CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Recommended Textbook:

Welding: Principles and Applications 8th Edition

Course Description:

Presents the theory and operation of gas metal arc welding. Emphasizes safety protocols, and proper vertical welding and overhead welding positions using mild steel and aluminum.

Course Topics

1. Vertical welding position
2. Overhead welding position

Learning Objectives

1. Demonstrate the proper welding technique in vertical position.
2. Demonstrate the proper welding technique in overhead position.
3. *Perform welds using proper preparation and 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
- Work at your own pace
- Live or taped lectures and demonstrations

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

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.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

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)	

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Corrective Action Taken:

_____
_____
_____
_____
_____
_____
_____

Student: _____ Instructor: _____

Grading Scale:

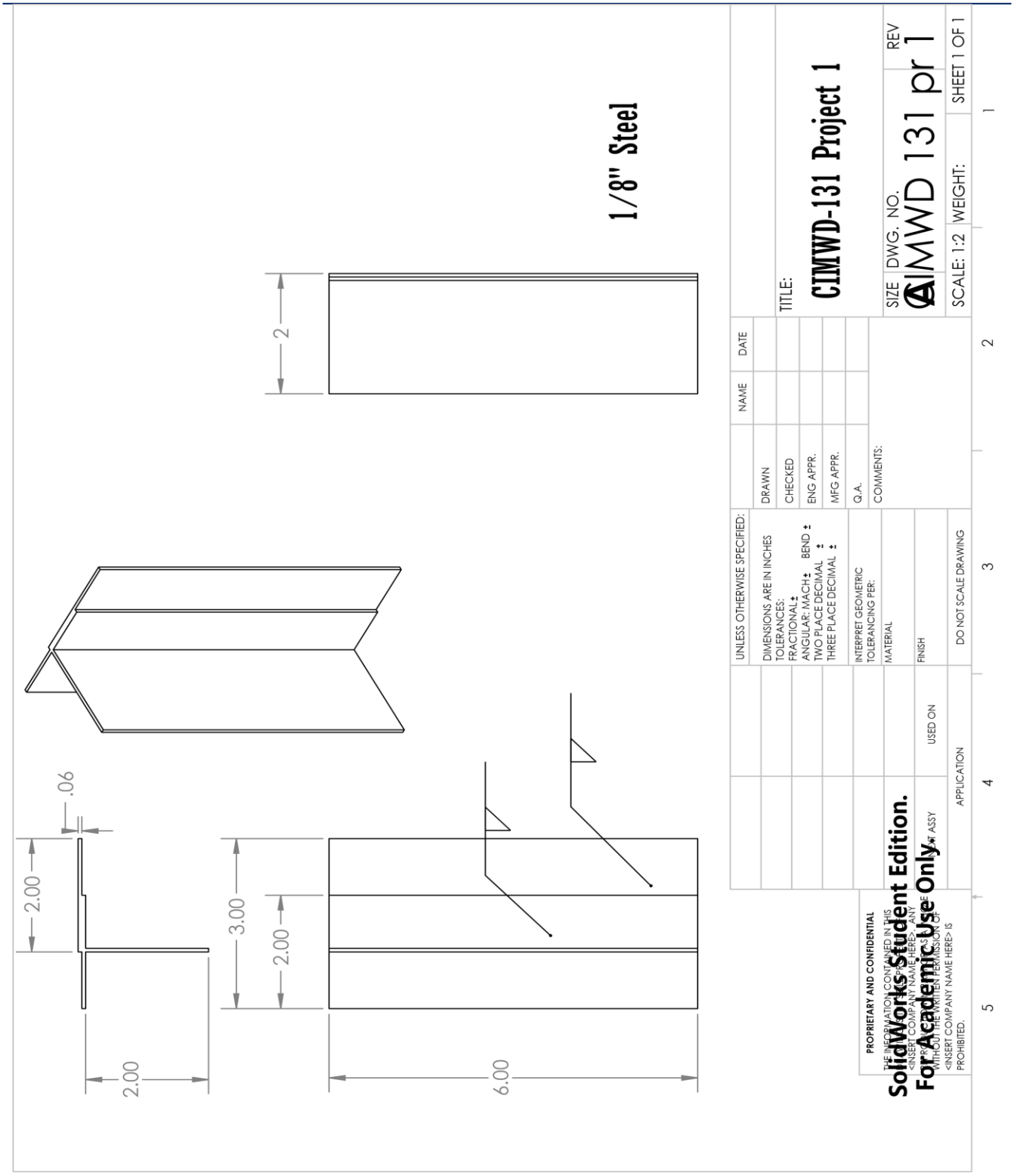
A+ = 100-98
A = 97-93
A- = 92-90
B+ = 89-87
B = 86-83
B- = 82-80
C+ = 79-77
C = 76-73
C- = 72-70
D+ = 69-67
D = 66-63
D- = 62-60
E = 59-below

