

AS 1012.25.1:2020



STANDARDS  
Australia



# Methods of testing concrete

**Method 25.1: Determination of the fibre content of plastic state concrete  
(wash-out test)**



AS 1012.25.1:2020

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- Cement Concrete & Aggregates Australia
- Concrete Institute of Australia
- National Association of Testing Authorities Australia
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## Method 25.1: Determination of the fibre content of plastic state concrete (wash-out test)

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## **Preface**

This Standard was prepared by the Standards Australia Committee BD-042, Methods of Testing Concrete.

The objective of this Standard is to detail the method for determining the fibre content of plastic state concrete using a wash-out method.

This is the first publication of this test method which has been derived from existing VicRoads Test Method RC 377.01 (March 2019), Copyright © 2019 VicRoads, Melbourne, Victoria.

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## NOTES

# Australian Standard®

## Methods of testing concrete

### Method 25.1: Determination of the fibre content of plastic state concrete (wash-out test)

#### 1 Scope

This Standard sets out the method for determining the fibre content of concrete that is in the plastic state, by using a wash-out process.

A sample is taken from a concrete load, or from concrete made in the laboratory and compacted into a measure of known volume. The steel or synthetic fibres are washed out, separated and dried. The fibre content is determined from the mass of fibre and the measured volume of concrete.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document:

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1012.1, *Methods of testing concrete, Method 1: Sampling of concrete*

AS 1012.2, *Methods of testing concrete, Method 2: Preparing concrete mixes in the laboratory*

#### 3 Terms and definitions

For the purpose of this document, the terms and definitions given in all referenced AS 1012 series documents and those below apply.

##### 3.1

##### **may**

indicates the existence of an option

##### 3.2

##### **shall**

indicates that a statement is mandatory

##### 3.3

##### **should**

indicates a recommendation

#### 4 Apparatus and materials

##### 4.1 Measure

##### 4.1.1 General

The measure shall be made of metal not less than 3 mm thick, be watertight and be sufficiently rigid to maintain its shape with rough usage. The inside surface shall be smooth and free from corrosion. The rim of the measure shall be machined to a plane surface perpendicular to the axis of the cylinder.

NOTE The measure should be provided with carrying handles.

The diameter of the measure shall be between 0.75 and 1.25 times the height.

For testing concrete with aggregates of nominal size not exceeding 40 mm, the capacity of the bowl shall be not less than 5 L.

For testing concrete with larger aggregate, a larger bowl shall be used (e.g. for concrete with maximum 75 mm nominal size aggregate). A measure of capacity not less than 10 L shall be used.

#### **4.1.2 Volume check**

The measure shall be checked at a known temperature by determining the mass in kilograms of water required to precisely fill it. Filling shall be achieved by sliding a flat glass cover plate over the overfilled measure such that no air is trapped under the cover. The capacity of the measure shall be obtained by dividing the mass of water so determined by the unit mass of water at that temperature, e.g. 997.5 kg/m<sup>3</sup> at 23 °C.

When compacted as per this test method, the volume of the concrete sample ( $V_c$ ) shall be the same volume as that determined for the measure, expressed to the nearest 0.02 L.

#### **4.2 Balance**

A balance of sufficient capacity with a limit of performance as follows:

- (a) For mass determinations greater than 2 kg, a limit of performance not exceeding  $\pm 5$  g with an accuracy of at least 1 g.
- (b) For mass determinations less than 2 kg, a limit of performance not exceeding  $\pm 0.5$  g readable to 0.1 g.

#### **4.3 Rod**

The rod used for the compacting of concrete in the measure shall be a metal rod of  $16 \pm 1$  mm in diameter, approximately 600 mm long and having at least one end tapered for a distance of approximately 25 mm to a spherical shape having a radius of approximately 5 mm.

#### **4.4 Mallet**

The mallet used in conjunction with the rod for compacting of concrete shall be fitted with a hard rubber or hard plastics head of mass approximately 0.25 kg.

#### **4.5 Scoop**

A scoop, shovel or other receptacle used for sampling concrete, with a capacity of not less than 1 L.

#### **4.6 Glass cover plate**

A flat glass or plastic cover plate shall be used in the volume check of the measure.

