Module 29101-09 has no Performance Profile Sheet; no performance testing is required for this module.
## Rating Levels:

(1) Passed: performed task  
(2) Failed: did not perform task

Also, list the date the testing for each task was completed.

## Recognition:

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Set up oxyfuel equipment.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Light and adjust an oxyfuel torch.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3. Shut down oxyfuel cutting equipment.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4. Disassemble oxyfuel equipment.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5. Change empty cylinders.</td>
<td></td>
</tr>
</tbody>
</table>

continued
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>6. Cut shapes from various thicknesses of steel, emphasizing:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Straight line</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Square shape</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Piercing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bevel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Slot</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7. Perform washing.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8. Perform gouging.</td>
<td></td>
</tr>
</tbody>
</table>
## Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting Up, Igniting, Adjusting, and Shutting Down Oxyfuel Equipment</td>
<td>2.11</td>
</tr>
<tr>
<td>2</td>
<td>Cutting a Shape from Thin Steel</td>
<td>2.12</td>
</tr>
<tr>
<td>3</td>
<td>Cutting a Shape from Thick Steel</td>
<td>2.13</td>
</tr>
</tbody>
</table>
SETTING UP, IGNITING, ADJUSTING, AND SHUTTING DOWN OXYFUEL EQUIPMENT

Using oxyfuel equipment that has been completely disassembled, demonstrate how to:
- Set up oxyfuel equipment
- Ignite and adjust the flame
  - Carburizing
  - Neutral
  - Oxidizing
- Shut off the torch
- Shut down the oxyfuel equipment

Criteria for Acceptance:
- Set up the oxyfuel equipment in the correct sequence
- Demonstrate that there are no leaks
- Properly adjust all three flames
- Shut off the torch in the correct sequence
- Shut down the oxyfuel equipment
CUTTING A SHAPE FROM THIN STEEL

Using a carbon steel plate, lay out and cut the shape and holes shown in the figure. If available, use a machine track cutter to straight cut the 6" dimensions.

NOTE: MATERIAL – CARBON STEEL ⅛" TO ⅛" THICK
HOLES ¼" DIAMETER
SLOTS ⅛" × 1½"

Criteria for Acceptance:

• Outside dimensions ±⅛"
• Inside dimensions (holes and slots) ±⅛"
• Square ±5°
• Minimal amount of dross sticking to plate which can be easily removed
• Square kerf face with minimal notching not exceeding ⅛" deep
CUTTING A SHAPE FROM THICK STEEL

Using a carbon steel plate, lay out and cut the shape and holes shown in the figure. If available, use a machine track cutter to bevel and straight cut the 6" dimensions.

**NOTE:** MATERIAL – CARBON STEEL OVER ¼" THICK OR GREATER
HOLES ¼" DIAMETER
SLOTS ¼" × 1½"

Criteria for Acceptance:

- Outside dimensions ±¼"
- Inside dimensions (holes and slots) ±¼"
- Square ±5°
- Bevel ±2°
- Minimal amount of dross sticking to plate which can be easily removed
- Square kerf face with minimal notching not exceeding ¼" deep

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<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1. Set up plasma arc cutting equipment.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Set the amperage and gas pressures or flow rates for the type and thickness of metal to be cut.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3. Square-cut metal using plasma arc cutting equipment.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5. Pierce and cut slots in metal using plasma arc cutting equipment.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6. Dismantle and store the equipment.</td>
<td></td>
</tr>
</tbody>
</table>
### Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plasma Arc Cutting</td>
<td>3.9</td>
</tr>
</tbody>
</table>
notes
PLASMA ARC CUTTING

Using carbon steel, lay out and cut the shape shown in the figure.

**Criteria for Acceptance:**

- Outside dimensions ±\(\frac{1}{8}\)"
- Inside (holes and slots) dimensions ±\(\frac{1}{8}\)"
- Square ±2°
- Bevel ±2°
- Minimal amount of dross sticking to plate which can be easily removed
- Square kerf face with minimal notching not exceeding ±\(\frac{1}{8}\)" deep
### Objective TASK

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Select and install CAC-A electrodes.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Prepare the work area and CAC-A equipment for safe operation.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3. Use CAC-A equipment for washing.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4. Use CAC-A equipment for gouging.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5. Perform storage and housekeeping activities for CAC-A equipment.</td>
<td></td>
</tr>
</tbody>
</table>
Air Carbon Arc Cutting and Gouging

Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAC-A Washing and Gouging</td>
<td>4.11</td>
</tr>
</tbody>
</table>
PERFORM CAC-A WASHING

Using any of the materials identified below, perform CAC-A washing to remove the portion identified by the instructor. Materials that can be used for this task include:

- Steel backing strip on a butt weld
- Excess buildup on the face of a weld
- Rivets or bolts in a plate
- Blocks, angles, clips, eyes, D-rings, or items welded to a plate

Criteria for Acceptance

- Material removed flush with the base metal surface
- No notching in the surface of the base metal

PERFORM CAC-A GOUGING

Using mild steel plate ½" thick or thicker, gouge a U-groove at least 8" long as shown in the figure in the 1G and 2G or 1F and 2F positions.

Criteria for Acceptance

- Groove width and depth are uniform to ±¼"
- Root face minimum is ¾"
- Groove bottom radius minimum is ¼"
- Included angle of groove walls is 45° ±10°
- Groove walls are smooth and uniform
- No dross within the groove
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 4</td>
<td>1. Mechanically bevel the edge of a mild steel plate ¼-inch to ¾-inch thick at 22½ degrees (or 30 degrees, depending on the equipment available).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2. Thermally prepare a bevel.</td>
<td></td>
</tr>
</tbody>
</table>

Rating Levels: (1) Passed: performed task   (2) Failed: did not perform task
Also, list the date the testing for each task was completed.

