



Design of Jakarta Mass Rapid Transit package CP103

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Abstract

Completed in 2019, Jakarta's first MRT system is providing much-needed relief to the congested road network of this city and to its population of around ten million people. Constructing infrastructure in a congested, developed urban area provides substantial challenges for designers, the contractor and client. This paper considers the design of the viaducts and stations within one of the MRT packages, and how site constraints impacted the ultimate solution. Also discussed is the impact of onerous seismic design criteria such as those specified for this project. High serviceability ground accelerations challenged the designer to introduce flexibility into the structural response, whilst simultaneously providing necessary resistance in the ultimate case.

Keywords: Mass Rapid Transit, precast segmental, post-tensioning, seismic design, bridges, stations.

1 Project Introduction

Jakarta province has a population of over ten million people [1], with a further twenty million in the wider Jabodetabek region, making it the second most populous urban area in the world [2]. However, the city's road congestion is world famous and was getting worse: in 2010 it was reported only 56% of commuter trips used public transport, with vehicular use growing 9.5% per annum compared to just 0.01% annual increase in roads [3]. The MRT, Jakarta's first, opened to the public in March 2019 with the aim of moving journeys away from the roads and relieving Jakarta's traffic congestion.

Phase I of the project has been completed and comprises 13 stations along 16km of the route running approximately north-south, from Lebak Bulus to Bundaran Hotel Indonesia roundabout. The southernmost 10km of the route is elevated, with the rest subterranean. 2020 saw the start of construction of Phase IIA, which will extend the route 6km further north, with seven additional underground stations. Longer-term plans include

an 87km east-west line, interchanging with the north-south lines [4].

Package CP103 included 3.7km of elevated viaducts, four stations, and a transition structure bringing the alignment back to grade, ahead of the tunnel portal (in CP104). From south to north, stations within the package are Haji Naw, Blok A, Blok M and ASEAN (originally called Sisingamangaraja).

The MRT is operated by PT Mass Rapid Transit Jakarta (MRTJ), founded by the Jakarta Provincial Government in 2008. MRTJ appointed Jakarta MRT Construction Management Consultants (JMCMC) to manage the design and construction stages, with the entirety of Phase I broken into a number of contract packages (CP).

CP103 design and build contract was awarded in mid-2013 to a joint venture of Obayashi, Shimizu and Jaya Konstruksi (OSJ). OSJ appointed Hewson Consulting Engineers as structural designer for viaduct and stations, with architectural design by PT Arkonin.