



Photos Courtesy of Sacyr.

The Hisgaura Valley Bridge

The new bridge over the Hisgaura Valley in the Province of Santander, Colombia, is a part of the major highway improvements in the corridor Malaga-Curos. The crossing on Hisgaura Valley has presented challenges to the owner (INVIAS) with frequent landslides that cause road closures and require costly repairs. The owner decided to improve the 147-km long segment Malaga-Curos, which features road widening and a new alignment to replace the existing crossing over the Hisgaura Valley. The project is funded by the Fondo de Adaptacion. In 2013, Sacyr construction was awarded with project and retained **Pedelta** to design the three bridges, including a balanced cantilever girder bridge and a cable-stayed bridge, which is the centerpiece of this project. **Pedelta** was awarded the opportunity to develop the concept and produced a detailed design of the Hisgaura cable-stayed bridge in less than one year, including geotechnical investigation, and wind analysis and aeroelastic testing. Construction started in the beginning of 2015 and completion is expected by the end of 2018.

The Hisgaura Bridge is 653 m (2,142-ft) long continuous structure with a 330-m main span, 125-m side spans and two 36.5 m flanking spans in one side. The superstructure is a cast-in-place post-tensioned concrete deck with two edge girders that accommodates two lanes and sidewalks. The post-tensioned concrete light-weight deck system is extremely simple and efficient to allow a segment construction cycle of 5 days.

64 parallel strand stay-cables support the deck arranged in a harp pattern in two inclined planes. Cable anchorages are spaced at 10-m apart with floor beam spanning between edge girders at 5-m intervals. The construction of the deck is in balanced cantilever using a light-weight form traveler with 5 m long deck segments.

The elevation of the bridge is over 80 m above the bottom of the valley, with concrete pylons of 69 m above the deck. The two inverted Y-shape pylons have 142 and 125 m in height respectively. The two legs have a hollow rectangular cross-section of variable depth and are supported by deep foundations. Below the deck, the pylon has two permanent bracings. Construction of pier 5 m high segments uses climbing formworks and brackets, which are adapted to the tapered elevation. The partially cantilever deck are susceptible to wind buffeting and requires temporary restrains – tiedowns anchored at the pylon foundation – to ensure bridge stability against both wind and seismic actions.

The Hisgaura Bridge is designed in accordance with the 2012 AASHTO LRFD Bridge Design Specifications and stay cables in accordance with PTI specifications. The bridge is in a high seismic region. In order to reduce seismic demand, the bridge is seismically protected with preloaded viscous spring dampers that dissipate over 30% of the energy induced by a seismic event. The seismic design is in accordance with AASTHO Guide Specifications for LRFD Seismic Isolation Design.

Simple and efficient deck system allows 5 day segment construction cycle.

OWNER:
Fondo de Adaptacion - Colombia

DESIGNER:
Pedelta, Inc.

DESIGN-BUILD TEAM:
SACYR – **Pedelta, Inc.**

CONTRACTOR:
SACYR Construction

CONSTRUCTION ENGINEERING SERVICES:
Pedelta, Inc.

**CONSTRUCTABILITY REVIEW/
ESTIMATING SERVICES:**
CEI-Dessau

**CONSTRUCTION ENGINEERING
INSPECTION:**
CEI-Dessau

FORMWORK FOR PIERS AND TOWERS:
ULMA

**FORM TRAVELERS FOR
CAST-IN-PLACE SEGMENTS:**
Structural Technologies VSL

POST-TENSIONING MATERIALS:
Structural Technologies VSL

STAY CABLE MATERIALS:
Structural Technologies VSL

BEARINGS:
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