Estimated Time for Projects:

Project 1: 4 hrs
Project 2: 4 hrs
Project 3: 4 hrs
Project 4: 4 hrs
Project 5: 8 hrs
Project 6: 2 hrs
Project 7: 2 hrs

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 1

Weld Type	2 Fillet Weld
Welding Process	GMAW
Position	Vertical Down
Material	1/8” Steel
Joint Type	Tee and Lap
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit Transfer
Tungsten Electrode	
Shielding Gas	75% Argon/25% CO2
Flow Rate	25 cfh
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	GMAW	ER-70s-6	.035”		DC+	40	5.5	
“	Lap								

Technique: Weld all joints in vertical down

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

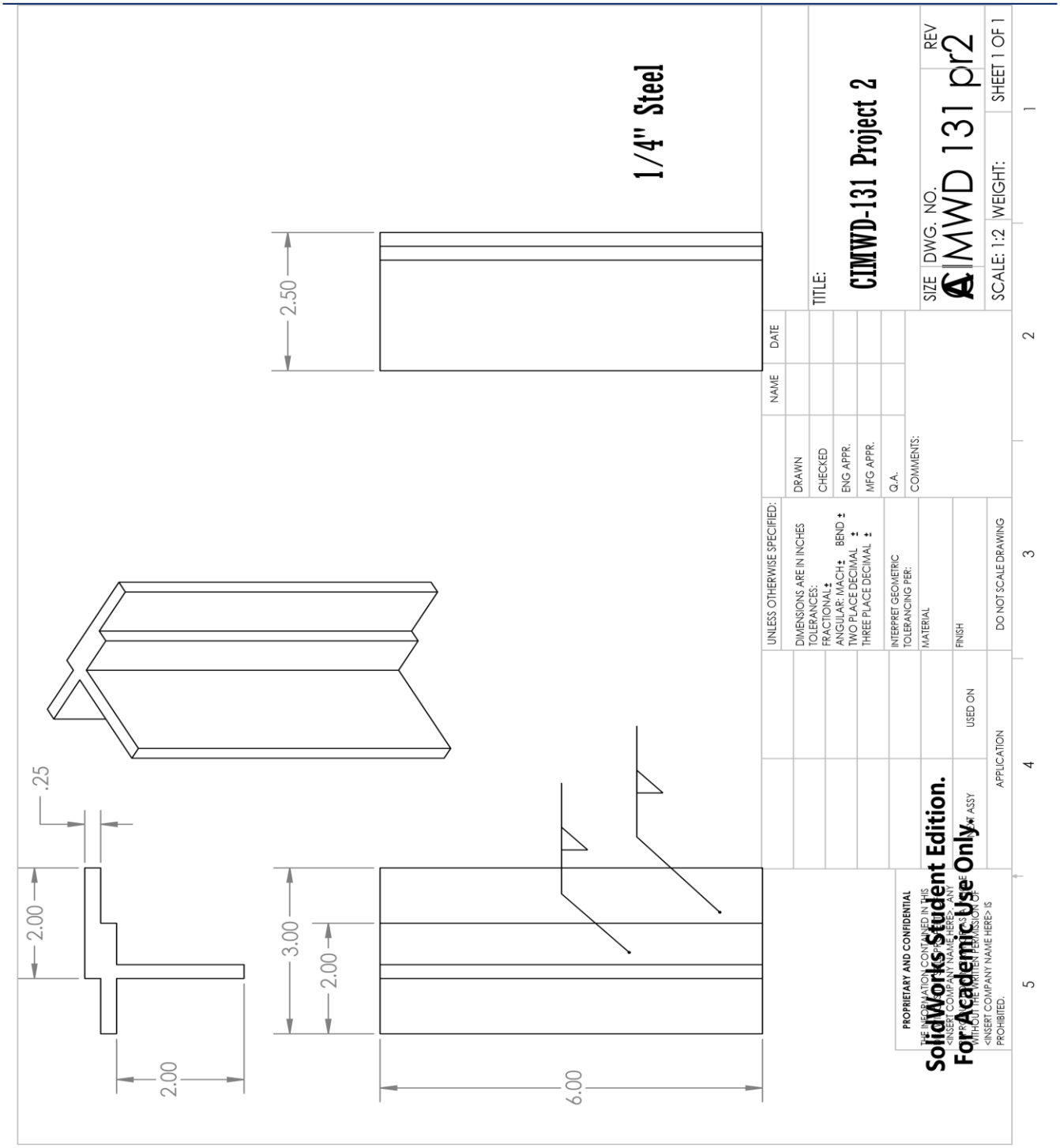
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 2