#### **4.7 Vibrators**

Internal vibrators used for the compacting of concrete shall have a frequency of vibration of at least 115 Hz. The outside diameter of the vibrating element inserted into the concrete shall be not more than 20 % of the least dimension of the measure. The outside diameter shall be at least 15 mm.

External vibrators used for the compacting of concrete shall have a frequency of vibration of at least 50 Hz. The measure shall be clamped securely to the vibrator.

#### 4.8 Trowel or float

An appropriate steel or wooden trowel or float should be used to smooth the surface of the concrete in the measure.

#### 4.9 Magnet

A magnet suitable for the collection of steel fibres.

#### 4.10 Sieve or filter

A sieve or filter equipment suitable for washing out cementitious material and other fine materials from plastic state concrete while retaining the fibres within the sample.

#### 4.11 Isopropyl alcohol

Technical grade isopropyl alcohol for use where synthetic fibres are being used.

### 5 Procedure

#### 5.1 Sampling

- (a) For concrete sampled in the field, the test sample shall be obtained in accordance with the requirements of AS 1012.1. Commence the test immediately following the completion of mixing the test sample. For concrete prepared in the laboratory, the test sample shall be prepared in accordance with AS 1012.2.

NOTE Due to the nature of the testing procedure, concrete sampled in the field may need to be tested away from the sampling site. In this situation, a set retarding agent may be added to the sample to enable testing at an alternative location.

- (b) Place and fully compact the concrete in the measure by one of the methods described in [Clause 5.2](#) without causing segregation or excessive laitance. No slump concrete shall be compacted only by the vibration method. The concrete shall be levelled off with a trowel or float to be flush with the top of the container.

#### 5.2 Compaction

##### 5.2.1 Compaction by hand

Compaction shall be carried out as follows:

- (a) Fill the measure in three approximately equal layers with the scoop. As each scoopful of concrete is being placed into the measure, move the scoop around the top edge of the measure as the concrete slides out, to ensure symmetrical distribution of the concrete within the measure.
- (b) Fully compact each layer by rodding. Rod the bottom layer throughout its depth. For each upper layer, penetrate into the underlying layer with at least the first 10 strokes.

NOTE 1 The minimum number of strokes per layer required to compact average concretes with different consistencies is set out as a guide for up to 250 mm diameter measures in [Table 1](#). For slumps of less than 40 mm, refer to AS 1012.8.1.

NOTE 2 More strokes are required for bowls of larger diameters, proportional to the area.

**Table 1 — Minimum number of strokes per layer for varying slumps**

Slump mm	Minimum number of strokes per layer		
	150 mm diameter bowl	200 mm diameter bowl	250 mm diameter bowl
Over 75	40	45	70
55 – 75	40	55	85
40 – 50	40	65	100

Where the concrete contains weak lightweight aggregate particles that degrade with hand compaction, a reduced number of tamping blows and increased tapping of the measure may be adopted, provided that the complete compaction is achieved.

- (c) After each layer is rodded, tap the side of the measure 10 to 15 times with the mallet to release any air bubbles and to close any surface voids.
- (d) Place sufficient concrete in the last layer to slightly overfill the measure when compacted. However, where the measure is not completely filled after compaction of the top layer, some additional concrete may be added and worked into the surface with a trowel or float.
- (e) Strike off the surface of the concrete and smoothly finish with the glass cover plate to ensure the measure is volumetrically filled.

### 5.2.2 Compaction by vibration

Compaction by vibration shall be carried out as follows:

- (a) Fill the measure in two approximately equal layers with the scoop. As each scoopful of concrete is being placed into the measure, move the scoop around the top edge of the measure as the concrete slides out, to ensure symmetrical distribution of the concrete within the measure.
- (b) Place all the concrete for each layer before commencing vibration.
- (c) Vibrate each layer only long enough to achieve full compaction. Avoid over-vibration.

NOTE The duration of vibration required to compact each layer will depend upon the workability of the concrete and the effectiveness of the vibrator. Usually the surface of the concrete becomes relatively smooth in appearance and substantial air bubbles cease breaking the surface when sufficient vibration has been applied. Extreme care should be taken to avoid segregation when using vibration to compact concrete with slump greater than 100 mm.

