Concrete materials and methods of concrete construction/ Methods of test and standard practices for concrete

Preface

This is the tenth edition of the combined CSA Standards A23.1, *Concrete materials and methods of concrete construction*, and A23.2, *Methods of test and standard practices for concrete*. These Standards are part of the CSA A23 series on concrete and reinforced concrete and supersede the previous editions published in 2000, 1994, 1990, 1977, 1973, 1967, 1960, 1942, and 1929. CSA A23.2 was previously titled *Methods of Test for Concrete*.

Significant changes from the previous edition include the following:

(a) The technical content of the Standard is now grouped in the following subject areas:
  (i) materials and concrete properties — Clause 4;
  (ii) production and delivery — Clause 5;
  (iii) formwork, reinforcement, and prestressing — Clause 6;
  (iv) placing, finishing, and curing concrete — Clause 7; and
  (v) concrete with special performance or material requirements — Clause 8.

(b) All tables have been moved to the back of the Standard.

(c) The Standard now provides the user with two alternatives for specifying and ordering concrete, either performance or prescriptive criteria. The "common" alternative has been removed. The roles of the owner, contractor, and supplier are defined.

(d) A new Annex J on selecting the performance alternative when ordering concrete using Table 5 is provided.

(e) In the definitions (Clause 3), five new admixture types have been added under "Admixture": "Chemical", "Corrosion-inhibiting", "Lithium-based", "Shrinkage-reducing", and "Viscosity-modifying". Definitions for "Fines" and "Mineral filler" have also been added.

(f) The type designation and nomenclature for hydraulic and blended cement have changed to align with the changes made in CSA A3001. These new designations, involving letters rather than numbers, and associated nomenclature denote the intended use of the hydraulic cement in the final product (see CSA A3001, Annex C, for more details).

(g) Requirements for mix water have been modified to reflect changes in the industry and to address user concerns with water quality.

(h) A number of minor changes have been made to the requirements for aggregates, including the addition of limits for flat and elongated particles, in Table 12. The Micro-Deval tests and the unconfined freeze-thaw tests have become standard requirements, and the $MgSO_4$ soundness loss test is retained as an alternative requirement in Table 12. Reference to mineral fillers has been added; mineral fillers may be utilized in the production of special performance concretes such as self-consolidating concrete (SCC).

(i) A new exposure class, C-XL (extended service life concrete), has been introduced in this Standard, with special curing requirements.

(j) Use of chloride ion penetrability as a criterion for concrete durability has been introduced to the Standard, for C-XL and C-1 exposure classes, based on the ASTM C 1202 test.

(k) The agricultural class of concrete has been brought into this Standard (see Tables 1 and 2) and classified with two different curing regimes.

(l) A new clause on self-consolidating concrete (SCC), including test methods for evaluating workability characteristics of SCC, has been added. SCC offers many advantages in placing concrete, especially in heavily reinforced structures, architectural concrete, and structures where proper consolidation by vibration is difficult.

(m) A new clause for concrete made with a high volume of supplementary cementing material (HVSCM) sets out levels of cement replacement and special handling and curing requirements.

(n) A new Annex K on high volume supplementary cementing materials is provided.

(o) Some test methods have been revised so that, over time, all will include clear scope and precision and bias statements.

(p) A new test method for petrographic examination of aggregate is provided (A23.2-15A).

(q) Extensive changes have been made to standard practices A23.2-27A and A23.2-28A.

CSA Standards A23.1 and A23.2 are intended to provide a document that is complete and self-contained for use in the field.

The Technical Committee includes representatives from most geographical areas of Canada and from all sectors of the industry: concrete producers, specifying and regulatory authorities, materials consultants, researchers, and teachers. The Technical Committee intends to review and update the Standards on a continuing basis and to maintain a close liaison with the CSA Technical Committee on Design of Concrete Structures.

These Standards were prepared by the Technical Committee on Concrete Materials and Construction, under the jurisdiction of the Strategic Steering Committee on Concrete and Related Products, and have been formally approved by the Technical Committee. They will be submitted to the Standards Council of Canada for approval as National Standards of Canada.

December 2004

Notes:

(1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*

(2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

(3) *This publication was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.*

(4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*

(5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.*

Requests for interpretation should

(a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;

(b) provide an explanation of circumstances surrounding the actual field condition; and

(c) be phrased where possible to permit a specific "yes" or "no" answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are published in CSA's periodical* Info Update*, which is available on the CSA Web site at www.csa.ca.*

CSA Standard

A23.1-04
Concrete materials and methods of concrete construction

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0 Introduction

This Standard is intended to be used in its entirety. Caution should be exercised in extracting individual clauses and using them in project specifications, since taking them out of context can change their meaning.

A number of notes and several annexes, inserted for guidance, can in some cases be made mandatory by appropriate references in contract documents.

The user's attention is drawn to the fact that many clauses provide alternatives and require choices to be made by the user of the Standard. The actual choices should be clearly identified in the contract documents.

1 Scope

1.1 General

This Standard provides the requirements for materials and methods of construction for cast-in-place concrete and concrete precast in the field.

Notes:

(1) *Requirements for the design of concrete structures are provided in CSA A23.3 and CAN/CSA-S6. Design of some specialty concrete products is described in separate CSA Standards.*

(2) *Methods of test for concrete are provided in CSA A23.2.*

(3) *Design provisions governing the fire resistance of reinforced concrete structures are set out in the* National Building Code of Canada.

1.2 Precast concrete

Requirements for the plant production of precast concrete are set out in CAN/CSA-A23.4.

1.3 Precasting of concrete in the field

1.3.1

At the option of the owner, precasting of concrete in the field or in a temporary plant is governed by this Standard or by CAN/CSA-A23.4, except as limited by Clauses 1.3.2, 1.3.3, and 1.3.4 of this Standard.

Note: *Guidelines for such a choice are provided in CAN/CSA-A23.4.*

1.3.2

Precast products that may be produced in accordance with this Standard include conventionally reinforced elements of structures such as tilt-up walls, stair flights, landings, balcony slabs, lintels, and sills. Products requiring prestressing or post-tensioning are produced in accordance with CAN/CSA-A23.4.

Note: *For references to tilt-up construction, see PCA PA163 and ACI 551R.*

1.3.3

If tolerances equivalent to the requirements of CAN/CSA-A23.4 are desired, then CAN/CSA-A23.4 is specified for all precasting operations.

1.3.4
The requirements of CAN/CSA-A23.4 are applicable to pretensioned concrete and precast concrete used in segmental construction.

1.3.5
In addition to the requirements of this Standard, the requirements of CAN/CSA-A23.4 are applicable to precast concrete.

1.4 Parking garages
For parking garages, the additional requirements of CAN/CSA-S413 are applicable.

1.5 Residential concrete
For residential concrete, the requirements of CAN/CSA-A438 apply.

1.6 Approval for equivalents
This Standard does not specifically cover the use of proprietary materials or methods of construction. They may be permitted by the owner under a separate specification, provided that the quality of the resulting construction meets the minimum requirements of this Standard.

1.7 Terminology
In CSA Standards, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications
This Standard and CSA A23.2 refer to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA (Canadian Standards Association)

A23.2-04
Methods of test and standard practices for concrete

A23.3-94 (R2000)
Design of Concrete Structures

CAN/CSA-A23.4-00/CAN/CSA-A251-00
Precast Concrete – Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products

A283-00 (R2004)
Qualification Code for Concrete Testing Laboratories

A371-94 (R1999)
Masonry Construction for Buildings

CAN/CSA-A438-00
Concrete Construction for Houses and Small Buildings