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UNITED ASSOCIATION WELDER TRAINING



HOW TO TAKE A WELD TEST

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FIRST make sure you have the details of the weld test. You should call the test supervisor if at all possible and politely ask them the details of the weld test. *(For example: 2 inch carbon steel schedule 80 pipe with 6010 root and 7018 fill passes, or 2 inch stainless steel inch schedule 40 pipe with ER308 GTAW root & hot pass, and E308 SMAW filler passes.)* Also, call a local union training center and ask if you can arrange some practice time once you find out what to practice. If it is a good job that pays well, it is worth your time to practice, if it helps you pass the weld test.

SAFETY PRACTICES

- Before starting any welding operations, you should make a complete inspection of the equipment
- Clean work area
- Be sure of your surroundings
- Proper Ventilation
- NO Flammable Materials

TEST PREPARATION

- Before beginning the test, ask the test supervisor about any specific test requirements such as:
 - Time limits
 - Inspection hold points
 - Use of stringer or weave beads
 - Amount of push through on root pass
 - Maximum weld reinforcement of the cap
- Be sure to read the Welding Procedure Specification for the test carefully. Success on the examination depends upon following the specification carefully for a quality weld.
- Only coupons provided by the test supervisor should be used

TEST COUPON PREPARATION

- Mild steel must always be mechanically cleaned prior to welding
- Rust, paint, oil and grease, or any surface contaminants must be removed
- Clean (*e.g. flapper wheel*) at least 1" from joint prep edge, both on the I.D. and O.D
- Check the bevel angle and land thickness, comply with weld procedure requirements

EQUIPMENT

- With the many types of welding machines available, certain considerations must be made in order to fit the right machine to the job
- Ask the test supervisor if you can take a little time to weld some beads on scrap steel to become familiar with the machine's settings for welding
- Light welding (low output requirements of about 200 Amps or less) can often be done with single phase welding machines
- Larger DC welding machines used for heavy plate, structural fabrication and high production welding generally need three phase
- When setting a welding machine to do an open root weld, you need to find an amperage setting that is hot enough to open up a keyhole fast but not too hot that the keyhole gets too big. The main thing to look for when setting a welding machine to run an open root weld is for the amperage to be high enough that the electrode does not stick when testing it on a piece of scrap metal

ELECTRODES IDENTIFICATION & SELECTION

- The type and size of electrodes will be specified on the welding procedure used for the test. (examples: E6010, E7018, ER70S-2, ER308, E308)
- The procedure may specify a range of electrode diameters and leave it up to the welder to use what electrode best suites them. Good practice is to ask the test supervisor if there are any specific diameters required for the test.
- Only use filler metals provided to you by the test supervisor.
- Inspect electrodes for damage (such as broken flux or loss of identification), any problems notify the test supervisor.

FIT-UP & ALIGNMENT

- Proper fit-up is important if a good weld is to be made
- Clamping or fixturing is often done to ensure proper fit-up of the test coupon (example: use an angle iron to lay the pipe coupons on, it keeps the pipe coupons inline and makes it easier to tack
- Pipe coupons must be beveled correctly and consistently.
- Root openings and joint angles must be consistent all the way around the pipe for better results
- Using a spacing tool to check and ensure proper gap root opening (example: a piece of 1/8" tig wire or spacer blocks)
- The test coupon alignment should be 1/16" on the ID.

TACK WELDING TEST COUPON

- Weld four 3/8" to 1/2" long tacks at 90° increments spaced evenly around the diameter of the weld joint.
- If one space is slightly wider than the other, deposit third tack weld in wide space. Shrinking of tack weld will equalize spacing. If space is too wide to tack weld, correct by tapping on table or using wedge.
- Penetration into the root with complete fusion into both sides of the joint forming a 1/8" max. I.D. reinforcement (root protrusion).
- With pipe in a vertical position, and weld groove in the horizontal position the rod angle should be 10° upward electrode angle and favor upper root face.
- Tack welds shall be included into the root pass and shall be maintained to dimension and location and be free of visible cracks, porosity, lack of fusion and inclusions.
- Grind tacks to minimum (1/16") thickness to hold alignment.
- Grind sides to smooth, round edge and grind ends to sharp, feathered edge.
- Check the root opening as it can close up during tack welding. Use a cutting wheel to open up the root opening. The cutting wheel will almost always make a perfectly even root opening.
- Only after you have checked the joint for, fit-up, tack and alignment should you call the test supervisor to inspect the coupon.

