Sathorn Bridge, Bangkok (Thailand)

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7. Sathorn Bridge, Bangkok (Thailand)

Owner:	*Public Works Department, Ministry of Interior, Thailand*
Design and supervision:	*Cowiconsult, Denmark, in joint venture with Seven Associates Co. and Krungthep Engineering Consultants Co., Bangkok.*
Contractor:	*Joint venture by Italian Thai, Dragages & Travaux Publics and Italvie*
Works duration:	*38 months*
Service date:	*1982*

Introduction

The project consists of a 6 km freeway, of which 3 km is constructed along the existing Sathorn Road on the eastern riverside (Bangkok side). It then crosses the 230 m wide river on a 1,2 km bridge structure and continues with approx. 1,8 km freeway on the western riverside (Thonburi side).

On the 1,2 km bridge section, the three-lane carriageways are placed on two separate bridges, to allow for a future mass transit bridge between them. The bridge structures can be divided into:

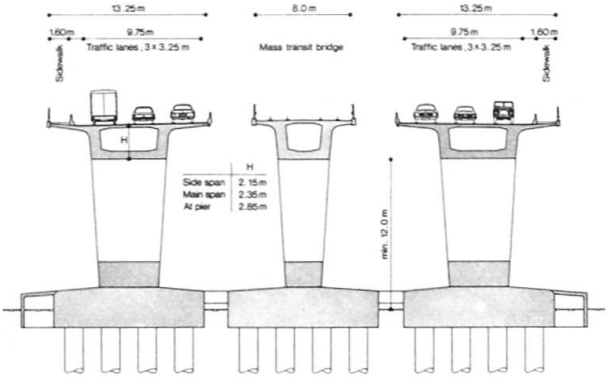
- Main bridge of 224 m with span lengths 66 + 92 + 66 m.
- Approach spans of 305 with span lengths of 35 + 6 x 45 m.
- Abutment structures of approx. 200 m.

Foundations

The soil conditions in Bangkok are dominated by upper layers of soft clay with a high water content. Below, from approx. –12 to –20 m lies stiff clay underlayed by layers of sand and very stiff clay. Pile foundations are, therefore, needed in all places.

The river piers are all founded on 13 cased piles, 1,50 m dia., bored to a depth of –46 m into the lower sandlayers, in order to gain sufficient bearing capacity and bending resistance, especially if scour problems occur in the foundation area.

All other piers are founded on ordinary R.C. piles mainly 0.35 x 0.35 m, penetrating some metres into the uppper sand layers, i.e. level –20 to –25 m.



Cross sections of main bridges

Main bridge

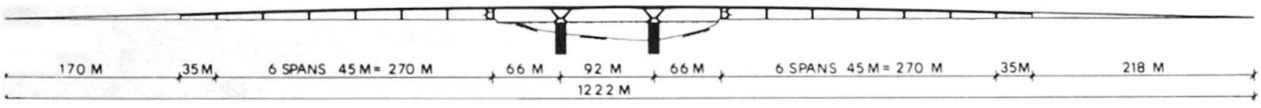
The river pier pile caps are solid reinforced concrete blocks and to avoid fine cracking, diagonal prestressing has been introduced. The pile caps have been provided with a hollow reinforced concrete "ship stem" for both hydraulic reasons and to absorb the energy in case of ship collision.

The pile caps were constructed by means of an open concrete caisson, which formed the outer part of the pile cap.

Inclined pier legs have been introduced for structural and aesthetical reasons. A slender main girder has hereby been obtained and long term deformations due to creep, shrinkage etc. have been essentially reduced.

The superstructure consists of a hollow prestressed box girder with a varying construction depth from 2,35 m in the main span, 2,85 m over the river piers to 2,15 m in the sidespan. The total width of the separate bridge half is 13,25 m incl. 1,6 m sidewalk.

Only longitudinal prestressing tendons are provided of Freyssinet 19T15 type (in centre span 22 tendons, over river piers 26 tendons and side span 20 tendons). Due to the spanwise construction of the main bridge, the tendons have to be coupled at the construction joints. 50 % of the tendons are joinded by couplers and 50 % by overlapping.



The superstructure has been cast in five sections by an overhead steel scaffolding girder. The two 44 m sections over the river pier were first cast and prestressed, then the side spans, and finally the centre span. After completion, the structure is continuous over the full length with expansion joints at the land piers only.

Approach Spans

The pile caps are solid reinforced concrete blocks and the pier shafts are also of solid reinforced concrete except for the land pier pileshafts, which are hollow and provide access to the superstructure. On all the piers Neopot sliding bearings have been placed, except for the centre pier where a fixed bearing is used.

The superstructure consists of a 305 m continuous hollow prestressed concrete box girder with a construction depth of 2,17 m and a total width of 11,25 m and no sidewalks, as the pedestrians will be taken down to the ground level by flights of stairs at the landpiers.