Recognition: When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
**Performance Accreditation Tasks**

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepare Plate Joints Mechanically</td>
<td>5.9</td>
</tr>
<tr>
<td>2</td>
<td>Prepare Joints Thermally</td>
<td>5.10</td>
</tr>
</tbody>
</table>
PREPARE PLATE JOINTS MECHANICALLY

Using a nibbler or cutter, mechanically prepare the edge of a ⅜" to ⅝" carbon steel plate with a bevel of 22½° (or 30° bevel depending on equipment available).

NOTE: BASE METAL = CARBON STEEL PLATE

Criteria for Acceptance:

- Bevel angle ±2½°
- Bevel face smooth and uniform to ⅛"
- Root face ±⅛"

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PERFORMANCE ACCREDITATION TASKS — MODULE 29105-09
Using oxyfuel or plasma arc cutting equipment, thermally prepare the edge of a $\frac{3}{8}$" to $\frac{3}{4}$" carbon steel plate with a bevel of $22\frac{1}{2}^\circ$ (or $30^\circ$ depending on equipment available).

**Criteria for Acceptance:**
- Bevel angle $\pm 2\frac{1}{2}^\circ$
- No dross
- Minimal notching not exceeding $\frac{1}{8}$" deep on the kerf face
- Minimum of $\frac{1}{8}$" radius at the top edge and bottom edge of the kerf
- Root face $\pm \frac{1}{16}$"
Module 29106-09 has no Performance Profile Sheet; no performance testing is required for this module.
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1. Set up a machine for welding.</td>
<td></td>
</tr>
</tbody>
</table>
Module 29108-09 has no Performance Profile Sheet; no performance testing is required for this module.
Objective TASK RATING

1. Set up welding equipment.

3. Strike an arc.

5. Make stringer, weave, and overlapping beads using E6010 and E7018 electrodes.

Recognition: When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4. Make fillet welds using E6010 and E7018 in the specified position:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Horizontal (2F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vertical (3F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Overhead (4F)</td>
<td></td>
</tr>
</tbody>
</table>
## Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Build a Pad with E6010 Electrodes in the Flat Position</td>
<td>9.9</td>
</tr>
<tr>
<td>2</td>
<td>Build a Pad with E7018 Electrodes in the Flat Position</td>
<td>9.10</td>
</tr>
<tr>
<td>3</td>
<td>Horizontal (2F) Fillet Weld with E6010 Electrodes</td>
<td>9.11</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal (2F) Fillet Weld with E7018 Electrodes</td>
<td>9.12</td>
</tr>
<tr>
<td>5</td>
<td>Vertical (3F) Fillet Weld with E6010 Electrodes</td>
<td>9.13</td>
</tr>
<tr>
<td>6</td>
<td>Vertical (3F) Fillet Weld with E7018 Electrodes</td>
<td>9.14</td>
</tr>
<tr>
<td>7</td>
<td>Overhead (4F) Fillet Weld with E6010 Electrodes</td>
<td>9.15</td>
</tr>
<tr>
<td>8</td>
<td>Overhead (4F) Fillet Weld with E7018 Electrodes</td>
<td>9.16</td>
</tr>
</tbody>
</table>
BUILD A PAD WITH E6010 ELECTRODES IN THE FLAT POSITION

Using ⅜" E6010 electrodes, build up a pad of weld metal on carbon steel plate as indicated.

NOTE: BASE METAL = CARBON STEEL PLATE AT LEAST ⅜" THICK

Criteria for Acceptance:

- Weld beads straight to within ⅜"
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Face of the pad flat to within ⅜"
- Smooth flat transition with complete fusion at the toes of one bead into the face of the previous bead
- No porosity
- No overlap at weld toes
- No excessive undercut
- No inclusions
- No cracks
BUILD A PAD WITH E7018 ELECTRODES IN THE FLAT POSITION

Using 3/8" E7018 electrodes, build up a pad of weld metal on carbon steel plate as indicated.

NOTE: BASE METAL = CARBON STEEL PLATE AT LEAST 3/4" THICK

Criteria for Acceptance:

- Weld beads straight to within 3/8"
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Face of the pad flat to within 3/8"
- Smooth flat transition with complete fusion at the toes of one bead into the face of the previous bead
- No porosity
- No overlap at weld toes
- No excessive undercut
- No inclusions
- No cracks
HORIZONTAL (2F) FILLET WELD WITH E6010 ELECTRODES

Using \( \frac{3}{8} \)" E6010 electrodes, make a horizontal fillet weld as indicated.

**NOTE:** BASE METAL = CARBON STEEL PLATE AT LEAST \( \frac{3}{4} \)" THICK

**Criteria for Acceptance:**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, \pm \( \frac{3}{8} \)"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap
HORIZONTAL (2F) FILLET WELD WITH E7018 ELECTRODES

Using ⅜” E7018 electrodes, make a horizontal fillet weld as indicated.

**Criteria for Acceptance:**
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, ±¼"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap
VERTICAL (3F) FILLET WELD WITH E6010 ELECTRODES

Using ⅛" E6010 electrodes, make a vertical fillet weld as indicated.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, ±⅛"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap at weld toes
VERTICAL (3F) FILLET WELD WITH E7018 ELECTRODES

Using ⅜" E7018 electrodes, make a vertical fillet weld as indicated.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, ±⅛"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap at weld toes

NOTE: BASE METAL = CARBON STEEL PLATE AT LEAST ⅜" THICK
OVERHEAD (4F) FILLET WELD WITH E6010 ELECTRODES

Using ¼" E6010 electrodes, make an overhead fillet weld as indicated.

NOTE: BASE METAL = CARBON STEEL PLATE AT LEAST ¼" THICK

Criteria for Acceptance:
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, ±¼"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap
OVERHEAD (4F) FILLET WELD WITH E7018 ELECTRODES

Using 5/8" E7018 electrodes, make an overhead fillet weld as indicated.

