
**Geotechnical investigation and
testing — Testing of geotechnical
structures —**

**Part 4:
Testing of piles: dynamic load testing**

*Reconnaissance et essais géotechniques — Essais de structures
géotechniques —*

Partie 4: Essais de pieux: essai de chargement dynamique

Document Preview

ISO 22477-4:2018

<https://standards.iteh.ai/catalog/standards/iso/90750df7-c988-4dcf-8632-c5c720b206cf/iso-22477-4-2018>



iTeh Standards
(<https://standards.itih.ai>)
Document Preview

ISO 22477-4:2018

<https://standards.itih.ai/catalog/standards/iso/90750df7-c988-4dcf-8632-c5c720b206cf/iso-22477-4-2018>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	2
3 Terms, definitions and symbols	2
3.1 Terms and definitions	2
3.2 Symbols	4
4 Testing equipment	4
4.1 General	4
4.2 Loading	5
4.2.1 General	5
4.2.2 Loading by an impact driving system	6
4.2.3 Loading by a single or multiple blow drop mass	6
4.3 Measurements	6
4.3.1 General	6
4.3.2 Measurements for dynamic impact tests	7
4.3.3 Measurements and recordings required for pile driving formula or wave equation analysis	8
5 Test procedure	9
5.1 Preparation for testing	9
5.2 Safety requirements	9
5.2.1 People and equipment in the surrounding area	9
5.2.2 Test pile	10
5.3 Preparation of the pile	10
5.4 Timing of tests	10
5.4.1 General	10
5.4.2 Driving — Continuous monitoring and end of initial driving test	10
5.4.3 Re-driving	10
5.4.4 Bored or cast-in-situ piles	11
6 Test results	11
6.1 Test results for dynamic load test with driving formula	11
6.2 Test results for dynamic load test with wave equation analysis	11
6.3 Test results for dynamic load test with measurements at the pile head	11
7 Test reporting	12
Annex A (informative) Driving formula	14
Annex B (informative) Wave equation analysis	17
Annex C (informative) Examples of transducer attachment and pile extension details	27
Annex D (informative) Evaluation by closed form solutions using empirical damping values	29
Annex E (informative) Evaluation of the measurements by signal matching	36
Annex F (informative) Multi-blow dynamic testing technique	44
Bibliography	51

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 341, *Geotechnical investigation and testing*, in collaboration with ISO Technical Committee TC 182, *Geotechnics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 22477 series can be found on the ISO website.
<https://standards.iteh.ai/catalog/standards/iso/2017/50017/c788-4dc1-8832-c5c720b206cf/iso-22477-4-2018>

Introduction

This document establishes the specifications for the execution of dynamic load tests in which a single pile is subject to an axial load in compression to measure strain, acceleration and displacement under dynamic loading and to allow an assessment of its compressive resistance. This document outlines how a dynamic load test is defined and specifies the equipment and testing procedures required. Informative non-prescriptive guidance is included on the analysis of dynamic load test results required to determine mobilized or ultimate measured compressive resistance of a pile.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO 22477-4:2018](https://standards.iteh.ai/catalog/standards/iso/90750df7-c988-4dcf-8632-c5c720b206cf/iso-22477-4-2018)

<https://standards.iteh.ai/catalog/standards/iso/90750df7-c988-4dcf-8632-c5c720b206cf/iso-22477-4-2018>

Geotechnical investigation and testing — Testing of geotechnical structures —

Part 4: Testing of piles: dynamic load testing

1 Scope

This document establishes the specifications for the execution of dynamic load tests in which a single pile is subject to an axial dynamic load in compression.

This document outlines the methods of testing required to allow assessment of pile resistance to be determined from the following methods and procedures described in EN1997-1:2004+A1:2013:

- a) dynamic impact testing – determination of pile compressive resistance by evaluation of measurements of strain and acceleration and or displacement at the pile head with respect to time;
- b) pile driving formulae – evaluation of pile compressive resistance from blow counts and hammer energy during pile driving;
- c) wave equation analysis – evaluation of pile compressive resistance from blow counts by modelling of the pile, soil and driving equipment;
- d) multi-blow dynamic testing – evaluation of pile compressive resistance from a series of blows designed to generate different levels of pile head displacement and velocity.

This document is applicable to piles loaded axially in compression.

This document is applicable to all pile types mentioned in EN 1536, EN 12699 and EN 14199.

The tests considered in this document are limited to dynamic load tests on piles only.

NOTE 1 ISO 22477-4 can be used in conjunction with EN1997-1:2004+A1:2013. Numerical values of partial factors for limit states from pile load tests to be taken into account in design are provided in EN 1997-1. For design to EN 1997-1 the results from dynamic load tests will be considered equivalent to the measured compressive resistance $R_{c,m}$ after being subject to appropriate analysis.

NOTE 2 Guidance on analysis procedures for dynamic load testing results is given in [Annexes A, B, D, E](#) and [F](#).

This document provides specifications for:

- i) investigation tests, whereby a sacrificial pile is loaded up to ultimate limit state;
- ii) control tests, whereby the pile is loaded up to a specified load in excess of the serviceability limit state.

NOTE 3 Generally, an investigation test focuses on general knowledge of a pile type; a control test focuses on one specific application of a pile.