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## ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS

**AC472**

**September 2008  
(Effective October 1, 2008)**

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### PREFACE

The attached accreditation criteria has been issued to provide all interested parties with guidelines on implementing performance features of the applicable standards referenced in the accreditation criteria. The criteria was developed and adopted following public hearings conducted by the International Accreditation Service, Inc. (IAS), Accreditation Committee and is effective on the date shown above. All accreditations issued or reissued on or after the effective date must comply with criteria. If the criteria is 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. This criteria may be further revised as the need dictates.

IAS may consider alternate criteria provided the proponent submits substantiating data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet applicable accreditation requirements.

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# ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS

## 1.0 INTRODUCTION

**1.1 Scope:** This document sets forth the requirements for obtaining and maintaining International Accreditation Service, Inc. (IAS), accreditation under the Inspection Programs for Manufacturers of Metal Building Systems, and for the qualifying data that must be submitted. This document supplements the IAS Rules of Procedure for Inspection Programs for Manufacturers of Metal Building Systems.

**1.2 Overview:** Accredited entities complying with this criteria will have demonstrated that 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 quality system developed in concert with an IAS-accredited inspection agency which conducts unannounced inspections to verify continued compliance with this criteria. Although accredited entities are evaluated on their performance measures to consistently produce products of the required quality mandated by specified requirements, this criteria does not cover the products or the design or performance characteristics of the products.

## 2.0 REFERENCES

**2.1** *International Building Code*<sup>®</sup>, 2006 edition, published by the International Code Council.

**2.2** IAS Accreditation Criteria for Inspection Agencies.

**2.3** IAS Rules of Procedure for Inspection Programs for Manufacturers of Metal Building Systems.

**2.4** ISO/IEC (International Organization for Standardization/International Electrotechnical Commission) Standard 17020:1998, General Criteria for the Operation of Various Types of Bodies Performing Inspection.

**2.5** ANSI/AWS D1.1, AWS D1.3, Structural Welding Code.

**2.6** AWS Welding Quality Assurance Guideline for Fabricators.

**2.7** ANSI/AWS A2.4, Welding Symbols.

**2.8** ANSI/AWS A3.0, Terms and Definitions.

**2.9** SSPC, The Society for Protective Coatings.

**2.9.1** Steel Structures Painting Manual, Volume I, Good Painting Practice.

**2.9.2** Steel Structures Painting Manual, Volume II, Systems and Specifications.

**2.10** MBMA Metal Building Systems Manual, 2006 edition.

**2.11** ANSI/AISC 360-05, Specification for Structural Steel Buildings.

**2.12** AISI/COS/NASPEC 2001 (Including AISI/COS/NASPEC-SUP04 North American Specification for the Design of Cold-Formed Steel Structural Members).

## 3.0 DEFINITIONS

For the purposes of this accreditation criteria, the definitions given in ISO/IEC Standards 2:2004 and 17000:2004, and the definitions that follow, apply.

**3.1 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*<sup>®</sup>, 2006 edition.

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

**3.3 Metal Building System:** An integrated set of components and assemblies, including but not limited to frames that are built-up structural steel members, secondary members that are cold-formed steel or steel joists, and cladding components, specifically designed to support and transfer loads and provide a complete or partial building shell.

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

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

**3.6 Quality System Management:** A management approach to quality improvement based on the participation of corporate management in improving processes, products and services provided to the customer.

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

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

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

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

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

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

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

**3.14 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 9.1.1 and 9.1.2 or 9.2.1 and 9.2.2 of this criteria.

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

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

**3.17 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.

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

**3.19 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.

**3.20 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.

**3.21 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.

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

**3.23 Letter of Certification:** A project document that certifies the design of the metal building system as required by AC472 Section 8.3.2.3.

## **4.0 GENERAL REQUIREMENTS**

### **4.1 Quality System**

**4.1.1** Entities accredited under this criteria shall establish and implement a quality system that is fully documented. This documented quality system must describe the procedures and quality activities for ensuring that fabricated products meet the specified requirements.

**4.1.2** A documented quality management system manual 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 that the general requirements in Section 4.0, personnel requirements in Section 5.0, data in Section 6.0, the statements in Section 7.0, and the written procedures noted in Section 8.0 of this accreditation criteria have been included.

