SUMMARY OF MAJOR CHANGES APPEARING IN PUBLIC REVIEW ONE DRAFT OF AISC 313-25

The following is a list of major changes appearing in the public review draft of AISC 313-25 dated July 18, 2025.

- Glossary: New terms are introduced that are tied to new provisions regarding specific instructions to the contrary in Section 1.1, and other new concepts herein. Added the term *steel frame* to clarify the applicability of requirements throughout the Code.
- Abbreviations: Added an abbreviations list to compile all relevant organization names and commonly abbreviated terms.
- Section 1.1: Revised to strengthen the Code and provide clear requirements when specific instructions to the contrary are included in contract documents. Expanded the commentary for achieving a common understanding of the responsibilities and expectations of each party.
- Section 1.7: Added this new section regarding the construction schedule.
- Section 1.10: Added commentary providing guidance on erector safety.
- Section 3: Revised section and commentary extensively to coordinate with AISC 370. It includes separate subsections for structural design documents and specifications issued for construction and for structural design documents and specification issued as contract documents.
- Section 3.2.2: Removed the requirement to provide alloy UNS number or ASTM standard because this was determined to be adequately covered in AISC 370.
- Section 4.5: Added requirements for review of fabrication and erection documents, including additional commentary guidance.
- Section 5.2: Revised requirements for stock materials appropriate for stainless steel.
- Section 6.3: Updated requirements for backing and runoff tabs to be clear and consistent within this standard and in coordination with AWS D1.6.
- Section 6.4 and 7.13: Removed of erection and fabrication tolerances for compilation into a new Section 11.
- Section 7.8: Updated requirements for temporary fasteners as is appropriate for design of structural stainless steel.
- Section 10.4: Revised AESS fabrication requirements.
- Table 10-1: Revised to align with Section 10.4 updates.
- Section 11: Added this new section compiling all fabrication and erection tolerances.
- Section 11.2: Updated and expanded fabrication tolerance requirements, including camber.
- Section 11.3: Updated and expanded erection tolerance requirements.
- Section 11 Figures: Updated to align with code language revisions.

AISC 313-XX

Code of Standard Practice for Structural Stainless Steel Buildings

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Draft Dated July 18, 2025
(not yet) Approved by the Committee on Structural Stainless Steel

Smarter.
Stronger.
Steel.

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GLOSSARY

The following terms are used in this Code. Where used, terms are italicized to alert the user that the term is defined in this Glossary.

Adjustable items. See Section 11.3.1.3.

Allowance. A monetary amount included in a contract as a placeholder for work that is anticipated but not defined at the time the contract is executed.

Alloy steel. A steel, other than a *stainless steel*, that conforms to the definition of *alloy steel* given in ASTM A941.

Anchor bolt. See *anchor rod.*

Anchor rod. A mechanical device that is either cast in concrete or drilled and chemically adhered, grouted, or wedged into concrete and/or masonry for the purpose of the subsequent attachment of *structural stainless steel*.

Applicable building code. Building code under which the structure is designed.

Approval documents. The *structural stainless steel shop drawings*, *erection drawings*, and *embedment drawings*, or where the parties have agreed in the *contract documents* to provide digital model(s), the *fabrication* and *erection models*. A combination of drawings and digital models also may be provided.

Architect. The entity that is professionally qualified and duly licensed to perform architectural services.

Architecturally exposed structural stainless steel. See Section 10.

Bearing devices. Shop-attached base and bearing plates, loose base and bearing plates, and leveling devices, such as leveling plates, leveling nuts and washers, and leveling screws.

Bimetallic interface. Any location where *structural stainless steel* has a direct electrical contact to a dissimilar metal.

Built-up member. Member fabricated from *structural stainless steel* components, which may include rolled or extruded sections, *built-up sections*, and/or plates, using intermittent welds or fasteners.

Built-up section (or shape). Section fabricated from *structural stainless steel* elements welded together with a continuous weld along the entire length of the member.

Camber. Curvature fabricated into a beam or truss so as to compensate for deflection induced by loads.

Carbon steel. A steel, other than *stainless steel*, that conforms to the definition of *carbon steel* given in ASTM A941.

Clarification. An interpretation of the *design documents* or *specifications* that have been *released for construction*, made in response to an *RFI* or a note on an approval document. A *clarification* provides an explanation that neither revises the information that has been *released for construction* nor alters the cost or schedule of performance of the work.

The Code, This Code. This document, the AISC *Code of Standard Practice for Structural Stainless Steel Buildings*, as adopted by the American Institute of Steel Construction.

Building column line. The grid line of column centers set in the field based on the dimensions shown on the structural *design documents* and using the building layout provided by the *owner's designated representative for construction*. Column offsets are taken from the *building column line*. The *building column line* may be straight or curved as shown in the structural *design documents*.

Connection. An assembly of one or more joints that is used to transmit forces between two or more members.

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.

Contract documents. The documents that define the responsibilities of the parties that are involved in bidding, fabricating, and erecting *structural stainless steel*. Contract documents include the *design documents*, the *specifications*, and the contract.

Design documents. Design drawings, *design model,* or a combination of drawings and models.

Design drawings. Graphic and pictorial portions of the *contract documents* showing the design, location, and dimensions of the work. These documents generally include, but are not necessarily limited to, *plans*, elevations, sections, details, schedules, diagrams, and notes.

Design model. Three-dimensional digital model of the structure that conveys the *structural stainless steel* requirements given in Section 3.1.

Detailer. See *Steel detailer*.

Embedment drawings. Drawings that show the location and placement of items that are installed to receive *structural stainless steel*.

Engineer, engineer of record. See *Structural engineer of record*.

Erection bracing drawings. Drawings that are prepared by the *erector* to illustrate the sequence of erection, any requirements for temporary supports and the requirements for raising, bolting, and/or welding. These drawings are in addition to the *erection drawings*.

Erection documents. *Erection drawings*, *erection model*, or a combination of drawings and models.

Erection drawings. Field-installation or member-placement drawings showing the location and attachment of the individual *structural stainless steel* shipping pieces.

Erection model. Three-dimensional digital model produced to convey the information necessary to erect the *structural stainless steel*. This may be the same digital model as the *fabrication model*, but it is not required to be.

Erector. The entity that is responsible for the erection of the *structural stainless steel*.

Fabrication documents. *Shop drawings*, *fabrication model*, or a combination of drawings and models.

Fabrication model. Three-dimensional digital model produced to convey the information necessary to fabricate the *structural stainless steel*.

Fabricator. The entity that is responsible for detailing (except in Section 4.5) and fabricating the *structural stainless steel*.

Finish line, column finish line. The as-erected top of a column shipping piece at a tier splice or top of column, including all tolerances per Section 11.2.1.

Free iron. Iron, especially non-stainless steel, deposited onto a metal surface from an external source; also known as contaminant iron.

Hazardous materials. Components, compounds, or devices that are either encountered during the performance of the contract work or incorporated into it containing substances that, notwithstanding the application of reasonable care, present a threat of harm to persons and/or the environment.

Inspector. The *owner's* testing and inspection agency's representative.

Issued for construction. The *engineer of record's* designation that the design documents and specifications are authorized to be used to construct the steel structure depicted in the design documents and specifications, and that these design documents and

specifications incorporate the information that is to be provided per the requirements of Section A4 of the AISC *Specification for Structural Stainless Steel Buildings* (ANSI/AISC 370).

Issuing of design documents and specifications. The process by which the *owner's designated representative for design* (ODRD) delivers design documents and specifications for the purpose as designated and dated therein under contract to their client. See also *Releasing of design documents and specifications*.

Mill material. Steel mill products that are ordered expressly for the requirements of a specific project.

Other structures. Structures designed, fabricated, and erected in a manner similar to buildings, with building-like vertical and lateral load-resisting elements.

Other steel alloys. Any steel alloy other than those listed in ANSI/AISC 370, Section A3.1b, including *carbon steel* and *alloy steel*.

Owner. The entity that is identified as such in the *contract documents*.

Owner's designated representative for construction (ODRC). 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 jobsite.

Owner's designated representative for design (ODRD). The *owner* or the entity that is responsible to the *owner* for the overall structural design of the project, including the *steel frame*. This is usually the *structural engineer of record*.

Released for construction. The term that describes the status of *contract documents* that are in such a condition that the *fabricator* and the *erector* can rely upon them for the performance of their work, including the ordering of material and the preparation of *shop* and *erection drawings* or *fabrication* and *erection models*.

Revision. An instruction or directive providing information that differs from information that has been *released for construction*. A *revision* may, but does not always, impact the cost or schedule of performance of the work.

Releasing of design documents and specifications. The process by which an owner, *ODRC*, or other party delivers design documents and specifications prepared by the *ODRD* for the purpose designated therein, to another party. See also *Issuing of design documents and specifications*.

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

Shop drawings. Drawings of the individual *structural stainless steel* shipping pieces that are to be produced in the fabrication shop.

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

Stainless steel. A steel that conforms to a specification that requires, by mass percent, a minimum chromium content of 10.5%, and a maximum carbon content of less than 1.20%.

Steel detailer. The entity that produces the *approval documents*.

Steel frame. A structural system made from *stainless steel*, *other steel alloys*, or a combination thereof.

Strength grade. *Stainless steel* designation for a specific set of minimal mechanical property requirements for one or more alloys.

Structural engineer of record (*SER*). The licensed professional who is responsible for sealing the *contract documents*, which indicates that he or she has performed or supervised the analysis, design, and document preparation for the structure and has knowledge of the load-carrying structural system.

Structural stainless steel. All elements of the framing system as listed in Section 2.1 made from *stainless steel*.

Structural steel. Elements of the structural frame produced from *other steel alloys*.

Substantiating connection information. Information submitted by the *fabricator* in support of *connections* either selected by the *steel detailer* or designed by the licensed engineer working for the *fabricator*.

Tier. The *structural stainless steel* framing defined by a column shipping piece.

Transfer force. A force local to the intersection of structural members that is required to be transferred across that intersection through a *connection* and its elements to assure the continuity of the load path in a structural frame.

Upper finished splice line. The top surface of a column shipping piece in a multi-*tier* building. The top of the shipping piece does not include detail material such as splice plates or erection aids.

UNS designation. Identification system for specific metals and alloys.

Weld show-through. In *architecturally exposed structural stainless steel*, visual indication of the presence of a weld or welds on the side of the member opposite the weld.

Working points, *work points*. Points that occur at the intersection of working lines. Working lines are the center lines of members in trusses, beams, columns, or vertical and horizontal bracing, except in an unsymmetrical cross section for which the working line is the neutral axis. This definition does not apply to member work points and working lines as defined in Section 11.2.2.2 or Section 11.3 of *this Code*.

ABBREVIATIONS

The following abbreviations are used in this Code. The abbreviations are written out where they first appear within a Section.

AESSS (architecturally exposed structural stainless steel)
AISC (American Institute of Steel Construction)
ANSI (American National Standards Institute)
ASD (allowable strength design)
ASME (American Society of Mechanical Engineers)
ASTM (American Society of Testing and Materials)
AWS (American Welding Society)
CAD (computer-aided design)
HSS (hollow structural section)
LRFD (load and resistance factor design)
ODRC (owner's designated representative for construction)
ODRD (owner's designated representative for design)
OSHA (Occupational Safety and Health Administration)
RFI (request for information)
SEI (Structural Engineering Institute)
SER (structural engineer of record)
UNS (unified numbering system)

CODE OF STANDARD PRACTICE FOR STRUCTURAL STAINLESS STEEL BUILDINGS

SECTION 1. GENERAL PROVISIONS

1.1. Scope

The *Code of Standard Practice for Structural Stainless Steel Buildings*, hereafter referred to as *the Code*, sets forth criteria for the trade practices involved in the design and construction of buildings and *other structures*, which incorporate *structural stainless steel* and shall apply to all projects that involve fabricated *structural stainless steel*. In the absence of specific instructions to the contrary in the *contract documents*, the trade practices that are defined in this Code shall govern the fabrication and erection of *structural stainless steel* and any *bimetallic interfaces* that may be integral to the *structural stainless steel*. Specific instructions to the contrary shall not violate any provisions of *applicable building codes*. The contract with the *fabricator* or *erector* shall identify by Code section number any specific instructions to the contrary not contained in the *design documents* or *specifications*. If specific instructions to the contrary have not been provided as required in this section, the provisions of *the Code* shall apply as written herein.

This code is applicable to the alloys specified in ANSI/AISC 370.

Commentary:

The practices defined in this Code are the commonly accepted standards of custom and usage for *structural stainless steel* fabrication and erection, which generally represent the most efficient approach. Some provisions in *this Code* have been incorporated by reference into the International Building Code. These sections include, but are not limited to, (1) requirements for structural *design documents* and *specifications* issued for various purposes as defined in Section 3; (2) definition of *structural stainless steel* as defined in Section 2.1; (3) consideration for initial system imperfections, including fabrication and erection tolerances, as set forth in Section 11; (4) surface preparation and painting requirements as set forth in Section 3; (5) fabricator and erector quality control requirements as set forth in Section 8; and (6) requirements for fabricator and erector approval documents as set forth in Section 4.

Reference is also made herein to the *Specification for Structural Stainless Steel Buildings* (ANSI/AISC 370-25) Section A4, which contains requirements for *design documents* and *specifications issued for construction*. ANSI/AISC 370 is incorporated by reference into the International Building Code (IBC) and is therefore part of the building code.

The Code is a copyrighted document and has important legal consequences. Its language has been carefully written to apply to the construction of *structural stainless steel* buildings and *other structures*. Some projects may warrant specific modifications to Code provision(s) to suit project conditions. In such cases, any

modifications to the specific language of *the Code* should be clearly set forth in the contract documents.

The Code is a balanced, consensus document written in a "party-neutral" manner and should not be modified for the purpose of dictating a commercial advantage. To that end, Section 1.1 requires any specific instructions to the contrary unrelated to design elements (e.g., relating to commercial terms) to include a reference to the specific Code section number. This requirement is intended to ensure that all parties are aware of and specifically agree to specific instructions to the contrary that may work to the advantage of one party and to the disadvantage of another.

Extreme care should be taken to ensure that any modification is written in mandatory code language where applicable and is consistent with all other sections of *the Code* to result in a unified document. No modifications should be made to any Code section that violates the life safety or serviceability provisions of the *applicable building code* or results in a commercial advantage for any party that violates the intention of *the Code* to serve as a fair, balanced consensus document.

A meeting is recommended with the project stakeholders, including the *owner's designated representative for construction* (ODRC), the *owner's designated representative for design* (ODRD), the *fabricator/erector* and other parties, as appropriate, to discuss the scope of the project prior to the *design documents* and *specifications* being designated as *released for construction* as required by Section 3. This meeting can benefit the stakeholders in achieving a common understanding of the responsibilities and expectations of each party. Specifically, a discussion of any instructions to the contrary that modify any provisions of *the Code* that are applicable to the project and are included as part of the contract with the *fabricator/erector* should be clearly reviewed among the parties.

It is noted that *the Code* applies to all projects that involve fabricated *structural stainless steel* regardless of what delivery method is selected by the *owner*. Refer to Section 3.2.

This Code is not intended to define a professional standard of care for the *owner's designated representative for design*; change the duties and responsibilities of the *owner*, contractor, *architect,* or *structural engineer of record* from those set forth in the *contract documents*; nor assign to the *owner*, *architect,* or *structural engineer of record* any duty or authority to undertake responsibility inconsistent with the provisions of the *contract documents*.

1.2. Dates of Referenced Specifications, Codes, and Standards

The following dated versions of documents are referenced in this Code:

ANSI/AISC 370-25 *Specification for Structural Stainless Steel Buildings*
ASME B46.1-2019 *Surface Texture (Surface Roughness, Waviness, and Lay)*
ASTM A380/A380M-17 *Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems*
ASTM A484/A484M-24 *Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings*

ASTM A941-24 *Standard Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys*
ASTM A967/A967M-17 *Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts*
ASTM A1069/A1069M-23 *Standard Specification for Laser and Laser Hybrid Welded Stainless Steel Bars, Plates, and Shapes*
AWS D1.1/D1.1M:2025 *Structural Welding Code – Steel*
AWS D1.6/D1.6M:2017-AMD1 *Structural Welding Code—Stainless Steel*
ASCE/SEI 8-22 *Specification for the Design of Cold-Formed Stainless Steel Structural Members*
SSPC-SP 1—SSPC *Surface Preparation Specification No. 1, Solvent Cleaning*, 2016

Commentary:
Additionally, the following dated versions of documents are referenced in the Commentary on this Code:
AIA Document E202—2022 *Building Information Modeling Protocol Exhibit*
AIA Document E203—2013 *Building Information Modeling and Digital Data Exhibit*
AIA Document G201—2013 *Project Digital Data Protocol Form*
AIA Document G202—2013 *Project Building Information Modeling Protocol Form*
ASTM A6/A6M—2024a *Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling*
BIMFORUM 2023 *Level of Development Specification*
CASE Document 962—*National Practice Guidelines for the Structural Engineer of Record*, 2018
Consensus Docs 301—2013 *BIM Addendum*
International Code Council—2024 *International Building Code*
OSHA *Safety and Health Regulations for Construction*—29 CRF 1926 Subpart R—Steel Erection

1.3. Units

In this Code, the values stated in either U.S. customary units or SI units shall be used. Each system shall be used independently of the other.

Commentary:
In this Code, dimensions, weights, and other measures are given in U.S. customary units with rounded or rationalized SI-unit equivalents in brackets. Because the values stated in each system are not exact equivalents, the selective combination of values from each of the two systems is not permitted.

1.4. Responsibility for Identifying Contract Documents

The *owner's designated representative for construction (ODRC)* shall identify all *contract documents*. When the *design drawings* and a *design model* are both provided, the *owner's designated representative for design (ODRD)* shall specify which document is the controlling *contract document*. The *contract documents* shall establish the procedures for communicating changes to the *contract documents*, permitted use of design and other digital models, and restrictions on the release of these digital models to other parties.

Commentary:
There can be many combinations of drawings and digital models used as part of the *contract documents*, and to transfer information between the many entities in the design and construction processes. The communication of design information to the *fabricator* through the *design model* is permitted in this Code. This Code does not designate which of these possible documents takes precedence because of the variation in current practice. The document hierarchy is left to the *ODRD* and communicated through the *ODRC*. The *ODRC* must provide guidance as to which information is to be considered to have precedence if conflicts exist.

1.5. Design Criteria

For *structural stainless steel* buildings and other *structural stainless steel* structures, in the absence of other design criteria, the provisions in ANSI/AISC 370 shall govern the design of the *structural stainless steel*.

1.6. Responsibility for Design

1.6.1. When the *ODRD* provides the design, *design documents*, and *specifications*, the *fabricator* and the *erector* are not responsible for the suitability, adequacy, or building-code conformance of the design.

1.6.2. When the *owner* enters into a direct contract with the *fabricator* to both design and fabricate an entire, completed *structural stainless steel* structure, the *fabricator* shall be responsible for the suitability, adequacy, conformance with *owner*-established performance criteria, and building-code conformance of the *structural stainless steel* design. The *owner* shall be responsible for the suitability, adequacy, and building-code conformance of the non-*structural stainless steel* elements and shall establish the performance criteria for the *steel frame*.

1.7. Construction Schedule

The *ODRC* shall provide a construction schedule in the bid documents. The period of performance by the *fabricator* and *erector* shall be mutually agreed upon with the *ODRC* prior to contract award.

1.8. Patents and Copyrights

The entity or entities that are responsible for the specification and/or selection of proprietary structural designs shall secure all intellectual property rights necessary for the use of those designs.

1.9. Existing Structures

1.9.1. Demolition and shoring of any part of an existing structure are not within the scope of work that is provided by either the *fabricator* or the *erector*. Such demolition and shoring shall be performed in a timely manner so as not to interfere with or delay the work of the *fabricator* or the *erector*.

1.9.2. Protection of an existing structure and its contents and equipment, so as to prevent damage from normal erection processes, is not within the scope of work that is provided by either the *fabricator* or the *erector*. Such protection shall be performed in a timely manner so as not to interfere with or delay the work of the *fabricator* or the *erector*.

1.9.3. Surveying or field dimensioning of an existing structure is not within the scope of work that is provided by either the *fabricator* or the *erector*. Such surveying or field dimensioning, which is necessary for the completion of the *approval documents* and fabrication, shall be performed and furnished to the *fabricator* in a timely manner so as not to interfere with or delay the work of the *fabricator* or the *erector*.

