Rachel Carson Bridge (Ninth Street Bridge)

City of Pittsburgh
Historic Landmark Nomination

Prepared by Jesse A. Belfast, Michael Baker International, Inc.

ALLEGHENY COUNTY

April 2025

PRESERVATION PITTSBURGH

City of Pittsburgh
Department of City Planning

Historic Nomination Application

Application information

A Property information

Historic name of property *Ninth Street Bridge*

Current name of property *Rachel Carson Bridge*

Property address *None*

For Districts, attach a list of all street address of each property included in the nomination and a clear street map illustrating the proposed district boundaries.

B Classification and use - check all that apply

Select classification type. Refer to definitions page for classification descriptions

✓ Historic Structure	Historic Site	
Historic District	Historic Object	

Ownership

Private - residence	✓ Public - government	Place of religious worship
Private - other	Public - other	

Describe current use below

Bridge

The Historic Preservation Ordinance permits nominations by any of the following: the Mayor, a Historic Review Commission member, a Planning Commission member, a City Councilperson, the owner of record, any City resident for at least one year, and for a District, at least 25% of the owners of record.

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Historic Nomination Application

Nomination information and instructions

Provide written narratives for each section below and include as an attachment PDF document type. ***Incomplete applications may delay receipt of nomination, staff review and scheduling of required hearings.***

C Description

Provide a description of the structure, district, site, or object. If it has been altered over time, indicate the date(s) and nature of the alteration(s). Include the following information as applicable:

- *Year built*
- *Architectural style*
- *Arrangement of architectural elements*
- *Building materials*
- *Method(s) of construction*
- *Type and arrangement of buildings*
- *Visual character*
- *Street pattern*
- *Density*
- *Topography*
- *History of the development of the area*
- *Architect and/or builder*

D History

Provide a history of the structure, district, site, or object. Include a bibliography of sources consulted, copies of relevant source materials,and the following information as applicable.

- *History of the development of the area;*
- *Circumstances which brought the structure, district, site, or object into being;*
- *Biographical information on architects, builders, developers, artisans, planners, or others who created or contributed to the structure, district, site, or object;*
- *Contextual background on building type(s) and/or style(s);*
- *Importance of the structure, district, site, or object in the larger community over the course of its existence.*
- *Include a bibliography of all sources consulted at the end. Where historical information is uncertain or disputed, reference sources in the text.*

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Nomination information and instructions (cont.)

E Significance

At least one of the ten criteria listed in the Code must be met for Historic Designation. Provide a detailed description of how this nomination meets one or more criteria.

The structure, building, site, district, object is significant because of (note all that apply):

1. *Its location as a site of a significant historic or prehistoric event or activity;*
2. *Its identification with a person or persons who significantly contributed to the cultural, historic, architectural, archaeological, or related aspects of the development of the City of Pittsburgh, State of Pennsylvania, Mid-Atlantic region, or the United States;*
3. *Its exemplification of an architectural type, style or design distinguished by innovation, rarity, uniqueness, or overall quality of design, detail, materials, or craftsmanship;*
4. *Its identification as the work of an architect, designer, engineer, or builder whose individual work is significant in the history or development of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States;*
5. *Its exemplification of important planning and urban design techniques distinguished by innovation, rarity, uniqueness, or overall quality of design or detail;*
6. *Its location as a site of an important archaeological resource;*
7. *Its association with important cultural or social aspects or events in the history of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States;*
8. *Its exemplification of a pattern of neighborhood development or settlement significant to the cultural history or traditions of the City, whose components may lack individual distinction;*
9. *Its representation of a cultural, historic, architectural, archaeological, or related theme expressed through distinctive areas, properties, sites, structures, or objects that may or may not be contiguous; or*
10. *Its unique location and distinctive physical appearance or presence representing an established and familiar visual feature of a neighborhood, community, or the City of Pittsburgh.*

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Nomination information and instructions (cont.)

F Integrity

In addition to Significance, "any area, property, site, structure, or object that meets any one or more of the criteria listed above shall also have sufficient integrity or location, design, materials, and workmanship to make it worthy or preservation or restoration."

G Notification / consent of property owner(s)

The nomination must be accompanied by evidence that the nominator has made a good-faith effort to communicate their interest in the historic designation of this landmark or district to the owner(s) of these properties. Describe how this was done, and attach evidence that the owner(s) of the nominated landmark or of the properties within the nominated district have been informed of the nomination. This may include a copy of a notification letter with a mailing list, a letter confirming phone calls, or a petition signed by affected property owners.

In the case of a nomination as a Historic District the nomination shall be accompanied by a petition signed by the owners of record of 25% of the properties within the boundaries of the proposed District.

Nomination of any religious property shall be accompanied by a signed letter of consent from the property's owner.

H Photographs of property

The application shall include photographs of all elevations of an individual building and its setting, or the front elevation of each building in a district. In the case of closely spaced buildings or row houses, several buildings may be included in one photograph. Each photograph must be labeled with the street address of the building(s) and the month and year the photograph was taken.

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Nomination information and instructions (cont.)

I List of supporting documents

Copies of major supporting documents should accompany the nomination form. Such documents may include, but are not limited to:

- *Historic photographs;*
- *Historic and contemporary maps;*
- *Historic or contemporary texts describing people, places, or events that comprise the historic context of the subject property or district.*
- *Historic or contemporary texts describing the subject property or district*
- *Oversized materials (such as architectural drawings) and materials too fragile to copy may be accepted.*

J Completeness Check

*The following are **required** for the Historic Nomination Application to be considered a complete application. A nomination is deemed accepted upon staff approval of Completeness Check in OneStopPGH.*

- ✓ Property information
- ✓ Classification & Use
- ✓ Description
- ✓ History
- ✓ Statement of Significance
- ✓ Statement of Integrity
- ✓ Notification of property owner
- ✓ Photographs
- ✓ Application fee

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Definitions and Terminology

Additional definitions are provided in the Historic Preservation Ordinance Chapter 1101.02 Definitions

» ***Historic Structure:*** *means anything constructed or erected, the use of which requires directly or indirectly, a permanent location on the land, including walks, fences, signs, steps and sidewalks at which events that made a significant contribution to national, state or local history occurred or which involved a close association with the lives of people of nations, state or local significance; or an outstanding example of a period, style, architectural movement, or method of construction; or one of the last surviving works of a pioneer architect, builder or designer; or one of the last survivors of a particular style or period of construction.*

» ***Historic District****: means a defined territorial division of land which shall include more than one (1) contiguous or related parcels of property, specifically identified by separate resolution, at which events occurred that made a significant contribution to national, state, or local history, or which contains more than one historic structure or historic landmarks, or which contains groups, rows or sets of structures or landmarks, or which contains an aggregate example of a period, style, architectural movements or method of construction, providing distinguishing characteristics of the architectural type or architectural period it represents.*

» ***Historic Site:*** *means the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure whether standing, ruined or vanished, where the location itself maintains historical or archaeological value regardless of the value of any existing structures.*

» ***Historic Object:*** *means a material thing of historic significance for functional, aesthetic cultural or scientific reasons that may be, by nature or design, movable yet related to a specific setting or environment.*

Rachel Carson Bridge

Historic Nomination Form

Addendum

7. Physical Description

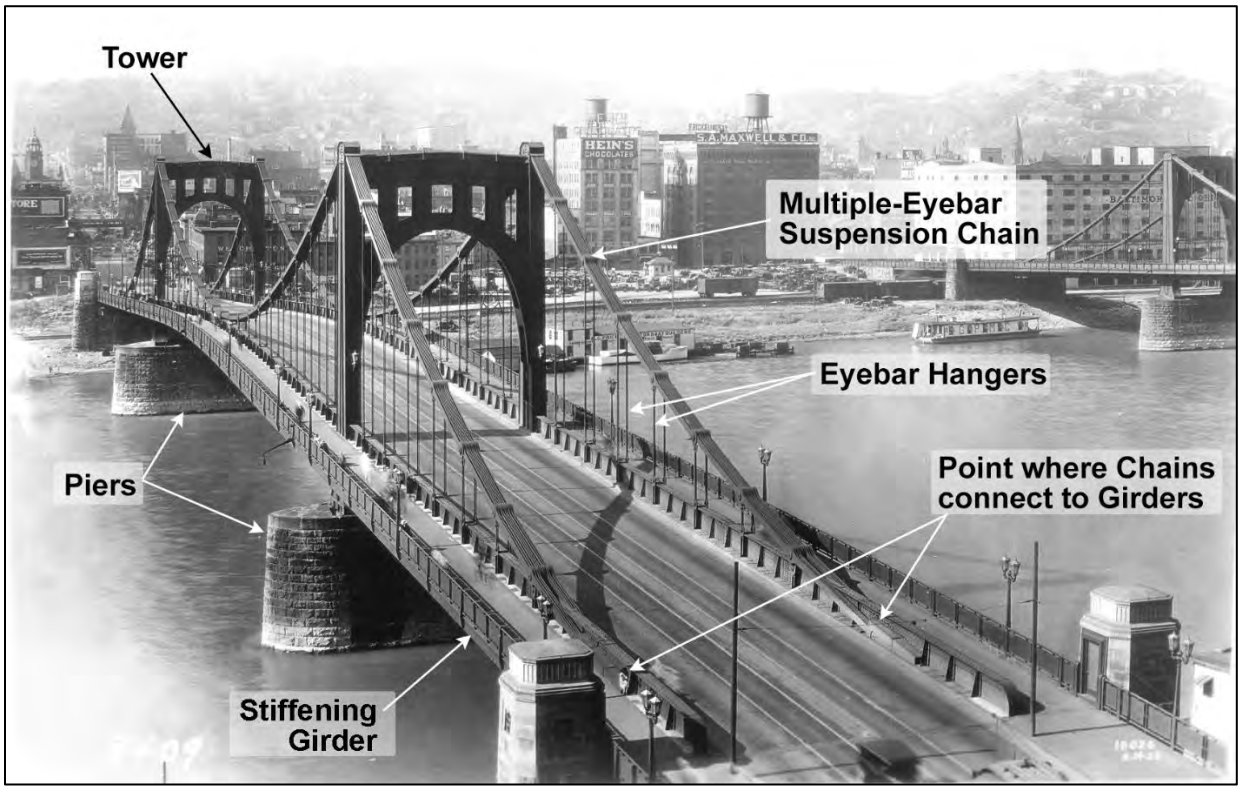
Setting and Site

The Rachel Carson Bridge (Ninth Street Bridge) is the fourth Allegheny River crossing, located about 415' upstream from the Andy Warhol Bridge (Seventh Street Bridge). The structure, along with the nearby Roberto Clemente (Sixth Street) and Andy Warhol (Seventh Street) bridges makes up a trio of nearly identical structures known collectively as the Sisters Bridges. Previous documentation of the three structures in the Historic American Engineering Record (HAER) identifies them as the Three Sisters Bridges with the secondary name Trinity of Bridges (Hawley 1998). The Rachel Carson Bridge carries vehicular, bicycle, and pedestrian traffic over the Allegheny River, Tenth Street Bypass, and riverfront trails. On its south end, the structure connects with Ninth Street in downtown Pittsburgh; on its north end, the structure connects with Anderson Street in the North Side. The nearest cross streets are Fort Duquesne Boulevard to the south and Isabella Street to the north. Prior to the 1956 construction of Fort Duquesne Boulevard, the south end of the bridge crossed the Allegheny Wharf, and the Pennsylvania Railroad had an overpass at the bridge's abutments. Prior to the construction of the riverfront trail at the north end of the bridge, the span crossed the tracks of the Baltimore & Ohio's Pittsburgh & Western Railroad.

