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The Jiangyin Yangtze River Highway Suspension Bridge

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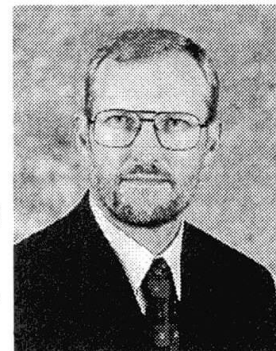
Zhou Shi Zhong, born 1943, received his civil engineering degree from the University of Hehai.



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Chris Davis, born 1952, received his engineering degree from the University of Leicester. He has worked in major bridge projects throughout his career.



Summary

The Jiangyin Yangtze River Highway Bridge in Jiangsu Province, China is a 1 385 m main span suspension bridge now under construction some 200 km west of Shanghai and due to open to traffic in September 1999. Forming the most easterly fixed link across the Yangtze River, this strategic crossing will complete a new coastal road from Heilongjiang in the North to Hainan Province in the South. This paper describes the search for quality in procuring the bridge and planning its maintenance and operation.

Keywords: Suspension bridge; quality management; design; construction; operation; maintenance.

Abstract

The River Yangtze, one of the world's great rivers, is the dividing line between the North and the South of China. Construction of fixed links across it to replace existing ferry services is a key requirement in China's drive to improve internal traffic communications to assist the development of its rapidly growing economy. Since 1968 the most easterly fixed crossing of the River Yangtze has been at Nanjing, some 400 km West of Shanghai.

Jiangyin, a small town about midway between Nanjing and Shanghai, lies on a strategic route for traffic between the North and South of China. Ferries currently serve traffic on this route, and delays can be prolonged. River traffic on the Yangtze at Jiangyin is intense with the passage of vessels regularly exceeding 100 during a one hour period.

In 1991, the Jiangsu Province Communications Department (JPCD) was entrusted with the task of designing and bringing into operation a new crossing of the River Yangtze at Jiangyin. Feasibility studies established that the most effective solution was to provide a 1 385 m main span suspension

bridge for the main crossing. This will be China's longest span by a considerable margin, and the fourth longest in the world.

From the outset, JPCD was determined that the procurement of the new bridge would achieve the highest possible standards consistent with internationally recognised best practice. To help achieve this objective, JPCD enlisted the support of Mott MacDonald to advise during the feasibility study, preliminary design and subsequent stages of the project.

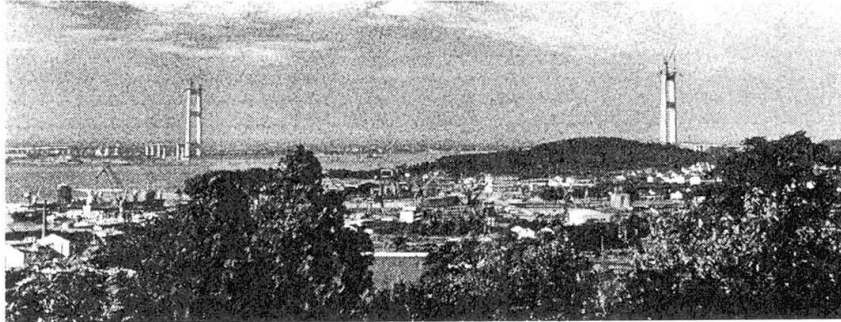


Figure 1 – Jiangyin Yangtze Bridge during construction

Building on established international practice, the design team developed the suspension bridge concept and completed detailed designs for the project. Thorough seismic and wind engineering studies, including model tests, were undertaken at Shanghai's Tongji University to confirm satisfactory performance of the structure. Large scale site trials proved the design of the very long concrete piles used for one of the main tower piers.

Major Chinese contractors built the bridge substructure, which incorporates in the North Anchorage one of the world's largest open caisson foundations. The superstructure contract was awarded to a British contractor after international tendering — the first time this procurement route had been adopted for any bridge project in China. These arrangements have demanded careful management of the construction interfaces.

Pragmatic procedures have been established to ensure that the designers' original intentions are achieved through all stages of construction. Particular attention is given to the quality of materials and workmanship to achieve a durable and robust structure. The superstructure contractor has procured fabricated steelwork, cable wire and steel castings in both China and Britain, adapting its purchase specifications, production techniques and quality assurance procedures to meet the needs of Chinese practice.

Extensive peer review during design and construction, both within the teams and by invited international experts, has made a valuable contribution to developing a world class project — and an outstanding example of close co-operation between Chinese and Western bridge engineers working together in China.

At the time of writing, construction of the bridge is progressing rapidly towards completion, in time for the bridge to be opened to traffic by China's President Jiang Zemin in September 1999. In a remarkably short time, China has planned, designed and constructed a truly world class long span suspension bridge, which is likely to be the precursor to many more similar bridge projects in China.