ICC EVALUATION SERVICE

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

ACCEPTANCE CRITERIA FOR MOLDED PLASTIC FOOTING PADS

AC49

Approved October 2009

Effective November 1, 2009

Previously approved October 2008, October 2007 and September 1990

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.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (**I**) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (➜) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

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 set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features 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 if 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 by ICC-ES for purpose of issuing ICC-ES evaluation reports.

ACCEPTANCE CRITERIA FOR MOLDED PLASTIC FOOTING PADS (AC49)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for molded plastic footing pads to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2009 and 2006 *International Building Code*® (IBC) and the 2009 and 2006 *International Residential Code*® (IRC). Bases of recognition are IBC Section 104.11 and IRC Section R104.11. Applicable code sections are:

1.1.1 Footings and Foundations: 2006 IBC Sections 1805 (Footings and Foundations), 1805.1 (General), 1805.2 (Depth of Footings), and 1805.4 (Footings); 2009 IBC Sections 1808 (Foundations) and 1809 (Shallow Foundations); and 2009 and 2006 IRC Sections R401 (Foundations—General), R402 (Foundations—Materials), and R403 (Foundations—Footings).

1.1.2 Residential Decks: 2006 IBC Sections 310 (Residential Group R-3 One- and Two-Family Dwelling Units), Section 1602.1 (Definitions—Deck), 1604.8.3 (Anchorage – Decks), Table 1607.1 (Live Loads),1613 (Earthquake Loads—Exception 1); 2009 IBC Sections 310 (Residential Group R-3 One- and Two-Family Dwelling Units), 1604.8.3 (Anchorage – Decks), Table 1607.1 (Live Loads),1613 (Earthquake Loads—Exception 1); and 2006 IRC Sections R101.2 (Scope), R202 (Definitions—Deck), R502.2.2 (Decks); 2009 IRC Sections R101.2 (Scope) and R502.2.2 (Decks).

1.1.3 Agricultural Buildings Group U Occupancies: 2009 and 2006 IBC Sections 312 (Utility and Miscellaneous Group U), Table 1604.5 (Occupancy Category of Buildings and Other Structures), 1613.1 (Earthquake Loads—Exception 3), and Appendix C (Group U—Agricultural Buildings)

The reason for the development of this acceptance criteria is to allow the evaluation of molded plastic footing pads as an alternative footing material, since the codes do not provide requirements for the evaluation of molded plastic footing pads.

1.2 Scope: The molded plastic footing pad is a footing for the support of a wood column on an exterior residential deck, and post-frame agricultural buildings for Type V construction. The molded plastic footing pad shall only be used as an individual isolated footing supporting downward compression loads.

1.3 Codes and Referenced Standards: Where standards are referenced in this criteria, these standards shall be applied consistently with the code upon which compliance is based.

1.3.1 2009 *International Building Code*® (IBC), International Code Council.

1.3.2 2006 *International Building Code*® (IBC), International Code Council.

1.3.3 2009 *International Residential Code*® (IRC), International Code Council.

1.3.4 2006 *International Residential Code*® (IRC), International Code Council.

1.3.5 ASTM D 790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical insulating Materials, ASTM International.

1.3.6 ASTM D 2990-01, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics, ASTM International.

1.3.7 ICC-ES Acceptance Criteria for Air-conditioning Equipment Pads (AC100).

1.3.8 ASABE/ANSI EP 486.1 (2000), Shallow-post Foundation Design, American Society of Agricultural and Biological Engineers.

1.4 Definitions:

1.4.1 Molded Plastic Footing Pads: Circular ribbed plastic pads injection-molded from of a mix of virgin or recycled plastic, and used as a shallow rigid footing that transmits design bearing load uniformly to the supporting soil.

1.4.2 Deck: Refer to the definitions in 2006 IBC Section 1602 and 2006 IRC Chapter 2.

1.4.3 Post-frame Building System: A post-frame building system is characterized by primary structural frames of posts as columns and trusses or rafters as roof framing. The roof framing is attached to the posts, either directly or indirectly through structural headers. Posts are typically graded lumber, graded timbers, or laminated lumber, or are fabricated of composite or hybrid material. Posts are embedded in the soil and supported on isolated footings, or are attached to the top of piers, concrete or masonry walls, slabs-on-grade, or other suitable foundations. Secondary framing members, purlins in the roof and girts in the walls are attached to the primary framing members to provide lateral support and to transfer sheathing loads, both in-plane and out-of-plane, to the posts and roof framing. Structures are sheathed with a wide variety of materials, including metal and wood structural panels or other suitable materials.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description: Complete information concerning material specifications, thickness, size and the manufacturing process. This information shall be submitted with the quality documentation required under Section 5.2.

