

APPENDIX 29109A

Performance Accreditation Tasks

The American Welding Society (AWS) School Excelling through National Skills Standards Education (SENSE) program is a comprehensive set of minimum Standards and Guidelines for Welding Education programs. The following Performance Accreditation Tasks (PATs) are aligned with and designed around the SENSE program.

PATs correspond to and support the learning objectives in *AWS EG2.0, Guide for the Training and Qualification of Welding Personnel: Entry-Level Welder*.

Note that to satisfy all learning objectives in *AWS EG2.0*, the instructor must also use the PATs contained in the second level of the NCCER *Welding* curriculum.

PATs 1 and 2 correspond to *AWS EG2.0, Module 4 – Shielded Metal Arc Welding*, Key Indicators 3 and 4.

PATs 3 through 10 correspond to *AWS EG2.0, Module 4 – Shielded Metal Arc Welding*, Key Indicators 3, 4, and 5.

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

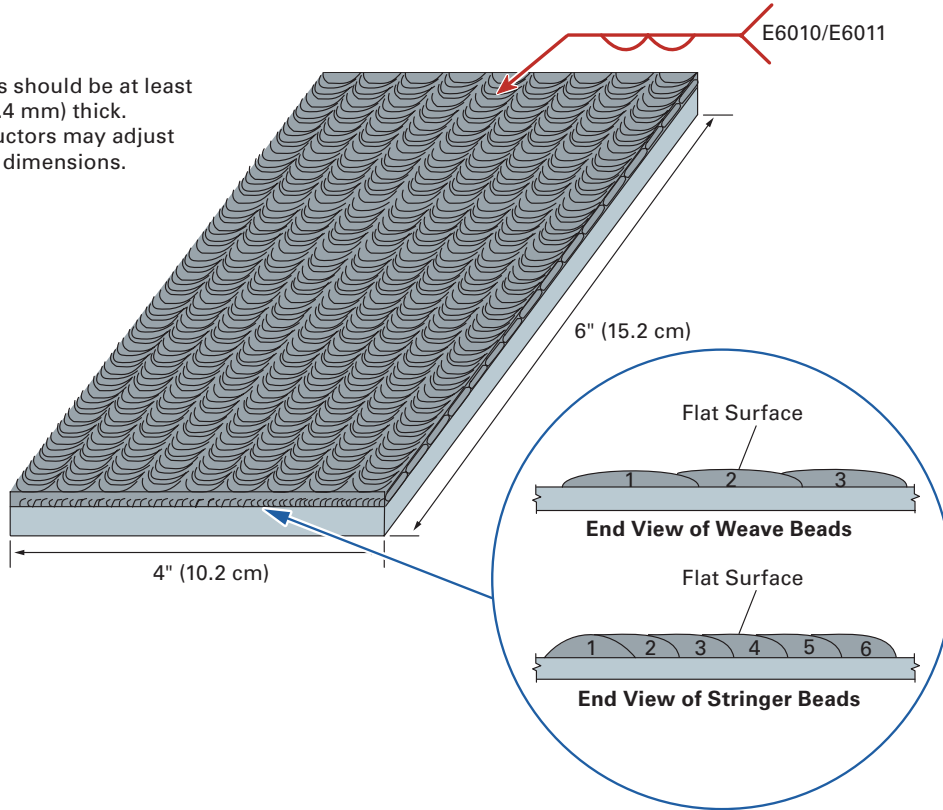
The following tasks test your competency running beads and producing fillet welds with SMAW equipment and techniques. Don't perform these tasks until your instructor directs you to do so. Practice the tasks until you're thoroughly familiar with the procedures.

After you complete each task, take it to your instructor for evaluation.

Surfacing Welds with E6010/E6011 Electrodes in the Flat Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E6010/E6011 electrodes, build up a pad with surfacing welds on carbon steel plate in the flat position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick. Instructors may adjust plate dimensions.



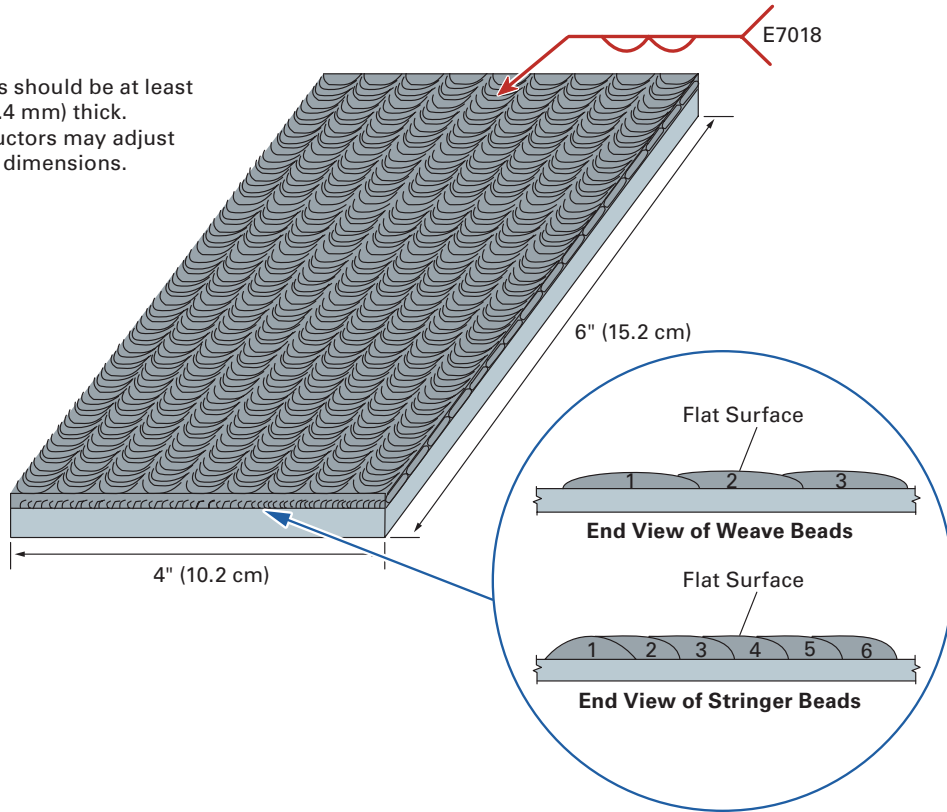
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Weld beads straight to within $\frac{1}{8}$ " (3.2 mm) _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Face of the pad flat to within $\frac{1}{8}$ " (3.2 mm) _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Surfacing Welds with E7018 Electrodes in the Flat Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E7018 electrodes, build up a pad with surfacing welds on carbon steel plate in the flat position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick. Instructors may adjust plate dimensions.



