NZS 4407:1991



Methods of sampling and testing road aggregates

NZS 4407:1991



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COMMITTEE REPRESENTATION

This Standard was prepared under the direction of the Building and Civil Engineering Divisional Committee (30/-) for the Standards Council, established under the Standards Act 1988.

The Road Aggregates Testing Committee (44/7) was responsible for the preparation of the Standard and consisted of representatives of the following organizations:

Aggregates Association of New Zealand New Zealand Contractors Federation New Zealand Counties Association New Zealand Geomechanics Society Testing Laboratory Registration Council of New Zealand Transit New Zealand Works and Development Services Corporation

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STANDARDS ASSOCIATION OF NEW ZEALAND

GTH FLOOR, WELLINGTON TRADE CENTRE, 181-187 VICTORIA STREET, WELLINGTON 1.

(Private Bag, Wellington) Telephone: (04)842-108 Fax: (04)843-938

 AMENDMENTS

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RELATED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND S	TANDARDS	Test reference herein
NZS 3111:1986	Methods of test for water and	3.6, 3.9, 3.10, 3.11
NZS 4402:	Methods of testing soils for civil engineering purposes	5.10, 5.11
Test 2.1:1986	Determination of the water content	3.1
Test 2.3:1986	Determination of the plastic limit	3.3
Test 2.4:1986	Determination of the plasticity index	3.4
Test 2.5:1986	Determination of the cone penetration limit	3.2
Test 2.7.1:1946	Determination of the solid density of soil particles – Method for coarse,	
T	medium and fine soils	3.7.1
Test 2.8.1:1986	Determination of the particle-size distribution – Standard method by	
	wet sieving	3.8.1
Test 2.8.2:1986	Determination of the particle-size distribution – Subsidiary method by	
	dry sieving	3.8.2
Test 3.4:1986	Detection of presence of allophane in soils	3.2, 3.3
Test 4.1.1:1986	Determination of the dry density/	
	water content relationship – New	
T	Zealand standard compaction test	3.15
lest 4.1.2:1986	Determination of the dry density/	
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Test 4 1 3·1986	Determination of the dry density/	5.15
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	Zealand vibrating hammer	
	compaction test	3.15
Test 5.1.1:1986	Determination of the density of soil -	_
	Sand replacement method for the	
	determination of the <i>in situ</i> density	4.1.1
Test 6.1.1:1986	Determination of the California	
	Bearing Ratio (CBR) – Standard	
	raporatory method for remoulded	2 1 5
	specifiens	5.15
NZS 6507:	Materials testing machines and	
	force verification equipment	
Part 1:1986	Specification for the grading of the	3.10, 3.15
	forces applied by materials testing	
	machines	
American stan	DARDS	
ASTM D 5-86	Test method for penetration of	3.2
ASTM E 11-87	Wire-cloth sieves for testing	
	purposes	Part 1
ASIM E 323-80	Perforated-plate sieves for testing purposes	Part I

AUSTRALIAN STANDARDS

AS 1152:1973	Test sieves	Part 1
AS 2103:1978	Dial gauges and dial test indicators	
	(metric series)	Part 1

BRITISH STANDARDS

*BS 410:1986 *BS 593:1974 *BS 604:1982	Test sieves Laboratory thermometers Graduated glass measuring cylinders	Part 1 Part 1 Part 1.
	2	3.5, 3.9
BS 846:1985	Burettes	Part 1, 3.5
BS 1583:1986	One-mark pipettes	Part 1, 3.5
BS 1792:1982	One-mark volumetric flasks	Part 1, 3.5
BS 3423:1986	Recommendations for design of glass vacuum vessels (including desiccators) for laboratory use	Part 1, 3.5
BS 5404:	Plastics laboratory ware	
Part 2:1977	Graduated measuring cylinders	3.9
NEW ZEALAND LE	GISLATION	
		4.0.1.4.0.

The Radiation Protection Act 1965	4.2.1, 4.2.2
	4.2.3, 4.2.4
The Radiation Protection Regulations 1973	4.2.1, 4.2.2
C C	4.2.3, 4.2.4

* Endorsed as suitable for use in New Zealand

The users of this Standard should ensure that their copies of the abovementioned New Zealand Standards or of overseas Standards endorsed as suitable for use in New Zealand are the latest revisions or include the latest amendments. Such amendments are listed in the annual SANZ *Catalogue* which is supplemented by lists contained in the monthly magazine *Standards* issued free of charge to committee and subscribing members of SANZ.

