Sydney Metro Cable Stayed Bridge, a Meeting of Precast Segmental Concrete and Cable Stayed Construction Technology

John Anderson

SMEC South Africa, Cape Town, South Africa

David Jefferson, Derik Hanekom

SMEC, Sydney, Australia

Contact: john.anderson@smec.com

Abstract

Sydney Metro's expansion into the north west of the city has recently included the construction of 4.5 km of elevated viaduct that includes a one of kind cable rail bridge. Set out on a 403 m horizontal radius with a 130 m long main span, the bridge's prestressed precast concrete segmental deck is supported by a single plane of cables. An integral part of the design challenge was the need to construct the bridge using the same overhead gantry used to construct the simply support spans on the main viaduct. Using the gantry, the three span structure was first built as a continuous girder supported on the four permanent supports with five temporary supports. The deck sections were erected as a series of cantilevers, then connected into a continuous girder and finally, after the release of the temporary supports, converted into a cable supported structure. A feature of the design was the staging of the deck prestressing that avoided removing strand installed during a previous stage as the bridge metamorphized from a seven-span structure to a three-span structure.

Keywords: precast segmental, erection engineering, cable stayed, temporary works, rail, curved

1 Introduction

Located in the north west of Sydney is a unique, curved in plan, three-span cable stayed rail bridge constructed using precast segmental concrete. The bridge forms the tail end of a 4,5 km elevated viaduct that is part of the new Sydney Metro. Both structures were recently constructed by the Impregilio Salini Joint Venture (ISJV). The Sydney Metro project's first phase, the Northwest line, includes 8 new stations, approximately 15,5 kms of tunnels and the aforementioned 'skytrain' viaduct.

The insights in this paper relate to the fact that the bridge's deck was first built as a seven span continuous girder on temporary supports using an overhead self-launching gantry. Thereafter the bridge was converted into a three span cable stayed bridge and the temporary supports were removed. The use of the precast segmental concrete for the deck superstructure was a required continuation of the main viaduct. This required the integration of the techniques and temporary works used to build precast segmental concrete bridges with the demands of cable stayed bridge construction.

https://doi.org/10.2749/nantes.2018.s16-25
Distributed by structurae