

#354

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: **WELDING**

CODE NO MET 100-3

SEMESTER: F90

PROGRAM: HEAVY EQUIPMENT DIESEL

AUTHOR D. SOCCHIA

DATE: 1990 09 05

PREVIOUS OUTLINE DATED: 1989 05 19

APPROVED

Dean, School of Technical Trades

Date X?* // y^c/&

COURSE NAME: WELDING

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TOTAL CREDIT HOURS: 45

PREREQUISITE(S): Students must be able to read, write and comprehend at the Grade 10 Level.

PHILOSOPHY/GOALS:

This course will serve as an introduction to general welding practices commonly used by the heavy diesel mechanic.

Emphasis will be placed upon safe work practices; set-up and operation of equipment? general welding practices.

STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. Identify mild steel, stainless steel, aluminum and cast iron base metals.
2. Identify and select commonly used filler wires and electrodes.
3. Cut and assemble metals for gas and arc welding operations.
4. Produce sound welds via O.F.G., S.M.A.W. and G.M.A.W. procedures.

. TOPICS TO BE COVERED:

1. Course Introduction and Orientation
2. O.F.G. Welding and Cutting Equipment/Practices
3. S.M.A.W. Equipment and Practices
4. G.M.A.W. Equipment and Practices
5. A.A.C. Equipment and Practices (Optional)

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IV LEARNING ACTIVITIES REQUIRED RESOURCES

Topic No.	No. of Periods	General Topic Description	Resources
INTRODUCTION AND ORIENTATION:			
		Identify and describe the contents of 'Welding' Met100-3 with respect to:	Handouts
		i) course outline	
		ii) course guidelines	
		iii) course marking system including attendance	
2.		O.F.G. WELDING AND CUTTING EQUIPMENT & PRACTICES:	
		2.1 Assembly and handling of equipment to include:	Demo
		i) hoses, regulators, torches and tips	Discussion
		ii) damaged and/or faulty equipment	Handouts
		iii) cleaning, adjustment and care of goggles	
		iv) pressurize, purge and adjust torch	
		v) shutting down O.F.G. station and draining of torch	
	1/2	2.2 Backfire and Flashback to include	
		i) identification of warning signs	Discussion
		ii) dangers and responses	Handout
		iii) prevention methods	
		iv) situations that involve use of cylinder gas	
	1/2	2.3 Types of O.F.G. Flames and Fuel mixtures to include:	Demo
		i) flame type vs gas mixture and appearance	Handouts
		ii) flame type vs potential use	
		iii) effects on weld puddle and completed weldment	

<u>Topic No.</u>	<u>No. of Periods</u>	<u>General Topic Description</u>	<u>Resources</u>
	2	2.4 Fusion Welding Practices on Gauge Metal I i) running lines of fusion using stringer & weave techniques ii) running beads with filler rod iii) pad exercise c/w filler rod	Demo Practice
	1/2	2.5 Mild Steel Filler Metals and their selection i) RG45 and RG60 ii) tensile strength and ductility iii) weld soundness with respect to Si content iv) puddle control	Handouts
	2	2.6 Fusion Welding Practices on Gauge Metal II i) lap joint with rod ii) tee joint with rod iii) butt joint with rod	Demo Practice
	1/2	2.7 Weld Faults, Identification and Prevention to include: i) appearance ii) excessive convexity and concavity iii) undercut and porosity iv) overlap and lack of fusion v) brittle welds	Discussion Handouts
	2	2.8 Fusion Welding Practices on Gauge Metal III (optional) (same as 2.6 above)	
	1/2	2.9 Construction of O.F.G. cylinders i) study cross section of gas cylinders ii) locate and describe safety devices iii) identification and marking of cylinders	Discussion Handouts

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<u>Topic No.</u>	<u>NO. of Periods</u>	<u>General Topic Description</u>	<u>Resources</u>
	3	3.0 Non-Fusion Welding Practices to include: i) braze welding - definition, uses, advantages and disadvantages ii) braze weld lap joint and test destructively iii) brazing - definition, uses, advantages and disadvantages iv) braze - tee joint using Allstate #45 (RB45) and test destructively	Discussion Handouts Practice
	3	3.1 Flame Cutting Practices and Procedures to include: i) safety & equipment set-up ii) manual straight line cutting with and without guide bar iii) bevel cutting iv) piercing v) cutting of round stock and pipe	Discussion Handouts Practice
X		WRITTEN TEST & REVIEW	
	2	i) Theory test on all O.F.G. theory discussions, handouts and practices ii) Review and marking of all theory tests	Handouts
3-		S.M.A.W- EQUIPMENT AND PRACTICES	
		3.1 Introduction to S.M.A.W. to include: i) general safe work practices ii) repairs to and cleaning of shields, lenses, holders, cables, ground clamp (what students may and may not repair)	Discussion Handouts

