AISC Certification Program for
Bridge and Highway Metal Component Manufacturers

Standard for Bridge and Highway Metal Component Manufacturers—2008

Issued by the
AMERICAN INSTITUTE OF STEEL CONSTRUCTION
Prepared under the direction of the
AISC CERTIFICATION COMMITTEE
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1. Purpose

The purpose of the AISC Certification Program for Bridge and Highway Metal Component Manufacturers is to confirm to owners, the design community and the construction industry that a certified manufacturing firm has the personnel, organization, experience, procedures, knowledge, equipment and commitment to produce components of the quality required for normal bridge and highway construction.

2. Scope

This Certification Standard for Bridge and Highway Metal Component Manufacturers offers assistance to manufacturing and transportation professionals and to owners in assessing manufacturers’ capability to satisfy component quality needs. Users of this standard should verify the manufacturer’s capacity independently.

The standard describes certification requirements for facilities that manufacture and supply specific components composed primarily of metal to bridge and highway construction projects. These facilities have quality management systems with defined functions and responsibilities. The scope of this certification does not include installation, or erection of the components.

Certification to this standard is appropriate for manufacturers of components that include bracing not designed for primary loads (diaphragms, cross frames and lateral bracing); camera, light, sign and signal support structures; bridge rail; stairs; walkways; grid decks; drains; scuppers; expansion joints; bearings; ballast plates; and mechanical movable bridge equipment. Manufacturers of camera, light, sign and signal support structures; high mast light towers; bridge rail; complex expansion joints; high load multi-rotational (HLMR) bearings; and mechanical movable bridge equipment shall also be required to meet specific supplemental requirements to this standard.

The quality management system of these manufacturing facilities (not products) is certified. The certification should not be interpreted as a product inspection of components. Certification includes all functions of manufacturing and providing components from receipt of contract through final delivery. To maintain certification status, the manufacturer shall follow its quality management system, regardless of whether the requirement for this certification is in contract documents, and shall supply and be responsible for the entire component.

The certification program is open to all manufacturers of components covered by this standard, regardless of size and regardless of AISC membership status.

3. References

The manufacturer shall have the reference documents and standards necessary for existing contracts readily available to those who need them.

The manufacturer shall have the latest editions available and be able to demonstrate the ability to work to and meet the requirements of:

- AISC Selected ASTM Standards for Structural Steel Fabrication
- AASHTO/ASTM standards applicable to the component manufacturers product and/or contract documents (for verification purposes)
- AWS D1.1 Structural Welding Code – Steel, AWS D1.2 Structural Welding Code – Aluminum, or AASHTO/AWS D1.5 Bridge Welding Code. (Welding codes shall be applicable to manufacturer’s product and contract documents. At least one welding code shall be available.)
- AWS A2.4 Symbols
- AWS A3.0 Terms and Definitions
- AISC Code of Standard Practice for Steel Buildings and Bridges1
- SSPC Steel Structures Painting Manual, Volume I, Good Painting Practice
- SSPC Steel Structures Painting Manual, Volume II, Systems and Specifications
- Owners’ specifications for all projects in progress or proposed.

4. Definitions

The following terms are italicized where used in this standard to alert the user that the term is defined in this section. As used in this standard, the words shall or will denote a mandatory requirement. The word should denotes a guideline or recommendation. The word may denotes an opportunity to make a choice.

AISC. American Institute of Steel Construction—the certifying body.

ASTM. American Society for Testing and Materials.

AWS. American Welding Society.

Assembly. Two or more components joined to make a part or product that can be the final item or that join to other components. Joining methods include welding, bolting, pressure fit, molding, and adhesion.

C of C. Certificate of Compliance or Certificate of Conformance.

1An electronic PDF version of this reference may be downloaded free from www.aisc.org/freepubs.
Checker. A person in a detailing organization who, because of experience and ability, has advanced successfully to a position of responsibility with the ability to perform the final verification of shop drawings without direct supervision.

Checking (of shop and installation drawings). A detailed review of all diagrams and dimensions on shop and installation drawings by a qualified checker other than the original detailer. Checking will compare the drawings to contract documents and applicable references. Issues to review include, but are not limited to:

- Geometry
- Correct connections
- Proper notes
- Proper material usage
- Assignment of complete welding symbols
- Proper coatings and preparation
- Proper depiction and notation of instructions and details necessary for field installation.

Coating. Coatings may include paint, powder coatings, galvanizing, metalizing, Teflon and electro-deposited metals.

Component. A bridge or transportation related item that contract documents stipulate to be obtained from an AISC Certified Bridge and Highway Metal Component Manufacturer and that is not covered by either the AISC Simple Bridge or AISC Major Bridge Fabricator Certifications. A component may be entirely produced by the manufacturer, or comprised of subassemblies and parts from subcontractors and suppliers, assembled by the manufacturer. A finished component may ship as a single piece or multiple elements, and may require field assembly or adjustment, based upon installation instructions provided by the manufacturer.

Contract Documents. The documents that define the responsibilities of the parties that are involved in manufacturing and installing of components. These documents normally include the design drawings, the specifications and the contract.

Corrective Action. The action or actions undertaken to identify and eliminate the root cause of a product or process nonconformance to prevent its recurrence. Corrective action is not the repair or rework of an identified nonconforming product or process to meet specified requirements.

Customer. Entity (potentially the general contractor, specialty contractor, owner) contracting with the manufacturer for manufactured components.

Design Drawings. The graphic and accompanying narrative portions of the contract documents showing the design, location and dimensions of the work. These documents generally include: plans, elevations, sections, details, schedules, diagrams and notes.

Detailer. Person who performs the function of detailing.

Detailing. The function that produces shop and installation drawings from contract documents.

