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by

American Institute of Steel Construction

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PREFACE

This Preface is not a part of AISC 2017 Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components. It is intended for informational purposes only.

This Standard is the result of the deliberations of a balanced committee, the membership of which included engineers, fabricators, erectors, quality control consultants, a code official, a state bridge official, and a general contractor. This Standard is proprietary and has been created for the sole use of the AISC Certification Program as part of its policies and procedures for auditing and certification.

This Standard brings together provisions from four individual predecessor standards relating to the four industry segments: steel building fabrication (Chapter 2), metal-component manufacturing (Chapter 3), steel bridge fabrication (Chapters 4, 4.I, 4.A, and 4.F), and steel erection (Chapter 5) that have been a part of the AISC Certification Program since its beginnings in 1975. Chapter 1 provides general requirements that apply to the four industry segments and Chapters 2, 3, 4, 4.I, 4.A, 4.F and 5 contain supplementary requirements in addition to those in Chapter 1. This revision of the standard includes editorial changes to the chapter and section headings intended to facilitate implementation of the standard.

The Committee thanks Seth Bransky for his contribution as a member of the Committee for part of this cycle.

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TABLE OF CONTENTS

GLOSSARY	x.
CHAPTER 1. GENERAL REQUIREMENTS	1
1.1. PURPOSE	1.
1.2. SCOPE	1.
1.3. REFERENCES	2.
1.4. DEFINITIONS	2.
1.5. MANAGEMENT RESPONSIBILITY	2
1.5.1. Policy for Quality	2
1.5.2. Periodic Management Review	3
1.5.3. Responsible Quality Personnel	3
1.5.4. Resource Management	4
1.5.5. Quality Management System	4.
1.5.6. Internal Communication	4
1.5.7. Quality Manual	4.
1.6. CONSTRUCTION DOCUMENT REVIEW AND COMMUNICATION	5.
1.7. DETAILING	5.
1.7.1. Detailing Standards	6
1.7.2. Checking	6.
1.7.3. Approval of Approval Documents and Release for Fabrication	7
1.7.4. Shop Drawings Supplied by Others	7
1.7.5. Management of Detailing	8
1.7.6. Detailing Functions	8
1.7.7. Subcontract Services	9
1.8. CONTROL OF MANAGEMENT SYSTEM DOCUMENTS AND PROJECT DOCUMENTS	9
1.8.1. Management System Documents	9
1.8.1.1. Quality Management System Documents	9
1.8.1.2. Review and Approval	9
1.8.1.3. Revision Control	9
1.8.1.4. Access	10
1.8.1.5. Communication	10
1.8.2. Project Documents	10
1.8.2.1. Tracking	10
1.8.2.2. Revision Control	10
1.8.2.3. Access	11
1.8.2.4. Communication	11

1.9.	MAINTENANCE OF QUALITY RECORDS	11
1.9.1.	Retention	11
1.9.2.	Storage	11
1.9.3.	Retrieval	12
1.10.	PURCHASING	12
1.10.1.	Purchasing Data	12
1.10.2.	Selection of Subcontractors and Suppliers	12
1.10.3.	Verification of Purchased Product, Materials and Services.	12
1.10.4.	Control of Customer-Furnished Material	13
1.11.	MATERIAL IDENTIFICATION	13
1.12.	PROCESS CONTROLS	14
1.12.1.	Welding	14
1.12.2.	Bolt Installation.	14
1.12.3.	Material Preparation for Application of Coatings	14
1.12.4.	Coating Application	14
1.12.5.	Equipment Maintenance.	15
1.13.	INSPECTION AND TESTING	15
1.13.1.	Assignment of QC Inspections and Monitoring.	15
1.13.2.	In-Process Inspection	15
1.13.3.	Final Inspection	16
1.13.4.	Inspection Records	16
1.14.	CALIBRATION OF INSPECTION, MEASURING AND TEST EQUIPMENT	16
1.15.	CONTROL OF NONCONFORMANCES	17
1.15.1.	Nonconformance with Management Systems.	17
1.15.2.	Nonconforming Product and Work	17
1.16.	CORRECTIVE ACTION	18
1.17.	HANDLING, STORAGE AND DELIVERY OF PRODUCTS AND MATERIALS	18
1.18.	TRAINING	18
1.19.	INTERNAL AUDIT	19

