

The Present Status and Future of Concrete

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Basically civil engineering concrete structures must be tough, beautiful, and durable, and there are many such examples. In an earthquake, typhoon, or tsunami they must not collapse, or else exhibit a benign failure; they must have beauty to be loved by the local communities; and must have long life to be used by our children, grandchildren, great-grandchildren, and subsequent generations. In Japan, I think there has been a major change from the era of construction during high economic growth when there was a pressing social demand for numerical expansion of infrastructure, to an era when although construction is still necessary the importance of maintenance is increased and it is necessary to enhance the quality of the infrastructure.

When I succeeded Kyuichi Maruyama as Chairperson of the Concrete Committee, I had 3 major policies: performance verification on the time axis, internationalization, and environment. The necessity for performance verification technology had already been stated, standard specifications prescribed the performance, and this was being recognized by the world. However, it cannot necessarily be said that a sufficient level has been attained, and in particular in the case of the time axis performance verification is still not sufficient, it is still immature. I believe that when verification on the time axis is possible, only then can we start to leave behind the era of maintenance management. In connection with internationalization, joint WS are being held with various countries, and an English language version of the Standard Specifications has been published. It was impossible to complete the initial plan in 1 year, it took about 3 years. I think a faster response was needed. Regarding environment, the 2012 version of the Standard Specifications incorporated a considerable number of points of caution. In the "General Requirements" section of the Standard Specifications for Concrete Structures, the content on environment was enhanced as the result of many discussions.

The current Standard Specifications are performance based. However, I believe that design action as creation is genuinely necessary and at the same time a joy to humans. In performance verification, to a certain extent rational theory only will suffice, but for design a sensitiveness is also required, and it is necessary that the engineer have "intuition" based on experience. The roots of engineering lie in experience. In particular experiential engineering is an aspect of civil engineering in nature. Computers, IT, or systems are only virtual. The essence of civil engineering is not in the office, but on the site of construction or maintenance, where one is confronted with nature. Unexpected perceptions and knowledge lie hidden on the actual site. I think autonomous operation of tools requires a mechanism of human control. I have great expectations for human power based on experience on site in a variety of circumstances.

The infrastructure of urban society is formed from concrete structures. However, the degree of importance varies from member to member. Therefore, I think it is necessary to carry out design, construction, and maintenance envisaging the scenarios, including environment, for each member and part. Creating scenarios requires not simply technical capability, but also has a human cultural aspect including philosophy. I hope that research to determine the behavior of concrete structures in 4-dimensional space will continue into the future in order to enable these actions.