1.9.4. Abatement or removal of *hazardous materials* is not within the scope of work that is provided by either the *fabricator* or the *erector*. Such abatement or removal shall be performed in a timely manner so as not to interfere with or delay the work of the *fabricator* or the *erector*.

1.10. Means, Methods, and Safety of Erection

1.10.1. The *erector* shall be responsible for the means, methods, and safety of erection of the *steel frame*.

1.10.2. The *structural engineer of record* (*SER*) shall be responsible for the structural adequacy of the design of the structure in the completed project. The *SER* shall not be responsible for the means, methods, and safety of erection of the *steel frame*. See also Section 7.10.

Commentary:
The *erector* normally establishes the methods and sequence of the work for the erection process, including the safety of the personnel involved in these activities. Special requirements should be included in the bid documents when another party prescribes erection means and methods. The erector is also in control of the stability of the structure during this activity. A site-specific or project-specific erection plan and erection bracing drawings can provide the work plan and control mechanisms

to maintain safety for personnel and structural stability during erection. The *ODRC*, per OSHA 29 CFR 1926 Subpart R—Steel Erection, provides information and support to the erector to assure safety and structural stability. The *ODRD* provides the required information related to structural stability as required by Section 7.10.1.

1.11. Tolerances

Tolerances for materials, fabrication, and erection shall be as stipulated in Sections 5, 10, and 11. Tolerances absent from *this Code* or the *contract documents* shall not be considered zero by default.

Commentary:
Tolerances are not necessarily specified in this Code for every possible variation that could be encountered. For most projects, where a tolerance is not specified or covered in this Code, it is not needed to ensure that the fabricated and erected *structural stainless steel* complies with the requirements in Section 11. If a special design concept or system component requires a tolerance that is not specified in this Code, the necessary tolerance should be specified in the *contract documents*. If a tolerance is not shown and is deemed by the *fabricator* and/or *erector* to be important to the successful fabrication and erection of the *structural stainless steel*, it should be requested from the *owner's designated representative for design*. The absence of a tolerance in this Code for a particular condition does not mean that the tolerance is zero; rather, it means that no tolerance has been established. In any case, the default tolerance is not zero.

SECTION 2. CLASSIFICATION OF MATERIALS

2.1. Definition of Structural Stainless Steel

Structural stainless steel shall consist of the *stainless steel* elements of the *steel frame* that are shown and sized in the structural *design documents*, essential to support the design loads and listed as follows.

Anchor rods that will receive the *steel frame*
Base plates, if part of the *steel frame*
Beams, including those from *built-up members*
Bearing plates, if part of the *steel frame*
Bearings of steel for girders or trusses
Bracing, if permanent
Canopy framing
Columns, including those from *built-up members*
Connection materials for framing *structural steel* or *structural stainless steel* elements.
Crane stops
Door frames, if part of the *steel frame*
Edge angles and plates, if attached to the *steel frame* or steel (open-web) joists
Embedded *structural stainless steel* parts, other than bearing plates, that will receive the *steel frame*
Expansion joints, if attached to the *steel frame*
Fasteners for connecting *structural stainless steel* items: permanent shop bolts, nuts, and washers; shop bolts, nuts, and washers for shipment; field bolts, nuts, and washers for permanent *connections*; and permanent pins
Floor-opening frames, if attached to the *steel frame* or steel (open-web) joists
Floor plates (checkered or plain), if attached to the *steel frame*.
Girders, including those from *built-up members*
Girts
Grillage beams and girders
Hangers, if framing *structural stainless steel* to the *steel frame*
Leveling nuts and washers
Leveling plates
Leveling screws
Lintels, if attached to the *steel frame*
Machinery supports, if attached to the *steel frame*
Marquee framing

Monorail elements, if attached to the *steel frame*
Posts, if part of the *steel frame*
Purlins
Relieving angles, if attached to the *steel frame*
Roof-opening frames, if attached to the *steel frame* or steel (open-web) joists
Roof-screen support frames

Sag rods, if part of the *steel frame* and connecting *structural stainless steel* to *structural stainless steel* or *structural steel*
Shear stud connectors, if specified to be shop attached
Shims, if permanent
Steel plate shear walls and/or composite steel plate shear wall systems, and steel plate structures, if made from standard shapes and/or plates, and if part of the *steel frame*.
Struts, if permanent and part of the *steel frame*
Tie rods, if part of the *steel frame*
Trusses
Wall-opening frames, if attached to the *steel frame*
Wedges, if permanent

Commentary:
The *fabricator* normally fabricates the items listed in Section 2.1. Such items must be shown, sized, and described in the structural *design documents*. Bracing includes vertical bracing for resistance to wind load and structural stability, horizontal bracing for floor and roof systems, and permanent stability bracing for components of the *steel frame*.

2.2. Other Steel, Iron, or Metal Items

Structural stainless steel shall not include items that are not generally described in Section 2.1, even where such items are shown in the structural *design documents* or are attached to the *steel frame*. Items include, but are not limited to, the following:

Any elements covered by ASCE/SEI 8
Base plates, if not part of the *steel frame*
Bearing plates, if not part of the *steel frame*
Bearings, if nonsteel
Cables for permanent bracing or suspension systems
Castings
Catwalks
Chutes
Cold-formed steel products
Cold-rolled steel products, except those that are specifically covered in ANSI/AISC 370
Corner guards
Crane rails, splices, bolts, and clamps
Door guards
Embedded steel parts, other than bearing plates, that do not receive the *steel frame* or that are embedded in precast concrete
Expansion joints, if not attached to the *steel frame*
Flagpole support steel
Floor plates (checkered or plain), if not attached to the *steel frame*

Forgings
Gage-metal products
Grating
Handrail and guards
Hangers, if not framing *structural stainless steel* to the *steel frame*
Hoppers
Items that are required for the assembly or erection of materials that are furnished by trades other than the *fabricator* or *erector*
Ladders
Lintels, if not attached to the *steel frame*
Masonry anchors
Ornamental metal framing
Other miscellaneous metal not already listed
Pressure vessels
Reinforcing steel for concrete or masonry
Relieving angles, if not attached to the *steel frame*
Safety cages
Shear stud connectors, if specified to be field installed
Stacks
Stairs
Steel deck
Steel (open-web) joists
Steel joist girders
Steel used as piling or piling accessories
Tanks
Toe plates
Trench or pit covers

Commentary:
Section 2.2 includes many items that may be furnished by the *fabricator* if contracted to do so by specific notation and detail in the *contract documents*. When such items are contracted to be provided by the *fabricator*, coordination will normally be required between the *fabricator* and other material suppliers and trades. The provisions in this Code are not intended to apply to items in Section 2.2.

SECTION 3. DESIGN DOCUMENTS AND SPECIFICATIONS

The issuing of design documents and specifications shall be by the *owner's designated representative for design (ODRD)*. The releasing of *design documents* and *specifications* shall be by an *owner*, *owner's designated representative for construction* (*ODRC)*, or other party. *Design documents* and *specifications* shall be released in accordance with Section A4.2 of ANSI/AISC 370.

Commentary:
Refer to the ANSI/AISC 370 Commentary to Section A4.2 for guidelines related to the issuance and release of design documents and specifications on a project.

3.1. Structural Design Documents and Specifications Issued for Construction

Structural design documents and specifications issued for construction for all or a portion of the work shall be based upon a completed design for the scope of work represented and provide the following information, as applicable, to define the work to be fabricated and erected:

(a) Information as required by the applicable building code.
(b) Information as required in ANSI/AISC 370 Section A4.
(c) Surface finish requirements as required for cleanability and aesthetics.
(d) Designation of members to which the requirements of Section 10 for *AESSS* apply.
(e) Where leveling plates are to be furnished, their locations and required thickness and sizes.

The structural *design documents*, *specifications*, and addenda shall be numbered and dated for the purposes of identification. Three-dimensional digital models shall contain a unique identifier.

Commentary:
In the interests of public safety, structural *design documents* and *specifications* issued for construction for all, or a portion of the work must be based upon a completed design for the scope of work represented. The items listed should include contractual requirements addressed in *the Code*.

The *engineer of record* should also consider all or a portion of the specified information to be shown on structural *design documents* and *specifications* used for ordering structural steel or placing mill orders. Changes made after ordering *structural stainless steel* or placing mill orders will likely lead to change orders if not properly coordinated and addressed in a timely manner prior to construction. Revisions to the *design documents* and *specifications* are covered under Section 3.6.

In some cases, the owner can benefit when reasonable latitude is allowed in the contract documents for alternatives that can reduce costs without compromising quality. However, critical requirements that are necessary to protect the *owner's*

interests that affect the integrity of the structure or that are necessary for the *fabricator* or *erector* to proceed with their work must be included in *the contract documents* issued for construction. A list of important information and requirements are provided to supplement items required for documents issued for construction in ANSI/AISC 370. This list should be modified or supplemented, if necessary, to suit actual project conditions.

3.2. Structural Design Documents and Specifications Issued as Contract Documents

3.2.1. Traditional Design-Bid-Build Delivery Method

For a traditional design-bid-build delivery method, structural *design documents* and *specifications* issued as the basis for *contract documents* shall provide the information as specified in Section 3.1 for structural *design documents* and *specifications issued for construction*.

3.2.2. Alternativ Delivery Methods

For alternative delivery methods, when structural *design documents* and *specifications* not meeting all the listed requirements of Section 3.2.1 are issued as *contract documents*, the listed information not specified shall be acknowledged in the contract with the *fabricator* and the *erector*. The *contract documents* shall convey the character, quantity, and complexity of the *structural stainless steel* to be fabricated and erected so that the *fabricator* and *erector* can provide bids that are accurate and complete. The information furnished shall include the following items as minimum requirements:

(a) The size, section, and location of all members. Unless the structural product used to make a member is known to exist in *stainless steel*, the cross section of the structural member shall be clearly defined, including by its overall dimensions and by the plate thicknesses of its constituent components.

Commentary:
Many of the steel structural shapes or structural products found in ASTM A6/A6M and the AISC *Steel Construction Manual* are not commonly available as rolled or extruded shapes in *stainless steel*. Many *structural stainless steel* shapes can be produced as laser or laser hybrid welded per ASTM A1069/A1069M or ASTM A1127/A1127M or fabricated as otherwise allowed in ANSI/AISC 370, Table A3.1. *Built-up sections* should be completely specified in the *contract documents*.

(b) The required *stainless steel* alloy, including *UNS designation*; *strength grade*, if applicable; heat treatment condition, if applicable; and surface finish requirements of the *structural stainless steel* shall be incorporated in the *contract documents*.

(c) Any paint, coatings, gaskets, bushings, or other means necessary to mitigate galvanic corrosion at all *bimetallic interfaces* on the *structural stainless steel*.
(d) Geometry and work points necessary for layout.
(e) Column base, floor, and roof elevations.
(f) Column centers and offsets.
(g) The camber requirements for members.
(f) The lateral force-resisting system and connecting diaphragm elements that provide for lateral strength and stability in the completed structure.
(g) Requirements for all *connections* and member reinforcement as required by Sections 3.2.3 and 3.2.4. For *connections* that are delegated by Section 3.2.3, Option 3, the *engineer of record* shall provide project-specific schematic *connection* details for all *connection* types based on realistic design forces to define the design intent and sufficient information for the delegated *connection* designer (the licensed engineer to whom the work is delegated) to understand the scope and nature of the delegated work and its relationship to the overall design. The information that is required to perform the delegated design shall be commensurate with the character and complexity of the project.

Where any of the information required for a complete design as defined in Section 3.1 for *design documents* and *specifications* issued for construction is not specified, including member reinforcement and *connections* that are delegated with Section 3.2.3, Option 3, *allowances* shall be specified in the contract and the provisions of Section 9.1.5 shall apply.

When the actual quantity and/or details of any of the required items differ from the specified *allowances*, including *connections* and all member reinforcement where delegated with Section 3.2.3, Option 3, the final contract price and schedule shall be adjusted equitably in accordance with Section 9.1.5.

When an alternative project delivery method is selected, release of the structural *design documents* and *specifications* shall constitute a release for the purpose stated on the *design documents* and *specifications* that were issued by the *ODRD*, as specified in Section 3, regardless of the status of the architectural, electrical, mechanical, and other interfacing designs and *contract documents*. Subsequent revisions, if any, released after the *design documents* and *specifications* are released for construction, shall be the responsibility of the owner and shall be made in accordance with Sections 3.6 and 9.3.

Commentary:
The Code has been modified to clarify the requirements for *design documents* and *specifications* issued for construction (refer to the Glossary for the definition of *issued for construction*) and issued for *contract documents* (*design drawings* and/or *digital model*, where applicable, *specifications*, and the contract with the *fabricator* or *erector*). Documents *issued for construction* for all or a portion of the work are subject to the requirements of Section 3.1. *Design documents* issued as the basis of a contract for *structural stainless steel* fabrication and erection are covered in a new Section 3.2. Section 3.2 now addresses all the items formerly located in Sections 3.1.1 and 3.1.2 of the 2021 Code, including member reinforcement (such

as stiffeners, web doubler plates, and beam bearing stiffeners) away from *connections* and at locations of *connections*. Any of these items, or other items that are not defined on partially complete documents issued for *contract documents* as stated in Section 3.2.2 for alternate delivery methods, should be treated as an allowance by the various stakeholders to a contract. The requirements for an allowance are covered in Section 9.1.5, including the commentary, which further explains their purpose and application.

Contract documents can vary greatly in complexity and completeness depending on the delivery method utilized for the project. Nonetheless, the *fabricator* and *erector* must be able to rely upon the accuracy and completeness of the *contract documents* for bidding. This allows the *fabricator* and *erector* to provide the *owner* with bids that are adequate and complete.

This section lists the minimum requirements for *contract documents*. If partially complete documents are issued for *contract documents*, the parties (including, but not limited to, the *owner*, *ODRD* and *ODRC*, the *fabricator*, and *erector*) should collaborate to reach mutual agreement on what information is not specified and document in writing what *allowances* are to be included with appropriate contingencies for the uncertainty (including *allowances* for member reinforcement and *connections* where Option 3 is specified). Any contracts can then be executed according to the provisions of Section 9.1.5 for reconciliation by change order after the design of the missing information is completed. Refer to Commentary Section 9.1.5.

Alternative project delivery methods other than the traditional design-bid-build method generally provide for a condensed schedule for the design and construction of a project in an effort to reduce overall cost of a project. The *owner* elects to release for construction the structural *design documents* and *specifications*, which may be partially complete, at a time that may precede the completion of and coordination with architectural, mechanical, electrical, and other design work and *contract documents*. The release of the structural *design documents* and *specifications* may also precede the release of the General Conditions and Division 1 Specifications.

Release of the structural *design documents* and *specifications* to the *fabricator* for ordering of material constitutes a *release for construction*. Accordingly, the *fabricator* and the *erector* may begin their work based upon those partially complete documents. As the structural, architectural, mechanical, electrical, and other *design documents* for the project are completed, *revisions* are likely required in design and/or construction. Thus, when considering these alternative project delivery methods, the owner should evaluate the potential benefits to the project schedule and cost along with the added cost of changes that are likely to occur. A project cost contingency is necessary to allow for these subsequent changes. The potential cost savings to the project is net of the cost of these design and construction changes.

3.2.3. **Requirements for Connections**

The *ODRD* shall indicate one of the following options for each *connection*:

(1) Option 1: The complete *connection* design shall be shown in the structural *design documents*.
(2) Option 2: The *connection* shall be designated in the structural *design documents* or *specifications* to be selected or completed by an experienced *steel detailer*. The experienced *steel detailer* shall utilize reference information provided in the *design documents* in the selection or completion of the *connections*. A list of other reference information, if any, provided by the *detailer* shall be approved by the *ODRD*.
(3) Option 3: The *connection* shall be designated in the structural *design documents* or *specifications* to be designed by a licensed engineer working for the *fabricator*. The following additional requirements apply:

    (a) *Substantiating connection information* shall be provided for Option 3.
    (b) The *fabricator* shall submit in a timely manner representative samples of the required *substantiating connection information* for all types of *connections* in the *steel frame* to the *ODRD*. The *ODRD* shall confirm in writing in a timely manner that these representative samples are consistent with the requirements of the *contract documents*, or shall advise what modifications are required to bring the representative samples into compliance with the requirements of the *contract documents*. This initial submittal and review is in addition to the requirements in Section 4.4.
    (c) The licensed engineer in responsible charge of the *connection* design shall review and confirm in writing as part of the *substantiating connection information*, that the *approval documents* properly incorporate the connection designs. However, this review by this licensed engineer in responsible charge of the *connection* design does not replace the approval process of the *approval documents* by the *ODRD* in Section 4.4.
    (d) The *fabricator* shall provide a means by which the *substantiating connection information* is referenced to the related *connections* on the *approval documents* for the purpose of review.

When Option 2 or 3 is specified, the *owner's designated representative for design* shall provide the following *connection* design criteria in the structural *design documents* and *specifications*:

(a) Project specific *connection* details that show the conceptual configuration for the order of magnitude forces to be transferred.
(b) Any restrictions on the types of *connections* that are permitted.
(c) Data concerning the loads including shears, moments, axial forces, and *transfer forces* that are resisted by the individual members and their *connections*, sufficient to allow selection, completion, or design of the *connection* details while preparing the *approval documents.*
(d) Whether the data required in (c) is given at the service-load level or the factored-load level.

(e) Whether LRFD or ASD is to be used in the selection, completion, or design of *connection* details.
(f) What *substantiating connection information* is to be provided with the *approval documents* to the *ODRD*.

In all three of the preceding options, the approval process in Section 4.4 shall be followed.

Commentary:
There are three options covered in this Section:

(1) In Option 1, the *ODRD* shows the complete design of the *connections* in the structural *design documents*. The following information is included:

(a) All work point locations and *connection* geometry
(b) All plate and angle sizes, thicknesses, dimensions, alloys, and *strength grades* (where required)
(c) All weld types, sizes, lengths, locations and strengths
(d) All bolt alloys, sizes, locations, quantities, and *strength grades*
(e) Member setback distances from the specified work point
(f) Surface preparation at faying surfaces for bolting or for corrosion protection
(g) Any member end preparation required such as copes, blocks, cuts, or chipping
(h) Any member reinforcement required at *connections* (see Section 3.2.4)
(i) Consideration of all applicable strength limit states
(j) Consideration of fit-up and constructability
(k) Any other items required for consideration in the particular *connection* design and detailing so that a *steel detailer* can detail the *connection* on the *fabrication documents*

The intent of this approach is that complete design information necessary for detailing the *connection* is shown in the structural *design documents*. Typical details are shown for each *connection* type, set of geometric parameters, and adjacent framing conditions. The *steel detailer* will then be able to transfer this information to the *approval documents*, applying it to the individual pieces being detailed.

(2) In Option 2, the *ODRD* allows an experienced *steel detailer* to select or complete the *connections*. This is commonly done by referring to loads embedded in the digital model, tables or schematic information in the structural *design documents*, or other reference information approved by the *ODRD*, such as journal papers and recognized software output. Tables and schematic information in the structural *design documents* should provide such

information as weld types and sizes, plate thicknesses, and quantities of bolts. However, there may be some geometry and dimensional information that the *steel detailer* must develop. The *steel detailer* will then configure the *connections* based upon the design loads and other information given in the structural *design documents* and *specifications*.

The intent of this method is that the *steel detailer* will select the *connection* materials and configuration from the referenced tables or complete the specific *connection* configuration (e.g., dimensions, edge distances and bolt spacing) based upon the *connection* details that are shown in the structural *design documents*.

The *steel detailer* must be experienced and familiar with AISC requirements for *connection* configurations, the calculation of dimensions, and adaptation of typical *connection* details to similar situations. Notations of loadings in the structural *design documents* are only to facilitate selection of the *connections* from the referenced documents. It is not the intent that this method be used when the practice of engineering is required.

(3) Option 3 reflects the practice to have a licensed engineer working for or retained by the *fabricator* design the *connections*, and recognizes the information required by the *fabricator* to do this work. The *ODRD*, who has the knowledge of the structure as a whole, must review and approve the *approval documents*, and the *substantiating connection information* that is requested. See Section 4.4 for the approval process.

