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## **ACCREDITATION CRITERIA FOR FABRICATOR INSPECTION PROGRAMS FOR REINFORCED AND PRECAST/PRESTRESSED CONCRETE**

**AC157**

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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 FABRICATOR INSPECTION PROGRAMS FOR REINFORCED AND PRECAST/PRESTRESSED CONCRETE

## 1.0 INTRODUCTION

The purpose of this accreditation criteria is to specify the minimum requirements for IAS-approved fabricator inspection programs for reinforced concrete. Compliance with this criteria will demonstrate the following qualifications as outlined in Section 1704.2.2 of the *International Building Code*<sup>®</sup>, 2006 edition, published by the International Code Council.

1.1 The fabricator has developed and submitted a detailed fabrication procedural manual reflecting key quality control procedures that provide a basis for inspection control of workmanship and the fabricator's plant.

1.2 The fabricator's quality control capabilities, plant and personnel, as outlined in the fabrication procedural manual, have been verified by an initial on-site assessment conducted jointly by IAS and an IAS-accredited inspection agency.

1.3 The fabricator submits to quarterly unannounced plant inspections by an IAS-accredited inspection agency, to monitor the effectiveness of the quality control program.

1.4 The fabricator will promptly investigate and respond to IAS or a building official when apprised of complaints regarding noncompliance of the finished product with stated specifications.

This criteria does not cover the fabricated 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 *Building Code and Commentary*<sup>™</sup>, ACI 318-99/318R-99, American Concrete Institute.

2.3 *State of California Department of Transportation Standard Specifications July 1999*<sup>™</sup>, Department of Transportation.

2.4 *Manual for Quality Control: Structural Precast Concrete*<sup>™</sup>, MNL 116 Edition 4, Precast Concrete Institute.

2.5 IAS Accreditation Criteria for Inspection Agencies.

2.6 IAS Accreditation Criteria for Testing Laboratories.

2.7 IAS Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.

2.8 IAS Rules of Procedure for Accreditation of Fabricator Inspection Programs.

2.9 ANSI/ISO/ASQC Q9001-1994, *Quality Systems—Model for Quality Assurance in Design, Development, Production, Installation and Servicing*.

2.10 ISO/IEC Standard 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.

2.11 ISO/IEC Standard 17011, *Conformity Assessment — General Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies*.

2.12 ISO/IEC Standard 17020, *General requirements for various types of bodies performing inspection*.

## 3.0 DEFINITIONS

For the purposes of this accreditation criteria, the definitions given in ISO 8402, 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 Section 1701.7 of the UBC and Section 1704.2.2 of the IBC.

**3.2 Quality Assurance:** A planned and systematic pattern of all actions necessary to provide adequate confidence that a product will conform to established requirements.

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

**Note 1:** A product may include service, hardware, processed materials, or a combination thereof.

**Note 2:** A product can be tangible (e.g., assemblies or processed materials) or intangible (e.g., knowledge or concepts), or a combination thereof.

**3.4 PCI Certified Plant:** A fabricator that is currently participating in good standing in the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program.

## 4.0 GENERAL REQUIREMENTS

### 4.1 Quality System:

4.1.1 The fabricator shall establish and implement a quality system that is fully documented. This documented quality system must describe the fabricator's procedures and quality activities for ensuring that fabricated products meet the specified requirements.

4.1.2 The fabricator, in concert with an IAS-accredited inspection agency, shall prepare and submit to IAS its documented quality assurance system, including a cross-reference matrix ensuring that the data in Section 5.0, the statements in Section 6.0, and the written procedures noted in Section 7.0 of this accreditation criteria have been included.

4.1.3 The submitted quality assurance documents must be signed and dated by an authorized representative of the fabricator.

4.1.4 The submitted quality assurance documents must be signed and dated by an authorized representative of an IAS-accredited inspection agency, attesting that the inspection agency has reviewed the fabricator's documented quality system. The purpose of the agency's review is to ensure that there is adequate detail for the agency to properly perform its inspection functions.

