SYSTRA International Bridge Technologies (SYSTRA IBT) is a firm solely dedicated to bridge engineering. We are a wholly-owned subsidiary of the SYSTRA Group, a world leader in the design of transport infrastructure. IBT is a cornerstone of SYSTRA Bridges, a network of 350 bridge specialists deployed worldwide. SYSTRA Bridges encompasses IBT’s offices in the United States, Canada, and the Middle East, and SYSTRA’s bridge design hubs in France, Korea, and India.

SYSTRA’s experience in mass transit and infrastructure engineering includes projects located in 150 different countries throughout the world. IBT’s professionals have extensive experience in all facets of bridge engineering. Our clients include transportation authorities, general contractors, and multi-discipline engineering firms. We have been the Engineer-of-Record for both traditional design/bid/build and for design/build projects.

IBT’s specialized bridge types include cable-stayed, extradosed, and segmental concrete bridges. We are a world leader in metro and high-speed rail elevated guideway design.

SYSTRA Bridges brings references in suspension bridges, arches, and truss bridges. SYSTRA’s U-shaped viaduct design has been used to build 280 miles (450 km) of elevated guideway. SYSTRA is also a world leader in rail systems specialty engineering.

SYSTRA International Bridge Technologies emphasizes the importance of producing bridges tailor-designed for their site that are constructible and economical without sacrificing elegance. We aim to develop cost-saving concepts considering well-conceived construction methods, selecting suitable materials based on cost-effectiveness.
The Atlantic Bridge is a 3081 m (10,108 ft) long bridge near the city of Colón, Panama. The main cable-stayed unit has a central span of 530 m (1,738 ft) and provides a minimum vertical clearance of 75 m (246 ft) above the canal. Approach spans have lengths of 45 m (147 ft), 82 m (269 ft), and 125 m (410 ft). The 23.6 m (7.7 ft) wide deck carries four traffic lanes with emergency shoulders. The bridge has been designed for significant seismic forces resulting from a peak rock acceleration of approximately 0.8 g.

The cable-stayed spans consist of two parallel box girders connected with transverse diaphragms. The deck, which is built using the balanced cantilever method, is supported by two planes of stay cables anchored along its edges. The delta shape pylons extend 135 m (442 ft) above the roadway, and their legs are connected with a crossbeam directly under the bridge deck.

The approach span superstructure consists of a single-cell box girder with constant depth for the 45 m (147 ft) spans and variable depth for the 82 m (269 ft) and 125 m (410 ft) spans. The 45 m (147 ft) spans are incrementally launched, while the 82 m (269 ft) and 125 m (410 ft) spans are built in balanced cantilever using traveling forms.

Foundations consist of 1.8 m (5 ft) and 2.5 m (8 ft) diameter drilled shafts. Design-Bid-Build-Value Engineering.
The Ohio River Bridges-Downtown Crossing will connect Downtown Louisville to Southern Indiana. The new bridge will carry the northbound I-65 traffic immediately upstream of the existing Kennedy Bridge. The southbound traffic will be carried by the existing bridge.

The total length of the cable-stayed structure is 2,000 ft (610 m) with two main spans of 750 ft (229 m) providing a minimum clearance for the navigation channel of 680 ft x 71 ft (207 m x 22 m).

The 128 ft (39 m) wide superstructure carries six lanes of traffic and a 17 ft (5.2 m) wide pedestrian/bikeway. It is supported by two planes of stay cables anchored along the edges of the deck. The three pylons have vertical legs without any cross beams above roadway level.

This innovative concept was selected over 32 other alternatives as a result of a 15-month bridge type selection process with extensive public involvement. Design-Build.
The bridge over the Carlos Camacho Espíritu Boulevard (formerly Valsequillo Boulevard) is located in the city of Puebla, State of Puebla, Mexico. The 313 m (1,026 ft) long structure consists of a 105 m (344 ft) long north approach, a 173 m (567 ft) long cable-stayed structure, and a 35 m (115 ft) long south approach. The bridge alleviates traffic at one of the city’s most congested intersections. Both the cable-stayed structure and the approaches required special aesthetically pleasing designs as the bridge is located in one of Puebla’s main arteries.

