application. • Describe welding positions, including flat, horizontal vertical and overhead. • Divide the students into groups and assign each group a specific task. Have each group outline (draw) the components and diagram of the tasks. • Demonstrate all of the TAR Skillsets. May use the Contren Modules for training. <p>Assessment:</p> <ul style="list-style-type: none"> • Each student will complete and pass a safety exam on items b-r. • Validate mastery of the skillsets using the TAR Checklist.

<p>l. Weld a pad in the Flat (IG) pos. w/E 7018.</p> <p>m. Weld a Tee joint in the horizontal (2F) pos. w/E7018.</p> <p>n. Weld a V-groove open butt joint in the horizontal (2G) pos. w/E7018.</p> <p>o. Weld a pad in the VU pos. w/E 7018.</p> <p>p. Weld a Tee-joint in the VU (3F) pos. w/E 7018.</p> <p>q. Weld a V-groove butt joint in the VU (3G) pos. w/E7018.</p> <p>r. Weld a Tee joint in the OH (4F) pos. w/E7018.</p>	
--	--

Welding Inspection and Testing Principles



Competencies and Outcomes	Strategies for Competencies
<p>1. Air Carbon Arc Cutting.</p> <ul style="list-style-type: none"> a. Describe Inspection and Testing Principles. b. Examine cut surface and edges of prepared base metal parts. c. Recognize and describe welding codes and standards. d. Examine tack, intermediate layers and completed welds. e. Perform a guided bend test. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Identify and explain the reasons for having regulations and codes for welding. Identify agencies who set regulations for welding codes. • Describe different tests given for weld certification. • Discuss how to analyze weld imperfections, their causes and nondestructive practices. <p>Assessment:</p> <ul style="list-style-type: none"> • Validate mastery of the skillsets using the TAR Checklist.



TAR

(Training Achievement Record)

Evaluation Checklist

for

Welding

Directions for Completing TARs

A. When the student performs a task listed in the "DUTIES AND TASKS" column, the instructor should rate the student's level of performance by circling a, b, or c in the "PERFORMANCE RATING" column.

RATING

a - Proficient and able to teach others	The student consistently performs the task accurately without supervision. The student possesses sufficient skill to teach the task to others.
b - Proficient	The student performs the task to industry standards with little or no supervision. This is the minimum performance rating for TAR skill completion.
c - Exposed/not proficient	The student has been introduced to the task, but cannot perform the task to industry standards.

1. If the student performs the task at a level c, circle the number in pencil so that it can later be erased and entered permanently as b or a when the student improves his/her performance. A performance level of b is satisfactory (passing) and can be entered permanently or, at the instructor's discretion, circled in pencil to allow the student to improve his/her performance at a later date.
2. When the student performs the task to the instructor's satisfaction, (**at a level of b or a**) circle the appropriate performance rating, and enter the date in the "**DATE COMPLETED**" column. The instructor and student should initial the **DUTY** area when **all the tasks** in that duty area are completed.

B. When the student completes the TAR or terminates the program before completing the TAR, the instructor must finalize the TAR by doing the following:

1. Check the appropriate box and enter the date that the student completed the TAR or terminated the training program in the space provided at the top of page 1:

Completed or Terminated Training: _____
Date



Training Guidelines

Welding



WELDING
Shielded Metal Arc Welding Qualified Welder

TRAINING ACHIEVEMENT RECORD (TAR) FOR:

Name: _____

IDN: _____

Date Entered Training: _____

Completed or Terminated Training: _____
Date

CENTER'S NAME: _____

Address: _____

Phone: _____

Instructor: _____

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
A. EMPLOYABILITY SKILLS				
1. Demonstrate the ability to dress appropriately for work.	a b c l			
2. Demonstrate the ability to arrive for work on time.	a b c			
3. Demonstrate the ability to respond appropriately to supervision.	a b c			
4. Demonstrate the ability to follow directions.	a b c			
5. Demonstrate the ability to listen effectively.	a b c			
6. Demonstrate the ability to ask for clarification when further information is required.	a b c			
7. Demonstrate the ability to share information and explain procedures to another person.	a b c			
8. Demonstrate the ability to take initiative.	a b c			
9. Demonstrate the ability to satisfy customers.	a b c			
10. Demonstrate the ability to work as a member of a team.	a b c			
11. Demonstrate the ability to work harmoniously with diverse races, sexes, ages and cultures.	a b c			
12. Demonstrate the ability to troubleshoot and solve problems.	a b c			
13. Demonstrate the ability to access and use information from manuals and computers.	a b c			
14. Demonstrate the ability to maintain good hygiene.	a b c			
15. Demonstrate the ability to stay on task.	a b c			

