SPECIALIZED TESTING
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IAS ACCREDITED

DOC'S INDUSTRIES, INC.
I-PIN ANCHOR TEST PROGRAM

STATIC TENSION TESTS

SPECIALIZED TESTING REPORT NUMBER STQA50609

TEST DATES: 10/6/2016 and 10/11/2016
REPORT DATE: 10/24/2016

TEST SPONSOR
DOC'S INDUSTRIES, INC.
4121 GUARDIAN ST.
SIMI VALLEY, CA 93063

TESTED BY:

SPECIALIZED TESTING
10600 PIONEER BLVD.
SANTA FE SPRINGS, CA 90670

REPORT PREPARED BY:

MARTIN MEJIA
PROJECT MANAGER

DOC'S INDUSTRIES, INC.
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I. OBJECTIVE

The objective of the test program was to determine the static tension capacity of Doc's Industries, Inc. I-Pin anchor installed in lightweight concrete test members.

II. TEST STANDARDS

The test program was conducted in general compliance with ASTM E488 - *Standard Test Methods for Strength of Anchors in Concrete Elements*.

III. TEST PROGRAM SCOPE

Five static tension tests of the Doc's Industries, Inc. 1/4-in. diameter I-Pin anchor were performed in a lightweight concrete test member.

IV. LABORATORY OF RECORD

Specialized Testing, Inc. (IAS TL228), was the laboratory of record. All ASTM E488 tests were performed at the laboratory facilities of Specialized Testing. Specialized Testing's IAS scope of accreditation specifically includes ASTM E488.

V. TEST SPECIMEN IDENTIFICATION

Doc's Industries, Inc. 1/4-in. diameter I-Pin anchor was tested in this test program.

Figure 1 presents a photograph of the 1/4-in. diameter I-Pin anchor.

Figure 1 – 1/4-in. Diameter I-Pin Anchor

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VI. TEST MEMBERS

The test member used in this test program consisted of an unreinforced lightweight concrete slab. The slab was obtained from Specialized Testing, Inc.'s inventory.

The compressive strength of the lightweight concrete slab test member was determined by testing two drilled cores in accordance with ASTM C42 and ASTM C39. The lightweight concrete compressive strength at 125-days is 4,028-psi.

VII. SCREW ANCHOR INSTALLATION

The screw anchor installations were performed pursuant to the instructions of Doc's Industries, Inc. as follows:

- The holes were drilled with a roto hammer (in rotation and hammer mode) using a Bosch 1/4-in. diameter SDS plus carbide bit, part number HC2041.
- A hole was drilled to a depth of at least 1-1/4-in.
- The holes were cleaned with a hand held squeeze bulb air blower to remove any dust that gravity kept in the hole.
- The anchors were driven into the concrete with a hammer.

VIII. TEST EQUIPMENT

The test equipment consisted of a tension reaction bridge member, test fixtures, test apparatus and a spherical washer joint fixture. The reaction bridge supported the test apparatus and distributed the test forces. The test fixtures connected the I-Pin anchors to the test apparatus. The test apparatus imparted and measured the force applied to the I-Pin anchors during testing. The spherical washer joint fixture was used to promote axial and normal load during the tension and shear tests.

The reaction bridge design was generally based on Table 1 and Figure 1 of ASTM E488. The I-Pin anchors were connected to the test apparatus using a shackle that was positioned through the hole of the I-Pin anchor.

The test apparatus imparted and measured the test force and displacement. The test apparatus consisted of a hollow core hydraulic cylinder, a hydraulic pump, a 10,000-lbs. load cell, and LVDT displacement transducers.

The data acquisition system recorded the test data. The data acquisition system consisted of data acquisition hardware, an IBM computer and LabView software. The data acquisition rate was 50-hertz.

The load cells and displacement transducers were calibrated by United Calibration. United Calibration is an ISO/IEC 17025 accredited calibration company. The calibration instruments used are traceable to NIST. All current calibration certificates are in the quality control files of Specialized Testing.

Figure 2 presents a photograph of the tension test apparatus.

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Figure 2 – Tension Test Apparatus

IX. TEST SET-UP AND PROCEDURE

Each I-Pin anchor was tested with the reaction bridge points in minimum compliance with Table 1 of ASTM E488. A connection rod was coupled to the load cell and passed through the hollow core hydraulic ram on one end of the test apparatus. A nut was placed on the end of this connecting rod so that the system was fixed from above. A second threaded connecting rod was coupled to the spherical washer joint. A third connecting rod was threaded into the spherical washer joint and to the test fixture. The spherical washer joint was used to promote axial loading in tension and normal loading in shear. The tension test force was axial to the shank of the I-Pin anchor.

The tension tests were setup with two LVDT displacement sensors positioned at 180-degrees apart onto a displacement datum plate. The LVDTs were supported with magnetic base stands positioned on a steel plate that rested on the surface of the test member. Note that the LVDT calibration parameters are not in compliance with ASTM E488.

A pre-loaded of approximately 5-percent of the target load was applied to the I-Pin anchors. After the pre-load was applied, the displacement sensors were set to a zero reading with the data acquisition system.

All I-Pin anchors were tested to ultimate capacity at a uniform rate with a test duration between 1-min. and 3-min. Maximum load and displacement readings were electronically recorded. The failure mode of each test was recorded on the data sheet.

Note that spacing and edge distance tests were outside the scope of this test program.

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X. FAILURE MODES

The typical failure mode for all tests was anchor pullout with concrete breakout.

Figure 3 presents a photograph of the noted failure mode. The failure mode of all tests is recorded in the attached laboratory data sheets.

Figure 3 – Failure Mode – I-Pin Anchor Pullout and Concrete Breakout

XI. TEST RESULTS

The results of the static tension tests are presented in the attached data sheet.

XII. PERSONNEL

The following personnel participated in the test program:

Martin Mejia – Project Manager and Test Report Author
Ricardo Flores – Technician

XIII. SIGNED FOR THE COMPANY

Martin Mejia

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ATTACHMENT – DATA SHEET

DS-PQ-651 GENERAL USE DATA SHEET

Created by: GH - Approved by: MM

Use of Data Sheet Authorized by:	M. Mejia
Date of test	10/6/16 (Test Nos. 1 through 3) and 10/11/16 (Test Nos. 4 and 5)
Client Name	Doc's Industries, Inc.
Work Order Number	STQA50609
Product Name	1/4-in. I-Pin Anchors
Technicians Name	R. Flores and M. Mejia
Test Equipment	PDAQ with 10,000-lbs. load cell and two LVDTs
Test Standards	ASTM E488

Test Number	Maximum Load (lbs)	Displacement at Maximum Load (in)	Failure Mode
1	1,629	0.323	Anchor Pullout with Concrete Breakout
2	1,488	0.245	Anchor Pullout with Concrete Breakout
3	1,625	0.230	Anchor Pullout with Concrete Breakout
4	1,407	0.390	Anchor Pullout with Concrete Breakout
5	1,427	0.379	Anchor Pullout with Concrete Breakout
Average	**1,515**	**0.313**	

Notes/Drawings

Corrected Date: 10/24/2016

This corrected report supersedes and replaces all reports prior to the correction date. All corrected information is double underlined.