

Upgrade & Retrofit of Existing Infrastructure & How it Contributes to Sustainability to Extend the Service Life of Structures

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Abstract

We live in a world of ultimately limited resources and as engineers we are responsible for the most efficient use of those resources. The needs of the societies we serve change and our infrastructure is under constant pressure to adapt to new requirements. Many of these demands are about capacity and drive a desire to replace existing structures with bigger and seemingly better designs. And whereas it's always nice to start with a clean sheet when preparing a design it is an obligation upon us engineers to make the most effective use of what is already there. Only in this way can we start to tackle the sustainability challenge brought upon us by the climate emergency. There are many ways that existing infrastructure can be used and repurposed so that the changing demands can be met.

The keynote paper will address the way in which existing bridge infrastructure has been adapted and expanded to meet the requirements of greater structural capacity.

Keywords: Refurbishment, widening, strengthening, sustainability, .

1 Introduction

Bridge engineers have created some beautiful and effective structures that have stood the test of time. There is a real attraction to creating a bridge. It is more than just a structure, it is means for bringing communities together, to promoting trade and cooperation, to ending divides. Once they are built, they become a vital part of our infrastructure and we and we are reliant on them.

At the same time, the benefits of increased flow of people and goods may place further demands on the infrastructure and the capacity may become too little and throttle additional development. We have seen this with many crossings where radical intervention is required to increase capacity and meet this demand.

Historically, we designed structures for what we needed at the time. We built then to last for 100

years but only as far as durability is concerned. With a few notable exceptions, we rarely considered future capacity.

What usually stops this planning for the future is economics, but this can be a false economy; the cost of twinning or extensions to bridges run at many times the original cost. However, if capital is limited and there is uncertainty then there is some justification for such reticence. A case in point is the clever engineering for the Auckland Harbour Bridge. This was built in the early 1950s and the design made allowances for providing additional capacity in the form of the "clip-on" attachments to the deck which were added in 1969 to increase the capacity of the bridge. This work, planned at the original design stage, successfully resulted in a doubling of the traffic able to cross the bridge.