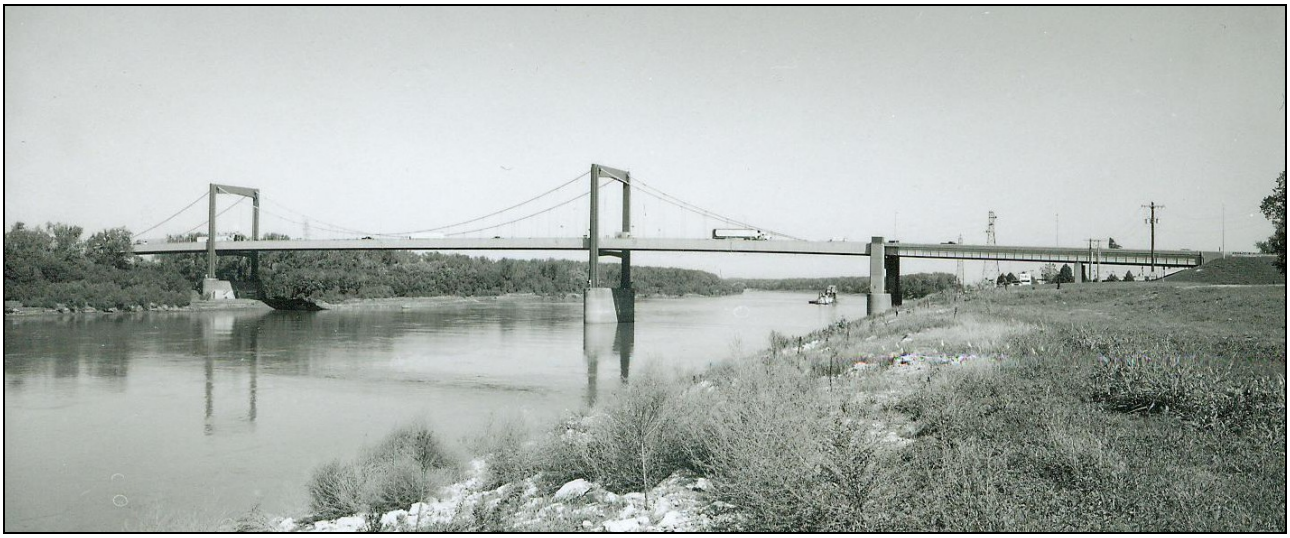
# Documentation of the Historic Paseo Bridge on the Missouri River at Kansas City

Bridge No. L07345
Jackson and Clay Counties, Interstate 29/35



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Paseo Bridge
(Missouri River Bridge No. L07345)
Spanning Missouri River on Interstate 29/35
Kansas City vicinity
Jackson and Clay Counties
Missouri

HAER No. MO-116

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Midwest Regional Office
National Park Service
601 Riverfront Drive
Omaha, Nebraska 68102-4226

HISTORIC AMERICAN ENGINEERING RECORD
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Photographer: Shaun Schmitz, October 2007

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HISTORIC AMERICAN ENGINEERING RECORD

# PASEO BRIDGE
(Missouri River Bridge No. L07345)

HAER No. MO-116

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|---|---|
| Location: | Spanning Missouri River on Interstate 29/35<br>Kansas City vicinity<br>Jackson and Clay Counties<br>Missouri |
| UTM: | Zone 15<br>Northing 4331569<br>Easting 364647 |
| Quad: | Kansas City [Missouri, Kansas] – 7.5' Quadrangle, 1991 |
| Construction: | 1952-54 |
| Designer: | Jacob Karol; Howard, Needles, Tammen and Bergendoff |
| Present Owner: | Missouri Department of Transportation, Jefferson City, Missouri |
| Present Use: | River bridge to be removed and replaced by a new river bridge; projected date of removal in 2011. |
| Significance: | The Paseo Bridge represents one of only a few self-anchored suspension bridges ever built in the United States. This unique bridge design was chosen to provide Kansas City with a signature structure, and the Paseo Bridge has served as a symbolic gateway into Kansas City since the 1950s. The bridge also represents one of the major civic achievements in post-World War II Kansas City history. Construction of the bridge was financed by the collection of tolls, and it was the last toll bridge to be owned and operated by the Missouri State Highway Commission. Finally, the Paseo Bridge provides an excellent example of large-scale highway bridge construction in the mid-twentieth century. |
| Project Information: | The Paseo Bridge was documented in 2008 by Thomas J. Gubbels, Missouri Department of Transportation, Historic Preservation Section, P.O. Box 270, Jefferson City, Missouri, 65102. |

## I. Physical Description of the Paseo Bridge

The Paseo Bridge represents a rare and unusual bridge type, the self-anchored suspension bridge. Suspension bridges were constructed throughout the United States beginning in the early nineteenth century. A suspension bridge features a bridge deck that is hung from vertical suspension members, usually steel cables, which are in tension, passing over large towers that are in compression. In most suspension bridges the ends of the suspension cables are joined to massive anchorages on either end of the structure. However, since the mid-nineteenth century engineers have designed a bridge where the suspension cables are anchored to the girders that carry the bridge deck, creating a "self-anchored" structure. In a self-anchored suspension bridge, the bridge girders carry a large axial compression force that resists the inward pull of the suspension cables, allowing the structure to support its own weight. Since the self-anchored bridge design requires the erection of the bridge deck girder prior to any other work on the superstructure, the design has generally been limited to river crossings of moderate length. However, the design was considered a practical and aesthetic alternative for situations where large external anchorages were impractical. Thus, the self-anchored suspension design proved to be an excellent choice for the Paseo Bridge.[1]

The Paseo Bridge in Kansas City carries Interstates 29 and 35 across the Missouri River. It links Kansas City's central business district to the community of North Kansas City. The overall length of the structure is 1,827' with a 55' clearance above the high water line of the Missouri River. The structure originally featured two 26' roadways with a 3 percent grade divided by a 4' decorative median and 3' sidewalks on both sides of the bridge. The Paseo Bridge features two standard plate-girder approach spans on its south side measuring 90' and 175' in length, while on the north, the bridge features deck plate-girder approach spans measuring 220' and 110' in length. These approach spans rest on standard abutments and piers, and they represent ordinary design standards of the era. The Paseo Bridge is linked to Paseo Avenue in Kansas City and the junction of Interstates 29 and 35 in North Kansas City by ordinary plate-girder viaducts.[2]

The engineering features of the Paseo Bridge that distinguish the structure and make it historically significant are its three self-anchored suspension spans. The central suspension span

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[1]National Cooperative Highway Research Program, "A Context for Common Historic Bridge Types," NCHRP Project 25-25, Task 15, October 2005, 3.132-3.136; John Ochsendorf, "Self-Anchored Suspension Bridges" (M.S. thesis, Princeton University, 1998), 1, 88; and John Ochsendorf and David Billington, "Self-Anchored Suspension Bridges," *Journal of Bridge Engineering* 4 (August 1999): 151.

[2]Howard, Needles, Tammen, and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri, Construction Plans," 1954, as held by the Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri; and "Kansas City Gets Bridge Fast," *Engineering News-Record*, 16 April 1953, 37.

is approximately 616' in length, and it is framed by two smaller self-anchored spans that are each 308' long. Four massive concrete piers sunk to blue shale beneath the Missouri River support the self-anchored suspension spans. These piers are labeled from south to north as Piers 2, 3, 4, and 5, on original construction plans. Piers 2 and 5 are composed of twin 22' diameter columns measuring 73' in height for Pier 2 and 100' in height for Pier 5. The columns of Piers 2 and 5 are spaced 69' apart when measured from the center to center of each column. Each of these piers is topped with a large concrete cap measuring 87' in length x 18' in width with a vertical height of 36'. While Piers 2 and 5 are flow-through structures, Piers 3 and 4 are closed structures. Piers 3 and 4 are both 98' long and 20' wide, with heights of 108'-6" for Pier 3 and 114' for Pier 4. Piers 3 and 4 are both capped by 42' solid concrete caps that are curved at either end to a 10' radius. The lower portions of Piers 3 and 4 each feature an internal shaft measuring 11' x 14'-6" extending from the cap to the bottom of the pier. Piers 3 and 4 are both crowned with large concrete pads where the lower struts of the suspension towers rest.[3]

Since the Paseo Bridge was designed a self-anchored structure, the first elements of the superstructure to be erected were the stiffening girders and the flooring system. Massive stiffening girders formed from steel box members 10' deep x 5'-6" wide were installed on both sides of the bridge. These stiffening girders are composed of riveted steel plates of various sizes, with some being as large as 104" x 104". The two stiffening girders are tied to the bridge piers via two vertical struts and two 11" steel pins. The flooring system of the Paseo Bridge is composed of large floor beams located at each point where the suspension cables tie into the stiffening girder, a total of 48 points across both sides of the structure. Most of the floor beams feature four steel angles measuring 6" x 6" with a thickness of 7/8" and massive square steel plates measuring 72" x 72". The floor beams are joined by top and bottom lateral struts and lateral bracing. The original bridge deck of the Paseo Bridge featured a 7" cement slab with an 1-½" parabolic crown as well as standard steel guardrails. The bridge deck contained numerous expansion joints, and the flooring system was linked to the bridge piers by both fixed and expansion shoes.[4]

The suspension cables that support the Paseo Bridge rest atop large steel towers that form the most imposing element of the superstructure. The steel towers are 136' tall and feature twin steel columns with 65'-6" of space between each column. The columns are irregularly shaped and are composed of riveted steel plates and angles. The bases of each column vary in size from 11' x 5'-11" for the tower above Pier 3 to 11' x 8' for the tower above Pier 4. Each tower features a lower strut immediately underneath the stiffening girder and flooring system. The

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[3]*Ibid*.

[4]*Ibid*.; and Missouri Department of Transportation, "Bridge Failure Points to Mechanically Frozen Pin," *Breakthrough Research Bulletin*, September 2005, downloaded 3 January 2008 from http://168.166.124.22/RDT/reports/Ri03015/orb05008.pdf, 1.

lower struts are composed of steel plates and four steel angles, and they vary in height from 4'-6" to 7'-½". The lower strut measures approximately 72' in length between the inner edges of each column for the tower atop Pier 4 and 65'-6" for the lower strut of the tower above Pier 3. The upper struts of each steel tower vary in height from 10'-½" to 13'-½". Each tower features two saddles where the primary cable of the cable system rests. The two primary suspension cables that carry the weight of the Paseo Bridge are composed of thirty-seven individual steel wires varying in circumference from 1-¼" to 1-¾" surrounded by extruded aluminum fillers and steel wrapping. The primary suspension cables are joined directly to the stiffening girder by large steel anchors constructed inside the girder box as well as large pipes atop the stiffening girder.[5]

A total of ninety-six suspender cables connect the primary suspension cables to the stiffening girder of the Paseo Bridge, creating forty-eight bridge spans each measuring 25'-8" in length. The suspender cables are composed of four individual steel ropes measuring 1-½" in circumference, and they are linked to the primary suspension cables by large steel bands and suspender clamps and to the stiffening girder by suspender collars. Two commemorative plaques were installed on the Paseo Bridge in 1954. The plaque on the west side of the bridge acknowledged Howard, Needles, Tammen and Bergendoff as the bridge designer and recognized sponsorship of the new bridge by the Jackson and Clay County courts, the Missouri State Highway Commission, the Citizen's Regional Planning Council, and the City of Kansas City. The plaque on the east side of the Paseo Bridge noted that the structure was awarded a prize by the American Institute of Steel Construction for being the most beautiful steel bridge built in 1954.[6]

## II. History of the Paseo Bridge

### A. Prelude: Kansas City in the 1940s and Early 1950s

The origins of the Paseo Bridge across the Missouri River lay in the numerous changes that occurred in Kansas City during the years following the end of the Second World War. Kansas City had prospered during World War II thanks to its extensive railroad and commercial base. The city's industries had shifted easily to wartime production, supplying boats, airplanes, and munitions for the country's war effort.[7] When the war came to an end, Kansas City was on

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[5]Howard, Needles, Tammen, and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri, Construction Plans."

[6]*Ibid*.; and "This Dog Can Hunt, and Read a Plaque, Too," *Kansas City Star*, 11 April 2007, B2.

[7]For a lively discussion of life in Kansas City during World War II, see Sherry Lamb Schirmer and Richard D. McKinzie, *At the River's Bend: An Illustrated History of Kansas City, Independence and Jackson County* (Woodland Hills, California: Windsor Publications, 1982), 229-231.

the cusp of an era of tremendous growth and change. The community would experience tremendous economic, physical, and population growth, and Kansas City would soon become a major midwestern metropolis. The city would also experience huge changes in its political leadership with the emergence of professional civic leaders who greatly influenced the physical growth of the metropolitan area. Kansas City was a changing community in the mid-1940s, and city leaders were faced with difficult decisions that would impact the community for decades to come.

Perhaps the single most critical change that occurred in postwar Kansas City was a change in the way the city was governed. Throughout the 1920s and 1930s, Kansas City was under the control of a single man, Tom Pendergast. Pendergast was a nineteenth-century political boss who adapted to twentieth century realities. Pendergast first rose to power by providing favors and services to Kansas City's impoverished masses, but he maintained power by forming political clubs that also appealed to the city's middle-class base, by providing benefits to local business groups, and supplying jobs to middle-class professionals. Pendergast soon controlled the City Council and Mayor, as well as the police and fire departments, and by 1930, Pendergast personally controlled all aspects of government in metropolitan Kansas City.[8]

The Pendergast era in Kansas City was a time of civic corruption and chaos. Tom Pendergast used city jobs to help maintain control over the city's middle-class, hiring over 6,000 people to work for the city, a number far larger than needed to run the community. Payoffs to city officials were common, and the police department was filled with officers who, "couldn't read or write; who carried pistols with no firing pins, and who thought arson was some kind of poison."[9] Pendergast was also involved with all forms of vice in Kansas City, including prostitution, gambling, and illegal liquor production. Some civic improvements did occur during Pendergast's reign over Kansas City, including the construction of a new downtown courthouse and the improvement of Jackson County's highway system. However, a shell company controlled by Pendergast provided the cement for these two projects, as well for numerous other city improvements, providing even more income for the Pendergast machine.[10] Tom Pendergast finally began to lose his grip on Kansas City in the late 1930s as reformers challenged his power

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[8]Lyle W. Dorsett and David P. Setran, "Pendergast, Thomas J. (1872-1945)," in *Dictionary of Missouri Biography*, ed. Lawrence O. Chistensen and others (Columbia: University of Missouri Press, 1999), 603.

[9]Gladwin Hill, *Detroit Free Press*, 3 January 1942; quoted in Bill Gilbert, *This City, This Man: The Cookingham Era in Kansas City* (Washington, D.C.: International City Management Association, 1978), 5.

[10]One of Tom Pendergast's shell companies, the W.A. Ross Cement Company, supplied cement and other supplies for several bridges and highways built by the Missouri State Highway Commission in the late 1920s and 1930s. See Thomas Gubbels, "Bridge K-510A Over Niangua River Branch, Lake of the Ozarks," December 1999, as held in the Cultural Inventory, Missouri State Historic Preservation Office, Jefferson City, Missouri, 6.

base. In April 1939 Pendergast was indicted on charges of tax evasion, and in May 1939 he was sentenced to fifteen months in federal prison. Pendergast's time in prison ended his political career, and he died in Kansas City on January 26, 1945.[11]

In 1940, Kansas City Mayor John Gage and the newly elected City Council realized that the community was at a crossroads. Kansas City's City Charter had been revised in 1925, and under the new system, the daily affairs of the city were controlled by a professional City Manager selected on a non-partisan basis by the City Council. Kansas City's elected officials basically served as civic watchdogs who oversaw the City Manager's office and made sure that he was running the city efficiently and within budget.[12] Thus, Kansas City's civic leaders set out in 1940 to find an experienced, professional city manager to take over and repair "one of the most backward, one of the rottenest governments in the country."[13]

In April 1940, the City Council hired L.P. Cookingham as Kansas City's new City Manager. Cookingham was serving as the City Manager of Saginaw, Michigan, and the 44-year old had extensive experience in city operations. Cookingham served as City Manager in Kansas City until 1959, and he proved to be a competent reformer up to the task of repairing the damage done during the Pendergast era. When Cookingham took office in Kansas City, he discovered a bloated city government that was $20 million in debt. Cookingham took decisive action, eliminating 2,000 city jobs within six months and erasing the city's debt within a year. By the end of his tenure in Kansas City, Cookingham had eliminated all vestiges of the Pendergast era and created an efficient, professional city government that proved extremely capable of dealing with the many problems faced by the Kansas City community. [14]

L.P. Cookingham not only believed that the day-to-day affairs of running Kansas City needed to be handled professionally, he also wanted professional input on the question of how to manage growth in the metropolitan area. To do this, Cookingham hired engineers and other professionals to carefully study how to spend the city's money on critical infrastructure

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[11]Dorsett and Setran, "Pendergast," 603-604; and Gilbert, *This City*, 4-6. For a detailed summary of the Pendergast era and its impact on Kansas City's civic affairs, see A. Theodore Brown and Lyle W. Dorsett, *K.C.: A History of Kansas City, Missouri* (Boulder, Colorado: Pruett Publishing Company, 1978), 188-215.

[12]Brown and Dorsett, *K.C.: A History*, 227; and Schirmer and McKinzie, *At the River's Bend*, 190.

[13]*Kansas City Star*, 15 May 1940; quoted in Gilbert, *This City*, 1.

[14]Gilbert, *This City*, 16-18; Brown and Dorsett, *K.C.: A History*, 227-229; James C. Fitzpatrick, "New Manager Made Big Changes Fast: Corrupt, Inefficient System was Reformed," *Kansas City* Star, 23 July 1992, A10; and Donald B. Oster, "Cookingham, L. Perry (1896-1992)," in *Dictionary of Missouri Biography*, ed. Lawrence O. Chistensen and others (Columbia: University of Missouri Press, 1999), 206-207. L.P. Cookingham rarely went by his first name, Laurie, choosing instead to simply use his initials or ask people to call him by his middle name, Perry.

improvements. During Cookingham's tenure, Kansas City created a master plan to guide future growth and infrastructure improvements. The city issued millions of dollars in city bonds and used the money to improve the sewer system, build a new international airport, and finance new expressways and bridges. Studies were made of traffic and growth patterns throughout the region, and Cookingham used these studies to guide the construction of an extensive expressway system that engineers believed would allow the city to grow and thrive.[15] Under Cookingham, Kansas City was run according to professional theory, and engineers and professional managers ultimately decided where to build new bridges across the Missouri River and how to finance the new structures. As the Kansas City Star noted upon Cookingham's death in 1992:

> He [Cookingham] was the embodiment of the professional theory: The city would be run by competent engineers and planners, not on the basis of favoritism and plunder in exchange for votes. It was not a new concept, but it had never had much of a trial here. When the framework of city manager government was established, the machine took it over. The reformers of 1940 and Cookingham made it work.[16]

Another critical issue facing L.P. Cookingham and Kansas City's leaders during the postwar era was how to deal with rapid physical and population growth on the outer edges of the Kansas City metropolitan area. Like most other cities, Kansas City experienced rapid population growth during the "baby boom" that occurred after the end of World War II along with population shifts away from the city into suburban neighborhoods. Small rural communities on the outskirts of Kansas City such as Blue Springs, Lees Summit, and Raytown experienced rapid growth in the 1950s. By the late twentieth century, these small towns had become large suburban enclaves with populations that had exploded from a few hundred residents after World War II to tens of thousands of people.[17]

One particular area of suburban growth that drew the attention of Kansas City's civic leaders in the years after World War II was the section of the metropolitan area located north of the Missouri River, referred to by local residents as the "Northland." The Missouri River had traditionally formed the northern boundary of Kansas City, but in the early twentieth century several small towns and subdivisions sprang up immediately north of the river. One such

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[15]Brown and Dorsett, *K.C.: A History*, 237-242; and Kansas City, Missouri, City Planning and Development Department, *2nd District City Council Handbook* (Kansas City: Kansas City, Missouri, City Planning and Development Department, 2002), 38.

[16]James W. Scott, "Kansas City's Cookingham," *Kansas City Star*, 24 July 1992, C6. For a detailed list of Cookingham's accomplishments as City Manager of Kansas City, See Gilbert, *This Man*, 238-258.

[17]Schirmer and McKinzie, *At the River's Bend*, 257-272; and Rick Montgomery, "Churning Out Children, Settling Into Subdivisions, We Were Ready to Go…Big League," *Kansas City Star*, 28 June 1998, A1, A11, A12.

community was North Kansas City, created in 1913 as a joint venture by three local companies: Armour Meat Packing, Swift Meat Packing, and the Chicago, Burlington, and Quincy Railroad. These three companies platted out a small industrial community on the north side of the Missouri River immediately adjacent to the Armour-Swift-Burlington (A.S.B.) railroad bridge leading into downtown Kansas City. North Kansas City residents could commute into Kansas City proper via an electric railroad line that ran across the A.S.B. railroad bridge, by walking or riding across the upper deck of the Hannibal Bridge, or by using available ferry services. North Kansas City grew slowly during its first decades, but by 1951, the community was home to an estimated 4,000 residents, 200 retails stores, and 175 wholesale businesses and industries.[18] Other parts of the Northland were expanding in the early 1950s as well. Immediately north and east of North Kansas City the community of Claycomo was the site of a new Ford Automobile factory that would employ approximately 6,000 people.[19]

L.P. Cookingham saw the rapid growth in the suburbs surrounding Kansas City and concluded that if the city did not take immediate action, it could lose much of its tax base. Thus, Kansas City launched an aggressive annexation program in the late 1940s, and by 1960 the city had grown in size from 81 square miles to almost 130 square miles.[20] Several annexed areas were located north of the Missouri River, but since North Kansas City was already incorporated, it remained an independent entity. The expansion of Kansas City outside the limits of Jackson County was extremely controversial in the 1950s, but as later historians have pointed out, the annexations conducted by Cookingham allowed the city to grow and prosper:

> Historians will note that he [Cookingham] changed the shape of Kansas City by planning and promoting the annexation of land in Platte and Clay counties north of the Missouri River. His planning and guidance put the Kansas City International Airport in the Northland. Subtract Cookingham's vision, and you might also subtract KCI, the TWA Overhaul Base, highways, Metro North Shopping Center, most subdivisions, most businesses and most jobs. That

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[18]City of North Kansas City, Missouri, *North Kansas City Annals: 1912-1987* (North Kansas City: City of North Kansas City, Missouri, 1988), *passim*; Mildred Fulton, ed., *Bridge to the Past: A Personal History of North Kansas City* (North Kansas City: City of North Kansas City, Missouri, 1983), *passim*; and Howard, Needles, Tammen and Bergendoff, *Report on Proposed Toll Bridge Across the Missouri River* (Kansas City: Howard, Needles, Tammen and Bergendoff, 1950), 7. Special thanks are extended to Sara Prem of the HNTB Corporation for providing the author a copy of this difficult to find 1950 engineering report.

[19]"Official Statement of Jackson and Clay Counties, Missouri, Relating to the Proposed Issue of $16,000 Paseo Bridge Revenue Bonds," 11 August 1952, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 3.

[20]Montgomery, "Churning Out Children," A12. By the time Cookingham's annexation program was fully implemented in the early 1960s, Kansas City had grown to encompass over 310 square miles. See William Worley, *Kansas City: Rise of a Regional Metropolis* (Carlsbad, California: Heritage Media Corporation, 2002), 95.

> wouldn't leave much, and most of us would be living and working somewhere else. Things could easily have been different.[21]

B. The Planners' Vision: A New River Bridge for Kansas City

One critical issue faced by L.P. Cookingham and other local civic leaders in the postwar era was how to accommodate increasing traffic between suburban areas north of the Missouri River and downtown Kansas City. Kansas City annexed approximately 20 square miles north of the Missouri River in 1950, and demographers anticipated that the population of the annexed region would grow from 10,000 to 45,000 residents by 1970. Civic leaders in Kansas City had realized for years that new highway bridges across the Missouri River were a critical prerequisite for metropolitan growth. In 1927 Kansas City made an informal study of the feasibility of constructing a new bridge across the Missouri River, and in 1937 surveys were conducted to see if it would be possible to add lanes to the A.S.B. railroad bridge to accommodate automobile traffic. None of these studies led to any action, but in the late 1940s, the City Plan Commission of Kansas City under the leadership of L.P. Cookingham commissioned a local engineering firm to conduct a thorough study of the bridges across the Missouri River between downtown Kansas City and the Northland. The engineering firm of Howard, Needles, Tammen and Bergendoff, known locally as HNTB, conducted the study, and in January 1950, the firm's engineers presented their conclusions and recommendations to Kansas City as well as Jackson County, Clay County, and the Missouri State Highway Commission.[22]

HNTB engineers began their 1950 report on the feasibility of building a new bridge across the Missouri River in Kansas City by briefly summarizing current markets and economic trends. Kansas City was a major commercial and agricultural center thanks to its extensive transportation system. The community also had a thriving industrial base and a vibrant downtown district that served as Kansas City's business center. However, economic and demographic growth of North Kansas City had created additional automobile traffic that could not be sustained by current facilities. The report noted:

> As regards cross-river traffic, the accentuated growth of industry, wholesale establishments and warehouse facilities in North Kansas City, just across the river from the central business district of Kansas City, is of particular interest. In recent years this independently incorporated community has been growing commercially at a rate well above that of the district as a whole. Aside from the usual commercial traffic, there is a considerable amount of cross-river shuttle

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[21]Bill Graham, "Manager's Vision Had Big Impact," *Kansas City Star*, 30 July 1992, B1.

[22]Howard, Needles, Tammen and Bergendoff, *Report on Proposed Toll Bridge*, 1-2, 7; and "Kansas City Gets Bridge Fast," 35.

> traffic resulting from working population residing in Kansas City, employed in North Kansas City, and vice versa.[23]

Traffic studies indicated that the A.S.B. Bridge carried approximately 75 percent of all automobile traffic between North Kansas City and Kansas City. This structure, built in 1912, featured a double railway track on its lower deck and four narrow automobile lanes on its upper deck. The driving lanes atop the A.S.B. Bridge were divided by the bridge's trusses and difficult approaches that required sharp turns before vehicles could cross the structure. Engineers estimated that the A.S.B. Bridge had a practical capacity of no more than 900 vehicles per hour, and because of its poor condition, traffic delays at the bridge were "frequent and considerable."[24] Commuters between North Kansas City and downtown Kansas City could also cross the river on the Hannibal Bridge. This structure had been in service since 1917, and it too was considered inadequate to serve Kansas City's modern traffic needs:

> The alignment of the viaduct spans [of the Hannibal Bridge] as well as the street approaches is poor and the grades are steep…The location of the bridge, its poor alignment, narrow roadway, delays caused by span operation for passing river traffic and frequent congestion due to the relatively heavy traffic to and from the Municipal Airport, leaves little, if any, capacity to absorb overflow traffic from the A.S.B. Bridge…Therefore, this facility…has but limited use and does not share in the principal north-south traffic.[25]

In order to provide for the increased traffic across the Missouri River, HNTB engineers recommended the construction of a new, multi-lane bridge connecting North Kansas City to Kansas City's central business district. The proposed bridge would carry four lanes of traffic divided by a 4' median and would feature 3' sidewalks on both sides of the structure. The southern, downtown end of the bridge would connect into either Paseo Boulevard or Lydia Avenue, a city street located one block west of Paseo Boulevard, while the northern end of the bridge would connect into relocated U.S. Highways 69 and 71 in North Kansas City. Detailed

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[23]Howard, Needles, Tammen and Bergendoff, *Report on Proposed Toll Bridge*, 7.

[24]*Ibid*., 18. In 1946, the Missouri State Highway Department conducted a detailed origin and destination study of all traffic crossing the A.S.B. and Hannibal Bridges in Kansas City, and this report provided the raw data that was used by HNTB to analyze whether or not the two bridges could handle future transportation needs. See *Ibid*., 19.

