

AISCQC001  
AISC 201-06

---

# AISC Certification Program for Structural Steel Fabricators

Standard for Steel Building Structures—2006

---

Approved by the  
AISC BOARD OF DIRECTORS  
Prepared under the direction of the  
AISC CERTIFICATION COMMITTEE  
December 4, 2006



AISC © 2006

by

American Institute of Steel Construction

The information presented in this Standard has been prepared by the Certification Committee of the American Institute of Steel Construction (AISC) in a consensus manner in accordance with recognized industry standards, codes, and practices. The Standard has been prepared within the scope and for the purposes stated in the body of this document and for no other purpose.

The Standard has been developed by a balanced committee of participants in the industry who have particular experience and expertise in the topics addressed in the Standard. Every effort has been made to solicit comments and participation from a broad cross section of the construction industry. Participation by any federal or state agency representative(s) in this process is not to be interpreted as government endorsement of this Standard.

AISC accepts responsibility for only those interpretations of this Standard that are issued in writing and in accordance with governing AISC procedures and policies. Issuances of informal interpretations are not necessarily the official interpretation of AISC or its Certification Committee. This Standard is subject to revision at any time by the AISC Certification Committee.

Neither AISC nor its program auditors approve, rate, or endorse any item, construction technique, proprietary device, or activity referenced in this Standard. Nor do they take any position with respect to the validity of any patent rights asserted in connection with any items referenced in this Standard, nor suggest infringement of any patent, nor undertake to insure or indemnify anyone utilizing this Standard against liability for infringement of any applicable Letters Patent.

AISC disclaims for itself, its committee members and its program auditors any liability for any injury to persons or to property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this Standard or application of the activities or devices referenced herein.

Caution must be exercised when relying upon other specifications or codes developed by other bodies and incorporated by reference herein. Such material may be modified or amended from time to time by such other bodies subsequent to the printing of this Standard. AISC bears no responsibility for such material other than to refer to it as being applicable to this Standard and to incorporate it by reference at the time of the initial publication of this Standard.

Prepared under the direction of the

### **AISC CERTIFICATION COMMITTEE**

David Harwell, Chairperson	Central Texas Iron Works, Inc.
Roberta L. Marsteller, Secretary	American Institute of Steel Construction
Richard Arn	Weldtech International
William G. Ashton	Ashton Detailing Company
Bruce Basden	Basden Steel Corporation
Theodore L. Droessler	Clark County Dept. of Development Services Building Division
Heather Gilmer	Texas Dept. of Transportation—Construction Division
Keith Landwehr	Schuff Steel Company
Clay Larson	City of Coon Rapids, Engineering Division
John T. Linn	John Linn Associates, Inc.
H. Scott Metzger	Harman Services
Terry Peshia	Garbe Iron Works, Inc.
Homer R. Peterson, II	Peterson Beckner Industries Inc.
Alan T. Sheppard	The DuRoss Group, Inc.
Louis N. Triandafilou	Federal Highway Administration
John J. Weninger, Jr.	Lionakis Beaumont Design Group Inc.

### **ADVISORY**

Daniel J. Kaufman	Quality Management Company, LLC
Brian W. Miller	American Institute of Steel Construction
Patricia A. Thomashefsky	Quality Management Company, LLC
Michael A. West	Computerized Structural Design, S.C.

### **STAFF**

Roger E. Ferch	American Institute of Steel Construction
David B. Ratterman, Esq.	Stites & Harbison, PLLC



