

Design of Rail Viaducts over the Hajar Mountains

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Abstract

Major railway bridges across the Hajar mountain range belonging to the Etihad Rail Package D of Stage Two of the UAE National Railway Network are built above important wadis and roads.

Standard railway bridges are articulated in 40m long simply supported spans. Tall piers and abutments are required due to the complex terrain and the rail alignment configuration.

Construction logistics and program being key constraints, solutions featuring precast elements have been favoured. The bridge section is made of 7 post-tensioned precast I-girders of 2.50m depth and a reinforced concrete top slab supporting the ballasted track system.

The aim of this paper is to describe the structural system as well as to discuss some important design related aspects related to the precast girder type railway bridges built across the Hajar mountains.

Keywords: railway bridges; heavy freight; precast girders; post-tensioning; rail-structure interaction; scour; seismicity.

1 Introduction

The Etihad Rail Package D of Stage Two of the UAE National Railway Network project (ER2D) comprises the design and construction of the permanent-way infrastructure works carrying dual track freight and passenger trains from Sharjah to the Fujairah Port, through approximately 145km. It will allow completing the first rail connection between the northern ports to the rest of the United Arab Emirates.

ER2D will cross the Hajar mountain range through a succession of 9 tunnels, in addition to the construction of 35 bridges and 32 underpasses. This area is characterized by steep sided mountains with exposed rock surface and marked V-shaped wadis. Detailed hydraulic modelling has been required to capture the complex terrain highly

susceptible to flash floods and position the hydraulic crossings appropriately at the location of high flows. Railway viaducts also provide grade separated access for highways, sand tracks utilized locally as well as for camel crossings.

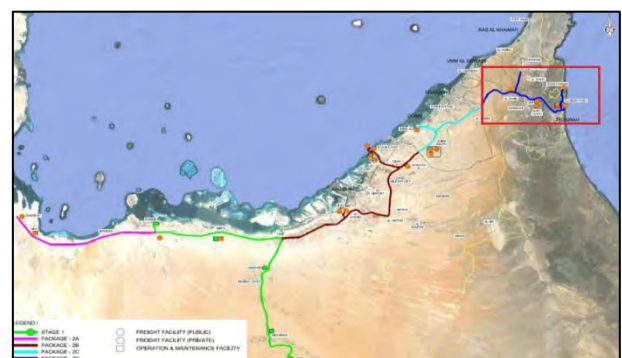


Figure 1. Etihad Rail network