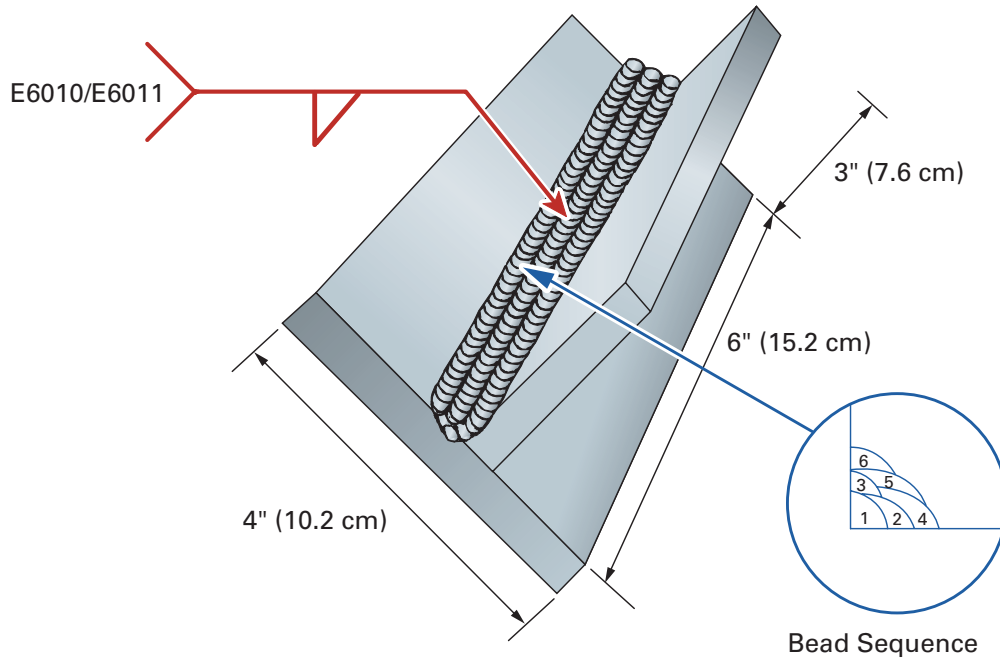
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Weld beads straight to within $\frac{1}{8}$ " (3.2 mm) _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Face of the pad flat to within $\frac{1}{8}$ " (3.2 mm) _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E6010/E6011 Electrodes in the Flat (1F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E6010/E6011 electrodes, make a fillet weld on carbon steel plate in the flat position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



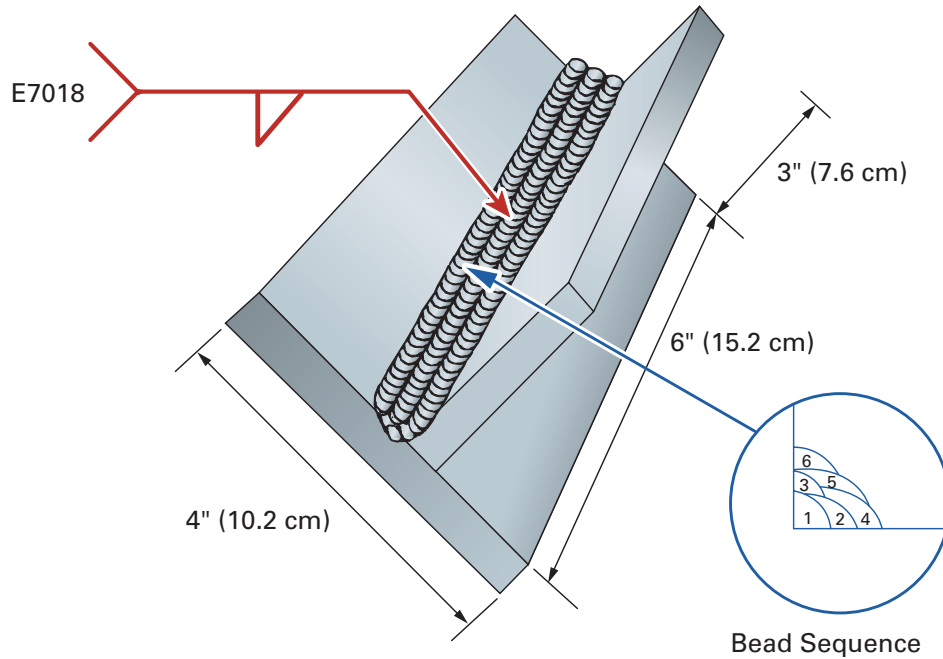
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E7018 Electrodes in the Flat (1F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E7018 electrodes, make a fillet weld on carbon steel plate in the flat position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