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
16. Demonstrate the ability to maintain tools and equipment properly.	a b c			
B. OCCUPATIONAL ORIENTATION				
1. Demonstrate ability to follow safe practices.	a b c			
2. Demonstrate ability to follow written details to complete assignments.	a b c			
3. Describe the welding process.	a b c			
C. WELDING MATHEMATICS				
1. Use ruler and tape measure (metric type) to perform accurate measurements to the nearest 1/16.	a b c			
2. Compute decimal equivalents.	a b c			
3. Use a decimal equivalent chart.	a b c			
4. Add and subtract decimals.	a b c			
5. Use a metric equivalent chart.	a b c			
6. Make sketches using graph paper.	a b c			
7. Estimate the cost of materials for a welding project.	a b c			
D. DRAWING AND WELDING SYMBOL INTERPRETATION				
1. Interpret basic elements of a drawing or sketch.	a b c			
2. Identify types of joints and welds.	a b c			
3. Interpret welding symbol information.	a b c			
E. CUT AND SHAPE BASE METAL WITH AUXILIARY EQUIPMENT				
1. Pass safety exam on items 2-4.	a b c			

Training Guidelines

Welding

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
2. Use a grinder to prepare base metal.	a b c			
3. Cut and shape base metal with available equipment (iron worker, power hacksaw, drill press, etc.).	a b c			
4. Identify and describe hand tools and their functions.	a b c			
F. FLAME CUT WITH OXY-FUEL				
1. Pass safety exam on items 2-7.	a b c			
2. Describe the flame cutting process.	a b c			
3. Perform safety inspections of equipment and accessories.	a b c			
4. Inspect, clean and/or replace cutting tips.	a b c			
5. Gouge materials with a hand cutting torch.	a b c			
6. Cut and bevel base metal with hand torch.	a b c			
7. Prepare welding joints.	a b c			
G. MACHINE OXY-FUEL GAS CUTTING (TRACK BURNER)				
1. Pass safety exam on items 2-6.	a b c			
2. Perform safety inspections of equipment and accessories.	a b c			
3. Inspect, clean and/or replace cutting tips.	a b c			
4. Set up for machine oxy-fuel gas cutting operations on plain carbon steel.	a b c			
5. Perform straight cutting operations on plain carbon steel.	a b c			
6. Perform beveled cutting operations on plain carbon steel.	a b c			

Training Guidelines

Welding

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
H. AIR CARBON ARC CUTTING				
1. Pass safety exam on items 2-6.	a b c			
2. Perform safety inspections of equipment and accessories.	a b c			
3. Make minor repairs to equipment and accessories.	a b c			
4. Set up for manual air carbon arc gouging and cutting operations on plain carbon steel.	a b c			
5. Operate manual air carbon arc equipment.	a b c			
6. Perform metal removal operations on plain carbon steel.	a b c			
I. WELD BASE METAL WITH SHIELDED METAL ARC WELDING (SMAW) EQUIPMENT				
1. Pass safety exam on items 2-18.	a b c			
2. Perform safety inspections of equipment and accessories.	a b c			
3. Make minor repairs to equipment and accessories	a b c			
4. Set up base metal and machine to weld SMAW materials.	a b c			
5. Weld a pad in the flat (1G) pos. w/E6013.	a b c			
6. Weld a Tee joint in the horizontal (2F) pos. w/E6013.	a b c			
7. Weld a V-groove open butt joint in the horizontal (2G) pos. w/E6013.	a b c			
8. Weld a pad in the VU pos. w/E6013.	a b c			
9. Weld a Tee joint in the VU (3F) pos. w/E6013.	a b c			
10. Weld a V-groove butt joint in the VU (3G) pos. w/E6013.	a b c			

