

C210/C215 High Speed Rail project - Taiwan



An unusual full span pre-casting alternative option to achieve the precast and installation of 563 full span segments of 740 t each.



▲ FSPC technique: a speed of erection faster than one bridge span per day.

Cast-in-place and pre-cast segmental structures are well known techniques in Taiwan; FSPC has been rarely used.

It promised the structural advantages of a single monolithic box girder for the double track (14m wide) plus a speed of erection faster than one bridge span per day.

The Taiwan High Speed Rail corridor runs on the western side of Taiwan from Taipei in the north to Kaohsiung in the south with a maximum speed of 300 km/h.

In the north, the first two sections (contract C210 and C215) were awarded to a joint venture of Obayashi and Fu Tsu who let a major sub-contract to a joint venture between VSL and Rizzani de Eccher.

Each casting line consists of two reinforcement jigs for the end diaphragms, one full length rebar jig for the primary steel cage, one casting mould, one storage area for second stage casting of derailment walls and an outside storage area for completed spans.

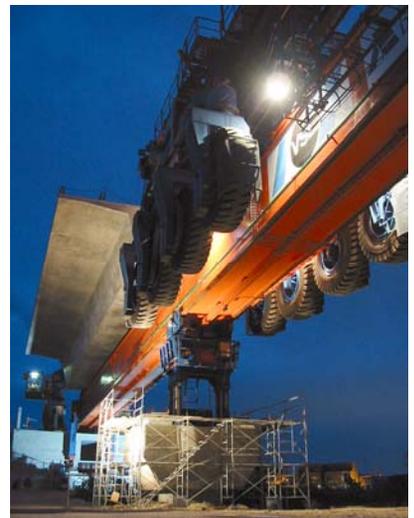
Work commenced on site in 2001 with the first pre-casting achieved in June 2002 and the first span's erection one month later.

Both the design of the spans and the casting yard have centered around a target peak cycle of 2 days per 30m beam per casting bed.

The yard is mostly covered by a purpose built factory consisting of 3 casting lines, each with the ability to operate independently.

Scope of works performed

- Full Span Precast & erection including formwork, reinforcing, concreting, pre-tensioning, post-tensioning, structural bearing & shear key installation for 563 number of box girders.
- Balanced cantilever construction of 7 post-tensioned cast in-situ bridges.
- Follow-up work, including production & installation of around 8000 numbers of precast parapets cast in-situ of cable troughs, derailment walls, OCS poles and guy wire foundations.
- Equipment supply: supply of all necessary plant and equipment.



▲ Day and night shifts

Two 55 tons overhead cranes service each factory's mould and one pair of 500 tons heavy lifting gantries moves completed spans into the storage area.

The addition of steam curing and release of the pre-tension jacks completes the 2 day casting cycle for the 700 tons, 30m-long box girders.

The transport and erection of such huge box girders is pivotal to the success of the FSPC method and was executed by one carrier, an overhead beam supported by two rotating 8 tyred bogies over a 45m span, and a support beam,



▲ Carrier deployed with 8 tyred bogies supporting an overhead beam

OWNER

Taiwan High Speed Rails Corporation

ENGINEER

T.Y. Lin International Taiwan

MAIN CONTRACTOR

Joint Venture between Obayashi and Fu Tsu

VSL Entity

Joint venture between VSL Taiwan and Rizziani de Eccher



▲ Three lines of casting beds

a 72m-long steel box girder. It moves crab-like over the stored box girders in the casting yard, lifts the unit to be erected and reverses from the casting yard where the

bogies are rotated 90°. It is then in a position to travel to the support beam, at a loaded speed of 4km/hr, along the previously erected viaduct.

On arrival at the new span's erection location, the carrier drives into the support beam with the front bogie straddling the beam and its top chord traveller. Jacks on the traveller raise the front of the carrier and the assembly of carrier and box girder is pulled out onto the support beam. At the stage where the box girder is suspended above its final position, the support beam is launched from underneath so that the box girder can be placed. The support beam is retracted slightly, the carrier reversed onto the newly place deck and returns for the next cycle.

Up to 14 spans have been placed in a week and up to 3 in a single day. Having completed the 7 free-cantilever bridges in situ along with the erection of 563 full-span segments (740 tonnes each), this innovative and challenging project was finished over 3 months ahead of the required and already accelerated completion date.



▲ The precast beam



▲ Self launching mould



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