[25]*Ibid*., 12. A new, multi-lane automobile bridge across the Missouri was opened next to the Hannibal Bridge in 1957 to accommodate traffic between downtown Kansas City and the Municipal Airport. This structure, known as the Broadway Bridge, was built by Kansas City using funds from city bond issues, and it operated as a toll bridge until 1991 when it became a free facility. See City of Kansas City, Missouri, "1957," downloaded 12 December 2007 from http://www.kcmo.org/timeline.nsf/web/19570120?opendocument.

designs for the bridge were not provided, but a typical bridge section showed the "Lydia Avenue Bridge" as a standard through-truss structure. If the Lydia Avenue Bridge and adjacent expressways were built, HNTB predicted that the new facility would "serve as a direct, expeditious river crossing." The structure was ultimately built adjacent to Paseo Boulevard and the Sixth Street Trafficway in downtown Kansas City, and thereafter it became known as the Paseo Bridge.[26]

In addition to the construction of a new bridge, HNTB engineers also recommended the conversion of an abandoned railroad bridge located approximately three miles downriver from the A.S.B. Bridge to a two-lane automotive facility. The Milwaukee-Rock Island Railroad had built this bridge in 1884, but it had been replaced and abandoned in 1945. The abandoned bridge was too light to handle modern automotive traffic, but it could easily be upgraded and improved to offer an alternative route across the Missouri River. The north side of this bridge could be connected to a highway that passed through the center of an area annexed into Kansas City in 1950, and its south side emptied into a rapidly developing industrial zone. By rehabilitating this railroad bridge, a new river crossing could be created that would ease the traffic loads on the A.S.B. Bridge and the planned Lydia Avenue Bridge.[27]

To pay for construction of the Lydia Avenue Bridge and rehabilitation of the Milwaukee-Rock Island Railroad Bridge, HNTB recommended that both facilities be operated as toll bridges. Kansas City residents had already approved approximately $35 million of general obligation bonds to finance improvements recommended by L.P. Cookingham, and HNTB engineers doubted that citizens would be willing to support another bond issue to pay for new bridge construction. In addition, the Missouri State Highway Commission did not have sufficient funds to pay for the proposed bridge improvements in Kansas City. The highway commission had already provided over $11 million in federal funds to finance expressway projects in Kansas City, and HNTB estimated that in the future, less than $1.3 million per year in state and federal funding would be available for projects in the Kansas City metropolitan area. Thus, the only option available was to finance the new bridge projects by revenue bonds supported by tolls collected from traffic crossing the Lydia Avenue Bridge and the rehabilitated

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[26]Howard, Needles, Tammen and Bergendoff, *Report on Proposed Toll Bridge*, 21-31. All major river crossings built by the Missouri State Highway Commission prior to the 1950s were through-truss structures, and thus HNTB designers probably assumed that the Lydia Avenue Bridge would feature this standard design.

[27]*Ibid*., 32-36. Kansas City eventually purchased the abandoned railroad bridge in 1951, rehabilitated the structure, and opened it as a toll-free, two-lane river crossing in September 1953. The rehabilitated structure was known as the Chouteau Bridge, and it served as an alternative entryway into Kansas City until it was replaced by a modern, four-lane structure in 2001. See Clayton Fraser, "HAER Inventory Form: Chouteau Bridge," in Clayton Fraser, *Missouri Historic Bridge Inventory* (Loveland, Colorado: Fraserdesign, Inc., 1996); and Howard, Needles, Tammen and Bergendoff, *Missouri River Bridge at the Paseo, Kansas City, Missouri: Review and Report on Engineering Studies, Estimates of Construction and Other Costs, and Estimates of Traffic and Revenue* (Kansas City, Missouri: Howard, Needles, Tammen and Bergendoff, 1952), 27.

railroad bridge. HNTB engineers estimated that toll-supported revenue bonds could be paid off in approximately thirty years if a fee of 10 cents per automobile and 25 cents per truck or bus was charged to cross the Missouri River. HNTB also recommended that all existing river crossings in Kansas City be converted into toll facilities so that improvements to the A.S.B. Bridge and Hannibal Bridge could also be financed by toll revenue.[28]

After HNTB submitted its report regarding the feasibility of building a new bridge across the Missouri River in downtown Kansas City, local leaders began to take steps to make the proposed bridge a reality. After several months of study, the County courts of Jackson and Clay counties voted to undertake joint sponsorship of the proposed river bridge. County leaders hired HNTB in September 1951 to update their 1950 engineering study and to develop detailed designs for the proposed bridge. HNTB engineers were also asked to further investigate financing plans for the new bridge and to develop a feasible alternative to pay for the new structure without imposing tolls onto any existing bridges in the Kansas City area.[29]

In October 1951 a public hearing sponsored by the U.S. Army Corps of Engineers was held in downtown Kansas City to gauge public opinion regarding a new bridge. At the public meeting the only concerns regarding the proposed bridge came from shipping interests who were concerned that the structure might impede barge traffic on the Missouri River. L.P. Cookingham and other city officials told the public that the new bridge was an absolute necessity so the metropolitan area could accommodate the explosive industrial and residential growth occurring on the north side of the Missouri River. R.N. Bergendoff, one of the partners in HNTB, attended the public meeting and presented preliminary sketches of the proposed bridge. The preliminary drawings showed a three-span suspension bridge connecting into downtown Kansas City at Lydia Avenue.[30] Bergendoff told the audience that his firm was recommending the construction

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[28]Howard, Needles, Tammen and Bergendoff, *Report on Proposed Toll Bridge*, 36-65. HNTB noted in its 1950 report that federal laws permitted local governments to build and operate toll bridges, but it was unclear whether or not Missouri state law would allow revenue bonds to be used to finance new bridge construction. See *Ibid*., 66-67.

[29]"Kansas City Gets Bridge Fast," 35-36; R.N. Bergendoff to Rex Whitton, signed letter, 25 September 1951, microfiche copy in "General Correspondence File – Paseo Bridge Project," Collection 12-0087, Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri; and R.N. Bergendoff to Rex Whitton, signed letter, 20 November 1951, microfiche copy in "General Correspondence File – Paseo Bridge Project," Collection 12-0087, Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri. Materials held in Collection 12-0087 henceforth cited as part of the "Bridge File."

[30]U.S. Army Corps of Engineers, "Notice of Public Hearing," 15 October 1951, Bridge File; R.N. Bergendoff to Rex Whitton, signed letter, 20 October 1951, Bridge File; J.L. Pasley to Vaughn Enlsow, signed memorandum, 1 November 1951, Bridge File; and "Appeal for New Span," *Kansas City Star*, 31 October 1951, 8.

of a suspension bridge instead of a standard through-truss structure because he believed, "Kansas City is entitled to at least one attractive bridge."[31]

Following the October 1951 public meeting HNTB engineers continued working on design plans for the proposed bridge across the Missouri River at Kansas City, but privately, R.N. Bergendoff expressed concern that the proposed financing plan would not provide enough money to pay for construction costs. County and city officials told HNTB that local residents would not support the idea of tolling all river crossings in the Kansas City area, and thus HNTB needed to develop alternative financing plans for the new structure. HNTB officials estimated that it would cost at least $15 million to build the new bridge, and R.N. Bergendoff advised that the proposed structure "would not attract and divert sufficient traffic to amortize a bond issue to finance the complete project."[32] However, Bergendoff suggested in the fall of 1951 that if toll revenue generated by the new bridge could be supplemented by an annual contribution of $800,000 from an outside source for ten years, the bridge would be adequately financed and work could begin on the new structure as soon as the fall of 1953.[33] When Rex Whitton, the Chief Engineer of the Missouri State Highway Department, received this information from HNTB, he offered no official response. Although Whitton remained silent, the proposed bridge fit perfectly into the highway department's future plans for the Kansas City metropolitan area. The highway department had already made plans for a new bridge across the Missouri River in Kansas City in its 1951 master plan for future expressway construction in the Kansas City area.[34] Construction of a toll bridge in Kansas City thus offered the opportunity to provide for traffic needs in Kansas City at a reduced cost to the Missouri State Highway Commission, and when asked to formally approve the project, the highway commission readily gave its blessing.

On May 13, 1952, officials from Kansas City, Clay County, Jackson County, and HNTB made a formal presentation to the Missouri State Highway Commission asking for state assistance in constructing the new bridge. The delegates told the highway commission that they hoped to complete construction of the bridge and open it to traffic no later than January 1, 1954.

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[31]Quoted in "Appeal for New Span," *Kansas City Star*, 31 October 1951, 8.

[32]R.N. Bergendoff to Rex Whitton, signed letter, 20 November 1951.

[33]*Ibid*.

[34]In the late 1940s and early 1950s, the Kansas City Plan Commission developed a comprehensive plan for expressway construction in the Kansas City metropolitan area, and this plan was later used by the Missouri State Highway Department to guide the construction of new expressways and later the Interstate Highway System in Kansas City. This master plan also called for the construction of a large highway loop completely encircling downtown Kansas City. See City Plan Commission of Kansas City, *Expressways Greater Kansas City: An Engineering Report for the Missouri State Highway Department and the Department of Commerce Bureau of Public Roads* (Kansas City: City Plan Commission of Kansas City, Missouri, 1951), 17-18, 37-45.

To cover the estimated $15 million construction cost for the new structure, the delegation asked the highway commission to provide an $800,000 annual subsidy for ten years to supplement toll revenue. R.N. Bergendoff promised the highway commission that "the dynamic growth of the city will take care of paying for the bridge" and predicted that toll revenue would grow sufficiently to pay off the bonds before their thirty-year maturity.[35] The highway commission agreed in principle to provide financial support for the new bridge, and after a few minor revisions, a contract was signed between all parties for the construction of the Paseo Bridge.[36]

In July 1952, the Missouri State Highway Commission, the City of Kansas City, the Jackson County Court, and the Clay County Court signed a formal agreement for the financing and construction of the Paseo Bridge. Under the agreement, the engineering firm of HNTB would oversee and manage the actual design and construction of a multi-span bridge across the Missouri River along with adjacent approaches and connections to area expressways for an annual fee of $3,000. The Jackson County Court and Clay County Court would issue $16 million of revenue bonds to pay for construction of the Paseo Bridge, and the thirty-year bonds would be financed by tolls ranging from 5 to 25 cents collected from automobiles, trucks, and pedestrians crossing the new structure. While the initial construction estimate was $15 million, the Commission minutes recorded the $16 million figure as the exact value of the bonds necessary for local sources to issue. The Missouri State Highway Commission would formally review and approve all decisions made by HNTB regarding the design of the proposed bridge and the contractors who would build the new structure. The highway commission agreed to provide an annual subsidy of $800,000 paid into a sinking fund that would make up for any shortfall in anticipated toll revenue. The highway commission also agreed to acquire all necessary rights-of-way for the new bridge, maintain the bridge, and provide for the collection of tolls from drivers crossing the structure. All expenses incurred by the highway commission would be reimbursed from toll revenue, and no federal aid would be used to finance the construction of the new bridge. Once the revenue bonds had been paid off, the highway commission would take over ownership of the Paseo Bridge and open it to traffic as a free river

[35]Karl Peterson Jr., "Urge Bridge Plan," *Kansas City Star*, 14 May 1952, 8.

[36]Peterson, "Urge Bridge Plan," 1, 8; "Funds for Span," *Kansas City* Times, 13 May 1952, 1; Rex Whitton to R.N. Bergendoff, signed letter, 16 May 1952, Bridge File; and Missouri State Highway Commission, "Minutes of the Special and Statutory Meetings of the State Highway Commission, Held in Jefferson City, Missouri, on Monday, May 12, 1952, and Tuesday, May 13, 1952," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 80-81. Some issues that needed to be ironed out before the highway commission would approve the contract for the Paseo Bridge included whether or not it was legal to allow HNTB to oversee the design and construction of the new structure, acquisition of right of way for the bridge, and ongoing management and maintenance of the bridge. See B.L. Crossett to Rex Whitton, signed letter, 22 May 1952, Bridge File; Robert Hyder to Robert Fizzell, signed letter, 7 July 1952, Bridge File; and Robert Hyder to Harris Rodgers, signed letter, 25 August 1952, Bridge File.

crossing.[37] The signing of this contract meant that a new bridge connecting downtown Kansas City to the Northland would soon become a reality, and work continued in the summer of 1952 to finalize designs for the Paseo Bridge and its adjacent approaches.[38]

When HNTB engineers prepared final design plans for the Paseo Bridge, they decided to build the structure as a self-anchored suspension bridge. Self-anchored suspension bridges were extremely uncommon. Several self-anchored suspension bridges had been built in Europe in the late nineteenth and early twentieth centuries, but the design was only used for a handful of structures in the United States. For example, three identical self-anchored suspension bridges commonly known as the "three sisters" were built across the Allegheny River in downtown Pittsburgh, Pennsylvania, in the 1920s. In 1933 the Missouri State Highway Commission built a three-span self-anchored suspension bridge across the Little Niangua branch of the Lake of the Ozarks on a farm-to-market road. This suspension bridge was 450' long, and it only cost $36,914 to erect. A self-anchored suspension bridge cost less to build than other options for this small crossing, and it provided an aesthetically appealing option that complemented the scenic beauty of the Lake of the Ozarks region.[39]

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[37]"Kansas City Gets Bridge Fast," 36; "Official Statement of Jackson and Clay Counties," 7-16; Missouri State Highway Commission, "Minutes of the Special Meeting of the State Highway Commission, Held in St. Louis, Missouri, on Wednesday July 16,1952," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 3; "Contract Relating to the Construction and Operation of the Paseo Bridge in Jackson and Clay Counties," 16 July 1952, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 1-5; and R.N. Bergendoff to Rex Whitton, signed letter, 2 September 1952, Bridge File. Highway department officials contacted the Bureau of Public Roads in the summer of 1952 to see if any federal funds were available to help pay for the construction of the Paseo Bridge. Unfortunately, federal law clearly stated that no federal funding could be used to finance construction of a toll bridge, so Missouri was left to its own devices in paying for the new structure. See Clifford Shoemaker to Rex Whitton, signed letter, 3 July 1952, Bridge File.

[38]North Kansas City officials frequently complained that they were left out of the planning and design process for the Paseo Bridge. City officials hoped that the project would include the construction of several full interchanges connecting North Kansas City's industrial district to the new bridge and its adjacent expressway. Unfortunately, the interchanges constructed in North Kansas City did not meet local needs, and the issue of linking the Paseo Bridge to major thoroughfares in the northland continues to be an issue today. See Kenneth Elliot to Rex Whitton, signed letter, 14 August 1953, Bridge File; Rex Whitton to Kenneth Elliot, signed letter, 20 August 1953; and Andy Hyland, "Northland Businesses Hear Paseo Bridge Details," *Kansas City Star*, 17 November 2007, B1.

[39]Clayton Fraser, "HAER Inventory Form: Little Niangua River Bridge," in Clayton Fraser, *Missouri Historic Bridge Inventory* (Loveland, Colorado: Fraserdesign, Inc., 1996); Howard Mullins, "Self-Anchored Suspension Bridge Built in Missouri," *Engineering News-Record*, 28 September 1933, 367-368; and Ochsendorf, "Self-Anchored Suspension Bridges," 3-26. Howard Mullins, an engineer who worked for the Missouri State Highway Department, designed and oversaw construction of this small self-anchored suspension bridge. The structure, designated Bridge S-391 by the Missouri Department of Transportation, still carries traffic today across the Niangua River on State Route J in Camden County.

The designers of the Paseo Bridge chose to build the structure as a self-anchored suspension bridge for many of the same reasons as the structure across the Little Niangua branch of the Lake of the Ozarks. In their final proposal for the Paseo Bridge, HNTB engineers called for the construction of a self-anchored suspension bridge featuring a 616' center span and two 308' side spans.[40] When HNTB compared the estimated costs involved in building a self-anchored suspension bridge to the cost of constructing a traditional cantilevered through-truss bridge, the costs turned out to be identical.[41] In addition, HNTB engineers pointed out that a self-anchored suspension bridge would be an aesthetically pleasing structure that would draw national and international attention to Kansas City:

> A self-anchored suspension type span is proposed for the main river crossing. Detailed design studies have been made of various types of structures that will meet the requirements of span lengths and clearances. The suspension span, without sacrificing economy, has decided advantages as regards aesthetics, simplicity and approaches closest the open deck type construction generally preferred for highway bridges. It will have certain publicity attraction in that it will be the first suspension type bridge constructed across the Missouri River, and the longest self-anchored bridge in the United States with the widest roadway.[42]

In addition, the primary designer of the Paseo Bridge, Jacob Karol, had written his doctoral dissertation on the construction of suspension bridges, and thus he favored the unique design for the Paseo Bridge project.[43] Finally, the self-anchored suspension bridge design was a practical choice for the Paseo Bridge because such structures did not require large anchorages on either end, thus eliminating the need for additional right-of-way purchases and the construction of large anchorages.[44] The self-anchored bridge design never gained national popularity, but it proved to be a practical and attractive choice for Kansas City's new river crossing.

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[40]Howard, Needles, Tammen and Bergendoff, *Missouri River Bridge at the Paseo*, 19.

[41]R.N. Bergendoff to Vaughn Enslow, signed letter, 18 August 1952, Bridge File. HNTB Engineers also prepared cost estimates for building the Paseo Bridge as a tied arch bridge and as a suspension bridge with external anchorages and found that the self-anchored suspension design compared favorably to the other design options.

[42]Howard, Needles, Tammen and Bergendoff, *Missouri River Bridge at the Paseo*, 37.

[43]Harry Karol, "Jacob Karol, Life Member, ASCE," *Transactions of the American Society of Civil Engineers* 149 (1985): 366. Karol worked for HNTB and its predecessors as a bridge designer from 1930-1936 and 1945-1973, and he won numerous accolades for his bridge designs. See *Ibid*.; and "Deaths: Jacob Karol," *Kansas City Star*, 11 December 1983, 3B.

[44]For a detailed explanation of the engineering differences between a self-anchored suspension bridge and an ordinary suspension bridge, see Ochsendorf, "Self-Anchored Suspension Bridges," *passim*.

In August 1952 the Jackson County Court and Clay County Court sold $16 million of revenue bonds to finance the construction of the Paseo Bridge, and the process of hiring contractors to build the new structure began immediately. HNTB officials suggested that the contracting process proceed as quickly as possible so that construction of river piers could begin during the winter months when the Missouri River would be at a low water.[45] Thus, a notice to contractors was sent out in early September soliciting bids for construction of four large concrete piers that would support the main spans of the Paseo Bridge. All work on the piers had to be completed within 500 days of the issuance of a notice to proceed, otherwise liquidated damages would be assessed against the contractor. HNTB engineers estimated that the four piers would cost approximately $1,834,200 to build.[46]

When the bids for the construction of the Paseo Bridge piers were received at the Jackson County Courthouse on September 26, 1952, the Kansas City Bridge Company and the Massman Construction Company jointly submitted the low bid of $2,182,360. Although this bid exceeded the engineers' estimate, HNTB recommended its acceptance. HNTB noted that there was a great degree of uncertainty involved in preparing the estimates for pier construction and thus some cost leeway should be allowed. HNTB officials also suggested that interest earned on the revenue bonds and contingency funds provided by the Missouri State Highway Commission could easily cover the additional costs.[47] The Jackson and Clay county courts ultimately acceded to HNTB's arguments and accepted the low bid offered for the bridge piers. A notice to proceed was issued to the Kansas City Bridge Company and the Massman Construction Company on October 20, 1952, and HNTB officials estimated that work on the four piers would be completed by August 1, 1953.[48] Actual construction of the bridge piers began in the late fall of 1952, and the dream of a new Missouri River crossing for Kansas City promised to soon become a reality.

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[45]"Kansas City Gets Bridge Fast," 36; R.N. Bergendoff to Rex Whitton, signed letter, 4 August 1952, Bridge File; and R.N. Bergendoff to Rex Whitton, signed letter, 18 August 1952, Bridge File. The Paseo Bridge revenue bonds offered an average annual interest rate of 3.37 percent. The bonds were redeemable in 30 years or earlier if sufficient tolls were collected to pay off the debt prior to maturity. See "Kansas City Gets Bridge Fast," 36; and "Official Statement of Jackson and Clay Counties," 9.

[46]Howard, Needles, Tammen and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri: Notice to Bidders," 10 September 1952, Bridge File; and R.N. Bergendoff to the Clay County Court and Jackson County Court, signed memorandum, 27 September 1952, Bridge File.

[47]"Paseo Pier Bids In," *Kansas City Star*, 26 September 1952, 3; Howard, Needles, Tammen and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri: Bids Received by Jackson and Clay Counties, Missouri," 26 September 1952, Bridge File; and R.N. Bergendoff to the Clay County Court and Jackson County Court, signed memorandum, 27 September 1952, Bridge File.

[48]R.N. Bergendoff to Kansas City Bridge Company and Massman Construction Company, signed letter, 20 October 1952, Bridge File.

C. Building the Paseo Bridge

Construction of the four concrete piers that support the Paseo Bridge began in October 1952. Although the process for building and sinking the four piers to bedrock was extremely complex, the work performed by the Kansas City Bridge Company and the Massman Construction Company proceeded rapidly and smoothly. The four piers, labeled Piers 2, 3, 4, and 5 on original bridge plans, were built using a variety of construction techniques. The contractors began the construction process by dredging the Missouri River and using steel cofferdams to create temporary sand islands in the river channel. Cofferdams are temporary steel structures used to keep water or soil out of the area where a bridge pier is to be built, and the sand islands built for the Paseo River substructure measured 70' x 120' for Piers 3 and 4 and 74' x 113' for Piers 2 and 5. V-shaped steel breakwaters placed approximately 90' upstream from the construction site protected the temporary sand islands. These breakwaters protected the pier worksites from ice and other debris and allowed construction to continue throughout the year without any major interruptions due to bad weather.[49]

After the temporary sand islands had been constructed, workers with the Kansas City Bridge Company and the Massman Construction Company dredged the bed of the Missouri River. However, dredging alone was insufficient to set the footings of the piers to bedrock, so caissons had to be employed. H. F. Nelson, an engineer who supervised construction of the Missouri River Bridge at Waverly, Missouri, in the early 1920s, provided a succinct description of how caissons worked:

> Caissons might be compared to an airtight box of steel or wood and turned upside down…After being placed in position in the water the concrete forms which were built on top are filled with concrete, except for the shaft which allows the men, called sand hogs, to be lowered into the caisson where they work under air pressure digging out the sand which goes to the top through suction lines. The weight of the concrete sinks the caisson as the sand is excavated and more concrete is added keeping the concrete above the water line until the caisson lands on solid foundation…The caisson is then filled with concrete through the supply shaft and the foundation is then ready for the pier.[50]

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[49]"Kansas City Gets Bridge Fast," 37; Howard, Needles, Tammen and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri: Notice to Bidders," 10 September 1952, Bridge File; and U.S. Army Corps of Engineers, "Notice of Permit Pending," 23 October 1952, Bridge File. For a detailed explanation of how cofferdams are used during the construction of bridge substructures, see Alex Kruggel, "Cofferdam Construction," April 1999, downloaded 19 December 2007 from https://engineering.purdue.edu/CEM/Research/coffer.htm.

[50]Quoted in "Waverly Bridge in Early Days," *Carrollton Daily Democrat*, 7 August 1975, 2.

For the Paseo Bridge piers, the caissons were constructed and sunk inside the temporary islands formed by the cofferdams. The caissons were composed of 12' x 20' steel forms set in 3' to 5' of solid blue shale beneath the Missouri River. High levels of air pressure ranging up to fifty-two pounds per square inch were experienced within the caissons, and thus the "sandhogs" who worked inside them could only work shifts of thirty minutes per day to protect them from the dangers of nitrogen poisoning.[51] Once the caissons were set, they were filled with concrete to form the footings of each individual pier. The piers were then built up by pouring concrete into temporary wood forms to the heights necessary to support the superstructure. Pier 2 was close enough to the shoreline that its concrete was poured from a land-based truck, but the three other piers had to be poured from large barge-mounted cranes. This process allowed for the efficient construction of the Paseo Bridge substructure, and work on the four piers was completed by September 1953. After the piers were built, the cofferdams and temporary sand islands were removed, allowing the Missouri River to resume its ordinary flow.[52]

After the Kansas City Bridge Company and the Massman Construction Company began work on the bridge piers, HNTB officials turned their attention to hiring a contractor to erect the superstructure of the Paseo Bridge. In November 1952 HNTB published an announcement seeking a contractor to furnish, fabricate, and erect the steel superstructure of the three-span suspension bridge and to lay the cement roadway across the entire structure. HNTB officials hoped that multiple companies would submit bids for the superstructure, but only two companies offered bids for the project when bids were opened on January 9, 1953. The American Bridge Company offered the low bid of $4,990,272. This bid far exceeded the engineering estimate prepared in June 1952 by HNTB of $3,770,450. R.N. Bergendoff commented that the primary reason for the bids coming in higher than the original estimates was due to increased steel prices. Industrial grade steel was being sold for approximately 20 cents per pound in the summer of 1952 when the estimate was made, but the lowest bid offered by the American Bridge Company in early 1953 was to provide steel at a cost of 30.3 cents per pound.[53]

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[51]Working inside a caisson was a dirty and dangerous endeavor, especially in the early twentieth century. Negative air pressure inside caissons occasionally caused workers to suffer from nitrogen poisoning, pain, bleeding, and even death. By the middle of the twentieth century the dangers of caisson work were well understood, and no workers were killed while setting the piers for the Paseo Bridge.

[52]"Kansas City Gets Bridge Fast," 37; U.S. Army Corps of Engineers, "Notice of Permit Pending," 23 October 1952, Bridge File; and Howard, Needles, Tammen and Bergendoff, "Chronology of Events: Paseo Project, Missouri River at Kansas City, Missouri, 1952-1954," May 1954, Bridge File. Although the Kansas City Bridge Company and the Massman Construction Company missed the August 1, 1953, deadline called for in their original contract, no liquidated damages were assessed against either company.

[53]"Bridge Bids In," *Kansas City* Star, 10 January 1953, 2; R.N. Bergendoff to Vaughn Enslow, signed letter, 19 November 1952, Bridge File; Howard, Needles, Tammen and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri: Bids Received by Jackson and Clay Counties, Missouri," 9 January 1953, Bridge File; and R.N. Bergendoff to the Clay County Court and Jackson County Court, signed memorandum, 16 January

In response to the unexpectedly high bids for the Paseo Bridge superstructure, the Jackson and Clay county courts asked R.N. Bergendoff to meet with officials from the American Bridge Company to see if they could reduce some of their unit prices. The American Bridge Company offered minor reductions in the prices submitted in their bid, including a deduction of $120,000 if the deadline for completion of the superstructure was extended six months. Bergendoff recommended against any extension of the deadline and suggested that the difference between the original estimate and the received bid be covered by contingency funds provided by the Missouri State Highway Commission. The county courts and the Missouri State Highway Commission agreed with Bergendoff's recommendations and allowed the American Bridge Company to build the Paseo Bridge superstructure. Under the terms of their contract, minor tasks such as cleaning and painting could be completed later, but the American Bridge Company was to have the superstructure ready to receive traffic no later than April 28, 1954.[54]

Although only three contractors were directly involved with the construction of the substructure and superstructure of the Paseo Bridge, a total of twenty-two contracts were signed between HNTB and various contractors for the entire bridge project. Additional elements of the Paseo Bridge project included grading for the approach spans, construction of plate-girder approach spans, construction of interchanges in North Kansas City and downtown Kansas City, installation of lighting along the bridge, and construction of toll booths on either end of the structure. When all these contracts were added together, the total cost of the Paseo Bridge project swelled to over $18 million. To compensate for price overruns, the Jackson County Court and Clay County Court issued an additional $1,750,000 of revenue bonds in December 1953. This bond issue allowed the project to move forward without delay, and officials anticipated that the Paseo Bridge would open to traffic in the spring of 1954.[55]

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1953, Bridge File. The Bethlehem Steel Company submitted the second bid on January 9, 1953, offering to fabricate and erect the Paseo Bridge superstructure for $5,180,135.

[54]J.A. Williams to Rex Whitton, signed letter, 19 January 1953, Bridge File; R.N. Bergendoff to Rex Whitton, signed letter, 2 February 1953, Bridge File; R.N. Bergendoff to N.G. Obbard, signed letter, 2 February 1953, Bridge File; and Missouri State Highway Commission, "Minutes of the Special and Statutory Commission Meetings Held in Jefferson City, Missouri, on Monday, January 12, 1953, Tuesday, January 13, 1953, and Wednesday January 14, 1953," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 77-79.

