APPENDIX 29301A

Performance Accreditation Tasks

PATs provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for trainees.

The following tasks are designed to evaluate your ability to run open-root V-groove pipe welds with SMAW equipment in the four standard test positions using E6010, E6011, and E7018 electrodes. Perform each task when you are instructed to do so by your instructor. As you complete each task, take it to your instructor for evaluation. Do not proceed to the next task until instructed to do so.

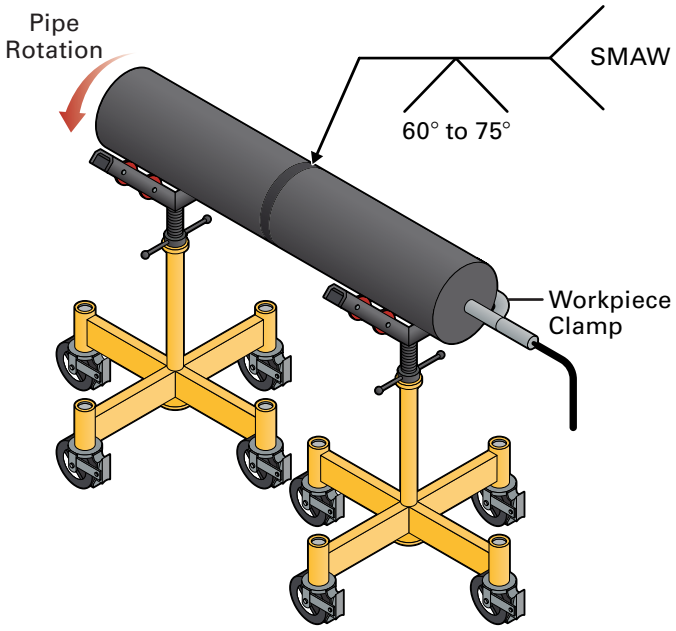
For AWS 1G Rotated, 2G, 5G, and 6G certifications, refer to the latest edition of *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders* for bend test requirements. AWS EG3.0, Supplement, *Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures* is also available.

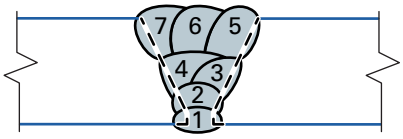
PATs 2 through 4 correspond to *AWS EG3.0, Section 3.3.7 Module 7: Shielded Metal Arc Welding (SMAW)—Pipe.* PAT 1 has no AWS correlation.

Performance Accreditation Tasks **Module 29301**

Open-Root V-Groove Pipe Weld in the 1G Rotated Position

Using ⅛" (3.2 mm) E6010 and E6011 electrodes for the root pass, 3⁄32" (2.4 mm) E7018 electrodes for the hot pass, and 3⁄32" or ⅛" (2.4 mm or 3.2 mm) E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 1G Rotated position as shown.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

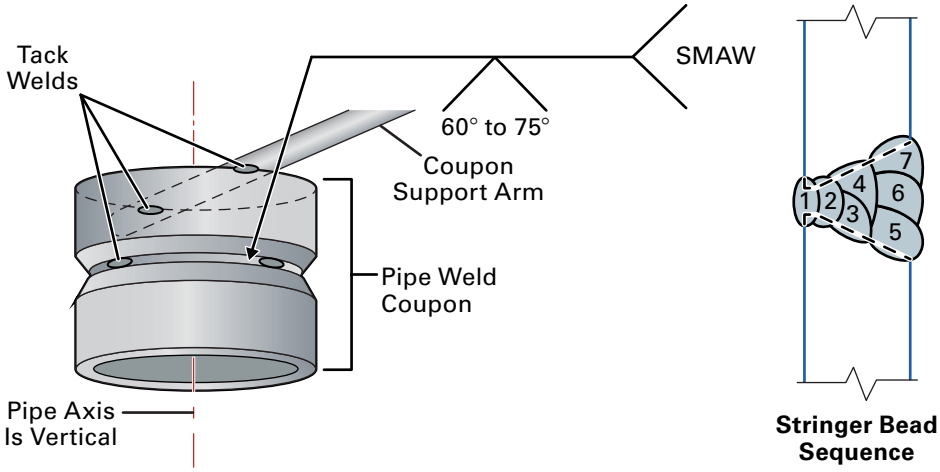
Criteria for Acceptance:

- Uniform, rippled appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size _____
- Acceptable weld profile in accordance with *Figure 12* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3⁄32" (2.4 mm) _____
- No undercut greater than 1⁄32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No inclusions _____
- No cracks _____

Figure A01

Open-Root V-Groove Pipe Weld in the 2G Position

Using 1/8" (3.2 mm) E6010 and E6011 electrodes for the root pass, 3/32" (2.4 mm) E7018 electrodes for the hot pass, and 3/32" or 1/8" (2.4 mm or 3.2 mm) E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 2G position as shown.



Criteria for Acceptance:

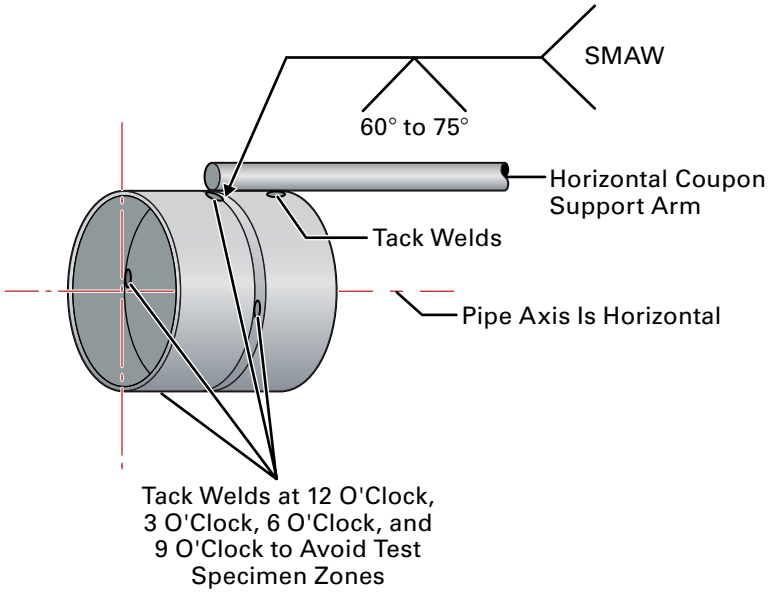
- Uniform, rippled appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size _____
- Acceptable weld profile in accordance with *Figure 12* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No inclusions _____
- No cracks _____

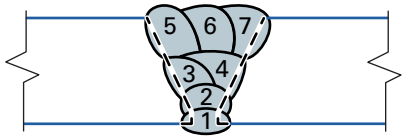
Figure A02

Performance Accreditation Tasks **Module 29301**

Open-Root V-Groove Pipe Weld in the 5G Position

Using ⅛" (3.2 mm) E6010 and E6011 electrodes for the root pass, 3⁄32" (2.4 mm) E7018 electrodes for the hot pass, and 3⁄32" or ⅛" (2.4 mm or 3.2 mm) E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 5G position as shown. For the root pass, weld using the E6010 and E6011 electrodes in the uphill direction. The downhill direction can be used for additional practice.





Stringer Bead Sequence

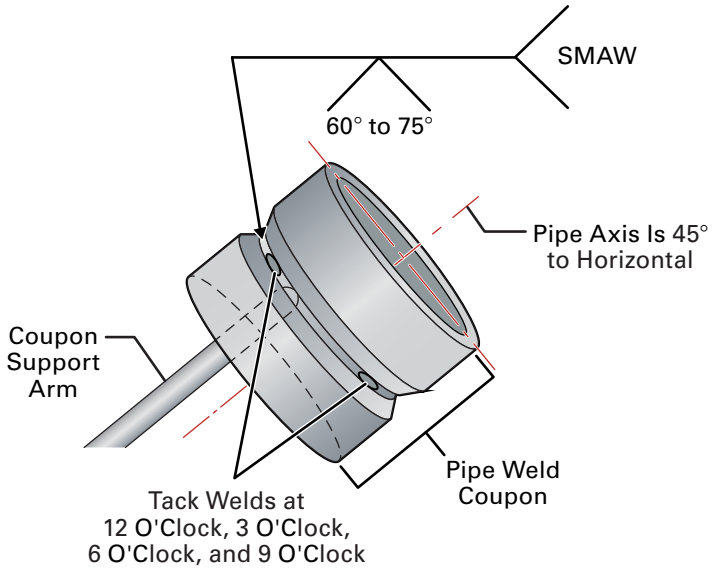
Criteria for Acceptance:

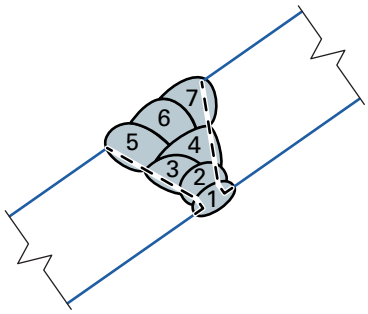
- Uniform, rippled appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size _____
- Acceptable weld profile in accordance with *Figure 12* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3⁄32" (2.4 mm) _____
- No undercut greater than 1⁄32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No inclusions _____
- No cracks _____

