AMCA
AMERICAN MANUFACTURING COMPLIANCE AUTHORITY

PLASMA CUTTING QUALITY STANDARD

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Quality Standards for Plasma Cutting Operations

Developed by

AMERICAN MANUFACTURING COMPLIANCE AUTHORITY (AMCA)

1. Purpose and Scope

These standards establish the minimum quality, safety, and performance requirements for plasma cutting processes used in manufacturing, fabrication, and industrial operations. They apply to mechanized and manual plasma cutting of carbon steel, stainless steel, aluminum, and non-ferrous metals. Compliance ensures consistent cut quality, equipment reliability, operator safety, and traceable documentation in accordance with AMCA manufacturing expectations.

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2. Definitions

Plasma Cutting: A thermal cutting process using a constricted arc to melt and expel material.
Kerf Width: Width of material removed by the cutting process.
Dross: Residual material adhering to the underside of a cut edge.
Consumables: Replaceable torch components including electrodes, nozzles, and shields.
Cut Quality Classifications:

- **Class A:** Precision cuts requiring minimal post-processing.
- **Class B:** General fabrication cuts with moderate cleanup.
- **Class C:** Rough cuts where dimensional accuracy is non-critical.

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3. Equipment Requirements

3.1 **System Calibration**

- Plasma cutting units shall be calibrated per manufacturer recommendations at minimum every 6 months.
- Air supply must maintain consistent pressure (±5 psi) and cleanliness rated

at ISO 8573-1 Class 2 or better.

3.2 **Consumable Management**

- Consumables must be inspected prior to each shift and replaced when exhibiting wear beyond 15% of their original tolerance profile.
- Only OEM or AMCA-approved equivalent consumables may be used to maintain cut consistency.

3.3 **Maintenance**

- Daily: Inspect torch leads, grounding clamps, and cooling systems.
- Weekly: Check gas flow regulators, filters, and coolant levels.
- Monthly: Document a full system performance check, including arc voltage response and torch alignment.

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4. Process Requirements

4.1 **Material Preparation**

- Material must be free of heavy rust, oil, coatings, and debris in the cutting path.
- Plates shall be inspected for warpage; deviations greater than 3 mm over 1 meter must be corrected or clamped.

4.2 **Process Parameter Control**

Operators must set and verify the following parameters prior to cutting:

- **Cutting current (Amps):** Within ±5% of recommended settings.
- **Arc voltage:** Within manufacturer tolerance.
- **Travel speed:** Adjusted to prevent excessive dross and maintain perpendicularity.
- **Stand-off height:** Maintained within ±0.5 mm for mechanized systems.

4.3 **Piercing Procedures**

- Use correct pierce height to minimize spatter and extend consumable life.
- Piercing shall not occur within 10 mm of an edge unless cutting charts permit.

4.4 **Heat Input Control**

- Avoid overheating localized areas; extended cuts shall include cool-down intervals.
- Warping must be controlled through sequencing, fixture support, or reduced amperage.

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5. Cut Quality Standards

5.1 **Dimensional Tolerance**

- Class A: ±0.25 mm
- Class B: ±0.75 mm
- Class C: ±2.0 mm

5.2 **Edge Squareness**

Measured deviation from 90° on plate thickness:

- Class A: ≤ 3°
- Class B: ≤ 5°
- Class C: ≤ 8°

5.3 **Surface Finish**

- Class A: Smooth edge, no stratification lines deeper than 0.2 mm.
- Class B: Minor striations acceptable, no sharp burrs.
- Class C: Heavy striation allowed; burrs may be present.

5.4 **Dross Classification**

- **None/Low:** Easily removed with a hand tool—required for Class A.
- **Moderate:** Requires grinding—acceptable for Class B.
- **Heavy:** Adhered and thick—allowed only for Class C operations.

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6. Inspection and Testing Requirements

6.1 **Visual Inspection**

All completed parts must undergo visual inspection for:

- Proper kerf width
- Continuity of cut
- Absence of arc blow-out marks
- Excessive dross or slag

6.2 **Dimensional Verification**
Critical dimensions shall be checked with calibrated measuring tools. Documentation is required for Class A and B cuts.

6.3 **Edge Integrity Testing**
Parts requiring structural use must be checked for:

- Micro-cracks from improper piercing
- Heat-affected zone (HAZ) not exceeding manufacturer limits
- No significant melting beyond the cut boundary

6.4 **Sample Qualification**
New equipment or new operators must produce qualification samples that meet Class B standards or higher prior to production approval.

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7. Operator Qualifications

7.1 **Training Requirements**
Operators shall receive training in:

- Plasma system operation and controls
- Consumable selection and inspection
- Safety procedures and hazard identification
- Reading cut charts and process specifications

7.2 **Certification**
AMCA recommends annual recertification for operators of mechanized CNC plasma systems.

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8. Safety Standards

8.1 **PPE Requirements**

- Flame-resistant clothing
- Eye and face protection meeting ANSI Z87 standards
- Hearing protection for environments above 85 dB
- Gloves rated for thermal and mechanical hazards

8.2 **Operational Safety**

- Work area must be free from flammable materials within 10 feet.
- Adequate ventilation or fume extraction must be active during cutting.
- Grounding clamps must be secured on clean metal surfaces.

8.3 **Emergency Procedures**

- Operators must know the location of emergency shut-offs.
- Fire extinguishers rated for Class ABC fires must be accessible.
- Any arc instability must trigger an immediate stop and inspection.

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9. Documentation and Recordkeeping

- Daily equipment logs noting inspections, maintenance, and parameter checks.
- Batch records for each production run, including machine settings and operator ID.
- Non-conformance reports documented and reviewed weekly.
- Calibration certificates maintained for a minimum of 3 years.

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10. Continuous Improvement

- Quarterly review of dross levels, consumable usage, and cut quality trends.
- Root-cause analysis required for repeated deviations.

- Operators encouraged to submit improvement suggestions to production supervisors.

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