2.1.2 Installation Instructions: Installation details and limitations, include allowable loads based on soil bearing capacity.

2.1.3 Packaging and Identification: A description of the method of packaging and field identification of the molded plastic footing pad. Identification provisions shall include the evaluation report number.

2.1.4 Field Preparation: Field modification or fabrication of this product is not permitted.

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 molded plastic footing pad for tests under this criteria shall comply with Section 3.2 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

The performance characteristics for molded plastic footing pads described in Sections 3.1, 3.2. 3.4, 3.5 and 3.6 shall be documented by testing and shall be conducted for each type of plastic material used in manufacturing the pads. Full-size molded plastic footing pads in each size and configuration to be listed in the evaluation report shall be tested to document performance characteristics described in Sections 3.5 and 3.6.

3.1 Exposure to Soil: The test methods are noted in Section 4.1 of this criteria.

3.2 Low-temperature Brittleness: The test methods are noted in Section 4.2.

3.3 Density: The test methods are noted in Section 4.3.

3.4 Stiffness: The test methods are noted in Section 4.4.

3.5 Allowable Vertical Load Tests: The test methods are noted in Section 4.5.

3.6 Creep Test: The test methods are noted in Section 4.6.

4.0 TEST METHODS

4.1 Exposure to Soil Environment: Testing shall be conducted for in-ground use in accordance with Section 4.3.1 of AC100.

4.2 Low-temperature Brittleness: Testing shall be conducted in accordance with Section 4.3.2 of AC100.

4.3 Density: Testing shall be conducted in accordance with Section 4.3.3 of AC100.

4.4 Stiffness: Test samples representative of the molded plastic footing pads to be listed in the evaluation report shall be tested for flexural modulus of elasticity in accordance with ASTM D 790 to evaluate the molded plastic footing pad as a rigid footing which transmits loads uniformly to the supporting soil. Five identical specimens of footing pad shall be tested.

Conditions of Acceptance: The average of the five identical test specimens must exhibit a flexural modulus of elasticity of 250,000 psi (1725 MPa) or greater.

4.5 Allowable Vertical Load Test:

4.5.1 Purpose: The purpose of this test is to evaluate the strength of the molded plastic footing pad under simulated support conditions. The footing shall be tested on a substrate with the following characteristics: readily definable strength characteristics, relatively uniform stiffness throughout, consistent and/or repeatable stiffness between multiple tests.

4.5.2 Evaluation and Selection of Soil Substrate: A substrate material composed of expanded polystyrene (EPS) or extruded polystyrene (XPS) shall be selected for use as a test substrate. Other materials meeting the basic requirements of Section 4.5.2.1 may also be used for laboratory testing. If actual soil is to be used as the test substrate in laboratory testing, special consideration must be given to the factors influencing soil stiffness and repeatability, such as soil confinement and compaction methods between subsequent tests.

4.5.2.1. Substrate Stiffness Classification: Molded plastic footings pads shall be tested on a Class of Materials 5 substrate (Table 1) having a maximum modified modulus of soil reaction, *k*, not to exceed the values in Table 1. Subsequent testing on stiffer substrates may be performed where increased load capacity on stiffer soils is desired.

4.5.2.2. Substrate Evaluation: The modified modulus of soil reaction of the substrate shall be assessed using the procedure described below. The report shall indicate the test soil classification and the actual modulus of soil reaction, *k*, in psi/in. (kPa/mm).

All substrate material and test specimens shall be conditioned at standard laboratory conditions of 73.4 + 3.6° F (23.0 + 15.8° C) and 50 + 5 percent relative humidity for not less than 48 hours prior to testing. Standard laboratory conditions shall be maintained throughout testing.

The configuration (width, depth, thickness, and material lot/batch) of the substrate material during the stiffness evaluation shall be the same size substrate that is to be used during the test of the footing as required in Section 4.5.3.

The modulus of soil reaction, *k*, shall be measured by centering a 1-inch-thick (25.4 mm), 12-inch-diameter (304.8 mm) steel plate on the representative substrate. A load of 1131 lbf (10 psi) [5090 N (69 kPa)] shall be applied to the center of the plate at a uniform rate. The full load shall be applied over an interval not to exceed 1 minute. The full load shall be maintained for 10 minutes.

A deflection gauge having a resolution of 0.001 inch (0.03 mm) shall be positioned to measure the deflection at the point of load application. Load and deflection readings shall be logged continuously to produce a load-deflection plot for the substrate.

The modulus of soil reaction, *k*, shall be calculated as 10 divided by the total deformation of the plate under the 1131 lbf load (10 psi) [5090 N (69 kPa)]. The total deformation measurement shall be the total deformation measured at 10 minutes of sustained load, including the deflection occurring during the initial loading. A “toe-correction” may be applied to the total deflection value to account for the load required to bring the loading plate into full bearing with the substrate.