- (d) Where an internal vibrator is used, compact each layer by four insertions of the vibrator at points symmetrically distributed over the cross-section of the measure. Do not allow the vibrator to rest on the bottom of the measure or touch the sides of the measure. Take care to withdraw the vibrator in such a manner that no air pockets are left in the specimen. After vibrating the top layer, tap the sides of the measure sharply 10 to 15 times with the mallet.
- (e) Where external vibration is used, rigidly attach or securely hold the measure against the vibrating element or vibrating surface.
- (f) Add the top layer so as to avoid overflowing of the measure by more than 6 mm and thus losing excessive mortar by overflowing during vibration. After vibrating the top layer, some additional concrete may be added and worked into the surface with a trowel or float.
- (g) Strike off the surface of the concrete and smoothly finish with the glass cover plate to ensure the measure is volumetrically filled.

### 5.2.3 Compaction of self-compacting concrete

The procedure shall be as follows:

- (a) Place concrete in the measure using a scoop or bucket, in continuous motion ensuring uniform distribution of the concrete within the measure.
- (b) Tap the measure with the mallet while filling, to remove all entrapped air.
- (c) Strike off the surface of the concrete and smoothly finish with the glass cover plate to ensure the measure is volumetrically filled.

### 5.3 Fibre Collection

- (a) The fibres may be washed out, separated and collected from the concrete within the measure.
- (b) The concrete within the measure shall be placed in a sieve, filter equipment or other means where the cementitious materials and other fine materials and aggregates can be washed out such that the fibres can be separated from the concrete mass.
- (c) Steel fibres shall be collected directly or by using a magnet.

Where synthetic fibres are used, the sample may be soaked with technical grade isopropyl alcohol and stirred until the fibres can be separated from the concrete for recovery.

Adequate care shall be taken during the fibre wash out and collection process so that loss of any fibres does not occur.

- (d) The recovered fibres shall be cleaned and sufficiently dried to remove all surface moisture. The mass ( $M_f$ ) of the dried fibres shall be measured to the nearest 0.1 g.

## 6 Calculation of fibre content

The fibre content of the test sample of concrete shall be calculated as follows in [Equation 1](#):

$$F_c = \frac{M_f}{V_c} \quad 1$$

where

$F_c$  = fibre content, in kg/m<sup>3</sup>

$M_f$  = mass of fibre recovered from the test sample, in g

$V_c$  = volume of the measure, in L

## 7 Records

The following information shall be recorded:

- (a) Identification of concrete.
- (b) Job site or laboratory where tested.
- (c) Date and time of test.
- (d) Method of compaction. Where compaction was performed by hand, the number of strokes per layer.
- (e) Identification and volume of the measure.

- (f) Mass of the fibres collected from the concrete sample.
- (g) The calculated fibre content ( $F_c$ ) of the test sample to the nearest 0.1 kg/m<sup>3</sup>.
- (h) Identification of the fibres, manufacturer or description of the fibre type.
- (i) Identification of the testing operator.
- (j) Reference to this Standard, i.e. AS 1012.25.1.
- (k) Such other information contained in the sampling records (refer to AS 1012.1 and AS 1012.2) as may be requested.

## 8 Test report

The following shall be included in the report:

- (a) Identification of concrete.
- (b) Date of sampling.
- (c) Job site or laboratory where the test is carried out.
- (d) Method of compaction. Where compaction was performed by hand, the number of strokes per layer.
- (e) The calculated fibre content ( $F_c$ ) of the test sample to the nearest 0.1 kg/m<sup>3</sup>.
- (f) Identification of the fibres, manufacturer or description of the fibre type.
- (g) Reference to this Standard, i.e. AS 1012.25.1.
- (h) Such other information contained in the sampling records (refer to AS 1012.1 and AS 1012.2) as may be requested.

## Bibliography

AS 1012.8.1, *Methods of testing concrete, Method 8.1: Making and curing concrete — Compression and indirect tensile test specimens*

VICROADS. VicRoads Test Method RC 377.01 — Determination of the Fibre Content of Fresh Concrete (Wash-out Method) March 2019

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