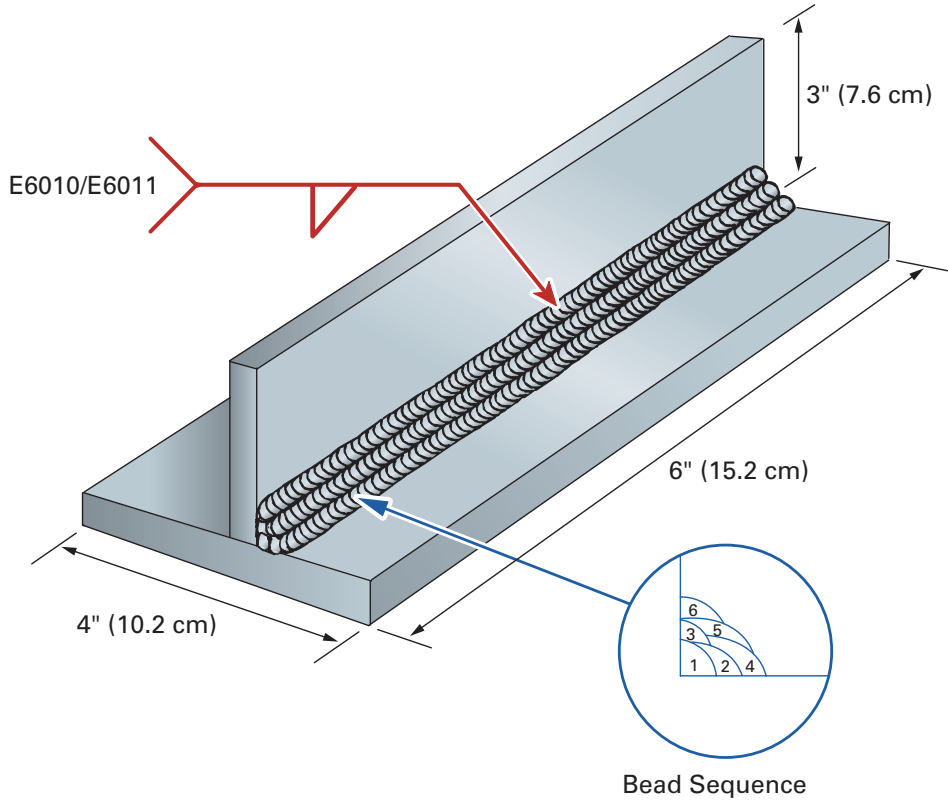
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E6010/E6011 Electrodes in the Horizontal (2F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E6010/E6011 electrodes, make a fillet weld on carbon steel plate in the horizontal position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



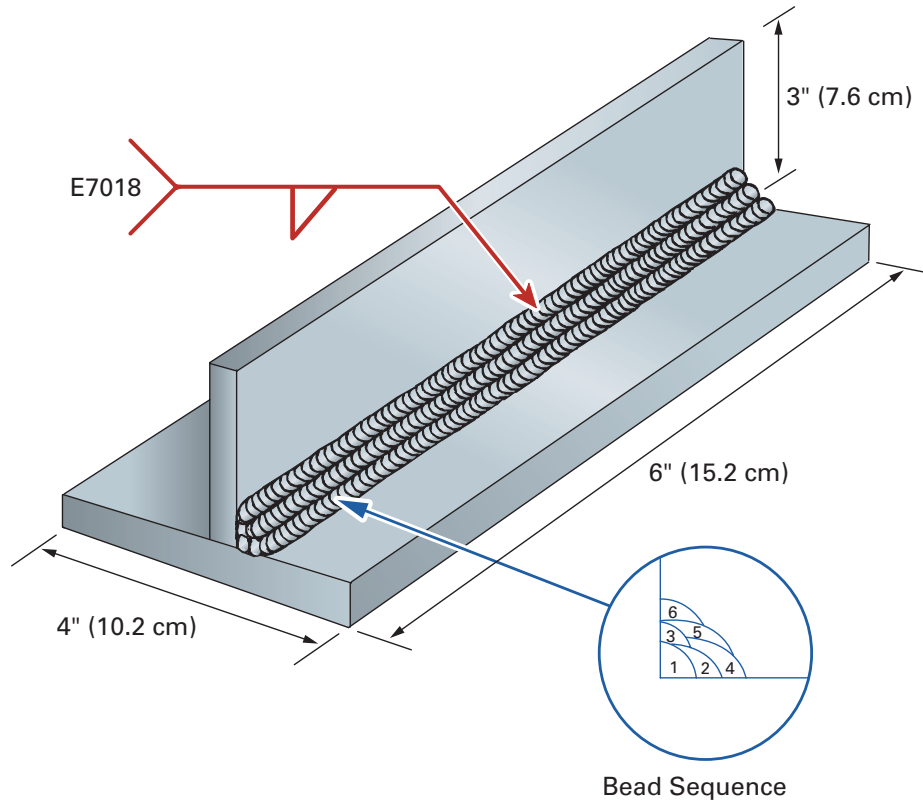
Criteria for Acceptance:

- No arc strikes outside the weld area
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm)
- Acceptable weld profile in accordance with Module 29109 *Figure 3*
- Smooth transition with complete fusion at the toes of the weld
- No pores larger than $\frac{3}{32}$ " (2.4 mm)
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less
- No overlap
- No inclusions
- No cracks

Fillet Weld with E7018 Electrodes in the Horizontal (2F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E7018 electrodes, make a fillet weld on carbon steel plate in the horizontal position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