Training Guidelines

Welding

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
11. Weld a Tee joint in the OH (4F) pos. w/E6013.	a b c			
12. Weld a pad in the flat (1G) pos. w/E7018.	a b c			
13. Weld a Tee joint in the horizontal (2F) pos. w/E7018.	a b c			
14. Weld a V-groove open butt joint in the horizontal (2G) pos. w/E7018.	a b c			
15. Weld a pad in the VU pos. w/E7018.	a b c			
16. Weld a Tee joint the VU (3F) pos. w/E7018.	a b c			
17. Weld a V-groove butt joint in the VU (3G) pos. w/E7018.	a b c			
18. Weld a Tee joint in the OH (4F) pos. w/E7018.	a b c			
J. WELDING INSPECTION AND TESTING PRINCIPLES				
1. Describe welding inspection methods.	a b c			
2. Examine cut surfaces and edges of prepared base metal parts.	a b c			
3. Recognize and describe welding codes and standards.	a b c			
4. Examine tack, intermediate layers and completed welds.	a b c			
5. Perform a guided bend test.	a b c			
K. EMPLOYER SPECIFIC SKILLS				
1.	a b c			
2.	a b c			
3.	a b c			

Training Guidelines

Welding

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
4.	a b c			
5.	a b c			

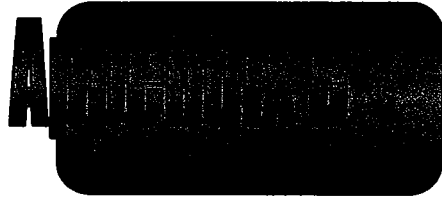
EXTRA SKILLSETS ADDED BY MOLSA TRAINERS

Duties and tasks	المهام و الواجبات	Performance rating
MACHINE OXY-FUEL GAS CUTTING (TRACK BURNER)	ماكينة قطع تعمل بالغاز و الأوكسجين	
1- pass safety exam on items 2-6	1- مراجعة تعليمات السلامة في الفقرات 2-6	
2- perform safety inspections of equipment and accessories	2- اداء فحوصات السلامة للمعدات و الملحقات	
3- Inspect, clean and/or replace cutting tips	3- معاينة و تنظيف و استبدال رؤوس القطع	
4- set up for machine oxy – fuel gas cutting operations on plain carbon steel	4- الاعداد لعمليات القطع بواسطة ماكينة تعمل بالغاز و الأوكسجين على صفحة حديدية كاربونية مستوية	
5- perform straight cutting operations on plain carbon steel	5- اداء عمليات قطع مستقيمة على صفحة حديدية كاربونية مستوية	
6- perform beveled cutting operations on plain carbon steel	6- اداء عمليات القطع المائل على صفحة حديدية كاربونية مستوية	
AIR CARBON ARC CUTTING	قطع ARC الكاربونية الهوائية	
1- pass safety exam on items 2-6	1- مراجعة تعليمات السلامة في الفقرات 2-6	
2- perform safety inspections of equipment and accessories	2- اداء فحوصات السلامة للمعدات و الملحقات	
3- make minor repairs to equipment and accessories	3- اجراء تصليحات ثانوية للمعدات و الملحقات	
4- set up for normal air carbon arc gouging and cutting operations on plain carbon steel	4- الاعداد لعمليات قطع و تنقير arc الكاربونية الهوائية على صفحة حديدية مستوية	
5- operate manual air carbon arc equipment	5- تشغيل معدات arc الكاربونية الهوائية اليدوية	
6- perform metal removal operations on plain carbon steel	6- اداء عمليات ازالة المعدن على صفحة حديدية كاربونية مستوية	

a - Proficient and able to teach others;

b - Proficient;

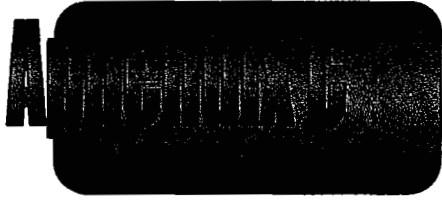
c - Exposed/not proficient



Workplace Skills for the 21st Century for Welding

Workplace Skills for the 21st Century for all Modules

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.



Suggested References

Suggested References

Althouse, A., Turnquist, C., Bowditch, W., Bowditch, K., & Bowditch, M. (2003). *Modern welding*. Tinley Park, IL: Goodheart-Willcox.