Documented Procedure (quality management system procedure). A procedure that is established, documented, implemented, and maintained. The documentation provides information about how to perform the activity or process consistently. Documentation can include written instructions, drawings, diagrams, charts, specifications, and references or excerpts of appropriate technical standards and codes. Documentation shall contain:

- The purpose of the procedure
- Process definition that includes steps required for completion
- Assignment of responsibility for completion
- Assignment of responsibility for review of the procedure
- Identification of the records that are generated.

Documented Training. Training in which there is a record of the course outline, a record of who attended, the date it was given, and the instructor who provided the training.

Element. A primary section of this standard as shown in the Table of Contents.

Engineer of Record. The licensed professional who is responsible for sealing the contract documents, which indicate that he or she has performed or supervised the analysis, design and document preparation for the structure and has knowledge of the load-carrying structural system.

Executive Management. The manufacturer’s chief executive officer, president or individuals responsible for overseeing the quality management system. Executive management has full authority in final decision-making for all aspects of the quality management system.

Installation Drawings. Field-installation or member-placement drawings that are prepared by the manufacturer to show the location and attachment of the individual manufactured components.

Manufacture (manufacturing, manufactured). The process of designing, producing, testing, and assembling components by the manufacturer.

Manufacturer. The entity that manufactures components. In the context of this document, the manufacturer is the entity being certified.

MTR. Material Manufacturer’s Test Report as described in Section 14 of ASTM A6.

Nonconformance. Attribute(s) of materials, consumables, manufactured product (in process or final), and processes not meeting contract, regulatory, or manufacturer defined requirements.

Objective Evidence. Data supporting the existence or verification of something. Records, statements of fact, or other information which are relevant to the audit criteria and verifiable. In this context, it is evidence of whether the quality management system is functioning properly. Objective evidence can be obtained through:

- Observation of the performance of a task or physical products
- Measurements
- Tests
- Review of a record, document, or procedure
- The result of an interview with one or more employees about their duties or performance of a task.

Owner. The entity that is identified as such or identified as the contracting authority in the contract documents.

Owner’s Designated Representative for Construction. The owner or the entity that is responsible to the owner for the construction of the project, including its construction supervision, quality, and acceptance.

Owner’s Designated Representative for Design. The owner or the entity that is responsible to the owner for the overall structural design of the project, including the structural steel frame. This is usually the structural engineer of record.

Owner’s Designated Representative for Quality. The owner or the entity that is responsible to the owner for quality inspection of the project. This entity is often referred to as the Quality Assurance Inspector (QAI).

PQR. Procedure Qualification Record as defined by ANSI/AWS A3.0.

Procedure. See Documented Procedure.

Quality Assurance (QA). That part of the manufacturer’s quality management focused on providing confidence that quality requirements will be fulfilled. For the purposes of this program, quality assurance is the planned system of documented procedures and organizational requirements developed and implemented for the purpose of measuring and assuring compliance with customer requirements and quality goals. Quality assurance encompasses such areas as compliance with project specification technical requirements, compliance with referenced standards and achievement of customer service objectives. Specific functions included in quality assurance are:

- Determination of quality criteria
- Establishment of a plan to monitor quality, including assignment of quality control (inspection)
- Determination of acceptance criteria
- Determination of QC personnel qualifications
- Oversight (periodic monitoring) of QC activities
- Summarizing and reporting quality conformance measures to management
- Oversight of corrective action process.

Quality Control (QC). That part of the manufacturer’s quality management focused on fulfilling quality requirements. QC is the inspection of work. Conformity evaluation and judgment accompanied, as appropriate, by measuring, testing, or gauging.

Quality Manual. A document stating the quality policy and describing the quality management system of the manufacturer’s organization.

Quality Management System. A system to establish policy, objectives, plans, and resources to direct and control an organization with regard to quality.

Quality Record. A specific type of quality document that provides objective evidence of activities performed or results achieved.

RFI. A documented request for information or clarification generated during the construction phase of the project.

Shipping Piece. Individual member for field installation carrying a specific identification mark.

Shop Drawings. Detailed drawings of the individual shipping pieces, showing necessary information for their production and assembly.

Specifications. The portion of the contract documents that consists of the written requirements for materials, standards and workmanship.

SSPC. The Society for Protective Coatings.

Standard. The Certification Standard for Bridge and Highway Metal Component Manufacturers.

Subcontractor. A firm that performs a portion of the manufacturer’s contract work such as design, fabrication, detailing, coating application, inspection, and test or consulting services.

Supplier. A firm that supplies materials (including but not limited to: mill materials, process supplies, welding consumables, coatings and process machinery) or completed product (including but not limited to: fasteners, and proprietary buy-out items) needed to fulfill the manufacturer’s contract requirements.

Training. See Documented Training.

WPS. Welding Procedure Specification as defined by ANSI/AWS A3.0.

5. Management Responsibility

Management shall define and adopt a commitment to quality and shall direct and lead the manufacturer to assure continual progress toward achieving the objectives of the commitment.
The manufacturer’s executive management is responsible to develop and maintain a quality management system to meet the specific requirements of this standard, industry and government regulations, and contract documents.

5.1 Policy for Quality and Quality Goals

Executive management shall adopt, document, and maintain a policy for quality. The policy shall define:

- A commitment to quality and meeting contract requirements
- Quality management system objectives that provide a framework for establishing and reviewing quality goals of the manufacturer’s organization.

Management shall ensure that the policy for quality is understood, implemented, and maintained at appropriate levels of the manufacturer’s organization.

Executive management shall direct the development of systems necessary and establish measurable quality goals to achieve the objectives of the manufacturer’s policy for quality. Executive management will document and demonstrate that:

- There is a minimum of one specific measurable quality goal related to component manufacture
- Specific measurements related to goals are being recorded
- Current goal achievement levels are known relative to a previous measurement or baseline
- As quality goals are achieved, new goals are set that demonstrate commitment to continual improvement. New goals can be a new level of achievement for a previous goal, or a new goal that has not been previously examined.