When, under Section 3.2.3, the *ODRD* designates that *connections* are to be designed by a licensed engineer employed or retained by the *fabricator*, this work is incidental to, and part of the requirements for fabricating and constructing the *steel frame*. The licensed engineer performing the *connection* design is not providing a peer review of the *contract documents.*

The *ODRD* reviews the *approval documents* during the approvals process as specified in Section 4.4 for conformance with the specified criteria and compatibility with the design of the primary structure.

One of these options should be indicated for each *connection* in a project. It is acceptable to group *connection* types and utilize a combination of these options for the various *connection* types involved in a project. Option 3 is not normally specified for *connections* that can be selected or completed as noted in Option 2 without practicing engineering.

If there are any restrictions as to the types of *connections* to be used, it is required that these limitations be set forth in the structural *design documents* and *specifications*. There are a variety of *connections* available for a given situation. Preference for a particular type will vary between *fabricators* and *erectors*. Stating these limitations, if any, in the structural *design documents* and *specifications* will help to avoid repeated changes to the *approval documents* due to the selection of a *connection* that is not acceptable to the *ODRD*, thereby avoiding additional cost and/or delay for revising the *approval documents*.

For Option 2 and Option 3, the structural *design documents* must indicate the design loads for *connections* including *transfer forces*. *Transfer forces* can be determined using the *connection* geometry and statics for an individual load combination. However, *transfer forces* must be explicitly provided by the *engineer of record* when *connection* design loads are provided as maximum and minimum member forces resulting from more than one load combination or resulting from prescriptive rules provided in the *contract documents*.

The structural *design documents* must indicate the method of design used as LRFD or ASD. In order to conform to the spirit of ANSI/AISC 370, the *connections* must be selected using the same method and the corresponding references.

Substantiating connection information can take many forms. When Option 2 is designated, the *approval documents* may suffice unless additional information is requested by the *engineer of record*. When Option 3 is designated, the *substantiating connection information* is required and may take the form of hand calculations and/or software output, and any additional information as requested by the *ODRD*.

When *substantiating connection information* is required, it is required that representative samples of that information be agreed upon prior to preparation of the *approval documents*, in order to avoid additional cost and/or delay for the *connection* redesign and/or revising that might otherwise result.

The *ODRD* may require that the *substantiating connection information* be signed and sealed for Option 3. The signing and sealing of the cover letter transmitting the *approval documents* and *substantiating connection information* may suffice. This signing and sealing indicates that a licensed engineer performed the work but does not replace the approval process provided in Section 4.4.

A requirement to sign and seal each sheet of the *shop* and *erection drawings* is discouraged as it may serve to confuse the design responsibility between the *ODRD* and the licensed engineer's work in performing the *connection* design. Such a requirement may not be possible when submitting *fabrication* and *erection models*.

3.2.4. Requirements for Member Reinforcement

1. At locations away from *connections*: stiffeners, web doubler plates, bearing stiffeners, and all other member reinforcement, where required, shall be designed by the *ODRD* and shown in sufficient detail in the structural *design documents* so that the quantity, detailing, and fabrication requirements for these items can be readily understood.
2. At locations of *connections*: the following requirements shall apply to column stiffeners, web doubler plates, beam bearing stiffeners, and all other member reinforcement required to satisfy strength and equilibrium of forces through the *connection*:
   (a) These items, if required, shall be designed by the *ODRD* and shown in the structural *design documents* so that the quantity, detailing and fabrication requirements can be readily understood. or

(b) Where *connections* and member reinforcement are specified to be designed by a licensed *engineer* working for the *fabricator*, the *ODRD* shall provide project-specific schematic details for member reinforcement with sufficient information for a *fabricator* to obtain an accurate bidding quantity and any limitations regarding the type and connection of member reinforcement. If no quantities or conceptual configurations are shown, member reinforcement at *connections* will not be included in the bid.

Commentary:
When considering member reinforcement, Option 3 is most useful when the *ODRD* delegates the *connection* design but has selected members to eliminate or minimize the need for member reinforcement at *connections*. Alternatively, the *design documents* should specify that the determination and design of member reinforcement at *connections* is delegated to the licensed *engineer* working for the *fabricator*. In such cases, the *ODRD* must provide schematic details for member reinforcement with sufficient information for bidding.

When no quantities and details are shown for column stiffeners, web doubler plates, beam bearing stiffeners, and/or other member reinforcement required to satisfy strength and equilibrium of forces through *connections*, the *fabricator's* bid reflects no *allowance* for these items. Should it subsequently be determined that member reinforcement at *connections* is required, the provisions of Sections 9.4 and 9.5 then apply.

3.3. Architectural, Electrical, and Mechanical Design Documents and Specifications

All requirements for the quantities, sizes, and locations of *structural stainless steel* shall be shown or noted in the structural *design documents*. The structural *design documents* are permitted to reference the architectural, electrical, and/or mechanical *design documents* as a supplement to the structural *design documents* for the purposes of defining detail configurations and construction information.

When the referenced information is not available at the time of structural design, bidding, detailing, or fabrication, subsequent *revisions* shall be the responsibility of the *owner* and shall be made in accordance with Sections 3.6 and 9.3.

3.4. Discrepancies

When discrepancies exist between the *design documents* and *specifications*, the *design documents* shall govern. When discrepancies exist between scale dimensions in the *design documents* and the figures written in them, the figures shall govern. When discrepancies exist between the structural *design documents* and the architectural, electrical, or mechanical *design documents*, or the *design documents* for other trades, the structural *design documents* shall govern. When

discrepancies exist between the *design drawings* and the *design model*, the governing document shall be as identified per Section 1.4.

When a discrepancy is discovered in the *contract documents* in the course of the *fabricator's* work, the *fabricator* shall promptly notify the *ODRC* so that the discrepancy can be resolved. Such resolution shall be timely so as not to delay the *fabricator's* work. See Sections 3.6 and 9.3.

It is not the *fabricator's* responsibility to discover discrepancies, including those that are associated with the coordination of the various design disciplines.

3.5. Legibility of Design Drawings

Design drawings shall be clearly legible and drawn to an identified scale that is appropriate to clearly convey the information.

Commentary:
Historically, the most commonly accepted scale for *structural steel* drawings has been 1/8 in. per ft (10 mm per 1 000 mm). There are, however, situations where a smaller or larger scale is appropriate. Ultimately, consideration must be given to the clarity of the drawing.

The scaling of the *design drawings* to determine dimensions is not an accepted practice for detailing the *approval documents*. However, it should be remembered when preparing *design drawings* that scaling may be the only method available when early-submission drawings are used to determine dimensions for estimating and bidding purposes.

3.6. Revisions to the Design Documents and Specifications

Revisions to the *design documents* and *specifications* shall be made either by issuing new *design documents* and *specifications* or by reissuing the existing *design documents* and *specifications*. In either case, all *revisions*, including *revisions* that are communicated through responses to *RFIs* or the annotation of the *approval documents* (see Section 4.4.2), shall be clearly and individually indicated in the *contract documents*. The *contract documents* shall be dated and identified by *revision* number. When the *design documents* are communicated using *design drawings*, each *design drawing* shall be identified by the same drawing number throughout the duration of the project, regardless of the *revision*. See also Section 9.3.

When *revisions* are communicated using *design models*, *revisions* shall be made evident in the revised *design model* submitted by identifying within the *design model* which items are changed. Alternatively, the changes shall be submitted with a written document describing in explicit detail the items that are changed. A historic tracking of changes must either be present in the revised *design model* or maintained in the written record of changes.

The party or entity that is contractually assigned responsibility for managing the *design model* shall maintain accurate accounting and tracking records of the most current *design model*, as well as previously superseded *design models*, and shall

facilitate a tracking mechanism so that all contracted parties are aware of, and have access to, the most current *design model*.

Commentary:
Revisions to the *design documents* and *specifications* can be made by issuing sketches and supplemental information separate from the *design documents* and *specifications*. These sketches and supplemental information become amendments to the *design documents* and *specifications* and are considered new *contract documents*. All sketches and supplemental information must be uniquely identified with a number and date as the latest instructions until such time as they may be superseded by new information.

When *revisions* are made by revising and reissuing the existing structural *design documents* and/or *specifications*, a unique *revision* number and date must be added to those documents to identify that information as the latest instructions until such time as they may be superseded by new information. When the *design documents* are communicated using *design drawings*, the same unique drawing number must identify each *design drawing* throughout the duration of the project so that revisions can be properly tracked, thus avoiding confusion and miscommunication among the various entities involved in the project.

When *revisions* are communicated through the annotation of the *approval documents* or contractor submissions, such changes must be confirmed in writing by one of the aforementioned methods. This written confirmation is imperative to maintain control of the cost and schedule of a project and to avoid potential errors in fabrication.

When *design models* are used, a similar unique method of identifying each *revision* must be used. This method can vary in various digital modeling software, but the same level of notation of changes must be present in the revised *design model* as would be used on *design drawings*.

3.7 Intellectual Property

Any copyright or other property or proprietary rights owned by the *ODRD* in any content included within the *contract documents*, whether created specifically for an individual project or otherwise made available for use on an individual project, shall remain the exclusive property of the *ODRD*.

SECTION 4. APPROVAL DOCUMENTS

4.1. Owner Responsibility

The *owner* shall furnish, in a timely manner and in accordance with the *contract documents*, the complete structural *design documents* and *specifications* that have been *released for construction*. Unless otherwise noted, *design documents* and *specifications* that are provided as part of the contract bid documents shall constitute authorization by the *owner* that the *design documents* and *specifications* are *released for construction*.

Commentary:
When the *owner* issues *design documents* and *specifications* that are *released for construction*, the *fabricator* and the *erector* rely on the fact that these are the *owner's* requirements for the project. This release is required by the *fabricator* prior to the ordering of material and the preparation and completion of the *approval documents*.

To ensure the orderly flow of material procurement, detailing, fabrication, and erection activities on phased construction projects, it is essential that designs are not continuously revised after they have been *released for construction*. In essence, once a portion of a design is *released for construction*, the essential elements of that design should be "frozen" to ensure adherence to the contract price and construction schedule. Alternatively, all parties should reach a common understanding of the effects of future changes, if any, as they affect scheduled deliveries and added costs.

A pre-detailing conference, held after the *structural stainless steel* fabrication contract is awarded, can benefit the project. Typical attendees may include the *owner's designated representative for construction*, the *owner's designated representative for design*, the *fabricator*, the *steel detailer*, and the *erector*. Topics of the meeting should relate to the specifics of the project and might include:

- Contract document review and general project overview, including *clarifications* of scope of work, tolerances, layouts and sequences, and special considerations.
- Detailing and coordination needs, such as bolting, welding, and *connection* considerations, constructability considerations, OSHA requirements, coordination with other trades, and the advanced bill of materials.
- The project communication system, including distribution of contact information for relevant parties to the contract, identification of the primary and alternate contacts in the general contractor's office, and the *RFI* system to be used on the project.
- The submittal schedule, including the method of submitting (electronic or hard copy); for hard copy, how many copies of documents are required; *connection* submittals; and identification of schedule-critical areas of the project, if any.

- If digital models will be used as part of the delivery method for the *design documents*, the parties should determine and convey the *levels of development*, the digital model types that will be furnished, the authorized uses of such digital models, the transmission of digital models to prevent the loss or alteration of data, interoperability, and methods of review and approval. The term "levels of development" refers to the level of completeness of elements within the digital model (see the BIMFORUM *Level of Development Specification*). The term "authorized uses" refers to the permitted uses of the digital model(s) and the digital data associated with the digital model(s). Such authorized uses may include the right to (1) store and view the digital model(s) for informational purposes only; (2) rely upon, store and view the digital model(s) to carry out the work on the project; (3) reproduce and distribute the digital model(s) for informational purposes only; (4) rely upon, reproduce and distribute the digital model(s) to carry out the work; (5) incorporate additional digital data into the digital model(s) without modifying the data received to carry out the work on the project; (6) modify the digital model(s) as required to carry out the work on the project; (7) produce the digital model(s) in an archival format for the *owner* to use as a reference for as-built construction data and/or for the operation of the project after completion; and/or (8) other authorized uses specified in the *contract documents*.
- Review of quality and inspection requirements, including the approvals process for corrective work.

Record of the meeting should be written and distributed to all parties. Subsequent meetings to discuss progress and issues that arise during construction also can be helpful, particularly when they are held on a regular schedule.

4.2. Fabricator Responsibility

4.2.1. Except as provided in Section 4.5, the *fabricator* shall produce the *approval documents* for the fabrication and erection of the *structural stainless steel* and is responsible for the following:

(a) The transfer of information from the *contract documents* into accurate and complete *approval documents*
(b) The development of accurate, detailed dimensional information to provide for the fit-up of parts in the field

Commentary:
The *fabricator* is permitted to use the services of independent *steel detailers* to produce *approval documents* and to perform other support services, such as producing advanced bills of material and bolt summaries.

As the *fabricator* develops the detailed dimensional information for production of the *approval documents*, there may be discrepancies, missing information, or conflicts discovered in the *contract documents*. See Section 3.4.

4.2.2. Any copyright or other property or proprietary rights owned by the *fabricator* in any content included within the *approval documents*, whether created specifically for an individual project or otherwise made available for use on an individual project, shall remain the exclusive property of the *fabricator*.

4.2.3. When the *approval documents* are *shop* and *erection drawings*, each *shop* and *erection drawing* shall be identified by the same drawing number throughout the duration of the project and shall be identified by *revision* number and date, with each specific *revision* clearly identified. When the *approval documents* are *fabrication* and *erection models*, each submittal shall be uniquely identified.

When the *fabricator* submits a request to change *connection* details that are described in the *contract documents*, the *fabricator* shall notify *the owner's designated representatives for design (ODRD)* and *construction (ODRC)* in writing in advance of the submission of the *approval documents*. The *owner's designated representative for design* shall review and approve or reject the request in a timely manner.

When requested to do so by the *ODRD*, the *fabricator* shall provide to the *ODRD* and the *ODRC* its schedule for the submittal of *approval documents* so as to facilitate the timely flow of information between all parties.

Commentary:
When the *fabricator* intends to make a submission of alternative *connection* details to those shown in the *contract documents*, the *fabricator* must notify the *ODRD* and the *ODRC* in advance. This will allow the parties involved to plan for the increased effort that may be required to review the alternative *connection* details. In addition, the *owner* will be able to evaluate the potential for cost savings and/or schedule improvements against the additional design cost for review of the alternative *connection* details by the *ODRD*. This evaluation by the *owner* may result in the rejection of the alternative *connection* details or acceptance of the submission for review based upon cost savings, schedule improvements, and/or job efficiencies.

The *ODRD* may request the *fabricator's* schedule for the submittal of the *approval documents*. This process is intended to allow the parties to plan for the staffing demands of the submission schedule. The *contract documents* may address this issue in more detail. In the absence of the requirement to provide this schedule, none need be provided.

When the *fabricator* provides a schedule for the submission of the *approval documents*, it must be recognized that this schedule may be affected by *revisions* and the response time to requests for missing information or the resolution of discrepancies.

4.3. Use of Digital Files or Copies of the Design Documents

The *fabricator* shall neither use nor reproduce any part of the *design documents* as part of the *approval documents* without the written permission of the *ODRD*. When

digital files or copies of the *design documents* are made available for the *fabricator's* use as part of the *approval documents*, the *fabricator* shall accept this information under the following conditions:

(a) All information contained in the digital files or copies of the *design documents* shall be considered instruments of service of the *ODRD* and shall not be used for other projects, additions to the project, or the completion of the project by others. Digital files or copies of the *design documents* shall remain the property of the *ODRD* and in no case shall the transfer of these copies of the *design documents* be considered a sale or unrestricted license.
(b) CAD files or copies of the *design drawings* shall not be considered to be *contract documents*. In the event of a conflict between the *design drawings* and the CAD files or copies thereof, the *design drawings* shall govern.
(c) When a *design model* is made available for use by the *fabricator*, the *ODRC* shall designate whether the *design model* and/or other documents are to be considered the *contract documents*. See Section 1.4.
(d) Any party or entity that creates a copy of the *design model* does so at their own risk.
(e) The use of copies of the *design documents* shall not in any way obviate the *fabricator's* responsibility for proper checking and coordination of dimensions, details, member sizes and fit-up, and quantities of materials as required to facilitate the preparation of *approval documents* that are complete and accurate as required in Section 4.2.
(f) If copies of *design drawings* are used by the *fabricator*, the *fabricator* shall remove information that is not required for the fabrication or erection of the *structural stainless steel* from the copies of the *design drawings*.

Commentary:
Copies of the *design documents* often are readily available to the *fabricator*. As a result, the *ODRD* may have reduced control over the unauthorized use of the *design documents*. There are many copyright and other legal issues to be considered.

The *ODRD* may choose to make copies of the *design documents* available to the *fabricator* and may charge a service or licensing fee for this convenience. In doing so, a carefully negotiated agreement should be established to set out the specific responsibilities of both parties in view of the liabilities involved for both parties. For sample contracts, see Consensus Docs 301 *BIM Addendum*, AIA Document E202 *Building Information Modeling Protocol Exhibit*, AIA Document E203 *Building Information Modeling and Digital Data Exhibit*, AIA Document G201 *Project Digital Data Protocol Form*, and AIA Document G202 *Project Building Information Modeling Protocol Form*.

Once the *design model* has been accessed and/or modified by any entity other than the *owner's designated representative for design*, the resulting model is considered a copy of the *design model* and is no longer part of the *contract documents*.

The copies of the *design documents* are provided to the *fabricator* for convenience only. The information therein should be adapted for use only in

reference to the placement of *structural stainless steel* members during erection. The *fabricator* should treat this information as if it were fully produced by the *fabricator* and undertake the same level of checking and quality assurance. When amendments or *revisions* are made to the *contract documents*, the *fabricator* must update this reference material.

When copies of the *design drawing*s are provided to the *fabricator*, they often contain other information, such as architectural backgrounds or references to other *contract documents*. This additional material should be removed when producing the *approval documents* to avoid the potential for confusion.

Just like the transmission of the *design documents* created by the *owner's designated representative for design* does not convey ownership rights in the *design documents*, the transmission of the *approval documents* created by the *fabricator* does not convey ownership rights in the *approval documents*.

4.4. Approval

The *approval documents* shall be submitted to the *ODRD* and the *ODRC* for review and approval. The *approval documents* shall be returned to the *fabricator* within 14 calendar days.

Final *substantiating connection information* shall also be submitted with the *approval documents* when Option 3 is designated, and as required in the contract documents when Option 2 is designated. The *ODRD* is the final authority in the event of a disagreement between parties regarding the design of *connections* to be incorporated into the overall *steel frame*. The *fabricator* and licensed engineer in responsible charge of *connection* design are entitled to rely upon the *connection* design criteria provided in accordance with Section 3.2. *Revisions* to these criteria shall be addressed in accordance with Sections 9.3 and 9.4.

Approved *approval documents* shall be individually annotated by the *ODRD* and *ODRC* as either approved or approved subject to corrections noted. When so required, the *fabricator* shall subsequently make the corrections noted and furnish corrected *fabrication* and *erection documents* to the *ODRD* and the *ODRC*.

Commentary:

As used in *this Code*, the 14-day allotment for the return of *approval documents* is intended to represent the *fabricator's* portal-to-portal time. The intent in *this Code* is that, in the absence of information to the contrary in the *contract documents*, 14 days may be assumed for the purposes of bidding, contracting, and scheduling. When additional time is desired, such as when *substantiating connection information* is part of the submittals, the modified allotment should be specified in the *contract documents*. A submittal schedule is commonly used to facilitate the approval process.

If the *approval documents* are approved subject to corrections noted, the *ODRD* may or may not require that it be resubmitted for record purposes following correction. If the *approval documents* are not approved, *revisions* must be made, and the documents resubmitted until approval is achieved.

4.4.1. Approval, approval subject to corrections noted, and similar approvals of the *approval documents* shall constitute the following:

(a) Confirmation that the *fabricator* has correctly interpreted the *contract documents* in the preparation of those submittals.
(b) Confirmation that the *ODRD* has reviewed and approved the *connection* details shown in the *approval documents* submitted in accordance with Section 3.2.3.
(c) Release by the *ODRD* and the *ODRC* for the *fabricator* to begin fabrication using the approved submittals.

Such approval shall not relieve the *fabricator* of the responsibility for either the accuracy of the detailed dimensions in the *approval documents* or the general fit-up of parts that are to be assembled in the field.

The *fabricator* shall determine the fabrication schedule that is necessary to meet the requirements of the contract.