Topic No.	NO. Of Periods	<u>General Topic Description</u>	Resources
		<ul style="list-style-type: none"> iii) types of welding machines iv) current adjustment and selection devices v) familiarization with adjustments for various shop machines 	
		3.2 Determine and set the correct amount of amperage <ul style="list-style-type: none"> i) strike arc and run beads using E6011, E7018, E7024 ii) recognize correct bead and crater appearance iii) adjust arc length, travel speed and amperage to produce desired results iv) running single beads using stringer and weave techniques v) pad exercise on mild steel plate using E6011, E7018 and E7024 	Demo Practice
	1/2	3.3 Selection of Welding Machines to include: <ul style="list-style-type: none"> i) electrical input, phase requirements ii) output and duty cycle iii) constant current (variable voltage) machines iv) constant voltage (variable current) machines v) face plate of welding machine 	Discussion Handouts
		3.4 S.M.A.W. Practices II <ul style="list-style-type: none"> - completion of pad exercise from 3.2 above - tee and lap joints on plate using E6011 & E7018 	Demo Practice

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Topic NO.	NO. Of <u>Periods</u>	<u>General Topic Description</u>	Resources
	1/2	3.5 Weld Faults; Recognition and Prevention to include: <ul style="list-style-type: none"> i) weld profile ii) overlap iii) excessive buildup iv) undercut v) porosity vi) arc blow vii) underbead and crater cracks 	Discussion Handouts
		3.6 S.M.A.W. Practices III <ul style="list-style-type: none"> i) pipe on plate exercises using E7018 & E7024 ii) combination groove/fillet weld using E7018 (optional) 	Demo Practices
		3.7 Selection of Filler Metals to include: <ul style="list-style-type: none"> i) identification of electrodes according to AWS/CSA classifications and diameters ii) operating characteristics of commonly used electrodes iii) identification of stainless steel and cast iron electrodes 	Handouts
		3.8 S.M.A.W. Practices IV <ul style="list-style-type: none"> i) simulated cast iron repair weld using ENiFe on mild steel ii) simulated stainless steel repair weld using E309-16 on mild steel 	Discussion Demo Practice
G.M.A.W. EQUIPMENT & PRACTICES			
		4.1 Introduction to G.M.A.W. to include: <ul style="list-style-type: none"> i) general safe work practices ii) differences between GMAW and SMAW iii) selecting and setting amperage, voltage, wire speed and gas flow rate iv) striking arc and running beads 	Discussion Demo Practice

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No. of Periods	General Topic Description	Resources
1	4.2 Selection of Filler Wires and Shielding Gases: i) identification of electrodes according to AWS/CSA classifications and diameters ii) identification of shielding gas and function iii) compatibility of filler wire to shielding gas and transfer mode	Discussion Handouts
2-1/2	4.3 G.M.A.W. Practices i) Tee joint on plate (3 passes) ii) Lap joint on plate (1 pass)	Demo Practice
A-A.C. EQUIPMENT AND PRACTICES (OPTIONAL)		
3	5.1 Introduction to A.A.C. to include: i) general safe work practices ii) setup of gouging station iii) purpose of A.A.C. gouging iv) selecting adequate power supply, air line and work environment v) setting amperage and making practice cuts vi) gouging off old welds vii) gouging out cracks and defects	Discussion Demo Practice
WRITTEN TEST AND REVIEW		
3	i) Theory test on all S.M.A.W.; G.M.A.W., and A.A.C. theory discussions, handouts and practices ii) review and marking of all theory tests	Handouts

Note: S.M.A.W.; S.M.A.W.; and A.A.C. shop practices are intended to overlap in a controlled manner to allow students the maximum time for completion of shop projects.

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V. EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS ETC.)

<u>General Assessment</u>	<u>Final Mark *</u>
A+ = 95 - 100%	2 Theory Tests 30%
A = 85 - 94%	Shop Assignments 70%
B = 75 - 84%	Attendance (See Atached)
C = 60 - 74%	
R = 0 - 59%	
	TOTAL 100%

VI. REQUIRED STUDENT RESOURCES

CSA Approved Safety Work Boots

CSA Approved Safety (Impact) Glasses

Notebook, Pen, Paper

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION: (title, publisher, edition, date, library call number if applicable - see attached example)

Periodical Section

N/A

Audiovisual Section

N/A

VIII. SPECIAL NOTES

* Student evaluations concerning the 'Final Mark' are further affected by the conditions set forth in the printed handout 'Guidelines for Related Welding'. Be sure to obtain a copy from your instructor.