Common Weld Defects – Causes and Cures

For any weld to be acceptable, it must meet three specific criteria:

1. The weld procedure must demonstrate that the weld metal will meet all the required mechanical and metallurgical properties of the design.

2. The specific design of the weld joint must meet the strength requirements to support the loads applied to the joint.

3. The production weld must meet the quality requirements and design sizes specified by the design engineer and the relevant construction codes.

The purpose of inspection is to verify compliance of the production welds with the requirements of the third element. Below are some of the common types of problems that inspectors find, with suggestions on how to eliminate and/or remediate the problem.

Missing Welds

The simplest type of weld problem to solve!
Unacceptable Weld Profile

Every weld has an ideal profile. Deviations can result in insufficient cross-sectional strength and/or stress concentrations that may lead to cracking or premature failure. “Unacceptable profile” can include any of the following: weld too small (not enough fill or too few passes), weld too flat, excessive weld fill, uneven weld profile, excessive concavity or convexity, or excessive surface roughness.

Here are some examples of unacceptable weld profiles:

![Example 1](image1.jpg)
![Example 2](image2.jpg)
![Example 3](image3.jpg)
![Example 4](image4.jpg)
An unacceptable profile can be caused by one or a combination of: improper electrode size, current, poor weave pattern, poor weld techniques, poor weld sequencing, and poor joint fit up. Ensure that your welders are clear on what is required. For existing welds, the welder may be able to add metal to correct the problem, or it may be necessary to grind out and re-weld.

**Undercut**

This defect appears as an unfilled groove in the base metal at the edge of the weld (examples below). The cause is usually one or more of: incorrect electrode angle, poor weaving technique, excessive current, or inappropriate travel speed. The welder may be able to fill in the undercut using a smaller electrode.

Examples of undercut welds:
Holes (Porosity)

Porosity can be caused by one or more of: contamination of weld surfaces or filler metals, improper electrode selection, inadequate shielding, unstable arc, too short or too long an arc length, too high a travel speed, and generally poor welding technique. The effect of porosity on weld performance will depend on the number, location, and size of the holes. Porosity cannot be repaired by welding overtop of the problem. Grind out to remove the porosity, then re-weld.

Other Weld Defects

Other defects include cracks, craters, inclusions, and physical damage (arc strikes, slag inclusions, and hammer impacts). Again, the first step in addressing these defects is to ensure that welders understand why it’s important to properly prepare the joint and always follow approved welding procedures.

Working with Your Inspector

Qualimet’s welding inspectors will work with you to address any inspection issues and help improve your weld quality over the long term. For more information, please contact EJ at 780-641-0757 or email ej@qualimet.ca.