Figure A03

Open-Root V-Groove Pipe Weld in the 6G Position

Using ⅛" (3.2 mm) E6010 and E6011 electrodes for the root pass, 3⁄32" (2.4 mm) E7018 electrodes for the hot pass, and 3⁄32" or ⅛" (2.4 mm or 3.2 mm) E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 6G position as shown. If required for qualification test purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon. For the root pass, weld using the E6010 and E6011 electrodes in the uphill direction. The downhill direction can be used for additional practice.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform, rippled appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size _____
- Acceptable weld profile in accordance with *Figure 12* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3⁄32" (2.4 mm) _____
- No undercut greater than 1⁄32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No inclusions _____
- No cracks _____

Figure A04

APPENDIX 29302A

Performance Accreditation Tasks

The Performance accreditation Tasks (PATs) provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

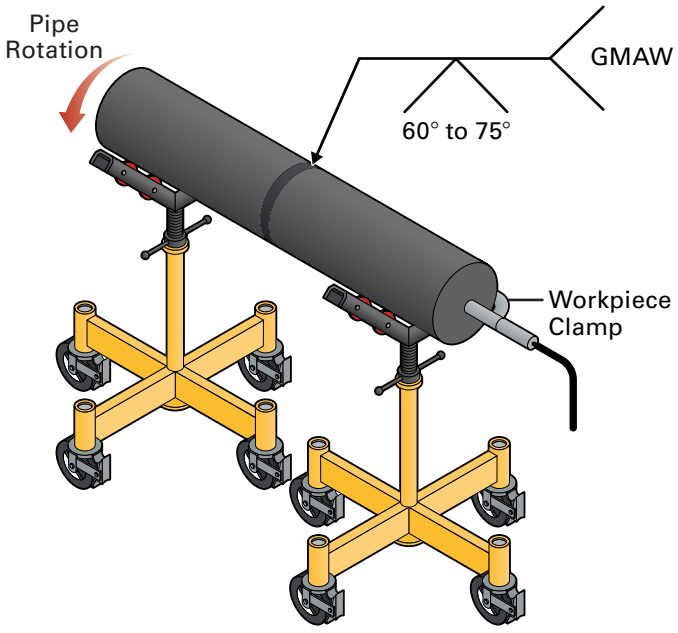
The following tasks are designed to evaluate your ability to run open-root V-groove welds with GMAW equipment in the four standard test positions, using carbon steel wire of the appropriate diameter and shielding gas. Perform each task when you are instructed to do so by your instructor. As you complete each task, show it to your instructor for evaluation. Do not proceed to the next task until you are told to do so by your instructor.

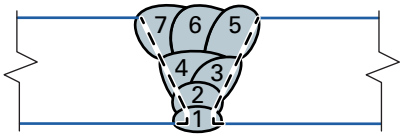
For AWS 1G Rotated, 2G, 5G, and 6G certifications, refer to *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders* for bend test requirements.

PATs 2 and 3 correspond to *AWS EG3.0, Section 3.3.9 Module 9: Gas Metal Arc Welding (GMAW)—Pipe.* PAT 1 has no AWS correlation.

Open-Root V-Groove Pipe Weld in the 1G Rotated Position

Using carbon steel wire of the appropriate diameter, shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 1G Rotated position.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

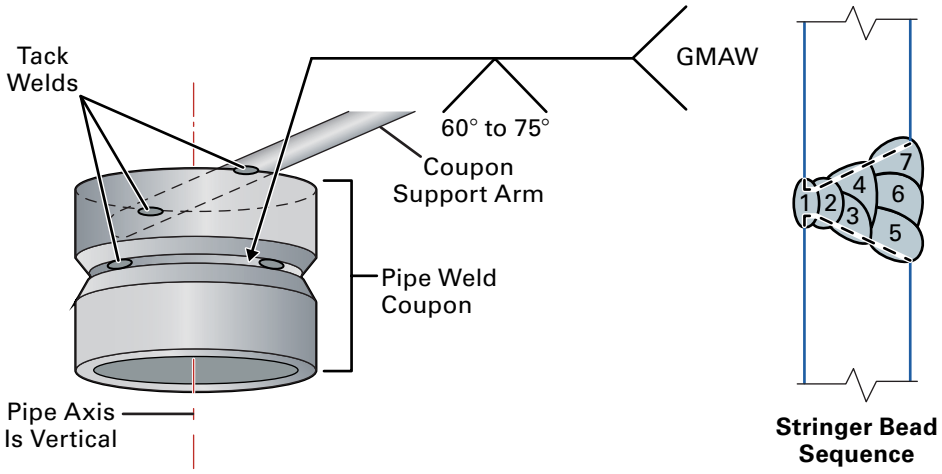
Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A01

Open-Root V-Groove Pipe Weld in the 2G Position

Using carbon steel wire of the appropriate diameter, shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 2G position.



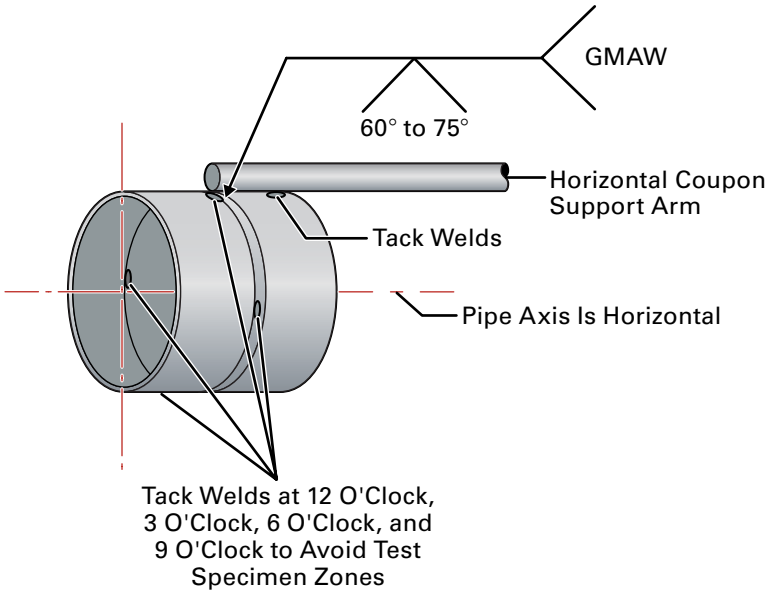
Criteria for Acceptance:

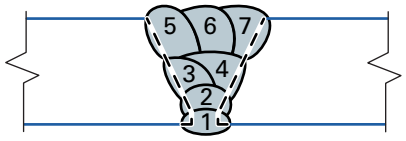
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A02

Open-Root V-Groove Pipe Weld in the 5G Position

Using carbon steel wire of the appropriate diameter, shielding gas, and stringer or weave beads, make an open-root V-groove weld on carbon steel pipe in the 5G position. The root pass can be accomplished uphill or downhill at the discretion of the instructor. Fill and cap passes shall be done uphill.





Stringer Bead Sequence

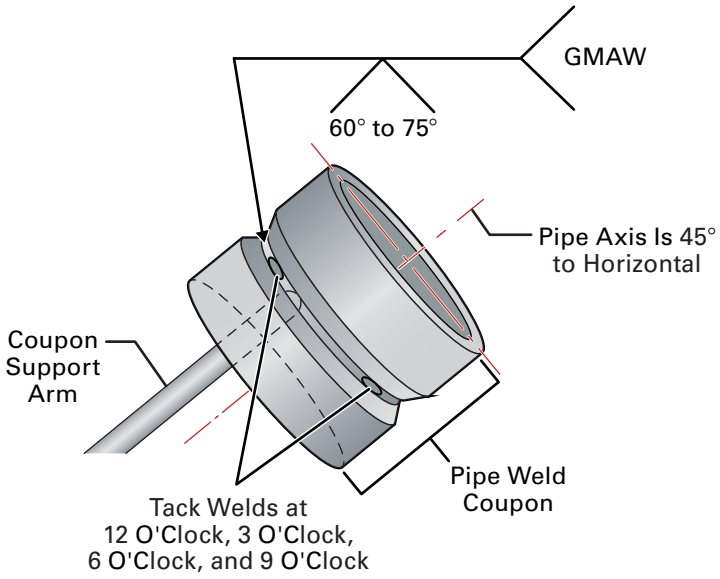
Criteria for Acceptance:

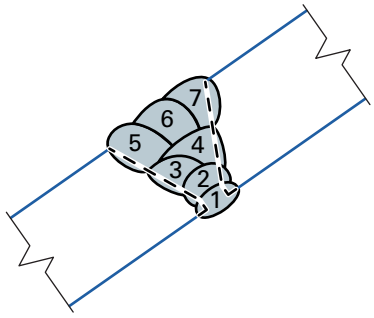
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A03

Open-Root V-Groove Pipe Weld in the 6G (or 6GR) Position

Using carbon steel wire of the appropriate diameter, shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 6G (or 6GR) position. The root pass can be accomplished uphill or downhill at the discretion of the instructor. Fill and cap passes shall be done uphill.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A04

APPENDIX 29303A

Performance Accreditation Tasks

PATs provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

The following tasks are designed to evaluate your ability to run open-root V-groove welds with FCAW-G or FCAW-S equipment in three standard test positions using carbon steel wire of the appropriate diameter. Perform each task when you are instructed to do so by your instructor. As you complete each task, show it to your instructor for evaluation. Do not proceed to the next task until you are told to do so.