CROSS REFERENCES

The table below lists, against each method of test, the designation of all other methods of test to which reference is made. It is provided to assist purchasers of individual test methods to determine whether it is necessary to obtain other methods of test in order to properly conduct the test concerned.

It should be noted that Parts 1 and 2 of this Standard are applicable to all tests.

Test	Referenced tests	Test	Referenced tests
3.1	_	3.10	_
3.2	3.1	3.11	3.6, 3.9
3.3	3.1, 3.2	3.12	_
3.4	3.2, 3.3	3.13	3.14
3.5	_	3.14	3.13
3.6	_	3.15	3.1
3.7.1	_	4.1.1	3.1
3.7.2	_	4.2.1	4.2.3, 4.2.4
3.8.1	3.1	4.2.2	4.2.3, 4.2.4
3.8.2	3.8.1	4.2.3	3.1, 4.1.1, 4.2.1, 4.2.2
3.9	3.6	4.2.4	4.2.1, 4.2.2

FOREWORD

Road transport is a major component of New Zealand's infrastructure and quality in construction is an essential consideration. Aggregate quality is fundamental to the construction of the pavements required to support road transport. This Standard provides the basis for the testing of road aggregate characteristics.

As a result of requests by interested parties, SANZ formed a project committee to prepare a Standard. The basis for the Standard was a draft prepared by the Aggregates Association of New Zealand.

The principal objective of the committee has been to provide a comprehensive collection of road aggregate test methods. In addressing this task the importance of proper sampling was recognized, for a test result is only as good as the sample which is submitted for testing. A section on aggregate sampling is included as an integral part of the Standard.

In preparing this Standard the committee has not attempted to create any new test methods. Some of the test methods used have been derived from existing methods in NZS 4402, *Methods of testing soils for civil engineering purposes* and NZS 3111, *Methods of test for water and aggregate for concrete*. Other test methods have been derived from overseas Standards or from established methods which hitherto have not been standardized. Where appropriate, these methods have been adopted to reflect the particular features of road aggregates.

REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Director, Standards Association of New Zealand, Private Bag, Wellington.

NEW ZEALAND STANDARD

METHODS OF SAMPLING AND TESTING ROAD AGGREGATES

PART I PRELIMINARY AND GENERAL

1.1 SCOPE

1.1.1

This Standard specifies methods of sampling and testing road aggregates as follows:

General provisions	Part 1
Methods of sampling	Part 2
Methods of testing in the laboratory	Part 3
Methods of testing in the field	Part 4

1.2 INTERPRETATION

1.2.1

The provisions of Part I are applicable to and shall be read in conjunction with the methods contained in this Standard.

1.2.2

In this Standard, including the Notes thereto, the imperative mood or the word "shall" indicates an operation or a requirement that is to be adopted in order to comply with the Standard. The word "should" indicates a recommended practice.

1.2.3

Cross references to other clauses or clause subdivisions within this Standard quote the number only.

1.2.4

The full titles of reference documents cited in this Standard are given in the list of Related Documents immediately following the "Contents".

1.3

DEFINITIONS

1.3.1

For the purposes of this Standard the following definitions apply:

AGGREGATE. A granular material of mineral composition such as a processed or naturally occurring rock, gravel, sand or slag.

COARSE AGGREGATE. All aggregate retained on the 4.75 mm test sieve.

FINE AGGREGATE. All aggregate passing the 4.75 mm test sieve.

CONE PENETRATION LIMIT. The water content at which the fine fraction of an aggregate passes from the liquid to the plastic state as determined by the cone penetration test.

DISTILLED WATER. In addition to its accepted meaning, includes for the purposes of this Standard de-ionized water.

NOMINAL AGGREGATE SIZE. The largest size listed in the applicable specification, for example "all passing 40 mm (AP40)".

PARTICLE SIZE DISTRIBUTION. The percentage of the various grain sizes present in an aggregate as determined by sieving or other means.

PLASTIC LIMIT. The water content at which a fine aggregate or the fine fraction of an aggregate approaches a solid state and becomes too dry to be in a plastic condition as determined by the plastic limit test.