5.2 Direction and Leadership

Executive management and management of functional positions that perform and verify work affecting quality shall review the manufacturer’s quality management system at planned intervals, but not less than annually.

Records from management reviews shall be maintained. Management review requirements will be defined by the manufacturer and include a specific method to obtain, appropriately assess and analyze, and then report the following:

- Results of internal, external and AISC audits
- Opportunities for improvement of product quality
- Corrective action activity and resolution based on internal and external stimuli
- Need for changes to the quality management system
- Customer feedback, for example: surveys, letters of recognition, personal interviews, requests for rework and complaints
- The level of qualification and training of personnel
- Channels for communication to address and resolve all quality issues including customer complaints
- Process performance, which is the effectiveness of the means, methods, and practices that produce the product. Process performance may be monitored with measures and data that include: process nonconformance records (e.g., errors in following welding, bolting or detailing procedures), shipping delays, improper disposition of nonconformances, AISC audit corrective action requests not closed in time, failure to conduct management review or other meetings per documented procedure.
- Product nonconformance. Attributes of manufactured product (in-process or final) that do not meet acceptance criteria, for example; errors in welding, bolting, coating, or dimensionality
- Results from previous management reviews.

Results from the management review shall include the record and implementation plan for any decisions and actions related to:

- Improvement of the effectiveness of the quality management system and its processes
- Improvement of product quality
- Resource needs.

5.3 Management Representative

Executive management shall appoint a member of management who may or may not be the chief executive— and who, regardless of other responsibilities, shall have ability, responsibility, and authority to:

- Ensure that procedures needed for the quality management system are established, implemented and maintained in accordance with this standard.
- Report to executive management on the performance of the quality management system and any need for improvement.
- Promote awareness of customer requirements throughout the manufacturer’s organization.
- Review the quality management system at defined intervals sufficient to ensure its relevance and effectiveness in satisfying this standard.
- Communicate with external parties on matters relating to the quality management system.

5.4 Resources

The manufacturer shall have the resources needed to comply with contract documents.
5.4.1 Personnel
The qualification requirements, responsibility, authority, and the interrelation of functional positions that manage, perform and verify work affecting quality shall be defined as required in Section 5.6.

Personnel performing defined functions shall have the required qualifications and the ability to successfully perform the function. Objective evidence of qualification may be demonstrated through biographies, resumes, training records, and individual licenses or certifications.

Personnel can be assigned to more than one task, provided they are qualified and able to fully perform the duties of each position. Individual(s) responsible for quality assurance or quality control management who report to (or serve as) production management shall also report directly to (or be) executive management.

Qualified management shall be assigned to manage the functions detailed in elements 5 through 19 of this standard and shall include as a minimum the Management Representative and positions that manage:

- Engineering when design is performed by the manufacturer
- Detailing
- Purchasing
- Manufacturing operations
- Quality assurance
- Quality control.

Members of management shall be aware of the requirements for the management review detailed in Section 5.2 and the results of the most recent review.

5.4.2 Buildings, Workspace and Associated Utilities
A manufacturing facility shall consist of areas and buildings that provide space for routine functions considered part of component manufacturing. The areas and buildings shall be conducive to achieving consistent work quality.

5.4.3 Process Equipment (both hardware and software)
The manufacturer shall have under their control the equipment necessary to perform the functions common to their manufacturing process and consistent with the specifications and standards common to the work. Equipment shall be maintained to produce the required quality.

5.5 Internal Communication
Executive management shall ensure that appropriate communication processes are established within the manufacturer’s organization and that the effectiveness of the quality management system is communicated to appropriate individuals.

5.6 Documentation Requirements
5.6.1 General Requirements
Quality management system documentation shall include:

- A quality manual
- Statements of a quality policy and quality objectives (as described in Section 5.1)
- Procedures and their associated quality records required by this standard
- Documents needed by the organization to ensure the effective planning, operation, and control of its processes.

The extent of the quality management system documentation can differ from one organization to another due to: the size of organization, the type of activities, the complexity and interaction of processes.

5.6.2 Quality Manual
The manufacturer shall establish and maintain a quality manual satisfying all of the requirements of this standard, as well as applicable reference documents, industry and government regulations, codes, and contract requirements. Requirements may be satisfied in a single document called the quality manual or in separate documents referenced by the quality manual.

5.6.2.1 Organization
The quality manual shall include a page showing the current revision date and the name and location of the manufacturer.

The quality manual shall include or reference documents that include:

- Policies and organizational description
- Organizational chart describing responsibility, authority, and the interrelationship of functional positions that manage, perform, and verify work affecting quality
- Job descriptions and required qualifications for executive management and functional positions that manage, perform, and verify work affecting quality
- Qualification evidence and biographies for individuals in positions that require qualification
- A Facility Plan
- An Equipment List
- Established documented procedures
• Description of the interaction and communication between the quality management system processes used by the manufacturer to produce products of the required quality.

Procedures may be issued separately or be an integral part of the quality manual. The manufacturer’s management determines the level of detail in the quality manual and procedures. At a minimum, these documents shall be detailed sufficiently to describe the quality management system used by the manufacturer to assure the required quality.

Management shall define what additional procedures, drawings, or other documents are required beyond the minimum requirements set by this standard to meet the needs of the manufacturer’s organization and its customers.

5.6.2.2 Approval

Executive management shall document their approval of the quality manual. At a minimum, the quality manual shall be signed and dated by the highest ranking individual responsible for the facility.