Commentary:
When considering the current language in this Section, the Committee sought language that would parallel the practices of CASE. In CASE Document 962, CASE indicates that when the design of some element of the primary structural system is left to someone other than the *structural engineer of record*, "…such elements, including *connections* designed by others, should be reviewed by the *structural engineer of record*. He [or she] should review such designs and details, accept or reject them and be responsible for their effects on the primary structural system." Historically, both ANSI/AISC 313 and the AISC *Code of Standard Practice for Steel Buildings and Bridges*, ANSI/AISC 303, have embraced this same concept.

From the inception of ANSI/AISC 303, AISC, and the industry in general, have recognized that only the *ODRD* has all the information necessary to evaluate the total impact of *connection* details on the overall structural design of the project. This authority traditionally has been exercised during the approval process for the *approval documents*. The *ODRD* has thus retained responsibility for the adequacy and safety of the entire structure since at least the 1927 edition of ANSI/AISC 303.

4.4.2. Unless otherwise noted, any additions, deletions, or *revisions* that are indicated in responses to *RFIs* or on the approved *approval documents* shall constitute authorization by the *owner* that the additions, deletions, or *revisions* are *released for construction*. The *fabricator* and the *erector* shall promptly notify the *ODRC* when any direction or notation in responses to *RFIs* or on the *approval documents* or other information will result in an additional cost and/or a delay. See Sections 3.6 and 9.3.

Commentary:

When the *fabricator* notifies the *ODRC* that a direction or notation in responses to *RFIs* or on the *approval documents* will result in an additional cost or a delay, it is then normally the responsibility of the *ODRC* to subsequently notify the *ODRD*.

4.5. Fabrication and/or Erection Documents Not Furnished by the Fabricator

When the *fabrication* and *erection documents* are not prepared by the *fabricator*, but are furnished by others, they shall be reviewed and approved by the *ODRD* and final *fabrication* and *erection documents* shall be delivered to the *fabricator* in a timely manner. These *fabrication* and *erection documents* shall be prepared, insofar as is practical, in accordance with the shop fabrication and detailing standards of the *fabricator*. The *fabricator* shall not be responsible for the completeness, coordination, or accuracy of *fabrication* and *erection documents* so furnished, nor for the general fit-up of the members that are fabricated in accordance with the documents provided.

Commentary:
Preparation of *fabrication* and *erection* documents by parties other than the *fabricator* carries significant risks for the project team and should only be undertaken after careful consideration of these risks.

The preparation of the fabrication and *erection documents* is very specific to the needs of the *fabricator* performing the work, and an integral part of the constructability and coordination assurance of the project. If a party other than the *fabricator* prepares the *fabrication* and *erection documents*, the *contract documents* should be very clear as to the management of this process, including the manner in which the following issues will be addressed:

- Review and approval of the *fabrication* and *erection documents* by the *ODRD*.
- Standards, format and contents of the *fabrication* and *erection documents*, or representative documents that will be part of the *contract documents*, for the mill order, field bolts, and numerical control files for fabrication.
- Provisions for proper risk management (errors and omissions or product liability, as applicable).
- Licensing of proprietary products and technology, and any associated fees.
- Incorporation of normal "pre-detailing" sequencing, erection aids, other OSHA Sub Part R requirements, or other local or regional safety requirements.
- Specific shop standards including preferred marking system of members, standard material sizes, and field considerations such as erection issues related to site access and erection clearances.
- Timing and content of information necessary for material to be sourced, ordered, delivered, stored, fabricated, and shipped to accommodate the construction schedule.
- Schedule updates for documents and tracking of impact to overall project schedule and contract, as these dates are impacted.
- *Revision* and control of *fabrication* and *erection documents* in order to maintain the integrity of all parts of the *fabrication* and *erection* process.

- Late released items that impact such items as, but not limited to, fabrication resource allocation, delivery dates and erection sequences, particularly if the late released items are on the project's critical path or delay the release of critical path items. Late released items include items not completed due to lack of design information, items requiring additional information from the designer, or items affected by others, such as owner's design changes or modifications to the construction sequence by the *ODRC*.
- Fabrication phase support, including issues that arise on night shift and weekends.
- Protocol for handling delays in the field, including responsibility for standby costs of labor or equipment.
- Coordination of joist, deck, and other manufactured items, including coordination and addressing of requests for information.
- ..... Resolution of field issues and construction phase requests for information.

4.6. The RFI Process

When requests for information (*RFIs*) are issued, the process shall include the maintenance of a written record of inquiries and responses related to interpretation and implementation of the *contract documents*, including the *clarifications* and/or *revisions* to the *contract documents* that result, if any. *RFIs* shall not be used for the incremental release for construction of the *design documents*. When *RFIs* involve discrepancies or *revisions*, see Sections 3.4, 3.6, and 4.4.2.

When a *design model* is used as the *design documents*, the changes and/or *clarifications* made in response to *RFIs* shall be incorporated into the *design model*.

Commentary:

The *RFI* process is most commonly used during the detailing process but can also be used to forward inquiries by the *erector* or to inform the *ODRD* in the event of a *fabricator* or *erector* error and to develop corrective measures to resolve such errors.

The *RFI* process is intended to provide a written record of inquiries and associated responses but not to replace all verbal communication between the parties on the project. *RFIs* should be prepared and responded to in a timely fashion so as not to delay the work of the *steel detailer*, *fabricator,* and *erector*. Discussion of the *RFI* issues and possible solutions between the *fabricator*, *erector,* and *ODRD* and the *ODRC* often can facilitate timely and practical resolution. Unlike submittals in Section 4.4, *RFI* response time can vary depending on the urgency of the issue, the amount of work required by the *ODRD* and the *ODRC* to develop a complete response, and other circumstances, such as building official approval.

RFIs should be prepared in a standardized format, including *RFI* number and date, identity of the author, reference to a specific location(s) in the *design documents* or specification section, the needed response date, a description of a suggested solution (graphic depictions are recommended for more complex issues), and an indication of possible schedule and cost impacts. *RFIs* should be limited to one question each (unless multiple questions are interrelated to the same issue) to

facilitate the resolution and minimize response time. Questions and proposed solutions presented in *RFIs* should be clear and complete. *RFI* responses should be equally clear and complete in the depictions of the solutions and signed and dated by the responding party.

Unless otherwise noted, the *fabricator* and *erector* can assume that a response to an *RFI* constitutes a release for construction. However, if the response will result in an increase in cost or a delay in schedule, Section 4.4.2 requires that the *fabricator* and/or *erector* promptly inform the *ODRD* and *ODRC*.

4.7. Erection Documents

The *erection documents* shall be provided to the *erector* in a timely manner so as to allow the *erector* to properly plan and perform the work.

Commentary:
For planning purposes, this may include release of preliminary *erection documents*, if requested by the *erector*.

SECTION 5. MATERIALS

5.1. Mill Materials

Unless otherwise noted in the *contract documents*, the *fabricator* is permitted to order the materials that are necessary for fabrication when the *fabricator* receives *contract documents* that have been *released for construction*.

Commentary:
The *fabricator* may purchase materials in stock lengths, exact lengths, or multiples of exact lengths to suit the dimensions shown in the structural *design documents*. Such purchases will normally be job-specific in nature and may not be suitable for use on other projects or returned for full credit if subsequent design changes make these materials unsuitable for their originally intended use. The *fabricator* should be paid for these materials upon delivery from the mill, subject to appropriate additional payment or credit if subsequent unanticipated modification or reorder is required. Purchasing materials to exact lengths is not considered fabrication.

5.1.1. Unless otherwise specified by means of special testing requirements in the *contract documents*, mill testing shall be limited to those tests that are required for the material in the ASTM standards indicated in the *contract documents*. Materials shall be labeled by the supplier as produced in accordance with applicable ASTM standards prior to delivery to the *fabricator's* shop or other point of use. Material not so labeled by the supplier shall not be used until:

(a) Its identification is established by means of testing in accordance with the applicable ASTM standards
(b) A *fabricator's* identification, as described in Section 6.1 has been applied.

5.1.2. When *mill material* does not satisfy the tolerances of the ASTM standards or AWS standards for the product form for camber, profile, flatness, or sweep, the *fabricator* shall be permitted to perform corrective procedures, including the use of controlled heating and/or mechanical straightening, subject to the limitations in ANSI/AISC 370.

Commentary:
Dimensional tolerances for mill or built up *structural stainless steel* are set forth in the applicable ASTM standards for each product. Normal variations in the cross-sectional geometry of *structural stainless steel* shapes must be recognized by the designer, the *fabricator*, the *steel detailer*, and the *erector*. Geometric perfection of the cross section is not necessary for either structural or architectural reasons, if the tolerances are recognized and provided for.

The product or general requirements for each ASTM standard also stipulate tolerances for straightness that are adequate for typical construction. However, these characteristics may be controlled or corrected to closer tolerances during the

fabrication process when the added cost is justified by the special requirements for an atypical project.

The *fabricator* should be in close communication with the mill in the case where out of tolerance material is discovered. The remediation methods may vary greatly depending upon the processes used to make the section.

5.1.3. When the surface of the *structural stainless steel* has variations that exceed the tolerances found in the ASTM or AWS standards for the product form and these variations are discovered or occur after the receipt of *mill material* or built-up material, the *fabricator* shall, at the *fabricator's* option, be permitted to perform the corrective procedures prescribed in the applicable ASTM standard. Should the applicable ASTM standard not include corrective procedures for mill reconditioning, the *fabricator* may propose remediation procedures to the *ODRD* for review and approval.

5.1.4. When special tolerances that are more restrictive than those in the applicable ASTM standards are required for *mill materials*, such special tolerances shall be specified in the *contract documents*. The *fabricator* shall, at the *fabricator's* option, be permitted to order material to the applicable ASTM standards tolerances and subsequently perform the corrective procedures described in Sections 5.1.2 and 5.1.3.

5.2. Stock Materials

5.2.1. Stock material that does not have a material test report or material certificate of compliance shall not be used. The material test report or material certificate of compliance shall confirm compliance with the applicable ASTM standard for the material, and shall include mechanical properties (ultimate strength, yield strength, and percent elongation) tested in accordance with ASTM A370 and chemistry tested in accordance with ASTM A751. Testing shall be performed by a certified testing laboratory.

5.2.2. Mill certifications or material test reports from a certified lab shall be accepted as sufficient record of the quality of materials taken from stock by the *fabricator*. The *fabricator* shall review and retain the mill certifications or material test reports that cover such stock materials. The *fabricator* shall maintain records that identify individual pieces or bundled lot of stock material against individual material test reports or material certificates of compliance.

SECTION 6. SHOP FABRICATION AND DELIVERY

6.1. Identification of Material

6.1.1. The *fabricator* shall be able to demonstrate by written procedure and actual practice a method of material identification, visible up to the point of assembling members as follows:

(a) For all material, identification capability shall include shape designation, *stainless steel* alloy, and, where appropriate, *strength grade* and condition or heat treatment. Representative material test reports and material certificates of compliance shall be furnished by the *fabricator* if requested to do so by the *owner's designated representative for design* (*ODRD*), either in the *contract documents* or in separate written instructions given to the *fabricator* prior to ordering *mill materials*.

(b) For material ordered in accordance with an ASTM supplement or other special material requirements in the *contract documents*, identification capability shall include *stainless steel* alloy, and, where appropriate, *strength grade*, condition or heat treatment, and laboratory test reports (if required) or mill certification documenting compliance with supplementary requirements with heat number. The corresponding material test reports shall be furnished by the *fabricator* if requested to do so by the *ODRD*, either in the *contract documents* or in separate written instructions given to the *fabricator* prior to ordering *mill materials*.

6.1.2. During fabrication, up to the point of assembling members, each piece of material that is ordered to special material requirements shall carry a *fabricator's* identification label or an original supplier's identification label. The *fabricator's* identification label shall be in accordance with the *fabricator's* established material identification system, which shall be on record and available prior to the start of fabrication for the information of the *owner's designated representative for construction* (*ODRC*), the building code authority, and the *inspector*.

Commentary:
In many applications, *fabricator's* identification marks may adversely affect either the appearance or corrosion resistance of the *structural stainless steel* elements. The *fabricator's* identification marks shall be of a size and location that does not cause unacceptable corrosion or blemishing of the surface after erection.

6.1.3. Members that are made of material that is ordered to special material requirements shall not be given the same assembling or erection mark as members made of other material, even if they are of identical dimensions and detail.

6.2. Preparation of Material

6.2.1. Plasma or laser cutting of *structural stainless steel* by hand-guided or mechanically guided means is permitted.

6.2.2. Surfaces of cut edges that are specified as "finished," with no further definition in the *contract documents* shall have a roughness height value measured in accordance with ASME B46.1 that is equal to or less than 500 µin. (12.5 µm) R_a. The use of any fabricating technique that produces such a finish is permitted.

Commentary:
Most cutting processes, including friction sawing and cold sawing, and milling processes meet a surface roughness limitation of 500 µin. (12.5 µm) R_a per ASME B46.1. Note that a 500 µin. (12.5 µm) R_a roughness height is very rough and may increase the accumulation of corrosive deposits. There is a direct correlation between rougher surfaces and the increased potential for corrosion of *stainless steel* in an aggressive environment.

6.3. Fitting and Fastening

6.3.1. Projecting elements of *connection* materials need not be straightened in the connecting plane, subject to the limitations in ANSI/AISC 370.

6.3.2. Backing and runoff tabs shall be used in accordance with AWS D1.6/D1.6M as required to produce sound welds. When requested by the fabricator or erector and approved by the *ODRD*, the backing need not be removed.

6.3.3. Unless otherwise noted in the *fabrication documents*, high-strength bolts for shop-attached *connection* material shall be installed in the shop in accordance with the requirements in ANSI/AISC 370.

6.4. Shop Cleaning and Finishing (see also Section 3.1)
The finish required on *structural stainless steel* shall be specified in the *contract documents*. *Structural stainless steel* that has no special finish requirements shall be supplied with no coatings and it shall be cleaned of oil and grease with solvent cleaners, and of dirt, *free iron*, and other foreign material by sweeping with a fiber brush or other suitable means in accordance with ASTM A967/A967M. Deeply embedded contamination from *free iron* or other metals shall be removed in compliance with ASTM A380/A380M.

Commentary:
There are a wide variety of finishes and surface treatments available. The type of surface finish may have implications for the long-term performance of the *structural stainless steel* elements, with smoother finishes providing better corrosion performance.

If the *contract documents* specify that the *structural stainless steel* is to have a finish other than as ordered from the mill, the *fabricator* shall perform such operations as required with clean media and appropriate tools that impart no foreign matter on the surface of the *structural stainless steel*. The work shall be performed in an area that is free of airborne steel and other contaminants.

Commentary:
The use of recycled blast media, recycled abrasives, and steel wire brushes may all leave *stainless steel* with *free iron* embedded or on its surface. This will stain under normal atmospheric conditions. Proper tooling and a shop environment that is free of airborne steel is required to produce *structural stainless steel* that will not stain under normal atmospheric conditions.

6.5. Marking and Shipping of Materials

6.5.1. Unless otherwise specified in the *contract documents*, erection marks shall be applied to the *structural stainless steel* members by painting or other suitable means in accordance with ANSI/AISC 370, Section M2.

6.5.2. Bolt assemblies and loose bolts, nuts, and washers shall be shipped in separate closed containers according to length and diameter, as applicable. Pins and other small parts and packages of bolts, nuts, and washers shall be shipped in boxes, crates, kegs, or barrels. A list and description of the material shall appear on the outside of each closed container.

6.6. Delivery of Materials

6.6.1. Fabricated *structural stainless steel* shall be delivered in a sequence that will permit efficient and economical fabrication and erection, and that is consistent with requirements in the *contract documents*. If the *owner* or *ODRC* wishes to prescribe or control the sequence of delivery of materials, that entity shall specify the required sequence in the *contract documents*. If the *ODRC* contracts separately for delivery and for erection, the *ODRC* shall coordinate planning between contractors.

6.6.2. *Anchor rods*, washers, nuts, and other anchorage or grillage materials that are to be built into concrete or masonry shall be shipped so that they will be available when needed. The *ODRC* shall allow the *fabricator* sufficient time to fabricate and ship such materials before they are needed.

6.6.3. If any shortage is claimed relative to the quantities of materials that are shown in the shipping statements, the *ODRC* or the *erector* shall promptly notify the *fabricator* so that the claim can be investigated.

Commentary:
The quantities of material that are shown in the shipping statement are customarily accepted as correct by the *ODRC*, the *fabricator*, and the *erector*.

6.6.4. Unless otherwise specified in the *contract documents*, and subject to the approved *approval documents*, the *fabricator* shall limit the number of field splices to that consistent with minimum project cost.

Commentary:
This section recognizes that the size and weight of *structural stainless steel* assemblies may be limited by shop capabilities, the permissible weight, and clearance dimensions of available transportation or jobsite conditions.

6.6.5. If material arrives at its destination in damaged condition, the receiving entity shall promptly notify the *fabricator* and carrier prior to unloading the material or promptly upon discovery prior to erection.

SECTION 7. ERECTION

7.1. Method of Erection

Fabricated *structural stainless steel* shall be erected using methods and a sequence that will permit efficient and economical performance of erection, and that is consistent with the requirements in the *contract documents*. If the *owner* or *owner's designated representative for construction* (*ODRC*) wishes to prescribe or control the method and/or sequence of erection, or specifies that certain members cannot be erected in their normal sequence, that entity shall specify the required method and sequence in the *contract documents*. If the *ODRC* contracts separately for fabrication services and for erection services, the *ODRC* shall coordinate planning between contractors.

Commentary:
Design modifications and/or erection aids are sometimes requested by the *erector* to allow or facilitate the erection of the *steel frame*. When this is the case, the *erector* should notify the *fabricator* prior to the preparation of the *approval documents* so that the *fabricator* may refer the *erector's* request to the *owner's designated representatives for design* and *construction* for resolution.

7.2. Jobsite Conditions

The *ODRC* shall provide and maintain the following for the *fabricator* and the *erector*:

(a) Adequate access roads into and through the jobsite for the safe delivery and movement of the material to be erected and of derricks, cranes, trucks, and other necessary equipment such that they can proceed under their own power
(b) A firm, properly graded, drained, convenient, and adequate space at the jobsite for the operation of the *erector's* equipment, free from overhead obstructions, such as power lines, telephone lines, or similar conditions
(c) Adequate storage space, when the structure does not occupy the full available jobsite, to enable the *fabricator* and the *erector* to operate at maximum practical speed and allow for the separation of *structural stainless steel* and *other steel alloys*

Otherwise, the *ODRC* shall inform the *fabricator* and the *erector* of the actual jobsite conditions and/or special delivery requirements prior to bidding.

7.3. Foundations, Piers and Abutments

The accurate location, strength, and suitability of, and access to, all foundations, piers, and abutments shall be the responsibility of the *ODRC*.

7.4. Lines and Benchmarks

The *ODRC* shall be responsible for the accurate location of lines and benchmarks at the jobsite and shall furnish the *erector* with a plan that contains all such information. The *ODRC* shall establish offset lines and reference elevations at each level for the *erector's* use in the positioning of *adjustable items* (see Section 11.3.1.3), if any.

7.5. Installation of Anchor Rods, Foundation Bolts, and Other Embedded Items

7.5.1. *Anchor rods*, foundation bolts, and other embedded items shall be set by the *ODRC* in accordance with *embedment drawings* that have been approved by the *owner's designated representatives for design* (*ODRD*) and the ODRC. The variation in location of these items from the dimensions shown in the approved *embedment drawings* shall be as follows:

(a) The vertical variation in location from the specified top of *anchor rod* location shall be a maximum of plus or minus 1/2 in. (13 mm).
(b) The horizontal variation in location from the specified position of each *anchor rod* centerline at any location along its projection above the concrete shall be equal to or less than the dimensions given for the *anchor rod* diameters listed as follows:

Anchor Rod Diameter, in. (mm)	Horizontal Variation, in. (mm)
3/4 and 7/8 (19 and 22)	1/4 (6)
1, 1-1/4, 1-1/2 (25, 31, 38)	3/8 (10)
1-3/4, 2, 2-1/2 (44, 50, 63)	1/2 (13)

Commentary:
The tolerances established in this Section have been selected for compatibility with the holes sizes that are recommended for base plates. This work was a collaboration between ACI and AISC to accommodate standard anchor rod placement. If special conditions require more restrictive tolerances, such as for smaller holes, the required tolerances should be stated in the *contract documents*. When the *anchor rods* are set in sleeves, the adjustment provided may be used to satisfy the required anchor-rod setting tolerances.

