Fall 9-1-2005

WEL 282T.01: Pipe Welding -- SMAW and GTAW

Robert Shook
The University Of Montana

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THE UNIVERSITY OF MONTANA, MISSOULA
COLLEGE OF TECHNOLOGY
INDUSTRIAL TECHNOLOGY DEPARTMENT

COURSE SYLLABUS

COURSE NUMBER AND TITLE:  WEL U282T, Pipe Welding -- SMAW and GTAW

SEMESTER CREDITS:  4

PREREQUISITES:  WEL 181T (SMAW) and WEL 280T (GTAW)

INSTRUCTOR NAME:  Robert Shook
PHONE NUMBER:  243-7644
OFFICE LOCATION:  West Campus, Welding Lab office.
OFFICE HOURS:  Mondays, 11:00am to 12:00 noon or by appointment.

RELATIONSHIP TO PROGRAM:  Provides theory of fit-up and welding technique with skill development using two welding process that are primary in the welding of pipe. This experience complements the other welding activities taught in the program to attain a solid, broad based understanding of welding as an industrial metals joining process.

COURSE DESCRIPTION:  Emphasis on skill development in the welding of pipe sections to extremely high quality levels as required by national codes and standards. Pipe welding using GTAW for the root pass and SMAW for the remaining passes in all positions. Visual inspection and destructive testing used to evaluate work according to industry standards.

COURSE OBJECTIVES:
1. Using E-6010 electrodes weld root passes on 3/8” plate and pipe that meet visual and destructive testing as provided in American Society of Mechanical Engineers (ASME) Section IX, Boiler and Pressure Vessel Code.

2. Using E-7018 electrodes weld fill and cover passes on 3/8” plate and pipe that meet visual and destructive testing as provided in American Society of Mechanical Engineers (ASME) Section IX, Boiler and Pressure Vessel Code.

3. Using specifications provided in ASME Section IX, Boiler and Pressure Vessel Code. demonstrate correct preparation and fit-up of pipe sections.

4. Demonstrate an understanding of the technical knowledge related to successful welding of pipe to a code or standard by scoring 70% or better on a written exam covering this material.

5. Demonstrate the successful welding of 5” or 6” schedule 80 pipe in the 2G position (pipe axis is vertical), the 5G position, (the pipe axis is horizontal) and the 6G position, (the pipe axis is at a 45° angle) using E-6010 and E-7018 electrode.
6. Demonstrate the successful welding of 3” or 4” schedule 80 pipe in the 2G position (pipe axis is vertical), the 5G position, (the pipe axis is horizontal) and the 6G position, (the pipe axis is at a 45° angle) using GTAW for the root and E-7018 for the cover.

**STUDENT PERFORMANCE ASSESSMENT METHODS AND GRADING PROCEDURES:**

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Weightage</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Hands on Welding Tests</td>
<td>50%</td>
<td>A = 93% - 100%</td>
</tr>
<tr>
<td>Written tests</td>
<td>30%</td>
<td>B = 92% - 82%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10%</td>
<td>C = 81% - 70%</td>
</tr>
<tr>
<td>Completed Notebook</td>
<td>05%</td>
<td>D = 69% - 60%</td>
</tr>
<tr>
<td>Professionalism</td>
<td>05%</td>
<td>F = 59% or less</td>
</tr>
</tbody>
</table>

**Practical Hands on Welding Tests:** Upon successful completion of lab assignments a hands on welding test derived from written specifications and graphics (drawings) will be administered. It will be graded based upon execution ie. fit-up, weld profile, workmanship, etc. as prescribed by AWS standards.

**Written tests:** these tests are derived from reading assignments given in class (homework), notes from class lectures, video presentations, etc.

**Quizzes** are composed of your name/date and three questions. Name and date are worth 25%. Each question is worth 25%. To receive credit for questions they must be written out and correctly answered. Quizzes may be given at any time during the course scheduled meeting time.

**Completed Notebook** is a compilation of class notes and handouts. To receive the full 5% the notebook must be neat and organized. It must also be contained or be found contiguous within a three ring binder.

**Professionalism** is defined as a combination of one's attitude, motivation, participation, organization and work area cleanliness.

**ATTENDANCE POLICY:** Attendance is not taken, although you are required to be in attendance to successfully complete the course.

**OTHER POLICIES:** Safety is required to be practiced at all times. Eye protection is mandatory at all times in the Lab area. Disregard of safe practices, endangering yourself or others may result in you being denied access to the Lab area. Last day to complete lab assignments is the second day of finals week.

**REQUIRED TEXT:** The Procedure Handbook of Arc Welding, 13th Edition. Author: The Lincoln Electric Company Publisher: The Lincoln Electric Company

Shielded Metal Pipe Welding - Uphill  
Author: Hobart School of Welding Tech  
Publisher: The Hobart School of Welding Technology

**SUGGESTED REFERENCE MATERIALS:**  
The Welding Journal, monthly periodical published by the American Welding Society  

SUPPLIES:
- Welding helmet with #10 or #11 lens
- Gas Tungsten Arc welding gloves (TIG) and SMAW gloves
- Eye protection
- Pliers with wire cutting capabilities
- Full size “pipe” hand brush (has tapered grouping of bristles)
- Chipping hammer
- Leather welding jacket or equivalent
- Striker
- Lock for locker
- Tape measure

COURSE OUTLINE:
1. Typical Fit-ups for Welded Pipe
2. Welding codes as they apply to welded pipe
3. SMAW of welded pipe -- technique
4. GTAW of welded pipe -- technique
5. Techniques used to evaluate welded pipe
   5.1 Visual inspection
   5.2 Destructive testing
   5.3 Non destructive evaluation (NDE)
6. Practical welding experience of pipe
   6.1 Plate – 2G, 3G, 4G
   6.2 Pipe 2G, 6010 root, 7018 fill
   6.3 Pipe 5G, 6010 root, 7018 fill
   6.4 Pipe 6G, 6010 root, 7018 fill
   6.5 Pipe 2G, GTAW root, 7018 fill
   6.6 Pipe 5G, GTAW root, 7018 fill