The bridge division of Louis Berger's design center of excellence in Santader, Spain presented the following design projects at the VI Congress of the Scientific-Technical Association of Structural Concrete (ACHE) in Madrid, Spain.

Viaduct over Genil River | Granada External Bypass, Spain
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, Guillermo Ortega

Louis Berger designed the viaduct over the Genil River, a highway bridge located at the Granada External Bypass in the south of Spain. The three-span, 110-meter-long bridge spans the river with an 80-meter-long tied arch. The 41.2-meter-wide superstructure includes three reinforced concrete arches – a central vertical arch and inclined arches on each side.

San Benito Viaduct | Pontevedra, Spain
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, Guillermo Ortega, José Manuel Martínez

The 171-meter-long, 3-span San Benito viaduct over the Lerez River is a high speed railway bridge near the city of Pontevedra in northwest Spain. The superstructure is a single cell box post-tensioned haunch girder, 6.25 meters deep at piers and 3.25 meters deep at the center of the middle span. The bottom slab of the box girder is 5.7 meters wide at piers, while the total width of the top slab is 14.0 meters. The webs are inclined and 0.6 meters thick.

The side spans were constructed using full shoring, and the 84-meters-long central span over the river was erected using the cantilever method, with each cantilevered segment built cast in place using traveler formwork. Cantilevered segments were joined by a 2-meter cast-in-place stitch.

Viaduct over the Guadalhorce River and the A-92 Highway | Malaga, Spain
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, Guillermo Ortega, José Manuel Martínez, Ricardo Rafael Pereira, Cristina Gaite

The Guadalhorce viaduct, designed by Louis Berger, is part of the high-speed rail line Antequera-Peña de los Enamorados in southern Spain. It stretches over 2,525 meters in length and consists of 49 spans, each 51.25 meters long. Situated in a medium-risk seismic zone, it is one of the longest bridges of its type in the country.

A continuous single-cell post-tensioned box-girder, 3.4 meters in depth, comprises the superstructure. The main span, which crosses the A-92 highway, is 90 meters long and is reinforced by two steel-tied arches. A delta-shaped post-tensioned concrete pier is designed and positioned to meet the frictional, braking and longitudinal seismic forces induced by the large length of the viaduct, and expansion joints are placed at both abutments.

Construction of the viaduct, currently underway, employs two self-launching formwork gantries working simultaneously to execute a span-by-span erection of the viaduct, starting from each abutment and moving toward the delta-shaped pier.

North Tarrant Expressway – East Segment | Texas, United States
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, Juan Francisco Martín Caracuel, Ricardo Rafael Pereira, Cristina Gaite, José Emilio Herrero (Ferrovial-Agromán), Rebeca Gómez (Ferrovial-Agromán)

The east segment of the North Tarrant Expressway extends 6.9 miles from the I-820 Northeast Interchange in Fort Worth, Texas, USA. Louis Berger's design doubles the existing capacity of the expressway by rebuilding the four to six existing main lanes and adding four-toll managed lanes plus frontage roads and auxiliary lanes. Construction started in late 2010 and is anticipated to reach substantial completion in mid-2015. All structures along the expressway consist of precast pre-stressed concrete girder bridges, with girder depth varying from 54 to 62 inches depending on span length and girder spacing.

Los Gallardos | Sorbas High Speed Railway Viaducts, Spain
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, Guillermo Ortega, Jorge de Vena

Three viaducts designed by Louis Berger have been built by means of a self-launching formwork gantry in the Los Gallardos – Sorbas segment of the high speed railway between Murcia and Almería in the southeast of Spain:

- Almocaizar Viaduct (534 meters long with a typical span of 51 meters).
- La Gloria Viaduct (381 meters long with a typical span of 51 meters).
- Los Giles Viaduct (360 meters long with a typical span of 48 meters).

Because the viaducts are located in a seismic region, the design strategy for managing longitudinal earthquake action includes hydraulic viscous dampers to dissipate energy in the abutments and sliding pendulum bearings for re-centering on the piers.

Analysis and Measurement of the Behavior of High Speed Railway Bridges
Speakers: Oscar Ramón Ramos, Marcos Pantaleón, David García Sánchez

Louis Berger performed measurement and analysis to link the experience accumulated by the Spanish Railway Administration (ADIF) during the last 20 years of high speed railway structures design with the actual behavior of structures once they are operative. Fundamental criteria such as expansion joint dimensioning, the performance of rail expansion devices, the behavior of piers facing horizontal forces, or the operation of sliding bearing support devices still present certain unknowns yet unresolved. To explore these issues, Louis Berger selected 100 bridges of different types and locations and performed monthly field tracings from December 2006 to the end of 2009.

Field work included:

- Pier base inspection.
- Measurement of the gap between deck and non-fixed abutment.
- Air and concrete deck temperature measurement.
- Bearing device inspection and relative pier-deck displacement monitor installation.
- Measurement of the verticality loss of the piers by topography.
- The relative movements of switch blades regarding references placed as a function of the rail thermal variations.

Louis Berger then compared field measured data with calculated values by applying current code regulations. To generate accurate statistical models and realistic conclusions, data had to be organized and classified, sufficient data to constitute a representative value according to statistical theory had to be collected, and data had to be physically coherent.

Using the collected data, diverse statistical inference models were developed by analyzing topics such as temperature strains based on section types and the possibility of increasing the free expansion length of bridges taking into account the existing types.