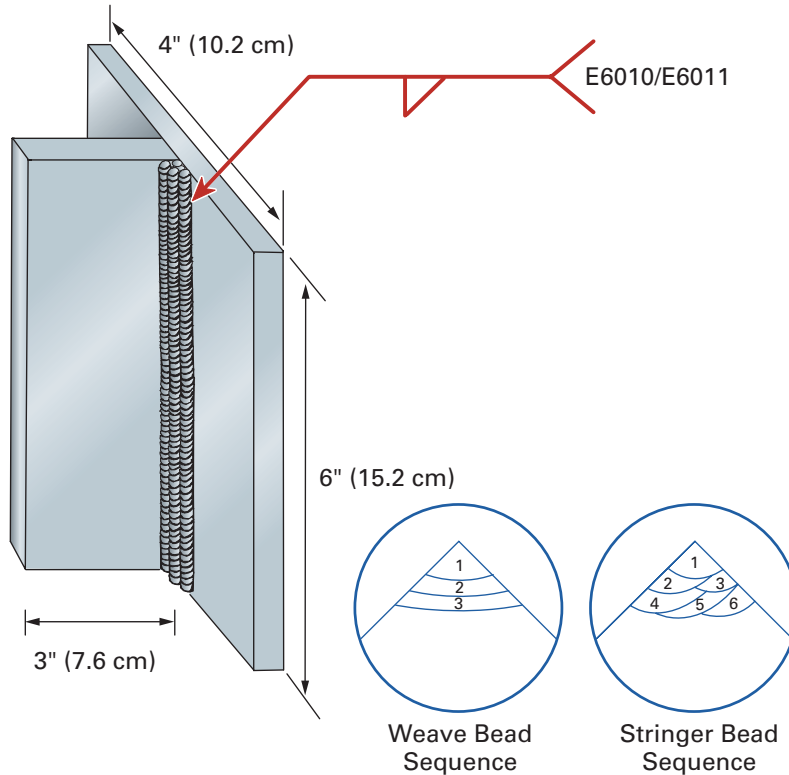
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E6010/E6011 Electrodes in the Vertical (3F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E6010/E6011 electrodes, make a fillet weld on carbon steel plate in the vertical position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



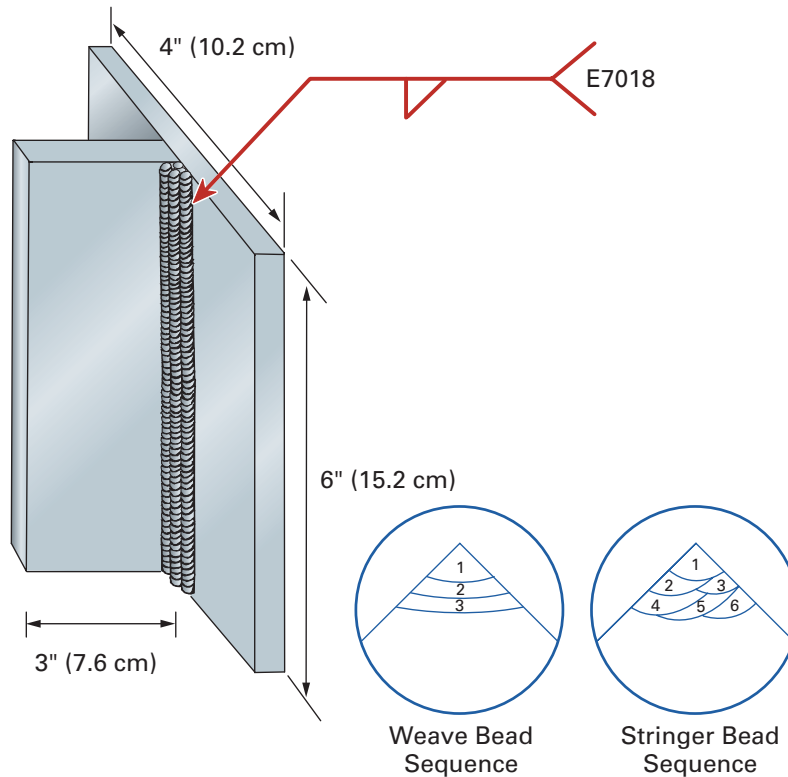
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E7018 Electrodes in the Vertical (3F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E7018 electrodes, make a fillet weld on carbon steel plate in the vertical position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



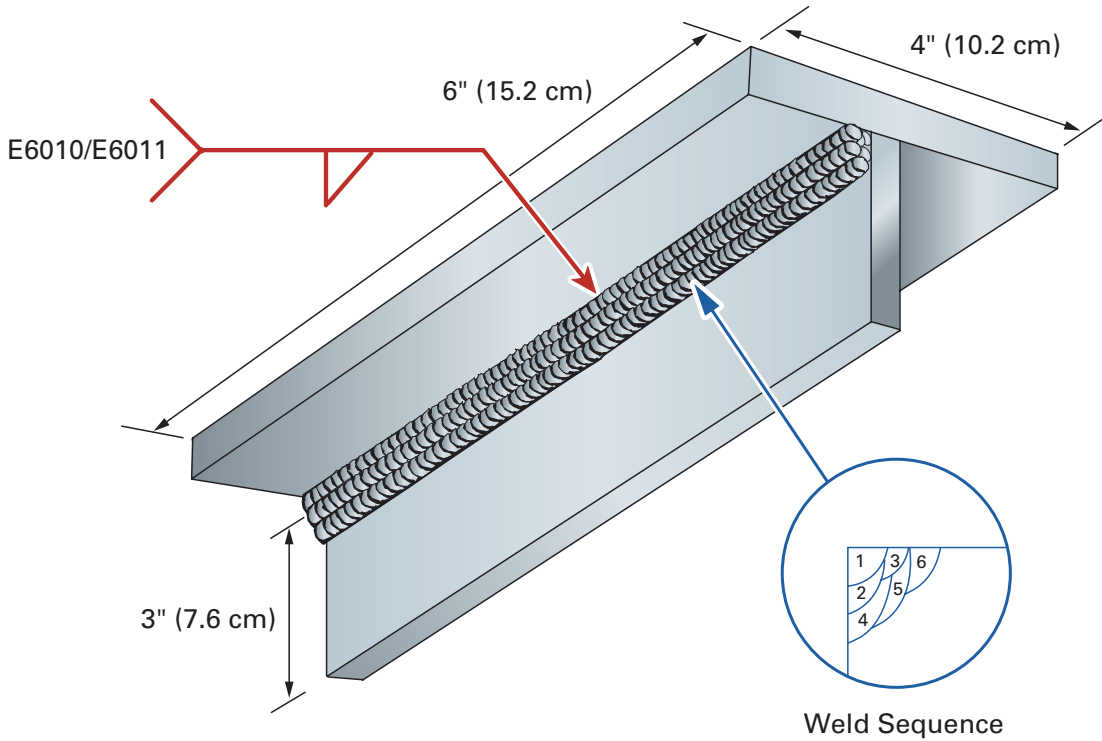
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E6010/E6011 Electrodes in the Overhead (4F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E6010/E6011 electrodes, make a fillet weld on carbon steel plate in the overhead position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