Weld Type	2 Fillet Weld
Welding Process	GMAW
Position	Vertical
Material	1/4” Steel
Joint Type	Lap and Tee
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit Transfer
Tungsten Electrode	
Shielding Gas	75% Argon/25% CO2
Flow Rate	25 cfh
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
Weave	Tee	GMAW	ER-70s-6	.035”		DC+	50	6.0	
Weave	Lap								

Technique:
Weld all joints in Vertical Up

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

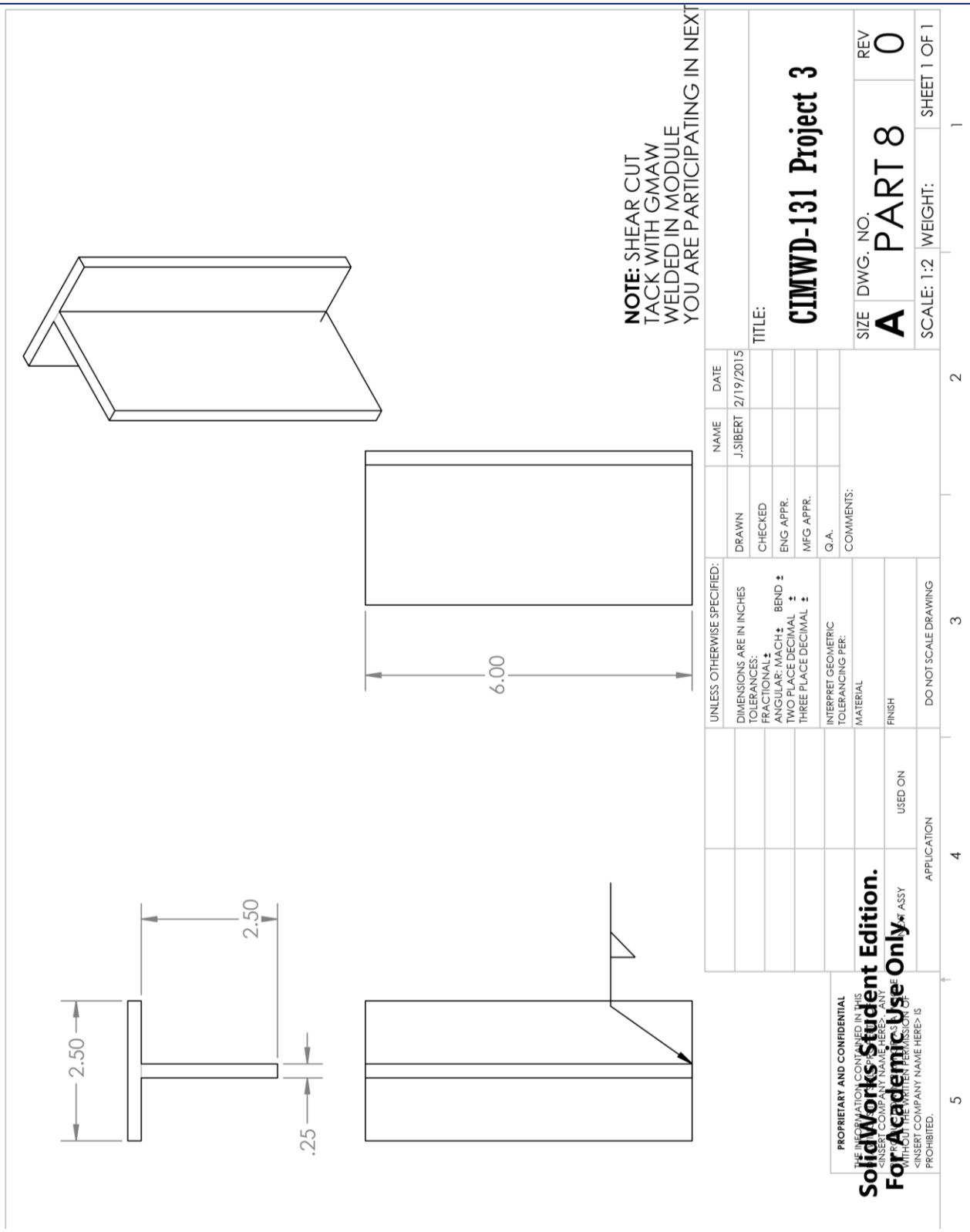
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 3