PLASTICITY INDEX. The numerical difference between the cone penetration limit and the plastic limit of the fine fraction of an aggregate.

REPEATABILITY. The value below which the absolute difference between two single test results obtained with the same method on identical test material, under the same conditions (same operator, same apparatus, same laboratory, and short intervals of time), may be expected to lie with a specified probability. In the absence of other indications, the probability is 95 %.

REPRODUCIBILITY. The value below which the absolute difference between two single test results obtained with the same method on identical test material, but under different conditions (different operators, different apparatus, different laboratories and/or different times), may be expected to lie with a specified probability. In the absence of other indications, the probability is 95 %.

SAMPLE.

FIELD SAMPLE. A random or selected sample of aggregate obtained in the field for dispatch to the laboratory for testing and consisting of one or more increments.

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SUB-SAMPLE. A sample of aggregate obtained from a field sample by quartering or by means of a sample divider to enable a test or series of tests to be performed.

TEST SAMPLE. A sample of aggregate obtained from a field sample or from a sub-sample by quartering or by means of a sample divider for use in a particular test.

SAMPLING. The selection of a representative portion of a material.

SPECIMEN. A part of a test sample or sub-sample obtained by means other than by dividing, such as by sieving.

TEST SIEVE. Either:

- (a) A square-holed perforated plate sieve having a nominal aperture size 4.75 mm or greater and conforming to BS 410, AS 1152 or ASTM E 323, or
- (b) A woven-wire cloth sieve having a nominal aperture size 4.75 mm or smaller and conforming to BS 410 (full tolerances), AS 1152 (Grade B) or ASTM E 11.

UNIFORMLY GRADED (or closely graded). Having a particle size distribution most of which extends over a very limited range of particle sizes without excess or deficiency of any specific sizes within that limited range.

WATER CONTENT. The mass of water which can be removed from the aggregate by heating as specified in this Standard expressed as a percentage of the dry mass.

NOTE - Although the term "water content" has been used throughout this Standard, the term "moisture content" is also widely used.

WELL GRADED. Having a particle size distribution extending over a wide range of particle sizes without excess or deficiency of any specific sizes within that range.

1.4 APPARATUS

1.4.1

Apparatus shall, where possible, comply with New Zealand, British or Australian Standards, for example:

BRITISH STANDARDS

BS 410 Test sievesBS 593 Laboratory thermometersBS 604 Graduated glass measuring cylindersBS 846 BurettesBS 1583 One-mark pipettes

BS 1792 One-mark volumetric flasks

- BS 3423 Recommendations for the design of glass vacuum desiccators
- BS 5404 Plastics laboratory ware Part 2 Graduated measuring cylinders

AUSTRALIAN STANDARDS

- AS 1152 Test sieves
- AS 2103 Dial gauges and dial test indicators (metric series)

1.4.2

Drying ovens

1.4.2.1

General requirements

The purpose of a drying oven is to dry a sample of aggregate to a constant mass in accordance with Test 3.1.

Drying ovens shall meet the following requirements:

- (a) Be provided with a thermometer whose sensing element is located in the air-stream moving towards the vents of the cabinet and not less than 50 mm below the ceiling of the cabinet. The temperature indicator shall be located so that it can be observed from the working space in front of the cabinet, and shall be readable and accurate to 1 °C.
- (b) Be fitted with an adjustable automatic control device for maintaining the oven temperature within the range 105 °C to 110 °C when empty and with the vents open. The oven temperature shall be measured with the thermometer.
- (c) Be adequately vented to permit escape of moisture laden air.
- (d) The maximum temperature at any point shall not exceed the specified upper limit of 110 °C and shall be determined by placing a temperature indicating device(s) readable and accurate to 1 °C at the corners and centres of each shelf when the oven is empty and with the vents open.

NOTE - A mercury in glass thermometer is acceptable only if it is used in conjunction with a heat sink, such as by immersion of the thermometer bulb in sand.

All the above measurements shall be taken after a minimum of 12 h continuous operation with door closed and forced ventilation operating if fitted.

1.4.2.2

Loading of drying ovens

Sufficient clearance shall be left around the sides and between the shelves when the oven is fully loaded to permit the free circulation of air through the oven.