WSDOT FOP for ASTM C 1621/C 1621M[1]

Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring

1. Scope

1.1 This test method covers determination of the passing ability of self-consolidating concrete by using the J-Ring in combination with a slump cone mold. The test method is limited to concrete with maximum size of aggregate of 1 in (25 mm).

1.2 The values stated in either inch-pounds or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 The text of this standard references notes that provide explanatory material. These notes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. (***Warning:*** Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.)

2. Referenced Documents

2.1 ASTM Standards

C 125 Terminology Relating to Concrete and Concrete Aggregates

C 143/C 143M
Test Method for Slump of Hydraulic-Cement Concrete

C 172 Practice for Sampling Freshly Mixed Concrete

C 173/C 173M
Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C 1611/C 1611M
Test Method for Slump Flow of Self-Consolidating Concrete

3. Terminology

3.1 Definitions

3.1.1 For definitions of terms used in this test method, refer to Terminology C 125.

3.2 Definitions of terms specific to this standard:

3.2.1 *Halo* – An observed cement paste or mortar ring that has clearly separated from the coarse aggregate, around the outside circumference of concrete after flowing from the slump cone.

[1]This Test Method is based on ASTM C 1621/C 1621M and has been modified per WSDOT standards. To view the redline modifications, contact the WSDOT Quality Systems Manager at 360-709-5412.

3.2.2 *J-ring* – An apparatus consisting of a rigid ring supported on sixteen ⅝ in (16 mm) diameter rods equally spaced on a 12 in (300 mm) diameter circle 4 in (100 mm) above a flat surface as shown in Figure 1.

3.2.3 *J-ring flow* – The distance of lateral flow of concrete using the J-Ring in combination with a slump cone.

3.2.4 *Passing ability* – The ability of self-consolidating concrete to flow under its own weight (without vibration) and fill completely all spaces within intricate formwork, containing obstacles, such as reinforcement.

4. Summary of Test Method

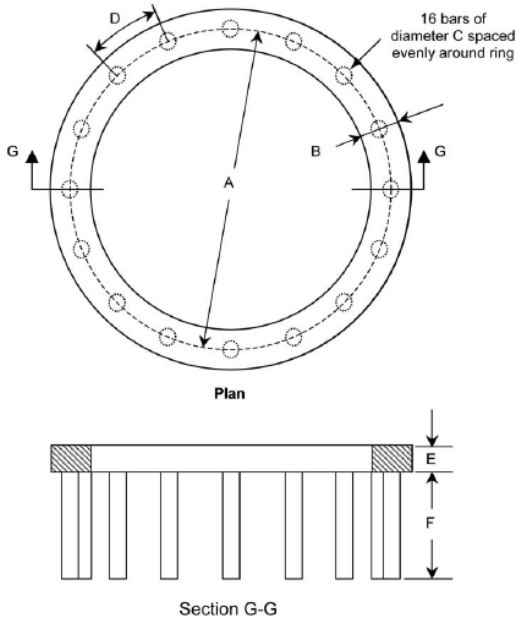
4.1 A sample of freshly mixed concrete is placed in a slump mold (inverted position) that is concentric with the J-Ring (Figure 2). The concrete is placed in one lift without tamping or vibration. The mold is raised, and the concrete is allowed to pass through J-Ring and subside (Figure 3).

The diameters of the concrete, in two directions approximately perpendicular to each other, are measured and averaged to obtain the J-Ring flow. The test is repeated without the J-Ring to obtain the slump flow.

The difference between the slump flow and J-Ring flow is an indicator of the passing ability of the concrete.

5. Significance and Use

5.1 This test method provides a procedure to determine the passing ability of self-consolidating concrete mixtures. The difference between the slump flow and J-Ring flow is an indication of the passing ability of the concrete. A difference less than 1 in (25 mm) indicates good passing ability and a difference greater than 2 in (50 mm) indicates poor passing ability. The orientation of the slump cone for the J-Ring test and for the slump flow test without the J-Ring shall be the same.



Dimension	in	mm
A	12.0 ± 0.13	300 ± 3.3
B	1.5 ± 0.06	38 ± 1.5
C	0.625 ± 0.13	16 ± 3.3
D	2.36 ± 0.06	58.9 ± 1.5
E	1.0 ± 0.06	25 ± 1.5
F	4.0 ± 0.06	200 ± 1.5

Figure 1

5.2 This test method is applicable for laboratory use in comparing the passing ability of different concrete mixtures. It is also applicable in the field as a quality control test.

6. Apparatus

6.1 J-Ring – The apparatus shall consist of a steel (or equivalent nonabsorbent, rigid material) ring measuring 12 in (300 mm) in diameter at the center of the ring and 1 in (25 mm) in thickness, and sixteen ⅝ in (16 mm) diameter smooth steel rods spaced evenly around the ring measuring 4 in (100 mm) in length (see Figure 1).

6.2 Mold – The mold (slump cone) used in this test method is as described in FOP for AASHTO T 119.

6.3 Base Plate – A nonabsorbent, rigid plate having a diameter of at least 36 in (915 mm).

Note 1: Field experience has shown that base plates made from sealed or laminated plywood, rigid plastic, or steel are suitable for performing this test.