**4.1.3** The submitted quality assurance document must be signed and dated by the highest level of authority within the organization.

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

**4.2** The submitted quality assurance document must be reviewed at least annually.

**4.3 Follow-up Inspections:** Entities accredited under this criteria must obtain the services of an IAS-accredited inspection agency, which is accredited for the specified discipline, to conduct, at a minimum, biannual unannounced inspections (two per year) of the fabrication facility. The IAS-accredited inspection agency may perform one of the two inspections per year as a joint review with IAS.

**4.4 Assessment by IAS:** Prior to accreditation, an on-site assessment by IAS is required. This assessment will be conducted jointly with the accredited inspection agency. The purpose of this joint assessment is to determine compliance with the documented quality system, and to assess the inspection procedures of the inspection agency.

**4.5 Accreditation Subsections:** The program consists of three parts as described in Sections 4.5.1 through 4.5.3. Fabrication facilities may be accredited under any combination of the three.

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

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

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

## **5.0 PERSONNEL**

### **5.1 Part A**

**5.1.1 Quality Manager:** Entities accredited under this criteria shall designate a quality manager who has the necessary training and experience to complete the tasks listed in Sections 5.1.1.1 through 5.1.1.5. The quality manager shall report directly to the highest level of authority within the organization. The quality manager shall have the following responsibilities:

**5.1.1.1** Maintaining the documented quality system in accordance with this criteria.

**5.1.1.2** Monitoring the effective implementation of the documented quality system.

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

**5.1.1.4** Assuring that annual management reviews are conducted and documented to assure the adequacy and effectiveness of the quality 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.

**5.1.1.5** Developing quality plans that meet contract documents, and having knowledge of and access to the appropriate documents to meet this requirement.

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

**5.1.2.1** 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 Steel Inspector.

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

**5.1.2.3** 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.

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

**5.1.2.5** Be responsible for overall workmanship and for making sure that all structural weldments and cold-formed products requiring welding are 100% 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 quality manager to ensure that inspections are performed and documented and that the product meets project requirements. Qualified personnel must meet the requirements of Section 5.1.2.1 of this 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 8.1.5.3.

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

**5.1.2.7** 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.

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

**5.1.2.9** Be responsible for ensuring that fabrication of weldments and cold-formed products meet the fabrication tolerances outlined in Table 10.1 or Table 10.2.

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

**5.1.3.1** All welding personnel shall be qualified by the test as described in ANSI/AWS D1.1 or D1.3, as

appropriate, by a qualified independent third-party agency. Acceptable 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 appropriate Canadian Welding Bureau (CWB) to the requirements of the Canadian Standards Association Standard W178.2, Certification of Welding Inspectors. The in-house CWI, CWB, or ICC structural steel inspector may administer the welding tests; however, 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 a mutual recognition arrangement.

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

## **5.2 Part B**

**5.2.1 Quality Manager:** Entities accredited under this criteria shall designate a quality manager who has the necessary training and experience to complete the tasks listed in Sections 5.2.1.1 through 5.2.1.5. The quality manager shall report directly to the highest level of authority within the organization. The quality manager shall have the following responsibilities:

**5.2.1.1** Maintaining the documented quality system in accordance with this criteria.

**5.2.1.2** Monitoring the effective implementation of the documented quality system.

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

**5.2.1.4** Assuring that annual management reviews are conducted and documented to assure the adequacy and effectiveness of the quality 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.

**5.2.1.5** Developing quality plans that meet contract documents, and having knowledge of and access to the appropriate documents to meet this requirement.

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

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

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

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

**5.2.2.4** Be responsible for ensuring that fabrication of cold-formed products meets the fabrication tolerances outlined in Table 10.1.

### **5.3 Part C**

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

**5.3.1** 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 *International Building Code*<sup>®</sup> and the design of metal building systems.

**5.3.2** 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.

## **6.0 REQUIRED DATA**

### **6.1 Part A**

**6.1.1** 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.

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

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

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

**6.1.5** 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.

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

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

**6.1.8** Evidence that welding personnel are qualified by an independent, third-party CWI, CWB, or ICC structural steel inspector in accordance with Section 5.1.3.1 of this criteria.