[55]"Supplemental Contract Relating to the Construction and Operation of the Paseo Bridge in Jackson and Clay Counties," 28 December 1953, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 1-3; Howard, Needles, Tammen and Bergendoff, "Contract Data: Paseo Project," May 1954, Bridge File; Rex Whitton to R.N. Bergendoff, signed letter, 1 July 1954, Bridge File; and Greater Kansas City Citizens Regional Planning Council, "Paseo Bridge Dedication: August 13, 1954," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 2.

Construction of the Paseo Bridge superstructure began in the spring of 1953, and it took over a year to complete this phase of the bridge project. The American Bridge Company started by building temporary wood bents in the Missouri River to provide a base for the falsework needed to erect the bridge superstructure. A temporary trestle was also constructed from the south bank of the Missouri River approximately 157' downstream from the centerline of the new bridge to shuttle steel and other supplies into the river.[56] Once these temporary support structures were in place, the American Bridge Company followed a very specific construction sequence to ensure successful erection of the Paseo Bridge superstructure. The first step undertaken by the American Bridge Company was the construction of the floor system along with the installation of two stiffening girders. Since the Paseo Bridge was to be self-anchored, the primary suspension cables would link to the stiffening girder rather than to external anchorages, and thus the stiffening girders needed to be erected before any work could begin on the remainder of the superstructure.[57] The next step in the construction of the superstructure was to build two steel towers above Piers 3 and 4 to support the primary suspension cables. Once the towers were complete, the primary suspension cables were installed atop the towers and attached to the stiffening girders at either end of the structure. The next step taken by the American Bridge Company was the installation of the hanging suspension cables that joined the primary suspension cables to the stiffening girders. The entire suspension system was then jacked into place and the actual driving deck was poured across the length of the superstructure. The complex process involved in erecting a self-anchored bridge was different from other bridge designs, and it required the full attention of the American Bridge Company's work crews to make sure that the proper sequence was followed.[58] A handful of workers were injured during the construction of the Paseo Bridge superstructure. Two workers fell from the floor system while working on the superstructure, but their injuries were not life threatening. Two workers also lost fingers during the installation of the cable system, but fortunately no workers were killed by industrial accidents during construction of the Paseo Bridge.[59]

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[56]U.S. Army Corps of Engineers, "Notice of Permit Pending," 16 April 1953, Bridge File.

[57]In most bridge designs, the vertical elements of the superstructure are the first built, but in a self-anchored structure, the floor system and stiffening girder must be constructed first. For a detailed explanation of the engineering theories and construction process for self-anchored suspension bridges, see Ochsendorf, "Self-Anchored Suspension Bridges," 47-80, 88-89; and Ochsendorf and Billington, "Self-Anchored Suspension Bridges," 151, 153-155.

[58]"Kansas City Gets Bridge Fast," 37; and Howard, Needles, Tammen, and Bergendoff, "Missouri River Bridge at the Paseo, Kansas City, Missouri, Construction Plans." The original construction plans for the Paseo Bridge provided detailed instructions regarding the erection of the superstructure, including the order of construction and explicit strategies for installing the complex suspension system.

[59]"Falls 65 Feet at the Paseo Bridge," *North Kansas City News-Dispatch*, 19 April 1954, 1; and J.J. Corbett to Rex Whitton, signed letter, 10 August 1954, Bridge File. Although there were no fatalities directly caused by construction of the Paseo Bridge, one worker was electrocuted while installing power lines across the structure, and

Work on the superstructure of the Paseo Bridge proceeded rapidly, and by the spring of 1954, the project was nearing completion. The only delays encountered by the American Bridge Company occurred when labor troubles prevented the sandblasting of several steel segments of the superstructure. This issue was quickly resolved, and on May 15, 1954, the steel superstructure was joined to fixed and expansion shoes atop Pier 5, essentially completing the project.[60] Twenty-two different contracts were signed to construct various segments of the Paseo Bridge and its approaches. When each phase of construction was complete, HNTB engineers performed a preliminary inspection to make sure that the segment was acceptable. However, a final inspection of the entire Paseo Bridge was performed on August 11, 1954, by engineers from the Missouri State Highway Department. Several tasks still needed to be completed, including painting steel elements of the superstructure, installation of lighting across the structure, and construction of a cloverleaf on the north side of the bridge. The inspecting engineers concluded that it was safe to open the bridge to traffic, and a ceremony commemorating the opening of the Paseo Bridge was set for August 13, 1954.[61]

On that date, a ceremony was held at tollhouses on the north end of the Paseo Bridge to celebrate the opening of the structure. A crowd of approximately 500 people attended the ceremony while hundreds more lined up in their automobiles for a chance to cross the new bridge. The ceremony began with a band performance and brief speeches by civic leaders and highway department officials. In his opening remarks, Kansas City Archbishop Edwin O'Hara gave thanks for the new opportunities that the new bridge would provide for the local community:

> The noble structure which we today dedicate to the honor of God and to the service of this great metropolitan community opens a new avenue of commerce and communications with a large promise of better economic conditions and with

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another worker suffered a fatal heart attack while working at the job site. See J.J. Corbett to Rex Whitton, signed letter, 10 August 1954, Bridge File.

[60]Thomas Soddy to R.N. Bergendoff, signed letter, 15 February 1954, Bridge File; and J.A. Williams to J.J. Corbett, signed letter, 2 March 1954, Bridge File. Local labor unions forbade painters from going inside confined box sections of the Paseo Bridge superstructure to sandblast the steel members. Instead of fighting the union, the bridge specifications were altered slightly to allow for the interior of the steel box sections to remain rough and unpainted. A labor strike in the summer of 1953 also closed down the Paseo Bridge project for several weeks. These work stoppages were the primary reason why the Paseo Bridge opened to traffic slightly later than originally anticipated. See Howard, Needles, Tammen and Bergendoff, "Chronology of Events: Paseo Project, Missouri River at Kansas City, Missouri, 1952-1954," May 1954, Bridge File; and "When Work Resumes Machines Will take Huge Bites Out of Hill for North Approach to Paseo Bridge," *North Kansas City News-Dispatch*, 13 July 1953, 1.

[61]Rex Whitton to R.N. Bergendoff, signed letter, 1 July 1954, Bridge File; "City Officials Inspect Bridge Project," *North Kansas City News-Dispatch*, 5 July 1954, 1; H.M. Brush, "Semi-Final Inspection: Paseo Project," 11 August 1954, Bridge File; and "Bridge Fete Near," *Kansas City Star*, 11 August 1954, 1.

> visions of improved standards of physical well-being. It will unite hitherto separated communities and make available opportunities for richer social and cultural contacts. It will create more gracious conditions of living in numerous homes.[62]

Following the opening prayer, R.N. Bergendoff formally presented the Paseo Bridge to the Jackson and Clay County courts, and D.W. Sutphin, superintendent for the American Bridge Company, cut a half-inch steel cable with a blowtorch to symbolically open the bridge. Once the cable was cut, a parade of old cars from the early twentieth century driven by members of the Kansas City Chapter of the Horseless Carriage Club of America were the first automobiles to drive across the bridge. Several Coast Guard ships sailed underneath the Paseo Bridge, and a squadron of C-46 military transport airplanes flew overhead. Once the opening ceremony was complete, local and state dignitaries retreated to the Muehlebach Hotel for a private luncheon. Speakers at this luncheon included L.P. Cookingham and Harris D. Rodgers, Chairman of the Missouri State Highway Commission. Meanwhile, throngs of cars crossed the Paseo Bridge throughout the day. Approximately 27,000 vehicles crossed Paseo Bridge on its opening day; no tolls were charged to cross the structure on its first day of operation.[63] Beginning at 12:01 AM on August 14, 1954, tolls ranging from 10 to 35 cents were charged to cross the Paseo Bridge.[64]

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[62]"Hail New Span Opening," *Kansas City Star*, 13 August 1954, 3.

[63]*Ibid*., 1-2; "Bridge Fete Near," *Kansas City Star*, 11 August 1954, 1-2; "The Paseo Bridge Ceremonies at 10o'Clock This Morning," *Kansas City Times*, 13 August 1954, 1; "Throngs Over Paseo," *North Kansas City News-Dispatch*, 16 August 1954, 4; and Greater Kansas City Citizens Regional Planning Council, "Paseo Bridge Dedication: August 13, 1954," *passim*. Crews continued work on the Paseo Bridge even during the opening ceremony; wrapping cable and painting the underside of the structure while the ceremony proceeded. See "Hail New Span Opening," *Kansas City Star*, 13 August 1954, 3.

[64]Vehicles crossing the Paseo Bridge were required to pay a toll after August 13, 1954. However, numerous local groups claimed that the toll was a hardship and that their vehicles should be allowed to freely cross the structure. This forced the Missouri State Highway Commission to adapt a concrete policy regarding free crossings of the Paseo Bridge:

> All vehicles crossing the Paseo bridge in Jackson and Clay Counties shall pay the posted toll excepting vehicles on business directly connected with the operation of the bridge, the vehicles at the time engaged in use by employees performing their duties in connection with the operation and maintenance of the bridge and the approaching highways, and vehicles operated by police or fire departments actually engaged in the performance of their official duties.

See Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday and Friday July 25-26, 1968," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 19.

The completion of the Paseo Bridge marked a major milestone in the history of Kansas City. Local newspapers praised the structure, calling it an example of how cooperation could lead to progress in the metropolitan area:

> Co-operation is a powerful force. For years the city pushed the idea. The Citizen's Regional Planning council stirred area interest and brought together the representatives of the two counties involved. The engineering firm of Howard, Needles, Tammen and Bergendoff made the studies, demonstrated that the project could be financed with tolls and became the firm in charge of building. The two counties united as sponsoring agents. The state highway commission took a leading part to get the job done and joined with the city on a plan that cleared the financing problem…Now, in almost incredibly short time, the great project is delivered. Co-operation has triumphed.[65]

By the first week of September 1954, an average of 6,400 cars crossed the Paseo Bridge daily, significantly reducing traffic on Kansas City's other river crossings.[66] The Paseo Bridge was one of the largest self-anchored suspension bridges ever built, and the American Institute of Steel Construction named the structure the most beautiful bridge built anywhere in the world in 1954.[67] The Paseo Bridge carried two major highways, U.S. Routes 71 and 69, into downtown Kansas City and connected them to expressways carrying traffic away from the central business district. The bridge fit well into the professionals' vision of a modern expressway surrounding and linking downtown Kansas City to the rest of the metropolitan area and the rest of the world, and the Paseo Bridge became a symbol of the faith in progress and technology that dominated the thinking of the region's post-war leadership. Everything was up to date in Kansas City, and the Paseo Bridge provided a stunning visual memorial to civic progress made during the post-war era.

D. Post-construction History of the Paseo Bridge

When the Paseo Bridge opened to traffic, it immediately became the primary connector between downtown Kansas City and the Northland region. By November 1954, daily traffic across the bridge averaged 6,803 vehicles, yielding average daily revenues of $695.51.[68] Toll

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[65]"A New Building Triumph," *Kansas City Times*, 14 August 1954, 34.

[66]Robert Hyder to Rex Whitton, signed letter, 3 September 1954, Bridge File.

[67]Karol, "Jacob Karol, Life Member, ASCE," 366.

[68]Jackson and Clay Counties, Missouri, "Paseo Bridge: Report to Bondholders for the Month Ended November 30, 1954," Bridge File, 1. The only construction work that still needed to be completed by November 1954 was the installation of lighting on the underside of the bridge.

revenues continued to rise as traffic across the Paseo Bridge increased in the late 1950s and early 1960s, and by 1963, traffic levels had risen to the point that highway department officials could confidently predict that sufficient revenue would be raised to pay off the bridge bonds in a timely manner.[69] Traffic across the Paseo Bridge far exceeded initial expectations thanks to rapid growth in the Northland. Numerous new industries set up factories and distribution centers north of the Missouri River in the 1960s, and the opening of the new Ford Automobile factory at Claycomo and the Mid-Continent International Airport further increased traffic between downtown Kansas City and the Northland. By 1966, traffic across the Paseo Bridge exceeded estimates for 1982, the anticipated maturity date of the bonds issued to finance bridge construction! In March 1966, an average of 36,507 vehicles crossed the Paseo Bridge daily, and the number of accidents on the bridge had also increased significantly since 1954. Engineering studies indicated that the 4'-wide median dividing the opposing lanes of traffic across the bridge was too narrow. Crossover accidents occurred frequently, including an incident in January 1965 that led to six fatalities. To combat this alarming trend, HNTB engineers recommended that a concrete median barrier be constructed across the Paseo Bridge to separate and protect opposing traffic lanes. The estimated cost to build the concrete median was $115,000, which was to be financed by toll revenue and a $24,000 contribution from the Missouri State Highway Commission. A concrete barrier was installed across the Paseo Bridge by the end of 1966, but traffic levels continued to increase, as did the need for additional maintenance work to ensure smooth traffic flow between downtown Kansas City and the Northland.[70]

The Paseo Bridge did not fare well under the heavier than expected traffic that crossed the structure in the late 1960s and early 1970s. Several structural repairs were needed by the early 1970s, including the replacement of several expansion joints in the superstructure, reconstruction of the abutments beneath the approach spans, and reinforcement of the cables and other steel members of the superstructure. This rehabilitation project began soon after the Highway Commission took ownership of the structure in October 1972, and when the rehabilitation project was complete, the Paseo Bridge was renamed Bridge L-734R in highway

[69]Robert Hyder to Raymond Skov, signed letter, 10 October 1963, Bridge File.

[70]R.N. Bergendoff to M.J. Snider, signed letter, 6 April 1966, Bridge File; Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday and Friday April 14-15, 1966," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 6-7; and "Supplemental Agreement, Median Barrier, Route I-35, Clay and Jackson Counties, Paseo Bridge Toll Project," 20 August 1966, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 2-4.

department records. The rehabilitated structure carried two interstate highways, I-29 and I-35, into downtown Kansas City.[71]

By 1970 toll revenues had increased to the point that leaders in Kansas City, Jackson County, and Clay County decided to approach the Missouri State Highway Commission and ask them to set a date to retire the revenue bonds and open the Paseo Bridge as a free facility. In November 1970 a delegation from Kansas City met with the highway commission and asked them to set a date to end the collection of tolls for the Paseo Bridge. The highway commission refused to set a date to end the tolls at this meeting and warned that tolls might need to be extended into the future to finance the rehabilitation of the bridge. The Paseo Bridge had deteriorated badly by the early 1970s, and highway department engineers estimated that at least $13 million was needed to repair the bridge and have it meet uniform design standards for the interstate system. This money was not available from the highway department's regular budget, so the commission was considering a toll extension to pay for the necessary bridge improvements.[72] Fortunately for local commuters who had grown tired of paying a toll to cross the Paseo Bridge, the federal government decided in March 1971 to finance the rehabilitation of the structure. The federal highway administration agreed to provide up to $13.8 million to pay for rehabilitation of the Paseo Bridge, and the Missouri State Highway Commission decided to set October 1, 1972, as the last day that a toll would be charged for vehicles to cross the structure.[73]

Although the Missouri State Highway Commission decided in the fall of 1971 that tolls would be removed from the Paseo Bridge, on October 1, 1972, Kansas City officials initially refused to sign the agreement. Kansas City officials informed the highway commission that they could not afford the $73,600 needed to build an interchange connecting Front Street to the south

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[71] Missouri State Highway Department, "Rehabilitation of the Missouri River Bridge at the Paseo, Kansas City, Missouri: Project I-IG-35-1(97)," 1972, as held by the Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri.

[72] Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Wednesday and Thursday November 18-19, 1970," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 77-79; and see Craig Ladwig, "Toll Takers Gone but Dime Habit Stays with Paseo Motorists," *Kansas City Star*, 2 October 1972, 4.

[73] Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Wednesday and Thursday, April 14-15, 1971," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 11-12; and Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday, October 14, 1971," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 45-46.

end of the Paseo Bridge. A new interchange was necessary to connect the growing industrial zone along Front Street to the interstate system, and the city's costs to build the new interchange could be covered easily if tolls were collected from traffic across the Paseo Bridge until October 15, 1972, instead of the October 1 date proposed by the highway commission. [74] This proposed toll extension did not sit well with Jack Stapleton, Chairman of the Missouri State Highway Commission, who told Kansas City officials, "I am sure that all of us understand that the matter of tolls on the Paseo Bridge has been discussed numerous times and when the proper amount of money has been raised, then, certainly those tolls are going to come off."[75] The Missouri State Highway Commission refused on principle to extend tolls any later than necessary to pay off construction of the Paseo Bridge, but Kansas City officials warned that unless the Front Street interchange was rebuilt, the bridge would not meet interstate standards.[76] After a few months of discussion and negotiation, the highway commission agreed in February 1972 to finance the construction of a new interchange at Front Street as long as Kansas City secured the necessary right of way for the facility. Kansas City accepted this offer and on February 22, 1972, signed an agreement to end the collection of tolls for the Paseo Bridge on October 1. Ownership of the bridge would be turned over to the Missouri State Highway Commission on October 1, 1972, and henceforth, the bridge would operate as a toll-free facility.[77]

At midnight, September 30, 1972, the Paseo Bridge officially became a toll-free facility when Kansas City Mayor Charles Wheeler paid the final symbolic 10 cent toll to cross the structure. Later on the morning of October 1, 1972, a brief ceremony was held to commemorate the transfer of the bridge to the Missouri State Highway Commission. Jack Stapleton, Chairman of the highway commission, and other local dignitaries swung sledgehammers at the tollbooths on the north side of the Paseo Bridge. A large banner proclaiming "It's Free" was hung across

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[74]Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday, December 16, 1971," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 6; and Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday and Friday, February 17-18, 1972," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 10-12.

[75]Jack Stapleton to Ivan Waite, signed letter, 10 January 1972, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri.

[76]Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday, December 16, 1971," 6.

[77]Missouri State Highway Commission, "Minutes of Special Highway Commission Meeting Held in Jefferson City, Missouri, on Thursday and Friday, February 17-18, 1972," 12-13; and "Third Supplemental Agreement to Contract Relating to the Construction and Operation of Paseo Bridge," 22 February 1972, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri.

the entry ports on either side of the bridge, but confused commuters continued to toss dimes into the automated tollbooths while other drivers handed 10 cents to workers tearing down the tollbooths. Work to rehabilitate the Paseo Bridge began as soon as it was taken over by the highway commission, and lane closures continued across the structure into the spring of 1973.[78] The Paseo Bridge was the last toll bridge operated by the Missouri State Highway Commission, and it continued to carry heavy traffic across the Missouri River throughout the 1970s.

The Paseo Bridge served as a critical connector between downtown Kansas City and the ever-expanding Northland throughout the late 20th century, but unintended consequences of building the bridge and the development of Kansas City's expressway system began to show themselves as well. The Paseo Bridge was a small part of a complex expressway system designed by HNTB engineers in the mid-twentieth century. This system included construction of a highway "loop" around downtown Kansas City; a loop that planners believed would "serve as a distributor traffic artery, furnishing access to the four sides of the Central Business District."[79] Engineers and local leaders such as L.P. Cookingham saw Kansas City's highway loop as an efficient system that would provide numerous tangible and intangible benefits to the entire community. A report by the City Plan Commission claimed:

> The expressway system would decrease congestion on the existing streets and therefore avoid extensive street widenings. Values of property adjacent to the expressway system would be increased. There would be a decrease in danger to pedestrians crossing streets and thoroughfares because of lower volumes of vehicular traffic. Express mass transportation service on the expressways would benefit users of this type of transportation. The expressway system provides an opportunity for convenient travel over safe and enjoyable routes…A properly located, well-designed expressway reflects public spirit, is a source of local pride, and provides inspiration for greater municipal achievement.[80]

Unfortunately, construction of the highway loop had the opposite effect on downtown Kansas City than originally intended. Instead of drawing people and businesses to downtown, Kansas

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[78]Missouri State Highway Department, "News Release: Toll Booths to Close on K.C. Paseo bridge for the Last Time," 27 September 1972, Bridge File; "No More Tolls," *Kansas City Star*, 28 September 1972, 10A; Garnett Joseph, "Last Dime Into Tollbox," *Kansas City Times*, 2 October 1972, 4A; and Craig Ladwig, "Toll Takers Gone but Dime Habit Stays with Paseo Motorists," *Kansas City Star*, 2 October 1972, 4. The tolls charged to cross the Paseo Bridge did not increase after 1954, remaining 10 cents for automobiles and 15 to 35 cents for trucks and larger vehicles until 1972. Fritze Schumacher, manager of the Paseo Bridge for the highway department, noted that a wide variety of items had been tossed into the baskets at the automated tollbooths over the years, including slugs, bolts, buttons, chewing gum, and chicken bones. See Joseph, "Last Dime Into Tollbox," 4A.

[79]City Plan Commission of Kansas City, Missouri, *Expressways Greater Kansas City*, 40.

[80]*Ibid*., 112.

City's expressway system allowed for a mass migration to surrounding suburbs. While suburban communities such as Overland Park, Lee's Summit, and Blue Springs boomed, downtown Kansas City rapidly lost business and witnessed the decimation of numerous central neighborhoods. Instead of drawing people to the downtown area, the highway loop with its confusing jumble of entrances and exits made it difficult for drivers to navigate the central business district. By the late 1990s, downtown Kansas City had become an isolated area that held little attraction for metropolitan residents.[81] As part of the expressway system, the Paseo Bridge unintentionally contributed to the decline of downtown Kansas City just as it boosted the fortunes of the Northland. Kansas City's central business district is still struggling to recover today.

By the beginning of the twenty-first century, the Paseo Bridge had become one of the busiest river crossings in the Kansas City metropolitan area, carrying approximately 94,000 vehicles daily. The Paseo Bridge served as a critical link between downtown Kansas City and the Northland as well as a primary Missouri River crossing for cross-country traffic on Interstates 29 and 35. The importance of the Paseo Bridge to Kansas City became apparent in the early 2000s when it was twice shut down to traffic, causing massive traffic snarls and delays for metropolitan commuters. The first closure occurred on January 23, 2003, when a frozen steel pin led to a cracked strut on the underside of the bridge superstructure. This structural failure caused the bridge deck on the south side of the Paseo Bridge to suddenly rise up approximately eight inches above the failed strut, creating a dangerous traffic hazard. Local police closed the bridge at approximately 4:00 PM, creating a massive traffic jam in downtown Kansas City as commuters scrambled to find other ways to return to their homes in the Northland. An emergency contract was let by the Missouri State Highway Commission to repair the Paseo Bridge's deck and to replace the failed strut. Traffic was temporarily detoured to the Chouteau and Broadway Bridges in downtown Kansas City while the emergency repairs were made, and the repaired Paseo Bridge reopened to traffic on Saturday, February 1, 2003.[82]

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[81]David Martin, "The Concrete Bungle," *The Pitch*, 27 January 2005, downloaded 2 January 2008 from http://pitch.com/2005-01-27/news/the-concrete-bungle/full, *passim*. For additional commentaries on the unintended consequences of highway construction and suburban growth on Kansas City, see Sherry Lamb Schirmer, *A City Divided: The Racial Landscape of Kansas City, 1900-1960* (Columbia: University of Missouri Press, 2002), *passim*; and Thomas Gubbels, "A Moral Crime: School Integration in the Kansas City School District," (Ph.D. diss., University of Missouri-Columbia, 1998), *passim*.

[82]John Schulz and James Hart, "Cold Hits the Breaking Point: Paseo Bridge Cracks," *Kansas City Star*, 23 January 2003, A1; Jeffrey Spivak, "Repair Bid OK'd for Paseo Bridge: Plate Replacement is Expected to Take Up to Two Weeks," *Kansas City Star*, 26 January 2003, B1; Mike Rice, "'It's Just Like the Checkered Flag Going Down': As Paseo Bridge Opens, City and State Weigh More Improvements," *Kansas City Star*, 2 February 2003, B1; and Missouri Department of Transportation, "Bridge Failure Points to Mechanically Frozen Pin," 1-4. The root cause of the Paseo Bridge failure was overstressing of the vertical strut caused by a frozen connection pin. Problems with the steel pin were caused by years of corrosion by the accumulation of salt and sand used to clear snow and ice from the bridge deck, and the extreme cold temperatures in the winter of 2003 caused the pin to fail.

Although the Paseo Bridge was repaired quickly in the winter of 2003, highway department officials realized that the aging structure would need a major overhaul if it was to continue to carry heavy traffic across the Missouri River. Thus, the Missouri Department of Transportation decided in May 2005 to shut down the Paseo Bridge for an estimated six months to conduct a variety of repairs to lengthen the lifespan of the structure. The wide-ranging rehabilitation project included repairs to the bridge piers, sandblasting and painting the cable suspension towers as well as other steel superstructure members, resurfacing the bridge deck, installation of a new guardrail, wrapping the suspension cables with a waterproof membrane, replacement of expansion joints and several gusset plates in the superstructure, and the installation of redundant features to ensure that the suspension system would not fail under adverse conditions. The rehabilitation project also featured the installation of a decorative lighting system and aesthetic enhancements at the ends of the bridge. During the 2005 closure the 97,000 vehicles that crossed the Paseo Bridge on an average day were forced to find alternate routes across the river. Traffic across the two nearest alternative crossings, the Broadway Bridge and the Choteau Bridge, doubled during the Paseo Bridge rehabilitation, and travel times for commuters from the Northland to downtown Kansas City increased dramatically. Traffic accidents increased by 61 percent in North Kansas City during the bridge closure, and businesses located near the bridge experienced dramatic downturns as customers avoided the area. The rehabilitation project was completed ahead of schedule, however, and the Paseo Bridge reopened to traffic on September 1, 2005. Once the rehabilitation project was completed, the Paseo Bridge was renamed Bridge L07345 by the Missouri Department of Transportation.[83]

Problems caused by the closures of the Paseo Bridge in 2003 and 2005 vividly illustrated how important the structure is to the Kansas City area, and with continued growth in the Northland, traffic across the bridge will continue to increase significantly. Today, approximately 100,000 cars and trucks cross the Paseo Bridge each day, and the bridge and its approaches have become a major traffic bottleneck for the Kansas City metropolitan area.[84] To alleviate traffic problems and to provide for future growth, the Missouri Department of Transportation has hired

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[83]Kevin Collison, "Long Closing Ahead for KC Bridge: Paseo Span to be Shut Down 4-6 Months in 2005," *Kansas City Star*, 22 November 2003, A1; Mike Rice, "97,000 of Us Need New Route Over River," *Kansas City Star*, 16 May 2005, A1; Brad Cooper, "Gridlock? We've Crossed that Bridge," *Kansas City Star*, 23 August 2005, B1; Mike Rice and Tanya Fogg Young, "Reopenings Bring a Close to Tiring Treks," *Kansas City Star*, 2 September 2005, A1; and Mike Rice, "Year in Review: Top 10 Stories in the Northland," *Kansas City Star*, 28 December 2005, 1. Traffic congestion in the Kansas City area was exacerbated in July 2005 when the Kansas Department of Transportation decided to close down the bridge carrying Interstate 635 across the Missouri River for rehabilitation. This created increased traffic on bridges that were already taxed to the limit, and local residents expressed disappointment that Missouri and Kansas highway officials failed to work together to lessen the headaches caused by concurrent bridge closures.

[84]Brad Cooper and Bill Graham, "Bold Design to Mark New Paseo Bridge," *Kansas City Star*, 15 November 2007, A1, A14. For a detailed explanation of the traffic problems that led to the need for a new bridge across the Missouri River, See U.S. Department of Transportation, Federal Highway Administration, and Missouri

a team of contractors known as the Paseo Corridor Constructors to build a six-lane bridge across the Missouri River as a replacement for the Paseo Bridge. The new bridge will be known as the Christopher S. Bond Memorial Bridge after the United States Senator who secured funding for the project, and the bridge will feature a cable-stay design with a 300' diamond-shaped tower under which all traffic will pass. This unique bridge design is intended to provide a signature structure comparable to the unique self-anchored suspension design of the original Paseo Bridge. Work on the new bridge is scheduled to begin in the spring of 2008 and be completed by June 2011. When the new bridge is opened to traffic, the Paseo Bridge will be demolished.[85] The Paseo Bridge has served the community well since opening in 1954, and it remains a symbol of civic pride and achievement.