Weld Type	Fillet
Welding Process	GMAW
Position	Vertical
Material	1/4” Steel
Joint Type	Tee
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit Transfer
Tungsten Electrode	
Shielding Gas	75% Argon/25% CO2
Flow Rate	25 cfh
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
Weave	Tee	GMAW	ER-70s-6	.035”		DC+	50	6.5	

Technique:
Tee Joint use stringer bead to weld a multi pass weld in vertical up

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

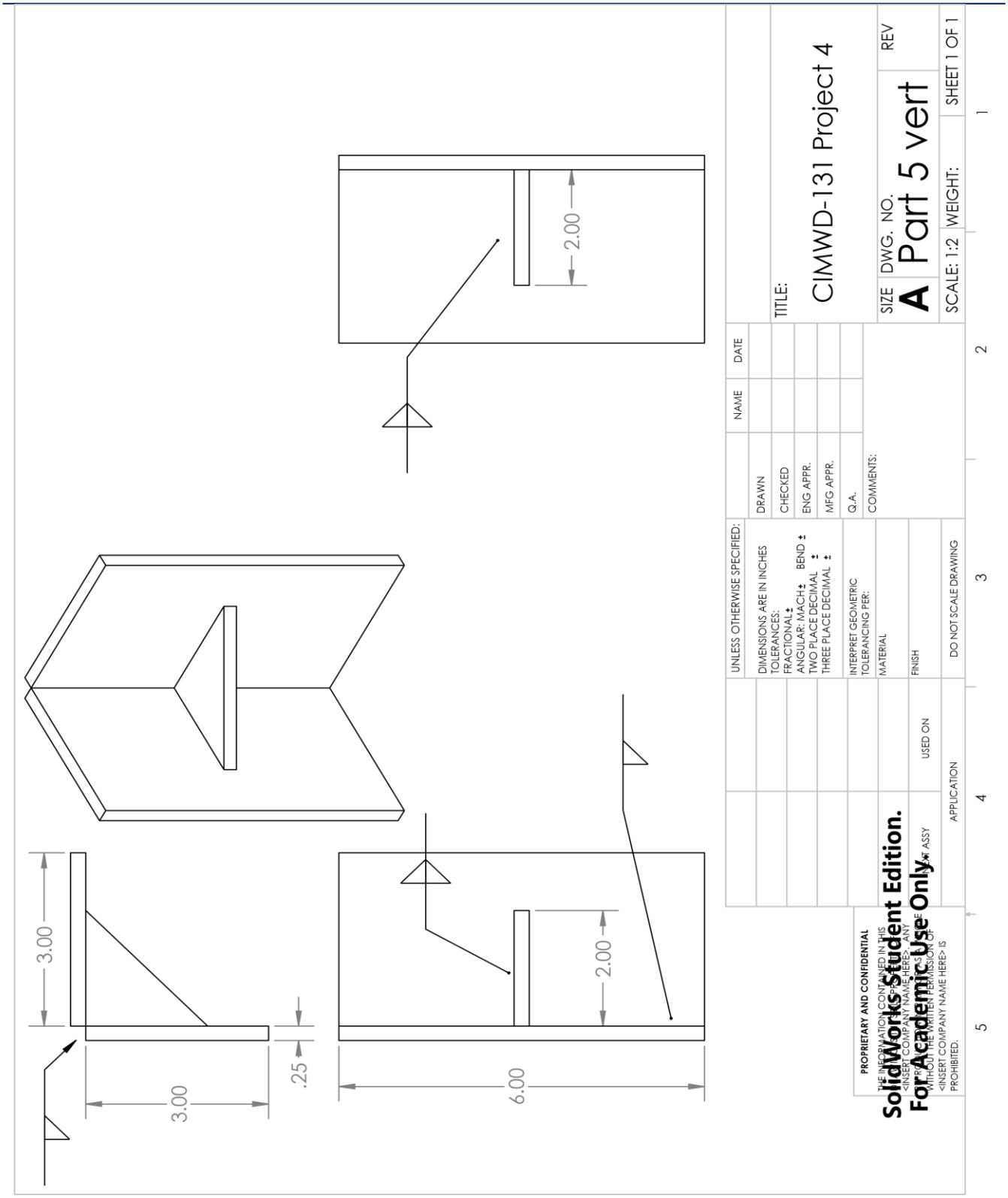
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 4