The cable-stayed structure has an 84 m (275 ft) – 54 m (177 ft) – 35 m (115 ft) asymmetrical span arrangement. The pylon has a unique architectural shape, which provides a sense of inclination without actually being inclined. This is achieved by varying the dimensions on three of the five faces. The roadway is supported on either side by two shallow longitudinal concrete edge girders measuring 0.70 m (2.3 ft) deep. A grid consisting of two central 1.4 m (4.5 ft) deep steel beams and variable depth, steel transverse floor beams works compositely with the concrete deck slab to distribute forces to the edge girders. The variable depth and architectural openings in the transverse floor beams enhance the slender appearance of the deck.

The approaches are composed of 35 m (115 ft) long simply supported spans. The two central 1.4 m (4.5 ft) deep steel girders, the variable depth steel transverse floor beams, and the composite concrete deck from the cable-stayed span continue to form the superstructure for the approach spans. The use of this structural system provides visual continuity between the approach and the cable-stayed structure, and it provides the approaches with an equally slender appearance.

SYSTRA IBT was responsible for concept development—including the incorporation of all aesthetic requests—as well as final design and construction engineering.
The Samuel De Champlain Bridge spans the St. Lawrence River from Île-des-Sœurs to Brossard downstream from the original Champlain Bridge. The 34 km long bridge consists of three independent structures—one for northbound traffic, one for southbound traffic, and one for a transit corridor. The typical 50.255 m wide deck constructed by two 5 metre gaps between deck structures allows for 6 lanes of traffic, 2 lanes of a transit corridor, and a multiple-use-path. Each roadway deck consists of a constant depth, composite twin steel box girder with a precast concrete deck.

The 240 m cable supported main span crosses the St. Lawrence Seaway with a vertical clearance of 38.5 m above high water level. The three individual structures are connected by steel cross beams over the length of the main spans. The superstructure is supported by two planes of stay cables anchored in a twin leg pylon straddling the transit corridor. The lower pylon is made of precast, match-cast concrete segments, while the upper pylon is cast-in-place. The back span for the cable-stayed bridge was erected on falsework, and the main span was erected segmentally in one direction with a lifting system on the deck. The pylons and piers for the cable-stayed structure are supported on piles socketed into the rock.

The approach spans are continuous with four to seven spans per unit. The typical approach span length is 80.4 m. A 109 m span is required for crossing Route 132 at the east end of the bridge. The approach spans is supported on unique piers with twin inclined legs. The pier legs are made of precast, match-cast concrete segments that are connected with post-tensioning tendons to a steel pier cap. The piers are are generally supported on precast concrete spread footings keyed into the rock. The approach spans are erected with floating cranes. The steel girders are spliced to limit the maximum lifting weight at 85 t. Design-Build.
The Charles W. Cullen Bridge carries the SR1 Coastal Highway across the Indian River Inlet in Delaware. The roadway includes four lanes of traffic with shoulders, a 12 ft (3.6 m) sidewalk, and a sand bypass system. The bridge is divided into a 1,750 ft (533 m) long cable-stayed span unit and 850 ft (259 m) long approach spans. The cable-stayed main span is 950 ft (289 m), providing a minimum horizontal clearance of 900 ft (274 m) for the Inlet. The required vertical clearance over the 200 ft (61 m) wide navigation channel is 45 ft (14 m) with a maximum grade of 4% for the roadway profile.

The superstructure components include edge girders, floor beams, and a concrete slab. It is supported by two planes of stay cables anchored in the edge girders. The stay cables are anchored in two vertical reinforced concrete pylons with steel beams connecting two opposite stay anchorages to resist tensions across the pylon section. The floor beams and edge girders are post-tensioned. The top slab is also post-tensioned longitudinally in the vicinity of the transition piers and the center portion of the main span. The foundations for the main span unit consist of 36 in x 36 in 914 mm x 914 mm pre-stressed piles. The cable-stayed spans were built on falsework over land and in cantilever with a travelling form for the portion of the main span located over water. Design-build project.

AWARDS:
2013 American Segmental Bridge Institute Award of Excellence
2013 American Council of Engineering Companies National Recognition Award
2013 ACEC, Delaware Chapter, Grand Conceptor Award
2013 AGC of America, Alliant Build America Best Design-Build Highway & Transportation Project
2012 American Society of Civil Engineers, Delaware Chapter Outstanding Large Project of the Year

ESSENTIALS:
Owner: State of Delaware Department of Transportation
Design-Build Contractor: Skanska USA
Prime Consultant: AECOM
Year Completed: 2011

SYSTRA IBT’s Role:
Subconsultant for cable-stayed spans
• Concept Design
• Detailed Design in association with AECOM
The Coast Meridian Overpass follows the alignment of Coast Meridian Road and serves as a critical transportation link between the north and south of Port Coquitlam, British Columbia. It includes a new structure over the Canada Pacific Railway yard and Lougheed Highway. The overpass carries four traffic lanes, a central median divider, bicycle lanes in both directions, and a sidewalk on the west side. The 23.8 m (78 ft) wide superstructure consists of twin steel box girders connected with floor beams and composite precast concrete deck panels with a reinforced concrete overlay. It is supported by a central plane of stay cables anchored in steel pylons within the median.

