

Merit Award: Short Span

Garden State Parkway Interchange 159

Bergen County, New Jersey



Improvements to Garden State Parkway Interchange 159 in Bergen County, New Jersey, provide a much-needed direct connection between the southbound Garden State Parkway and eastbound I-80, an important commuter route to New York. Previously, this was a circuitous route taken either through several local streets or via NJ Route 17. This project has relieved severe peak-hour congestion on local streets as well as regional congestion extending to NJ Route 17.

The new ramp alignment includes an eight span, continuous, sharply curved, and horseshoe-shaped 834' long curved monocell steel trapezoidal box girder superstructure with a radius of 230'.

Opened to traffic in January 1998, this bridge is the first monocell box girder vehicular bridge in New Jersey. The solid stainless steel reinforcement used in its deck was also another first in New Jersey. This usage represents the largest quantity of stainless steel reinforcement in a transportation project in the United States.

The project was completed six months ahead of schedule and at a total cost of \$8,339,000, less than one percent over the bid amount of \$8,260,000. This slight increase was due to additional roadway barriers.

Several innovative features were incorporated into the project to address the many challenges posed during design and construction phases. Providing for thermal movements without introducing large stresses was a major challenge in such a sharply curved structure. The superstructure was designed with fixity at the abutment ends only, therefore allowing for unrestricted thermal movements at all other interior supports. At the same time, seismic movements and forces had to be accommodated without penalizing only the abutments. We developed a method that would both engage one of the interior piers to share seismic forces

while still allowing for design thermal movements. The deck slab is the top flange of the box structure and for economics, a non post-tensioned reinforced concrete deck slab was also specified. Recognizing that future deck slab replacement would be impossible without closing the bridge a new method to extend the life of the deck was necessary. This resulted in the use of solid stainless steel reinforcement for the deck slab at a small increase in initial cost.

Community involvement meetings were held and a great effort was expended to assuage the concerns of the several immediate neighbors to the project. As a result, restricted hours for steel H-pile driving, monitoring vibrations during pile driving and the construction of a permanent detour route for oversized vehicles on an adjacent property were all incorporated. Special architectural treatments were specified within the substructure in order to enhance the appearance of the box girder, and paint schemes were carefully considered to achieve the best adaptation of the structure to the environment.

This complex yet aesthetically pleasing structure was built well ahead of schedule due to the environment of teamwork that prevailed among the designer, client, and contractor for the entirety of the project.

The first curved steel monocell box girder vehicular bridge in New Jersey was successfully constructed with no significant problems and opened to traffic, providing a much needed link between two major commuter routes.

The Garden State Parkway (GSP) is, at once, both a major north-south route on Interstate Route I-80, as well as a major east-west route intersect in Bergen County—a densely populated area of northern New Jersey. Until completion of this ramp, the southbound GSP had no direct connection to eastbound I-80. The previous, indirect circuitous connection was through several local streets and signalized intersections, or via NJ Route 17, another heavily traveled commuter route. This created a source of severe morning peak hour congestion on the affected local streets. Regional traffic on the already congested NJ Route 17 was seriously affected by commuters bound for New York who used Route 17 to access Route I-80. Various studies firmly established the need for a direct link between the two arteries.

The new direct connection ramp from the southbound GSP to eastbound I-80 is an extension of the existing off-ramp at Interchange 159. The new ramp passes



under the I-80 bridge in the westernmost span, runs parallel to the southbound GSP and curves sharply in a loop to connect with eastbound I-80. The single lane ramp crosses over a light industrial area on a sharply curved viaduct with a 230' radius.

The new off-ramp crosses the existing I-80 overpass structure under its westerly span. The existing west abutment is a stub abutment on steel H-piles. The front row of piles is battered and the vertical underclearance in this span is limited. Therefore, retaining the large sloped fill, in order to construct the new ramp, posed another challenge. This was overcome by construction of a cast-in-place soil nailed retaining wall, another first in New Jersey roadway construction.

The ramp structure is an 875' long (measured along the centerline) horseshoe shaped eight span continuous steel monocell trapezoidal box girder made composite with a cast-in-place reinforced concrete deck slab. The 24' roadway is superelevated at 6% and has 1'6" barrier curbs on each side. The box girder web plates are spaced at 12'6" on centers at the top, resulting in 7'3" wide deck overhangs.

The span arrangement (measured along the bridge centerline) consists of

six interior spans of 118'5" each with end spans of 78'9" and 85'9". The vertical profile of the ramp is a constant 0.5% upgrade ascending from the GSP to Route I-80 EAST BOUND.

The semi-stub abutments are conventional reinforced concrete, supported on 140 ton capacity steel H-piles. Tapered solid wall piers, shaped to accentuate the trapezoidal shape of the superstructure, also have special architectural surface treatment.

Project Team

Owner	New Jersey Highway Authority (Garden State Parkway)
Designer	Parsons Brinckerhoff-FG
Steel Fabricator	Tampa Steel Erecting Co.
Steel Detailer	Tensor Engineering Co.
Steel Erector	Archer Steel Construction Co., Inc.
General Contractors	Railroad Construction Co. (The RCC Group)