## III. Construction Contractors

### A. Jacob Karol and Howard, Needles, Tammen and Bergendoff

When local officials needed a company to design and oversee the construction of the Paseo Bridge, they turned to one of Kansas City's most famous engineering firms, Howard, Needles, Tammen and Bergendoff. HNTB began in 1914 as a partnership between three noted engineers, John Lyle Harrington, Ernest E. Howard, and Louis Russell Ash. Railroad companies were initially the firm's largest customers, and engineers from Howard, Harrington and Ash oversaw railroad projects throughout the United States and in Japan, Russia, China, and Canada. Eventually a branch office was opened in New York City to allow access to potentially lucrative toll bridge projects and eastern capital. By 1921, the firm had designed over 200 bridges. In the 1920s Howard, Harrington and Ash drew up plans for bridges across the Missouri River at Waverly, Boonville, and Bellefontaine. The firm also designed highway bridges spanning the Mississippi River at Louisiana, Alton, and Cape Girardeau, Missouri, as well as Mississippi River bridges at Natchez and Vicksburg, Mississippi.[86]

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Department of Transportation, "Interstate 29/35 Paseo Bridge Corridor: Final Environmental Impact Statement," November 2006, downloaded 3 January 2008 from http://www.modot.org/kansascity/major_projects/I-29,I-35%20EIS%20&%20Location%20Study.htm, I-1 - I-6.

[85]Brad Cooper and Bill Graham, "Bold Design to Mark New Paseo Bridge," A1, A14; and Missouri Department of Transportation, "KCIcon News Release: Paseo Corridor Constructors Selected for $245 Million Landmark Bridge Project," 14 November 2007, downloaded 3 January 2008 from http://www.kcrivercrossings.org/teamdocs/NewsRelease11_14_07.pdf. Although there will be lane restrictions and occasional detours, the Paseo Bridge is slated to remain open to traffic while the new Christopher S. Bond Memorial Bridge is being built.

[86]Kathi Ann Brown, *Diversity by Design: Celebrating 75 Years of Howard Needles Tammen & Bergendoff 1914-1989* (Kansas City: HNTB Corporation, 1989), 12-36; and Thomas Gubbels, "Waverly Bridge," HAER No.

In 1941, the firm of Howard, Harrington and Ash changed its name to Howard, Needles, Tammen and Bergendoff. The senior partner in this firm, Ernest Howard, had a long history of engineering work in Kansas City. He not only designed the model for the A.S.B. Bridge across the Missouri River, he also designed and oversaw construction of the Sixth Street Viaduct. During the Second World War, HNTB contributed to the war effort by designing and rehabilitating airport runways and control systems. Following the end of the war, HNTB began to specialize in the design of urban expressways and turnpikes. For example, HNTB designed and oversaw construction of the 118-mile New Jersey Turnpike in 1948, and the firm also designed multi-lane expressways for New York, New Hampshire and Ohio. Later, the firm played a key role in the design and construction of the interstate highway system throughout the nation. Howard, Needles, Tammen and Bergendoff continues today as the HNTB Corporation. The HNTB Corporation specializes in a variety of engineering and architectural pursuits, including the design and construction of bridges, airports, and expressways. The company continues to provide design and construction services for numerous projects sponsored by the Missouri Department of Transportation. [87]

Jacob Karol, the engineer who designed the Paseo Bridge, was a lifelong Kansas City resident. He was born on October 22, 1907, and in 1938, he received a Ph.D. in Engineering from the University of Illinois. Karol's doctoral dissertation was entitled, "A Partial Influence Line Procedure for Suspension Bridge Analysis by the Deflection Theory," reflecting his interest in suspension bridge design. Karol began his career in 1930 as a bridge designer working in Kansas City for the firm of Ash, Howard, Needles, and Tammen. Following graduate school and a brief stint as an aeronautical engineer during the Second World War, Karol returned to Kansas City in July 1945 to work for Howard, Needles, Tammen and Bergendoff. Karol prepared the design plans for the self-anchored suspension span of the Paseo Bridge in 1952, and in 1954 the American Institute of Steel Construction chose the structure as the most beautiful steel bridge in America spanning more than 400'. Karol continued to design bridges for HNTB until his retirement in 1974, and he received numerous awards and citations for his work. Karol received a distinguished alumni award from the University of Illinois in 1975, and he established scholarships to help students pursuing careers in engineering at the University of Illinois and at Kansas City Metropolitan Community College. Karol passed away in Kansas City, Missouri, on December 9, 1983, leaving behind a legacy of design excellence.[88]

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MO-112, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2003, 24-28.

[87]Brown, *Diversity by Design*, 12-13, 37-76; and HNTB Corporation, "HNTB History," downloaded 3 January 2008 from http://www.hntb.com/about_history.jsp?co=5&sub=5&companyid=0.

[88]Karol, "Jacob Karol, Life Member, ASCE," 366-367; and "Deaths: Jacob Karol," *Kansas City Star*, 11 December 1983, 3B.

B. Kansas City Bridge Company

The Kansas City Bridge Company helped build the river piers that support the Paseo Bridge's self-anchored suspension spans. Joseph Hoover, an engineer with ties to several Kansas City area bridge companies, founded the Kansas City Bridge Company in the late nineteenth century. Hoover was born in 1850 near North Canton, Ohio, and he received a civil engineering degree from the University of Michigan in 1875. He worked as chief engineer of the Indianapolis Bridge Company before joining the Wrought Iron Bridge Company of Canton, Ohio, in 1878. Hoover moved to Kansas City in 1884 as the western agent for the Wrought Iron Bridge Company, and he continued in that position when the company was acquired by the American Bridge Company in 1900. While still employed by the Wrought Iron Bridge Company, Hoover created his own bridge company in 1893. The Kansas City Bridge Company incorporated on January 30, 1893, with an initial capital fund of $10,000 divided into one hundred shares. According to its charter, the Kansas City Bridge Company planned to perform a wide variety of construction tasks:

> The purposes for which said corporation is formed are the following to wit: To do a general manufacturing and mercantile business and more particularly to work in wood and iron, to design, build and sell railway and highway bridges and all kinds of structural work, to buy take own hold or lease real estate for the purposes of said company and to sell or mortgage any property belonging to said company as provided by law, to borrow money and secure the same upon any and all property of the company and in general to transact such other business as is usually transacted by companies of like character.[89]

By 1908, Hoover had expanded his business dealings, owning stakes in the Hoover Construction Company and the Contractors Machinery Company. He remained with the Kansas City Bridge Company in an advisory capacity until his death in 1925.[90]

By 1910, Hoover had surrendered the presidency of the Kansas City Bridge Company to Alexander Maitland, Jr. Maitland was born near Richmond, Missouri, in 1866, and received his degree in civil engineering from the University of Missouri in 1889. Maitland briefly taught as an assistant professor of civil engineering at the University of Missouri and then served for five years as an assistant engineer in the bridge and building department of the Missouri Pacific

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[89]Kansas City Bridge Company, "Articles of Association," 30 January 1893, as held by the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

[90]*Ibid.*; Carrie Westlake Whitney, *Kansas City, Missouri, Its History and Its People: 1800-1908* (Chicago: S. J. Clarke Publishing Co., 1908), 396-399; and Thomas Gubbels, "Lexington Bridge," HAER No. MO-111, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2003, 29-30.

Railroad. Maitland moved to Kansas City in 1898, and in 1901 he became the contracting manager for the American Bridge Company. In 1905 Maitland joined the Kansas City Bridge Company, soon becoming its president. H. P. Treadway served as vice-president and treasurer of the Kansas City Bridge Company under Maitland and the two men were founding members of the Kansas City Chapter of the American Society of Civil Engineers.[91]

In the early twentieth century the Kansas City Bridge Company worked on the construction of bridges across the Missouri River in Nebraska, Missouri, and Kansas. In the early 1920s the Kansas City Bridge Company was selected by the Missouri State Highway Commission to build a bridge across the Missouri River at Lexington, Missouri. Later in the 1920s, a private group hired the Kansas City Bridge Company to build a toll bridge across the Missouri River at Blair, Nebraska, that later became a toll-free structure known as the Abraham Lincoln Memorial Bridge.[92] The Kansas City Bridge Company remained active throughout the 1930s, winning contracts to help build highway bridges across the Missouri River at Rulo, Nebraska, and South Omaha, Nebraska.[93] The company also constructed the substructure of a monumental vertical lift-bridge across the Missouri River at Booneville, Missouri, for the Missouri-Kansas-Texas Railroad Company in 1932.[94] The Kansas City Bridge Company had extensive experience building bridges across the Missouri River, making them an excellent choice for the construction of the bridge piers that would support the river spans of the Paseo Bridge. The Kansas City Bridge Company continued to work on construction projects throughout the Midwest until it was formally dissolved at the request of the company's board of directors on August 2, 2000.[95]

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[91]Gubbels, "Lexington Bridge," 30.

[92]*Ibid*., 17-18; and Clayton Fraser, "Abraham Lincoln Memorial Bridge," HAER No. NE-1, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1987, 33-37.

[93]Federal Highway Administration, "Historic Bridges of Nebraska: Rulo Bridge," downloaded 4 January 2008 from http://www.fhwa.dot.gov/nediv/bridges/richards.htm; and Federal Highway Administration, "Historic Bridges of Nebraska: South Omaha Bridge," downloaded 4 January 2008 from http://www.fhwa.dot.gov/nediv/bridges/douglas.htm. The Kansas City Bridge Company also worked on two major construction projects in Kansas City, Kansas, in the 1930s, the Seventh Street Trafficway and the Fairfax Bridge. See "Bridge Opened 50 Years Ago Today," *Kansas City Kansan*, 21 April 1985, downloaded 4 January 2008 from http://www.kckpl.lib.ks.us/kscoll/lochist/thennow/TN03.htm.

[94]"Save the Katy Bridge: Historic Bridge Facts," downloaded 4 January 2008 from http://savethekatybridge.org/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=18&MMN_position=25:25.

[95]Kansas City Bridge Company, "Certificate of Termination," 2 August 2000, as held by the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

C. Massman Construction Company

The Massman Construction Company worked in partnership with the Kansas City Bridge Company to construct the four river piers that support the self-anchored suspension span of the Paseo Bridge. Henry Massman, the founder of the Massman Construction Company, was born in Quincy, Illinois, in 1879, but his family moved to Kansas City when he was only two years old. Henry Massman's father, J.H. Massman, owned and operated a brick-making company, and at age 14 Massman dropped out of school and went to work for his father as an apprentice bricklayer. Massman continued to work as a bricklayer for several years, working on a variety of local and regional projects, including the construction of large railroad shops for the Kansas City Southern Railroad in Shreveport, Louisiana. When Massman was twenty-one years old he founded a sand dredging company in Kansas City with $1,500 that he borrowed from his father. Massman's sand dredging company was known as the Builders Sand Company, and he eventually sold the firm to the Stewart-Peck Sand Company of St. Louis for over $100,000.[96]

After Henry Massman sold his sand dredging business, he began to look for new entrepreneurial opportunities. Massman had spent most of the early years of his life working alongside the Missouri River, and in 1908, he founded a construction company that would grow to specialize in river-related construction. The Massman Construction Company did not formally incorporate until 1916. According to its corporate charter, the Massman Construction Company planned to conduct a wide variety of construction activities:

> The corporation is formed for the following purposes: to construct and maintain any and all kinds of public [and] private improvements, including the construction and maintenance of embankments for the reclaiming of lands, bridges, railroads, buildings, highways; to make and execute contracts for all kinds of construction work, and to carry on a general contracting business; to own and operate rock quarries or other properties producing building materials; to buy, sell and deal in building materials of all kind; to own, build, or hire and lease steamboats, barges and other boats, engines, cars, and other equipment of railroads necessary or convenient to the transaction of any of its business; to buy and sell real estate…and to do and perform all things necessary or incident to the transaction of its business.[97]

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[96]"Henry J. Massman Dies," *Kansas City Star*, 25 June 1972, 3A; Schirmer and McKinzie, *At the River's Bend*, 318; Worley, *Kansas City*, 122; and Dick Fowler, *Leaders in Our Town* (Kansas City, Missouri: Burd and Fletcher, 1952), 294-295.

[97]Massman Construction Company, "Articles of Association," 12 November 1916, as held by the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

One of the new company's first major jobs was a riverbank stabilization project for a railroad bridge at Napoleon, Missouri. The Massman Construction Company won a major contract in 1926 from the U.S. Army Corps of Engineers to construct a six-foot channel along the entire length of the Missouri River from Omaha, Nebraska, to its junction with the Kaw River in Kansas City. The company continued to work for the federal government throughout the 1930s and 1940s, constructing several projects financed by New Deal recovery funds as well as building munitions plants during the Second World War.[98]

By the end of the Second World War, the Massman Construction Company had evolved into one of the largest contractors in the Kansas City area. Henry Massman stepped down as president of the company in 1953 and turned its operation over to his son, Henry Massman Jr. The Massman Construction Company continued to specialize in river work in Kansas City, Missouri, constructing the substructures of the Paseo Bridge and the Liberty Bend Bridge, as well as flood protection structures such as the Armourdale floodwall and numerous agricultural levees.[99] The Massman Construction Company continued to expand throughout the late twentieth century, becoming a major regional construction firm specializing in dam construction, riverbank protection, bridge foundation work, power plant construction, and general construction. Some of the company's major projects in Missouri included construction of the Clarence Cannon Dam along the Salt River near Hannibal and the construction of ten river piers for the eastern approach of the Bill Emerson Memorial Bridge in Cape Girardeau.[100] The Massman Construction Company continues to perform construction work throughout the United States today, and it is one of the companies that will participate in the construction of the Christopher S. Bond Memorial Bridge, the bridge that will eventually replace the Paseo Bridge as the major river crossing connecting downtown Kansas City to the Northland.[101]

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[98]"Henry J. Massman Dies," 3A; Schirmer and McKinzie, *At the River's Bend*, 318; and Fowler, *Leaders in Our Town*, 295.

[99]"H.J. Massman, Jr., Builder, 64, Dies," *Kansas City* Times, 10 July 1970, 3; Fowler, *Leaders in Our Town*, 295; and Worley, *Kansas City*, 122.

[100]Massman Construction Company, "Bridges," downloaded 6 January 2008 from http://www.massman.net/bridges.html; and Massman Construction Company, "Locks and Dams," downloaded 6 January 2008 from http://www.massman/net/locks_and_dams.html.

[101]Missouri Department of Transportation, "KCIcon News Release: Paseo Corridor Constructors Selected." The two companies that will partner with the Massman Construction Company to build the Christopher S. Bond Memorial Bridge are Clarkson Construction Company of Kansas City, Missouri, and Kiewit Construction Company of Omaha, Nebraska.

D. American Bridge Company

The American Bridge Company erected the steel superstructure of the self-anchored suspension spans that compose the majority of the Paseo Bridge. Several officers from the Kansas City Bridge Company had links to the American Bridge Company, including company founder Joseph Hoover and later company president Alexander Maitland, Jr. The American Bridge Company was founded in 1900 when entrepreneur J. P. Morgan led the consolidation of twenty-eight of the nation's largest steel fabricators and construction companies into a single corporation. The consolidated company had some Missouri roots. The Keystone Bridge Works, one of the twenty-eight companies absorbed into the mega-corporation, erected the steel arch spans of the Eads Bridge over the Mississippi River at St. Louis. This was the first steel bridge spanning the Mississippi River, and although it is closed to automobile traffic, it is still in use today as part of St. Louis' light rail system and as a pedestrian crossing.[102]

In 1901, the American Bridge Company became a subsidiary of a newly consolidated trust, the United States Steel Corporation. The American Bridge Company owned and operated several huge steel fabrication facilities, including shops in Chicago, Illinois, Gary, Indiana, and Ambridge, Pennsylvania. The company built several noted bridges and buildings throughout the twentieth century, including the Carquinez Strait Bridge over San Francisco Bay, the Galbraith Bridge over the Mississippi River at Rock Island, Illinois, the Chrysler Building in New York City, and the Superdome in New Orleans, Louisiana. In addition to the Paseo Bridge, the American Bridge Company has constructed numerous large suspension bridges throughout the world, including the Verrazano Narrows Bridge in New York City and the Oakland Bay Bridge linking Oakland and San Francisco. The American Bridge Company became a privately held corporation in 1987, and today the company remains an international leader in bridge design, manufacture, and construction.[103]

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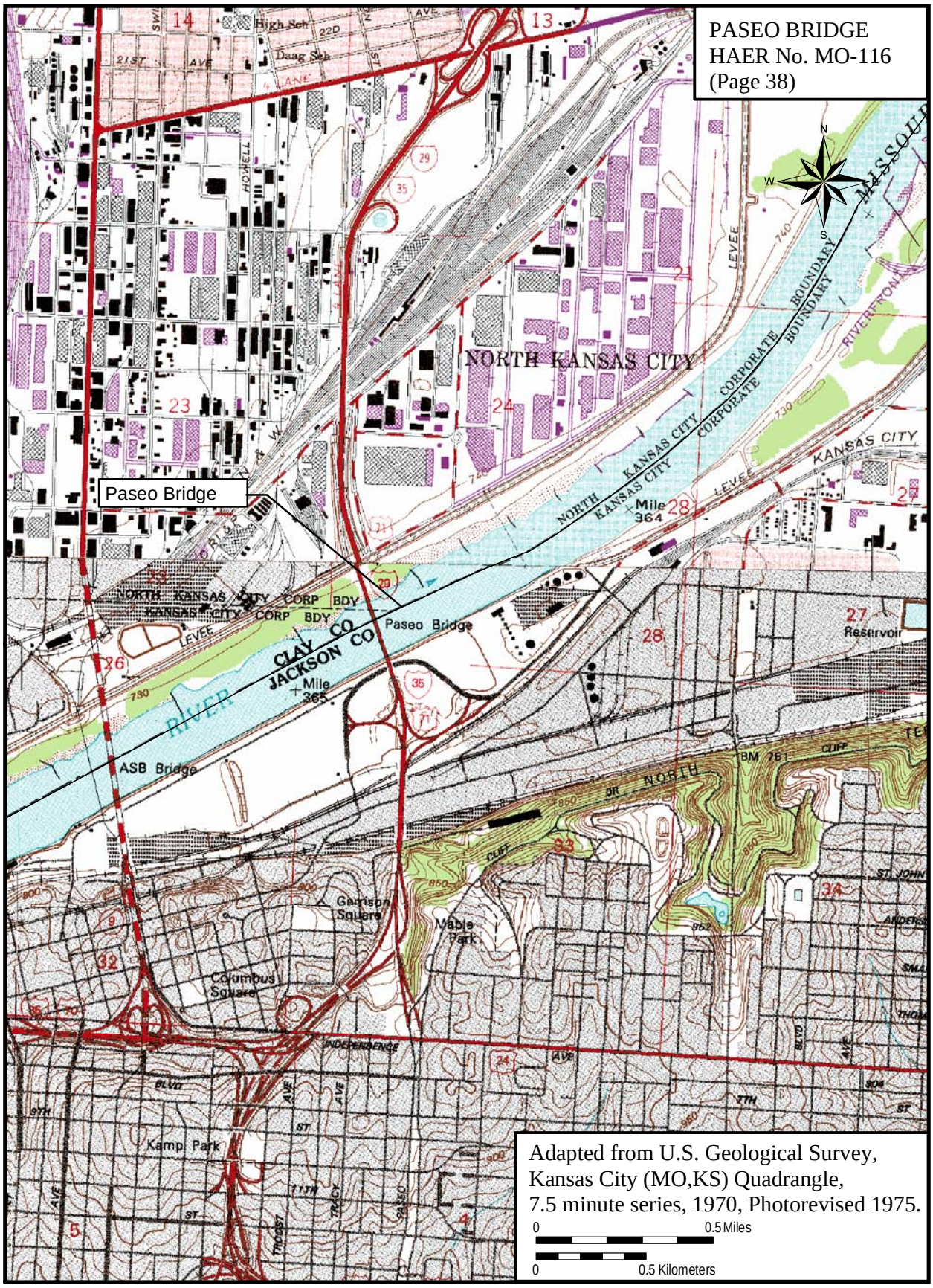
[102]Robert Duffy, "A Bridge to the Past and Future - Reopening of the Eads Bridge," *St. Louis Post-Dispatch*, 29 June 2003, A1; American Bridge Company, "Company History," downloaded 7 January 2008 from http://www.americanbridge.net/index.php?option=com_content&task=view&id=44&Itemid=72, and Gubbels, "Lexington Bridge," 32-33.

[103]Gubbels, "Lexington Bridge," 33; American Bridge Company, "Company History"; and American Bridge Company, "Experience - Suspension Bridges," downloaded 7 January 2008 from http://www.americanbridge.net/index.php?option=com_content&task=blogcategory&id=49&Itemid=128.


PASEO BRIDGE
HAER No. MO-116
(Page 38)
Paseo Bridge
NORTH KANSAS CITY
NORTH KANSAS CITY CORPORATE BOUNDARY
KANSAS CITY
Mile 364
Mile 365
RIVER
CLAY CO
JACKSON CO
Paseo Bridge
ASB Bridge
Reservoir
Garrison Square
Maple Park
Columbus Square
Kamp Park
INDEPENDENCE AVE
PASEO
Adapted from U.S. Geological Survey,
Kansas City (MO,KS) Quadrangle,
7.5 minute series, 1970, Photorevised 1975.
0
0.5 Miles
0
0.5 Kilometers

JACKSON COUNTY COURT

HARRY M. FLEMING, PRESIDING JUDGE
WILLIAM T. RANDALL
FRED W. KLABER

CLAY COUNTY COURT

B. L. CROSSETT, PRESIDING JUDGE
J. F. MAURER
CURTIS HALL

# MISSOURI RIVER BRIDGE AT THE PASEO

## KANSAS CITY, MO.

CONTRACT NO. 1
RIVER PIERS

LIST OF DRAWINGS

L01 COVER SHEET
L02 GENERAL PLAN AND ELEVATION
L03 RIVER STAGES
L04 PIERS 2, 3, 4 AND 5 - GENERAL VIEWS
L05 PIERS 1 AND 5
L06 PIERS 3 AND 4

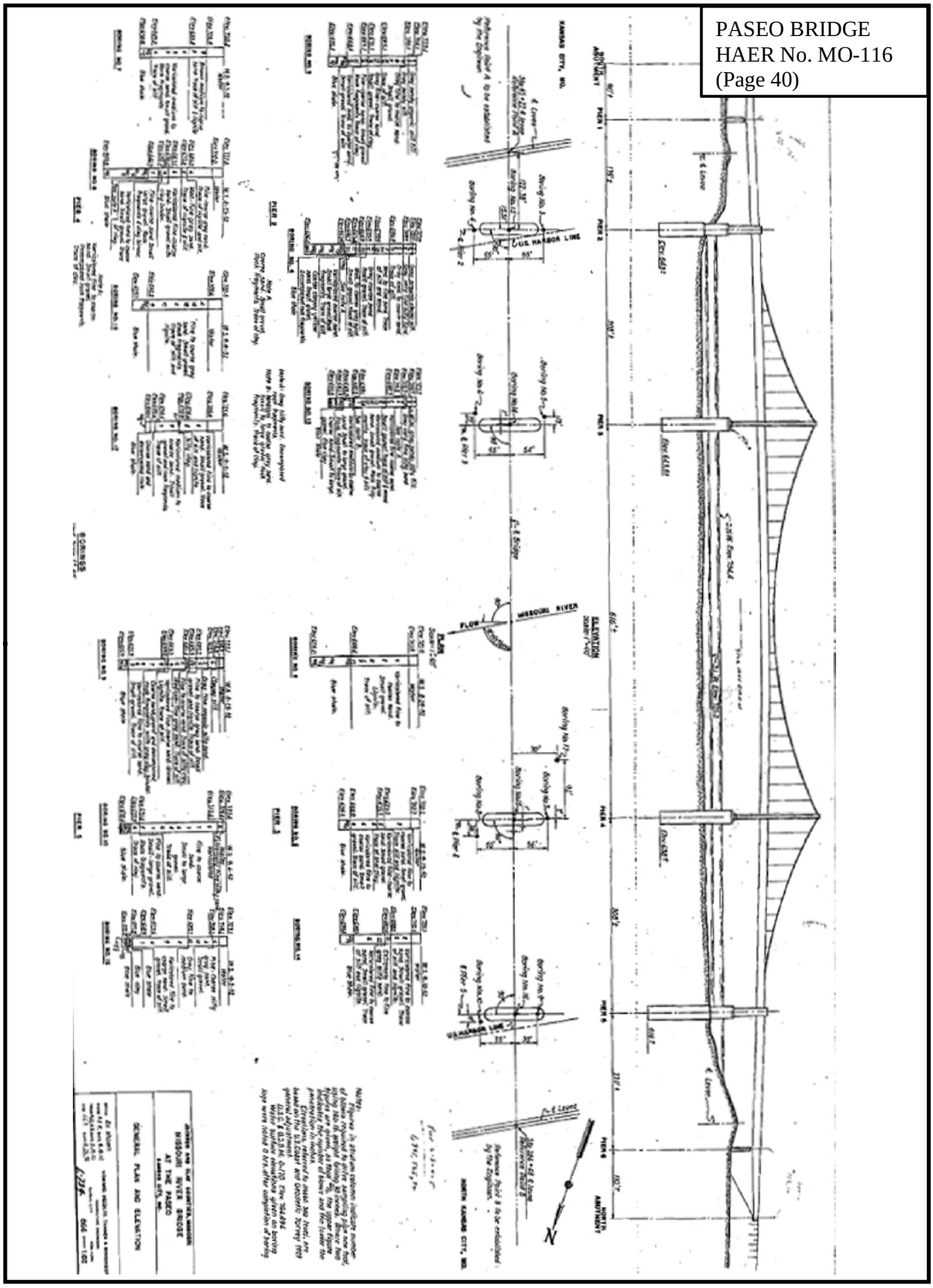
LOCATION PLAN

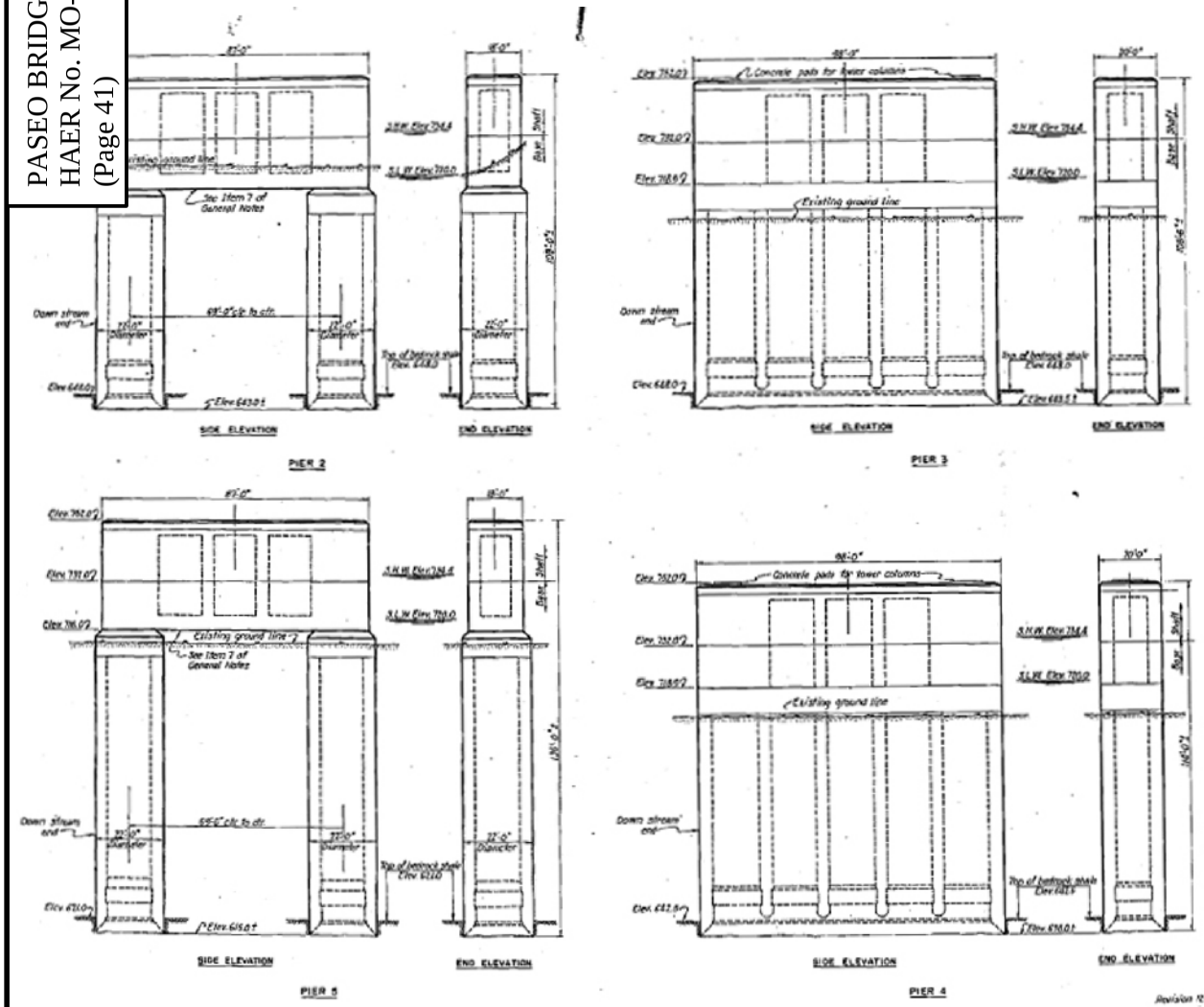
PREPARED AND RECOMMENDED BY
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY, MO. NEW YORK, N.Y.