## TABLE OF CONTENTS

<b>1.</b>	<b>Purpose .....</b>	<b>1</b>
<b>2.</b>	<b>Scope .....</b>	<b>1</b>
<b>3.</b>	<b>References.....</b>	<b>1</b>
<b>4.</b>	<b>Definitions.....</b>	<b>1</b>
<b>5.</b>	<b>Management Responsibility .....</b>	<b>4</b>
	5.1 Policy for Quality and Quality Goals .....	4
	5.2 Direction and Leadership .....	4
	5.3 Management Representative.....	5
	5.4 Resources .....	5
	5.5 Internal Communication .....	6
	5.6 Documentation Requirements .....	6
<b>6.</b>	<b>Contract and Project Specification Review and Communication .....</b>	<b>6</b>
<b>7.</b>	<b>Detailing.....</b>	<b>7</b>
	7.1 Detailing Procedures.....	7
	7.2 Detailing Function Resources.....	8
<b>8.</b>	<b>Document and Data Control .....</b>	<b>9</b>
	8.1 Review and Approval.....	9
	8.2 Customer Requirements .....	9
	8.3 Revision Control.....	9
	8.4 Access .....	9
	8.5 Obsolescence and Transmittal .....	9
<b>9.</b>	<b>Control of Quality Records .....</b>	<b>9</b>
	9.1 Retention of Quality Records .....	10
	9.2 Availability of Quality Records.....	10
<b>10.</b>	<b>Purchasing.....</b>	<b>10</b>
	10.1 Purchasing Data.....	10
	10.2 Selection of Subcontractors and Suppliers.....	10
	10.3 Verification of Purchased Product, Materials, and Services .....	11
	10.4 Customer Verification of Fabricated Product .....	11
	10.5 Control of Customer-Supplied Material .....	11
<b>11.</b>	<b>Material Identification .....</b>	<b>11</b>
<b>12.</b>	<b>Fabrication Process Control.....</b>	<b>11</b>
	12.1 Welding.....	11
	12.2 Bolt Installation .....	11
	12.3 Material Preparation for Application of Coatings .....	12
	12.4 Coating Application.....	12
	12.5 Equipment Maintenance .....	12
<b>13.</b>	<b>Inspection and Testing.....</b>	<b>12</b>
	13.1 Assignment of QC Inspections and Monitoring.....	12
	13.2 Inspection Procedure .....	12
<b>14.</b>	<b>Calibration of Inspection, Measuring, and Test Equipment.....</b>	<b>13</b>
<b>15.</b>	<b>Control of Nonconformances.....</b>	<b>13</b>
	15.1 Nonconforming Process .....	13
	15.2 Nonconforming Product .....	13
<b>16.</b>	<b>Corrective Action.....</b>	<b>14</b>
<b>17.</b>	<b>Handling, Storage and Delivery of Product and Materials.....</b>	<b>14</b>
<b>18.</b>	<b>Training .....</b>	<b>14</b>
<b>19.</b>	<b>Internal Audit.....</b>	<b>14</b>



## 1. Purpose

The purpose of the AISC Certification Program for Structural Steel Fabricators is to confirm to owners, the design community, building officials, and the construction industry that a certified structural steel fabricating facility has the personnel, organization, experience, procedures, knowledge, equipment, and commitment to produce fabricated steel of the quality required for normal structural steel building construction.

## 2. Scope

This Certification Standard for Steel Building Structures is intended to offer assistance to building professionals and owners in assessing Fabricators' capability to satisfy project quality needs. Users of this Standard must evaluate Fabricator capacity independently.

The Standard describes requirements for certification of facilities that fabricate and supply the structural steel frames for buildings. These facilities have Quality Management Systems with defined functions and responsibilities.

The Quality Management System of fabrication facilities (not products) is certified. The certification should not be understood as a product inspection of fabricated Structural Steel. Certification includes all functions of providing Structural Steel fabrication from receipt of contract through final delivery. The scope of this certification does not include design or erection.

The certification program is open to all Fabricators of Structural Steel, regardless of size and regardless of AISC membership status.

## 3. References

The Fabricator shall have the reference documents and standards necessary to make personnel aware of the requirements of the work. References shall be consistent with the requirements of existing contracts and be readily available to those who need them.

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

- AISC *Steel Construction Manual*, which includes the following specifications, codes, and standards:
  - AISC *Specification for Structural Steel Buildings*<sup>1</sup>
  - RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts*<sup>1</sup>

- AISC *Code of Standard Practice for Steel Buildings and Bridges*<sup>1</sup>
- ANSI/AWS D1.1 *Structural Welding Code—Steel*
- AISC *Selected ASTM Standards for Structural Steel Fabrication*<sup>2</sup>

The Fabricator should also have the following references readily available:

- ANSI/AWS A2.4 *Symbols*
- ANSI/AWS A3.0 *Terms and Definitions*
- AWS *Welding Quality Assurance Guideline for Fabricators (WQAG)*
- SSPC *Steel Structures Painting Manual, Volume I, Good Painting Practice*
- SSPC *Steel Structures Painting Manual, Volume II, Systems and Specifications*
- AISC *Seismic Provisions for Structural Steel Buildings*<sup>1</sup>
- AISC *Detailing for Steel Construction*

## 4. Definitions

The following terms are capitalized 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 obligation to make a choice.

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

*ASTM*. American Society for Testing and Materials.

*AWS*. American Welding Society.

