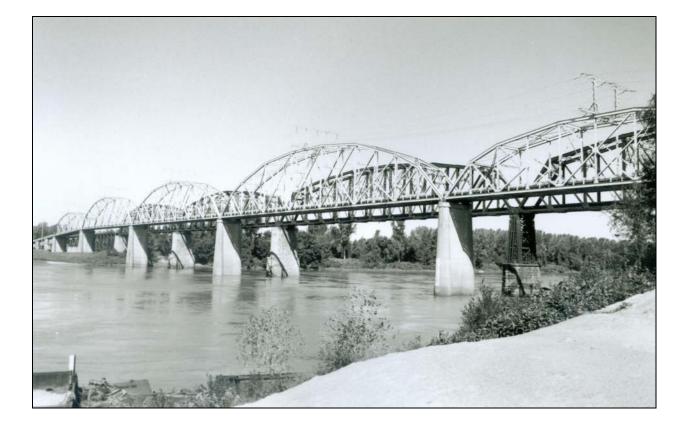
# **Documentation of the Historic Missouri River Bridge at Glasgow**

Bridge No. G00693 Howard County, Route 240





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## HISTORIC DOCUMENTATION BRIDGE G00693

I. Introduction

Location: Highway Bridge carrying Missouri State Route 240 over the Missouri River at Glasgow, Howard County, Missouri

Construction Dates: 1923-1925

Present Owner: Missouri Department of Transportation, Jefferson City, Missouri

Present Use: Highway bridge to be modified by the construction of a new superstructure; Renovation project to begin in 2008

Significance: Bridge G00693 is an excellent example of a large-scale, multi-span truss bridge representing standard designs and construction procedures used during the early years of the Missouri State Highway Department. Bridge G00693 is approximately 2,224' long, and it features five Pennsylvania through-truss spans and seven Pratt deck-truss approach spans. Bridge G00693 was one of several bridges across the Missouri River built by the Missouri State Highway Department in the early 1920s, and although the structure has been repeatedly rehabilitated, it has changed little since it opened to traffic in 1925.

Historian: Thomas J. Gubbels, Historic Preservation Section, Design Division, Missouri Department of Transportation, August 2007.

#### II. History of Bridge G00693

## A. Historic Background - The City of Glasgow

Glasgow, a small community on the western edge of Howard County, has always been intimately linked to the Missouri River. Euro-American settlers began to stream into Howard County in the first years of the nineteenth century, and several efforts were made to plat out a shipping community along the Missouri River. These efforts at town building failed as floods, attacks by Native Americans, and disease led to the collapse of early Howard County communities such as Chariton, Monticello, and Thortonsburg. Howard County experienced a rapid influx of settlers from southern states such as Kentucky, Virginia, and Tennessee in the early decades of the nineteenth century, and local leaders realized that a port city on the Missouri River was needed to provide a shipping point for the county's agricultural exports. Thus, thirteen businessmen joined together in the fall of 1836 to plat a town on the banks of the Missouri River. The new community was named Glasgow after James Glasgow, an early Howard County settler, and the town quickly became a major shipping point for steamboat traffic along the Missouri River.<sup>1</sup>

In the years leading up to the Civil War, Glasgow became one of central Missouri's economic centers. Settlers in Howard County produced a wide variety of agricultural products, including cattle, grain, and hemp. However, Howard County's primary cash crop during the antebellum era was tobacco. Southern settlers introduced tobacco to the region, and by 1850, Howard County was Missouri's top tobacco producer harvesting over three millions pounds of burley-leaf tobacco. Tobacco was an extremely labor-intensive product, so slavery was widely practiced throughout Howard County. Many migrants to the Glasgow area brought along their slaves, and by 1850, the slave population of Howard County totaled 4,890.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup>*History of Howard and Chariton Counties, Missouri* (St. Louis, MO: National Historical Company, 1883), 205-209; T. Berry Smith and Pearl Sims Gehrig, *History of Chariton and Howard Counties, Missouri* (Topeka, KS: Historical Publishing Company, 1923), 105-106; Kenneth Westhues, *The Dream of Thirteen Men, Glasgow: The History of Glasgow, Founding to Present* (Glasgow, MO: Glasgow Lions Club, 1966), 1-9; James Goodrich and Lynn Wolf Gentzler, eds., *Marking Missouri History* (Columbia, MO: State Historical Society of Missouri, 1998), 156; and Judy Bentley and Kathy Hagedorn, eds., *Glasgow: The Way It Was* (Marceline, MO: Walsworth Publishing Company, 2001), 1-3. An early failed settlement in the Glasgow vicinity was given the rather unwieldy moniker "Louisville-on-the-Missouri," reflecting the strong Southern character of the region's Euro-American settlers. See Westhues, *The Dream of Thirteen Men*, 8.

<sup>&</sup>lt;sup>2</sup>Keith Graham, Veita Hampton, and Stephan Savoia, eds., *Glasgow: Story of a Missouri Rivertown* (Columbia, MO: University of Missouri School of Journalism, 1979), 86-89; R. Douglas Hurt, *Agriculture and Slavery in Missouri's Little Dixie* (Columbia, MO: University of Missouri Press, 1992), 72, 218; and United States Bureau of the Census, "1840 Census of Agriculture: Missouri," microfiche copy available from Missouri State Archives, Jefferson City, MO. The white population of Howard County in 1850 was only 9,039, meaning that slaves made up 35 percent of the county's total population. See Hurt, *Agriculture and Slavery*, 219.

Glasgow formally incorporated in 1845, and by that time the town had become a commercial hub for Central Missouri. Glasgow was located immediately adjacent to the Missouri River, and steamboats along the river regularly docked at the port of Glasgow to drop off imports from throughout the country and to pick up loads of tobacco for export to St. Louis, New Orleans, and beyond. Records from 1848 indicate that approximately 500 steamboats docked at Glasgow, and 3,194 hogsheads of tobacco, 2,628 bushels of hemp, and 36,312 bushels of wheat were shipped out of the city over the course of the year. Numerous businesses and services were established in Glasgow to support the town's commercial activities, including hotels, banks, taverns, and restaurants. Manufacturing facilities for sorting, cleaning, and processing tobacco were constructed along the wharf at Glasgow, and by 1852, approximately one-third of all tobacco produced in Missouri was shipped through Glasgow. Glasgow was also the home of Reed and Rutherford, a firm that advertised slaves for sale with prices ranging from \$290 for a disabled 38-year old woman to \$1,166 for a healthy 25-year old man. By 1860 Glasgow had emerged as a thriving commercial community that reflected the county's strong southern roots, but the foundations of the local economy would soon be shaken by the Civil War.<sup>3</sup>

When the Civil War began in 1861, the majority of Howard County residents attempted to maintain a neutral position. Several rallies were held in Glasgow to advocate that Missouri stay out of the emergent conflict. As Missouri was drawn into the war, however, Howard County residents remained true to their southern heritage and volunteered in large numbers for Confederate military service. During the war there were only a handful of skirmishes and small battles in Howard County, but in October 1864, Glasgow was the site of a major battle that resulted in the destruction of a large portion of the community.<sup>4</sup>

In the fall of 1864, Confederate forces under General Sterling Price marched into Missouri in an attempt to retake the state and rally local Confederate supporters. By October 13, 1864, Confederate troops had advanced northward to Boonville, and Price was making plans to attack Glasgow believing that Union forces had stored a significant cache of small arms and ammunition at the city hall. Meanwhile, Union forces under the command of Colonel Chester Harding had sailed from St. Joseph to Glasgow aboard the steamboat *West Wind* to reinforce the local Union garrison. In the early morning hours of October 15, 1864, Confederate artillery opened fire from the west bank of the Missouri River, raining artillery shells down upon Union forces at Glasgow. Additional Confederate troops advanced from the south and east into Glasgow, and a major firefight quickly erupted. Union troops realized that they could not repel the attack, so the Glasgow City hall was set afire to keep it from falling into Confederate hands. Terms of

<sup>&</sup>lt;sup>3</sup>Bentley and Hagedorn, *Glasgow: The Way it Was*, 3, 41; Goodrich and Gentzler, *Marking Missouri* History, 156; Graham, Hampton, and Savoia, *Glasgow: Story of a Missouri Rivertown*, 86; Hurt, *Agriculture and Slavery*, 72; and Westhues, *The Dream of Thirteen Men*, 10-23.

<sup>&</sup>lt;sup>4</sup>*History of Howard and Chariton Counties*, 274-279; and Wisthues, *The Dream of Thirteen Men*, 24-26. Approximately 1,500 Howard County residents served in Confederate forces during the Civil War. In addition, an estimated 600 former slaves from Howard County volunteered to serve in Union military units. See *History of Howard and Chariton Counties*, 274.

surrender were negotiated and Union forces were allowed to freely leave the city without incident. The following day Confederate forces ransacked Glasgow, stealing whatever they could from local merchants citizens. Confederate troops did not find the alleged cache of small arms at city hall, but they were able to capture large quantities of blankets, uniforms, and horses. In addition, Confederate forces sank the *West Wind* as it sat moored at the Glasgow wharf.<sup>5</sup> The Battle of Glasgow was the only major Civil War battle that took place within Howard County, but at the end of the conflict Glasgow faced an uncertain economic future.

In the aftermath of the Civil War, Howard County farmers were forced to adopt new crops and a new labor system. Corn and cattle quickly replaced tobacco as the county's agricultural focus, and mechanized agriculture replaced the more labor-intensive production techniques of the antebellum era. Glasgow's leaders hoped that the community would remain a commercial center, but the emergence of a new transportation method threatened the community's survival. Steamboats continued to traverse the Missouri River in the postbellum era, but railroad systems offered a viable transportation alternative. It soon became cheaper for farmers to ship their crops to outside markets via the railroad rather than by river, and as one contemporary observer noted, Glasgow residents realized that they needed a link to this emerging transportation system to remain a viable commercial center:

After building the railroads named above [the North Missouri and the Wabash], the produce and surplus of the farmers along the lines of these roads found a better market, as they thought, in Chicago and St. Louis, and, consequently, withdrew their business from Glasgow.<sup>6</sup>

In an effort to attract rail connections to the area, Howard County voters approved bonds to support the construction of new lines through the county. Two railroad companies ultimately took advantage of this offer and constructed lines that connected Glasgow to a nationwide rail network. In 1874, the Wabash Railroad constructed a spur line between Salisbury, a rural support community in Chariton County, and Glasgow. This line came into the north side of Glasgow and passed between the riverfront and the downtown district, providing local businesses with easy railroad access. The Wabash operated along this rail line until 1940, providing the community with a passenger and freight connection to the outside world.<sup>7</sup> In addition to the Wabash Railroad, the Chicago and Alton Railroad Company also built a line into Glasgow during the late 1870s. The Chicago and Alton Railroad constructed a line connecting St. Louis and Chicago in the antebellum era, and in the 1870s the company was looking to expand westward into central Missouri and beyond. To this end the Chicago and Alton began work in the mid-1870s on an expansion of their line that would run from Mexico in Audrain County to Glasgow. This

<sup>&</sup>lt;sup>5</sup>James Denny, "The Battle of Glasgow," *Boone's Lick Heritage*, September 1995, 4-9; Goodrich and Gentzler, *Marking Missouri History*, 156; and Westhues, *The Dream of Thirteen Men*, 28-31.

<sup>&</sup>lt;sup>6</sup> History of Howard and Chariton Counties, 209.

<sup>&</sup>lt;sup>7</sup>*Ibid.*, 210-211; and Bentley and Hagedorn, *Glasgow: The Way it Was*, 48-49.

branch line reached Glasgow in 1878, providing yet another transportation option for local residents. Numerous grain bins and other storage facilities were quickly built beside the new rail lines at Glasgow, and the presence of these two railroads allowed Glasgow to maintain its status as a commercial center.<sup>8</sup>

Although the Chicago and Alton Railroad was happy to tap into central Missouri's lucrative freight market, company leaders had a grander vision of extending their rail line into Kansas City. Kansas City was rapidly emerging in the late nineteenth century as a commercial hub comparable to St. Louis or Chicago, and the Chicago and Alton Railroad considered expansion into the city as critical to its survival. In order to extend their lines into Kansas City, the Chicago and Alton Railroad needed to construct a bridge across the Missouri River, and they choose to do so at the western terminus of their existing lines, Glasgow. Construction work on the Chicago and Alton Bridge at Glasgow began in May 1878. The new structure was to feature three Whipple throughtruss spans as well as two Whipple deck-trusses, and the superstructure of the railroad bridge was to be composed entirely of steel members. Many engineers ridiculed the decision to build the railroad bridge as a steel structure, believing that steel was too brittle to survive Missouri's cold winters. Most railroad bridges of the era were constructed from a combination of iron and steel, and when the Chicago and Alton Railroad bridge opened in June 1879, it was the first all-steel bridge ever built. A large community celebration was held to commemorate the opening of the new railroad bridge, and as one historian observed, Glasgow's leaders believed the bridge would transform the city into a commercial Mecca on par with Missouri's largest urban center:

To Glasgow the railroads were a promise of continued prominence in a new era. When Glasgow was first settled many said it would soon surpass St. Louis. No one said that in the 1870's, but there was instead an attitude of 'Whatever St. Louis has, we have too, but only on a smaller scale; and we have something St. Louis doesn't: clean air to breathe while we enjoy our luxury and wide open spaces to roam when we feel like roaming.' Glasgow was proud, proud of herself, a golden city.<sup>9</sup>

The Chicago and Alton railroad bridge was reconstructed in 1899, with several Parker and Pratt trusses replacing the original Whipple design. The substructure of the bridge was partially rebuilt, but several of the original stone piers were incorporated into the new structure. Rail traffic continues today along the former Chicago and Alton railroad line at Glasgow under the auspices of the Kansas City Southern Railroad, but railroads no longer serve as the primary means of transportation for local residents.<sup>10</sup>

<sup>&</sup>lt;sup>8</sup>History of Howard and Chariton Counties, 210-211; Bentley and Hagedorn, Glasgow: The Way it Was, 47; Graham, Hampton, and Savoia, Glasgow: Story of a Missouri Rivertown, 66; and Smith and Gehrig, History of Chariton and Howard Counties, 127-130.

<sup>&</sup>lt;sup>9</sup>Westhues, *The Dream of Thirteen Men*, 46-47.

<sup>&</sup>lt;sup>10</sup>Bentley and Hagedorn, *Glasgow: The Way it Was*, 44; Goodrich and Gentzler, *Marking Missouri* History, 156; Westhues, *The Dream of Thirteen Men*, 42-46; Smith and Gehrig, *History of Chariton and Howard Counties*, 130-131; Henry Voorhees, *The Alton Railroad Bridge at Glasgow, Missouri 1879* (New

Glasgow remained a prosperous commercial center at the beginning of the twentieth century thanks to its access to two national railroad systems and a stable agricultural economy. Glasgow was the home to two colleges, numerous churches, and a wide variety of businesses. The community featured two railroad depots and a busy riverfront where grain and other agricultural goods were stored and shipped to outside markets. However, there were signs of change on the horizon. The automobile was beginning to emerge as the preferred form of personal transportation, and rumblings were heard for an improved transportation system. Soon Glasgow would be caught up in a road and bridge building *zeitgeist* that swept through Missouri in the 1920s, and efforts would begin to finance the construction of an automobile bridge across the Missouri River at Glasgow.

#### B. Seeking a River Bridge for Glasgow

In the early twentieth century Missouri was beginning to pull itself "out of the mud" and into the modern highway era. Prior to 1907, county governments controlled road and bridge building in Missouri. Individual counties decided how much money to spend on road construction, and taxes were levied at the local level for road and bridge maintenance. Unfortunately, this led to a jumbled system of uncoordinated roads, and local governments could not raise sufficient funds to finance major projects such as bridging the Missouri River. This situation began to change in 1907 when the Missouri General Assembly appointed a State Road Engineer and in 1913 with the creation of the Missouri State Highway Department. Several campaigns were conducted to convince Missourians to support bond issues to pay for statewide road construction, culminating in the 1921 passage of the Centennial Road Law. The Centennial Road Law created a centralized highway commission to coordinate the construction of a statewide road system linking Missouri's county seats that would be paid for using federal and state The Centennial Road Law also allowed the commission to build cross-state funds. highways linking Missouri's major metropolitan areas. Supported by a \$60 million bond issue that had been approved by voters in 1920, the Missouri State Highway Commission began building hard-surfaced state highways throughout the state. By 1930, Missouri's basic highway system was approximately 70 percent complete, and paved or graded state highways had been built in every county.<sup>11</sup>

York, NY: Newcomen Society, 1944), 7-13; and "Historic Railroad Bridges of the United States: Glasgow Railroad Bridge," downloaded 26 July 2007 from <a href="http://bridgehunter.com/mo/howard/glasgow-rr/">http://bridgehunter.com/mo/howard/glasgow-rr/</a>.

<sup>&</sup>lt;sup>11</sup>Missouri Department of Transportation, "History Chronology," downloaded 27 July 2007 from <u>http://www.modot.mo.gov/about/general\_info/history.htm</u>; Missouri State Highway Commission, *Seventh Biennial Report of the State Highway Commission of Missouri for the Period Ending December 1, 1930* (Jefferson City, Missouri: Hugh Stephens Press, 1930), 84-93; and Milton Rafferty, *The Ozarks: Land and Life* (Norman, OK: University of Oklahoma Press, 1980), 108-110. Good roads advocates used the slogan "Lift Missouri Out of the Mud" repeatedly in the 1920s as part of their efforts to win public support for road construction funding. For a detailed discussion of road building obstacles that had to be overcome in Missouri during the early twentieth century, see Richard Traylor, "Pulling Missouri Out of the Mud: Highway Politics, The Centennial Road Law, and the Problems of Progressive Identity," *Missouri Historical Review*, 98 (October 2003): *passim*.

As automobile ownership increased in the early decades of the twentieth century, Glasgow residents quickly came to realize that their community needed to be attached to a high-quality road system if it was to remain a commercial center. As part of this road system, a new bridge would be needed to carry automobiles across the Missouri River. Numerous steam-powered ferries operated at the Glasgow wharf in the early twentieth century, providing a way to transport both wagons and automobiles across the river. These ferries did not operate during the cold Missouri winters or after sunset, making them an unreliable transportation resource.<sup>12</sup> Clearly some type of highway bridge needed to be built at Glasgow, and local leaders began to advocate for the construction of such a structure in the early 1920s.

One of the first ideas suggested by local Glasgow leaders was the addition of a roadway to the Chicago and Alton Railroad Bridge. A delegation of Glasgow businessmen approached the railroad company in 1921 to ask if it would be possible to attach a toll bridge to their river crossing at Glasgow. A toll bridge would provide steady income for any private road association that chose Glasgow for its highways, and attaching a road to the railroad bridge offered a cheaper alternative than the construction of an entirely new structure. Engineers with the Chicago and Alton Railroad studied the proposition and announced that it would be impossible to add another deck to the Glasgow Railroad Bridge without causing major damage to the original structure.<sup>13</sup> Despite this setback, local leaders continued to believe that the construction of a bridge across the Missouri River at Glasgow was feasible, and A.B. Price, a local insurance salesman, wrote an editorial in the local newspaper encouraging Glasgow residents to continue to work for an automobile crossing:

There is no use to lay down on the bridge proposition at Glasgow. Because the Alton engineers do not believe it can be swung to the railroad bridge is no reason why it cannot be put across. We have a number of men in Glasgow who are red hot on the proposition, and if they can get others on the "Golden Belt Highway" interested, the bridge can be put over anyway.<sup>14</sup>

<sup>&</sup>lt;sup>12</sup> Bentley and Hagedorn, *Glasgow: The Way it Was*, 41-43. Ferries offering transportation across the Missouri River also operated at Waverly and Lexington in the early twentieth century, and these two communities also worked with the Missouri State Highway Department to build bridges across the river in the 1920s. See Thomas Gubbels, "No Longer a Barrier': Bridging the Missouri River in Lafayette County," *Missouri Historical Review* 97 (January 2003): 112-113.

<sup>&</sup>lt;sup>13</sup>"May Cross on C&A Bridge," *Glasgow Missourian*, 17 February 1921, 2; and "No Addition Can Be Built to Bridge," *Glasgow Missourian*, 24 March 1921, 1.

<sup>&</sup>lt;sup>14</sup>"Why Not Bridge at Glasgow Anyway?," *Glasgow Missourian*, 31 March 1921, 1. Many Missouri towns worked to have their cities included on privately marked highway systems in the early twentieth century. Many auto-trail associations had been formed to mark and map roads across Missouri and the entire nation, including the Golden Belt Highway Association and the National Old Trails Highway Association. Glasgow made efforts to be listed as part of both of these two highway systems. Private highway associations proved to be notoriously unreliable in marking and mapping America's roads, and in 1924 the federal government created a standardized system for marking the U.S. Highway system to replace the jumbled mess created by the auto-trail groups. See David Austin, "A History of the Missouri

Although Glasgow's bridge advocates were rebuffed in their effort to attach a vehicular crossing to the Chicago and Alton Railroad Bridge, they continued to seek funding for a new structure across the Missouri River. In the spring of 1921 the campaign for a new bridge at Glasgow took on an added sense of urgency when a group of businessmen from nearby Boonville, Missouri, announced that they had pledged \$100,000 for the construction of a toll bridge across the Missouri River at their town that would be integrated into the National Old Trails Highway. Glasgow's leaders realized that if a new bridge was built at Boonville it was unlikely that either a privately marked highway or a major state highway would be routed through their community.<sup>15</sup>

In response to this potential threat to their dream of a bridge across the Missouri River at Glasgow, local leaders began soliciting private funds to build a vehicular bridge. In May 1921 a delegation led by William Hannaca, owner of a local garage and a Dodge Brothers automobile dealership, met with the Missouri State Highway Board. The delegation suggested that the highway board consider expanding the road that ran from Fayette to Glasgow across the Missouri River into Saline County through the cities of Gilliam, Slater, and Marshall. Hannaca informed the highway board that local residents had pledged over \$400,000 to pay for a bridge across the Missouri River at Glasgow, and he promised that if the state built an improved highway through Howard and Saline Counties, the bridge would be built to join together the two new roads. The highway board thanked the group for their interest, but the board said it was not authorized to approve the construction of any additional state highways through Saline County.<sup>16</sup> The Missouri State Highway board had very limited powers, but the Missouri General Assembly soon passed a law that dramatically expanded the state's highway system and paved the way for the construction of a new bridge at Glasgow.

Late in the summer of 1921, the Missouri General Assembly passed the Centennial Road Law, marking the final step in the transition from local to state control over road construction. The Centennial Road Law passed in special session after long, heated debate and compromise between urban and rural legislators. It created a fourmember Missouri State Highway Commission with broadened powers to locate, design, construct, and maintain the state highway system, let contracts, and purchase rights of way. The new law detailed a 1,500-mile system of primary routes to be comprised of

State Highway Department," September 2000, Electronic copy available from Design Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO, 2-3; and Dan McNichol, *The Roads That Built America: The Incredible Story of the U.S. Interstate System* (New York, NY: Sterling Publishing Company, 2006), 64-81.

<sup>&</sup>lt;sup>15</sup>"Boonville Bridge Rumors," *Glasgow Missourian*, 28 April 1921, 2; and David Austin, "Boonville Bridge," HAER No. MO-80, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1994, 3-4.

<sup>&</sup>lt;sup>16</sup>"Delegation Visits Highway Board," *Glasgow* Missourian, 19 May 1921, 1; and Missouri State Highway Board, "Minutes of the Missouri State Highway Board Meeting. May 9 to 14, 1921," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, MO, 37-38. For a detailed biography of William Hannaca, see Smith and Gehrig, *History of Chariton and Howard Counties*, 796-797.

hard surfaced roads connecting Missouri's principal cities. It also explicitly defined a secondary system of 6,100 miles, chiefly of graded earth and gravel, linking all of Missouri's county seats. The law mandated that highway construction be carried on simultaneously as far as possible in all counties, and it offered new hope to the supporters of a river bridge at Glasgow.<sup>17</sup>

In April 1922 representatives from Saline and Howard Counties traveled to Jefferson City to meet with the Missouri State Highway Commission. The delegation, led by William B. Nievert, co-owner of a Ford Automobile dealership in Glasgow, told the commission that local residents were willing to pay for half the costs needed to build a new bridge across the Missouri River. The Missouri State Highway Commission was amenable to this proposal, but the commission refused to formally endorse construction of the bridge until local voters approved their share of the financing. Engineers with the Missouri State Highway Department estimated that the proposed Glasgow Bridge would cost approximately \$400,000 to build, and unless local funds were raised to pay for half the total by the end of 1922, the project would be scrapped. The delegation left the meeting with a strong sense of optimism that they would be able to convince local voters to finance their share of the Glasgow Bridge, and they immediately launched a campaign to win favor for the proposed structure.<sup>18</sup>

When news of the meeting with the Missouri State Highway Commission reached Glasgow, the local newspaper proclaimed that "the outlook for a free bridge was never so bright," and it predicted that the needed bond issue would "go over by a good majority in every township in the county."<sup>19</sup> Bridge boosters from throughout Howard County gathered in Glasgow to plot out a strategy for the bond campaign. A petition requesting a \$100,000 bond issue was presented to the Howard County Court, and an election was set for May 26, 1922. Campaign committees were organized in each township, and bridge boosters used postcards, posters, circulars, and newspaper advertisements to spread their message. One of the primary arguments presented by bridge advocates was the idea that

<sup>&</sup>lt;sup>17</sup>Austin, "A History of the Missouri State Highway Department," 9; and Missouri Department of Transportation, "History Chronology." Many observers believed that the first project that would be built by the fledgling highway commission was a road connecting Missouri's two largest communities, St. Louis and Kansas City. Such a road would need to pass through Howard County due to the state's geography, and the only question to be answered was where the new highway would cross the Missouri River. See "Glasgow on State Highway," *Glasgow Missourian*, 21 July 1921, 1; "The Old Trails Road," *Glasgow Missourian*, 19 January 1922, 1; Bentley and Hagedorn, *Glasgow: The Way it Was*, 41; and Smith and Gehrig, *History of Chariton and Howard Counties*, 131.

<sup>&</sup>lt;sup>18</sup>Smith and Gehrig, *History of Chariton and Howard Counties*, 127, 446; "Delegation Asks Highway Commission for Aid on Bridge on Glasgow Route," *Glasgow Missourian*, 27 April 1922; and Missouri State Highway Commission, "Minutes of the State Highway Commission Meeting. April 20, 1922," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, MO, 4. Under limits imposed by the voter-approved bonds that financed statewide highway projects, the highway commission could pay for no more than half the costs of new bridge construction. In addition, all projects paid for by the bond issue had to be started by December 31, 1922, if they were to qualify for state funding. See Austin, "A History of the Missouri State Highway Department," 8; and Austin, "Boonville Bridge," 9.

<sup>&</sup>lt;sup>19</sup>"Bridge Boosters Get Busy," *Glasgow Missourian*, 4 May 1922, 1.

Howard County would receive enormous economic and social benefits for a relatively small investment. In order to pay off the bond issue, Howard County residents were told that their property taxes would likely need to be increased only \$3 per every \$1,000 of assessed value. In exchange, a new bridge would be built that would benefit the entire county. In addition, construction of the bridge would likely lead to the construction of two or more new state highways through the county, improving transportation and providing additional jobs for the entire community. Bridge advocates also pointed out that Howard County residents were going to supply tax money to the Missouri State Highway Department regardless of whether or not the bridge was built, and thus the Glasgow Bridge represented an opportunity for county residents to get a fair return on their state tax investment.<sup>20</sup> Finally, bridge boosters appealed to voters' emotions, promising "success means progress and prosperity for all," while "failure means isolation and perhaps stagnation." The local newspaper endorsed the bond proposal, promoting the bridge and the state highway that would surely follow as a wonderful investment opportunity:

One of the primary hard surface roads through the county means prosperity and good times for all, plenty of work for the next two years, unless we want some one to hand us out something for nothing. I can't see how we can ever accomplish so much for the small outlay that we will be called upon to pay the way of taxes. It is one of the most important and uplifting undertakings that has ever come our way and we should readily grasp the opportunity and leave not a stone unturned to secure this prize. Vote 'er straight on Friday, May 26.<sup>21</sup>

When local polling places opened on May 26, 1922, large numbers of Howard County voters came to cast their vote. Observers noted that people were waiting in line even before the polls opened and that large numbers of women voters participated in the election. When the votes were totaled, the bond issue passed overwhelmingly by a margin of 5,304 in favor to 1,140 opposed. The bond issue found strong support in Glasgow and Fayette, the county seat, but it was strongly opposed in New Franklin. Many New Franklin residents had purchased stock in the privately financed Boonville Bridge, and the proposed structure at Boonville would empty into their community. New Franklin voters thus voted against the competing bridge at Glasgow by a 721 to 49 margin, but this local opposition was not strong enough to overcome the general

<sup>&</sup>lt;sup>20</sup>*Ibid.*; "Boom Free Bridge for Howard County," *Fayette Advertiser*, 4 May 1922, 1; "Bridge Boosters Busy," *Glasgow Missourian*, 11 May 1922, 1, 18 May 1922, 1; "'Me Too's' Budget," *Glasgow Missourian*, 18 May 1922, 1; "Attention Voters of Howard County," *Glasgow Missourian*, 18 May 1922, 2; and "We Want Your Vote for the Bridge," *Fayette Advertiser*, 25 May 1922, 3.. In addition to the \$100,000 for the Glasgow Bridge, the initiative placed before Howard County voters also included \$5,000 to help finance improvements to the roads leading up to the proposed river bridge at Boonville. See "In Re \$105,000 Bond Issue," *Glasgow Missourian*, 25 May 1922, 4; and "Boom Free Bridge for Howard County, *Fayette Advertiser*, 4 May 1922, 1.

<sup>&</sup>lt;sup>21</sup>"Free Bridge at Glasgow," *Glasgow Missourian*, 11 May 1922, 1. This editorial was signed with the pseudonym "Me Too."

countywide support for the Glasgow Bridge.<sup>22</sup> The local Glasgow newspaper celebrated the triumph of the bridge bond issue, happily noting that the election represented "a perfect union of thought working as nicely as 10,000 bees in a hive."<sup>23</sup> However, the newspaper also warned that unless Saline County residents also supported a bond issue, the financing for the proposed Glasgow Bridge would fall apart and a great opportunity for local progress would come to nothing.

The campaign to win approval for a bond issue for the Glasgow Bridge followed a similar pattern in Saline County. On May 8, 1922, a petition signed by 637 residents was presented to the Saline County Court asking them to issue bonds worth \$300,000 to support the construction of bridges across the Missouri River at Glasgow and Miami. The county court approved the petition and set a countywide election for June 2, 1922.<sup>24</sup> Saline County bridge backers met soon afterwards at both Marshall and Slater to develop a strategy to win over local voters. Bridge supporters bought advertisements in local newspapers, spoke to local community groups, and posted fliers calling upon local citizens to support the bridge bonds. The arguments in favor of the bridge bonds presented in Saline County were very similar to those articulated in Howard County. Appeals were made to voters' emotions, stating that patriotic, progressive citizens had a civic duty to support the bridge bonds. In addition, bridge supporters in Saline County argued that once the Glasgow Bridge was constructed, new state highways would most certainly follow. The bridge bonds also offered a tremendous bargain for Saline County residents. The bonds would be issued for twenty years at a maximum rate of five percent, meaning that the owner of an 80-acre farm would see his annual taxes increase by no more than \$1.60.<sup>25</sup> As a local newspaper pointed out, a Saline County resident could, "cut off a few cigars, a few drinks, a few boxes of face powder, or a few picture shows, pay the whole bill and not even know it."<sup>26</sup> Perhaps the best summary of the arguments in favor of the bridge bonds was presented in the Gilliam Globe in an editorial by Saline County Circuit Judge John Rich:

<sup>&</sup>lt;sup>22</sup>"Opposing the Bond Issue," *Fayette Advertiser*, 25 May 1922, 1; and "The Bond Issue Goes Over Five to One," *Glasgow Missourian*, 1 June 19221, 1. When voters in Howard and Saline Counties approved bond issues to help pay for a toll-free bridge at Glasgow, the backers of the Boonville Bridge revamped their plans to construct a toll bridge and changed their structure into a free facility that would be absorbed into the Missouri state system. See Austin, "Boonville Bridge," 8-10.

<sup>&</sup>lt;sup>23</sup>"Bond Issue Election Harmonious," *Glasgow Missourian*, 1 June 1922, 1.

<sup>&</sup>lt;sup>24</sup>"Court Orders Bridge Vote," *Marshall Democrat* News, 11 May 1922, 1; "Court Orders Election for Bridge Bonds," *Gilliam* Globe, 11 May 1922, 1; and Saline County Clerk, *Records of the Saline County Court Book 2: 1922-1927*, microfiche copy available from Missouri State Archives, Jefferson City, MO, 64-65.

<sup>&</sup>lt;sup>25</sup>"Bridge Drive Mass Meeting Monday Night," *Slater News*, 23 May 1922, 1; "Court Pledges Bond Money Use," *Marshall Democrat News*, 25 May 1922, 1; and "Facts About Saline County's \$300,000 Bond Election," *Gilliam Globe*, 25 May 1922, 2.

<sup>&</sup>lt;sup>26</sup>"Free Bridge Fact Sheet," *Gilliam Globe*, 1 June 1922, 3.

In view of the very small cost of these bridges to the individual citizens of the County, and of the fact that the Government will pay half the cost thereof; in view of the probability that two roads of highest grade will be located through the County if the bridges are built and in the building of these roads over three million dollars will be expended in the county, in view of the great convenience and financial profit to the people of the County from the building of roads and bridges it seems to me that we should not hesitate to vote for the issuance of the bonds.<sup>27</sup>

When the returns from the election were tallied, Saline County voters overwhelmingly approved the bond issue by a vote of 5,515 in favor to 1,823 opposed. The bond issue was strongly supported in Marshall, the county seat, and in towns along the likely route of a state highway leading to the Glasgow Bridge such as Slater and Gilliam. However, voters in smaller Saline County towns such as Arrow Rock voted against the bridge bonds believing that they would see no benefit from the new structure, as did voters in towns such as Grand Pass and Malta Bend that were located near the site of another proposed bridge across the Missouri River at Waverly in Lafayette County.<sup>28</sup> Still, the bond issue passed by a sizeable margin, and the stage was set for work to begin on designing and letting a contract for a river bridge at Glasgow.

Once local financial support for the Glasgow Bridge had been secured, the Missouri State Highway Department began the process of designing the new structure and seeking federal approval. On June 13, 1922, a delegation from Howard and Saline Counties met with the Missouri State Highway Commission to let them know that bond issues had been approved in both counties. The highway commission agreed to seek federal aid to pay for its half of the construction costs, and Fred Adgate, a consulting engineer who worked for the Foundation Company in Chicago, Illinois, was hired to draw up blueprints for the new structure.<sup>29</sup> By the fall of 1922 Adgate had completed preliminary plans for the Glasgow Bridge. Adgate's plans called for the construction of five Pennsylvania through-truss spans across the Missouri River along with several smaller deck-truss approach spans. Adgate also presented alternative designs for the

<sup>&</sup>lt;sup>27</sup>John Rich, "Favors Bridge Proposition," *Gilliam Globe*, 1 June 1922, 1.

