LARIMER AVENUE BRIDGE
Pennsylvania Historic Bridges Recording Project - II
Spanning Washington Blvd. at Larimer Ave. (State Rt. 8)
Pittsburgh
Allegheny County
Pennsylvania

HAER No. PA-488

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HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD

LARIMER AVENUE BRIDGE

HAER No. PA-488

Location:	Spanning Washington Blvd. at Larimer Ave. (State Rt. 8), Pittsburgh, Allegheny County, Pennsylvania.
USGS Quadrangle:	Pittsburgh East, Pennsylvania (7.5-minute series, 1993).
UTM Coordinates:	17/592520/4480205
Dates of Construction:	1911-12.
Designer:	John A. Ferguson.
Builder:	John F. Casey Company (Pittsburgh).
Present Owner:	City of Pittsburgh.
Present Use:	Vehicular bridge.
Significance:	At the time of its construction, the Larimer Avenue Bridge was the world's longest reinforced concrete arch span. The bridge was part of a large public works program in Pittsburgh responding to several reports critical of the city's civic and transportation infrastructure. Details of the Larimer Avenue Bridge's construction provide valuable insights into the use of reinforced concrete, still a relatively new material when the bridge was completed.
Historian:	Haven Hawley, August 1998.
Project Description:	The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer. The field work, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

Pittsburgh in 1911 was a changing city. In the first two decades of the twentieth century, Progressive Era elites and professionals took up issues of efficiency and urban reform as ways of addressing the ills of America's industrial society. In Pittsburgh, voluntary and legislative reforms for mediating poverty, class divisions, and the industrial pollution endemic to early twentieth-century steel manufacturing characterized the Progressive movement. In response to a number of studies by social scientists, reformers pushed city officials to reexamine the role of government in providing services to citizens.[1] The long-awaited annexation of Allegheny City in 1907 further turned Pittsburgh's attention toward elevating its citizens' quality of life. With the goal of a greater Pittsburgh encompassing the North Side and areas south of the city within a single metropolitan entity virtually complete, internal improvements became the focus of municipal studies. The City Planning Report of 1909 examined infrastructure and environmental conditions, raising awareness that inadequate transportation and a lack of pollution controls threatened the area's growth.[2]

Despite continuing battles with bridge owners to eliminate tolls on all river crossings to facilitate traffic flow within greater Pittsburgh, two reports in 1910 advised more major changes to keep the Point's central business district (CBD) vibrant.[3] The two reports reflected their authors' different visions for the future of transportation in Pittsburgh. Chicago-based consultant Bion J. Arnold focused on downtown mass transit as a critical issue for retaining businesses in the city center. He emphasized the need for a subway system to keep street levels open for railways, pedestrians, and motor traffic.[4] Frederick Law Olmsted, renowned landscape architect and urban planner, also paid attention to the downtown transportation problem, but noted the symbiotic relationship between the CBD and residential areas. Unlike Arnold, Olmsted anticipated the growing popularity of private automobiles. (Olmsted pictured motorized and horse-powered vehicles existing side by side, not yet grasping the preference for automobiles that became evident within a decade of his report.) Olmsted's recommendations for more thoroughfares to connect and speed traffic between downtown and its suburbs accompanied his

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[1] On Progressive Era reform, see Robert H. Wiebe, *Businessmen and Reform: A Study of the Progressive Movement* (Cambridge, Mass.: Harvard Univ. Press, 1962), and Roy Lubove, *Twentieth-Century Pittsburgh: Government, Business, and Environmental Change* (Pittsburgh: Univ. of Pittsburgh Press, 1996).

[2] Pittsburgh Civic Commission, *City Planning for Pittsburgh, Outline and Procedure: A Report by Bion J. Arnold, Chicago, John R. Freeman, Providence, Frederick Law Olmsted, Boston* (Pittsburgh: Pittsburgh Civic Commission, 1910).

[3] Pittsburgh Chamber of Commerce, *Report of Committee on Free Bridges* (Pittsburgh: Chamber of Commerce, 1911). A discussion of the free bridges movement is included in U.S. Department of the Interior, Historic American Engineering Record (HAER) No. PA-490, "Three Sisters Bridges," 1998, Prints and Photographs Division, Library of Congress, Washington, D.C.

