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Precast concrete products - Full-scale testing requirements in standards on precast concrete products

Produits préfabriqués en béton - Exigences pour les essais en vraie grandeur dans les normes sur les produits préfabriqués en béton

Betonfertigteile - Anforderungen an Prüfungen an Bauteilen in Originalgröbe in den Normen für Betonfertigteile

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Foreword

This document (CEN/TR 14862:2004) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR.

Introduction

Any product standard will require a certain amount of testing as part of the evaluation of conformity. The tests may be part of initial type testing or part of production control. It may be tests on materials, dimensions etc. Or it may be tests on the finished product.

The following types of testing may be involved as a part of either initial type testing or production control, [1]:

a) tests to establish directly the ultimate resistance or serviceability properties of structural parts. Test results are treated as absolute values valid for the group from which the sample was taken;

b) tests to obtain specific material properties using specified testing procedures;

c) tests to reduce uncertainties in parameters in load or load effect models;

d) tests to reduce uncertainties in parameters used in resistance models. Test results are defined as the ratio between measured and calculated values and statistical rules are applied to the ratio;

e) control tests to check the identity or quality of delivered products or the consistency of the production characteristics;

f) tests carried out during execution in order to obtain information needed for part of the execution;

g) control tests to check the behaviour of an actual structure or of structural members after completion.

Testing of full-scale products may be involved in all types of test except type (b).

Testing methods may or may not leave the tested product fit for further use (non-destructive or destructive testing). However, apart from checks on geometrical properties, full-scale testing will usually damage the tested product so that it cannot be used in a structure.

Tests of type (a) do not take into account prior knowledge as easily as type (d) tests. It means that the most effective use of full-scale testing will be (effectively destructive) tests of type (d).

The aim of the report is to assist the standard writers in CEN/TC 229 regime in preparing requirements on full-scale testing in product standards. Initial type testing of a product requires the producer to establish relevant properties of the product. This is often done by means of calculation models given in a standard, but in some cases full-scale testing may be used effectively to reduce uncertainties in these calculation models, maintaining the intended reliability.

The main statistical rules to be followed in this process are given in Eurocode – Basis of structural design (prEN 1990). The report illustrates how these rules may be applied in a product standard.

A practical example concerning hollow core slabs is also given. The test results used in this example were made available from Spenncon AS Hønefoss, Norway.

1 Scope

This document gives guidelines on how full-scale tests may be incorporated in product standards as a tool to reduce incertainties in resistance models.

This document also gives guidelines to designers setting up a proper test programme as part of the initial design of a component.

2 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 1168, *Precast concrete products - Hollow core slabs for floors.*

EN 1990:2002, *Eurocode - Basis of structural design*.

EN 1992-1-1, *Eurocode 2: Design of concrete structures - Part 1 - 1: General rules and rules for buildings.*

EN 13369, *Common rules for precast concrete structures.*

ISO 12491:1997, *Statistical methods for quality control of building materials and components.*

RILEM TC40-TPC3:1985, *Flexural and shearing tests on prefabricated concrete elements, Materials and structures, Vol. 18, No 108.*

3 Terms and definitions

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

3.1
accompanying test
test to determine a material property by direct or indirect methods

3.2
biased sampling
a selection of units, taken from a lot according to a selection plan

3.3
full-scale test
test performed on a finished product to determine directly the properties of the product. Properties may include behaviour, stiffness, strengths etc. of the product subjected to relevant actions

3.4
initial type testing
a procedure to demonstrate compliance of a product with the requirements applying to the product. The procedure may utilise calculation and standard materials testing and it may be assisted by full-scale tests on the product

3.5
random sampling
a selection of units, taken at random from a lot. Each unit of the lot has the same chance of being selected