

CONCRETE CONSTRUCTION

AMENDMENT No. 1

August 2003

REVISED TEXT

EXPLANATORY NOTE

SUMMARY: This amendment is a result of NZS 3104:2003 being published. This fully revised Standard no longer refers to 'grades of concrete'. The terminology is now Normal Concrete, Special Concrete and Prescribed Mix Concrete. This amendment applies to Sections 1, 6 and 9 of NZS 3109.

APPROVAL

Amendment No. 1 was approved on 24 July 2003 by the Standards Council to be an amendment to NZS 3109:1997.

1.1.2 (Page 9)

**Delete** existing text and **substitute** the following:

“For the production of concrete, compliance with this Standard is satisfied through compliance with NZS 3104.”

**Delete** the whole of 1.1.3.

(Amendment No.1, August 2003)

2 (Page 11)

**Delete** the following definitions:

“GRADED READY MIXED CONCRETE PLANT”

“PRODUCTION GRADE, HIGH”

“PRODUCTION GRADE, ORDINARY”

(Amendment No.1, August 2003)

2 (Page 12)

**Delete** the following definitions:

“PRODUCTION GRADE, SPECIAL”

“TARGET MEAN STRENGTH”

(Amendment No.1, August 2003)

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**PART 6** (Pages 34-42)

**Delete** the whole of Part 6 and **substitute** the following:

**6 SUPPLY OF CONCRETE****6.1 Materials and limitations**

Materials for concrete and grout shall comply with the relevant requirements of NZS 3104 but shall if specified be subject to the following limitations:

## (a) Chlorides:

The calculated total chloride content of concrete based on measurements of acid soluble chloride content arising from aggregate, mixing water and admixtures expressed as mass of chloride ion per unit volume of concrete shall be limited as follows:

Prestressed concrete ..... 0.50 kg/m<sup>3</sup>

Reinforced concrete

(i) Located in a moist environment or exposed to chloride ..... 0.80 kg/m<sup>3</sup>

(ii) Located in a dry or protected from moisture environment ..... 1.6 kg/m<sup>3</sup>.

Test procedures for determining the acid soluble chloride content shall conform to ASTM C1152.

## (b) Sulphate:

Sulphate content of concrete as placed, expressed as the percentage by mass of acid-soluble SO<sub>3</sub> to mass of cement shall not be greater than 5.0 %.

## (c) Other salts

Other salts shall not be added to concrete unless it can be shown that they do not adversely affect durability.

**C6.1**

*To reduce the risk of reinforcement corrosion, 6.1 effectively precludes the use in reinforced as well as prestressed concrete of:*

(a) *Sea water;*

(b) *Some unwashed beach sand in which chloride accumulates may have concentrations which exceed that permitted by 6.1. It is advisable to check that sand from marine sources does not have unacceptable chloride levels;*

(c) *Accelerating admixtures containing calcium except in above-ground dry situations.*

**6.2 Specification and manufacture of concrete**

Concrete to which this Standard applies shall be:

## (a) Specified as Normal (N) or Special (S) or Prescribed Mix (P) in accordance with NZS 3104 together with:

(i) The specified compressive strength;

(ii) Nominal maximum aggregate size;

(iii) Workability;

(iv) Method of placement; and

(v) Any additional requirements associated with Special Concrete.

## (b) Manufactured in accordance with NZS 3104.

**C6.2**

*Where high early strength and specific quantities of air entrainment are required, then the concrete should be specified as a Special Concrete to include these requirements along with any other (if any) special requirements.*

**6.3 Concrete mixes**

The following descriptions apply:

- (a) Normal Concrete mixes shall be selected from the standardized strength list: N 17.5, 20, 25, 30, 35, 40, 45 and 50 MPa;
- (b) Prescribed Mix Concrete shall be selected from the following restricted strength list: P 17.5, 20 and 25 MPa;
- (c) Special Concrete mixes shall be specified to identify the special performance parameters required together with specified testing and compliance tolerances;
- (d) Mixes over 50 MPa characteristic strength at 28 days shall be considered to be Special Concretes.