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

*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 Drawings, digital Manufacturing Models, and Erection Drawings)*. A detailed review of all sketches and dimensions on Shop Drawings, digital Manufacturing Models, and Erection Drawings by a qualified Checker other than the original detailer. Checking will compare the Shop Drawings, digital Manufacturing Models, and Erection Drawings to project requirements that include, but are not limited to:

<sup>1</sup>An electronic PDF version of this reference may be downloaded free from [www.aisc.org/freepubs](http://www.aisc.org/freepubs).

<sup>2</sup>This custom compilation created by ASTM for AISC contains the normally applicable and routinely used ASTM Standards for fabricated steel. Alternatively, these Standards are available in other publications offered by ASTM and at [www.astm.org](http://www.astm.org).

- Geometry
- Use of the correct connections
- Proper notes
- Proper material usage
- Assignment of complete welding symbols
- Proper coatings and preparation
- Proper representation on Erection Drawings including the notation of any necessary instructions and depiction of details necessary to conduct the work in the field

*Contract Documents*<sup>†</sup>. The documents that define the responsibilities of the parties that are involved in bidding, fabricating, and erecting Structural Steel. 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 identified nonconforming product or process to meet specified requirements.

*Corrective Measure*. The measure taken to bring a nonconforming product or process into conformance with specified requirements.

*Customer*. Entity (potentially the general contractor, Owner, Specifier, or Engineer of Record) contracting with the Fabricator for fabricated Structural Steel.

*Design Drawings*<sup>†</sup>. The graphic and pictorial 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*. See *Steel Detailer*.

*Detailing*. The function that produces Shop Drawings, digital Manufacturing Models, and Erection 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 an 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 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 provides the training.

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

*Engineer of Record*<sup>†</sup>. See *Structural Engineer of Record*.

*Erection Drawings*<sup>†</sup>. Field-installation or member placement drawings that are prepared by the Fabricator to show the location and attachment of the individual shipping pieces.

*Executive Management*. The 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.

*Executive Management Team*. The individuals responsible for managing the functions listed in Section 5.4.1 at a minimum and as defined by the Fabricator's organization chart.

*Fabrication*. The process of preparation and assembly of individual parts into a shipping piece in accordance with all contract documents. Fabrication includes all production operations performed in the manufacturing and shipping of the product (e.g., assembly, drilling, sawing, milling, thermal, and mechanical cutting).

*Fabricator*<sup>†</sup>. The entity that is responsible for fabricating the Structural Steel. NOTE: The Fabricator referenced in this document is the entity being certified.

*Key Position/Function*. Executive Management and positions in the Fabricator's Quality Management System that manage:

- Detailing
- Purchasing
- Quality Assurance
- Quality Control
- Fabrication process
- Project management functions

---

<sup>†</sup>from the AISC Code of Standard Practice

Additionally, a Key Position/Function is any position cited in this document as requiring qualification.

*Manufacturing Model.* Digital sub-model of the Logical Product Model as defined in Appendix A of the AISC *Code of Standard Practice for Steel Buildings and Bridges*. The Manufacturing Model includes data represented in detailing for fabrication.

*MTR.* Mill Test Report as defined in Section 14 of ASTM A6.

*Nonconformance.* Attributes of materials, consumables, fabricated product (in-process or final), and processes that do not meet contract, regulatory, or Fabricator defined requirements.

*NDT (NDE).* Nondestructive Testing (Nondestructive Examination).

*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 that 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*<sup>†</sup>. The entity that is identified as such in the Contract Documents.

*Owner's Designated Representative for Construction*<sup>†</sup>. The Owner or the entity that is responsible to the Owner for the overall construction of the project, including its planning, quality, and completion. This is usually the general contractor, the construction manager, or similar authority at the job site.

*Owner's Designated Representative for Design*<sup>†</sup>. 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.

*Procedure.* See *Documented Procedure*.

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

*P.E.* Professional Engineer.

*Quality Assurance (QA).* That part of quality management focused on providing confidence that quality requirements will be fulfilled<sup>††</sup>. 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 providing confidence that quality goals are achieved. 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

*Quality Control (QC).* QC is the inspection of work. Conformity evaluation and judgment accompanied as appropriate by measuring, testing, or gauging<sup>††</sup>.

*Quality Manual.* A document stating the quality policy and describing the Quality Management System of the Fabricator'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.

*RCSC.* Research Council on Structural Connections.

*RFI*<sup>†</sup>. A written request for information or clarification generated during the construction phase of the project.

*Structural Engineer of Record*<sup>†</sup>. 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

<sup>†</sup>from the AISC Code of Standard Practice

<sup>††</sup>from ANSI/ISO/ASQ Q9000-2000

structure and has knowledge of the load-carrying structural system.

