Oxyacetylene Weld Troubleshooting

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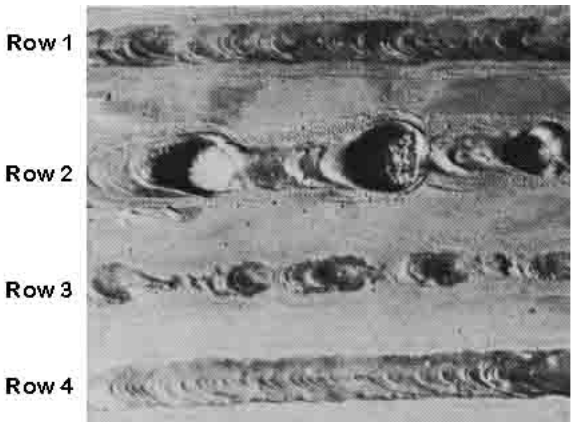
This Oxyacetylene weld troubleshooting guide is easy to use. Simply find the problem in the table of contents on the left or match one of

our many illustrations to the problem.

Often acetylene welding issues occur when one of the basics weren't performed properly. This includes:

- only weld bare metal with all paints, oils and rust removed
- fit metal parts before welding
- a welding jig table might be needed to secure the project
- firm clamping in position
- selection of correct gas pressure based on tip selection
- right speed of travel (fast or slow can result in issues such as burning or a poor bead – see illustration below)

Examples of Acetylene Weld Bead Defects



- Row 1: Satisfactory weld bead that could be more uniform
- Row 2: Poor bead caused by a torch tip that is too large for material being welded or slow speed of travel.
- Row 3: Caused by moving too rapidly, not allowing a proper weld bead to form
- Row 4: Satisfactory weld except for burned section at far right. Defect caused by not moving the weld bead fast enough as the weld is

being completed.

Distortion Weld Troubleshooting

Weld Distortion Troubleshooting

Weld Troubleshooting Tips

Why Distortion Occurs:	How to Fix It:
1. Overheating at joint	1. Allow each bead to cool
2. Welding too slow	2. Weld at constant speed - use a speed tip
3. Pool to Small	3. Use larger size or triangular shaped rod
4. Improper Sequence	4. Offset pieces before welding

Step 1. Check to see whether shrinkage of deposited metal has pulled welded parts together.

1. Properly clamp or tack weld parts to resist shrinkage.
2. Separate or preform parts sufficiently to allow for shrinkage of welds.
3. Peen the deposited metal while still hot.

Step 2. Check for uniform heating of parts during welding.

1. Support parts of structure to be welded to prevent buckling in heated sections due to weight of parts themselves.
2. Preheating is desirable in some heavy structures.
3. Removal of rolling or forming strains before welding is sometimes helpful.

Step 3. Check for proper welding sequence.

1. Study the structure and develop a definite sequence of welding.
2. Distribute welding to prevent excessive local heating.

Welding Stresses

Step 1. Check the joint design for excessive rigidity.

1. Slight movement of parts during welding will reduce welding stresses.
2. Develop a welding procedure that permits all parts to be free to move as long as possible.

Step 2. Check for proper welding procedure.

1. Make weld in as few passes as practical.
2. Use special intermittent or alternating welding sequence and back-step or skip welding procedure.
3. Properly clamp parts adjacent to the joint. Use backup fixtures to cool parts rapidly.

Step 3. If no improper conditions exist, stresses could merely be those inherent in any weld, especially in heavy parts.

1. Peen each deposit of weld metal. Stress relieve finished product at 1100 to 1250°F (593 to 677°C) 1 hour per 1.0 in. (25.4 cm) of thickness.

Warping of Thin Plates

Acetylene Weld Warping Troubleshooting

Weld Troubleshooting Tips

Why Warping Occurs:

1. Shrinkage of Material
2. Overheating
3. Faulty Preparation
4. Faulty Clamping of Parts

How to Fix It:

1. Preheat Material to Relieve Stress
2. Weld rapidly - use back-up weld
3. Too much root gap
4. Clamp parts properly- back-up to cool
5. For multi-layer welds - allow each layer to cool

Step 1. Check for shrinkage of deposited weld metal.