Weld Type	Fillet
Welding Process	GMAW
Position	Vertical and Horizontal
Material	1/4” Steel
Joint Type	Tees, Overhead, and Outside Corner
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit Transfer
Tungsten Electrode	
Shielding Gas	75% Argon/25% CO2
Flow Rate	25 cfh
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
Weave	Tee	GMAW	ER-70s-6	.035”		DC+	50	6	
Weave	O Corner	“	“	“		“	“		

Technique:
Weld all joints in Vertical and Horizontal

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

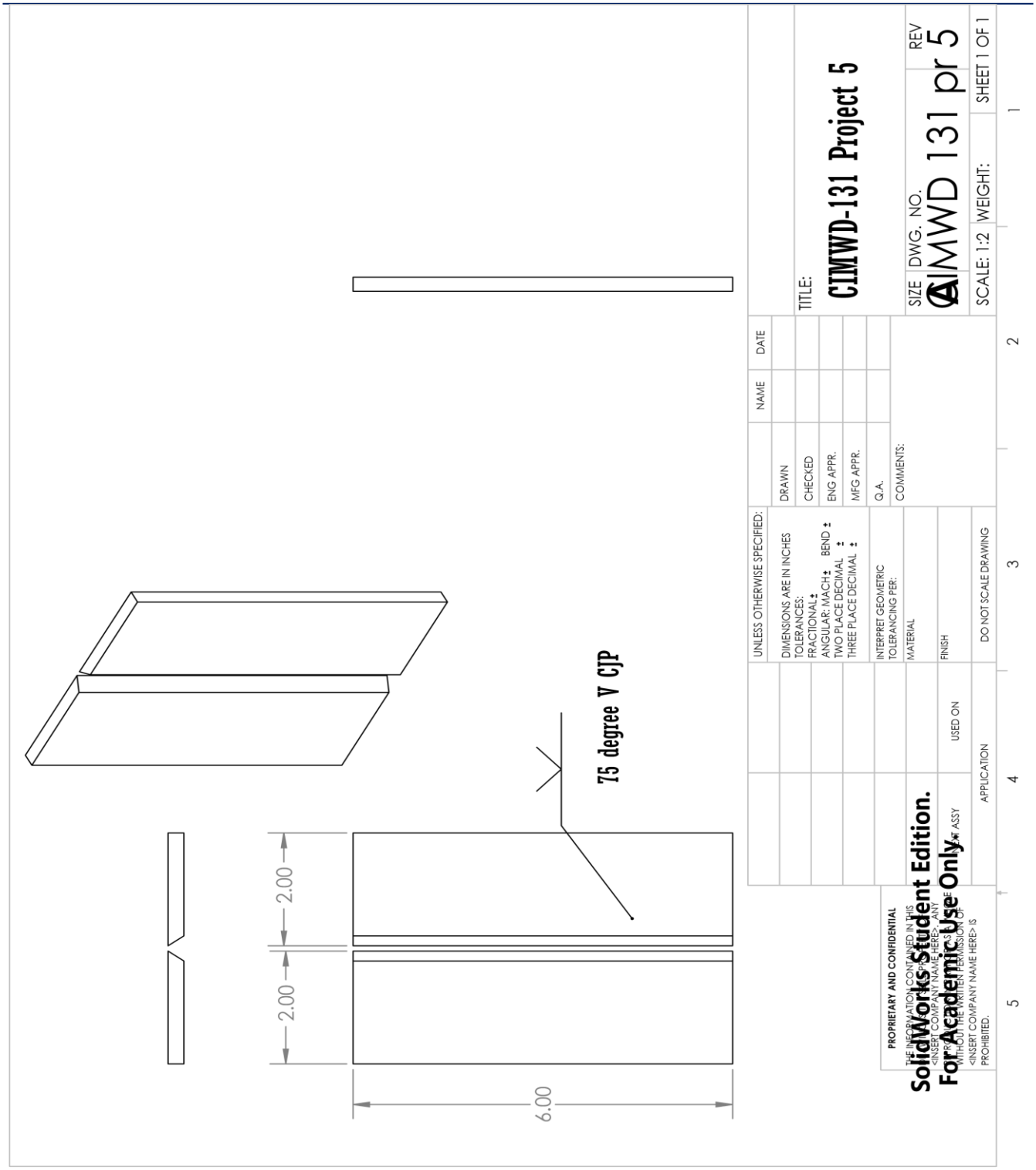
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 5