*S.E.* Structural Engineer.

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

*Shop Drawings*<sup>†</sup>. Drawings of the individual Structural Steel Shipping Pieces that are to be produced in the fabrication shop.

*Specifications*<sup>†</sup>. The portion of the Contract Documents that consists of the written requirements for materials, standards, and workmanship.

*Specifier.* The entity defining the requirements for fabricated Structural Steel.

*SSPC*<sup>†</sup>. SSPC: The Society for Protective Coatings, which was formerly known as the Steel Structures Painting Council.

*Standard.* The Certification Standard for Steel Building Structures.

*Steel Detailer*<sup>†</sup>. The entity that produces the Shop and Erection Drawings.

*Structural Steel*<sup>†</sup>. Elements of the structural frame as given in Section 2.1 of the AISC *Code of Standard Practice for Steel Buildings and Bridges*.

*Subcontractor.* A firm that performs a portion of the Fabricator's contract work such as fabrication, detailing, coating application, inspection, or consulting services.

*Supplier.* A firm that supplies materials (including but not limited to: mill materials, process supplies, welding consumables, coatings, and process machinery) and completed purchased product (including but not limited to: fasteners, decking, joists, and proprietary buy-out items) needed to fulfill the Fabricator'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 Fabricator to assure continuous progress toward achieving the objectives of the commitment. The Fabricator'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 requirements.

### 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 that includes a commitment to meet contract requirements.
- Quality Management System objectives that provide a framework for establishing and reviewing quality goals of the Fabricator's organization.

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

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

- There is a minimum of one specific measurable quality goal related to Structural Steel Fabrication
- 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 shall be set that demonstrate commitment to continuous improvement. New goals can be a new level of achievement of a previous goal, or a new goal that has not been previously examined.

### 5.2 Direction and Leadership

Executive Management and the Executive Management Team shall review the Fabricator'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 Fabricator 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
- Need for changes to the Quality Management System

<sup>†</sup>from the AISC Code of Standard Practice

- Customer feedback, for example; surveys, letters of recognition, personal interviews, requests for Corrective Action 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. Processes are the means, methods, practices that produce the product. Performance measures monitor the effectiveness of those processes, for example; detailing process errors, shipping delays, improper treatment of Nonconformances, AISC audit Corrective Action Requests not closed in time, failure to conduct management review or other meetings per Procedure
- Product Nonconformance. Attributes of manufactured product (in process or final) that do not meet requirements. Product is nonconforming when it does not meet acceptance criteria, for example; errors measured in welding, bolting and coating, and dimensional errors
- Results from previous management reviews

The output from the management review shall include the record and implementation of 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.
- Ensure the promotion of awareness of customer requirements throughout the Fabricator's organization.
- Review the Quality Management System at defined intervals sufficient to ensure the stability of the Quality Management System and its effectiveness in satisfying this Standard.
- Communicate with external parties on matters relating to the Quality Management System.

## 5.4 Resources

The Fabricator shall have the resources needed to comply with contract specifications. Resources shall include, but are not limited to, the resources described in the subsections of 5.4.

### 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 perform fully the duties of each position. Individual(s) responsible for Quality Assurance or Quality Control management who also serve as production management shall report directly to (or be) Executive Management.

Individual(s) responsible for Quality Assurance or Quality Control management who report to production management shall also report directly to Executive Management.

A qualified Executive Management Team shall be assigned to manage the functions detailed in Sections 5 through 19 of this Standard and shall include as a minimum:

- Management Representative
- Detailing management
- Purchasing management
- Fabrication process management
- Quality Assurance management
- Quality Control management

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

### 5.4.2 Buildings, Workspace, and Associated Utilities

A fabrication facility shall consist of areas and buildings that provide space for the routine functions considered to be part of steel fabrication. The areas and buildings shall be conducive to achieving consistent quality work.

### 5.4.3 Fabrication Process Equipment

The Fabricator shall have under their control the equipment necessary to perform the functions common to fabrication consistent with the specifications and standards common to the work. Equipment must be maintained to produce the required quality.

## 5.5 Internal Communication

Executive Management shall ensure that appropriate communication processes are established within the Fabricator's organization and that communication takes place regarding the effectiveness of the Quality Management System.

## 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 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 Fabricator shall establish and maintain a Quality Manual stating the quality policy and describing the Quality Management System implemented in the Fabricator's organization.

The documented Quality Manual shall satisfy 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 may be satisfied 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 Fabricator.