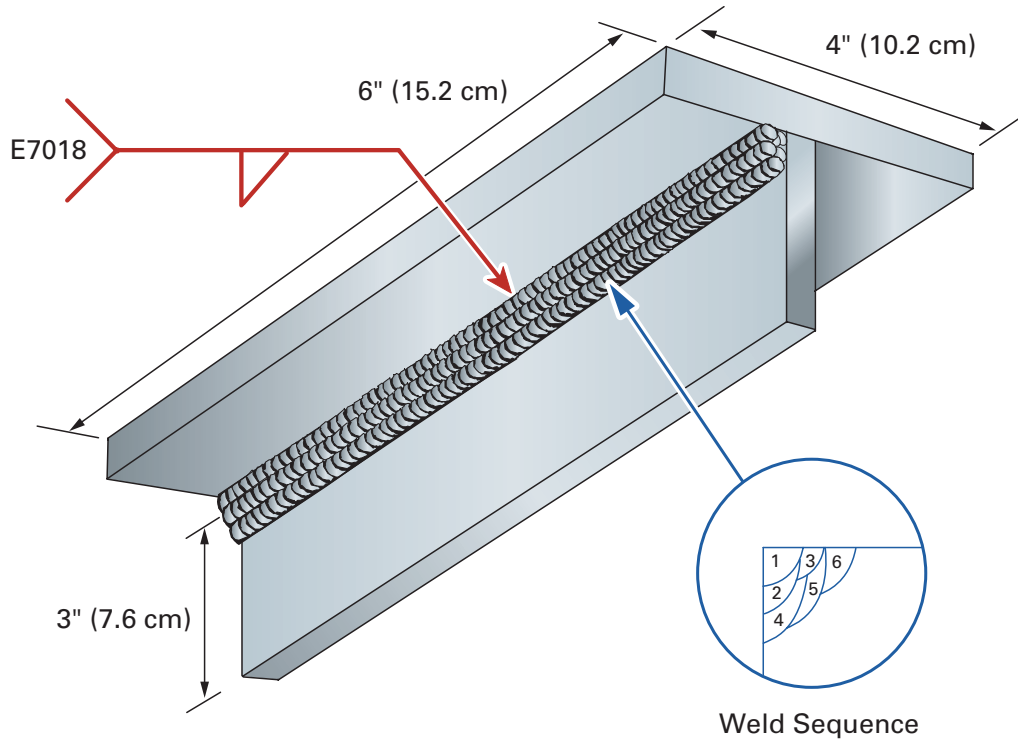
Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

Fillet Weld with E7018 Electrodes in the Overhead (4F) Position

Using $\frac{3}{32}$ " to $\frac{5}{32}$ " (2.4 mm to 4.0 mm) E7018 electrodes, make a fillet weld on carbon steel plate in the overhead position as indicated.

Note: Plates should be at least $\frac{1}{4}$ " (6.4 mm) thick.



Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29109 *Figure 3* _____
- Smooth transition with complete fusion at the toes of the weld _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____

APPENDIX 29111A

Performance Accreditation Tasks

The American Welding Society (AWS) School Excelling through National Skills Standards Education (SENSE) program is a comprehensive set of minimum Standards and Guidelines for Welding Education programs. The following Performance Accreditation Tasks (PATs) are aligned with and designed around the SENSE program.

PATs correspond to and support the learning objectives in *AWS EG2.0, Guide for the Training and Qualification of Welding Personnel: Entry-Level Welder*.

Note that to satisfy all learning objectives in *AWS EG2.0*, the instructor must also use the PATs contained in the second level of the NCCER *Welding* curriculum.

PATs 1 through 4 correspond to *AWS EG2.0, Module 4 – Shielded Metal Arc Welding*, Key Indicators 3, 4, and 6. PATs 2 and 3 also correspond to *AWS EG2.0, Module 4 – Shielded Metal Arc Welding*, Key Indicator 7, if the instructor chooses to perform the guided bend test. Refer to NCCER Module 29106, *Weld Quality*, for guided bend acceptance criteria.

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

The following tasks test your competency in welding V-groove welds in the 1G, 2G, 3G, and 4G positions. Don't perform these tasks until your instructor directs you to do so. Practice the tasks until you're thoroughly familiar with the procedures.

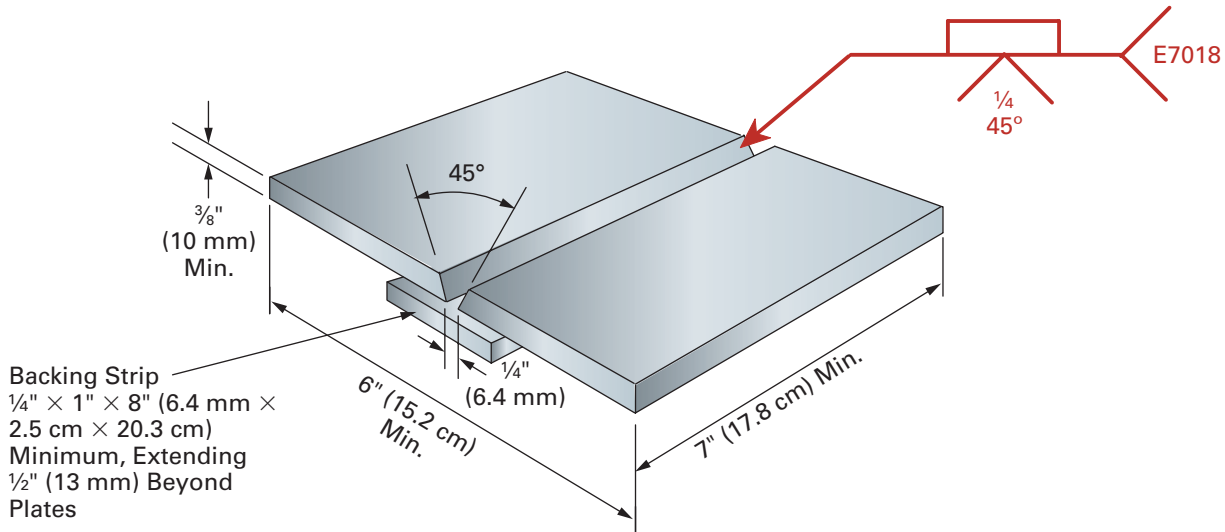
After you complete each task, take it to your instructor for evaluation.