The structure is 580 m (1,902 ft) long with six spans of 102.5 m (336 ft), 125 m (410 ft), 110 m (360 ft), 125 m (410 ft), 71.4 m (234 ft), and 46.5 m (152 ft). The bridge is supported on multi-column reinforced concrete bents and 2 m (6.5 ft) diameter piles.

In order to maintain railroad operations, the bridge was push-launched from the south abutment. This included a 40 m (131 ft) long launching nose and temporary stay cables ahead of the lead span. At the time of construction, the 125 m (410 ft) clear launched span was one of the longest on record in North America. After completion of launching, permanent stay cables were installed and partially stressed. Then, the concrete deck and deck furniture were installed, and the stay cables were re-stressed.

Launching operations were successfully executed and resulted in no unanticipated closures of the railway yard. Construction was completed on schedule; and the bridge opened in March of 2010, completing a vital link for the community. Design-build project.

This project has received the following awards:
- 2011 ACEC Canadian – Award of Excellence in Transportation
- 2012 ACEC California – Honor Award in Engineering Excellence

**ESSENTIALS:**

Owner: City of Port Coquitlam, British Columbia, Canada
Design-Build Contractor: SNC-LAVALIN
Year Completed: 2010
SYSTRA IBT’s Role: Detail design and construction engineering.
The award-winning Eleanor Schonell Bridge across the Brisbane River in Australia connects Dutton Park to the University of Queensland campus. The 20 m (66 ft) wide bridge carries two lanes of traffic and two sidewalks with canopies for pedestrians and bicycles. It is designed to accommodate a future light rail track.

The main cable-stayed bridge consists of a 183 m (600 ft) main span and 30 m (98 ft) and 73 m (240 ft) side spans. Two planes of stay cables in a “harp” arrangement support the steel-concrete composite superstructure. The concrete pylons rest on concrete pile caps at water level. The pile caps are supported by 1.5 m (4.9 ft) diameter bored piles.

SYSTRA IBT developed the structural design for the cable-stayed spans in association with GHD. This design-build project was completed on an accelerated schedule with design starting in February 2005 and construction substantially complete in September 2006.

This project received the following awards:
- 2008 ACEC/CELSOC Golden State Award – Highest honor for projects engineered in the State of California
- 2008 ACEC Honor Award – Excellence in Engineering Design

ESSENTIALS:

Client/Owner: City of Brisbane
Contractor: John Holland
Prime Consultants: GHD
Year Completed: 2007
SYSTRA IBT’s Role:
Detailed design and construction engineering for cable-stayed bridge, technical assistance on site.
The Hale Boggs Memorial Bridge, which crosses the Mississippi River at Luling in St. Charles Parish, Louisiana, opened in 1983 as part of I-310 and was the first major cable-stayed bridge built in the United States.

The main structure is 2,745 ft (837 m) long with a main span of 1,222 ft (372 m) providing a navigation channel of 1,187 ft x 133 ft (362 m x 41 m). The bridge deck is 82 ft (25 m) wide and carries four lanes of traffic with a full shoulder on each side. During several inspections, corrosion was discovered in the original stay cable system composed of parallel ⅛” wires (up to 307 wires per cable).

SYSTRA IBT developed a cable replacement strategy that minimizes impact to traffic and modifications to the existing structure. The stays have been replaced with a modern parallel strand system with superior durability and maintenance characteristics. A system of temporary cables and saddles on top of the pylons enable the bridge to remain in service throughout the stay replacement procedure without the need for load restrictions.
The Hodaryiat Bridge connects the Abu Dhabi southern coastline to the Hodariyat Island coastline. The 1.3 km (4,265 ft) long bridge provides a 29 m (95 ft) vertical clearance for the 170 m (557 ft) wide navigation channel. The superstructure carries six lanes of traffic and two walkways. It consists of a 36.3 m (119 ft) wide single cell precast segmental concrete box girder with stiffening struts inside and outside the box.