The substrate is acceptable for use if the modified modulus of soil reaction, *k*, does not exceed the value in Table 1, for the class of soil being evaluated.

4.5.3 Procedure: The molded plastic footing pad shall be supported on the test substrate while subjected to a concentrated load using the following procedure:

The footing shall be centered on the test substrate material from the same batch qualified for use in accordance with Section 4.5.2.2. The substrate shall not be less than 4 inches (102 mm) thick and shall be of

sufficient size to extend beyond the footing by not less than 1.5 inches (38.1 mm) on all sides.

The molded plastic footing pad shall be oriented as required by the manufacturer's installation instructions (i.e., stiffening ribs facing up).

The test load shall be applied to the footing over an area simulating the minimum contact area anticipated in service.

The test load shall be applied with an eccentricity that is to be the maximum permitted in-service eccentricity. The eccentricity shall be taken as the distance from the geometric center of the footing to the center of the applied load. A minimum eccentricity of 0.5 inch (12.7 mm) shall be used.

The rate of loading shall be such that presumptive load-bearing value for the soil class being qualified is reached in approximately 10 minutes [e.g., for Class 5 soil, the loading rate (in lbf/minute) equals the pad area times 1500 psf (72 000 Pa) per 10 minutes]. The load shall be applied at this rate until ultimate is reached.

Deflection gauges having a resolution of 0.001 inch (0.03 mm) shall be positioned to measure the deflection at the point of load application and at two locations along the edge of the footing. The gauges at the edge of the footing shall be positioned along the same line, that which intersects the center of the applied load, on opposite sides of the applied load, with one gauge along the closest edge to the applied load and the other gauge along the edge farthest from the applied load. Load and deflection readings shall be logged continuously to produce a load-deflection plot for each test.

4.5.4 Allowable Vertical Load: The allowable vertical load for the molded plastic footing pad shall be taken as the lesser of the following:

1. Maximum load divided by 3.0.

2. Maximum presumptive load for the soil class being assessed (i.e., presumptive load-bearing value times the area of the plastic footing).

3. Load at which a 0.75-inch (19.05 mm) deflection occurs at the point of load application (total deflection). A "toe correction" may be applied to the deflection measurements to account for the load required to bring the plastic footing pad into full bearing with the substrate.

Three tests of each size of footing are required, with none of the results varying more than 15 percent from the average of the three, unless the lowest test value is used. The average result from a minimum of five tests may be used regardless of the variations. The results from two tests may be used when the higher value does not exceed the lower value by more than 5 percent and the lower value is used.

4.6 Creep Test:

4.6.1 Purpose: The purpose of this test is to evaluate the strength of the molded plastic footing pad under sustained loads.

4.6.2 Procedure: The footing shall be subjected to a sustained concentrated load for 2000 hours in accordance with ASTM D 2990 except as modified below:

All test specimens shall be conditioned at standard laboratory conditions of 73.4 + 3.6º F (23 + 15.8° C) and 50 + 5% relative humidity for not less than 48 hours prior to testing. Standard laboratory conditions shall be maintained throughout testing.

Specimens shall be continuously supported around the perimeter of the footing on a rigid support. The support shall have a radius of 0.125 inch (3.18 mm) and shall have a test span equal to the nominal footing dimension minus 1 inch (25.4 mm) in each direction being supported. The circular footings shall be supported on a rigid circular support having a diameter equal to the nominal footing diameter minus 1 inch (25.4 mm). The specimen shall be centered on the support so that the specimen overhangs the support by $^1/_2$ inch (12.7 mm) on all sides.

The footing shall be oriented as required by the manufacturer's installation instructions (i.e., stiffening ribs facing up).

The test load shall be applied to the footing over an area simulating the minimum contact area anticipated in service.

The test load shall be applied with an eccentricity that is to be the maximum permitted in-service eccentricity. The eccentricity shall be taken as the distance from the geometric center of the footing to the center of the applied load. A minimum eccentricity of 0.5 inch (12.7 mm) shall be used.

The average net deflection of the footing under the allowable load must be calculated. The net deflection of the footing shall be calculated as the deflection at the point of load application minus the average of the two deflections recorded at the edge of the footer. This deflection shall be determined at the allowable load using the load deflection curves generated in accordance with Section 4.5. The allowable load shall be calculated as specified in Section 4.5.4.

The creep test load shall be equal to the applied load required to produce an immediate (short-term) deflection at point of load application that is equal to the net deflection determined in Section 4.6.2. The creep test load shall be determined using the support conditions for the creep test, as required in Section 4.6.2. The purpose of this procedure is to produce the same state of flexural strain when testing according to Section 4.5 (flexible support) except under the support conditions required in Section 4.6.2 (rigid support).

