ICC EVALUATION SERVICE

ICC Evaluation Service, Inc.
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April 30, 2009

TO: **PARTIES INTERESTED IN EVALUATION REPORTS ON MECHANICAL PINNED SPLICES (MPSs) FOR PRECAST PRESTRESSED CONCRETE PILES**

SUBJECT: Proposed Acceptance Criteria for Mechanical Pinned Splices (MPSs) for Precast Prestressed Concrete Piles, Subject AC414-0609-R1 (DZ/BG)

Hearing Information:
Thursday, June 4, 2009
8:00 a.m.
DoubleTree Hotel
808 South 20th Street
Birmingham, Alabama 35205
(800) 222-8733

Dear Madam or Sir:

The proposed new acceptance criteria, enclosed with this letter, will be considered by the ICC-ES Evaluation Committee at the hearing noted above. The proposed acceptance criteria is intended to address requirements for mechanical pinned splices (MPSs) with MPS components embedded into precast prestressed concrete foundation piles during casting of concrete. The pile segments are spliced during driving operations, such that an MPS component embedded in the upper pile segment is joined to the corresponding MPS component embedded in the lower pile segment with steel locking pins after the lower pile segment has been driven. The MPSs are intended to comply with the requirements for pile splices that have adequate capacity to resist all vertical and lateral forces induced by driving and service loads, as required by Sections 1808.2.7, 1809.2.1, and 1809.2.3 of the 2006 *International Building Code*® (IBC). The MPSs are limited to pile regions where soil provides sufficient lateral support as described in IBC Section 1808.2.9, and are outside of the ductile regions for seismic requirements as described in Sections 1809.2.3.2.1 and 1809.2.3.2.2 of the IBC.

Staff requests input as to whether the axial tension and compression stiffness of the MPSs should be modeled in the impact test described in Section 4.2 and the in-situ testing described in Section 6.5 for piles under driving conditions.

You are cordially invited to submit written comments on agenda items, or to attend the Evaluation Committee hearing and present verbal comments. If you wish to contribute to the hearing, please note the following:

1. Written comments that are received by the Los Angeles business/regional office by **May 19, 2009,** will be forwarded to the committee prior to the hearing, and will be posted on the ICC-ES web site shortly after the comment deadline.

2. Written comments received up to ten days before the meeting, and staff memos responding to comments, will be posted to the web site on **May 29, 2009**.

3. ICC-ES is no longer providing printed copies at the meeting of proposed acceptance criteria, staff memos or public comments. These documents will be available on a limited number of CDs at the meeting, for uploading to computers; and ICC-ES will make arrangements with the hotel business center to have hard copies available for photocopying.

4. Written comments that miss the deadline noted in item (1), above, will only be available at the meeting if you provide 35 copies, collated, stapled, and three-hole punched, either at the meeting itself or to the Los Angeles business/regional office by **May 29, 2009**.

5. If you plan to speak for more than 15 minutes, or offer a visual presentation lasting longer, you should notify ICC-ES staff as far as possible in advance. There will be a computer, projector, and screen available at the meeting for anyone wishing to make a visual presentation, and presentations in most cases will need to be in PowerPoint format. Also, ICC-ES will need to be provided with your presentation at least a half-hour before the start of the relevant meeting session (morning or afternoon) on either a CD or a flash card.

6. If you have any special needs related to a presentation, you should contact ICC-ES staff well in advance of the meeting.

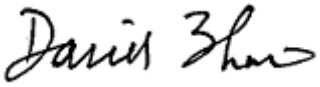
7. Any visual aids for viewing at committee meetings (charts, overhead transparencies, slides, videos, electronic presentations, etc.) will be permitted only if a copy is provided to ICC-ES, before the presentation, in a medium that can be retained with other records of the meeting.

8. Any materials submitted for committee consideration are considered nonconfidential and available for public discussion, as noted in Section 2.7 of the ICC-ES Rules of Procedure for the Evaluation Committee.

9. Prior to the meeting, you should refrain from trying to communicate directly with committee members about agenda items, either verbally or in writing. Committee members reserve the right to refuse such communications.

Your cooperation with these guidelines is much appreciated, as is your interest in the deliberations of the Evaluation Committee. If you have any question, please contact the undersigned at (800) 423-6587, extension 3722, or Brian Gerber, S.E., Principal Structural Engineer, at extension 3255. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,



David Zhao, P.E., S.E.
Senior Staff Engineer

DZ/jw

Enclosures

cc: Evaluation Committee

ICC EVALUATION SERVICE, INC.,
RULES OF PROCEDURE FOR THE EVALUATION COMMITTEE

1.0 PURPOSE

The purpose of the Evaluation Committee is to monitor the work of ICC-ES, in issuing evaluation reports; to evaluate and approve acceptance criteria on which evaluation reports may be based; and to sponsor related changes in the applicable codes.

2.0 MEETINGS

2.1 The Evaluation Committee shall schedule meetings that are open to the public in discharging its duties under Section 1, subject to Section 3.

2.2 All scheduled meetings shall be publicly announced.

2.3 Two-thirds ($^2/_3$) of the voting Evaluation Committee members shall constitute a quorum. A majority vote of members present is required on any action.

2.4 In the absence of the nonvoting chairman-moderator, Evaluation Committee members present shall elect an alternate chairman from the committee for that meeting. The alternate chairman shall be counted as a voting committee member for purposes of maintaining a committee quorum and to cast a tie-breaking vote of the committee.

2.5 Minutes of the meetings shall be kept.

2.6 An electronic audio record of meetings shall be made by ICC-ES; no other audio, video, electronic or stenographic recordings of the meetings will be permitted. Visual aids (including, but not limited to, charts, overhead transparencies, slides, videos, or presentation software) viewed at meetings shall be permitted only if the presenter provides ICC-ES before presentation with a copy of the visual aid in a medium which can be retained by ICC-ES with its record of the meeting and which can also be provided to interested parties requesting a copy. A copy of the ICC-ES recording of the meeting and such visual aids, if any, will be available to interested parties upon written request made to ICC-ES together with a payment as required by ICC-ES to cover costs of preparation and duplication of the copy. These materials will be available beginning five days after the conclusion of the meeting but will no longer be available after one year from the conclusion of the meeting.

2.7 Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members regarding agenda items. All written communications and submissions regarding agenda items should be delivered to ICC-ES. All such written communications and submissions shall be considered nonconfidential and available for discussion in open session of an Evaluation Committee meeting, and shall be delivered at least ten days before the scheduled Evaluation Committee meeting if they are to be forwarded to the committee. Materials delivered to ICC-ES at least ten days before the scheduled meeting will be posted on the ICC-ES web site (www.icc-es.org) prior to the meeting. After this time, parties wishing to submit materials for consideration by the Evaluation Committee must deliver a sufficient number of copies as directed by ICC-ES. Consideration of materials not received by ICC-ES at least ten days before the meeting is at the discretion of the Evaluation Committee. Following the meeting, ICC-ES will make all materials considered by the Evaluation Committee available on the web site for a maximum period of one year following the meeting. The committee reserves the right to refuse recognition of communications which do not comply with the provisions of this section.

3.0 CLOSED SESSIONS

Evaluation Committee meetings shall be open except that the chairman may call for a closed session to seek advice of counsel.

4.0 ACCEPTANCE CRITERIA

4.1 Acceptance criteria are established by the committee to provide a basis for issuing ICC-ES evaluation reports on products and systems under codes referenced in Section 2.0 of the Rules of Procedure for Evaluation Reports. They also clarify conditions of acceptance for products and systems specifically regulated by the codes.

