

## Assessment of in-situ compressive strength in structures and precast concrete components

# Evaluation de la résistance à la compression sur site des structures et des éléments préfabriqués en béton

# Bewertung der Druckfestigkeit von Beton in Bauwerken oder in Bauwerksteilen

01/2007



## National Foreword

This European Standard EN 13791:2007 was adopted as Luxembourgish Standard ILNAS-EN 13791:2007.

Every interested party, which is member of an organization based in Luxembourg, can participate for FREE in the development of Luxembourgish (ILNAS), European (CEN, CENELEC) and International (ISO, IEC) standards:

- Participate in the design of standards
- Foresee future developments
- Participate in technical committee meetings

<https://portail-qualite.public.lu/fr/normes-normalisation/participer-normalisation.html>

### **THIS PUBLICATION IS COPYRIGHT PROTECTED**

Nothing from this publication may be reproduced or utilized in any form or by any mean - electronic, mechanical, photocopying or any other data carries without prior permission!

EUROPEAN STANDARD ILNAS-EN 13791:2007 **EN 13791**  
NORME EUROPÉENNE  
EUROPÄISCHE NORM  
January 2007

---

ICS 91.080.40

English Version

**Assessment of in-situ compressive strength in structures and  
precast concrete components**

Evaluation de la résistance à la compression du béton en  
place dans les structures et les éléments préfabriqués

Bewertung der Druckfestigkeit von Beton in Bauwerken  
oder in Bauwerksteilen

This European Standard was approved by CEN on 10 November 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, 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.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**

# Contents

Page

Foreword.....	4
Introduction .....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Symbols and abbreviations .....	9
5 Principles.....	10
6 Characteristic in-situ compressive strength in relation to compressive strength class .....	10
7 Assessment of characteristic in-situ compressive strength by testing of cores .....	11
7.1 Specimens .....	11
7.2 Number of test specimens.....	11
7.3 Assessment.....	11
7.3.1 General.....	11
7.3.2 Approach A.....	12
7.3.3 Approach B.....	12
8 Assessment of characteristic in-situ compressive strength by indirect methods.....	13
8.1 General.....	13
8.1.1 Methods .....	13
8.1.2 Alternative 1 – Direct correlation with cores .....	13
8.1.3 Alternative 2 – Calibration with cores for a limited strength range using an established relationship.....	14
8.2 Indirect tests correlated with in-situ compressive strength, (Alternative 1) .....	14
8.2.1 Application .....	14
8.2.2 Testing procedure.....	14
8.2.3 Establishing the relationship between test result and in-situ compressive strength.....	14
8.2.4 Assessment of in-situ compressive strength.....	14
8.3 Use of a relationship determined from a limited number of cores and a basic curve, (Alternative 2) .....	15
8.3.1 General.....	15
8.3.2 Testing .....	15
8.3.3 Procedure .....	15
8.3.4 Validity of relationships .....	19
8.3.5 Estimation of in-situ compressive strength.....	19
8.4 Combination of in-situ strength test results by various test methods .....	19
9 Assessment where conformity of concrete based on standard tests is in doubt:.....	20
10 Assessment report .....	21
Annex A (informative) Factors influencing core strength.....	22
A.1 General.....	22
A.2 Concrete characteristics .....	22
A.2.1 Moisture content .....	22
A.2.2 Voidage .....	22
A.2.3 Direction relative to the casting .....	22
A.2.4 Imperfections .....	22
A.3 Testing variables.....	22
A.3.1 Diameter of core.....	22
A.3.2 Length/diameter ratio .....	23

<b>A.3.3</b>	<b>Flatness of end surfaces .....</b>	<b>23</b>
<b>A.3.4</b>	<b>Capping of end surfaces.....</b>	<b>23</b>
<b>A.3.5</b>	<b>Effect of drilling .....</b>	<b>23</b>
<b>A.3.6</b>	<b>Reinforcement .....</b>	<b>23</b>
<b>Annex B</b>	<b>(informative) Factors influencing results by indirect test methods .....</b>	<b>24</b>
<b>B.1</b>	<b>Rebound hammer tests.....</b>	<b>24</b>
<b>B.2</b>	<b>Ultrasonic pulse velocity measurements.....</b>	<b>24</b>
<b>B.3</b>	<b>Pull-out tests .....</b>	<b>24</b>
<b>Annex C</b>	<b>(informative) Concepts concerning the relationship between in-situ strength and strength from standard test specimens .....</b>	<b>25</b>
<b>Annex D</b>	<b>(informative) Guidelines for planning, sampling and evaluation of test results when assessing in-situ strength .....</b>	<b>26</b>
<b>D.1</b>	<b>Planning.....</b>	<b>26</b>
<b>D.2</b>	<b>Sampling.....</b>	<b>26</b>
<b>D.3</b>	<b>Testing programme .....</b>	<b>26</b>
<b>D.4</b>	<b>Assessment .....</b>	<b>27</b>
	<b>Bibliography .....</b>	<b>28</b>

## Foreword

This document (EN 13791:2007) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2007, and conflicting national standards shall be withdrawn at the latest by July 2007.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, 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

This European Standard provides techniques for estimating in-situ compressive strength in concrete structures and precast concrete components. Testing in-situ strength takes into account the effects of both the materials and execution (compaction, curing, etc.).

