



CIMWD-211 Syllabus

Pipe Welding – 6G Welding

Recommended Textbook:

Welding: Principles and Applications 8th Edition

Course Description:

Introduces safety protocols and weld pipe preparation. Focuses on pipe welding in 6G welding position using the shielded metal arc and the gas tungsten arc welding processes.

Course Topics

1. Safety.
2. Pipe preparation and alignment.
3. 6G welding position with SMAW.
4. 6G welding position with GTAW.

Learning Objectives

1. Demonstrate proper safety practices for pipe welding.
2. Identify and explain the 6G pipe welding positions.
3. Demonstrate the proper alignment techniques for welded pipe joints.
4. *Perform a weld using the proper techniques for the 6G positions using the Shielded Metal Arc Welding process.
5. *Perform a weld using the proper techniques for the 6G positions using the Gas Tungsten Arc Welding process.

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-211 Syllabus

Pipe Welding – 6G 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-211 Syllabus

Pipe Welding – 6G 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-211 Syllabus

Pipe Welding – 6G 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: 10 hrs
- Project 3: 16 hrs





CIMWD-211 Syllabus

Pipe Welding – 6G Welding

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| | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">NAME</td> <td style="width: 15%;">DATE</td> <td rowspan="5" style="width: 15%; vertical-align: top;"> TITLE: CIMWD-111 Project 4 </td> <td rowspan="5" style="width: 15%; vertical-align: top;"> SIZE DWG. NO. A Part 10 </td> <td rowspan="5" style="width: 15%; vertical-align: top;"> REV SCALE: 1:2 WEIGHT: SHEET 1 OF 1 </td> </tr> <tr> <td>DRAWN</td> <td></td> <td></td> </tr> <tr> <td>CHECKED</td> <td></td> <td></td> </tr> <tr> <td>ENG APPR.</td> <td></td> <td></td> </tr> <tr> <td>MFG APPR.</td> <td></td> <td></td> </tr> <tr> <td colspan="3">Q.A.</td> <td colspan="3">COMMENTS:</td> </tr> <tr> <td colspan="6"> UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± </td> </tr> <tr> <td colspan="6"> INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL: FINISH: DO NOT SCALE DRAWING </td> </tr> <tr> <td colspan="6" style="text-align: center;"> APPLICATION </td> </tr> <tr> <td colspan="6" style="text-align: center;"> USED ON </td> </tr> </table> | | NAME | DATE | TITLE: CIMWD-111 Project 4 | SIZE DWG. NO. A Part 10 | REV SCALE: 1:2 WEIGHT: SHEET 1 OF 1 | DRAWN | | | CHECKED | | | ENG APPR. | | | MFG APPR. | | | Q.A. | | | COMMENTS: | | | UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± | | | | | | INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL: FINISH: DO NOT SCALE DRAWING | | | | | | APPLICATION | | | | | | USED ON | | | | | |
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CIMWD-211 Syllabus

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Welding Procedure Specification

| | |
|----------|---------------------|
| WPS Name | CIMWD-121 Project 1 |
|----------|---------------------|

| | |
|------------------|-----------------|
| Weld Type | Vee Groove Weld |
| Welding Process | SMAW |
| Position | Vertical |
| Material | 1/4" Steel |
| Joint Type | Butt |
| Backing Option | CJP |
| Backing Material | |

| | |
|--------------------|---------------------------|
| Polarity | DC+ |
| Electrode | E6010 3/32 and 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 | 50 | DC+ | | | |
| | Fill | SMAW | E7018 | 3/32 | 70 | " | | | |
| | Cover | SMAW | E7018 | 3/32 | 70 | " | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Technique:

Root Pass using E6010 for CJP. Grind root on face side smooth. Fill and cover using E7018 with a stringer or weave in vertical up position.





CIMWD-211 Syllabus

Pipe Welding – 6G 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-211 Syllabus

Pipe Welding – 6G Welding

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NOTES: FLAME CUT BEVEL
3/32 LAND
6010 3/32 ROOT
7018 3/32 FILL & COVER

| | | | |
|-----------|---------|---------|--|
| DRAWN | NAME | DATE | |
| CHECKED | JSIBERT | 3/27/15 | |
| ENG APPR. | | | |
| MFG APPR. | | | |
| Q.A. | | | |
| COMMENTS: | | | |

TITLE:
CIMWD-211 Project 1

SIZE DWG. NO. REV
A6G Drawing 0

SCALE: 1:4 WEIGHT: SHEET 1 OF 1

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USED ON APPLICATION





CIMWD-211 Syllabus

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Welding Procedure Specification

| | |
|----------|---------------------|
| WPS Name | CIMWD-211 Project 1 |
|----------|---------------------|

| | |
|------------------|-----------------|
| Weld Type | CJP Groove |
| Welding Process | SMAW or GTAW |
| Position | 6G |
| Material | 3" Sch. 80 Pipe |
| Joint Type | Vee Butt |
| Backing Option | No Backer |
| Backing Material | |

| | |
|--------------------|------------------------|
| Polarity | DC+ |
| Electrode | E6010 3/32, E7018 3/32 |
| Transfer Mode | |
| Tungsten Electrode | Or 2% Ceriated |
| Shielding Gas | 100% Argon |
| Flow Rate | 25cfh |
| 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 | " | | | |
| Stringer | Root & Fill | GTAW | ER70s-6 | 1/16 or 3/32 | 120a | " | | | |
| | | | | | | | | | |





CIMWD-211 Syllabus

Pipe Welding – 6G Welding

Technique:

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

GTAW- Root/Fill/Cover use ER70s-6 1/16" or 3/32" filler metal

Initial/Interpass Cleaning- Chip and Brush

Number of Electrodes-

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-211 Syllabus

Pipe Welding – 6G Welding

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