INTERNATIONAL ACCREDITATION SERVICE®

ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS

AC472

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PREFACE

The attached accreditation criteria have been issued to provide all interested parties with guidelines on implementing performance features of the applicable standards referenced herein. The criteria were developed and adopted following public hearings conducted by the International Accreditation Service, Inc. (IAS), Accreditation Committee and are effective on the date shown above. All accreditations issued or reissued on or after the effective date must comply with these criteria. If the criteria are an updated version from a previous edition, solid vertical lines (|) in the outer margin within the criteria indicate a technical change or addition from the previous edition. Deletion indicators (→) are provided in the outer margins where a paragraph or item has been deleted if the deletion resulted from a technical change. These criteria may be further revised as the need dictates.

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ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS

1 INTRODUCTION

1.1 **Scope:** These criteria set forth the requirements for obtaining and maintaining International Accreditation Service, Inc. (IAS), Inspection Programs for Manufacturers of Metal Building Systems accreditation. The criteria supplement the IAS Rules of Procedure for Inspection Programs for Manufacturers of Metal Building Systems.

1.2 **Overview:** Accredited entities complying with these criteria will have demonstrated they have the personnel, organization, experience, knowledge, quality procedures and commitment to fabricate in accordance with specified requirements. IAS-accredited inspection programs for manufacturers of metal building systems operate under a documented management system developed in concert with an IAS-accredited inspection agency which conducts unannounced inspections to verify continued compliance with these criteria. The management system includes the manufacturer's written fabrication procedures and quality control manuals which provide a basis for control of materials and workmanship, with periodic inspections of fabrication and quality control practices by an IAS-accredited inspection agency. Although accredited entities are evaluated on their performance measures to consistently produce products of the required quality mandated by specified requirements, these criteria do not cover the products or the design or performance characteristics of the products.

1.3 **Normative and Reference Documents**: Publications listed below refer to current editions (unless otherwise stated).

1.3.1 American Welding Society: D1.1, D1.3, Structural Welding Code.

1.3.2 ISO 9606-1, Qualification testing of welders – Fusion welding – Part 1: Steels.

1.3.3 ISO/IEC 17000, Conformity assessment - Vocabulary and general principles.

1.3.4 International Accreditation Service, Inc. (IAS), Accreditation Criteria for Inspection Programs for Manufacturers of Cold-formed Steel Structural and Nonstructural Components Not Requiring Welding accreditation (AC473).

1.3.5 IAS Rules of Procedure for Accreditation of Inspection Programs for Manufacturers of Metal Building Systems.

1.3.6 International Building Code®, published by the International Code Council.

1.3.7 American Welding Society: A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.

1.3.8 American Welding Society: A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.

1.3.9 American Welding Society: QC1, Standard for AWS Certification of Welding Inspectors.

1.3.10 Canadian Standards Association: W178.2, Certification of welding inspectors.

1.3.11 The American Society for Nondestructive Testing (ASNT): SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing.

1.3.12 American Institute of Steel Construction (AISC), ANSI/AISC 360 Specification for Structural Steel Buildings.

1.3.13 American Iron and Steel Institute: AISI S100: North American Specification for the Design of Cold-Formed Steel Structural.

1.3.14 MBMA Manuals:

1.3.14.1 Metal Building Systems Manual

1.3.14.2 Metal Roofing Systems Design Manual

1.3.14.3 Fire Resistance Design Guide for Metal Building Systems

1.3.14.4 Guide for Inspecting Metal Building Systems

1.3.14.5 MBMA Model Written Practice-UT Certification

2 DEFINITIONS

For the purposes of these accreditation criteria, the definitions given in ISO/IEC 17000, and the definitions that follow, apply.

2.1 **Approved Fabricator**: An established and qualified person, firm or corporation approved by the building official pursuant to the approved fabricator designation in Section 1702 of the *International Building Code*®.

2.2 **Cold-formed Products**: Products such as cold-formed Z- or C-shaped structural members or roll-formed sheeting or deck designed to resist vertical and/or lateral loads.

2.3 **Contract Documents**: Documents that describe the metal building system to be supplied in its entirety for a given project. These documents include work orders, drawings, specifications, and buyer sketches.

2.4 **Corrective Action**: Implemented action necessary to eliminate or reduce the root cause of an identified problem.

2.5 **General Manager**: The person occupying the highest position of authority within a facility's organization.

2.6 **Letter of Certification**: A project document that certifies the design of the metal building system as required by AC472 Section 4.6.3.2.3.

2.7 **Management System**: A set of interrelated or interacting elements that organizations use to direct, control and coordinate how policies are implemented and objectives are achieved. Previously, this was referred to as Quality Management System.

2.8 **Metal Building Systems Manufacturer**: An entity which may be a company, division, subsidiary or similar organization that designs and manufactures a metal building system which

consists of an integrated set of components and assemblies, including but not limited to frames that are primary structural steel members, secondary members that are cold-formed steel and steel joists, and roof and wall cladding components, specifically designed to support and transfer loads and provide a complete or partial building shell.

2.9 **Nonconformance**: An action employed that renders a design, member, or component unacceptable for the intended use as specified in contract documents or these criteria.

2.10 **Nondestructive Testing (NDT)**: The process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system.

2.11 **PQR**: Procedure Qualification Record in accordance with AWS Standards, as applicable.

2.12 **Procedure**: An implemented and written document that describes who does what, when, where, why and how.

2.13 **Product**: Result of activities or processes.

2.14 **Production Engineer**: An engineer who performs final designs on projects so that project documents and shop documents can be made.

2.15 **Project:** A process consisting of a set of coordinated and controlled activities undertaken to achieve customer requirements.

2.16 **Project Documents**: Documents produced for the buyer's use to support the implementation of the project. These documents include permit and erection drawings, installation manuals and letters of certification.

2.17 **Quality Assurance**: Measurable systematic actions to assure confidence that the implementation of planned activities result in meeting objectives, goals and contract documents.

2.18 **Quality Control**: The act of examination, testing or measurement that verifies processes and services, or that documents conform to specified criteria.

2.19 **Quality Manager**: A quality professional, designated by management who has demonstrated competence in establishing, maintaining and implementing a management system with consistent results. The quality manager shall have direct access to the highest executive level and shall report on the performance of the quality system to the organization's management for use as a basis for improvement of the management system.

2.20 **Quality Plan**: A written document that describes the procedures and policies implemented to assure product quality meets requirements of specific contract documents. As a minimum, quality plans must meet the requirements of Sections 4.7.1.1 and 4.7.1.2 or 4.7.2.1 and 4.7.2.2 of these criteria.

2.21 **Repair**: Action taken to render a member or component acceptable for the intended use.

2.22 **Shop Documents**: Documents produced that describe the individual parts and pieces of a metal building system to be fabricated in the fabrication facility. These documents include shop details, bills of material, manifests, bills of lading, etc.

2.23 **Specification**: A document that states the obligatory requirements to which the product must conform.

2.24 **Structural Weldments**: Structural framing involving welding, coping, cutting, and drilling of built-up I-shaped sections, rolled shapes, or cold-formed sections.

2.25 **Subcontractor**: An entity that provides goods or services per stipulated project or shop documents. A subcontractor is hired to perform specific tasks. An example of a subcontractor is a structural steel fabricator.