These tests do not replace concrete testing according to EN 206-1.

EN 206-1 refers to the guidance of this standard for assessing the strength in structures and precast concrete components.

The following examples illustrate where this estimate of in-situ strength of concrete may be required:

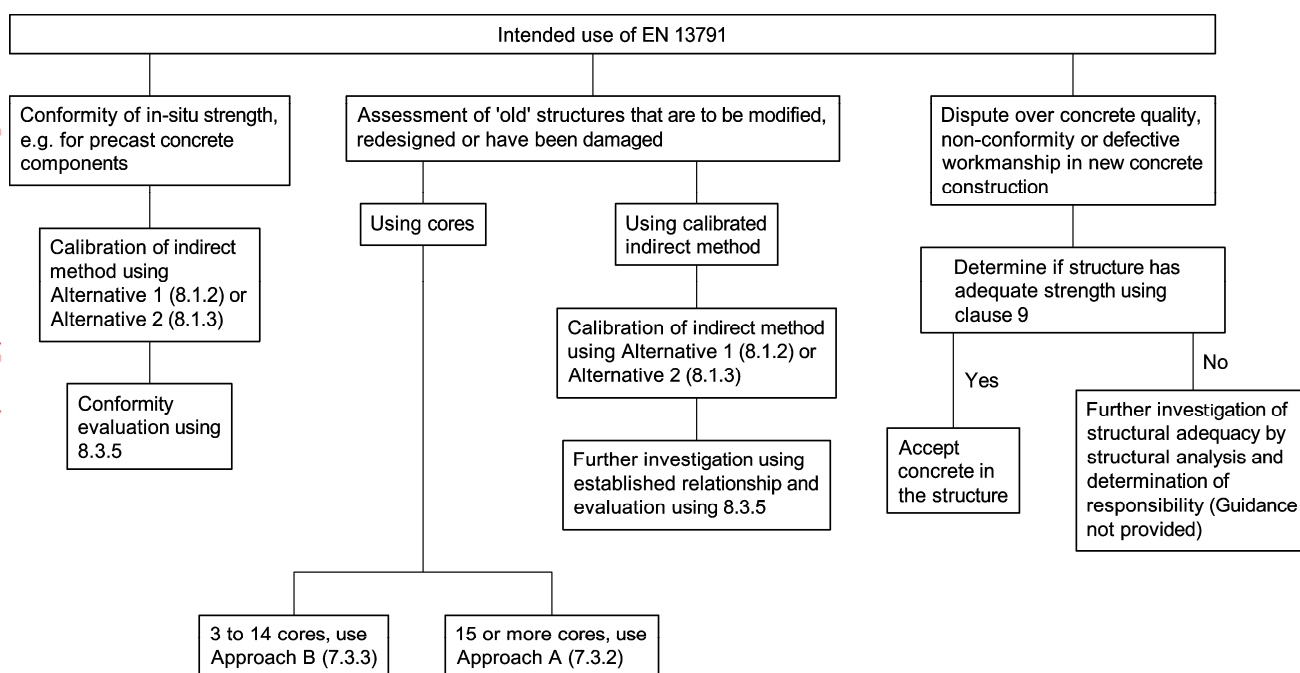
- when an existing structure is to be modified or redesigned;
- to assess structural adequacy when doubt arises about the compressive strength in the structure due to defective workmanship, deterioration of concrete due to fire or other causes;
- when an assessment of the in-situ concrete strength is needed during construction;
- to assess structural adequacy in the case of non-conformity of the compressive strength obtained from standard test specimens;
- assessment of conformity of the in-situ concrete compressive strength when specified in a specification or product standard.

Where identified in this standard, national provisions are permitted or required.

An outline of the procedures for these different uses of this standard is given in Flowchart 1.

For specific production conditions and constituent materials, development of economic design where permitted by national provisions may be possible through the assessing the partial safety factor,  $\gamma_c$  from knowledge of the in-situ compressive strength and the strength of standard test specimens.

When assessing compressive strengths in cases other than checking the quality of the concrete or the workmanship during execution or before accepting the structure for use, the appropriate reduction in the partial safety factor should be determined on a case-by-case basis according to national provisions.



Flowchart 1