- Distribute heat input more evenly over full length of seam.

Step 2. Check for excessive local heating at the joint.

- Weld rapidly with a minimum heat input to prevent excessive local heating of the plates adjacent to the weld.

Step 3. Check for proper preparation of the joint.

1. Do not have excessive space between the parts to be welded. Prepare thin plate edges with flanged joints, making offset approximately equal to the thickness of the plates. No filler rod is necessary for this type of joint.
2. Fabricate a U-shaped corrugation in the plates parallel to and approximately 1/2 in. (12.7 mm) away from the seam. This will serve as an expansion joint to take up movement during and after the welding operation.

Step 4. Check for proper welding procedure.

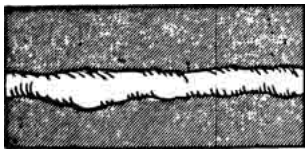
1. Use special welding sequence and backstep or skip procedure.
2. Preheat material to relieve stress.

Step 5. Check for proper clamping of parts.

1. Properly clamp parts adjacent to the joint. Use backup fixtures to cool parts rapidly.

Poor Weld Appearance

Acetylene Troubleshooting Poor Weld Appearance



Weld Troubleshooting Tips

Reasons for Poor Weld Appearance:

1. Uneven Pressure
2. Excessive Stretching
3. Uneven Heating

Solutions:

1. Practice starting, stopping and and finger manipulation on rod
2. Hold rod at proper angle
3. Use slow uniform fanning motion, heat both rod and material

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Step 1. Check the welding technique, flame adjustment, and welding rod manipulation.

1. Ensure the use of the proper welding technique for the welding rod used.
2. Do not use excessive heat.
3. Use a uniform weave and welding speed at all times.

Step 2. Check the welding rod used, as the poor appearance may be due to the inherent characteristics of the particular rod.

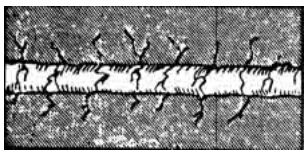
- Use a welding rod designed for the type of weld being made.

Step 3. Check for proper joint preparation.

- Prepare all joints properly.

Cracked Welds

How to Troubleshoot Weld Stress Cracking



Weld Troubleshooting Tips

Why Cracked Welds Occur:

1. Improper welding temperature
2. Undue stress on weld

Solutions:

1. Use recommended welding temperature
2. Allow for expansion and contraction

3. Chemical attack
4. Rod and base material not same composition
5. Oxidation or degradation of weld

3. Stay within known chemical resistance and working temperatures of material
4. Use similar materials and inert gas for welding
5. Refer to recommended application

Step 1. Check the joint design for excessive rigidity.

- Redesign the structure or modify the welding procedure in order to eliminate rigid joints.

Step 2. Check to see if the welds are too small for the size of the parts joined.

- Do not use too small a weld between heavy plates. Increase the size of welds by adding more filler metal.

Step 3. Check for proper welding procedure.

1. Do not make welds in string beads. Deposit weld metal full size in short sections 8.0 to 10.0 in. (203.2 to 254.0 mm) long. (This is called block sequence.)
2. Welding sequence should be such as to leave ends free to move as long as possible.
3. Preheating parts to be welded sometimes helps to reduce high contraction stresses caused by localized high temperatures.

Step 4. Check for poor welds.

1. Make sure welds are sound and the fusion is good.

Step 5. Check for proper preparation of joints.

- Prepare joints with a uniform and proper free space. In some cases a free space is essential. In other cases a shrink or press fit may be required.

Undercut

Step 1. Check for excessive weaving of the bead, improper tip size, and insufficient welding rod added to molten puddle.

1. Modify welding procedure to balance weave of bead and rate of welding rod deposition, using proper tip size.
2. Do not use too small a welding rod.

Step 2. Check for proper manipulation of the welding.