2.26 **Vendor**: An entity that provides inventoriable, proprietary buy-out items that are available for sale. These items are typically chosen from a catalogue or list and are finite in terms of available options and quantity. Examples of vendors are bolt manufacturers and steel mills.

2.27 **WPS**: Welding Procedure Specification in accordance with ANSI/AWS D1.1 or AWS D1.3, as applicable.

3 ELIGIBILITY

The metal building systems manufacturer must have, at a minimum, in-house capabilities for Parts A and C. Part B components can be manufactured in-house or outsourced under the quality assurance requirements under Part B. Entities that outsource any cold-form secondary and sheeting products to facilities that are not IAS-accredited facilities must ensure annually that the manufacturer effectively implements a quality management system that is compliant with Part B of these criteria.

4 REQUIRED BASIC INFORMATION

4.1 Fabricator inspection programs for manufacturers of metal building systems must demonstrate compliance with the following requirements:

4.1.1 The requirements of these accreditation criteria;

4.1.2 IAS Rules of Procedure for Accreditation of Inspection Programs for Manufacturers of Metal Building Systems.

4.2 General Requirements

4.2.1 Quality System

4.2.1.1 Entities accredited under these criteria shall establish and implement a quality system which is fully documented. This documented management system must describe the procedures and quality activities for ensuring fabricated products meet the specified requirements.

4.2.1.2 A documented management system shall be prepared and submitted to IAS. The documentation shall include a cross-reference matrix prepared in concert with an IAS-accredited inspection agency ensuring the general requirements in Section 4.2, personnel requirements in Section 4.3, data in Section 4.4, the statements in Section 4.5, and the written procedures noted in Section 4.6 of these accreditation criteria have been included.

4.2.1.3 The submitted management system must be signed and dated by the highest level of authority within the organization.

4.2.1.4 The submitted quality assurance document must be signed and dated by an authorized representative of an IAS-accredited inspection agency, attesting the inspection agency has reviewed the documented quality system and it is sufficient to allow scheduling of an onsite joint assessment with IAS.

4.2.2 The submitted documentation must be reviewed at least annually.

4.2.3 The program consists of three parts:

4.2.3.1 **Part A**: Fabrication of structural weldments and cold-formed products requiring welding.

4.2.3.2 **Part B**: Fabrication of cold-formed products not requiring welding.

4.2.3.3 **Part C**: Design of metal building systems.

4.3 Personnel

4.3.1 Part A

4.3.1.1 **Quality Manager**: Entities accredited under these criteria shall designate a quality manager who has the necessary training and experience to complete the tasks listed in Sections 4.3.1.1.1 through 4.3.1.1.5. The quality manager shall report directly to the highest level of authority within the organization. The quality manager shall have the following responsibilities:

4.3.1.1.1 Maintaining the documented management system in accordance with these criteria.

4.3.1.1.2 Monitoring the effective implementation of the documented quality system.

4.3.1.1.3 Assuring that periodic internal audits are conducted and documented, and corrective actions are implemented.

4.3.1.1.4 Assuring annual management reviews are conducted and documented to assure the adequacy and effectiveness of the management system. Annual management reviews must produce a summary and a documented plan of action for improvement. Documents to be considered during the annual management review must include, but are not limited to, customer complaints, back charges, internal audit results and corrective actions.

4.3.1.1.5 Developing quality plans which meet contract documents, and having knowledge of and access to the appropriate documents to meet this requirement.

4.3.1.2 **In-house Quality Control (QC) Inspector**: Entities accredited under these criteria shall designate an in-house quality control inspector who, as a minimum, must meet the following requirements:

4.3.1.2.1 Be a Certified Welding Inspector (CWI) in accordance with the provisions of AWS QC1 or the equivalent requirements of the Canadian Standards Association (CSA) Standard W178.2 or for an ICC Structural Welding Special Inspector (S2).

4.3.1.2.2 Be familiar with and demonstrate knowledge of codes and specifications, as appropriate, for the scope of work specified in the contract documents.

4.3.1.2.3 Be responsible for assuring that only qualified and certified welders are used, as specified by contract documents for the welding process and procedures permitted for use.

4.3.1.2.4 Be responsible for assuring continuity of the welders' qualifications as required by American Welding Society AWS D1.1 or D1.3, as appropriate.

4.3.1.2.5 Qualified personnel must be responsible for overall workmanship and for ensuring all structural members and weldments are 100 percent visually inspected. Although inspections may be delegated to qualified personnel during the receipt and in-process stages of assembly, it is the responsibility of the in-house quality control inspector to ensure that inspections are performed and documented and that the product meets project requirements. Qualified personnel must meet the requirements of Section 4.3.1.2.1 of these criteria or demonstrate competence to perform inspections by appropriate training and/or experience in metals fabrication, inspection and testing. The basis for designating qualified personnel shall be documented by the in-house quality control inspector as noted in AC472 Section 4.6.1.5.3.

4.3.1.2.6 Be responsible for ensuring incoming raw materials are properly identified and inspected for compliance with quality plans and specifications.

4.3.1.2.7 Be responsible for ensuring and documenting that the final assembly can be traced back to the incoming materials, the quality assurance records and the individual welder.

4.3.1.2.8 Be responsible for reviewing all Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs) before these are used in production welding operations.

4.3.1.2.9 Be responsible for ensuring fabrication of weldments and cold-formed products meet the fabrication tolerances outlined in Table 4.1 or Table 4.2.

4.3.1.3 **Welding Personnel**: Entities accredited under this criteria shall ensure the following conditions are met:

4.3.1.3.1 All welding personnel shall be qualified by the test as described in ANSI/AWS D1.1 or D1.3, or other accepted country-specific test standard, as appropriate, by a qualified independent third-party agency. Third-party qualification shall be by certification as an AWS Certified Welding Inspector (CWI) in accordance with the provisions of AWS QC1, *Standard Guide for Qualification and Certification of Welding Inspectors*; or current qualification by the Canadian Welding Bureau (CWB) to the requirements of the Canadian Standards Association Standard W178.2, *Certification of Welding Inspectors*; or current qualification by approved third-party agencies, such as those accredited by an accreditation body that is an IAS Mutual Recognition Arrangement (MRA) partner, per ISO 9606-1; or by the International Code Council as an ICC Structural Welding Special Inspector (S2). The in-house CWI, CWB, or ICC structural welding special inspector (S2) may administer the welding tests; however, the qualification coupon shall be evaluated by the third party CWI, CWB or ICC Structural Welding Special Inspector. If tensile testing is required for qualification of welding personnel, the test, or test sample, must be sent to an IAS-accredited testing laboratory for examination. Such laboratories must be accredited by IAS or by an accreditation body that is a partner with IAS in an MRA.

4.3.1.3.2 All welding personnel shall have and use an identifying number, letter or symbol for the purpose of traceability.

4.3.1.4 **Nondestructive Testing**: Procedures shall be developed as required by the applicable building code and in the project documents.