**6.1.9** The name and certification number of the CWI, CWB, or ICC special inspector acting as the in-house quality control inspector.

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

**6.1.11** 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.

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

**6.1.13** 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.

### **6.2 Part B**

**6.2.1** 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.

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

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

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

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

**6.2.6** 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.

**6.2.7** A list of approved vendors.

**6.2.8** 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.

### **6.3 Part C**

**6.3.1** 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.

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

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

## **7.0 REQUIRED STATEMENTS**

### **7.1 Part A**

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

**7.1.1** A quality policy statement that includes the following elements:

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

**7.1.1.2** The elements of the quality assurance program will be disseminated to all personnel assigned activities that affect the quality of the product.

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

**7.1.3** 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's having been reported.

**7.1.4** Entities accredited under this 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.

**7.1.5** 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.

**7.1.6** 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.

## **7.2 Part B**

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

**7.2.1** A quality policy statement that includes the following elements:

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

**7.2.1.2** The elements of the quality assurance program will be disseminated to all personnel assigned activities that affect the quality of the product.

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

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**7.2.4** Entities accredited under this 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.

**7.2.5** 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.

**7.2.6** 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.

## **7.3 Part C**

**7.3.1** A quality policy statement that includes the following elements:

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

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

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

**7.3.3** 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's being reported.

**7.3.4** Entities accredited under this 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.

**7.3.5** 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.

**7.3.6** 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.

**7.3.7** A Letter of Certification will be issued for all projects per the procedure required in Section 8.3.2.3.

## **8.0 REQUIRED WRITTEN PROCEDURES**

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

### **8.1 Part A**

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

**8.1.1.1** A document approval procedure.

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

**8.1.1.3** A procedure to ensure that documents are available at all locations where necessary for the proper functioning of the quality system.

## **8.1.2 Purchasing**

**8.1.2.1** 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.

**8.1.2.2** 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.

**8.1.3 Product Traceability:** The traceability procedure must describe the method used to ensure items are traceable as specified in the contract documents. Items that 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, certified welders, 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, 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.

**8.1.4 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.

**8.1.5 Inspection and Testing:** The inspection procedure shall include provisions for receipt, in-process and final inspections as appropriate to provide a level of assurance 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 shall include the following:

**8.1.5.1** 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.

**8.1.5.2** 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 10.1; and monitoring of roll-forming operations for shape tolerances per Figure 10.1.) 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 that are delegated.

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

**8.1.6 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 that such testing equipment is approved prior to use.

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

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

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

**8.1.10 Internal Audits:** Entities accredited under this 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 that compares the most recent audit to the previous audit, and shall include the elements of AC472.

**8.1.11 Control of Quality Records:** Entities accredited under this criteria must determine methods for

storing, maintaining and accessing quality records for a minimum of two years. Quality records must include the following:

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

**8.1.12 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, machine operators, welders, and fitters.

## 8.2 Part B

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

**8.2.1.1** A document approval procedure.

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

**8.2.1.3** A procedure to ensure that documents are available at all locations where necessary for the proper functioning of the quality system.

## 8.2.2 Purchasing

**8.2.2.1** 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.

**8.2.2.2** 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.

**8.2.3 Product Traceability:** The traceability procedure must describe the method used to ensure items are traceable as specified in the contract documents. Items that 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, 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, 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.

**8.2.4 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.

**8.2.5 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:

**8.2.5.1** 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.

**8.2.5.2** In-process inspection for workmanship that 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 10.1 or Table 10.2, and monitoring of roll-forming operations for shape tolerances per Figure 10.1.)

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

**8.2.6 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 that such testing equipment is calibrated to ensure consistency with the required measuring capabilities. It is the accredited entity's responsibility to ensure that such testing equipment is approved prior to use.

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

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

**8.2.9** Handling, storage and delivery procedure shall include identifying and storing of incoming materials and

finished products as appropriate to minimize damage and deterioration.

**8.2.10 Internal Audits:** Entities accredited under this 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 that compares the most recent audit to the previous audit, and shall include the elements of AC472.