Cary, H. (2002). *Modern welding technology* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

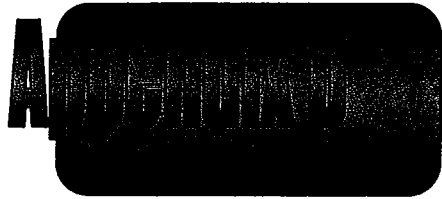
Jeffus, L. (1997). *Welding principles and application* (4th ed.). Clifton Park, NY: Thompson Delmar Learning.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2001). *Welding level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2001). *Welding level II*. Upper Saddle River, NJ: Pearson Prentice Hall.

Boyce, J. G., Margolis, L., & Slade, S. (2000). *Mathematics for technical and vocational students*. Upper Saddle River, NJ: Prentice Hall.



Recommended Tools & Equipment

ITEM	المادة	الكمية
Bench, work or steel topped layout	منضدة حديدية للعمل	2
Band saw, fixed pedestal with accessories	منشار حزام مع مكملاته	2
Compressed air supply and accessories(min. 80 psi)	ضاغط هواء مع مكملاته	1
Gas metal arc(GMAW/ FCAW)(spray and short circuit)	لحام قوس معدني غازي	6
Grinder , pedestal	كوسرة ثابتة	2
Welding mask	قناع لحام	30
Hoist , chain 5-ton	زنجيل رفع 5 طن	1
Oxy / fuel set, manual gas cutting	سيت (او كسجين / غاز) للقطع اليدوي بواسطة الغاز	5
Oxy / fuel set, machine gas cutting	سيت او كسجين / غاز للقطع الميكانيكي بواسطة الغاز	1
Press, drill magnetic pedestal base ¾ drive	مزرّف ثابت ذو قاعدة مغناطيسية 4/3 ضاغط	1
Press, hydraulic	ضاغط هيدروليكي	1
Ventilation system	نظام تهوية	1
Welder, shielded metal arc(SMAW)	لحام قوس معدني مغطى MIG	6
Welder AC/DC, SMAW / GTAW, CC /CV GMAW /FACA capable, combination welding machine, 300 amp, ready-to-use.	لحام قوس معدني بواسطة الغاز متعدد الاستعمال 300 أمب	1
Brush, carbon steel wire	فرشاة حديدية	100
Brush, stainless steel wire	فرشاة ستينليس ستيل	100
Cabinet, eye safety, sanitizing	خزانة لواقية العيون و مطهرات	1
Chisel set, cold	ازميل بارد	2
Clamps, C 8-inch	كلاب 8 انج - فخة	10
Cutter, air carbon arc (CAC-A)	قاطع قوس-هواء كاربون	1
Fire extinguisher	طفاية حريق	5
File, 10-inch mill, half round –bastard cut	ميرد نصف دائري 10 انج	30
Flint, oxy/ fuel friction	حجر قدح بالاحتكاك لمنظومة او كسجين غاز	12
gloves, welders (pair)	كفوف لحام	30
Grinder, 7-9 inch right angle, Industrial	كوسرة 7 - 9 انج بزاوية قائمة - يده قائمة	6
Kit, first aid Industrial	حقيبة اسعافات اولية	1
Pliers, 10-inch groove or slip joint	بلايس 10 انج ذو مفصل متحرك	30
Pliers, 6-inch side or diagonal cutting	بلايس 6 انج قطع جانبي او مائل	30
Pliers, 10-inch vise grip clamp	بلايس 10 انج كلاب ذو شفة منكنة - التقرص	30
Pliers, 6-inch needle nosed	بلايس لاقية 6 انج	30
Pliers, MIG	بلايس	3
Tongs, welder	تونك لحام	30
Wrench set, combination	تشكيلة مفكات على النظام الانكليزي	2
wrench set, Allen or hex to 3/8 inch Standard & Metric	سيت مفكات البنيكي او سداسي الى 8/3 انج متري و انكليزي	
Wrench, 12-inch adjustable	مفك 12 انج متغير	30
Wrench set, combination (Metric)	تشكيلة سيت مفكات على النظام المتري	2

