BS EN 12350-9:2010

BSI Standards Publication

Testing fresh concrete

Part 9: Self-compacting concrete — V-funnel test

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National foreword

This British Standard is the UK implementation of EN 12350-9:2010.

The UK participation in its preparation was entrusted to Technical Committee B/517/1, Concrete production and testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (EN 12350-9:2010) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2011, and conflicting national standards shall be withdrawn at the latest by January 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This standard is based on the results from the EU-project "Testing-SCC" under the 5th Frame Programme (GRD2-2000-30024/G6RD-CT-2001-00580).

Owing to its significant advantages in the improvement of construction quality and working environment, self-compacting concrete (SCC) has been widely accepted by the construction owners. The use of SCC in practical concrete construction is steadily increasing. Since SCC has to give satisfactory in-situ properties (perfect filling of the mould and embedment of the reinforcement, homogeneity and full compaction) without vibration, the proper methods for testing the fresh SCC are very important. These should address three key properties: filling ability, passing ability and resistance to segregation. It is desirable, especially in the case of new constituents or new concrete compositions, to test the consistence of fresh SCC before casting in place.

A number of test methods including this test are available for testing fresh SCC. Most of the commonly used test methods were evaluated in the recently closed EU-project "Testing-SCC" under the 5th Frame Programme (GRD2-2000-30024/G6RD-CT-2001-00580). According to the results from this EU project, it seems no single test method can completely cover all the three key properties. Nevertheless any test method should at least be correlated to the practical situation and give consistent results in order to provide reliable data for judgment of concrete workability.

This standard is one of a series concerned with testing fresh concrete.

EN 12350, *Testing fresh concrete*, consists of the following parts:

— *Part 1: Sampling*

— *Part 2: Slump-test*

— *Part 3: Vebe test*

— *Part 4: Degree of compactability*

— *Part 5: Flow table test*

— *Part 6: Density*

— *Part 7: Air content — Pressure methods*

— *Part 8: Self-compacting concrete — Slump-flow test*

— *Part 9: Self-compacting concrete — V-funnel test*

— *Part 10: Self-compacting concrete — L box test*

— *Part 11: Self-compacting concrete — Sieve segregation test*

— *Part 12: Self-compacting concrete — J-ring test*

CAUTION — When cement is mixed with water, alkali is released. Take precautions to avoid dry cement entering the eyes, mouth and nose whilst mixing concrete. Prevent skin contact with wet cement or concrete by wearing suitable protective clothing. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the procedure for determining the V-funnel flow time for self-compacting concrete. The test is not suitable when the maximum size of the aggregate exceeds 22,4 mm.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12350-1, *Testing fresh concrete — Part 1: Sampling*

3 Principle

The V-funnel test is used to assess the viscosity and filling ability of self-compacting concrete.

A V shaped funnel is filled with fresh concrete and the time taken for the concrete to flow out of the funnel is measured and recorded as the V-funnel flow time.

4 Apparatus

4.1 V-funnel, made to the internal dimensions and tolerances in Figure 1, fitted with a quick release, watertight hinged or sliding gate at its base and supported by a frame so that the top of the funnel is horizontal with sufficient clearance beneath the gate to place the container underneath.

The V-funnel shall be made from metal which shall be reference material; the surfaces shall be smooth, and not readily attacked by cement paste or be liable to rusting.

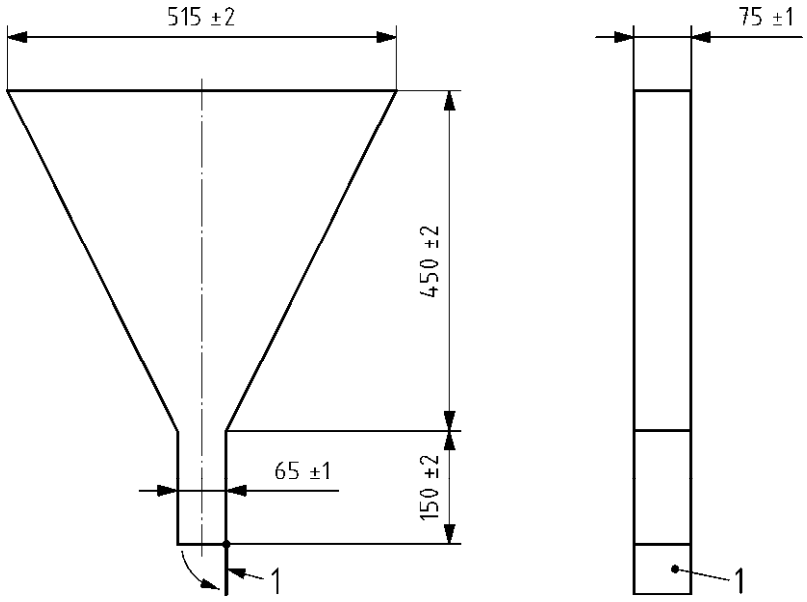
If the funnel is made from other materials, in-use performance test data shall be available which demonstrates long-term equivalence with metal.

4.2 Container, to hold the test sample and having a volume not less than 12 l.

4.3 Stop watch, capable of measuring to 0,1 s.

4.4 Straight edge, for striking off concrete level with the top of the funnel.

Dimensions in millimetres



Key
1 Hinged or sliding gate

Figure 1 — V-funnel

5 Test sample

A sample of at least 12 l shall be obtained in accordance with EN 12350-1.

6 Procedure

Clean the funnel and bottom gate, then dampen all the inside surface including the gate. Close the gate and pour the sample of concrete into the funnel in one operation, without any agitation or mechanical compaction, then strike off the top with the straight edge so that the concrete is level with the top of the funnel. Place the container under the funnel in order to collect the concrete. After a delay of (10 ± 2) s from filling the funnel, open the gate quickly and measure the time t_v, to 0,1 s, from opening the gate to when it is possible to see vertically through the funnel into the container below for the first time. The time t_v is the V-funnel flow time.

The flow of concrete from the funnel shall be continuous. If a blockage occurs the test shall be repeated. If a second blockage occurs the concrete lacks the necessary viscosity and filling ability of self-compacting concrete. Report if a blockage has occurred.

7 Test report

The test report shall include:

a) identification of the test sample;

b) location where the test was performed;

c) date and time of test;

d) V-funnel flow time, t_v, to the nearest 0,5 s;

e) any deviation from the standard test method;

f) declaration by the person technically responsible for the test that it was carried out in accordance with this standard, except as noted in item e).

The report may include:

g) temperature of the concrete at the time of test;

h) age of concrete at time of test (if known).

8 Repeatability and reproducibility

The repeatability r and reproducibility R have been determined by a programme including ten laboratories, 20 operators and two replicates, and interpreted in accordance with ISO 5725-2.

The resulting values for r and R are given in Table 1.

Table 1 — Repeatability and reproducibility for typical values of V-funnel flow time

V-funnel flow time t_v in seconds	**3,0**	**5,0**	**8,0**	**12,0**	**> 15,0**
Repeatability r in seconds	0,4	1,1	2,1	3,4	4,4
Reproducibility R in seconds	0,6	1,6	3,1	5,1	6,6

Bibliography

[1] ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

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