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

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

**8.2.12 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.

### 8.3 Part C

**8.3.1 Contract Review:** Review of contract documents to ensure that the needed resources exist to fulfill the contract requirements. The contract review procedure must include provisions that 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 requirements and must be approved by the Engineer in Responsible Charge.

**8.3.2 Engineering:** Entities accredited under this criteria shall have written procedures for production engineering that shall include, at a minimum, requirements covering the information in Sections 8.3.2.1 through 8.3.2.4.

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

**8.3.2.2** Information for the preparation and checking of design calculations and erection drawings. Design calculations are to be in conformance with the specified building code, including the editions of AISC 360 and AISI S100 as identified in the building code.

**8.3.2.3** 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*<sup>®</sup>, is to be included. The Letter of Certification shall be sealed in accordance with the engineering laws of the appropriate jurisdiction.

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

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

- Order documents
- Contract review documents
- Design calculations and drawings
- Certificate of design conformance
- Training records
- Evaluations of subcontract engineers and detailers.

**8.3.4 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.

## 9.0 CONTROL OF REQUIRED PROCEDURES

### 9.1 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 that contract reviews are managed, controlled, and successfully implemented and communicated to appropriate personnel:

**9.1.1** Quality plans to ensure that 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.

**9.1.2** As a minimum, quality plans shall address the following:

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

1. Origin of materials
2. Substitution requirements
3. Material test report requirements

### 9.1.2.2 Workmanship:

1. Cutting of plates or shapes
2. Drilling or punching of holes
  - i. Edge distance
  - ii. Repair of miss-located holes
3. Welding requirements
  - i. Welding procedure specifications
  - ii. Control consumables
4. Cambering, bending, straightening
5. Dimensional tolerances (See Table 10.2 for built-up section tolerances)

### 9.1.2.3 Coating/Painting/Galvanizing:

1. Surface preparation
2. Manufacture and type of coating
3. Application of coating

**9.1.2.4** Required inspections and sequence of inspections to verify conformance of an item or activity to specified requirements

1. Procedures
  - i. Receiving
  - ii. In-process
  - iii. Final
  - iv. Records and reports
2. Nondestructive testing requirements

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

**9.1.2.6** Shipping, packaging, and handling requirements.

## 9.2 Part B

**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 that contract reviews are managed, controlled, and successfully implemented and communicated to appropriate personnel:

**9.2.1** Quality plans to ensure that 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.

**9.2.2** As a minimum, quality plans shall address the following:

### 9.2.2.1 Material: ASTM Grade and Type:

1. Origin of materials
2. Substitution requirements
3. Material test report requirements

### 9.2.2.2 Workmanship:

1. Drilling or punching of holes
  - i. Edge distance
  - ii. Repair of miss-located holes
2. Cambering, bending, straightening
3. Dimensional tolerances (See Tables 10.1 and 10.2 for section tolerances)

### 9.2.2.3 Coating/Painting/Galvanizing:

1. Surface preparation
2. Manufacture and type of coating
3. Application of coating

**9.2.2.4** Required inspections and sequence of inspections to verify conformance of an item or activity to specified requirements

- Procedures
1. Receiving
  2. In-process
  3. Final
  4. Records and reports

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

**9.2.2.6** Shipping, packaging and handling requirements.

## 9.3 Part C

**9.3.1 Contract Review:** The Engineer in Responsible Charge must ensure that 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.