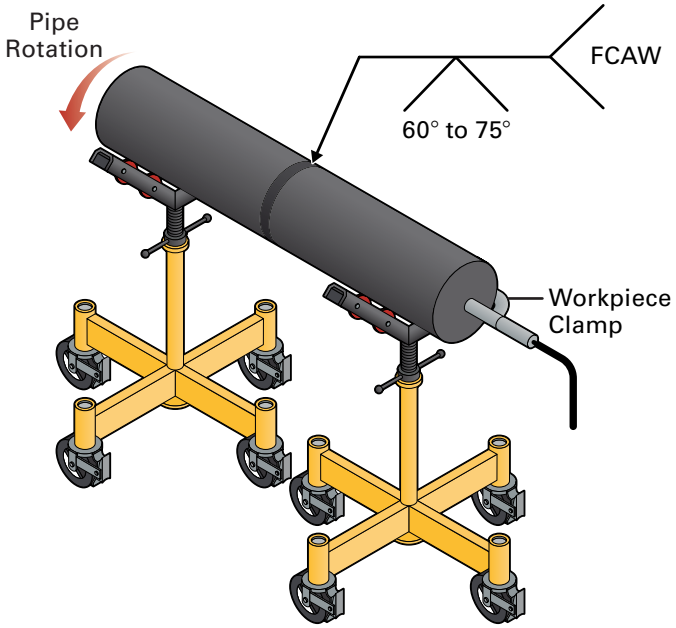
For AWS 2G, 5G, and 6G certifications, refer to *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders* for bend test requirements.

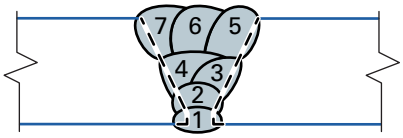
PATs 2 and 3 correspond to *AWS EG3.0, Section 3.3.11, Module 11: Flux Cored Arc Welding (FCAW)—Pipe, Key Indicator 3*. PAT 4 corresponds to *AWS EG3.0, Section 3.3.11, Module 11: Flux Cored Arc Welding (FCAW)—Pipe, Key Indicator 4*. PAT 1 has no AWS correlation.

Open-Root V-Groove Pipe Weld in the 1G Rotated Position

Using FCAW-G or FCAW-S carbon steel wire of the appropriate diameter and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 1G Rotated position. For FCAW-G, use the appropriate shielding gas.

Note: Depending on site procedures or practices, the root pass for the following tasks may be run using another welding process, such as GTAW, GMAW, SMAW, or backing material. Check with your instructor to determine the welding process to use for the root pass.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

Criteria for Acceptance:

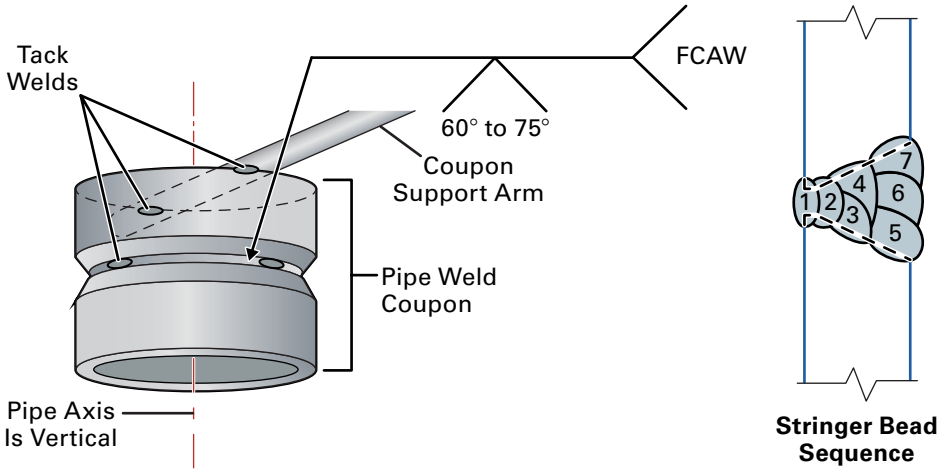
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____
- No inclusions _____

Figure A01

Open-Root V-Groove Pipe Weld in the 2G Position

Using FCAW-G or FCAW-S carbon steel wire of the appropriate diameter and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 2G position. For FCAW-G, use the appropriate shielding gas.

Note: Depending on site procedures or practices, the root pass for the following tasks may be run using another welding process, such as GTAW, GMAW, SMAW, or backing material. Check with your instructor to determine the welding process to use for the root pass.



Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____
- No inclusions _____

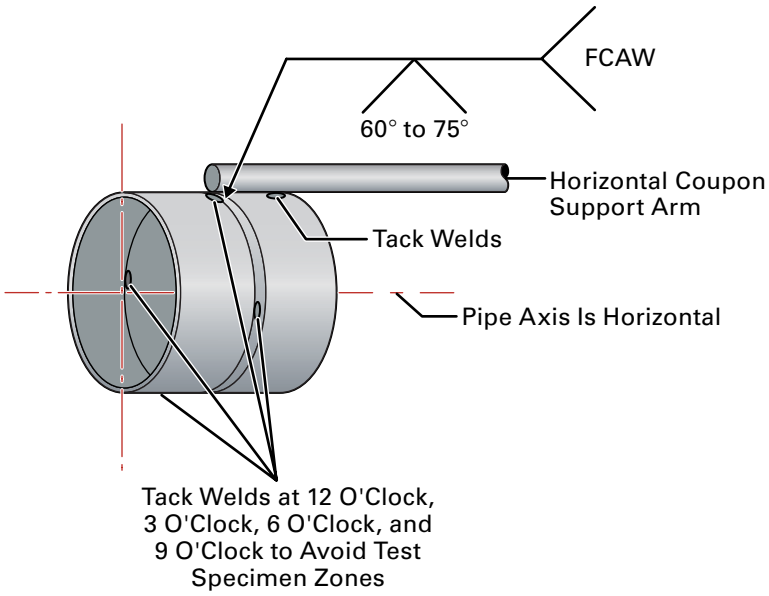
Figure A02

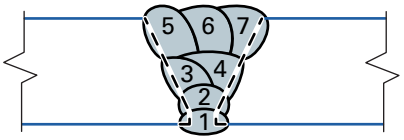
Performance Accreditation Tasks **Module 29303**

Open-Root V-Groove Pipe Weld in the 5G Position

Using FCAW-G or FCAW-S carbon steel wire of the appropriate diameter and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 5G position. For FCAW-G, use the appropriate shielding gas.

Note: Depending on site procedures or practices, the root pass for the following tasks may be run using another welding process, such as GTAW, GMAW, SMAW, or backing material. Check with your instructor to determine the welding process to use for the root pass.





Stringer Bead Sequence

Criteria for Acceptance:

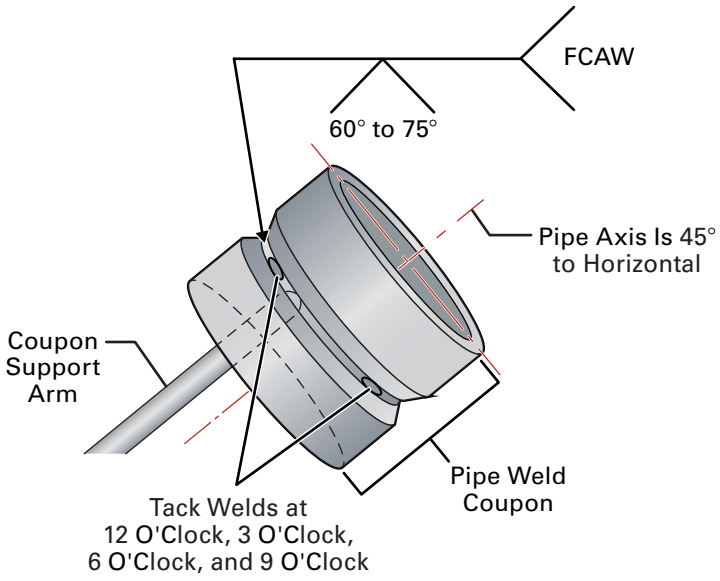
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____
- No inclusions _____

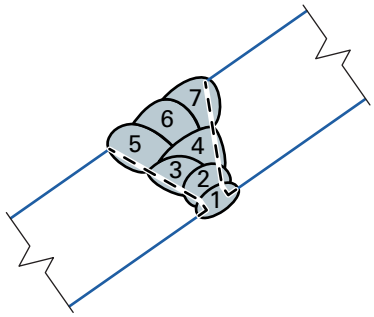
Figure A03

Open-Root V-Groove Pipe Weld in the 6G (or 6GR) Position

Using FCAW-G or FCAW-S carbon steel wire of the appropriate diameter and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 6G position. For FCAW-G, use the appropriate shielding gas.

Note: Depending on site procedures or practices, the root pass for the following tasks may be run using another welding process, such as GTAW, GMAW, SMAW, or backing material. Check with your instructor to determine the welding process to use for the root pass.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 14* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____
- No inclusions _____

Figure A04

APPENDIX 29304A

Performance Accreditation Tasks

Performance Accreditation Tasks (PATs) provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

The following tasks are designed to evaluate your ability to run open-root V-groove welds with GTAW equipment in four standard test positions using carbon steel filler rod of the appropriate diameter and argon shielding gas. Perform each task when you are instructed to do so by your instructor. As you complete each task, show it to your instructor for evaluation. Do not proceed to the next task until you are told to do so.