NOTE: BASE METAL = CARBON STEEL PLATE AT LEAST 1/4" THICK

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size, ± 1/8"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap
Objective | TASK | RATING
---|---|---
4 | 1. Fit up joints using plate and fit-up tools. | 
5 | 2. Check the joint for proper fit-up and alignment using gauges and measuring devices. | 

Rating Levels: (1) Passed: performed task   (2) Failed: did not perform task
Also, list the date the testing for each task was completed.

Recognition: When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
### Performance Profile Sheet

**Craft:** Welding  
**Module Number:** 29111-09  
**Module Title:** SMAW – Groove Welds with Backing

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1. Set up the arc welding equipment for making groove welds.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2. Make flat welds with backing on V-groove joints using E7018 electrodes.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3. Make horizontal welds with backing on V-groove joints using E7018 electrodes.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5. Make overhead welds with backing on V-groove joints using E7018 electrodes.</td>
<td></td>
</tr>
</tbody>
</table>

**Rating Levels:**  
(1) Passed: performed task  
(2) Failed: did not perform task  
Also, list the date the testing for each task was completed.

**Recognition:**  
When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

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SMAW – Groove Welds with Backing

Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V-Groove Welds with Backing in the Flat (1G) Position</td>
<td>11.9</td>
</tr>
<tr>
<td>2</td>
<td>V-Groove Welds with Backing in the Horizontal (2G) Position</td>
<td>11.10</td>
</tr>
<tr>
<td>3</td>
<td>V-Groove Weld with Backing in the Vertical (3G) Position</td>
<td>11.11</td>
</tr>
<tr>
<td>4</td>
<td>V-Groove Weld with Backing in the Overhead (4G) Position</td>
<td>11.12</td>
</tr>
</tbody>
</table>
Using ⅛", ¼", or ⅜" E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the flat position as indicated.

**Criteria for Acceptance:**
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±⅛"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
V-GROOVE WELDS WITH BACKING IN THE HORIZONTAL (2G) POSITION

Using ⅛", ⅛", or ⅝" E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the horizontal position as indicated.

NOTE: BASE METAL = CARBON STEEL PLATE

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±⅛"
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No overlap
- No inclusions
- No cracks
- Acceptable guided bend test results per AWS QC-10: 2004
Using \( \frac{3}{8}'' \), \( \frac{1}{4}'' \), or \( \frac{1}{2}'' \) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the vertical position as indicated.

**NOTE:** BASE METAL = CARBON STEEL PLATE

**Criteria for Acceptance:**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size \( \pm \frac{1}{8}'' \)
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- Acceptable guided bend test results per AWS QC-10: 2004
Using \( \frac{3}{8}'' \), \( \frac{1}{4}'' \), or \( \frac{5}{8}'' \) E7018 electrodes, make a V-groove weld with steel backing on carbon steel plate in the overhead position as indicated.

**Criteria for Acceptance:**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±\( \frac{3}{8}'' \)
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No overlap
- No inclusions
- No cracks
- Acceptable guided bend test results per AWS QC-10: 2004
Objective | TASK | RATING
--- | --- | ---
1 | 1. Prepare arc welding equipment for open V-groove welds. | 
2 | 2. Make open V-groove welds with E6010 and E7018 electrodes in the following positions: | 
| • Flat (1G) | | 
| • Horizontal (2G) | | 
| • Vertical (3G) | | 
| • Overhead (4G) | | 

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
## Performance Accreditation Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open V-Groove with E6010 and E7018 Electrodes in the Flat Position</td>
<td>12.9</td>
</tr>
<tr>
<td>2</td>
<td>Open V-Groove with E6010 and E7018 Electrodes in the Horizontal Position</td>
<td>12.10</td>
</tr>
<tr>
<td>3</td>
<td>Open V-Groove with E6010 and E7018 Electrodes in the Vertical Position</td>
<td>12.11</td>
</tr>
<tr>
<td>4</td>
<td>Open V-Groove with E6010 and E7018 Electrodes in the Overhead Position</td>
<td>12.12</td>
</tr>
</tbody>
</table>
OPEN V-GROOVE WITH E6010 AND E7018 ELECTRODES IN THE FLAT POSITION

Using ¾" E6010 electrodes for the root pass and ½" or ¾" 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:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size
- Acceptable weld profile in accordance with the ASME ASME Boiler and Pressure Vessel Code
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of ¾"
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- Acceptable guided bend test results (optional)
OPEN V-GROOVE WITH E6010 AND E7018 ELECTRODES IN THE HORIZONTAL POSITION

Using ¼" E6010 electrodes for the root pass and ½" or ¾" E7018 electrodes for the fill and cover passes, make an open-root V-groove weld on carbon steel plate in the horizontal position as shown.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of ¾"
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- Acceptable guided bend test results (optional)
OPEN V-GROOVE WITH E6010 AND E7018 ELECTRODES IN THE VERTICAL POSITION

Using ⅜" E6010 electrodes for the root pass and ⅜" or ½" 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:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of ¾"
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- Acceptable guided bend test results
OPEN V-GROOVE WITH E6010 AND E7018 ELECTRODES IN THE OVERHEAD POSITION

Using ⅛" E6010 electrodes for the root pass and ⅛" or ¼" E7018 electrodes for the fill and cover passes, make an open-root V-groove weld on carbon steel plate in the overhead position as indicated.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Complete uniform root penetration at least flush with the base metal to a maximum buildup of ¼"
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- Acceptable guided bend test results
**Objective 3, 4**

1. Identify and interpret welding symbols on a provided drawing.

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, 4</td>
<td>1. Identify and interpret welding symbols on a provided drawing.</td>
<td></td>
</tr>
</tbody>
</table>
**Performance Profile Sheet**

**Craft:** Welding  
**Module Number:** 29202-09  
**Module Title:** Reading Welding Detail Drawings

**Trainee Name:** _____________________________________________________________

**Trainee Social Security Number:** ____________________________________________

**Class:** ___________________________________________________________________

**Training Program Sponsor:** _________________________________________________

**Instructor:** _______________________________________________________________  

**Rating Levels:**  
(1) Passed: performed task   (2) Failed: did not perform task  
Also, list the date the testing for each task was completed.

