



CIMWD-110 Syllabus

Shielded Metal Arc Welding – Flat and Horizontal Welding

Recommended Textbook:

Welding: Principles and Applications 8th Edition

Course Description:

Examines the theory and practical operation of shielded metal arc welding in both a flat and horizontal welding position. Emphasizes safety protocols, machine settings, and filler metals.

Course Topics

1. Safety protocols.
2. SMAW welding machine.
3. Filler metals.
4. Flat position welding.
5. Horizontal position welding.

Learning Objectives

1. Demonstrate proper safety practices for Shielded Metal Arc Welding.
2. Apply the proper welding machine settings for a given competency using the Shielded Metal Arc Welding process.
3. Identify and explain various welding electrodes used in the Shielded Metal Arc Welding process.
4. Demonstrate proper welding technique in flat position using the Shielded Metal Arc Welding process.
5. Demonstrate proper welding technique in horizontal position using the Shielded Metal Arc Welding process.
6. *Perform multiple welds using proper welding technique for a given weldment.

Competency-Based Education

The Welding Program at Henry Ford College uses a system of learning called Competency-Based Education (CBE). This competency-based welding program is centered on teaching specific job skills required in industry and mastery of these skills.

CBE is a very personalized teaching system that has the following characteristics:

- Ongoing Program
- Open entry - flexible schedule
- Credit granted for work completed
- Evaluation (grades) based on performance
- Fixed content in each course
- Variety of student levels served in each class





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- Work at your own pace
- Live or taped lectures and demonstrations

This competency-based program has several very important benefits for you:

- You will be given a list of the skills and knowledge needed to complete the program successfully.
- Your performance will not be compared to that of other students, but to a fixed standard, which has been set for the program.
- If you have already acquired certain skills required for this program, you may simply demonstrate this and begin focusing your attention on new skills.
- You will be able to review learning materials several times in order to attain the skill or knowledge.
- If you are able to attain the skills easily, you may progress through the program faster than the average person. If you progress through the program faster than average, you can graduate in a shorter time frame.

What's Required of You:

For this system to work, you will be expected to:

1. Assume the responsibility for your own learning. Your instructor will give you assistance, but the actual responsibility for learning rests with you, the student.
2. Utilize the materials provided for you. The program's resources have been carefully chosen and developed to help you learn.
3. Devote your energy to attaining the skills and knowledge required for your program.

The Instructor's Role:

The instructors in HFC's Welding Program work with students individually and guide them through the learning process with the help of many different learning resources. In CBE, instructors are often referred to as learning managers because they manage the activities in the program and facilitate the learning process. If you are having difficulty, you should go to your instructor with your problem. The instructor's goal is to find the most effective way to help you learn the tasks in the program.

How your grade is computed in this program:

If your class is a designated lecture module, your grade will be based off of an exit quiz. When a passing grade is complete, you will be able to move on to the next module.

If this class is a designated lab module, your grade will be based off of a grading matrix. You will evaluate your competencies along with the instructor. You will need a 3-ring binder to keep the finished and signed grading sheets. Those will be turned in when all projects are finished for the module your taking. The final grade will be entered when these are reviewed.





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Welding Technology Grading Checklist

Check	Criteria	Points
	Safety (10 points)	
	PPE	
	Equipment in working order	
	Lab rules followed	
	Work areas cleaned and tools returned	
	Welding, Cutting, & Fabrication Set-Up (10 points)	
	Welding machine set correctly	
	Cutting machines set correctly	
	Fabrication machines set correctly	
	Followed Instructions (10 points)	
	Parts cut to correct size	
	Joints assembled correctly	
	Position of weld was correct	
	Correct filler metal was used	
	Visual Inspection of weld (20 points)	
	Bead width	
	Welding angle	
	Arc gap if applicable	
	Porosity	
	Fillet weld size if applicable	
	Groove weld under fill	
	Joint penetration	
	Incomplete fusion	
	Cracks	
	Cold lap	
	Undercut	
	Arc strikes	
	Fillet weld contour if applicable	
	Inclusions	
	Groove weld height (overfill)	





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Corrective Action Taken:

Student: _____

Instructor: _____

Grading Scale:

- A+ = 100-98
- A = 97-93
- A- = 92-90
- B+ = 89-87
- B = 86-83
- B- = 82-80
- C+ = 79-77
- C = 76-73
- C- = 72-70
- D+ = 69-67
- D = 66-63
- D- = 62-60
- E = 59-below

Chapters:

3, 4, 22, 23, 24, 25, 28

Estimated Time for Projects:

- Project 1: 10hrs
- Project 2: 2hrs
- Project 3: 6hrs
- Project 4: 12hrs





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NOTE: OFC PROCESS
 SIDE 1: 6013 1/8 9DA
 SIDE 2: 7024 1/8 140A
 SIDE 3: 6010 1/8 8DA
 SIDE 4: 7018 1/8 120A