Route 1 pt.
RECEIVED
Bureau of Bridges

APPROVED
CHIEF ENGINEER
MO. STATE HWY. COMM.
DATE

Dr. No. L-734


KANSAS CITY, MO.
U.S. HARBOR LINE
MISSOURI RIVER
FLOW
ELEVATION
PLAN
NORTH ABUTMENT
PIER 1
PIER 2
PIER 3
PIER 4
PIER 5
PIER 6
N
GENERAL PLAN AND ELEVATION
MISSOURI RIVER BRIDGE
AT THE PASEO
KANSAS CITY, MO.




GENERAL NOTES

1. CONCRETE
Concrete shall be class 3C. See Specifications.

2. CONCRETE SURFACE FINISH
For concrete surface finish of piers above Elev 737.0 or ground line, see Specifications.

3. REINFORCING STEEL
Unless otherwise shown on the plans. (1) All bars shall be lapped 36 bar diameters in making a splice. (2) Minimum covering from surface of concrete to face of nearest reinforcing bar shall be 2 inches. (3) Dimensions are given to the center lines of bars.

4. TEMPLATE-SCREED-FRAMES AND ANCHOR BOLTS
There will be template-screed-frames and anchor bolts for the tower shoe base plates on Piers 3 and 4. The sizes and details of these frames and anchor bolts will be furnished later. For construction procedure concerning the setting of these screed-frames and anchor bolts, see Article 3.06 of Specifications.

5. RED ROCK SHALE
Elevations of top of bed rock shale indicated will be used for determination of excavation quantities to be paid for under Item 4, of the Proposal. All excavation above elevations indicated to be included in price paid for "Concrete Bases of Piers," Item 1 of Proposal.

6. CUTTING EDGE ELEVATIONS
Final elevations of cutting edges are subject to determination prior to sinking of pier. See Specifications.

7. FORMS
Forms for concrete above Elev 716.0 for Piers 2 and 5 to be adequately supported to avoid overstressing the concrete.

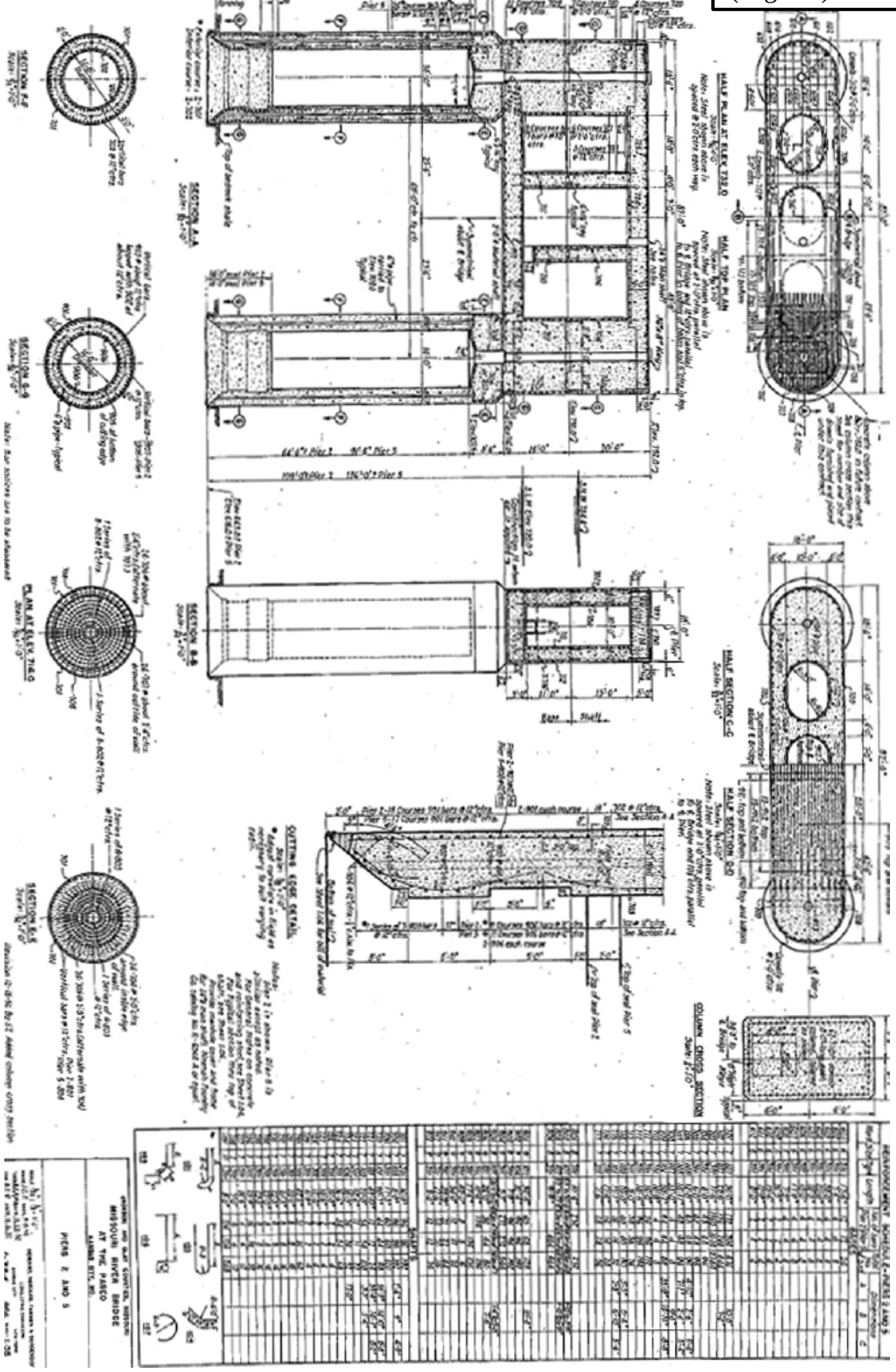
8. ELECTRICAL GROUNDS
Provide a No. 0 bare stranded solid copper ground wire at Piers 3 and 4. Wire to be brazed or suitably clamped to steel cutting edge and extended up through caisson, either in blow pipe or embedded in concrete, to top of pier. Extend wire 5 ft. above top of concrete for attachment to tower column by others.

JACKSON AND CLAY COUNTIES, MISSOURI
MISSOURI RIVER BRIDGE
AT THE PASEO
KANSAS CITY, MO.

PIERS 2, 3, 4 AND 5-GENERAL VIEWS

SCALE 1" = 10'-0"
DATE 12-18-52
DRAWN J.E.C.
TRACED
CHECKED
DATE 9-18-52
DATE 9-22-52
EDWARD BARDLES, TANNER & HERRICK
CONSULTING ENGINEERS
KANSAS CITY
NEW YORK
2-7.3K 866 SHEET 104

Revision 12-18-52 By J.E.C. Horiz. dimensions of top slab made same as shaft dimensions.


SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
HALF PLAN AT ELEV. 738.0
HALF TOP PLAN
HALF SECTION C-C
HALF SECTION D-D
PLAN AT ELEV. 714.0
CUTTING EDGE DETAIL
COLUMN CROSS SECTION
REINFORCEMENT SCHEDULE - PIERS 2 AND 5
MISSOURI RIVER BRIDGE
AT THE PASEO
KANSAS CITY, MO.
PIERS 2 AND 5

JACKSON COUNTY COURT
HARRY M. FLEMING, PRESIDING JUDGE
WILLIAM T. RANDALL
HENRY H. FOX, JR.

CLAY COUNTY COURT
B. L. CROSSETT, PRESIDING JUDGE
FORD WHITE
CURTIS HALL

# MISSOURI RIVER BRIDGE AT THE PASEO

## KANSAS CITY, MO.

LOCATION PLAN

PREPARED AND RECOMMENDED BY
HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
KANSAS CITY, MO. NEW YORK, N.Y.
R A Bergendoff

## CONTRACT NO. 2
## RIVER BRIDGE SUPERSTRUCTURE

LIST OF DRAWINGS

2.01 TITLE SHEET
2.02 GENERAL PLAN AND ELEVATION
2.03 APPROACH SPANS - CROSS SECTIONS
2.04 " " - STEEL FRAMING PLAN AND GIRDER ELEVATIONS
2.05 " " " " " " " "
2.06 " " - GIRDER DETAILS
2.07 " " - " " "
2.08 " " - " " "
2.09 " " - SHOES
2.10 " " - EXPANSION JOINTS
2.11 " " - ROADWAY SLAB AND DRAINAGE
2.12 TOWERS - GENERAL VIEWS
2.13 " - COLUMN BASE AND SPLICES
2.14 " - LOWER STRUT
2.15 " - UPPER STRUT
2.16 SUSPENDED SPANS - CROSS SECTION AND FLOOR SYSTEM
2.17 " " - STEEL FRAMING PLAN AND GIRDER ELEVATION
2.18 " " - STIFFENING GIRDER AT CABLE ANCHOR
2.19 " " - " " " " ENTRANCE
2.20 " " - " " " HINGES
2.21 " " - " " " SPLICES
2.22 " " - " " BEARINGS AND ANCHORS
2.23 " " - CABLES AND ACCESSORIES
2.24 " " - ROADWAY SLAB
2.25 " " - STRESSES AND ERECTION DIAGRAMS
2.26 HANDRAIL AND ACCESS WALKS
2.27 LIGHTING
2.28 CONCRETE BENT AT PIERS 2 AND 5
2.29 RIVER STAGES
2.30 BORINGS
2.31 PERSPECTIVE VIEWS

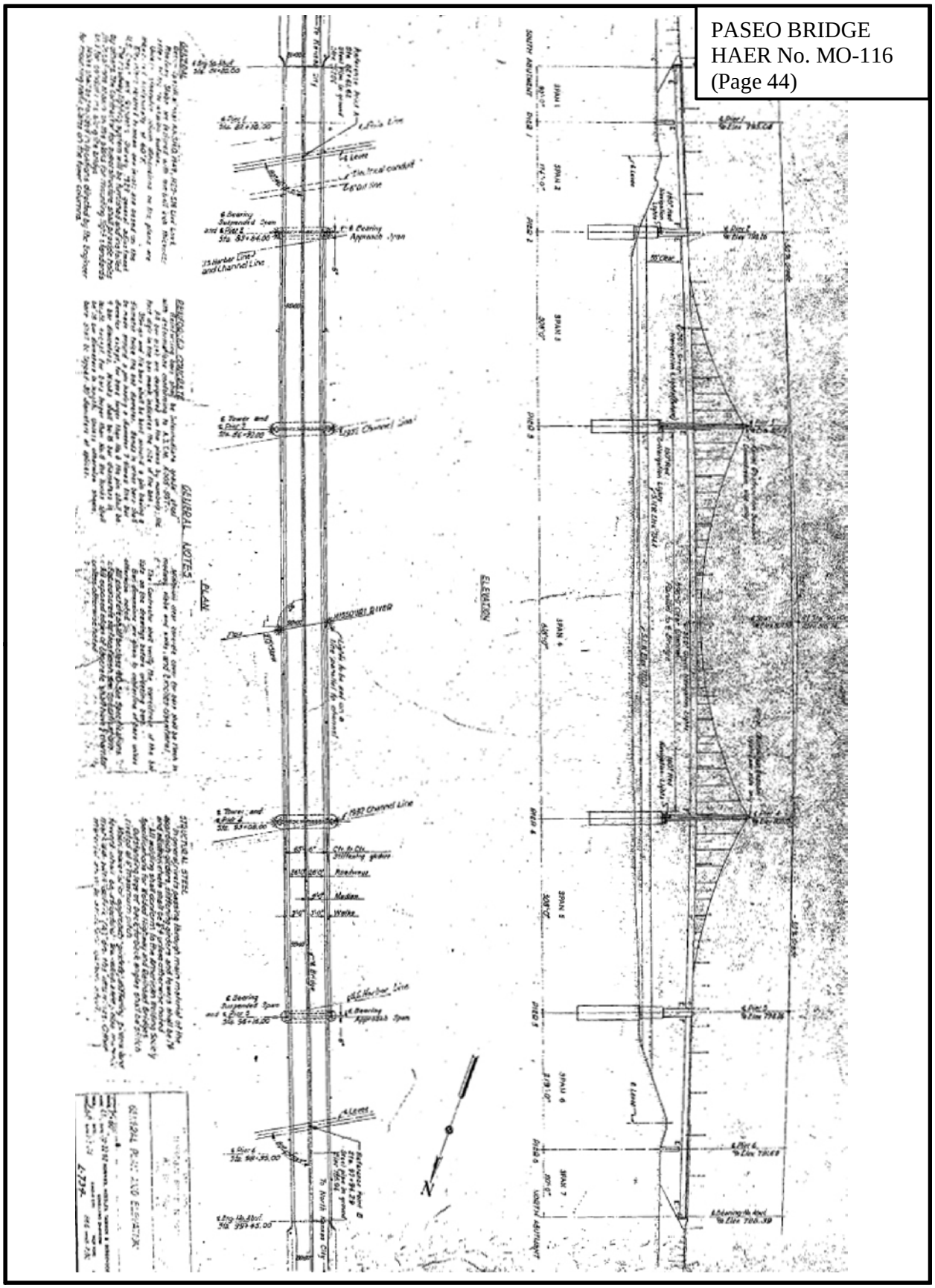
RECEIVED
Bureau of Bridges

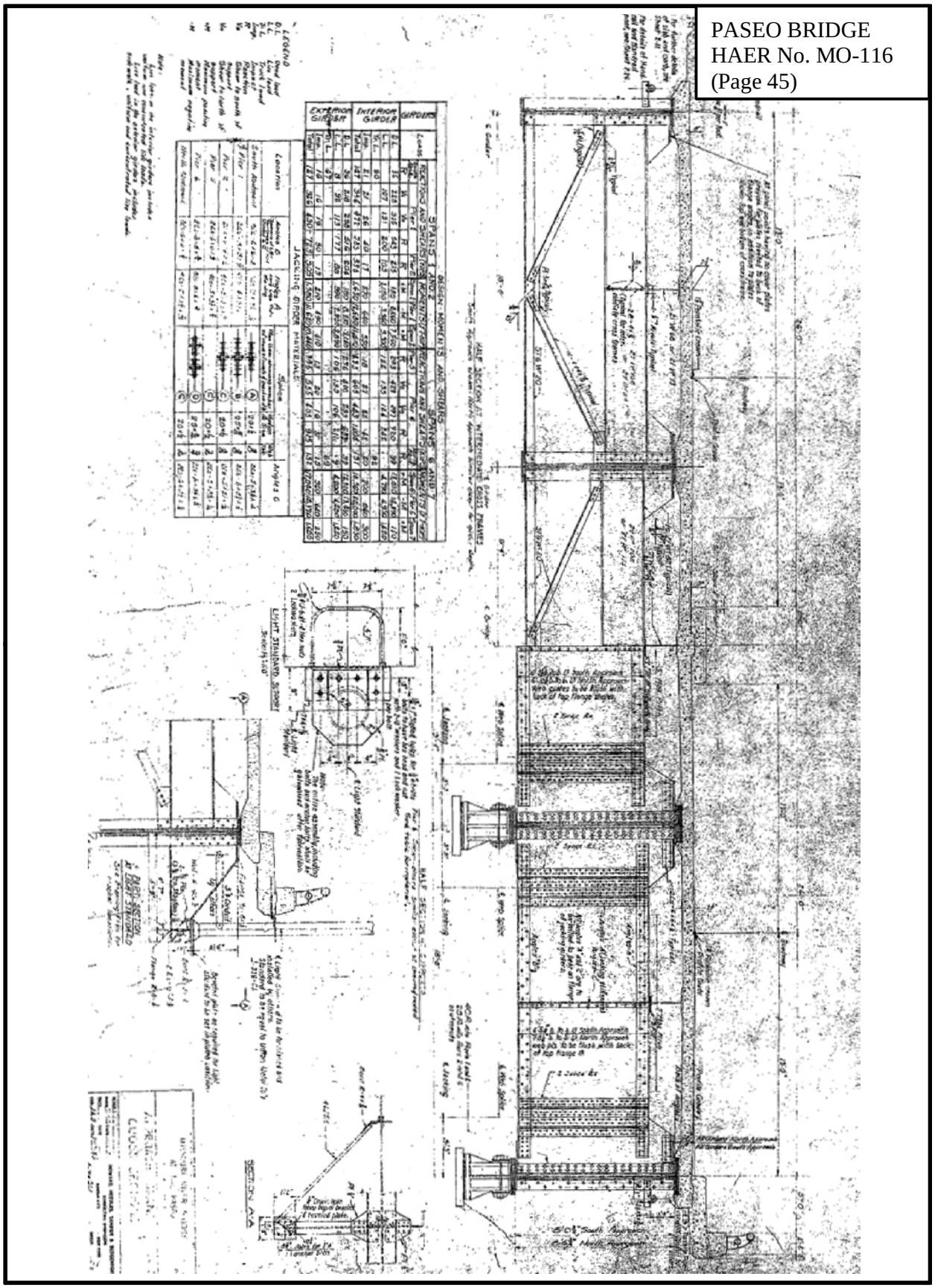
Route 535

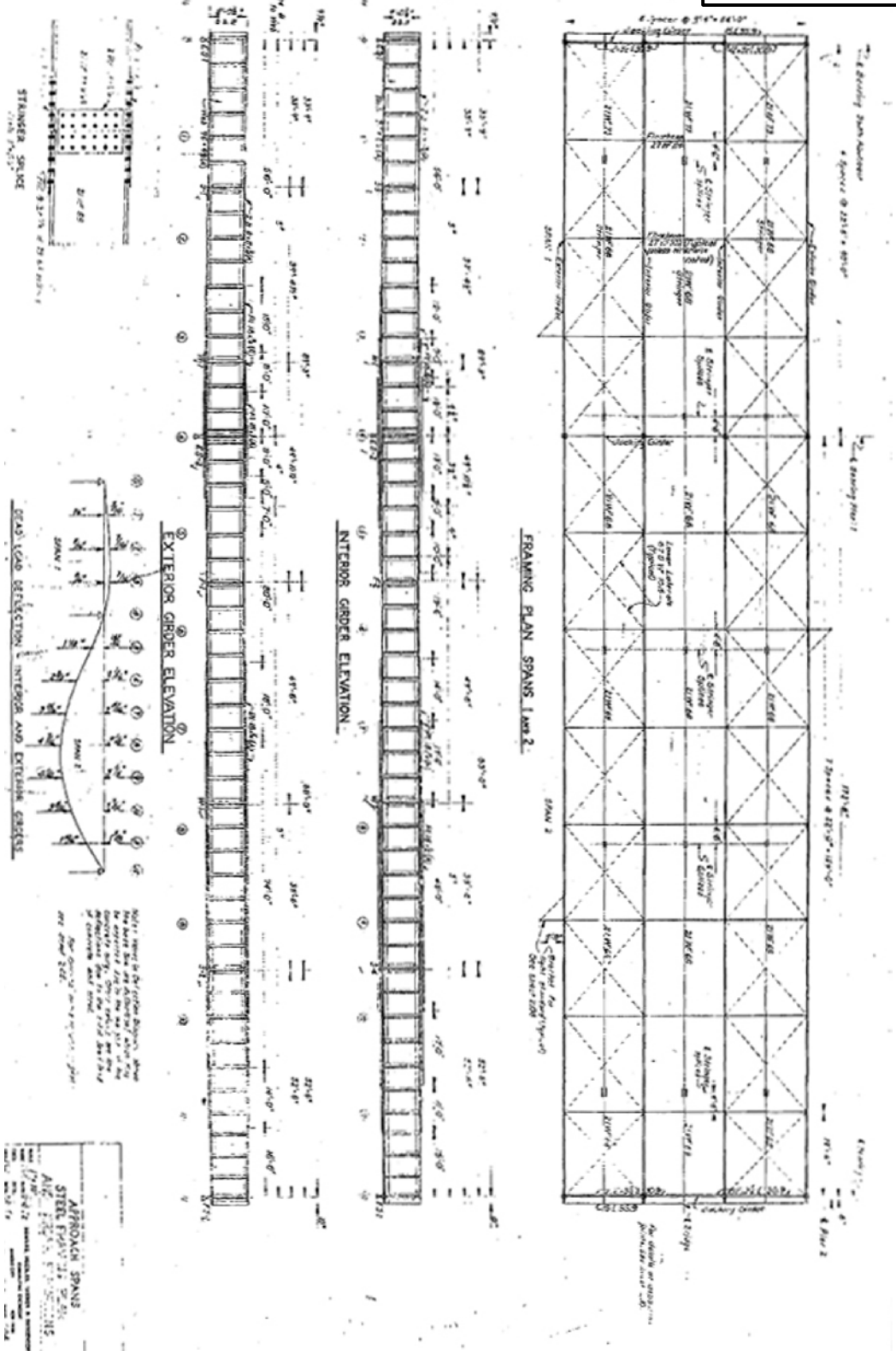
APPROVED
CHIEF ENGINEER
MO. STATE HWY. COMM.