<sup>&</sup>lt;sup>28</sup>Saline County Clerk, *Records of the Saline County Court Book* 2, 70-72; and "Saline County Over the Top on the Bond Election," *Gilliam Globe*, 8 June 1922, 1. Although Saline County voters approved bond funding for the construction of bridges at both Glasgow and Miami in June 1922, the Missouri State Highway Commission declined the offer of local aid for a Missouri River bridge at Miami since it would not connect to a designated state highway. Saline County residents continued to agitate for an additional bridge at Miami, and in 1938, the project was funded via a federal work relief grant. Sverdrup and Parcel, a St. Louis based engineering firm, designed the Miami Bridge, and the structure opened to traffic in June 1940. See Clayton Fraser, "HAER Inventory: McDaniel Memorial Bridge K-999R," in *Missouri Historic Bridge Inventory: Draft Inventory Report* (Loveland, Colorado: Fraserdesign Inc., 1996); and Missouri State Highway Commission, "Minutes of the State Highway Commission Meeting. June 13, 1922," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, MO, 5.

<sup>&</sup>lt;sup>29</sup>Missouri State Highway Commission, "Minutes of the State Highway Commission Meeting. June 13, 1922, 5; and "Free Bridge Promoters in Conference Here," *Glasgow Missourian*, 15 June 1922, 1.

Glasgow Bridge that would allow the structure to be built at a lower cost. Some of these alternatives included using wood rather than steel to build the approach spans leading up to the main portion of the bridge and laying a wooden deck across the bridge instead of giving it a concrete driving surface.<sup>30</sup> Although these design alternatives offered some potential savings, B.H. Piepmeier, the Chief Engineer of the Missouri State Highway Department, suggested that it would be better to build the structure from more durable materials. Piepmeier also noted that the savings obtained from using wood instead of concrete for the bridge deck would be less than \$2,300, a pittance in comparison to the estimated cost of the entire structure.<sup>31</sup> Additional local funds were ultimately raised in both Saline and Howard Counties to pay for increased costs due to design decisions to use steel and concrete instead of wood for the Glasgow Bridge, and the structure was built using the more durable materials.<sup>32</sup>

While Fred Adgate worked on the blueprints for the Glasgow Bridge, officials with the Missouri State Highway Department approached the United States Bureau of Public Roads seeking federal approval for the new structure. Since federal money would be used to pay for the highway department's portion of construction costs, federal engineers with the Bureau of Public Roads had to approve the basic design and layout of the Glasgow Bridge. After federal engineers viewed Adgate's preliminary bridge plans and inspected the proposed bridge site, they asked for numerous design changes that threatened to significantly delay the letting of a construction contract. Most of the proposed design changes consisted of minor suggestions such as using thicker steel in the bridge superstructure, pouring a concrete floor instead of having a wooden bridge deck, and possibly building a retaining wall on the east bank of the bridge to protect the nearby piers of the Chicago and Alton Railroad Bridge. However, the primary federal concern was the potential impact of the Missouri River on the proposed structure. Federal engineers noted that preliminary bridge plans contained no features to protect the approaches to the Glasgow Bridge from river scour. Federal engineers were concerned that unless such protections were implemented, the river would cut a new channel rendering the bridge obsolete. Thus, the federal government suggested that the site for

<sup>&</sup>lt;sup>30</sup>F.W. Adgate, "Glasgow Bridge Over Missouri River at Glasgow, MO: General Plan and Profile," 1925, microfiche copy available from Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO; and Clayton Fraser, "HAER Inventory: Glasgow Bridge G-69R," in *Missouri Historic Bridge Inventory: Draft Inventory Report* (Loveland, Colorado: Fraserdesign Inc., 1996).

<sup>&</sup>lt;sup>31</sup>B.H. Piepmeier to F.W. Adgate, Signed Letter, 7 October 1922, microfiche copy in "General Correspondence File – Construction Project No. FA-217," Collection 12-0158, Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO. Materials in this collection henceforth cited as part of the "Bridge File."

<sup>&</sup>lt;sup>32</sup>The Saline County Court and Howard County Court both agreed in the fall of 1922 to provide up to \$150,000 to pay for their share of the costs of the Glasgow Bridge. See Howard County Court to Missouri State Highway Commission, Signed Memorandum 6 November 1922, Bridge File; and Saline County Court to Missouri State Highway Department, Signed Memorandum, 31 October 1922, Bridge File.

the new bridge be moved upstream away from Glasgow to a new location where the Missouri River was less narrow and less likely to erode any approach spans.<sup>33</sup>

When B.H. Piepmeier learned the opinions of federal engineers, he immediately launched an effort to convince them that the Missouri River was not a threat to the proposed Glasgow Bridge. He pointed out that moving the site for the proposed bridge upriver would require the new structure to cross the watershed of both the Missouri and Chariton Rivers, entailing the construction of a significantly longer bridge. In addition, moving the bridge to a new site would take it out of Howard County, rendering the bond funds approved by local voters unavailable for construction of the new structure. Piepmeier also noted that the Chicago and Alton Railroad Bridge provided a natural barrier that would protect the proposed highway bridge. The Missouri River would need to destroy a significant portion of the railroad bridge before the highway bridge would be impacted, and since the railroad company would do everything in its power to protect its bridge, there was little chance that the highway bridge would ever encounter any real danger from river scour.<sup>34</sup>

Despite B.H. Piepmeier's effort to change the opinions of federal officials, federal approval for construction of the Glasgow Bridge was not received until well after contracts for construction of the new structure were let. The Missouri State Highway Commission could no longer spend available funds for bridge construction after December 31, 1922, and Piepmeier pleaded with the Director of the Bureau of Public Roads in November 1922 for quick federal approval of the plans for the new structure.<sup>35</sup> Piepmeier also did his best to assure representatives in Saline and Howard Counties that federal approval for the bridge design would be received in a timely manner and promised them that the local bond funds approved by local voters would not go to waste. Ultimately the highway department let contracts for the construction of the Glasgow Bridge in December 1922 without having formal federal approval for the new structure. Fortunately, the Bureau of Public Roads gave its blessing to the final design for the

<sup>&</sup>lt;sup>33</sup>O.L. Glover, "Bureau of Public Roads Inspection Report on Glasgow Bridge Project," 6 September 1922, Bridge File; John Chamberlin, "Memorandum to Mr. Wonders," 9 November 1922, Bridge File; and John Chamberlin, "Memorandum to Mr. Wonders," 22 January 1923, Bridge File. Federal officials also recommended the placement of several floating wooden booms between the railroad bridge and the Glasgow Bridge to protect the bridge substructure from potential damage. Fred Adgate created a basic design for the wooden booms, but the federal government eventually decided that they would not be needed to protect the new bridge. See F.W. Adgate, "Glasgow Bridge Over Missouri River at Glasgow, MO: General Plan and Profile;" and B.H. Piepmeier to H.H. Lotter, Signed Letter, 10 November 1922, Bridge File.

<sup>&</sup>lt;sup>34</sup> John Chamberlin, "Memorandum to Mr. Wonders," 3 October 1922, Bridge File; and B.H. Piepmeier to J.C. Wonders, Signed Letter, 4 October 1922, Bridge File.

<sup>&</sup>lt;sup>35</sup>B.H. Piepmeier to P. St. John Wilson, Signed Letter, 10 November 1922. In his letter Piepmeier promised federal officials that in exchange for rapid approval of the plans for the Glasgow Bridge the Missouri State Highway Department would provide, "any cooperation the Bureau [of Public Roads] will require…before the contract is finally awarded."

Glasgow Bridge in February 1923, and construction of the new bridge was allowed to proceed.  $^{36}$ 

On December 16, 1922, the Missouri State Highway Department formally opened the bids received to build a bridge across the Missouri River at Glasgow. The highway department allowed construction contractors to offer bids for the construction of the entire bridge or separate bids for the bridge substructure and superstructure. Four companies sent in bids for the Glasgow Bridge, and the Union Bridge and Construction Company and the Mt. Vernon Bridge Company submitted the lowest bids. The Union Bridge and Construction Company offered to build the substructure for \$297,002.50, while the Mt. Vernon Bridge Company said it would erect the bridge superstructure and deck for \$269,310. The combined total bid was \$566,312.50, which was slightly below the highway department's estimated cost of \$570,522 to build the new bridge.<sup>37</sup> Two weeks after bids were received, the Missouri State Highway Commission awarded construction contracts to the two companies that presented the lowest bids for the Glasgow Bridge. A ten percent contingency fee was added to each contract to cover unanticipated engineering fees and construction changes, pushing the total funds needed to build the bridge to slightly over  $600,000^{38}$  The two contractors were each allotted twelve months to complete their portion of the bridge, meaning that the Glasgow Bridge was slated to open to traffic around January 1, 1925.<sup>39</sup> The Glasgow newspaper celebrated the selection of the contractors by the highway commission, describing it as a major victory for local bridge boosters:

The long drawn out struggle to get a bridge located here, and the many exasperating obstacles and delays, which often threatened to completely

<sup>&</sup>lt;sup>36</sup>B.H. Piepmeier to F.W. Adgate, Signed Letter, 21 February 1923. Several informal agreements between the Missouri State Highway Department and the Bureau of Public Roads were made in the fall of 1922 regarding the design of the Glasgow Bridge, but formal approval did not come until early 1923. Despite the fact that the approval needed to guarantee federal funding for the new bridge had not been received, highway department officials repeatedly promised local officials in Howard and Saline Counties that the project would move forward and asked them to go ahead and purchase the right of way needed for the new bridge. See "Glasgow Gets Federal Aid," *Glasgow* Missourian, 24 August 1922, 1; and "The Glasgow Bridge Assured," *Glasgow* Missourian, 26 October 1922, 2.

<sup>&</sup>lt;sup>37</sup>Missouri State Highway Commission, "Tabulation of Bids Received: Project No. FA-217," microfiche copy available from Design Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO. Two other companies also submitted bids for the Glasgow Bridge. The Missouri Valley Bridge and Iron Company offered to construct the substructure of the Glasgow Bridge for \$304,289.80, while the Kansas City Bridge Company submitted a bid of \$638,383.25 to build the entire bridge structure.

<sup>&</sup>lt;sup>38</sup>Missouri State Highway Commission, "Minutes of the State Highway Commission Meeting: December 30, 1922," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, MO, 7. The highway commission also awarded contracts for the construction of bridges across the Missouri River at Waverly and Lexington during this special December meeting.

<sup>&</sup>lt;sup>39</sup>Missouri State Highway Commission, "Specifications for Constructing (or Improving) State Road: Project Number 217, Howard and Saline Counties," Bridge File.

block the project, have all been overcome and from this time forward we expect the work to move ahead smoothly and uninterruptedly.<sup>40</sup>

Unfortunately, early optimism would give way to reality as construction work on the Glasgow Bridge proceeded. Several obstacles and problems plagued the construction of the bridge, and ultimately it would not open to traffic until several months after the original construction deadline.

#### C. Building the Glasgow Bridge

Although the Missouri State Highway Commission approved contracts for construction of the Glasgow Bridge at the end of 1922, the contractors were not allowed to begin work on the bridge until March 1923. Highway department officials refused to release the bridge plans to the contractors until the Bureau of Public Roads gave final approval. Once the federal government accepted the plans, the Union Bridge and Construction Company began to ship material to the site via the Chicago and Alton Railroad. In March 1923 the Union Bridge and Construction Company began working on needed support facilities such as a cement factory, train yard, and worker housing. The company also started building a wooden tramway that would be used to move material into position for construction work in the Missouri River. By the end of the month, the company was ready to set the foundation for the first pier.<sup>41</sup>

The primary tool used to set the piers of the Glasgow Bridge was the caisson. Caissons were essentially reinforced wooden boxes that were built to keep the Missouri River away from the excavation site. Once bedrock was reached, the caisson was filled with concrete to form the base of the river pier. H. F. Nelson, a highway department engineer who supervised construction of the Missouri River Bridge at Waverly, Missouri, provided a succinct description of how caissons worked:

Caissons might be compared to an airtight box of steel or wood and turned upside down. These used were made of heavy timber. 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, which in this case is two feet of shale. All the caissons are sunk two feet into shale to prevent any danger of

<sup>&</sup>lt;sup>40</sup>Bridge Work to Begin Soon," Glasgow Missourian, 18 January 1923, 2.

<sup>&</sup>lt;sup>41</sup>"Bridge Work Progressing," *Glasgow Missourian*, 28 March 1923, 3; B.H. Piepmeier to W.L. Six, Signed Letter, 22 January 1923, Bridge File; B.H. Piepmeier to C.A. Neal, Signed Letter, 16 February 1923, Bridge File; United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 9 March 1923, Bridge File; and United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 3 April 1923, Bridge File. In addition to the tramway, a barge equipped with a large derrick was also used to assist with the construction of the Glasgow Bridge substructure.

scowing or slipping from river pressure, ice or drift. The caisson is then filled with concrete through the supply shaft and the foundation is then ready for the pier.<sup>42</sup>

To ensure that the piers of the Glasgow Bridge were set on strong foundations, federal engineers inspected each caisson before it was filled with cement.<sup>43</sup> Working inside a caisson was a dirty and dangerous endeavor for construction workers. Negative air pressure in the caissons occasionally caused workers to suffer from nitrogen poisoning, pain, bleeding, and even death. Fortunately, no workers were killed while setting the piers of the Glasgow Bridge.<sup>44</sup>

Work on the substructure of the Glasgow Bridge continued steadily throughout the spring, summer, and fall of 1923, but despite the best efforts of the Union Bridge and Construction Company, the substructure was not completed by the end of 1924 as promised in the original construction contract. There were several reasons why the Union Bridge and Construction Company fell behind in its effort to build the Glasgow Bridge substructure. One critical factor was the changing nature of the Missouri River. During the summer and fall of 1923 the Missouri River experienced several rapid rises, significantly delaying construction work. One of the most significant river rises occurred in early October, forcing the Union Bridge and Construction Company to cease all work in the river. The company also had to scramble to protect its tramway and remove falsework from one of its piers in order to keep the river from washing them away.<sup>45</sup> By the end of the year, construction company officials estimated that high water had caused them to lose at least ninety days of work time, leading to a major delay.<sup>46</sup>

<sup>&</sup>lt;sup>42</sup>Quoted in "Waverly Bridge in Early Days," *Carrollton Daily Democrat*, 7 August 1975, 2. Caissons were also employed in the 1920s to assist in the construction of piers for bridges across the Missouri River at Lexington, Waverly, and Hermann. See Gubbels, "No Longer a Barrier'," 120-121; and Thomas Gubbels, "Hermann Bridge," HAER No. MO-114, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2003, 17-18.

<sup>&</sup>lt;sup>43</sup>B.H. Piepmeier to L.C. Beattie, Signed Letter, 17 March 1923, Bridge File. For detailed schematic drawings of the caissons used during the construction of the Glasgow Bridge, see Adgate, "Glasgow Bridge Over Missouri River at Glasgow, MO: General Plan and Profile."

<sup>&</sup>lt;sup>44</sup>The only recorded fatality associated with the construction of the Glasgow Bridge occurred in December 1924 when a gas explosion killed Joseph Chancellor, a timekeeper for the Mt. Vernon Bridge Company. See Missouri State Highway Commission, "Progress Report Project 217: Week Ending December 24, 1924," Bridge File; and Missouri State Board of Health, "Certificate of Death: Joseph Edson Chancellor," File Number 34461, downloaded 22 August 2007 from http://www.sos.mo.gov/archives/resources/deathcertificates/.

<sup>&</sup>lt;sup>45</sup>Missouri State Highway Commission, "Progress Report Project 217: Week Ending October 4, 1923," Bridge File. This same river rise washed away a 1,600-foot section of tramway that had been built by the Missouri Valley Bridge and Iron Company to assist in the construction of the Waverly Bridge. Gubbels, "'No Longer a Barrier'," 123.

<sup>&</sup>lt;sup>46</sup>W.H. Bozier to J.A. Williams, Signed Letter, 21 December 1923, Bridge File.

In addition to delays caused by river rises and high water, the Union Bridge and Construction Company also experienced problems setting its caissons to bedrock underneath the Missouri River. The soundings used to produce estimates of where bedrock would be reached proved inaccurate, forcing construction workers to excavate to greater depths than expected. In addition, efforts to sink the caissons were delayed when workers discovered stone and iron remains left in the river from the construction of the original Chicago and Alton Railroad Bridge. This debris was not noted on any of the original plans for the highway bridge, and officials with the Union Bridge and Construction Company estimated that laborers spent an extra eighteen days on the job simply removing scrap from the river bottom. Several delays were also caused by ongoing design changes made in the field by highway department engineers.<sup>47</sup> Design changes were a common occurrence during construction projects as actual conditions rarely matched those anticipated by bridge designers, but such delays frustrated contractors such as the Union Bridge and Construction Company who were under pressure to finish their work as soon as possible.

When officials with the Union Bridge and Construction Company realized that they were not going to fulfill their contractual obligation to complete the substructure by December 31, 1923, they asked the highway department for an extension. The company presented a list of the reasons for the construction delays to J.A. Williams, the highway department engineer who directly supervised construction of the Glasgow Bridge. Williams sympathized with the plight of the Union Bridge and Construction Company, telling Leif Sverdrup, the engineer in charge of the Missouri State Highway Department's Bridge Division, that the company deserved a three or four month extension to allow them to complete their work.<sup>48</sup> Sverdrup, however, felt little empathy for the Union Bridge and Construction Company. Although Sverdrup acknowledged that the contractor had experienced "considerable difficulties during construction," he refused to grant any Instead, Sverdrup simply encouraged the Union Bridge and contract extension. Construction Company to work as rapidly as possible to finish the substructure, concluding that he saw "no reason why this work should not be completed by about the 15th of March or a little later."<sup>49</sup>

Despite the challenges of cold weather and dangers created by ice floes in the Missouri River, the Union Bridge and Construction Company continued working throughout the early months of 1924 to finish the Glasgow Bridge substructure. By the middle of February the company had completed all work on the land-based concrete bents and on four of the six river-based piers. By mid-March the final river piers had been poured and allowed to set, and the only remaining work to be completed by the Union Bridge and Construction Company was filing down portions of the cement piers and filling small holes where wooden forms had been attached to the substructure.<sup>50</sup> On

<sup>47</sup>Ibid.

<sup>&</sup>lt;sup>48</sup>*Ibid.*; and J.A. Williams to Leif Sverdrup, Signed Letter 14 January 1922, Bridge File.

<sup>&</sup>lt;sup>49</sup>L.J. Sverdrup to J.A. Williams, Signed Letter, 22 January 1924, Bridge File.

April 5, 1924, Leif Sverdrup conducted a final inspection of the substructure and declared that the "workmanship on these various units is very good."<sup>51</sup> No liquidated damages were taken from the contract awarded to the Union Bridge and Construction Company as punishment for the delays in completing the substructure, and highway department officials still hoped that the entire bridge might open to traffic by the end of 1924.

In the early fall of 1923 workers from the Mt. Vernon Bridge Company arrived in Glasgow to begin construction of the Glasgow Bridge superstructure.<sup>52</sup> Work on the superstructure and substructure of the Glasgow Bridge proceeded concurrently for several months until the Union Bridge and Construction Company completed their work. Construction of the Glasgow Bridge superstructure followed a standard process that was employed during the construction of numerous other river crossings in Missouri. Steel members that would be used to construct the superstructure were first shipped via the Chicago and Alton Railroad to the job site. The steel members would then be roughed out on the banks of the river as falsework was built to prepare for the erection of a particular segment of the superstructure. The steel was riveted together and swung into place for the individual spans using heavy construction equipment. Once the top and lower chords and the verticals and diagonals were in place, workers would install the floor beams that would carry the deck across the bridge. Finally, workers painted the steel members with a coat of lead paint to help protect the superstructure from wear and weather damage. This process allowed the Mt. Vernon Bridge Company to make slow, but steady progress on the construction of the Glasgow Bridge superstructure.

By April 1924 the substructure of the Glasgow Bridge had been completed and work on the superstructure could proceed without hindrance. The Mt. Vernon Bridge Company was ready to continue working on the steel superstructure in the spring of 1924, but the company felt that it needed assistance to pour the concrete deck for the new bridge. The Mt. Vernon Bridge Company was extremely busy in 1924, working on the construction of major river bridges at Boonville, Missouri, and Omaha, Nebraska, in addition to Glasgow.<sup>53</sup> The company thus asked the Missouri State Highway Department if it would be acceptable for them to hire a subcontractor to pour the concrete deck that would carry traffic across the Glasgow Bridge. The highway department had no problem allowing a subcontractor to work on the Glasgow Bridge as long as Mt. Vernon Bridge Company acknowledged that the hiring of a subcontractor did not relieve them of any duties or responsibilities outlined in the original bridge contract. Once the Mt. Vernon Bridge Company agreed that it would not abdicate any of its responsibilities, the Missouri

<sup>&</sup>lt;sup>50</sup>United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 15 February 19234, Bridge File; and United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 21 March 1924, Bridge File.

<sup>&</sup>lt;sup>51</sup>Missouri State Highway Commission, "Final Inspection Report: Substructure for the Bridge Over the Missouri River at Glasgow," 5 April 1924, Bridge File.

<sup>&</sup>lt;sup>52</sup>Missouri State Highway Commission, "Progress Report Project 217: Week Ending September 6, 1923," Bridge File.

<sup>&</sup>lt;sup>53</sup>Austin, "Boonville Bridge," 11.

State Highway Department asked several contractors if they were interested in pouring the concrete deck of the Glasgow Bridge. The highway department informed several of its regular contracting companies that the Mt. Vernon Bridge Company was looking to sub-let the portion of their Glasgow Bridge contract calling for the construction a 21' wide, 10" thick concrete driving surface across the entire structure.<sup>54</sup>

Although the highway department recommended using one of its regular contracting companies to build the deck of the Glasgow Bridge, the Mt. Vernon Bridge Company instead hired an individual, Ernest Vermillion from Higginsville, Missouri, to complete the task.<sup>55</sup> Ernest Vermillion had built numerous concrete bridges, culverts, and bridge decks for county governments in Missouri, but he had never worked on a job for the Missouri State Highway Department. Highway department officials were initially hesitant to hire an unknown individual to work on one of its most important bridge projects. However, officials with the Mt. Vernon Bridge Company assured the department that they would retain final responsibility for the bridge deck and suggested that Vermillion would carry out his duties quickly and responsibly:

Please be advised that we will have about 1100 feet of this floor ready to begin the construction in less than a month, and my agreement with Mr. Vermillion will be that he order his material at once and carry out the construction of this part of the work promptly. Of course, the Mt. Vernon Bridge Company understands that this work must be carried out satisfactorily, and that we are relieved of no responsibility to the State Highway Department in sub-letting this work to anyone, and in case the work is not being done satisfactorily, we have the right to take the work and complete it ourselves. The fact that a large part of this work can be begun in the near future makes a much better condition and safeguards us against a delay.<sup>56</sup>

Following an internal investigation into Vermillion's qualifications and character, the Missouri State Highway Department agreed in July 1924 to allow him to subcontract for the construction of the driving surface of the Glasgow Bridge.<sup>57</sup> Ernest Vermillion

<sup>&</sup>lt;sup>54</sup>L.J. Sverdrup to M.E. Gillioz, Signed Letter, 29 April 1924; Bridge File; and Leif Sverdrup to W.L. Six, Signed Letter, 20 May 1924, Bridge File.

<sup>&</sup>lt;sup>55</sup>W.L. Six to B.H. Piepmeier, Signed Letter, 14 July 1924, Bridge File.

<sup>&</sup>lt;sup>56</sup> W.L. Six to B.H. Piepmeier, Signed Letter, 16 July 1924, Bridge File.

<sup>&</sup>lt;sup>57</sup>B.H. Piepmeier to W.L. Six, Signed Letter, 21 July 1924, Bridge File. In an effort to win approval from the highway department, Ernest Vermillion claimed that he personally knew and would receive support from C.D. Matthews, a member of the Missouri State Highway Commission. B.H. Piepmeier wrote to Matthews privately to ask if he believed that Vermillion would be able to successfully pour the bridge deck at Glasgow. In response to Piepmeier's inquiry, Matthews explained that he only knew Ernest Vermillion peripherally through his work in doing the brickwork on the International Shoe Factory in Jefferson City. However, Matthews also commented that Vermillion "seemed to be a hustler" and that he was "big enough to take the work that the Mt. Vernon Bridge Co. wished to sub-let." Once Matthews' endorsement was received, Piepmeier decided to allow Ernest Vermillion to work as a

arrived on the job site in Glasgow at the end of July, and his work crews ultimately proved up to the challenge of completing the bridge deck in a timely manner.<sup>58</sup>

In the late summer and fall of 1924 work on the Glasgow Bridge proceeded rapidly and smoothly. The Mt. Vernon Bridge Company continued to work on erecting the final spans of the superstructure, and Ernest Vermillion's work team set up a concrete plant and other facilities needed to pour the bridge deck. In mid-September Ernest Vermillion poured the first 200' segment of deck on the west side of the bridge, and in his inspection report Bridge Engineer Leif Sverdrup noted that Vermillion "has been doing an excellent job. Very good surface and good alignment of the curbs have been obtained."<sup>59</sup> A few weeks later, the Mt. Vernon Bridge Company swung the steel for the final span of the bridge superstructure into position, and by mid-December, the final spans of the superstructure had been fully riveted and almost completely painted. Only minor tasks remained to complete work on the Glasgow Bridge superstructure, and progress on the construction of the bridge deck proceeded rapidly until cold weather forced Ernest Vermillion to shut down until warmer weather arrived in the spring of 1925.<sup>60</sup>

During the cold early months of 1925 only minor tasks such as painting and placing forms for future concrete pours were performed on the Glasgow Bridge. When temperatures began to moderate in March 1925, highway department officials asked Ernest Vermillion to resume working on the bridge deck. Vermillion assured the department that workers would return to the job site soon and that he would finish pouring the deck within one month after reasonable weather resumed. By mid-March Vermillion had restarted work on the concrete deck as well as the placement of a wooden deck atop one of the approach spans.<sup>61</sup> In an effort to open the Glasgow Bridge as soon

<sup>59</sup>United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 16 September 1924, Bridge File. Quotation from L.J. Sverdrup, "Bureau of Bridges Inspection Report: Project 217," 22 October 1924, Bridge File."

<sup>60</sup>Missouri State Highway Commission, "Progress Report Project 217: Week Ending October 29, 1924," Bridge File; and Missouri State Highway Commission, "Progress Report Project 217: Week Ending December 17, 1924," Bridge File. Bridge Engineer Leif Sverdrup sent a warning to the local highway department engineer in November 1924 that freezing temperatures would soon arrive, and he advised that precautions were needed to protect any concrete poured during cold weather. Sverdrup also sent a thermometer to the local engineer along with the observation; "I think this will tell you exact temperature a little better than just sticking your nose out of the door in the morning." See L.J. Sverdrup to J.M. Graham, Signed Letter, 6 November 1924, Bridge File; and LJ. Sverdrup to J.M. Graham, Signed Letter, 15 November 1924.

<sup>61</sup>L.J. Sverdrup, "Bureau of Bridges Inspection Report: Project 217," 20 January 1925, Bridge File; Missouri State Highway Commission, "Progress Report Project 217: Week Ending March 4, 1925,"

subcontractor on the Glasgow Bridge. See B.H. Piepmeier to C.D. Matthews, Signed Letter, 16 July 1924, Bridge File; and C.D. Matthews to B.H. Piepmeier, Signed Letter, 18 July 1924, Bridge File.

<sup>&</sup>lt;sup>58</sup>Missouri State Highway Commission, "Progress Report Project 217: Week Ending July 31, 1924," Bridge File.

as possible, the Missouri State Highway Department decided in the fall of 1924 to place a temporary wood deck atop the easternmost approach span. The department also wanted to allow the fill beneath this approach to settle before installing a permanent concrete roadbed.<sup>62</sup> By mid-April the entire substructure, superstructure, and deck of the Glasgow Bridge had been completed, and by the end of the month, the structure had received its final inspection and was finally ready to carry traffic.<sup>63</sup> Thanks to the dedicated efforts and hard work of the three contractors, the Glasgow Bridge opened only a few months later than stipulated in the original construction contract.

The Glasgow Bridge opened to traffic in May 1925, and on June 4, 1925, a formal ceremony was held at Glasgow to commemorate the completion of the new structure. Approximately 15,000 people flocked to Glasgow from surrounding communities such as Fayette, Gilliam, Marshall, Slater, and Boonville to participate in the festivities. Visitors to Glasgow were entertained by a parade, performances by numerous community bands, dances, and picnic lunches. The crowd was especially enthralled by an hour-long flyover by three military airplanes from Fort Leavenworth, Kansas. Following a formal ribbon-cutting ceremony at the center of the new bridge speeches were given by a variety of political leaders, including former Glasgow Mayor W.B. Nievert, Senator James Reed, and Theodore Gary, Chairman of the Missouri State Highway Commission. The celebration continued well into the evening with dancing and riverboat excursions along the Missouri River.<sup>64</sup> Local newspapers praised the new bridge, proclaiming it a fitting monument to local efforts to build a river crossing at Glasgow:

Our hat's [sic] off to the live wire citizenship of Glasgow who engineered the deal to get the bridge which is a monument to their zeal and progressive spirit and which will be a convenience for all time to the people not only of Howard and Saline Counties but to those of the State and nation who may perchance pass this way.<sup>65</sup>

<sup>62</sup>V.W. Enslow to J.M. Graham, Signed Letter, 3 October 1924, Bridge File; W.L. Six to V.W. Enslow, Signed Letter, 19 January 1925; B.H. Piepmeier to J.C. Wonders, Signed Letter, 18 February 1925, Bridge File; United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 9 March 1925, Bridge File; and United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 29 May 1925, Bridge File. Vaughn W. Enslow was the Assistant State Bridge Engineer under Leif Sverdrup, and he became the department's Acting Bridge Engineer when Sverdrup left public service for the private sector. The Mt. Vernon Bridge Company was paid an additional \$1,087 for installation of the temporary wooden deck.

<sup>63</sup>United States Bureau of Public Roads, "Inspection Report on Glasgow Bridge Project," 15 April1925, Bridge File; and Missouri State Highway Commission, "Final Inspection Report: Bridge Over the Missouri River at Glasgow," 29 April 1924, Bridge File.

Bridge File; and Missouri State Highway Commission, "Progress Report Project 217: Week Ending March 11, 1925," Bridge File.

<sup>&</sup>lt;sup>64</sup>"Glasgow's Greatest Day," *Glasgow Missourian*, 11 June 1925, 1; "Twenty Thousand People Visit Glasgow," *Gilliam Globe*, 11 June 1925, 1; and "What the Editors Say," *Glasgow Missourian*, 18 June 1925, 1; and Bentley and Hagedorn, *Glasgow: The Way it Was*, 53.

<sup>&</sup>lt;sup>65</sup>"What the Editors Say," *Glasgow Missourian*, 18 June 1925, 1.

The completed Glasgow Bridge measured over 2,200' in length and cost slightly less than \$608,000 to build, and local leaders believed that the new structure would lead to the construction of a major state highway through Glasgow and an economic boom for the surrounding community.<sup>66</sup>

#### D. Post-construction History of the Glasgow Bridge

Although local supporters believed that the construction of a bridge across the Missouri River would guarantee the construction of a major state highway through Glasgow, their hopes never came to fruition. The Missouri State Highway Department instead chose a more southerly route for the major state highway connecting St. Louis and Kansas City. This major highway, labeled U.S. Highway 40, became one of the busiest thoroughfares through Missouri, and it crossed the Missouri River at Boonville rather than Glasgow. Instead of a major cross-state route, a simple spur highway was built through Saline and Howard Counties to carry traffic to and from the Glasgow Bridge. This highway was originally labeled Missouri State Route 20, and later it was renamed Missouri State Route 240 to reflect its status as a minor spur of U.S. Highway 40. The dream of a major interstate highway crossing through Glasgow at the new bridge never became a reality, and although the bridge proved a boon for local farmers and businessmen, it never provided the economic stimulus hoped for by bridge boosters.<sup>67</sup>

The completion of the Glasgow Bridge did provide a minor economic stimulus for the local community following its completion. The new structure improved access to the railroad yard at Glasgow, providing farmers in eastern Saline County with a new shipping point. The bridge also allowed Glasgow-based businesses to sell their goods and services to a new regional market. However, by the 1970s it had become clear that Glasgow had declined significantly since its nineteenth century heyday. The local economy had fallen on hard times, and young people were leaving the community to seek better opportunities elsewhere. However, numerous small businesses still operated along Glasgow's Main Street providing service to local residents as well as the surrounding agricultural countryside.<sup>68</sup> Today, Glasgow is a rural support community with a population of 1,252, and it continues to serve as a regional transportation hub thanks to its two bridges across the Missouri River.<sup>69</sup>

<sup>&</sup>lt;sup>66</sup>Fraser, "HAER Inventory: Glasgow Bridge G-69R;" and Missouri State Highway Department, "Recapitulation of Final Costs: Project 217," 17 May 1926, Bridge File.

<sup>&</sup>lt;sup>67</sup>The routing of U.S. Highway 40 through Boonville led to an economic renaissance for the town as new businesses sprung up to serve travelers on the cross-nation roadway. However, Boonville entered into a period of decline when Interstate 70 bypassed the community in favor of a new river crossing near Rocheport, Missouri. See Austin, "Boonville Bridge," 13.

<sup>&</sup>lt;sup>68</sup>Graham, Hampton, and Savoia, *Glasgow: Story of a Missouri Rivertown, passim.* 

<sup>&</sup>lt;sup>69</sup>Missouri Census Data Center, "Demographic Profile, 2000 Census: Glasgow City," downloaded 27 August 2007 from <u>http://mcdc2.missouri.edu/</u>.

Although the Glasgow Bridge has functioned in place since it opened to traffic in 1925, the structure has undergone repeated rehabilitations. When the Glasgow Bridge was accepted into the state system in 1925, the Missouri State Highway Department labeled the structure Bridge G-69. The bridge was renamed repeatedly following its numerous rehabilitations, and today, it is officially known as Bridge G00693. In 1986, the original deck of the Glasgow Bridge was replaced with a concrete-filled grid system, and new guardrails and drainages were installed along the length of the structure. A few years later, a new navigational lighting system was installed along the Glasgow Bridge, the footings of one of the bridge piers were reinforced, and the deck received an asphalt coat. As of the summer of 2007, the Glasgow Bridge remained open to traffic, but it needs to shut down regularly for repairs.<sup>70</sup> In order to better serve the driving public, the Missouri Department of Transportation is planning to partially reconstruct the Glasgow Overall, the Glasgow Bridge remains an excellent example of the 1920s Bridge. movement to build highway bridges across the Missouri River, but the structure needs to be rebuilt so it can continue to serve the transportation needs of local and regional travelers.