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 Key Positions/Functions
- Qualification evidence and biographies for individuals in Key Positions/Functions
- A Facility Plan
- An Equipment List
- Established Documented Procedures
- Description of the interaction and communication between the processes of the Quality Management System used by the Fabricator to produce products of the required quality

Procedures may be issued separately or be an integral part of the Quality Manual. The Fabricator's management determines the level of detail in the Quality Manual and Procedures. At a minimum, these documents shall be detailed enough to adequately describe the Quality Management System used by the Fabricator to assure the production of products of 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 Fabricator's organization and its customers.

#### 5.6.2.2 Approval

Executive Management shall approve 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 Fabricator shall develop a Documented Procedure for contract and project specification review. The Procedure shall require that a contract and project specification review be completed for each structural steel project performed. The review shall begin no later than the Fabricator's acceptance of responsibility for performing the work. Ideally, the review should begin during the project estimation or bid process.

The review shall identify, determine, plan, and record the specific project requirements as well as define distribution of the recorded specific project requirements to the respon-

sible individuals in the Fabricator's organization. This review will consider any issue that affects the Fabricator'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 or other sources) to assure that the Fabricator fully understands the 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 project requirements that, if missed, will have a major impact on project quality.

## 7. Detailing

### 7.1 Detailing Procedures

#### 7.1.1 Preparation of Shop Drawings and Erection Drawings

The Shop and Erection Drawings produced shall incorporate all Customer requirements, specifications, codes, and relevant standards to adequately procure materials, fabricate, and erect the Structural Steel frame. To ensure and verify this, a Documented Procedure for preparation of Shop and Erection Drawings shall be developed, which describes:

- How project requirements are reviewed and incorporated.
- How the Fabricator coordinates, clarifies, resolves, and tracks information with the Customer (e.g., construction change documents, Requests for Information [RFI]) and how the associated resolutions are tracked and controlled).

#### 7.1.2 Detailing Standards

The Fabricator will prepare and utilize Detailing standards describing technical preferences and requirements customarily used in the shop. These standards will show special information required on advance bills such as allowances for cuts, camber, or supplementary requirements. The Detailing standards will include how mill order lists are prepared which, at a minimum, include:

- Sizes
- Appropriate ASTM specification references
- Special ordering information
- Any allowances or tolerances

The Detailing standards shall describe the Fabricator's preferred methods of drawing layout, including but not limited to:

- Views
- Title block information
- Designation of shipping sequences
- Piece marking system
- Dimensional preferences
- Commonly used shop abbreviations
- Showing bolt placement lists (including bolt type and installation requirements)
- Information required on weld symbols including any special NDT requirements

The Detailing standards shall describe the Fabricator's preferred method for:

- Selection of connection geometry and material (including sizes and specifications)
- Detailing holes, fasteners, washers, cuts, and copes
- Assignment of appropriate welding symbols (shop and field welds)
- Selecting bolt type and installation method
- Showing surface preparation (including specification of surface finish)
- Designating coating requirements (including coating materials and dry film thickness)
- Showing any necessary special instructions to fabricate and erect the structural steel frame

#### 7.1.3 Shop and Erection Drawings

The Fabricator shall develop a Documented Procedure to provide for Checking of all Shop and Erection Drawings and to describe the approval method used for Shop Drawings.

##### 7.1.3.1 Checking of Shop and Erection Drawings

The Procedure for Checking of Shop and Erection Drawings shall describe the method by which the Fabricator or its Subcontractor performs and records final check of Shop and Erection Drawings to ensure compliance with Contract Documents before release for fabrication and erection. 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 Erection Drawing.

For computer-generated Shop Drawings and Manufacturing Models, 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 fabrication.

#### **7.1.3.2 Approval of Shop Drawings**

The Procedure for Checking of Shop and Erection Drawings shall describe the method used to document approval of Shop Drawings released for fabrication. Such methods may include signatures, stamps, logs, files, or lists.

The method shall have provisions for recording Owner's Designated Representatives for Design and Construction approval of Shop Drawings—whether produced in house or by a Subcontractor.

The Procedure shall require that waiver of approval from the Owner's Designated Representative for Design or from the Owner's Designated Representative for Construction be in writing.

#### **7.1.3.3 Customer-Supplied Shop Drawings**

When the Fabricator receives Shop Drawings from the Customer, a Documented Procedure shall define the method of receipt, revision, and control of those drawings.

## **7.2 Detailing Function Resources**

### **7.2.1 References (required library)**

The Fabricator shall maintain as a minimum, a library of the required references listed in Section 3.