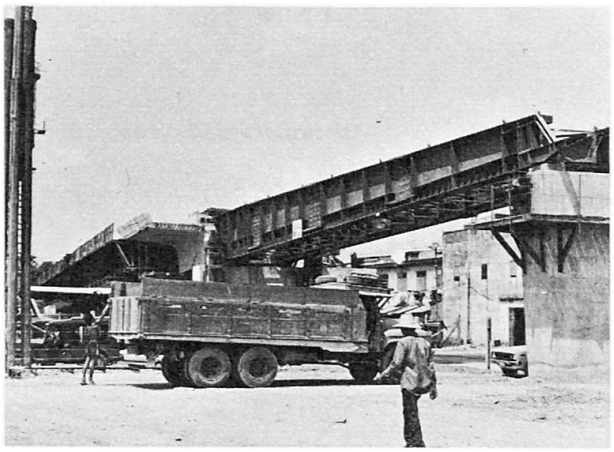
The superstructure is constructed by the incremental launching method with casting beds close to the abutment structures. An unique provisional prestressing, with tendons partly exterior to the superstructure concrete, is added to obtain a central prestressing during launching.

When pushed, the superstructure slides on top of the piers by means of teflon plates. The "pushing forces" are established by means of steel tendons on each side of the superstructure and the steel tendons are stepwise gripped by special jacks placed at the rear end frame.

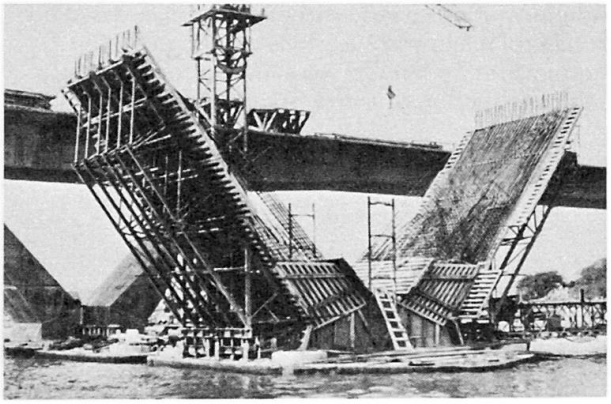
Abutment Structures

As high earth embankments are prohibitive on the soft layer in Bangkok, the bridge ramps have been constructed as 200 m piled reinforced concrete structures consisting of two longitudinal walls carrying the bridge deck.

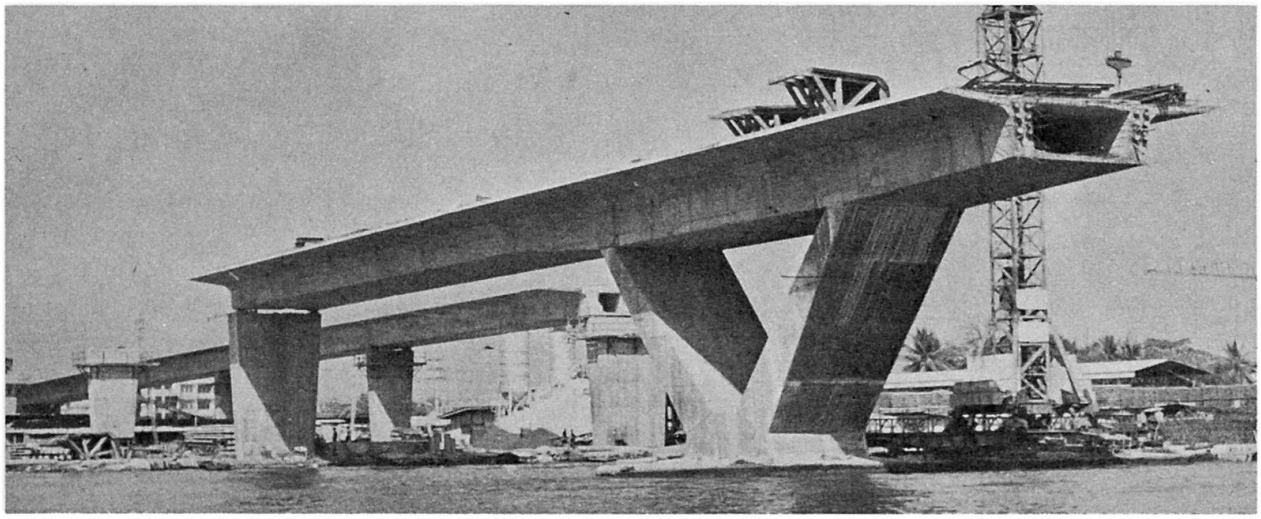
(L. Jonsen)



Approach spans during construction



River pier legs during construction



Completed pier section and sidespan of main bridge