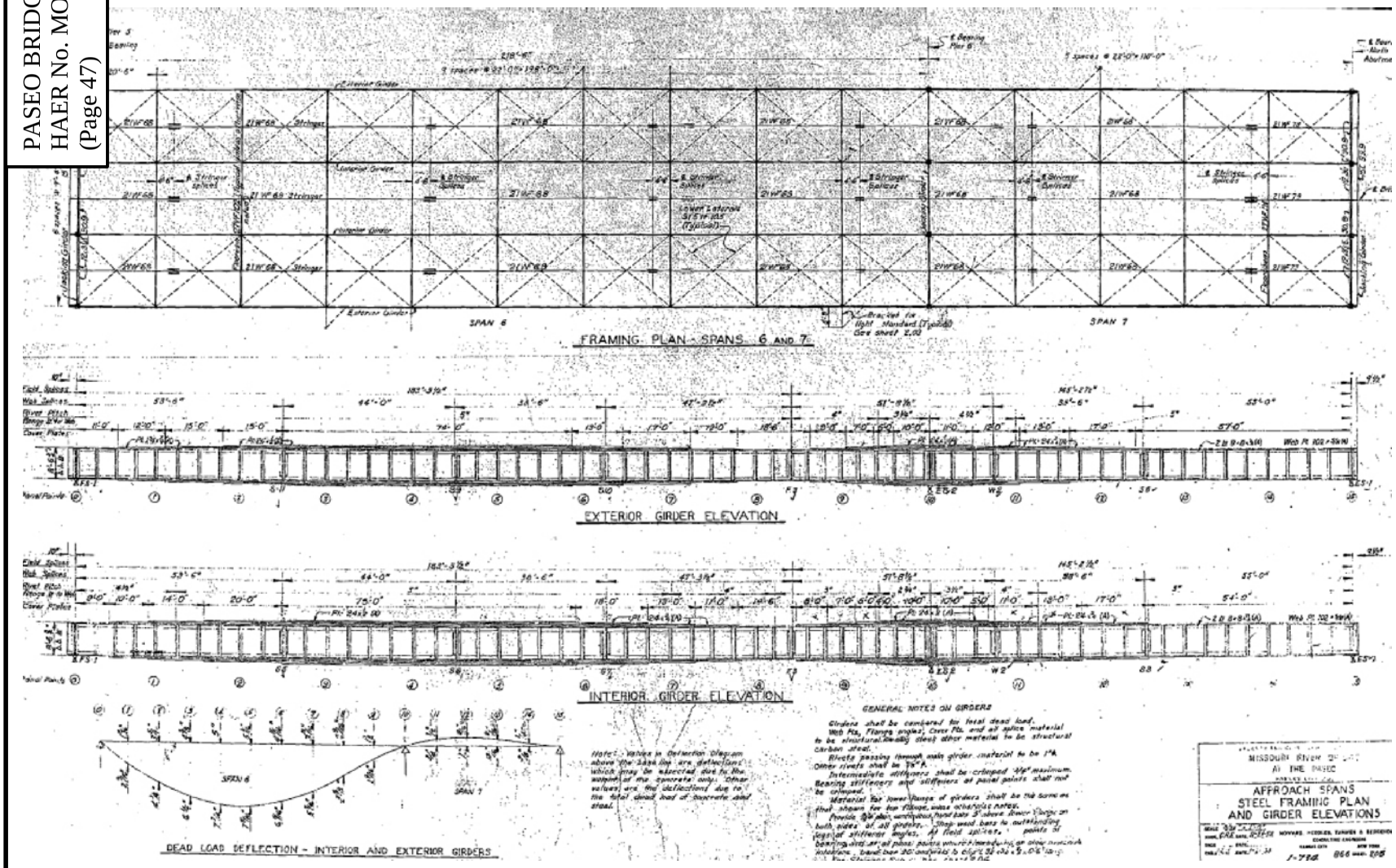
Feb 7, 1955
DATE

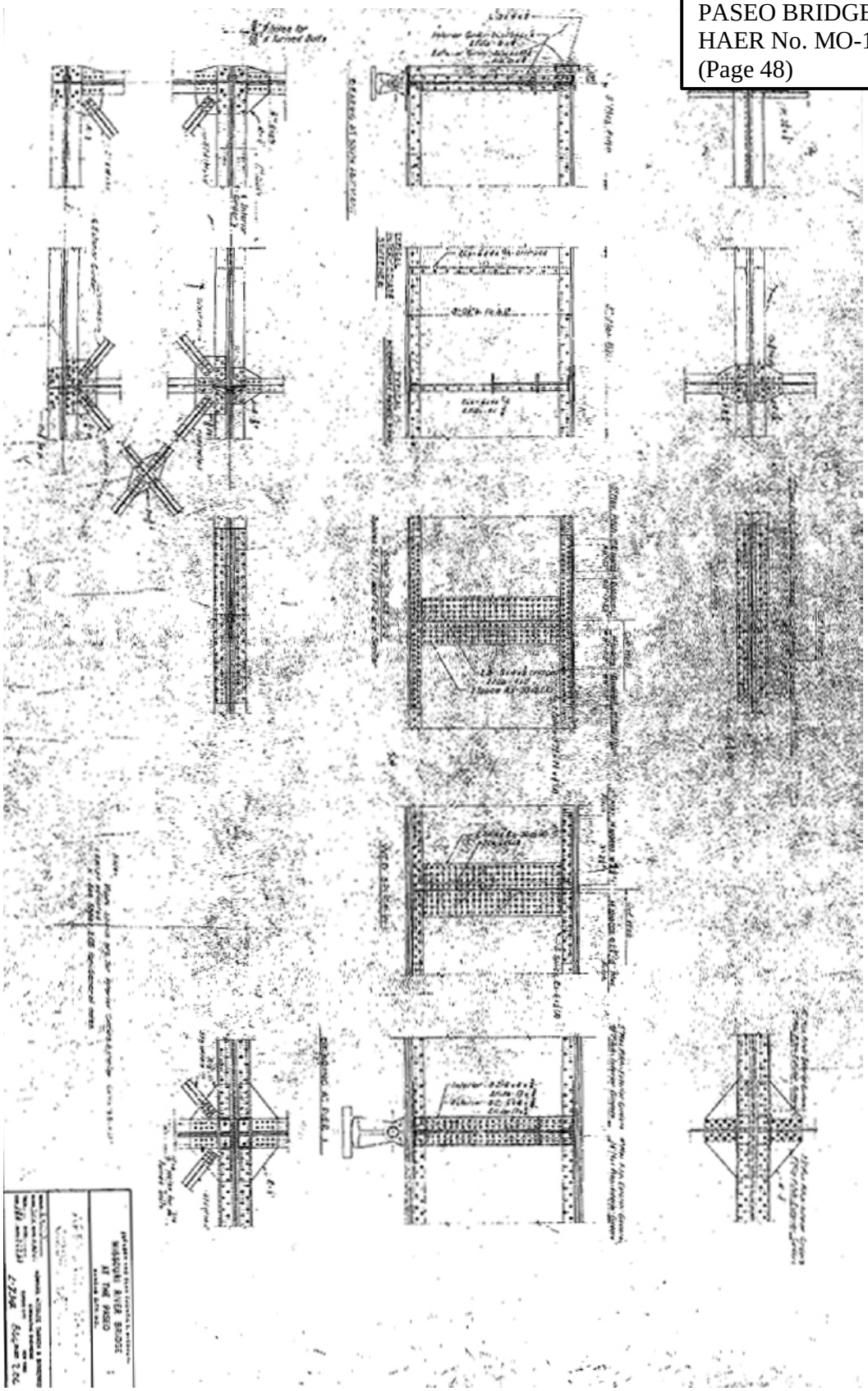
L-734

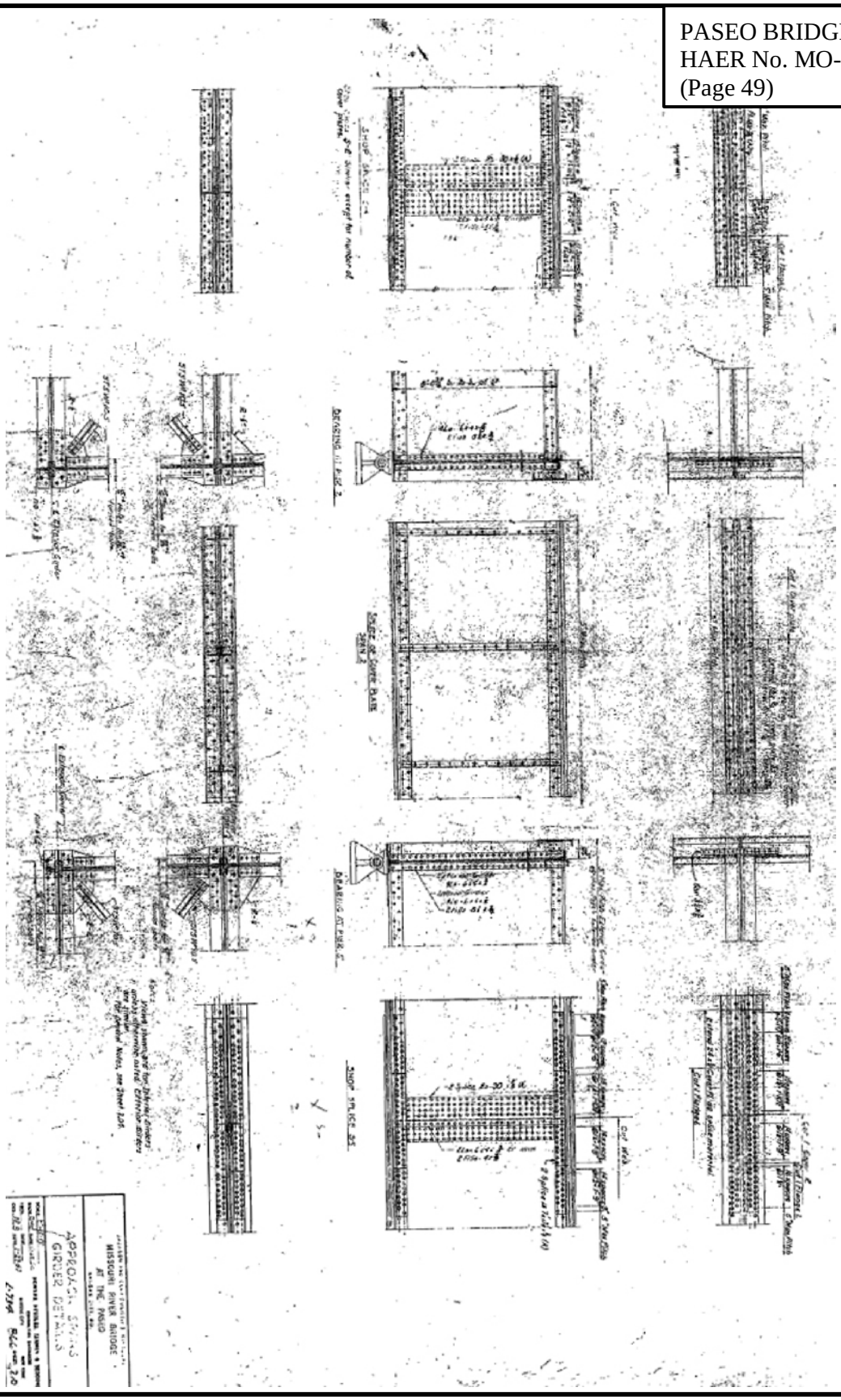

PLAN
ELEVATION
GENERAL NOTES
MISSOURI RIVER
N

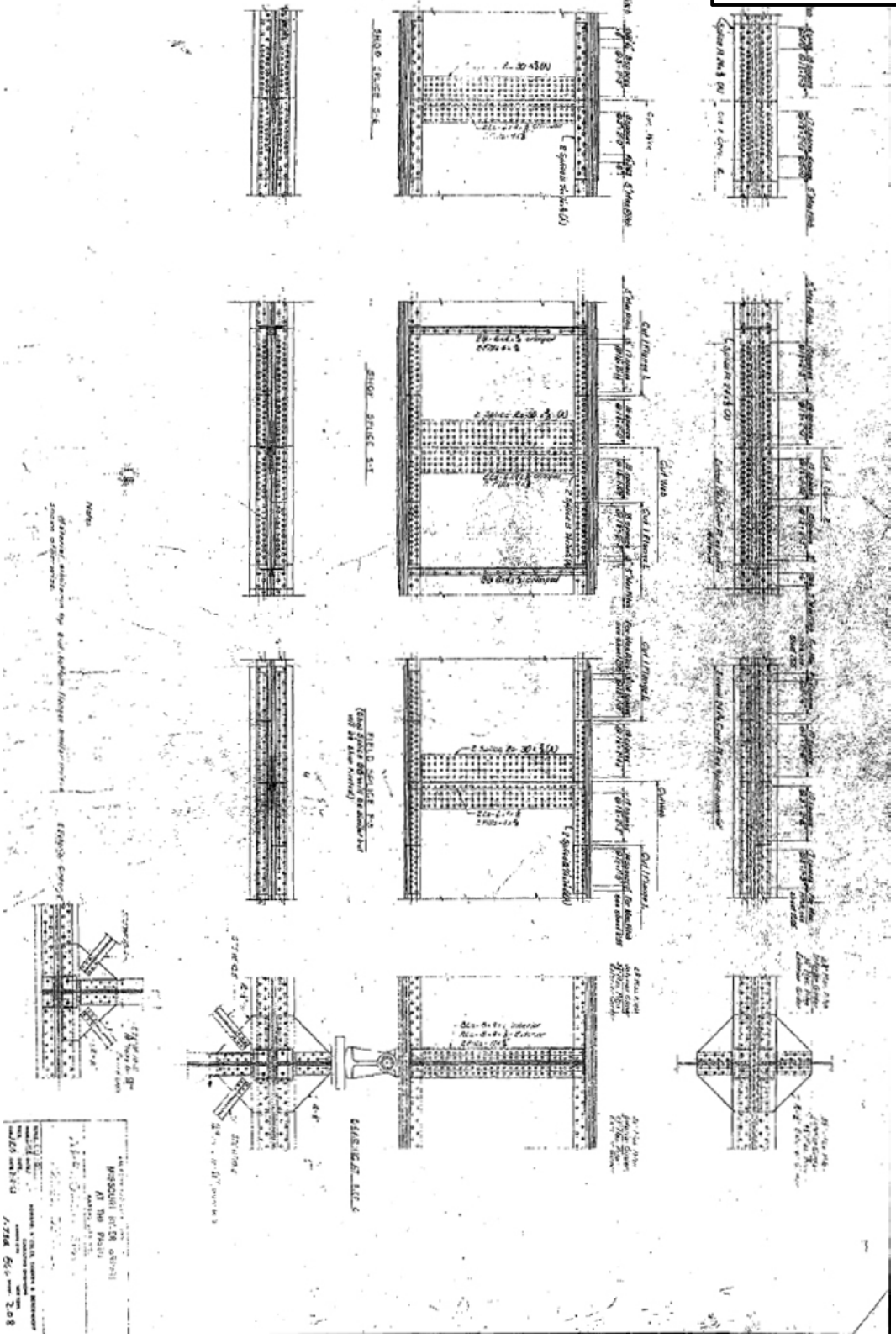


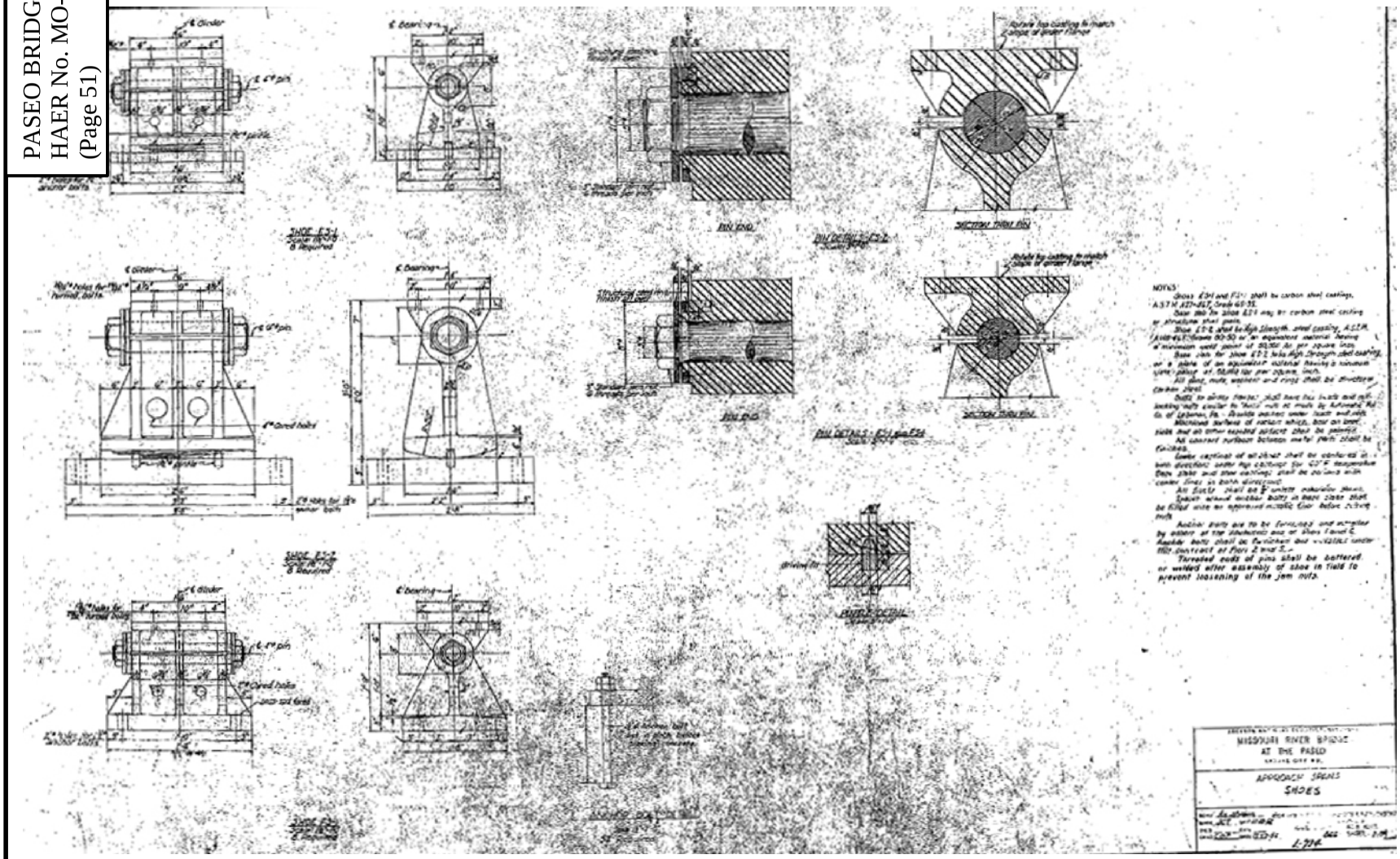

FRAMING PLAN SPANS 1 AND 2
INTERIOR GIRDER ELEVATION
EXTERIOR GIRDER ELEVATION
DEAD LOAD DEFLECTION INTERIOR AND EXTERIOR GIRDERS
STRINGER SPLICE
APPROACH SPANS
STEEL FRAMING PLAN

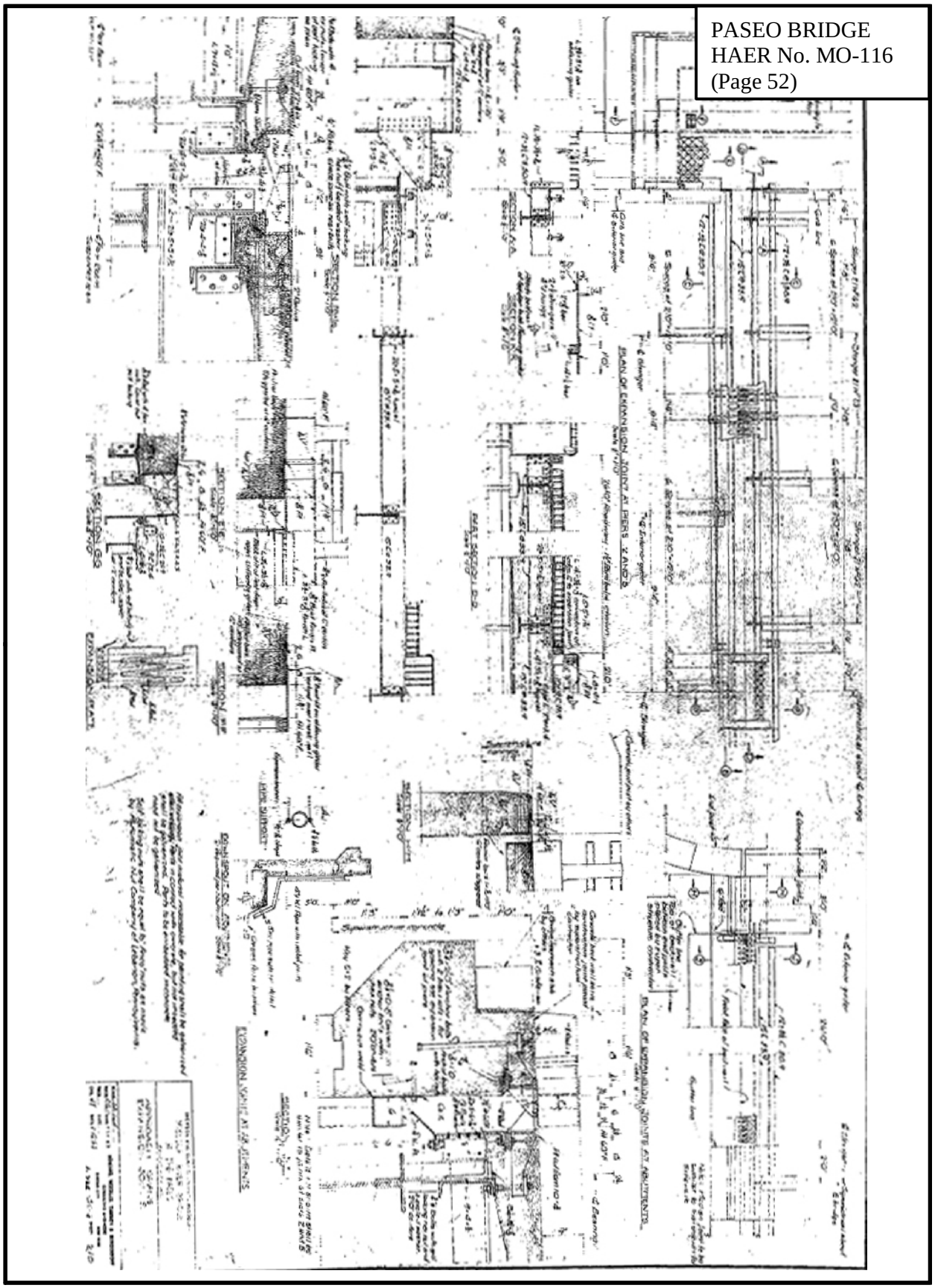

SPAN 6
SPAN 7
FRAMING PLAN - SPANS 6 AND 7
EXTERIOR GIRDER ELEVATION
INTERIOR GIRDER ELEVATION
DEAD LOAD DEFLECTION - INTERIOR AND EXTERIOR GIRDERS
GENERAL NOTES ON GIRDERS
MISSOURI RIVER
AT THE PASEO
APPROACH SPANS
STEEL FRAMING PLAN
AND GIRDER ELEVATIONS