Performance Accreditation Tasks

Module 29111

V-Groove Welds with Backing in the Flat (1G) Position

Using $\frac{3}{32}$ " , $\frac{1}{8}$ " , or $\frac{5}{32}$ " (2.4 mm, 3.2 mm, or 4.0 mm) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the flat position as indicated.



Inspection Hold Points:

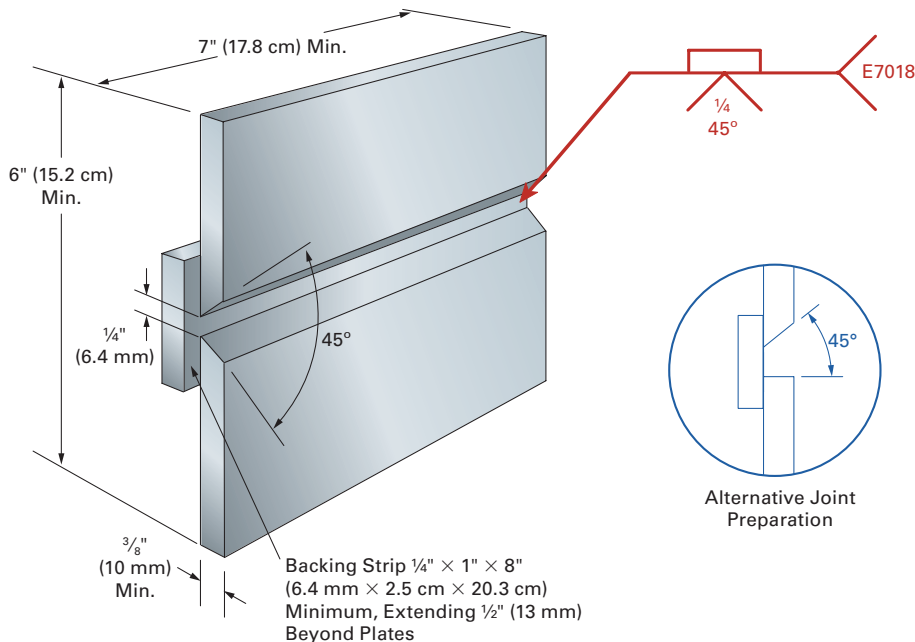
- Fit-up _____
- Root pass _____
- Final _____

Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29111 *Figure 15* _____
- Smooth transition with complete fusion at the toes of the weld _____
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm) _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- Acceptable guided bend test results (instructor option) _____

V-Groove Welds with Backing in the Horizontal (2G) Position

Using $\frac{3}{32}$ " , $\frac{1}{8}$ " , or $\frac{5}{32}$ " (2.4 mm, 3.2 mm, or 4.0 mm) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the horizontal position as indicated.



Inspection Hold Points:

- Fit-up
- Root pass
- Final

Criteria for Acceptance:

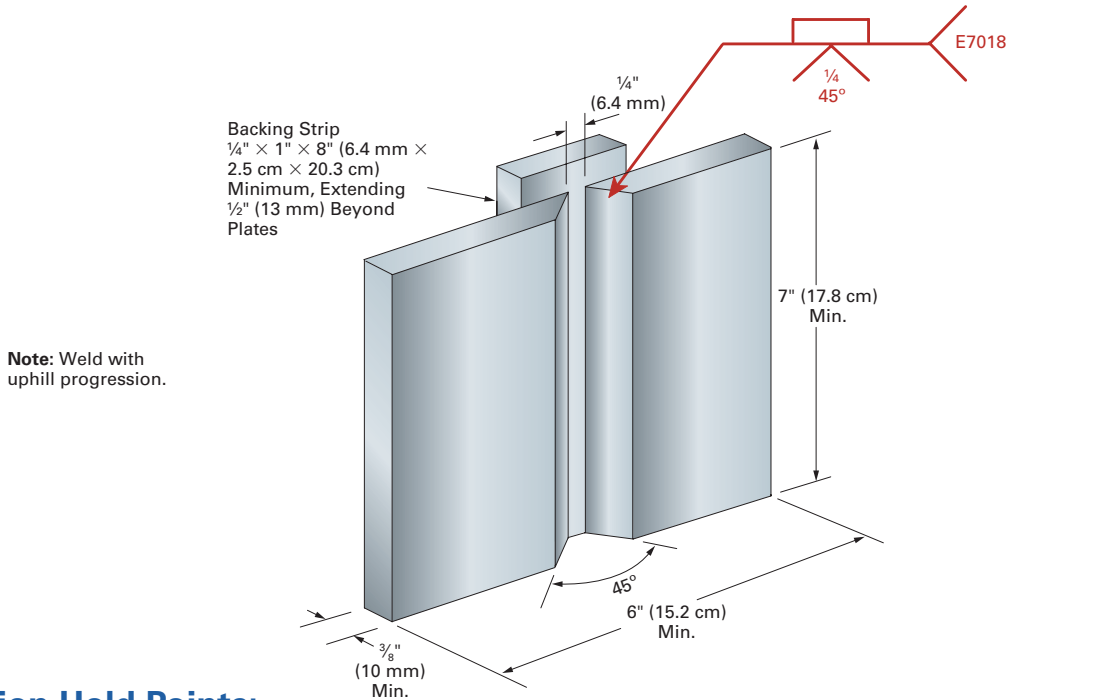
- No arc strikes outside the weld area
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm)
- Acceptable weld profile in accordance with Module 29111 *Figure 15*
- Smooth transition with complete fusion at the toes of the weld
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm)
- No pores larger than $\frac{3}{32}$ " (2.4 mm)
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less
- No overlap
- No inclusions
- No cracks
- Acceptable guided bend test results (instructor option)

Performance Accreditation Tasks

Module 29111

V-Groove Welds with Backing in the Vertical (3G) Position

Using $\frac{3}{32}$ " , $\frac{1}{8}$ " , or $\frac{5}{32}$ " (2.4 mm, 3.2 mm, or 4.0 mm) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the vertical position as indicated.