**Recognition:**  
When testing for the NCCER Standardized Craft Training Program,  
be sure to record Performance testing results on Craft Training Report  
Form 200, and submit the results to the Training Program Sponsor.

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1. Draw or sketch a welding drawing based on a given image or drawing.</td>
<td></td>
</tr>
</tbody>
</table>
Module 29203-09 has no Performance Profile Sheet; no performance testing is required for this module.
Objective | TASK | RATING
--- | --- | ---
1 | 1. Preheat base metal to 350°F and verify preheat using a temperature-indicating device. |   

Rating Levels:  
(1) Passed: performed task  
(2) Failed: did not perform task  

Also, list the date the testing for each task was completed.

Recognition:  
When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
Objective | TASK | RATING
--- | --- | ---
5 | 1. Set up GMAW and FCAW equipment with appropriate shielding gases and filler metals. | 

Recognition: When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
### Objective 1

1. Make multiple-pass GMAW-S (short-circuit) fillet welds on carbon steel plate coupons in the following positions, using solid or composite wire:

<table>
<thead>
<tr>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F</td>
</tr>
<tr>
<td>2F</td>
</tr>
<tr>
<td>3F</td>
</tr>
<tr>
<td>4F</td>
</tr>
</tbody>
</table>

**Rating Levels:**

(1) Passed: performed task  
(2) Failed: did not perform task

**Recognition:**

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
### Objective 4

2. Make multiple-pass FCAW-G/GM (gas-shielded) or FCAW-S (self-shielded) fillet welds on carbon steel plate coupons in the following positions:

- 1F
- 2F
- 3F
- 4F

### Objective 5

3. Make multiple-pass FCAW-G/GM (gas-shielded) or FCAW-S (self-shielded) V-groove welds on carbon steel plate coupons in the following positions (with or without backing):

- 1G
- 2G
- 3G
- 4G

continued
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4. Make multiple-pass GMAW-S (short-circuit) V-groove welds on carbon steel plate coupons in the following positions (with or without backing), using solid or composite wire:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4G</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5. Make multiple-pass GMAW spray fillet welds on carbon steel plate coupons in the following positions, using solid or composite wire:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2F</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6. Make multiple-pass GMAW spray V-groove welds on carbon steel plate coupons in the 1G position (with or without backing), using solid or composite wire.</td>
<td></td>
</tr>
</tbody>
</table>
MAKE A FILLET WELD IN THE (1F) FLAT POSITION

As directed by the instructor, use GMAW (spray and/or short-circuiting transfer), FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/16"
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
As directed by the instructor, use GMAW (spray and/or short-circuiting transfer), FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/16"
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
MAKE A FILLET WELD IN THE (3F) VERTICAL POSITION

As directed by the instructor, use GMAW, FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a vertical fillet weld on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{3}{16}\)" 
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE A FILLET WELD IN THE (4F) OVERHEAD POSITION

As directed by the instructor, use GMAW, FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ± ¼"
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE A GROOVE WELD, WITH OR WITHOUT BACKING, IN THE (1G) FLAT POSITION

As directed by the instructor, use GMAW (spray and/or short-circuiting transfer), FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a multiple-pass groove weld using stringer beads on carbon steel plate, with or without backing, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/16"
- Acceptable weld profile in accordance with the applicable code or standard
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/8", if applicable
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
## MAKE A GROOVE WELD, WITH OR WITHOUT BACKING, IN THE (2G) HORIZONTAL POSITION

As directed by the instructor, use GMAW, FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a multiple-pass groove weld on carbon steel plate, with or without backing, as shown.

### Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/8”
- Acceptable weld profile in accordance with the applicable code or standard
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/4”, if applicable
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

### Joint Details

**Without Backing**

- 0” – 1/8”
- 45°
- 22 1/2°

**With Backing**

- 1/4”
- 60° – 75°
- 30° – 37 1/2°
- 0” – 1/4”

---

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MAKE A GROOVE WELD, WITH OR WITHOUT BACKING, IN THE (3G) VERTICAL POSITION

As directed by the instructor, use GMAW, FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a multiple-pass groove weld on carbon steel plate, with or without backing, as shown.

Note: Run the root vertical up or vertical down as specified by your instructor.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{1}{64}\)"
- Acceptable weld profile in accordance with the applicable code or standard
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of \(\frac{1}{64}\)", if applicable
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

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MAKE A GROOVE WELD, WITH OR WITHOUT BACKING, IN THE (4G) OVERHEAD POSITION

As directed by the instructor, use GMAW, FCAW, or both processes with carbon steel solid or flux-cored electrode wire sizes, and, if required, appropriate shielding gas to make a multiple-pass groove weld on carbon steel plate, with or without backing, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/6"  
- Acceptable weld profile in accordance with the applicable code or standard
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/6", if applicable
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
**Objective** | **TASK** | **RATING**
--- | --- | ---
4 | 1. Select shielding gas for a given application. | 
3 | 2. Select filler metal for a given application. | 
4, 5 | 3. Connect the shielding gas and set the flow rate. | 
5 | 4. Select and prepare the electrode. | 
2, 5 | 5. Break down and reassemble a GTAW torch. | 

(1) Passed: performed task  (2) Failed: did not perform task

Also, list the date the testing for each task was completed.

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
Objective TASK RATING

1 1. Build a pad with stringer beads on carbon steel plate coupons in the flat (1G) position using GTAW equipment and carbon steel filler metal.