Acceptance criteria may involve a product, material, method of construction, or service. Consideration of any acceptance criteria must be in conjunction with a current and valid application for an ICC-ES evaluation report, an existing ICC-ES evaluation report, or as otherwise determined by the Evaluation Committee.

4.2 Procedure:

4.2.1 Proposed acceptance criteria shall be developed by the ICC-ES staff and discussed in open session with the Evaluation Committee during a scheduled meeting, except as permitted in Section 5.0 of these rules.

4.2.2 Proposed acceptance criteria shall be available to interested parties at least 30 days before discussion at the committee meeting.

4.2.3 The committee shall be informed of all pertinent written communications received by ICC-ES.

4.2.4 Attendees at Evaluation Committee meetings shall have the opportunity to speak on acceptance criteria listed on the meeting agenda, to provide information to committee members.

4.3 Approval of acceptance criteria shall be as specified in Section 2.3 of these rules.

4.4 Actions of the Evaluation Committee may be

appealed in accordance with the ICC-ES Rules of Procedure for Appeal of Acceptance Criteria or the ICC-ES Rules of Procedure for Appeals of Evaluation Committee Technical Decisions.

5.0 COMMITTEE BALLOTING FOR ACCEPTANCE CRITERIA

5.1 Acceptance criteria may be issued without a public hearing following a 30-day public comment period and a majority vote for approval by the Evaluation Committee when, in the opinion of ICC-ES staff, one or more of the following conditions have been met:

1. The subject is nonstructural, does not involve life safety, and is addressed in nationally recognized standards or generally accepted industry standards.

2. The subject is a revision to an existing acceptance criteria that requires a formal action by the Evaluation Committee, and public comments raised were resolved by staff with commenters fully informed.

3. Other acceptance criteria and/or the code provide precedence for the revised criteria.

5.2 Negative votes must be based upon one or more of the following, for the ballots to be considered valid and require resolution:

a. *Lack of clarity*: There is insufficient explanation of the scope of the acceptance criteria or insufficient description of the intended use of the product or system; or the acceptance criteria is so unclear as to be unacceptable. (The areas where greater clarity is required must be specifically identified.)

b. *Insufficiency*: The criteria is insufficient for proper evaluation of the product or system. (The provisions of the criteria that are in question must be specifically identified.)

c. *The subject of the acceptance criteria is not within the scope of the applicable codes*: A report issued by ICC-ES is intended to provide a basis for approval under the codes. If the subject of the acceptance criteria is not regulated by the codes, there is no basis for issuing a report, or a criteria. (Specifics must be provided concerning the inapplicability of the code.)

d. *The subject of the acceptance criteria needs to be discussed in a public hearings*. The committee member requests additional input from other committee members, staff or industry.

5.3 An Evaluation Committee member, in voting on an acceptance criteria, may only cast the following ballots:

- Approved
- Approved with Comments
- Negative: Do Not Proceed

6.0 COMMITTEE COMMUNICATION

Direct communication between committee members, and between committee members and an applicant or concerned party, with regard to the processing of a particular acceptance criteria or evaluation report shall take place only in a public hearing of the Evaluation Committee. Accordingly:

6.1 Committee members receiving an electronic ballot should respond only to the sender (staff). Committee members who wish to discuss a particular matter with other committee members, before reaching a decision, should ballot accordingly and bring the matter to the attention of ICC-ES staff, so the issue can be placed on the agenda of a future committee meeting.

6.2 Committee members who are contacted by an applicant or concerned party on a particular matter that will be brought to the committee will refrain from private communication and will encourage the applicant or concerned party to forward their concerns through the ICC-ES staff in writing, and/or make their concerns known by addressing the committee at a public hearing, so that their concerns can receive the attention of all committee members.■

Effective March 18, 2008

ICC EVALUATION SERVICE

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

PROPOSED ACCEPTANCE CRITERIA FOR MECHANICAL PINNED SPLICES (MPSs) FOR PRECAST PRESTRESSED CONCRETE PILES

AC414

Proposed April 2009

PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

> **The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.**

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Acceptance criteria are developed for use solely for purposes of issuing ICC-ES evaluation reports.

PROPOSED ACCEPTANCE CRITERIA FOR MECHANICAL PINNED SPLICEs (MPSs) FOR PRECAST, PRESTRESSED CONCRETE PILES

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for mechanical pinned splices (MPSs) for precast, prestressed concrete piles to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 *International Building Code*® (IBC). The basis of recognition is IBC Section 104.11.

The reason for the development of this criteria is to provide guidelines for the evaluation of MPSs for precast, prestressed concrete piles, since the codes do not provide requirements for testing and determination of structural capacities of these products.

1.2 Scope: This acceptance criteria applies to MPSs with components embedded into precast, prestressed concrete piles during casting of concrete. Pile segments are spliced during driving operations, such that an upper segment of pile is spliced to the corresponding lower segment with an MPS after the lower segment has been driven.

This criteria is limited to precast, prestressed concrete piles joined with MPSs used under the following conditions: The specified compressive strength of concrete shall be 6,000 psi (41.3 MPa); the total pile length shall be at least 50 feet (15 240 mm); exposure conditions to soil shall not be indicative of potential MPS deterioration or corrosion situations.

1.3 Codes and Referenced Standards:

1.3.1 2006 *International Building Code*® (IBC), International Code Council.

1.3.2 ACI 318–05, Building Code Requirements for Structural Concrete, American Concrete Institute.

1.3.3 ACI Committee 543, Design, Manufacture, and Installation of Concrete Piles, (ACI 543R-00), American Concrete Institute.

1.3.4 AISC 360–05, Specification for Structural Steel Buildings, American Institute of Steel Construction.

1.3.5 AWS A5.28–05, Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding, American Welding Society

1.3.6 AWS D1.1–04, Structural Welding Code — Steel, American Welding Society.

1.3.7 AWS D1.4–98, Structural Welding Code — Reinforcing Steel, American Welding Society.

1.3.8 MIL-HDBK-1007/3, Soil Dynamics and Special Design Aspect, Department of Defense.

1.3.9 PCI Committee on Prestressed Concrete Piling, Recommended Practice for Design, Manufacture and Installation of Prestressed Concrete Piling (PCI Committee Report March-April 1993), Precast/Prestressed Concrete Institute.

1.3.10 ASTM A 311/A 311M-95 (2000), Standard Specification for Cold-Drawn, Stress-Relieved Carbon Steel Bars Subject to Mechanical Property Requirements, ASTM International.

1.3.11 ASTM A 370-03a, Standard Test Methods and Definitions for Mechanical Testing of Steel Products, ASTM International.

1.3.12 ASTM A 706/A 706M-04a, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement, ASTM International.

1.3.13 ASTM C 31/C 31M-03a, Standard Specification for Making and Curing Concrete Test Specimens in the Field, ASTM International.

1.3.14 ASTM C 39/C 39M-03, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ASTM International.

1.3.15 ASTM C 78-08, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), ASTM International.

1.3.16 ASTM C 172-04, Standard Practice for Sampling Freshly Mixed Concrete, ASTM International.

1.3.17 ASTM D 198-08, Standard Test Methods of Static Tests of Lumber in Structural Sizes, ASTM International.

1.3.18 ASTM D 4945-00, Standard Test Method for High-Strain Dynamic Testing of Piles, ASTM International.

1.3.19 ASTM E 4-01, Standard Practices for Force Verification of Test Machines, ASTM International.

1.3.20 ASTM E 8-08, Standard Test Method for Tension Testing of Metallic Materials, ASTM International.

1.3.21 ASTM E 83-02, Standard Practice for Verification and Classification of Extensometer System, ASTM International.

1.3.22 EN 10025-1:2004, Hot Rolled Products of Structural Steels — Part 1: General Technical Delivery Conditions, European Committee for Standardization.