6. Contract and Project Specification Review and Communication

The manufacturer shall develop a documented procedure for contract and project specification review requiring their completion for every project that includes performance or a product in accordance with specifications. The review shall begin no later than the manufacturer’s acceptance of responsibility for performing the work.

The review shall identify, determine, plan, and record the specific project requirements as well as define distribution of those recorded requirements to the responsible individuals in the manufacturer’s organization. This review will consider the current status of any issue that affects the manufacturer’s capability to perform the work.

The procedure shall provide for review of the original contract documents, revised contract documents and changes received through clarification (e.g. requests for information [RFI] or other sources) to assure that the affected staff (e.g., engineering, procurement, assembly, QC) fully understand the applicable contract requirements.

Evidence of contract review can take the form of technical summaries, signoffs, change orders, schedules and allocation of adequate resources. Such evidence shall indicate consideration of pertinent elements of this standard managed by the functions listed in Section 5.4.1 and other critical component requirements that, if missed, may have a major impact on project quality and satisfying the contract.

7. Design and Detailing

7.1 Design Procedure

Where component design is provided by the manufacturer, the design process shall be defined by a documented procedure. The procedure shall describe steps in the design development, review and verification phases of the process. The procedure shall:

• Define methods for determining component product requirements from:
  – Contract documents
  – Customer and industry input
  – Regulatory and code requirements
  – Similar component designs.

• Define a design review process to identify and propose solutions for nonconformances with product requirements. Identify the individuals responsible and keep records of the design review process.

• Define methods to identify, document, evaluate, and approve design changes before implementation. Keep records of all documents.

• Define a means for validating the function of the resulting component with respect to intended uses and identified component requirements. Identify individuals responsible and keep records of the validation process.

7.1.1 Professional Engineer Review of Design for Standard Components

For products that are standard components not specific to any one project, the manufacturer shall have on file and available to the customer a set of design calculations reviewed and stamped by a professional engineer to signify that the designed product meets the current applicable code requirements for its intended use. Any design tables or design processes published with the product literature shall also be reviewed and stamped by a professional engineer. Shop drawings for these components shall include a statement that the component details are based on designs that have been reviewed and stamped by a professional engineer and are on file with the manufacturer.

7.1.2 Professional Engineer Review of Design for Non-Standard Components

For products that are job-specific, the manufacturer shall retain the services of a professional engineer to review and stamp the site-specific design of the component. The engineer shall also review the shop drawings produced for the component and verify their consistency with the design. The results of this review shall be indicated on the component shop drawings.

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7.2 Detailing Procedure

7.2.1 Preparation of Manufacturing Drawings

The manufacturing drawings produced shall incorporate all customer requirements, specifications, codes and relevant standards to adequately procure materials, manufacture and install the component. To ensure this, a documented procedure for preparation of manufacturing shop and installation drawings shall be developed, which describes:

• How project requirements are reviewed and incorporated.
• How the manufacturer coordinates, proposes changes, and tracks information with the customer (e.g., change documents, requests for information [RFI]) and how the associated resolutions are tracked and controlled.
• How the manufacturer includes owner-required information on each drawing (e.g., route, section, county, contract number, and structure identification).

7.2.2 Detailing Standards

The manufacturer will prepare and utilize detailing standards describing technical preferences and requirements customarily used in the manufacturing facility. These standards will show special information required on advance bills such as allowances for cuts or supplementary requirements. The standards will include how bills of material are prepared which, at a minimum, include:

• Sizes
• Appropriate ASTM or AASHTO specification references
• Special ordering information
• Any allowances or tolerances.

The detailing standards will illustrate the manufacturer’s preferred methods of shop and installation drawing layout, including:

• Views
• Title block information
• The method of designating shipping sequences
• The piece marking system
• Dimensional preferences
• Commonly used shop abbreviations
• Assembly and installation requirements.

If applicable, illustrate information to be included on weld symbols and the preferred way to designate surface preparation and coating requirements.

7.2.3 Shop and Installation Drawings

The manufacturer shall develop a documented procedure to provide for checking of all shop and installation drawings and to describe the approval method used for shop and installation drawings. The manufacturer may describe checking and approval in a single procedure or separately in two or more documents.

7.2.3.1 Checking of Shop and Installation Drawings

The procedure for checking of shop and installation drawings shall describe the method used by the manufacturer or its subcontractor to perform and record the final check of shop and installation drawings to ensure compliance with contract documents before release for manufacture and installation. Evidence of the effective implementation of such methods may include signatures, stamps, logs, files or lists. Records shall provide means for identification of the individual checker who performed the final check of each shop or installation drawing.

For computer-generated shop drawings, the procedure will identify the data, variables, graphics, calculating formulas and other output that are checked to verify the accuracy of the software.

When detailing is performed by a subcontractor, the procedure will define the extent of review by detailing management and checking of received detailing products before release for manufacture and installation.

7.2.3.2 Approval of Shop and Installation Drawings

The procedure for approval of shop and installation drawings shall describe the method used to document the approval of shop and installation drawings released for manufacture and installation. Such methods may include signatures, stamps, logs, files or lists.

The method shall have provisions for recording approval of shop drawings, whether produced in house or through a subcontractor, by the owner’s designated representatives for design and/or construction.

The procedure shall require that any waiver of approval from the owner’s designated representative for design or from the owner’s designated representative for construction be in writing.
7.2.3.3 Customer Supplied Shop Drawings

When the manufacturer receives shop drawings from the customer, a documented procedure shall define the method of receipt, revision and control of those drawings.

7.3 Detailing Function Resources

7.3.1 References (required library)

The manufacturer shall maintain as a minimum, a library of the applicable references listed in element 3.

7.3.2 Personnel

The manufacturer’s staff shall manage detailing. Detailing functions may be performed by employees or subcontractors.