4.3.1.5 If metal building manufacturers include nondestructive testing as an in-house practice, they will receive recognition on the certificate of accreditation. As a minimum, there must be in-house staff certified in accordance with SNT-TC-1A. The hours required for certification as Level I and Level II UT technician shall not be less than the hours stated in “MBMA Model Written Practice-UT Certification” as referenced in Section 1.3.14.5.

4.3.2 **Part B**

4.3.2.1 **Quality Manager:** Entities accredited under these criteria shall designate a quality manager who has the necessary training and experience to complete the tasks listed in Sections 4.3.2.1.1 through 4.3.2.1.5. The quality manager shall report directly to

the highest level of authority within the organization. The quality manager shall have the following responsibilities:

4.3.2.1.1 Maintaining the documented management system in accordance with these criteria.

4.3.2.1.2 Monitoring the effective implementation of the documented management system.

4.3.2.1.3 Assuring periodic internal audits are conducted and documented, and corrective actions are implemented.

4.3.2.1.4 Assuring annual management reviews are conducted and documented to assure the adequacy and effectiveness of the management system. Annual management reviews must produce a summary and a documented plan of action for improvement. Documents to be considered during the annual management review must include, but are not limited to, customer complaints, back charges, internal audit results and corrective actions.

4.3.2.1.5 Developing quality plans which meet contract documents, and having knowledge of and access to the appropriate documents to meet this requirement.

4.3.2.2 **In-house Quality Control (QC) Inspector**: Entities accredited under this criteria shall designate an in-house quality control inspector who, as a minimum, must meet the following requirements:

4.3.2.2.1 Be familiar with and demonstrate knowledge of codes and specifications, as appropriate, for the scope of work specified in the contract documents.

4.3.2.2.2 Be responsible for ensuring incoming raw materials are properly identified and inspected for compliance with quality plans and specifications.

4.3.2.2.3 Be responsible for ensuring and documenting the final fabrication assembly can be traced back to the incoming materials and the quality assurance records.

4.3.2.2.4 Be responsible for ensuring fabrication of cold-formed products meets the fabrication tolerances outlined in Table 4.1.

4.3.3 **Part C**

Engineer in Responsible Charge: Entities accredited under these criteria shall designate an Engineer in Responsible Charge who, as a minimum, must meet the following requirements:

4.3.3.1 Be a professional engineer registered or licensed in the United States to practice engineering or an engineer duly registered or licensed in the country in which the facility is located, who has experience with the building code and the design of metal building systems.

4.3.3.2 Have full authority for the control of engineering performed at the facility as related to technical decision making. This person need not be the highest level of authority within the organization of the facility as long as appropriate technical authority has been granted to him/her.

4.3.3.3 Assuring annual management reviews are conducted to assure the adequacy and effectiveness of the quality system. Annual management reviews must produce a documented summary and a documented plan of action for improvement. Documents to be considered during the annual management review must include, but are not limited to, customer complaints, back charges, internal audit results and corrective actions.

4.4 Required Data

4.4.1 Part A

4.4.1.1 The name of the facility, the physical street address, mailing address (if different), information on the person serving as the IAS contact (including the telephone number and e-mail address), and the telephone number of the facility.

4.4.1.2 A floor plan of the fabrication facility. The floor plan need not be to scale.

4.4.1.3 A list of major production equipment, including welding, burning, lifting and inspection equipment.

4.4.1.4 A list of typical items fabricated (e.g., beams, trusses, girders, bracing members, etc.).

4.4.1.5 A copy of all WPSs for production welding. The WPSs shall be written to include essential and nonessential variables, in accordance with AWS D1.1 or D1.3, as appropriate for the type of fabrication performed at the facility.

4.4.1.6 A copy of all PQRs for WPSs qualified by testing, when required.

4.4.1.7 A list of qualified welding personnel, including their approved welding process, limitations on their qualifications and their identification marks.

4.4.1.8 Evidence that welding personnel are qualified by an independent, third-party CWI, CWB, or ICC Structural Welding Special Inspector in accordance with Section 4.3.1.3.1 of these criteria.

4.4.1.9 The name and certification number of the CWI, CWB, or ICC Structural Welding Special Inspector acting as the in-house quality control inspector.

4.4.1.10 The name of the deputy in-house QC inspector who assumes the position in the absence of the primary in-house QC person.

4.4.1.11 An organizational chart including the names of the responsible quality managers. This chart must show the relationships among the CEO, the Engineer In

Responsible Charge, general manager, quality manager, in-house quality control inspector, deputy in-house inspector, production manager and welding personnel.

4.4.1.12 A list of approved vendors, including any testing agencies employed to verify a WPS.

4.4.1.13 A list of test and measuring equipment.

Test and measuring equipment must be calibrated and traceable to a national standard. The equipment list must include sufficient testing instruments to assure quality compliance as appropriate for the items being fabricated.

4.4.2 **Part B**

4.4.2.1 The name of the facility, the physical street address, mailing address (if different), information on the person serving as the IAS contact (including the telephone number and e-mail address), and the telephone number of the facility.

4.4.2.2 A floor plan of the fabrication facility. The floor plan need not be to scale.

4.4.2.3 A list of major production equipment, including burning, lifting and inspection equipment.

4.4.2.4 A list of typical items fabricated (e.g., cold formed sections, roof and wall panels, etc.).

4.4.2.5 The name of the deputy in-house QC inspector who assumes the position in the absence of the primary in-house QC person.

4.4.2.6 An organizational chart including the names of the responsible quality managers. This chart must show the relationships among the CEO, general manager, quality manager, in-house quality control inspector, deputy in-house inspector and production manager.

4.4.2.7 A list of approved vendors.

4.4.2.8 A list of test and measuring equipment.

Test and measuring equipment must be calibrated and traceable to a national standard. The equipment list must include sufficient testing instruments to assure quality compliance as appropriate for the items being fabricated.

4.4.3 **Part C**

4.4.3.1 The name of the facility, the physical street address, mailing address (if different), information on the person serving as the IAS contact (including the telephone number and e-mail address), and the telephone number of the facility.

4.4.3.2 An organizational chart showing the relationships among the CEO, general manager, Engineer in Responsible Charge, and production engineers.

4.4.3.3 A listing of all engineers performing production engineering, along with their years of experience in designing metal building systems.

4.5 **Required Statements**

4.5.1 **Part A**

The following statements shall be provided in the quality system submittal:

4.5.1.1 A quality policy statement that includes the following elements:

4.5.1.1.1 All activities of the organization shall be directed in such a manner as to ensure that the quality requirements of AC472 will be met.

4.5.1.1.2 The elements of the quality assurance program will be disseminated to all personnel assigned activities whicht affect the quality of the product.

4.5.1.2 IAS will be notified, in writing prior to any cancellation of the inspection agreement with the accredited inspection agency.

4.5.1.3 Copies of reports of inspections conducted by the inspection agency, if they note major quality control variations, will be forwarded to IAS within 10 days of the major deficiency having been reported.

4.5.1.4 Entities accredited under these criteria will notify the inspection agency when the facility is to be closed for extended time periods other than for normally scheduled periods for maintenance or vacations, or for two or more weeks regardless of the circumstances of the closure. IAS and the inspection agency will be notified 10 days prior to resumption of operations.

4.5.1.5 IAS will be notified in writing by the accredited entity and the inspection agency if unannounced, follow-up inspections have not been conducted by the inspection agency.

