Abstract
The economic growth being seen in Southeast Asia is driving a significant investment in infrastructure, particularly in the major cities of the region. Constructing elevated highways and railways in an already congested urban environment requires innovative solutions, adopting prefabricated modular construction techniques to form curved/longer span bridges and viaducts.

The form of these bridges challenges the engineer, but the adoption of computational design techniques has granted the designer a key tool which permits agility in determining the arrangement while simplifying the approach to optimisation.

Computational design and prefabrication are closely aligned with the drive for sustainability in construction. Large sections of the bridges are fabricated in a factory or workshop based on the same 3-D model prepared for delivery of the design. The efficient use of materials and resources becomes intrinsic to the design process in finding the most suitable form and geometry. The manufacturing process leads to less site-based plant and a smaller workforce, working in a safer environment.

Keywords: computational design, prefabrication, sustainable solutions.

1 Introduction
Infrastructure in Southeast Asia continues to grow at a rapid rate. Urbanisation and the need for rail and road links between major cities together with increasing congestion within these cities, are driving the need for major viaducts and longer span bridges across the region.

Viaducts have traditionally been constructed using precast beams with the deck being cast in situ. This form of construction works well in a rural environment where viaduct is straight, and the large beams can be handled and placed without impacting the local residents. In a congested city, the alignment is likely to be curved and the handling of long bridge beams far more challenging. Consequently, alternative approaches using segments rather than beams have been adopted, but this change comes with challenges as a segmental bridge requires different skill sets for both the designer and the contractor.

With there being more river crossings and sea crossings for new road and rail links, the need for long span bridges has risen significantly in Southeast Asia, with clients frequently requiring “landmark” structures that form a focal point to developments and infrastructure schemes. The complexity of such structures has to be addressed by the designer, who needs to satisfy the client with an elegant and aesthetically interesting bridge, while also meeting the demand for structural efficiency.

Computational design provides the designer with the tools to review a number of options in a small period of time and to quickly develop an optimised solution for both viaducts and long span bridges. It also provides the design engineer with the agility to