Bridge Description

The Rachel Carson Bridge is composed of two, multi-girder steel approach spans approximately 75' and 60' in length (Spans 1 and 5) and a three-span, self-anchored, steel eyebar suspension bridge that is 860' in length (Spans 2-4). The overall structure length is 995'. The 66'-6" wide bridge deck consists of a 37'-11" curb-to-curb, reinforced concrete deck with a ½" integral wearing surface placed on the original steel buckle plates, and sidewalks on both sides of the roadway. The cantilevered sidewalks are 14'-3" wide in Spans 1 and 5 and are 12'-0" wide in spans 2 through 4. The bridge deck is supported by built-up riveted girders in Spans 1 and 5 (Photo 8 and Photo 23) and a girder-floorbeam-stringer system in Spans 2 through 4 (Photo 21 and Photo 22). The built-up riveted floor system is supported by heat-treated steel eyebar suspension chains and suspenders (Photo 15 and Photo 16). The main eyebar chains consist of packs of either 8 or 9 eyebars in each panel, which are supported by built-up riveted towers (Photo 13). The eyebars are 14" wide with varying thicknesses up to 2". The substructure consists of a stone masonry abutment (south end; hidden by reinforced-concrete facing since ca. 1955) (Photo 8), four stone masonry piers (Photo 6), and a stone masonry abutment (north end) (Photo 24). The roadway contains one vehicular lane in each direction plus a left turn lane at each end of the bridge (Photo 12). The bridge has a maximum vertical clearance of 47.1' above pool level of the Allegheny River, which requires an unusually steep grade of 4.175 percent from either end of the structure to its center.

The stiffening girder is a built-up, riveted I-girder combined with additional exterior webs and a bottom flange, measuring 9'-0.5" deep, of which 3'-8" project above the roadway (Photo 22 and Photo 14) (Pittsburgh Post 4 January 1925). On the roadway side is a steel cover plate that completes an enclosed steel box. A sidewalk covers the opposite side of the web, but there is a gap below the sidewalk and the exterior plate. The box is divided into cells between each panel point by full depth diaphragms. The cells are approximately 5'-3" deep by 2'-3" wide by 7'-2" long. Each cell is accessible by an access hatch through the cover plate or sidewalk.



1929 photo of the identical Roberto Clemente (Sixth Street) Bridge with major structural elements labeled.

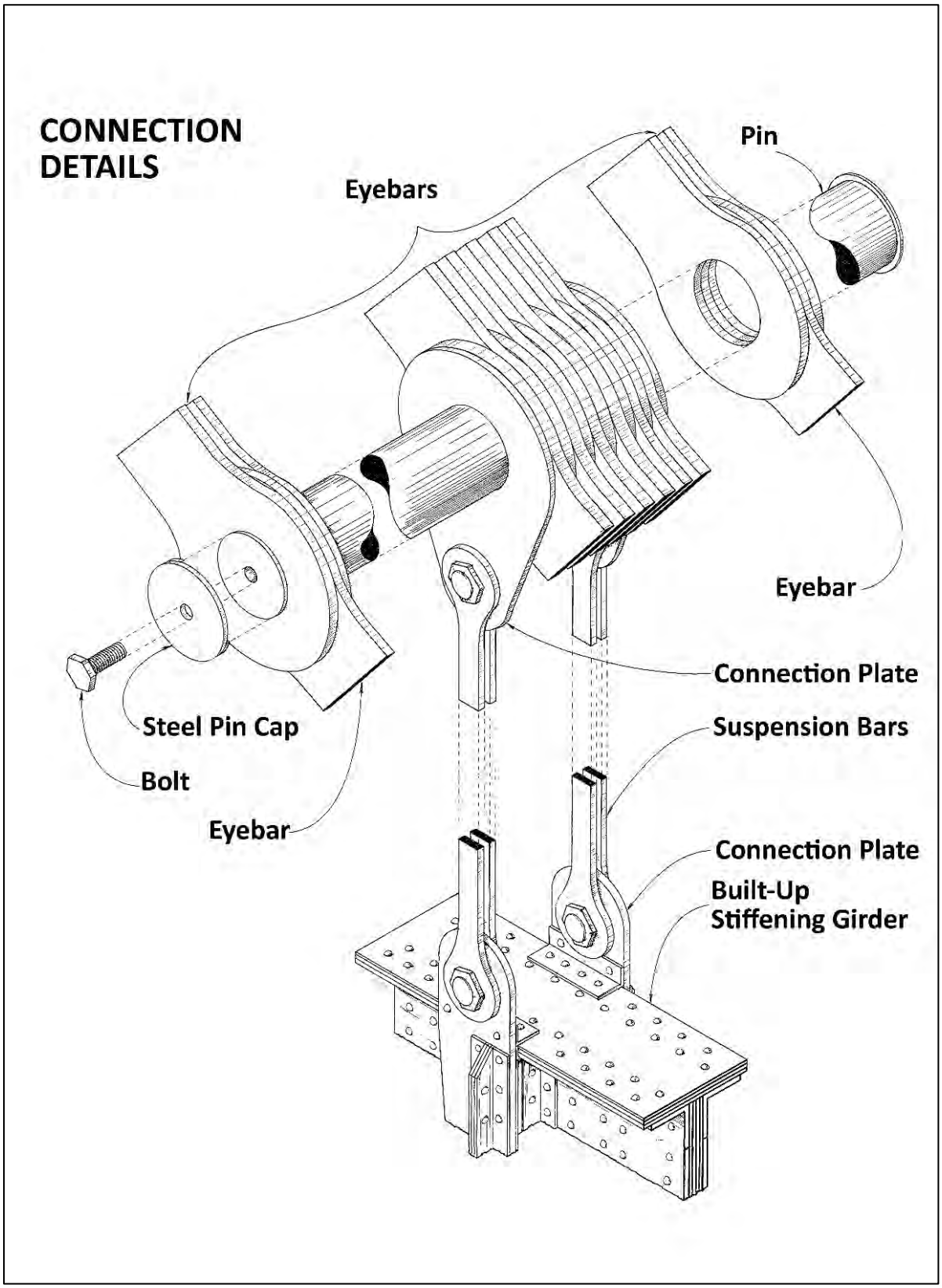


Diagram of pin-and-eyebar connection details at eyebar chain and stiffening girder.

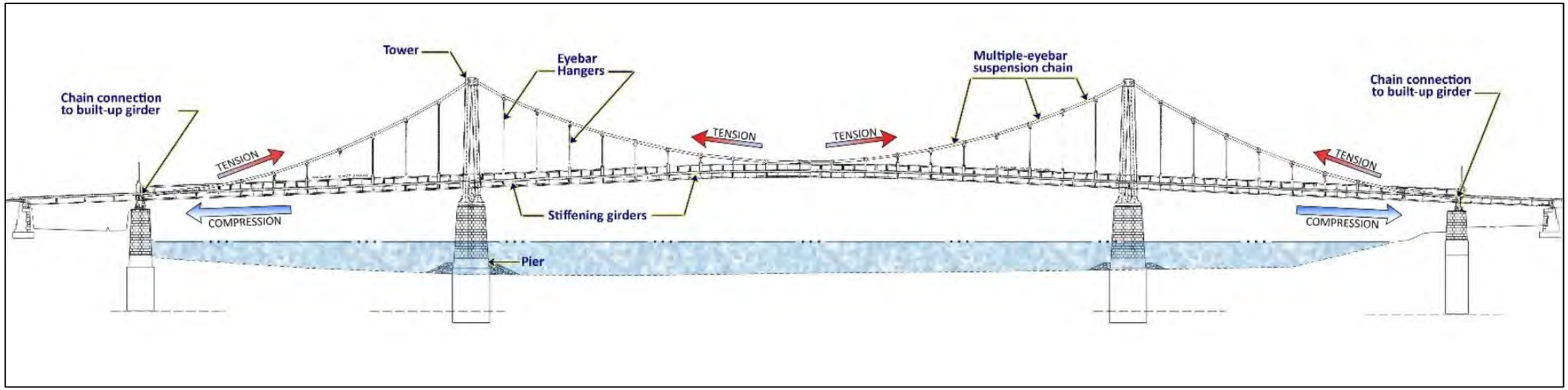


Diagram of major structural elements of the Sisters Bridges.

The structural members themselves are without ornament; instead, the simple forms of the towers, eyebar chains, and suspenders possess intrinsic beauty. Each tower is battered and constructed of solid riveted plates and angles; the arched cross bracing contains five cut-outs (Photo 16, Photo 17, and Photo 18). To account for expansion and contraction, the south tower rests upon roller bearings and the outer piers rest upon rocker bearings; the north tower rests upon fixed bearings (Engineering News-Record 1924; Covell 1926). The primary ornamental features of the bridge are the octagonal pylons on the outer piers (Photo 19). Each pylon contains a door on the sidewalk side with a large bronze plaque containing the Allegheny County seal, bridge name, and individuals responsible for its construction (Photo 11). The other three sides of each pylon facing cardinal directions contain cast iron grills with a 3x3 grid of alternating circles and octagons. At sidewalk level, the pylon masonry transitions from rock-face sandstone ashlars to finely tooled sandstone ashlars. Above the level of the doors, there are three courses of granite molding that step back successively, topped by a cut granite shaft with vertical ribs and a flat granite cap and modern octagonal lantern.

Existing roadway lighting consists of ca. 2020 paired octagonal fixtures with 16' poles that are mounted on modern brackets attached to the sidewalk fascia beams (Photo 4). In addition, each of the four pylons on the outer two piers contains an octagonal lantern (ca. 2020), whose design was inspired by pylons installed or proposed to be installed on the Seventh Street Bridge ca. 1930. In 2023, ornamental LED lighting was installed to illuminate the eyebar pins, suspenders, and towers.

Ca. 1955, the south abutment was faced with concrete in connection with the construction of Fort Duquesne Boulevard. In the 1990s, Allegheny County replaced the original solid-panel bridge railings with wire mesh panels to allow for better views from the sidewalk. An exception are the bridge transition railings south of the pylons (on the downtown side of the bridge) which were replaced ca. 1955 with Allegheny County standard "tulip" style malleable iron railings in connection with the construction of Fort Duquesne Boulevard. The ca. 1955 tulip-style railings also line the staircase in the bridge's southwest quadrant that accesses the Three Rivers Heritage Trail (Photo 7).