### **7.2.2 Personnel**

The Fabricator shall employ staff personnel assigned to Detailing management. Connection consultation and other Detailing functions may either be performed by employed staff personnel or by Subcontractors.

#### **7.2.2.1 Detailing Management**

Responsibilities for Personnel performing Detailing management shall include:

- Overseeing the production of Shop and Erection Drawings
- Liaising with designers
- Scheduling
- Developing and maintaining company Detailing standards and Detailing Procedures

- Transmittals related to Owner's Designated Representative for Design and Construction approvals and connection consultation subcontracting
- Coordinating and incorporating construction requirements
- Training Detailers and Checkers

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

- Experience in Detailing and Checking Shop and Erection Drawings that have met the approval of the Owner's Representative for Design for a variety of structures representative of projects the company provides. The Fabricator shall determine and describe a way to demonstrate competence.
- Graduate engineer with experience related to Structural Steel fabrication.
- Licensed P.E. or S.E., with experience related to Structural Steel fabrication.

#### **7.2.2.2 Detailing Functions**

Personnel who perform Detailing and/or Checking of Shop and Erection Drawings shall have experience in drawing projects typical of 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 fabrication. Qualification requirements for Checkers shall be defined and documented as required in Section 5.4.1 and include Training and experience in connection selection. Competency of staff employed and subcontracted individuals performing final checks shall be verifiable.

#### **7.2.2.3 Connection Consultation**

Qualification requirements for personnel providing connection development guidance to Detailers performing connection detailing shall include one or more of the following:

- Experience in connection development and in Detailing and Checking of Shop and Erection Drawings for steel that have met the approval of the Owner's Representative for Design for a variety of structures representative of projects the company provides. The Fabricator shall determine

and describe a way to demonstrate competence.

- Graduate Engineer with experience related to Structural Steel fabrication.
- Licensed P.E. or S.E., with experience related to Structural Steel fabrication.

### 7.2.3 Subcontract Services

In lieu of employed staff personnel, Subcontractors may be used for the following functions: Detailing, connection consultation, Checking of Shop and Erection Drawings, training of Detailers and Checkers. However, the Fabricator retains the responsibility for compliance with the requirements of this Standard.

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

## 8. Document and Data Control

The Fabricator shall develop a Documented Procedure to control documents and data affecting quality including:

- The Quality Manual
- Contract Documents
- Shop and Erection Drawings
- Detailing standards
- All Documented Procedures

### 8.1 Review and Approval

Documents affecting quality 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 Fabricator shall develop a Documented Procedure to receive and document Customer requirements and Fabricator originated changes as they occur throughout the fabricating and detailing process. Customer requirements may be received in original Contract Documents, or subsequent telecommunications, letters, transmittals related to product requirements.

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 Erection Drawings to all necessary departments and personnel at the Fabricator's facility and necessary external organizations, Subcontractors, or Suppliers.

### 8.3 Revision Control

The revision shall be clearly identifiable on all documents and data controlled by the Procedure and there shall be a method for monitoring and identifying the latest revision. The Fabricator shall establish a method to ensure identification of changes to the Quality Manual or referenced Procedures from 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 fabrication or erection process.

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

- The Quality Manual and other Quality Management System documents
- Contract Documents including Design Drawings
- Shop and Erection Drawings

A transmittal system will be established to record the distribution of drawings, documents, and specifications to Customers, Subcontractors, and Suppliers. The records shall indicate the status of approval and release to fabrication or erection.

## 9. Control of Quality Records

The Fabricator shall develop a Documented Procedure for Quality Records that provides for:

- Identification
- Collection
- Storage
- Maintenance
- Retention
- Disposition

All Quality Records shall be legible and shall be stored and retained 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
- Drawing logs
- MTRs
- C of Cs
- Design changes
- RFIs
- Mill and consumable purchase orders
- Records or summaries of Nonconformance reports
- Corrective Action Requests
- Training records
- Subcontractor and Supplier evaluations
- Internal and external Quality Management System audits

### 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 long enough to permit evaluation of the records during the course of project construction.

### 9.2 Availability of Quality Records

Specific Quality Records required by contract or regulation, shall be made available for review and evaluation by the Fabricator for the required time period.

## 10. Purchasing

The Fabricator 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 Fabricator. Purchasing documents, Subcontractor and Supplier qualification records, and records of the periodic evaluation of Subcontractors and Suppliers shall be maintained.