7.5.2. Unless otherwise specified in the *contract documents*, *anchor rods* shall be set with their longitudinal axis perpendicular to the theoretical bearing surface.

7.5.3. Embedded items and *connection* materials that are part of the work of other trades, but that will receive *structural stainless steel*, shall be located and set by the *ODRC* in accordance with an approved *embedment drawing*. The variation in location of these items shall be limited to a magnitude that is consistent with the tolerances that are specified in Section 11.3 for the erection of the *structural stainless steel*.

Embedded items and *connection* materials that are part of work of other trades shall be marked in such a way as to indicate whether the embedded items are *other steel alloys* or *stainless steel*.

7.5.4. All work that is performed by the *ODRC* shall be completed so as not to delay or interfere with the work of the *fabricator* and the *erector*. The *ODRC* shall conduct a survey of the as-built locations of *anchor rods*, foundation bolts, and other embedded items, and shall verify that all items covered in Section 7.5 meet the corresponding tolerances. When corrective action is necessary, the *ODRC* shall obtain the guidance and approval of the *ODRD*.

Commentary:
Few *fabricators* or *erectors* have the capability to provide this survey. Under standard practice, it is the responsibility of others.

7.6. Installation of Bearing Devices

7.6.1. All leveling plates, leveling nuts, and washers, and loose base and bearing plates that can be handled without a derrick or crane are set to line and grade by the *ODRC*.

7.6.2. Loose base and bearing plates that require handling with a derrick or crane shall be set by the *erector* to lines and grades established by the *ODRC*. The *fabricator* shall clearly scribe loose base and bearing plates with lines or other suitable marks to facilitate proper alignment.

7.6.3. Base and bearing plates that are shop attached to shipping pieces shall be set with the shipping pieces by the *erector* to lines and grades established by the *ODRC*. See Section 11.3.

7.6.4. Promptly after the setting of all *bearing devices*, the *ODRC* shall check them for line and grade as required in Section 7.6.4 (a) and 7.6.4 (b). The variation in elevation relative to the specified grade for all *bearing devices* shall be a maximum of plus or minus 1/8 in. (3 mm). The final location of *bearing devices* shall be the responsibility of the *ODRC*.

(a) For base and bearing plates shop attached to shipping pieces, the variation shall be measured at the top of the base or bearing plate.

(b) For loose base and bearing plates and other leveling devices, the variation shall be measured at the top of the base or bearing plate, or devices.

Commentary:
The 1/8 in. (3 mm) tolerance on elevation of *bearing devices* relative to established grades is provided to permit some variation in setting *bearing devices*, and to account for the accuracy that is attainable with standard surveying instruments. The

use of leveling plates larger than 22 in. by 22 in. (550 mm by 550 mm) is discouraged and grouting is recommended with larger sizes. For the purposes of erection stability, the use of leveling nuts and washers is discouraged when base plates have less than four *anchor rods*.

7.7. Grouting

Grouting shall be the responsibility of the *ODRC*. Leveling plates and loose base and bearing plates shall be promptly grouted after they are set and checked for line and grade. Columns with attached base plates, beams with attached bearing plates, and other similar members with attached *bearing devices* that are temporarily supported on leveling nuts and washers, shims, or other similar leveling devices shall be promptly grouted after the *steel frame*, or portion thereof, has been plumbed.

Commentary:
In the majority of structures, the vertical load from the column bases is transmitted to the foundations through structural grout. In general, there are three methods by which support is provided for column bases during erection:

(a) Pre-grouted leveling plates or loose base plates
(b) Shims
(c) Leveling nuts and washers on the *anchor rods* beneath the column base

Standard practice provides that loose base plates and leveling plates are to be grouted as they are set. *Bearing devices* that are set on shims or leveling nuts are grouted after plumbing, which means that the weight of the erected *steel frame* is supported on the shims or washers, nuts, and *anchor rods*. The *erector* must take care to ensure that the load that is transmitted in this temporary condition does not exceed the strength of the shims or washers, nuts, and *anchor rods*. These considerations are presented in greater detail in AISC Design Guide 1, *Base Plate and Anchor Rod Design*, and AISC Design Guide 10, *Erection Bracing of Low-Rise Structural Steel Frames*, which are written for *structural steel* but generally apply to *structural stainless steel* as well.

7.8. Field Connection Material

7.8.1. The *fabricator* shall provide field *connection* details that are consistent with the requirements in the *contract documents* and that will, in the *fabricator's* opinion, result in economical fabrication and erection.

7.8.2. When the *fabricator* is responsible for erecting the *structural stainless steel*, the *fabricator* shall furnish all materials that are required for both temporary and permanent *connection* of the component parts of the *steel frame*.

7.8.3. When the erection of the *structural stainless steel* is not performed by the *fabricator*, the *fabricator* shall furnish the following field *connection* material:

(a) Bolts, nuts, and washers in sufficient quantity for all *structural stainless steel*-to-*structural stainless steel* field *connections* that are to be permanently bolted. The *fabricator* shall include an extra 2% plus 3 bolts, subject to a minimum of 5 extra bolts, of each grade, type, diameter, length, and production lot number. Bolt material, alloy grade, and type shall be as specified in the *contract documents*.
(b) Shims that are shown as necessary for make-up of permanent *structural stainless steel*-to-*structural stainless steel* field *connections*.
(c) Backing and runoff tabs that are required for field welding.

7.8.4. The *erector* shall furnish all welding electrodes, fit-up bolts, and drift pins used for the erection of the *structural stainless steel*. Non-steel backing, if used, shall be furnished by the *erector*.

7.8.5. The supplier of temporary supports, backing, and other erection aids shall take all care necessary to provide materials that are compatible with the *structural stainless steel* and its intended long term appearance and finish.

Commentary:

For temporary bracing and supports, bolts used to join *structural stainless steel* to itself and to *other steel alloys* should be of a *stainless steel* material and grade that has corrosion resistance equal to or better than the neighboring material.

The use of *other steel alloys* for temporary bracing and assembly fixtures can leave the surface of *structural stainless steel* contaminated. Where finished *structural stainless steel* is specified, the *fabricator* and *erector* should protect against contamination and damage. If contamination occurs, the corrosion resistance of the *structural stainless steel* should be restored using ASTM A967/A967M or ASTM A380/A380M depending on the severity of the damage.

7.9. Loose Material

Unless otherwise specified in the *contract documents*, loose *structural stainless steel* items that are not connected to the *steel frame* shall be set by the *ODRC* without assistance from the *erector*.

7.10. Temporary Support of Steel Frames

7.10.1. The *ODRD* shall identify the following in the *contract documents*:

(a) The lateral force-resisting system and connecting diaphragm elements that provide for lateral strength and stability in the completed structure
(b) Any special erection conditions or other considerations that are required by the design concept, such as the use of shores, jacks, or loads that must be

adjusted as erection progresses to set or maintain camber, position within specified tolerances, or prestress.

Commentary:

The intent of Section 7.10.1 of *the Code* is to alert the *ODRC* and the *erector* of the means for lateral force resistance in the completed structure so that appropriate planning can occur for construction of the building. Examples of a description of the lateral force-resisting system as required in Section 7.10.1(a) are shown in the following.

Example 1 is an all-steel building with a composite metal deck and concrete floor system. All lateral force resistance is provided by welded moment frames in each orthogonal building direction. One suitable description of this lateral force-resisting system is as follows:

All lateral force resistance and stability of the building in the completed structure is provided by moment frames with welded beam-to-column connections framed in each orthogonal direction (see plan sheets for locations). The composite metal deck and concrete floors serve as horizontal diaphragms that distribute the lateral wind forces horizontally to the vertical moment frames. The vertical moment frames carry the applied lateral loads to the building foundation.

Example 2 is a steel-framed building with a composite metal deck and concrete floor system. All beam-to-column *connections* are simple *connections* and all lateral force resistance is provided by reinforced concrete shear walls in the building core and in the stairwells. One suitable description of this lateral force-resisting system is as follows:

All lateral force resistance and stability of the building in the completed structure is provided exclusively by cast-in-place reinforced concrete shear walls in the building core and stairwells (see plan sheets for locations). These walls provide all lateral force resistance in each orthogonal building direction. The composite metal deck and concrete floors serve as horizontal diaphragms that distribute the lateral wind forces horizontally to the concrete shear walls. The concrete shear walls carry the applied lateral loads to the building foundation.

See also Commentary Section 7.10.3.

Section 7.10.1(b) is intended to apply to special requirements inherent in the design concept that could not otherwise be known by the *erector*. Such conditions might include designs that require the use of shores or jacks to impart a load or to obtain a specific elevation or position in a subsequent step of the erection process in a sequentially erected structure or member. These requirements would not be apparent to an *erector* and must be identified so the *erector* can properly bid, plan, and perform the erection.

The *erector* is responsible for installation of all members (including cantilevered members) to the specified plumbness, elevation, and alignment within the erection tolerances specified in this Code. The *erector* must provide all temporary supports

and devices to maintain elevation or position within these tolerances. This work is part of the means and methods of the *erector* and the *ODRD* need not specify these methods or related equipment.

See also the preset elevation requirements for cantilevered members in Section A4 of ANSI/AISC 370.

7.10.2. The *ODRC* shall indicate to the *erector* prior to bidding, the installation schedule for non-*structural stainless steel* elements of the lateral force-resisting system and connecting diaphragm elements identified by the *ODRD* in the *contract documents*.

Commentary:
See Commentary Section 7.10.3.

7.10.3. Based upon the information provided in accordance with Sections 7.10.1 and 7.10.2, the *erector* shall determine the need for, furnish, and install all temporary supports, such as temporary guys, cables, beams, falsework, cribbing, erection aids, or other elements required for the erection operation. If the selection or design of such temporary supports is necessary, this shall be the responsibility of the *erector*. These temporary supports shall be sufficient to secure and maintain the stability of the bare *structural stainless steel* framing, or any portion thereof, against loads that are likely to be encountered during erection, including those due to wind and those that result from erection operations.

The *erector* need not consider loads during erection that result from the performance of work by, or the acts of, others, except as specifically identified by the *ODRD* or the *ODRC*. Further, the *erector* need not consider those loads that are unpredictable, such as loads due to hurricane, tornado, earthquake, explosion, or collision.

Temporary supports that are required during or after the erection of the *steel frame* for the support of loads caused by non-*structural stainless steel* elements, including cladding, interior partitions, and other such elements that will induce or transmit loads to the *steel frame* during or after erection, shall be the responsibility of others.

Commentary:
Many *steel frames* have lateral force-resisting systems that are activated during the erection process. Such lateral force-resisting systems may consist of welded moment frames, braced frames, or, in some instances, columns that cantilever from fixed-base foundations. Such frames are normally braced with temporary guys that, together with the steel deck floor and roof diaphragms or other diaphragm bracing that may be included as part of the design, provide stability during the erection process. The guy cables are also commonly used to plumb the *steel frame*. The *erector* normally furnishes and installs the required temporary supports and bracing to secure the bare *steel frame*, or portion thereof, during the erection process. When *erection bracing drawings* are required in the *contract documents*, those drawings show this information. The need for and selection or design of temporary supports

should be based on industry standards such as AISC Design Guide 10, *Erection Bracing of Low-Rise Structural Steel Frames*.

If the *ODRC* determines that steel decking is not installed by the *erector*, temporary diaphragm bracing may be required if a horizontal diaphragm is not available to distribute loads to the vertical and lateral force-resisting system. If the steel deck will not be available as a diaphragm during *structural stainless steel* erection, the *ODRC* must communicate this condition to the *erector* prior to bidding. If such diaphragm bracing is required, it must be furnished and installed by the *erector*.

Sometimes structural systems that are employed by the *ODRD* rely upon other elements besides the *steel frame* for lateral force resistance. For instance, concrete or masonry shear walls or precast spandrels may be used to provide resistance to vertical and lateral forces in the completed structure. Because these situations may not be obvious to the contractor or the *erector*, it is required in *this Code* that the *ODRD* must identify such situations in the *contract documents*. Similarly, if a structure is designed so that special erection techniques are required, such as jacking to impose certain loads or position during erection, it is required in *this Code* that such requirements be specifically identified in the *contract documents*.

In some instances, the *ODRD* may elect to show erection bracing in the structural *design documents*. When this is the case, the *ODRD* should then confirm that the bracing requirements were understood by review and approval of the *erection documents* during the submittal process.

Sometimes during construction of a building, collateral building elements, such as exterior cladding, may be required to be installed on the bare *steel frame* prior to completion of the lateral force-resisting system. These elements may increase the potential for lateral loads on the temporary supports. Such temporary supports may also be required to be left in place after the *steel frame* has been erected. Special provisions should be made by *the ODRC* for these conditions.

7.10.4. All temporary supports that are required for the erection operation and furnished and installed by the *erector* shall remain the property of the *erector* and shall not be modified, moved, or removed without the consent of the *erector*. Temporary supports provided by the *erector* shall remain in place until the portion of the *steel frame* that they brace is complete and the lateral force-resisting system and connecting diaphragm elements identified by the *ODRD* in accordance with Section 7.10.1 are installed. Temporary supports that are required to be left in place after the completion of *structural stainless steel* erection shall be removed when no longer needed by the *ODRC* and returned to the *erector* in good condition.

7.11. Safety Protection

7.11.1. The *erector* shall provide floor coverings, handrails, walkways, and other safety protection for the *erector's* personnel as required by law and the applicable safety regulations. Unless otherwise specified in the *contract documents*, the *erector* is permitted to remove such safety protection from areas where the erection operations are completed.

7.11.2. When safety protection provided by the *erector* is left in an area for the use of other trades after the *structural stainless steel* erection activity is completed, the *ODRC* shall:

(a) Accept responsibility for and maintain this protection
(b) Indemnify the *fabricator* and the *erector* from damages that may be incurred from the use of this protection by other trades
(c) Ensure that this protection is adequate for use by other affected trades
(d) Ensure that this protection complies with applicable safety regulations when being used by other trades
(e) Remove this protection when it is no longer required and return it to the *erector* in the same condition as it was received

7.11.3. Safety protection for other trades that are not under the direct employment of the *erector* shall be the responsibility of the *ODRC*.

7.11.4. When permanent steel decking is used for protective flooring and is installed by the *ODRC*, all such work shall be scheduled and performed in a timely manner so as not to interfere with or delay the work of the *fabricator* or the *erector*. The sequence of installation that is used shall meet all safety regulations.

7.11.5. Unless the interaction and safety of activities of others, such as construction by others or the storage of materials that belong to others, are coordinated with the work of the *erector* by the *ODRC*, such activities are prohibited until the erection of the *steel frame*, or portion thereof, is completed by the *erector* and accepted by the *ODRC*.

7.12. Accumulation of Mill and Fabrication Tolerances

The accumulation of mill tolerances and fabrication tolerances shall not cause the erection tolerances to be exceeded.

Commentary:
It is recognized that accumulations of mill tolerances and fabrication tolerances generally occur between the locations at which erection tolerances are applied, and not at the same locations.

7.13. Owner's Acceptance

Prior to placing or applying any other materials, the *ODRC* shall determine that the location of the *structural stainless steel* is acceptable for plumbness, elevation, and alignment and is in accordance with applicable requirements of *this Code*, ANSI/AISC 370 Chapters M and N, and any project specific requirements. The *erector* shall be given either timely notice of acceptance by the *ODRC* or a listing of specific items that are to be corrected in order to obtain acceptance. Such notice

shall be rendered promptly upon completion of any part of the work and prior to the start of work by other trades that may be supported, attached, or applied to the *steel frame*.

7.14. Correction of Errors

The correction of minor misfits by moderate amounts of reaming, grinding, welding, or cutting, and the drawing of elements into line with drift pins shall be considered to be normal erection operations. Errors that cannot be corrected using the foregoing means, or that require major changes in member or *connection* configuration, shall be promptly reported to the *ODRD*, the *ODRC*, and the *fabricator*, by the *erector*, to enable the responsible entity to either correct the error or approve the most efficient and economical method of correction to be used by others.

Commentary:
As used in this Section, the term "moderate" refers to the amount of reaming, grinding, welding, or cutting that must be done on the project as a whole, not the amount that is required at an individual location. It is not intended to address limitations on the amount of material that is removed by reaming at an individual bolt hole, for example, which is limited by the bolt-hole size and tolerance requirements in ANSI/AISC 370.

7.15. Cuts, Alterations, and Holes for Other Trades

Neither the *fabricator* nor the *erector* shall cut, drill, or otherwise alter their work, nor the work of other trades, to accommodate other trades, unless such work is clearly specified in the *contract documents*. When such work is so specified, the *ODRD* and the *ODRC* shall furnish complete information as to materials, size, location, and number of alterations in a timely manner so as not to delay the preparation of the *approval documents*.

7.16. Handling and Storage

The *erector* shall take reasonable care in the proper handling and storage of the *structural stainless steel* during erection operations to avoid the accumulation of excess dirt, cross contamination between *stainless steel* to *other steel alloys*, and foreign matter. The *erector* shall not be responsible for the removal from the *structural stainless steel* of dust, dirt, or other foreign matter that may accumulate during erection as the result of jobsite conditions or exposure to the elements. The *erector* shall be responsible for any reconditioning necessary that is a result of handling or storage at site.

Commentary:
During storage, loading, transport, unloading, and erection, blemish marks caused by slings, chains, blocking, tie-downs, cross contamination, etc., occur in varying

degrees. Abrasions caused by handling or cartage after finishing are to be expected. It must be recognized that any shop-applied finished surface, no matter how carefully protected, may require reconditioning in the field. Reconditioning these blemished areas in accordance with project specification requirements is the responsibility of the contractor performing the field reconditioning.

The *erector* is responsible for the proper storage and handling of fabricated *structural stainless steel* at the jobsite during erection. Finished and shop-painted *structural stainless steel* that is stored in the field pending erection should be kept free of the ground and positioned so as to minimize the potential for water retention. The *owner* or *ODRC* is responsible for providing suitable jobsite conditions and proper access so that the *fabricator* and the *erector* may perform their work.

Jobsite conditions are frequently muddy, sandy, dusty, or a combination thereof during the erection period. Under such conditions, it may be impossible to store and handle the *structural stainless steel* in such a way as to completely avoid any accumulation of mud, dirt, or sand on the surface of the *structural stainless steel*, even though the *fabricator* and the *erector* manages to proceed with their work.

Repairs of damage to finished surfaces and/or removal of foreign materials due to adverse jobsite conditions are outside the scope of responsibility of the *fabricator* and the *erector* when reasonable attempts at proper handling and storage have been made.

7.17. Field Finishing

Neither the *fabricator* nor the *erector* is responsible for finishing field bolt heads and nuts, or field welds, nor to touch up abrasions of the shop applied surface finish, nor to perform any other field finishing.

7.18. Final Cleaning Up

Upon the completion of erection and before final acceptance, the *erector* shall remove all of the *erector's* falsework, rubbish, and temporary buildings.

SECTION 8. QUALITY CONTROL

8.1. General

8.1.1. The *fabricator* shall maintain a quality control program to ensure that the work is performed in accordance with the requirements in *this Code*, ANSI/AISC 370, and the *contract documents.*

8.1.2. The *erector* shall maintain a quality control program to ensure that the work is performed in accordance with the requirements in this Code, ANSI/AISC 370, and the *contract documents*. The *erector* shall be capable of performing the erection of the *structural stainless steel* and shall provide the equipment, personnel, and management for the scope, magnitude, and required quality of each project.

8.1.3. When the *owner* requires more extensive quality control procedures or independent inspection by qualified personnel, this shall be clearly stated in the *contract documents*, including a definition of the scope of such inspection.

8.2. Inspection of Mill Material

Material test reports and material certificates of compliance shall constitute sufficient evidence that the mill product satisfies material order requirements. The *fabricator* shall make a visual inspection of material that is received from the mill, but need not perform any material tests unless the *owner's designated representative for design* (*ODRD*) specifies in the *contract documents* that additional testing is to be performed at the *owner's* expense.

8.3. Nondestructive Testing

When nondestructive testing is required, the process, extent, technique, and standards of acceptance shall be clearly specified in the *contract documents*.

8.4. Independent Inspection

When inspection by personnel other than those of the *fabricator* and/or *erector* is specified in the *contract documents*, the requirements in Sections 8.4.1 through 8.4.6 shall be met.