1.3.23 EN 10025-2:2004, Hot Rolled Products of Structural Steels — Part 2: Technical Delivery Conditions for Non-alloy Structural Steels, European Committee for Standardization.

1.3.24 EN 12794:2005, Precast Concrete Products — Foundation Piles, European Committee for Standardization.

1.3.25 EN 13369:2004, Common Rules for Precast Concrete Products, European Committee for Standardization.

1.4 Definitions: Definitions in the IBC, ACI 318, ACI 543R, PCI Committee Report, and AISC 360 apply to this criteria. In addition, the terms below apply to this criteria. Refer to Figure 5 for a typical MPS configuration.

1.4.1 Mechanical Pinned Splice (MPS): A pile joint consists of two embedded components with one cast at the end of one pile segment, and the other cast at the end of another pile segment. The two embedded components are joined together in the field during driving by steel locking pins. Refer to Figure 5 for a typical MPS configuration.

1.4.2 Mechanical Pinned Splice – Pile Assembly (MPSPA): A precast, prestressed concrete pile consisting of two pile segments that are joined together by an MPS in the field during driving.

1.4.3 Pile Joint: The required devices by which separate segments of a precast, prestressed concrete pile are structurally connected at the jobsite during driving.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description: A detailed description of the MPSs, including information concerning material specifications, configurations, dimensions, the manufacturing process, and restrictions or limitations on use. Information shall be provided on, but shall not be limited to, the following items: Steel female and male lock mechanisms; steel locking pins; steel pipe anchors; steel plates; steel reinforcements; concrete; welding; referenced material standards; grades of steel; sizes and dimensions of each component of the MPSs; the specified compressive strength of concrete at 28 days and at time of driving [shall be 6,000 psi (41.3 MPa)]; curing conditions of concrete piles; welding electrode classification; type of gas shielding; welding procedure; and dimensioned drawings of the MPSs and corresponding components.

2.1.2 Packaging and Identification: A description of the method of packaging and field identification of all components of the MPS, including both the components embedded in pile segments and the steel locking pins. Field identification provisions shall include the name of the report holder, the ICC-ES evaluation report number, and the name or logo of the inspection agency.

2.1.3 Installation Instructions: Manufacturer's published instructions shall include the following items: A description of how the MPSs are installed at the project site, including special tools or gages needed, product handling and storage, procedures for field assembly and procedures for performance (strength and stiffness) verification.

2.2 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.3 Test Reports: Test reports shall comply with AC85.

2.4 Product Sampling: Sampling of the MPSs for tests under this criteria shall comply with Section 3.1 of AC85. The fabrication of the test assemblies shall be witnessed by or verified by the testing laboratory.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 General: The strength and stiffness of the MPSs shall be based on a rational engineering analysis described in Section 3.3 and verified by testing data complying with Section 4.0, with tests conducted on the specimens of MPSPAs. The material properties utilized for such rational engineering analysis required by Section 3.3 shall be the actual properties determined in accordance with Section 3.2, in order to demonstrate the validity of the proposed rational engineering analysis.

3.2 Test Materials:

3.2.1 Concrete:

3.2.1.1 General: Samples for strength tests shall be taken in accordance with ASTM C 172. Concrete test cylinders and beams shall be prepared in accordance with ASTM C 31 and made from the same sample of concrete and same curing process, including curing time, as the concrete used in specimens of MPSPAs tested in accordance with Section 4.0. Compressive strength tests on cylinders shall be in accordance with ASTM C 39 for correlating tests conducted in accordance with

Sections 4. 2 through 4.6. Flexural strength tests on beams shall be in accordance with ASTM C 78 for correlating tests conducted in accordance with Section 4.3.

3.2.1.2 Properties: A compressive strength test shall determine the average of the strengths of two cylinders. There shall be three compressive strength tests to correlate tests conducted in Sections 4.2, 4.3, 4.4, 4.5 and 4.6, respectively; and three flexural strength tests to correlate tests conducted in Section 4.3. The concrete compressive and flexural strength tests shall be conducted within 24 hours of tests described in Section 4.0 on specimens of MPSPAs. The tested compressive strengths shall comply with Section 5.6.3 of ACI 318. The average values of strength tests shall be used for a rational engineering analysis described in Section 3.3.

3.2.2 Steel Female and Male Lock Mechanisms:

3.2.2.1 General: The purpose of this test is to demonstrate the compliance of the lock mechanisms with the intended performance requirements set forth in AISC 360.

3.2.2.2 Properties: Testing shall be conducted in accordance with Section 10 of EN 10025-1. The sample size shall be a minimum of three specimens for each steel grade except, when a larger number of specimens is required in accordance with EN 10025-1. The locking mechanism steel shall conform to EN 10025-2 for EN S355 J2G3 steel.

3.2.3 Steel Locking Pins:

3.2.3.1 General: Material testing data in the form of a mill certificate or test report from a testing laboratory shall be submitted for the steel locking pins.

3.2.3.2 Properties: Steel locking pins shall conform to ASTM A 311.

3.2.4 Steel Reinforcements:

3.2.4.1 General: Material testing data in the form of a mill certificate or test report from a testing laboratory shall be submitted for the steel reinforcements.

3.2.4.2 Properties: Deformed steel reinforcing bars shall comply with ASTM A 706.

3.2.5 Welding:

3.2.5.1 General: A certificate of analysis of welding electrodes used in the fabrication of the MPSPAs that are tested as required in Section 4.0, shall be submitted. An electrode manufacturer or a testing laboratory shall generate the analysis reports.

3.2.5.2 Properties: The welding electrodes and shielding for steel components of the MPS shall conform to requirements for ER80S-X set forth in AWS A5.28.

3.2.6 Other Steel Components of the MPSs:

3.2.6.1 General: Material testing data in the form of a mill certificate or test report from a testing laboratory shall be submitted for all other steel components, such as steel pipe anchors and steel plates of the MPSs.

3.2.6.2 Properties: Steel components of the MPSs, such as steel pipe anchors and steel plates, shall conform to corresponding referenced material standards specified in the AISC 360, including mechanical properties and chemical composition.

3.3 Rational Engineering Analysis:

3.3.1 General: A rational engineering analysis shall be employed to determine the capacity (strength and stiffness) of the MPSs. This rational engineering

analysis shall be in accordance with well-established principles of mechanics and shall comply with IBC Section 1604.4 and take into account equilibrium, stability, geometric compatibility and both the actual material properties determined in accordance with Section 3.2 and nominal specified material properties complying with the IBC and its referenced standards, with both approaches are clarified in the following paragraph.

In this criteria, applying the rational engineering analysis described in the paragraph above, when the actual material properties determined in accordance with Section 3.2 are utilized, the corresponding predicted strength shall be identified as calculated actual strength, which is compared to the tested strength determined in accordance with Section 4.0. Where the nominal specified material properties complying with applicable codes and referenced standards are utilized, the corresponding predicted strength shall be identified as calculated nominal strength, which is the strength recognized in a ICC-ES evaluation report provided that all conditions of acceptance described in Section 4.2.6, 4.3.8, 4.4.7, 4.5.8 and 4.6.7 are satisfied.