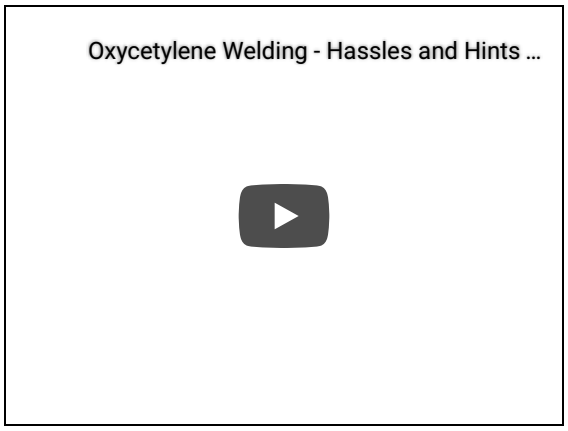
1. Avoid excessive and nonuniform weaving.
2. A uniform weave with unvarying heat input will aid greatly in preventing undercut in butt welds.

Step 3. Check for proper welding technique -- improper welding rod deposition with nonuniform heating.

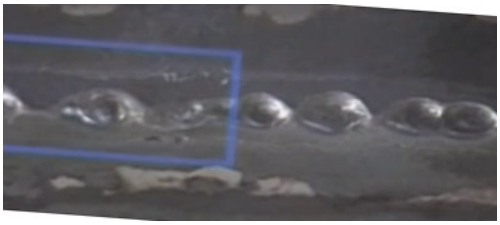
1. Do not hold welding rod too near the lower edge of the vertical plate when making a horizontal fillet weld, as undercut on the vertical plate will result.

Incomplete Penetration

Oxyacetylene Weld Penetration Troubleshooting



Troubleshooting Incomplete Weld Penetration



Example of Poor Penetration. Weld troubleshooting ideas include possibilities such as welding speed that is too fast (causes a small puddle that doesn't reach through full thickness of the metal). Solution is to slow down the welding speed.

Weld Troubleshooting Tips

Why Incomplete Penetration Occurs:

1. Faulty preparation
2. Rod too large
3. Welding too fast
4. Not enough root gap

Solutions:

1. Under 60 degree bevel
2. Use small rod at root
3. Check for flow lines while welding
4. Use tacking tip or leave 1/32" root gap and clamp pieces

Step 1. Check for proper preparation of joint.

1. Be sure to allow the proper free space at the bottom of the weld.
2. Deposit a layer of weld metal on the back side of the joint, where accessible, to ensure complete fusion at the root of the joint.

Step 2. Check the size of the welding rod used.

1. Select proper sized welding rod to obtain a balance in the heat requirements for melting welding rod, breaking down side walls, and maintaining the puddle of molten metal at the desired size.
2. Use small diameter welding rods in a narrow welding groove.

Step 3. Check to see if welding tip is too small, resulting in insufficient heat input.

1. Use sufficient heat input to obtain proper penetration for the plate thickness being welded.

Step 4. Check for an excessive welding speed.

1. Welding speed should be slow enough to allow welding heat to penetrate to the bottom of the joint.

Porous Welds

Troubleshooting Porous Welds

Weld Troubleshooting Tips

Why Porous Welds Occur:

1. Porous weld rods
2. Balance of heat on rod
3. Welding too fast
4. Rod too large
5. Improper starts or stops
6. Improper crossing of beads
7. Stretching rods

Solutions:

1. Inspect rod
2. Use proper fanning motion
3. Check welding temperature
4. Weld beads in proper sequence
5. Cut rod at angle, but cool before releasing
6. Stagger starts and overlap splices 1/2"

Step 1. Check the inherent properties of the particular type of welding rod.

- Use welding rod of proper chemical analysis.

Step 2. Check the welding procedure and flame adjustment.

1. Avoid overheating molten puddle of weld metal.
2. Use the proper flame adjustment and flux, if necessary, to ensure sound welds.

Step 3. Check to see if puddling time is sufficient to allow entrapped gas, oxides, and slag inclusions to escape to the surface.