8.4.1. The *fabricator* and the *erector* shall provide the *inspector* with access to all places where the work is being performed. A minimum of 24 hours notification shall be given prior to the commencement of work.

8.4.2. Inspection of shop work by the *inspector* shall be performed in the *fabricator's* shop to the fullest extent possible. Such inspections shall be timely, in-sequence, and performed in such a manner as will not disrupt fabrication operations and will

permit the repair of nonconforming work while the material is still in-process in the fabrication shop.

8.4.3. Inspection of field work shall be promptly completed without delaying the progress or correction of the work.

8.4.4. Rejection of material or workmanship that is not in conformance with the *contract documents* shall be permitted at any time during the progress of the work. However, this provision shall not relieve the *owner* or the *inspector* of the obligation for timely, in-sequence inspections.

8.4.5. The *fabricator*, *erector*, and *ODRD* and the *owner's designated representatives for construction* (*ODRC*) shall be informed of deficiencies that are noted by the *inspector* promptly after the inspection. Copies of all reports prepared by the *inspector* shall be promptly given to the *fabricator*, *erector*, *ODRD*, and *ODRC*. The necessary corrective work shall be performed in a timely manner.

8.4.6. The *inspector* shall not suggest, direct, or approve the *fabricator* or *erector* to deviate from the *contract documents* or the approved *approval documents*, or approve such deviation, without the written approval of the *ODRD* and the *ODRC*.

SECTION 9. CONTRACTS

9.1. Contracts and Payment

9.1.1. For contracts that stipulate a lump sum price, the work that is required to be performed by the *fabricator* and the *erector* shall be completely defined in the *contract documents*.

9.1.2. For contracts that stipulate a price per pound, the scope of work that is required to be performed by the *fabricator* and the *erector*, the type of materials, the character of fabrication, and the conditions of erection shall be based upon the *contract documents*, which shall be representative of the work to be performed.

9.1.3. For contracts that stipulate a price per item, the work that is required to be performed by the *fabricator* and the *erector* shall be based upon the quantity and the character of the items that are described in the *contract documents*.

9.1.4. For contracts that stipulate unit prices for various categories of *structural stainless steel*, the scope of work that is required to be performed by the *fabricator* and the *erector* shall be based upon the quantity, character, and complexity of the items in each category as described in the *contract documents*, and shall also be representative of the work to be performed in each category.

9.1.5. When an *allowance* for work is called for in the *contract documents* and the associated work is subsequently defined as to the quantity, complexity, and timing of that work after the contract is executed, the contract price for this work shall be adjusted by change order.

Commentary:
Allowances, if used, are not a true definition of the cost of work to be performed. By nature, an *allowance* is only an estimate and placeholder in the bid. Once the actual work is defined, the actual cost can be provided. It must be recognized that the actual cost can be higher or lower than the *allowance*. See Section 9.4.

Allowances required by the *contract documents* or proposed by the bidder should be as thoroughly defined as practicable as to the distinct nature of the work covered by the *allowance*, including whether the *allowance* is to include materials only, fabrication costs, and/or erection costs.

9.2. Calculation of Weights

Unless otherwise specified in the contract, for contracts stipulating a price per pound for fabricated *structural stainless steel* that is delivered and/or erected, the quantities of materials for payment shall be determined by the calculation of the gross weight of materials as shown in the *fabrication documents*.

Commentary:

The standard procedure for calculation of weights that is described in this Code meets the need for a universally acceptable system for defining "pay weights" in contracts based upon the weight of delivered and/or erected materials. These procedures permit the *owner* to easily and accurately evaluate price-per-pound proposals from potential suppliers and enables all parties to a contract to have a clear and common understanding of the basis for payment.

The procedure in this Code affords a simple, readily understood method of calculation that will produce pay weights that are consistent throughout the industry and that may be easily verified by the *owner*. While this procedure does not produce actual weights, it can be used by purchasers and suppliers to define a widely accepted basis for bidding and contracting for *structural stainless steel*. However, any other system, rather than the current system based on gross weight as described in Sections 9.2.1 through 9.2.5, can be used as the basis for a contractual agreement. These systems could include net weight, as calculated on the *shop drawings*, or actual weight, as determined from shipping weight masters, or others, for those products delivered to the site. When other systems are used, both the supplier and the purchaser should clearly understand how the alternative procedure is handled.

9.2.1. The weights shall be calculated based on the densities for the alloy family.

Commentary:
ANSI/AISC 370, Table User Note A3.1, is a source for these density values.

9.2.2. The weights of *structural stainless steel* shapes, plates, and bars shall be calculated on the basis of *fabrication documents* that show the actual quantities and dimensions of material to be fabricated, as follows:

(a) The weights of all *structural stainless steel* shapes shall be calculated using the nominal weight per ft (mass per m) and the detailed overall length.
(b) The weights of plates and bars shall be calculated using the detailed overall rectangular dimensions.
(c) When parts can be economically cut in multiples from material of larger dimensions, the weight shall be calculated on the basis of the theoretical rectangular dimensions of the material from which the parts are cut.
(d) When parts are cut from sections produced in standard lengths, leaving a length that is not useable on the same contract, the weight shall be calculated using the nominal weight per ft (mass per m) and the overall length of the section from which the parts are cut.
(e) Deductions shall not be made for material that is removed for cuts, copes, clips, blocks, drilling, punching, boring, slot milling, planing, or weld joint preparation.

9.2.3. The weights of items such as *anchor rods*, clevises, turnbuckles, sleeve nuts, recessed-pin nuts, cotter pins, and similar components shall be taken from the manufacturer's catalog and the manufacturer's shipping weight shall be used.

9.2.4. The weights of shop or field weld metal and protective coatings shall not be included in the calculated weight for the purposes of payment.

9.3. Revisions to the Contract Documents

Revisions to the *contract documents* shall be confirmed by change order or extra work order. Unless otherwise noted, the issuance of a *revision* to the *contract documents* shall constitute authorization by the *owner* that the *revision* is *released for construction*. The contract price and schedule shall be adjusted in accordance with Sections 9.4 and 9.5.

9.4. Contract Price Adjustment

9.4.1. When the scope of work and responsibilities of the *fabricator* and the *erector* are changed from those previously established in the *contract documents*, an appropriate modification of the contract price shall be made. In computing the contract price adjustment, the *fabricator* and the *erector* shall consider the quantity of work that is added or deleted, the modifications in the character of the work, and the timeliness of the change with respect to the status of material ordering, detailing, fabrication, and erection operations.

Commentary:
The fabrication and erection of *structural stainless steel* is a dynamic process. Typically, material is being acquired at the same time that the *approval documents* are being prepared. Additionally, the fabrication shop will normally fabricate pieces in the order that the *structural stainless steel* is being shipped and erected.

Items that are revised or placed on hold generally upset these relationships and can be very disruptive to the digital modeling, detailing, fabricating, and erecting processes. The provisions in Sections 3.6, 4.4.2, and 9.3 are intended to minimize these disruptions so as to allow work to continue. Accordingly, it is required in this Code that the reviewer of requests for contract price adjustments recognize this and allow compensation to the *fabricator* and the *erector* for these inefficiencies and for the materials that are purchased and the detailing, fabrication, and erection that has been performed, when affected by the change.

9.4.2. Requests for contract price adjustments shall be presented by the *fabricator* and/or the *erector* in a timely manner and shall be accompanied by a description of the change that is sufficient to permit evaluation and timely approval by the *owner*.

9.4.3. Price-per-pound and price-per-item contracts shall provide for additions or deletions to the quantity, type, and character of work that are made prior to the time the *contract documents* are *released for construction*. When changes are made that affect the quantity, type, or character of work after the *contract documents* are *released for construction*, the contract price shall be equitably adjusted.

9.5. Scheduling

9.5.1. The contract schedule shall state when the *design documents* will be *released for construction*, if the *design documents* are not available at the time of bidding, and when the jobsite, foundations, piers, and abutments will be ready, free from obstructions, and accessible to the *erector*, so that erection can start at the designated time and continue without interference or delay caused by the *owner's designated representative for construction* (*ODRC*) or other trades.

9.5.2. The *fabricator* and the *erector* shall advise the *owner's designated representatives for design* (*ODRD*) and *ODRC*, in a timely manner, of the effect any *revision* has on the contract schedule.

9.5.3. If the fabrication or erection is significantly delayed due to *revisions* to the requirements of the contract, or for other reasons that are the responsibility of others, the *fabricator* and/or *erector* shall be compensated for the additional costs incurred.

9.6. Terms of Payment

The *fabricator* shall be paid for *mill materials* and fabricated product that is stored off the jobsite. Other terms of payment for the contract shall be outlined in the *contract documents*.

Commentary:

These terms include such items as progress payments for material, fabrication, erection, retainage, performance and payment bonds, and final payment. If a performance or payment bond, paid for by the *owner*, is required by contract, no retainage shall be required.

SECTION 10. ARCHITECTURALLY EXPOSED STRUCTURAL STAINLESS STEEL (AESSS)

10.1. General Requirements

When members are specifically designated as *architecturally exposed structural stainless steel* or *AESSS* in the *contract documents*, the requirements in Sections 1 through 9 shall apply as modified in Section 10. Surfaces exposed to view of *AESSS* members and components shall be fabricated and erected with the care and dimensional tolerances that are stipulated in Sections 10.2 through 10.6.

Commentary:
The designation of *structural stainless steel* as *AESSS* adds cost, and that cost is higher as the level of the *AESSS* designation increases.

10.1.1. The following categories shall be used when referring to *AESSS*:

AESSS 1: Basic elements.
AESSS 2: Feature elements viewed at a distance greater than 20 ft (6 m)
AESSS 3: Feature elements viewed at a distance less than 20 ft (6 m)
AESSS 4: Showcase elements with special surface and edge treatment beyond fabrication
AESSS C: Custom elements with characteristics described in the *contract documents*

Commentary:
The categories are listed in the *AESSS* matrix shown in Table 10.1. Each category describes characteristics with successively more detailed—and costly—requirements.

- Basic elements in AESSS 1 are those that have workmanship requirements that exceed what would be done in non-*AESSS* construction.
- Feature elements in AESSS 2 and 3 exceed the basic requirements, but the intent is to allow the viewer to see the art of metalworking. AESSS 2 is achieved primarily through geometry without finish work and treats things that can be seen at a larger viewing distance, like enhanced treatment of bolts, welds, *connection* and fabrication details, and tolerances for gaps, copes, and similar details. AESSS 3 is achieved through geometry and basic finish work and treats things that can be seen at a closer viewing distance or are subject to touch by the viewer, with welds that are generally smooth but visible. AESSS 3 involves the use of a mock-up and acceptance is based upon the approved conditions of the mock-up.
- Showcase elements in AESSS 4 are those for which the designer intends that the form is the only feature showing in an element. All welds are ground and blended, edges are ground square and true. All surfaces are finished to a smoothness that doesn't catch on a cloth or glove. Tolerances of fabricated

forms are more stringent—generally half of standard tolerance. AESSS 4 involves the use of a mock-up and acceptance is based upon the approved conditions of the mock-up.

- Custom elements in AESSS C are those with other requirements defined in the *contract documents,* which may be more or less stringent than the other categories because individual desired characteristics may be required at the discretion of the specifier.

Table 10.1
AESSS Category Matrix

ID	Characteristics	Reference Section	Category			
			AESSS 4 Showcase Elements	AESSS 3 Feature Elements in Close View	AESSS 2 Feature Elements not in Close View	AESSS 1 Basic Elements
1.1	Butt and plug weld reinforcement limited to 1/16 in. (2 mm)	10.4.9			•	•
1.2	Surface preparation to meet SSPC-SP 1	10.4.11	•	•	•	•
1.3	Sharp edges eased	10.4.7	•	•	•	•
1.4	Continuous weld appearance	10.4.8	•	•	•	•
1.5	Consistent bolt appearance	10.4.1(g)	•	•	•	•
1.6	Weld spatters removed	10.4.8	•	•	•	•
2.1	Mock-ups	10.1.2	•	•	Optional	
2.2	The fabricated product shall have one-half the applicable ASTM or AWS straightness tolerance	10.4.3(b) & 10.4.5	•	•	•	
2.3	Fabrication, and erection marks not visible	10.4.2	•	•	•	
3.1	Mill marks not visible	10.4.2	•	•		
3.2	Butt and plug welds ground smooth and filled	10.4.9	•	•		
3.3	HSS weld seam oriented for reduced visibility	10.4.12	•	•		
3.4	Cross-sectional abutting surfaces aligned	10.4.3(a)	•	•		
3.5	Joint gap tolerances minimized	10.4.6	•	•		
4.1	HSS seam treated to comply with mock-up	10.4.12	•			
4.2	Welds contoured and blended	10.4.8	•			
4.3	Surfaces filled and sanded	10.4.7	•			
4.4	Weld show-through to meet acceptance criteria established by mock-up	10.4.10	•			

Notes:
1. AESSS C are custom elements with characteristics described in the contract documents.
2. Standard structural stainless steel contains no AESSS characteristics.

10.1.2. A mock-up shall be required for AESSS 3 and 4. If a mock-up is to be used in other *AESSS* categories, it shall be specified in the *contract documents*. When required, the nature and extent of the mock-up shall be specified in the *contract documents*.

Alternatively, when a mock-up is not practical, the first piece of an element or *connection* can be used to determine acceptability.

Commentary:
Generally, a mock-up is produced and approved in the shop and subsequently placed in the field. The acceptability of the mock-up can be affected by many factors, including distance of view, lighting, and finishing. The expectations for the location and conditions of the mock-up at time of approval should be defined in the *contract documents*.

10.2. Contract Documents

The following additional information shall be provided in the *contract documents* when *AESSS* is specified:

(a) Specific identification of members or components that are *AESSS* using the AESSS Categories listed in Section 10.1.1 and Table 10.1.
(b) Fabrication and/or erection tolerances that are to be more restrictive than provided for in this section, if any.
(c) For AESSS Category C, the *AESSS* matrix included in Table 10.1 shall be used to specify the required treatment of the element.
(d) Any variations from the *AESSS* characteristics of Table 10.1.
(e) Any other special requirements for *AESSS* members and components, such as the orientation of HSS weld seams and bolt heads.

10.3. Approval Documents

All members designated as *AESSS* shall be clearly identified to a Category, either AESSS 1, 2, 3, 4, or C, in the *approval documents*. Tack welds, temporary braces, backing, and fixtures used in fabrication of *AESSS* shall be shown in the *fabrication documents*. Architecturally sensitive *connection* details shall be submitted for approval by the *owner's designated representative for design* prior to completion of the *approval documents*.

Commentary:
Variations, if any, from the AESSS Categories listed must be clearly noted. These variations could include machined surfaces, locally abraded surfaces, and forgings. In addition, if distinction is to be made between different surfaces or parts of members, the transition line/plane must be clearly identified/defined on the *approval documents*.

10.4. Fabrication

10.4.1. The following applies to the *fabricator* with respect to *AESSS*:

(a) The *fabricator* shall fabricate and handle the *structural stainless steel* with care to avoid marking, contaminating, or distorting the *structural stainless steel* members.
(b) Slings shall be synthetic material such as nylon or polyester.
(c) Care shall be taken to minimize damage to any finished faces, edges, or features.
(d) When temporary braces or fixtures are required during fabrication or shipment, or to facilitate erection, care shall be taken to avoid blemishes, contamination from *free iron*, or unsightly surfaces resulting from the use or removal of such temporary elements.
(e) Tack welds not incorporated into final welds shall be treated consistently with requirements for final welds.
(f) All weld backing exposed to view and weld runoff tabs shall be removed, and the welds ground smooth.
(g) Bolted *connections* shall have all bolt heads on the same side of the *connection* and shall be consistent from one *connection* to another as specified by the *contract documents*.

10.4.2. Members fabricated of unfinished *structural stainless steel* that are to be *AESSS* may still have erection marks on surfaces in the completed structure. Special requirements, if any, shall be specified as Category AESSS C. Fabrication and erection marks shall not be visible for Categories AESSS 2, 3, and 4, and mill marks shall not be visible for categories AESSS 3 and 4. Special requirements, if any, shall be specified as Category AESSS C.

10.4.3. The permissible tolerances for member depth, width, out of square, and camber and sweep shall be as specified in the references found in ANSI/AISC 370. The following exceptions apply:

(a) For Categories AESSS 3 and 4, the matching of abutting cross sections shall be required.
(b) For Categories AESSS 2, 3, and 4, the as-fabricated straightness tolerance shall be one-half of that specified in the references found in ANSI/AISC 370.

Commentary:
The ability to match individual cross sections at a member splice depends on material thickness, mill tolerances for cross-section variation, joint configuration, and the process applied to the member(s) prior to splicing, such as cambering, curving, etc. Members with thinner cross-sectional elements that vary within tolerance may be drawn together more readily than those with thicker elements, and other elements may be so thick they cannot be drawn together to match at the splice. Users are cautioned to explore fabrication costs and capabilities for joining specific member cross sections and to use a mock-up to document expectations. AISC Design Guide 33, *Curved Member Design*, also provides guidance on cross-section distortion for curved members.

10.4.4. For curved structural members the as-fabricated variation from the theoretical curvature shall be equal to or less than the standard camber and sweep tolerances permitted for straight members in the applicable ASTM or AWS standard.

Commentary:
The curvature tolerance for curved *AESSS* members is not reduced from that used for curved non-*AESSS* members because curved members have no straight line to sight and the resulting deviations are therefore indistinguishable. See also the Commentary to Section 11.2.2.

10.4.5. For Categories AESSS 2, 3, and 4, the straightness tolerance for a *built-up member* as a whole shall be one-half the tolerance specified in AWS D1.1/D1.1M.

10.4.6. For Categories AESSS 3 and 4, copes, miters, and cuts in surfaces exposed to view shall have a gap that is uniform within 1/8 in. (3 mm), if shown to be an open joint. If instead the joint is shown to be in contact, the contact shall be uniform within 1/16 in. (2 mm).

10.4.7. Unless otherwise noted in the *contract documents*, for Categories AESSS 1, 2, and 3, the surface condition of the *structural stainless steel* given in the ASTM or AWS standards for the shape used shall be acceptable as the base for final graining or abrasive finishing. For Category AESSS 4, local non-typical surface imperfections shall be weld filled and sanded to meet the acceptance criteria established with the mock-up required in Section 10.1.2.

10.4.8. For Categories AESSS 1, 2, and 3, welds shall meet AWS D1.6/D1.6M requirements, except that (a) weld spatter exposed to view, if any, shall be removed, and (b) all heat staining shall be removed in accordance with ASTM A380/A380M. For Category AESSS 4, welds shall be contoured and blended, and spatter and heat staining exposed to view shall be removed in accordance with ASTM A380/A380M. Where contoured, blended, or seal welds are to be provided for Categories AESSS 1, 2, and 3, those welds shall be defined in the *contract documents*.

10.4.9. For Categories AESSS 1 and 2, weld projection up to 1/16 in. (2 mm) is acceptable for butt and plug welded joints. For Categories AESSS 3 and 4, welds shall be ground smooth or weld filled.

10.4.10. For Categories AESSS 1, 2, and 3, *weld show-through* shall be acceptable as produced. For Category AESSS 4, the *weld show-through* shall meet the acceptance criteria established with the mock-up required in Section 10.1.2.

Commentary:
Weld show-through is a visual indication of the presence of a weld or welds on the opposite surface from the viewer. It is a function of weld size and material

thickness and can't be eliminated in thin material with thick welds. When *weld show-through* is a concern, this should be addressed in the mock-up.

10.4.11. *AESSS* shall be prepared as follows:

(a) All surface contaminants, including grease or oil, embedded iron, or other substances, if any is present, shall be removed by solvent cleaning to meet the requirements of SSPC-SP 1 and meet the passivation requirements of ASTM A967/A967M.
(b) Weld spatter, slivers, and similar surface discontinuities shall be removed.
(c) Sharp corners resulting from shearing, flame cutting, or grinding shall be eased.

10.4.12. For Categories AESSS 1 and 2, seams of hollow structural sections shall be acceptable as produced. For Category AESSS 3, seams shall be oriented as specified in the *contract documents*. For Category AESSS 4, seams shall be treated so they are not apparent.

10.5. Delivery of Materials

The *fabricator* shall use special care to avoid surface contamination, bending, twisting, or otherwise distorting *AESSS*. All tie-downs on loads shall be synthetic material such as nylon or polyester to avoid damage to edges and surfaces of members. The standard for acceptance of delivered and erected members shall be equivalent to the standard employed at fabrication.