The calculated actual and nominal strength in resisting compression, tension, shear and bending shall be the lesser of the following: the MPS strength based on the least strength of all components of the MPS; and strength of each pile end region adjacent to the MPS due to the interaction among the MPS and both pile segments.

The rational engineering analysis employed shall take into account applicable interactions among different loadings such as compression, tension, bending moment and lateral shear, in order to demonstrate compliance with Sections 1605.2 and 1605.3 of the IBC. The calculated actual strength of MPSs subject to combined loadings

determined in accordance with the rational engineering analysis described in this Section shall be verified by testing data complying with Section 4.0. To utilize rational analysis in the development of interaction diagrams for combined flexure and axial loads, observed controlling failure mechanisms must be considered. For combined flexure and axial tension, the controlling tested limit state observed in the tension tests shall match the controlling tested limit state observed in the bending tests. If controlling limit states are observed to be inconsistent between flexure and axial tension, no interaction diagram for flexure and axial tension shall be reported. For combined flexure and axial compression, the controlling failure mechanism observed in the flexural test shall be used for the analysis, and the controlling limit state for the axial compression tests shall be crushing of the concrete. If controlling limit state observed for the axial compression tests is not crushing of the concrete, then no interaction diagram for flexure and axial compression shall be reported.

The rational engineering analysis employed shall determine the pile stiffness and deformation capacity for lateral loads taking into account the contributions of the MPS so as to demonstrate compliance with Sections 1808.2.8.3, 1808.2.12, and 1808.2.9.3 of the IBC. The results from the rational engineering analysis shall be verified by test data complying with Section 4.0.

3.3.2 Conditions of Acceptance: The rational engineering analysis employed in Section 3.3.1 shall be deemed to be in compliance with this criteria provided the following requirements are satisfied: the conditions of acceptance described in Sections 4.2.6, 4.3.8, 4.4.7, 4.5.8 and 4.6.7 are all satisfied.

4.0 TEST METHODS

4.1 General: The specimens of MPSPAs shall subject to impact tests in accordance with Section 4.2. Subsequent to the impact tests, the specimens are extracted from the ground, the MPSs examined, and then the specimens are tested in accordance with the test methods described in Sections 4.3, 4.4, 4.5, and 4.6; for bending, shear, tension, and compression, respectively. Proper precautionary measures such as water jetting may be necessary in order to minimize tension applied to the pile during extraction. The purpose of these combination tests is to verify that the MPSs have adequate capacity to resist all stresses induced by driving and service loads, as required by Sections 1808.2.7, 1809.2.1, 1809.2.1.4, and 1809.2.3.2 of the IBC.

4.2 Impact Test:

4.2.1 General: The purpose of the impact test is to verify that the MPSs can provide and maintain true alignment of pile segments and the position of piles during and subsequent to driving installation and can maintain structural integrity subsequent to driving; and to demonstrate compliance with Sections 1808.2.6 and 1808.2.7 of the IBC. The impact test shall be conducted in accordance with ASTM D 4945, Section 1.6 of MIL–HDBK–1007/3, and Annex A of EN 12794, with the modifications and clarifications described in Sections 4.2.2 through 4.2.6 below.

4.2.2 Test Apparatus: In addition to test apparatus specified in Section 5 of ASTM D 4945, the pile-driving rig shall be capable of maintaining the submitted impact loads to an accuracy of +/-10 percent of the specified values, which are described in Section 4.2.4.

4.2.3 Test Specimens: Each test specimen consists of two pile segments, which are connected by a MPS. Both the upper and lower pile segments

shall be at least 14 feet (4 267 mm) long. The lower pile segment shall have adequate length to ensure that the MPS remains above the ground throughout the impact test. The lower pile segment may be provided with a pile shoe to prevent tip damage during driving. A minimum of three identical test specimens shall be required for each combination test described in Section 4.1 for each different size and configuration of the MPSs.

4.2.4 Test Procedure: The impact test shall take place in a well-defined area, where a geotechnical investigation shows sufficient soil bearing capacity at a suitable depth. The lower driven pile segment is driven vertically until it stands firmly embedded in the soil such that the pile joint is above the ground and can be observed throughout the test. After driving of the lower pile segment into position, the upper pile segment is joined to the lower segment in accordance with the MPS manufacturer's written installation instructions.

The impact load test consists of impact blows to the spliced pile generating compressive and tensile stresses across the spliced pile joint. At least 1,000 impact blows shall be applied during each test. The compressive stress around the MPS caused by impact blows shall simulate increasingly stiffening soil conditions, such as those encountered during practical driving operations. At least 500 blows shall be applied at 50 percent (+/-10 percent) of maximum compressive driving stress, 500 blows or more shall be applied at 70 percent (+/-10 percent) of maximum compressive driving stress, and 10 blows or more shall be applied at 100 percent (+/-10 percent) of maximum compressive driving stress, where the maximum compressive driving stress is equal to 3,500 psi (24.1 Mpa). Driving stresses shall be based upon recorded data in

accordance with ASTM D 4945 and the wave equation analysis described in Section 1.6 of the MIL–HDBK–1007/3.

4.2.5 Data Recording and Analysis: Data recording and analysis shall comply with Section 6 of ASTM D 4945 and Section 1.6 of MIL–HDBK–1007/3. In addition, the MPS and pile sections around the MPS shall be visually examined for any damage, such as spalling of concrete at the head of the pile, spalling of concrete near the MPS, and transverse cracking or breaking of pile, and the findings shall be recorded. The alignment between the upper and lower pile segments (angular deviation) shall be measured in accordance with Annex J of EN 13369 and Annex E of EN 12794.

4.2.6 Conditions of Acceptance: The MPS is deemed to be in compliance with Section 4.2 of this criteria provided that, subsequent to the impact tests, every specimen comply with the all of the following requirements: 1) No damage has occurred at the pile joint or in pile segments near the pile joint; 2) The angular deviation between the lower and upper pile segments is no more than 1:150; 3) The maximum compressive stress in the pile during driving is less than $0.75\times(0.85\times f'_c - f_{pe})$; and 4) The maximum tensile stress in the pile during driving is less than the allowable tensile stress which is $0.75\times(6\times\sqrt{f'_c} + f_{pe})$. Compliance with Section 6.5 is required in order to satisfy the item 4 requirements.

4.3 Bending Test:

4.3.1 General: The purpose of the bending tests, after being subject to the impact test described in Section 4.2 of this criteria, is to verify the adequacy of the

flexural bending strength of the MPSs after installation, and to evaluate the contribution effect of the MPSs to the pile flexural stiffness. The bending tests shall be conducted in accordance with Annex A, Section A1.5 of EN 12794, with modifications and clarifications described in Sections 4.3.2 through 4.3.8 below.

4.3.2 Test Specimens: A minimum of three identical test specimens that have been tested in accordance with Section 4.2 of this criteria shall be used for the bending test for each MPS size and configuration subsequent to the impact test.

4.3.3 Apparatus:

4.3.3.1 *Testing Machine:* A device that provides (1) a rigid frame to support the specimen yet permit the specimen to deflect without restraint, (2) a loading head through which the force is applied without high-stress concentrations in the specimen, and (3) a force-measuring device that is calibrated to ensure accuracy in accordance with ASTM E 4.