Rating Levels: (1) Passed: performed task (2) Failed: did not perform task

Also, list the date the testing for each task was completed.

Recognition: When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2. Perform multiple-pass fillet welds on carbon steel plate coupons in the following positions, using GTAW equipment and carbon steel filler metal:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4F</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3. Perform multiple-pass V-groove welds on carbon steel plate in the following positions, using GTAW equipment and carbon steel filler metal:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4G</td>
<td></td>
</tr>
</tbody>
</table>
As directed by the instructor, use GTAW process with carbon steel filler metal to build a pad on a carbon steel coupon in the flat position.

**Criteria for Acceptance**
- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{1}{16}\)"
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

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As directed by the instructor, use GTAW process with carbon steel filler metal to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±\(\frac{1}{6}\)"
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON CARBON STEEL PLATE IN THE (2F) HORIZONTAL POSITION

As directed by the instructor, use GTAW process with carbon steel solid filler metal to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±\(\frac{1}{16}"\)
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON CARBON STEEL PLATE IN THE (3F) VERTICAL POSITION

As directed by the instructor, use GTAW process with carbon steel filler metal to make a vertical fillet weld on carbon steel plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{1}{16}\)"
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON CARBON STEEL PLATE IN THE (4F) OVERHEAD POSITION

As directed by the instructor, use GTAW process with carbon steel filler metal to make a six-pass fillet weld using stringer beads on carbon steel plate, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ± ⅛"
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
As directed by the instructor, use GTAW process with carbon steel filler metal to make multiple-pass V-groove welds on carbon steel plate in the flat (1G) position, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face ____________
- Craters and restarts filled to the full cross section of the weld ____________
- Uniform weld size ± 1/16” ____________
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code ____________
- Smooth transition with complete fusion at the toes of the weld ____________
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/8” ____________
- No porosity ____________
- No overlap ____________
- No excessive undercut ____________
- No inclusions ____________
- No cracks ____________
- No pinholes (fish eyes) ____________
MAKE MULTIPLE-PASS V-GROOVE WELDS ON CARBON STEEL PLATE IN THE HORIZONTAL (2G) POSITION

As directed by the instructor, use GTAW process with carbon steel filler metal to make multiple-pass V-groove welds on carbon steel plate in the horizontal (2G) position, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±\(\frac{1}{16}\)" 
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of \(\frac{3}{16}\)"
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
MAKE MULTIPLE-PASS V-GROOVE WELDS ON CARBON STEEL PLATE IN THE VERTICAL (3G) POSITION

As directed by the instructor, use GTAW process with carbon steel filler metal to make multiple-pass V-groove welds on carbon steel plate in the vertical (3G) position, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/16"
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/8"
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
As directed by the instructor, use GTAW process with carbon steel filler metal to make multiple-pass V-groove welds on carbon steel plate in the overhead (4G) position, as shown.

**Joint Details**

- **MAX:** 1/8"
- 0" - 1/8"
- 6"
- 5"

**Note:** Base metal, carbon steel plate at least 1/4" thick

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ± 1/16"
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 1/8"
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fish eyes)
**Performance Profile Sheet**

**Craft:** Welding  
**Module Number:** 29301-10  
**Module Title:** SMAW – Open-Root Pipe Welds

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Prepare SMAW equipment for open-root pipe welds.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Make pipe welds in the 1G-ROTATED position.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3. Make pipe welds in the 2G position.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4. Make pipe welds in the 5G position.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5. Make pipe welds in the 6G position.</td>
<td></td>
</tr>
</tbody>
</table>

**Rating Levels:**  
(1) Passed: performed task  
(2) Failed: did not perform task  
Also, list the date the testing for each task was completed.

**Recognition:**  
When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
OPEN-ROOT V-GROOVE PIPE WELD
IN THE 1G-ROTATED POSITION

Using ¼" E6010 electrodes for the root pass, ⅜" E7018 electrodes for the hot pass, and ⅜" or ⅛" E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 1G-ROTATED 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 the 
  ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum buildup of ⅛"
- No porosity
- No excessive undercut
- No inclusions
- No cracks

NOTE: THE ACTUAL NUMBER OF WELD BEADS WILL VARY DEPENDING ON THE WALL THICKNESS.
**OPEN-ROOT V-GROOVE PIPE WELD IN THE 2G POSITION**

Using ¼" E6010 electrodes for the root pass, ⅜" E7018 electrodes for the hot pass, and ⅝" or ⅞" 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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum buildup of ⅛"
- No porosity
- No excessive undercut
- No inclusions
- No cracks
OPEN-ROOT V-GROOVE PIPE WELD IN THE 5G POSITION

Using \( \frac{1}{4} \)" E6010 electrodes for the root pass, \( \frac{3}{8} \)" E7018 electrodes for the hot pass, and \( \frac{3}{8} \)" or \( \frac{1}{8} \)" E7018 electrodes for the remaining passes, make an open-root V-groove weld on carbon steel pipe in the 5G 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 the 
  \textit{ASME Boiler and Pressure Vessel Code – Section IX}
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum buildup of \( \frac{3}{8} \)"
- No porosity
- No excessive undercut
- No inclusions
- No cracks
OPEN-ROOT V-GROOVE PIPE WELD IN THE 6G POSITION

Using 1/4" E6010 electrodes for the root pass, 3/16" E7018 electrodes for the hot pass, and 3/32" or 1/8" 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.

