

Paper ID:74-32

The carbon footprint of long span bridges

Dr David Collings
david.collings@arcadis.com
Technical Director ARCADIS
Guildford, UK

ABSTRACT

The construction industry accounts for approximately 40% of worldwide carbon emissions with steel and cement productions each accounting for approximately 8%. Bridges are relatively carbon intensive within this emissions group. The carbon emission of bridges during their construction has been studied, this paper reviews the data published to date and highlights that relevant to long span bridges. For the purpose of this paper long span bridges are defined as those with spans of 200m or greater. The paper then considers this data together with some additional data by the author to show carbon emission trends for major long span bridges. The data is analysed to consider average values, variations and trends (particularly with span and bridge type). Many recent long span bridges have significant deep-water foundations, the paper considers the amount of carbon in foundations and superstructure for a number of bridges. Based on the findings the paper outlines the aspects of future major bridges that could be considered to reduce the carbon emissions of future long span bridges.

Keywords: Bridges, Carbon Emissions, Long Span, Multiple Span, Sustainability.

1 INTRODUCTION

Climate change issues and in particular the reduction of the carbon footprint of the structure is likely to be important for future long span bridges. The construction industry accounts for approximately 40% of worldwide carbon emissions with steel and cement productions each accounting for approximately 8%. Bridges are relatively carbon intensive within this emissions group (Collings, 2020). This paper reviews the published data for the carbon footprint of long span bridges and summarises the data for 200m to 2,000m spans. It also considers proposed structures which extend the data to 5,000m span. The paper is an extension of the authors wider research work on the carbon footprint of bridges (Collings, 2021) that outlines the carbon footprint of conventional road, rail and footbridges. This paper uses the same methodology as the previous study to estimate the carbon emissions.

2 DEFINITIONS

For the purpose of this paper long span bridges are defined as those with spans of 200m or greater. The span being the longest span within a multiple span structure (Figure 1). The length of the bridge is the length of the main long span bridge, excluding approach viaducts. For cable stay spans this is typically the distance between expansion joints (Figure 1a). For suspension bridges the length is typically from anchorage to anchorage (Figure 1b). For data on complete crossings including approach viaducts see Mullins and Collings (2022). The bridge width is the distance from parapet to parapet. For twin deck structures with a gap between decks an effective width is used to estimate the