4.3.3.2 *Support Apparatus:* *Devices that provide support for the specimen at the specified span.*

4.3.3.2.1 *Reaction Bearing Plates*: The specimen shall be supported by metal bearing plates to prevent damage to the specimen at the point of contact between specimen and reaction support. The plates shall be of sufficient length, thickness, and width to provide a firm-bearing surface and ensure a uniform bearing stress across the width of the specimen.

4.3.3.2.2 *Bearing Reaction Supports*: The bearing plates shall be supported by devices that provide unrestricted longitudinal deformation and rotation of the specimen at the reactions due to loading. Provisions shall be made to

restrict horizontal translation of the specimen normal to the length of the specimen at the supports.

4.3.3.2.3 ***Lateral Support*****:** Support shall be provided as required to restrict lateral displacement. Each support shall allow vertical movement without frictional restraint.

4.3.3.3 ***Load Apparatus*****:** Devices that transfer the applied load from the testing machine at designated points onto the specimen. Provisions shall be made to prevent eccentric loading of the load-measuring device.

4.3.3.3.1 ***Load Plates and Rollers*****:** The load shall be applied through steel bearing plates and rollers, which are of sufficient thickness and extend entirely across the specimen width to eliminate high-stress concentrations at places of contact between specimen and steel bearing plates. Steel bearing plates and rollers shall consist of two plates separated by a minimum diameter of 2-inch (51 mm) round steel bar, oriented normal to the specimen span. The minimum dimensions of the plates shall be 1-inch (25 mm) -thick by 8-inch (203 mm) wide by 18-inch (457 mm) long, with the long direction oriented normal to the specimen span.

4.3.3.3.2 ***Load Point:*** Location of load points relative to the reactions shall be as identified in the specific test procedure.

4.3.3.4 ***Force Measuring Device:*** The force-measuring device (load-cell or equivalent device)) shall have the capacity to measure the full range of loading, and shall be calibrated prior to the test in accordance with ASTM E 4.

4.3.3.5 *Displacement Measuring Device:* The displacement-measuring device shall be LVDT device or equivalent, which shall provide continuous readings with an accuracy of at least 0.004 inch (0.1 mm).

4.3.4 Test Setup: The test setup shall comply with requirements set forth in Annex A, Section A1.5 of EN 12794 with modifications described in Section 4.3.3 and Figure 1 of this criteria.

4.3.5 Test Procedure: Prior to the bending test, the separation (gap) between two splice halves shall be measured in accordance with Annex A, Section A1.5 including Figure A.1 of EN 12794 for splice under flexural tension stress and flexural compression stress. The test specimen is placed on two supports such that the bending occurs about the weakest principle axis of the pile. The span length (between end supports) of the test must be equal to or greater than 10 times the minimal cross sectional dimension of the pile specimen, or 20 ft (6 096 mm) whichever is greater. The pile joint shall be situated in the middle of the span. Two equal point loads, located symmetrically about the splice shall be applied simultaneously, such that a near constant moment occurs over the middle span between point loads. The increase of each load step is chosen in order that at least 10 load steps are made before the maximum bending moment has been reached. After each load step, the loads are kept constant for at least 3 minutes. Continue the load steps until complete failure has been reached. Refer to Figure 1 of this criteria for illustration.

4.3.6 Data Recording and Analysis:

4.3.6.1 Load: The applied load shall be measured and recorded continuously at the point of loading during the test.

4.3.6.2 Separation (Gap) at the Splice Joint: The separation on the lower side of the test specimen, between the two joint halves, shall be measured and recorded continuously during the test.

4.3.6.3 Displacement: The vertical displacements shall be measured continuously at the three locations as indicated in Figure 1. The first displacement shall be measured when the pile specimen is exposed to its own weight only (zero reading).

4.3.6.4 Reinforcing Strain: Longitudinal strain of the reinforcing shall be measured directly using resistance type strain gages applied directly to bottom reinforcing. Strain gages shall be applied at a distance not greater than 2 inch (51 mm) (+/-1 inch) (+/-25.4 mm) from the extent of the female or male locking mechanism, on one side or on each side of the joint. The average of two maximum strain recordings shall be used to determine the maximum measured strain prior to failure. Strains shall be recorded continuously throughout loading at a rate not less than 100 records per minute.

4.3.6.5 Controlling Limit State: The limit state controlling failure shall be reported.

4.3.7 Flexural Stiffness: The tested equivalent moment of inertia of the MPSPA, I_{eq}, shall be calculated in accordance with Annex A, Section A.1.6 of EN 12794, where the “M” is the calculated actual flexural strength at pile cross section adjacent to the MPS based on the tested material properties in accordance with Section 3.2 of this criteria and described in Section 3.3.1 of this criteria, which shall be less than the tested ultimate bending moment prior to failure based on tests

conducted in accordance with Section 4.3 of this criteria. The effective moment of inertia of the precast prestressed concrete piles, I_e, shall be calculated in accordance with Section 9.5.2.3 of the ACI 318, where the "f_r" is determined by flexural strength test under Section 3.2.1 of this criteria, M_a is replaced by the calculated actual flexural strength as defined in this Section 4.3.7 of this criteria, I_g and I_{cr} are calculated based on the tested material properties in accordance with Section 3.2 of this criteria. Engineering analysis for reinforced concrete shall comply with applicable provisions of the ACI 318.

4.3.8 Conditions of Acceptance: Each MPS shall satisfy all of the following requirements: 1) Conditions of acceptance described in Section 4.2.6 of this criteria; 2) The tested ultimate bending moment in the splice prior to failure is equal or greater than the calculated actual flexural strength for the MPS as described in Section 3.3.1 of this criteria; and 3) The tested equivalent moment of inertia of the MPSPA, I_{eq}, shall be greater than 95 percent of the effective moment of inertia of the pile, I_e, where both I_{eq} and I_e are described in Section 4.3.7 of this criteria.

4.4 Shear Test:

4.4.1 General Criteria: The purpose of the shear tests, after being subject to the impact test described in Section 4.2 of this criteria, is to verify the adequacy of the shear strength of the MPSs.

4.4.2 Test Specimens: A minimum of three identical test specimens that have been tested in accordance with Section 4.2 of this criteria shall be used for the shear test for each MPS size and configuration subsequent to the impact test.

4.4.3 Apparatus: The apparatus shall be as described in Section 4.3.3.

4.4.4 Test Setup: The shear test shall be conducted on specimens described in Section 4.4.2 of this criteria with the MPS located at the midpoint of the specimens. The full length of the specimens must be equal to or greater than 10 times the minimal cross sectional dimension of the pile specimen, or 28 ft (8 534 mm), whichever is greater. The specimens shall be horizontally arranged in a testing machine with three bearing reaction supports. A load shall be applied normal to the pile specimen at a single load point, located at a distance equal to the depth of the specimen from the splice location along the span of the pile specimen, and aligned with the center of the pile specimen in the direction normal to the span. Load shall be applied through load apparatus as described in Section 4.3.3.3. Lateral supports shall be provided as described in Section 4.3.3.2.3.

4.4.5 Test Procedure: The total load shall be applied in steps and the increase of each load step shall be chosen such that at least 10 load steps are required prior to specimen failure. Each load increment shall be held for a minimum of three minutes. The applied load shall be measured and recorded continuously at the point of loading using a force-measuring device described in Section 4.3.3.3.3. At least two displacement-measuring devices described in Section 4.3.3.3.4 are placed across the MPS, one at each side of specimen. The relative vertical displacement across the pile joint is measured and recorded continuously. The rate of recording shall not be less than 100 records per minute. At each load step, the specimen is examined for any damage, such as concrete crack or distress in MPS. Continue load steps until complete failure has been reached. Refer to Figure 2 of this criteria for illustration.