### III. Design and Construction Contractors

## A. Bridge Designer: Fred Adgate and the Foundation Company

Fred Adgate, an engineer employed by the Foundation Company of Chicago, Illinois, created the original plans for the Glasgow Bridge. Little is known about the corporate history of the Foundation Company. The forerunner of the Foundation Company was created in New York in 1902. This company was originally called the Foundation and Contracting Company, but it soon shortened its name to the Foundation Company to reflect its specialty, the design and construction of foundations for structures and buildings. Some of the Foundation Company's earliest projects included building foundations for skyscrapers in the Manhattan area including the Woolworth Building and the Empire State Building. The Foundation Company quickly gained national recognition as an industry leader in foundation work, and its early twentieth century projects included a variety of bridges, mineshafts, tunnels, and dams.<sup>71</sup>

<sup>&</sup>lt;sup>70</sup>Fraser, "HAER Inventory: Glasgow Bridge G-69R; Missouri Highway and Transportation Commission, "Repairs to Bridge Over Missouri River State Route 240 at Glasgow: Project No. 4-P204-7715," 1986, microfiche copy available from Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO; Missouri Highway and Transportation Commission, "Navigational Lighting System Replacement Bridge Over Missouri River at Glasgow, Missouri: Project No. CO97-NAV(1)M," 1993, microfiche copy available from Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO; and Missouri Highway and Transportation Commission, "Repairs to Bridge Over Missouri River State Route 240 at Glasgow: Project No. 225R33XOG00693," 1993, microfiche copy available from Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO.

<sup>&</sup>lt;sup>71</sup>Haven Hawley, "Three Sisters Bridges," HAER No. PA-490, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1998, 30; Justin Spivey, "St. Charles Air Line Bridge," HAER No. IL-157, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2001, 21; and P.A.C. Spero and Company,

By the 1920s the Foundation Company had expanded beyond its New York origins to include branches throughout the Midwest, including an office in Chicago where Fred Agate was a company employee. During the 1920s and 1930s the Foundation Company worked on numerous major projects throughout North America. For example, the Foundation Company sank the piers for the Grace Memorial Bridge across the Cooper River in Charlotte, North Carolina, and the piers for the Mainstreet Bridge in Jacksonville, Florida. The Foundation Company used a wide variety of construction techniques to build structural foundations, including cofferdams, pile driving, and pneumatic caissons. Fred Adgate remained active as a designer and consulting engineer in the 1920s as well, securing a \$10,000 contract from the Cape Girardeau, Missouri, Chamber of Commerce in 1925 to draw up preliminary plans and prepare cost estimates for a new bridge across the Mississippi River.<sup>72</sup>

One of the largest jobs ever undertaken by the Foundation Company was the construction of bridges along the Canadian Pacific Railway. This transcontinental rail line was built across Canada in the early twentieth century, and the Foundation Company was involved with the construction of most of the bridges in this massive project. To provide efficient service for its customers the Foundation Company opened a branch office in Canada. The Foundation Company of Canada quickly became wealthy and bought out the New York and Chicago offices to assume control of the entire corporation. Today, the direct descendent of the Foundation Company is Aecon Buildings, Inc., the U.S. branch of the Aecon Corporation. Aecon Corporation is Canada's largest publicly held construction firm, and its U.S. branch focuses on the design and construction of entertainment, office, industrial, and mixed-use projects.<sup>73</sup>

#### B. Substructure Contractor: Union Bridge and Construction Company

In December 1922 the Union Bridge and Construction Company won the contract to build the substructure of the Glasgow Bridge. This company was incorporated in December 1906 by L. S. Stewart, Leo Treadwell, H. K. Seltzer, and Clarence A. Neal. Located in Kansas City, Missouri, the company began with \$50,000 in capital divided among the four founders who constituted the company's board of directors. The company's articles of incorporation carefully detailed the intentions of the new business:

<sup>&</sup>quot;Coraopolis Bridge," HAER No. PA-217, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1990, 12.

<sup>&</sup>lt;sup>72</sup>Hawley, "Three Sisters Bridges," 30; David Austin, "Cape Girardeau Bridge," HAER No. MO-84, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1995, 7; Florida Department of Transportation, "Structures Design Office - Historic Mainstreet Bridge," downloaded 29 August 2007 from <u>http://www.dot.state.fl.us/structures/botm/mainstreet/mainstreet.htm</u>; and South Carolina Department of Transportation, "Cooper River Bridge Replacement - History," downloaded 29 August 2007 from <u>http://www.cooperriverbridge.org/history.shtml</u>.

<sup>&</sup>lt;sup>73</sup>P.A.C. Spero and Company, "Coraopolis Bridge, 12; Aecon Buildings Inc., "Company History," downloaded 29 August 2007 from <u>http://www.usa.aecon.com/CompanyHistory.htm</u>; and Aecon Corporation, "Corporate Profile," downloaded 29 August 2007 from <u>http://www.aecon.com</u>.

To construct bridges, tunnels, canals, viaducts, buildings, foundations, retaining walls, sewers, sidewalks and pavements, drive piling, build wharves, trestles, and do dredging, grading, and concrete and masonry work of all kinds, make surveys, borings, and engineering plans for construction work and to do all things properly incident to the matters above mentioned.<sup>74</sup>

A little more than three years later, the company increased its capital stock to \$100,000. The company's headquarters was located in the Sharp Building at Eleventh and Walnut streets in downtown Kansas City, Missouri. The company's declared assets totaled \$128,067, while the company's liabilities totaled only \$16,015. Stewart was the president and chairman of the board of the company in 1910, with Neal serving as corporate secretary.<sup>75</sup>

Twenty years later, Clarence A. Neal founded a new construction company with the same name as his previous firm. In July 1932 the Union Bridge and Construction Company was incorporated under the state laws of Delaware. Joining Neal in the new venture were fellow Kansas City residents E. M. Philpot and H. C. Beck. The new company established its Delaware office in Dover, where its acting agent was Arley B. Magee, Inc. The new company once again had a long list of principal intentions including owning, operating, and building railway and highway bridges; charging bridge tolls; constructing and operating elevators, warehouses, terminals, and ice plants; acquiring and controlling lands for railway terminals and yards; to construct a variety of engineered structures and facilities; and to trade in goods, stocks, land, and securities.<sup>76</sup> In December 1932, Neal formally dissolved the Missouri-based Union Bridge and Construction Company and at the same time applied for a license for his Delaware-based Union Bridge and Construction Company to conduct business within Missouri. The Delaware-based company's declared purposes of operation in Missouri, however, were exactly the same as those contained in the 1906 charter of the Union Bridge and Construction Company. Fenton Hume registered as the principal agent of the company's Missouri branch, and the Missouri office of the Union Bridge and Construction Company

<sup>&</sup>lt;sup>74</sup>Union Bridge and Construction Company, "Articles of Incorporation," 4 December 1906, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

<sup>&</sup>lt;sup>75</sup>*Ibid.*; Union Bridge and Construction Company, "Increase of Capital Stock," 9 March 1910, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri; and David Austin and Toni Prawl, "Mark Twain Memorial Bridge," HAER No. MO-77, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1995, 28-30.

<sup>&</sup>lt;sup>76</sup>David Austin and Toni Prawl, "Mark Twain Memorial Bridge," 19-20; and Union Bridge and Construction Company, "Articles of Incorporation," 1 July 1932, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

was located at 603 B. M. A. Building in Kansas City. In April 1938, the company retired from further business within the state of Missouri.<sup>77</sup>

Little is known of the projects built by the Union Bridge and Construction Company within Missouri. However, it appears that the company specialized in building the substructures of major river bridges. In 1923 the company subcontracted with the Kansas City Bridge Company to sink the piers for the Lexington Bridge across the Missouri River. Later, in 1928, the company built the substructure of the Chain of Rocks Bridge spanning the Mississippi River at St. Louis, Missouri. Finally, the Union Bridge and Construction Company constructed the substructure of the monumental Mark Twain Memorial Bridge, which spanned the Mississippi River at Hannibal, Missouri, in 1934-1935.<sup>78</sup>

## C. Superstructure Contractor: Mt. Vernon Bridge Company

The Mt. Vernon Bridge Company of Mount Vernon, Ohio, received the contract to build the superstructure of the Glasgow Bridge. This company was originally incorporated in 1880 as the Mt. Vernon Bridge Works, with \$40,000 in capital. The company initially specialized in the construction of small-scale wrought iron highway bridges, but the company also built several structures for the Pennsylvania Railroad. By 1886 the company had moved into a new plant located near the Baltimore and Ohio Railroad depot in Mt. Vernon, but financial disaster soon struck, forcing the company into bankruptcy in 1894. The assets of the Mt. Vernon Bridge Works remained in receivership until September 1897, when they were acquired by James Westwater, a Columbus-based contractor. Westwater obtained a state charter under the name of Mount Vernon Bridge Company, capitalized with \$60,000 in stock. Like its predecessor, the Mount Vernon Bridge Company specialized in the erection of railroad and road bridges. A fire on St. Valentines' Day in 1910 destroyed much of the company's bridge works, but the company rebounded, building a larger complex of brick buildings covering seven acres. By 1912, the Mt. Vernon Bridge Company employed approximately 240 people.<sup>79</sup>

Over the years the Mt. Vernon Bridge Company expanded its abilities to construct larger steel projects. In the mid-1920s, the company erected the superstructure for

<sup>&</sup>lt;sup>77</sup>David Austin and Toni Prawl, "Mark Twain Memorial Bridge," 19-20; Union Bridge and Construction Company, "Affidavit of Dissolution," 20 December 1932, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri; Union Bridge and Construction Company, "Evidence of Incorporation," 20 December 1932, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri; and Union Bridge and Construction Company, "Affidavit of Retirement," 1 April 1938, as held in the Corporations Division, Missouri Secretary of State, Missouri State Information Center, Jefferson City, Missouri.

<sup>&</sup>lt;sup>78</sup>David Austin and Toni Prawl, "Mark Twain Memorial Bridge," 19-20; Thomas Gubbels, "Lexington Bridge," HAER No. MO-111, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2003, 31-32; and "Seven New Mississippi River Highway Bridges," *Engineering News Record* 105 (1930): 181-182.

<sup>&</sup>lt;sup>79</sup>Austin, "Boonville Bridge," 19; and Austin and Prawl, "Mark Twain Memorial Bridge," 20-21.

bridges across the Missouri River at both Boonville and Glasgow. In the mid-1930s the Mt. Vernon Bridge Company built the superstructure of the Mark Twain Memorial Bridge across the Mississippi River at Hannibal, Missouri. Other major bridge projects undertaken by the Mt. Vernon Bridge Company included Ohio River bridges at Madison, Indiana, and at Pomeroy, Ohio; the world's longest bascule-type bridge in Lorain, Ohio; and the nation's three longest simple span structures, built in Louisiana. The company won awards for the Passaic River Bridge at Rutherford, New Jersey, in 1949, and for their New York Central Railroad bridge over Ohio's Cuyahoga River in 1953. The Mt. Vernon Bridge Company also erected the steel for Ohio Stadium, St. John Arena, and the Neil House, all in Columbus. The Mount Vernon Bridge Company suspended operations in the 1960s, and the Cooper-Bessemer Corporation purchased the company's former Ohio plant site.<sup>80</sup>

#### D. Bridge Deck Subcontractor: Ernest Vermillion

Very little is known about Ernest Vermillion, the subcontractor hired by the Mt. Vernon Bridge Company to pour the concrete deck of the Glasgow Bridge. Ernest Vermillion was born on March 8, 1887, in Oak Grove, Missouri. He served in the United States Army during the First World War, achieving the rank of Second Lieutenant. After the war he moved to Higginsville and began working as a construction contractor. Vermillion was listed as a contractor living in his own home in Higginsville, Missouri, along with his wife Dakota and two daughters in the 1920 census of Lafayette County. During the 1920s, Vermillion owned and operated a firm called the "Vermillion Brothers" Construction Company," but he never registered his company with the Missouri Secretary of State. County Court records indicate that Vermillion built concrete bridges and culverts throughout Lafayette County, Missouri, in the 1910s and 1920s, and he later worked on the construction of the International Shoe Factory in Jefferson City. In 1929 Ernest Vermillion moved to Kansas City where he continued to work as a general contractor. Vermillion retired in 1958, and he lived at his home at 438 W. 67th Terrace in Kansas City until his death on July 2, 1968. Vermillion was active in the community, serving as a member of the Community Christian Church of Kansas City and the Higginsville chapter of the American Legion.<sup>81</sup>

#### IV. Physical Description of Bridge G00693

The Glasgow Bridge over the Missouri River (Bridge No. G00693) consists of several truss spans featuring slightly different designs. The largest portion of the bridge contains five rigid-connected Pennsylvania through-truss spans. These five spans vary in length from 224'-6" to 343'-9", and they contain from ten to fourteen panels. The Glasgow Bridge also features seven rigid-connected Pratt deck-truss approach spans that

<sup>&</sup>lt;sup>80</sup>Ibid.

<sup>&</sup>lt;sup>81</sup>"Ernest P. Vermillion," *Kansas City Times*, 3 July 1968, 1C; "Obituaries: Ernest P. Vermillion," *Higginsville Advance*, 4 July 1968, 2; C.D. Matthews to B.H. Piepmeier, Signed Letter, 18 July 1924, Bridge File; and United States Bureau of the Census, "1920 Population Census of Lafayette County, Missouri," microfiche copy available from Missouri State Archives, Jefferson City, MO.

vary in length from 96' to 98'-4". The overall length of the Glasgow Bridge is 2,244'. The substructure that supports the Glasgow Bridge features six tapered concrete piers, five concrete bents, and two reinforced concrete abutments.<sup>82</sup> During the 1920s bridge building boom in Missouri, fifteen of the eighteen structures built across the Missouri River featured Pennsylvania through-truss spans. The Pennsylvania truss was patented in 1875 as a refinement of the standard Pratt truss, and the design was originally used primarily in the construction of railroad bridges. Like other truss designs, the Pennsylvania truss features vertical compression members and two-panel diagonals in tension. However, the Pennsylvania truss substitutes polygonal top chords for economy of materials. Pennsylvania trusses also feature sub-struts or sub-ties that provide lateral support for the diagonals and stiffen the truss when placed under heavy loads.<sup>83</sup> Pennsylvania trusses were incorporated into the design of the Glasgow, Waverly and Boonville Bridges across the Missouri River, and the Glasgow Bridge thus fits well within the general *zeitgeist* of 1920s Missouri River bridge construction.

The substructure of the Glasgow Bridge is composed of steel-reinforced concrete bents, piers, and abutments. The first three bents underneath the easternmost portion of the bridge are labeled Piers A, B, and C on the original construction plans. These columns of these three piers rest on massive square footings measuring 12' x 12' for Pier A and 9' x 9' for Piers B and C. Piers B and C are also underlain by creosoted timber piles. The exact heights of the columns that compose Piers A, B, and C are not provided by Adgate's original construction plans. Pier A features 36' of lateral spacing between its support columns, while Piers B and C feature 32' of lateral spacing. A large concrete crown measuring 28' 6" in length by 3' in thickness tops each pier. The bents on the west shore of the Glasgow Bridge are labeled Piers D, E, F, and G on the original construction plans. Each of these four bents sit atop large concrete footings measuring 10' x 10' with a thickness of 3' as well as buried timber pilings. The heights of these four bents vary, but they all feature a spill-through design. Six tapered concrete piers were set to bedrock beneath the Missouri River to support the portion of the Glasgow Bridge that passes over water. Pier 1 is the easternmost pier. It rests upon massive rectangular concrete footings that are 8' thick and 12'-8" x 17'-8". The columns of Pier 1 taper as they rise to a 7' width at their top. The crown atop Pier 1 measures 28' 6" in length by 3' in thickness. Piers 2, 3, 4 and 5, feature identical designs, varying only in the height of their columns and in the thickness of their support footings. Pier 6 is the westernmost pier of the Glasgow Bridge. This pier is slightly different from the others in that timber piles in addition to concrete footings support it, and its crown is slightly longer, 31', than the crowns atop the other river piers. The only major reconstruction of

<sup>&</sup>lt;sup>82</sup>The physical description of the Glasgow Bridge is based on F.W. Adgate, "Glasgow Bridge Over Missouri River at Glasgow, MO: General Plan and Profile;" and Fraser, "HAER Inventory: Glasgow Bridge G-69R." Adgate's original construction plans for the Glasgow Bridge refer to all elements of the substructure as piers; he did not distinguish between piers, bents, or abutments. See F.W. Adgate, "Glasgow Bridge Over Missouri River at Glasgow, MO: General Plan and Profile."

<sup>&</sup>lt;sup>83</sup>For further information on the history and design of Pennsylvania Truss bridges, see Fraser, *Missouri Historic Bridge Inventory: Draft Inventory Report*, 102-103; and National Cooperative Highway Research Program, "A Context for Common Historic Bridge Types," NCHRP Project 25-25, Task 15, October 2005, 3.37-3.38.

the Glasgow Bridge substructure occurred in the early 1990s when the concrete footings beneath Pier D were rebuilt.<sup>84</sup>

Three rigid-connected Pratt deck-truss approach spans are located on the eastern end of the Glasgow Bridge, while four rigid-connected Pratt deck-truss approach spans can be found on the west end of the structure. The three eastern approach spans vary in length, measuring 97', 97'-11', and 98'-4", while the four western approach spans are each 96' long. Except for their varying lengths, the approach spans are identical in design, each featuring six panels. The top and bottom chord of each approach span is composed of two welded 12" steel channels, while the verticals and diagonals are both made up of two steel angles that vary in size and thickness. The top and bottom struts are composed of two steel angles, while the top and bottom lateral bracing feature single angles. The deck approach spans are further reinforced by sway bracing composed of a single steel angle measuring 3-1/2" x 3" with a thickness of 5/16". Steel stringers composed of massive steel I-beams carry the bridge deck across each approach span, and the decks across the approach spans feature a relatively steep 5% grade. Each individual approach span is joined to underlying bents by both fixed shoes and roller joints that allow for minimal movement. In 1986 the Pratt deck-truss approach spans were slightly modified with the installation of a new drainage system, a concrete-filled grid deck, and new guardrails. Modern concrete approach spans were also constructed atop the fill on either end of the bridge, with an 18'-3" span built on the east end of the structure and a 16' span built on its western edge.<sup>85</sup>

The majority of the Glasgow Bridge superstructure consists of five rigidconnected Pennsylvania through-truss spans that vary in length but all feature the same basic design. The lower chord carries the bridge deck, and it is made from two channels with batten plates and lacing. The upper chord and inclined end post of each throughtruss consists of two built-up channels with cover plates and lacing. The verticals are made from four angles with batten plates and lacing, while the diagonals are composed of two channels with batten plates and lacing. The top lateral bracing consists of a single steel angle, while the lateral bracing along the lower chord is composed of four angles with lacing. The struts of each Pennsylvania through-truss span feature four angles with bracing. The floor beams consist of two large I-beams, and the original 20'-3" wide deck consisted of 10" of poured concrete atop steel stringers (later replaced by a new concrete deck over a corrugated steel web). The superstructure is joined to the substructure by fixed, rocker, and roller shoes, and other than some minor repairs and the installation of a navigation lighting system, the superstructure has not changed significantly since the

<sup>&</sup>lt;sup>84</sup>For details regarding the replacement footings beneath Pier D, See Missouri Highway and Transportation Commission, "Repairs to Bridge Over Missouri River State Route 240 at Glasgow: Project No. 225R33XOG00693."

<sup>&</sup>lt;sup>85</sup>For details regarding repairs to the approach spans, See Missouri Highway and Transportation Commission, "Repairs to Bridge Over Missouri River State Route 240 at Glasgow: Project No. 4-P204-7715."

bridge opened to traffic in 1925.<sup>86</sup> Commemorative plaques were installed at both entrance portals to the Glasgow Bridge providing the following information:

Glasgow Bridge. Financed By Howard County, Saline County. Federal Aid Appropriated By Missouri State Highway Commission. Designed By F.W. Adgate, Consulting Engineer, Chicago, Ill. Supervised By Missouri State Highway Department, B.H. Piepmeier, Chief Engineer, L.J. Sverdrup, Bridge Engineer. Contractors, Substructure, Union Bridge & Const. Co., Kansas City, Mo. Superstructure, Mt. Vernon Bridge Co., Mt. Vernon, Ohio. Completed 1925.<sup>87</sup>

<sup>&</sup>lt;sup>86</sup>For details about recent repairs to the Glasgow Bridge superstructure, See *Ibid.*; and Missouri Highway and Transportation Commission, "Navigational Lighting System Replacement Bridge Over Missouri River at Glasgow, Missouri: Project No. CO97-NAV(1)M."

<sup>&</sup>lt;sup>87</sup>Fraser, "HAER Inventory: Glasgow Bridge G-69R."

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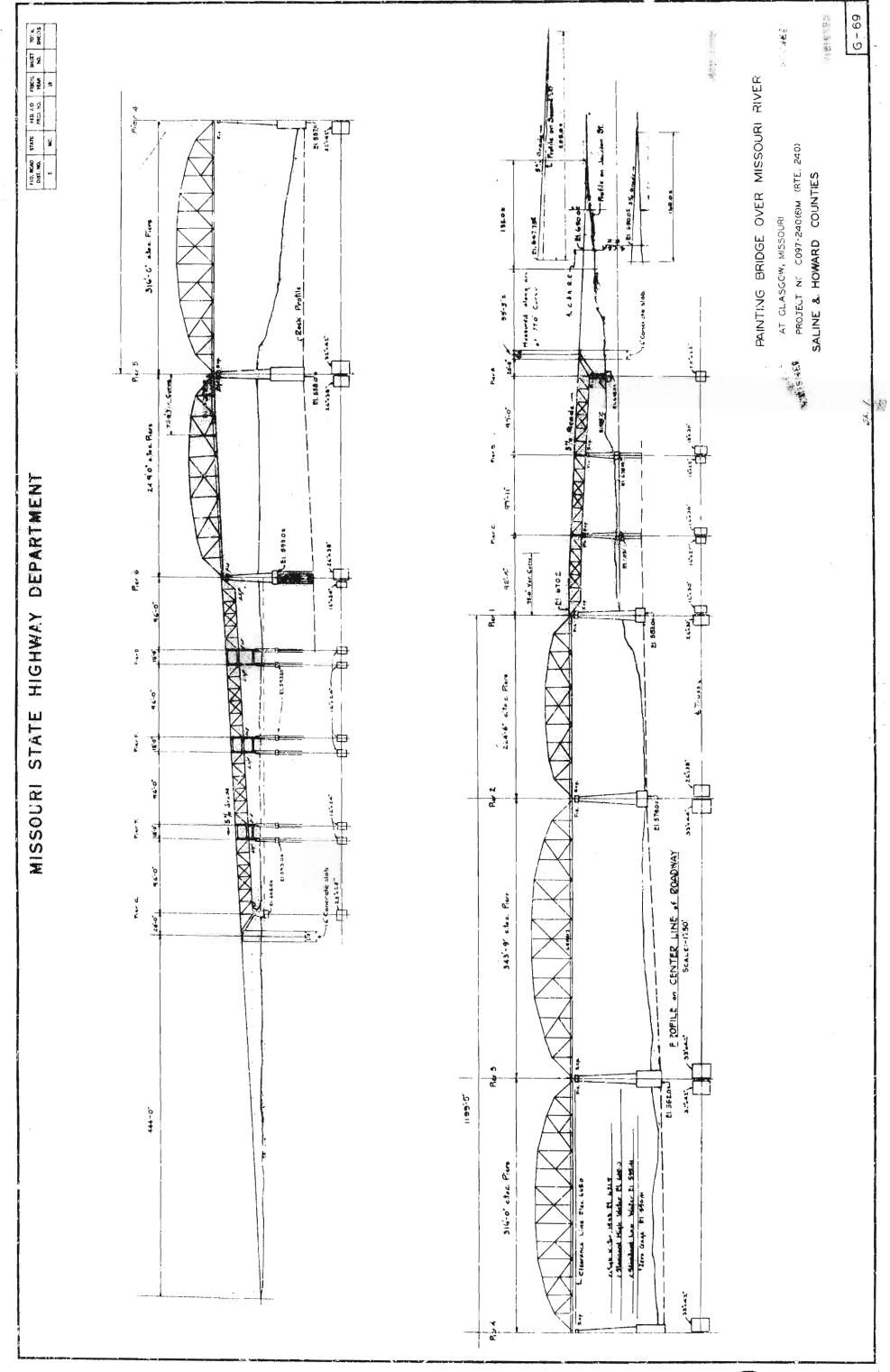
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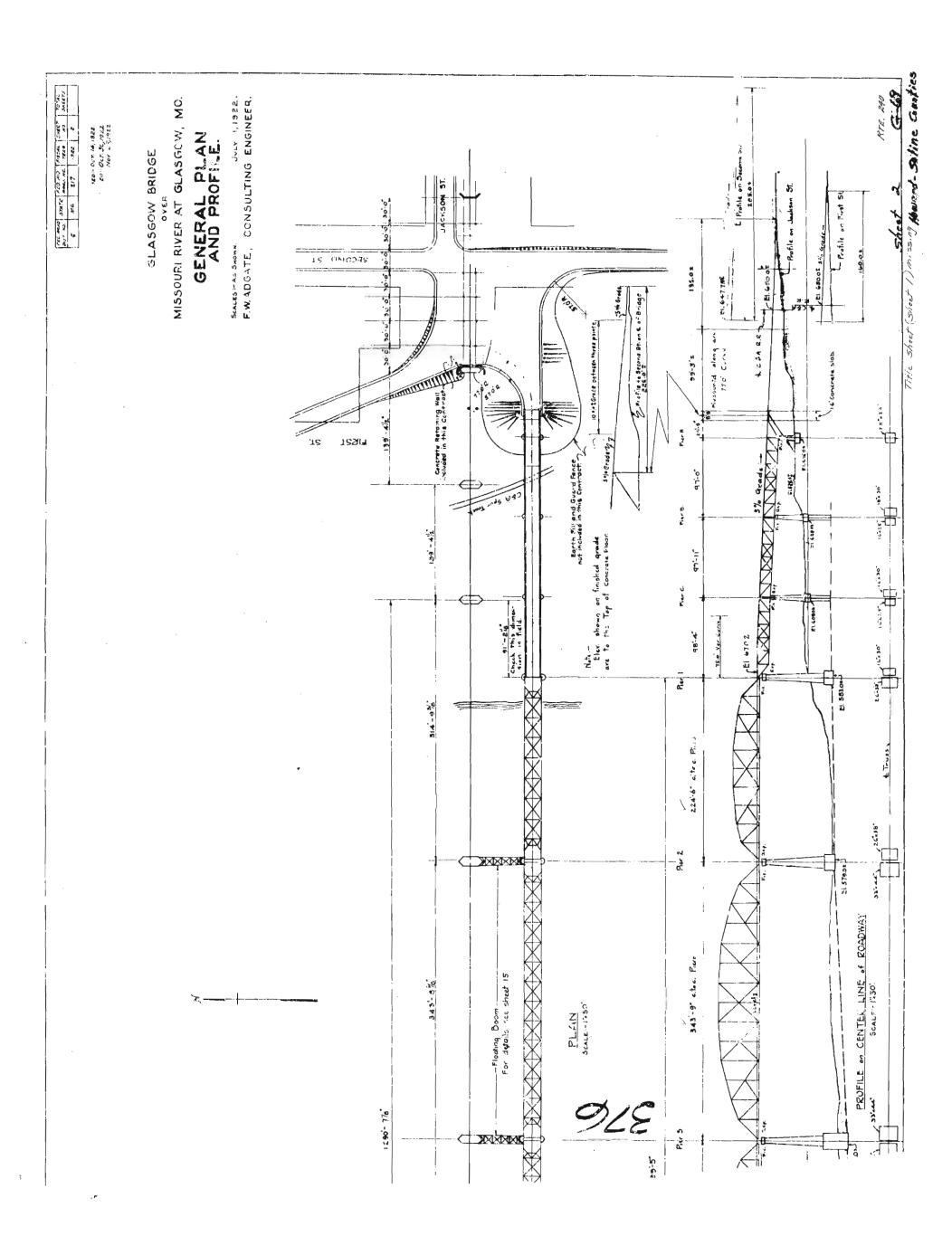
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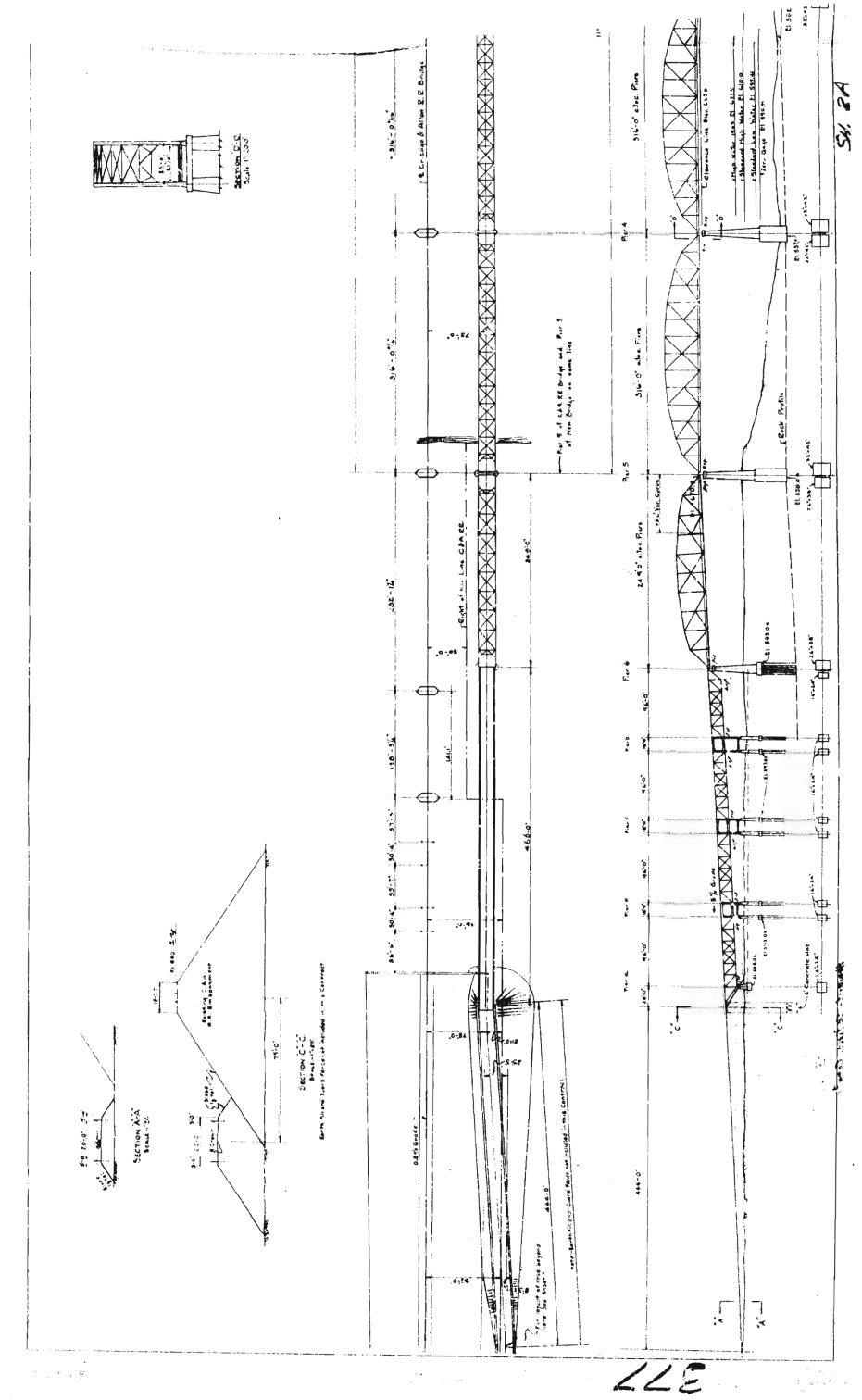
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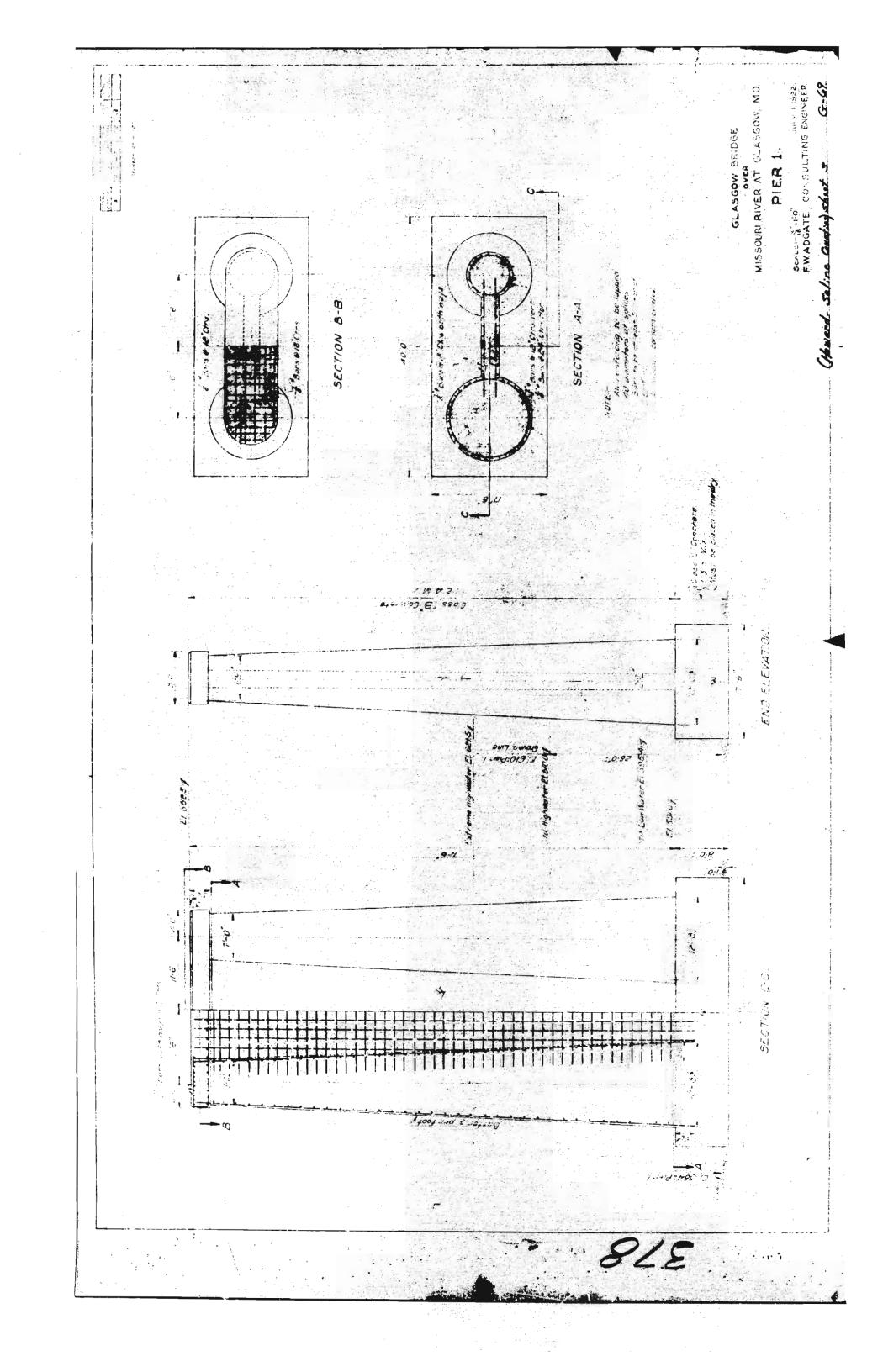
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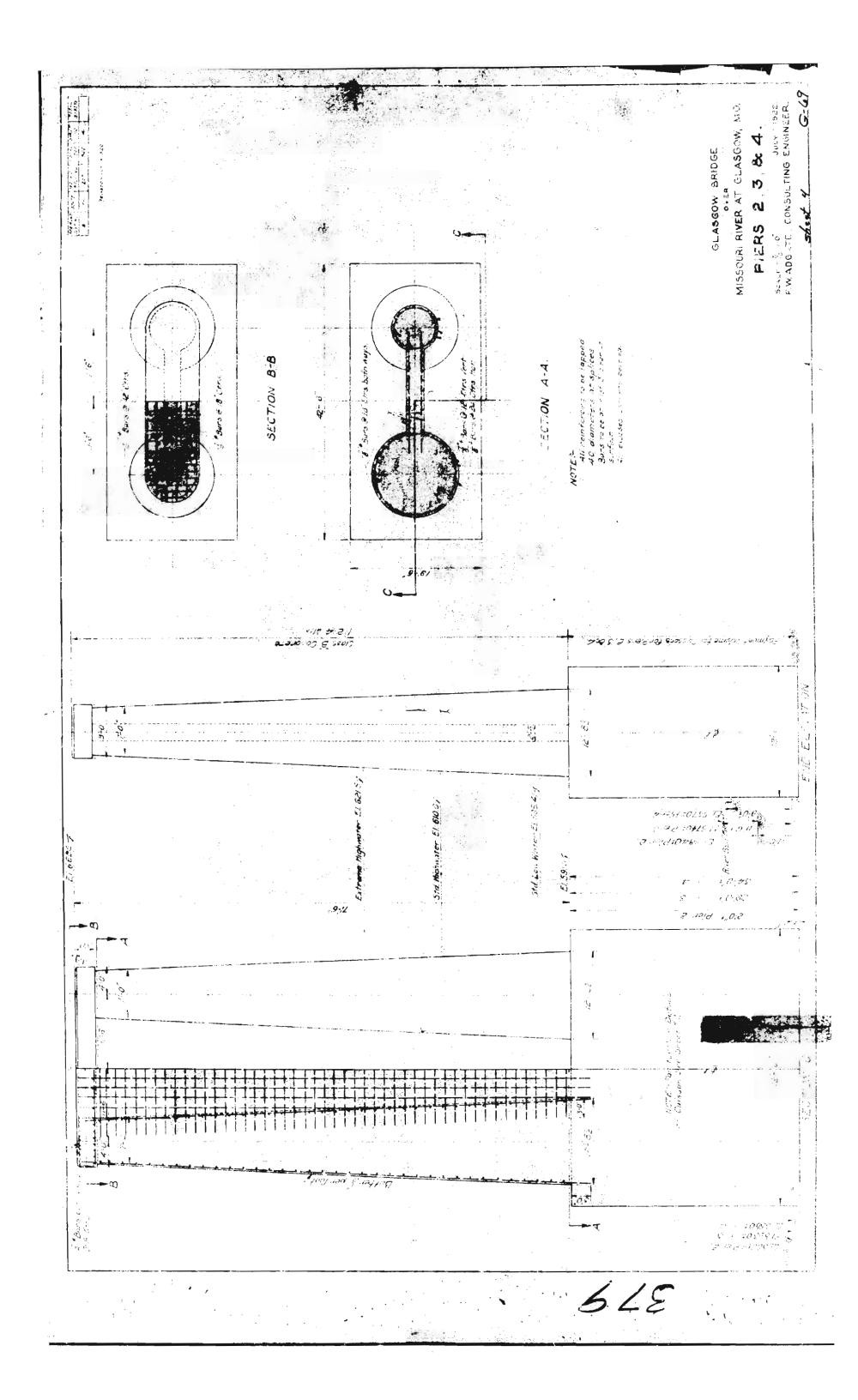