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 the *ASME Boiler and Pressure Vessel Code, Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum buildup of 1/8"
- No porosity
- No excessive undercut
- No inclusions
- No cracks

NOTE:
If required for qualification purposes, a restricting ring may be added to the 6G position coupon to form a 6GR position coupon.
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Set up GMAW equipment for open-root V-groove pipe welds.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Make GMAW open-root V-groove pipe welds in the 1G-ROTATED position using applicable filler metal and shielding gas.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3. Make GMAW open-root V-groove pipe welds in the 2G position using applicable filler metal and shielding gas.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4. Make GMAW open-root V-groove pipe welds in the 5G position using applicable filler metal and shielding gas.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5. Make GMAW open-root V-groove pipe welds in the 6G (or 6GR) position using applicable filler metal and shielding gas.</td>
<td></td>
</tr>
</tbody>
</table>
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.

**Note:** Depending on site procedures or practices, the root pass for the following tasks may be run using another welding process such as GTAW or SMAW. 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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ¼”
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

**NOTE:** THE ACTUAL NUMBER OF WELD BEADS WILL VARY DEPENDING ON THE WALL THICKNESS.
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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of 3/8"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
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.

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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of $\frac{1}{4}$"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
OPEN-ROOT V-GROOVE PIPE WELD IN THE 6G (OR 6 GR) 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.

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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of \( \frac{1}{8} \)"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

NOTE:
IF REQUIRED FOR QUALIFICATION PURPOSES,
A RESTRICTING RING MAY BE ADDED TO THE 6G POSITION COUPON TO FORM A 6GR POSITION COUPON.
Craft: Welding
Module Number: 29303-10
Module Title: FCAW – Pipe

TRAINER NAME: _____________________________________________________________

TRAINER SOCIAL SECURITY NUMBER: _________________________________________

CLASS: ____________________________________________________________________

TRAINING PROGRAM SPONSOR: _______________________________________________

____________________________________________________________________________

INSTRUCTOR: _______________________________________________________________

Rating Levels: (1) Passed: performed task (2) Failed: did not perform task
Also, list the date the testing for each task was completed.

Recognition: When testing for the NCCER Standardized Craft Training Program,
be sure to record Performance testing results on Training Report Form
200, and submit the results to the Training Program Sponsor.

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Set up FCAW equipment for open-root V-groove pipe welds.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Make FCAW open-root V-groove pipe welds in the 1G-ROTATED position.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3. Make FCAW open-root V-groove pipe welds in the 2G position.</td>
<td></td>
</tr>
</tbody>
</table>
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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of 1/8"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
- No pinholes (fisheyes)
- No inclusions

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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 or weave 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.

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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ⅛”
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
- No pinholes (fisheyes)
- No inclusions
OPEN-ROOT V-GROOVE PIPE WELD IN THE 6G (OR 6 GR) 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 (or 6GR) 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 and guided bend test in accordance with the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of 1/8"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
- No pinholes (fisheyes)
- No inclusions
Craft: Welding
Module Number: 29304-10
Module Title: GTAW – Carbon Steel Pipe

TRAINEE NAME: _____________________________________________________________

TRAINEE SOCIAL SECURITY NUMBER: _________________________________________

CLASS: ____________________________________________________________________

TRAINING PROGRAM SPONSOR: _______________________________________________

INSTRUCTOR: _______________________________________________________________

Rating Levels: (1) Passed: performed task   (2) Failed: did not perform task
Also, list the date the testing for each task was completed.

Recognition: When testing for the NCCER Standardized Craft Training Program,
be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Set up GTAW equipment to create open-root V-groove welds on carbon steel pipe using appropriate filler metal and argon gas.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2. Make GTAW open-root V-groove welds on carbon steel pipe in the 2G position using carbon steel filler metal and argon gas.</td>
<td></td>
</tr>
</tbody>
</table>
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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of \( \frac{1}{8} \)"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
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.

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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ⅛"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
GTAW OPEN-ROOT V-GROOVE PIPE WELD IN THE 6G (OR 6 GR) 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.

Criteria for Acceptance

- Uniform appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile and guided bend test in accordance with the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of 1/8"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

NOTE:
IF REQUIRED FOR QUALIFICATION PURPOSES, A RESTRICTING RING MAY BE ADDED TO THE 6G POSITION COUPON TO FORM A 6GR POSITION COUPON.
**Performance Profile Sheet**

Craft: Welding

Module Number: 29305-10

Module Title: GTAW – Low-Alloy and Stainless Steel Pipe

---

**Trainee Name:** ________________________________

**Trainee Social Security Number:** ________________________________

**Class:** ________________________________

**Training Program Sponsor:** ________________________________

**Instructor:** ________________________________

---

**Rating Levels:**

1. Passed: performed task  
2. Failed: did not perform task

Also, list the date the testing for each task was completed.

**Recognition:**

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

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<table>
<thead>
<tr>
<th>Objective</th>
<th>Task</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Prepare the area for GTAW.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2. Set up GTAW equipment to create welds on carbon or stainless steel pipe with the appropriate filler metal.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3. Make GTAW open-root V-groove welds on appropriate metal pipe in the 2G position using low-alloy and stainless steel filler metal.</td>
<td></td>
</tr>
</tbody>
</table>

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Copyright © 2010 National Center for Construction Education and Research. Permission is granted to reproduce this page provided that copies are for local use only and that each copy contains this notice.
Using GTAW equipment and stainless and/or low-alloy steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on stainless steel or 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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ⅛"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
GTAW OPEN-ROOT V-GROOVE PIPE WELD IN THE 5G POSITION

Using GTAW equipment and stainless and/or low-alloy steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on stainless steel or carbon steel pipe in the 5G 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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of \( \frac{3}{16} \)"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

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GTAW OPEN-ROOT V-GROOVE PIPE WELD IN THE 6G (OR 6 GR) POSITION

Using GTAW equipment and stainless and/or low-alloy steel filler rod of the appropriate diameter, argon shielding gas, and stringer beads, make an open-root V-groove weld on stainless steel or carbon steel pipe in the 6G (or 6GR) 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 and guided bend test in accordance with the ASME Boiler and Pressure Vessel Code – Section IX
• Smooth transition with complete fusion at the toes of the weld
• Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ¼”
• No porosity
• No excessive undercut
• No cracks
• No overlap
• No incomplete fusion