4.5.1.6 IAS and the accredited inspection agency must be notified within 30 days of any changes in management personnel. As a minimum, this would include the president, general manager, purchasing manager, production manager or quality manager.

4.5.2 **Part B**

The following statements shall be provided in the quality system submittal:

4.5.2.1 A quality policy statement which includes the following elements:

4.5.2.1.1 All activities of the organization shall be directed in such a manner as to ensure the quality requirements of AC472 will be met.

4.5.2.1.2 The elements of the quality assurance program will be disseminated to all personnel assigned activities which affect the quality of the product.

4.5.2.2 IAS will be notified, in writing, prior to any cancellation of the inspection agreement with the accredited inspection agency.

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4.5.2.6 IAS and the accredited inspection agency must be notified within 30 days of any changes in management personnel. As a minimum, this would include the president, general manager, purchasing manager, production manager, or quality manager.

4.5.3 **Part C**

4.5.3.1 A quality policy statement which includes the following elements:

4.5.3.1.1 All activities of the organization shall be directed in such a manner as to ensure the quality requirements of AC472 will be met.

4.5.3.1.2 The elements of the quality assurance program will be disseminated to all engineering personnel performing production engineering.

4.5.3.2 IAS will be notified, in writing, prior to any cancellation of the inspection agreement with the accredited inspection agency.

4.5.3.3 Copies of reports of inspections conducted by the inspection agency, if they note major quality control variations, will be forwarded by the accredited entity to IAS within 10 days of the major deficiency being reported.

4.5.3.4 Entities accredited under these criteria will notify the inspection agency when the facility is to be closed for extended time periods other than for normally scheduled periods for maintenance or vacations, or for two or more weeks regardless of the circumstances of the closure. IAS and the inspection agency will be notified 10 days prior to resumption of operations.

4.5.3.5 IAS will be notified in writing by the accredited entity and the inspection agency if unannounced, follow-up inspections have not been conducted by the inspection agency.

4.5.3.6 IAS and the accredited inspection agency must be notified within 30 days of any changes in management personnel. As a minimum, this would include the president, general manager, or Engineer in Responsible Charge.

4.5.3.7 A Letter of Certification will be issued for all projects per the procedure required in Section 4.6.3.2.3.

4.6 Required Written Procedures

Entities accredited under these criteria shall submit written procedures for the following:

4.6.1 **Part A**

4.6.1.1 **Document Control**: Control of documents and data relating to the quality functions must be provided. This control shall include the following:

4.6.1.1.1 A document approval procedure.

4.6.1.1.2 A procedure to ensure that only current, approved documents are used.

4.6.1.1.3 A procedure to ensure documents are available at all locations where necessary for the proper functioning of the management system.

4.6.1.2 **Purchasing**

4.6.1.2.1 Determining that purchased products will conform to specified requirements. The procedure must include a requirement that the type and grade of material be documented on the purchase order agreement.

4.6.1.2.2 Evaluation of subcontractors for their ability to meet subcontract requirements. Evaluations may contain summaries or logs, but must include a means of quantifying and measuring the ability of the subcontractor or supplier to provide quality products or services consistent with the required shop documents. For projects requiring IAS accreditation, fabrication may be subcontracted only to fabrication facilities that are currently IAS-accredited to AC472 or AC172 for primary frames or a fabrication facility that is AISC Certified. The organization that elects to subcontract work must ensure their in-house CWI is responsible for 100% of all welding regardless if the welding was performed in-house or subcontracted.

4.6.1.3 **Product Traceability**: The traceability procedure must describe the method used to ensure items are traceable as specified in the contract documents. Items which typically require traceability are materials and consumables which are incorporated into the final product. The project documents will determine if full materials traceability is required; however, the accredited entity must have a procedure to meet the project needs for the type of fabrication performed. In addition to project requirement needs, the accredited entity, as a minimum, must have in their control traceability of the finished product to incoming materials, certified welders, inspectors, plans and specifications. The procedure must make provision for documentation of this traceability on inspection forms or on a controlled copy of the detail drawing.

Material traceability to heat number, unless otherwise required by contract documents, is limited to main members and does not include items such as stiffeners, clips, and bolted end plates. As a minimum, all steel used and incorporated into the final product must be traceable to the type and grade of material.

4.6.1.4 **Process Control**: There must be a procedure that identifies how process control is communicated to appropriate personnel. Process control includes procedures such as cutting or saw operations, fitting and welding of the material, cambering and coating. Examples of forms used in the process control procedure are cut lists, standard drawings or detail drawings. The procedure must describe the accredited entity's method of communicating and establishing priorities of such operations.

4.6.1.5 **Inspection and Testing**: The inspection procedure shall include provisions for receipt, in-process and final inspections as appropriate to provide a level of assurance products are fabricated in accordance with contract documents by qualified personnel. Final inspections shall include a record of the results and resolution of nonconformances identified by subsequent inspections. As a minimum, inspection procedures shall include the following:

4.6.1.5.1 Receiving inspection of incoming materials to the required specification, including review of mill test reports and certificates of conformance to ensure compliance with contract documents.

4.6.1.5.2 In-process inspection for workmanship that can affect subsequent operations. (Examples of in-process inspections are nondestructive testing of welds that will be hidden or out of reach during the final inspection, visual examination of fit-up tolerances that will not be visible after welding, areas requiring coatings that will not be accessible during final inspection, monitoring of welding operations as appropriate, fabrication tolerances per Table 4.1, and monitoring of roll-forming operations for shape tolerances per Figure 4.1.) Welding process inspections on multiple pass welds must ensure that proper preheat and interpass temperatures are maintained and that the finished welds meet the tolerances specified in the contract documents and are of the required size, without rejectable indications such as cracks, undercuts, inclusions or porosity. In the event in-process weld inspections are delegated by the in-house Certified Welding Inspector (CWI), there must be documentation ensuring personnel performing assigned inspections have been trained on the specific tasks which are delegated.

4.6.1.5.3 All final welds are to be accepted under the direction of the in-house CWI, CWB, or ICC Structural Welding Special Inspector. There must be a record of the final inspection ensuring that receiving, in-process and final inspections have been performed.

Note: All inspectors or assistant inspectors who accept or reject welds must have a current eye exam in accordance with AWS D1.1.

4.6.1.6 **Control of Inspection, Measuring and Test Equipment**: There must be a maintenance schedule, including calibration procedures for testing equipment. Wherever possible, calibration services shall be provided by a calibration laboratory accredited by IAS or by an accreditation body that is a partner with IAS in a mutual recognition arrangement.

It is recognized there may not be nationally recognized standards available for unique testing equipment. When such instances exist, calibration procedures must be in compliance with manufacturer's recommendations to the extent that such testing equipment is calibrated to ensure consistency with the required measuring capabilities. It is the accredited entity's responsibility to ensure such testing equipment is approved prior to use.

4.6.1.7 **Control of Nonconforming Workmanship**: Procedures shall be established for identifying, documenting and assigning the disposition of nonconforming items.

4.6.1.8 **Corrective Action**: The procedure for corrective action shall include investigating, documenting and correcting nonconformances. The procedure must include a provision to preclude repetition.

