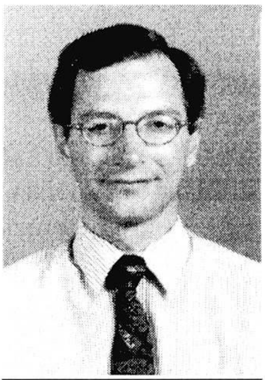
Cable Stayed Bridge in Bandung, Indonesia

Alan SHARPE
Halcrow Group Ltd.
Senior Bridge Engineer.
London, UK

Andrew J YEOWARD
Halcrow Group Ltd.
Engineering Manager,
Bridges Department.
London, UK

Roger J BUCKBY
Halcrow Group Ltd. Director
– Bridge Engineering
London, UK


Abstract

Indonesia is a developing county consisting of thousands of islands, and presently has plans for many long span structures to improve communication links within and between its larger cities. Bandung is a rapidly expanding city of 3 million inhabitants, located in the West Java province of Indonesia. Studies carried out by the Directorate General of Highways (Bina Marga), as part of the government's development plan, indicated that priority should be given to providing a new east-west elevated arterial road in the northern part of Bandung. Bina Marga appointed Sir William Halcrow and Partners in association with INCO of Kuwait, INDEC and Associates of Indonesia and LAPI-ITB to carry out the Final and Detailed Design of the project. High priority was given to this project by the government to develop the country's technological capabilities and it thus represents an important step in the realisation of its huge potential.
This paper will describe the design and construction methods adopted for this unusual structure and a brief summary is given below.

Project Description

The project consists of approximately 2.1 km of elevated viaduct together with a 400m long elevated bridge across the Cikapundung valley including a cable stayed bridge with a length of 161m.
The cable-stayed bridge over the valley carries three lanes of traffic in each direction and has a single tower located in the highway median, supporting the main span via a single plane, semiharp arrangement of stay cables. The tower is anchored to the backspan pier by an arrangement of parallel stay cables. The superstructure of the bridge is constructed by the precast, prestressed concrete glued

segmental method, with the main span being erected by cantilevering in the conventional manner from the pylon.

Cable Stayed Bridge description and construction

The span arrangement of the cable-stayed bridge was finalised after careful consideration of both the engineering requirements and aesthetics. It was concluded that an asymmetrical cable configuration with a vertical pylon was the most appropriate solution, resulting in a main span of 106 m and a back span of 55 m.

The height of the pylon is restricted by the close proximity of the local airport. As a result of this, the longest cables on the main span are at a relatively low angle to the horizontal. The deck is 32 m wide to accommodate the six lanes of traffic resulting in a low span to width ratio. Both these features lead to an unconventional form of load distribution with the superstructure supported partly by the stay cables and partly by longitudinal beam action. This necessitated very careful consideration with regards the method of construction as the deck must resist a stress range which reverses between the construction and the in service condition. Temporary prestress will be required during erection of the segments to keep these stresses within the required limits.

The superstructure will be a precast segmental concrete box girder with an external shape similar to that of the viaducts. Each longitudinal segment will be constructed in two sections with an in-situ central stitch enabling the same formwork moulds as the viaduct to be used. The adoption of an in-situ stitch also allows easy construction of the tapered deck sections at each end of the cable-stayed bridge.

The cable anchorages will be constructed within the central in-situ stitch. They will be tied into the precast units by a steel frame which will take the cable forces directly by tension into the concrete deck.

The prestress is contained within the top and bottom slab haunches thereby keeping the web thickness and weight to a minimum by ensuring that the ducts do not encroach within the webs.

The back span will be built on falsework supported from the ground because there are no intermediate stay cables in the span which can support it during construction. It will be post tensioned so that the falsework can be removed prior to erection of the main span. The main span is then built by cantilever methods by erecting two precast segments followed by casting of the in-situ stitch. The cantilever will continue until it reaches the transverse in-situ stitch joint located 13.75 m from the first pier.

Conclusion

The challenge of designing the first major elevated urban highway in central Bandung has produced an elegant symbol of advanced technology whilst at the same time preserving the unique character of the city. Tendering procedures and award of contract are due to take place this year, with completion due in 2000.