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Test Load Capacity of Polymer Concrete Underground Utility Structures

Reported by ACI Committee 548

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Test Method for Load Capacity of Polymer Concrete Underground Utility Structures

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Polymer concrete underground utility structures are used to house outside plant equipment such as electrical distribution line splices, natural gas distribution vaults, water meters, and communication line splices. This test method provides procedures for full-scale testing of three loading conditions similar to vehicle loading that may be experienced in field installations. Results obtained may be used to determine the load-carrying capacity of the structure being tested and provide data for direct comparison between structures of various designs. While this method may be used for any underground structure, it is primarily for use on polymer concrete and polymer concrete/composite structures up to 10 x 10 x 10 ft (3 x 3 x 3 m) in size.

Keywords: handholes; polymer concrete; testing; underground structure; utility structure.

CONTENTS

SECTION 1—INTRODUCTION

1.1

Testing polymer concrete (PC) underground utility structures as described herein began during the 1970s and the method was included in the *Western Underground Guide 3.6, Nonconcrete Enclosures*, last printed in 1988.* Guide 3.6 was developed by a group of utilities in the western United States to specify underground utility structures made from materials other than portland-cement concrete for their use. The guide includes complete product specifications and addresses four specific enclosure sizes. Its use has spread across the country and the Guide has become a de facto standard. Preparation of this ACI 548.7 document as a stan-

**Western Underground Committee Guide*, Nonconcrete Enclosures, WUC 3.6/02/0588, Western Underground Committee.

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dardized, separate test method permits users to specify performance criteria and incorporate testing procedures by reference. It can be used for all underground utility structure sizes currently in use. This document is to be provided to ASTM for consideration as an ASTM test method.

SECTION 2—SCOPE

2.1

This test method provides data to be used in evaluating the load-carrying capacity of polymer concrete (PC) underground utility structures, frequently called handholes, by full-scale testing of the structure. A PC underground structure includes a box, typically without a bottom, and a matching cover (Fig. 1). It may include an extension and, if so, testing shall be of the box and extension together. These test methods are primarily for PC and PC/fiber-reinforced polymer composite enclosures. They may also be used to test underground enclosures of portland-cement concrete or other materials.

2.2

Four procedures are provided:

2.2.1 *Vertical load capacity evaluation for the enclosure cover*—A concentrated load is applied to the cover to approximate a vehicle wheel load.

2.2.2 *Vertical load capacity evaluation for enclosure walls*—A concentrated load is applied to the box along its edge to approximate a vehicle wheel as it passes onto or off of the assembly.

2.2.3 *Lateral load capacity evaluation for enclosure walls*—A uniformly distributed load is applied to the largest box wall to approximate the pressures resulting from earth backfill and the surcharge of a nearby vehicle.

2.2.4 Determination of failure loads for the three defined load conditions as detailed in Section 10.4.

2.3

Each of three specimens shall be tested to the design load and cycled for each procedure. Test the three specimens to failure using Procedure 4 as given in 10.4 for each.

2.4

The design load shall be determined for testing purposes, and all safety factors related to the design load shall be reported.

2.5

Ambient service temperatures affect the performance of the enclosures. These tests shall be conducted at 75 ± 10 °F (24 ± 5 °C) unless another temperature is specified in the request for testing.

2.6

The paired values stated in inch-pound and SI units are usually not exact equivalents. Therefore, each system is to be used independently of the other. Combining values from the two systems may result in nonconformance with this test method.

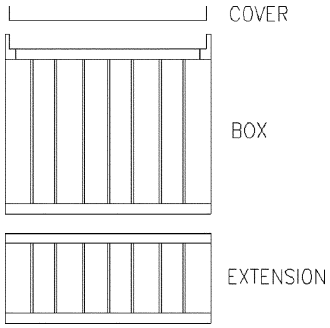

Fig. 1—Typical cover, box, and extension assembly.

SECTION 3—REFERENCED DOCUMENTS

3.1—ASTM standards

C 857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

SECTION 4—TERMINOLOGY

4.1—Definitions

4.1.1 *box*—main section of handhole containing a recess to receive the cover.

4.1.2 *cover*—top surface section of the handhole for closing the top access opening of the box section.

4.1.3 *design load*—The actual, expected load or loads that an underground utility structure supports in service calculated using ASTM C 857 or other rational design method.

4.1.4 *extension*—An add-on section that fits to the bottom or to the top of a box and extends its height.

4.1.5 *handhole*—A complete assembly that is not large enough for a person to enter and providing an access to an underground utility or fixture. The assembly includes a box, a cover, and, if needed, an extension.

4.1.6 *underground utility structure*—An enclosure for use underground that may be either a handhole or manhole.

SECTION 5—SIGNIFICANCE AND USE

5.1

The results from these test methods provide users with information about the maximum load capacity and deflection characteristics of the enclosure under three static loading conditions. The loading conditions approximate the three most severe conditions of loading encountered in actual installations and allow users to compare alternative materials and constructions to determine relative structural performance in service.

5.2

Actual loads and load footprints vary in service.

5.3

This test method provides information under repetitive static load conditions and does not provide any determination of resistance to impact, creep, or fatigue.