4.6.1.9 Handling, storage and delivery procedures shall include identifying and storing of incoming materials and finished products as appropriate to minimize damage and deterioration.

4.6.1.10 **Internal Audits**: Entities accredited under these criteria shall identify the frequency, method of documentation and the content of internal audits to determine the effectiveness of the quality system. Audits shall include a summary which compares the most recent audit to the previous audit, and shall include the elements of AC472.

4.6.1.11 **Control of Quality Records**: Entities accredited under these criteria must determine methods for storing, maintaining and accessing quality records for a minimum of two years. Quality records must include the following:

- 4.6.1.11.1 Completed in-house quality inspection reports, forms, and checklists.
- 4.6.1.11.2 Manufacturer test reports and certificates of compliance from vendors, for incoming materials and consumables.
- 4.6.1.11.3 Copies of inspection reports by the inspection agency.
- 4.6.1.11.4 Records of internal audits.
- 4.6.1.11.5 Training records.
- 4.6.1.11.6 Evaluations of vendors and subcontractors.

4.6.1.12 **Training**: There must be a procedure for the training of personnel who have an effect on the quality of the finished product. The procedure must include provision

for maintaining current personnel qualifications. As a minimum, there must be training requirements established for inspectors, assistant inspectors, machine operators, welders, and fitters.

4.6.2 **Part B**

4.6.2.1 **Document Control**: Control of documents and data relating to the quality functions must be provided. This control shall include the following:

4.6.2.1.1 A document approval procedure.

4.6.2.1.2 A procedure to ensure only current, approved documents are used.

4.6.2.1.3 A procedure to ensure documents are available at all locations where necessary for the proper functioning of the management system.

4.6.2.2 **Purchasing**

4.6.2.2.1 Determining purchased products will conform to specified requirements. The procedure must include a requirement that the type and grade of material be documented on the purchase order agreement.

4.6.2.2.2 Evaluation of subcontractors for their ability to meet subcontract requirements. Evaluations may contain summaries or logs, but must include a means of quantifying and measuring the ability of the subcontractor or supplier to provide quality products or services consistent with the required shop documents.

Note: While IAS understands some organizations use the term "subcontractor" synonymously with "supplier," there is a difference, and both suppliers and subcontractors are required to be evaluated on an annual basis.

4.6.2.3 **Product Traceability**: The traceability procedure must describe the method used to ensure items are traceable as specified in the contract documents. Items which typically require traceability are materials and consumables that are incorporated into the final product. The project documents will determine if full materials traceability is required; however, the accredited entity must have a procedure to meet the project needs for the type of fabrication performed. In addition to project requirement needs, the accredited entity, as a minimum, must have in their control traceability of the finished product to incoming materials, inspectors, plans and specifications. The procedure must make provision for documentation of this traceability on inspection forms or on a controlled copy of the detail drawing. Material traceability to a heat number, unless otherwise required by contract documents, is limited to main members and does not include items such as clips. However, as a minimum, all steel used and incorporated into the final product must be traceable to the type and grade of material.

4.6.2.4 **Process Control**: There must be a procedure that identifies how process control is communicated to appropriate personnel. Process control includes procedures such as cutting or saw operations and coating. Examples of forms used in the process control procedure are cut lists, standard drawings or detail drawings. The procedure must describe the method of communicating and establishing priorities of such operations.

Note: Manufacturers shall have a written procedure for implementing the Steel Coalition Lubricant Task Group Final Report dated May 14, 2002, and show evidence that roll formed roof panels and decking are in conformance with the manufacturer's written standards with regards to lubricants and labeling.

4.6.2.5 **Inspection and Testing**: The inspection procedure shall include provisions for receipt, in-process and final inspections as appropriate to provide a level of assurance that products are fabricated in accordance with contract documents by qualified personnel. Final inspections shall include a record of the results and resolution of nonconformances identified by subsequent inspections. As a minimum, inspection procedures include the following:

4.6.2.5.1 Receiving inspection of incoming materials to the required specification, including review of mill test reports and certificates of conformance to ensure compliance with contract documents.

4.6.2.5.2 In-process inspection for workmanship which can affect subsequent operations. (Examples of in-process inspections are areas requiring coatings that will not be accessible during final inspection, fabrication tolerances per Table 4.1 or Table 4.2, and monitoring of roll-forming operations for shape tolerances per Figure 4.1.)

4.6.2.5.3 Final inspection includes documented acceptance of all workmanship performed, including materials and coatings.

4.6.2.6 **Control of Inspection, Measuring and Test Equipment**: There must be a maintenance schedule, including calibration procedures for testing equipment. Wherever possible, calibration services shall be provided by a calibration laboratory accredited by IAS or by an accreditation body that is a partner with IAS in a mutual recognition arrangement.

It is recognized there may not be nationally recognized standards available for unique testing equipment. When such instances exist, calibration procedures must be in compliance with manufacturer's recommendations to the extent such testing equipment is calibrated to ensure consistency with the required measuring

capabilities. It is the accredited entity's responsibility to ensure such testing equipment is approved prior to use.

4.6.2.7 **Control of Nonconforming Workmanship**: Procedures shall be established for identifying, documenting and assigning the disposition of nonconforming items.

4.6.2.8 **Corrective Action**: The procedure for corrective action shall include investigating, documenting and correcting nonconformances. The procedure must include a provision to preclude repetition.

4.6.2.9 Handling, storage and delivery procedure shall include identifying and storing of incoming materials and finished products as appropriate to minimize damage and deterioration.

4.6.2.10 **Internal Audits**: Entities accredited under these criteria shall identify the frequency, method of documentation and the content of internal audits to determine the effectiveness of the quality system. Audits shall include a summary which compares the most recent audit to the previous audit, and shall include the elements of AC472.

4.6.2.11 **Control of Quality Records**: Entities accredited under these criteria must determine methods for storing, maintaining and accessing quality records for a minimum of two years. Quality records must include the following:

4.6.2.11.1 Completed in-house quality inspection reports, forms, and checklists.

4.6.2.11.2 Manufacturer test reports and certificates of compliance from vendors, for incoming materials and consumables.

4.6.2.11.3 Copies of inspection reports by the inspection agency.

4.6.2.11.4 Records of internal audits.

4.6.2.11.5 Training records.

4.6.2.11.6 Evaluations of vendors and subcontractors.

4.6.2.12 **Training**: There must be a procedure for the training of personnel who have an effect on the quality of the finished product. The procedure must include provision for maintaining current personnel qualifications. As a minimum, there must be training requirements established for inspectors and machine operators.

4.6.3 **Part C**

4.6.3.1 **Contract Review**: Review of contract documents to ensure the needed resources exist to fulfill the contract requirements. The contract review procedure must include provisions which assure the review is appropriate, and that the product and service will meet the specifications. Procedures must include a provision for the approval of exceptions or change requests. Reviews shall be performed by personnel who have access to the appropriate information and have adequate knowledge of the contract requirements. Reviews must be approved by the Engineer in Responsible Charge.

4.6.3.2 **Engineering**: Entities accredited under these criteria shall have written procedures for production engineering that shall include, at a minimum, requirements covering the information in Sections 4.6.3.2.1 through 4.6.3.2.4.