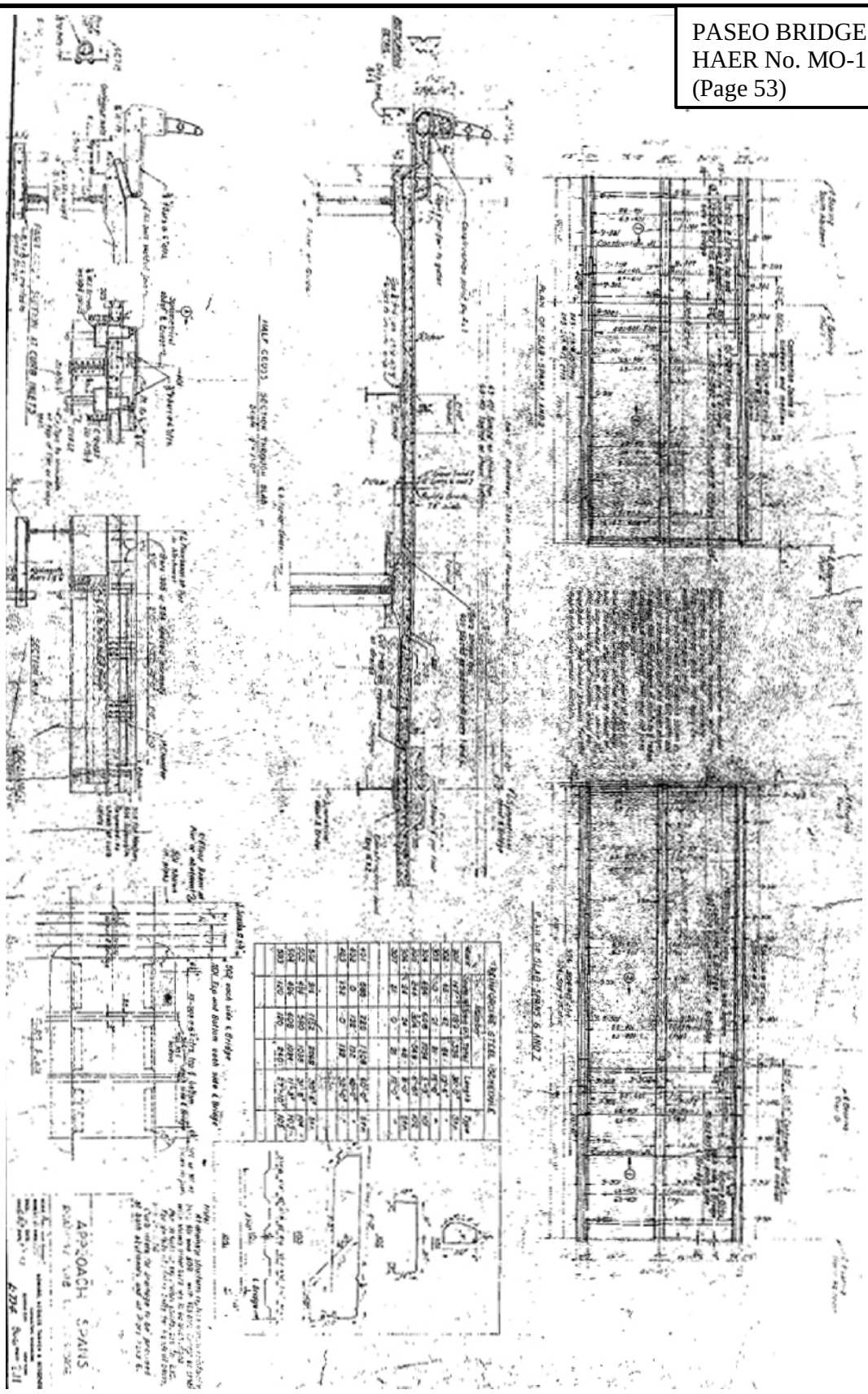


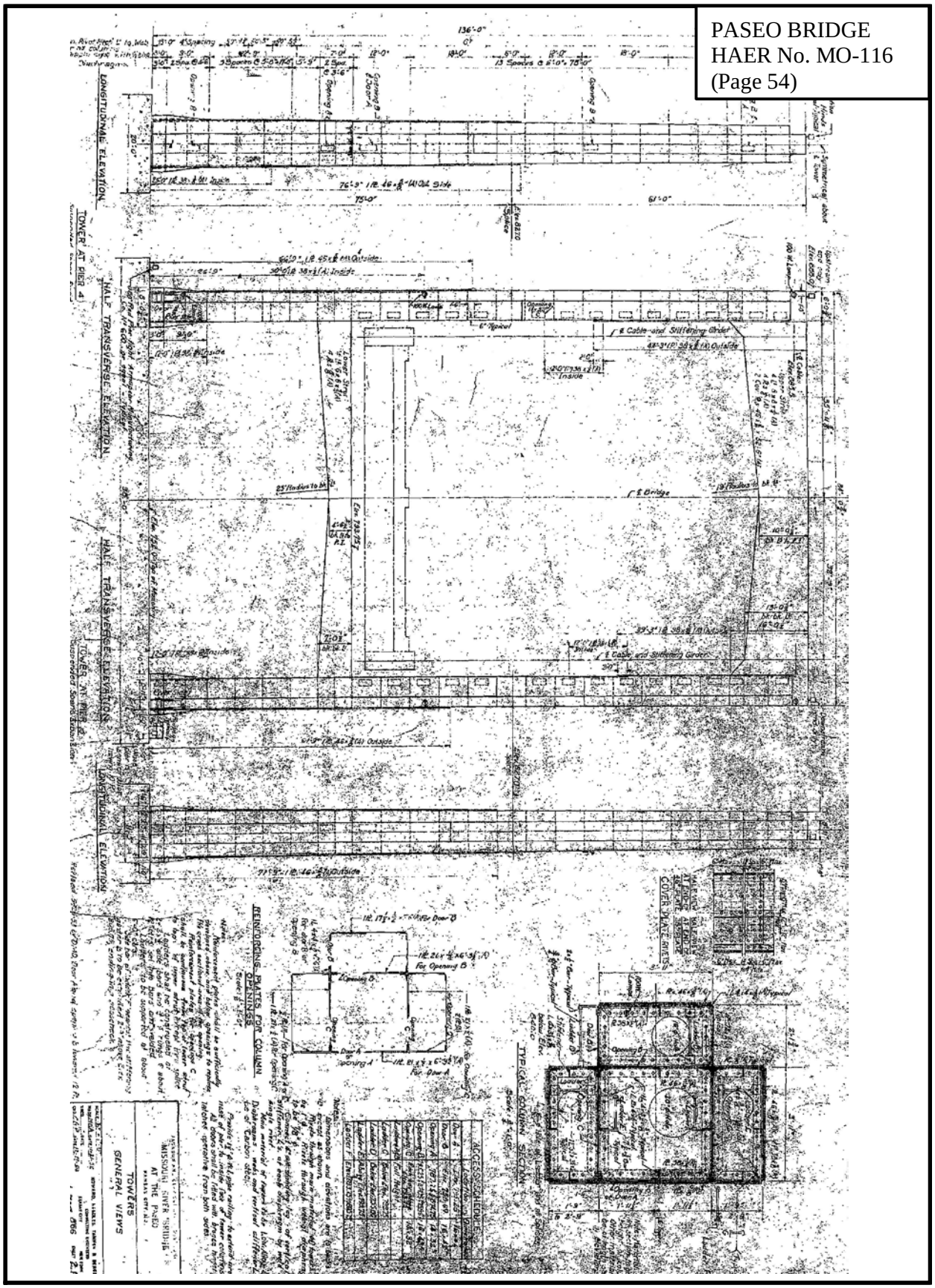

MISSOURI RIVER BRIDGE
AT THE PASEO
APPROACH SPANS
GIRDER DETAILS

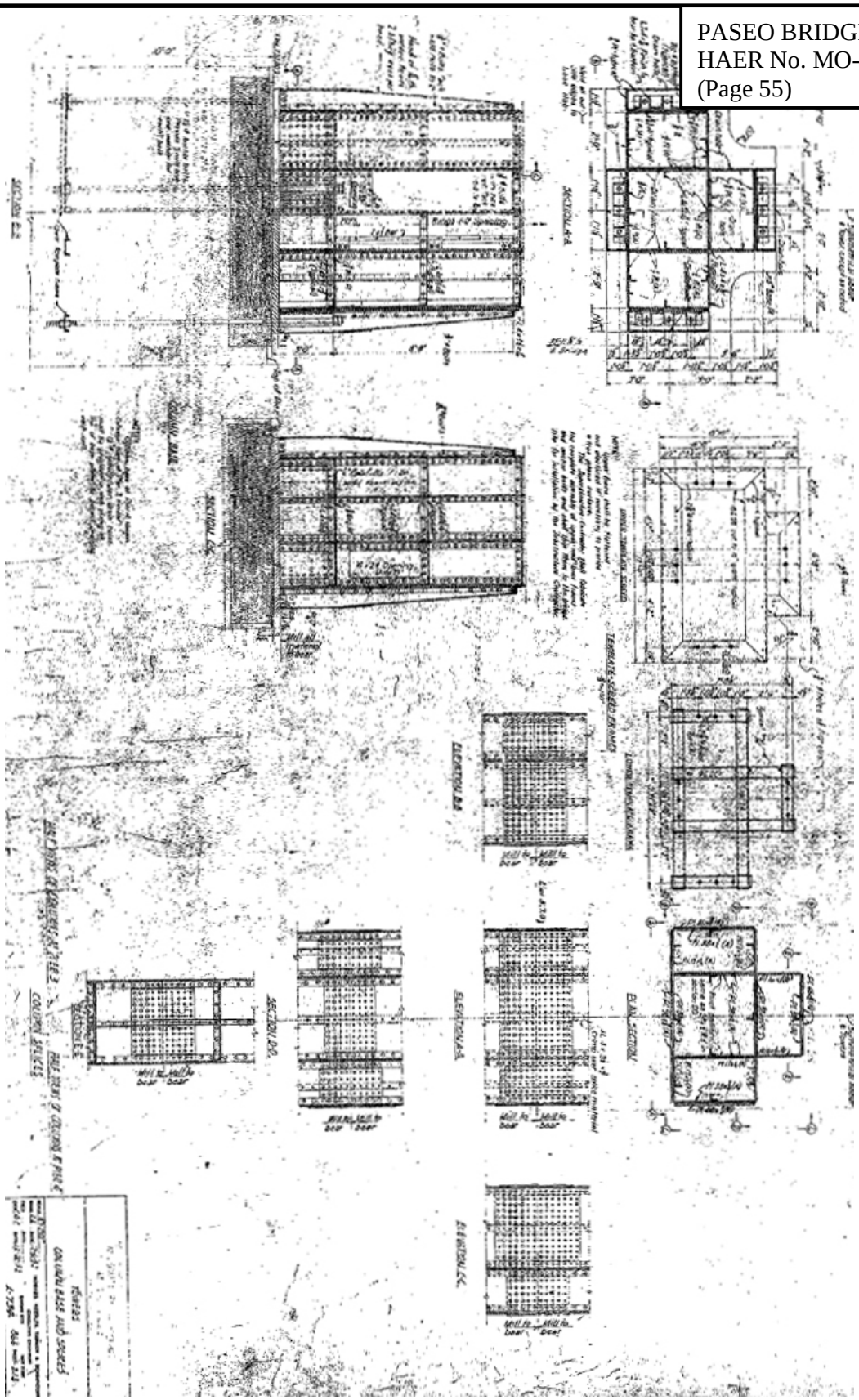


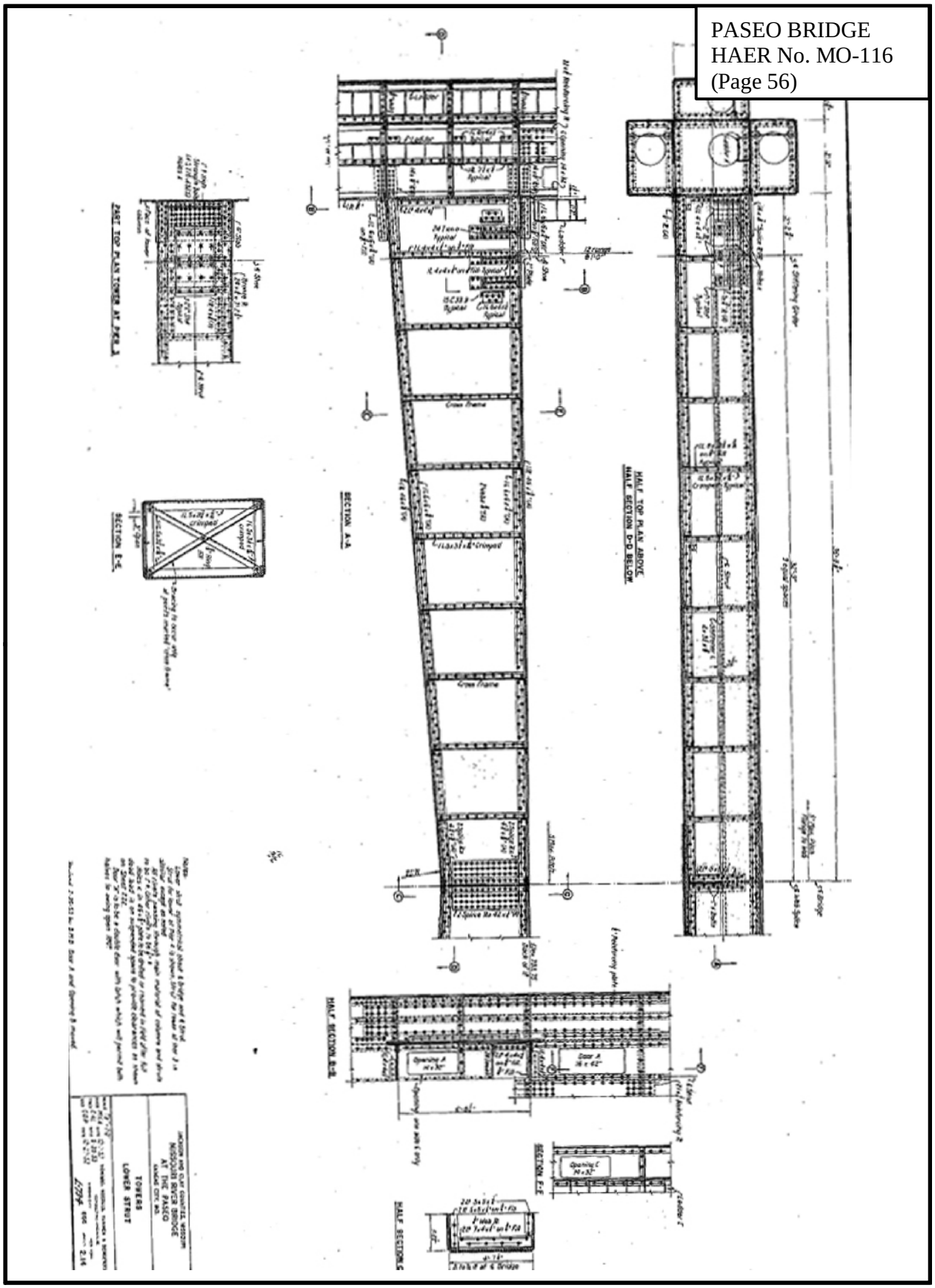

MISSOURI RIVER BRIDGE
AT THE PASEO
APPROACH SPANS
SHOES

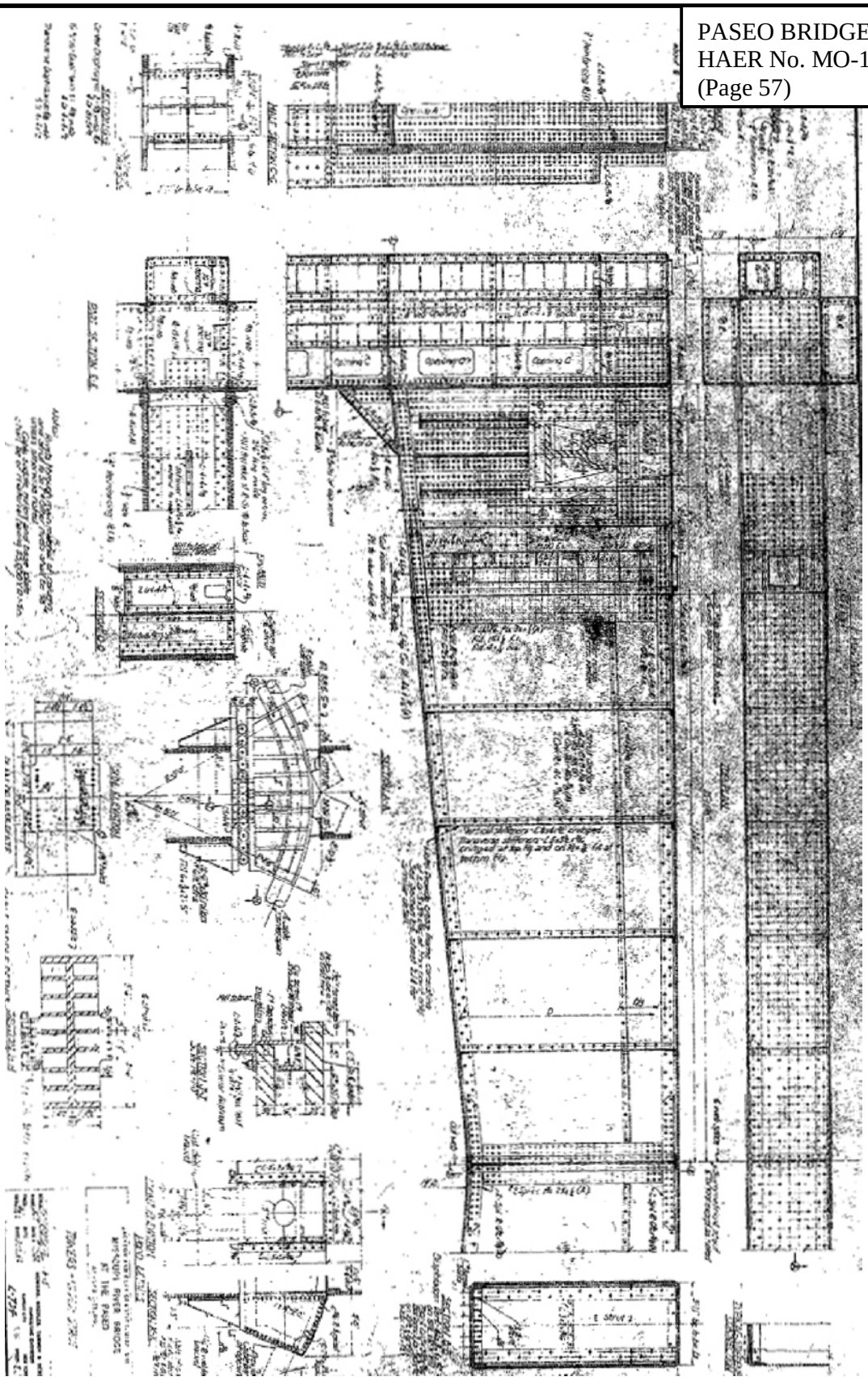


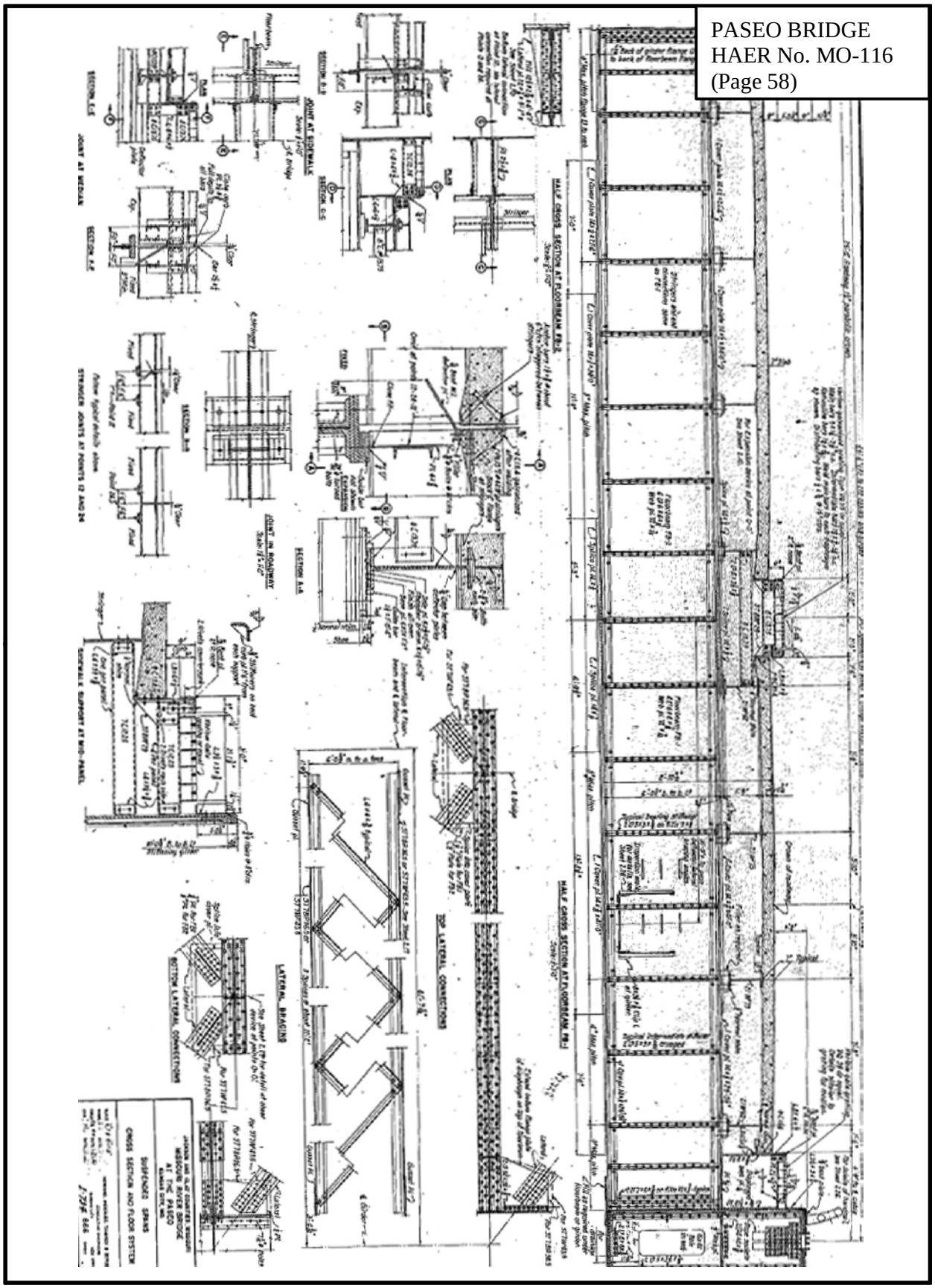



LONGITUDINAL ELEVATION
TOWER AT PIER 4
HALF TRANSVERSE ELEVATION
HALF TRANSVERSE ELEVATION
TOWER AT PIER 8
LONGITUDINAL ELEVATION
REINFORCING PLATES FOR COLUMN
TYPICAL COLUMN SECTION
COVER PLATE DETS
ACCESS SCHEDULE
MISSOURI RIVER TERRACE AT THE PASEO
KANSAS CITY, MO.
TOWERS
GENERAL VIEWS




PASEO TOP PLAN TOWER AT PIER 3
SECTION E-E
SECTION A-A
HALF TOP PLAN ABOVE
HALF SECTION D-D BELOW
HALF SECTION B-B
SECTION F-F
HALF SECTION G-G
JACKSON AND OLD COUNTIES, MISSOURI
MISSOURI RIVER BRIDGE
KANSAS CITY, MO.
TOWERS
LOWER STRUT

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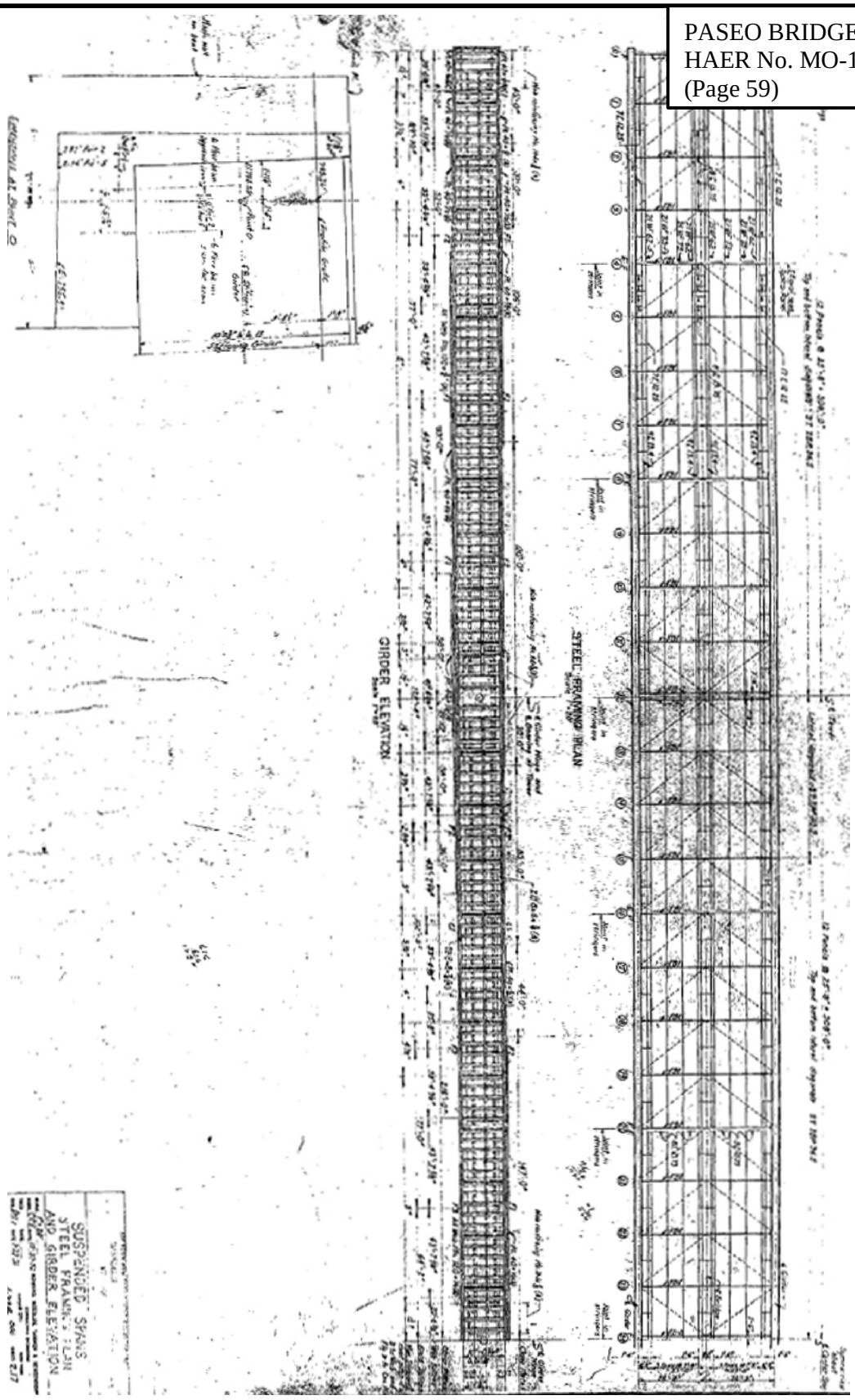
HALF CROSS SECTION AT FLOORBEAM FB-1
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
JOINT AT SIDEWALK
JOINT AT WEBS
JOINT IN ROADWAY
STRINGER JOINTS AT POINTS 12 AND 24
FLOORBEAM SUPPORT AT MID-PANEL
TOP LATERAL CONNECTIONS
LATERAL BRACING
BOTTOM LATERAL CONNECTIONS
MISSOURI RIVER BRIDGE
AT THE PASEO
CROSS SECTION AND FLOOR SYSTEM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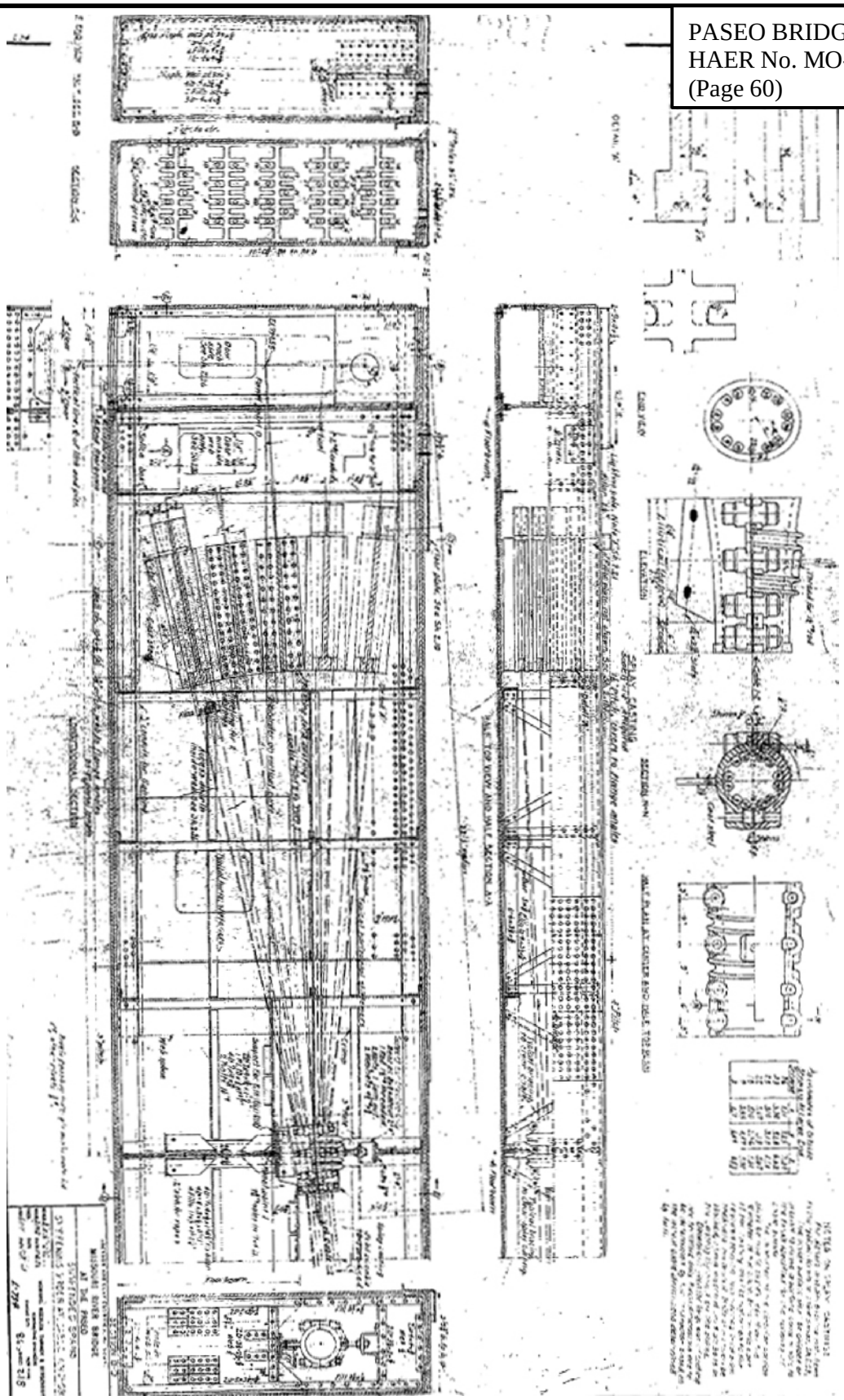
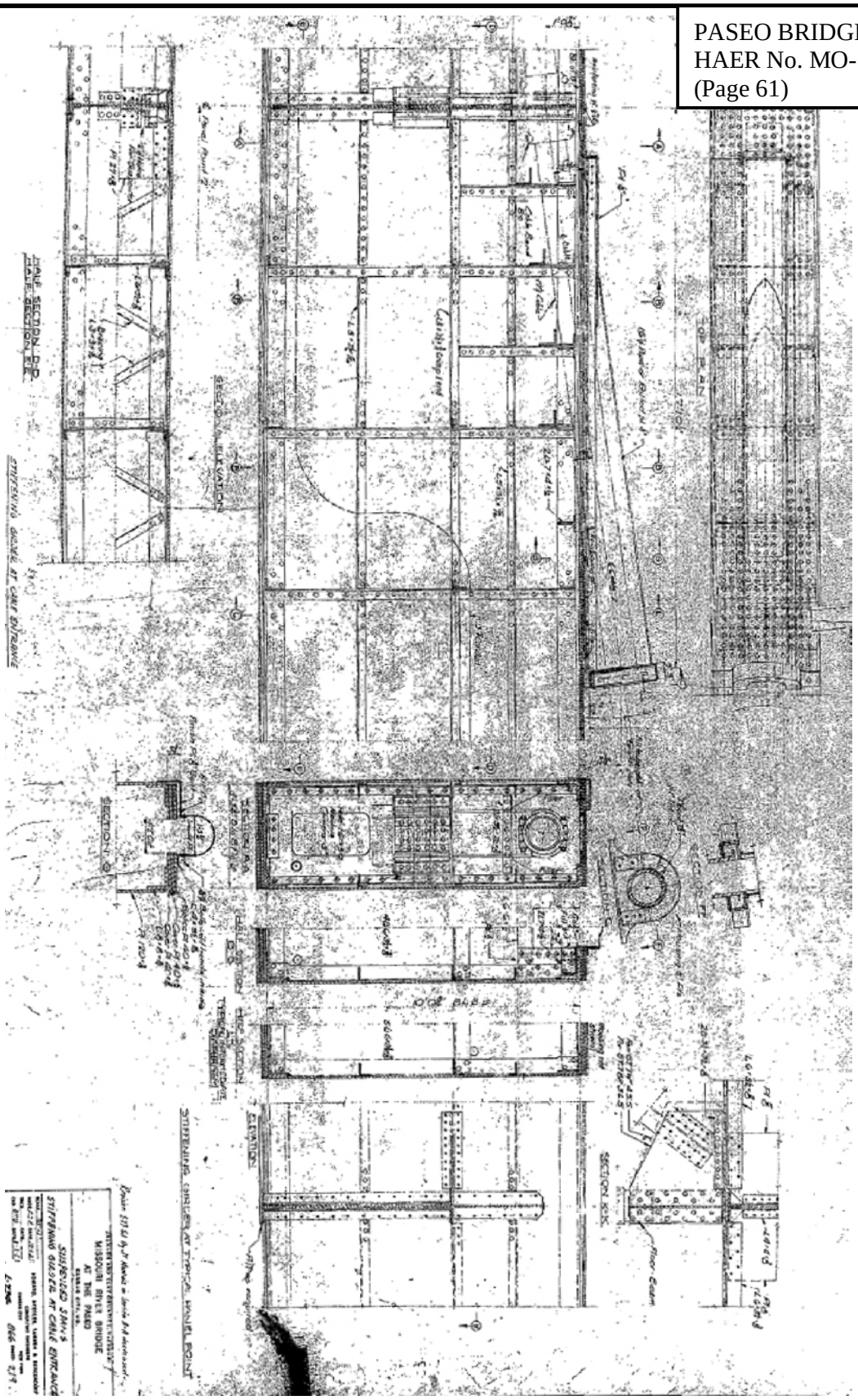
STEEL FRAMING PLAN
AND GIRDER ELEVATION
GIRDER ELEVATION
STEEL FRAMING PLAN