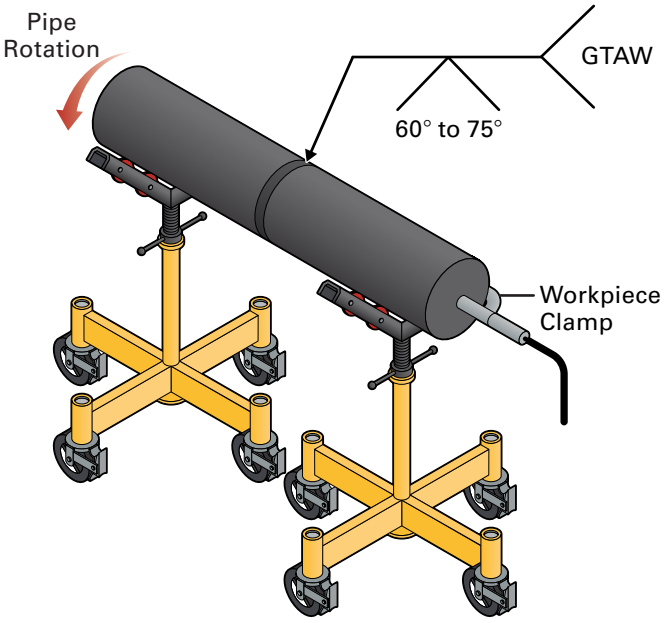
For AWS 2G, 5G, and 6G certifications, refer to *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders* for bend test requirements.

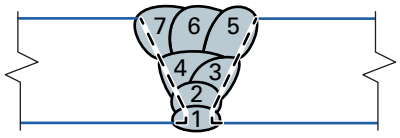
PATs 2 and 3 correspond to *AWS EG3.0, Section 3.3.13 Module 13: Gas Tungsten Arc Welding (GTAW)—Pipe, Key Indicator 3. PAT 4 corresponds to AWS EG3.0, Section 3.3.13 Module 13: Gas Tungsten Arc Welding (GTAW)—Pipe, Key Indicator 4.* PAT 1 has no AWS correlation.

Performance Accreditation Tasks — Module 29304

Open-Root V-Groove Pipe Weld in the 1G Rotated Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make open-root V-groove welds on carbon steel pipe in the 1G Rotated position.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

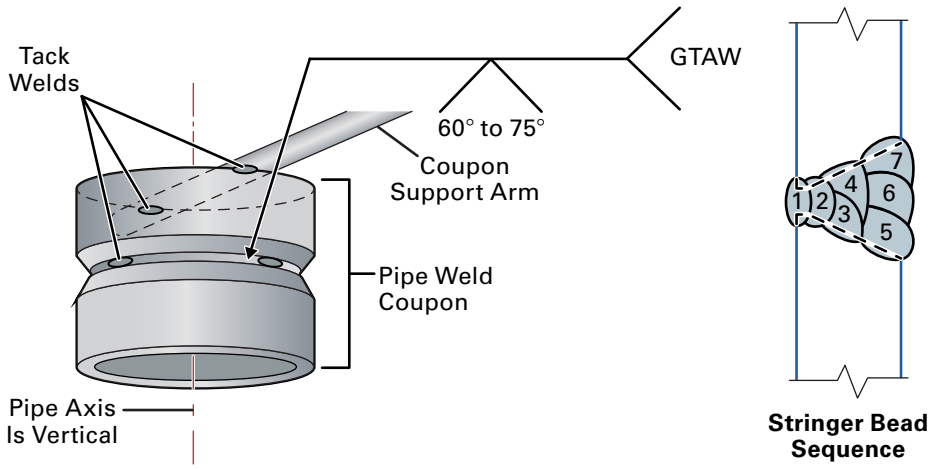
Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A01

GTAW Open-Root V-Groove Pipe Weld in the 2G Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 2G position.



Criteria for Acceptance:

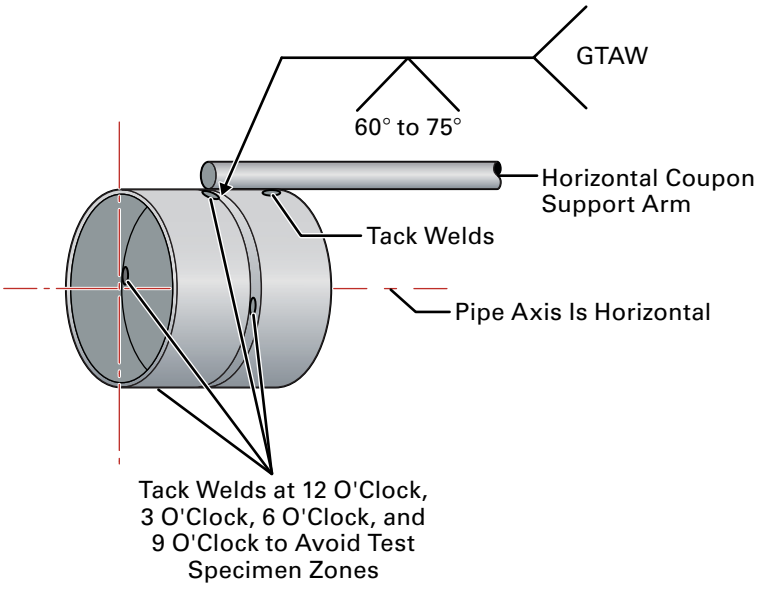
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

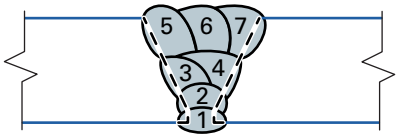
Figure A02

Performance Accreditation Tasks — Module 29304

GTAW Open-Root V-Groove Pipe Weld in the 5G Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer or weave beads, make an open-root V-groove weld on carbon steel pipe in the 5G position.





Stringer Bead Sequence

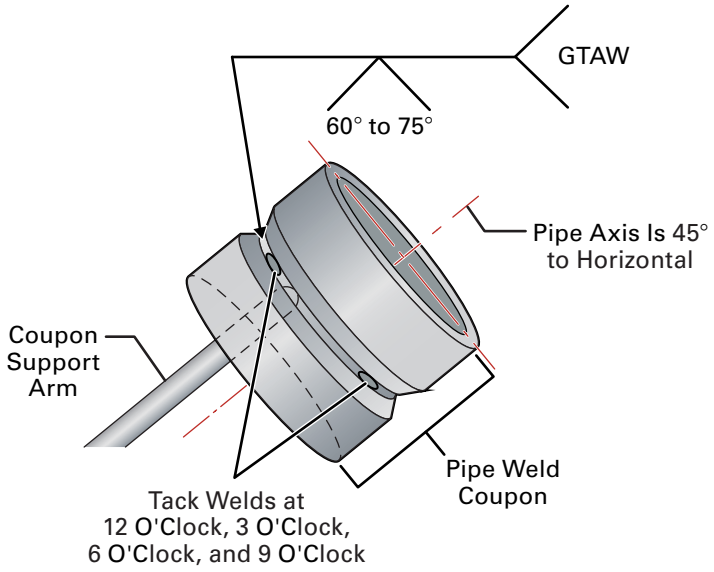
Criteria for Acceptance:

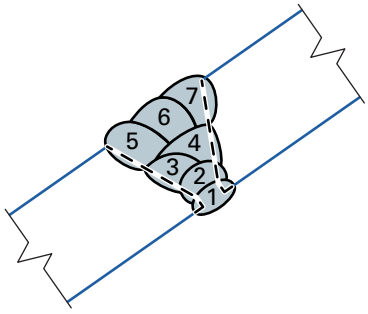
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A03

Open-Root V-Groove Pipe Weld in the 6G (or 6GR) Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 6G (or 6GR) position.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A04

APPENDIX 29304A

Performance Accreditation Tasks

Performance Accreditation Tasks (PATs) provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

The following tasks are designed to evaluate your ability to run open-root V-groove welds with GTAW equipment in four standard test positions using carbon steel filler rod of the appropriate diameter and argon shielding gas. Perform each task when you are instructed to do so by your instructor. As you complete each task, show it to your instructor for evaluation. Do not proceed to the next task until you are told to do so.

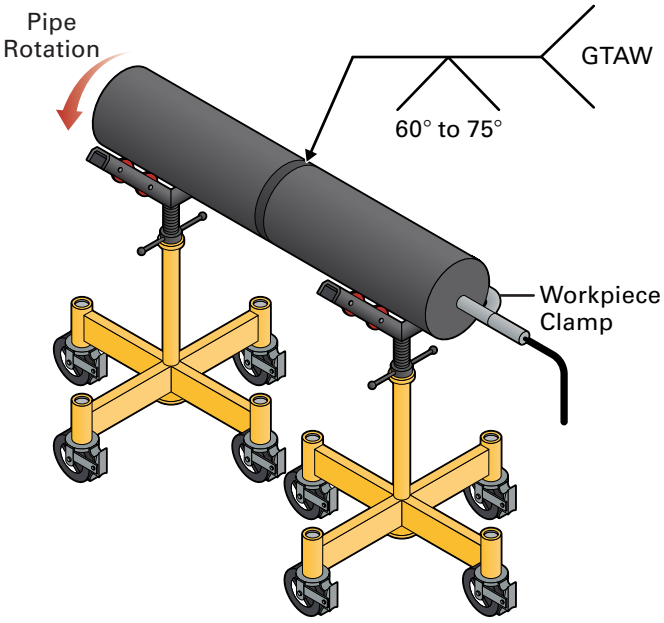
For AWS 2G, 5G, and 6G certifications, refer to *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders* for bend test requirements.

