



Extradosed Bridge Part of the Third Ring Road of Mecca – Conceptual Design

Fernando Sima, Mike Schlaich

schlaich bergermann partner, Berlin, Germany

Maher Youakim, Essam Ayoub, Karim Hany

Euro Consult for Engineering Consultancy, Cairo, Egypt

Mourad Bakhoum

ACE (Moharram – Bakhoum), Cairo, Egypt

Contact: essam.ayoub@euroconsult.com

Abstract

The aim of this paper is to present the conceptual design process of the proposed Extradosed Bridge, as part of the Third Ring Road of Mecca project, near the Jamarat site in KSA. The proposed bridge is conceived as an Extradosed Bridge with an open cross section with two main longitudinal girders in post tensioned concrete and spans of 85-145-90 m. It is the result of a conscious and rigorous conceptual design process, that took into consideration the special context and boundary conditions, in some cases, quite unusual for a road bridge. The resulting slender, durable, and elegant bridge fits in the context, providing an iconic, yet subtle reference to this important site.

Keywords: Extradosed Bridge, Skewed Bridge, Post-tensioned Concrete, Stay Cables, Vibrations, Constructability.

1 Introduction

A new bridge is foreseen as part of the Third Ring of Mecca project in Saudi Arabia, currently under design and construction, that serves as the new crossing over the Jamarat area, west of the holy site for Muslims, as part the development of the whole Hajj area. At first sight a conventional highway bridge, it is in a very special location that significantly conditioned the design: millions of pilgrims will make use of the bridge or pass under it during the Hajj every year in their pilgrimage to the holy Jamarat site.

As bridge designers, it is rare to have the chance to design a road bridge located in such prominent location. Therefore, the conceptual design of the bridge required careful considerations, taking into account the special context and the singular boundary conditions.

This paper describes the conceptual design process of this bridge which is presently out for tender and which the client wants to open to traffic by 2027. Numerous solutions were studied in the process, and finally two parallel extradosed