The 2017 rehabilitation of the structure resulted in few changes to the structure that are visible to the public. The flat curb plates were replaced with sloped curb plates to improve drainage and minimize steel deterioration of the plate girder. Steel repairs at member connections required the installation of approximately 45,000 button head (tension control) high-strength bolts. Of these 45,000 bolts, about a third (15,000) were new bolts in new holes and two-thirds (30,000) of the bolts replaced existing rivets. Approximately 11,000 of the 45,000 bolts are not visible, as they are located inside the stiffening girder. The remaining 34,000 bolts are minimally visible, as they are located on the underside of the structure and can only be seen from afar by river and trail traffic. The 2023 installation of decorative LED lighting was a minor alteration. Restoration efforts included cleaning and selective pointing or patching of masonry, restoration of the bronze plaques, and installation of period-appropriate lights. The bridge was repainted the same Aztec gold color that it has been since 1974.

Character-Defining Features

Character-defining features of the bridge include the pin-connected eyebars that compose the two main eyebar chain suspension members as well as the numerous eyebar suspenders, the four stone masonry piers (two of which have decorative pylons above the roadway), the abutments (one concrete and one stone), the two built-up riveted steel suspension towers, and the numerous built-up riveted steel bridge

members (including stiffening girders, sidewalk brackets, and floorbeams), steel buckle plates, decorative cast metal pylon window grates, and the bronze bridge plaques mounted on each of the four pylon doors. The railing and bridge lighting are modern replacements and do not contribute to the significance of the bridge. Allegheny County does not consider the ca. 1955 tulip style transition railings to be part of the bridge structure, nor do the tulip style railings contribute to the significance of the Ninth Street Bridge because they are associated with Fort Duquesne Boulevard, which was constructed by Allegheny County ca. 1955-56. However, these transition railings and the stairs (which also have tulip railings) are in the proposed historic structure boundary, and future alterations to them should consider the historic context/aesthetic of Fort Duquesne Boulevard.

8. Narrative History[1]

Summary

The Rachel Carson Bridge (known as the Ninth Street Bridge prior to 2006) is one of the three Sister Bridges carrying Sixth, Seventh, and Ninth streets across the Allegheny River in downtown Pittsburgh. The Sisters Bridges were built from 1924 to 1928 in response to a 1917 mandate from the War Department to provide increased navigable river clearance. In order to comply with the War Department's mandate, Allegheny County approved the issue of $29.2 million in bonds for new bridges, roads, and buildings to aid in the movement of goods and war materials along the rivers. The Rachel Carson Bridge is among 41 bridges constructed by Allegheny County between 1924 and 1928. The Allegheny County Department of Public Works designed the bridges as "a creative response to the political, commercial, and aesthetic concerns of Pittsburgh in the 1920s" (Hawley 1998:1). The Sisters Bridges are of historical engineering significance because they were the first self-anchored suspension spans in the United States, as well as the only trio of nearly identical bridges located side by side known to exist.

As proposed by the American Bridge Company, fabricator of the superstructures, the bridges were built using the cantilever method, which was the first use of this method for self-anchored suspension bridges. This construction method, in part, influenced the use of eyebar suspension chains, which itself is a rare subtype of suspension bridge. Unlike the Deutzer Hängebrücke (1913-15) at Cologne, Germany, which possibly served as the model for the Sisters Bridges, and unlike the contemporary self-anchored eyebar suspension at Tokyo (Kiyosu Bridge, 1925-28), which both feature steel rod-and-turnbuckle suspenders, the Sisters Bridges feature extremely rare steel eyebar suspenders. The Rachel Carson Bridge opened to traffic on November 26, 1926.

Predecessor Structures

In 1836, the Pittsburg and Allegheny Bridge Company obtained a charter to build a bridge at Hand Street (later Ninth Street) in Pittsburgh with Chestnut Street (later Anderson Street) in Allegheny City. When the tolled structure opened in 1840, it was the third largest span Burr arch-truss in the United States. It featured four 200'spans and one 190'span, and there were three truss lines, the center of which divided two 11' roadways. The covered structure had a limited vertical roadway clearance of 11', which was

[1] For a detailed account of events leading to the construction of, the Sisters Bridges see the HAER document prepared by Hawley (1998). The following historical narrative is largely adapted from this document.

insufficient for street rail cars to pass (Hawley 1998:5-6). In 1889, the Pleasant Valley Electric Street Railway purchased a controlling interest in the Pittsburg and Allegheny Bridge Company and planned for the 1840 structure's replacement. Ferris & Kaufman Company designed the replacement steel structure, which featured four rail tracks. The riveted steel and wrought iron Pratt truss structure was erected by the Iron City Bridge Company and opened in 1890 (Hawley 1998:10).

Greater Pittsburgh, Navigation and Free Bridges

The eventual replacement in the mid-1920s of the 1890 structure at Ninth Street was precipitated by efforts in the 1880s through the 1910s by the Pittsburgh Chamber of Commerce to support the establishment of a consolidated city government by annexing Allegheny City, to end tolls on bridges, and to foster improved navigation by supporting the construction of a national waterway linking Pittsburgh and the Ohio River to the Mississippi Valley and Erie Canal (Hawley 1998:13-14).

The 1899 River and Harbor Act authorized the Secretary of War to declare highway and railroad bridges over navigable bodies of water in violation if they were "an unreasonable obstruction to the free navigation of such waters on account of insufficient height, width of span, or otherwise" (qtd in Hawley 1998:14). Initial rulings by the Secretary of War in 1904 and 1911 found that the Allegheny River bridges posed no unreasonable obstruction and would not have to be razed. This finding influenced Allegheny County's decision to purchase and remove tolls on the private Allegheny River bridges on March 16, 1911 (Hawley 1998:15). Further agitation for increased clearances resulted in another review of conditions by district engineer Lt. Col. Shunk, and in 1916, Secretary of War Newton D. Baker concurred with Shunk's finding that the Allegheny River bridges obstructed river traffic. Baker issued an order on March 23, 1917, requiring clearance of 47.0', 47.1', and 47.3' over the Davis Island pool for the Sixth, Seventh, and Ninth Street bridges, respectively. Work on Seventh and Ninth Street bridges was required to begin by September 28, 1918, and work on the Sixth Street Bridge by 1919 (Hawley 1998:15). Other bridges determined to be out of compliance were those at Sixteenth, Thirtieth, and Forty-Third Streets (all owned by Allegheny County) and the Pittsburgh, Fort Wayne, and Chicago Railway Bridge (owned by a subsidiary of the Pennsylvania Railroad) (Hawley 1998:16). World War I delayed the deadline for commencement of bridge work on Seventh and Ninth streets to April 2, 1920; commencement of work on the Sixth Street Bridge was extended to April 1921 (Hawley 1998:18).

Allegheny County Government and Public Works

Allegheny County utilized a bond issue to purchase the Allegheny River bridges, for which it was obliged to pay fair market value. However, voters were reluctant to support additional funding for raising and reconstructing the structures. A $35 million bond issue failed in 1921, partly because of fears of corruption with large public works projects. The Pittsburgh Chamber of Commerce worked to increase support for a 1924 bond issue focused on bridge reconstruction and highway improvements. The $29.2 million bond issue was approved to finance construction of new bridges, municipal buildings, and roadways. Allegheny County formed a Department of Public Works to work with county commissioners to plan and implement these bond-related projects. Between 1924 and 1928, Allegheny County constructed 41 bridges costing over $21 million. The county continued this impressive program of development when a second bond issue focusing on roads and an airport was approved on June 26, 1928, for $43.7 million (Hawley 1998:20). Norman F. Brown was hired to head the new Department of Public Works, and he brought engineering

and design offices under a centralized public works agency. Vernon R. Covell (former County Engineer) became chief engineer of the Bureau of Bridges, and A. D. Nutter became the chief design engineer (Hawley 1998:21). Stanley Roush, Allegheny County Architect (and former City of Pittsburgh architect) oversaw the architectural design aspects of county bridge construction, including the Sisters Bridges.

Initial Bridge Designs

Four proposals for the replacement of the Sisters Bridges were made prior to Allegheny County's selection of the self-anchored suspension design. The first, was a two-humped bridge designed by F.A. Glafey in 1910 and publicized by boat operator Thomas Rees in 1917. This plan was not accepted by War Department or county engineers. A second plan, devised by Allegheny County's A. A. Henderson in 1923, proposed a continuous-traffic lift bridge that could be jacked up during navigation season. The War Department rejected this scheme because a malfunction in a single jack would render the bridge inoperable. County engineers further explored continuous-traffic lift designs, but the War Department ultimately approved fixed-span designs for continuous truss bridges at Sixth and Ninth streets designed by the City of Pittsburgh's Bureau of Architecture and a cantilever truss at Seventh Street designed by architects Rutan, Russel, & Wood (see Figure 4 for a rendering). After getting approval from numerous local boards and agencies, the County submitted the plans to the City of Pittsburgh's Art Commission on June 6, 1924. The Art Commission was formed in 1911 and charged with approving bridges costing more than $25,000. While waiting for approval, the county opened bidding on the bridge projects and proceeded to plan demolition work on the Seventh Street Bridge (Hawley 1998:23). The Art Commission rejected the plans, finding the use of through-truss structures objectionable. In spite of the known difficulties regarding slipping anchorages and inadequate anchorages, the Art Commission favored identical suspension bridges for the Sixth, Seventh, and Ninth Street crossings. The county was unwilling to condemn businesses to accommodate conventional suspension bridge designs, so the only viable solution was a self-anchored suspension bridge (Hawley 1998:24).

It is not known conclusively who within the Allegheny County Department of Public Works initially suggested the self-anchored suspension design, but consulting engineer T. J. Wilkerson publicly took credit for the design (Hawley 1998:26). Nor is it known how directly the solution was influenced by the Deutzer Hängebrücke (1913-15) at Cologne, Germany, which was the only self-anchored eyebar chain suspension in existence at the time. A photo of the structure was published in Hool and Kinne's book *Moveable and Long-Span Steel Bridges* (1923), so it is possible that the county engineering staff were familiar with the precedent.

It is interesting to note that at the same time Allegheny County engineers were contemplating suspension designs for the Pittsburgh bridges, Japanese engineers in Tokyo were developing plans for multiple crossings of the Sumida River, which were destroyed in a 1923 earthquake. The Japanese modeled the Kiyosu Bridge after the Deutzer Hängebrücke, and it is strikingly similar to the Sisters Bridges in Pittsburgh, with the exception that steel rods rather than eyebar suspenders are employed. Its designers embraced the "intrinsic beauty resulting from mechanics theory;" the "only architectural efforts were to make the main beam more slender in order to better express its elegance" (Kitagawa 2011:4-5). Unlike, the Pittsburgh Art Commission, Japanese authorities did not require identical nearby spans. The adjacent Eïtai

Bridge utilized a tied arch design that complemented the Kiyosu Bridge by using the same (though inverted) parabolic curve for its arch (Kitagawa 2011:5).