7.3.2.1 Detailing Management

Responsibilities for detailing management shall include:

- Overseeing the production of shop and installation drawings
- Communicating with designers
- Scheduling
- Developing and maintaining company detailing standards and detailing procedures
- Transmittals related to obtaining approval from the owner’s designated representatives for design and/or construction
- Coordinating and incorporating construction requirements
- Training of employed detailers and checkers.

Qualification requirements for detailing management personnel shall include one or more of the following:

- Experience in detailing and checking shop and installation drawings approved by an owner for projects, products, or services of equal or greater complexity than the company provides. The manufacturer shall determine and describe methods to demonstrate competence.
- Graduate engineer with experience related to manufacturing
- Licensed P.E. or S.E., with experience related to manufacturing.

7.3.2.2 Detailing Functions

Personnel who perform detailing and/or checking of shop and installation drawings shall have experience in drawing projects similar to the projects the company provides.

Detailers in training shall work under the supervision of a trained detailer or checker.

A qualified checker shall check all shop drawings before release for manufacture. Qualification requirements for checkers shall be defined and documented as required in Section 5.4.1. Demonstrated competency of employed and subcontracted individuals performing final checks shall be documented by detailing management.

7.3.2.3 Subcontract Services

In lieu of employed personnel, subcontractors may be used for the following functions: detailing, checking of shop and installation drawings, and training of detailers and checkers. However, the manufacturer retains the responsibility for compliance with the requirements of this standard.

The manufacturer shall define and document the qualification and selection process for choosing subcontractors as required in Section 10.2.

8. Document and Data Control

The manufacturer shall develop a documented procedure to control documents and data affecting quality including:

- The quality manual
- Contract documents (dissemination and revision control)
- Shop and installation drawings
- Detailing standards
- All documented procedures.

8.1 Review and Approval

Internal standards and procedures that are controlled by the manufacturer shall be reviewed and approved by authorized management. Revisions to the quality manual and other quality management system documents shall be reviewed for adequacy and approved by the same function and authority level that authorized the original document. The procedure for document and data control shall describe the frequency and requirements established by management for review and updating, and establish a method to identify changes.

8.2 Customer Requirements

The procedure shall define methods for receipt and documentation of customer requirements and corresponding
manufacturer-originated changes for compliance as they occur throughout the manufacturing and detailing process. Customer requirements may be received in original contract documents, or subsequent telecommunications, letters, transmittals related to product requirements, and construction changes or contract addenda.

The procedure shall require records (e.g., logs, files, or master lists) that show receipt of change data, incorporation, issue, and distribution of approved and revised shop drawings and installation drawings to all necessary departments and personnel at the manufacturer's facility and necessary external organizations, subcontractors, or suppliers.

8.3 Revision Control

The revision to the previous document shall be clearly identifiable on each amended document and reflected in data controlled by the procedure and there shall be a method for monitoring and identifying the latest revision.

The manufacturer shall establish a method to ensure identification of changes to the quality manual or referenced procedures from the previous revisions. Documents shall remain legible and easily identifiable.

8.4 Access

Relevant and current procedures and policies pertinent to an area of operation or management shall be available and readily accessible to all personnel responsible for performing work affecting the product quality.

8.5 Obsolescence and Transmittal

The procedure shall describe methods to prevent inadvertent use of controlled documents that are obsolete in the manufacturing or installation process.

A method shall be established and maintaining the latest revisions and location of:

- The quality manual and other quality management system documents
- Contract documents including design drawings and owner change orders
- Shop and installation drawings.

A transmittal system shall be established to record the distribution of drawings, documents and specifications to:

- Customers
- Subcontractors
- Suppliers.

The records shall indicate the status of approval and release to shop or installation.

9. Control of Quality Records

The manufacturer shall develop a documented procedure for quality records that provides for:

- Identification
- Collection
- Storage (location)
- Maintenance
- Retention (time duration)
- Disposition.

All quality records shall be legible and shall be stored in such a way that they are retrievable from facilities that provide a suitable environment to prevent damage, deterioration or loss. Quality records typically include, but are not limited to:

- Inspection records
- NDT reports
- Mill and consumable purchase orders
- MTRs
- C of Cs
- Contract review
- Contract clarifications
- RFIs with owner responses
- Design change records, including contract construction changes and addendums
- Drawing logs
- Component design validation records
- Records or summaries of nonconformance reports
- Corrective action reports
- Training records
- Subcontractor and supplier qualifications and evaluations
- Internal and external quality management system audit records.

9.1 Retention of Quality Records

Retention times shall be established and recorded for records retained for any purpose. The retention periods will be at least to the point of the manufacturer's final project ship date plus three years unless a longer period is required by contract or government regulation, and not less than the duration of any warranty provided by the manufacturer.

9.2 Availability of Quality Records

Specific quality records required by contract or regulation shall be made available for the owner's review and evaluation by the manufacturer for the required time period.
10. Purchasing

The manufacturer shall develop a documented procedure to ensure that subcontractors and suppliers provide materials, products, and services conforming to project requirements. Responsibility for quality of the subcontracted products and services remains with the Certified manufacturer. Purchase documents, subcontractor and supplier qualification records, and records of the periodic evaluation of subcontractors and suppliers shall be maintained.

10.1 Purchasing Data

The manufacturer shall clearly describe subcontracted work and the purchased products, materials, and services ordered in written purchasing documents. This shall include but not be limited to:

- The type of service, material, class, grade and other unique identification
- The applicable specifications, drawings, process requirements, and inspection instructions and any witness points required by the owner or the quality management system
- Delivery instructions and date
- Required C of Cs, MTRs and NDT reports.

Purchasing documents for materials furnished to ASTM specifications shall include the information required in the “Order Information” section of the ASTM standard.