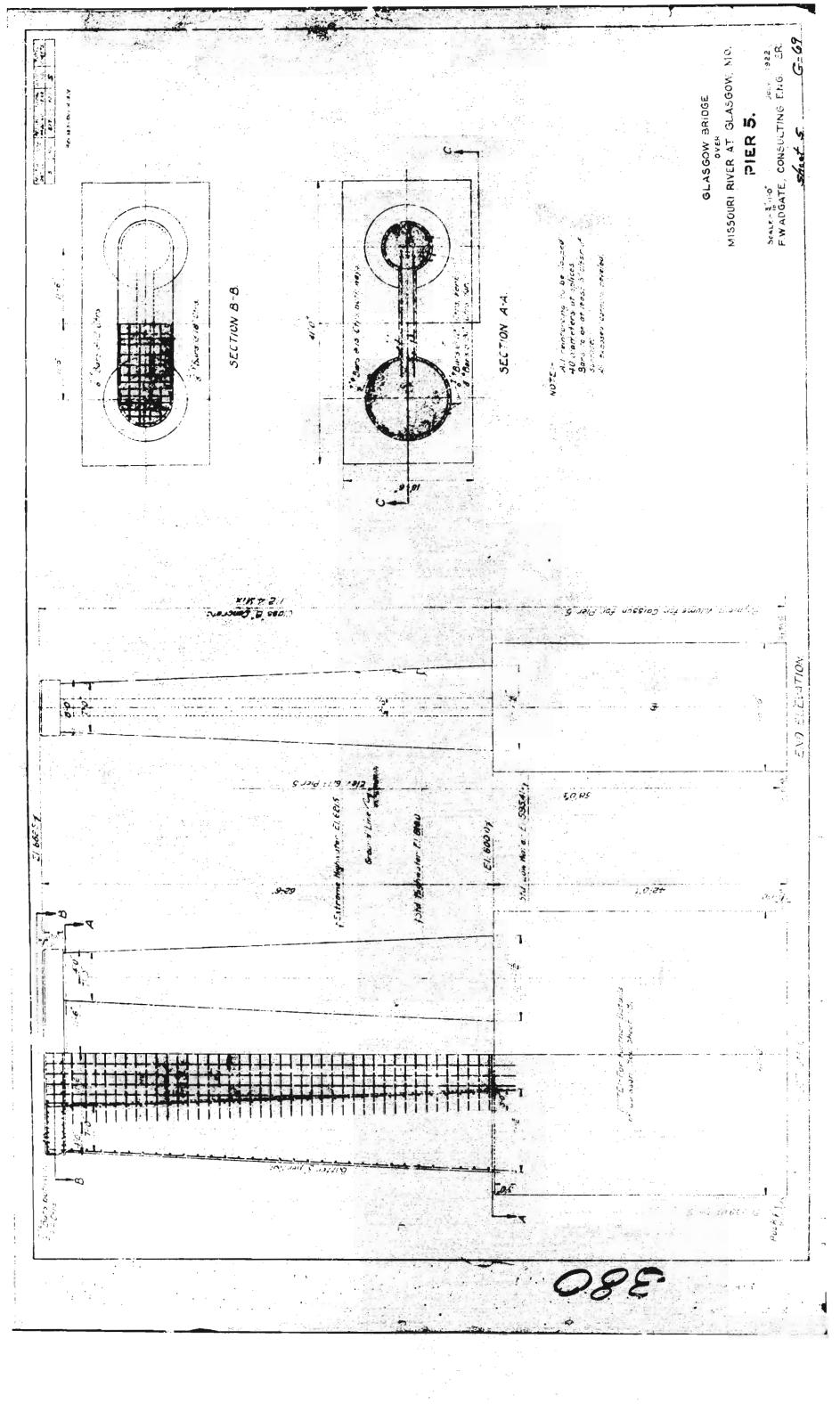


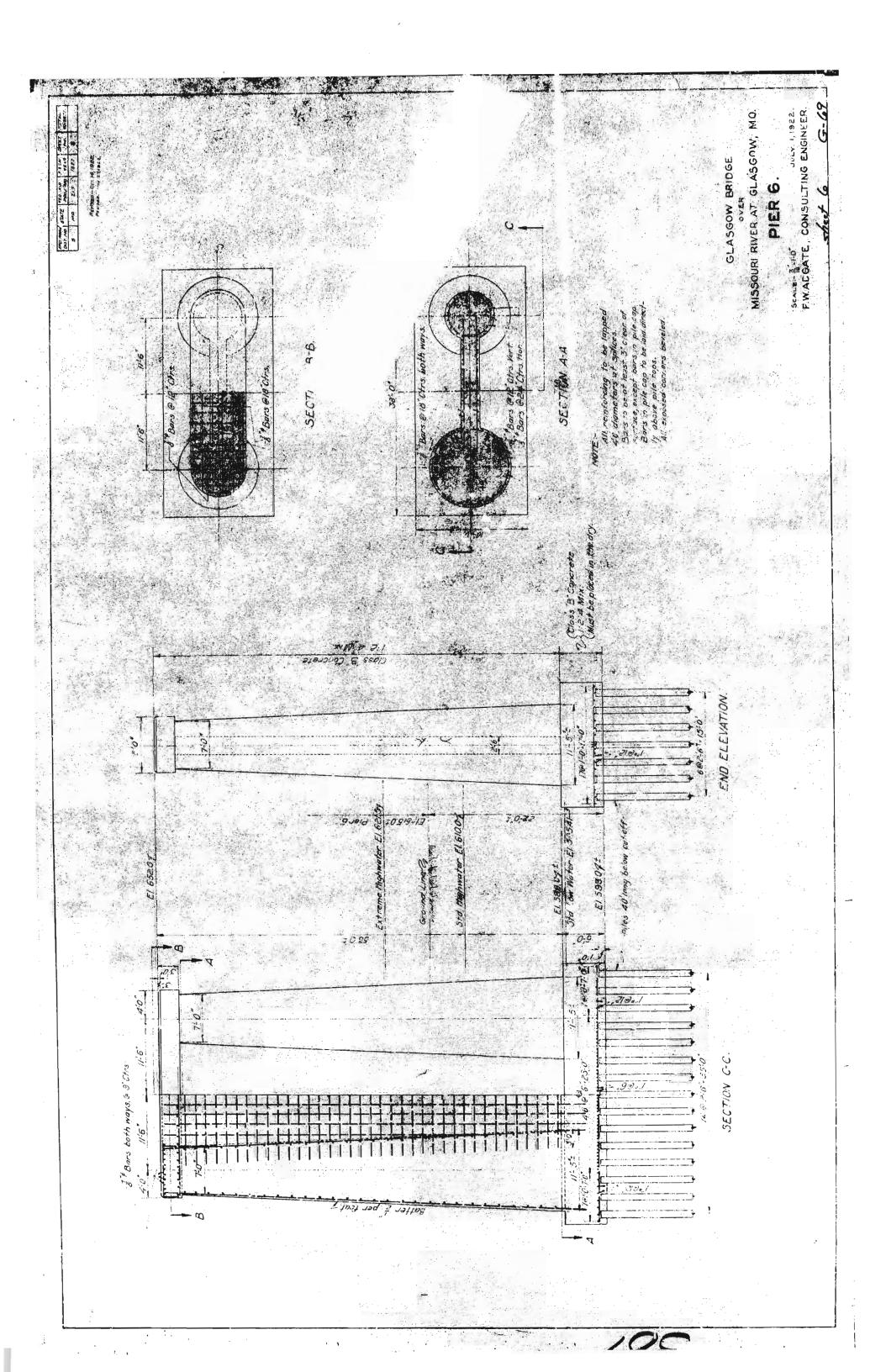


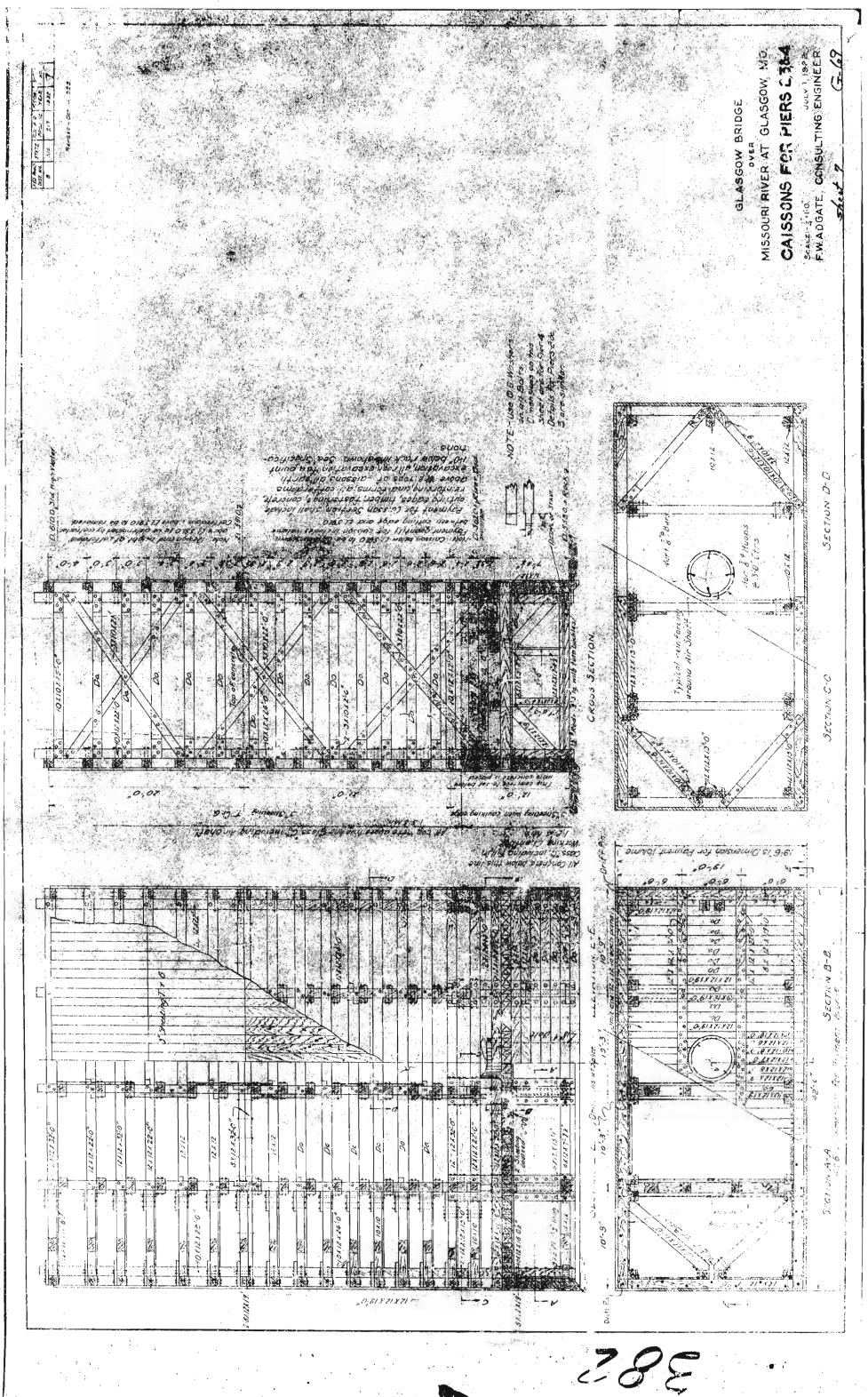
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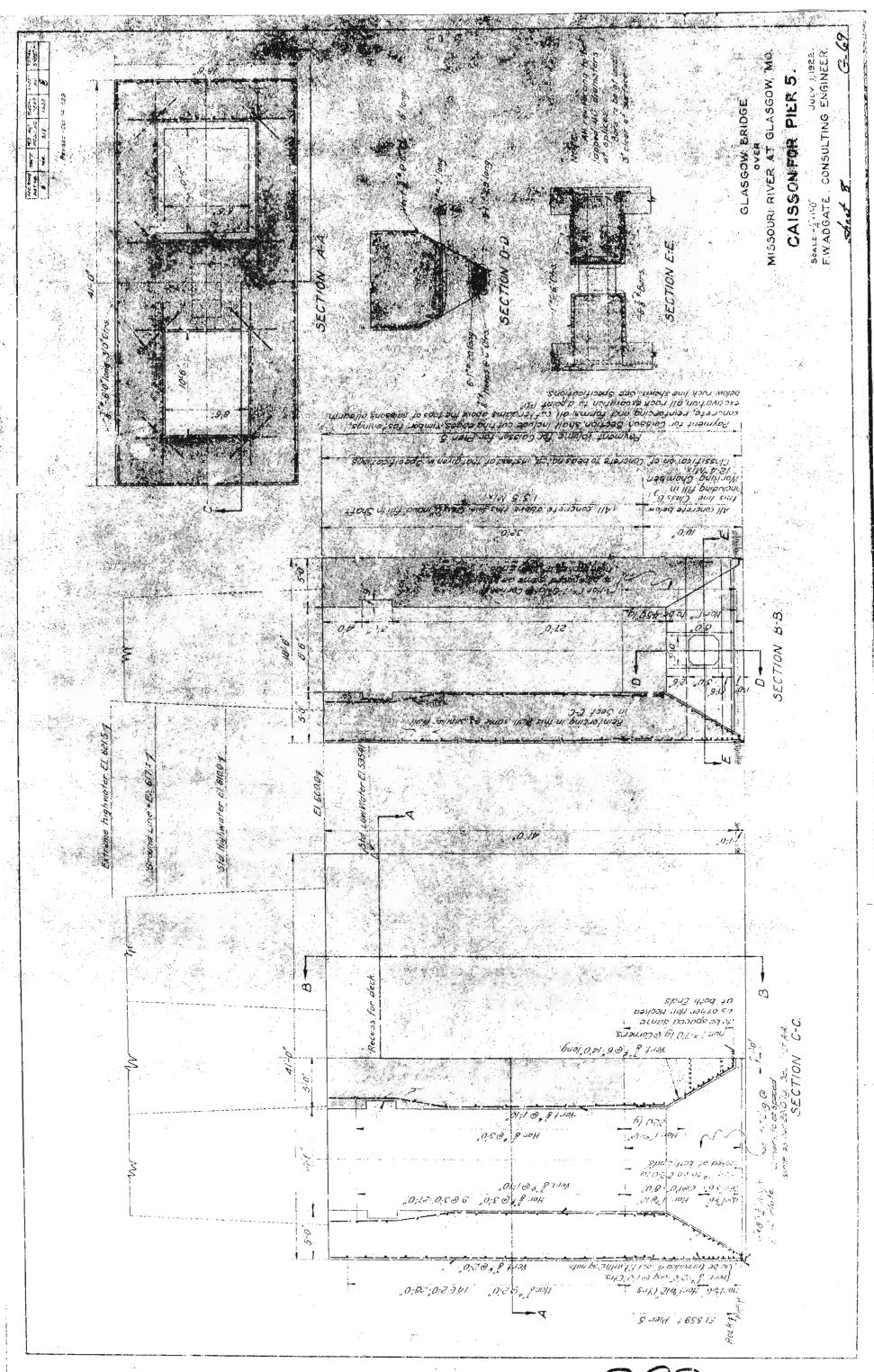






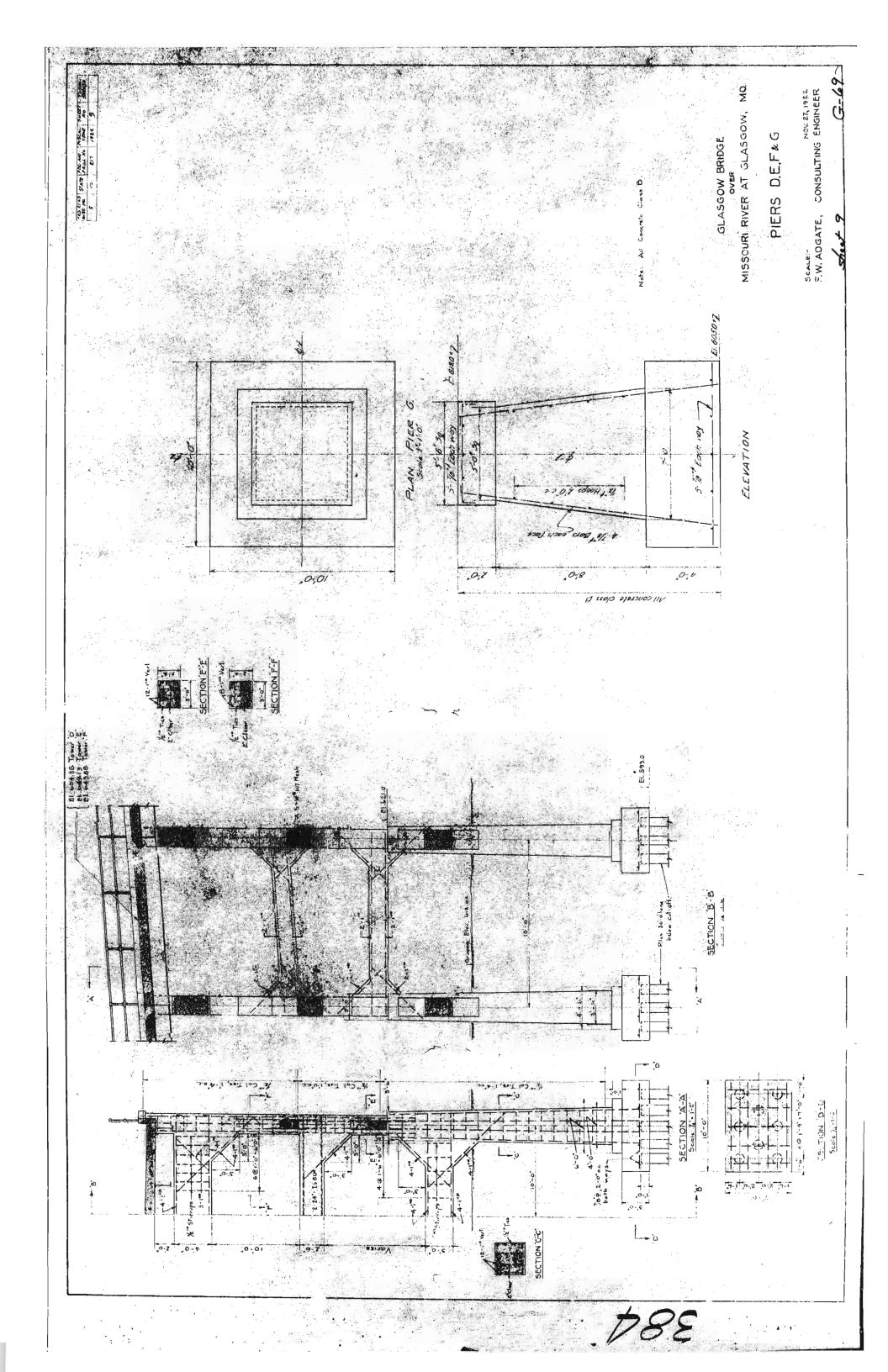


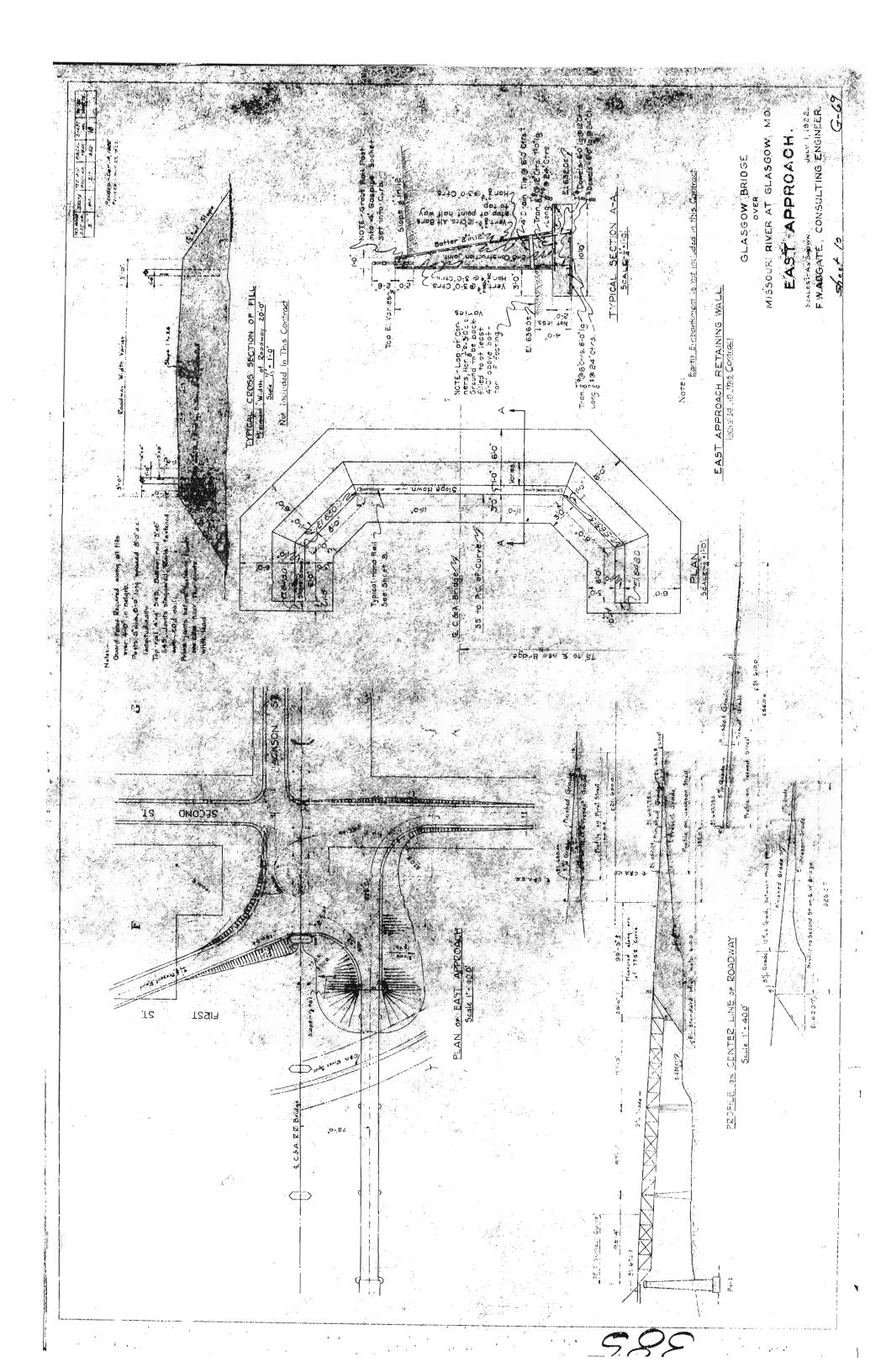


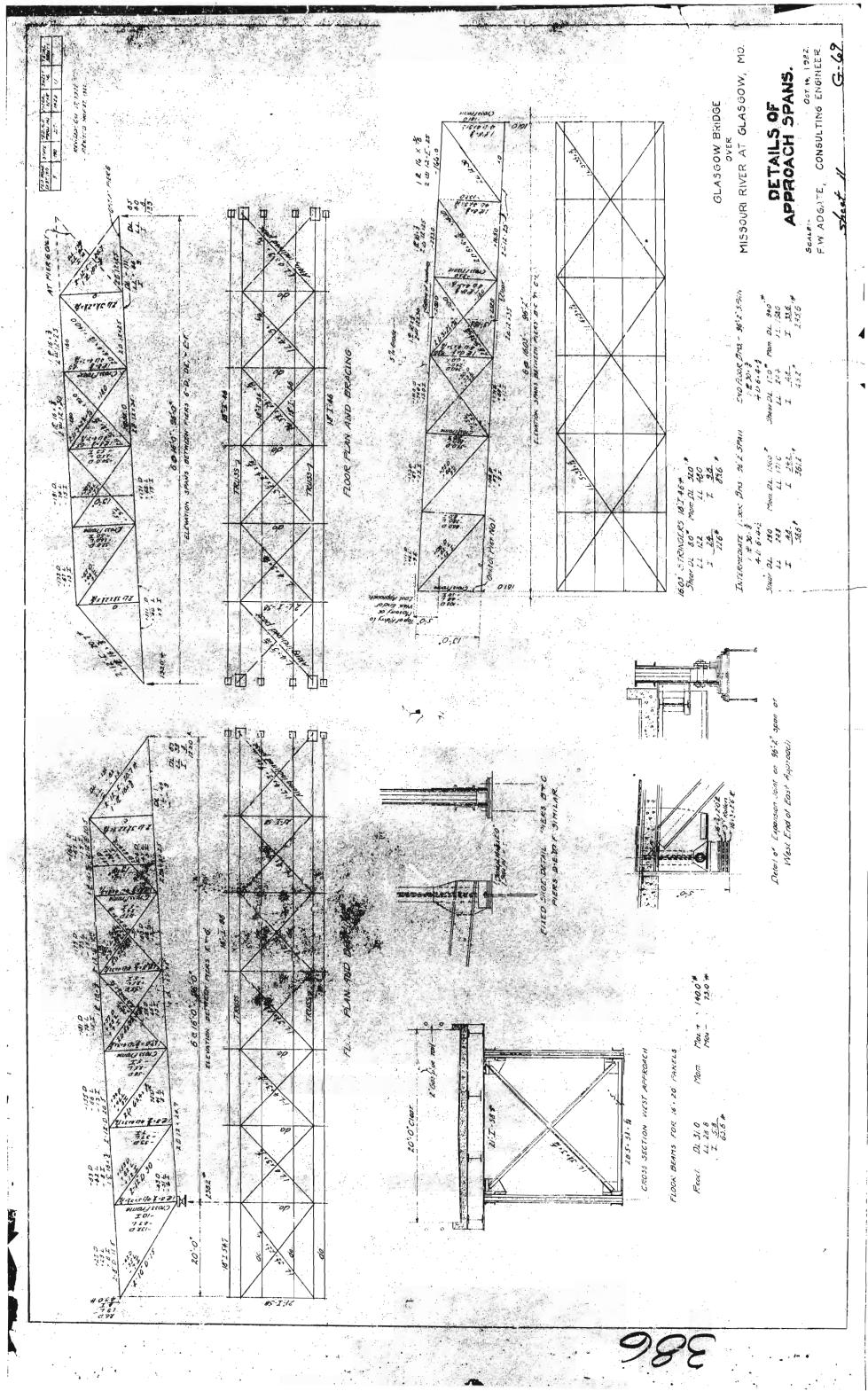


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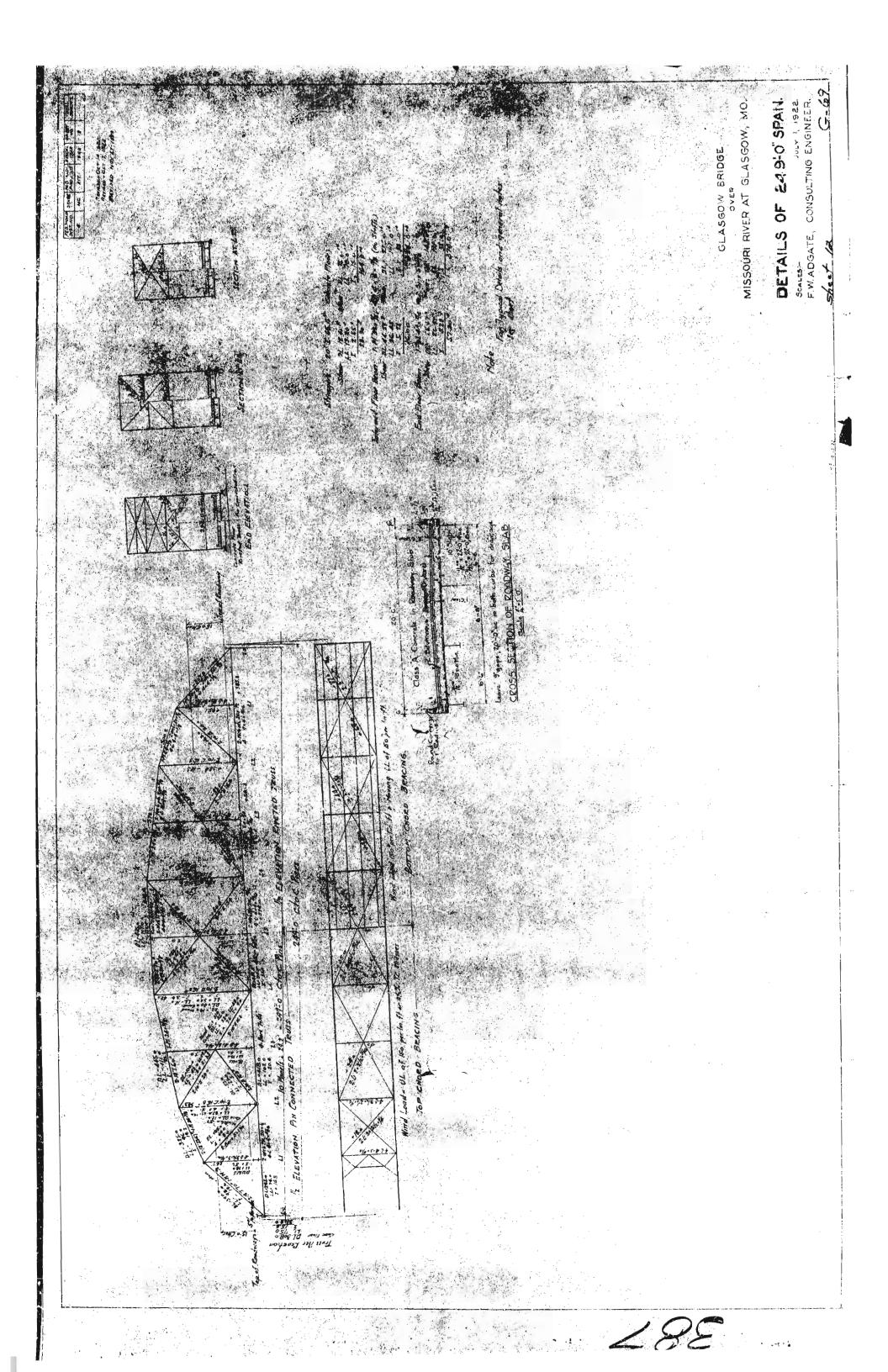
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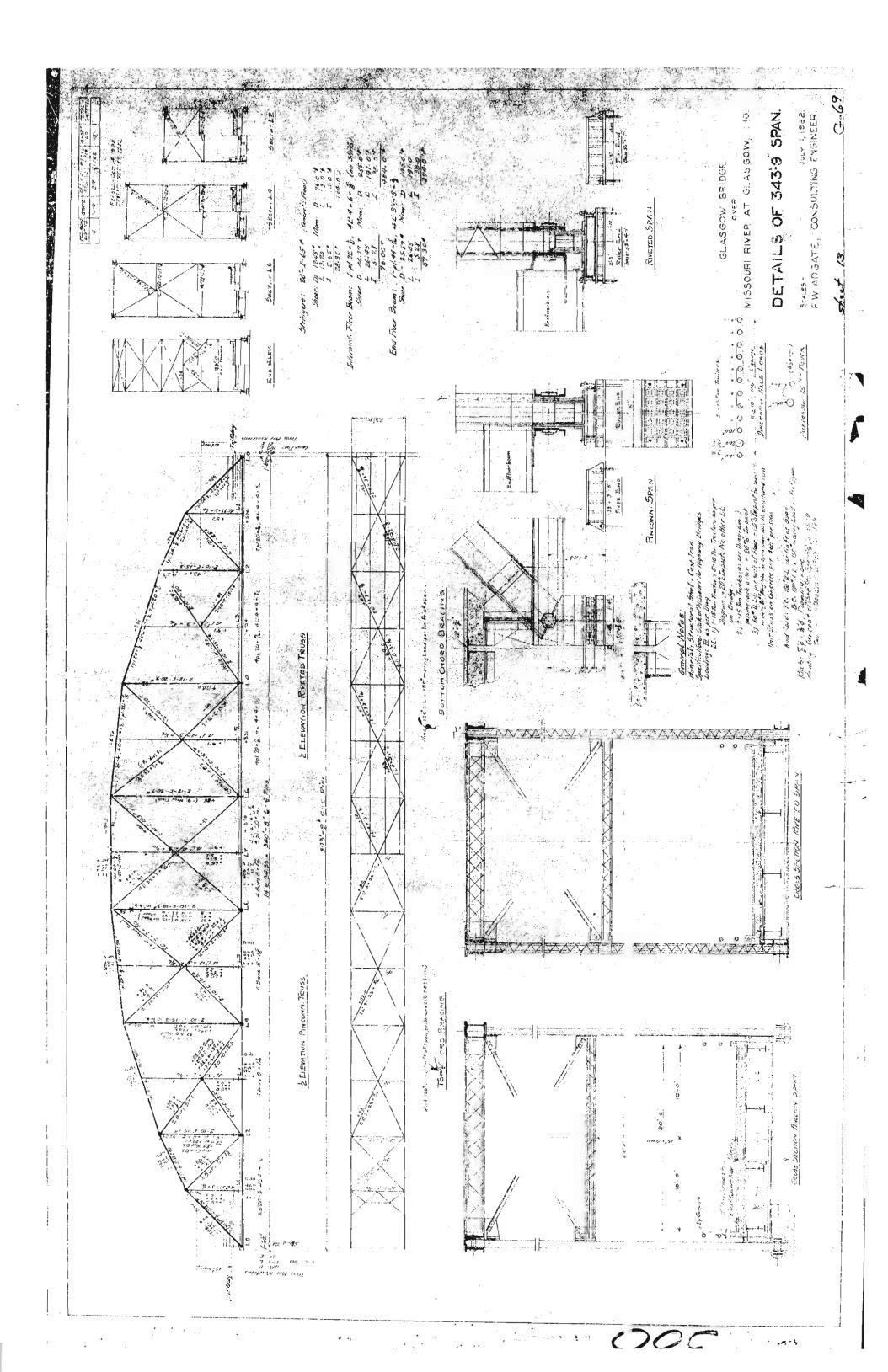