Contractors

> "Erecting suspension bridges using cantilever methods was a complex job demanding only the most experienced of contractors. After advertising the bids, the county awarded the contract for the three bridges' superstructure[s] to the American Bridge Company and the substructure[s] to the Foundation Company of New York. County commissioners, anxious to assure the public that contracts were in no way marred by corrupt deals, publicized the savings provided by awarding the contracts to the same company. By building all three bridges at a single price, the county shaved about $0.5 million off the project budget.
>
> The American Bridge Company, perhaps more than any other company in the world, was best qualified to work on a bridge with a continuous stiffening component. The company was then constructing the Florianópolis Bridge in Brazil, working from 1922 to 1926 on the longest eyebar suspension span in existence at that time. The 1113'-0"-long design featured towers with rocker bearings. The company brought to that project its own experimental heat-treated-eyebars, and as project contractor pioneered stiffening techniques that saved materials and money while providing greater rigidity.
>
> H. D. Robinson, who had worked with Steinman on the Florianópolis Bridge, had also consulted on towers for the Cologne bridge's design. Robinson used similar towers on the Rondout Bridge at Kingston, New York, which was constructed in 1922 and used a stiffening truss that functioned apart from the towers. By 1924, the American Bridge Company had many opportunities to acquire a base of knowledge that specifically would have helped in building a bridge such as that specified by Allegheny County engineers. Whether the firm advertised its services to the county before specifications were devised is not known. The American Bridge Company used its knowledge from the Florianópolis Bridge to prepare alternative designs for bridges over the Ohio River in Point Pleasant and in St. Marys, West Virginia, however, securing both projects.
>
> The American Bridge Company also accumulated vast experience by company acquisition. In 1900, J. P. Morgan consolidated two dozen bridge-building companies under the umbrella of the American Bridge Company, which a year later became a subsidiary of Morgan's U.S. Steel. Thereby he created an industrial giant that controlled half of the country's bridge-building capacity. The acquisition united large Pittsburgh competitors, like Carnegie's Keystone Bridge Works, and smaller area concerns, such as Schultz Bridge & Iron Works of nearby McKees Rocks. Morgan's reach also encompassed New York's Union Bridge Company, Gillette-Hezon Manufacturing Company of Minneapolis, and Berlin Iron Bridge Company of Connecticut in that first year, as well as other operations in coming years" (Hawley 1998:29-30).

V. R. Covell stated that the erection method was left to the bidders and that American Bridge Company's engineers developed the cantilevered method of erection, "one never before used on this type of structure" (Covell 1926:502).

> "The Foundation Company of New York brought its own wide experience in to Pittsburgh. Incorporated as the Foundation & Contracting Company in 1902 and specializing in 'design and construction of difficult foundations,' the firm shortened its name to the Foundation Company to reflect its specialized focus. Known for constructing foundations for skyscrapers at Manhattan Island's southern tip where bedrock was exceptionally deep, the company also expanded its operations to Canada and the Midwest. The Foundation Company's projects in the first decades of the twentieth century included bridges, mine shafts, tunnels, dams, and sea-walls. The firm used a variety of techniques, such as pneumatic caisson work, pile driving, and coffer-dam construction. The most prominent of its projects included sinking foundations for the Woolworth Building in New York City, at the time the tallest building in the world, 750'-0' above street level, and weighing 136,000 tons. The company also constructed foundations for the Miramachi and Pitt River bridges in Canada and the Penn Bridge in Coshocton, Ohio. With rock lying 50'-0" to 60'-0" under the Allegheny River's vigorous current, an experienced firm was needed for the Three Sisters Bridges" (Hawley 1998:30).

Construction

The Sixth Street Bridge served as the model for design for all three Sisters Bridges, though it was constructed last. The Seventh Street Bridge was constructed first, with demolition of the old structure beginning in September 1924. The three structures vary only slightly from one another in measurements.

"Engineers rejected using a temporary anchorage for the chain during erection because the site lacked adequate anchorages, both in clearance and in access to rock. Falsework was considered but the War Department's order to keep the river navigable precluded that method. One of the several unique aspects of the Three Sisters Bridges became, out of necessity, the erection of a suspension bridge with cantilever methods" (Hawley 1998: 33). Erection of the Seventh Street span began in July 1925. "Workers closed the girder in February 1926 and prepared the bridge for roadway construction. The next month, the War Department gave the county an ultimatum to begin work on the Sixth Street Bridge by the end of the year, forcing the county to rush work in progress on the Seventh and Ninth Street bridges" (Hawley 1998:34). The Seventh Street Bridge opened on June 17, 1926, and the Ninth Street Bridge opened on November 26, 1926. Because the 1892 superstructure of the Sixth Street Bridge was in good condition, the county reused it at nearby Coraopolis, resulting in a savings of $350,000 (Hawley 1998:34). The removal of the bridge 12 miles downriver to Coraopolis was done by the Foundation Company, and the structure was put into service in a mere 30 days in spring 1927.

Revisions were made to the design of Sixth Street Bridge's Piers 1 and 4 at the expense of the City of Pittsburgh to accommodate future subway construction by providing tunnel shields. These have never been used, as the current subway utilizes a different route across the Allegheny River. The Sixth Street Bridge was opened to pedestrians on September 14, 1928, and to all traffic on October 19, 1928.

Rachel Carson Bridge

Historic Nomination Form

Bibliography

Bibliography

Aurand, Martin
1985 Pennsylvania Historic Resource Survey Form for Sixth Street Bridge, Pittsburgh, Allegheny County, Pennsylvania. On file at the Pennsylvania Historical and Museum Commission, Harrisburg.

Covell, V. R.
1926 "Erecting a Self-Anchored Suspension Bridge—Seventh Street Bridge at Pittsburgh." *Engineering News-Record.* Vol. 97 No. 13 (September 13, 1926): 502-505.

Engineering News-Record
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1997 Pennsylvania Historic Bridge Inventory & Evaluation Form for Sixth Street Bridge, Pittsburgh, Allegheny County. Prepared for Pennsylvania Department of Transportation, Bureau of Environmental Quality. On file at the Pennsylvania Historical and Museum Commission, Harrisburg.

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1924 "Art Commission Gets Bridge Plans Today." 6 June: 4.
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1925 “New Bridges to Be Masterpieces of Construction.” 4 January.

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1925 “Three Bridges to be Identical in Type.” 18 March: 1, 5.

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9. Significance

According to legislation in Section 1.4 of the Pittsburgh Historic Preservation Ordinance, *Criteria for Designation,* a structure must meet at least one of the following criteria in order to be designated:

1. Its location as a site of a significant historic or prehistoric event or activity: *The Rachel Carson Bridge does not meet this Criterion for designation.*

2. Its identification with a person or persons who significantly contributed to the cultural, historic, architectural, archaeological, or related aspects of the development of the City of Pittsburgh, State of Pennsylvania, Mid-Atlantic region, or the United States: *The Rachel Carson Bridge does not meet this Criterion for designation.*

3. Its exemplification of an architectural type, style, or design distinguished by innovation, rarity, uniqueness, or overall quality of design, detail, materials, or craftsmanship.

The Rachel Carson Bridge meets Criterion 3 for its engineering merit as a very early example of a self-anchored suspension span constructed using the cantilever method and as one of the few surviving significant examples of an eyebar chain suspension bridge in the country. The Rachel Carson Bridge, along with its sister bridges were the first examples of self-anchored suspensions in the United States. Though about 70 self-anchored suspension bridges are in use today according to the international bridge database Structurae (structurae.net/en), the Sisters Bridges are among the oldest extant survivors, and nowhere else do three examples exist in proximity. Though the eyebar chain subtype of suspension bridge had long been in use by the 1920s, the three Sisters Bridges are among the largest and most substantial examples of the nine extant American examples of this type. Only 18 examples (inclusive of the three Sisters Bridges) of eyebar chain suspension bridges exist worldwide according to historicbridges.org. With the demolition of the Point Pleasant and St. Marys bridges over the Ohio River, the Sisters Bridges are the only extant examples of American Bridge Company-built eyebar chain suspension bridges in the United States; the only other extant example in the world is the Hercílio Luz Bridge in Florianópolis, Santa Catarina, Brazil.

The Rachel Carson Bridge, along with its sister bridges, exhibits an innovative solution to the problem of building suspension structures in a location that was known to have past problems with slipping of anchorages and that lacked adequate space for anchorages because of planned wharf improvements on the south side of the bridges and the presence of a railroad on the north end of the bridges. When the self-anchored design was selected by the Allegheny County Department of Public Works, only one other example existed, at Cologne, Germany. The structure's unusual cantilever method of construction was devised by the American Bridge Company, and it was the first use of its kind in the world.

The Rachel Carson Bridge is distinguished by overall quality of its design and by the distinctive design details of its pylons, such as carved and tooled masonry, bronze plaques, and decorative cast-iron ventilation grills, which exhibit a high level of quality in their materials and craftmanship.

4. Its identification as the work of an architect, designer, engineer, or builder whose individual work is significant in the history or development of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States.

The Rachel Carson Bridge and its sister bridges are significant for their association with the Allegheny County Department of Public Works, as they were designed during the department's most prolific and innovative period of bridge construction, during which 41 bridges were constructed. Allegheny County's locally funded infrastructure projects from the 1924-1931 were unprecedented in their scope, innovation, and quality of design. The Sisters Bridges, along with numerous other bridges, roads, and buildings that are still in use a century later, are a testament to the engineering and design prowess exhibited by the Allegheny County Department of Public Works.

5. Its exemplification of important planning and urban design techniques distinguished by innovation, rarity, uniqueness, or overall quality of design or detail.

The Rachel Carson Bridge and its sister bridges are the best representation of the power and influence of Pittsburgh's Art Commission in the early twentieth century. The commission's mandate for identical suspension bridges required the Allegheny County Department of Public Works to seek an innovative, rare, and unique design solution utilizing the first self-anchored, eyebar-chain suspension bridges in the United States. The structures were also the first of their type to be built using cantilevered construction. The Sisters Bridges embody a "specific response to local and national political configurations. The structures represent a larger process of social conflict and cohesion that began half a century before, as well as advances in material technology and design that became available only within the decade of [their] construction" (Hawley 1998:38).

6. Its location as a site of an important archaeological resource: *The Rachel Carson Bridge does not meet this Criterion for designation.*

7. Its association with important cultural of social aspects or events in the history of the City of Pittsburgh, the State of Pennsylvania, the Mid-Atlantic region, or the United States: *The Rachel Carson Bridge does not meet this Criterion for designation.*

8. Its exemplification of a pattern of neighborhood development or settlement significant to the cultural history or traditions of the City, whose components may lack individual distinction: *The Rachel Carson Bridge does not meet this Criterion for designation.*

9. Its representation of a cultural, historic, architectural, archaeological, or related theme expressed through distinctive areas, properties, sites, structures, or objects that may or may not be contiguous: *The Rachel Carson Bridge does not meet this Criterion for designation.*

10. Its unique location and distinctive physical appearance or presence representing an established and familiar visual feature of a neighborhood, community, or the City of Pittsburgh.

The Rachel Carson Bridge and its sister bridges form the only trio of identical bridges known to exist. Their location adjacent to downtown Pittsburgh's waterfront have made them the most recognizable symbol of Pittsburgh. The Rachel Carson Bridge is regularly and widely depicted in local and national media. In a city filled with outstanding bridges, the Sisters Bridges stand out as the most iconic landmarks among Pittsburgh's bridges.