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

## 10.0 FABRICATION TOLERANCES

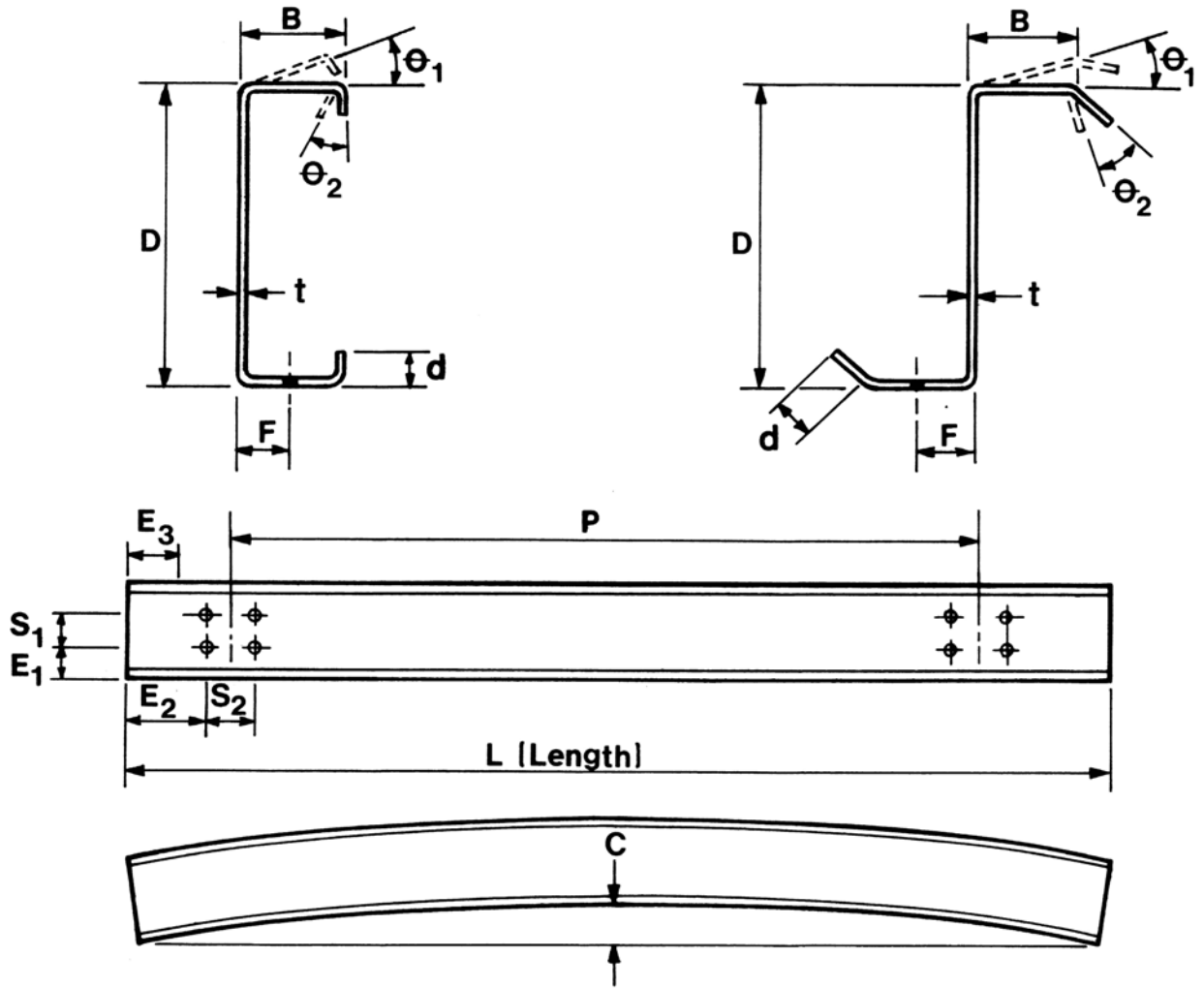
**10.1 Cold-formed Structural Members:** The fabrication tolerances indicated in Figure 10.1 for cold-formed structural members are defined in Table 10.1.

**10.2 Built-up Structural Members:** The fabrication tolerances indicated in Figures 10.2(a) and 10.2(b) for built-up structural members are defined in Table 10.2. ■

**Table 10.1**  
**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"
	$\theta_1$	3°	3°
	$\theta_2$	5°	5°
Hole Location	E <sub>1</sub>	1/8"	1/8"
	E <sub>2</sub>	1/8"	1/8"
	E <sub>3</sub>	1/8"	1/8"
	S <sub>1</sub>	1/16"	1/16"
	S <sub>2</sub>	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 10.1  
Cold-formed Structural Members



**Table 10.2**  
**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 <sub>1</sub>		1/8"	1/8"	
	N <sub>2</sub>		3/16"	3/16"	
	G <sub>1</sub>		1/16"	1/16"	
	G <sub>2</sub>		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 10.2(a)  
Built-up Structural Member