4.4.6 Controlling Limit State: The limit state controlling failure shall be reported.

4.4.7 Conditions of Acceptance: Each MPS shall satisfy all of the following requirements: 1) Conditions of acceptance described in Section 4.2.6 of this criteria; 2) The tested shear force capacity in the MPS prior to failure is equal or greater than the calculated actual shear strength for the MPS as described in Section 3.3.1 of this criteria; and 3) Failure must occur as a result of diagonal tension in the concrete.

4.5 Tension Test:

4.5.1 General Criteria: The purpose of the tension tests, after being subject to the impact test described in Section 4.2 of this criteria, is to verify the adequacy of the tensile strength of the MPSs.

4.5.2 Test Specimens: A minimum of three identical test specimens that have been tested in accordance with Section 4.2 of this criteria shall be used for the tension test for each MPS size and configuration subsequent to the impact test.

4.5.3 Apparatus: In addition to applicable apparatus described in Section 4.3.3 of this criteria such as force measuring device and displacement measuring device, the following terms apply to both tension and compression test described in Section 4.5 and 4.6, respectively.

4.5.3.1 ***Fixed-End Anchorage:*** A fixed reaction block shall be provided at the fixed end of specimens tested in axial tension and compression. The reaction block shall restrain translational displacements of the fixed end of specimens in any direction. Attachments made between the anchorage and the reaction block shall be concentric to the centroid of the pile specimen cross section.

4.5.3.2 ***End-Plate Anchorage:*** Anchorage plates shall be embedded into the free end and fixed end of the pile specimens tested in axial tension and compression**.** The anchorage shall be adequate to transfer tension and compression loading into the pile specimens from the free end (loading end), and to the reaction black at the fixed end of specimens. The embedment length of end plate anchorage reinforcing shall not be greater than 7 feet (2 134 mm).

4.5.3.3 ***Low-Friction Bearing Pad:*** Bearing pads of Teflon or similar material shall be placed between the pile specimen and the reaction floor so as to minimize friction between the pile specimen and the reaction floor.

4.5.4 Test Setup: Axial tension tests shall be conducted on specimens described in Section 4.5.2 of this criteria with the MPS located at the midpoint of the specimens. The specimen shall be horizontally arranged in a testing machine, described in Section 4.3.3.1, with one end supported by a fixed-end anchorage, and the other end free to displace along the length of the specimen. The specimen shall be placed on low-friction bearing pads as shown in Figure 3. Axial tension shall be applied at the free end through two load points on a load-transfer member, located such that the resultant axial force in the pile specimen is concentric about the centroid of the pile cross-section and loaded through an end-plate anchorage. Refer to Figures 3 and 4 for illustration.

4.5.5 Test Procedure: The total load shall be applied in steps and the increase of each load step shall be chosen such that at least 10 load steps are required prior to specimen failure. At least two displacement-measuring devices described in Section 4.3.3.3.4 are placed across the MPS, one at each side of specimen. The

relative displacement across the pile joint is measured and recorded continuously. Each load increment shall be held for a minimum of three minutes. The applied load shall be recorded continuously at the point of loading at a rate not less than 100 records per minute. At each load step, the specimen is examined for any damage, such as concrete crack or distress in the MPS. Continue the load steps until complete failure has been reached. Refer to Figures 3 and 4 of this criteria for illustration.

4.5.6 Longitudinal Strain: Longitudinal strain of the reinforcing shall be measured directly using resistance type strain gages applied directly to bottom reinforcing. Strain gages shall be applied at a distance not greater than 2 inch (51 mm) (+/-1 inch (25.4 mm) from the extent of the female or male locking mechanism, on one side or on each side of the joint. The average of two maximum strain recordings shall be used to determine the maximum measured strain prior to failure. Strain shall be recorded continuously throughout loading at a rate not less than 100 records per minute.

4.5.7 Controlling Limit State: The limit state controlling failure shall be reported.

4.5.8 Conditions of Acceptance: Each MPS shall satisfy all of the following requirements: 1) Conditions of acceptance described in Section 4.2.6 of this criteria; and 2) The tested tension force in the MPS prior to failure is equal or greater than the calculated actual axial tensile strength for the MPS as described in Section 3.3.1 of this criteria.

4.6 Compression Test:

4.6.1 General Criteria: The purpose of the compression tests, after being subject to the impact test described in Section 4.2 of this criteria, is to verify the adequacy of the compressive strength of the MPSs.

4.6.2 Test Specimens: A minimum of three identical test specimens that have been tested in accordance with Section 4.2 of this criteria shall be used for the compression test for each MPS size and configuration subsequent to the impact test.

4.6.3 Apparatus: The apparatus shall be as described in Section 4.5.3.

4.6.4 Test Setup: Axial compression tests shall be conducted on specimens described in Section 4.6.2 of this criteria with MPS located at the midpoint of the specimens. The specimen shall be horizontally arranged in a testing machine, described in Section 4.3.3.1, with one end supported by a fixed-end anchorage, and the other end free to displace along the length of the specimen. The specimen shall be placed on low-friction bearing pads as shown in Figure 3. Axial compression shall be applied at the free end through two load points on a load-transfer member, located such that the resultant axial force in the pile specimen is concentric about the centroid of the pile cross-section and loaded through an end-plate anchorage. The specimen shall be laterally braced as required to prevent buckling failure modes. Refer to Figures 3 and 4 of this criteria for illustration.

4.6.5 Test Procedure: The total load shall be applied in steps and the increase of each load step shall be chosen such that at least 10 load steps are required prior to specimen failure. At least two displacement-measuring devices described in Section 4.3.3.3.4 are placed across the MPS, one at each side of specimen. The relative displacement across the pile joint is measured and recorded continuously. Each

load increment shall be held for a minimum of three minutes. The applied load shall be recorded continuously at the point of loading at a rate not less than 100 records per minute. At each load step, the specimen is examined for any damage, such as concrete crack or distress in the MPS. Continue the load steps until complete failure has been reached. Refer to Figures 3 and 4 of this criteria for illustration.

4.6.6 Controlling Limit State: The limit state controlling failure shall be reported.

4.6.7 Conditions of Acceptance: Each MPS shall satisfy the following requirements: 1) Conditions of acceptance described in Section 4.2.6 of this criteria; and 2) The tested compression force in the MPS prior to failure is equal or greater than the calculated actual axial compressive strength for the MPS as described in Section 3.3.1 of this criteria.

5.0 QUALITY CONTROL

5.1 The products shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by the International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.

5.2 Quality documentation complying with ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted for each manufacturing facility.

6.0 EVALUATION REPORT RECOGNITION

The following information shall be included in the evaluation report:

6.1 Product Description: Information described in Section 2.1 of this criteria.

6.2 Design Strength: The design strength for flexural, shear, tension and compression, and combinations thereof, determined in accordance with Section 3.3.1 of

this criteria, shall be reported for each load combination in accordance with Section 1605.2 of the IBC.

6.2.1 Design Strength for Individual Actions: The design strength for flexural (ϕM_n), shear (ϕV_n), tension (ϕT_n), and compression (ϕP_n), shall be the calculated nominal strength, described in Section 3.3.1, in bending (M_n), shear (V_n), tension (T_n), and compression (P_n), multiplied by a appropriate strength reduction factor (ϕ), described in IBC or ACI 318, respectively.