10.6. Erection

The following applies to the *erector* with respect to *AESSS*:

(a) The *erector* shall use special care in unloading, handling, and erecting *AESSS* to avoid contamination, marking, or distorting the *AESSS*. The *erector* shall plan and execute all operations in such a manner that allows the architectural appearance of the structure to be maintained.
(b) Slings shall be synthetic material such as nylon or polyester.
(c) Care shall be taken to minimize damage to any exposed surface.
(d) When temporary braces or fixtures are required to facilitate erection, care shall be taken to avoid any contamination, blemishes, holes, or unsightly surfaces resulting from the use or removal of such temporary elements.
(e) Tack welds not incorporated into final welds shall be ground smooth.
(f) All weld backing exposed to view and weld runoff tabs shall be removed and the welds ground smooth.
(g) Bolted *connections* shall have all bolt heads on the same side of the *connection* and shall be consistent from one *connection* to another, as specified by the *contract documents*.

(h) For Category AESSS 4, open holes shall be filled with weld metal and smoothed by grinding to the standards applicable to the shop fabrication of the materials.

(i) Any surface contamination shall be removed in accordance with ASTM A967/A967M.

SECTION 11. FABRICATION AND ERECTION TOLERANCES

11.1. General Requirements

Structural stainless steel shall be fabricated and erected in conformance with the tolerances in this Section and as required in the *contract documents*.

11.2. Fabrication Tolerances

The tolerances on *structural stainless steel* fabrication shall be in conformance with the requirements in Section 11.2.1 through 11.2.8.

Commentary:
Fabrication tolerances are stipulated in several *specifications* and codes, each applicable to a specialized area of construction. Basic fabrication tolerances are stipulated in this Section. For *architecturally exposed structural stainless steel*, see Section 10. Other specifications and codes are also commonly incorporated by reference in the *contract documents*, such as ANSI/AISC 370, AWS D1.6/D1.6M.

If the *engineer of record* determines that additional tolerances are required by the design concept, the tolerances should be identified in the *contract documents*, as required by Section 1.11 and ANSI/AISC 370 Section A4.1. The tolerances should be expressed in terms consistent with those found in Section 11, i.e., a description of the parameter to be measured and a tolerance (acceptable deviation from the required parameter).

11.2.1. For members that have both ends finished (see Section 6.2.2) for contact bearing, the variation in the overall length shall be a maximum of plus or minus 1/32 in. (1 mm). For other members that frame to other *structural stainless steel* elements, the variation in the detailed length shall be as follows:

(a) For members that are equal to or less than 30 ft (9.1 m) in length, the variation shall be a maximum of plus or minus 1/16 in. (2 mm).
(b) For members that are greater than 30 ft (9.1 m) in length, the variation shall be a maximum of plus or minus 1/8 in. (3 mm).

Commentary:
Care should be taken in the measurement of precision elements, including a consideration of thermal expansion.

11.2.2. For straight and curved structural members, the permitted variation in specified straightness or curvature shall be as listed in Sections 11.2.2.1 and 11.2.2.2. In all cases, completed members shall be free of twists (except as allowed by ASTM standards), bends, and open joints. Sharp kinks or sharp bends shall be cause for rejection.

11.2.2.1. For straight structural members, the variation in straightness shall be equal to or less than that specified for structural shapes in the applicable ASTM standards except when a smaller variation is specified in the *contract documents*. In the absence of applicable ASTM standards for *structural stainless steel* shapes, the straightness tolerance found in ASTM A484/A484M, Table 12, shall apply to *structural stainless steel* shapes.

Commentary:
Straightness, camber, and twist tolerances may need to be part of the ordering information.

11.2.2.2. For curved structural members, the variation in the chord length shall be as defined in Section 11.2.1. Unless otherwise specified in the *design documents*, the variation in curvature measured at the middle ordinate shall be a maximum of plus or minus 1/8 in. (3 mm) times one-fifth the total arc length in ft (times two-thirds the total arc length in m) for members 10 ft (3 m) or greater in length. For members less than 10 ft (3 m) in length, the variation in curvature measured at the middle ordinate shall be a maximum of plus or minus 1/8 in. (3 mm). The middle ordinate is located between work points (W.P.) as shown in Figure C-11.1.

For curved members, the work points shall be defined as follows:

(a) For members other than horizontal members, the member work point shall be the actual center of the member at each end of the shipping piece.
(b) For horizontal members, the work point shall be the actual centerline of the top flange or top surface at each end.

Commentary:
Curved structural members, as referred to in this section, are defined as those members intended to maintain a specified curvature while in use. This section does not apply to members specified for *camber*. The location of the arc length is defined by the *design documents* and may be either at the member's inside radius, the outside radius, or the radius between work points.

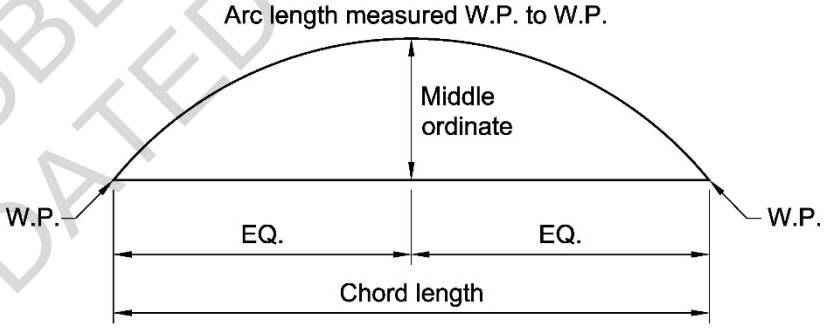


Fig. C-11.1. Illustration of the tolerance on curved structural steel member.

11.2.3. For beams that are detailed without specified *camber*, the member shall be fabricated so that, after erection, any incidental *camber* due to rolling or shop fabrication is upward. For trusses that are detailed without specified *camber*, the components shall be fabricated so that, after erection, any incidental *camber* in the truss due to rolling or shop fabrication is upward.

11.2.4.

Beams specified in the *contract documents* as cambered, which are ordered as straight as defined by the applicable ASTM specification and received by the *fabricator* with 75% of the specified *camber*, shall require no further cambering.

For beams specified in the *contract documents* as cambered, which are ordered as cambered or cambered by the fabricator, the variation in *camber* shall be as follows:

(a) For beams that are detailed equal to or less than 50 ft (15 m) in length, the variation shall be a maximum of minus zero/plus 1/2 in. (13 mm).
(b) For beams that are detailed greater than 50 ft (15 m) in length, the variation shall be a maximum of minus zero/plus 1/2 in. plus 1/8 in. for each 10 ft or fraction thereof (13 mm plus 3 mm for each 3 m or fraction thereof) in excess of 50 ft (15 m) in length.

For the purpose of inspection, *camber* shall be measured in the *fabricator's* shop in the unstressed condition.

Commentary:
Camber can only be properly specified and inspected in the unstressed condition. Inspection is best performed in the shop using established quality control procedures where remedial work, if required, can easily be performed.

Camber cannot be inspected after erection because the effect of dead load and *connection* restraint cannot be accurately determined. See AISC Design Guide 36, *Design Considerations for Camber*, Appendix B.

The *camber* tolerance in this section applies to camber induced in the fabrication process, which is done in response to *camber* requirements in the *contract documents*.

In *structural stainless steel* members there are two kinds of *camber*: (1) incidental *camber*, i.e., deviation from straightness, which is controlled by AWS, ASTM A484/A484M, or ASTM A1069/A1069M; and (2) induced *camber* which is specified by the *engineer of record* and is created by the *fabricator* or a supplier. Induced *camber* is controlled by the tolerances in Section 11.2.4. Straight members are subject to the straightness tolerances for sweep and *camber* in AWS, ASTM

A484/A484M, or ASTM A1069/A1069M. AISC has recommended that designers not specify *cambers* that are less than 3/4 in. (19 mm) to 1 in. (25 mm).

11.2.5. For fabricated trusses that are specified in the *contract documents* with *camber*, the variation in *camber* at each specified *camber* point shall be a maximum of plus or minus 1/800 of the distance to that point from the nearest point of support. For the purpose of inspection, *camber* shall be measured in the unstressed condition. For fabricated trusses that are specified in the *contract documents* without indication of *camber*, the foregoing requirements shall be applied at each panel point of the truss with a zero camber ordinate.

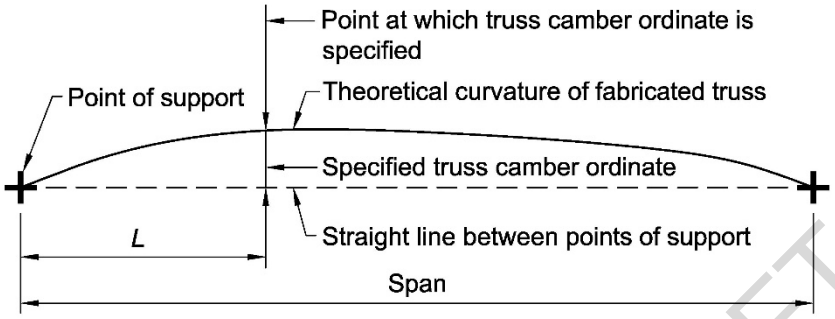
Commentary:
There is no known way to inspect truss *camber* in other than its "unstressed condition" because of factors that include the following:

(a) The effects of the dead weight of the member
(b) The restraint caused by the truss *connections* in the erected state
(c) The effects of additional dead load that may ultimately be intended to be applied, if any

Therefore, for shop fabricated trusses, inspection of the fabricator's work on truss camber should be done in the fabrication shop in the unstressed condition. See Figure C-11.2. However, it is common practice for field assembled trusses to be ground assembled either in the laydown or shored position and the *camber* should be checked before raising the truss.

11.2.6. When permissible variations in the depths of beams and girders result in abrupt changes in depth at splices, such deviations shall be accounted for as follows:

(a) For splices with bolted joints, the variations in depth shall be taken up with filler plates.
(b) For splices with welded joints, the weld profile shall be adjusted to conform to the variations in depth, the required cross section of weld shall be provided and the slope of the weld surface shall meet the requirements in AWS D1.6/D1.6M or, if a laser or laser hybrid welded section is specified, ASTM A1069/A1069M.



Taking *L* as the distance from the point at which truss camber is specified to the closer point of support, in. (mm), the tolerance on truss camber at that point is calculated as *L*/800. *L* must be equal to or less than one-half the span.

Fig. C-11.2. Illustration of the tolerance on camber for fabricated trusses with specified camber.

11.2.7. For holes in base and bearing plates, the variation from the detailed location with respect to the column shaft center lines shall be a maximum of plus or minus 1/8 in. (3 mm).

11.2.8. The tolerance on overall profile dimensions of welded *built-up members* and welded *built-up sections* not produced to an ASTM standard shall meet the requirements in AWS D1.6/D1.6M, or in the absence of specific tolerances provided therein, the tolerances in AWS D1.1/D1.1M shall be used.

11.3. Erection Tolerances

Erection tolerances shall be defined relative to member *working points* and working lines, which shall be defined as follows:

(a) For members other than horizontal members, the member work point shall be the actual center of the member at each end of the shipping piece.
(b) For horizontal members, the working point shall be the actual center line of the top flange or top surface at each end.
(c) The member working line shall be the straight line that connects the member *working points*.

Commentary:
The provision (b) applies at the "top flange" or "top surface" of a horizontal member. It should be noted that this may not be the uppermost point of members,

such as trusses with W-shape chords with webs horizontal or trusses with chords skewed from square. The *contract documents* may specify alternative *working points*.

The substitution of other *working points* is permitted for ease of use.

The tolerances on *structural stainless steel* erection shall be in accordance with the requirements in Section 11.3.1.

Commentary:

Thermal expansion and contraction may be a consideration in design and construction (see Figures C-11.3 and C-11.4). The coefficient of thermal expansion for *stainless steel* is different from *other steel alloys* and varies by *stainless steel* family (values for the coefficient of thermal expansion of *stainless steel* can be found in ANSI/AISC 370). Differential temperature effects should also be taken into account in plumbing surveys when tall *structural stainless steel* members are subjected to sun exposure on one side.

The Code does not provide explicit tolerances for the vertical position of the top of column shipping pieces at the *tier* splices in a multi-story frame. The design and construction teams need to establish requirements for monitoring the vertical position of the *tier* splices. Performance requirements should be addressed in the *contract documents*. The means of making adjustments should be addressed by pre-planning and mutual agreement among the affected parties prior to the commencement of fabrication and erection.

The alignment of lintels, spandrels, wall supports, and similar members that are used to connect other building construction units to the *steel frame* should have an adjustment of sufficient magnitude to allow for the accumulation of mill tolerances and fabrication tolerances, as well as the erection tolerances. See Figure C-11.5. If the *engineer of record* determines that additional tolerances are required by the design concept, the tolerances should be identified in the *contract documents*, as required by Section 1.11 and ANSI/AISC 370 Section A4.1. The tolerances should be expressed in terms consistent with those found in Section 11, i.e., a description of the parameter to be measured and a tolerance (acceptable deviation from the required parameter).

Tolerances for Complex Structures: During successive stages of erection, certain complex steel framed structures may require significant temporary support, bracing, and/or means to maintain geometry and stability during erection to mitigate substantial displacement or indeterminate load paths. These conditions may arise due to the planned sequential application of dead loads, including nonstructural elements, during or after completion of the erection of the steel frame. Some examples include, but are not limited to, structures that have nonstructural steel elements in their lateral force-resisting system, structures incorporating cable elements, long span and cantilevered structures, two-way girder or truss-framed structures, and inclined steel frames.

In order to achieve the specified plumb condition, elevation, and alignment of the structure at the completion of the *erector's* work, and to determine the

necessary fabrication geometry and preset geometry (*camber* or super-elevation) during erection of these structures, an analytical 3D model should be used by the *fabricator/erector* to perform a staged construction analysis and *erection bracing drawings*.

The determination of the fabrication geometry, any preset geometry, and the unstressed and stressed conditions of the steel frame is best achieved through a cooperative approach between the *fabricator*/*erector* and the *owner's designated representative for design*. The *fabricator*/*erector* should be provided with the same loads and the sequence of application of those loads used by the *owner's designated representative for design*. The *owner's designated representative for construction* should also provide a schedule for the application of the loads cited above for use in the creation of the *erection bracing drawings*.

Before commencing the work, the *fabricator*/*erector* and the *owner's designated representative for construction* must mutually agree as to how and when the requirements of Section 11.3 will be applied.

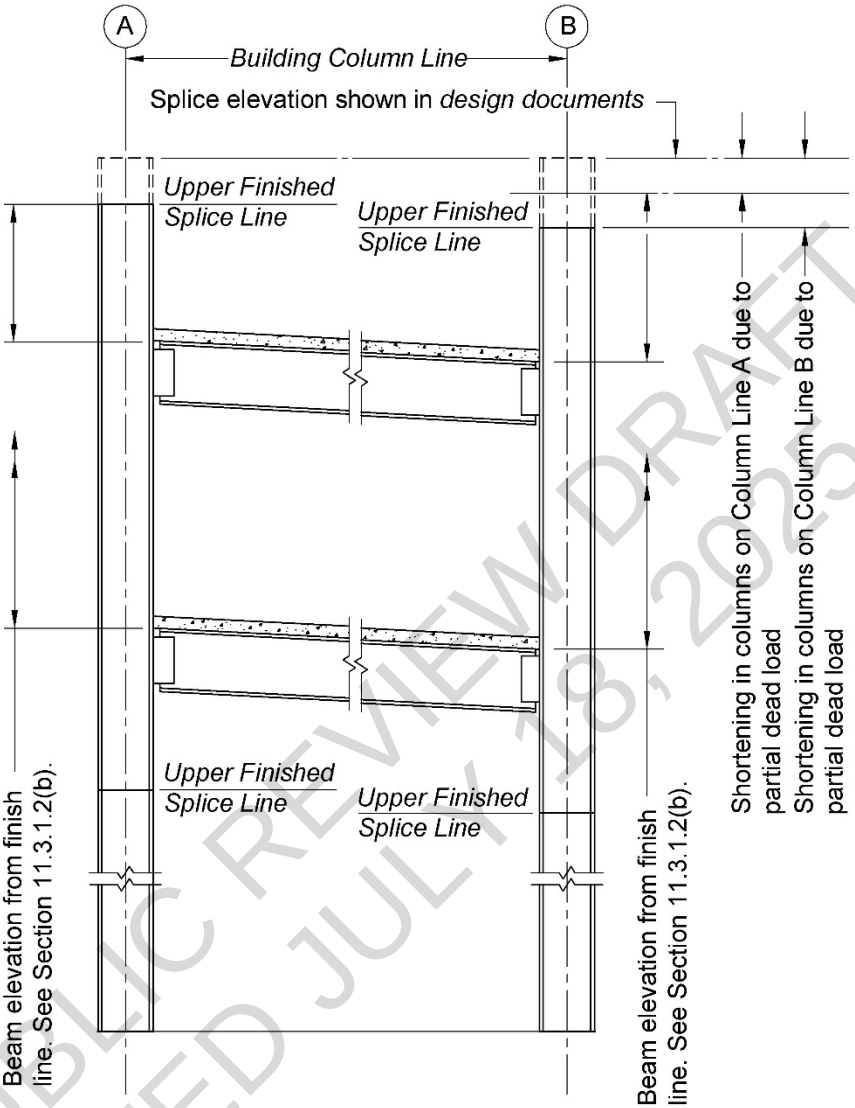


Fig. C-11.3. Effects of differential column shortening.

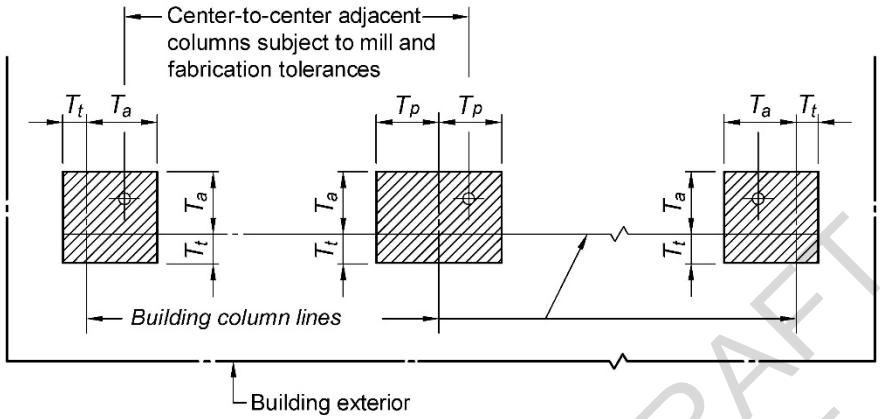
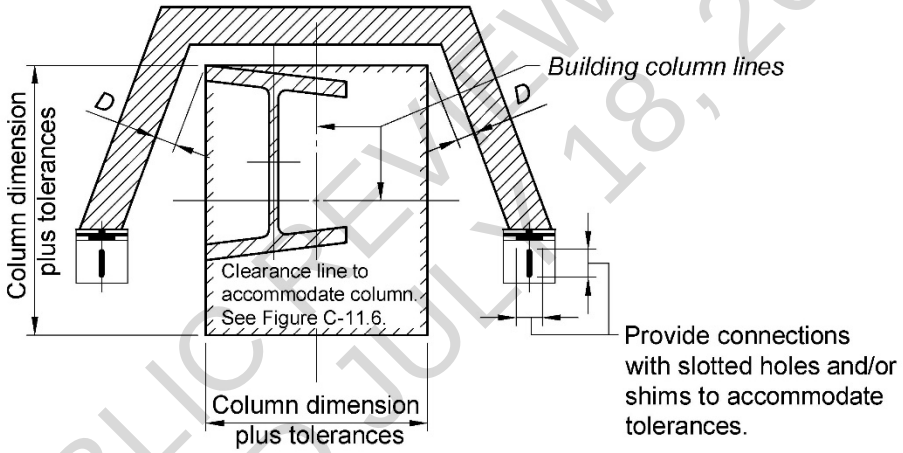


Fig. C-11.4. Tolerances in plan location of column.



If facia joints are set from nearest column finish line, allow ±⅝ in. (16 mm) for vertical adjustment. The entity responsible for the facia details must allow for progressive shortening of steel columns.