10.2 Selection of Suppliers and Subcontractors

The manufacturer shall evaluate and select subcontractors and suppliers on the basis of their ability to meet subcontract requirements, the manufacturer’s quality management system, the requirements of this standard, project requirements, and any specific inspection requirements.

A documented procedure shall be developed that describes how the manufacturer conducts initial and ongoing evaluation of subcontractors and suppliers. Management shall determine:

- Evaluation criteria
- Reevaluation interval
- Personnel involved in the evaluation process.

The manufacturer will evaluate subcontractors and suppliers via an audit or documented acceptable past experience. At a minimum, quality of the finished products and timely, proper delivery of services or products shall be part of the evaluation procedure.

10.2.1 Manufacturing Subcontractors

On projects requiring AISC Certification of the component manufacturer, a subcontractor selected to manufacture or provide assembly for a significant portion or all of a component shall have the required AISC Certification.

Exception: If a written waiver is obtained from the owner on projects requiring AISC Certification, a subcontracted manufacturer that is not AISC Certified is permitted.

10.2.2 Design Subcontractors

The manufacturer’s procedure defines the methods used for initial and ongoing evaluation of design subcontractors and may include direct or third party review of one or more of the following:

- Design products and other work to assess ability to perform the specific type of work the manufacturer is subcontracting
- Implementation and effectiveness of procedures to identify, document, evaluate, and approve design changes
- Employment experience records, education, and licensing for individual engineers and designers
- For ongoing evaluation, design error frequency and severity from manufacturer records.

10.2.3 Detailing Subcontractors

The manufacturer’s procedure defines the methods used for initial and ongoing evaluation of detailing subcontractors and may include direct or third party review of one or more of the following:

- Drawing products and other work to assess ability to perform the specific type of work the manufacturer is subcontracting
- Implementation and effectiveness of procedures to track RFIs
- Employment experience records for individual detailers and checkers
- For ongoing evaluation, detailing error frequency and severity from manufacturer records.

The manufacturer’s procedure shall define detailing subcontractor evaluation criteria that include how the following information is identified and incorporated into drawings:

- Material requirements and special conditions
- Coating requirements
- Contract document special conditions
- Inspection requirements
• Conformance to the manufacturer’s detailing standard
• Drawing check complete
• Identification of checkers.

When the manufacturer awards detailing subcontracts in advance of evaluation, the manufacturer’s procedure shall include methods to assess the “pre-evaluation” level of risk for not satisfying:

• Subcontract requirements
• The manufacturer’s quality management system
• The applicable requirements of this standard
• Project requirements
• Specific inspection requirements.

For “award in advance of evaluation”, the manufacturer’s procedure shall require a full evaluation of detailing subcontractors during the performance of the subcontracted work. Ongoing evaluation, as required in the procedure, shall be conducted if the detailing subcontractor is to be considered as a source for future work.

10.3 Verification of Purchased Product, Materials, and Services

The manufacturer’s procedure for purchasing shall define the control necessary to ensure conformance to the project requirements. This may depend upon the type of product, the potential impact of subcontracted product on the quality of the final product or the records available for the demonstrated capability and performance of similar products in previous projects. Test reports, C of Cs, or other evidence of quality control shall be kept on file as defined in the manufacturer’s procedure required by element 9.

10.4 Customer Verification of Manufactured Product

The customer or the customer’s representative shall be allowed the right to verify the conformance of the final product to the project requirements at the manufacturer’s premises.

10.5 Control of Customer-Supplied Material

If materials are supplied by the customer; the manufacturer shall verify, store and maintain materials in an appropriate fashion. Verification shall include confirmation that the material is what is required and meets the quality requirements. Customer-supplied material shall be protected to prevent use in other than its intended purpose. Any such product that is lost, damaged, or is otherwise unsuitable for use shall be recorded and reported to the customer.

11. Material Identification and Traceability

The manufacturer shall develop a documented procedure for identification of material and material traceability.

11.1 Material Identification

The procedure will describe how the manufacturer marks or maintains the identification of base materials from the point of receipt to the point of the first manufacturing operation to assure incorporation of the correct materials into the product.

• Structural Steel material shall be identified as stated in the AISC Code of Standard Practice for Steel Buildings and Bridges and in contract documents.
• Welding consumables shall be identified by the appropriate ANSI/AWS specification.
• Coating materials (excluding metallic coating) for components shall be identified by coating specification (for each coat if multiple coats), manufacturer, and manufacturer’s product name.
• Metallic coatings for components shall be identified by composition and the appropriate ASTM specification, including hot dip or mechanical galvanizing and metallizing.
• Fasteners for components shall be stored in containers clearly identified by type, grade, size and lot number(s).

MTRs, manufacturer’s test reports, and C of Cs for base materials, adhesives, fasteners, welding consumables, and coatings provide minimum material identification. In the absence of special contract requirements, these records shall constitute sufficient evidence that the material satisfies the purchase order requirements. Records that provide a basis for material identification shall be filed and retained as defined in the manufacturer’s procedure required by element 9.

11.2 Material Traceability

From the point of receipt and during the course of manufacture, materials shall maintain traceability. The manufacturer may use a marking method that identifies material type and grade or use a method that provides traceability through piece, assembly, or group numbering. Material traceability to corresponding MTRs is necessary only when specifically required by contract.

12. Manufacturing Process Control

The manufacturer shall develop documented procedures for process control necessary to produce a consistent, acceptable level of furnished product quality in accordance with applicable codes and specifications. The manufacturer will develop procedures for all manufacturing processes done...
at the facility. Manufacturing processes include: cutting, fitting and assembly, welding, drilling, punching, shearing, machining, bolting, cleaning, and coating. Procedure detail shall be sufficient to describe the operation and identify the tools and verification instrumentation required.