[4] Bion J. Arnold, *Report on the Pittsburgh Transportation Problem* (Pittsburgh: City of Pittsburgh, 1910).

advice for overhauling the bridge system carrying roadways over the Allegheny and Monongahela rivers.[5]

Olmsted's report recognized that the downtown district increasingly comprised merely a portion of Pittsburgh. With the completion of the greater Pittsburgh metropolitan area and the end to contentious municipal consolidation disputes, Pittsburgh's growth pattern entered a new phase. The city's main demographic trend of increasing population through annexation or new births was replaced by one of internal migration within city limits. City residents relocated from the urban core to outlying residential areas within the municipality. This movement away from the CBD placed pressure on city departments to provide services farther away from and linking those residential areas to downtown, as Olmsted had correctly perceived.[6]

Civic groups initiated and supported many studies of the city's infrastructure, aiming to reform urban transportation in a way that would stimulate the local economy and stem the tide of residents away from the city center while not harming the manufacturing interests that dominated the city's industrial core. The Pittsburgh Survey's suggestion to reorganize municipal agencies to be more effective helped support a philosophy of using city government power for positive rather than restrictive reforms.[7] While a consensus about the municipal government's role in forcing manufacturers to address labor or pollution issues proved hard to reach, transportation developments were perceived as broadly beneficial and less divisive. Infrastructure improvements to aid transportation goals found a more receptive audience. As public works historian Joel Tarr noted, "From 1911 to 1916, the city embarked on a program of street development that included improving main thoroughfares from the CBD to outlying areas, opening new highways, eliminating grade crossings, raising low level areas subject to flooding, reducing grades, and widening business thoroughfares."[8]

While the city struggled to reform its tax code into a system perceived to be more fair to workers, businesses, and landowners, bond issues provided an alternative source of construction funds. The city financed a variety of municipal improvement projects through bond sales and loans, including an asphalt plant, a water works, sewer construction, park alterations, and street reconstruction. Most notably, in 1911, voters passed bond issues that allowed the Public Works

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[5] Frederick Law Olmsted, *Pittsburgh: Main Thoroughfares and the Down Town District* (Pittsburgh: Pittsburgh Civic Commission, 1911).

[6] For more information along these lines, see Joel A. Tarr, *Transportation Innovation and Changing Spatial Patterns in Pittsburgh, 1850-1934* (Chicago: Public Works Historical Society, 1978); Samuel P. Hays, ed., *City at the Point: Essays on the Social History of Pittsburgh* (Pittsburgh: Univ. of Pittsburgh Press, 1989); and Lubove, *Twentieth-Century Pittsburgh.*

[7] The landmark Pittsburgh Survey, commissioned by the Russell Sage Foundation in 1907, resulted in six reports on various quality-of-life issues including labor conditions, charitable resources, and household life.

[8] Tarr, *Transportation Innovation,* 26.

Department to extend water lines, reduce the grade of the "Hump" in downtown Pittsburgh, build sewers to stabilize the flow of water in streams flowing through the city, and construct bridges.[9]

In an industrial city with the rugged terrain of Pittsburgh, structures for crossing streams and railroad rights-of-way played a vital role in upgraded infrastructure. Deep ravines isolated prospering suburban areas. East Liberty residents, for example, enjoyed proximity to the famed Highland Park, with its scenic roadways, sculpted landscaping, and open green spaces. But while the growing district was near Pittsburgh's second most important public recreation spot, a decaying wood-and-iron trestle separated it from downtown.

A special bond issue provided additional funds for constructing bridges over Negley Run, which separated the East Liberty and Highland Park areas from downtown and other suburbs. The crossings accommodated commuter traffic, opening business opportunities for the suburbanites while making the area and its park even more accessible to working-class citizens. That funding went toward work on two massive new structures: the Meadow Street Bridge over Negley Run and the Larimer Avenue Bridge over Washington Boulevard, which follows another branch of Negley Run. By the end of the 1911 fiscal year, $114,799.41 had been paid toward the two bridges out of the total bond fund of $178,594.40.[10] Almost $50,000 went to finish the Meadow Street project, with the remainder paying for continued construction at Larimer Avenue.[11]

At the time of its construction, the Larimer Avenue Bridge was the world's longest reinforced concrete arch span. The structure provided an up-to-date engineering solution to changing urban growth patterns. The bridge created closer internal ties within Greater Pittsburgh with a positive symbol of government action and a much-needed crossing that provided a point of local pride for East Liberty residents.

Economizing with Concrete

Both Meadow Street and Larimer Avenue bridges used reinforced concrete, a relatively new construction material that provided exceptional compressive strength at low cost. Even in the city of steel, concrete provided an attractive alternative to metal components that required painting and occasional replacement. N. S. Sprague, superintendent of the Bureau of Construction in Pittsburgh, explained why Pittsburgh's Department of Public Works turned to the new material for bridges. Comparing the cost of steel and concrete structures with similar load factors and artistic impression, he argued that even if a steel structure cost less than his agency's estimate of $170,000 for the Larimer Avenue Bridge, the savings in maintenance by using concrete would more than make up the difference. For the equivalent steel bridge, with an

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[9] City of Pittsburgh, *Annual Reports of the Executive Departments of the City of Pittsburgh for the Year Ending January 31, 1912,* vol. 2 (Pittsburgh: Pittsburgh Printing Co., 1912), 8.

[10] Pittsburgh, *Annual Reports ... 1912,* 2:8.

[11] Pittsburgh, *Annual Reports ... 1912,* Table 2-A.

initial cost of $150,000, Sprague calculated an "annual charge" of $8,732.50, including interest payments, repainting, repairs, and savings for replacement after fifty years. He continued:

> Now, if the concrete bridge cost $170,000, or $20,000 more than the steel structure, the only charge which can properly be made against a bridge of this type is interest on the first cost of the investment, which, computed at 4 per cent, would amount to an annual charge of $6,800.[12]

Sprague, like many engineers in the early days of reinforced concrete construction, held high expectations for the material. Although his calculations showed the concrete bridge to cost less over time, he erroneously assumed that concrete, unlike steel, would be maintenance-free after its erection and never need replacement.

Yet concrete structures, like their steel counterparts, require continuous upkeep, contrary to what many engineers thought when the material first became available. The belief that concrete would save money otherwise spent on maintenance encouraged its use, as did the material's ability to take pleasing shapes and surface treatments. By 1930, experience and observation showed that earlier promises of permanent beauty were exaggerated. Discoloration, streaking, and cracks affected concrete structures, and poor installation techniques proved hard to correct.[13] In 1911, however, concrete met municipal needs for economy, strength, and attractiveness.

The main dilemma facing designers was how to take advantage of concrete's compressive strength while keeping its low tension resistance irrelevant to a structure. A number of textbooks became available in the first decade of the twentieth century to assist engineers and technical students in this task (see Appendix). Authors F. E. Turneaure and E. R. Maurer advised that the choice lay not in either concrete or steel — but in using both. Steel offered tensile strength, especially in bar form. Yet it was relatively expensive compared to other materials, and steel needed to be made more durable and resistant to heat. Concrete provided durability and was fireproof; it also slowed corrosion of steel when placed around the metal. Concrete was much cheaper and could be mixed on site, while steel required a fabricating shop. In the 1913 edition of their book, Turneaure and Maurer compared current prices for the materials against their working stress capacities and advised that concrete and steel had working-capacity-to-cost ratios of 45 and 80, respectively. Concrete's cost of thirty cents per cubic foot against four cents a pound for steel ($20 per cubic foot) significantly altered the actual cost per unit of strength, despite the fact that concrete's working stress of 400 pounds per square inch (psi) was significantly lower than steel's 15,000 psi working stress. By encasing steel rods, beams, or

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[12] N. S. Sprague, "Large Reinforced Bridges in Pittsburgh," *Engineering Record* 66, No. 25 (21 Dec. 1912): 700.

[13] John Lyle Harrington, "Recent Developments in Bridge Superstructures," *Proceedings of the Engineers' Society of Western Pennsylvania* 46, No. 3 (Mar. 1930): 63.

columns in concrete, engineers could gain the benefits of each. Steel reinforcing rods especially saved money over fabricated steel members, they noted.[14]

Building with Concrete

Philadelphia's Walnut Lane Bridge, completed in 1908, set an early example of the size and beauty possible with concrete structures. The 233'-0"-long main arch span set a record for concrete bridges, and the structure's artistic arch form and bush-hammered surface fit it uniquely into the park setting in which it was constructed.[15]

Within two years, Pittsburgh completed the Meadow Street Bridge, a slightly more modest effort that gave citizens greater access to Highland Park. A 210'-0"-long main arch comprised the major portion of the 454'-0"-long structure, with one 14'-0" and three 21'-0" side arches on the approaches.[16] With this first step toward using reinforced concrete for large structures, the Pittsburgh Department of Public Works set its agenda for bridge construction through mid-decade.

The Division of Bridges worked on several reinforced concrete bridge projects during 1911, preparing preliminary drawings and cost estimates. Engineers also made stress calculations and design analyses for two bridges on Atherton Avenue, crossing over the Junction Railroad and the Pennsylvania Railroad.[17] The Atherton Avenue and Larimer Avenue projects focused on providing infrastructural improvements to Pittsburgh's mid-range outlying residential areas, tying citizens into the larger city while facilitating local commerce.

Construction started on the larger Atherton Avenue Bridge, over the Junction Railroad, on 1 November 1911. The structure had a 180'-0" main span, side spans of 45'-0" and 60'-0", and approaches of 70'-0" and 40'-0". Two 8'-0"-wide sidewalks lined both sides of the 60'-0"-wide roadway along the bridge's 415'-0" length. The height at mid-span measured 115'-0". Friday Construction Company, with H. A. Ward supervising the work, used 8,500 cubic yards of concrete in the structure. When completed just after the Larimer Avenue Bridge, Atherton Avenue's crossing over the Junction Railroad was the second largest concrete bridge in the city.[18]

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[14] F. E. Turneaure and E. R. Maurer, *Principles of Reinforced Concrete Construction,* 2nd rev. ed. (New York: John Wiley & Sons, 1913), 4-5.

[15] See U.S. Department of the Interior, Historic American Engineering Record (HAER) No. PA-504, "Walnut Lane Bridge," 1998, Prints and Photographs Division, Library of Congress, Washington, D.C.

[16] Pittsburgh, *Annual Reports ... 1912,* Table 3.

[17] Pittsburgh, *Annual Reports ... 1912,* Table 1.

[18] "New Concrete Bridge Is An Imposing Sight," *Pittsburgh Gazette Times,* 10. Dec. 1912, from Clippings File, Pittsburgh Bridges — Larimer, Pennsylvania Room, Carnegie Library, Pittsburgh, Pa. (hereinafter cited as CLP Clippings File).

The second Atherton Avenue Bridge, which a local newspaper cited as "The final link in a new way, connecting Pittsburgh's business district and the East end," completed the city's plan to open Center Avenue to more automobile traffic. The structure measured 380'-0" in length, and contained a 36'-0"-wide roadway on the bridge's 60'-0" width. Cranford Construction Company, a firm with offices in Pittsburgh and Cincinnati, used 7,500 cubic yards of concrete. B. S. Treadway supervised the project, which used steel centering instead of wooden falsework. Construction started on 1 June 1912, and workers prepared a temporary road surface to allow traffic the following February while the final concrete roadway was constructed.[19]

Larimer Avenue Bridge

Of the three projects, work commenced first on the Larimer Avenue Bridge, replacing a wood-and-iron viaduct constructed in 1891-92.[20] Six wooden towers supported the six 60'-0"-long trusses, with two trestle bents on the west and one on the east. Each of the original bridge's bents contained four levels of diagonal bracing. The Department of Public Works prepared drawings in 1904 for repairs to the decayed timber struts, erection of concrete piers, raising the elevation for settled portions of the structure, and readjusting bracing rods.[21] Other drawings in the City of Pittsburgh's Bureau of Bridges files include significant structural details such as stringer and buckle plate work, but it is unclear whether contractors carried out any of those plans, given the timing of the bridge's demolition and reconstruction.