### 10.1 Purchasing Data

The Fabricator 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.
- 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 Subcontractors and Suppliers

The Fabricator shall evaluate and select Subcontractors and Suppliers on the basis of their ability to meet subcontract requirements, the Fabricator’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 Fabricator conducts initial and ongoing evaluation of all Subcontractors and Suppliers. Management shall determine:

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

The Fabricator will evaluate Subcontractors and Suppliers via an audit or documented acceptable past experience. As 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 Fabrication Subcontractors

The Structural Steel Fabricator selected as a Subcontractor shall have the required AISC Certification on projects requiring AISC Certification.

A written waiver shall be obtained from the Owner’s Representatives for Design and Construction for any subcontracted Fabricator that is not an AISC Certified Fabricator on projects requiring AISC Certification.

#### 10.2.2 Detailing Subcontractors

The Fabricator’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 Fabricator 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 Fabricator records.

The Fabricator’s Procedure shall define Detailing Subcontractor evaluation criteria that include how

the following information is identified on or incorporated into drawings:

- Material requirements and special conditions
- Coating requirements
- Contract Document special conditions
- Inspection requirements
- Conformance to the Fabricator's Detailing standard
- Drawing check complete
- Identification of Checkers

When the Fabricator awards Detailing Subcontracts in advance of evaluation, the Fabricator's Procedure shall include methods to assess the "pre-evaluation" level of risk to meeting:

- Subcontract requirements
- The Fabricator's Quality Management System
- The requirements of this Standard
- Project requirements
- Specific inspection requirements

The Fabricator's Procedure shall require a full initial evaluation of "award in advance of evaluation" 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 Fabricator's Procedure for purchasing shall define the extent of control necessary to conform to the project requirements. This may be dependent upon the type of product, the impact of subcontracted product on the quality of the final product or the records available for the demonstrated capability and performance of previous projects. Test reports, C of Cs, or other evidence of Quality Control shall be kept on file as defined in the Fabricator's Procedure required by Element 9.

### **10.4 Customer Verification of Fabricated 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 Fabricator's premises.

### **10.5 Control of Customer-Supplied Material**

If materials are supplied by the Customer; the Fabricator 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**

The Fabricator shall develop a Documented Procedure for identification of material. The Procedure shall provide for identification of Structural Steel material as stated in the *AISC Code of Standard Practice for Steel Buildings and Bridges* and in Contract Documents.

MTRs, manufacturers' test reports, and C of Cs for base materials, bolts, welding consumables, and coatings provide minimum material identification. In the absence of special contract requirements, these records shall constitute sufficient evidence that product satisfies material order requirements. Records that provide a basis for material identification shall be filed and retained as defined in the Fabricator's Procedure required by Element 9.

## **12. Fabrication Process Control**

The Fabricator shall develop Documented Procedures for process control necessary to produce a consistent acceptable level of quality of the furnished product in accordance with the applicable codes or specifications. Fabrication processes include: thermal and mechanical cutting, fitting and assembly, welding, drilling, bolting, milling, and coating. The Fabricator will include additional "special Procedures" that cover fabrication processes done at the facility (e.g., cambering).

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 Fabricator'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 for welder, welding operator, and tack welder qualifications

### **12.2 Bolt Installation**

The Fabricator's bolting Procedure shall include pre-installation verification, installation, and inspection of

fastener assemblies for snug-tightened, pretensioned, and slip-critical joint types. The Procedure shall meet the requirements of the RCSC *Specification for Structural Joints Using ASTM A325 or A490 Bolts*.

### **12.3 Material Preparation for Application of Coatings**

#### **12.4 Coating Application**

#### **12.5 Equipment Maintenance**

The Fabricator shall develop a Documented Procedure defining an equipment maintenance program to produce the required quality. The Procedure shall define preventative maintenance for, at minimum, equipment critical to product quality and delivery requirements.

## **13. Inspection and Testing**

The Fabricator shall develop a Documented Procedure for inspection and testing activities to verify that the product quality meets the project requirements.

The inspection and testing Procedure shall define receipt, in-process, and final inspection of all product furnished to a project.

Product determined during inspection and testing to be nonconforming shall be addressed by the Fabricator'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 Fabricator'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 inspection 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 Certifications granted by recognized industry organizations related to Structural Steel Fabrication can be used as a basis for qualification. QC inspectors shall be periodically monitored by QA (either by repeating the QC duties or by witnessing their work).

Production personnel shall be assigned to QC inspection duties under the following conditions:

- They shall be trained both in knowledge and practice in proper inspection methods and acceptance criteria specified for the material they are inspecting.
- They are aware of their responsibilities and are given time to perform their inspection responsibilities.
- They do not inspect their own work.
- Their inspections are monitored by qualified QC personnel.

