

Introduction to Welding Technology Problem Solving

Introduction to Welding Technology – Problem Solving
(A concise, organized guide for students, instructors, and technicians)

1. Why Problem Solving Matters in Welding

Reason	What It Means for the Welder
Safety	Prevents burns, fumes, arc flash, and structural failures.
Quality	Ensures consistent bead shape, penetration, and mechanical properties.
Productivity	Reduces rework, scrap, and downtime.
Cost Control	Minimizes consumable waste (electrode, filler, shielding gas).
Certification	Demonstrates competence for AWS, ISO, and other standards.

2. Typical Welding Problems & Their Root Causes

Problem	Common Symptoms	Primary Root Causes
Porosity	Small gas bubbles, “pitted” surface	– Contaminated base metal (oil, rust) – Excess moisture in filler/flux – Improper shielding gas flow
Lack of Fusion/Penetration	Shallow bead, weak joint	– Low amperage or voltage – Too fast travel speed – Incorrect electrode angle
Cracking (hot/cold)	Cracks appear after cooling	– High carbon/low alloy steel – Preheat insufficient or excessive – Rapid cooling, restraint
Undercut / Overlap	Groove in base metal or excess metal on top	– Too high current (undercut) or too low (overlap) – Improper torch angle – Inconsistent travel speed

Introduction to Welding Technology Problem Solving

Problem	Common Symptoms	Primary Root Causes
Distortion	Warped or misaligned parts	– Uneven heat input – Improper clamping or fixturing – Large joint size without preheat – High current, low voltage
Spatter	Droplets of molten metal on surrounding area	– Incorrect polarity (for DC/EN/ DC/EP) – Poor shielding gas coverage

3. Structured Problem Solving Process

1. Define the Problem

- Record the exact defect (photo, location, joint type).
- Note welding parameters (current, voltage, speed, gas flow).

2. Gather Data

- Material specifications (grade, thickness, coating).
- Joint design (fitup, root gap, bevel angle).
- Equipment status (torch condition, gas regulator, electrode storage).

3. Identify Possible Causes (use a cause and effect diagram or “5 Why” analysis)

Example – Porosity:

- Why 1: Bubbles appear ? Shielding gas flow low.
- Why 2: Flow low ? Regulator set incorrectly.
- Why 3: Regulator set incorrectly ? Operator not trained on setup.

4. Test Hypotheses

- Change one variable at a time (e.g., increase gas flow from 15 L/min ? 20 L/min).
- Weld a test coupon under the new condition.

5. Implement Solution

Introduction to Welding Technology Problem Solving

- Apply the successful change to the production process.
- Document the new settings and any procedural updates.

6. Verify & Monitor

- Perform post-weld inspection (visual, NDT, mechanical test).
- Record results for at least three consecutive welds to confirm stability.

7. Standardize

- Update welding procedure specifications (WPS) and work instructions.
 - Train personnel on the revised process.
-

4.