



## Challenges of a Bridge Design in Tight Urban Areas

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### Abstract

Kuwait has one of the most prominent cars per square km ratio. Significant infrastructure upgrades continue. This paper mentions about multiple structural problems faced with a 3.2 km viaduct in one of the crowded main arterials of Kuwait City.

The structural design should meet public needs with stability, strength, serviceability, economically and aesthetically. Any design starts with new ideas and hopes. Unfortunately, designs always go through scope creep due to the nature of highway projects. At the time of despair, it is well understood that engineers are created by time, critical thinking, and creativity in addition to education. This paper aims on introducing and discussing every challenge faced, starting from the beginning of design in Kuwait City.

**Keywords:** pre-tensioning; post-tensioning; stay-in-place panels; cast-in-place slabs; cast-in-place splices; concrete I-girders; steel strong-back, challenges.

### 1 Introduction

Did you know that Kuwait City is the 24<sup>th</sup> Country of Vehicles per Capita globally? There are about 527 vehicles per 1000 people. More functional road and bridge designs with more capacity might solve the problem caused by the high number of cars. The idea of Falcon Viaduct has started only to be a solution for the traffic problems for one of the busiest roads in Kuwait City, Canada Dry Road.

Imagine a proposed viaduct with 3.2 km, with six lanes and two ways and a single carriageway above the existing arterial in the most crowded place in a city. The construction stages also should be considered, and these stages should be planned to finish at the earliest possible time, while the viaduct has been designing not to interrupt the traffic.

The designer has nothing except ideas at the beginning. Where should the designer start? What

would have been the designer's answer given time limitation and last long work? Time by time, there might be more problems and solutions. While trying to find the best solution initially, all these questions were answered at the end of the design. The engineer may face many difficulties, but finding solutions strengthen the engineer.

In this article challenges of a bridge design in city centre are discussed. Design stage for the project is finished but the construction stage is not started yet.

### 2 Challenges in Tight Urban Areas

The Canada Dry Road requires more capacity in Kuwait due to increasing traffic problems. Therefore, a bridge was suggested with 3.2 km in one of the crowded main arterials of Kuwait City.