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES		J. SIBERT	2/12/2015
TOLERANCES:			
FRACTIONAL: ±			
ANGULAR: MACH ± BEND ±			
TWO PLACE DECIMAL ±			
THREE PLACE DECIMAL ±			
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL			
FINISH			
DO NOT SCALE DRAWING			

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SIZE DWG. NO. REV
A PART 3 0

SCALE: 1:2 WEIGHT: SHEET 1 OF 1





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Welding Procedure Specification

WPS Name	CIMWD-110 Project 1
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Weld Type	4 Fillet Welds
Welding Process	SMAW
Position	Flat
Material	¼" Steel
Joint Type	Tee Flat
Backing Option	
Backing Material	

Polarity	DC+
Electrode	E6013 1/8, E7024 1/8, E6010 1/8, E7018 1/8
Transfer Mode	
Tungsten Electrode	
Shielding Gas	
Flow Rate	
Cup Size	

Welding Procedure

Weld Layers	Pass No.	Process	Filler Metal Classification	Filler Metal Diameter in (mm)	Current Amps	Current Type and Polarity	Wire Feed Speed	Volts	Remarks
Multi Pass to top		SMAW	E6013	1/8	90a	DC+			
			E7024	1/8	140a				
			E6010	1/8	80a				
			E7018	1/8	120a				

Technique:
4 Multi-pass fillet welds in flat positions using 4 different electrodes. Each side is to be filled to the top using multi-pass stringer technique. Each side will be with only 1 type of electrode.

Number of Electrodes- whatever it takes





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Heat Treatment:

Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench after 2-3 passes

Stress Relieving-

Additional Notes:

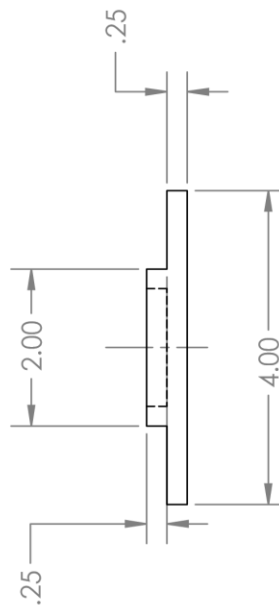
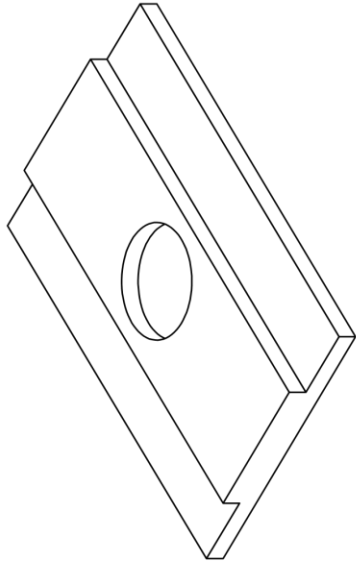
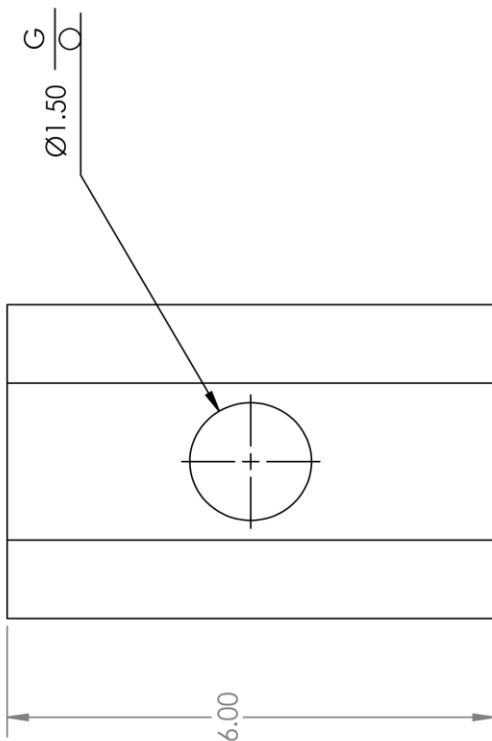
Show the instructor progress every 30 minutes minimum.