10. Integrity

Overall, the Rachel Carson Bridge has a high level of integrity and it retains all seven aspects of integrity (location, setting, design, materials workmanship, feeling, and association), as its original primary structural members are present and continue to function as originally designed. A number of riveted built-up members have had repairs to strengthen deteriorated areas, but such repairs have been limited to deteriorated sections and entire members have not been replaced. The replacement of rivets with button-head bolts was only done in select areas (many of which are not visible), and built-up members possess sufficient original fabric to retain their historic character. The original deck and wearing course have been replaced as needed over time as part of routine maintenance. The streetcar tracks and associated overhead wire suspenders (on the girder towers) and poles (at the curbline) have been removed. The removal of the railroads north and south of the bridge and the construction of Fort Duquesne Boulevard introduced a moderate visual change to the resource's setting, including the concrete facing of the south abutment. The bridge's original lighting system was removed ca. 1970. The original solid-panel bridge railing was replaced with a woven wire panel railing in the mid-1990s. The railing modifications are generally sympathetic with the overall design of the originals and do not greatly detract from the historic feeling of the bridge. The modifications to the lighting and railings are secondary, ornamental features of the bridge and they do not inhibit the bridge from conveying its historic significance in the area of engineering. The high degree of integrity of design, materials, workmanship, and feeling of the bridge's primary structural members is sufficient to convey the bridge's historical and engineering significance.

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Rachel Carson Bridge

Historic Nomination Form

Photo Logs

12. Photos

List of Photos (all photos taken by Jesse A. Belfast)

Photo 1. Rachel Carson Bridge (April 2024), overview of west elevation from south end, facing northeast.
Photo 2. Rachel Carson Bridge (April 2024), overview of west elevation of main span, facing east.
Photo 3. Rachel Carson Bridge (April 2024), overview of west elevation from north end of bridge, facing southeast.
Photo 4. Rachel Carson Bridge (April 2024), overview of south approach to bridge, facing northeast.
Photo 5. Rachel Carson Bridge (April 2024), overview of south approach to bridge, facing southeast.
Photo 6. Rachel Carson Bridge (April 2024), overview of west elevation of south end of bridge, facing southeast.
Photo 7. Rachel Carson Bridge (April 2024), detail of southwest staircase accessing the Allegheny Wharf/riverfront trail, facing northwest. The staircase dates to the ca. 1955 construction of Fort Duquesne Boulevard.
Photo 8. Rachel Carson Bridge (April 2024), overview of span over Fort Duquesne Boulevard and south abutment, facing east.
Photo 9. Rachel Carson Bridge (April 2024), view of east sidewalk, facing south from north end of bridge.
Photo 10. Rachel Carson Bridge (April 2024), view of northeast pylon and location where eyebar chains attach to stiffening girder, facing southeast.
Photo 11. Rachel Carson Bridge (April 2024), detail of dedication plaque on northwest pylon, facing west.
Photo 12. Rachel Carson Bridge (April 2024), overview of north end of bridge, facing south.
Photo 13. Rachel Carson Bridge (April 2024), detail of west eyebar chain at the point where it connects to the stiffening girder, facing south.
Photo 14. Rachel Carson Bridge (April 2024), detail of attachment point of west eyebar chain at northwest bridge quadrant, facing south.
Photo 15. Rachel Carson Bridge (April 2024), detail of detail of pin-connected eyebar suspenders and stirrups in northwest part of bridge, facing southeast. An LED light is visible covering the eyebar chain pin.
Photo 16. Rachel Carson Bridge (April 2024), overview of north tower and sidewalk side of built-up stiffening girder and lower stirrup-and-eyebar connections, facing southeast.
Photo 17. Rachel Carson Bridge (April 2024), detail of arched bracing on north tower, facing southeast.
Photo 18. Rachel Carson Bridge (April 2024), detail of north tower showing battered design and built-up, riveted construction, facing southeast.
Photo 19. Rachel Carson Bridge (April 2024), detail of west elevation of northwest pylon, facing east.
Photo 20. Rachel Carson Bridge (April 2024), overview of north pier and span of riverfront trail (former B&O Railroad), facing east.
Photo 21. Rachel Carson Bridge (April 2024), overview of underside of west elevation of bridge, facing south from north end of bridge, showing stiffening girder and sidewalk brackets.

Photo 22. Rachel Carson Bridge (April 2024), underside of north end of bridge, showing stiffening girders, floorbeams, and stringers, facing south.
Photo 23. Rachel Carson Bridge (April 2024), overview of north approach span and abutment, facing northwest.
Photo 24. Rachel Carson Bridge (April 2024), detail of west and south elevations of north abutment, facing northeast.

Photo 1. Rachel Carson Bridge (April 2024), overview of west elevation from south end, facing northeast.

Photo 2. Rachel Carson Bridge (April 2024), overview of west elevation of main span, facing east.

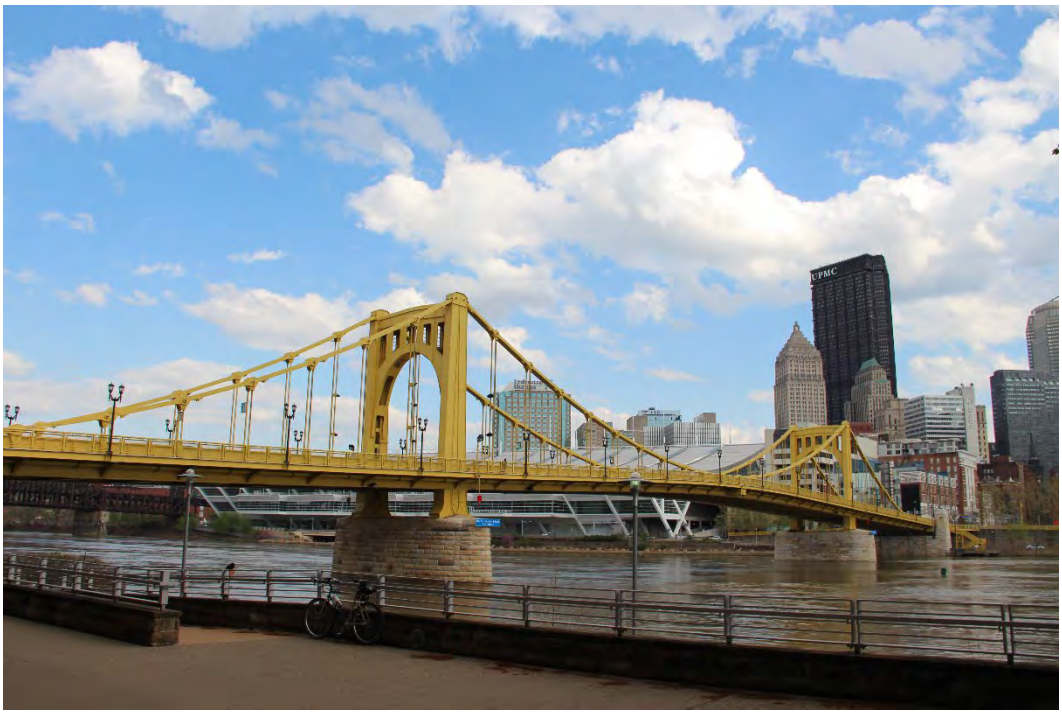
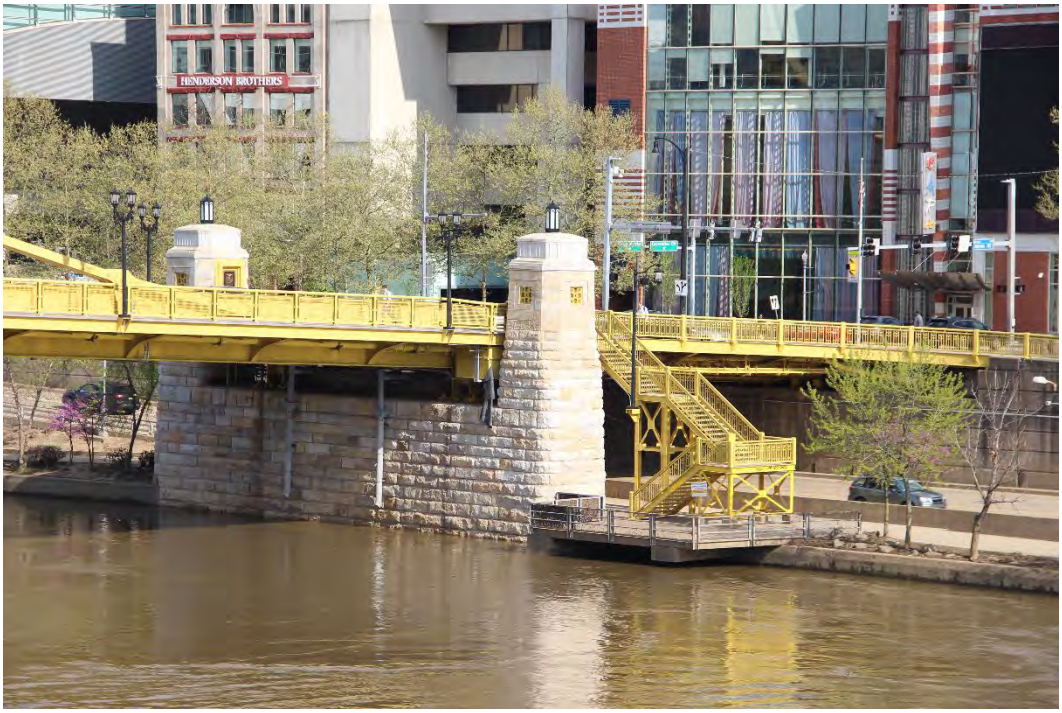


Photo 3. Rachel Carson Bridge (April 2024), overview of west elevation from north end of bridge, facing southeast.

Photo 4. Rachel Carson Bridge (April 2024), overview of south approach to bridge, facing northeast.

Photo 5. Rachel Carson Bridge (April 2024), overview of south approach to bridge, facing southeast.



