WELD 0015A - SHIELDED METAL ARC WELDING ON PIPE

Catalog Description

Formerly known as WELD 30
Prerequisite: Completion of WELD 5B with grade of "C" or better
Hours: 72 (18 lecture, 54 laboratory)
Description: Welding of pipe using accepted practices of industry with Shielded Metal Arc Welding Process. Emphasis on the welding techniques used for out-of-position welding (2G, 5G, 6G, and 6GR pipe full penetration welds). (CSU)

Course Student Learning Outcomes

- CSLO #1: Apply knowledge of safety standards for both a learning environment and work site environment with focus on the SMAW welding process, plus track OFC cutting process on plate and circular OFC cutting methods, plus other thermal and mechanical activities such as machining and grinding.
- CSLO #2: Define terms related to this course: essential variables, welding procedure specification, procedure qualification record, root opening, tie-in, pipe schedule, keyhole, electrode oscillation and whip technique.
- CSLO #3: Demonstrate manipulative skills of an advanced level to prepare and deposit SMAW welds with both stringer and weave techniques on carbon steel pipe in 2G, 5G, 6G, and 6GR pipe welding positions including pipe prep.

Effective Term

Fall 2019

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

36

Total Student Learning Hours

108

Course Objectives

Lecture Objectives:
1. Describe safe welding practices
2. Define and use terminology of welding code, AWS, ASME, API.
3. Identify and evaluate the skills needed for code quality Shielded Arc Welding
4. Differentiate welding discontinuities found in groove welds of pipe.
5. Compare and correlate feedback loop type power sources vs fine/course generator types as the volt and amp curve relates.
6. Identify good practices in joint designs in open groove welded butt joint with their effect as applied to travel up as compared to downward.
7. Characterize the differences needed in welding technique and setting to be used in travel up vs downward.
8. Identify welder testing process differences in Welding code authorities.
9. Develop written welding procedures to be applied in student job assignments.
10. Apply welding symbols and what joint preparations are needed to produce the identified weld.
Laboratory Objectives:
1. Employ safe practices when using related welding equipment in out-of-position applications (personal protective equipment devices and established practices related to out of position welding).
2. Practice and employ the skills needed for Shielded Metal Arc Welding in producing quality complete penetration welded joints using techniques for out-of-position (5G-6G pipe) according to procedures used in industry.
3. Compare various welding power supplies in relation to volt/amp curve and arc force controls.
4. Identify each commonly used SMAW electrode and the effect of the fluxing component as related to the welding arc behavior and technique used.
5. Analyze groove related weld defects of this welding process and perform corrective action to achieve successful result.
6. Prepare and weld plates using two types of weld techniques for F4 electrodes in overhead and vertical up travel using a Single Vee butt joint with steel backing joint design per AWS D1.1.
7. Prepare and weld pipes using three types of weld techniques for F3 and F4 electrodes on two different pipe thickness in 2G vertical fixed pipe position (uphill), 5G horizontal fixed pipe position and 6G 45 degree inclined fixed pipe position referenced in ASME code
8. Prepare and weld pipes using two types of weld techniques for F3 electrodes in 5G horizontal fixed pipe position (downhill) using Single Vee open root butt referenced in API code.
9. Analyze corrective procedures to control distortion during welding
10. Examine Welding Symbols used in blueprints.
11. Create and apply welding procedure specifications per established standards of welding code, (WPS).
12. Prepare and test practice welds using established industry procedures of destructive testing.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable

Methods of Evaluation

- Reports
  - Example: Short written report on principles and theory of Shielded Metal Arc Welding out of position on pipe. Evaluated based on accuracy.
- Skill Demonstrations
  - Example: Evaluation at each lab meeting based on American Welding Society acceptance criteria on visual appearance of welds, for example Oxy-Fuel Cutting.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. With instructor demonstration and oversight, students will apply various welding techniques.
2. Following class lecture, video presentation, and lab demonstration, student will practice advanced manipulative skills in vertical and overhead positions on each welding position on pipe.

Lecture:

1. Lecture and interpersonal group discussion on the various types and application of welding processes with following presentation of group results.

Distance Learning

1. Instructor will use slide show presentation, instructor created video, or lecture presentation on a learning platform to teach about best safety practices in the for personal protective equipment, the weld lab environment, and/or tools & equipment. Students will be given a scenario and expected to list the best safety practices that should be employed and explain why they should be used. Students will submit the assignment via text entry, file upload, video or audio recording.

Typical Out of Class Assignments

Reading Assignments

1. Read chapter from the text book on distortion and corrective procedures and be prepared to discuss in class. 2. Read the AWS Structural Code Steel D1.1 (sections one through six) to determine acceptance criteria when performing a welding qualification and list the criteria in a report. 3. Read section in text on Welding symbols. Students will compare Weld symbols used in assignments to Industry standard and be prepared to discuss symbols.

Writing, Problem Solving or Performance

1. Report from the reading assignments welding procedures and welding joint designs and visual acceptance criteria to code. 2. Demonstrate welding skill sets on each assigned job objective used in this course.

Other (Term projects, research papers, portfolios, etc.)

Required Materials

- Welding Principles and Practices
  - Author: Edward R. Bohnart
  - Publisher: McGraw-Hill
  - Publication Date: 2017
  - Text Edition: 5th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Welding Skills
  - Author: B. J. Moniz & R. T. Miller
  - Publisher: American Technical
  - Publication Date: 2010
  - Text Edition: 4th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Welding: Principles and Applications
  - Author: Larry F. Jeffus
  - Publisher: Delmar / Cengage Learning
  - Publication Date: 2011
  - Text Edition: 7th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Pipe Welding Procedures
  - Author: Hoobasar Rampaul
  - Publisher: Industrial Press
  - Publication Date: 2003
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.