4.6.3.2.1 Information on how incoming contract documents are to be evaluated and provided to the design engineer.

4.6.3.2.2 Information for the preparation and checking of design calculations and erection drawings. Design calculations are to be in conformance with the specified codes and standards.

4.6.3.2.3 A procedure for the creation of a Letter of Certification. All information pertinent to the structural design that is required to be indicated on the construction documents, as noted in Section 1603 of the applicable edition of the *International Building Code*®, is to be included. The Letter of Certification shall be sealed in accordance with the engineering laws of the appropriate jurisdiction. As a minimum, the letter of certification shall be in accordance with the requirements of the appropriate jurisdiction.

4.6.3.2.4 Information on how detail drawings are prepared and how revisions to project or shop documents and change orders are approved.

4.6.3.3 **Control of Quality Records**: Entities accredited under these criteria must determine methods for storing, maintaining and accessing quality records for a minimum of two years. Quality records must include the following:

4.6.3.3.1 Order documents

4.6.3.3.2 Contract review documents

4.6.3.3.3 Design calculations and drawings

4.6.3.3.4 Certificate of design conformance

4.6.3.3.5 Training records

4.6.3.3.6 Evaluations of subcontract engineers and detailers.

4.6.3.4 **Training**: There must be a procedure for the training of personnel who have an effect on the quality of the finished product. The procedure must include provision for maintaining current personnel qualifications. As a minimum, there must be training requirements established for project managers, engineers and detailers.

4.6.3.5 **Corrective Action**: The procedure for corrective action shall include investigating, documenting and correcting nonconformances. The procedure must include a provision to preclude repetition.

4.6.3.6 **Internal Audits**: Entities accredited under these criteria shall identify the frequency, method of documentation and the content of internal audits to determine the effectiveness of the quality system. Audits shall include a summary which compares the most recent audit to the previous audit, and shall include the elements of AC472.

4.7 **Control of Required Procedures**

4.7.1 **Part A**

Contract Review: The quality manager must ensure that contract quality requirements are met. The quality manager will be responsible for reviewing any instructions and/or procedures relative to activities affecting quality to determine if they are properly understood and implemented.

As a minimum, the following elements must be documented to ensure contract reviews are managed, controlled, and successfully implemented and communicated to appropriate personnel:

4.7.1.1 Quality plans to ensure fabrication conforms to the most recent project specifications. Quality plans shall include proprietary buy-out items and subcontract fabrication. Project specifications include design drawings, detail drawings, and other related documents.

4.7.1.2 As a minimum, quality plans shall address the following:

4.7.1.2.1 **Material**: ASTM Grade and Type, AWS filler metal classification.

4.7.1.2.1.1 Origin of materials

4.7.1.2.1.2 Substitution requirements

4.7.1.2.1.3 Material test report requirements

4.7.1.2.2 **Workmanship**

4.7.1.2.2.1 Cutting of components

4.7.1.2.2.1.1 Drilling or punching of holes

4.7.1.2.2.1.1.1 Edge distance

4.7.1.2.2.1.1.2 Repair of miss-located holes

4.7.1.2.2.1.2 Welding requirements

4.7.1.2.2.1.2.1 Welding procedure specifications

4.7.1.2.2.1.2.2 Control consumables

4.7.1.2.2.1.2.3 Cambering, bending, straightening

4.7.1.2.2.1.2.4 Dimensional tolerances (See Table 4.2 for built-up section tolerances)

4.7.1.2.3 **Coating/Painting/Galvanizing**

4.7.1.2.3.1 Surface preparation

4.7.1.2.3.2 Manufacture and type of coating

4.7.1.2.3.3 Application of coating

4.7.1.2.4 Required inspections and sequence of inspections to verify conformance of an item or activity to specified requirements. Procedures needed:

4.7.1.2.4.1 Receiving

4.7.1.2.4.2 In-process

4.7.1.2.4.3 Final

4.7.1.2.4.4 Records and reports

4.7.1.2.4.5 Nondestructive testing requirements

4.7.1.2.5 Acceptance criteria for inspections required in the contract documents for the scope of the project.

4.7.1.2.6 Shipping, packaging, and handling requirements.

4.7.2 **Part B**

Contract Review: The quality manager must ensure contract quality requirements are met. The quality manager will be responsible for reviewing any instructions and/or procedures relative to activities affecting quality to determine if they are properly understood and implemented.

As a minimum, the following elements must be documented to ensure contract reviews are managed, controlled, and successfully implemented and communicated to appropriate personnel:

4.7.2.1 Quality plans to ensure fabrication conforms to the most recent project specifications. Quality plans shall include proprietary buy-out items and subcontract fabrication. Project specifications include design drawings, detail drawings, and other related documents.

4.7.2.2 As a minimum, quality plans shall address the following:

4.7.2.2.1 **Material**: ASTM Grade and Type:

4.7.2.2.1.1 Origin of materials

4.7.2.2.1.2 Substitution requirements

4.7.2.2.1.3 Material test report requirements

4.7.2.2.2 **Workmanship**

4.7.2.2.2.1 Cutting of components

4.7.2.2.2.2 Drilling or punching of holes

4.7.2.2.2.3 Edge distance

4.7.2.2.2.4 Cambering, bending, straightening

4.7.2.2.2.5 Dimensional tolerances (See Tables 4.1 and 4.2 for section tolerances)

4.7.2.2.3 **Coating/Painting/Galvanizing**

4.7.2.2.3.1 Surface preparation

4.7.2.2.3.2 Manufacture and type of coating

4.7.2.2.3.3 Application of coating

4.7.2.2.3.4 Protection of coating

4.7.2.2.4 Required inspections and sequence of inspections to verify conformance of an item or activity to specified requirements. Procedures needed:

4.7.2.2.4.1 Receiving

4.7.2.2.4.2 In-process

4.7.2.2.4.3 Final

4.7.2.2.4.4 Records and reports

4.7.2.2.5 Acceptance criteria for inspections required in the contract documents for the scope of the project.

4.7.2.2.6 Shipping, packaging and handling requirements.

4.7.3 **Part C**

4.7.3.1 **Contract Review**: The Engineer in Responsible Charge must ensure contract requirements are met. The Engineer in Responsible Charge will be responsible for reviewing the contract documents relative to requirements affecting engineering to determine if they are properly understood and implemented.

4.7.3.2 **Design Review**: The Engineer in Responsible Charge will be responsible for ensuring the production engineer reviews the design documents and the shop documents to verify that the contract requirements are met.

4.8 **Fabrication Tolerances**

4.8.1 **Cold-formed Structural Members**: The fabrication tolerances indicated in Figure 4.1 for cold-formed structural members are defined in Table 4.1.

4.8.2 **Built-up Structural Members**: The fabrication tolerances indicated in Figures 4.2(a) and 4.2(b) for built-up structural members are defined in Table 4.2.

5 ADDITIONAL INFORMATION (AS APPLICABLE)

5.1 AWS Welding Quality Assurance Guideline for Fabricators.

5.2 SSPC, The Society for Protective Coatings.

5.2.1 Steel Structures Painting Manual, Volume I, Good Painting Practice.

5.2.2 Steel Structures Painting Manual, Volume II, Systems and Specifications.

5.3 Steel Joist Institute (SJI) Specifications.

5.4 SJI K-l.1 Standard Specification for Open Web Steel Joists, K-Series.

5.5 SJI LH/DLH-l.1 Standard Specification for Longspan Steel Joists, LH Series and Deep Longspan Steel Joists, DLH Series.

