

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

WELDING

---

MET100-3

---

HEAVY EQUIPMENT DIESEL

---

ONE

---

1987 07 02

---

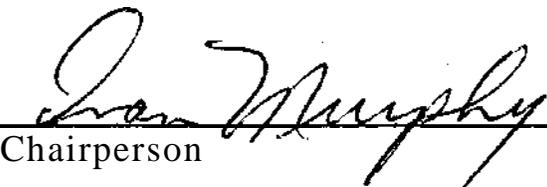
GUNTER THOM

---

New:

Revision:

XX

  
Chairperson

<sup>4</sup> (L te/tr

WELDING

MET100-3

**Course Name**

**Course Number**

**PHILOSOPHY/GOALS:**

Basic welding skills and knowledge of safe operation of welding and cutting equipment are required by the Heavy Equipment Diesel Mechanic.

This course will serve as an introduction to general welding practices in a diesel shop.

**METHODS OF ASSESSMENT (GRADING METHOD):**

2 Theory Tests	-	30%
Practical Skill	-	60%
Attendance/Attitude	-	10%
TOTAL	-	100%

**TEXTBOOK(S):**

**t**

I.A.S. Instruction Aid Sheets (handed out)  
and notes taken by students.

Students should be given the course outline summary sheet  
for MET100-3.

**OBJECTIVES:**

The basic objective is to develop a student with safe work habits in the use of O.A. welding and cutting equipment as well as stick electrode welding in all positions.

The student will gain an appreciation of Mig welding and carbon arc gouging in addition to repair welding practices dealing with mild steel and low alloy high strength steels.

The passing grade is a "C".

SUMMARY OF MET100-3

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
1a	1/2	Orientation to program.	I.A.S.#1
b		Introduction to O.A. Welding.	
2a	1	1 Assembling and handling of equipment.	Notes
b		1 Construction of equipment.	Notes
c		Repairs to accessories.	Demo
d		Types of O.A. flames and fuel mixtures.	I.A.S.#2
e		Welding Terms, positions, joints.	Notes/Demo
f		Filler metals and their selection	I.A.S.#3
		Weld faults.	Notes
		Fusion welding practices.	I.A.S.#4
		Non-fusion welding practices.	Notes/Demo
5	2	Cutting practices.	I.A.S.#5
			Notes/Demo
6	1/2	Written Test	
TOTAL HRS.	2	10	4 Weeks
7a	1/2	Introduction to SMAW.	
		Types of welding machines and their adjustments,	I.A.S.#7
b		Electrical principles.	Demo
c		Repairs to accessories.	I.A.S.#8
8	24	SMAW practices.	Demo
9a	1	Selection of welding machines,	I.A.S.#9
b		Selection of filler metals,	I.A.S.#10
c		Weld faults, recognition, prevention,	I.A.S.#11
d	1	Repair welding practices.	I.A.S.#12
e		Welding symbols.	I.A.S.#13
10	3	GMAW Practice.	I.A.S.#14
11	3	Carbon arc cutting practice(AAC).	Demo
			I.A.S.#15
12	1/2	Testing	Demo
TOTALS	30	11 Weeks	

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
1a	1/2	<p>Orientation to program.</p> <ul style="list-style-type: none"> <li>- outline of topics to be covered</li> <li>- grading system:A,B,C,R,I,X</li> <li>- method of evaluation</li> <li>- testing modes, dates</li> <li>- shop safety and regulations</li> <li>- personal safety</li> <li>- repair to shop equipment</li> </ul> <p>Introduction to O.A.W.</p> <ul style="list-style-type: none"> <li>- Scope: fusion <ul style="list-style-type: none"> <li>non-fusion</li> <li>cutting</li> <li>heating</li> </ul> </li> </ul>	I.A.S.#I
2a	1/2	<p>Assembling and handling of equipment*</p> <ul style="list-style-type: none"> <li>- assemble and disassemble hoses, regulators, torches, tips</li> <li>- identify and change "0<sup>M</sup> rings</li> <li>- adjust goggles, strikers</li> <li>- transport welding cylinders and cart</li> </ul> <p>Construction of equipment.</p> <ul style="list-style-type: none"> <li>- study cross-section of cylinders</li> <li>- location of safety devices</li> <li>- identification and marking of cylinders</li> </ul> <p>Repairs to accessories.</p> <ul style="list-style-type: none"> <li>- hose splicing, crimping tools, hose diameters</li> </ul> <p>Types of O.A. flames and fuel mixtures.</p> <ul style="list-style-type: none"> <li>- lighting torches and adjustment</li> <li>- flame type and effect on weld puddle</li> <li>- characteristics and uses of other fuel gases: Mapp, natural gas, propane, air-acetylene</li> </ul> <p>welding and cutting on containers</p>	<p>Notes Demo</p> <p>Notes Demo</p> <p>Demo</p> <p>I.A.S.#2 Notes/Demo</p>