The process definition will show that the manufacturer has assessed the process and identified the source and potential magnitude of variability in the process. The assessment is demonstrated by the inspection points and sampling plan of the inspection and testing procedure (element 13).

Regardless if these processes are routinely performed at the facility, effective implementation of the following documented procedures are required as a minimum:

12.1 Welding
The manufacturer’s welding procedure shall include:
• WPSs
• Preheat requirements
• PQRs
• Welder, welding operator, and tack welder Qualifications and Qualification Test Records
• Welder, welding operator, and tack welder performance records—to provide objective evidence that the “period of effectiveness” has not been exceeded and satisfactory performance is consistently achieved.

12.2 Bolt Installation
The manufacturer’s bolting procedure shall include pre-installation verification for pretensioned joints, installation, and inspection of fastener assemblies.

12.3 Material Preparation for Application of Coatings
The manufacturer’s procedure shall support achievement of cleanliness and surface profile required by coating manufacturer recommendations and product data sheets and by project specifications.

12.4 Coating Application
The manufacturer’s procedure shall support application and curing of coatings in accordance with manufacturer recommendations and product data sheets and with project specifications.

12.5 Equipment Maintenance
The manufacturer shall develop a documented procedure defining an equipment maintenance program to produce the required quality. The procedure shall define evaluation and preventive maintenance for, at minimum, equipment critical to product quality and delivery requirements.

13. Inspection and Testing
The manufacturer shall develop a documented procedure for inspection and testing activities to verify that the product quality meets project requirements.

The inspection and testing procedure shall define receipt, in-process, and final inspection of all materials and products furnished to a project.

Product determined to be nonconforming during inspection and testing shall be addressed by the manufacturer’s nonconformance procedure required in element 15.

For each type of inspection less than 100 percent, the procedure shall describe the methods for establishing sampling plans and for adjusting the level and frequency of inspection to assure expected contract quality. The manufacturer’s methods will adjust the level and frequency of inspection at any time the required level of quality is not met. The level or frequency of an inspection sampling plan shall not be zero where a nonconformance has been identified and corrective action has not been fully implemented and verified as effective.

13.1 Assignment of QC Inspections and Monitoring
The procedure shall define inspection and testing and the required records to meet the project requirements and shall assign QC inspection and QC monitoring duties.

Qualification requirements for QC inspectors shall be defined and documented as required in Section 5.4.1. QC inspectors shall be assigned on the basis of qualification, evidenced by experience, training and education. Qualification standards and individual certifications granted by recognized industry organizations related to component manufacturing can be used as a basis for qualification.

QC inspectors shall be periodically monitored by QA repeating the QC duties or witnessing their work. The procedure shall document how often quality control activities are sampled and checked.

Production personnel may be assigned to QC inspection duties under the following conditions:
• They are trained and knowledgeable in the practice of proper inspection methods and acceptance criteria specified for the material or products they are inspecting.
• They are aware of their responsibilities and are given time to perform them.
• They do not inspect their own work for final acceptance of product.
• Their work is monitored by qualified quality control personnel.
13.2 Inspection Procedure

The manufacturer’s procedure shall include provisions for the following:

13.2.1 Material Receipt Inspection

Materials received shall be compared to the purchase order requirements. The receiver shall identify the material, grade, and quantity and look for visible shipping damages. The receiver shall inspect material for obvious deviations from the requirements of purchase order specifications.

13.2.2 In-Process Inspection

The manufacturer shall employ in-process inspection plans and practices to provide a level of compliance assurance for specified process requirements and inspection acceptance criteria that are not verifiable at final inspection or that can hinder assembly. In-process inspection is appropriate for: welds, fit-up tolerances in areas not visible after welding, bolting, and cleaning and coating application on areas not accessible during final inspection.

Materials shall be inspected for specification and grade, workmanship, and tolerances using appropriate codes, standards, or a documented plan before manufacturing begins. Compliance with the manufacturer’s documented process control procedures shall be monitored.

The manufacturer shall perform NDT in all areas designated in the contract documents and as required by the welding code.

Under the conditions described in Section 13.1, production personnel shall be capable of inspecting the product or subassemblies before sending it to the next process.

13.2.3 Final Inspection

The manufacturer shall conduct final inspection. Designated, qualified QC inspectors shall perform the final inspection of component products after the fitting, welding, and coating operations, but prior to delivery. Inspection of products may be cumulative after each manufacturing process or by final inspection just prior to delivery.

Demonstrated competency of employees and subcontracted individuals performing final inspection shall be documented and evidenced by experience, training, and education.

13.2.4 Inspection Records

The inspection procedure shall indicate what records and marks are used to document inspections. In-process inspections shall be verifiable until the final inspection of the piece.

Final inspections shall be documented. The quality records produced shall be filed and retained as defined in the manufacturer’s procedure required by element 9. Inspection records shall clearly show the products and product aspects that were inspected and who performed the inspection.

14. Inspection, Measuring and Test Equipment

The manufacturer shall develop a documented procedure to control, calibrate, and maintain inspection, measuring and test equipment used to demonstrate that products and processes comply with specified requirements. Tools with devices for measuring properties or process variables are included when used to demonstrate the compliance of products and processes to the specified requirements.

The procedure shall define equipment calibration frequency. However, the volt/amp meters used to verify compliance with WPS parameters (on a welding machine or auxiliary meters) shall be calibrated whenever the accuracy of the meter is in question and at a minimum every twelve months.

Inspection, measuring and test equipment shall be used in a manner consistent with the required measurement. The precision capability of the equipment shall support reliable determination of compliance with acceptance criteria. When specifically required, technical data pertaining to the measurement equipment shall be made available to the owner’s representative for verification that the equipment is calibrated and performing properly.

