NATIONAL STEEL BRIDGE ALLIANCE

2001 Prize Bridge Award

WINNER:
MOVABLE SPAN

Ninth Street Bridge

over the Gowanus Canal
New York, NY

The Ninth Street Bridge is a new tower-drive vertical lift span with a main span length of 82′. The span was designed to provide a channel width of 60′ and a vertical clearance of 60′ above mean high water when open. The bridge provides three lanes of traffic and two 7′-6″ sidewalks connecting to the area city street grid. The lift span has steel multi-girder framing connected to a welded box lifting girder at each end. The box girders as well as the longitudinal girders are shaped to conform to the unsymmetrical street profile and cross-slope. The roadway deck is a half-filled steel grid. The sidewalk decks consist of a stiffened steel plate with an epoxy grit wearing-surface.

The two steel towers at each end of the bridge consist of four columns each connected at the top with cross girders supporting the machinery rooms. The counterweight sheaves were made larger in diameter than normal to provide adequate space between the counterweight and the lift span for machinery room access stairs. This arrangement optimized the use of space and thereby minimized the tower size. The lift span length was maximized and the structure was visually streamlined by use of compact steel towers. The operator's room is cantilevered from the southwest tower out over the roadway for optimal sight lines through the congested bracing system of the elevated subway.

Additional features included traffic control equipment and gates, highway and utility work, as well as construction of bulkheads and a pier protection system. The pier protection system consisted of stone-filled sheet pile cells along with greenheart timber dolphins and wales. Greenheart timber was used to maximize the life of the system and thereby eliminate the need to drive piles in the area for a long time to come.

Height of Lift Maximized within Site Constraints

Maximizing the height of lift was necessary in order to allow passage of vessels with tall masts and meet Coast Guard permit requirements. A 5′ clearance between the top of the new bridge and the bottom of the overhead bridge

was deemed the minimum acceptable for maintenance purposes. Since height of lift is the same as the distance the counterweight travels, counterweights located over the roadway, as is conventionally done, would limit the height of lift. In the conventional configuration, the counterweight reaches a point close to the roadway level when the span is fully raised. By using four independent counterweights consisting of compact steel boxes containing cast iron and lead located at the corners of the bridge outside of the roadway, the counterweight travel was increased. A further limiting factor to the height of lift is the splay of the counterweight ropes at the sheave. By arranging the ropes in a single row on a widened counterweight sheave without lateral splaying of the ropes, the distance between the lifting girder and the sheave in the fully raised position was minimized. With these two innovative features, the channel vertical clearance was increased to 60′ with the span open.

Constructability

The overhead structure and needs of navigation limited erection procedures for structural steel and machinery components. The tower cross girders provided a work platform which was used to erect the machinery room framing. Provisions for installation of the 20-ton sheaves 5′ below the TA structure were incorporated in the steel framing of the towers. Temporary steel roof extensions were added to lift the sheaves and move them into position at the top of the towers. The framing system designed allowed the contractor the option of either floating in the span or erecting it in the open position while continuing to allow navigation to pass below. Due to geometric constraints of the adjacent bridges, the float in option was not chosen. The lifting girders were hung from the counterweight ropes and longitudinal girders were erected sequentially. Access for the grating installation and completion of the lift span was readily available via the permanent stairways in the towers. Temporary weights were added to balance the span when lowering it for the first time to place the grating infill with the span down.

Owner
New York City Department of Transportation, New York, NY

Structural Engineer
Hardesty & Hanover, LLP, New York, NY

Steel Detailer
John Metcalfe Company, Monroeville, PA (AISC & NISD members)

Steel Erector
American Bridge, Pearl River, NY (NEA member)

Joint Venture General Contractor
Schiavone Construction Co./August C. Lozano P.E., Inc., Secaucus, NJ

Software
M Strudl