NOTE: IF REQUIRED FOR QUALIFICATION PURPOSES, A RESTRICTING RING MAY BE ADDED TO THE 6G POSITION COUPON TO FORM A 6GR POSITION COUPON.
**Objective** | **TASK** | **RATING**  
---|---|---  
4 | 1. Prepare SMAW equipment for stainless steel welds. |  
6 | 2. Make open-root V-groove welds on stainless steel plate joints in the 1G position using SMAW equipment and electrodes. |  
6 | 3. Make open-root V-groove welds on stainless steel plate joints in the 2G position using SMAW equipment and electrodes. |  
6 | 4. Make open-root V-groove welds on stainless steel plate joints in the 3G position using SMAW equipment and electrodes. |  

**Rating Levels:**  (1) Passed: performed task  (2) Failed: did not perform task  
Also, list the date the testing for each task was completed.  

**Recognition:**  When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
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<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5. Make open-root V-groove welds on stainless steel plate joints in the 4G position using SMAW equipment and electrodes.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6. Make open-root V-groove welds on stainless steel pipe joints in the 1G-ROTATED position using SMAW equipment and electrodes.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>7. Make open-root V-groove welds on stainless steel pipe joints in the 2G position using SMAW equipment and electrodes.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8. Make open-root V-groove welds on stainless steel pipe joints in the 5G position using SMAW equipment and electrodes.</td>
<td></td>
</tr>
</tbody>
</table>
OPEN-ROOT V-GROOVE WELDS ON STAINLESS STEEL PLATE JOINTS IN THE FLAT (1G) POSITION

**Note:** It is preferable to use stainless steel base metal. However, substituting carbon steel is permitted by the codes.

Using stainless steel electrodes, make an open-root V-groove weld on plate in the flat (1G) position, as shown.

![Joint Details Diagram](306A01.EPS)

**Criteria for Acceptance:**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of $\frac{3}{32}$”
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
OPEN-ROOT V-GROOVE WELDS ON STAINLESS STEEL PLATE JOINTS IN THE HORIZONTAL (2G) POSITION

Using stainless steel electrodes, make an open-root V-groove weld on plate in the horizontal (2G) position, as shown.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of \( \frac{3}{16} \)".
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
Using stainless steel electrodes, make an open-root V-groove weld on plate in the vertical (3G) position, as shown.

**Criteria for Acceptance:**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of \( \frac{3}{32} \) "
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
OPEN-ROOT V-GROOVE WELDS ON STAINLESS STEEL PLATE JOINTS IN THE OVERHEAD (4G) POSITION

Using stainless steel electrodes, make an open-root V-groove weld on plate in the overhead (4G) position, as shown.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of $\frac{3}{32}$" 
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
Using stainless steel electrodes, make an open-root V-groove weld on pipe in the multiple inclined (6G) position, as shown. If required, a restricting ring may be added to the 6G position to form a 6GR position coupon.

Criteria for Acceptance:

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the base metal to a maximum buildup of 3/32”
- No porosity
- No overlap
- No excessive undercut
- No inclusions
- No cracks
- No pinholes (fisheyes)
**Objective** | **TASK** | **RATING**
---|---|---
3 | 1. Make selected GMAW welds on aluminum plate: |  
  - Stringer beads  
  - Weave beads  
  - Weld restarts  
  - Weld terminations  
  - Overlapping beads |
<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2. Make selected GMAW fillet welds on aluminum plate in the following positions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4F</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3. Make selected GMAW V-groove welds on aluminum plate with backing in the following positions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3G</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4G</td>
<td></td>
</tr>
</tbody>
</table>
WELD A PAD ON ALUMINUM PLATE IN THE FLAT (1G) POSITION USING GMAW STRINGER BEADS

As directed by the instructor, use the GMAW process with the appropriate aluminum filler wire to make the following welds on aluminum plate: stringer beads, weave beads, weld restarts, weld terminations, and overlapping beads.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/16"
- Acceptable weld profile in accordance with the acceptable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE FLAT (1F) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/16”
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±\(\frac{1}{32}\)"
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE VERTICAL (3F) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

<table>
<thead>
<tr>
<th>Criteria for Acceptance</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform rippled appearance on the bead face</td>
<td></td>
</tr>
<tr>
<td>Craters and restarts filled to the full cross section of the weld</td>
<td></td>
</tr>
<tr>
<td>Uniform weld width ±1/6&quot;</td>
<td></td>
</tr>
<tr>
<td>Acceptable weld profile in accordance with the applicable code or standard</td>
<td></td>
</tr>
<tr>
<td>Smooth flat transition with complete fusion at the toes of the weld</td>
<td></td>
</tr>
<tr>
<td>No porosity</td>
<td></td>
</tr>
<tr>
<td>No excessive undercut</td>
<td></td>
</tr>
<tr>
<td>No inclusions</td>
<td></td>
</tr>
<tr>
<td>No cracks</td>
<td></td>
</tr>
</tbody>
</table>
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE OVERHEAD (4F) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/6" square
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

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MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE FLAT (1G) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a multiple-pass groove weld using stringer beads on aluminum plate with backing, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

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MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE HORIZONTAL (2G) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

**Criteria for Acceptance**

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE VERTICAL (3G) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

Note: Run the root vertical up.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE OVERHEAD (4G) POSITION

As directed by the instructor, use the GMAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
## Objective TASK

<table>
<thead>
<tr>
<th>Objective</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Set up GTAW equipment to make fillet and V-groove welds on aluminum plate.</td>
</tr>
<tr>
<td>3</td>
<td>2. Weld a pad on aluminum plate in the flat position using GTAW stringer beads.</td>
</tr>
</tbody>
</table>

(1) Passed: performed task  (2) Failed: did not perform task

Also, list the date the testing for each task was completed.