The 200 m (656 ft) long main span is supported by a single plane of stay cables within the bridge median. The foundations consist of 1.2 m (3 ft) and 1.5 m (4 ft) diameter drilled shafts socketed into the bedrock. The 55 m (180 ft) long approach spans are built by incremental launching from the abutments, while the main spans are built in balanced cantilever using a beam and winch system.

The approach piers are made of precast segments cast by the long-line method. The pile caps are formed with permanent precast shells supported by the pile casings. Construction started on site in January 2009 following the design-build contract award the previous September. Formal handover took place just 27 months later, in April 2012. Design-build project.

**ESSENTIALS:**

**Client:**
Abu Dhabi Department of Transportation

**Owner:**
Tourism Development & Investment Company

**Design/Build Contractor:**
Overseas AST / VSL Joint Venture

**Year Completed:** 2014

**SYSTRA IBT’s Role:**
Detailed design and construction engineering.
The Lewis and Clark Bridge completes a limited access bypass around the city of Louisville. The new bridge links Kentucky Highway 841 to Indiana Highway 265, creating an alternate route across the Ohio River.

The total length of the cable-stayed structure is 2,280 ft (695 m) with a main span of 1,200 ft (365 m) providing a minimum clearance for the navigation channel of 900 ft x 71 ft (274 m x 22 m).

The 124 ft (38 m) wide superstructure carries six lanes of traffic and a 13 ft (4 m) wide pedestrian/bikeway. It is supported by two planes of stay cables in a harp arrangement anchored along the edges of the deck. The pylons have an arched diamond shape and adhere to the strict height limitations established by local stakeholders.

This project was constructed as part of a DBOM (Design-Build-Operate-Maintain) procurement.
This is a signature structure on the long awaited roadway between Montreal and Laval in Quebec, Canada. The Oliver-Charbonneau Bridge is a 7.2 km (4.5 mi)-long toll road between Boulevard Henri Bourassa in Montréal and Highway 440 in Laval.

The 1.2 km (0.75 mi) main bridge consists of a plate girder approach with continuous spans up to 96 m (315 ft) and a 512 m (1678 ft) long cable stayed structure with a 280 m (918 ft) long main span. The 36 m (118 ft) wide bridge superstructure consists of a steel-concrete composite deck supported by two planes of stay cables in a fan arrangement along the edges. The stay cables are anchored in vertical concrete pylons supported on drilled shaft foundations with pile caps at water level. Rocker links are used at each end of the cable stayed spans to anchor the superstructure and allow for longitudinal deck movement.
This bridge, which connects the municipalities of Pitt Meadows and Port Coquitlam, is part of the North Fraser Perimeter Road in Vancouver. The bridge was constructed within the existing right-of-way and allows free passage of marine vessels without disrupting the flow of traffic on Highway 7.

The roadway allows for seven lanes of traffic and a bike path, and it has a provision for a future eighth traffic lane. The superstructure width varies from 40.5 m to 48 m (133 ft to 157.5 ft) in the initial configuration. The main river crossing consists of a three-span cable-stayed bridge with a 190 m (623 ft) main span. The bridge superstructure consists of a steel-concrete composite deck supported by three planes of stay cables in a “harp” arrangement. The bridge is supported on large diameter piles anchored in the till with pile caps at water level. The bridge was completed on-time and on-budget, and it opened to traffic in the fall of 2009. Design-build project.

**ESSENTIALS:**

| Client/Owner: Ministry of Transportation, B.C., Canada | Year Completed: 2009 |
| Design-Build Contractor: Kiewit Corporation | SYSTRA IBT’s Role: Detailed design and construction engineering for the main bridge, technical assistance on site. |
| Prime Consultants: ND LEA Inc., Associated Engineering | |
The 2,073 m (6,801 ft) long Port Mann Bridge carries the Trans Canada Highway (TCH) with ten lanes of traffic across the Fraser River in Vancouver, British Columbia. The crossing includes an 850 m (2,789 ft) long cable-stayed main span unit with 1,223 m (4,012 ft) long precast concrete segmental box girder approaches. The cable-stayed structure includes a 470 m (1,542 ft) main span and 190 m (623 ft) side spans. The 65 m (213 ft) wide superstructure consists of two five-lane decks separated by a 10 m (32 ft) median where the central pylons are located.

