

ATPF-2812: SPECIAL TOPICS: P/F FIXED HORIZONTAL 2G PIPE WELD

Cuyahoga Community College

Viewing: ATPF-2812 : Special Topics: P/F Fixed Horizontal 2G Pipe Weld

Academic Term:

Fall 2026

Subject Code

ATPF - Applied Ind Tech - Pipefitters

Course Number:

2812

Title:

Special Topics: P/F Fixed Horizontal 2G Pipe Weld

Catalog Description:

Basic pipefitter welding course covering open root welding including joint design, material selection and prep 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 horizontal pipe weld and how it relates to field applications.

Objective(s):

1. Discuss the purpose of pipe groove welds in the horizontal position and identify respective uses.
2. List and define the terms related to horizontal pipe groove welding.
3. List the different methods used for beveling carbon steel pipe.
4. Explain the purpose of beveling the pipe in the position to be welded.
5. Identify the physical properties of carbon steel pipe.
6. Identify the various types of groove welds.
7. Differentiate between roll welding and field position welding.
8. State examples of horizontal pipe groove welding.

Course Outcome(s):

Discuss the joint design required for pipe groove welding in the horizontal position 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 in the horizontal position 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 is affected by the change in position.

Course Outcome(s):

Demonstrate the ability to pipe groove weld in the fixed horizontal position 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 horizontal welding operations.
2. Operate power equipment and use hand tools to prepare the pipe and perform the weld and interpass cleaning in the field position.
3. Prepare welding materials with respect to the correct land, bevel, and root gap in accordance with prescribed tolerances.
4. Apply standard practices for machine setup.
5. Select the proper electrode for open root pass.
6. Assemble weld coupons and tack to establish a proper root gap.
7. Verify the fit-up of welding coupons to achieve prescribed results.
8. Apply proper welding techniques to perform an open root pipe groove weld.

Methods of Evaluation:

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

Course Content Outline:

1. Pipe groove welding
 - a. Purpose
 - i. Field application/ 2G
 1. Fabrication
 2. Vertical risers
 - ii. Fit up application
 1. Jewel clamp
 2. Fit up dogs
2. Terminology
 - a. Root opening
 - i. Groove weld
 - ii. Bevel angle
 - iii. Root gap
 - iv. Root penetration
 - v. 2-G
 - vi. Outside diameter reinforcement
 - vii. Inside diameter reinforcement
 - viii. Porosity
 - ix. Heat Affected Zone HAZ
 - x. Jewel clamp
 - xi. Bead overlap
 - xii. undercut
 - b. Bevel methods
 - i. Oxygen /acetylene
 - ii. Hand/mechanical
 - iii. Plasma arc
 - iv. Grind
 - c. Purpose
 - i. Body position
 - ii. Technique
 - iii. Rod angle maintenance

- d. 2-G weld bead properties
 - i. Root technique
 - ii. Fill layers
 - iii. Proper cap bead stacking
 - e. Pipe groove weld types
 - i. Single bevel
 - ii. Single J
 - iii. Single V
 - iv. Single U
 - v. Double bevel
 - vi. Double bevel J
 - vii. Double bevel V
 - viii. Double bevel U
 - ix. Square
 - x. Fillet weld types
 - 1. Slip on flange
 - 2. Socket weld
 - 3. Weld o-let
 - 4. Thread o-let
 - f. Material
 - i. A-106
 - ii. B-53
 - iii. Schedule 40
 - iv. Schedule 80
 - v. 304 stainless steel
3. Joint design
- a. Parameters
 - i. Weld Procedure Specifications WPS
 - 1. Minimum gaps, land and bevel angle
 - 2. Maximums
 - ii. Engineered specifications
 - iii. National Pipe Welding Bureau
 - b. Prescribed tolerances
 - i. Adherence
 - ii. Failure
 - 1. Weld crack
 - 2. Porosity
 - 3. Failure
 - 4. Undercut
 - iii. Acceptance
 - 1. Minimum standards
 - 2. Appearance
 - 3. Penetration
 - 4. Complete fusion
 - c. Open root quality
 - i. Consistent width
 - ii. Complete penetration
 - iii. Complete fusion
 - iv. Root thickness/reinforcement
 - d. Weld process
 - i. Shielded Metal Arc Welding SMAW
 - ii. Gas tungsten Metal Arc Welding TIG
 - iii. Gas Machine Welding MIG
4. Welding operations
- a. Safety procedures
 - i. Electrical
 - 1. Grounding
 - 2. Nicks and abrasions
 - 3. Polarity

- ii. PPE
 - 1. Safety glasses
 - 2. Gloves
 - 3. Fire retardant jacket
 - 4. Hood with lens
 - 5. Footwear
- b. Jobsite hazards
 - i. Fire
 - ii. Water
 - iii. Falls
 - iv. Pinch points
- c. Physical hazards
 - i. Burns
 - ii. Weld flash
 - iii. Electrical shock
 - iv. Respiratory
 - v. Hearing
- d. Hand and power tools
 - i. Selection
 - ii. Application
 - iii. Operation
- e. Material preparation
 - i. Land
 - ii. Bevel
 - 1. Angle
 - 2. Application
 - iii. Length
- f. Machine set up
 - i. Power
 - ii. Electrode holder and ground
 - iii. Amperage selection
- g. Electrode
- h.
 - i. Number
 - ii. Size
 - iii. Amperage setting
- i. Coupon assembly
 - i.
 - 1. Root gap
 - 2. Fit up
 - 3. tacks
 - 4. Fixture adjustment
 - ii. Verification
 - 1. Machine adjustment
 - 2. Set up and tack
 - 3. Gap gage
 - iii. Welding technique
 - 1. Rod angle
 - 2. Rod selection
 - 3. Arc length
 - 4. Travel speed
 - 5. 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/ReligiousAccommodationForm>. 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	<ul style="list-style-type: none"> o Welding Safety and Pipe Groove Welding * Personal Protective Equipment * Purpose of Pipe Groove Welding * Pipe Groove Welding Progression * Shop
Week 2	<ul style="list-style-type: none"> o Welding Safety and Pipe Groove Welding * Personal Protective Equipment * Purpose of Pipe Groove Welding * Pipe Groove Welding Progression * Shop
Week 3	<ul style="list-style-type: none"> o Coupon Preparation * Prepare Bevel and Land * Adjusting Weld Booth Set-up * Cutting Machine * Shop
Week 4	<ul style="list-style-type: none"> o Coupon Preparation * Prepare Bevel and Land * Adjusting Weld Booth Set-up * Cutting Machine * Shop
Week 5	<ul style="list-style-type: none"> o National Certified Pipe Welding Bureau Guidelines * Weld Procedure Specifications * Minimum and Maximum Gap * Electrode Identification <ul style="list-style-type: none"> a) Number b) Size c) Amperage Setting * Shop
Week 6	<ul style="list-style-type: none"> o National Certified Pipe Welding Bureau Guidelines * Weld Procedure Specifications * Minimum and Maximum Gap * Electrode Identification <ul style="list-style-type: none"> a) Number b) Size c) Amperage Setting * Shop
Week 7	<ul style="list-style-type: none"> o Weld Progression * Initial Root Pass <ul style="list-style-type: none"> a) Rod Angle b) Rod Selection c) Arc Length d) Travel Speed e) Key Hole * Welding Bead Characteristics * Uphill Welding Process * Shop

Week 8	<ul style="list-style-type: none"> o Weld Progression * Initial Root Pass a) Rod Angle b) Rod Selection c) Arc Length d) Travel Speed e) Key Hole * Welding Bead Characteristics * Uphill Welding Process * Shop
Week 9	<ul style="list-style-type: none"> o Weld Progression (continued) * Fill Pass * Proper Electrodes * Shop
Week 10	<ul style="list-style-type: none"> o Weld Progression (continued) * Fill Pass * Proper Electrodes * Shop
Week 11	<ul style="list-style-type: none"> o Weld Progression (continued) * Cover Pass * Height and Width of Cap * Shop
Week 12	<ul style="list-style-type: none"> o Weld Progression (continued) * Cover Pass * Height and Width of Cap * Shop
Week 13	<ul style="list-style-type: none"> o Practice Proper Body Position * Weld Booth Techniques * Shop
Week 14	<ul style="list-style-type: none"> o Practice Proper Body Position * Weld Booth Techniques * Shop
Week 15	Review
Week 16	Evaluation

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

Frankland, Thomas W. *Pipe Trades Manual*. McGraw-Hill, 1965.

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

Additional Resources for the Instructor

<http://www.thefabricator.com/article/arcwelding/stick-welding-tips-for-top-performance> (<http://www.thefabricator.com/article/arcwelding/stick-welding-tips-for-top-performance/>)

<http://www.millerwelds.com/resources/articles/stick-electrode-selection/>

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

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

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