A deflection gauge having a resolution of 0.001 inch (0.03 mm) shall be positioned to measure the deflection at the point of load application. Deflection measurements shall be taken at the intervals specified in ASTM D 2990, except the interval between readings shall not exceed 1 week (168 hours), or 24 hours where there is evidence of tertiary creep (increasing creep rate).

The deflection data shall be presented in two plots: one plotting the creep deformation (inches) versus time (hours), and the other plotting the creep rate (in./hour) versus time (hours). The report shall indicate clearly whether tertiary creep is evidenced in the data.

4.6.3 Conditions of Acceptance: The molded plastic footing pad shall not exhibit tertiary creep (increasing creep rate) under 2000 hours of sustained

load. Upon failure, the footing may be retested under a reduced creep load; however, the immediate deflection produced by the reduced creep load shall be used to calculate the corresponding allowable load from the load deflection plots produced in accordance with Section 4.5. The overall allowable load rating for the footing shall not exceed this reduced load.

5.0 QUALITY CONTROL

5.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

5.2 Third-party follow-up inspections are not required under this acceptance criteria.

5.3 Quality Control Tests: Quality control tests shall be conducted during the production of the pads in conformance with procedures set forth in the in-house quality control manual. The quality control tests and conditions of acceptance shall be as follows:

5.3.1 One flexural test in accordance with ASTM D 790 shall be performed for every 1,000 pads produced, and one concentrated load test in accordance with Section 4.6 of this report shall be performed for every 3,000 pads produced.

5.3.2 The test samples shall be randomly taken from the injection-molded products.

5.3.3 Percentages and types of material used shall be recorded for each day of production. If different material sources, percentages, or types of materials are introduced into any production run, tests noted above shall be performed and documented in accordance with procedures set forth in the in-house quality control manual.

5.3.4 Conditions of Acceptance: The determined flexural modulus and flexural strength shall not be less than 95 percent of the lowest control sample values reported in the initial qualification test report. The allowable deflection under load shall not be more than 95 percent of the value reported in the qualification test report.

6.0 EVALUATION REPORT RECOGNITION

6.1 Installation: The following is information that shall be included in the ICC-ES evaluation report on the molded plastic footing pads:

6.1.1 Table of allowable load capacities of each footing size based on soil bearing capacity.

6.1.2 Figure showing plan and cross-sectional view of footing pad with dimensions noted and rib configuration shown.

6.1.3 Detailed description of installation of molded plastic footing pads.

6.2 Conditions of Use: The following Conditions of Use for molded plastic footing pads shall be included in the evaluation report:

6.2.1 The [name of product defined as molded plastic footing pads] must be installed in accordance with this report and the applicable code.

6.2.2 The [name of product defined as molded plastic footing pads] are used to support wood posts used to support exterior residential decks or wood post columns for post-frame building systems for construction of Group U (Agricultural Buildings), Type V, construction under the IBC or any construction under the IRC.

6.2.3 The [name of product defined as molded plastic footing pads] must be installed below the frost line of the locality.

6.2.4 The [name of product defined as molded plastic footing pads] are used as individual isolated footings to resist bearing loads only and are not used to resist lateral or uplift loads.

6.2.5 The [name of the product defined as molded plastic footing pads] have not been evaluated for seismic or wind loads.

6.2.6 Mechanical fasteners must not be used with the molded plastic footing pads.

6.2.7 Patio covers or other types of roof construction must not be connected to residential decks supported by molded plastic footing pads

6.2.8 Design calculations in accordance with Chapter 18 of the IBC, Chapter 4 of the IRC and ASABE/ANSI EP 486.1 must be submitted to the code official documenting uplift and lateral load resistance.

6.2.9 The allowable soil bearing pressure and vertical movement for the [trade name of molded plastic footing pad product], must be determined by a site-specific geotechnical investigation or evaluation in accordance with Section 1803 of the IBC or Section R401.4 of the IRC. A geotechnical investigation or evaluation must be submitted to the code official for approval, when required by the applicable code.■

TABLE 1—SOIL CLASSIFICATION

CLASS OF MATERIALS	PRESUMPTIVE LOAD-BEARING VALUE (psf)	MINIMUM MODIFIED MODULUS OF SOIL REACTION, *k* (psi/in)
1. Crystalline bedrock	12,0000	—
2. Sedimentary and foliated rock	4,000	—
3. Sandy gravel and/or gravel (GW and GP)	3,000	800
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	400
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100

For **SI:** 1 psf = 48 Pa, 1 psi = 6.9 kPa, 1 inch = 25.4 mm.