6.2.2 Design Strength for Shear in combination with Flexural, Axial Loads: If the controlling failure mechanisms observed in the flexural test are one of the following: (1) Tension yielding of splice reinforcing; (2) Tension yielding of prestressing steel at the end regions of MPSs; (3) Bond slippage of prestressing steel at the end regions of MPSs; then the design strength for shear in combination with flexural, axial tension/compression shall be in accordance with Section 11.3.2 of the ACI 318.

6.2.3 Design Strength of Combined Flexure and Axial Loads: An interaction diagram for design flexural strength, ϕM_n, and design axial compression strength, ϕP_n, or design axial tension strength, ϕT_n, shall be determined in accordance with Section 3.3.1 of this criteria.

6.2.4 Flexural Stiffness: The flexural stiffness, $E_c I_e$, shall be as determined in accordance with Sections 4.3.7 and 4.3.8 of this criteria.

6.3 Code Compliance: The evaluation report shall state that the precast prestressed concrete piles utilizing the MPSs shall comply with the IBC and its referenced standards, including Sections 1808 and 1809 of the IBC.

6.4 Geotechnical Investigation: The evaluation report shall indicate that a site-specific geotechnical investigation is required for application of the MPS products. The geotechnical investigation shall comply with IBC Sections 1802 and 1808, including driven criteria, which shall be consistent with the requirements of this criteria for MPS application. The geotechnical investigation shall address the applicable geotechnical aspects, but not limited to, the following: the pile capacity in strength (to resist compression, tension, bending, and shear) and stiffness (to resist vertical settlement and lateral displacement) taking into account of contributions of the MPSs as described in Section 3.3.1; corrosive properties of the soil to ensure that a potential MPS corrosion situation does not exist; the effects of groundwater and other questionable characteristics of the site; the support conditions for the pile including lateral support; the provisions for in-situ testing as described in Section 6.5 of this criteria.

6.5 In–Situ Testing: The evaluation report shall indicate that for each soil condition identified in a geotechnical investigation report described in Section 6.4 of this criteria, in which precast prestressed concrete piles utilizing the MPS are to be installed, dynamic testing of a test pile shall be conducted in accordance with ASTM D 4945 and Section 1.6 of the MIL–HDBK–1007/3 to ensure that 1) Maximum allowable tensile stress described in Section 4.2.6 of this criteria is not exceeded; and 2) Damage do not occur to the pile including the MPS during driving installation. The testing agency shall be approved by the code official in accordance with Section 1702.1 of the IBC.

6.6 Installation: The evaluation report shall note any special training or certification required for installation professionals, equipment required for installation,

and a detailed description of proper installation techniques. Requirements and procedures for quality assurance inspection of product installation shall be described.

6.7 Special Inspection: The evaluation report shall state that special inspection in accordance with Sections 1704.7 and 1704.8 of the IBC is required.

6.8 Scope of Evaluations: The evaluation report shall state that the precast prestressed concrete piles joined with MPSs recognized in a ICC-ES evaluation report are limited to the following conditions: The specified compressive strength of concrete shall be 6,000 psi (41.3 Mpa) the total pile length shall be 50 feet (15 240 mm) larger; the site-specific geotechnical investigation indicating that there will be no deleterious action on the MPSs because of soil constituents, changing water levels or other factors.

6.9 Limitations: The evaluation report shall state that the following items have not been evaluated and are beyond the scope of the evaluation report: MPSs located in the ductile region of piles as identified in IBC Section 1809.2.3.2.1 for seismic design category C, and 1809.2.3.2.2 for seismic design category D, E or F; protection of pile materials including the MPSs as identified in IBC Section 1808.2.17; MPSs located in the region of unbraced length of piles and within 5 feet (1 524 mm) into firm ground and 10 feet (3 048 mm) into soft material as described in IBC Section 1808.2.9.2 or otherwise larger embedment length into the supporting soil as approved by the code official on the basis of a geotechnical investigation by a registered design professional.

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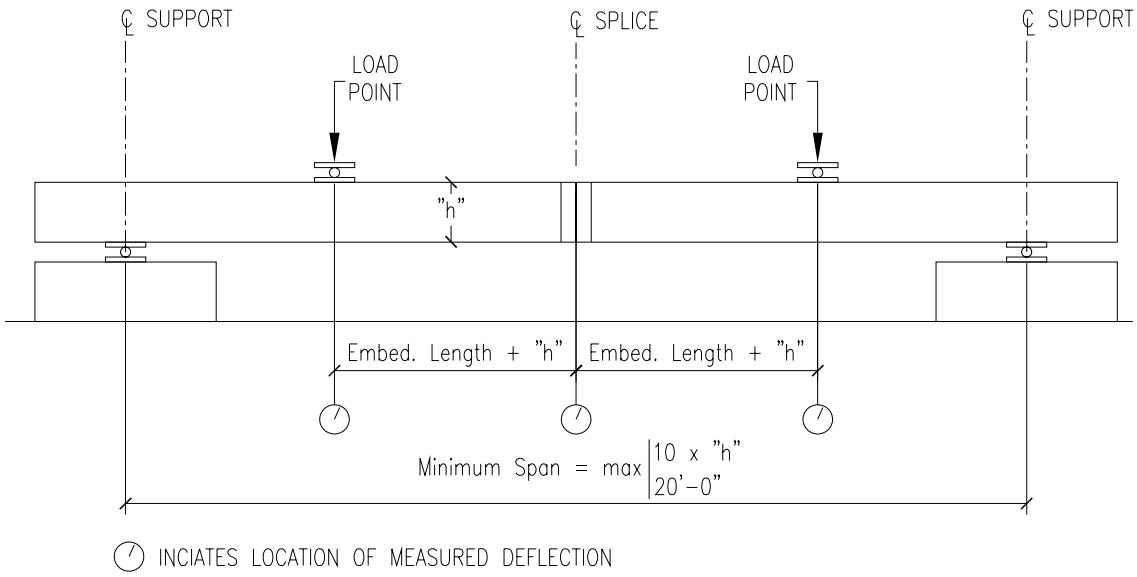