6.4 Strike Off Bar – As described in FOP for WAQTC T 152.

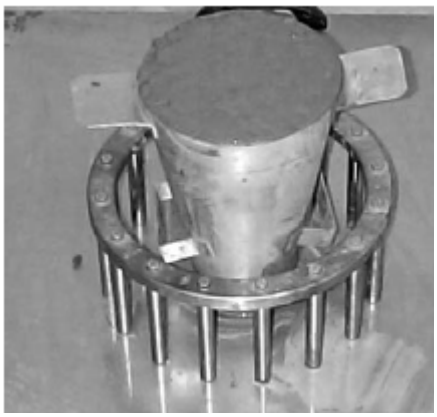
6.5 Measuring Device – A ruler, metal roll-up measuring tape, or similar rigid or semi-rigid length measuring instrument marked in increments of ¼ in (5 mm) or less.

7. Sample

7.1 The sample of concrete from which test specimens are made shall be representative of the entire batch. It shall be obtained in accordance with FOP for WAQTC TM 2.

8. Procedure

8.1 Perform the test on a flat, level, and nonabsorbent base plate. Position and shim the base plate so that it is fully supported and level. Pre-moisten base-plate with a damp towel, rag, or sponge. Rest the J-Ring at the center of the base plate.



J-Ring Setup with Inverted Mold Filled with Concrete
Figure 2

Ring Flow
Figure 3

8.2 WSDOT uses only Procedure B.

8.1.2 Filling Procedure B (Inverted Mold) – Dampen the mold, and place it on the base plate with the smaller opening facing down and concentric with the J-Ring. Support the mold and fill the mold in one lift (Note 2). Heap the concrete above the top of the mold.

Note 2: Filling the mold with concrete by using multiple scoops or by pouring from a bucket or similar container has been found to be acceptable.

8.3 Strike off the surface of the concrete level with the top of the mold by a sawing motion of the strike off bar. Remove concrete from the area surrounding the mold to preclude interference with the movement of the flowing concrete. Raise the mold a distance of 9 ± 3 in (230 ± 75 mm) in 3 ± 1 s by a steady vertical lift with no lateral or torsional motion. Complete the entire procedure from start of the filling through removal of the mold without interruption within an elapsed time of 2½ min.

8.4 Wait for the concrete to stop flowing and then measure the largest diameter ($d1$) of the resulting circular flow of concrete. When a halo is observed in the resulting circular flow of concrete, it shall be included as part of the diameter of the concrete. Measure a second diameter ($d2$) of the circular flow at approximately perpendicular to the first measured diameter ($d1$). Measure the diameters to the nearest ¼ in (5 mm). Determine the J-Ring flow in accordance with Section 9 of this test method.

8.5 Conduct a slump flow test without the J-Ring in accordance with Test Method C 1611/ C 1611M. Use the same filling procedure as used with the J-Ring. Complete the tests with and without the J-Ring within 6 min.

9. Calculation

9.1 Calculate J-Ring flow according to the following equation:

$$\text{J-Ring flow} = \frac{d^1 + d^2}{2}$$

9.2 Calculate the slump flow according to the following equation:

$$\text{Slump flow} = \frac{d^1 + d^2}{2}$$

9.3 Calculate the difference between slump flow and J-Ring flow to the nearest ½ in (10 mm). This number represents the passing ability of the concrete.

10. Blocking Assessment

10.1 Identify blocking assessment according to Table 1.

Difference Between Slump Flow and J-Ring Flow	Blocking Assessment
0 to 1 in (0 to 25 mm)	No visible blocking
> 1 to 2 in (>25 to 50 mm)	Minimal to noticeable blocking
> 2 in (>50 mm)	Noticeable to extreme blocking

Blocking Assessment
Table 1

11. Report

11.1 Report the filling procedure (A or B) that was used.

11.2 Report the J-Ring flow as the average of the two measured diameters to the nearest ½ in (10 mm).

11.3 Report the slump flow (without the J-Ring) as the average of the two measured diameters to the nearest ½ in (10 mm).

11.4 Report the passing ability as the difference between the slump flow and J-Ring flow to the nearest ½ in (10 mm). Identify the blocking assessment.

11.5 Report results on concrete delivery ticket (i.e., Certificate of Compliance).

11.6 The name of the tester who performed the field acceptance test is required on concrete delivery tickets containing test results.

12. Precision and Bias

See ASTM C 1621/C 1621M for precision and bias.

Performance Exam Checklist

WSDOT FOP for ASTM C 1621/C 1621M
Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring

Participant Name _____ Exam Date _____

	Procedure Element	**Yes**	**No**
1.	The tester has a copy of the current procedure on hand?	☐	☐
2.	All equipment is functioning according to the test procedure, and if required, has the current calibration/verification tags present?	☐	☐
3.	Sample was taken per WSDOT FOP for WAQTC TM 2?	☐	☐
4.	Molds and base plate dampened and base plate is flat, level and fully supported?	☐	☐
5.	Mold is centered in J-Ring and centered on base plate?	☐	☐
6.	Mold filled completely in one lift (slightly overfilled)?	☐	☐
7.	Mold struck off level with top opening?	☐	☐
8.	Excess material removed from base plate and mold raised 9 ± 3 inches, in 3 ± 1 seconds?	☐	☐
9.	After flow has stabilized, measure largest diameter (including halo)?	☐	☐
10.	Second measurement taken approximately perpendicular to first measurement?	☐	☐
11.	Measurements made to nearest ¼″?	☐	☐
12.	Test performed within 6 minutes of FOP for ASTM C 1611?	☐	☐
13.	All calculations performed correctly?	☐	☐
14.	Results reported to the nearest ½″?	☐	☐

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____

Comments: