

Othmar H. Ammann

By Darl Rastorfer

Othmar H. Ammann's most significant bridges were designed for the New York metropolitan region: the George Washington, Bayonne, Triborough, Bronx Whitestone, Throgs Neck, and Verrazano-Narrows Bridges. Two of them, the George Washington and Verrazano-Narrows, boasted the world's longest clear span when they opened in 1931 and 1964, respectively. All are visually eloquent, technically advanced, and cost-competitive, which is why Ammann is one of the 20th century's greatest civil engineers.

The Early Years

Interestingly, he was a late bloomer. Ammann designed his six most important bridges at the end of his career. During his first twenty years of practice, Ammann moved from job to job and distinguished himself as an outstanding project manager, but did not design a structure or express an interest in becoming a designer. Ammann was in his mid-forties when he first tried his hand at bridge design.

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Born in Switzerland in 1879, Ammann earned a degree in civil engineering from the Federal Polytechnic Institute in Zurich. One of his professors, Karl Emil Hilgard, regularly traveled to observe engineering practice in the United States. He claimed that young engineers in the U.S. were given responsibilities available to only "gray beards" in Europe. Hilgard encouraged his students to go to the States



Othmar H. Ammann, 1961. The 82-year-old bridge designer stands on the George Washington Bridge during the construction of the lower deck. (Photographer unknown; courtesy of the Port Authority of New York and New Jersey)

and practice for one or two years. Upon graduation, Ammann worked briefly in Switzerland and Germany before following his professor's advice.

He arrived in New York City with a special interest in long-span steel bridges, and managed to land a succession of jobs with private firms and steel companies that designed, detailed, fabricated, and constructed long-span steel structures.

Six years later, while working as a consultant in Philadelphia, Ammann met Gustav Lindenthal, a gregarious, colorful, and prominent long-span bridge designer whose influence would change Ammann's life. Lindenthal was completing the design of the Hell Gate Railroad Bridge in New York when he and Ammann became acquainted. Impressed by the younger engineer, Lindenthal asked Ammann to serve as his chief assistant once construction began on the bridge. Ammann came to look upon Lindenthal as a mentor, and was delighted to join his practice.

Lindenthal and Ammann made a splendid team. Lindenthal was a visionary who maintained good relationships among clients; Ammann's meticulous management practices kept work on schedule and within budget. Completed in 1917, the Hell Gate Railroad Bridge was a triumph. Unfortunately, America entered WW I three months after the bridge opened, bringing an end to nearly all civil projects. With no contracts to sustain the practice, Lindenthal helped Ammann find a position as the manager of a clay-mining operation in New Jersey. During the same period, Lindenthal revived and re-designed a bridge project he first conceived in 1896 – a structure intended to span the Hudson River at New York.

A Turning Point

When the war ended, the railroad companies backing Lindenthal's Hudson



Ammann's proposal for a Hudson River crossing as first presented to the public in 1924. (Rendered by Othmar H. Ammann, 1923; courtesy of Margot Ammann-Durrer)

project instructed him to detail the design, estimate costs, and publicly promote the scheme. Ammann returned to Lindenthal's office the same year, to work on construction details and traffic studies. Many Manhattan residents were passionately opposed to the trussed-cable suspension bridge, with its double-deck

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road system that had sixteen automobile lanes on the top level and twelve railroad lines on the lower deck: The bridge would bring an enormous volume of motor traffic to a section of the city where streets were already clogged with cars, trolleys, and trucks. Costs were working against the project too. As time passed, the estimated budget had to be adjusted upward and now stood at an eye-popping \$500 million (the equivalent of \$5 billion in 2004). When Ammann diplomatically approached Lindenthal and suggested that perhaps some adjustments were in order, Lindenthal soundly rebuffed him, refusing to reduce the gargantuan scale of the bridge or change its location to a less populated, less contentious site.

Lindenthal's office was running out of money as the approval process dragged

on. Ammann agreed to a greatly reduced salary with the understanding that the withheld pay would be reimbursed, and a partnership in the firm would be granted, once the contract for the construction phase was signed. For years he had longed for a partnership with Lindenthal, but now came to recognize that the Hudson project was doomed. He considered three options: he could leave Lindenthal's office and find a job with a New York firm that did smaller, more conventional civil engineering projects; he could return to Switzerland and find a position there; or, he could gamble with the riskiest career move of his life... strike out on his own. With little left to lose, the characteristically conservative Ammann left Lindenthal, and in March, 1923 began to work independently on the first bridge he ever designed... his own proposal for a Hudson crossing.

