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Self-Flowing Underwater Concrete Mixtures for High Rise Structures

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Placement of conventional concrete mixtures in underwater construction results in a high percentage of material loss due to washout of cement paste. This paper presents the influence of antiwashout admixture (AWA) on various properties of concrete. Eleven self-flowing concrete (SFC) mixtures using type II cement were proportioned. A combination of low water cement (w/c), high cement contents, antiwashout admixtures, fly ash, and silica fume were used to enhance the resistance of fresh concrete to washout. The concrete mixtures proportioned to be highly flowable, self-leveling and cohesive. The water-cementitious materials ratios ranged between 0.356 and 0.392 which correspond a typical underwater concrete mixture. The concrete mixtures were tested for slump, slump flow, washout resistance and compressive strength. The compressive strength of each concrete mixture cast underwater was determined at 3, 7, 28 days and compared with the compressive strength of the same concrete mixture cast in normal condition (in air). Test results indicated that the use of an AWA facilitates the production of flowable concrete mixtures with the added benefit of lower washout loss. Concrete mixture proportioned using Type II cement and fly ash at level of replacement of 15% was found to develop self flowing concrete with better fresh and hardened properties and more resistant to washout. The self-flowing underwater concretes developed a 28-day compressive strengths ranging from 20 to 28 MPa.