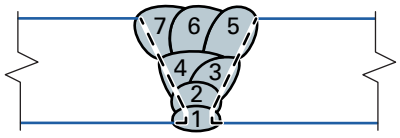
PATs 2 and 3 correspond to *AWS EG3.0, Section 3.3.13 Module 13: Gas Tungsten Arc Welding (GTAW)—Pipe, Key Indicator 3. PAT 4 corresponds to AWS EG3.0, Section 3.3.13 Module 13: Gas Tungsten Arc Welding (GTAW)—Pipe, Key Indicator 4.* PAT 1 has no AWS correlation.

Performance Accreditation Tasks — Module 29304

Open-Root V-Groove Pipe Weld in the 1G Rotated Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make open-root V-groove welds on carbon steel pipe in the 1G Rotated position.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

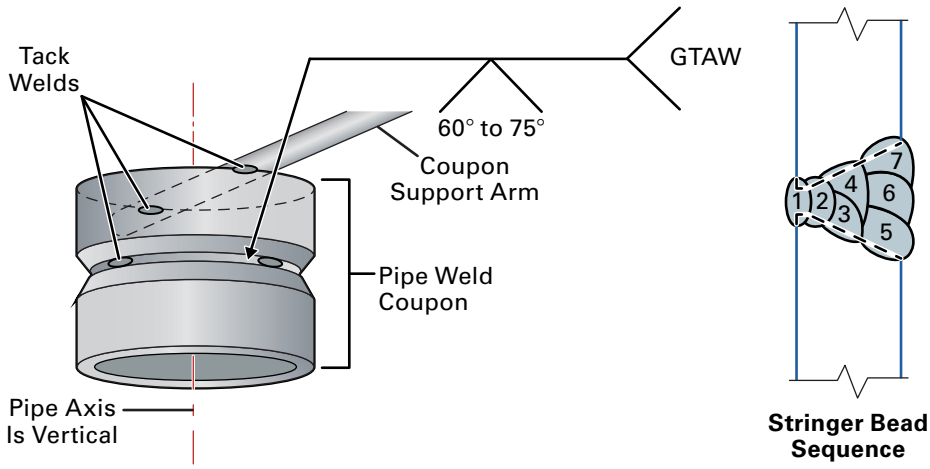
Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A01

GTAW Open-Root V-Groove Pipe Weld in the 2G Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 2G position.



Criteria for Acceptance:

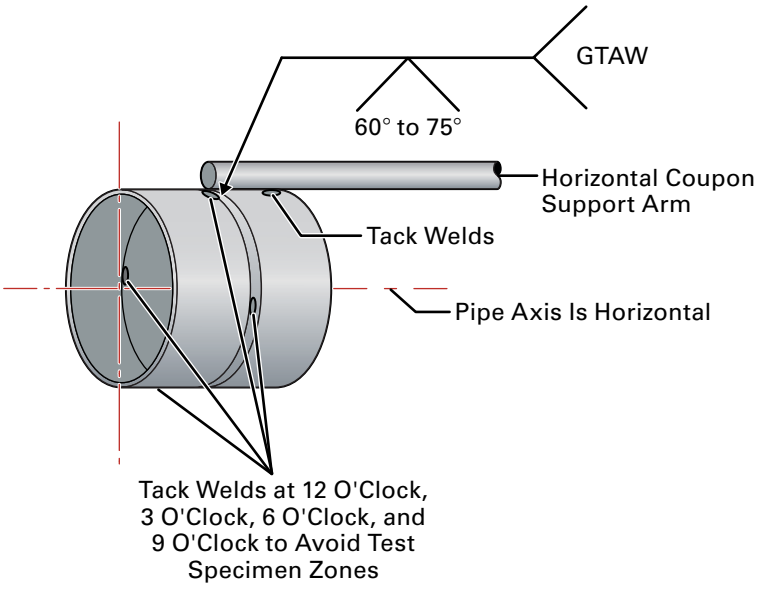
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

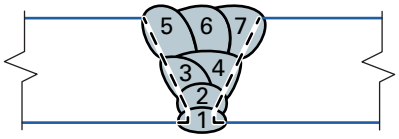
Figure A02

Performance Accreditation Tasks — Module 29304

GTAW Open-Root V-Groove Pipe Weld in the 5G Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer or weave beads, make an open-root V-groove weld on carbon steel pipe in the 5G position.





Stringer Bead Sequence

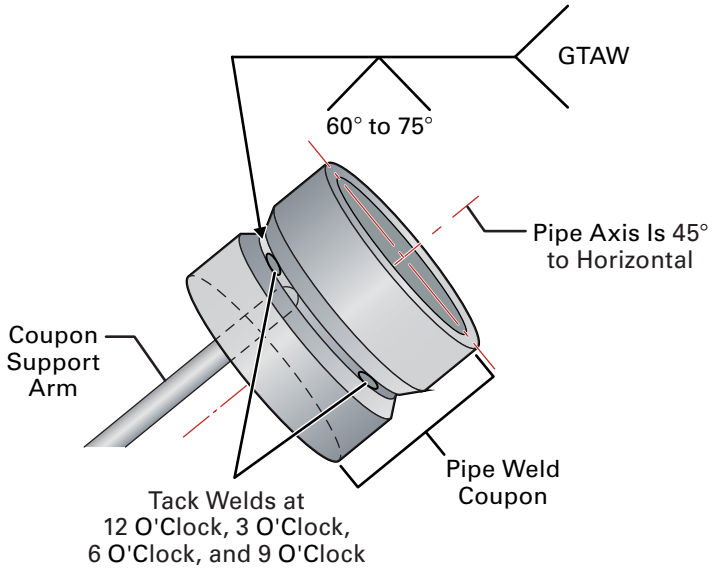
Criteria for Acceptance:

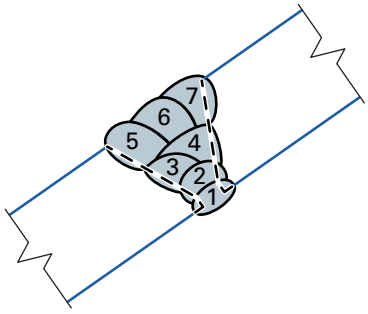
- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A03

Open-Root V-Groove Pipe Weld in the 6G (or 6GR) Position

Using GTAW equipment and carbon steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on carbon steel pipe in the 6G (or 6GR) position.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform appearance on the bead face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profile in accordance with *Figure 10* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No cracks _____
- No overlap _____
- No incomplete fusion _____

Figure A04

APPENDIX 29305A

Performance Accreditation Tasks

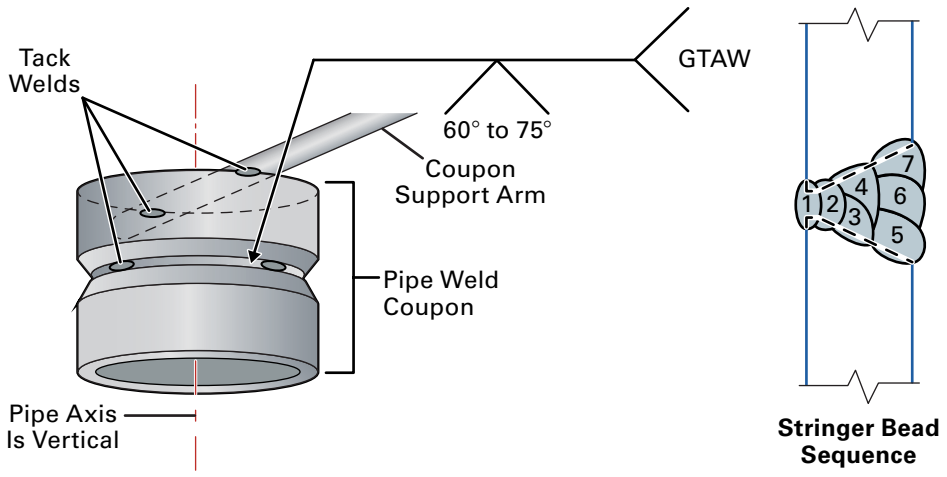
Performance Accreditation Tasks (PATs) provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

The following tasks are designed to evaluate your ability to run open-root V-groove welds with GTAW equipment in three standard test positions using stainless and/or low-alloy steel filler rod of the appropriate diameter and argon shielding gas. Perform each task when you are instructed to do so by your instructor. As you complete each task, show it to your instructor for evaluation. Do not proceed to the next task until instructed. Refer to *AWS EG3.0, Guide for the Training of Welding Personnel: SENSE, Level II—Advanced Welders for certification requirements and AWS EG3.0, Supplement, Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures* for bend test requirements.

PATs 1 and 2 correspond to *AWS EG3.0, Guide for the Training of Welding Personnel: Level II—Advanced Welders*. PAT 3 corresponds to *AWS EG3.0, Supplement, Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures*.

GTAW Open-Root V-Groove Pipe Weld in the 2G Position

Using GTAW equipment and low-alloy and/or stainless steel filler rod of the appropriate diameter, argon shielding and backing gas, and stringer beads, make an open-root V-groove weld in the 2G position. It is preferable to use stainless steel base metal; however, substituting carbon steel is permitted by industry codes.