5.6 Steel Coalition Lubricant Task Group Final Report, May14, 2002.

6 LINKS TO ADDITIONAL REFERENCES

6.1 IAS – www.iasonline.org

6.2 International Code Council – www.iccsafe.org

6.3 MBMA – www.mbma.com

Table 4.1
Cold-formed Structural Members

Formed Structural Members			
	Dimension	Tolerances	
		+	-
Geometry	D	3/16"	3/16"
	B	3/16"	3/16"
	d	3/8"	1/8"
	θ_1	3°	3°
	θ_2	5°	5°
Hole Location	E_1	1/8"	1/8"
	E_2	1/8"	1/8"
	E_3	1/8"	1/8"
	S_1	1/16"	1/16"
	S_2	1/16"	1/16"
	F	1/8"	1/8"
	P	1/8"	1/8"
Length (L)		1/8"	1/8"
Camber (C)		1/4" x L (ft)/ 10	
Minimum Thickness (t)		0.95 (Design t)	

Figure 4.1
Cold-formed Structural Members

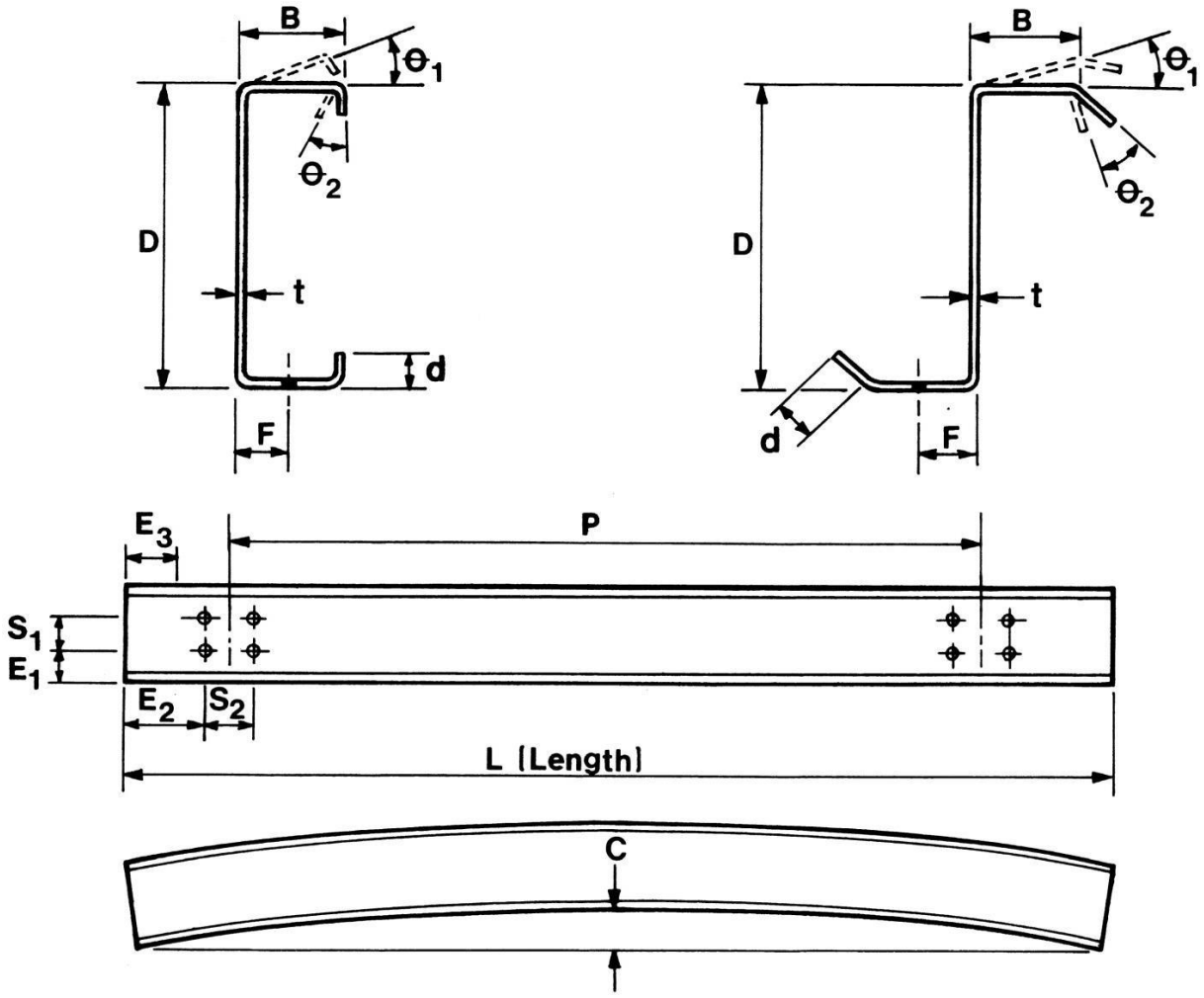
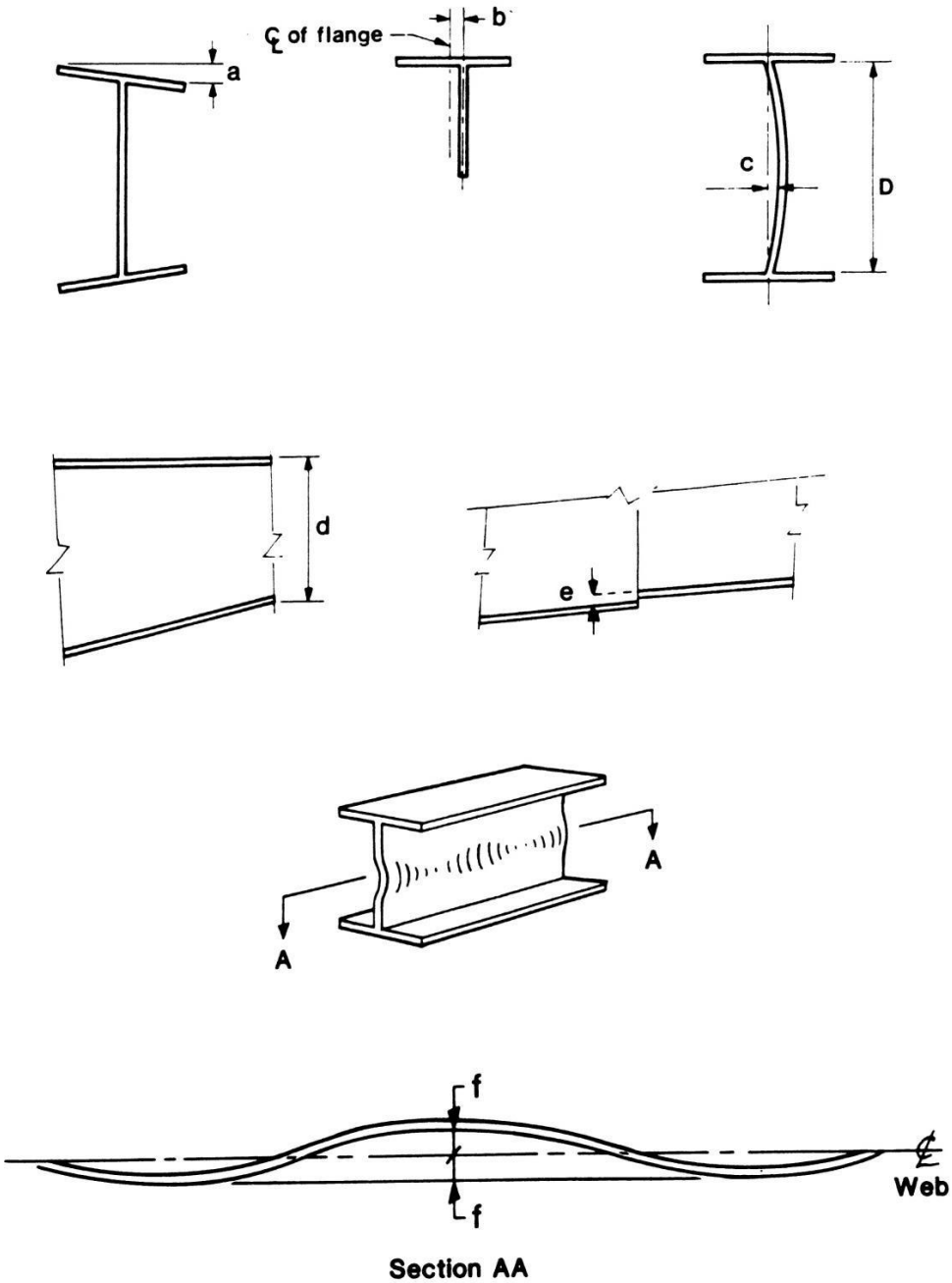