CHAPTER 3. METAL COMPONENT MANUFACTURER REQUIREMENTS . . .	23
3.3. REFERENCES	23
3.5. MANAGEMENT RESPONSIBILITY	23
3.5.4. Resource Management	23
3.5.4.2 Buildings, Workspace, Equipment and Associated Utilities	23
3.7. DETAILING	23
3.7.8. Design Procedure	23
3.7.9. Design for Standard Components	24
3.7.10 Design for Nonstandard Components	24
CHAPTER 4. BRIDGE FABRICATOR REQUIREMENTS	25
4.2. SCOPE	25
4.3. REFERENCES	26
4.5. MANAGEMENT RESPONSIBILITY	26
4.5.4. Resource Management	26
4.5.4.1. Personnel	26
4.5.4.2 Buildings, Workspace, Equipment and Associated Utilities	27
4.7. DETAILING	27
4.7.8. Preparation of Shop Drawings and Erection Drawings	27
4.12. PROCESS CONTROLS	27
4.12.2. Bolt Installation	27
CHAPTER 4.I. SUPPLEMENTAL REQUIREMENTS FOR FABRICATORS OF INTERMEDIATE BRIDGES	29
4.I.5. MANAGEMENT RESPONSIBILITY	29
4.I.5.4. Resource Management	29
4.I.5.4.2 Buildings, Workspace, Equipment and Associated Utilities	29
4.I.7. DETAILING	29
4.I.7.1. Detailing Standards	29
4.I.7.6. Detailing Functions	29
4.I.12. PROCESS CONTROLS	29
4.I.12.6. Laydown/Assembly	29
CHAPTER 4.A SUPPLEMENTAL REQUIREMENTS FOR FABRICATORS OF ADVANCED BRIDGES	31
4.A.6. CONSTRUCTION DOCUMENT REVIEW AND COMMUNICATION	31
4.A.12. PROCESS CONTROLS	32
4.A.12.1. Welding	32

CHAPTER 4.F. SUPPLEMENTAL REQUIREMENTS	
FOR FABRICATORS OF FRACTURE-CRITICAL MEMBERS	33
4.F.5. MANAGEMENT RESPONSIBILITY.	33
4.F.5.7. Quality Manual	33
4.F.7. DETAILING	33
4.F.7.1 Detailing Standards.	33
4.F.10PURCHASING	33
4.F.10.1Purchasing Data	33
4.F.11MATERIAL IDENTIFICATION	33
4.F.12PROCESS CONTROLS	34
4.F.12.1.Welding.	34
4.F.13INSPECTION AND TESTING	34
4.F.15CONTROL OF NONCONFORMANCES	34
4.F.15.2Nonconforming Product	34
CHAPTER 5. ERECTOR REQUIREMENTS	35
5.3. REFERENCES	35
5.3.1. Seismic Erection	35
5.3.2. Metal Deck Installation.	35
5.3.3. Bridge Erection	35
5.3.4. Safety.	36
5.5. MANAGEMENT RESPONSIBILITY	36
5.5.2. Periodic Management Review.	36
5.5.4. Resource Management	36
5.5.4.3Erection Tools and Equipment	36
5.5.8. Safety Manual	36
5.5.9. Policy for Safety.	37
5.5.10. Responsible Safety Personnel	37
5.8. CONTROL OF MANAGEMENT SYSTEM DOCUMENTS	
AND PROJECT DOCUMENTS	38
5.8.1. Management System Documents.	38
5.8.1.4. Access.	38
5.8.1.5. Communication	38
5.8.2. Project Documents	38
5.8.2.1. Tracking	38
5.8.2.3. Access.	38

5.10. PURCHASING 38

5.16. CORRECTIVE ACTION 38

5.18. TRAINING 38

5.19. INTERNAL AUDIT 39

5.20. ERECTION PLAN 40

5.21. SAFETY PLAN 40

5.22. OTHER PROJECT-SPECIFIC REQUIREMENTS 41

- 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 the AISC Bridge Fabricator Certification. 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 assembly or adjustment, based upon installation instructions provided by the manufacturer.
- Construction documents** Written, graphic and pictorial documents prepared or assembled for describing the design (including the structural system), location, and physical characteristics of the elements of a building necessary to obtain a building permit and construct a building. See also approved construction documents.
- Contract documents** 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 documents, the specifications and the contract.
- Corrective action** The action or actions undertaken to identify and eliminate the root cause of a service 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 furnished material** Material or products that the fabricator, erector or manufacturer receives from the customer directly for incorporation into their work.
- Detailer** See steel detailer.
- Detailing** The function that produces shop drawings, digital models, and erection framing (or installation) drawings from contract documents.
- Design drawings** The graphic and pictorial portions of the contract documents showing the design, location and dimensions of the work. These documents generally include, but are not limited to, plans, elevations, sections, details, schedules, diagrams and notes.
- Documentation (documented)** Material that provides information or evidence. Documentation may include written instructions, drawings, diagrams, charts, photographs, electronic media, specifications and references to or excerpts from appropriate technical standards and codes.
- Documented procedure** A procedure that is established, documented, implemented and maintained. The documentation provides information about how to perform an activity or process consistently. Documentation shall contain:
- The purpose of the procedure
 - Process definition that includes steps required for completion
 - Assignment of responsibility for performance
 - Assignment of responsibility for review, revision, and/or approval of the procedure
 - Identification of records that are generated
 - For inspection activities, frequency of observations or inspections and how those observations or inspections are documented