## 4.2 Follow-up Inspections:

**4.2.1** The fabricator must obtain the services of an IAS-accredited inspection agency that is accredited for the specific discipline of inspection of reinforced concrete.

**4.2.2** The agency must conduct, at a minimum, quarterly unannounced inspections (four per year) of the fabrication facility.

Fabricators that are currently PCI Certified Plants: the agency must conduct, at a minimum, three inspections per year.

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

After the initial year of accreditation, fabricators are subject to an on-site surveillance assessment by IAS, and every two years thereafter. Reference Section 6.0 of the IAS Rules of Procedure for Accreditation of Fabricator Inspection Programs.

**4.4 Key Quality Control Personnel:** The fabricator shall designate (where applicable) the following key personnel who shall:

### 4.4.1 Quality Control Manager (QCM):

**4.4.1.1** Be a full-time employee of the fabricator.

**4.4.1.2** Be certified by the Precast Concrete Institute (PCI) as a Level II technician/inspector or be certified by the International Code Council (ICC) as a special inspector in the category of "Reinforced Concrete."

**4.4.1.3** Have at least five years experience in reinforced concrete products.

**4.4.1.4** Be a registered design professional. (Alternatively, the fabricator may obtain the services [subcontracted] of a licensed engineer to assist the fabricator on technical issues, or assure that the design engineer conducts frequent site visits to assure compliance with the intent of the design.)

**4.4.1.5** Be responsible for the overall quality and the workmanship of the reinforced concrete product.

**4.4.1.6** Be responsible for maintaining the fabricator's documented quality assurance system.

**4.4.1.7** Be responsible for monitoring the effective implementation of the fabricator's documented quality assurance system.

**4.4.1.8** Be responsible for assuring that periodic internal audits are conducted and documented, and that corrective actions are implemented.

**4.4.1.9** Be responsible for assuring that annual management reviews are conducted and documented.

### 4.4.2 Quality Control Inspector (QCI):

**4.4.2.1** Be a full-time employee of the fabricator.

**4.4.2.2** Be certified by American Concrete Institute (ACI) as a Concrete Construction Inspector or equivalent.

**4.4.2.3** Be certified by American Concrete Institute (ACI) as a Concrete Laboratory Testing Technician—Grade II or equivalent, where in-house quality control testing is performed.

**4.4.2.4** Demonstrate their experience inspecting concrete mix design, formwork and placement of reinforcing steel as it relates to reinforced concrete products.

**4.4.2.5** Demonstrate experience inspecting the test procedures and evaluating test results as it relates to in-house testing of concrete.

### 4.4.3 Quality Control Technicians (QCTs):

**4.4.3.1 Concrete Sampling Technician:** Be certified by the American Concrete Institute (ACI) as a "Concrete Field Testing Technician" (Grade I), or equivalent.

**4.4.3.2 Concrete Strength Testing Technician:** Be certified by the American Concrete Institute (ACI) as a "Concrete Strength Testing Technician," or equivalent.

**4.4.3.3 Steel Reinforcement Technician:** Be trained by the fabricator for the placement of reinforcing steel.

**4.5 Structural Welding:** Structural welding shall be done in general accordance with the IAS Accreditation Criteria for Fabricator Inspection Programs for Structural Steel (AC172).

### 4.6 Daily Production Log:

**4.6.1** A daily production log shall be maintained detailing activities as they relate to setting forms, placing reinforcement, structural welding, prestressing operations, casting, curing and quality control inspections.

**4.6.2** The daily production log shall describe any problems or deficiencies discovered, and any testing or repair work performed.

### 4.7 Quality Control Testing:

**4.7.1** The fabricator shall have documented test procedures for all in-house test procedures.

**4.7.2** Calibration of all in-house test equipment shall be traceable to nationally recognized measurement standards.

**4.7.3** In-house quality control tests must be periodically verified by comparison of the fabricator's test results with the test results of an IAS-accredited testing laboratory or by a laboratory accredited under ISO/IEC Standard 17025 by an accreditation body operating under ISO/IEC Standard 17011 that is a partner with IAS in a mutual recognition arrangement (MRA).