Inspection Hold Points:

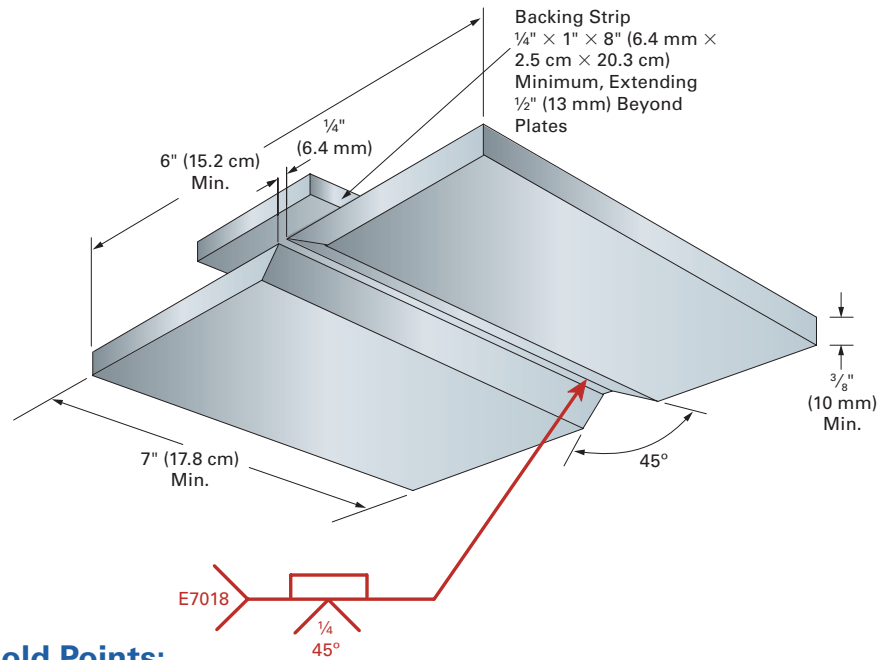
- Fit-up
- Root pass
- Final

Criteria for Acceptance:

- No arc strikes outside the weld area
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm)
- Acceptable weld profile in accordance with Module 29111 *Figure 15*
- Smooth transition with complete fusion at the toes of the weld
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm)
- No pores larger than $\frac{3}{32}$ " (2.4 mm)
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less
- No overlap
- No inclusions
- No cracks
- Acceptable guided bend test results (instructor option)

V-Groove Welds with Backing in the Overhead (4G) Position

Using $\frac{3}{32}$ " , $\frac{1}{8}$ " , or $\frac{5}{32}$ " (2.4 mm, 3.2 mm, or 4.0 mm) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the overhead position as indicated.



Inspection Hold Points:

- Fit-up
- Root pass
- Final

Criteria for Acceptance:

- No arc strikes outside the weld area
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm)
- Acceptable weld profile in accordance with Module 29111 *Figure 15*
- Smooth transition with complete fusion at the toes of the weld
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm)
- No pores larger than $\frac{3}{32}$ " (2.4 mm)
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less
- No overlap
- No inclusions
- No cracks
- Acceptable guided bend test results (instructor option)

APPENDIX 29112A

Performance Accreditation Tasks

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

The following tasks test your competency in welding open-root single V-groove welds in the 1G, 2G, 3G, and 4G positions. Don't perform these tasks until your instructor directs you to do so. Practice the tasks until you're thoroughly familiar with the procedures.

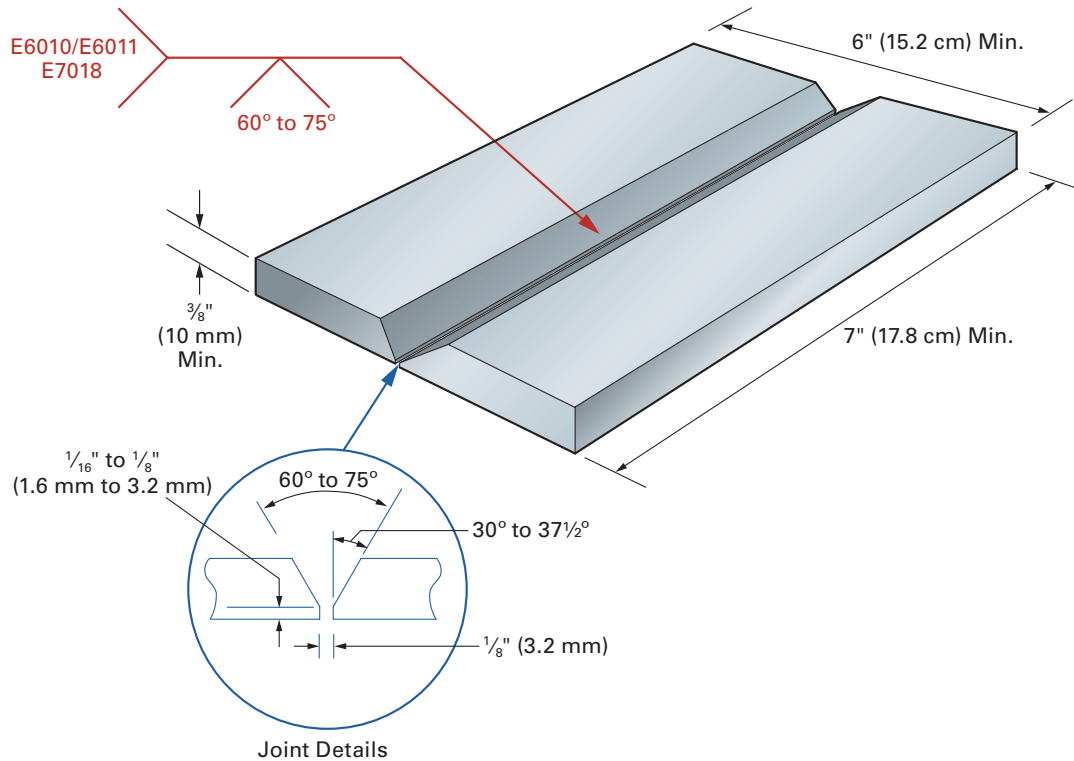
After you complete each task, take it to your instructor for evaluation.

