

JSCE-SF7 METHOD OF TESTS FOR FIBER CONTENT OF STEEL
FIBER REINFORCED CONCRETE

1. SCOPE

This standard specifies the method of tests for fiber contents of fresh steel fiber reinforced concrete and hardened steel fiber reinforced concrete.

2. TYPES OF TEST METHODS

The types of test methods and objects of application shall be as described below.

2.1 Washout Analysis Test Method

This method shall be applicable to fresh steel fiber reinforced concrete.

2.2 Magnetic Probing Method

This method shall be applicable to fresh steel fiber reinforced concrete and hardened steel fiber reinforced concrete.

Remarks: In case of using this test method for purposes such as quality control, it is advisable to use "Washout Analysis Test Method" to confirm the accuracy of the method.

3. WASHOUT ANALYSIS TEST METHOD

3.1 Apparatus

3.1.1 The container shall be a metal cylinder, watertight, and of adequate strength¹⁾. The minimum capacity of the container shall be 6 l, the diameter being approximately equal to the depth.

The volume of the container shall be computed by measuring the amount of water required to fill the container²⁾.

Note 1) The capacity of the container may be not less than 6 l as specified in JIS A 1116, JIS A 1118 or JIS A 1128.

Note 2) When filling the container with water, the container shall be filled to the extent that the water spills over slightly after which a polished glass plate shall be placed on top to remove excess water. Air bubbles must not be allowed to enter under the glass plate at this stage. The volume of the container shall be determined by dividing the weight of the water by the density of the water.

3.1.2 Weighing apparatus for concrete shall be to an accuracy of 10 g, while that of fibers shall be to an accuracy of 1 g.

3.2 Measurement of Steel Fiber Content

3.2.1 Samples of concrete shall be obtained in accordance with the provisions of JIS A 1115 (Method of Sampling Fresh Concrete), or prepared in accordance with the provisions given in the Japan Society of Civil Engineers standard, JSCE-SF1 (Method of Making Fiber Reinforced Concrete in the laboratory).

3.2.2 The quantity of concrete to be sampled shall be sufficient to permit a minimum of two measurements³⁾.

Note 3) In case of container capacity of 7 ℓ, a sample of about 25 ℓ will be adequate.

3.2.3 The sample shall be poured into the container in accordance with the provisions given in JIS A 1128 (Method of Test for Air Content of Fresh Concrete by Pressure Method)⁴⁾.

Note 4) The surface of the sample and the top of the container shall be made to coincide accurately.

3.2.4 The steel fibers shall be separated and collected while washing out the sample in the container with water⁵⁾.

Note 5) It will be advisable to collect steel fibers by emptying out a small amount of sample at a time into a receptacle such as a vat using a magnet.

3.2.5 The steel fibers collected shall be dried and the weight (W_F) measured.

3.2.6 The steel fiber content shall be calculated by the following equation:

$$V_f = \frac{W_F}{V \cdot P_F} \times 100$$

where, V_f : steel fiber content (%)

W_F : weight of steel fibers in container (g)

V : volume of container (cm³)

P_F : unit weight of steel fibers⁶⁾ (g/cm³)

Note 6) The unit weight of steel fibers is generally 7.85 g/cm³.

3.2.7 The steel fiber content shall be measured twice. When the values of two measurements satisfy the following condition, the average value shall be taken as the fiber content.

$$|V_{f1} - V_{f2}| \geq 0.05 V_f$$

where, V_f : average value of steel fiber content = $(V_{f1} + V_{f2})/2$ (%)

V_{f1}, V_{f2} : values of two measurements of steel fiber content (%)

4. MAGNETIC PROBING METHOD

4.1 Apparatus

4.1.1 The magnetic probing apparatus measures the steel fiber content in concrete by electromagnetic induction method and shall be composed of a probe and measuring apparatus. The probe shall possess a circular hole of a diameter permitting a $\phi 10 \times 20$ cm specimen or the container specified in section 4.1.2 to be inserted, and in addition, shall possess coils with lengths necessary for measuring the fiber content in the sample to sufficient accuracy⁷⁾.

The accuracies of values measured with the magnetic probing apparatus shall be checked employing the washout analysis test method explained in section 3.

Note 7) An example of a magnetic probing apparatus is shown in Fig. 1.

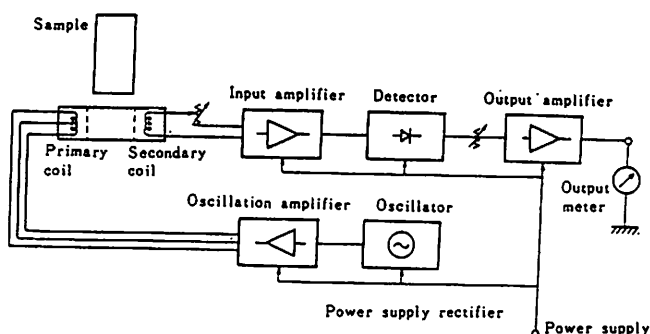


Fig. 1 Example of magnetic probing apparatus

4.1.2 The container to be used when measuring the fiber content of fresh steel fiber reinforced concrete shall have an inside diameter of 100 mm, and inside height of 200 mm, and shall be made of a non-magnetic material^{8),9)}.

Note 8) In case of using a plastic container its dimensions and construction shall be such that deformation will not occur when struck by a mallet.

Note 9) An outside diameter of the container not exceeding 120 mm shall be the standard.

4.2 Measurement of Fiber Content

4.2.1 Fresh Steel Fiber Reinforced Concrete

- (1) The specimen used for measurement shall be cast in the container specified in section 4.1.2 following the Japan society of Civil Engineers standard,

JSCE-SF 2 (Method of Making Specimens for Strength and Toughness Tests of Steel Fiber Reinforced Concrete).

- (2) The specimen for measurement shall be inserted in the probe of the magnetic probing apparatus¹⁰⁾, and the steel fiber content determined by the measuring apparatus¹¹⁾.

Note 10) The specimen shall be inserted at the center of the probe.

Note 11) When the readings of the measuring apparatus are in terms of electric current, the steel fiber content shall be determined by a calibration curve obtained in advance.

- (3) Measurements shall be made on a minimum of six specimens, and the average shall be taken as the steel fiber content¹²⁾.

Note 12) A sample on which a measurement has once been made shall not be poured in a separate container and remeasured.

4.2.2 Hardened Steel Fiber Reinforced Concrete

- (1) The specimen used for measurement shall be a ϕ 10 x 20 cm specimen made following the Japan Society of Civil Engineers standard, JSCE-SF 2 (Method of Making Specimens for Strength and Toughness Tests of Steel Fiber Reinforced Concrete)¹³⁾.

Note 13) In general, measurement will be difficult in case the orientation of steel fibers is of peculiar nature.

- (2) When applied to a core of shotcreted steel fiber reinforced concrete, the accuracy of measurement shall be confirmed in advance giving consideration to the orientation of steel fibers.
- (3) Measurement of fiber content shall be made adapting sections 4.2.1 (2) and 4.2.1 (3).

5. REPORT

The report shall include necessary items from the following:

- 1) Mix proportions of concrete, if available,
- 2) Configuration and dimensions of steel fiber used,
- 3) Steel fiber content,
- 4) Method of measurement,
- 5) Number of specimens,
- 6) Others.