D = Tolerance required by manufacturer of wall unit plus survey tolerances.

Fig. C-11.5. Clearance required to accommodate fascia.

11.3.1. The tolerances on position and alignment of member *working points* and working lines shall be as described in Sections 11.3.1.1 through 11.3.1.3.

11.3.1.1. For an individual column shipping piece intended to be vertical, the angular variation of the working line from a plumb line shall be a maximum of 1/500 of the distance between *working points*, subject to the following additional limitations:

(a) For an individual column, the horizontal variation in location from the specified position at the base shall be a maximum of 1/4 in. (6 mm) in any direction.

(b) At column splices the variation between the upper column centerline relative to each principal axis and the lower column centerline relative to each principal axis shall be a maximum of plus or minus 1/4 in. (6 mm).

(c) For an individual column shipping piece that is adjacent to an elevator shaft, the displacement of member *working points* shall be a maximum of 1 in. (25 mm) from the *building column line* in the first 20 stories. Above this level, an increase in the displacement of 1/32 in. (1 mm) is permitted for each additional story up to a maximum displacement of 2 in. (50 mm) from the *building column line*.

(d) For an exterior individual column shipping piece, the displacement of member *working points* from the *building column line* in the first 20 stories shall be a maximum of 1 in. (25 mm) toward and 2 in. (50 mm) away from the building exterior. Above this level, an increase in the displacement of 1/16 in. (2 mm) is permitted for each additional story up to a maximum displacement of 2 in. (50 mm) toward and 3 in. (75 mm) away from the building exterior.

Commentary:
The limitations that are described in this section and illustrated in Figures C-11.6 and C-11.7 make it possible to maintain built-in-place or prefabricated facades in a true vertical plane up to the 20th story, if *connections* that provide for 3 in. (75 mm) of adjustment are used. Above the 20th story, the facade may be maintained within 1/16 in. (2 mm) per story with a maximum total deviation of 1 in. (25 mm) from a true vertical plane, if *connections* that provide for 3 in. (75 mm) of adjustment are used. *Connections* that permit adjustments of plus 2 in. (50 mm) to minus 3 in. (75 mm)—a total of 5 in. (125 mm)—will be necessary in cases where it is desired to construct the facade to a true vertical plane above the 20th story.

(e) For an exterior individual column shipping piece, the member *working points* at any splice level for multi-*tier* buildings and at the tops of columns for single-*tier* buildings shall fall within a horizontal envelope, parallel to the exterior *building column line*, that is less than or equal to 1-1/2 in. (38 mm) wide for buildings up to 300 ft (91 m) in length. An increase in the width of this horizontal envelope of 1/2 in. (13 mm) is permitted for each additional 100 ft (30 m) in length up to a maximum width of 3 in. (75 mm).

Commentary:

This section limits the position of exterior column *working points* at any given splice elevation to a narrow horizontal envelope parallel to the exterior *building column line* (see Figure C-11.8). This envelope is limited to a width of 1-1/2 in. (38 mm), normal to the exterior *building column line*, in up to 300 ft (90 000 mm) of building length. The horizontal location of this envelope is not necessarily directly above or below the corresponding envelope at the adjacent splice elevations but should be within the limitation of the 1 in 500 plumbness tolerance specified for the controlling columns (see Figure C-11.7).

(f) For an exterior column shipping piece, the displacement of member working points from the *building column line* that is nominally parallel to the building exterior shall be a maximum of 2 in. (50 mm) in the first 20 stories. Above this level, an increase in the displacement of 1/16 in. (2 mm) is permitted for each additional story up to a maximum displacement of 3 in. (75 mm) in the direction nominally parallel to the building exterior.

(g) For columns bearing on transfer members such as transfer girders and trusses the reference line for column plumbness and position is located at the intersection of the conforming, as-erected center of the transfer member, and the orthogonal *building column line*.

Commentary:
As illustrated in Figure C-11.8, the position tolerance for a column bearing on a transfer member is measured at the column location from the transfer member centerline along its longitudinal axis and from the perpendicular *building column line*.

11.3.1.2. For members other than column shipping pieces, the following limitations shall apply:

(a) For a member that consists of an individual, straight shipping piece without field splices, other than a cantilevered member, the variation in alignment shall be acceptable if it is caused solely by variations in column alignment and/or primary supporting member alignment that are within the permissible variations for the fabrication and erection of such members.

(b) For a member that consists of an individual, straight shipping piece that connects to a column, the variation in the distance from the member working point to the *upper finished splice line* of the column shall be a maximum of plus 3/16 in. (5 mm) and minus 5/16 in. (8 mm). These tolerances also apply at the top of a column, either the top column in a multi-*tier* building or a column in a single-*tier* building.

(c) For a member that consists of an individual shipping piece that does not connect to a column, the variation in elevation shall be acceptable if it is caused solely by the variations in the elevations of the supporting members within the permissible variations for the fabrication and erection of those members.

(d) For a member that consists of an individual, straight shipping piece and that is a segment of a field assembled unit containing field splices between points of support, the plumbness, elevation, and alignment shall be acceptable if the angular variation, vertically and horizontally, of the working line from a straight line between points of support is a maximum of plus or minus 1/500 of the distance between *working points*.

Commentary:
The angular misalignment of the working line of all fabricated shipping pieces relative to the line between support points of the member as a whole in erected position must not exceed 1 in 500. Note that the tolerance is not stated in terms of a linear displacement at any point and is not to be taken as the overall length between supports divided by 500. Typical examples are shown in Figure C-11.9. Numerous conditions within tolerance for these and other cases are possible. The condition described in (d) applies to both plan and elevation tolerances.

(e) For a cantilevered member that consists of an individual, straight shipping piece, the plumbness, elevation, and alignment shall be acceptable if the angular variation of the working line from a straight line that is extended in the plan direction from the working point at its supported end is a maximum of 1/500 of the distance from the working point at the free end.

Commentary:
This tolerance is evaluated after the fixed end condition is sufficient to stabilize the cantilever and before the temporary support is removed. The preset specified in the *contract documents* should be calculated accordingly. The temporary support cannot be used to induce artificial deflection into the cantilever to meet this tolerance after the fixed end is restrained.

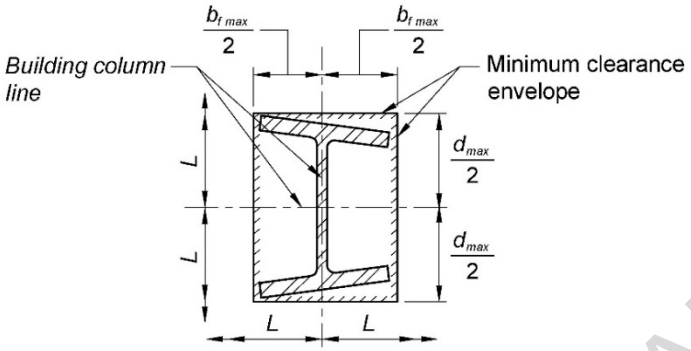
(f) For a member of irregular shape, the plumbness, elevation, and alignment shall be acceptable if the fabricated member is within its tolerances and the members that support it are within the tolerances specified in *this Code*.

(g) For a member that is fully assembled in the field in an unstressed condition, the same tolerances shall apply as if fully assembled in the shop.

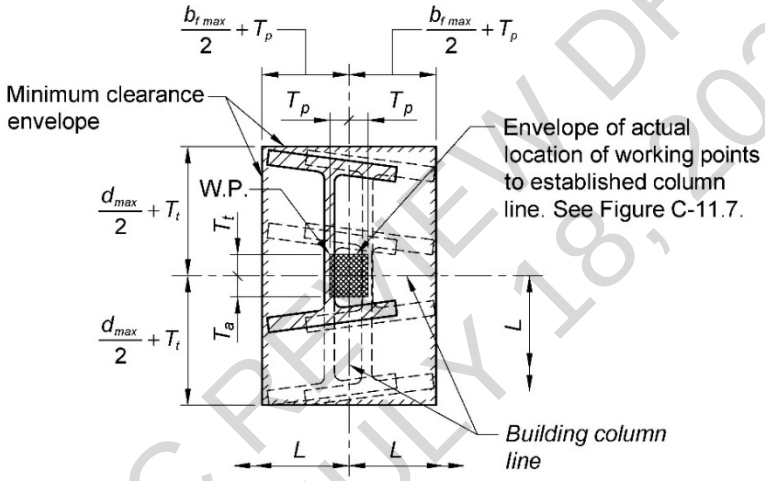
(h) For a member that is field-assembled, element-by-element, in place, temporary support shall be used or an alternative erection plan shall be submitted to the *owner's designated representatives for design* (*ODRD*) and *construction* (*ODRC*). The tolerance in Section 11.3.1.2(d) shall be met in the supported condition with *working points* taken at the point(s) of temporary support.

Commentary:
Trusses fabricated and erected as a unit or as an assembly of truss segments normally have excellent controls on vertical position regardless of fabrication and erection techniques. However, a truss fabricated and erected by assembling individual components in place in the field is potentially more

sensitive to deflections of the individual truss components and the partially completed work during erection, particularly the chord members. In such a case, the erection process should follow an erection plan that addresses this issue.



For Enclosures or Attachments That May Follow Column Alignment

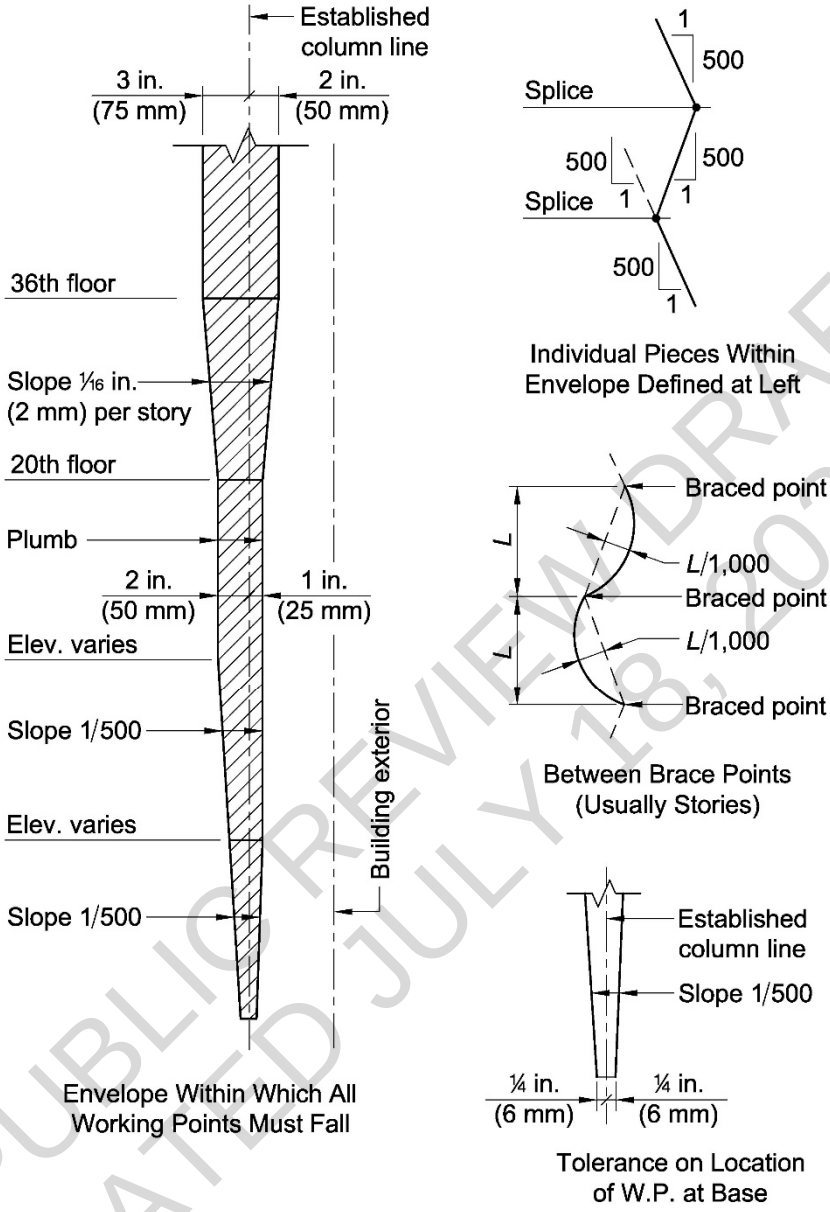


For Enclosures or Attachments That Must Be Held to Plan Location

L = Actual center-to-center of columns = plan dimensions ± column cross-section tolerance of columns ± beam length tolerance
T_a = Plumbness tolerance away from building exterior (varies, see Figure C-11.7)
T_t = Plumbness tolerance toward building exterior (varies, see Figure C-11.7)
T_p = Plumbness tolerance parallel to building exterior (= T_a)

Notes:
1. $b_{f\,max}$ and d_{max} per ASTM A6. See Figure C-5.1.
2. The maximum clearance envelope does not include permissible sweep and camber in the column material.

Fig. C-11.6. Clearance required to accommodate accumulated column tolerance.



Note: The plumb line through the base working point for an individual column is not necessarily the precise plan location because Section 7.13.1.1 deals only with plumbness tolerances and does not include inaccuracies in location of the established column line, foundations, and anchor rods beyond the erector's model. *Fig. C-11.7. Exterior column plumbness tolerance normal to building exterior.*

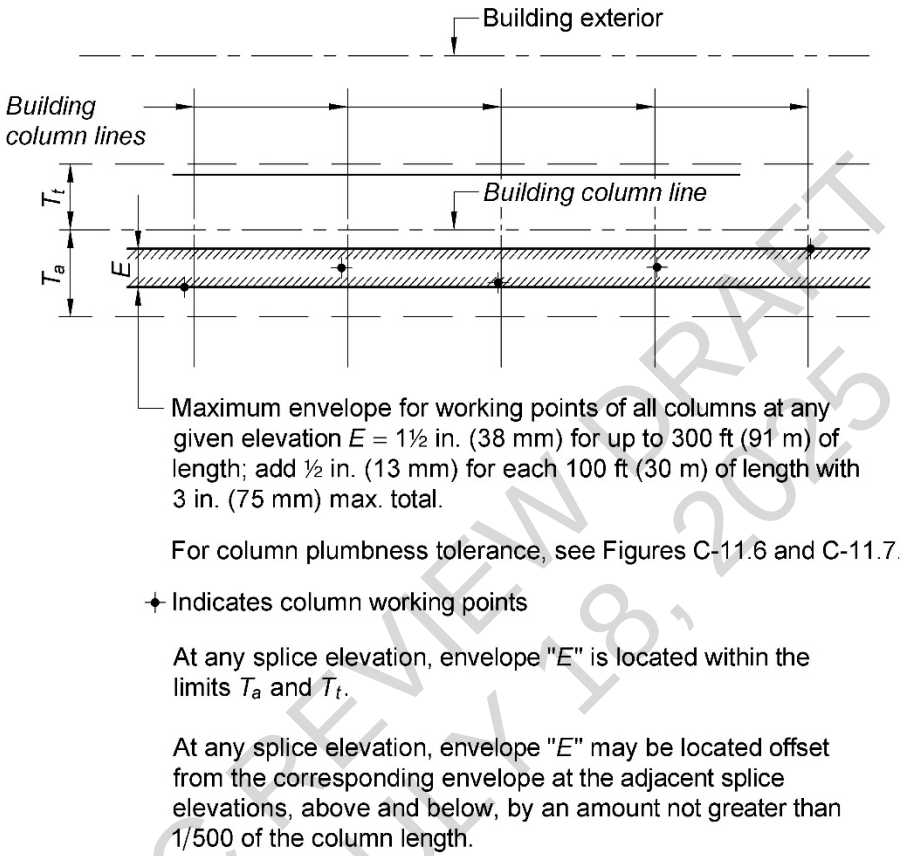


Fig. C-11.8. Tolerance in plan at any splice elevation of exterior columns.

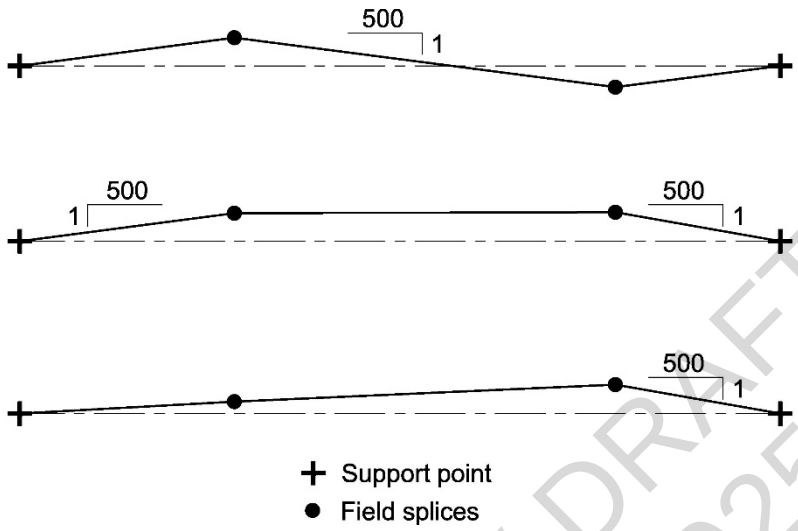


Fig. C-11.9. Alignment tolerances for members with field splices.

11.3.1.3. For members that are identified as *adjustable items* by the *ODRD* in the *contract documents*, the *fabricator* shall provide adjustable *connections* for these members to the supporting *steel frame*. Otherwise, the *fabricator* is permitted to provide nonadjustable *connections*. When *adjustable items* are specified, the *ODRD* shall indicate the total adjustability that is required for the proper alignment of these supports for other trades. The variation in the position and alignment of *adjustable items* shall be as follows:

(a) The variation in the vertical distance from the *upper finished splice line* of the nearest column to the support location specified in the structural *design documents* shall be a maximum of plus or minus 3/8 in. (10 mm).
(b) The variation in the horizontal distance from the established *finish line* at the particular floor shall be a maximum of plus or minus 3/8 in. (10 mm).
(c) The variation in vertical and horizontal alignment at the abutting ends of *adjustable items* shall be a maximum of plus or minus 3/16 in. (5 mm).

Commentary:
When the alignment of lintels, wall supports, curb angles, mullions, and similar supporting members for the use of other trades is required to be closer than that permitted by the foregoing tolerances for *structural stainless steel*, the *ODRD* must identify such items in the *contract documents* as *adjustable items*.

11.3.1.4. For inclined columns, the tolerances of 11.3.1.1(a), (c), (d), and (e) shall also apply at the *working points* of these columns.

11.3.2. In the design of *stainless steel* structures, the *ODRD* shall provide for the necessary clearances and adjustments for material furnished by other trades to accommodate the mill tolerances, fabrication tolerances, and erection tolerances in *this Code* for the *steel frame*.

Commentary:
In spite of all efforts to minimize inaccuracies, deviations will still exist; therefore, in addition, the designs of prefabricated wall panels, partition panels, fenestrations, floor-to-ceiling door frames, and similar elements must provide for clearance and details for adjustment as described in Section 11.3.2. Designs must provide for adjustment in the vertical dimension of prefabricated facade panels that are supported by the *steel frame* because the accumulation of shortening of loaded steel columns will result in the unstressed facade supported at each floor level being higher than the *structural stainless steel* framing to which it must be attached. Observations in the field have shown that where a heavy facade is erected to a greater height on one side of a multistory building than on the other, the *structural stainless steel* framing will be pulled out of alignment. Facades should be erected at a relatively uniform rate around the perimeter of the structure.

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Metric Conversion Factors for Common Steel Design Units in AISC Specifications

Unit	Multiply	by	to obtain
length	inch (in.)	25.4	millimeters (mm)
length	foot (ft)	0.304 8	meters (m)
mass	pound-mass (lbm)	0.453 6	kilogram (kg)
stress	ksi	6.895	megapascals (MPa), N/mm^2
moment	kip-in.	113 000	N-mm
energy	ft-lbf*	1.356	joule (J)
force	kip (1 000 lbf)*	4 448	newton (N)
force	psf	47.88	pascal (Pa), N/m^2
force	plf	14.59	N/m
force	kip/in.	175.1	N/mm
temperature	To convert °F to °C: $t_c° = (t_f° - 32)/1.8$		

* Force in lbf or N = mass × g, where g, acceleration due to gravity = 32.2 ft/sec^2 = 9.81 m/sec^2

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