Over the next eighteen months, Ammann designed, developed, and promoted a suspension bridge that was cost-conscious, practical, and disarmingly simple. It connected the relatively unpopulated northern end of Manhattan with Bergen County, New Jersey. This site avoided a contentious midtown location and placed the bridge where land prices were low. The scheme played down train transit, recognizing that railway expansion was leveling off, while automobile and truck traffic was on the rise. The proposal called for a single suspended deck designed



The George Washington Bridge after the completion of the lower deck in 1962. The bridge was designed for two decks, but only needed an upper deck during its first thirty years of service. (Photo, Jet Lowe; courtesy of the Library of Congress, HAER Collection)

to become a double-deck bridge when traffic volume justified more capacity. To economically engineer its 3,500-ft. central span (nearly twice that of the Brooklyn Bridge), Ammann applied the largely untested deflection theory in the design of the shallow suspended roadway. The estimated construction cost of Ammann's scheme was \$40 million (equivalent to approximately \$423 million today). Ten bridges patterned after Ammann's scheme could be built across the Hudson for the cost of a single Lindenthal bridge!

Lindenthal and Ammann were not the only engineers with proposals. Schemes for tunnels and bridges at other locations were all competing for investment dollars and governmental backing. As a single practitioner with no financial partners, it seemed unlikely that Ammann would prevail. He had, however, produced a brilliant design. In addition, the current governor of New Jersey, George Silzer, served on the board of directors of the clay operation Ammann previously managed. Ammann drew upon that acquaintance, and presented his design to Silzer. Silzer and Lindenthal had a long and collegial relationship, and Lindenthal was counting on Silzer to support his scheme. But, Ammann's plan better worked to Silzer's long-term political advantage. Silzer began promoting Ammann's proposal from behind the scenes. The news media, general public, and

elected officials on both sides of the Hudson were soon aligned with Ammann's plan too. The state legislatures of New York and New Jersey each authorized the proposal, and handed responsibility for constructing and operating the bridge to the recently chartered Port Authority of New York and New Jersey.

Ammann had produced the winning scheme, but was sidelined as a participant in its construction until Governor Silzer arranged for Ammann's appointment as the first Chief Engineer of the Port Authority of New York and New Jersey. Over the next thirty-five years, the Port Authority and New York's Triborough Bridge and Tunnel Authority, for which Ammann also served as Chief Engineer, undertook numerous large-scale civil engineering projects. Ammann's position meant that the design of the authorities' projects came to him uncontested. His first four long-span bridges, and the design of the Lincoln Tunnel, were done as an in-house Chief Engineer.

Ammann resigned in 1939, and began a private practice with Charles Whitney in 1947. Through Ammann & Whitney, Ammann designed his final two structures, the Throgs Neck Bridge and the Verrazano-Narrows Bridge.

The Legacy of a Master Builder

The story of the engineer's emergence and staying power on the world stage may seem startling, but Ammann was superbly qualified to step into the role of master builder, a term that implies a mastery of design as well as a mastery of construction. His construction knowledge and skills were



The George Washington Bridge began its service with a single-level roadway supported from below by a ribbon-like girder-truss. (Photographer unknown, courtesy of the Library of Congress)

firmly established before he broke from Lindenthal. Other qualities that impacted his success as a designer were also in place. He had a passion for his work and visceral intuition about structural dynamics. He was a respectful collaborator, and possessed a clear and explicit aesthetic theory that favored simple structures with clean, taught lines. Ammann advocated building a more expensive bridge if the added expense contributed to the structure's architectural appeal. As he stated,

"Economics and utility are not the engineer's only concerns. He must temper his practicality with aesthetic sensitivity. His structures should please the eye. In fact, an engineer designing a bridge is justified in making a more expensive design for beauty's sake alone. After all, many people will have to look at the bridge for the rest of their lives. Few of us appreciate eyesores, even if we should save a little money by building them."

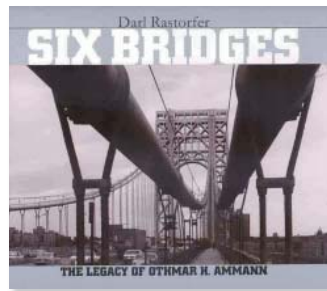
When, toward the end of his life, Ammann was asked to what he attributed his success, his reply was simply, "luck." He didn't mention persistence, a formidable intellect, or a profoundly agile sensibility for monumental form. How was he lucky? He felt fortunate that none of his structures failed, since structures



The Verrazano-Narrows Bridge. (Photo, Jet Lowe; courtesy of the Library of Congress, HAER Collection)

designed by colleagues using similar techniques had, most notably the Tacoma Narrows Bridge. He also seems to have appreciated how good fortune steered him to design. Had Lindenthal and the

railroad companies been successful with their Hudson River Bridge, it's highly unlikely that Ammann would even have taken up design in the first place. It is our good fortune that he did. ■



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