Chapter 6
Precast segmental span-by-span erection by
launching gantry

6.1. Introduction
Decks that are made self-supporting for self-weight span by span are by far the most common structural systems used for precast segmental viaducts. Unlike other systems, the contractor has little choice than to use overhead or underslung Launching Gantry (LG) when erecting such viaducts, unless it is possible to utilise ground-supported falsework. Decks are built span by span by stressing all segments of a span together with longitudinal prestressing cables, which run the full span length (refer to Section III, Chapter 15 for explanations about prestressing). Since such launching gantries need to be able to support the weight of an entire span, they are among the heaviest erection equipment used for bridge construction.

The method by which segments are joined and stressed together to make self-supporting spans has a direct impact on the LG’s performance criteria and configuration. The permanent work designer should understand the detail of how such bridges are built, since many design and detailing aspects are governed by construction considerations and not by in-service requirements. The contractor, when ordering a launching gantry, needs a good understanding of how the bridge they have to build works structurally, to enable them to order the right erection equipment (for details, refer to Section III, Chapter 15).

The content of this chapter is an extended version of a piece written for Structural Engineering International (Meyer, 2011).

6.2. Application range
Precast segmental bridge decks, which are built span by span, are used for spans from 20 to 60 m, deck widths from 5 to 24 m and span weights from 2000 to more than 20 000 kN. Typical range of application is between 30 and 50 m, with span weights between 2000 and 10 000 kN and segment weights between 300 and 1500 kN. These bridges can be classified according to how they are made self-supporting. As explained in Section III, Chapter 15, we can differentiate between three systems (Ganz and Meyer, 1997). The three systems are shown in Figure 6.1 with segmentation of the deck, the sequence of construction, the location of the construction joints and the layout of the longitudinal prestressing (in red).

6.3. General arrangement of the BDE
For erection of span-by-span precast segmental viaducts, a contractor has four options (A to D), as shown in Figure 6.2.
Figure 6.1 The three basic systems for construction of precast segmental bridge decks (VSL International)
Option A: ground-based falsework supporting segments underneath bottom slab and crane for handling of segments.

Option B: underslung gantry with pair of main girders supporting segments underneath their wings and segment loader or crane for handling of segments.

Option C: overhead gantry with pair of main girders for suspension of segments and for support of winch trolley for handling of segments.

Option D: overhead gantry with single main girder for suspension of segments and winch trolley for handling of segments.

Since the subject of this book is Bridge Deck Erection Equipment (BDE), the following explanations focus on underslung and overhead launching gantries and only a few comments are given about ground-based falsework. Ground-based falsework may be a valuable option for very small projects and for starting, end and odd spans on projects where the majority of spans are erected by gantries. Often such falsework systems need to be equipped with a pair of sliding beams to allow longitudinal movement of segments along the span to get segments into their final position, or at least for fine adjustment during joining.
6.3.1 Underslung launching gantries

Underslung LGs were originally developed for the erection of series of spans made up of box-girder segments with distinctive wing slabs, which are supported on single pier shafts with reasonably straight alignment in plan.

A typical underslung gantry is made up of the following main components (for illustration, refer to Figure 6.3).

A. **Brackets**: Pairs of brackets are attached laterally to the piers supporting the span to be erected. Normally a minimum of three sets are required per gantry. They are generally relocated by a crane. They are clamped against the pier shafts with high-tensile bars for transfer of bending moments and preferably transfer shear to pier by bearing and not by friction. Therefore often a pair of small recesses is needed at the pier top to enable such shear transfer. Brackets have mechanical components, which allow vertical, transverse, longitudinal translations and rotation about horizontal and vertical axes between the main girders and brackets.

B. **Pair of main girders**: They support precast segments of a span underneath their wings until they are stressed together to create a span. Main girders have a centre part, on which segments are moved along and then supported by, and a nose at each end, used for launching. Noses are tapered at the front to allow launching onto pre-placed brackets. The rear nose is sometimes omitted by provision of a pair of C-frames at the rear of the main girder. They run on the completed deck N when launching the gantry into span N + 1. In this case, the bridge deck has to be checked for the corresponding moving point loads and there is the need for running...