**4.7.4** When testing is contracted to an outside laboratory, tests should be conducted by an IAS-accredited testing laboratory or by a laboratory accredited by an IAS MRA partner.

## 5.0 REQUIRED DATA

The following information shall be included in the quality system submittal:

**5.1** The name, street address and telephone number of the fabrication facility.

- 5.2 A floor plan of the fabrication facility.
- 5.3 A list of major production equipment, keyed to the floor plan.
- 5.4 A list of typical items fabricated.
- 5.5 The name and qualifications of the quality control manager.
- 5.6 The names and the qualifications of the quality control inspectors.
- 5.7 The names and the qualifications of the quality control technicians.
- 5.8 An organizational chart for the fabricator. This chart must show the relationships among the management, quality control manager, quality control inspector, and quality control technicians.
- 5.9 A list of approved vendors, including any testing agencies.
- 5.10 A list of test and measuring equipment used for the quality functions of the fabricator.
- 5.11 An example of the daily production log.
- 5.12 An example of the data sheet used in contract review.

## 6.0 REQUIRED STATEMENTS

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

- 6.1 A policy statement that includes the following elements:
  - 6.1.1 All activities of the organization shall be directed in such a manner as to ensure that the quality requirements of this criteria will be met.
  - 6.1.2 The elements of the quality assurance program will be made known to all responsible personnel.
- 6.2 The quality system shall, at a minimum, be reviewed annually.
- 6.3 IAS will be notified, in writing, prior to any cancellation of the inspection agreement with the inspection agency.
- 6.4 Copies of reports of inspections conducted by the inspection agency, if they note major quality control variations, will to be forwarded to IAS by the fabricator within 10 days of the major deficiency(s) being reported.
- 6.5 The fabricator will notify the inspection agency when the fabrication facility is to be closed for extended time periods other than for normally scheduled periods for maintenance or vacations. IAS and the agency will be notified prior to resumption of operations.
- 6.6 IAS will be notified in writing if unannounced follow-up inspections have not been conducted by the inspection agency.
- 6.7 The fabricator will promptly investigate and respond to IAS or a building official when apprised of complaints regarding the noncompliance of finished product with stated specifications.

## 7.0 REQUIRED WRITTEN PROCEDURES

The fabricator shall submit written procedures for the following:

- 7.1 **Contract Review:** Review of new work to ensure the needed resources exist to fulfill the contract requirements.
- 7.2 **Document Control:** Control of documents and data relating to the quality functions of the fabricator. Controls must include the following:
  - 7.2.1 A means of document approval.
  - 7.2.2 A means to ensure that only current, approved documents are used.
  - 7.2.3 A means of ensuring that documents are available at all locations where necessary for the proper functioning of the quality system.
- 7.3 **Purchasing:** Determining that purchased products will conform to specified requirements.
- 7.4 **Subcontracting:** Evaluating subcontractors for their ability to meet subcontract requirements and the conditions of this criteria. When subcontracting is performed, such work shall be conducted in the shop of an IAS-accredited fabricator inspection program.
- 7.5 **Product Traceability:** Traceability of the finished product to:
  - 7.5.1 Incoming raw materials.
  - 7.5.2 Responsible quality control personnel.
  - 7.5.3 Plans and specifications.
  - 7.5.4 Quality records.
- 7.6 **Process Control:**
  - 7.6.1 **Placement of Reinforcing Steel:**
    - 7.6.1.1 Method to ensure reinforcing steel is free of contamination.
    - 7.6.1.2 Method of splicing and tying.
    - 7.6.1.3 Method of applying initial load in prestressing operations to straighten the individual strands and eliminate slack.
    - 7.6.1.4 Method of applying final load in prestressing operations.
    - 7.6.1.5 Method of determining stresses and elongation in prestressing operations.
    - 7.6.1.6 Method of determining compressive strength of the reinforced concrete product prior to detensioning.
    - 7.6.1.7 Method of detensioning to ensure the following:
      - 7.6.1.7.1 That sudden shock or loading is minimized.
      - 7.6.1.7.2 That eccentricity about the vertical axis of the member is limited.