- 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 it.
- Erection.** The process of assembling individual members into structural steel building or bridge in accordance with contract documents.
- Erection drawings.** Field-installation or member-placement drawings that are prepared to show the location and attachment of the individual shipping pieces.
- Erection plan.** The documentation of major resources and activities anticipated to be needed in performance of the work as it is affected by the conditions and requirements of one singular project.
- Erector.** The entity that is responsible for the erection of the structural steel.
- Executive management.** The highest ranking official(s) in the company, e.g., CEO, President, General Manager, Owner, etc. Executive management has full authority in final decision making for all aspects of the quality management system and safety management system.
- Fabrication.** The process of preparation and assembly of individual parts into a shipping piece in accordance with contract documents. Fabrication includes all production operations performed in the manufacturing and shipping of the product (e.g., assembly, drilling, sawing, milling, and thermal and mechanical cutting).
- Fabricator.** The entity that is responsible for detailing (except in Section 4.5 of the Standard Practice) and fabricating the structural steel.
- 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.
- Key position.** Executive management and positions in the fabricator's, manufacturer's or erector's quality management system that manage detailing, purchasing, quality assurance, quality control, fabrication processes, erection, project management, and the erector's safety functions.
- Management system.** See safety management system and quality management system.
- Manufacture (manufacturing, manufactured).** The process of designing, producing, testing and assembling components by the manufacturer.
- Manufacturer.** The entity that manufactures components.
- MTR.** Mill test report as defined in Section 14 of ASTM A6.
- Nonconformance.** Attributes of materials, consumables, fabricated or manufactured product (in-process or final), erected members, or processes that do not meet contract, regulatory, or internally defined requirements.
- NDT.** Nondestructive testing (nondestructive examination).
- Objective evidence.** Data supporting the existence or verification of something. Records, statements of fact, or other information that 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 may be obtained through:
- (a)

- (c) Tests
- (d) Review of a record, document or procedure
- (e) 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 in the contract documents

Owner's designated representative for construction. 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. 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. Seedocumented procedure

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

Quality assurance (QA) Monitoring and inspection tasks performed by an agency or firm

CHAPTER 1

GENERAL REQUIREMENTS

1.1. PURPOSE

The purpose of this Standard is to confirm to owners, the design community, the construction industry, and public officials that those who adhere to the requirements in this Standard have the personnel, organization, experience, documented procedures, knowledge, equipment and commitment to:

- (a) produce fabricated steel to the quality required for structural steel buildings and other structures;
- (b) produce components to the quality required for bridge and highway construction, or
- (c) produce fabricated steel to the quality required for steel highway or railroad bridge construction, or
- (d) erect fabricated steel to the quality required for structural steel buildings and other structures, steel highway or railroad bridge construction.

1.2. SCOPE

The requirements in this Standard shall apply as follows:

- (a) Chapters 1 and 2 shall apply to Building Fabricators, who fabricate and supply the structural steel frames for buildings.
- (b) Chapters 1 and 3 shall apply to Metal Component Manufacturers, who manufacture 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.
- (c) Chapters 1 and 4 shall apply to Bridge Fabricators, who fabricate and supply steel highway or railroad bridges.
- (d) Chapters 1 and 5 shall apply to Erectors.

In Chapters 2 through 5, only those subsections that are supplementary to Chapter 1 are indicated.

The Glossary is an integral part of this Standard. Nonmandatory Commentaries are provided for background, and the user is encouraged to consult them.

1.3. REFERENCES

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

The ability to work to and meet the requirements of the latest edition of the following documents shall be demonstrated:

- (a) ANSI/AISC 303 Code of Standard Practice for Steel Buildings and Bridges
- (b) RCSC Specification for Structural Joints Using High-Strength Bolts
- (c) AISC 503 Selected ASTM Standards for Structural Steel Fabrication, equivalent
- (d) AWS A2.4 Symbols
- (e) AWS A3.0M/A3.0 Terms and Definitions
- (f) AWS D1.1/D1.1M Structural Welding Code—Steel

1.4. DEFINITIONS

Definitions for terms in the body of this Standard printed in italics are defined in the Glossary. Acronyms for professional organizations are not italicized in the text but are included in the Glossary.

As used in this Standard, the words *shall* or *will* denote a mandatory requirement. The word *should* denotes a guideline or recommendation. The words *may* or *can* denote an opportunity to make a choice.

1.5. MANAGEMENT RESPONSIBILITY

1.5.1. Policy for Quality

Executive management shall ensure that the policy for quality is understood, implemented and maintained. The policy for quality shall include:

- (a) A commitment to quality that includes a commitment to meet the requirements in contract documents
- (b) A quality management system that provides a framework for establishing, communicating and reviewing quality goals.

Executive management shall establish goals to improve quality. Goals shall be measurable and documented through objective evidence. As quality goals are achieved, new goals shall be set that demonstrate commitment to continuous improvement.

Commentary: New quality goals can be a new level of achievement of a previous goal, or a new goal that has not been previously identified.