Weld Type	Vee Groove Weld
Welding Process	GMAW
Position	Vertical
Material	1/4” Steel
Joint Type	Butt
Backing Option	PJP
Backing Material	1/8” Steel

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit
Tungsten Electrode	
Shielding Gas	75% Argon 25% CO2
Flow Rate	25 cfh
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 or Weave		GMAW	ER70s-6	.035		DC+	50	6	

Technique:
Butt Joint filled with stringer beads or weave beads till just over flush in Vertical Up position

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

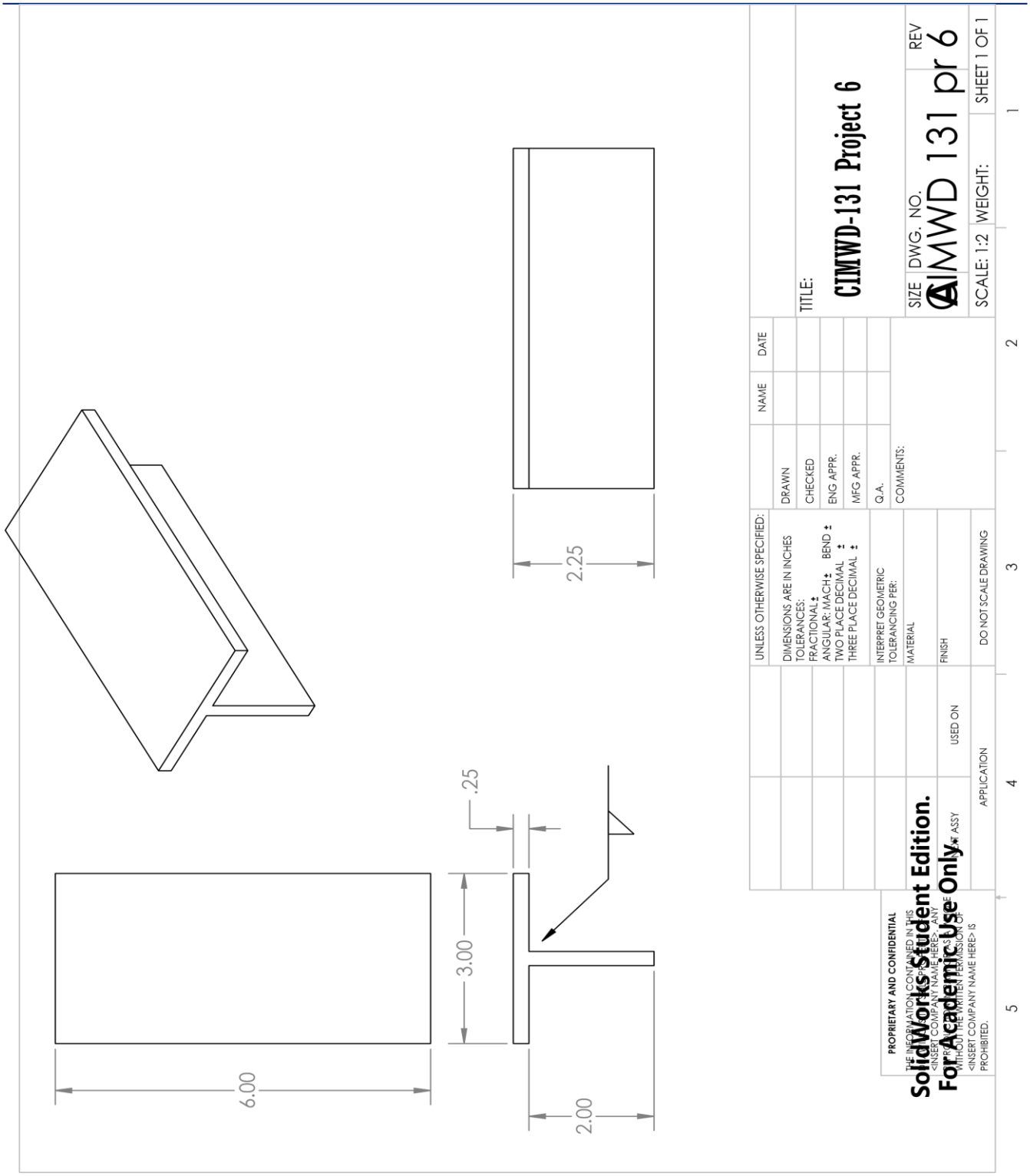
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 6

Weld Type	Fillet
Welding Process	GMAW
Position	Overhead
Material	1/4” Steel
Joint Type	Tee
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit
Tungsten Electrode	
Shielding Gas	75% Argon 25% CO2
Flow Rate	25 cfh
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 or Weave		GMAW	ER70s-6	.035		DC+	50	6	

Technique: Tee Joint use weave bead in overhead position

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Heat Treatment:
Preheat Temperature-