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Shielded Metal Arc Welding – Flat and Horizontal Welding



NOTE: (OFC) PROCESS
TACK WITH GMAW
PLUG WELD SHAW 7018 3/32
CUT IN HALF WITH H. BANSHAW

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	J.SIBERT	2/12/2015
TOLERANCES:	CHECKED		
FRACTIONAL: ±	ENG APPR.		
ANGULAR: MACH ±	MFG APPR.		
TWO PLACE DECIMAL ±	Q.A.		
THREE PLACE DECIMAL ±	COMMENTS:		
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL			
FINISH			
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TITLE: CIMWD-110 Project 2

SIZE DWG. NO. REV
A PART 1 0

SCALE: 1:2 WEIGHT: SHEET 1 OF 1

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Shielded Metal Arc Welding – Flat and Horizontal Welding

Welding Procedure Specification

WPS Name	CIMWD-110 Project 2
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Weld Type	Plug Weld
Welding Process	SMAW
Position	Flat
Material	¼" Steel
Joint Type	
Backing Option	
Backing Material	

Polarity	DC+
Electrode	E7018 3/32
Transfer Mode	
Tungsten Electrode	
Shielding Gas	
Flow Rate	
Cup Size	

Welding Procedure

Weld Layers	Pass No.	Process	Filler Metal Classification	Filler Metal Diameter in (mm)	Current Amps	Current Type and Polarity	Wire Feed Speed	Volts	Remarks
Till Filled		SMAW	E7018	3/32	75a	DC+			

Technique:
Stringer or Weave Bead- Stringer till filled

Initial/Interpass Cleaning- Chip and Brush

Number of Electrodes- 1-2





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Heat Treatment:

Preheat Temperature-

Post Heat Temperature-

Interpass Temperature-

Stress Relieving-

Additional Notes:

Project will be ground smooth and then cut along the width to evaluate the fusion and inclusions.





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Technical drawing showing a bent metal plate with dimensions: .25, 2.00, .25, 1.00, 2.00, 4.00, .25, 6.00.

NOTES:
CUT ON SHEAR
TACK USING GMAW
WELD UTILIZING
PROCESS IN MODULE

DRAWN	CHECKED	ENG APPR.	MFG APPR.	G.A.	COMMENTS:	NAME	DATE
						J.SIBERT	5/5/15

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
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SIZE DWG. NO. REV
APART 16 D .25

SCALE: 1:4 WEIGHT: SHEET 1 OF 1





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Welding Procedure Specification

WPS Name	CIMWD-110 Project 3
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Weld Type	2 Fillet and 1 PJP Groove
Welding Process	SMAW
Position	Horizontal
Material	¼" Steel
Joint Type	Tee, Lap, and Butt
Backing Option	
Backing Material	

Polarity	DC+
Electrode	E7018 3/32
Transfer Mode	
Tungsten Electrode	
Shielding Gas	
Flow Rate	
Cup Size	

Welding Procedure

Weld Layers	Pass No.	Process	Filler Metal Classification	Filler Metal Diameter in (mm)	Current Amps	Current Type and Polarity	Wire Feed Speed	Volts	Remarks
Stringer	Tee	SMAW	E7018	3/32	75a	DC+			
	Lap	"	E7018	3/32	75a	"			
	Butt	"	E7018	3/32	75a	"			

<p>Technique: 1 Stringer Bead on each Joint</p> <p>Initial/Interpass Cleaning- Chip and Brush</p> <p>Number of Electrodes- Whatever it takes</p>





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Shielded Metal Arc Welding – Flat and Horizontal Welding

Heat Treatment:

Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.





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Shielded Metal Arc Welding – Flat and Horizontal Welding

NOTE:
LINE CUT BEVEL
37 1/2 DEGREE
ROOT PASS 6010 3/32
FILL & COVER
7018 3/32
*GTAW ROOT, FILL
& COVER 3/32 FILLER

TITLE:
CIMWD-110 Project 4

DRAWN	NAME	DATE	REV
CHECKED	J.SIBERT	4/2/15	0
ENG APPR.			
MFG APPR.			
Q.A.			
COMMENTS:			

SIZE DWG. NO. **A PART 10.2**

SCALE: 1:2 WEIGHT: SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL: ±

ANGULAR: MACH ± BEND ±

TWO PLACE DECIMAL: ±

THREE PLACE DECIMAL: ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

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Welding Procedure Specification

WPS Name	CIMWD-110 Project 4
----------	---------------------

Weld Type	CJP Groove
Welding Process	SMAW
Position	Horizontal
Material	¼" Steel
Joint Type	Vee Butt
Backing Option	No Backer
Backing Material	

Polarity	DC+
Electrode	E6010 3/32, E7018 3/32
Transfer Mode	
Tungsten Electrode	
Shielding Gas	
Flow Rate	
Cup Size	

Welding Procedure

Weld Layers	Pass No.	Process	Filler Metal Classification	Filler Metal Diameter in (mm)	Current Amps	Current Type and Polarity	Wire Feed Speed	Volts	Remarks
Stringer	root	SMAW	E6010	3/32	50a	DC+			
	fill	"	E7018	3/32	75a	"			
	cover	"	E7018	3/32	75a	"			

Technique:
 Root Pass performed with E6010 3/32 for CJP. Fill and Cover Passes performed with E7018 3/32.

Initial/Interpass Cleaning- Chip and Brush

Weld to root, fill, and multipass cover





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Heat Treatment:

Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.





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