### **13.2 Inspection Procedure**

The Fabricator'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 shapes and plates for obvious deviations from the requirements of purchase order specifications.

#### **13.2.2 In-Process Inspection**

The Fabricator shall conduct in-process inspection. In-process inspection plans and practices will 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 that will be hidden or out of reach during the final inspection, visual examination of fit-up tolerances that will not be visible after welding, areas requiring coatings that will not be accessible during final inspection.

Materials shall be inspected for specification and grade, workmanship, and tolerances using appropriate codes, standards, or a documented plan before Fabrication begins. Compliance with documented bolting Procedures and welding Procedures (WPSs, preheat and welding personnel qualifications) shall be monitored.

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

#### **13.2.3 Final Inspection**

The Fabricator shall conduct final inspection. QC inspectors qualified and responsible for final inspection shall perform the final inspection of Structural Steel products after the fitting, welding, and coating operations, but prior to delivery.

Qualification requirements for personnel performing final inspection shall be defined and documented as required in Section 5.4.1. Competency of staff employed and subcontracted individuals performing final inspection shall be verifiable 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 Fabricator'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. Calibration of Inspection, Measuring, and Test Equipment

The Fabricator shall develop a Documented Procedure to control, calibrate, and maintain inspection, measuring, and test equipment used to demonstrate the compliance of products and processes to the specified requirements. Tools with devices for measuring properties of fabricated pieces or process variables are included in this requirement when they are 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 (may be welding machine volt and amp meters or auxiliary volt/amp 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 used shall support reliable determination of compliance with acceptance criteria. When specifically required, technical data pertaining to the measurement equipment shall be made available for verification that the measuring equipment is 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 made
- Handling, preservation, 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 Fabricator'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 Fabricator's Procedure required by Element 9
- Method of preventing inadvertent use of equipment that is not calibrated where calibrated equipment is required

### 15. Control of Nonconformances

The Fabricator shall develop a Documented Procedure to identify and control Nonconformances. These Nonconformances may be identified by the Fabricator's inspection program, process monitoring, and during internal and external audits, which are then addressed by the Corrective Action Procedure required by Element 16 and reviewed during the management review (Section 5.2).

#### 15.1 Nonconforming Process

Nonconformances related to the performance of the Quality Management System shall be documented to the detail level described by this Procedure.

#### 15.2 Nonconforming Product

Nonconforming product shall be documented to ensure that final product not conforming to specified requirements is prevented from 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 it is discovered. Records shall be kept of the pieces affected, the nature of the Nonconformance, the treatment selection, authorization, and reinspection results if applicable.

The responsibility for review, authority, and required qualifications for the personnel selecting treatment of nonconforming product shall be defined by the Procedure. If the treatment is rework or repair, the result will be inspected per drawing, specification, project requirements, and the Fabricator's inspection Procedure. The treatment of nonconforming product may be:

- Reworked
- Repaired
- Use as is (after more detailed analysis or acceptance by the Fabricator's engineering or management)
- Customer-approved nonconforming product
- Scrapped

Approval from the Owner's Designated Representatives for Design and Construction may be required by contract for treatment of Nonconformances. These approvals shall be in writing for treatments resulting in "use as is," "repaired," or "reworked."

## 16. Corrective Action

The Fabricator shall develop a Documented Procedure for Corrective Action. Any Corrective Action taken shall be to the degree appropriate to 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 by the Corrective Action 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, Corrective Measures taken, and list the actions to be taken to prevent recurrence.
4. Communicate the Corrective Action Request and resolution to the Management Team and appropriate members of the organization.
5. Follow up the Corrective Action taken 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 damage and deterioration. Material shall be marked with its identification and shall be listed on a manifest or shipping documents.

Delivery instructions and any shipping agreements (e.g., sequencing that complies with erection needs) between the Fabricator, the Customer, the Fabricator's Subcontractors, or the Fabricator's Suppliers shall be included in written purchasing documents as required in Section 10.1 of this Standard. Shipments by Subcontractors and Suppliers shall be coordinated and monitored for compliance with shipping and delivery instructions as required in Section 10.3 of this Standard.

## 18. Training

Inspection personnel performing final inspection of the product and personnel responsible for functions that affect quality shall receive initial and periodic Documented Training. Personnel receiving initial and periodic Training shall include: project managers, detailers, inspectors, welding personnel, fitters, and painters.

Personnel providing Training shall have 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 Fabricator shall perform an internal audit of each Element of the Quality Management System at least once a year to evaluate their 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 record of the audit result from each Element.