**C6.3**

*The introduction of the term 'Special Concrete' was considered necessary to be able to describe mixes that are often project-related, requiring special characteristics, particular materials or higher strengths. Concretes in harmful environments are likely to need special materials which will lead them to be classified as Special Concretes.*

*The specifier is required to specify the special parameters required for the concrete and to describe a method by which a producer is required to demonstrate performance.*

*It will also be necessary to develop a sampling and testing compliance regime for Special Concretes.*

*It may be appropriate to use strength testing at alternative times rather than the normal 28-day period.*

*Generally Normal Concretes are based on GP cement and Special Concretes may well use either GP or GB cements.*

*Prescribed Mix Concrete which uses prescriptive- based quantities may use GP or limestone filler cement.*

(Amendment No.1, August 2003)

**PART 9 (Pages 56 - 67)**

**Delete** the whole of Part 9 and **substitute** the following:

**9 CONCRETE ASSESSMENT****9.1 Production assessment and control**

The concrete manufacturing process shall follow the sampling, testing and control requirements of NZS 3104.

**9.2 Project assessment**

Where required by 6.3 or by the specifier, a system of assessment of concrete in a specific project or part of a project shall be instigated with the agreement of both the manufacturer and client, except that sampling and testing of concrete for slump, air content and strength shall follow the provisions of NZS 3104.

### C9.2

*It should be noted that trial mixes are likely to be needed with Special Concrete in order to establish performance guidelines suitable for compliance.*

*The statistical control methods of sampling in NZS 3104 may not result in samples of concrete being specifically taken from the project under consideration unless site mixing is being used. Where testing for a project or part of a project is specifically required, then this should be specified. The working of 9.2 can therefore be required by either the use of Special Concrete or by the need for the consultant to receive test results specifically for the project or parts of it.*

## 9.3 Project sampling

Where the designer, construction reviewer or general contractor have reason to doubt the quality of a batch of concrete supplied, then selected representative samples of the fresh concrete shall be taken in accordance with NZS 3112: Part 1. The compression strength results shall be judged against the representative sample limits set out in 9.4.1.

### C9.3

*It is emphasized that when this action is required, the sampling and preparation of samples for testing must be done strictly according to NZS 3112: Part 1. It is preferable to request the concrete supplier to sample and prepare the samples under the observation of the party requesting the check on concrete quality. The concrete supplier must under the terms of NZS 3104 have technicians experienced in the testing procedures of NZS 3112.*

## 9.4 Strength and special parameters

### 9.4.1 Rejection limits

Normal Concrete from a single test result:

Representative sample:  $0.85 f'_c$  or  $f'_c - 3.5 \text{ MPa}$   
(whichever is the greater)

Snatch sample:  $0.80 f'_c$  or  $f'_c - 4.5 \text{ MPa}$   
(whichever is the greater)

Special Concrete:

Strength: As for Normal Concrete

Special parameters: Limits to be set by specifier in accordance with 9.2.

### 9.4.2 Slump

Slump testing at time of delivery shall be conducted in accordance with NZS 3112: Part 1.

For the acceptance of the concrete represented the results of the slump shall have a value within the tolerance limits stated in table 9.1.

**Table 9.1 - Tolerances for nominated slump**

Nominated slump	Tolerance for snatch slump
60mm or less	$\pm 20 \text{ mm}$
70 -110	$\pm 30 \text{ mm}$
110 or greater	$\pm 40 \text{ mm}$

**9.4.2.1**

Where the slump of the concrete as delivered is less than specified and the concrete is less than one hour old, a limited addition of water by the concrete supplier shall be permitted, subject to the following:

- (a) Special Concrete has not been specified;
- (b) The amount of water added shall be limited to increase the slump to the nominated value, and shall under no circumstances exceed 10 litres per cubic metre of concrete;
- (c) After the water addition the mixer bowl shall be turned at a minimum of 30 revolutions at mixer speed;
- (d) The slump shall be re-measured and the amount of added water recorded on the concrete delivery docket.

**9.5 Concrete liable for rejection****9.5.1**

When concrete is liable for rejection under 9.3 the location and extent of the affected concrete shall be identified and assessed.

**9.5.2**

No further concrete shall be placed where it would prejudice the removal of the concrete in question.

**9.5.3**

The constructor or concrete supplier shall, if disputing the test results, arrange to have confirming tests made from hardened cores taken from the concrete in question. Such cores shall:

- (a) Be a minimum of three sound specimens;
- (b) Be of appropriate diameter consistent with the maximum size of aggregate used in the concrete;
- (c) Where possible, avoid damage to reinforcement;
- (d) Before sampling, receive prior approval from the designer ensuring positions for sampling do not cause unsatisfactory weakening of the structure;
- (e) Be tested in accordance with NZS 3112: Part 2 Section 9.

**C9.5.3**

*Prior to determining the extent and operation of obtaining samples, reference should be made to the Cement and Concrete Association publication "Concrete Core Testing".*

**9.5.3.1**

The results shall be evaluated in accordance with Concrete Society (UK) Report 11.

(Amendment No.1, August 2003)