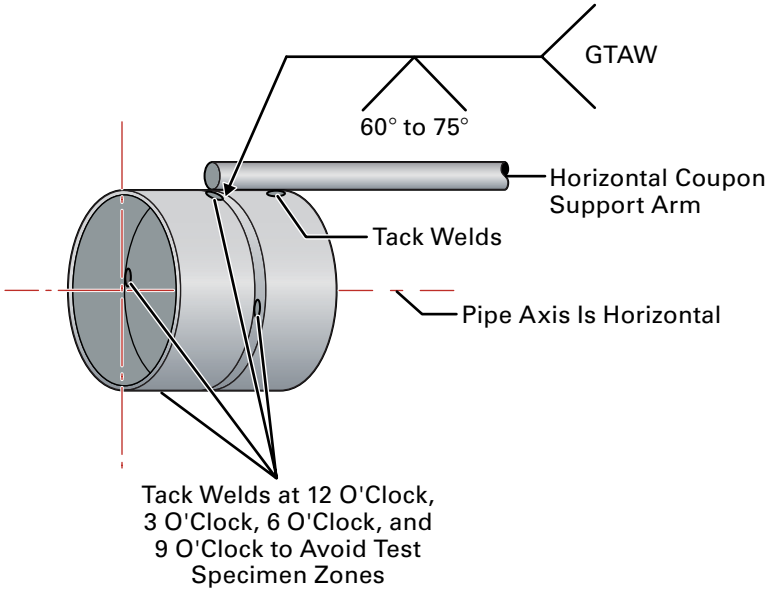
Criteria for Acceptance:

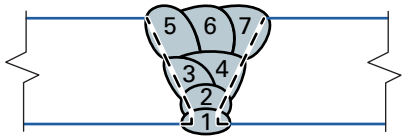
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 21* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No cracks _____
- No incomplete fusion _____

Figure A01

GTAW Open-Root V-Groove Pipe Weld in the 5G Position

Using GTAW equipment and low-alloy and/or stainless steel filler rod of the appropriate diameter, argon shielding and backing gas, and stringer beads, make an open-root V-groove weld in the 5G position. It is preferable to use stainless steel base metal; however, substituting carbon steel is permitted by industry codes.





Stringer Bead Sequence

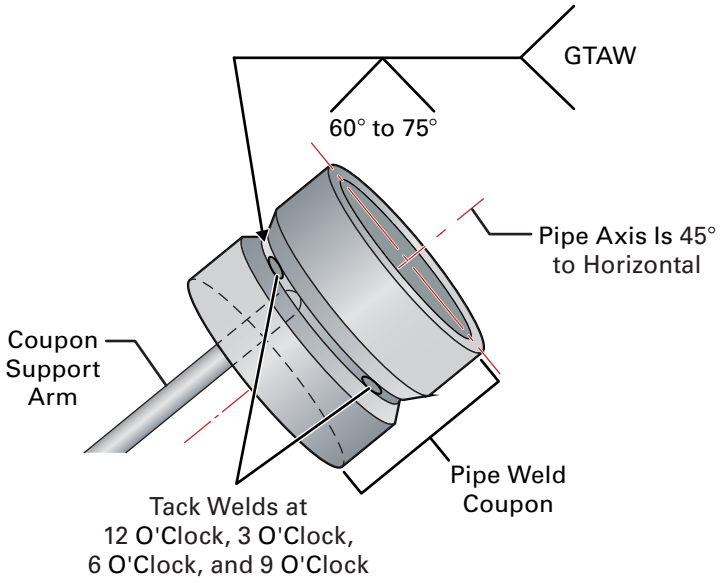
Criteria for Acceptance:

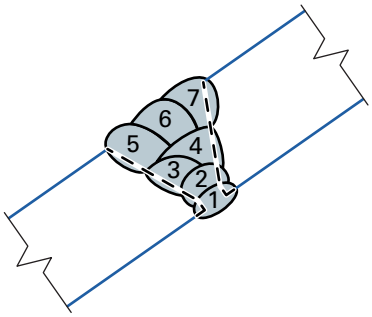
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 21* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No cracks _____
- No incomplete fusion _____

Figure A02

Open-Root V-Groove Pipe Weld in the 6G (or 6GR) Position

Using GTAW equipment and low-alloy and/or stainless steel filler rod of the appropriate diameter, argon shielding and backing gas, and stringer beads, make an open-root V-groove weld in the 6G position. It is preferable to use stainless steel base metal; however, substituting carbon steel is permitted by industry codes.





Stringer Bead Sequence

Note: If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 21* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No cracks _____
- No incomplete fusion _____

Figure A03

APPENDIX 29306A

Performance Accreditation Tasks

Performance Accreditation Tasks (PATs) provide specific acceptable criteria for performance and help to ensure a true competency-based welding program for students.

The following tasks are designed to evaluate your ability to run open-root V-groove welds on both plate and pipe in all positions using stainless steel electrodes and SMAW equipment. Perform each task when you are instructed to do so by your instructor. As you complete each task, take it to your instructor for evaluation. Do not proceed to the next task until you are told to do so.

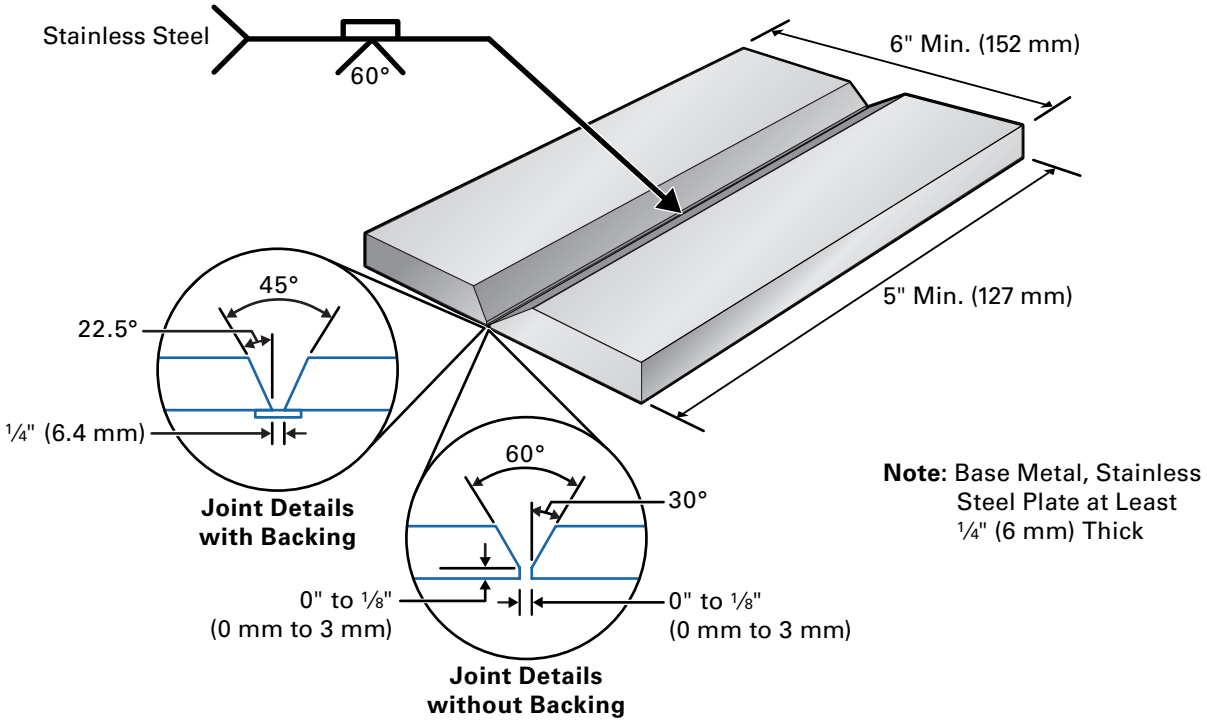
For AWS 6G certifications, refer to *AWS EG3.0, Supplement, Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures* for bend test requirements.

PATs 1 through 8 correspond with *AWS EG3.0*: *Guide for the Training of Welding Personnel*: *SENSE Level II*—Advanced Welders and *AWS EG3.0, Supplement, Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures.*

Performance Accreditation Tasks **Module 29306**

V-Groove Welds Stainless Steel Plate Joints in the Flat (1G) Position

Using stainless steel electrodes, complete a V-groove welding on plate with or without backing in the flat (1G) position as shown.