POSITION TEST COUPON FOR WELDING

- Set coupon in required 6G fixed test position.
- Tack weld locations should be in the 3, 6, 9 & 12 o'clock positions.
- Set the height of the test coupon to where that best suites you. (*Consider setting the height to weld the bottom half of the pipe on your knees that provide you more stability then standing.*) Remember the test coupon will be placed in the fixed position. During the test the coupon shall not be moved in any direction (side to side or up & down).
- Once coupon is ready call for the test supervisor to verify the position of the pipe.

ROOT PASS

- Position electrode with a 5° to 10° drag travel angle.
- Strike arc on tack. Initiate key hole moving forward using a slight whipping motion or osculating motion (You should maintain a consistent 1/8" gap between the rod and the metal you are depositing for consistent travel speed)
- After two or three movements, keep rod tip in keyhole moving smoothly.
- Travel slowly, decreasing speed slightly when approaching tack. Increase arc length slightly for good tie-in or sweep off in to the direction of travel.
- If you have trouble controlling weld puddle, increase electrode angle to 20° and use slight whipping motion.
- Make movements quick and precise to maintain correct key-hole size.
- **KEYHOLE should never exceed 3/16" diameter.**

ROOT PASS SEQUENCES

- Progression of welding is uphill.
- First sequence 6:00 to 3:00 o'clock
- Second sequence 6:00 to 9:00 o'clock
- Third sequence 9:00 to 12:00 o'clock
- Fourth sequence 3:00 to 12:00 o'clock
- Start with fresh rod on each quarter to ensure travel length.

CLEAN & PREP ROOT

- Remove any defects with portable grinder equipped using a thin grinding wheel
- Be sure to clean root I.D. with wire brush to remove any slag (*may cover problem area*).

BELOW ARE SOME BASIC GUIDELINES FOR TROUBLE SHOOTING OPEN ROOT WELDS

Keyhole Getting to Big

- Increase the angle of the drag.
- Lower the amperage.
- Start to whip the rod in longer motions.

Keyhole Closing Up

- Start pushing the rod forehand toward the direction of travel.
- Increase the angle of the push.
- Raise the amperage.

Concave Root or Suck Back On the Inside of the Pipe

- Push the rod inside the pipe so the arc is in the inside when welding. The sound of the electrode burning should be coming from the inside of the pipe.
- Slow down your travel speed.
- Start to use a very tight whip that is almost a slow steady motion. You want to give the electrode enough time to properly fill the root.
- Lower your amperage.
- Keep the keyhole smaller.

Excessive Root Weld Reinforcement

- Increase your travel speed.
- Use a longer whipping motion.
- Pull your electrode further out of the root when welding.
- Lower the amperage.

Restart Trouble or Tie in Lack of Fusion.

- Feather all tacks and restarts with a grinding wheel.
- Piggy Back all restarts and tie-ins at least a 1/4 of an inch.
- Pause for a second on all feathered edges to burn in properly.
- When tying in don't stop welding until you have penetrated the tack and covered most of it.

HOT PASS

- Use 3/32" E7018 with current setting 90-100 amps.
- Use slight "Z" weaving motion of electrode (for correct puddle angle) and pause (stop traveling brief moment at high side) to fill crater and undercut.
- Check for re-consumption of root (*melt/burn through of the root is not acceptable*).

FILL PASSES

- Make sure to stagger your starts.
- Due to variations in wall thickness for a given diameter pipe, and bead size, the number of passes may have to be modified. However, use the same sequence and general procedure always to completely fill the weld joint properly.

COVER PASS

- Stringer beads required for all passes (bead width shall not exceed ½")
- Stagger all starts and grind before starting.
- Cover pass should be left in the "as welded" position (*remember it's a weld test not a grinding test*).
- Weld ID & OD shall be uniform, without abrupt changes in width or height.
- No welding over or weld repairs on completed cover pass.
- Uneven and Meandering Weld Beads are unacceptable.
- Any of the following weld defects are cause for rejection of the coupon: Underfill, Surface Porosity, Root Concavity, Traces of Slag, Arc Strikes, Undercut, and Cold Lap.

SOME BASIC GUIDELINES FOR WELDING THE CAP ARE AS FOLLOWS:

- Keep your electrode angle pointed to the center of the pipe.
- Keep your arc length as short as possible.
- Move forward and side to side with the electrode, otherwise the weld become rough.
- When the pipe gets to hot let it cool down or put on a vice grip to lean on.
- Make sure you fuse the weld joint bevel edges.
- Overlap stringer beads from at least 25% to a maximum of 50%. The goal is for the weld to have a single profile when finished.