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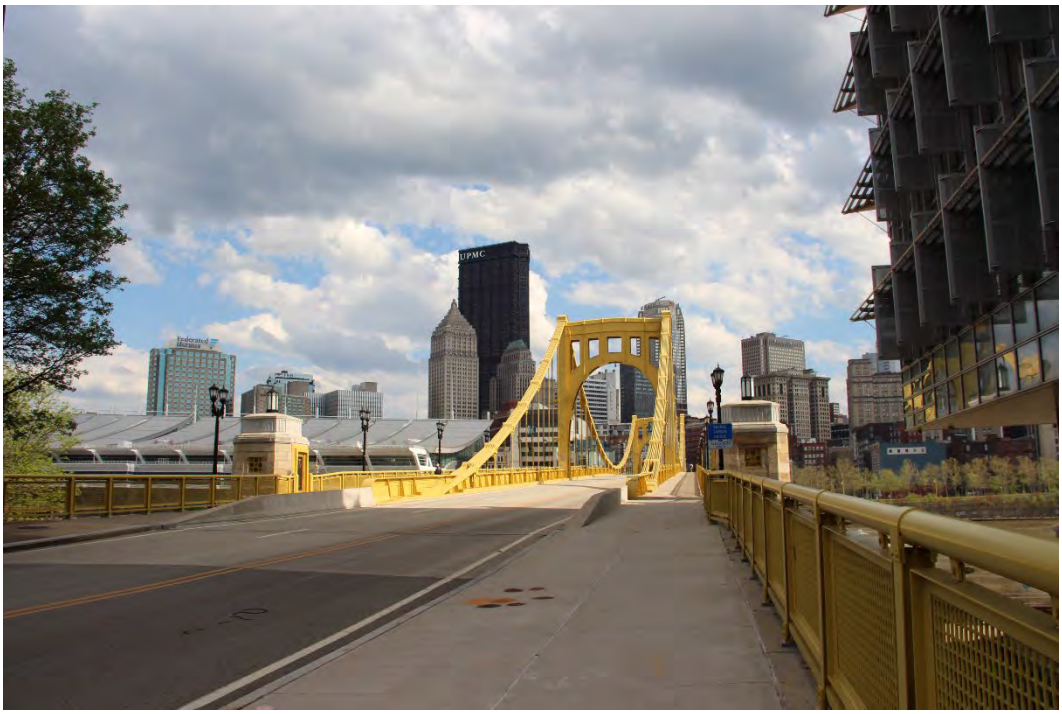

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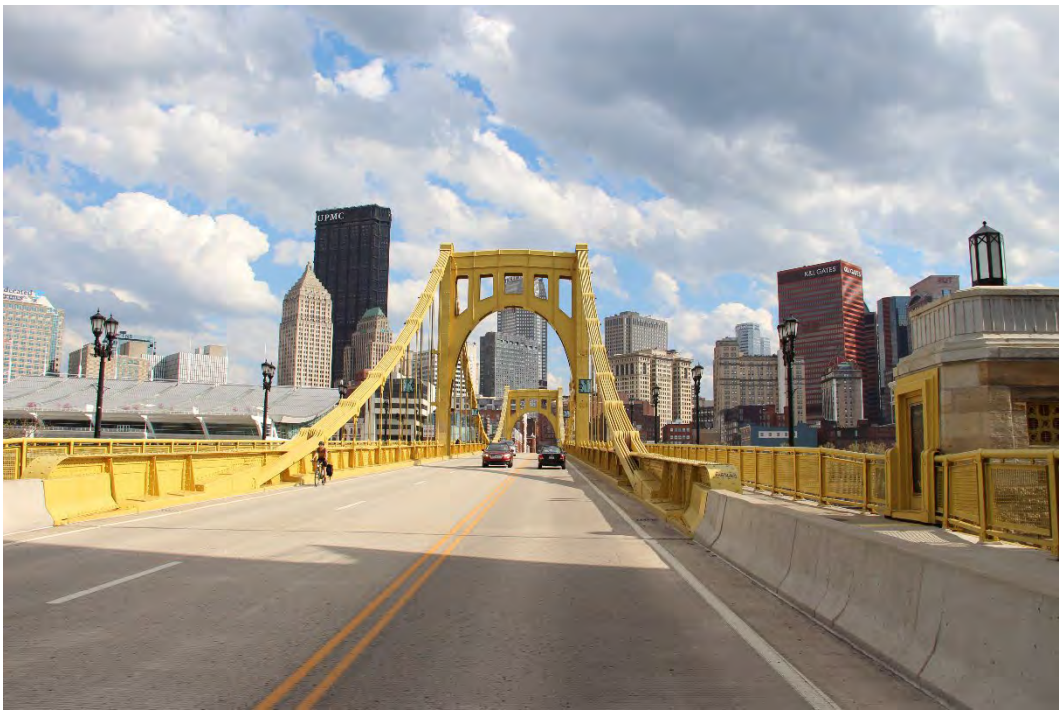


Photo 12. Rachel Carson Bridge (April 2024), overview of north end of bridge, facing south.

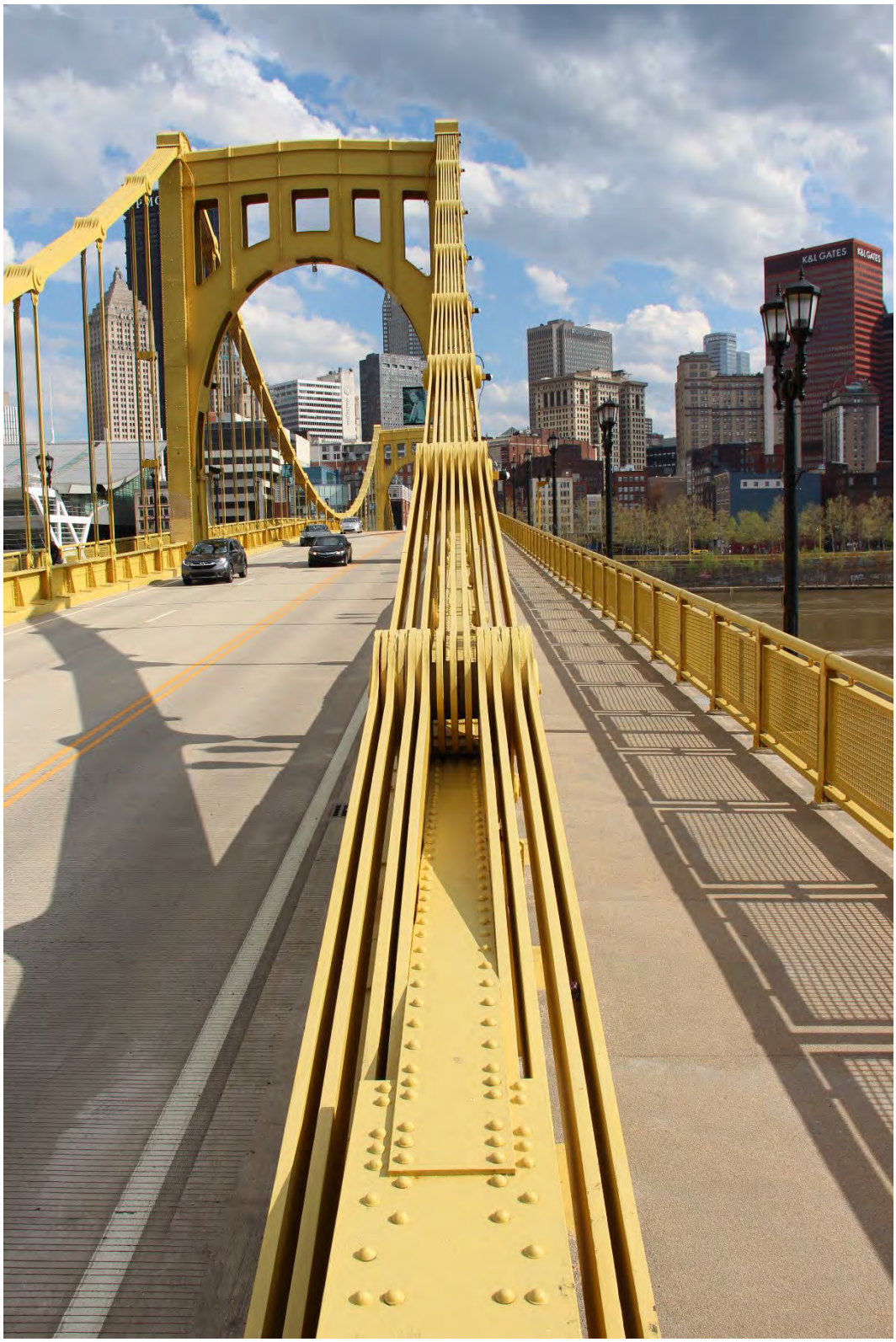
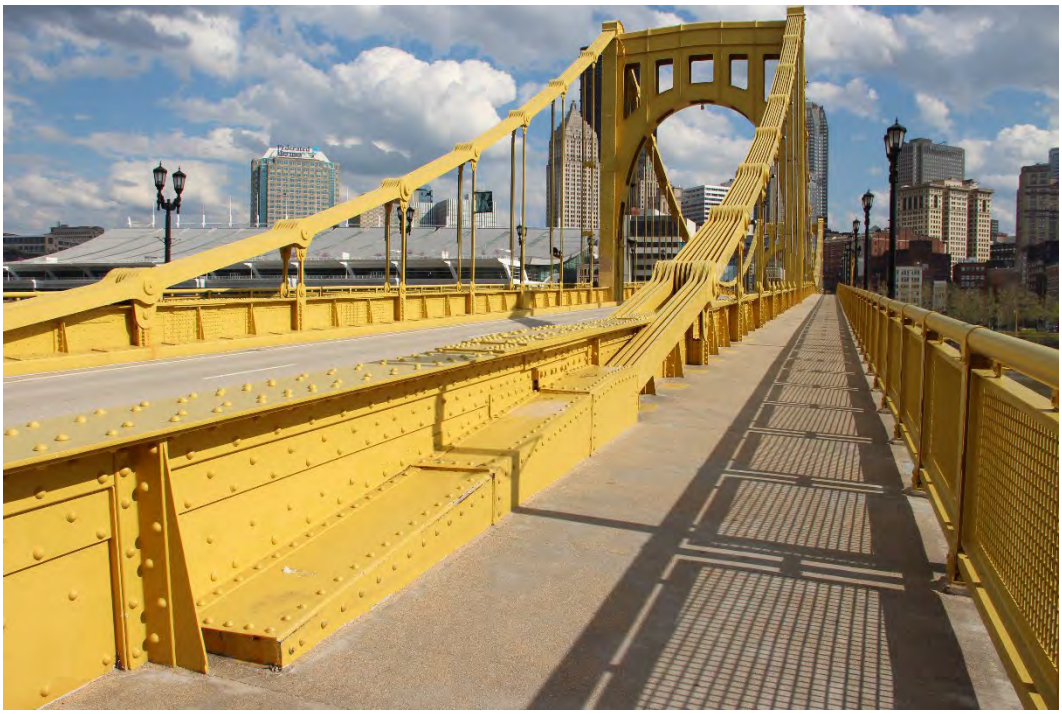


Photo 13. Rachel Carson Bridge (April 2024), detail of west eyebar chain at the point where it connects to the stiffening girder, facing south.