The Larimer Avenue Bridge design was modeled after Meadow Street, but designed to eclipse the world record for the longest reinforced concrete arch span. While the Meadow Street project was underway, engineers scheduled construction of a replacement for the Larimer Avenue structure. The old bridge made expansion of a street car line along Larimer Avenue impossible, but the solid new structure could accommodate mass transit in addition to automobile traffic, if needed in the future.[22] City engineers estimated the Larimer Avenue Bridge would cost about $175,000.[23] The John F. Casey Company won the contract with a bid of $140,948.39. The company began construction on 2 May 1911, completed the substructure, and

[19] "New Bridge Over P. R. R. Near Shadyside Station, Is Nearing Completion," *Pittsburgh Gazette Times*, 3 Jan. 1913, CLP Clippings File.

[20] "Larimer Ave. and Atherton Ave. Concrete Arch Bridges, Pittsburgh," *Engineering News* 68, No. 25 (19 Dec. 1912): 1125.

[21] "Repairs to Larimer Ave. Bridge," Drawing No. F-1748, 6 Apr. 1904, Larimer Avenue Bridge Construction Drawings, City of Pittsburgh, Department of Public Works, Bureau of Bridges and Structures (hereinafter cited as DPW Construction Drawings).

[22] *Engineering News*, "Larimer Ave. and Atherton Ave.," 1125.

[23] Pittsburgh, *Annual Reports ... 1912,* Table 2-A.

started superstructure work before year's end.[24] With 9,471 cubic yards of concrete, the Larimer Avenue Bridge easily outdistanced the Atherton Avenue bridges in length and volume.[25]

Although reinforced concrete may be used for arch bridges, the compressive forces inherent in arches made tension-resisting steel less necessary. As a new material, concrete's properties were still somewhat unknown when Pittsburgh's Department of Public Works designed the Larimer Avenue Bridge. The plans called for steel reinforcement in the ribs, but the stresses were deliberately calculated upon only the concrete's compressive resistance. This meant that the concrete could handle the imposed loads on its own, with the steel preventing cracks and providing an additional factor of safety. Sprague noted that the caution might have been considered "extravagant," but the lack of long-term knowledge about concrete, and the anticipated structural and safety benefits of steel reinforcement justified the process.[26] Engineer John A. Ferguson probably used a funicular analysis when designing the bridge, which was a five-centered arch with a 300'-0" clear span.[27]

The bridge crossed Negley Run, a steep ravine with a shale foundation that created anchorage problems. Concrete arches proved particularly appropriate for bridging such areas because they could be anchored in the sides of a valley, providing even greater clearance, and could be designed for lower pressures on foundation points.[28] The Washington Boulevard crossing adjoined another bridge at its eastern end, where the Pennsylvania Railroad's Brilliant Branch passed through an adjacent valley.

The Larimer Avenue Bridge design specified a length of 670'-0", with 10'-0"-wide sidewalks on either side of the 50'-0"-wide roadway. With the Washington Boulevard roadway through the Negley Run valley about 30 feet deeper than the springing line, which is 67'-0" below the crown, the total height of the structure from ground to deck is nearly 100 feet. Solid abutments and open-spandrel arch spans flank the 300'-0" center span, with a 44'-0"-long approach and four 25'-0" arches on the west, and three 25'-0" arches and an 80'-0" approach on the east. Approach arches are spaced 30'-0" on center. The two main piers measure 12'-0" wide, with a skewback 7'-7-1/2" wide.

The use of two arch ribs in the main span differs from the three used at Meadow Street. Measuring 30'-0" center the center, each 8'-0"-wide arch rib on the Larimer Avenue structure ranges in depth from 11'-0" at the springing line to 6'-6" at the crown. Eight large steel angles

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[24] Pittsburgh, *Annual Reports ... 1912,* Tables 2 and 3.

[25] Sprague, "Large Reinforced Bridges," 698.

[26] Sprague, "Large Reinforced Bridges," 699.

[27] Analysis throughout this paper has been significantly aided by insight from Justin M. Spivey, HAER engineer.