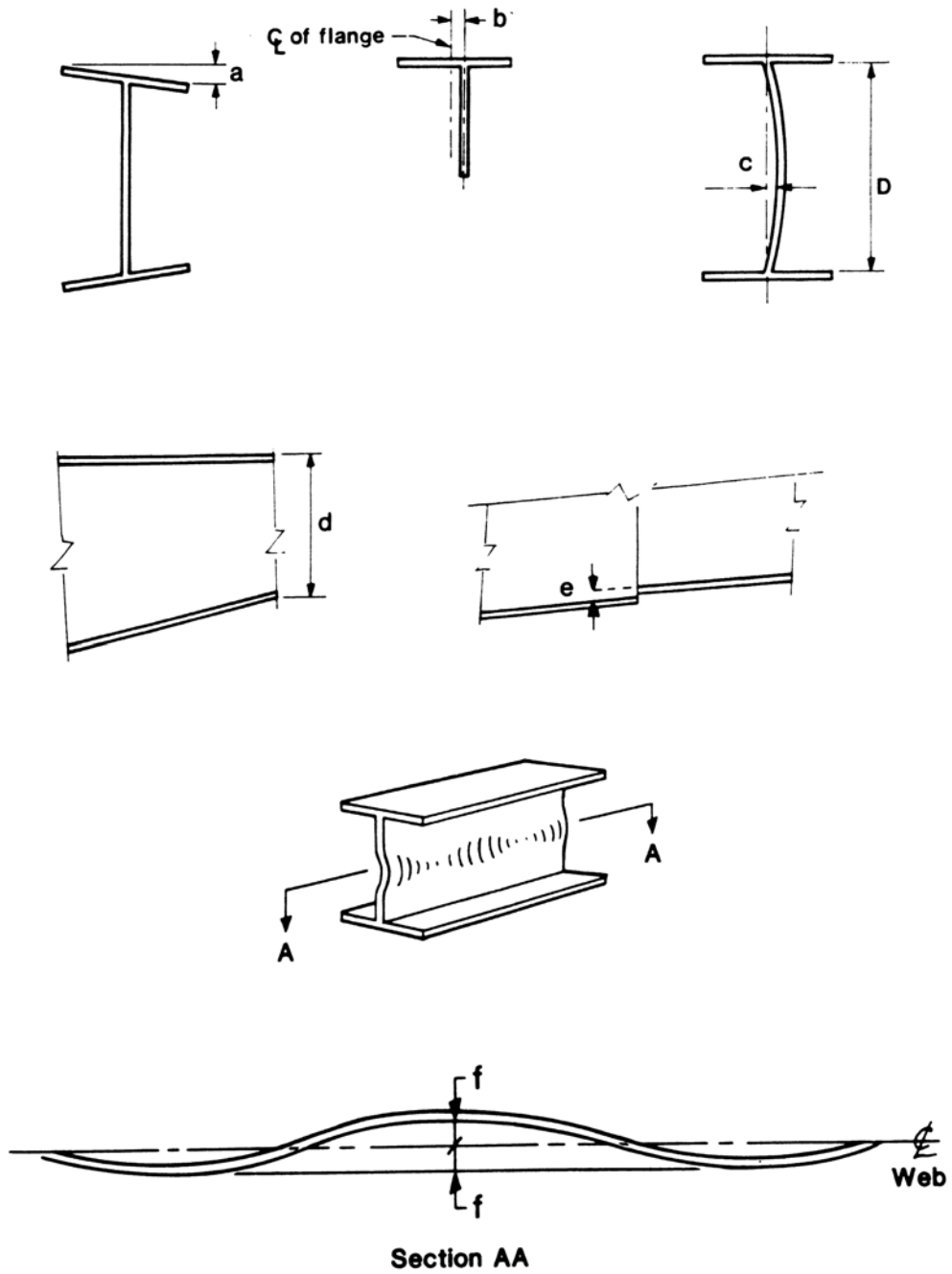


Figure 10.2(b)  
Built-up Structural Member