Post Heat Temperature-

Interpass Temperature- Quench between passes

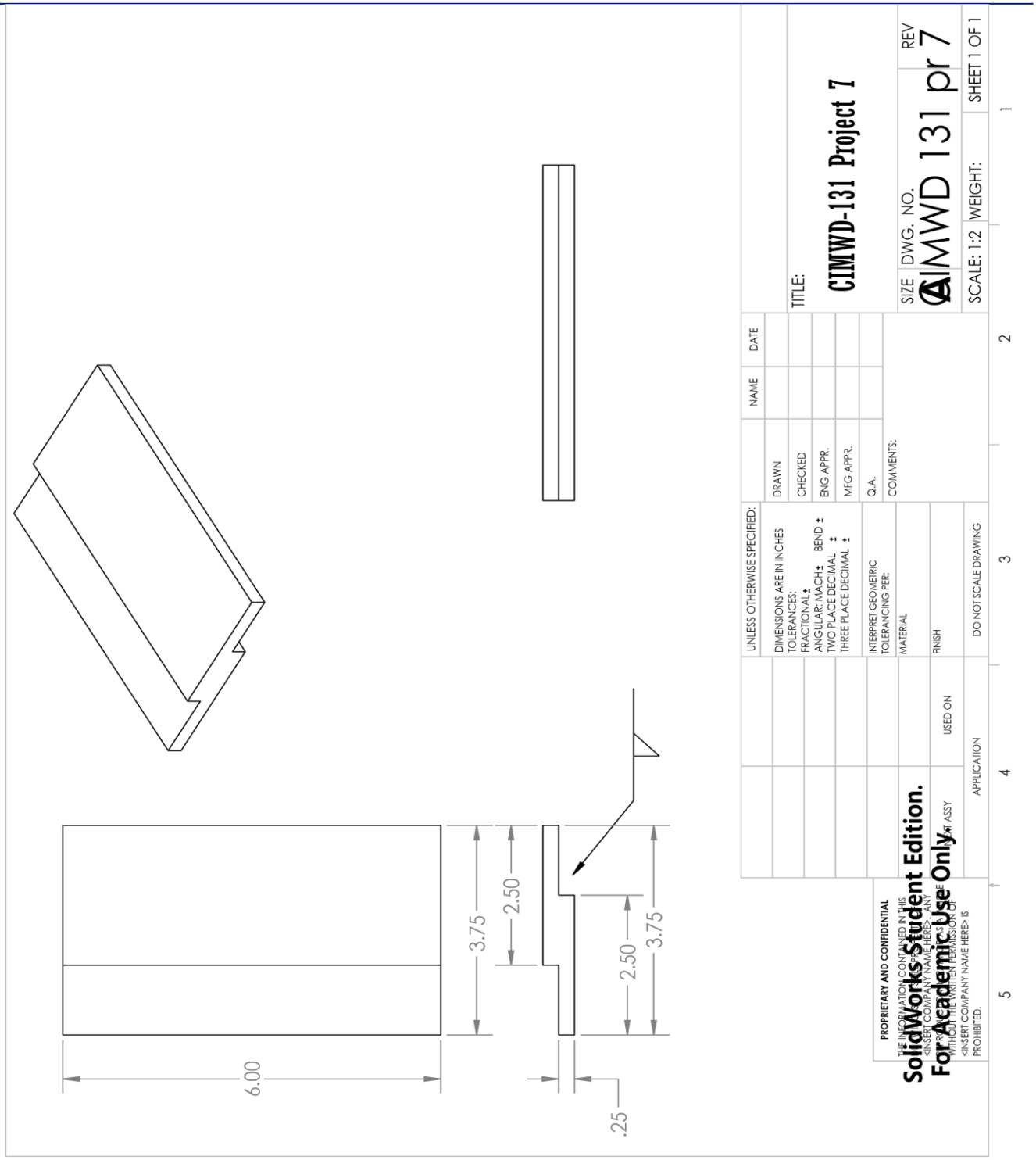
Stress Relieving-

Additional Notes:

Show the instructor progress every 30 minutes minimum.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding



CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

Welding Procedure Specification

WPS Name	CIMWD-131 Project 7

Weld Type	Fillet Weld
Welding Process	GMAW
Position	Overhead
Material	1/4” Steel
Joint Type	Lap
Backing Option	
Backing Material	

Polarity	DC+
Electrode	ER70s-6
Transfer Mode	Short Circuit Transfer
Tungsten Electrode	
Shielding Gas	75% Argon/25% CO2
Flow Rate	25 cfh
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
Weave	Tee	GMAW	ER-70s-6	.035”		DC+	50	7.0	

Technique:
Lap Joint use weave bead in overhead position

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead 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.

CIMWD-131 Syllabus

Gas Metal Arc Welding – Vertical and Overhead Welding

SAFETY DISCLAIMER:

M-SAMC educational resources are in no way meant to be a substitute for occupational safety and health standards. No guarantee is made to resource thoroughness, statutory or regulatory compliance, and related media may depict situations that are not in compliance with OSHA and other safety requirements. It is the responsibility of educators/employers and their students/employees, or anybody using our resources, to comply fully with all pertinent OSHA, and any other, rules and regulations in any jurisdiction in which they learn/work. M-SAMC will not be liable for any damages or other claims and demands arising out of the use of these educational resources. By using these resources, the user releases the Multi-State Advanced Manufacturing Consortium and participating educational institutions and their respective Boards, individual trustees, employees, contractors, and sub-contractors from any liability for injuries resulting from the use of the educational resources.

DOL DISCLAIMER:

This product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

RELEVANCY REMINDER:

M-SAMC resources reflect a shared understanding of grant partners at the time of development. In keeping with our industry and college partner requirements, our products are continuously improved. Updated versions of our work can be found here: http://www.msamc.org/resources.html.