Figure 1: Bending Test

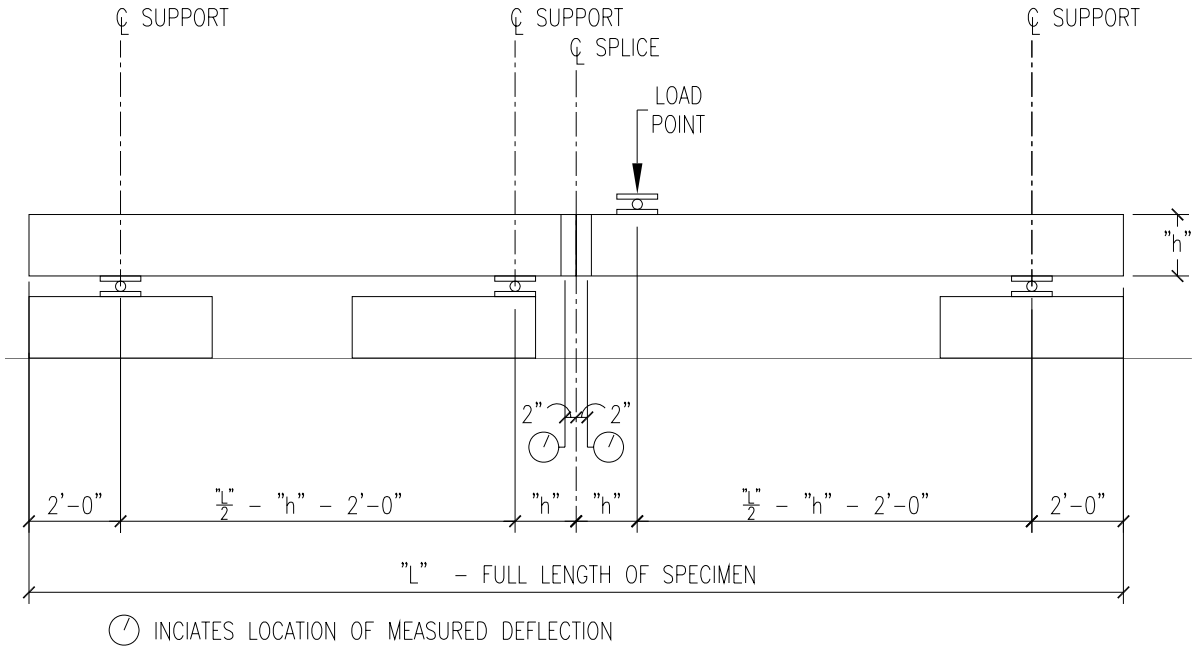

Figure 2: Shear Test

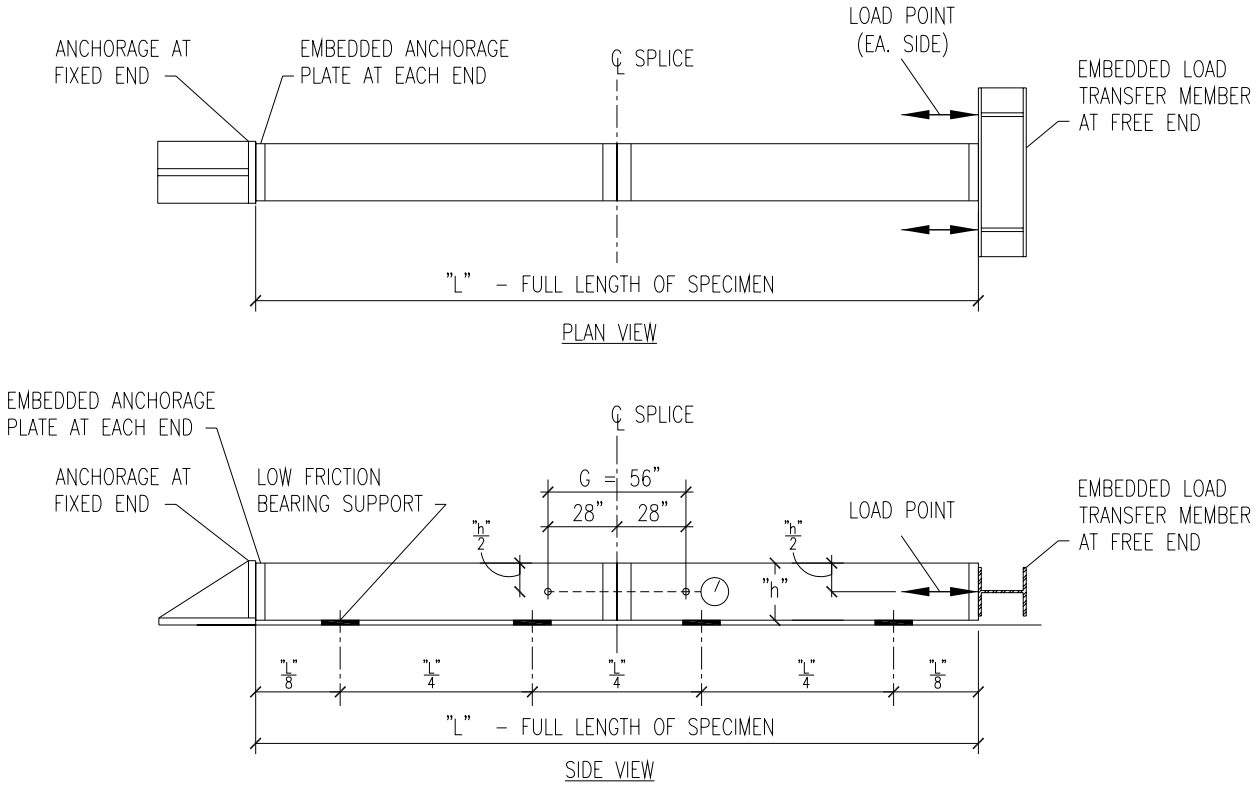

Figure 3: Tension and Compression Test

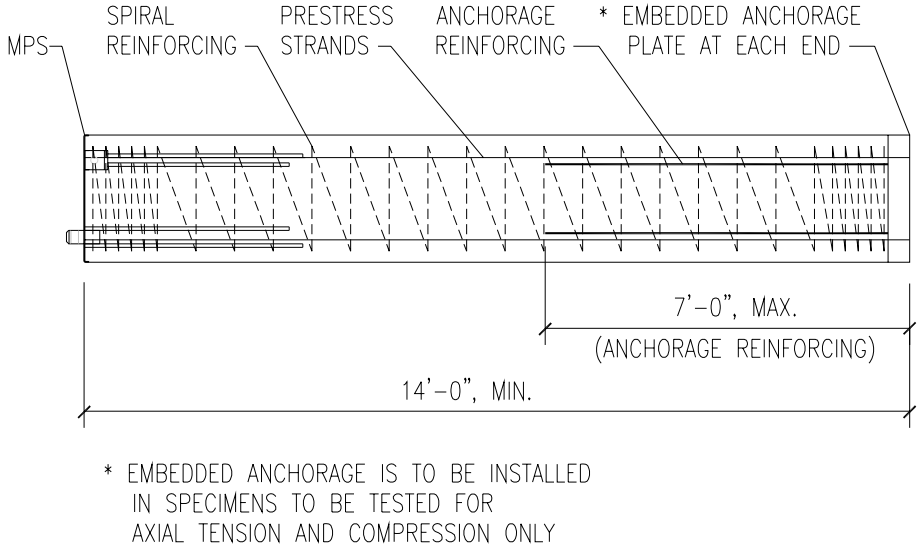

Figure 4: Pile Segment Detail for Tension and Compression Test

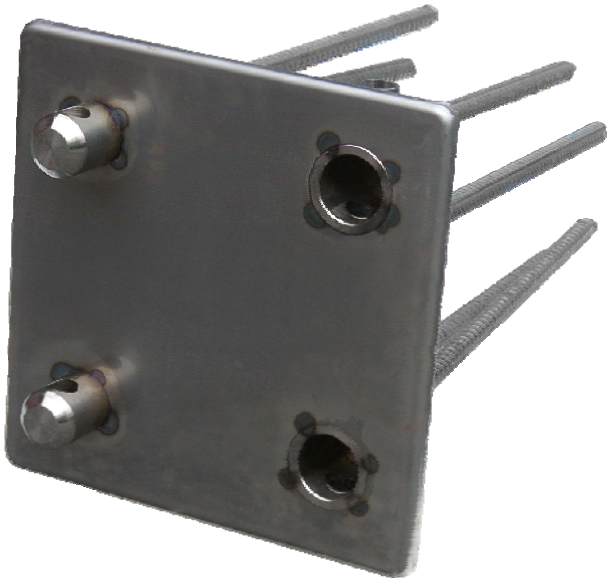

Figure 5: Photograph of a Typical MPS