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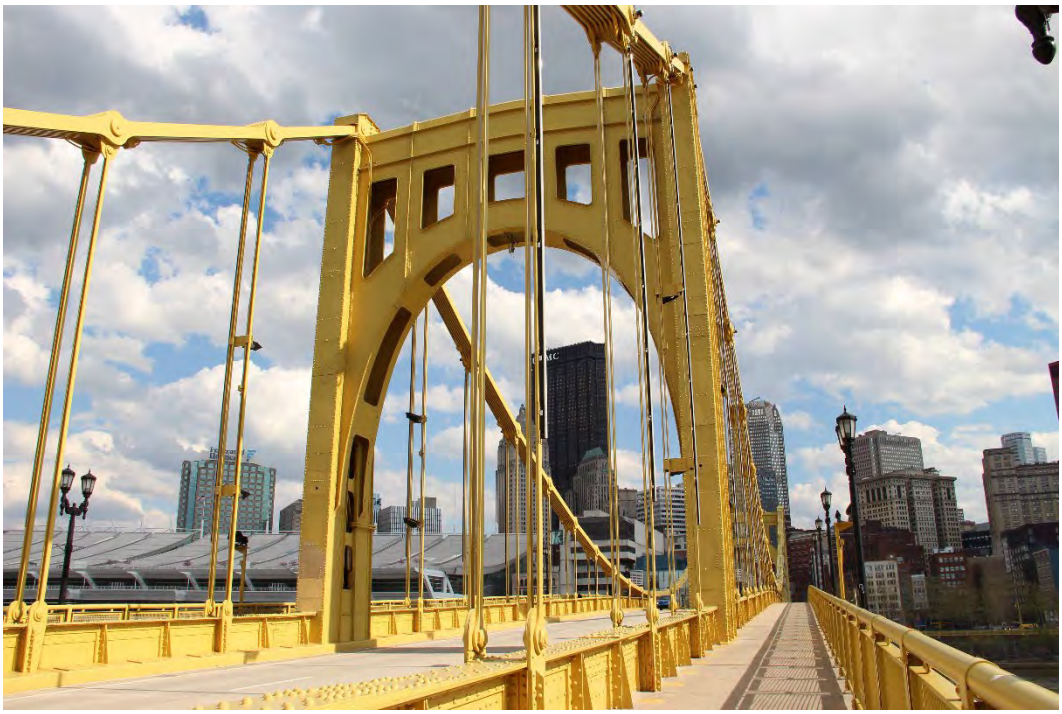

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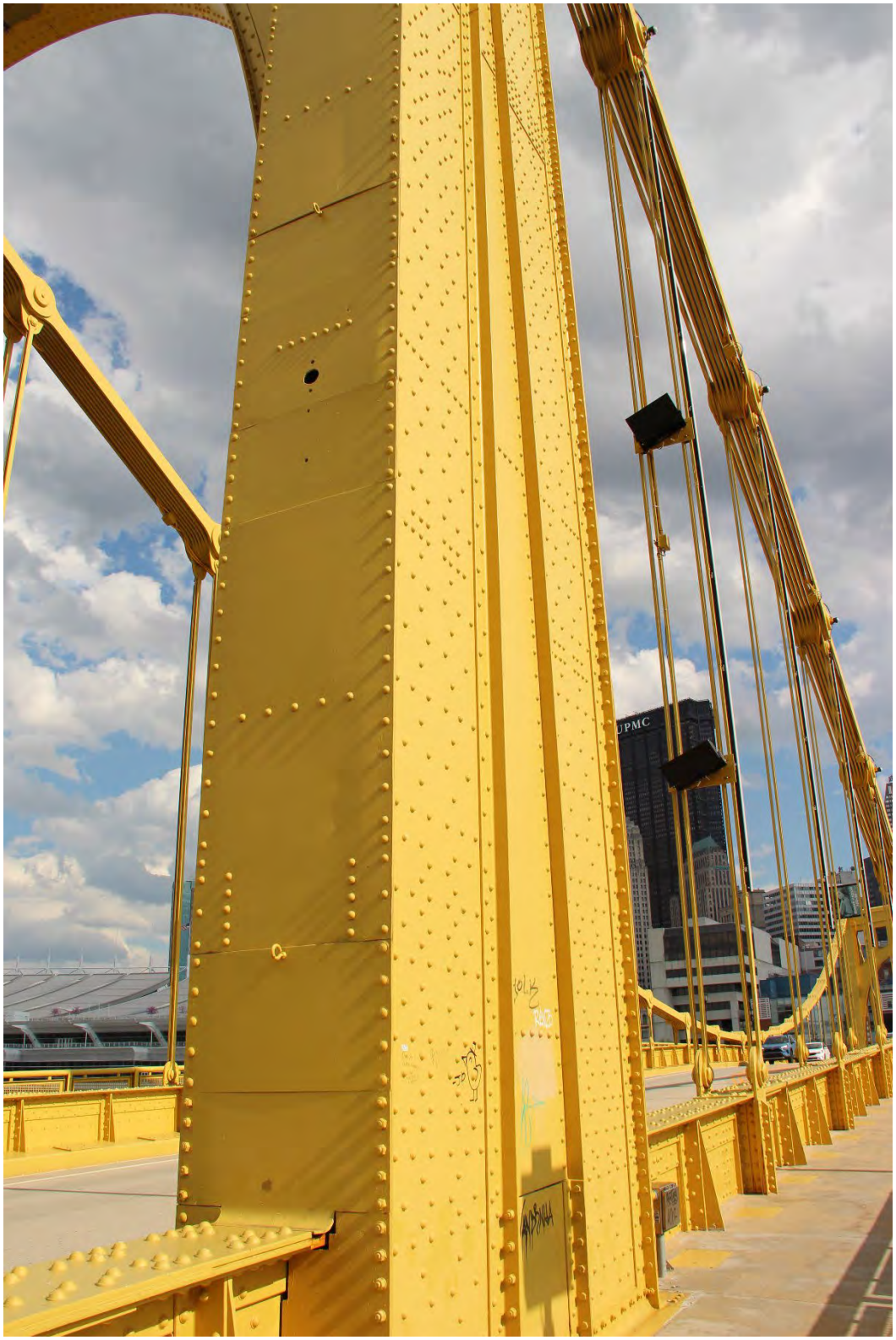

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Rachel Carson Bridge

Historic Nomination Form

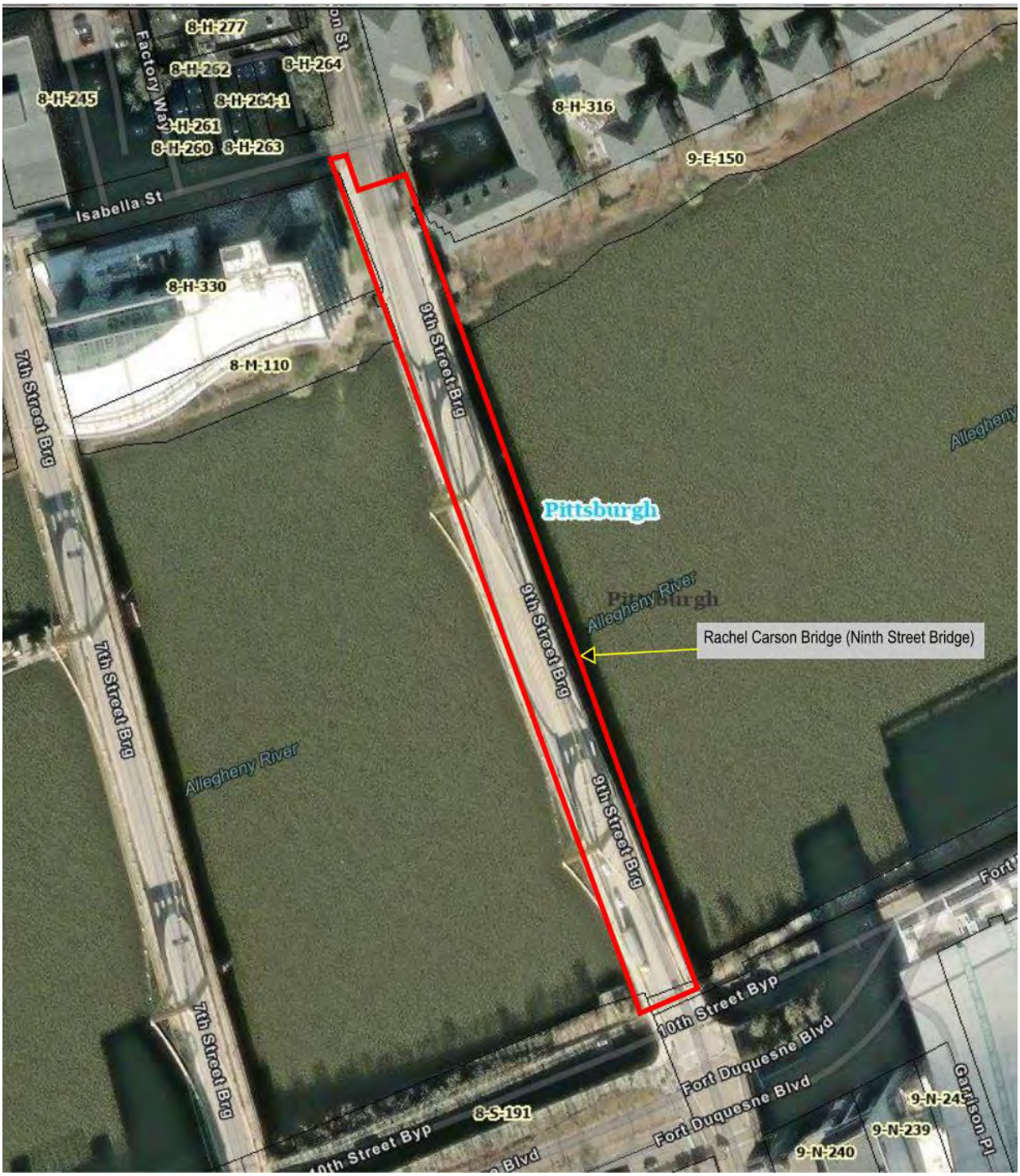
Supporting Documents

13. Supporting Documentation

List of Supporting Documents

Figure 1. Location of the Rachel Carson Bridge. The proposed historic structure boundary is shown in red. Note, the property is not located on any Allegheny County tax parcel.
Figure 2. Site plan (north part) on 2023 aerial mapping with photo directions.
Figure 3. Site plan (south part) on 2023 aerial mapping with photo directions.
Figure 4. Rendering of proposed Sixth, Seventh, and Ninth street bridges submitted to the Art Commission on June 6, 1924 (Pittsburgh Post 6 June 1924:4)
Figure 5. Preliminary renderings for the Sisters Bridges (Pittsburgh Sun 18 March 1925:1).
Figure 6. Early description of the Sisters Bridge (Pittsburgh Press, Sun 4 January 1925).
Figure 7. Erection sequence and force schematic depicted in Historic American Engineering Record for the Three Sisters Bridges, HAER PA 490-A (Hawley 1998).