Note: Base Metal, Stainless Steel Plate at Least ¼" (6 mm) Thick

Criteria for Acceptance:

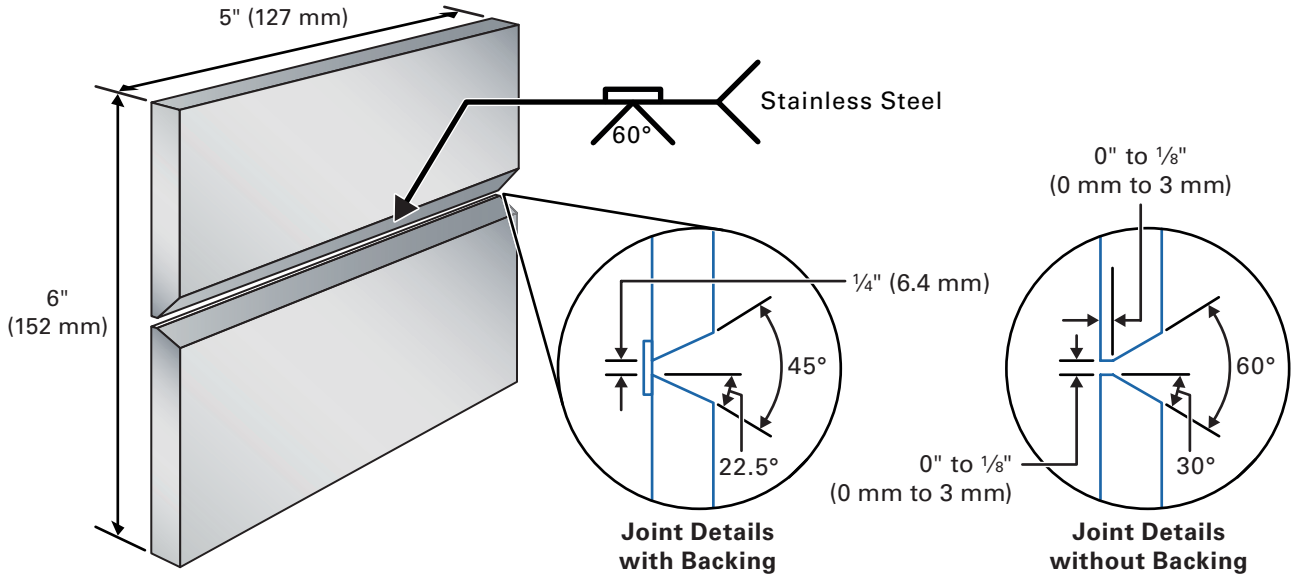
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the base metal, to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A01

V-Groove Welds Stainless Steel Plate Joints in the Horizontal (2G) Position

Using stainless steel electrodes, complete a V-groove welding on plate with or without backing in the horizontal (2G) position as shown.

Note: Base Metal, Stainless Steel Plate at Least ¼" (6 mm) Thick



Criteria for Acceptance:

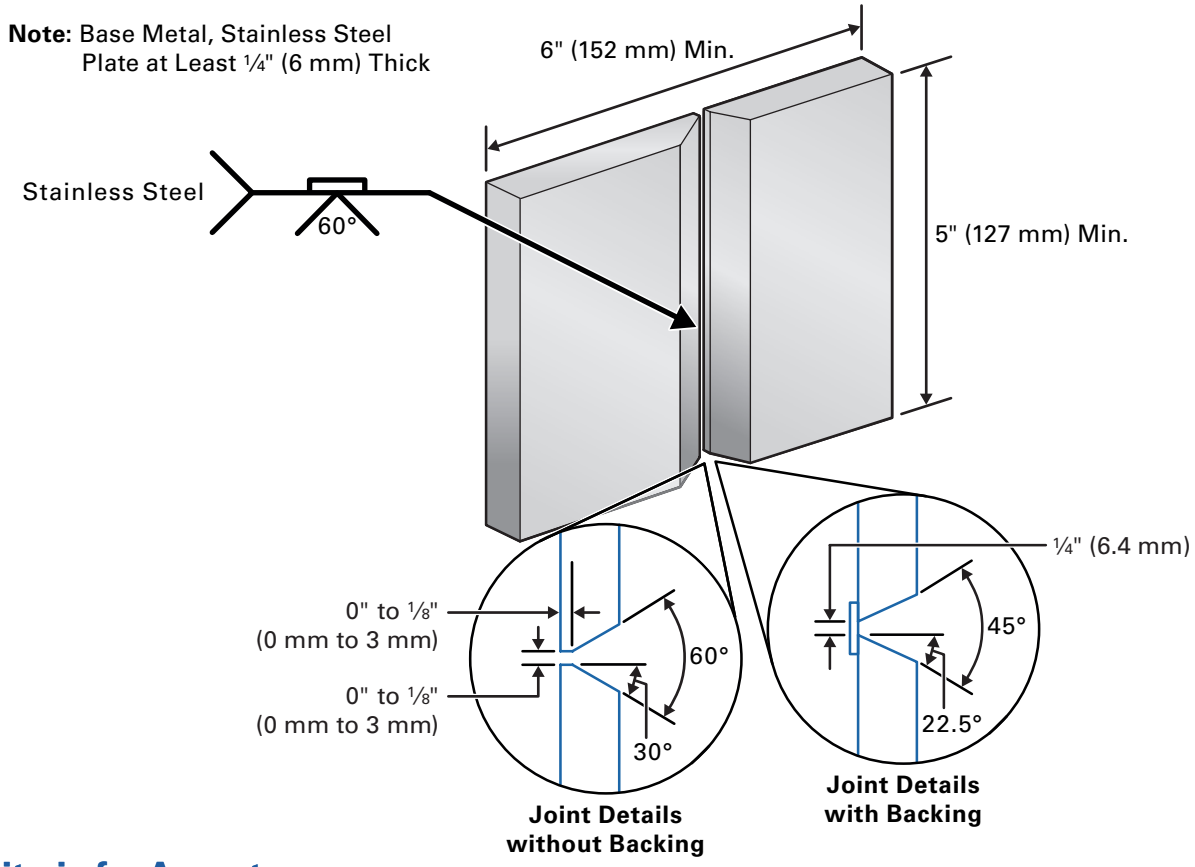
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the base metal, to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A02

Performance Accreditation Tasks **Module 29306**

V-Groove Welds on Stainless Steel Plate Joints in the Vertical (3G) Position

Using stainless steel electrodes, complete a V-groove welding on plate with or without backing in the vertical (3G) position as shown.



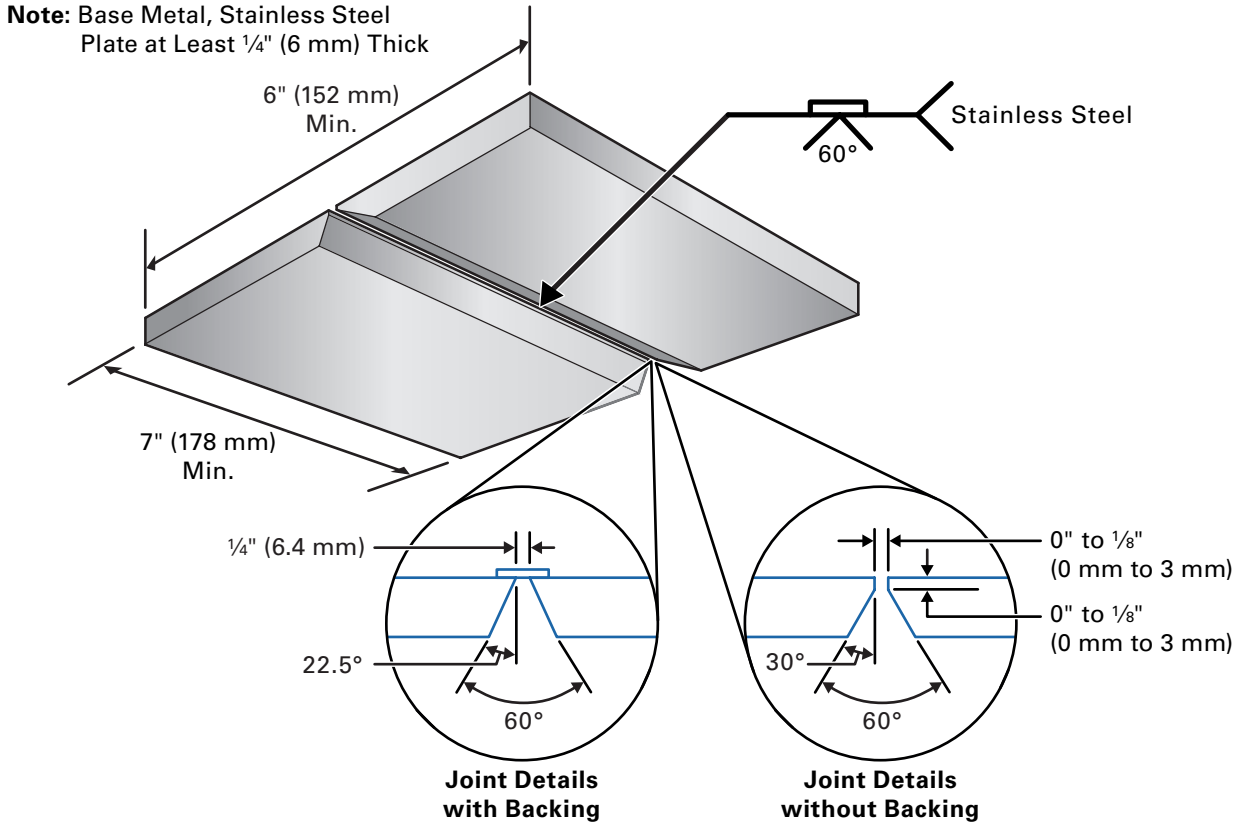
Criteria for Acceptance:

- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the base metal, to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A03

V-Groove Welds on Stainless Steel Plate Joints in the Overhead (4G) Position

Using stainless steel electrodes, complete a V-groove welding on plate with or without backing in the overhead (4G) position as shown.