For inspection, measuring, and test equipment used to demonstrate the compliance of products and processes to the specified requirements, the procedure shall include:

• An equipment list that provides a means for unique identification of each piece of equipment
• Service use for each piece of equipment including the required precision for the types of inspections, measurements or tests
• Handling and storage of inspection, measuring, and test equipment to maintain accuracy and fitness for use
• Calibration frequency for each piece of equipment based upon: service use, requirements of this standard, manufacturer’s recommendations, project requirements, specification requirements
• Identification of standards or certified equipment having a known valid relationship to internationally or nationally recognized standards used to calibrate each listed piece of equipment. Where such standards do not exist, the basis used for calibration shall be documented.
• The calibration procedure for each piece of equipment calibrated at the manufacturer’s facility
• The calibration accuracy acceptance criteria for each piece of equipment
• The action to be taken when equipment does not meet the calibration accuracy acceptance criteria
• Calibration quality record maintenance as defined in the manufacturer’s procedure required by element 9
• Method of preventing inadvertent use of uncalibrated equipment where calibration is required.

15. Control of Nonconformances

The manufacturer shall develop a documented procedure to identify and control nonconformances. Nonconformances may be identified by the manufacturer’s inspection program, processes monitoring, and during internal or external audits. Nonconformances are then addressed by the corrective action procedure (element 16) and reviewed during the management review (Section 5.2).

15.1 Nonconformance with the Quality Management System

Nonconformances are not limited to nonconforming product. A nonconformance related to the performance of the quality management system shall be documented to the detail and level described by this procedure.

15.2 Nonconforming Product

Nonconforming product not satisfying specified requirements shall be documented and prevented from unintentionally reaching the customer. This procedure shall provide for identification, documentation, evaluation, segregation (when practical), treatment of nonconforming product, and for notification of the relevant functions concerned.

Nonconforming product shall be clearly marked as soon as practical after discovery. Records shall be kept of the pieces affected, the nature of the nonconformance, the treatment selection, authorization, and reinspection results, if applicable.

The responsibility, authority, and required qualifications for the personnel selecting treatment of nonconforming product shall be defined by the procedure. will Manufacturer’s The treatment of nonconforming product may be:

• Redesign for approval
• Rework
• Repair
• Use as is (after analysis and acceptance by the manufacturer’s engineering or management)
• Customer-approved nonconforming product
• Scrap.

If the treatment is rework or repair, the result will be inspected per drawing, specification, project requirements, and the manufacturer’s inspection procedure.

Owner approval may be required by contract for treatment of nonconformances and will be documented in writing for scrapping owner-supplied material, “use as is”, "repair", or "rework" treatments, or customer-approved acceptance of nonconforming product.

16. Corrective Action

The manufacturer shall develop a documented procedure for corrective action. Any corrective action taken shall be appropriate for the magnitude of problems and commensurate with the risks to product quality.

The corrective action procedure shall include periodic review of records or summaries of nonconformances and of internal and external quality audit reports for determination and initiation of corrective actions. Corrective action may be applied when:

• There is a nonconformance that is repetitive in nature.
  This can be identified by periodically reviewing nonconformance reports or summaries for negative trends.
• Process nonconformances are found during the internal and external quality audits indicating that the quality management system may not be implemented and functioning as stated in the quality manual
• Nonconformance with the quality management system is found during the day-to-day execution of the system
• Nonconformance is unacceptable due to cost or severity.
• A customer complaint has been received.

The corrective action procedure shall address these steps:

1. Document a corrective action request (CAR) that includes the nonconformance to be addressed and the requirement that has not been met. The corrective action procedure shall define the functional positions authorized to issue a CAR and initiate the corrective action process.
2. Assign responsibility and establish a timeframe for the response to a CAR.
3. Investigate and document the scope of the nonconformance, root causes, and measures taken to bring a nonconforming product or process into conformance with specified requirements, and list the actions to be taken to prevent recurrence.
4. Communicate the corrective action request and resolution to management and appropriate members of the organization.
5. Follow up with periodic monitoring to assure the corrective action is implemented and is effective.
17. Handling, Storage and Delivery of Product and Materials

Material shall be stored, loaded and shipped to avoid loss or damage and minimize deterioration. Material shall be marked with identification and shall be listed on a manifest or shipping documents.

If a shipping agreement between the manufacturer, the customer or the subcontractors exists, material shall be shipped in compliance with the agreement, including sequencing that complies with installation needs. Shipments by subcontractors shall be coordinated and monitored for compliance with shipping instructions.

18. Training

Personnel responsible for functions that affect quality, including, but not limited to, project managers, designers, detailers, inspectors, welding personnel, fitters, and painters, shall receive initial and periodic documented training. Training records are quality records controlled as required in element 9.

Personnel providing training shall have appropriate training or experience in the subject they are teaching. Training course outlines include the subject and the key points. Evaluation of student comprehension of course material is desirable.

19. Internal Audit

The manufacturer shall perform an internal audit of each element of the quality management system at least once a year to evaluate compliance and the effectiveness of implementation.

The Management Representative or a qualified individual, independent of the function being audited, shall perform the audit and provide a written quality record of the audit result from each element.
Supplemental Requirements
(reference element 2. Scope):

- Camera, light, overhead sign, and signal supports
  none – may be defined in future revisions of this standard
- High mast light towers
  none – may be defined in future revisions of this standard
- Bridge rail
  none – may be defined in future revisions of this standard
- Complex expansion joints (includes modular and finger plate joints, but does not include strip seals and neoprene-only joints)
  none – may be defined in future revisions of this standard
- High load multi-rotational (HLMR) bearings
  none – may be defined in future revisions of this standard
- Mechanical movable bridge equipment
  none – may be defined in future revisions of this standard