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## Anti-Washout Concrete and Highly Workable Concrete

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### Summary

The foundations of the Akashi Kaikyo Bridge are enormous concrete structures, and the natural conditions under which they had to be constructed were without precedent. A special anti-washout concrete and highly-workable concrete were developed and used, respectively, for the main tower foundations constructed in the Akashi Strait and the anchorages on either shore.

### 1. Development and Use of Anti-washout Concrete

The two main-tower foundations were constructed in currents of up to 4 m/sec. by the laying-down caisson method. Anti-washout concrete was cast into the caissons. This type of concrete was first introduced into Japan between 1975 and 1984, and is made by adding an underwater anti-washout admixture and a superplasticizer to ordinary concrete. This provides it with excellent anti-washout properties as well as self-leveling characteristics. With a total of 264,000 m<sup>3</sup> of concrete needing to be cast in 30 operations, or about 9,000 m<sup>3</sup> per casting, for the main-tower foundations (2P and 3P), it was necessary to develop a new method of casting such massive amounts of concrete at speeds far in excess of conventional capabilities. Regarding the quality of the concrete, the challenges faced were (i) to minimize strength loss while retaining an adequate anti-washout property and flowability for many hours even after flowing through a long placing system; (ii) to look into reducing cement content, using low-heat cement, and using a precooling facility to prevent thermal cracking; and (iii) to calculate the lateral pressure that would act on the steel caissons (which functioned as forms) and study methods of controlling the pressure. After overcoming these challenges, concrete casting for the 2P and 3P foundations was successfully completed in October and December, 1990, respectively.