[28] Charles H. McAlister, "General Method Adopted for Constructing a 312' Reinforced Concrete Arch Bridge at Larimer Ave., Pittsburgh, Pa.," *Engineering and Contracting* 39, No. 2 (8 Jan. 1913): 51.

reinforce the arch ribs, with one placed at each corner and two back-to-back angles in the middle of the 8'-0" side, all placed longitudinally along the length of each rib.

Sixteen panels separate the deck and arch ribs, with 19'-6" spandrel arches in all except the center two panels.[29] The spandrel arches support the deck system, which is reinforced concrete with 30" x 84" floor beams placed 19'-6" on center, with 24" x 46" stringers. A floor slab of 10"-thick reinforced concrete completes the deck. Hot-rolled deformed steel rods reinforce the concrete sections.[30]

Ferguson's design solved several known engineering problems. In the Meadow Street structure, expansion dams over the main piers had caused cracks in the roadway columns. Ferguson moved expansion dams to the third panel point from the main piers. For added caution, each sidewalk panel received an expansion joint to anticipate differential temperatures because of thinner sidewalk construction.[31]

A 1913 account by Charles H. McAlister, who succeeded Ottomar Stange as superintendent for the John F. Casey Company, reported that the company relied upon a Lidgerwood cable way built on 60-foot-tall towers on either side of the project to convey materials along the structure. A railroad siding through the valley adjacent to the bridge made deliveries to the east of the structure. The railroad and cable way transported about 90 percent of needed materials to work areas. Also on the eastern slope, a mixing plant combined cement, stone, and sand, sending them by chute to a hopper where water was added. The mixture was then delivered by cable way.[32] Construction photographs available in the City Photographer's Collection show the cable system transporting boxes of tools, structural steel, and mixed concrete from the top of one slope to points along the arch ribs, as well as photos of concrete placement.[33]

The arch ribs were poured concurrently. Under Stange's guidance, the full timber falsework for pouring the arch ribs was constructed in three weeks.[34] Engineers divided each half of the arch ribs into five sections, pouring an entire section in one day but leaving keys between each. Keys were filled in a single pouring, producing an interlocked structural form acting as a single element. The order in which sections were poured was 5, 2, 3, 4, and 1 (numbered from 1 at the springing line to 5 at the crown). Section 1, the final section poured, was formed in a single piece with the main pier. Workers then filled in the keys. The contractor used

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[29] "General Drawing, Plan and Elevation," Drawing No. F-1728, Feb. 1912, DPW Construction Drawings; and *Engineering News,* "Larimer Ave. and Atherton Ave.," 1126.

[30] *Engineering News*, "Larimer Ave. and Atherton Ave.," 1126.

[31] *Engineering News,* "Larimer Ave. and Atherton Ave.," 1127.

[32] McAlister, "General Method Adopted," 51-52.

[33] City Photographer's Collection, Archives of Industrial Society, Hillman Library, University of Pittsburgh, Pittsburgh, Pa.

[34] For images of falsework construction, see City Photographer's Collection.

"Universal" cement, river sand, and 1" Ligonier limestone aggregate in a 1:2:4 ratio for the superstructure.[35] The bridge deck was formed on centering designed by Stange, which allowed bents to be lifted into place by the cable way and set for each pouring. The same bents were moved to the next section, saving the cost of constructing new forms for each pouring.

Stange also devised a trademark method used by the company on the Larimer Avenue Bridge and other projects. In order to leave the surface as undamaged as possible when removing molds, workers inserted small iron rods into the area to be poured, attaching the rods about 4" from the surface to a tapered stub rod that penetrated the form. With the form secured and concrete poured, the stubs could be plucked from the concrete and the remaining hole patched. Stange's method left the deeper rods in place, but unlike other ways of removing molds, left no metal near the surface where it could corrode.[36]

Specifications for troweling and bush hammering virtually the entire surface of the structure ensured that marks caused by form work would be evened and an attractive finish completed. Bush hammering entailed using an air hammer with a specified number of points per inch to create a uniform, slightly textured surface on concrete structures. The sides of each column and all exposed faces (except portions of the parapet walls and certain detailing on the columns) received this treatment.[37]