1.5.2. Periodic Management Review

Executive management shall conduct periodic review of the quality management system at planned intervals, but annually at a minimum. Management review shall encompass, assess and report the following, at a minimum:

- (a) A summary of previous management reviews.
- (b) Results of any internal and external audits conducted since the previous management review.
- (c) An assessment of customer feedback and feedback mechanisms, identifying opportunities for improving quality.
- (d) An assessment of product or work nonconformances. Both the number and severity of nonconformances shall be assessed.
- (e) An assessment of process nonconformances including compliance with the documented procedures comprising the quality management system.
- (f) An assessment of the effectiveness of corrective actions taken.
- (g) An assessment of the results of equipment inspections, including the adequacy of equipment resources.
- (h) An assessment of the adequacy of training program with respect to the levels of qualification required as appropriate.
- (i) An assessment of any proposed or required modifications to the quality management system.

The management review record shall include the decisions and actions required for implementation of:

- (a) Improvement of the effectiveness of the quality management system and its processes
- (b) Improvement of product quality
- (c) Resource needs

Records from management reviews shall be maintained according to the record retention policy.

1.5.3. Responsible Quality Personnel

Executive management shall designate a management representative for quality who shall report directly to (or be a part of) executive management. The designated management representative for quality may perform other functions within the company, provided that those functions do not conflict with the quality responsibilities. The designated management representative(s) shall have the ability, responsibility and authority to:

- (a) Ensure that documented procedures needed for the quality management systems are established, implemented and maintained in accordance with this Standard.
- (b) Report to executive management on the performance of the quality management system and any need for improvement.
- (c) Communicate with external parties on matters relating to the quality management system.

1.5.4. Resource Management

Resources necessary to comply with the contract documents shall be available. Resources shall include, but are not limited to, the resources described in the following. Personnel performing defined functions shall have the required qualifications and the ability to successfully perform the function.

Commentary: Objective evidence of qualification may be demonstrated through biographies, resumes, documented training, and individual licenses or certifications. Personnel may be assigned to more than one function, provided they are qualified and able to perform fully the duties of each position.

User Note: See Sections 2.5.4, 3.5.4, 4.5.4, 4.1.5.4 and 5.5.4 for nonpersonnel industry-specific resource requirements.

1.5.5. Quality Management System

The quality management system shall satisfy all of the requirements of this Standard and the requirements of the contract documents and referenced standards. The quality management system shall include a quality manual, documented procedures and records as required by this Standard.

Commentary: 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, and the complexity and interaction of processes. Requirements may be satisfied in a single document called the quality manual that may incorporate separate documents by reference.

1.5.6. Internal Communication

Executive management shall ensure that appropriate communication processes are established and that communication takes place on a regular basis regarding the effectiveness of management systems.

1.5.7. Quality Manual

The quality manual shall include a page showing the current revision date and the name and location of the facility or organization.

The quality manual shall include or incorporate by reference the following documents at a minimum:

- (a) Documented statements of a quality policy and quality objectives as required by this Standard.
- (b) Documented procedures established for the quality management system (or references to them), along with their associated quality records

- (c) Documents needed by the organization to ensure the effective planning, operation and control of its processes.
- (d) Organizational chart describing the interrelationship of functional positions that manage, perform and verify work affecting quality.
- (e) Job descriptions outlining responsibilities, authority and required qualifications for key positions
- (f) Qualification evidence for individuals key positions/functions.
- (g) Equipment list.
- (h) Facility plan (not applicable to rectory).

Executive management shall define additional documented procedures, drawings or other documents that are required beyond the minimum requirements set by this Standard to meet the needs of the organization and its customers.

The highest ranking member of executive management shall sign and date the quality manual

Commentary: Executive management determines the level of detail in the quality manual and procedures. At a minimum, these documents should be detailed enough to adequately describe the quality management system used to assure the end work meets the required quality.

1.6. CONSTRUCTION DOCUMENT REVIEW AND COMMUNICATION

A documented procedure shall be developed for contract and project specification review. The procedures shall require these reviews for each project, and the review shall begin no later than the acceptance of responsibility for performing the work.

Commentary: Ideally, the review should begin during the project estimation or bid process.

The review should identify, plan for and record the specific project requirements. The documented procedure should provide for review of the contract documents and referenced standards to ensure awareness of the contract requirements.

Evidence of contract review may take the form of technical summaries, sign-offs, schedules, change orders, and allocation of adequate resources, as well as development of a erection plan and a safety plan as applicable. Such evidence should indicate consideration of pertinent Sections of this Standard and other critical project requirements that, if missed, will have a major impact on project quality.

1.7. DETAILING

Section 1.7 does not apply to rectory

1.7.1. Detailing Standards

The fabricator

Commentary: Refer to Code of Standard Practice Section 4.5 for further elaboration.

1.7.5. Management of Detailing

The

CONTROL OF MANAGEMENT SYSTEM DOCUMENTS
AND PROJECT DOCUMENTS

Documents shall remain legible and easily identifiable.

1.8.1.4. Access

Documents shall be available and readily accessible to all personnel responsible for

1.8.2.3. Access

Documents shall be available and readily accessible to all personnel responsible for performing functions affecting the quality of the completed work.

1.8.2.4. Communication

Changes and revisions shall be clearly communicated to all personnel responsible for performing functions affecting the quality of the completed work.