Each separate roadway is supported by two planes of stay cables and consists of a composite structure of steel edge girders and floor beams with precast concrete deck panels. The single mast concrete pylons house anchorages for all four planes of cables. The pylons reach a height of about 160 m (524 ft) over the water, with the upper 40 m (131 ft) reserved for the composite steel-concrete stay anchorage housings. The approach spans consist of three parallel precast segmental box girders built by cantilever construction above the water and by span-by-span construction on land.

Foundations for the Port Mann Bridge are generally 1.8 m (5.9 ft) steel piles or 2.5 m (8.2 ft) drilled shafts supported on a firm ground till layer under the loose sand deposits at a depth below the river. Design-build project.
The Puente de la Unidad, a signature bridge that crosses the Santa Catarina River in Monterrey, Mexico, is an asymmetrical structure with a cable-stayed span of 187 m (613.5 ft) carrying four lanes of traffic and a central walkway.

The total bridge length is 304 m (997 ft), with the central pylon inclined at 60 degrees partially balancing the weight of the main span. The width of the bridge varies between 24 m and 33 m (79 ft and 108 ft).

On and off ramps merge onto the bridge on each side of the pylon. The bridge superstructure is supported along its sides by 13 sets of stay cables with a “harp” arrangement. The superstructure consists of longitudinal concrete edge beams, transverse steel beams, and a concrete slab. The pylon design allows traffic on the roadway parallel to the river to pass directly through the base of the pylon.

The bridge construction scheme was unidirectional cantilever with traveling forms and moveable supports.

The bridge’s special aesthetic features include architectural lighting and the use of white concrete. The bridge was built on a fast track schedule with start of design in October 2001 and completion of construction in September 2003.

In 2004, the project received the prestigious Grand Award for Excellence in Engineering Design from the American Council of Engineering Companies (ACEC) and the top Award in the Bridges Category from the Post-Tensioning Institute (PTI).

**ESSENTIALS:**

Client: Petróleos Mexicanos (Pemex)
Owner: State of Nuevo León Secretary of Communications and Transport
Contractor: Grupo Garza Ponce and VSL Corporation

SYSTRA IBT’s Role: Detailed design and construction engineering for the cable-stayed bridge, technical assistance on site.

General Consultant: Sistemas Óptimos Constructivos, S.A. (SOCSA)
Year Completed: 2003
The Zaragoza Bridge is located in the city of Puebla, Mexico. It is a 645 m (2,116 ft) long structure that consists of a 125 m (410 ft) long north approach, a 145 m (475 ft) long cable stayed bridge, and a 375 m (1,230 ft) long south approach. The bridge will provide fast access to the historic Forts of Loreto and Guadalupe area as well as to a newly built convention center.

The cable stayed bridge has a special architectural shape. It consists of twin A-shaped inclined concrete pylons, 2.0 m (6.5 ft) deep concrete edge girders, and a composite steel beam/precast concrete slab deck passing in between the pylon legs. The inclined pylons are supported by three levels of horizontal stays that balance the horizontal forces transmitted by the inclined stays. The substructure consists of a concrete pedestal over bored pile foundations and pile caps.

The approaches are integrated by eight 62.5 m (205 ft) long spans with a 3.5 m (11.5 ft) deep precast segmental concrete box beams. The connection of the superstructure to the reinforced concrete columns is monolithic. The substructure consists of bored reinforced concrete piles and a pier cap. The approaches are built using the balanced cantilever method with ground based cranes. Half of the end spans will be cast in place. Design-Build.

**ESSENTIALS:**

**Owner:** Gobierno del Estado de Puebla, Secretaría de Infraestructura

**Design/Build Contractor:** CODESA

**Year Completed:** 2012

**SYSTRA IBT's Role:** Detailed design and construction engineering, technical assistance on site.
The Veterans’ Glass City Skyway carries six lanes of I-280 traffic over the Maumee River in Toledo, Ohio. The project includes a 2 x 612 ft (186.5 m) span cable-stayed main bridge. The total bridge area for the main span, approaches, and ramps is 1.2 million square feet (111,540 m²). The entire bridge superstructure was built using precast segmental construction. The ramps, approach spans, merges, and main span backspan were erected span-by-span with overhead and underslung gantries. The front main span was built in unidirectional cantilever using mobile cranes.

**ESSENTIALS:**

- **Client/Owner:** Ohio Department of Transportation
- **Designer:** FIGG
- **Contractor:** FruCon Construction Company (Bilfinger Berger)
- **Year Completed:** 2007
- **SYSTRA IBT’s Role:** Construction engineering of approach structures and cable-stayed main span.