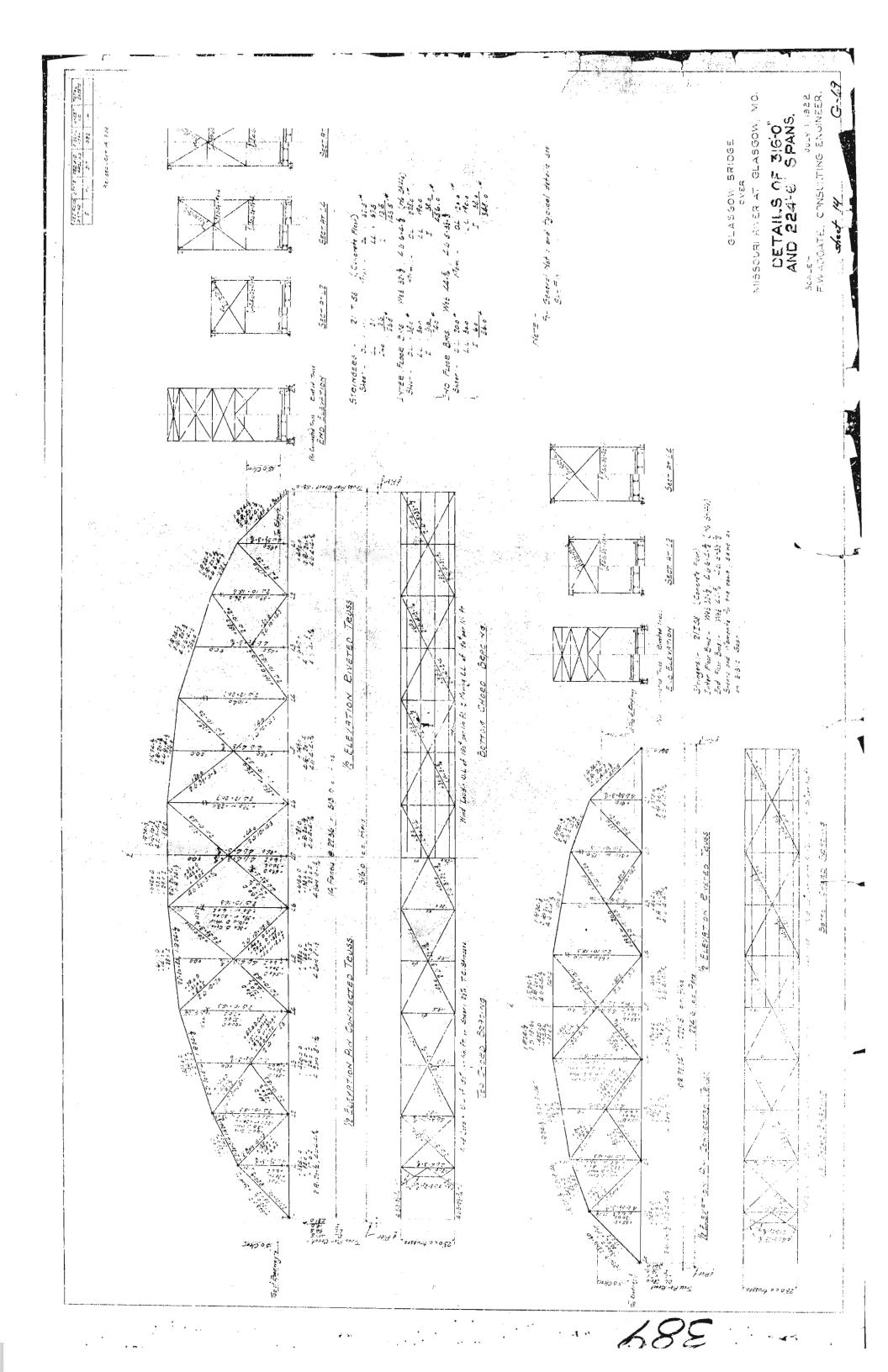


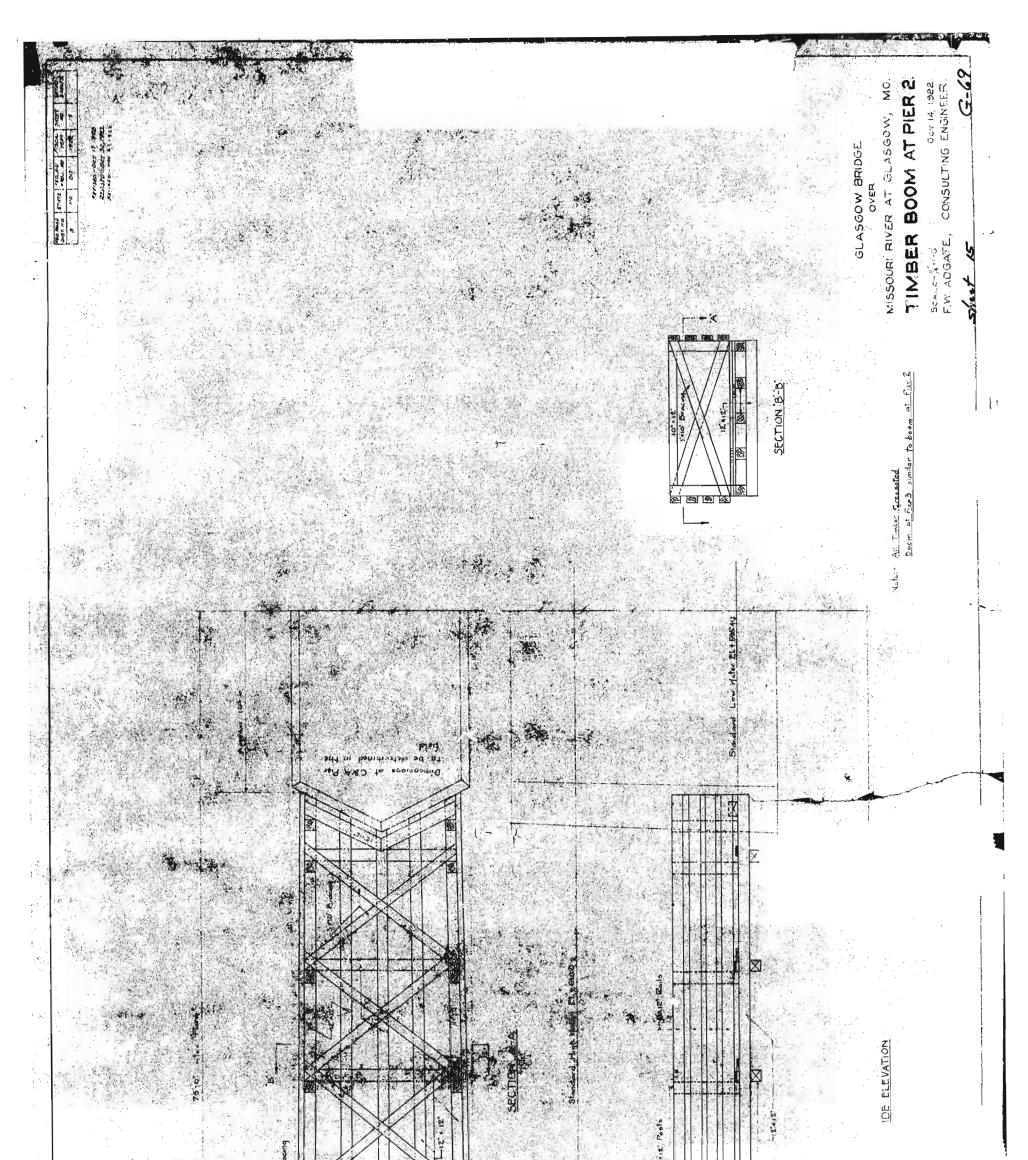


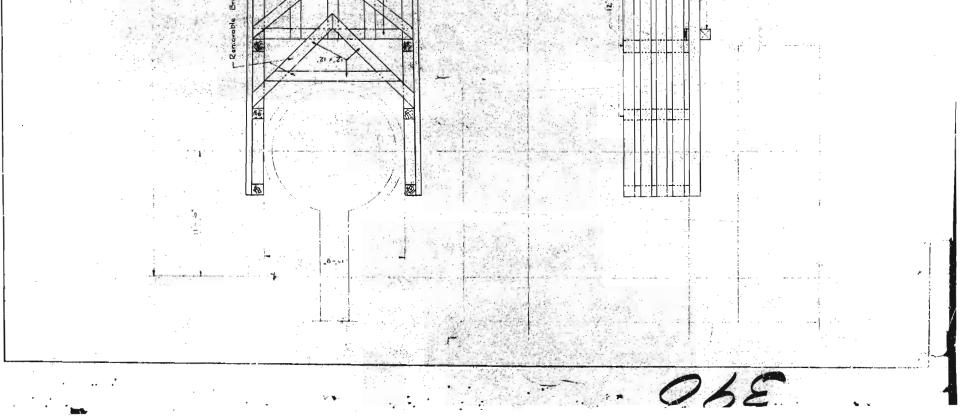
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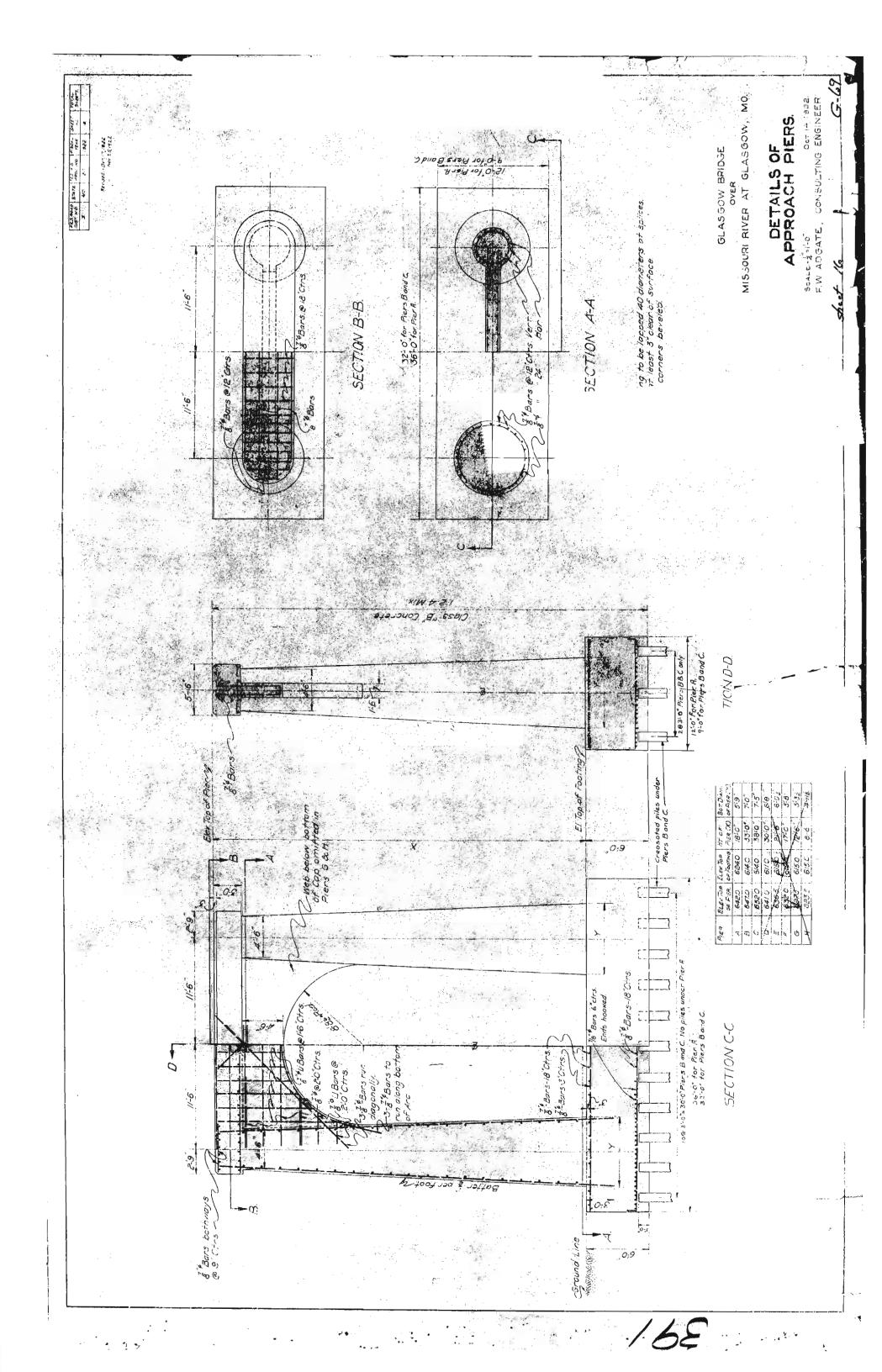