1.9. MAINTENANCE OF QUALITY RECORDS

A documented procedure shall be developed for the maintenance of quality records that provide for record identification, collection, storage and retrieval, retention, and disposition.

Commentary: Quality records commonly include items such as:

- (a) Certificates of conformance
- (b) Corrective action requests
- (c) Drawing logs
- (d) Equipment maintenance records
- (e) Inspection records
- (f) Internal and external quality management systems and safety management systems audits
- (g) Mill and consumable purchase orders
- (h) MTRs
- (i) NDT reports
- (j) Personnel certifications
- (k) Records or summaries of nonconformance reports
- (l) Revisions to the contract documents
- (m) RFIs and related documentation
- (n) Subcontractor and supplier evaluations
- (o) Training records

1.9.1. Retention

Quality records shall be subject to an established retention policy. Documented procedure for the control of quality records shall contain provisions for the disposition of the records at the end of the retention period.

Commentary: The retention and disposition procedures should consider the Code of Standard Practice and contract and legal requirements.

1.9.2. Storage

Quality records shall be stored in a manner that minimizes damage, deterioration or loss.

1.9.3. Retrieval

Quality records shall be accessible in a reasonable time frame.

1.10. PURCHASING

A documented procedure shall be developed to ensure that contractors and suppliers provide contracted services and materials conforming to project requirements.

1.10.1. Purchasing Data

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

- (a) The type of service, material, class, grade, and other unique identification
- (b) The applicable specifications, drawings, process requirements, and inspection instructions and any witness points
- (c) Delivery instructions and date
- (d) Required quality reports, certified test reports, and certificates of compliance/conformance of purchased materials

1.10.2. Selection of Subcontractors and Suppliers

Subcontractors and suppliers shall be evaluated and selected on the basis of their ability to meet subcontract requirements, management system requirements, the requirements of this Standard, and the requirements of the approved production documents and referenced standards.

A documented procedure shall be developed that describes how the certified company conducts initial and ongoing evaluation of subcontractors and suppliers.

Management shall determine:

- (a) Evaluation criteria
- (b) Reevaluation interval
- (c) Personnel involved in the evaluation process

Subcontractors and suppliers shall be evaluated via an audit documented acceptable past experience. As a minimum, quality of the final products and timely, proper delivery of services or products shall be part of the evaluation.

1.10.3. Verification of Purchased Product, Materials and Services

The documented procedure for verification shall identify the activities necessary for ensuring that purchased products, materials and services meet project requirements. Purchasing documents, subcontractor and supplier qualification records, and records of the periodic evaluation of subcontractors and suppliers shall be maintained as required by Section 1.9.

1.10.4. Control of Customer-Furnished Material

If materials are furnished by the customer, the organization shall verify, store and maintain materials in an appropriate fashion. Customer-furnished materials shall be protected to prevent use for other than its intended purpose. Any such product that is lost, damaged, or otherwise unsuitable for use shall be recorded and reported to the customer.

1.11. MATERIAL IDENTIFICATION

A documented procedure shall be developed for the identification of material. Records that provide a basis for material identification shall be maintained as defined for quality control records.

Structural steel material shall be identified as stated in the Code of Standard Practice, unless otherwise noted in the contract documents.

Welding consumables shall be identified in accordance with the appropriate AWS specification.

1.12. PROCESS CONTROLS

Documented procedures shall be developed for the processes necessary to produce a consistent, acceptable level of quality of the completed work in accordance with applicable codes and project requirements.

Regardless if these processes are routinely performed, effective implementation of the following documented procedures is required as a minimum.

1.12.1. Welding

A documented procedure shall be developed for welding.

The documented procedure for welding shall address the development and management of:

- (a) WPSs
- (b) Preheat requirements
- (c) PQRs
- (d) Storage (including ovens) and identification requirements for welding consumables
- (e) Welder, welding operator, and tack welder qualifications and qualification test records in accordance with appropriate AWS requirements
- (f) 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
- (g) Traceability of welds to the welders who produce them, as applicable

WPSs shall be in close proximity to and used by the welders, welding operators or tack welders.

1.12.2. Bolt Installation

A documented procedure shall be developed for bolting. The procedure shall meet the requirements of the AISC Specification for Structural Joints Using High-Strength Bolts and the requirements of approved instruction document and referenced standards. The documented bolting procedure shall include storage, pre-installation verification, installation, and inspection of fastener assemblies for snug-tightened, pretensioned and slip-critical joint types.

1.12.3. Material Preparation for Application of Coatings

The documented procedure for surface preparation shall support achievement of cleanliness and surface profile required by coating manufacturer recommendations, product data sheets, and contract documents

1.12.4. Coating Application

The documented procedure shall support application and curing of coatings in accordance with manufacturer recommendations and product data sheets and with contract documents

1.12.5. Equipment Maintenance

The documented procedure for equipment maintenance shall, at a minimum, define the evaluation of and preventive maintenance for equipment necessary to meet product or work quality and delivery requirements.

1.13. INSPECTION AND TESTING

A documented procedure shall be developed to ensure that the completed work meets the requirements of the contract documents.

