

Concrete Q&A

Flowing or Self-Consolidating Concrete

Q. *Is flowing concrete the same as self-consolidating concrete?*

A. Although the terms flowing and self-consolidating concrete (SCC) are used interchangeably by some people, they actually are different forms of highly flowable concrete.

The term flowing concrete is defined in ASTM C1017 as “concrete that is characterized by a slump greater than 7-1/2 in. (190 mm) while maintaining a cohesive nature...”¹ The high slump is obtained by adding large doses of high-range, water-reducing admixture to concrete with an initial slump of 2 to 3 in. (50 to 75 mm). Flowing concrete is often used to aid consolidation in areas that are highly congested or to increase production rates and decrease labor in precast concrete manufacturing facilities. Although these mixtures are highly flowable, they still require some consolidation by vibration or other means, but have the potential for segregation if overvibrated. Section 5.6.2 of ACI 212.3R-04, “Chemical Admixtures for Concrete,” describes the workability and flowability of flowing concrete as follows:

When concrete mixtures are properly proportioned, flowing concrete is extremely workable without bleeding and segregation. The upper slump limit at which flowable concrete still remains cohesive can be determined by testing the mixture before use. Segregation and bleeding can be reduced by increasing the fine-to-coarse aggregate ratio, improving the fine aggregate grading, or adding other fine material. Flowing concrete should be vibrated to achieve proper consolidation. The response of flowing concrete to machine finishing is similar to that of conventional concrete made with the same ingredients.²

SCC is described in ACI 237R-07, “Self-Consolidating Concrete,” as “highly flowable, nonsegregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.”³

It is often used where reinforcement is highly congested or in areas of complex formwork. It has also found application in architectural concrete because of its ability to create smooth surfaces free of honeycombing when used with high-quality formwork. To improve segregation resistance, a viscosity-modifying admixture is often added to the other conventional concrete materials used to produce SCC. Because SCC is so flowable, traditional slump tests are not applicable, but a somewhat similar test called the slump flow test, which involves measuring the spread of the concrete after being released from a slump cone, can be used as one measure of the flowability of the SCC. Because there is no external mechanical consolidation required with SCC, there is no danger of segregation due to overvibrating. There is, however, danger of segregation when the concrete flows over long distances. As noted in ACI 237R-07, “The main requirements of SCC involve securing high levels of deformability while maintaining a highly stable mixture.”³

References

1. ASTM C1017/C1017M-07, “Specification for Chemical Admixtures for Use in Producing Flowing Concrete,” ASTM International, West Conshohocken, PA, 2007, 9 pp.
2. ACI Committee 212, “Chemical Admixtures for Concrete (ACI 212.3R-04),” American Concrete Institute, Farmington Hills, MI, 2004, p. 17.
3. ACI Committee 237, “Self-Consolidating Concrete (ACI 237R-07),” American Concrete Institute, Farmington Hills, MI, 2007, 30 pp.

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