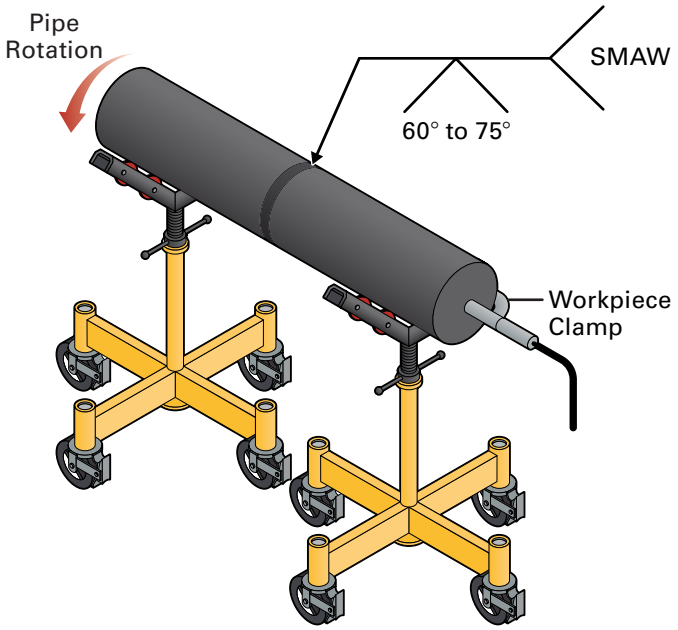
Criteria for Acceptance:

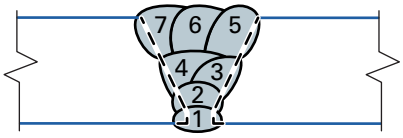
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the base metal, to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A04

Open-Root V-Groove Stainless Steel Pipe Weld in the 1G Rotated Position

Using stainless steel electrodes, make an open-root V-groove weld in the 1G Rotated position. It is preferable to use stainless steel pipe; however, substituting carbon steel is permitted by industry codes.





Stringer Bead Sequence

Note: The actual number of weld beads will vary depending on the wall thickness.

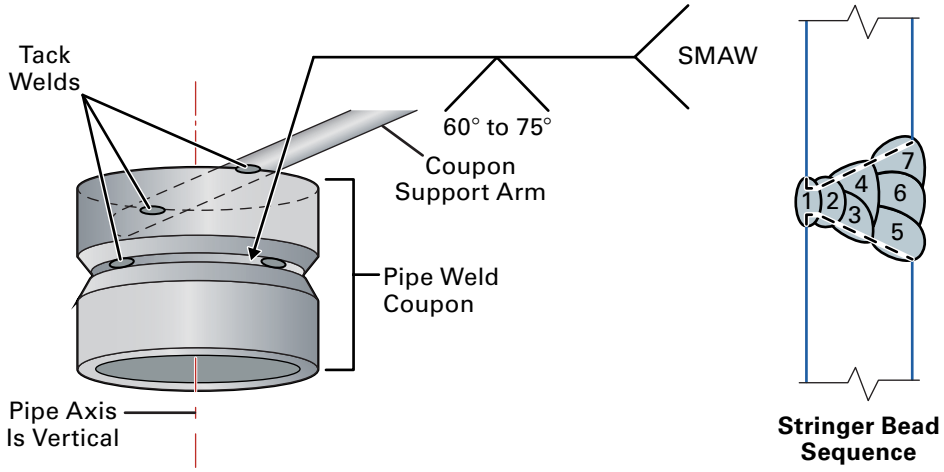
Criteria for Acceptance:

- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A05

Open-Root V-Groove Stainless Steel Pipe Weld in the 2G Position

Using stainless steel electrodes, make an open-root V-groove weld in the 2G position. It is preferable to use stainless steel pipe; however, substituting carbon steel is permitted by industry codes.



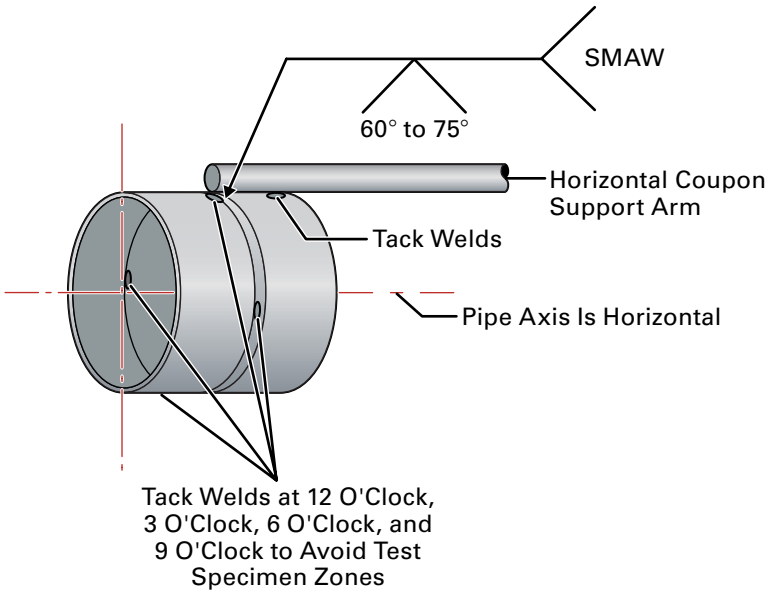
Criteria for Acceptance:

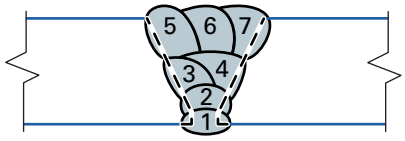
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks
- No incomplete fusion _____

Figure A06

Open-Root V-Groove Stainless Steel Pipe Weld in the 5G Position

Using stainless steel electrodes, make an open-root V-groove weld in the 5G position. It is preferable to use stainless steel pipe; however, substituting carbon steel is permitted by industry codes.





Stringer Bead Sequence

Criteria for Acceptance:

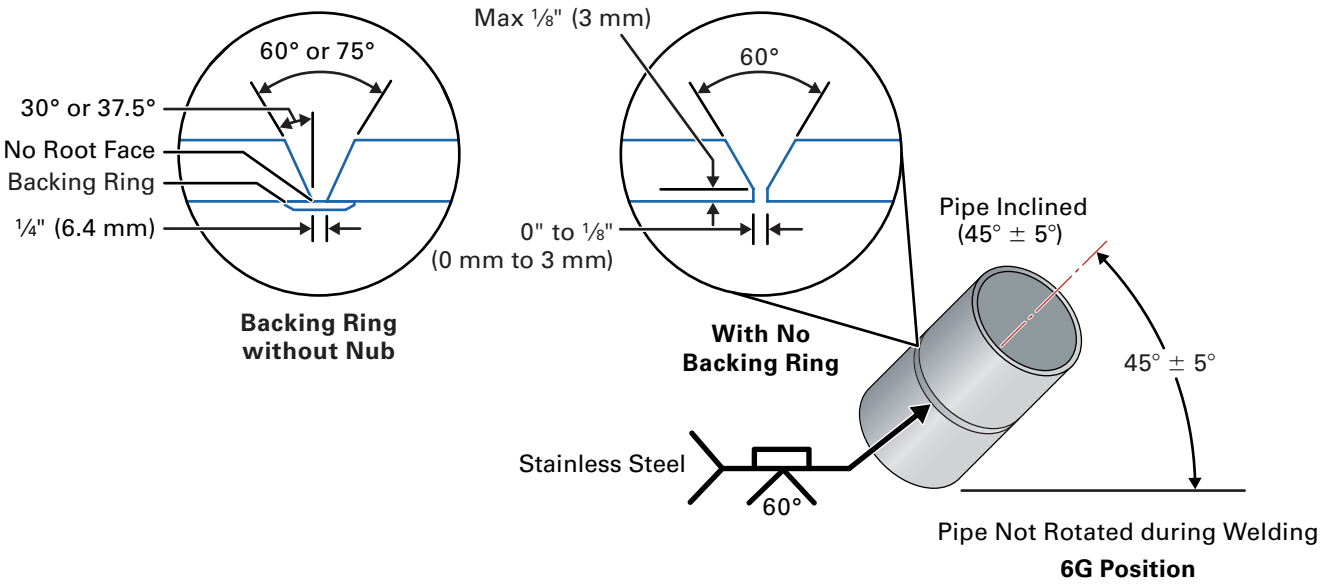
- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of 1/8" (3 mm) _____
- Porosity that does not exceed 3/32" (2.4 mm) _____
- No undercut greater than 1/32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A07

Open-Root V-Groove Stainless Steel Pipe Weld in the Multiple Inclined (6G) Position

Using stainless steel electrodes, make an open-root V-groove weld in the 6G position. It is preferable to use stainless steel pipe; however, substituting carbon steel is permitted by industry codes. A restriction ring may be added to the pipe to form the 6GR position coupon.

Note: Base Metal, Stainless Steel Schedule 40 or 80 Pipe at Least 3" (76 mm) in Diameter (DN80)



Criteria for Acceptance:

- Uniform appearance on the weld face _____
- Craters and restarts filled to the full cross section of the weld _____
- Acceptable weld profiles in accordance with *Figure 18* of this module _____
- Smooth transition with complete fusion at the toes of the weld _____
- Complete joint penetration and face reinforcement with the root reinforcement at least flush with the inside of the pipe, to a maximum buildup of ⅛" (3 mm) _____
- Porosity that does not exceed 3⁄32" (2.4 mm) _____
- No undercut greater than 1⁄32" (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- No incomplete fusion _____

Figure A08