Welding Machine 300 A	ماكينة لحام /	300 A	5
Welding Machine 500 A	ماكينة لحام /	500 A	1
Spot welding machine	ماكينة لحام النقطة		1
Tools set of Oxy welding	سيت اوكسجين		6
Handle tool of W.Machine	بدة اللحام		6
Welding gas torch 0.5 fonya	راس مشعل 0.5 فونية		12
Welding gas torch 0.1 fonya	راس مشعل 0.1 فونية		12
Welding gas torch cutter	راس مشعل قطع		12
Duel hose of gas connection	صوئدة مزدوجة		140 meters
Oxygen gas pressure regulator	منظم ضغط غاز الاوكسجين		6
Acetylene gas pressure regulator	منظم ضغط غاز الاستيلين		6
Oxygen gas cylinder	اسطوانة غاز اوكسجين		10
Acetylene gas cylinder	اسطوانة غاز استيلين		10
Propane gas cylinder	اسطوانة غاز البروبان - غاز الطبخ		6
High pressure gas regulator	منظم غاز ضغط عالي		6
Electrical big iron cutter 1.5 meter	مقص بليت كهربائي 1.5 متر		1
Plate iron cutter pulse punch (by handel)	مقص بليت ابو ذراع		1
Manual iron punching 26mm	بنج قطع الحديد يدوي 26 ملم		1
Iron cutter	كتر حدادي محلي		1
Electrical frequency saw (16 inch)	منشار ترددي كهربائي 16 انج		1
Box-column drill press (16 mm)	دريل ذو قاعدة 16 ملم		4
Electrical manual drill (13 mm)	دريل يدوي 13 ملم كهربائي		6
Small grinding machine "portable"	كوسرة طيارية صغيرة		1
Big grinding machine "portable"	كوسرة طيارية كبيرة		1
Machine vice (iron) 12 inch	منكنة 12 انج حديد		6
File (12 inch)	مبرد 12 انج		30
Iron smith hammer 1 kgm	مطرقة ا كغم		2
Knapping hammer	مطرقة نقارة		2
Stainless steel ruler (12 inch)	مسطرة 12 انج فولاذية		30
Welding vest	صدرية جلدية		30
Pliers (12 inch)	ملقط حدادة 12 انج		30
Numeric punches (medium size)	بنط ارقام وسط		2
Letter punches (medium size)	بنط حروف وسط		2
Measuring tape (5 meter)	قياسة خمسة متر		30
Scribe pen(shenkar)	قلم تخطيط شنكار		30
Protective welding mask	واقية لحام خوذة		20
Colored glass	زجاج ملون		50
White glass	زجاج ابيض		50
Gas welding goggles	نظارة اوكسجين		30
Manual hack saw (12 inch)	منشار يدوي 12 انج		30
Saw blades (12 inch)	تبيغ منشار 12 انج		13 doz
Cleaning needles	ابرة تنظيف المشعل فونية		15
Screw driver (set)	سيت درنقيسات		30
Welding wires 2.5	اسلاك لحام		300 BX
Welding wires 3.25	اسلاك لحام		500 BX

Welding wires 4	اسلاك لحام	40 BX
Ironsmith hammer - 5 kg	مطرقة 5 كغم	1
Welding gauge for measuring of welding seams	فيرنيه لقياس سمك اللحام	3
Combination angle with protector - all parts forged steel	زاوية ويط مع الواقيات (حديد)	30
Iron plate - 2 mm	بليت حديد 2 ملم	30
Iron plate - 1.5 mm	بليت حديد 1.5 ملم	25
Iron plate - 4 mm	بليت حديد 4 ملم	30
Iron plate - 6 mm	بليت حديد 6 ملم	25
Iron plate - 8 mm	بليت حديد 8 ملم	25
Iron plate - 10 mm	بليت حديد 10ملم	15
Iron angle shape - 1.5" / 5 mm	حديد زاوية 1.5 إنج 5 ملم	150 PCS
Iron angle shape - 2" / 5 mm	حديد زاوية 2 إنج 5 ملم	150 PCS
Iron angle shape - 4" / 5 mm	حديد زاوية 4 إنج 5 ملم	150 PCS
Wire welding - brass - 2.5 mm	واير لحام 2.5 ملم برصاص	400
Wire welding - brass - 3.25 mm	واير لحام 3.25 ملم برصاص	400
Wire welding - brass - 4 mm	واير لحام 4 ملم برصاص	400
Wire welding - brass	واير لحام برصاص	400
Wire welding - silver	واير لحام سلفر (فضة)	400
Auxiliary welding - brass	مساعد لحام البرصاص	30
Copper pipes 5/8	أنابيب نحاس 8/5 إنج	10