HALF SECTION PIER
HALF SECTION
STIFFENING GIRDER AT CABLE ENTRANCE
SECTION
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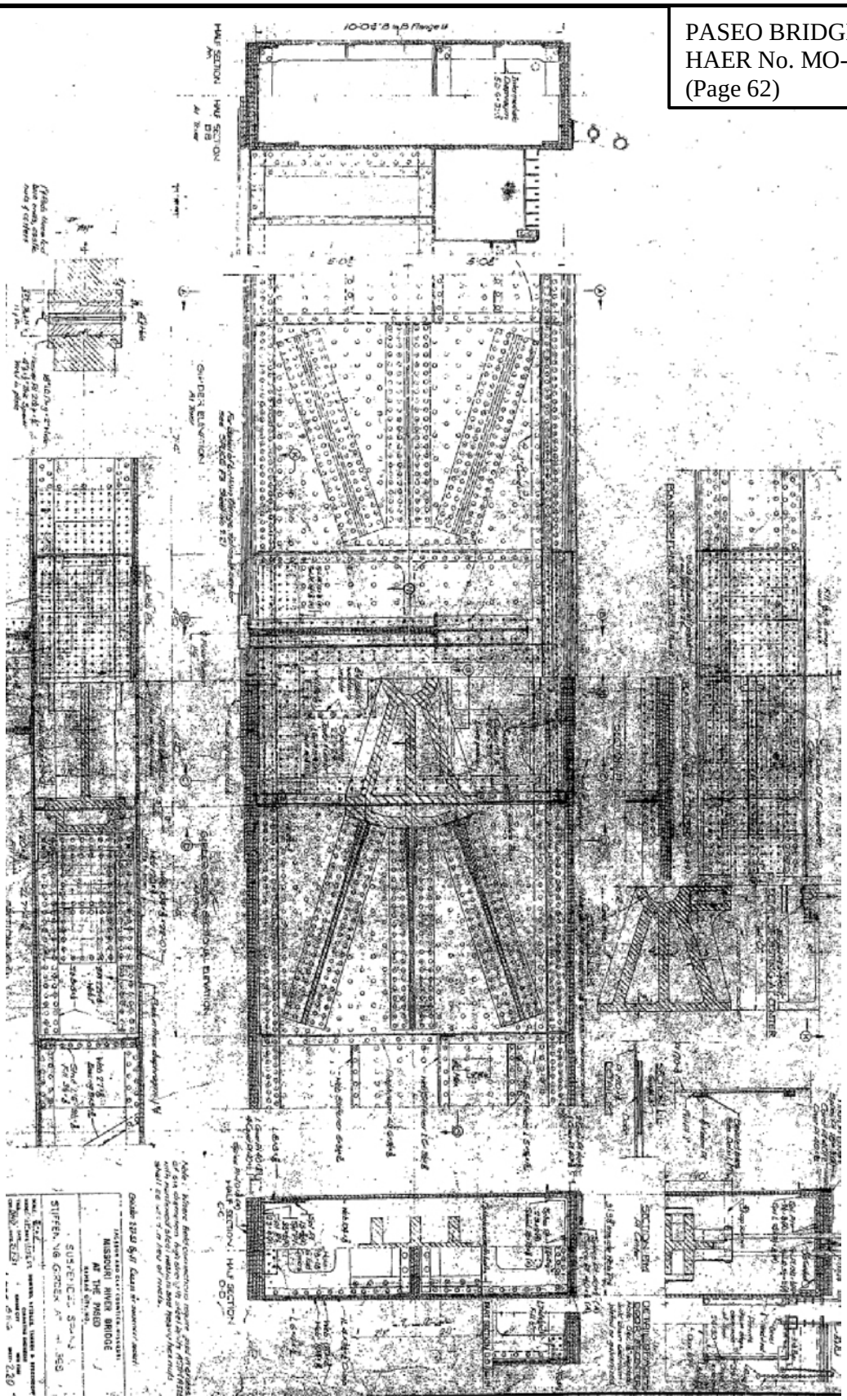
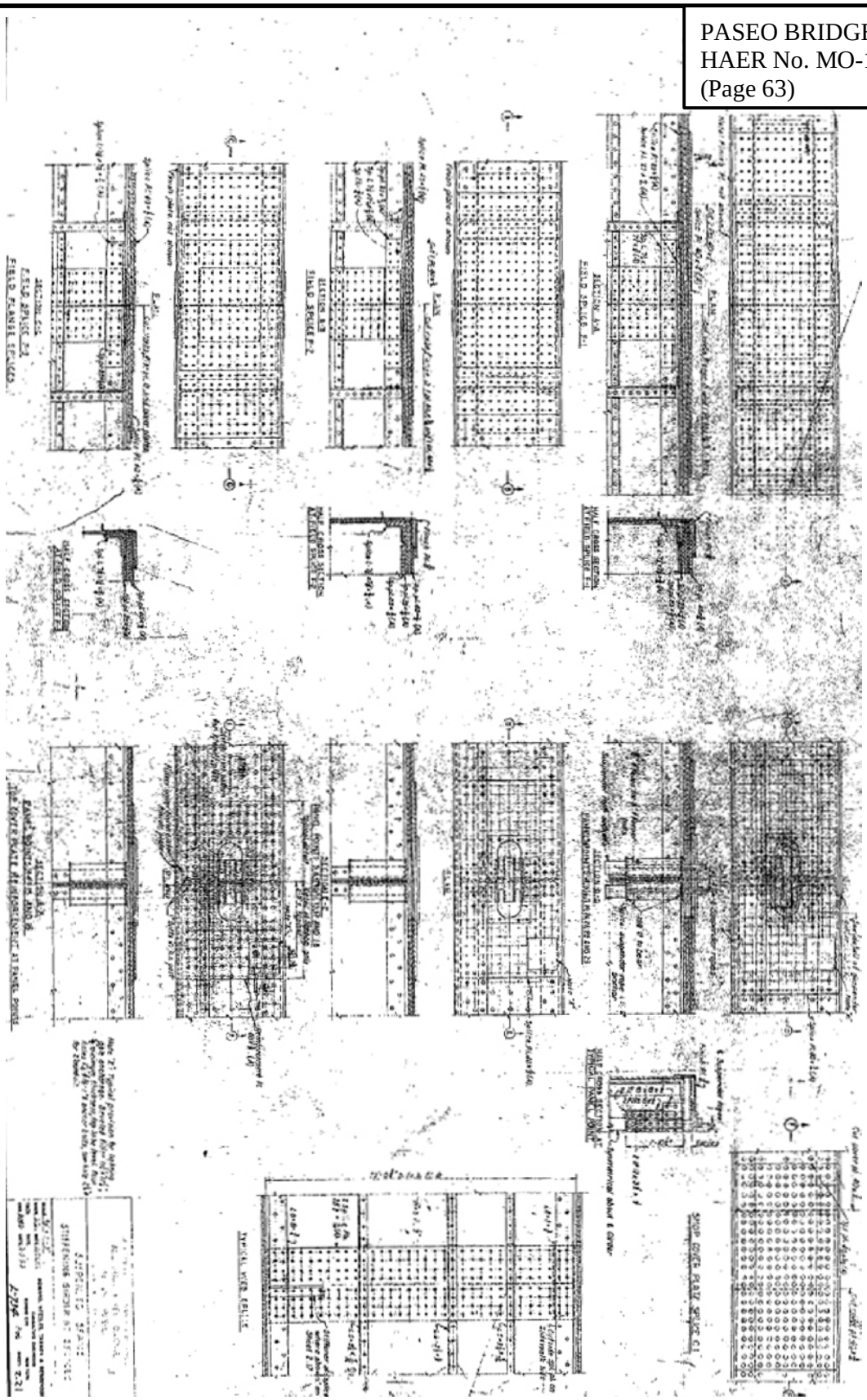
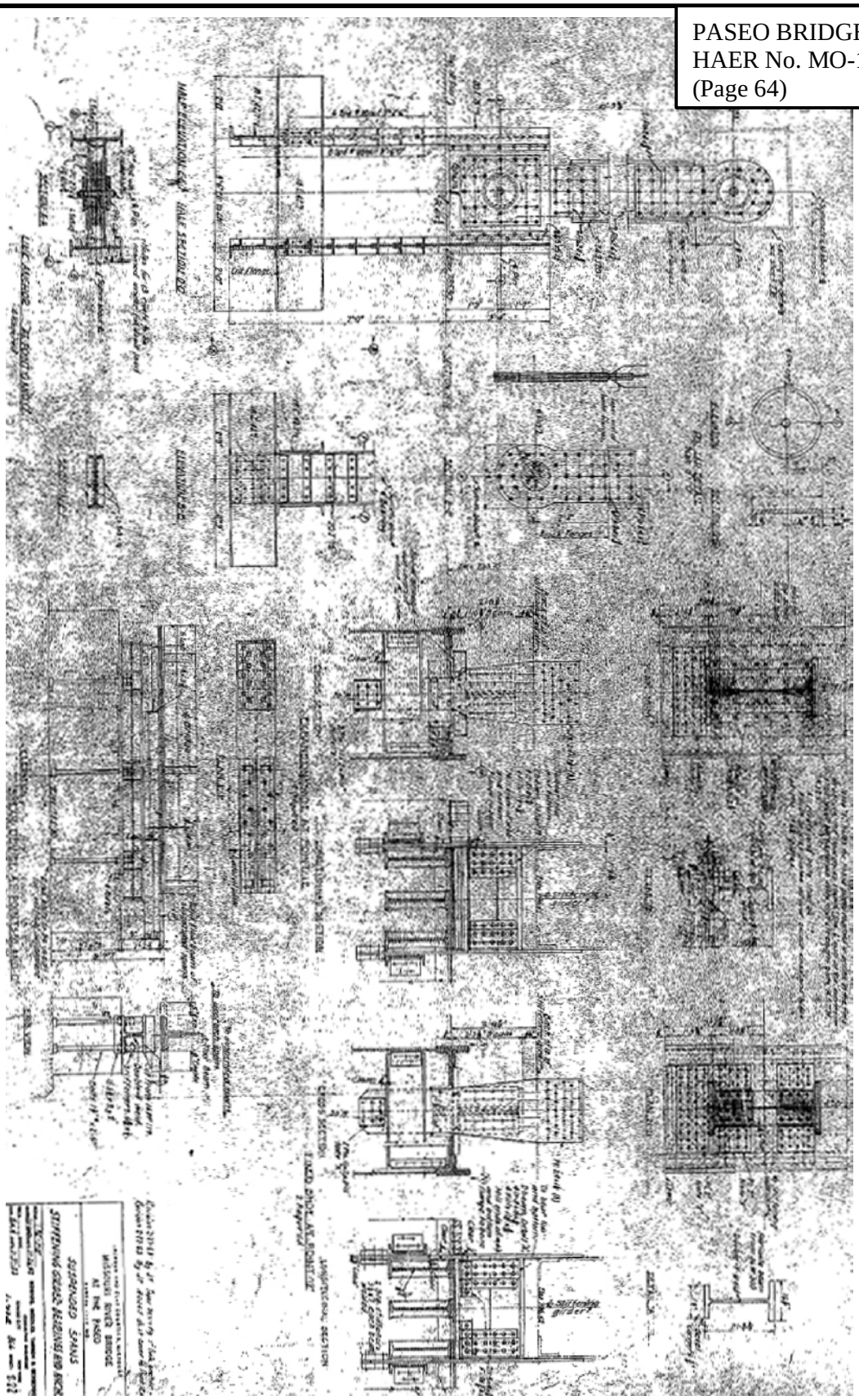
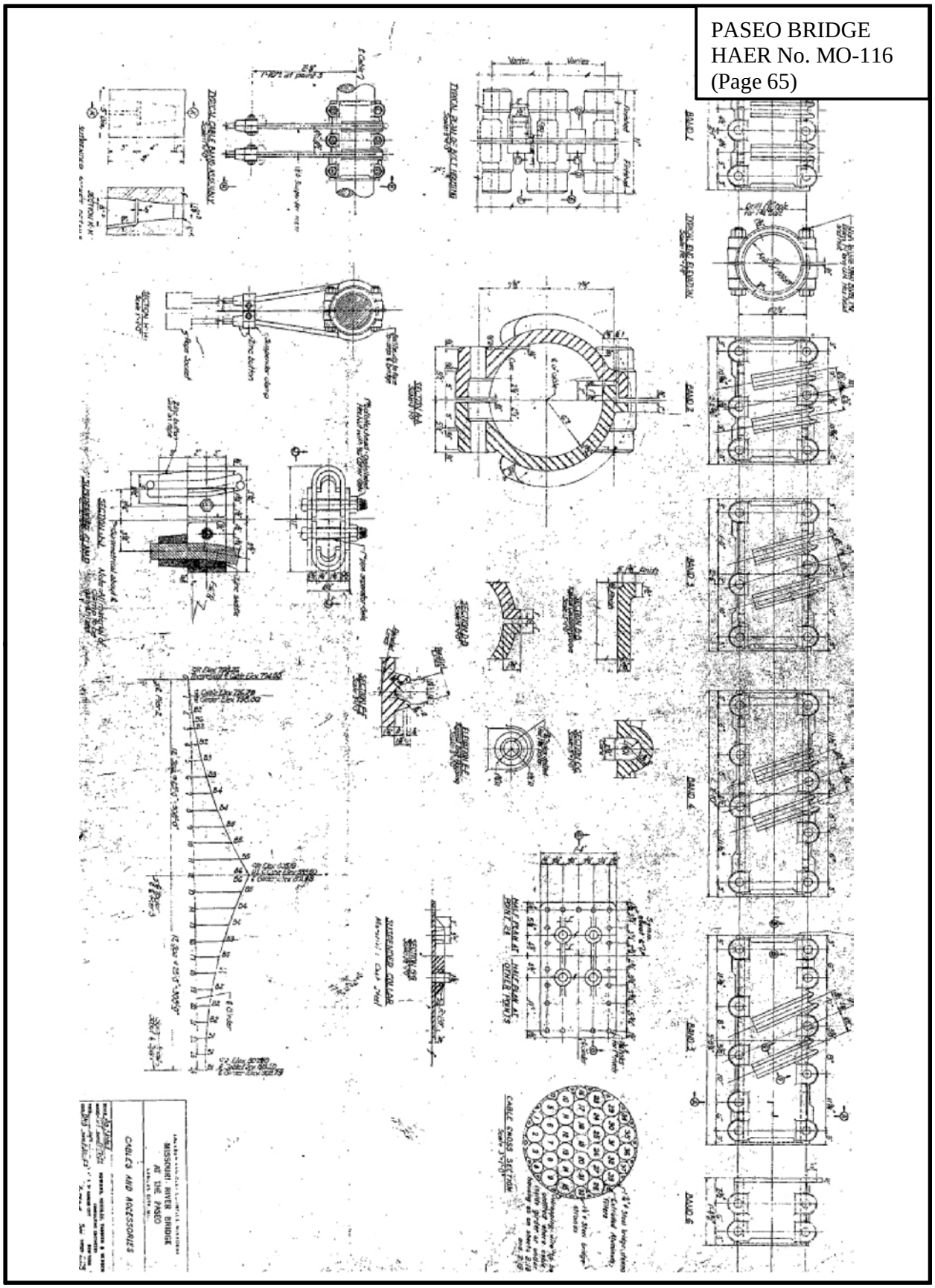
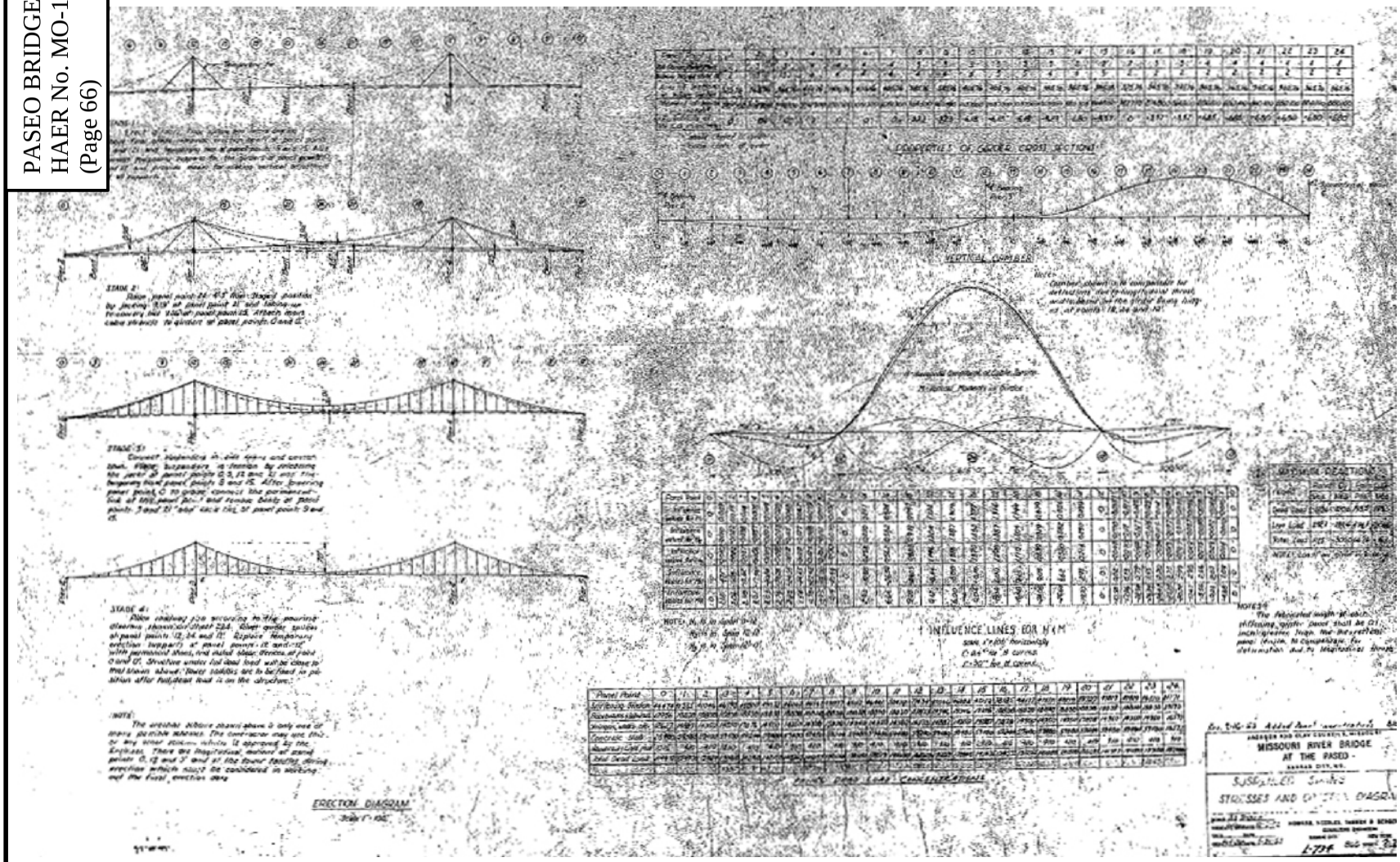
PLAN
SECTION A-A
SECTION
SECTION
SECTION
STIFFENING GIRDER AT TYPICAL PANEL POINT
MISSOURI RIVER BRIDGE
AT THE PASEO
KANSAS CITY, MO.
SUSPENDED SPANS
STIFFENING GIRDER AT CABLE ENTRANCE

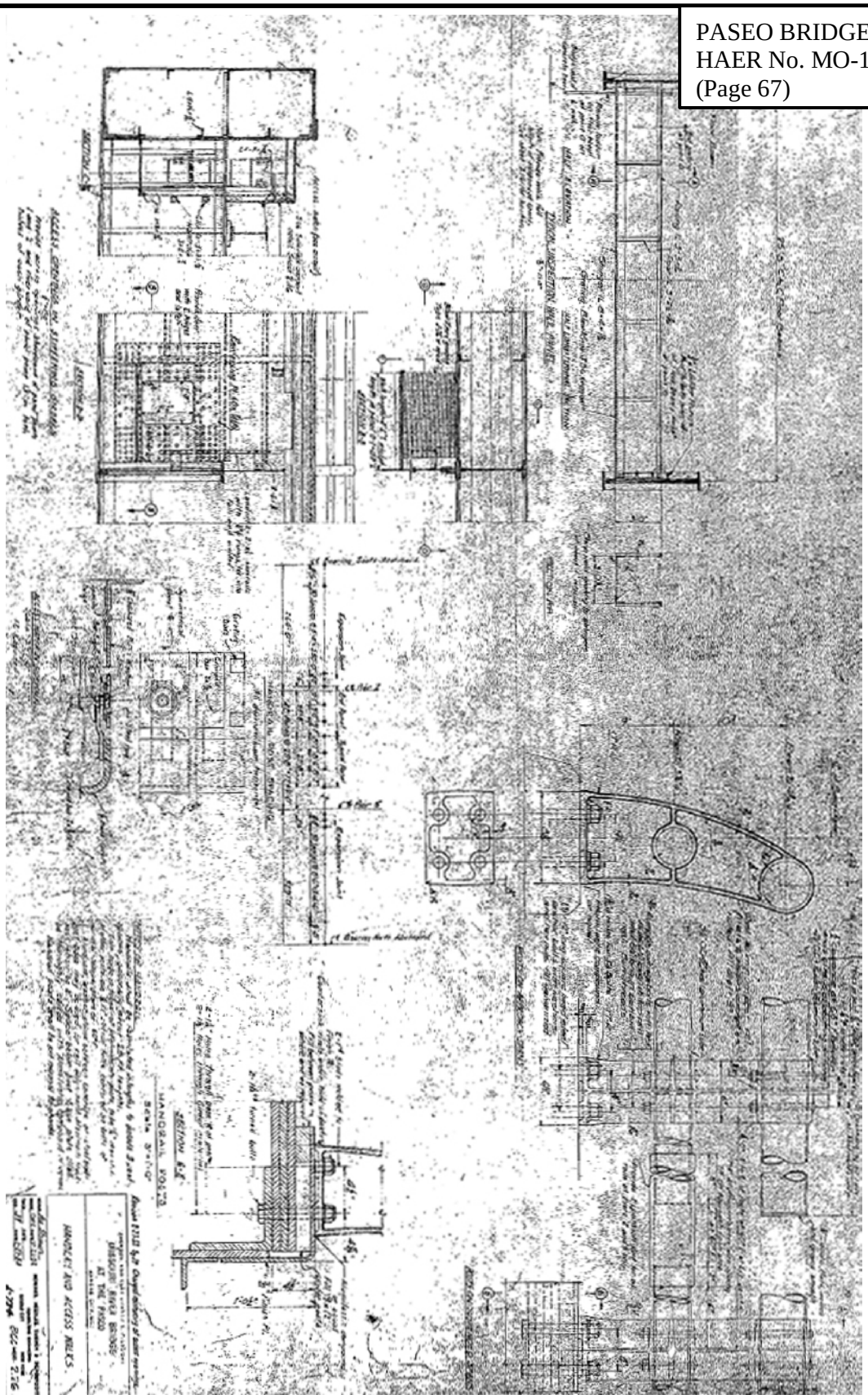

HALF SECTION AA
HALF SECTION BB
HALF SECTION CC
HALF SECTION DD
MISSOURI RIVER BRIDGE
AT THE
PASEO

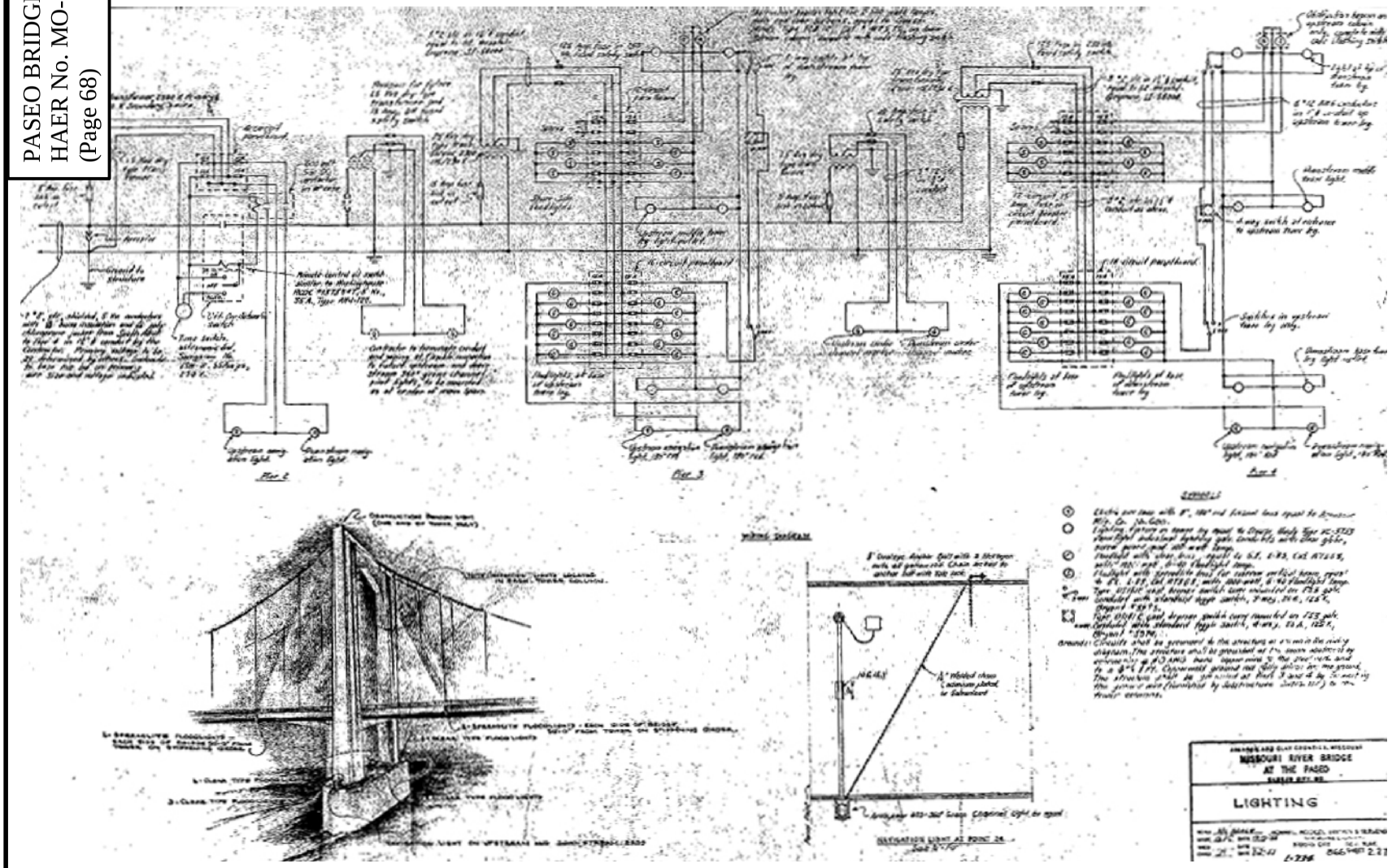



MISSOURI RIVER BRIDGE
AT THE PASEO
SUSPENDED SPANS


MISSOURI RIVER BRIDGE
AT THE PASEO
CABLES AND ACCESSORIES


STAGE 2:
STAGE 3:
STAGE 4:
NOTE:
ERECTION DIAGRAM
PROPERTIES OF GIRDER CROSS SECTIONS
VERTICAL CAMBER
INFLUENCE LINES FOR M & M
MISSOURI RIVER BRIDGE
AT THE PASEO -
KANSAS CITY, MO.
STRESSES AND DETAILS DIAGRAM

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MISSOURI RIVER BRIDGE
AT THE PASEO
LIGHTING

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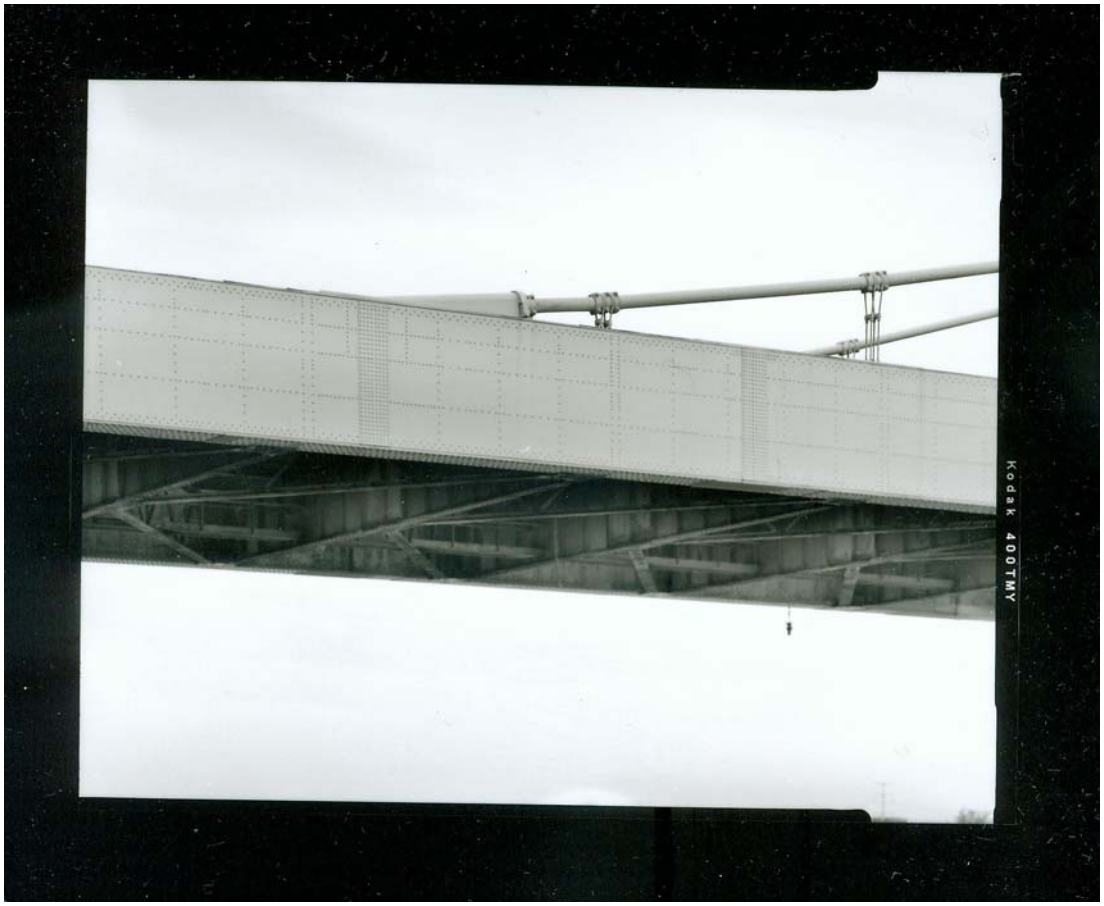

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