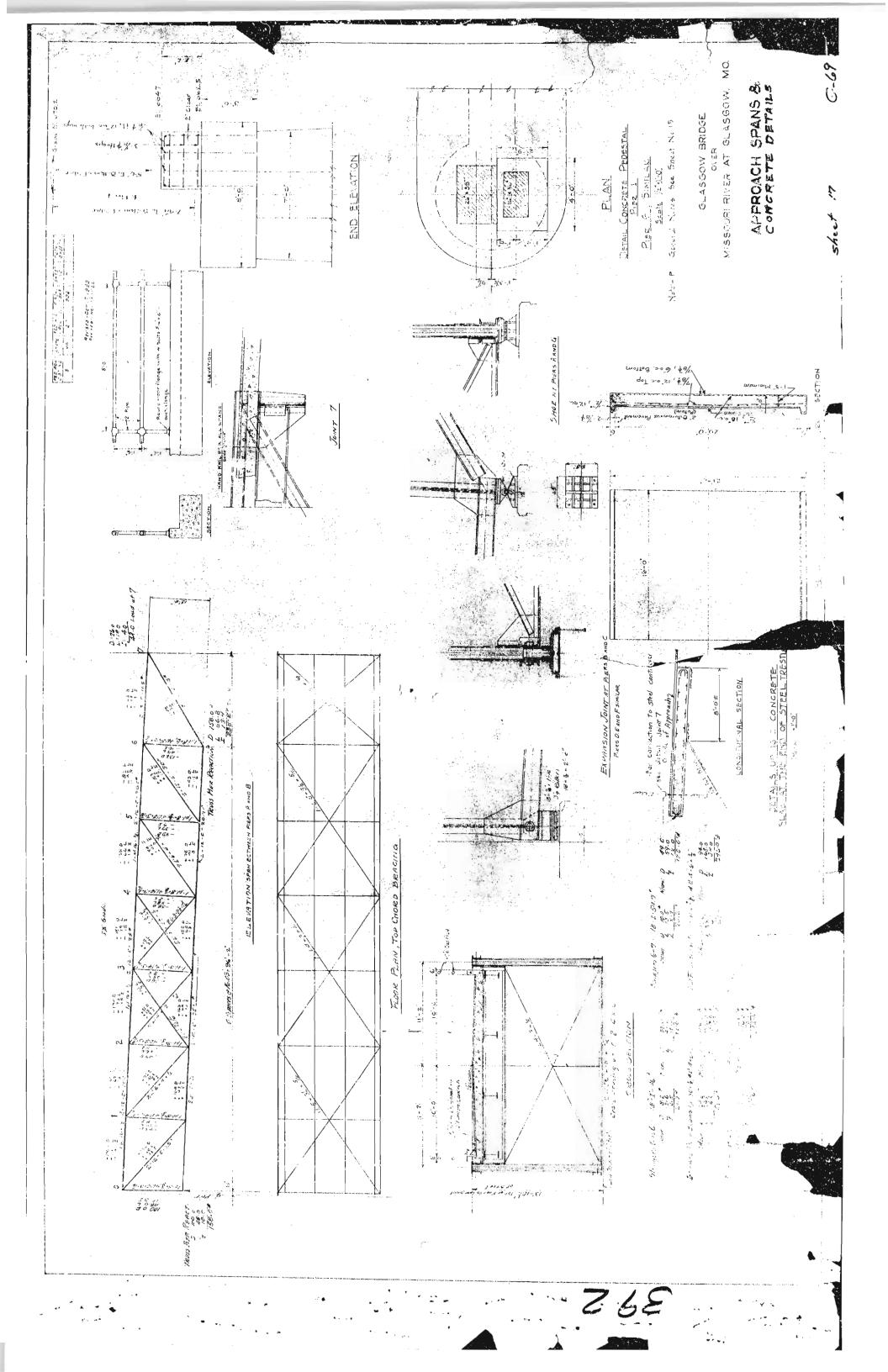


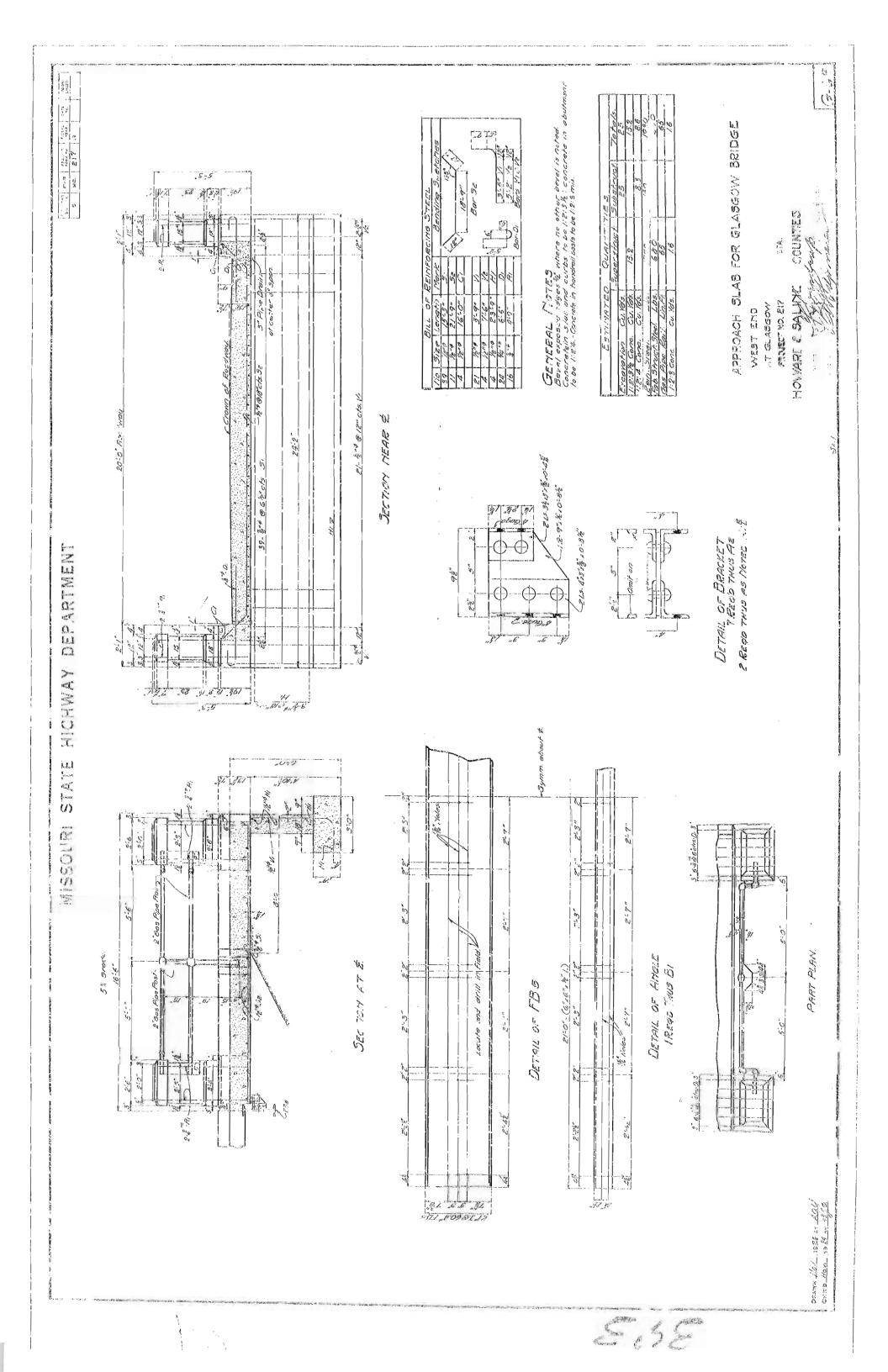


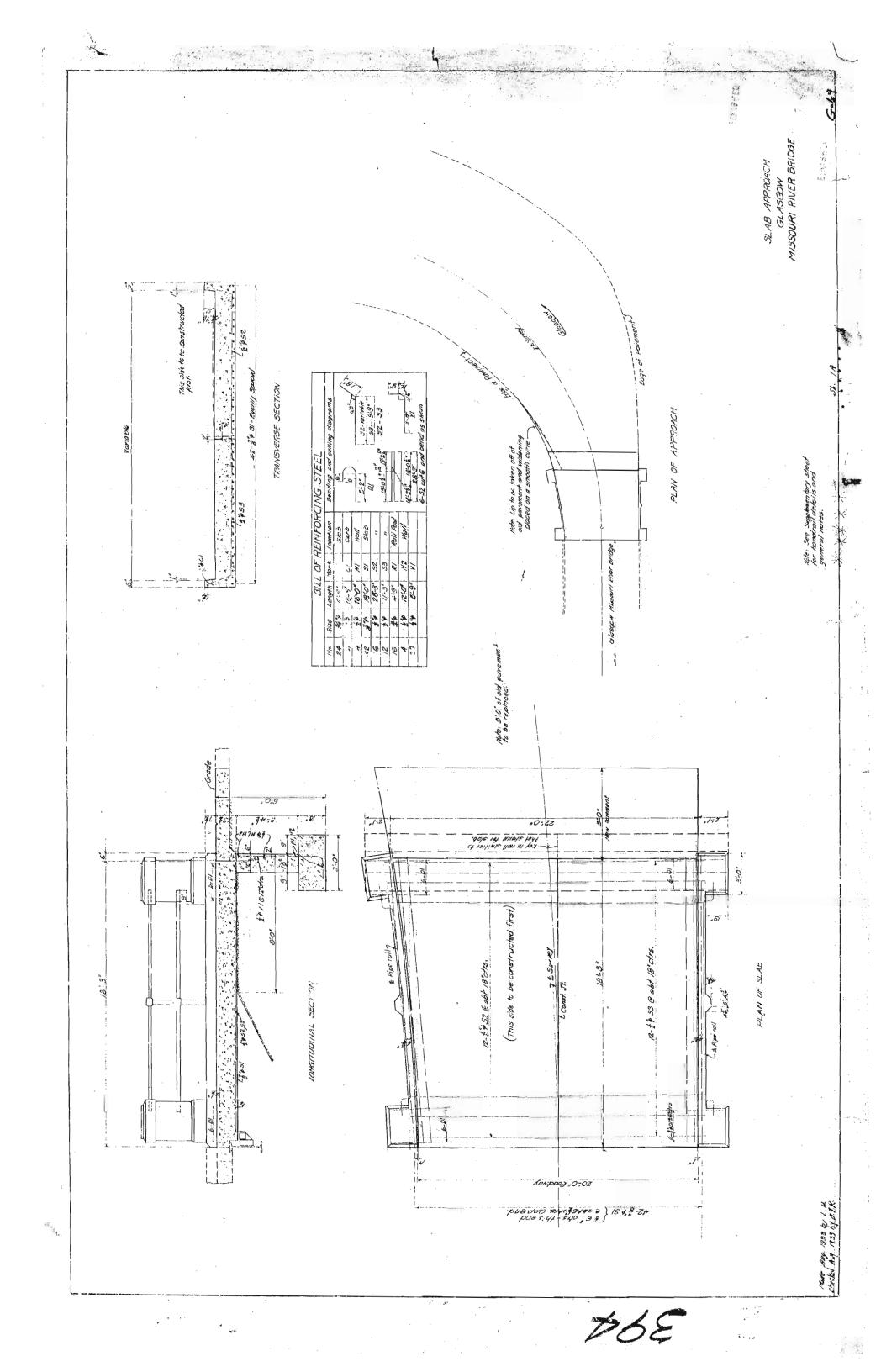






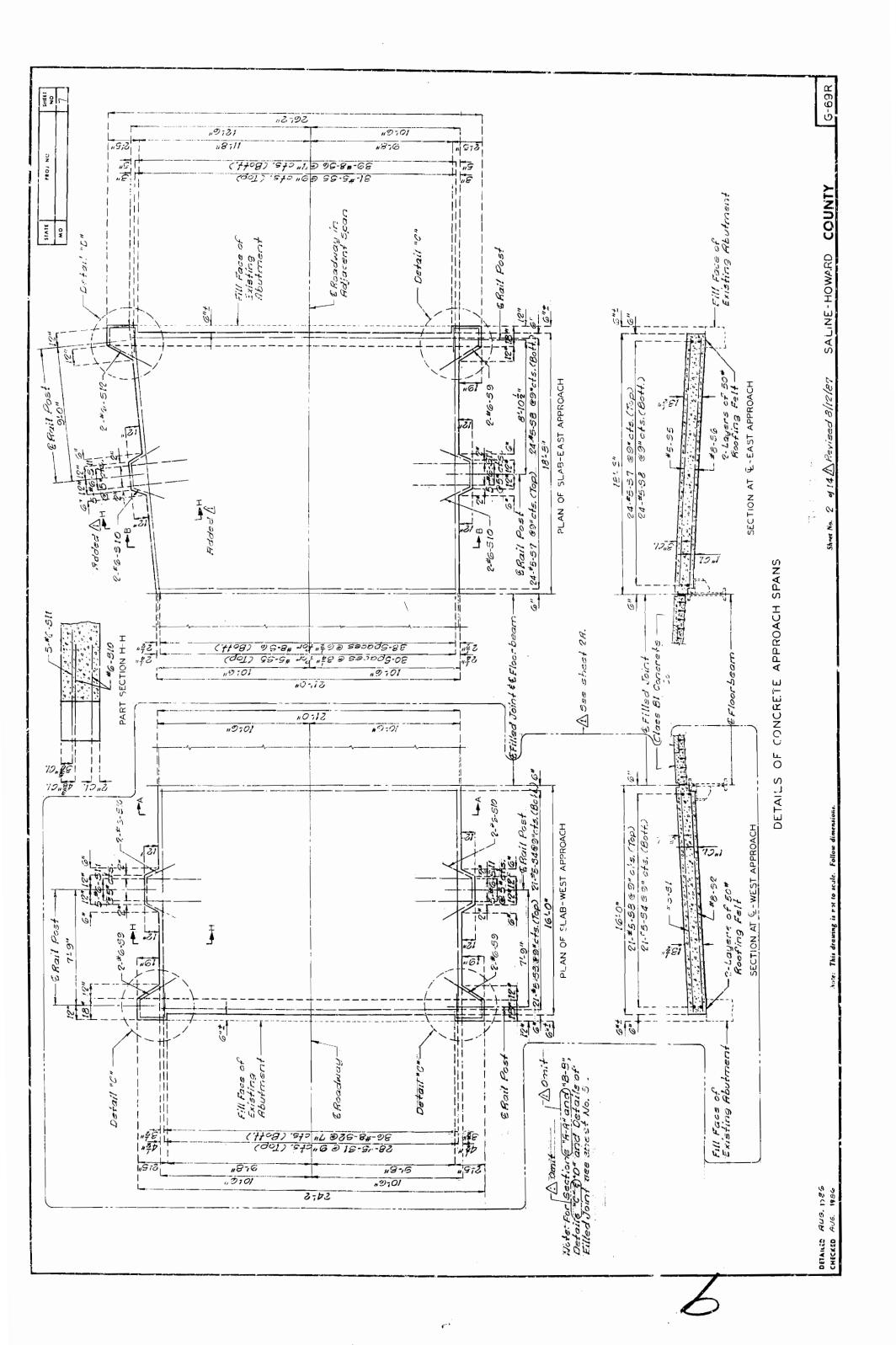


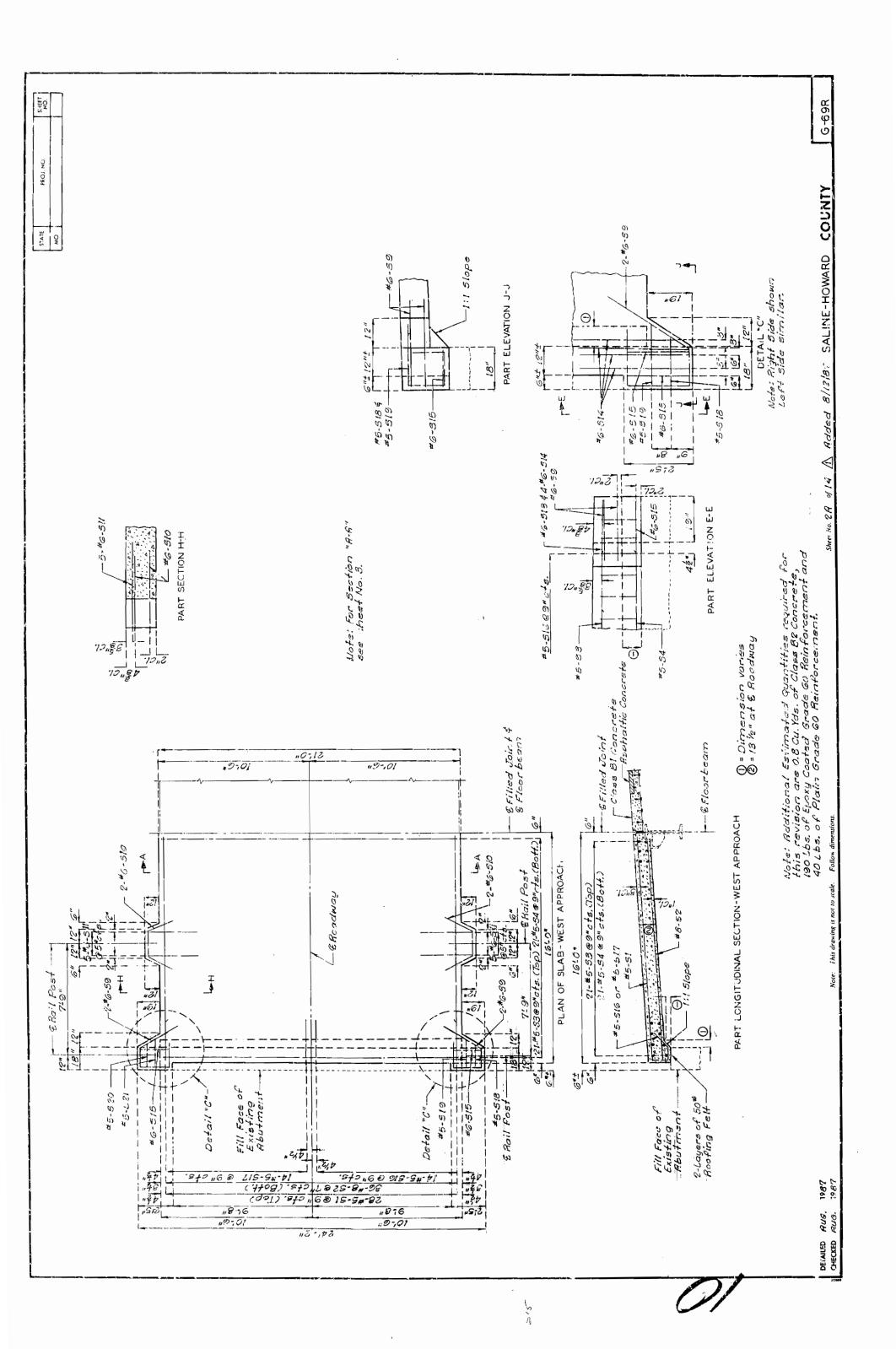


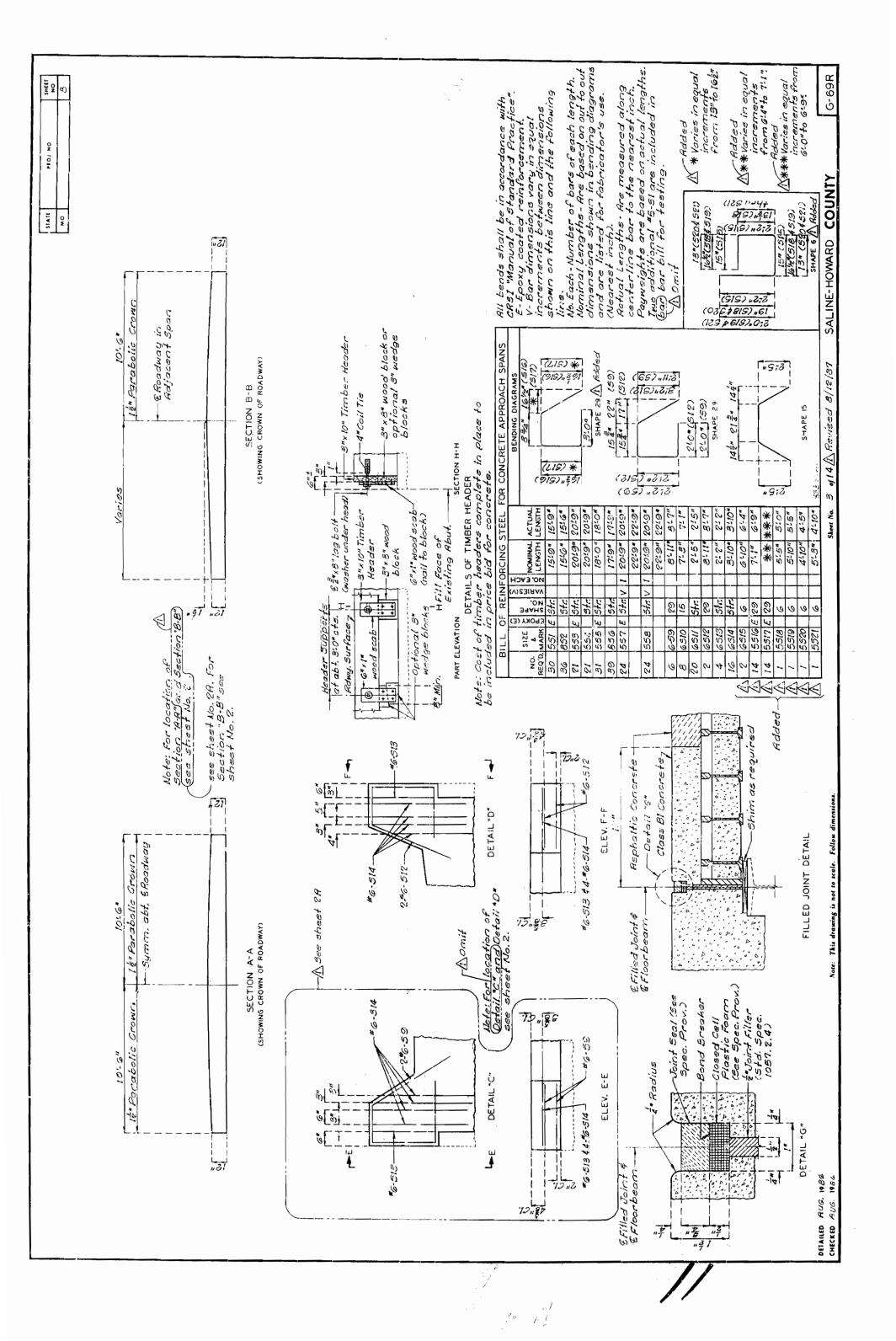


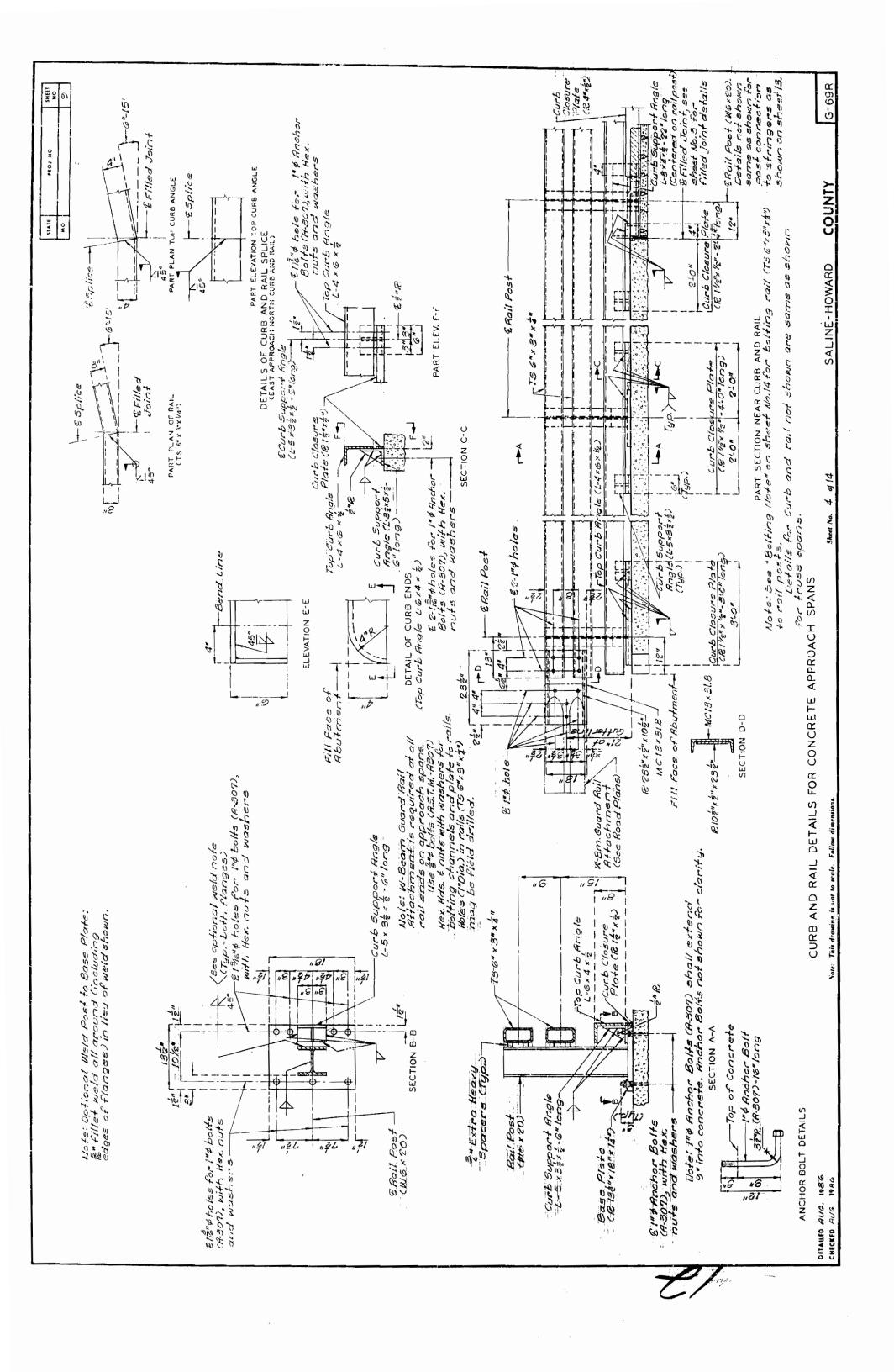
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9 (-1) @ 			12		
od Interims	GENERAL NOTES (CONT.): Cancrete Banding Compound: An approved epoxy bonding agent is required between ald and new concrete for substructure repair. See Standard Specifications.	ESTIMATED QUANTITIES ITEM Removal of Existing Bridge Deck 59. Ft Asobaltic Cement (Asphaltic Concrete) 50-70 or AC-20 (Type A Mir)	SUBSTR. SU	superstr. 47,360 4 40.7	10:AL 47,360 40.7
zir) fa=f.JUps! h 0 psi 0 psi 861 0 psi	Painting: Shop None; Field, System 8 Green, except as neted. Dimansions: Contractor shall verify all dimensions in the field before ordering new steei.	Minerai Aggregate (Aspnaltic Consrete) (Type A Mix) Bridge Deck Water Proofing (Liquid) 50 bstructure Repair (Formed), 5se 5pec Prov. 59, Ft Substructure Repair (Unformed), 5se 5pec. Prov. 59, Ft Class El Concrete (Supetr. Solid Slab' Class El Concrete (Supetr. Solid Slab' Laminated Neoprene Bearing Pads (Steel Structures) Each	255		.68 4, 900 258 660 30.7
be A500 (Grade B) cept as noted feel shall		רי) ארין דרי) אואברוקדע אואברוקערי	460	999	142 20 4,700 2,070 2,070
g shall be tion. ht dashed	Drainage System-Pier 5: All drainage system pipe and fittings shall be Reinforced Thermosetting Resin Pipe (RTRP) mesting the requirements of R.S.T.M. Specification 02996. All pipe supports and mounting brackets shall be R.S.T.M. Ass. All bosts for pipe supports and mounting Landate shall be stad and	Expansion Vevice (Finger Plate) Lim Ft. Steel Grid Floor (Concrete Filled) So.Ft. Bridye Rail (Two Tube Structural Steel) Lin. Ft. Rehabilitate Bearings Slab Drains Slab Drains Pearings Protective Coating for Concrete Bants (Deleterious Agents)		20 46,135 4,510 2 524 1	20 46,135 4,510 2 524 1
ed bars.	One of the anchor systems listed in the job opecial provisions shall be used for attaching pipe suppurts and mounting bruckets to existing concrete. These anchor systems shall be installed according to the manufacturer's specifications.	olace o		02 m m	~ 00 m
/en. A insd, top of inoted, s %1* b, h strength		Nofe: 133 59, Ff. of Substructure Repair (Formed) shall Nofe: 133 59, Ff. of Substructure Repair (Formed) shall and reficiency approximately 19 Lin. Ff. of the beam a approximately 1.8 Cu. Yd. of Closs BI Concrete. REPAIRS TO REPAIRS TO BRIDGE OVER MISSOURI RIV STATE BOAD ROUTE 240	vER	ل تعضيدين د مسيدين ا	n norine Suine Suine
Note: This drawing is not to scale.	Foilow dimensions.	715 1/23/06	<b>51A</b> . 1267+06 <b>Rff</b> . 240 <b>COUNTY</b>		510. 510. 706.5u G-69R

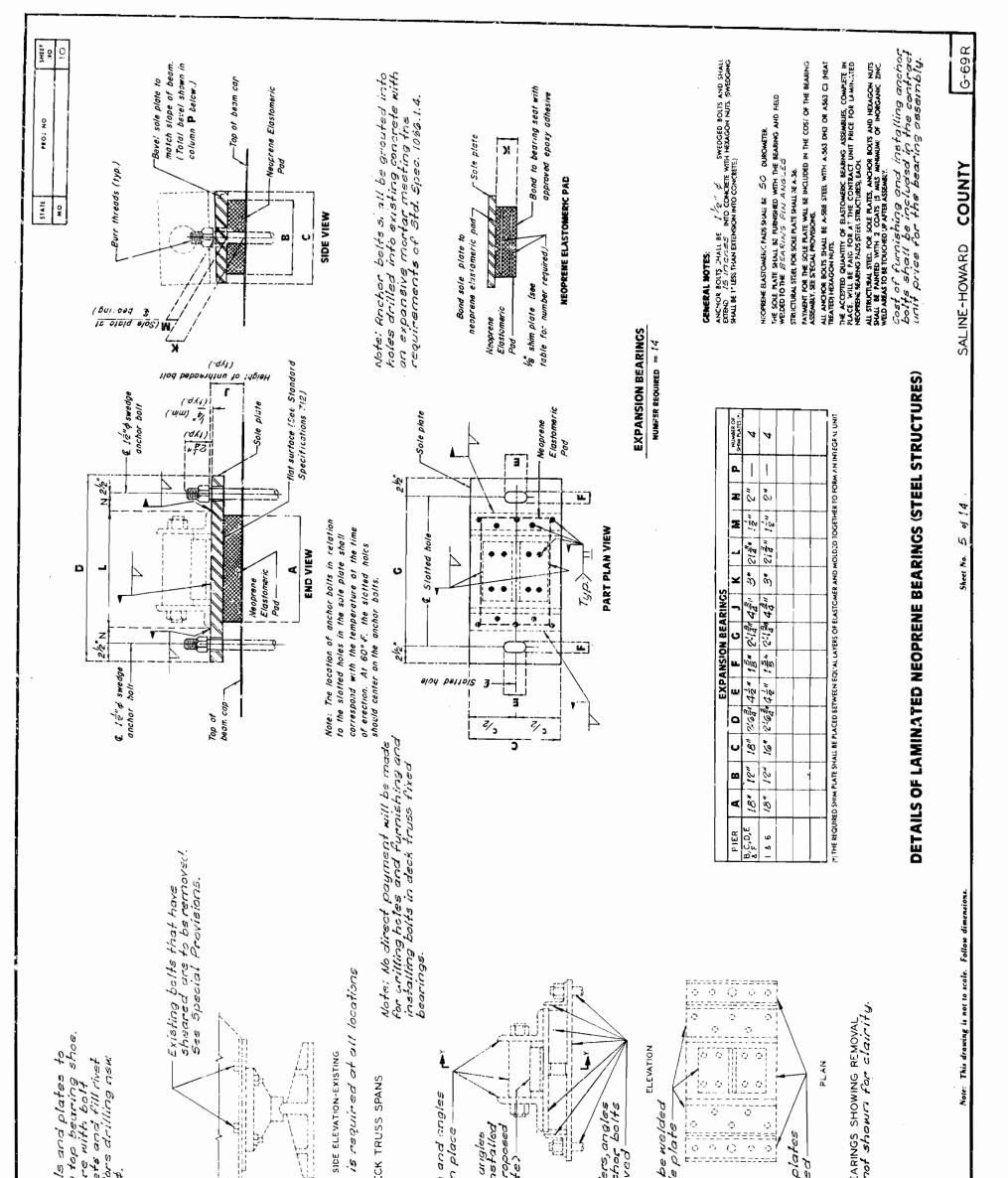
Build 16:0° Concrete Span Build 16:0° Concrete Span With Rail Posts, Rails and Guard Rail Attachments Guard Rail Attachments Rail Posts and Re Mest WEST WEST Mest	GENERAL NOTES: Design Speaifications: J.A.S.H.T.O. 1983 and II 1984 and 1985. Design Loading: HS 20-44 Load Fastor Design-Approach Spans	Ocsign Unit Stresses: Class BI Concrete (substructure repair); Class BI Concrete (Guncrete Rp)roach Class B2 Concrete (Concrete Rp)roach Class B2 Concrete (Concrete Rp)roach Structural Steel (Grade 60) fy=60,000 ps Structura! Steel Tubing (T3) fs= 20,000 ps Structura! Steel Tubing (T3) fs= 27,600 ps	Structural Steel: Structural Steel Tubing (TS) for rail shall be AS all other structural oteel shall be A36 sucept Reinforcing Steel: Minimum clearance to rsinforcing steel be its unless otherwise shown.	Navigation and Clearance Lights: All navigation and clearance lighting sh kept in operation during all construction	old and New Work: Outline of old work is indicated by light d liniss. Heavy lines indicate new work: Bars bonded in old concrete not remo shall be cleanly stripped and embedde new concrete where possible. If length available, old bars shall extend into ne concrete at least 40 diameters for sm concrete at least 40 diameters for sm concrete at least 40 diameters for sm	. Profile Grade: No "Profile Grade Elevations" are given. smooth traffic suface is to be chainsa expansion devices are to conform to cro slope of roadway surface except as not	Field Conrections: Field connections, High Strength Bolts %4 holes %6" 4, except as noted. Turn of Nut Method of tensioning high st ( 's will be permitted.	DESIGNED JULY 1986 DETAILED SEPT, 1986 CHECKED SEPT, 1986
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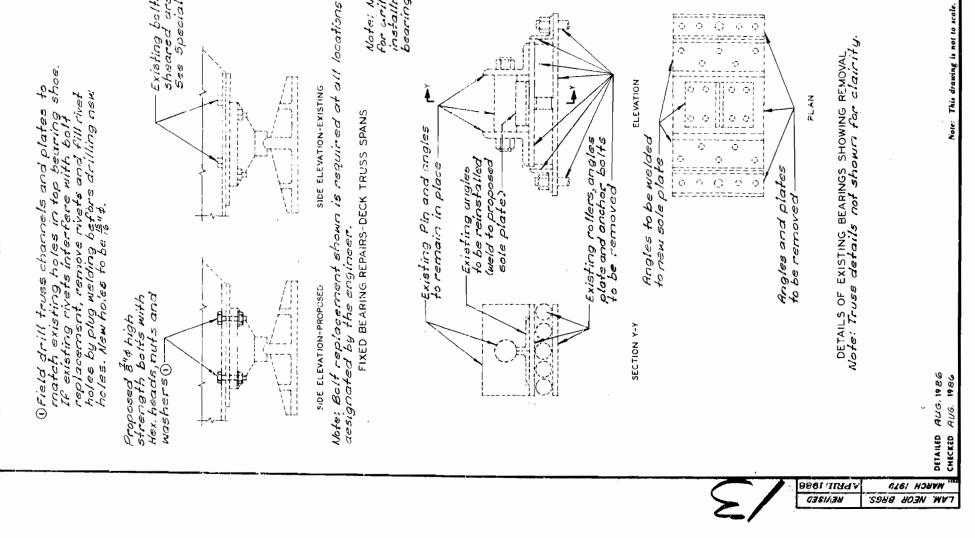




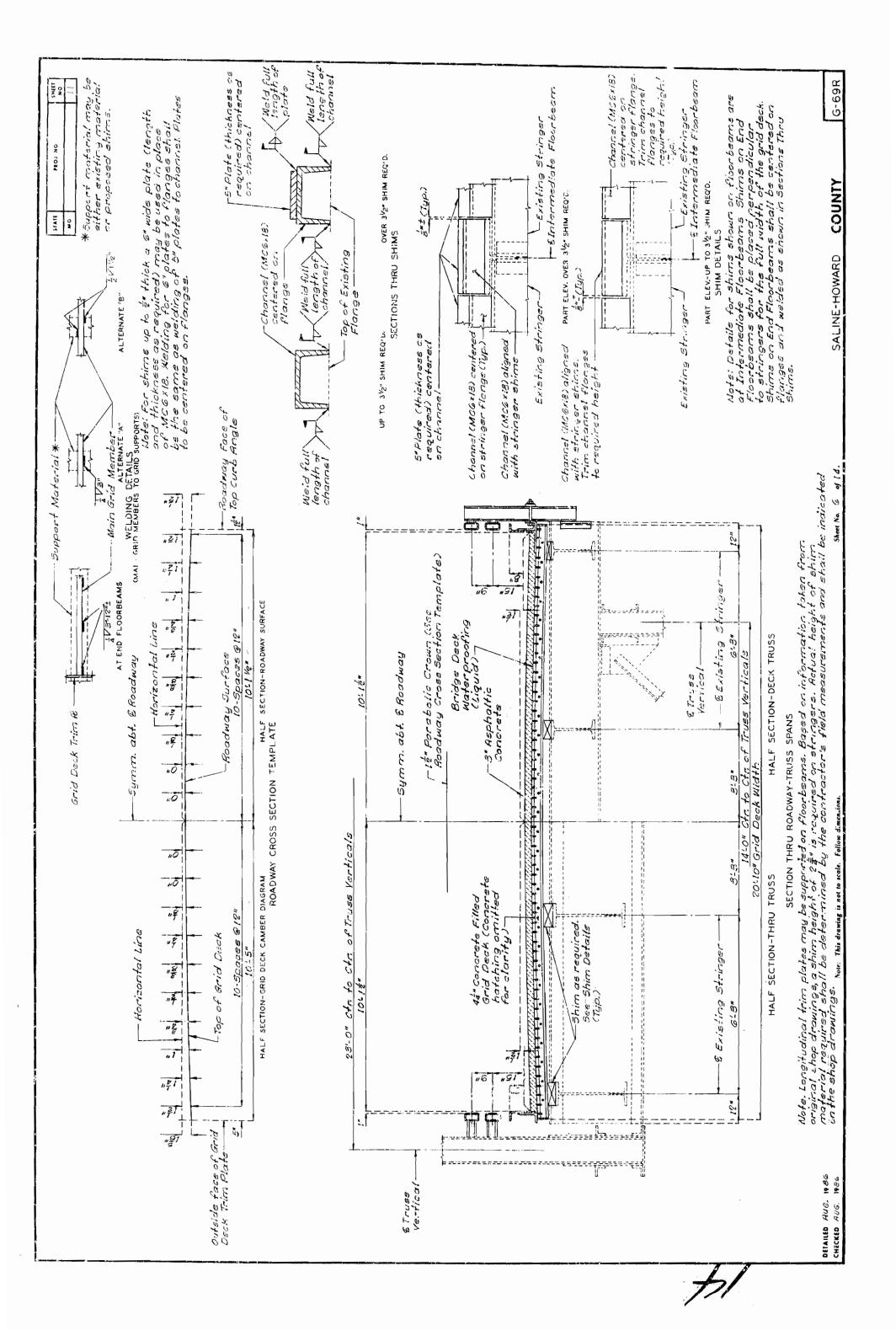




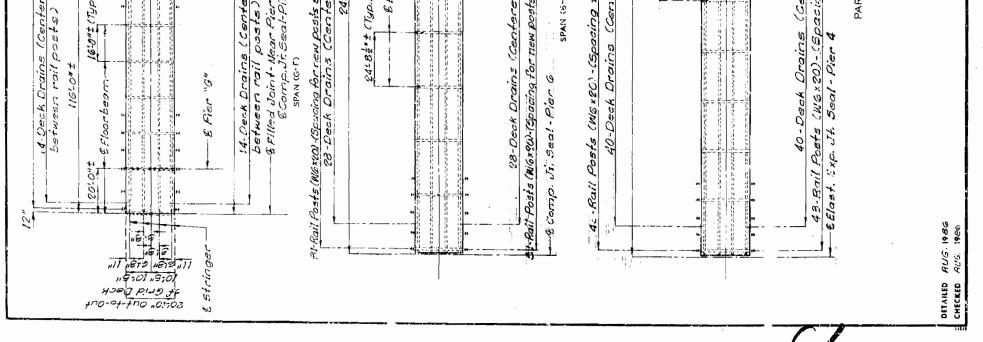


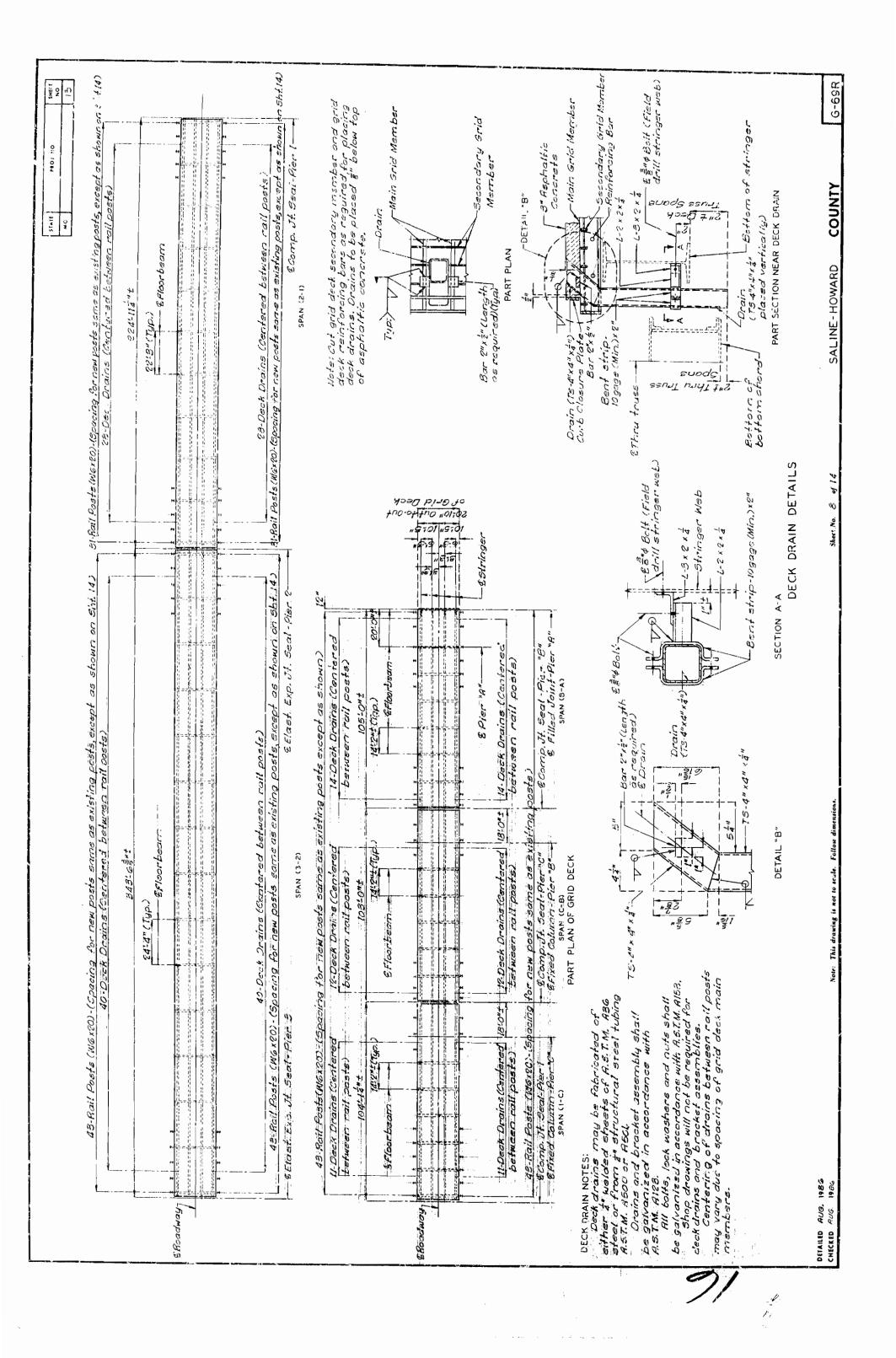


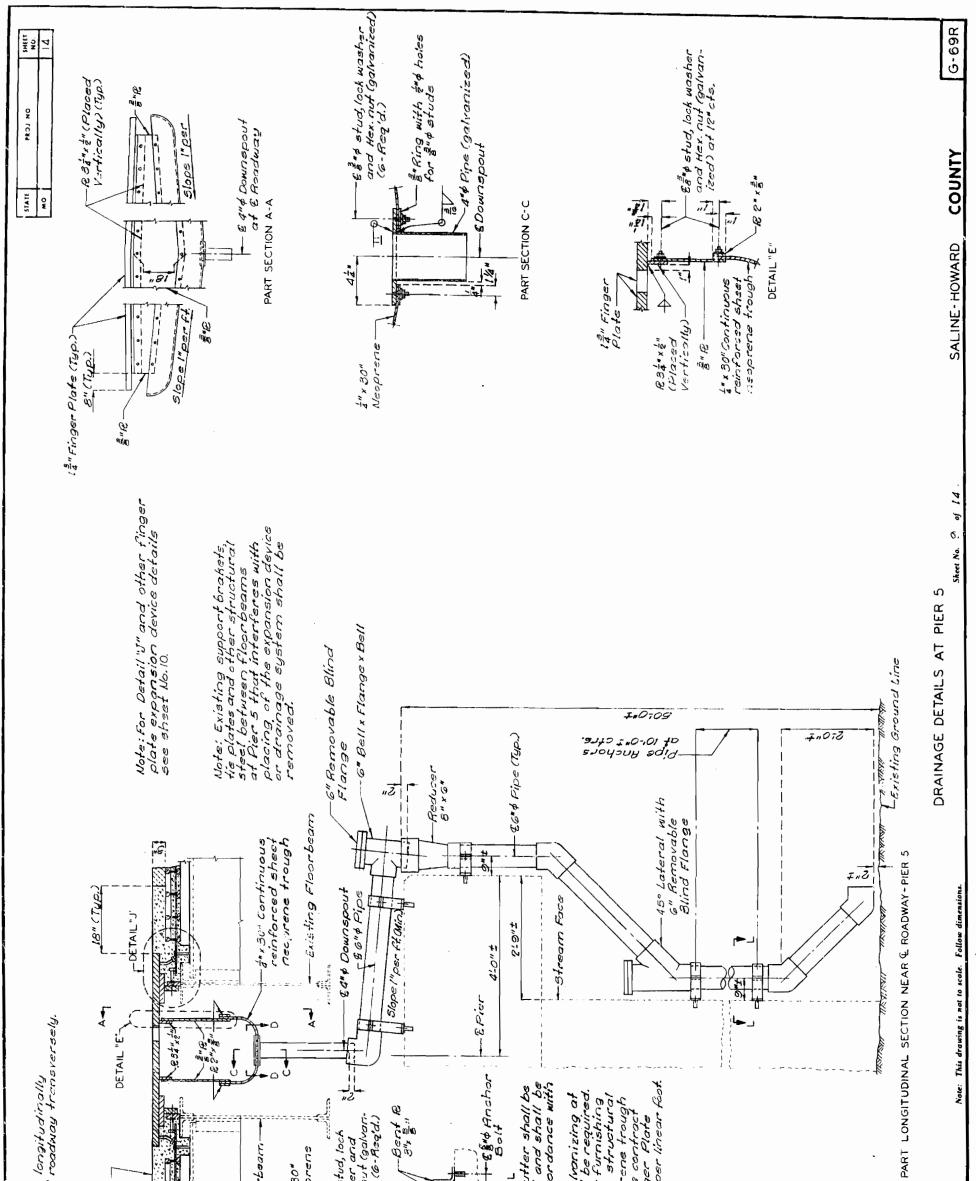
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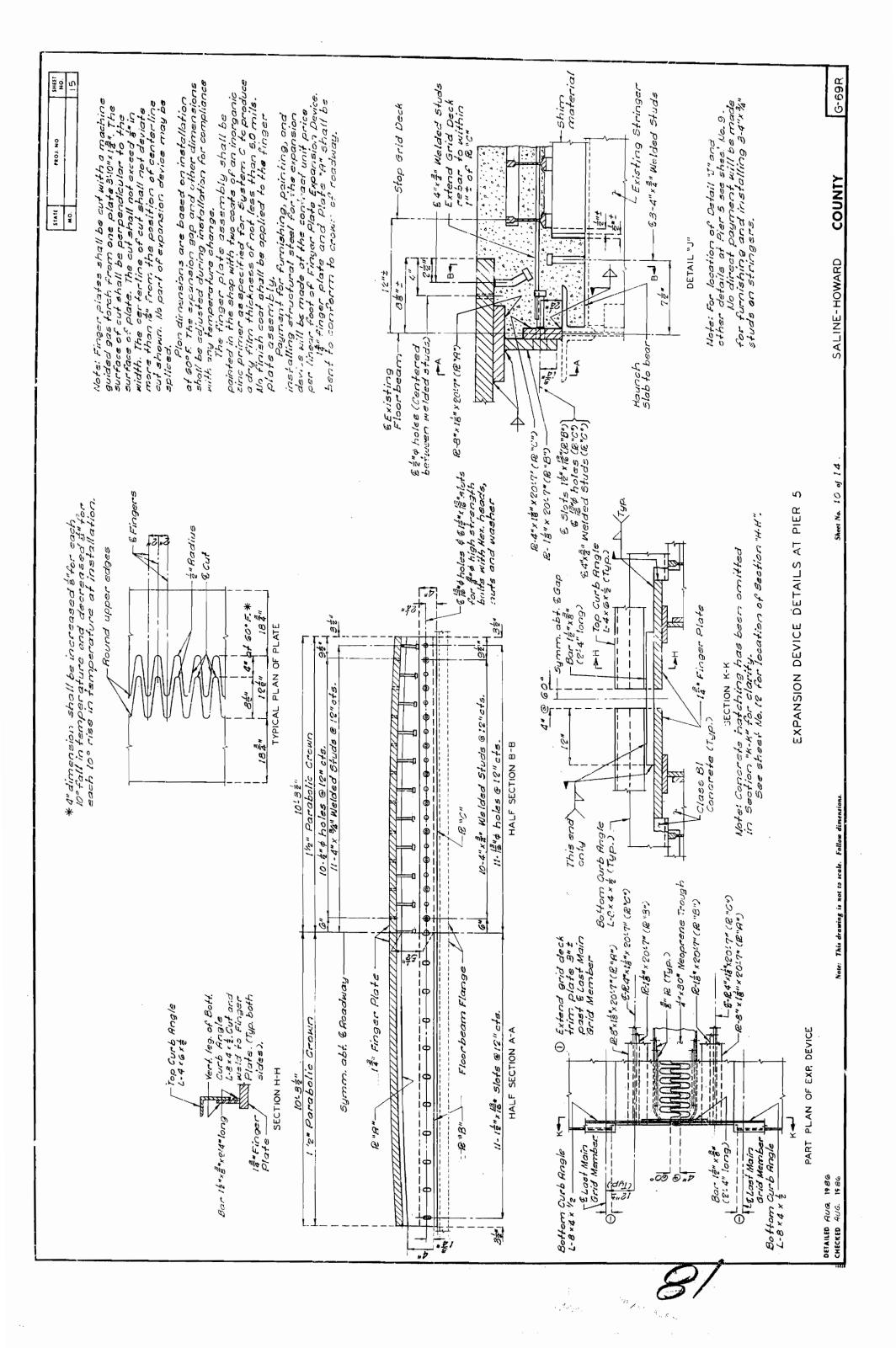
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1 posts same ar existing post. 12. Dice A Drains (Ce between noil post	E	14) 48-Rail Posts (Contered 18:04 12-Deck Drains (Contered between rail posts) 2. Comp. Jl. Seal. Pier 2. Comp. Jl. Seal. Pier 5. Rail Posts (W6x20). (Span 40. Deck Drain		43-Rail Posts (WGx202 43-Rail Posts (WGx202 Efinger (Late Expansion D 4 as shown on Sht. 42		except ae shown on Situ	
ste (Nex20) - (Spasing for new 12-Desh Drains (Senterad batween rail posts)	(6:0"±(Typ.)	(Spacing for ins (Centerso il posts) f. Seal-pier "E" no-Pier "E" 29 shown on 5ht		red between rail posts) ets same as existing pacts, sveept as shown on Sht 14) (5-5) g for new posts same as existing posts, except	en rail posts) sut	bełween rail posłe) ew posłs same as existing posts, exept GRID DECK GRID DECK	ı noi io scale. Follow dimension.
ET-Rail Poste		57- Rail Posts (W6 x20)- tered 18:0*± 12-Deck Dra er "G" betweer ra Pier"r - Efixed Colun fered betweer rail posts except	p.) E Floor beam	red between v <u>oi</u> <u>ets same as exvisitin</u> (6-5) <b>3 for new posts e</b>	-cd be	Gentered between	Note: This drawing is not to

