

ICS 91.100.30

English Version

Testing hardened concrete - Part 9: Freeze-thaw resistance - Scaling

Prüfung von Festbeton - Teil 9: Frost- und Frost-Tausalz-
Widerstand - Abwitterung

This Technical Specification (CEN/TS) was approved by CEN on 25 June 2005 for provisional application.

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Foreword

This Technical specification (CEN/TS 12390-9:2006) has been prepared by Technical Committee CEN/TC 51 "Cement and building limes", the secretariat of which is held by IBN.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

Concrete structures exposed to the effects of freezing and thawing need to be durable, to have an adequate resistance to this action and, in cases such as road construction, to freezing and thawing in the presence of de-icing agents. It is desirable, especially in the case of new constituents or new concrete compositions, to test for such properties. This also applies to concrete mixes, concrete products, precast concrete, concrete members or concrete in situ.

Many different test methods have been developed. No single test method can completely reproduce the conditions in the field in all individual cases. Nevertheless, any method should at least correlate to the practical situation and give consistent results. Such a test method may not be suitable for deciding whether the resistance is adequate in a specific instance but will provide data of the resistance of the concrete to freeze-thaw-attack and freeze-thaw-attack in the presence of de-icing agents.

If the concrete has inadequate resistance then the freeze-thaw attack can lead to two different types of damage, namely to scaling (surface weathering) and to internal structural damage. This part of this standard covers only testing for scaling resistance.

This Technical Specification has one reference method and two alternative methods. For routine testing either the reference method or one of the two alternative methods may be used with the agreement of the parties involved. In case of doubt, and if there is no such agreement, the reference method is used.

The application of limiting values will require the establishment of the correlation between laboratory results and field experience. Due to the nature of the freeze-thaw action, such correlation would have to be established in accordance with local conditions.

1 Scope

This Technical Specification describes the testing of the freeze-thaw scaling resistance of concrete both with water and with sodium chloride solution. It can be used either to compare new constituents or new concrete compositions against a constituent or a concrete composition that is known to give adequate performance in the local environment or to assess the test results against some absolute numerical values based on local experiences.

Extrapolation of test results to assess different concretes i.e. new constituents or new concrete compositions, requires an expert evaluation.

NOTE In some cases the test methods may not be suitable for testing special concretes e.g. high strength concrete or permeable concrete. In these cases the result is to be treated with caution. These tests may not identify aggregates that are subject to occasional 'pop-outs'.

There is no established correlation between the results obtained by the three test methods. All tests will clearly identify poor and good behaviour, but they differ in their assessment of marginal behaviour

There are two types of concrete deterioration when a freeze-thaw attack occurs, scaling and internal structural damage. Test methods on internal structural damage are described in a CEN Technical Report CEN/TR 15177 "Testing the freeze-thaw resistance of concrete - Internal structural damage".

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*.

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*.

EN 60751, *Industrial platinum resistance thermometer sensors (IEC 60751:1983 + A1:1986)*.

3 Terms and definitions

For the purposes of this Technical Specification, the following terms and definitions apply.

3.1

Freeze-thaw resistance

resistance against alternating freezing and thawing in the presence of water alone

3.2

Freeze-thaw resistance with de-icing salt

resistance against alternating freezing and thawing in the presence of de-icing salt

3.3

Scaling

loss of material at the surface of concrete due to freeze-thaw attack

3.4

Internal structural damage

cracks inside concrete which cannot be seen on the surface, but which lead to an alteration of concrete properties, e. g. reduction of the dynamic modulus of elasticity