**7.6.2 Concrete Mixtures:**

**7.6.2.1** Who is responsible for designing and verifying the concrete mix.

**7.6.2.2** How the mix will be verified before it is used. This verification must ensure the batching, mixing equipment, construction methods and curing environment are representative of actions performed at the fabrication facility.

**7.6.3 Batching and Mixing:**

**7.6.3.1** Method of proportioning the components of the design mix.

**7.6.3.2** Method used to mix the components of the design mix to ensure a uniform consistency.

**7.6.4 Placing Concrete:**

**7.6.4.1** Method of transporting the concrete from the mixer to the forms.

**7.6.4.2** Method of placing the concrete to avoid separation of the coarse aggregate from the mix.

**7.6.4.3** Method of consolidation of the concrete.

**7.6.4.4** Method to make sure density of the concrete strength test specimens are representative of the reinforced concrete product.

**7.6.5 Curing Concrete:**

**7.6.5.1** Method of curing the reinforced concrete product.

**7.6.5.2** Method of curing the concrete strength test specimens.

**7.6.6 Finishing:**

**7.6.6.1** Method of finishing unformed surfaces.

**7.6.6.2** Method of finishing surfaces of composite members.

**7.6.6.3** Method of finishing formed surfaces.

**7.6.6.4** Method of patching minor defects.

**7.7 Inspection and Testing:**

**7.7.1 Inspection of Incoming Raw Materials:** Inspection method used to ensure that all incoming raw materials comply with the specifications before they are placed into service.

**7.7.2 Inspection of Production Methods:**

**7.7.2.1** Inspection frequency and method used to ensure proper placement of reinforcing steel.

**7.7.2.2** Inspection frequency and method used to ensure reinforcing steel is not contaminated.

**7.7.2.3** Inspection method to verify proper stressing and elongation of reinforcing steel.

**7.7.2.4** Inspection frequency and methods used to ensure proper concrete mix design, including:

**7.7.2.4.1** Sieve analysis and unit weight of aggregates.

**7.7.2.4.2** Moisture content of aggregates.

**7.7.2.4.3** Slump of concrete.

**7.7.2.4.4** Air content.

**7.7.2.4.5** Unit weight of concrete.

**7.7.2.4.6** Temperature of concrete during placement.

**7.7.2.4.7** Ambient temperature during placement.

**7.7.2.4.8** Compressive strength.

**7.7.2.5** Inspection method used to ensure proper curing conditions of the reinforced concrete product.

**7.8 Control of Inspection, Measuring and Test Equipment:**

**7.8.1 Control Procedures:**

**7.8.1.1** Procedures used for the calibration of measuring and test equipment.

**7.8.1.2** Procedures to ensure the traceability of calibration records to nationally recognized standards.

**7.8.2 Control of Nonconforming Products:**

**7.8.2.1** Method of identifying nonconforming products.

**7.8.2.2** Method of assigning the disposition of nonconforming products.

**7.9 Corrective Action:** Investigating, documenting and correcting nonconformances.

**7.10 Handling and Storage:** Identifying and storing incoming materials and finished products.

**7.11 Internal Audits:** The frequency, method of documentation and the content of internal audits to determine the effectiveness of the quality system.

**7.12 Control of Quality Records:** Methods for storing, maintaining and accessing the following quality control records for a minimum of two years:

**7.12.1** In-house quality inspection reports, forms, checklists.

**7.12.2** Mill test reports and certificates of compliance from vendors for incoming raw materials.

**7.12.3** Copies of inspection reports by the inspection agency.

**7.12.4** Records of internal audits.

**7.12.5** Training records.

**7.12.6** Evaluations of vendors and subcontractors.

**7.13 Training:**

**7.13.1** Procedure for training all personnel who have an effect on the quality of the finished product.

**7.13.2** Procedure for maintaining current personnel qualifications.■