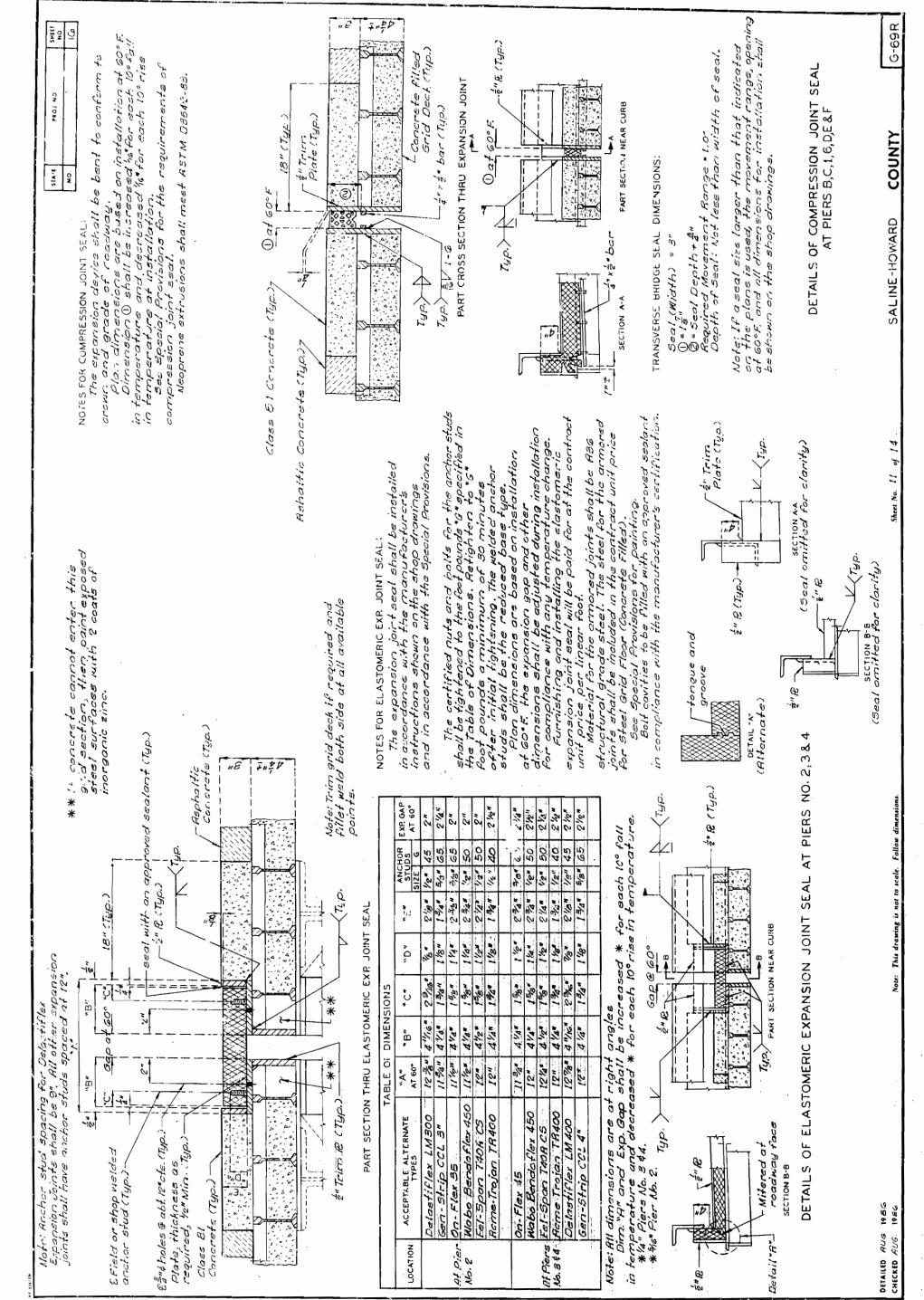


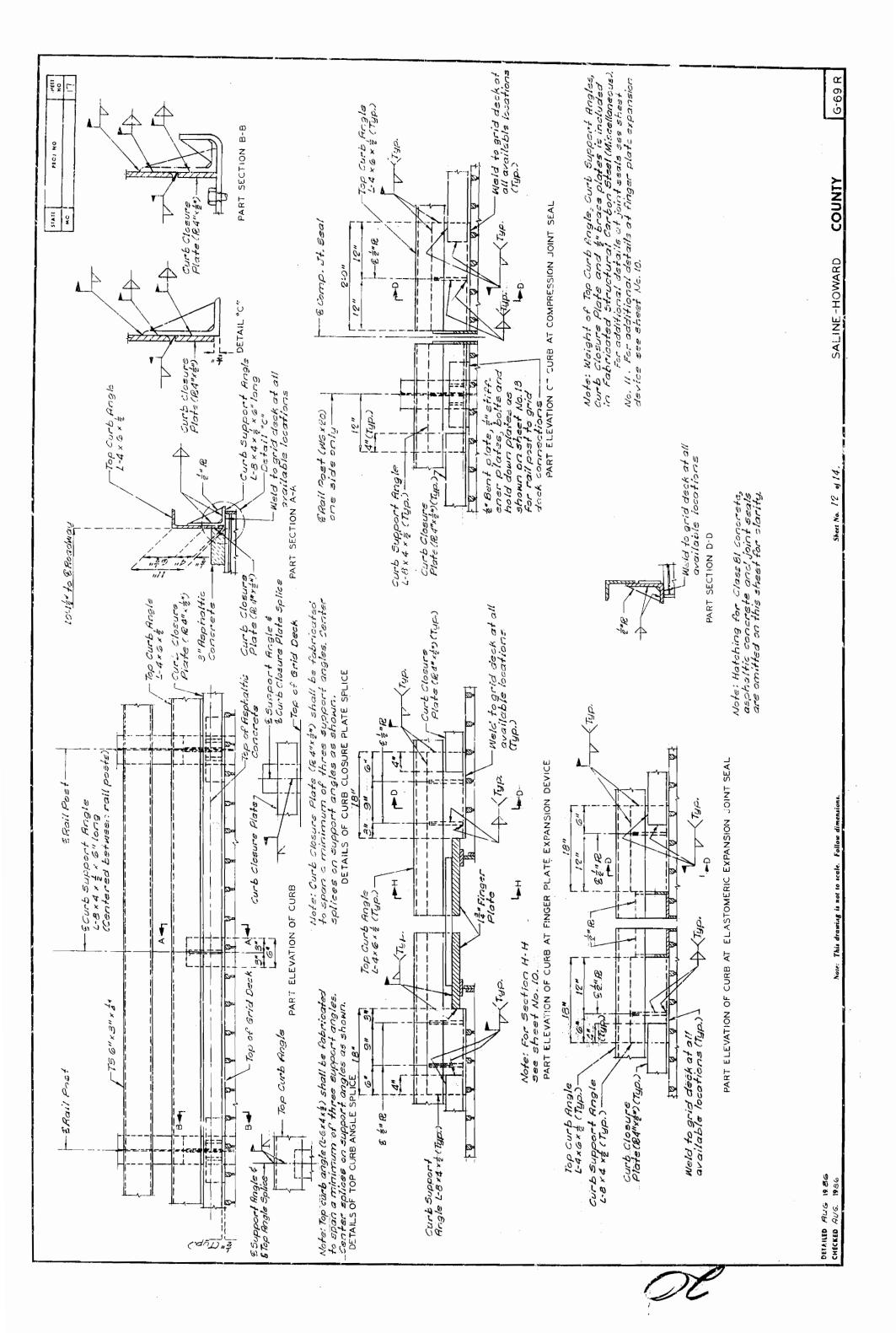


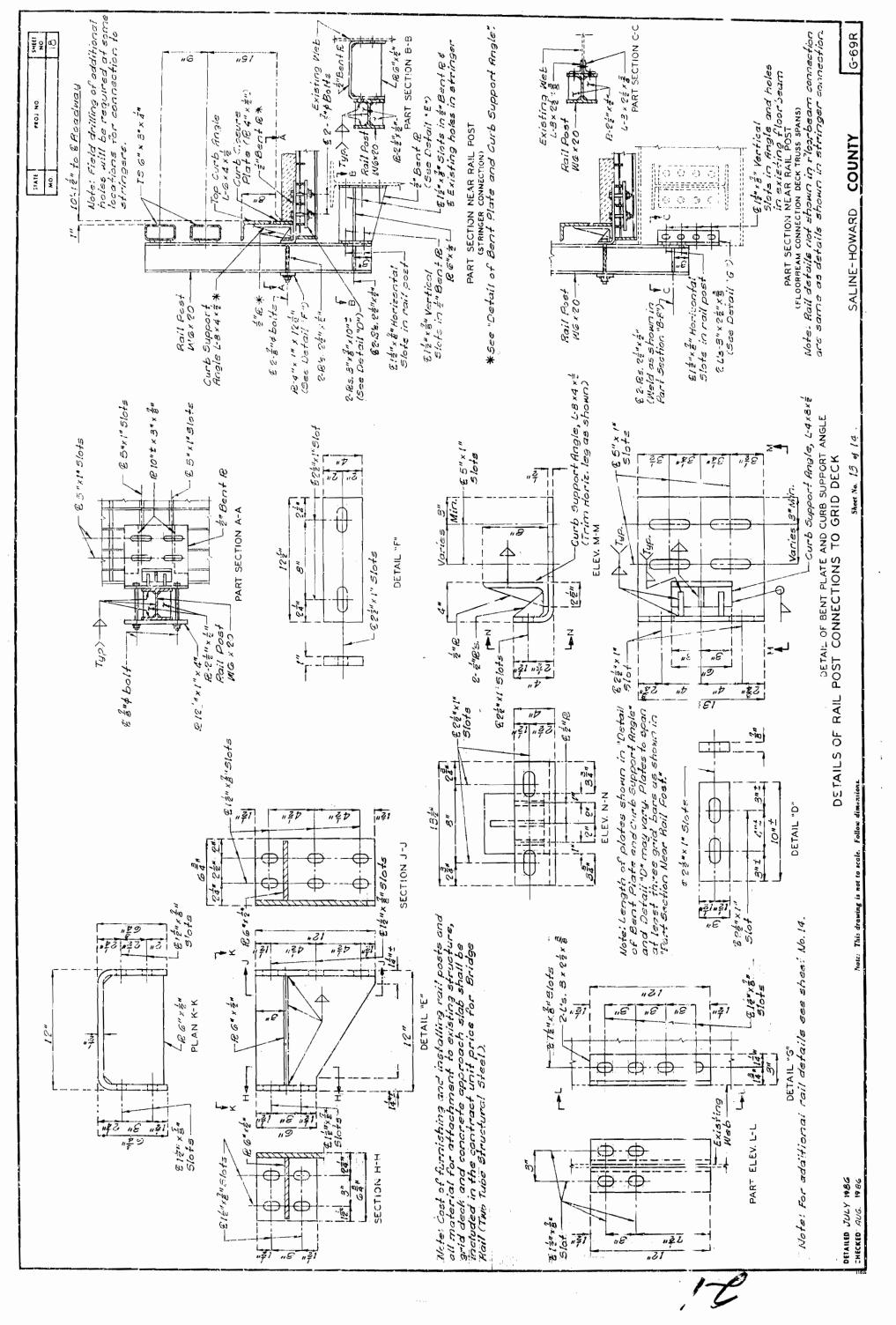


Note: Finger Plates shall be flat longitudinally and shall match the crown of roadway transversely. Repair of galvanizing at welded joints will be required. Payment for furnishing and installing the structural steel and t" Neoprene trough will be mods at the controct will price for Finger Plate Expansion Device per linear for. Egit Anchor Bolt Note: Plates for gutter shall be R.S.T.M. A.36 steel and shall be galvanized in accordance with R.S.T.M. A123. 112 -Bent R 3"1 5" PART SECTION D-D Cities of the Neoprens Existing Floorboam Class &! Concrete (Typ.) Asphaltic Concrete (Typ.) Existing Concreter DETAILED AUG. 1986 CHECKED AUG. 1986

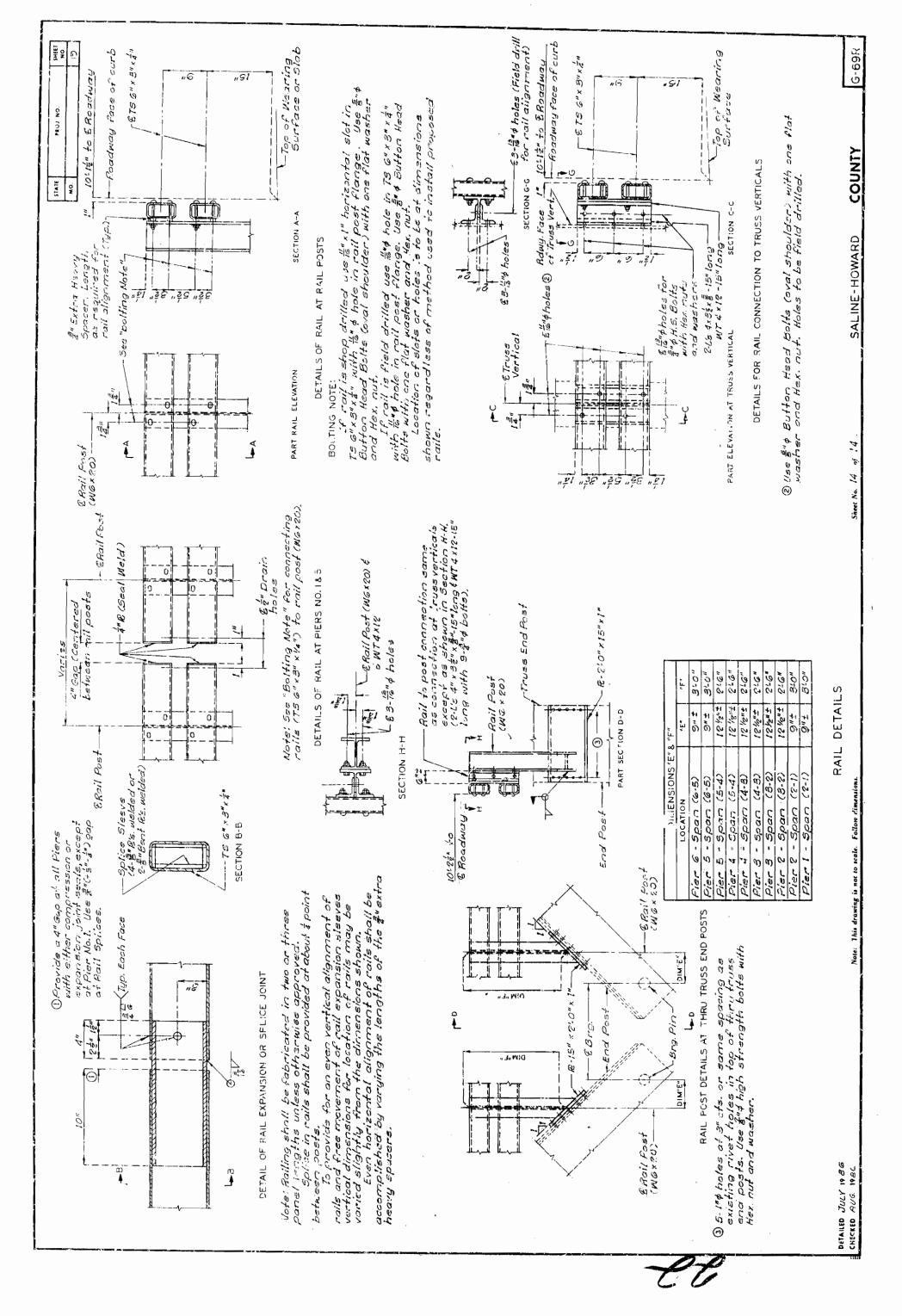






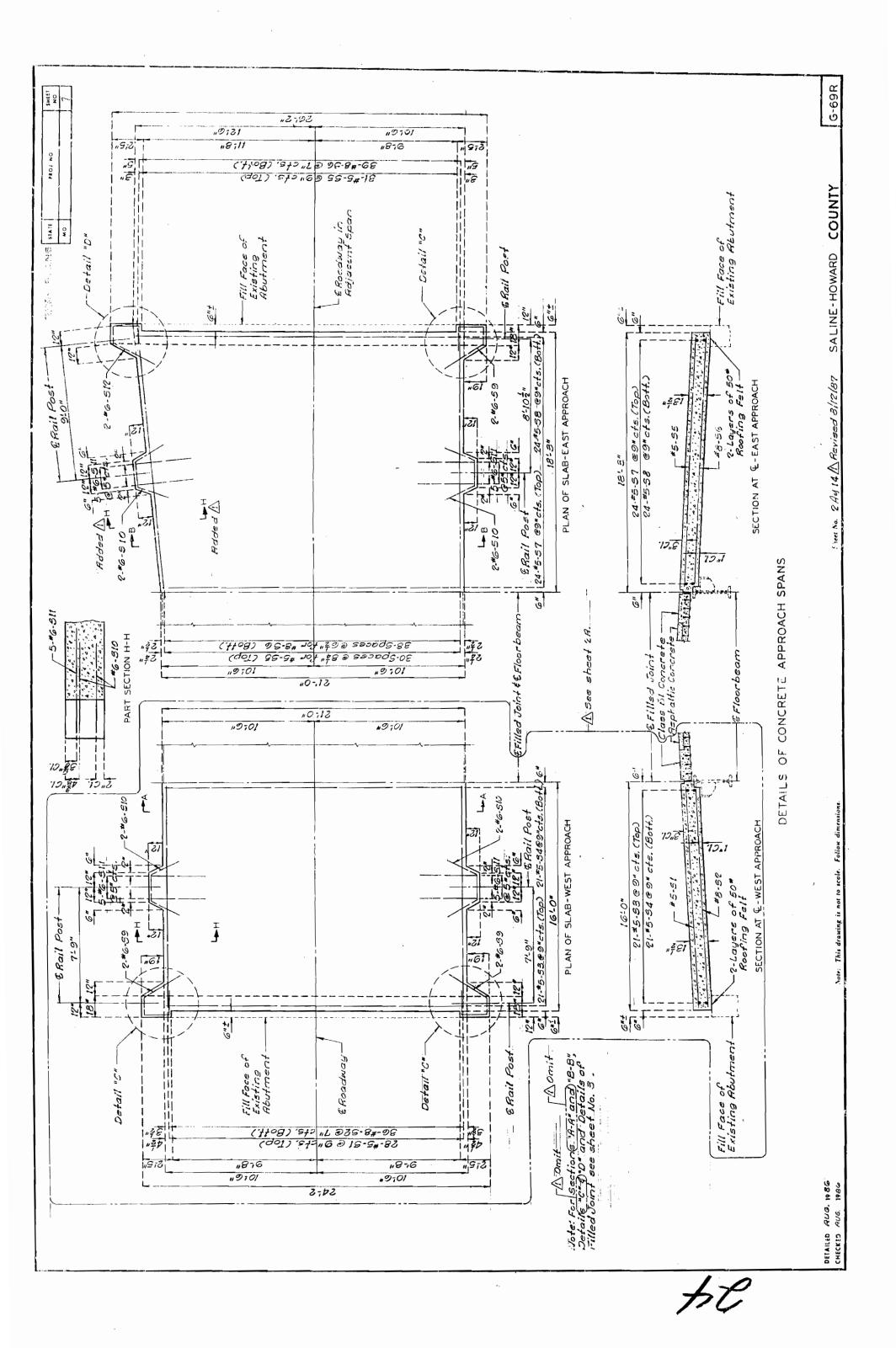


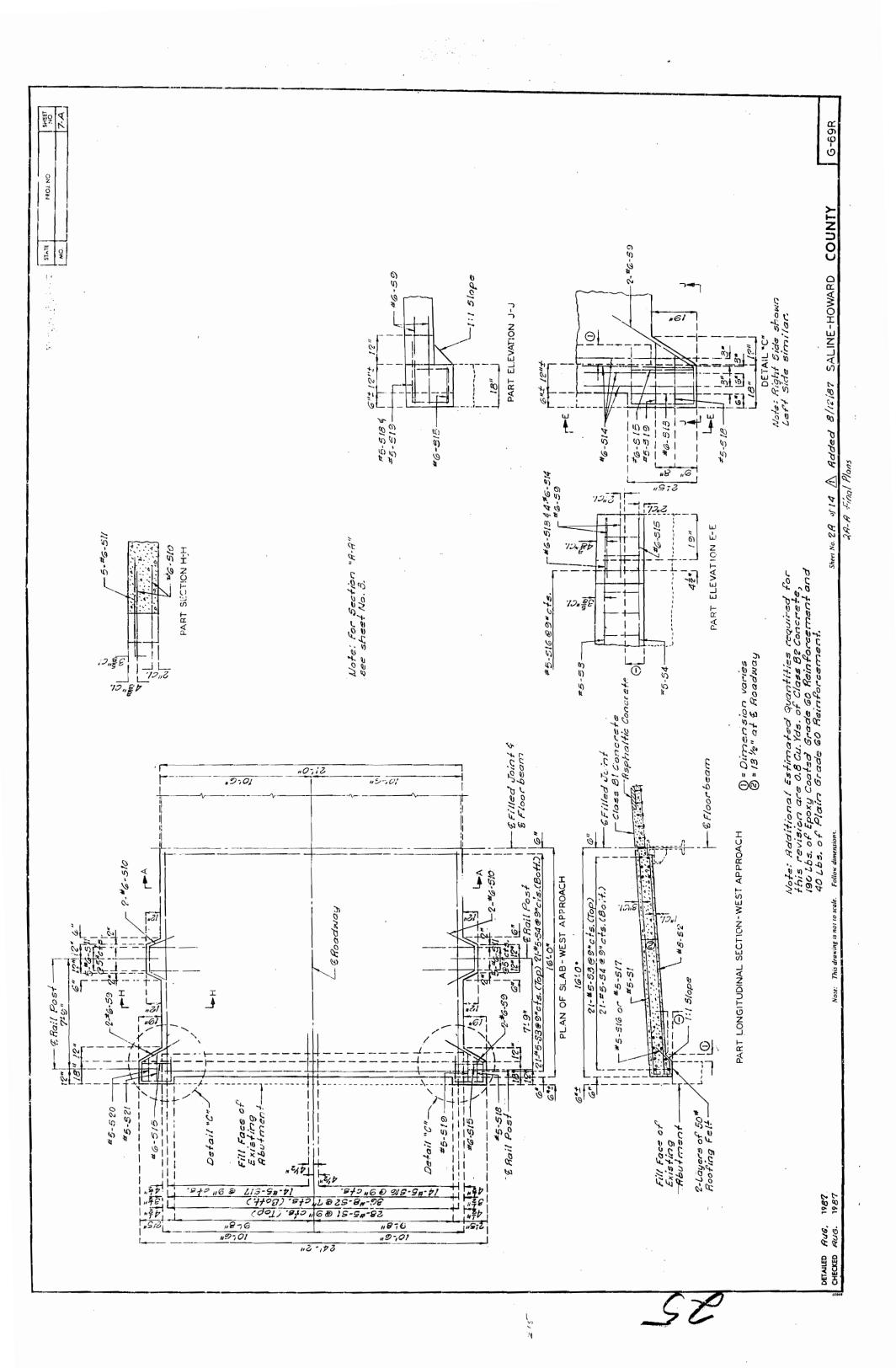
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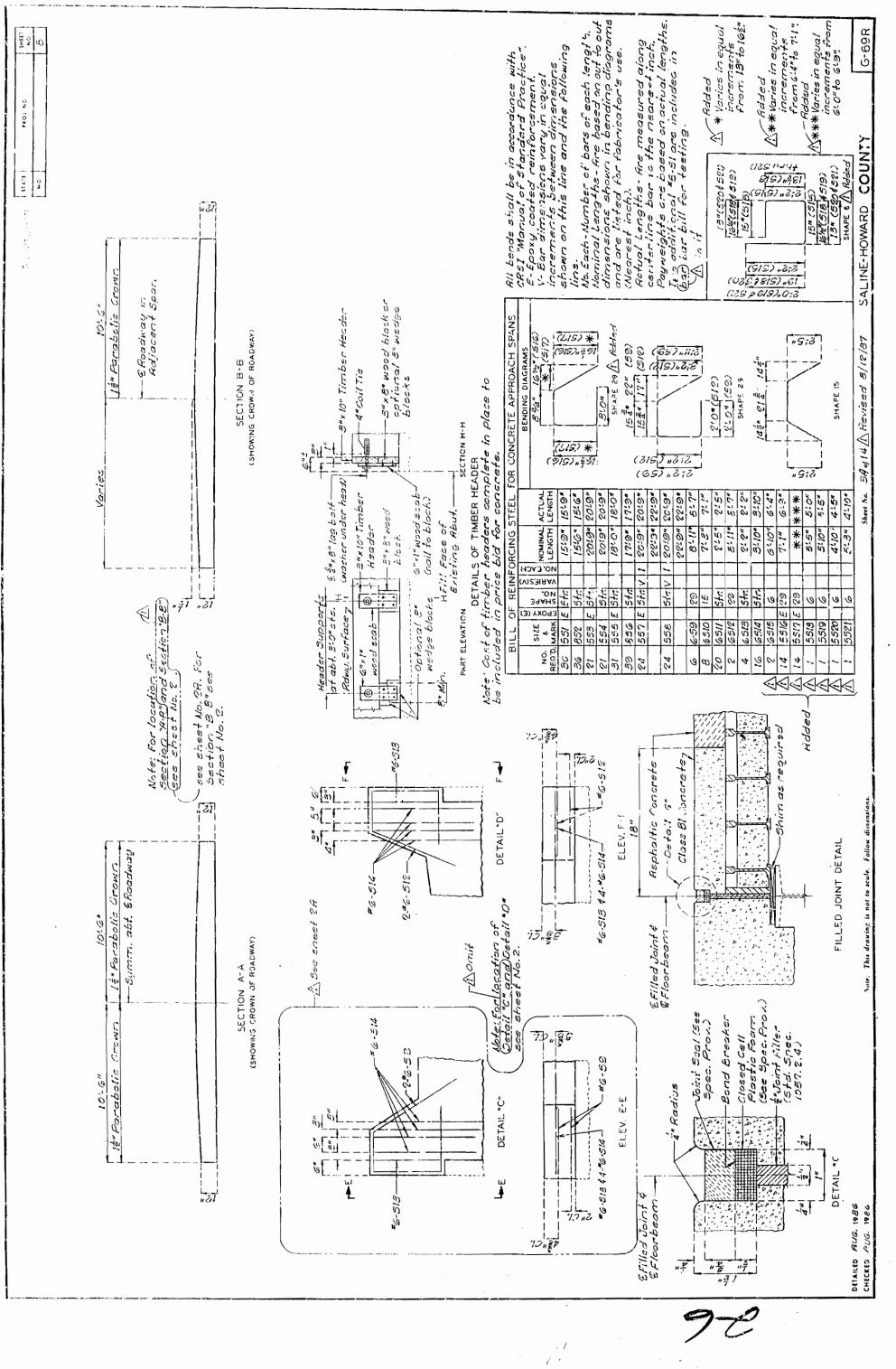


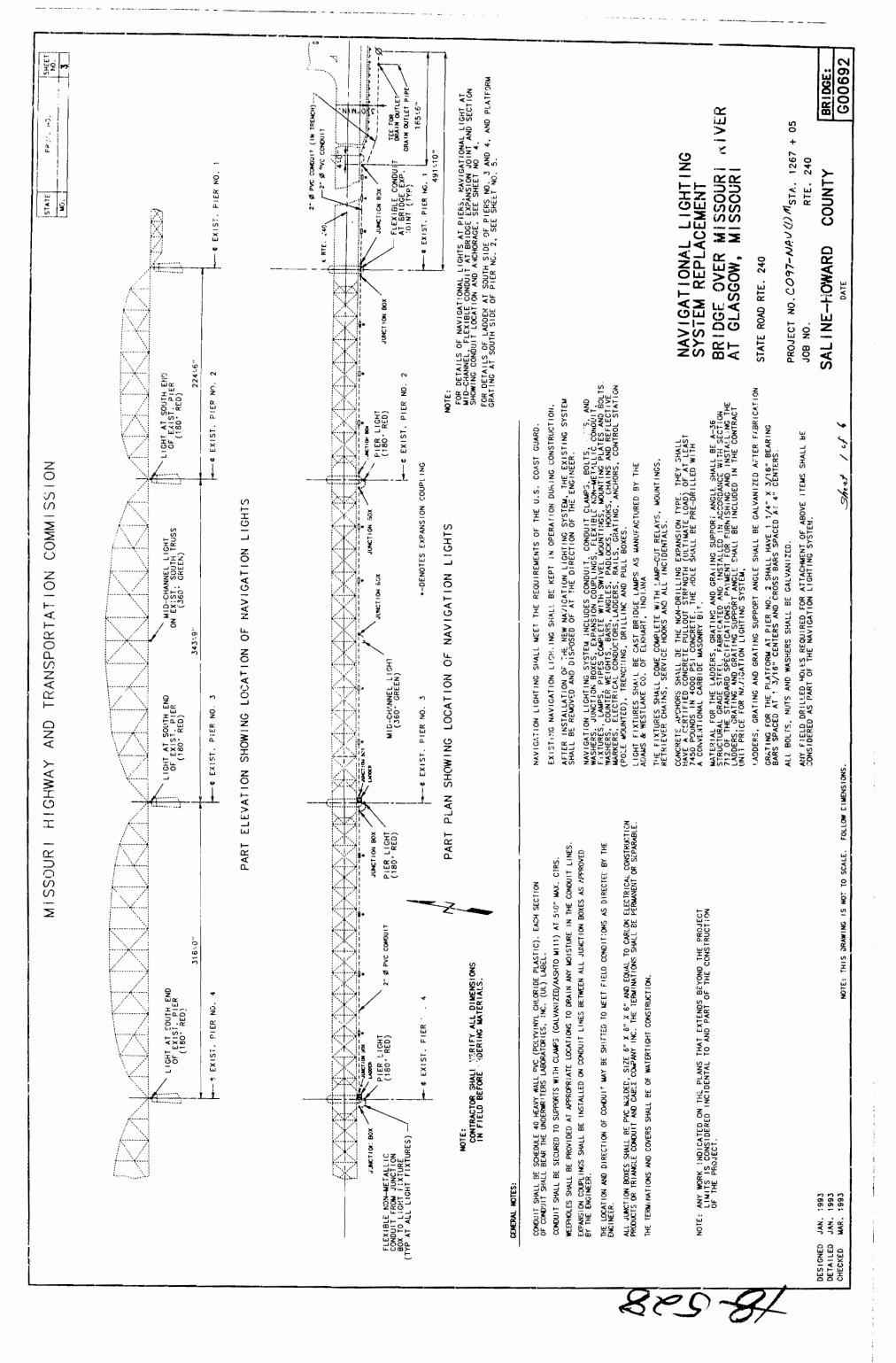
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8. 96'-18'96' ans te Filled 1 Drains, Rails.	249'-316'-816'-849'-224'6" - Thru Truss Epans Install Concrete Filled Grid Deck, Deck Drains, Rail Posts and Rails,	85'-18'-85'-18'-85'-18'-85'-18'- 85'-20' Deck Truos Spans Install Concrete Filled Grid Deck, Deck Drait	8-85'-18'-85'-20' K Trugs Spans All Concrete Filled Deck, Deck Orains Posts and Rails.	-Build 18+3" ( with Rail P Guard Rail	t8" Concr il Posts, Rail Atta	8:3" Concrete Span lail Posts, Rails and Rail Attachments
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Interims	GENERAL NOTES CONTY.	ESTIMATED QU	QUANTITIES			
	Concrete Bonding Compound: Concrete Bonding Compound: An approved epoxy bonding agent is required between old and new concrete for substructure renair. See Standard Specifications.	Removal of Existing Bridge Deck Asphaltic Cement (Asphaltic Concrete) Actor (Type A Mix)	52. Ft. e) Ton	SUBSILI	47,360 47,360	101AL 47,360 43.9
) fc= 600psi ssi	Painting: Shop None; Field, System B Green, except as	Mineral Aggregate (Asphaltic Concrete (Type A Mix) Bridge Deck Water proofing (Liquid)	refe) Ton Sq.Yd		834	834
si Ssi	Dimensions;	Substructure Repair (Formed), See Spec Prox Substructure Regair (Unformed), See Spec Prox Anna R.C. Annade (S. Gate Colid Stat.)		47/		28.21
i si	Contractor shall verity all almensions in the field before ordering new steel.	Laninated Neoprene Bearing Pade Steel St	ructures Each		14	2
1500 (Grade B)	Utilities: All utilities on structure and U.S.G.S. House at	Fretownsed varipression Expansion Jour Jean (3.11.) Elastomeric Expansion Joint Seal (3.11.) Lin. Ft. Elastomeric Expansion Joint Seal (1.11.) Lin. Ft.	Lin Fl.		20 20 41	200
ot as noted	Pier & Shall be kept in operation during construction, Access to U.S. G.S. House at	Reinforcing Steel	·47			6460 0
l shall	rier 's shall be provided as required auruig construction.	Fabricated Structural Carbon Steel (Miscellaneous) 15.	Hareous) Lb.		18	266.200
	Drainaae Sustem-Pier5:	Expansion Vevice (Finger Fiate) Steel Grid Floor (Concrete Filled)	59.FL	•	<b>N</b> X	46,135
shall be	All drainage system pipe and fiftings shall be Asinforced Thermosofting Reald Pipe (RTRP) meeting the	Bridge Hall (Two Tube Structural Steel) Rehabilitate Beatings	Lin. Ft.		4,510	4510 1
ċ	requirements of A.S.T.M. Specification 02996.		Each		524	1251
a'ashed	All pipe supports and mounting brackets shall be A.S.T.M. A36. All botts for pipe supports and mounting	Protective Conting for Concrete Bants	uno duna	_		
oved led into	brackets shall be 58°¢ A-307.	Weieterwus ngental Drainage System	Ł 4.			
h is ew	one of the anchor systems listed in the job special provisions shall be used for attaching	Stringer and Deck Truss Floorbeam Replacement Floorbeam Top Flange Replacement	sement Each Each	3 .	,	12
mooti bars.	pipe supports and mounting brackets to cristing concrete. These anchor systems shall be installed according to the manufacturers specifications.	Floorbeam Bottom Flange Replacement		. 2		12
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ad, top of	usst of turnishing and instanting pipe, tittugs, pipe supports, incunting brackets, anchor systems and all other drainage sustem in cidentals shall	50202 Martin Strand Replacement		171 153 44		1010000
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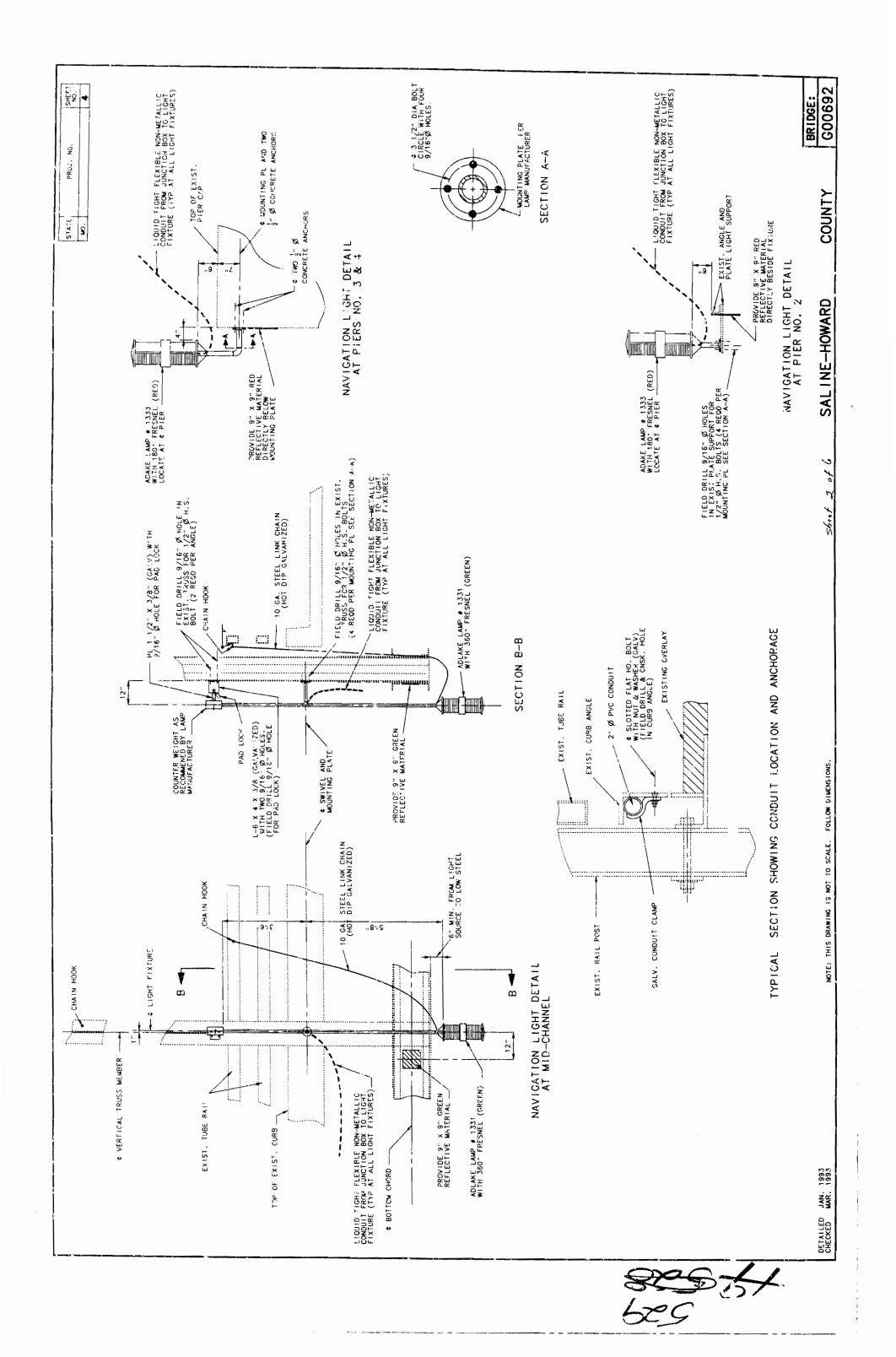


