

ATPF-1808: SPECIAL TOPICS: PIPE GROOVE WELD

Cuyahoga Community College

Viewing: ATPF-1808 : Special Topics: Pipe Groove Weld

Academic Term:

Fall 2026

Subject Code

ATPF - Applied Ind Tech - Pipefitters

Course Number:

1808

Title:

Special Topics: Pipe Groove Weld

Catalog Description:

Basic pipefitter welding course covering open root welding including joint design, material selection and preparation, and the welding process. Included in this course are technique demonstration and application with respect to root gap, land and fit up in compliance with industry standards.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to pipefitter's apprenticeship program.

Outcomes

Course Outcome(s):

Discuss the purpose of pipe groove welds, explain the process of plate beveling, the physical properties of the materials and various types of groove welds.

Objective(s):

1. Discuss the purpose of pipe groove welds in the pipefitting industry and identify specific applications.
2. List and define the terms related to pipe groove welding.
3. List the different methods used to bevel carbon steel pipe.
4. Explain the purpose of beveling plate material prior to welding.
5. Identify the physical properties of carbon steel pipe.
6. Identify the various types of groove welds.
7. Differentiate between fillet and pipe groove welds.
8. State examples of fillet and pipe groove welds.

Course Outcome(s):

Discuss the joint design required for pipe groove welding including engineered specifications, bevel angle and the effects of land and root gap dimensions and the weld process.

Objective(s):

1. Explain the parameters of pipe groove welding with respect to engineering specifications and function.
2. Explain the importance of adhering to the prescribed tolerances.
3. Explain how bevel angle, land thickness and joint design directly affect the quality of the open root.
4. Explain how the pipe weld process affects the joint design.

Course Outcome(s):

Demonstrate the ability to pipe groove weld and properly prepare the coupons, correctly adjust the machine settings and perform welding operations with respect to rod selection and technique.

Objective(s):

1. Apply the proper safety procedures to prepare the pipe and perform welding operations.
 2. Operate power equipment and use hand tools to prepare the pipe and perform the weld and inter pass cleaning.
 3. Prepare welding materials with respect to correct land, bevel and root gap in accord with the prescribed standards.
 4. Apply standard practices for machine set up.
 5. Select proper electrode for open root pass.
 6. Assemble weld coupons and tack to establish proper root gap.
 7. Verify fit up of welding coupons to achieve prescribed results.
 8. Apply proper welding techniques to perform open root pipe groove welds.
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Methods of Evaluation:

1. Participation
2. Attendance
3. Assignments
4. Quizzes/Exams

Course Content Outline:

Pipe groove welding

1. Purpose
1. Field application
 - a. Process piping systems
 - b. High pressure steam
2. Fabrications
3. Industrial applications
 - a. Strength
 - b. Industrial standard design
1. Terminology
1. Root opening
2. Groove weld
3. Bevel angle
4. Root gap
5. Root penetration
6. Burn through
7. Outside diameter reinforcement
8. Inside diameter reinforcement
9. Single V groove
10. Heat Affected Zone (HAZ)
 1. Bevel methods
 1. Oxygen/acetylene
 2. Hand/mechanical
 3. Machine
 4. Grind
 1. Purpose
 1. Configuration
 2. Joint specifications
 3. Strength
 1. Pipe properties
 1. Size
 2. Thickness

3. Material type
4. Schedule
1. Pipe groove weld types
 1. Single bevel
 2. Single J
 3. Single V
 4. Single U
 5. Double bevel
 6. Double bevel J
 7. Double bevel V
 8. Double bevel U
 9. Square
10. Fillet weld types
 - a. Slip on flange
 - b. Socket weld
 - c. Weld o let
 - d. Thread o let
- II. Joint design
 1. Parameters
 1. Weld procedure specifications WPS
 - a. Minimum gaps, land and bevel angle
 - b. Maximums
 2. Engineered specifications
 3. American Society of Mechanical Engineers ASME
 1. Prescribed tolerances
 1. Adherence
 2. Failure
 - a. Weld crack
 - b. Degradation of base material
 - c. Failure
 3. Acceptance
 - a. Minimum standards
 - b. Appearance
 - c. Penetration
 - d. Complete fusion
 1. Open root quality
 1. Consistent width
 2. Complete penetration
 3. Complete fusion
 4. Root thickness/reinforcement
 1. Weld process
 1. Shielded Metal Arc Welding SMAW
 2. Gas Tungsten Metal Arc Welding TIG
 3. Gas Machine Welding MIG
 1. Welding operations
 - a. Safety procedures
 1. PPE
 - a. Safety glasses
 - b. Gloves
 - c. Fire retardant jacket
 - d. Hood with lens
 - e. Footwear
 2. Electrical
 - a. Grounding
 - b. Nicks and abrasions
 - c. Polarity
 3. Jobsite hazards