Stanley Roush, an architect later involved with the Three Sisters Bridges in the city's public works program during the 1920s, designed distinctive lamp posts for each main pier of the Larimer Avenue Bridge.[38] From a concrete pedestal with a bronze base rose a narrow, polished granite column with two bronze-and-beveled-glass lamps supported by brackets. A bird with outstretched wings perched atop a globe that was secured by brass moldings to the column's top. Figures in relief and floral wreaths added to the decorative effect.[39]

To complete the project, Roush designed a bronze tablet to be placed under the bridge, bearing the names of Mayor William A. Magee, Public Works Director Joseph G. Armstrong, Bureau of Construction Superintendent N. S. Sprague, and Division Engineer T. J. Wilkerson.[40] Roush also planned landscaping for the gravel walkway below the bridge leading to a retaining wall and a monument near the bronze tablet, although the latter was not mentioned in contemporaneous accounts.[41]

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[35] *Engineering News,* "Larimer Ave. and Atherton Ave.," 1126-28.

[36] McAlister, "General Method Adopted," 53.

[37] "Plan of Bush Hammering," Drawing No. F-1726, Oct. 1911, DPW Construction Drawings.

[38] See U.S. Department of the Interior, HAER No. PA-490, "Three Sisters Bridges," 1998, Prints and Photographs Division, Library of Congress, Washington, D.C.

[39] "Details of Bronze Lamps and Tablet," Drawing No. F-1744, Jun. 1912, DPW Construction Drawings.

[40] "Details of Bronze Lamps and Tablet," Drawing No. F-1744, Jun. 1912, DPW Construction Drawings.

[41] "Retaining Wall and Tablet Support," Drawing No. F-1743, Jun. 1912, DPW Construction Drawings.

Bridge Opening

In July 1912, Pittsburgh's citizens and leaders could boast of having the longest concrete bridge in the world, and an attractive one at that. At a formal opening on 10 July, one month before the bridge actually saw use for traffic, East Liberty residents listened to a public prayer, a chorus of "America," and the mayor's speech before a parade celebrating the bridge.[42]

Businessmen in East Liberty led a parade over the span into the residential neighborhoods east of the bridge, celebrating the commercial and social intercourse expected to follow the area's improved connecting structure. Many shops closed at lunch so workers and owners could attend the huge event. Mayor Magee and members of the Pittsburgh City Council attended the opening, as did locals eager for the excitement of floats, marching paraders, and the distinction that the world's largest concrete bridge conferred upon the East Liberty area.[43]

The Larimer Avenue Bridge gave East Liberty and Pittsburgh a moment to forget the pollution, poverty, and class divisions that the Pittsburgh Survey trenchantly pointed out just five years earlier. A newspaper account of the bridge dedication noted the proud occasion in the quaint phrasing of a locally written paean:

> Then all the speakers told each other what a fine bridge it really is, how happy they were to be there, and how the bridge opened up unlimited districts for the expansion of commerce and a paradise for home-seekers. And when the program was over everybody was satisfied that it was the greatest celebration East Liberty has seen in years.[44]

The Larimer Avenue Bridge's construction represented both social and technical experiments. The city's public works program that began in 1911 was designed to literally bind the city together with infrastructure. Although the largest reinforced concrete bridge in the world when built, the Larimer Avenue Bridge was one of numerous structures of its type built by Pittsburgh and other cities who sought to provide city services with the greatest possible economy. Designers like John A. Ferguson and contracting superintendent Ottomar Stange tested new techniques for maximizing the potential of reinforced concrete, and their responses to technical problems provide insight into the learning curves associated with new technologies. In the end, those technical challenges were part of a social agenda pursued within the constraints of a contracted economy. Reinforced concrete structures like the Larimer Avenue Bridge remain in service today, reminders of how those who sought to build social programs helped direct technological practice in the early twentieth century.

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[42] "Larimer Avenue District Prepares to Open Bridge," *Pittsburgh Post,* 10 Jul. 1912, CLP Clippings File.

[43] "Larimer Bridge Is Dedicated," *Pittsburgh Telegraph,* 10 Jul. 1912, CLP Clippings File.

[44] "Bridge Officially Opened," *Pittsburgh Gazette Times,* 11 Jul. 1912, CLP Clippings File.

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