Table 4.2
Built-up Structural Members

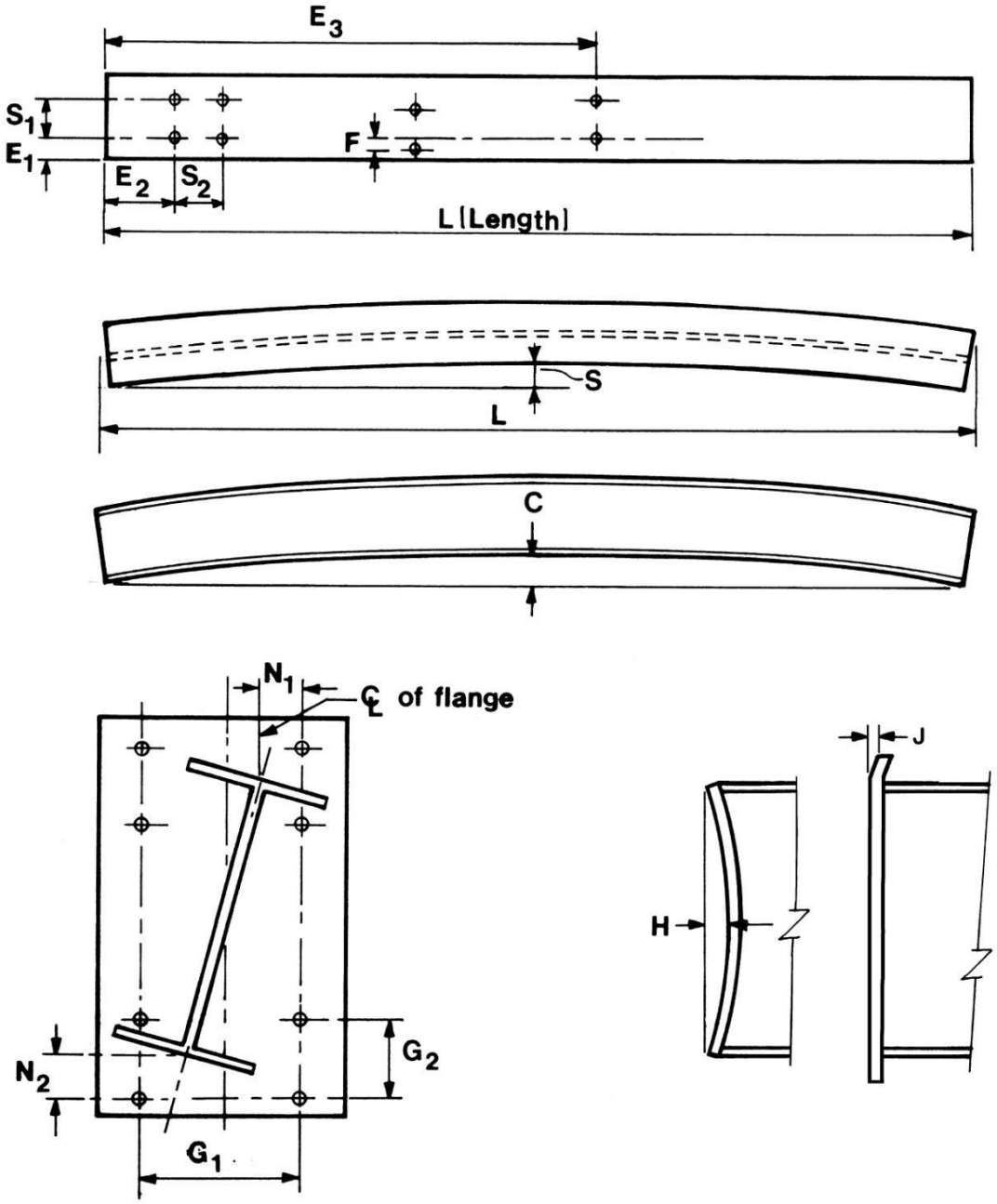
Built-up Structural Members				
	Dimension		Tolerances	
			+	-
	a		3°- 1/4" Max	3°- 1/4" Max
	b		1/4"	1/4"
	d		3/16"	3/16"
	e		1/8"	1/8"
	c		D/72"	
	f		D/72"	
	E1		1/8"	1/8"
	E2		1/8"	1/8"
	E3		1/8"	1/8"
	S1		1/16"	1/16"
	S2		1/16"	1/16"
	F		1/8"	1/8"
Length (L)			1/4"	1/4"
Sweep (S)			Runway Beams 1/8" x L(ft)/ 10	
			All Other members 1/4" x L(ft)/ 10	
Camber (C)			1/4" x L(ft)/ 10	
Splice Plates	N_1		1/8"	1/8"
	N_2		3/16"	3/16"
	G_1		1/16"	1/16"
	G_2		1/16"	1/16"
	H	Up to 24″	1/8"	1/8"
		24″ to 48″	3/16"	3/16"
		Over 48″	1/4"	1/4"
	J		1/4"	1/4"

Figure 4.2(a)
Built-up Structural Member



Section AA

Figure 4.2(b)
Built-up Structural Member



These criteria were previously issued April 2008, September 2008, May 2010, April 2011, August 2012, September 2013, February 2015, April 2017, June 2017, September 2018, October 2023, August 2024, and Editorially revised January 2019 and October 2025.