Maps



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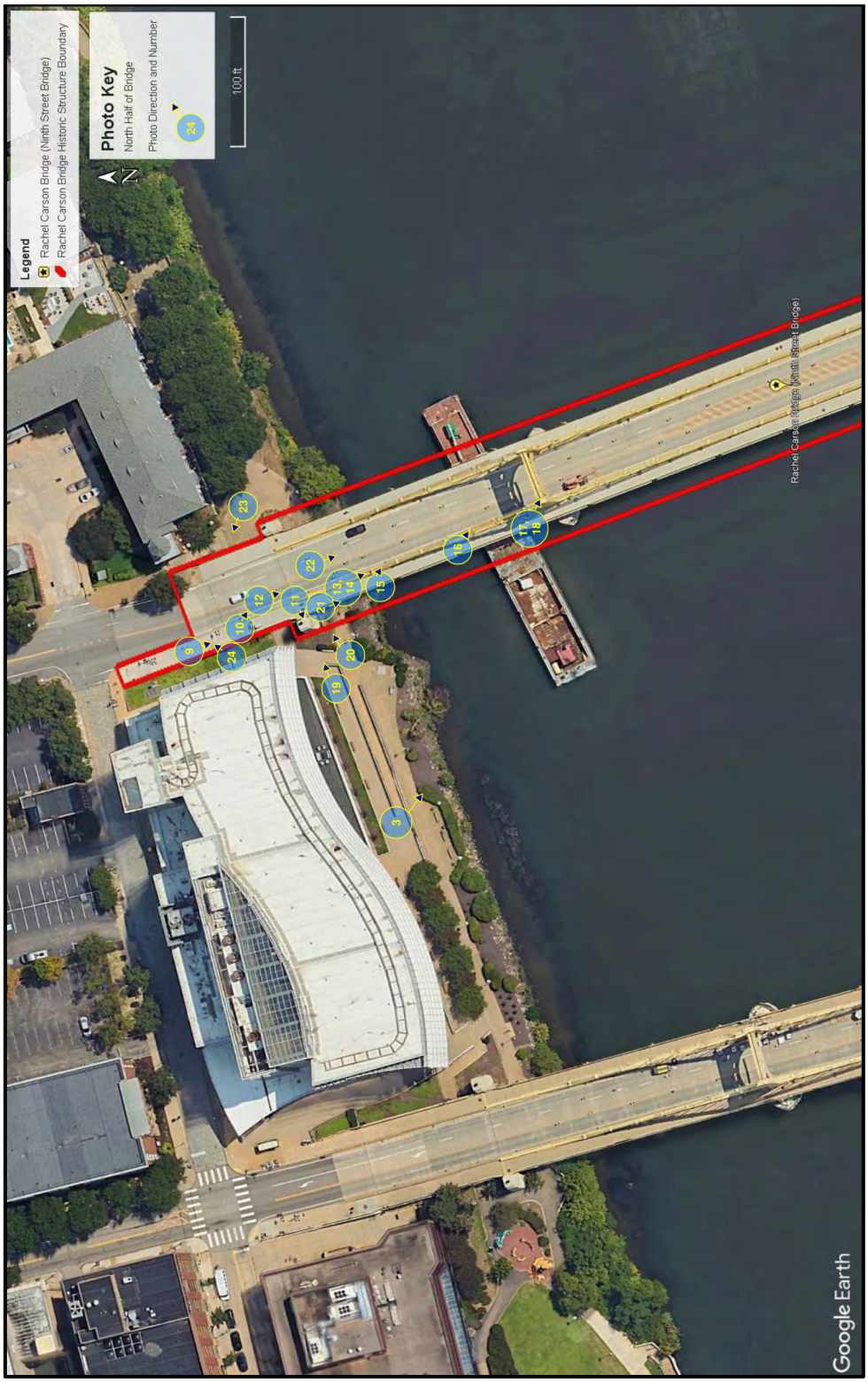

Figure 2. Site plan (north part) on 2023 aerial mapping with photo directions.

Figure 3. Site plan (south part) on 2023 aerial mapping with photo directions.

Other documentation

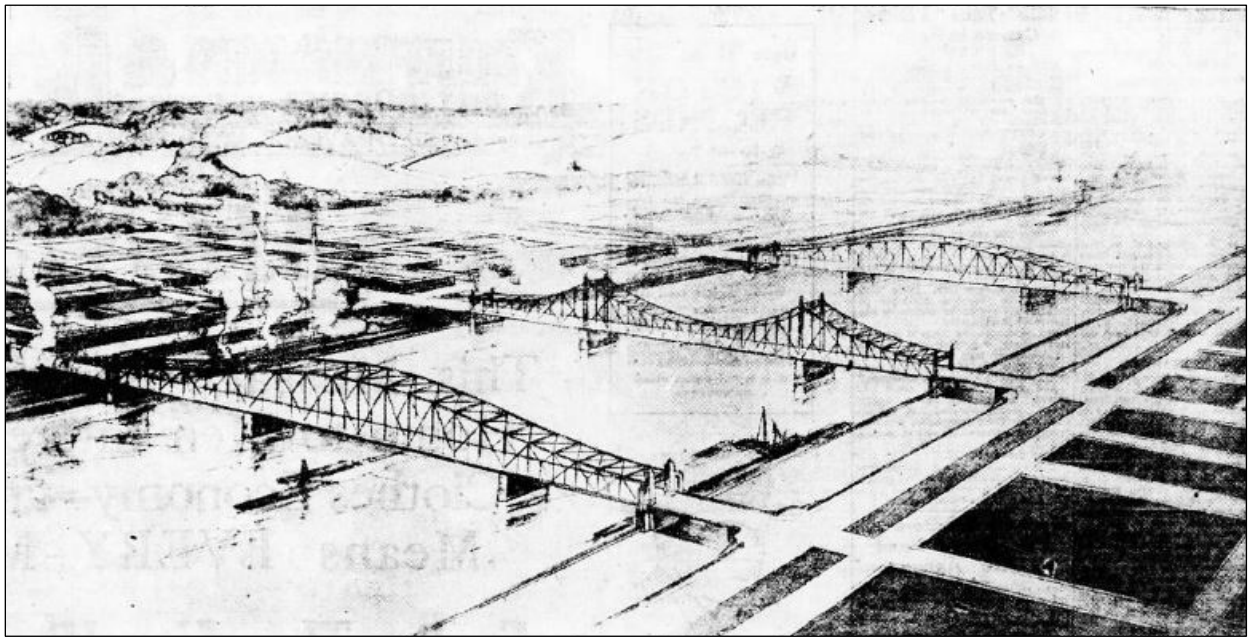

Figure 4. Rendering of proposed Sixth, Seventh, and Ninth street bridges submitted to the Art Commission on June 6, 1924 (Pittsburgh Post 6 June 1924:4)

NEW ALLEGHENY RIVER SPANS TO BE UNIQUE

Sun Mar 18 1925

1669

Three Bridges to Be Identical in Type

Simplicity of Design to Mark Unusual Group of Spans in Downtown District—First to Be Ready Next March.

Pittsburgh has been famed for many years as a bridge-building city, but it is believed that of all the thousands of spans which have been turned out of local mills and shops the three which are to carry Sixth, Seventh and Ninth streets across the Allegheny river will be unique. These structures will be identical in type and measurement, stand side by side, and together constitute what engineers and architects say will be one of the most unusual bridge groups in the world.

Director Brown of the county department of public works, and his associates, gave thought to many types and designs of trusses and other forms, but finally decided on what is known to engineers and architects as the "girder stiffened eye-bar suspension" style of construction. It was deemed as highly suitable for the 442-foot main spans and the 221-foot shore spans which resulted after the pier locations had been decided upon.

SIMPLICITY OF DESIGN.

The appeal of the three bridges to the eye as well as from an engineering standpoint, will be their extreme sim-

(Continued on Page Five, Col. Five.)

LAST MINUTE NEWS

MEDINA, O., March 18.—The body of Mrs. Lillian Gienkezn, the first of three persons to die from what is supposed to have been poisoning, was exhumed here today for examination, County Prosecutor Joseph A. Seymour announced.

DETROIT, March 18.—An air Pullman of the monoplane type, similar to one recently sold to the United States air mail service, was tested by its manufacturers today.

TORRINGTON, Conn., March 18.—The residence of Thomas J. Wall, prosecuting attorney of the Torrington city court, was severely damaged by an explosion believed to have been due to a bomb placed under the front veranda early today. The explosion follows closely wholesale liquor raids in Torrington.

MANCHESTER, England, March 12.—Baron Sheffield of Roscommon, Edward Lyulph Stanley, died today. His heir is the honorable Sir Arthur Lyulph Stanley.

COPENHAGEN, March 18.—A lockout and strike affecting nearly 50,000 men in the metallurgical industries are expected to begin tomorrow. Representatives of the employers and men have failed to reach an agreement after protracted negotiations.

WASHINGTON, March 18.—Disturbances in Peru, due to dissatisfaction over the award by President Coolidge in the Tacna-Arica arbitration case

The upper picture shows the appearance of the Seventh street bri when completed. The lower picture is of one of the portals to the s span and gives some idea of the steel towers, 70 feet in height, w will support the eye-bar cables to which the remainder of the br will be suspended.

Figure 5. Preliminary renderings for the Sisters Bridges (Pittsburgh Sun 18 March 1925:1).

New Bridges to Be Masterpieces Of Construction

Pittsburgh is to have another claim to the title of the "City of Bridges."

The new Sixth, Seventh and Ninth st. bridges which are to be erected by the county will be the first of their kind in the United States. The only two other like structures are in Cologne, Germany, and Budapest, Hungary.

They are to be built in such a manner that the bridges could stand on their river piers in safety without the land piers. This is assured by the heavy steel cables which will be 882 feet in length and 9 feet and one-half inch in diameter. The diameter of the cables is the greatest on any bridge in the country.

Another new feature to the spans is that they will be equipped with roller bearings under each of the suspension towers on the north river piers. These bearings will be 5 feet 6 inches in length and 14 inches in diameter and will be teethed. Ten of them will be packed in grease and enclosed in a box and will be between steel plates at the foot of each tower and the top of the piers. This arrangement will allow the bridge to expand and contract in various weather conditions without straining the structure. Engineers expect the bridge range of contraction and expansion to be between 7 and 8 inches.

Directly under each of the four suspension towers of each of the spans will be a large roller bearing. This bearing, 24 inches in diameter and 6 feet long, will move between the towers and steel plates on the top of the piers.

These bearings will permit the towers to tilt slightly in either direction, according to the way the bridge is loaded by traffic, balancing the weight on the structure.

The suspension cables of the structures will be composed of eyebars, specially heat treated, each 35 feet in length. Seven or eight of these bars will be placed in units which will be connected with roller bearings. At each of the spans they will be joined with the bridge proper with roller bearings and then continue into concrete supports.

The cables are expected to carry 1,000,000 pounds to the square inch.

Figure 6. Early description of the Sisters Bridge (Pittsburgh Press, Sun 4 January 1925).

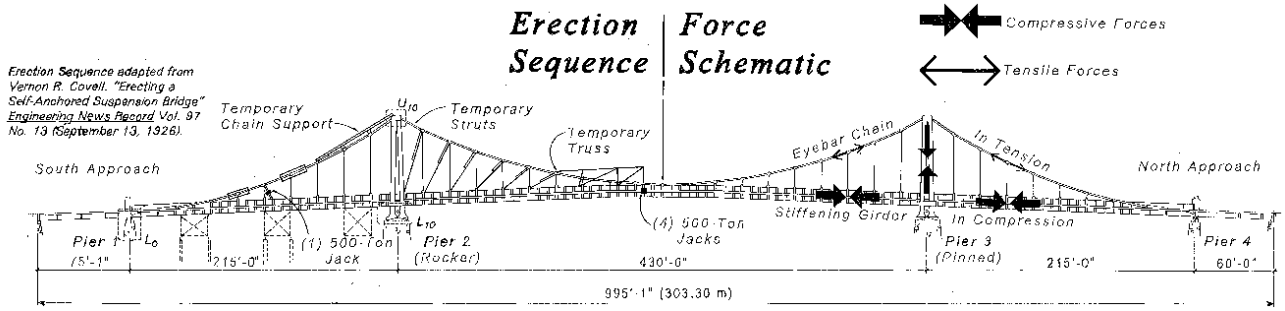

Figure 7. Erection sequence and force schematic depicted in Historic American Engineering Record for the Three Sisters Bridges, HAER PA 490-A (Hawley 1998).

Construction Progress Photos (courtesy of Allegheny County Public Works)