Commentary: Product or work determined during inspection and testing to be nonconforming should be addressed by the fabricator's, erector's or manufacturer's nonconformance procedure.

1.13.1. Assignment of QC Inspections and Monitoring

Qualification requirements for QC inspectors shall be defined and documented as required in Section 1.5.4.

Commentary: QC inspectors should be assigned on the basis of qualification, evidenced by experience, training and education. Qualification standards and certifications granted by recognized industry organizations can be used as a basis for qualification.

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

- (a) They are knowledgeable in proper inspection methods and acceptance criteria specified for the material or products they are inspecting and hold the required certification as applicable.
- (b) They are aware of their responsibilities and are given time to perform them.
- (c) They do not inspect their own work.
- (d) Their inspections are monitored by qualified quality control personnel.

1.13.2. In-Process Inspection

Materials shall be inspected before the work begins. The fabricator, manufacturer or erector shall employ in-process inspection plans and practices for specified process requirements and inspection acceptance criteria that are not verifiable at final inspection or for which final inspection can hinder subsequent work. In-process inspection is appropriate for processes including, but not limited to, welding, bolting, coatings surface preparation, and coating application, as applicable.

Compliance with documented process control procedures shall be monitored.

1.13.3. Final Inspection

Rented or borrowed equipment must be accompanied by a valid calibration certificate and is subject to the requirements of this Section.

For equipment that is damaged, dropped, knocked over or functioning improperly, the documented procedure shall include provisions for prominently marking or tagging such equipment to preclude usage and removing the equipment from service until it can be recalibrated, adjusted or repaired.

Whenever the accuracy of inspection, measuring and test equipment is in question, proactive calibration shall occur, regardless of manufacturer's recommendations.

The precision required of any piece of equipment shall be sufficient to satisfy the acceptance standards of the project specifications or industry standards

1.15. CONTROL OF NONCONFORMANCES

A documented procedure shall be developed to identify and control nonconformances

1.15.1. Nonconformance with Management Systems

A nonconformance related to the performance of the management system shall be documented

1.16. CORRECTIVE ACTION

A documented procedure shall be developed for corrective action to improve quality. Any corrective action taken shall be to the degree appropriate to the magnitude of problems and commensurate with the risks to quality. The documented 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. The corrective action procedure shall address these steps:

- (a) 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.
- (b) Assign responsibility and establish a time frame for the response to a CAR.
- (c) Investigate and document the scope of the nonconformance, root causes, corrective measures taken, and list the actions to be taken to prevent recurrence.
- (d) Communicate the corrective action request and resolution to executive management and appropriate members of the organization.
- (e) Follow up the corrective action taken with periodic monitoring to assure the corrective action is implemented and is effective.

Corrective actions shall be applied when:

- (a) There is a nonconformance that is repetitive in nature as identified by periodically reviewing nonconformance reports or summaries for negative trends.
- (b) 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.

CHAPTER 2

BUILDING FABRICATOR REQUIREMENTS

The requirements in Chapter 2 shall apply in addition to the requirements in Chapter 1, except where noted.

2.3.

CHAPTER 3

METAL COMPONENT MANUFACTURER REQUIREMENTS

The requirements in Chapter 3 shall apply in addition to the requirements in Chapter 1, except where noted.

3.3. REFERENCES

The ability to work to and meet the requirements of the latest edition of the following documents shall be demonstrated:

- (a) ANSI/AISC 360 Specification for Structural Steel Buildings
- (b) AASHTO/ASTM standards applicable to the component manufacturer's product and/or contract documents (for verification purposes)
- (c) SSPC Steel Structures Painting Manual, Volume I, Good Painting Practice
- (d) SSPC Steel Structures Painting Manual, Volume II, Systems and Specifications

Commentary: The fabricator should also have the following references available as applicable:

- (a) AWS D1.2 Structural Welding Code—Aluminum
- (b) AWS D1.3 Structural Welding Code—Sheet Steel
- (c) AASHTO/AWS D1.5 Bridge Welding Code
- (d) AWS D1.6 Structural Welding Code—Stainless Steel

3.5. MANAGEMENT RESPONSIBILITY

3.5.4. Resource Management

3.5.4.2 Buildings, Workspace, Equipment and Associated Utilities

A manufacturing facility shall consist of areas and buildings that provide space for routine functions considered part of component manufacturing. Work areas and buildings shall be conducive to achieving consistent work quality. The manufacturer shall have under their control the equipment and software necessary to perform manufacturing and inspection consistent with the specifications and standards applicable to the work.

3.7. DETAILING

3.7.8. Design Procedure

Where component design is provided by the manufacturer, the design process shall be defined by a documented procedure.

design development, review and verification phases of the process. The procedure shall:

- (a) Define methods for determining component product requirements from contract documents, customer and industry input, regulatory and code requirements, and similar component designs.
- (b) Define a design review process to identify and propose solutions for performance with product requirements. Identify the individuals responsible and keep records of the design review process.
- (c) Define methods to identify, document, evaluate and approve design changes before implementation. Keep records of all documents.
- (d) Describe 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.

