Self-Compacting Concrete for Sustainable Architecture

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Abstract:

Self-compacting concrete (SCC) is that concrete which can be placed and compacted under its own weight with little or no vibration, ensuring perfect filling of formwork even when access is difficult. The development of concretes which don't need any vibration is a building industry challenge, since the related energy saving improves its sustainability; the reduction in noise and health hazards improves the working environment, and freeing from workmanship skill improves the quality of the final product. In order to achieve this behavior the fresh concrete must show high fluidity as well as good cohesiveness.

In general, for producing SCC high volume of very fine materials is necessary in order to make the concrete more fluid and cohesive.

For this purpose, either silica fume or fly ash or rubble powder (that is a powder obtained from suitable treatment of rubble from building demolition) or MSW (municipal solid waste) ash were used as mineral addition, in order to ensure adequate rheological properties of SCCs. Preliminary rheological tests were carried out on pastes in which these materials were also added. Moreover, recycled instead of natural aggregate was used by substituting either the coarse or the fine aggregate fraction. The fresh concrete properties were evaluated both through the slump flow and the L-box test, by also determining segregation resistance.

The results obtained showed that SCC could be successfully developed by incorporating both recycled aggregates and waste powders. This encouraging goal, beyond technical performance, matches with the more and more widely accepted sustainable development issues.