\*

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
		Welding terras, positions, joints. <ul style="list-style-type: none"> <li>- 3 types of welds: bead, groove and fillet</li> <li>- explanation of face, root, throat of weld</li> <li>- 5 types of joints: butt, lap, tee, corner, edge</li> <li>- weld positions in respect to fillet welds</li> <li>- explanation of joint penetration and</li> </ul>	I.A.S.#3
		Fillet metals and their selection <ul style="list-style-type: none"> <li>- RG45, RG60</li> <li>- tensile strength, ductility</li> <li>- weld soundness in respect to SI content</li> </ul>	Notes
		Weld faults: identification and prevention. <ul style="list-style-type: none"> <li>- appearance, overlap, undercut, lack, of fusion, brittle welds, porosity, excessive convexity, concavity</li> </ul>	I.A.S.#4 Notes
		Fusion welding practices, 16 gauge metal. <ul style="list-style-type: none"> <li>- beads, no rod and with rod</li> <li>- edge joint without rod</li> <li>- outside corner joint, with rod</li> <li>- butt joint with rod</li> <li>- lap joint with rod</li> </ul>	
		Non-fusion welding practices. <ul style="list-style-type: none"> <li>- braze welding: definition, uses</li> <li>- advantages and disadvantages</li> <li>- braze weld tee-joint(both sides)</li> <li>- brazing, definition, uses</li> <li>- braze tee-joint 16 gauge metal using Allstate #45 (RB45)</li> <li>- soldering, copper to copper copper to steel</li> <li>- electric wire clips</li> </ul>	I.A.S.#5 Notes/Demo

t

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
5	2	Cutting practices: scope. - manual straight-line cutting with and without guide bar - bevel cutting, mitre cutting - piercing - cutting of round stock, bolts - gouging	I.A.S.#6 Notes/Demo
6	1/2	Written Test Summary	
7a	1/2	Introduction to SMAW. - types of welding machines: transformer - AC transformer/rectifier - AC/DC generator - DC - current adjustment on Lincoln, Hobart and Miller machines - portable welding machines- Hobart and Lincoln	I.A.S.#7 Demo
		Electrical principles. - polarity, OCV <sub>r</sub> , duty cycle - OCV adjustment on generators - volt-ampere characteristics	I.A.S.#8 Demo Demo Demo
		Repairs to accessories. - helmet, cables, holders	Demo
	12	SMAW practices. 'a' - bead and weave E6010/6011; 1/8 - 5/32 - bead and weave E7024/7028; 1/8 - 5/32 - bead and weave E7018; 1/8 •- 5/32 - pad; 1/8 E7024; 1/8 E7018; beads, flat position 2F tee-joint; 5/16" leg; 1/8 E7018 5/32- E6010 and E6011 horizontal pad; 1/8 E7018 vertical up bead and weave; 1/8 E7018 3F; bead and weave; 1/8 E7018 4F; bead and weave; 1/8 E7018; 1/8 E6011	I.A.S #9 Demo

t

TOPIC NO,	PERIODS	TOPIC DESCRIPTION	REFERENCE
	THEO/LAB		
\ 9a	1	Selection of welding machines. - electrical input, phase requirement - output and duty cycle - constant current and variable voltage machines - constant voltage and variable current machines - face plate of a welding machine	I.A.S.#10     Notes
		Selection of filler metals. - mechanical properties: tensile strength, ductility, impact strength - operating characteristics of electrodes - rod diameters - AWS/CSA classifications of mild steel electrodes - stainless steel electrodes - cast iron electrodes - aluminum electrodes - copper alloy electrodes - hardfacing electrodes	I.A.S.#11
		Weld faults; recognition, prevention. - weld profile, overlap, undercut, crater cracks, underbead cracking, porosity, arcblow	I.A.S.#12
		Repair welding practices. - distortion; occurrence, prevention - bead effects on micro structures of steels(H.A.Z.) - welding cast iron, aluminum, stainless steel, manganese steel, L.A.H.S. steel(Tl-plate) - hard facing practices	I.A.S.#13 Metals and How to Weld Them
		Welding symbols. - reference line and location of welding symbols - groove and fillet weld symbols - intermittent weld symbols	I.A,S.#14
10	2	GMAW practice.	Demo/I.A.S.#15
11	2	AAC-Carbon Arc Cutting.	Demo/I.A.S.#16
12	1/2	Testing	
TOTALS	2 16	9 Weeks	

t