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
## Objective 4

3. Make multiple-pass fillet welds on aluminum plate in the following positions using GTAW equipment and aluminum filler metal:

- 1F
- 2F
- 3F
- 4F

## Objective 5

4. Make multiple-pass V-groove welds on aluminum plate with backing in the following positions using GTAW equipment and aluminum filler metal:

- 1G
- 2G
- 3G
- 4G
WELD A PAD ON ALUMINUM PLATE IN THE FLAT (1G) POSITION USING GTAW STRINGER BEADS

As directed by the instructor, use the GTAW process with the appropriate aluminum filler wire to make the following welds on aluminum plate: stringer beads, weave beads, weld restarts, weld terminations, and overlapping beads.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{1}{16}\)" 
- Acceptable weld profile in accordance with the acceptable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE FLAT (1F) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/64"
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions

NOTE: BASE METAL, ALUMINUM PLATE AT LEAST 1/4" THICK

CLAMP OR TACK TO TABLE OR POSITIONING ARM

Bead Sequence
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE HORIZONTAL (2F) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size ±1/6" inches
- Smooth flat transition with complete fusion at the toes of the welds
- Acceptable weld profile in accordance with the applicable code or standard
- No porosity
- No excessive undercut
- No overlap
- No inclusions

NOTE: BASE METAL, ALUMINUM PLATE AT LEAST 1/4" THICK
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE VERTICAL (3F) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±1/6"
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS FILLET WELDS ON ALUMINUM PLATE IN THE OVERHEAD (4F) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a six-pass fillet weld using stringer beads on aluminum plate, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld width ±\(\frac{1}{16}\)" 
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE FLAT (1G) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a multiple-pass groove weld using stringer beads on aluminum plate with backing, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

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MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE HORIZONTAL (2G) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MAKE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE VERTICAL (3G) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

Note: Run the root vertical up.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
MADE MULTIPLE-PASS V-GROOVE WELDS ON ALUMINUM PLATE WITH BACKING IN THE OVERHEAD (4G) POSITION

As directed by the instructor, use the GTAW process with the appropriate aluminum wire to make a multiple-pass groove weld on aluminum plate with backing, as shown.

Criteria for Acceptance

- Uniform rippled appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Acceptable weld profile in accordance with the applicable code or standard
- Smooth flat transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks

NOTE: BASE METAL, ALUMINUM AT LEAST ¼" THICK
**Objective:**

1. Set up GTAW equipment to weld aluminum pipe.

3. Make GTAW V-groove and modified U-groove welds on aluminum pipe in the following positions:
   - 2G
   - 5G
   - 6G

**Rating Levels:**

(1) Passed: performed task  (2) Failed: did not perform task

Also, list the date the testing for each task was completed.

**Recognition:**

When testing for the NCCER Standardized Craft Training Program, be sure to record Performance testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
V-GROOVE OR MODIFIED U-GROOVE WELDS ON ALUMINUM PIPE IN THE 2G POSITION

As directed by your instructor, use the GTAW process with the appropriate aluminum filler wire, argon shielding gas, and stringer beads to make a multiple-pass groove weld on aluminum pipe in the 2G position with either type of joint.

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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
V-GROOVE OR MODIFIED U-GROOVE WELDS ON ALUMINUM PIPE IN THE 5G POSITION

As directed by your instructor, use the GTAW process with the appropriate aluminum filler wire, argon shielding gas, and stringer beads to make a multiple-pass groove weld on aluminum pipe in the 5G position with either type of joint.

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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
V-GROOVE OR MODIFIED U-GROOVE WELDS ON ALUMINUM PIPE IN THE 6G (OR 6GR) POSITION

As directed by your instructor, use the GTAW process with the appropriate aluminum filler wire, argon shielding gas, and stringer beads to make a multiple-pass groove weld on aluminum pipe in the 6G (or 6GR) position with either type of joint.

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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

NOTE: IF REQUIRED FOR QUALIFICATION PURPOSES, A RESTRICTING RING MAY BE ADDED TO THE 6G POSITION COUPON TO FORM A 6GR POSITION COUPON.
### Objective TASK | RATING
---|---
2 | 1. Make selected V-groove welds on aluminum pipe with backing in the following positions, using GMAW equipment:

• 2G
• 5G
• 6G
V-GROOVE WELDS ON ALUMINUM PIPE WITH BACKING IN THE 2G POSITION

Using aluminum filler wire of the appropriate diameter, proper shielding gas, and stringer beads, make V-groove welds on aluminum 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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of 1/8"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
V-GROOVE WELDS ON ALUMINUM PIPE WITH BACKING IN THE 5G POSITION

Using aluminum filler wire of the appropriate diameter, proper shielding gas, and stringer or weave beads, make V-groove welds on aluminum pipe in the 5G 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 the *ASME Boiler and Pressure Vessel Code – Section IX*
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of \( \frac{1}{8} \) inch
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion
Perf ormance Accreditation Tasks

V-GROOVE ON ALUMINUM PIPE WITH BACKING IN THE 6G (OR 6GR) POSITION

Using aluminum filler wire of the appropriate diameter, proper shielding gas, and stringer beads, make V-groove welds on aluminum pipe in the 6G (or 6GR) 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 the ASME Boiler and Pressure Vessel Code – Section IX
- Smooth transition with complete fusion at the toes of the weld
- Complete uniform root reinforcement at least flush with the inside of the pipe to a maximum of ¼"
- No porosity
- No excessive undercut
- No cracks
- No overlap
- No incomplete fusion

NOTE: IF REQUIRED FOR QUALIFICATION PURPOSES, A RESTRICTING RING MAY BE ADDED TO THE 6G POSITION COUPON TO FORM A 6GR POSITION COUPON.

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