Performance Accreditation Tasks

Module 29112

Open-Root V-Groove with E6010/E6011 and E7018 Electrodes in the Flat (1G) Position

Using $\frac{3}{32}$ " or $\frac{1}{8}$ " (2.4 mm or 3.2 mm) E6010/E6011 electrodes for the root pass and $\frac{3}{32}$ " or $\frac{1}{8}$ " (2.4 mm or 3.2 mm) E7018 electrodes for the fill and cover passes, make an open-root V-groove weld on carbon steel plate in the flat position as indicated.



Criteria for Acceptance:

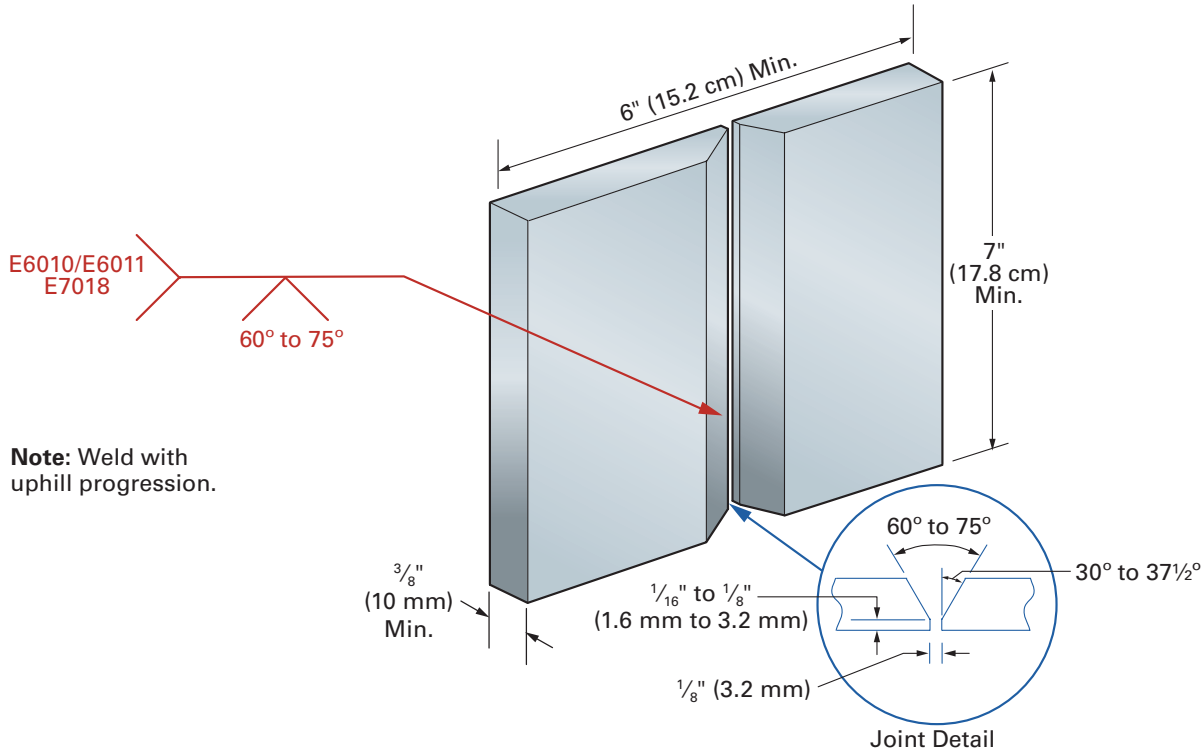
- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29112 *Figure 12* _____
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of $\frac{1}{8}$ " (3.2 mm) _____
- Smooth transition with complete fusion at the toes of the weld _____
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm) _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- Acceptable guided bend test results (instructor option) _____

Performance Accreditation Tasks

Module 29112

Open-Root V-Groove with E6010/E6011 and E7018 Electrodes in the Vertical (3G) Position

Using $\frac{3}{32}$ " or $\frac{1}{8}$ " (2.4 mm or 3.2 mm) E6010/E6011 electrodes for the root pass and $\frac{3}{32}$ " or $\frac{1}{8}$ " (2.4 mm or 3.2 mm) E7018 electrodes for the fill and cover passes, make an open-root V-groove weld on carbon steel plate in the vertical position as shown.



Criteria for Acceptance:

- No arc strikes outside the weld area _____
- Uniform rippled appearance on the bead face with no valley between the beads and acceptable tie-in _____
- Craters and restarts filled to the full cross section of the weld _____
- Uniform weld size $\pm \frac{1}{16}$ " (1.6 mm) _____
- Acceptable weld profile in accordance with Module 29112 *Figure 12* _____
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of $\frac{1}{8}$ " (3.2 mm) _____
- Smooth transition with complete fusion at the toes of the weld _____
- Face reinforcement no greater than $\frac{1}{8}$ " (3.2 mm) _____
- No pores larger than $\frac{3}{32}$ " (2.4 mm) _____
- No undercut greater than $\frac{1}{32}$ " (0.8 mm) deep or 10% of the base metal thickness, whichever is less _____
- No overlap _____
- No inclusions _____
- No cracks _____
- Acceptable guided bend test results (instructor option) _____