3.7.9. 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 prepared and sealed by a registered design professional to signify

CHAPTER 4

BRIDGE FABRICATOR REQUIREMENTS

The requirements in Chapter 4 shall apply in addition to the requirements in Chapter 1, except where noted.

4.2. SCOPE

This Standard establishes three categories of bridges: simple, intermediate and advanced. Fabricators producing intermediate bridges, advanced bridges, or fracture-critical members shall be required to meet supplemental requirements in Chapters 4.I, 4.A and 4.F, as applicable.

Bridge Category Descriptions:

Simple bridges consist of unspliced rolled sections.

Intermediate bridges are typical bridges that do not require extraordinary measures.

Commentary: Common examples of intermediate bridges include:

- (a) A rolled beam bridge with field or shop splices, either straight or with a radius over 500 ft
- (b) A built-up I-shaped plate girder bridge with constant web depth (except for dapped ends), with or without splices, either straight or with a radius over 500 ft
- (c) A built-up I-shaped plate girder with variable web depth (e.g., haunched), either straight or with a radius over 1000 ft
- (d) A truss with a length of 200 ft or less that is entirely or substantially preassembled at the certified facility and shipped in no more than three subassemblies

Advanced bridges are those requiring an additional standard of fabrication and erection, particularly with regard to geometric tolerances.

Commentary: Common examples of advanced bridges include:

- (a) Tub or trapezoidal box girders
- (b) Closed box girders
- (c) Large or non-preassembled trusses
- (d) Arches
- (e) Bascule bridges
- (f) Cable-supported bridges
- (g) Moveable bridges
- (h) Bridges with a particularly tight curve radius

4.3. REFERENCES

The ability to work to and meet the requirements of the latest edition of the following documents shall be demonstrated:

- (a) AASHTO/AWS D1.5 Bridge Welding Code

Commentary: The fabricator should also have the following references available as applicable:

- (a) AASHTO/NSBA S4.1 Steel Bridge Fabrication QC/QA Guide Specification
- (b) Chapter 15 of the AREMA Manual for Railway Engineering

4.5. MANAGEMENT RESPONSIBILITY

4.5.4. Resource Management

4.5.4.1. Personnel

In addition to the requirements in Section 1.5.4, the following additional qualification requirements shall apply:

- (a) For production and QA management functions, at least five years fabrication experience or training
- (b) For QC and purchasing management functions and detailing checkers at least three years steel fabrication experience or training

The fabricator shall have the following personnel on staff or available under contract, who are certified in accordance with the fabricator's NDT program:

- (a) At least one Certified Level III NDT administrator for each NDT method performed in the shop
- (b) At least one Certified Level II technician for each NDT method performed in the shop

CHAPTER 4.1

SUPPLEMENTAL REQUIREMENTS FOR FABRICATORS OF INTERMEDIATE BRIDGES

The requirements in Chapter 4.1 shall apply in addition to the requirements in Chapter 4, except where noted.

The fabricator shall have either:

- (a) Supplied plate girder spans with field splices for highway or railroad bridges within the last five years, or
- (b) Established a documented training program for the purpose of communicating intermediate bridge work functions to the work forces, and demonstrated capability to fabricate intermediate bridges.

Commentary: Users of this Standard are encouraged to evaluate fabricator capability on a project-specific basis.

4.1.5. MANAGEMENT RESPONSIBILITY

4.1.5.4. Resource Management

4.1.5.4.2 Buildings, Workspace, Equipment and Associated Utilities

Equipment shall include automatic, mechanized or semiautomatic welding equipment.

4.1.7. DETAILING

4.1.7.1. Detailing Standards

The detailing standards shall define the fabricator's method for presenting information on shop assembly (blocking) drawings.

4.1.7.6. Detailing Functions

Detailing personnel shall have an understanding of bridge geometry, including, but not limited to, vertical and horizontal alignment, cross-slope, and roadway transitions.

4.1.12. PROCESS CONTROLS

4.1.12.6 Laydown/Assembly

The fabricator's documented procedure for shop assembly of field connections shall include, at a minimum, the following items:

- (a) Provisions for control of assembled dimensions for both vertical and horizontal geometry
- (b) Provisions for control of accuracy of drilling and reaming of field connections
- (c) Documented procedures, including reference drawings, for match-marking shop-assembled pieces
- (d) Provisions for assuring the accuracy of numerically controlled equipment, if contract documents permit the use of such equipment in lieu of physical assembly

CHAPTER 4.A

SUPPLEMENTAL REQUIREMENTS FOR FABRICATORS OF ADVANCED BRIDGES

The requirements in Chapter 4.A shall apply in addition to the requirements in Chapter 4, except where noted.

The fabricator shall have either:

- (a) Supplied advanced bridges for highway or railroad applications within the last five years, or
- (b) Supplied intermediate bridges for highway or railroad use, established a documented training program for the purpose of communicating advanced bridge work functions to the work forces, and demonstrated capability to fabricate advanced bridges.