1. Use the multilayer welding technique to avoid carrying too large a molten puddle of weld metal.
2. Puddling keeps the weld metal longer and often ensures sounder welds.

Step 4. Check for poor base metal.

1. Modify the normal welding procedure to weld poor base metals of a given type.

Brittle Welds

Step 1. Check for unsatisfactory welding rod, producing air-hardening weld metal.

- Avoid welding rods producing air-hardening weld metal where ductility is desired. High tensile strength, low alloy steel rods

are air-hardened and require proper base metal preheating, post-heating, or both to avoid cracking due to brittleness.

Step 2. Check for excessive heat input from over sized welding tip, causing coarse-grained and burnt metal.

- Do not use excessive heat input, as this may cause coarse grain structure and oxide inclusions in weld metal deposits.

Step 3. Check for high carbon or alloy base metal which has not been taken into consideration.

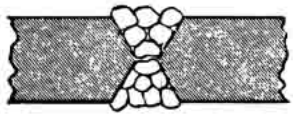
- Welds may absorb alloy elements from the patent metal and become hard. Do not weld a steel unless the composition and characteristics are known.

Step 4. Check for proper flame adjustment and welding procedure.

1. Adjust the flare so that the molten metal does not boil, foam, or spark.
2. A single pass weld maybe more brittle than multilayer weld, because it has not been refined by successive layers of weld metal.

Poor Fusion Weld

Poor Fusion Weld



Weld Troubleshooting Tips

Poor Fusion Weld Causes:

1. Faulty preparation
2. Improper welding techniques
3. Wrong speed
4. Improper choice of rod size
5. Wrong temperatures

Solutions:

1. Clean materials before welding
2. Keep pressure and fanning motion constant
3. Take more time by welding at lower temperatures
4. Use small rod at root and large rod at top - practice proper sequence
5. Preheat materials when necessary
6. Clamp parts securely

Step 1. Check the welding rod size.

- When welding in narrow grooves, use a welding rod small enough to reach the bottom.

Step 2. Check the tip size and heat input.

- Use sufficient heat to melt welding rod and to break down sidewalls of plate edges.

Step 3. Check the welding technique.

- Be sure the weave is wide enough to melt the sides of the joint thoroughly.

Step 4. Check for proper preparation of the joint.

- The deposited metal should completely fuse with the side walls of the plate metal to form a consolidated joint of base and weld metal.

Corrosion

Step 1. Check the type of welding rod used.

- Select welding rods with the proper corrosion resistance properties which are not changed by the welding process.

Step 2. Check whether the weld deposit is proper for the corrosive fluid or atmosphere.

1. Use the proper flux on both parent metal and welding rod to produce welds with the desired corrosion resistance.
2. Do not expect more from the weld than from the parent metal. On stainless steels, use welding rods that are equal to or better than the base metal in corrosion resistance.
3. For best corrosion resistance, use a filler rod whose composition is the same as the base metal.

Step 3. Check the metallurgical effect of welding.

- When welding 18-8 austenitic stainless steel, be sure the analysis of the steel and the welding procedure are correct, so that the welding process does not cause carbide precipitation. This condition can be corrected by annealing at 1900 to 2100°F (1038 to 1149°C).

Step 4. Check for proper cleaning of weld.

- Certain materials such as aluminum require special procedures for thorough cleaning of all slag to prevent corrosion.

Brittle Joints

Step 1. Check base metal for air hardening characteristics.

- In welding on medium carbon steel or certain alloy steels, the fusion zone may be hard as the result of rapid cooling. Preheating at 300 to 500°F (149 to 260°C) should be resorted to before welding.

Step 2. Check welding procedure.

- Multilayer welds will tend to anneal hard zones. Stress relieving at 1000 to 1250°F (538 to 677°C) after welding generally reduce hard areas formed during welding.

Step 3. Check type of welding rod used.

- The use of austenitic welding rods will often work on special steels, but the fusion zone will generally contain an alloy which is hard.
- For Additional Reading

  Welding Web

- **NEXT: Arc Weld Troubleshooting >>>**

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