- a. Fire
- b. Water
- c. Falls
- d. Pinch points
- 1. Physical hazards
 - a. Burns
 - b. Weld flash
 - c. Electrical shock
 - d. Respiratory
 - e. Hearing
 - i. Hand and power tools
- 1. Selection
- 2. Application
- 3. Operation
 - a. Material preparation
 - i. Land
 - ii. Bevel
 - 1. Angle
 - 2. Application
 - iii. Length
- 4. Machine set up
 - a. Power
 - b. Electrode holder and ground
 - c. Amperage selection
- 5. Electrode
 - a. Number
 - b. Size
 - c. Amperage setting
- 6. Coupon assembly
 - a. Root gap
 - b. Fit up
 - c. Tacks
 - d. Fixture adjustment
- 7. Verification
 - a. Machine adjustment
 - b. Set up and tack
 - c. Gap gage
- 8. welding technique
 - a. Rod angle
 - b. Rod selection
 - c. Arc length
 - d. Travel speed
 - e. Key hole

Religious Accommodation

Before reviewing the course schedule, students should carefully review the following religious accommodation policy and other required instructional policies:

Religious Accommodation:

Students seeking an accommodation for absences permitted under Ohio's Testing Your Faith Act must provide the instructor with written notice of the specific dates for which the student requires an accommodation and must do so not later than fourteen (14) days after the first day of instruction. Please submit requests for accommodations at this link: <https://portal2.tri-c.edu/ReligiousAccommodation/> Religious Accommodation Form. Students with questions about their religious accommodations under Ohio's Testing Your Faith Act may contact the College's Office of General Counsel and Legal Services by phone at 216.987.4856 or via email at legal@tri-c.edu.

Other Required Instructional Policies:

<https://www.tri-c.edu/student-resources/curriculum/documents/syllabus-part-b.pdf>

Weekly Schedule

	Topics
Week 1	Introduce groove weld specifications, including gap, land, and bevel angle
Week 2	Introduce groove weld specifications, including gap, land, and bevel angle
Week 3	Plate prep for welding procedures
Week 4	Plate prep for welding procedures
Week 5	Flat or 1G open root plate
Week 6	Flat or 1G open root plate
Week 7	2G horizontal plate change in technique for position change
Week 8	2G horizontal plate change in technique for position change
Week 9	5G vertical up plate welding; change in rod angle for position
Week 10	5G vertical up plate welding; change in rod angle for position
Week 11	3G overhead plate weld; body positions for overhead
Week 12	3G overhead plate weld; body positions for overhead
Week 13	Review weld specs for each plate weld position
Week 14	Review weld specs for each plate weld position
Week 15	Review
Week 16	Assessment: Plate Weld Test and Inspection

The Course Schedule is subject to change due to pedagogical needs, instructor discretion, parts of term, and unexpected events.

Required/Recommended Readings

Instructor-provided materials

Resources for the Instructor

United Association Training Department. *Welding Skills*. Annapolis, MD: United Association, www.ua.org/training

Frankland, Thomas W. . *Pipe Trades Manual*. McGraw-Hill, 1969.

Additional Resources for the Instructor

http://www.weldersuniverse.com/weld_types.html

http://www.weldingdata.com/groove_weld_positions_for_plate.htm

<http://www.millerwelds.com/resources/articles/smaw-stick-arc-welding-tips-techniques/>

www.ua.org (<https://catalog.tri-c.edu/www.ua.org>)

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