AMERICAN MANUFACTURING
COMPLIANCE AUTHORITY

METAL FORMING QUALITY STANDARD

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AMERICAN MANUFACTURING COMPLIANCE AUTHORITY (AMCA)
QUALITY STANDARDS FOR METAL FORMING OPERATIONS

1. Purpose and Scope

These Quality Standards for Metal Forming establish minimum requirements for the safe, consistent, and compliant execution of metal forming processes under the oversight of the American Manufacturing Compliance Authority (AMCA). These standards apply to all facilities performing metal forming operations including stamping, forging, rolling, bending, extrusion, and deep drawing. The goal is to ensure product integrity, process repeatability, worker safety, and alignment with recognized industry best practices.

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2. Definitions

- **Metal Forming:** Any mechanical process used to plastically deform metal into a desired shape without removing material.
- **Process Specification (PS):** A controlled document describing required equipment settings, materials, tolerances, and inspection criteria.
- **Critical-to-Quality (CTQ):** A product or process characteristic essential to performance, safety, or regulatory compliance.
- **Nonconformance:** Any deviation from documented specifications, standards, or customer requirements.

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3. Material Requirements

3.1 All incoming metals shall be verified for grade, alloy, heat number, dimensional accuracy, and surface condition according to documented receiving inspection procedures.
3.2 Certified Mill Test Reports (MTRs) shall be required for all primary metal inputs. MTRs must be authenticated, retained for a minimum of five years, and traceable to production batches.
3.3 Materials failing to meet specifications shall be segregated, labeled, and dispositioned under the facility’s nonconformance procedure.

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4. Equipment and Tooling Standards

4.1 All forming equipment—presses, rollers, dies, punches, hammers, and extrusion systems—shall be maintained per manufacturer recommendations and AMCA-approved maintenance schedules.
4.2 Tooling must be inspected and documented prior to installation for wear, cracks, deformation, or misalignment.
4.3 Calibration of force measurement systems, pressure sensors, and dimensional gauges shall occur at least annually, or more frequently if required by CTQ criteria.
4.4 Any equipment modification affecting forming performance must undergo a formal change review, risk assessment, and requalification.

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5. Process Control Requirements

5.1 Each metal forming process shall operate under a current Process Specification (PS) approved by Engineering and Quality Assurance.
5.2 PS documents shall include:

- Material type and condition
- Required lubrication and surface preparation
- Equipment parameters (force, speed, temperature, stroke, etc.)
- Dimensional tolerances and CTQs
- Sampling and inspection frequencies
- Safety and hazard controls
  5.3 Operators shall be trained and qualified on each PS before performing unsupervised work.
  5.4 Process deviations—including force spikes, temperature drift, abnormal sound, or unexpected tool wear—must be reported immediately and documented.

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6. In-Process Inspection and Measurement

6.1 Inspection points must be clearly defined within each PS and include measurement of dimensions, surface finish, hardness, and geometry as applicable.
6.2 CTQ characteristics shall be inspected at a frequency justified by statistical evidence (SPC) or customer requirement.

6.3 All measuring devices must be calibrated and traceable to national or international measurement standards.
6.4 Visual inspection shall follow AMCA-approved defect classification guidelines covering cracks, wrinkles, thinning, folds, flash, burrs, and surface contamination.

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7. Finished Product Verification

7.1 Final inspection shall confirm conformity to all specifications, including dimensional accuracy, mechanical properties, surface integrity, and functional fit.
7.2 Any product failing inspection shall be quarantined, tagged, and evaluated for rework, repair, or scrap.
7.3 Reworked parts must undergo full re-inspection and be traceable to the rework process used.

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8. Traceability Requirements

8.1 Each batch or lot must be traceable to:

- Material source and heat number
- Tooling set and equipment used
- Operators and inspection personnel
- Inspection results and process parameters
  8.2 Digital or physical records must be retained for a minimum of five years, or longer if required by contract.

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9. Safety and Environmental Controls

9.1 All metal forming operations shall follow AMCA Safety Code MF-12 or equivalent internal safety standards.
9.2 Safeguards shall include machine guarding, lockout/tagout, emergency stop systems, thermal PPE, and mechanical-impact PPE.
9.3 Lubricants, coolants, and metalworking fluids must be managed according to environmental regulations, including safe storage, spill containment, and disposal documentation.

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10. Personnel Competency and Training

10.1 All personnel involved in metal forming must be trained in equipment operation, safety protocols, product specifications, and nonconformance handling.
10.2 Competency tests shall be administered annually.
10.3 Records of training, certifications, and qualifications must be maintained and made available upon AMCA audit.

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11. Nonconformance and Corrective Action

11.1 Facilities must maintain documented procedures for detecting, reporting, investigating, and resolving nonconformances.
11.2 Root cause analysis shall be conducted using structured methodologies such as 5-Why, Fishbone, or FMEA.
11.3 Corrective actions must be verified for effectiveness, documented, and communicated to all relevant departments.

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12. Continuous Improvement Requirements

12.1 Metal forming processes must undergo periodic review to identify opportunities for improved quality, reduced scrap, and enhanced efficiency.
12.2 Facilities are encouraged to implement statistical process control (SPC), capability studies (Cp/Cpk), and predictive maintenance systems.
12.3 Customer feedback, audit results, and quality performance metrics shall be integrated into improvement planning.

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13. Compliance and Auditing

13.1 All facilities performing metal forming operations are subject to AMCA compliance audits at intervals determined by risk level and performance history.
13.2 Audit nonconformances must be corrected within the specified timeframe.
13.3 AMCA reserves the right to suspend or revoke compliance certification for repeated or severe violations.

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