“Ravine des trois bassins” Bridge in La Reunion Island. A successful application of extradosed prestressing

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1 PRESENTATION OF THE PROJECT

The outstanding viaduct crossing the Trois Bassins Ravine is on the key structures Route des Tamarins highway currently undergoing construction on Reunion Island (photo 1).

For architectural reasons and perfect integration into the landscape, a prestressed, single-cell structure was built Combining internal, external and extradosed tendons, a technique very seldom employed in France.

The geography of the site led to a very dissymmetric structure as the gap on the right bank of the ravine is wide and deep. From North to South, the length of the four spans are (diagram 2).

The deck is supported by three independent piers P1, P2, P3 with hollow oblong shafts of variable heights (48 m, 37 m and 8 from north to south).

The deck is a prestressed concrete single-box, 22 m wide, built by cantilevering from the piers. Transversally the wide cantilevers are stiffened by inclined steel struts. Extradosed tendons are placed over piers P1 and P2. The deck has a constant depth, with gussets over the piers. Typical cast in situ segments have a length of 3.60 m. The deck concrete is C60/75.

The deck is cast in two phases transversally (diagram 3):

- 1st phase: central core
- 2nd phase: overhangs and transverse prestressing.

Other than those already mentionned, this mode of construction has the following advantages:

- Lighter outfitting accessories and more cost-effective casting and prestressing.
- Simplification of the outfitting accessories, specifically for installation of brackets.

2 PRESTRESSING

For this Viaduct, EIFFAGE TP Prestressing Division used the DSI system. It comprised:

- Anchor prestressing of the emergency lanes (VSP) on the piers: cables 19T15S: Vertical cables anchored on the underside of the trimmer and in temporary blocks on the deck.
Diagram 2. North to South elevation.

Diagram 3. The deck is transversally constructed in two phases.

- **Prestressing of the cantilevers and splice cables:**
  12T15S and 19T15S cables; 160 tons of prestressing steel 316 anchor-blocks.
- **Transverse prestressing:** 4T15S cables, spacing 0.60 m, 63 tons of reinforcement with 1,200 anchorings. Sheats are flat, sleeved to the core/cantilever rework; the anchor-blocks are of the flat BBR type; grouting is performed with superstressem cement grout.
- **External prestressing:** 19T15S cable: 55 tons and 36 anchorings.
  - HDPE ducts
  - Petroleum wax grouting.
- **Extradosed prestressing:** 37T15S cables; a line of cables on the P2 mast and 2 lines of cables on the P1 mast.

Cables may be replaced one by one without disruption of traffic.

- 88 tons of T15.7 prestressing steel – 1,860 MPa – Galvanised, Sheathed, Waxed TBR.
- 37T15S type Dyna GRIP C37 anchor-blocks: anchor disk, wedges, ring nut, seals, elastomer damper, protection cover, damper vent located on the cable at the output of the deck.
- Deflection plate: oval formwork pipe, inside deflection pipe with vents and central nose.
- HDPE Connection/Anchoring: transition part between HDPE pipe and anchoring with expansion system.
- Fire protection: insulating product and external sheathing; finalising at the time of the worksite; original patented system easy to repair or to change after a fire and easily complying with standardised fire. Specific tests were carried at the CSTB.