Fabricators of advanced bridges shall also meet the supplemental requirements of Sections 4.1.5, 4.1.7 and 4.1.12.

Commentary: Users of this Standard are encouraged to evaluate fabricator capability on a project-specific basis.

4.A.6. CONSTRUCTION DOCUMENT REVIEW AND COMMUNICATION

The fabricator's documented procedures shall include a process for communicating with individuals in the fabricator's organization, the general contractor, and the owner regarding special fabrication-related requirements for advanced bridges, including:

- (a) Shop assemblies
- (b) Dimensional control and verification
- (c) Welding
- (d) NDT
- (e) High-performance materials
- (f) Erection considerations
- (g) Other atypical or special job requirements

Decisions made in the process of these communications shall be recorded, approved by the appropriate parties (if applicable), and the record shall be distributed to the appropriate parties. This distribution shall be controlled in accordance with Sections 1.6 and 1.8.

4.A.12. PROCESS CONTROLS

4.A.12.1. Welding

The fabricator's documented procedure for welding shall include a distortion control program.

CHAPTER 4.F
SUPPLEMENTAL REQUIREMENTS FOR
FABRICATORS

4.F.12. PROCESS CONTROLS

4.F.12.1. Welding

The fabricator's documented procedure for welding shall include:

- (a) PQRs for fracture-critical WPSs
- (b) Fracture-critical provisions for welding procedure qualification, preheat, and storage of consumables

4.F.13. INSPECTION AND TESTING

The fabricator's documented procedure shall include provisions for inspection of fracture-critical welds.

4.F.15. CONTROL OF NONCONFORMANCES

4.F.15.2. Nonconforming Product

The fabricator's documented procedure shall include provisions for critical and noncritical repairs of fracture-critical welds in accordance with AWS D1.5.

CHAPTER 5

ERECTOR REQUIREMENTS

5.3.4. Safety

The erector shall provide access to OSHA Part 1926 Safety and Health Regulations for Construction or the appropriate state equivalent to employees and others who require access to this information to perform their scope of work.

5.5. MANAGEMENT RESPONSIBILITY

5.5.2. Periodic Management Review

Executive management shall conduct periodic review of the safety management system at planned intervals, but annually at a minimum. The management review shall encompass the following, at a minimum:

- (a) A brief summary of applicable previous management reviews.
- (b) Results of any internal and external audits conducted since the previous management review.
- (c) An assessment of customer feedback and feedback mechanisms, identifying opportunities for improving safety.
- (d) An assessment of product nonconformances. Both the number and the severity of product

5.8. CONTROL OF MANAGEMENT SYSTEM DOCUMENTS AND PROJECT DOCUMENTS

5.8.1. Management System Documents

5.8.1.4. Access

The safety management system documents shall be available and readily accessible to all personnel affected by the safety management system

5.8.1.5. Communication

Changes and revisions to the safety management system documents shall be clearly communicated to all personnel affected by the safety management system

5.8.2. Project Documents

5.8.2.1. Tracking

Safetytraining shall include weekly safety training talks and an initial safety orientation for each employee.

Safetytraining shall include the requirements of OSHA 1926, as applicable.

Commentary: The safety plan described in Section 5.21 is an integral component of safety training.

OSHA provides minimum requirements for training in the following Subparts:

(a)

A safety plan shall consider known or reasonably anticipated hazards relating to the project site and construction activities. The safety plan shall include a pre-task analysis for each steel erection activity that occurs on the project site, a list of all hazardous materials in the control of the erector at the project site, an emergency evacuation plan, and requirements for regularly scheduled safety inspections.

The safety plan shall include the following information as appropriate for the project:

- (a) Project name and location
- (b) The erector's emergency contacts on site and off site
- (c) Medical services available on site, contact information for emergency services, and emergency evacuation procedures
- (d) Fall protection requirements that differ from those in the safety manual
- (e) Required personal protective equipment
- (f) Protection for openings and perimeters
- (g) Special procedures required, such as, but not limited to, lockout/tagout, confined space training, and lead exposure mitigation
- (h) Special training required
- (i) Employee drug-testing requirements that differ from those in the safety manual
- (j) Requirements for work attire
- (k) Information as provided to the erector regarding other hazardous materials on site

The safety plan shall be reviewed before the start of erection by the erector's project management team and be available to all employees assigned to the project. All revisions shall be approved by the individual responsible for safety management system and communicated to affected personnel at the time of the revision.

Commentary: The safety plan is an integral component of the safety program described in Section 5.18.

5.22. OTHER PROJECT-SPECIFIC REQUIREMENTS

In accordance with OSHA Subpart R, Code of Standard Practice and the contract documents, prior to the start of erection, the erector shall have documentation or other evidence that required site conditions have been met.

In accordance with the Code of Standard Practice and contract documents, the erector shall have documentation or other evidence that the required information in Section 7.10 of the Code of Standard Practice has been provided.

Commentary: The specific requirements are found in OSHA Subpart R 1926.752 a, b and c; OSHA 1926.755 b; and Code of Standard Practice Sections 7.2 and 7.3.