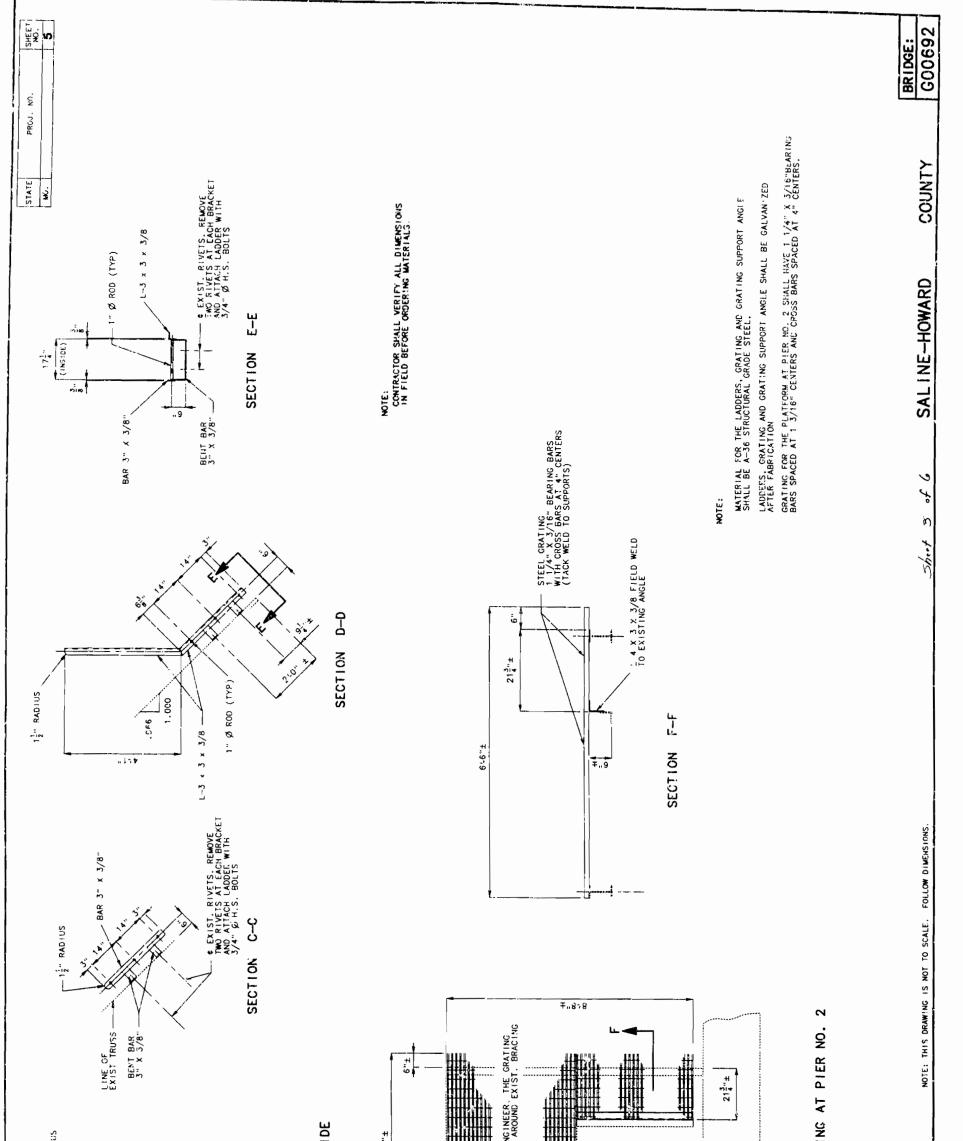


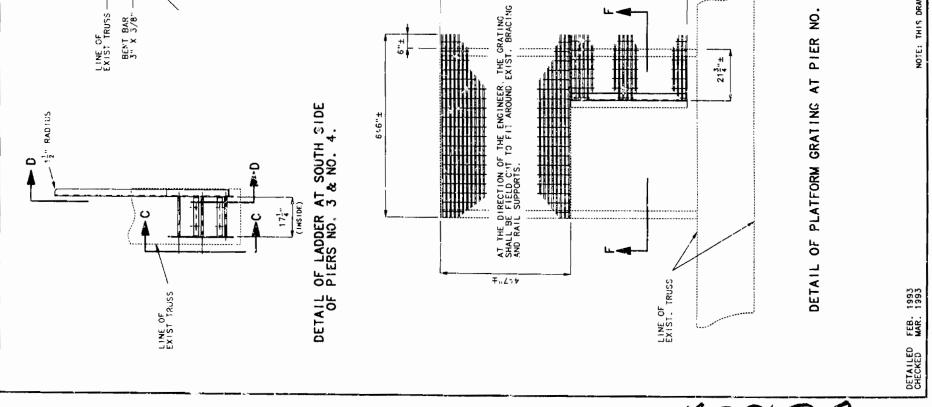




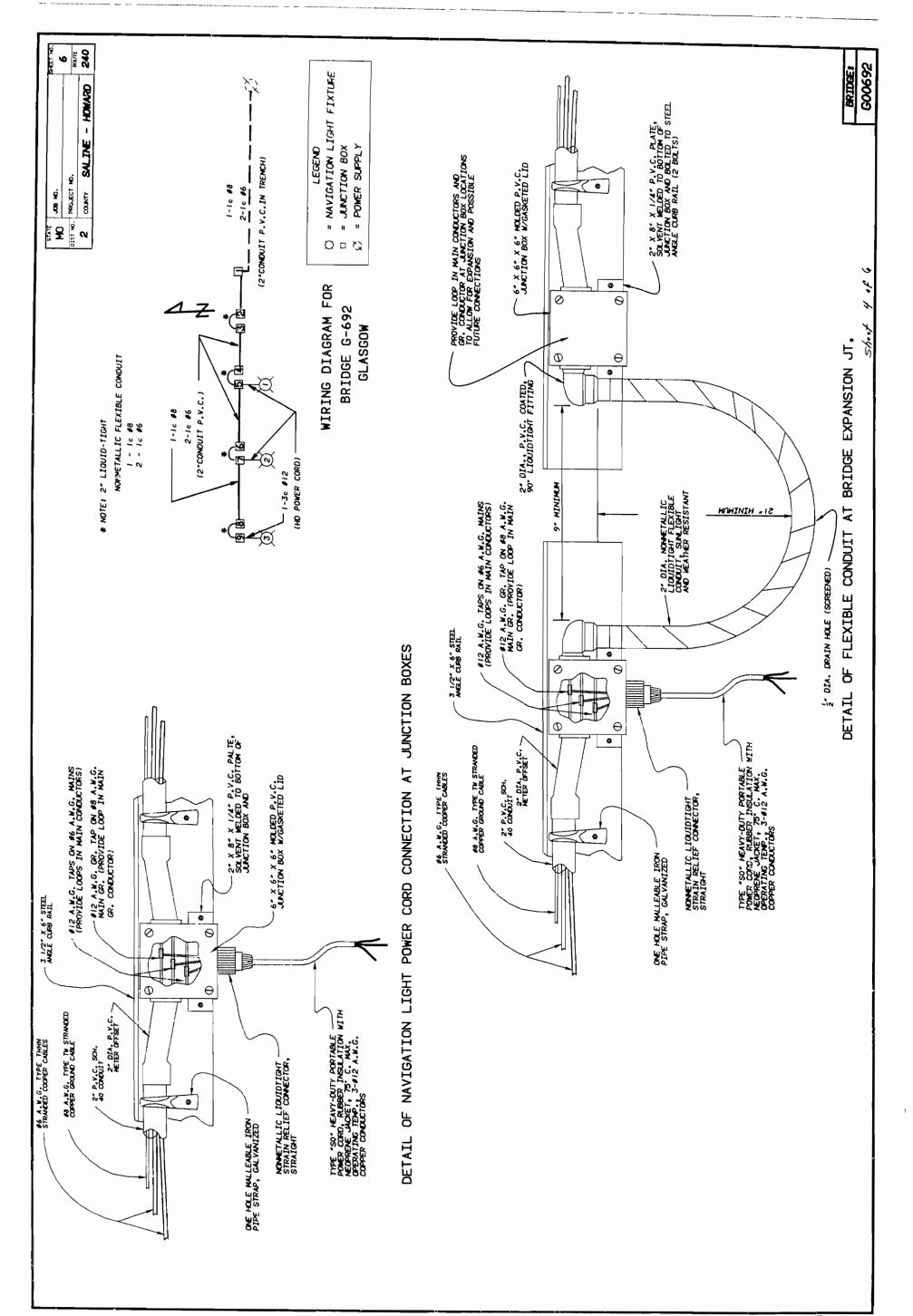


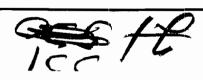


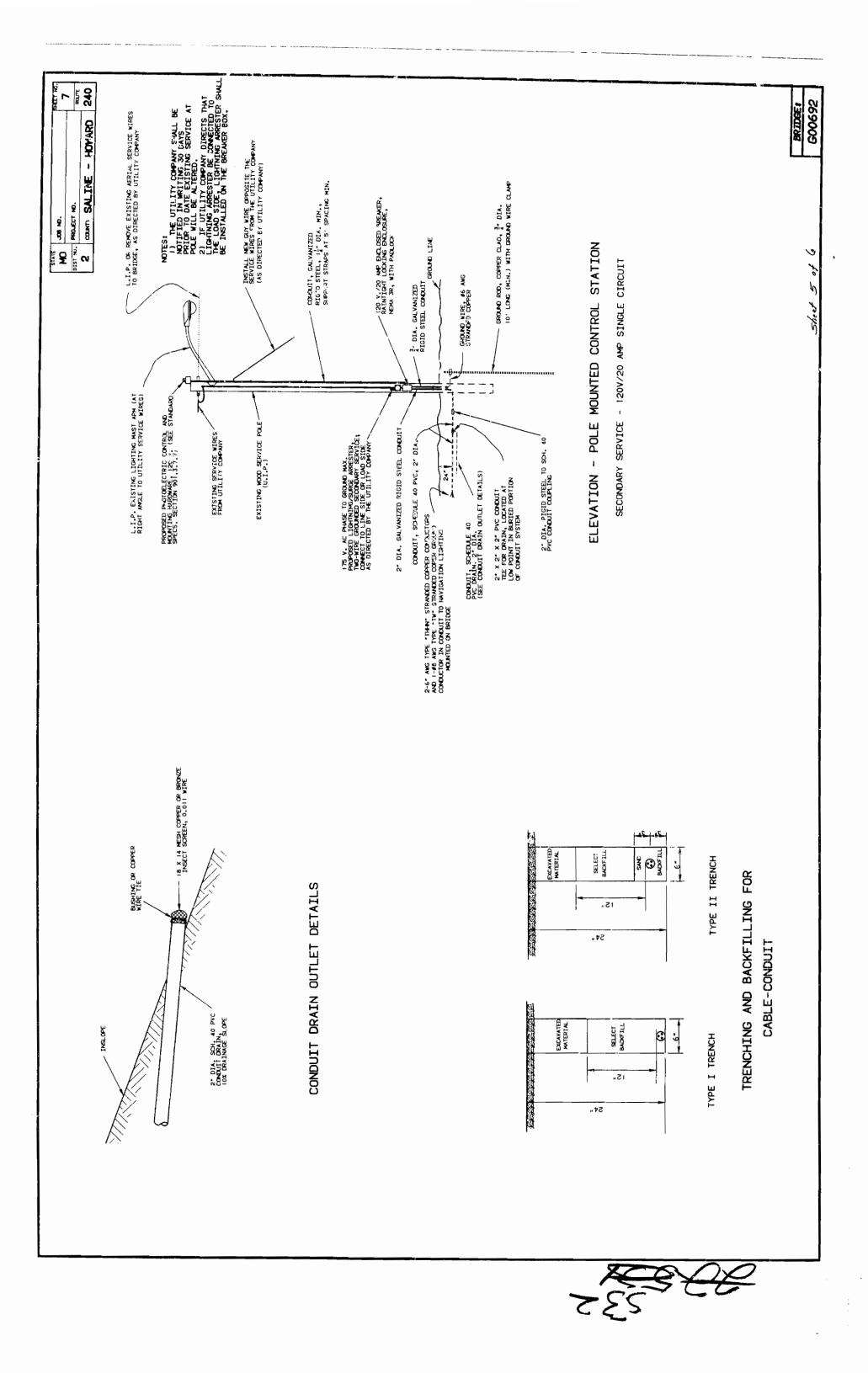


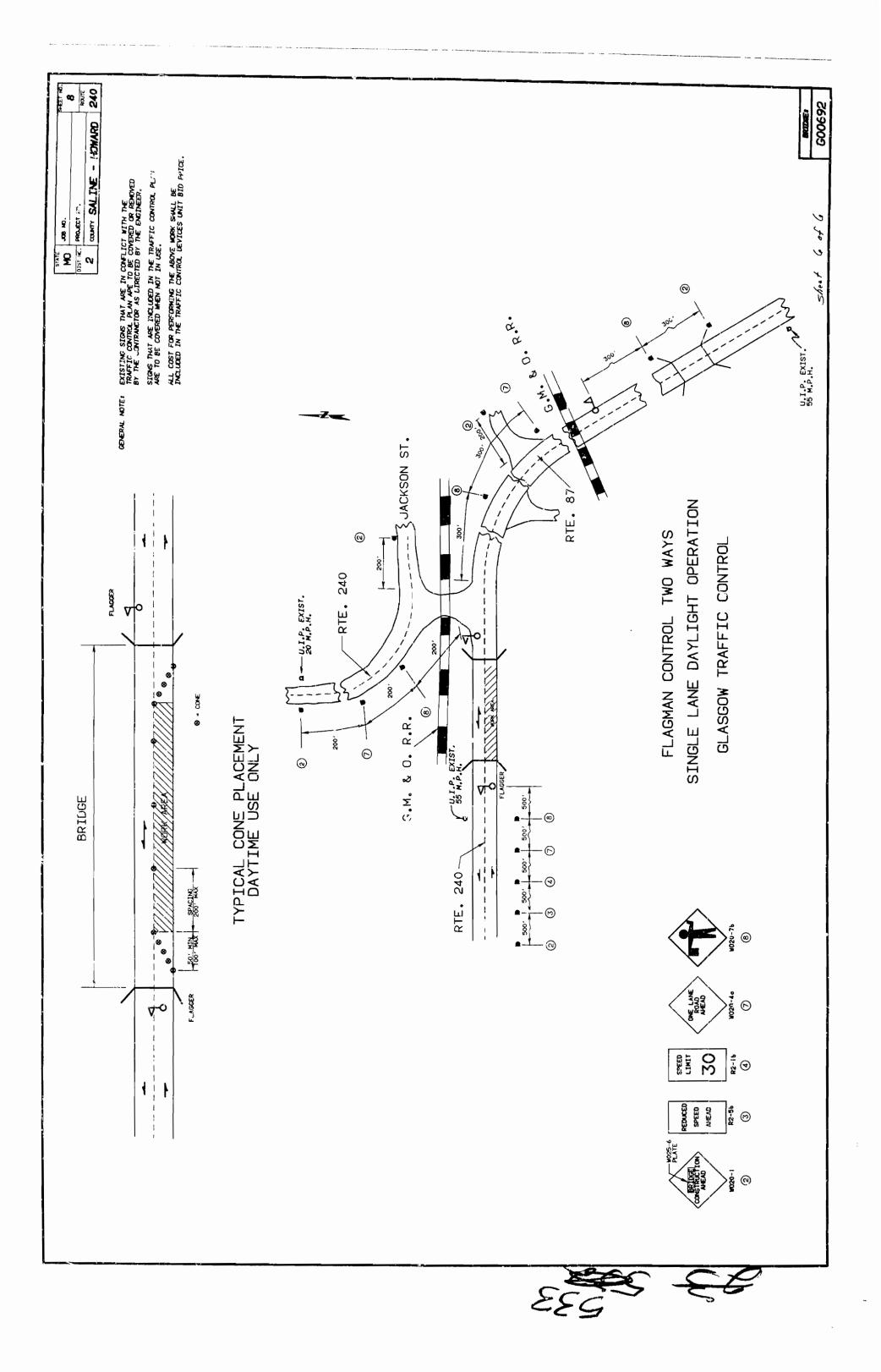












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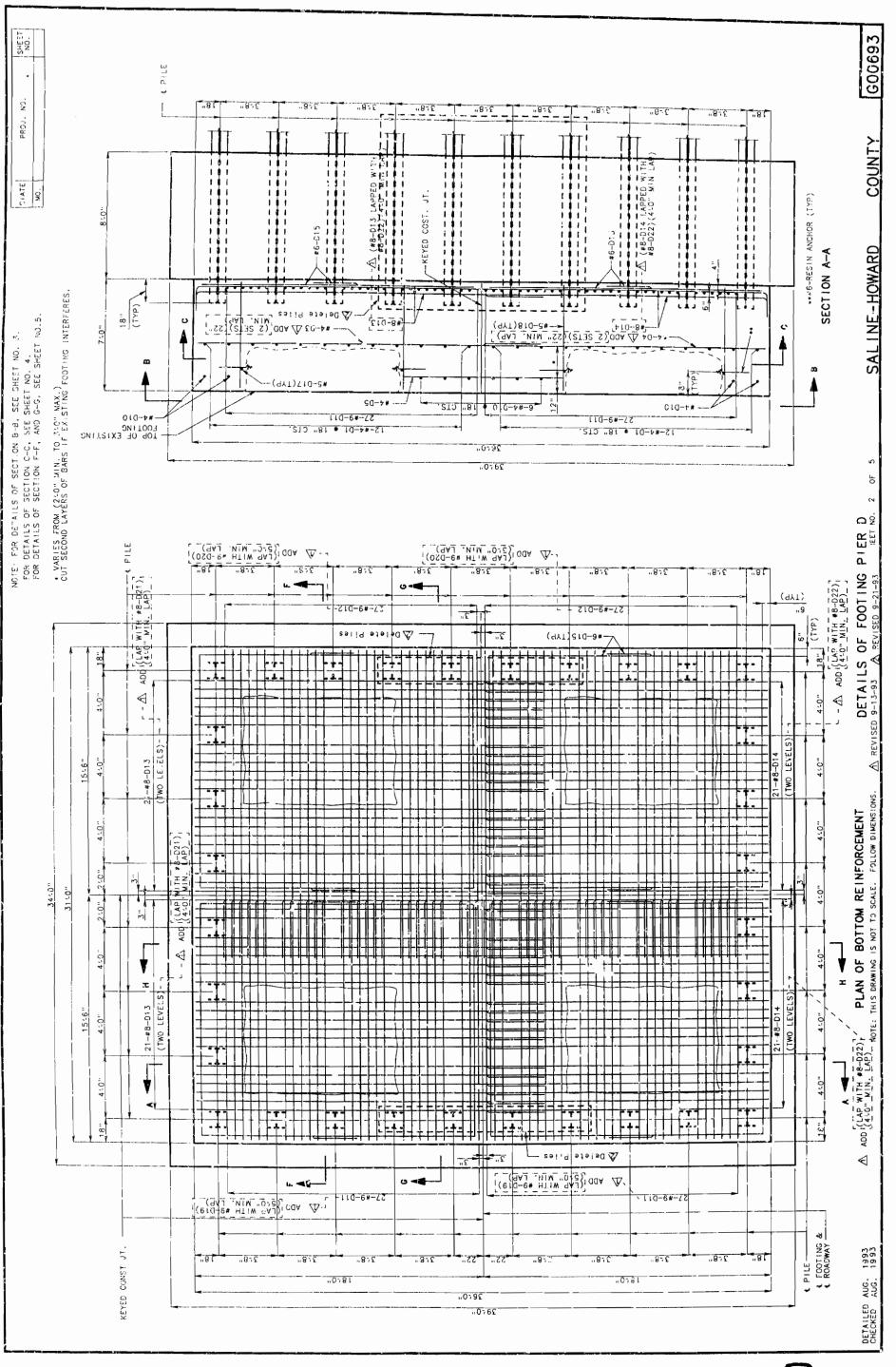
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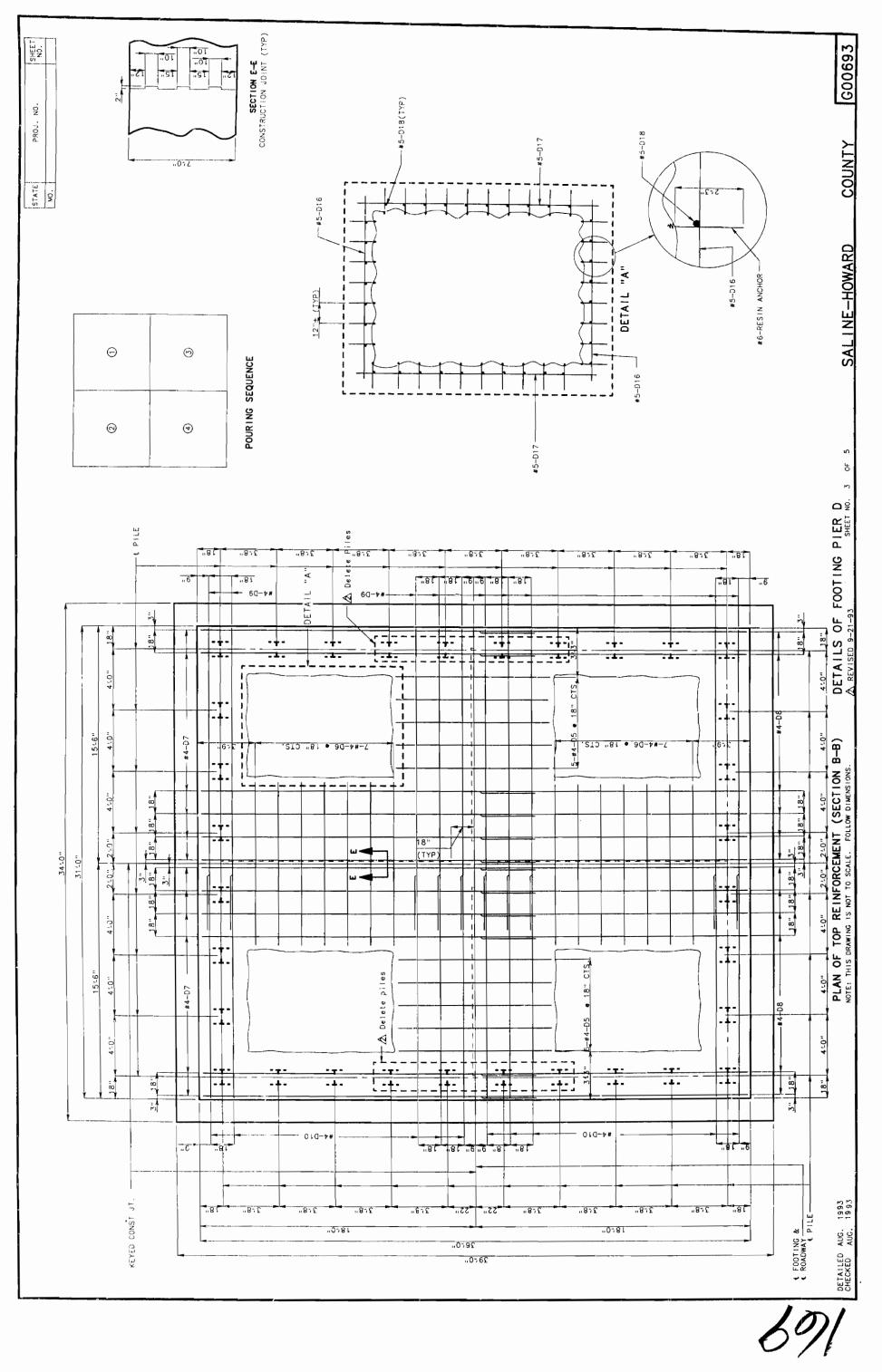




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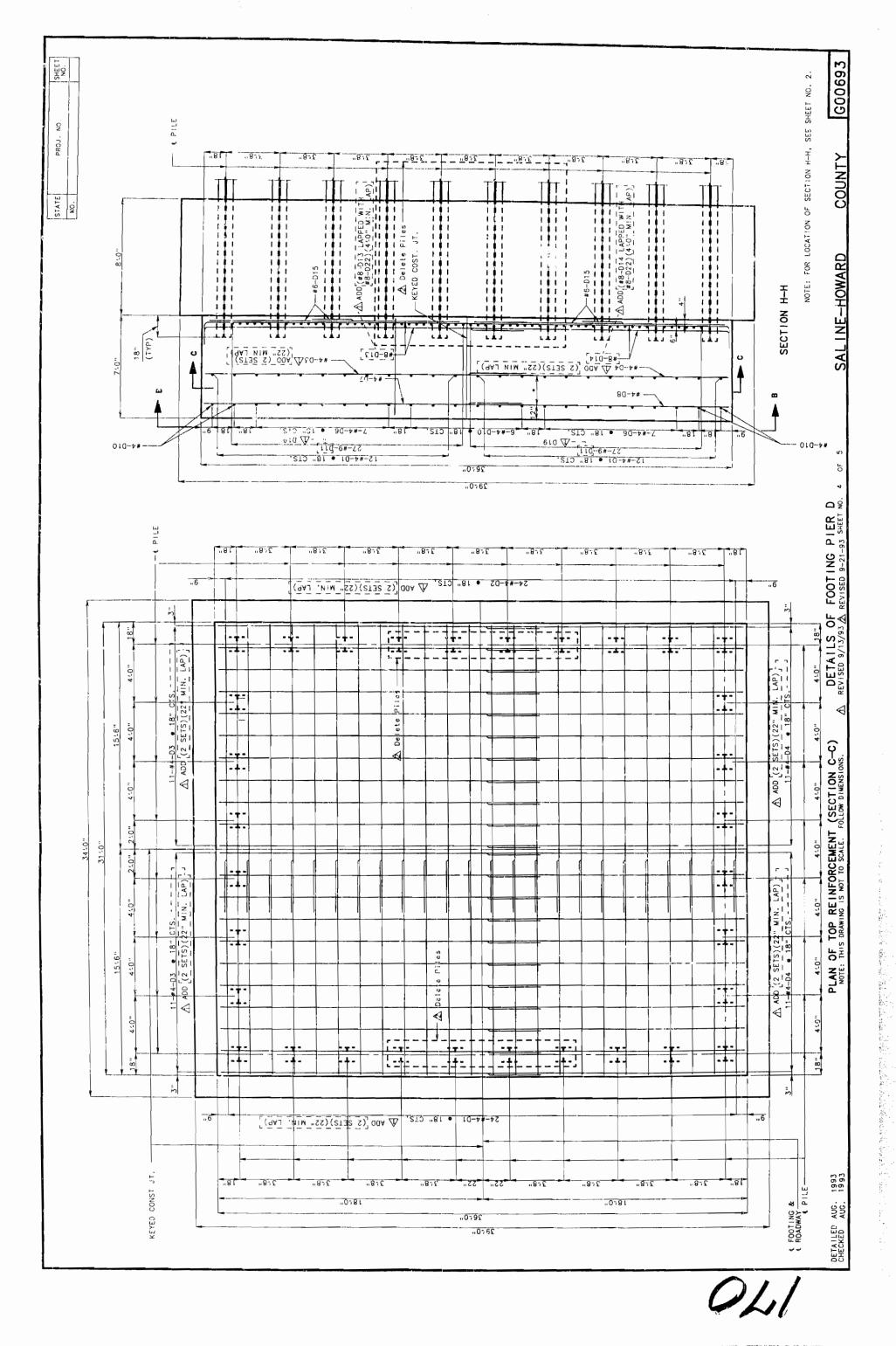
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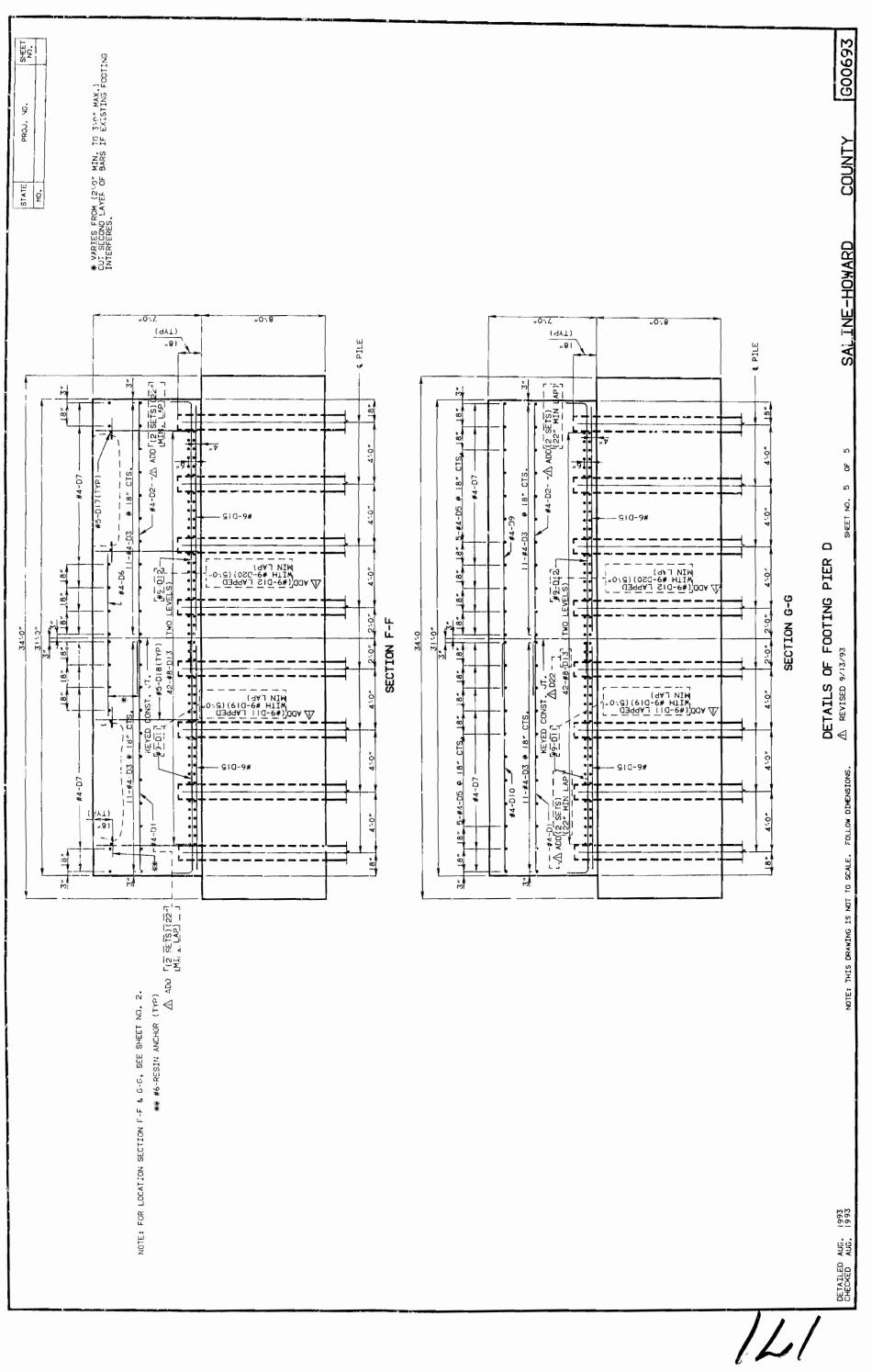




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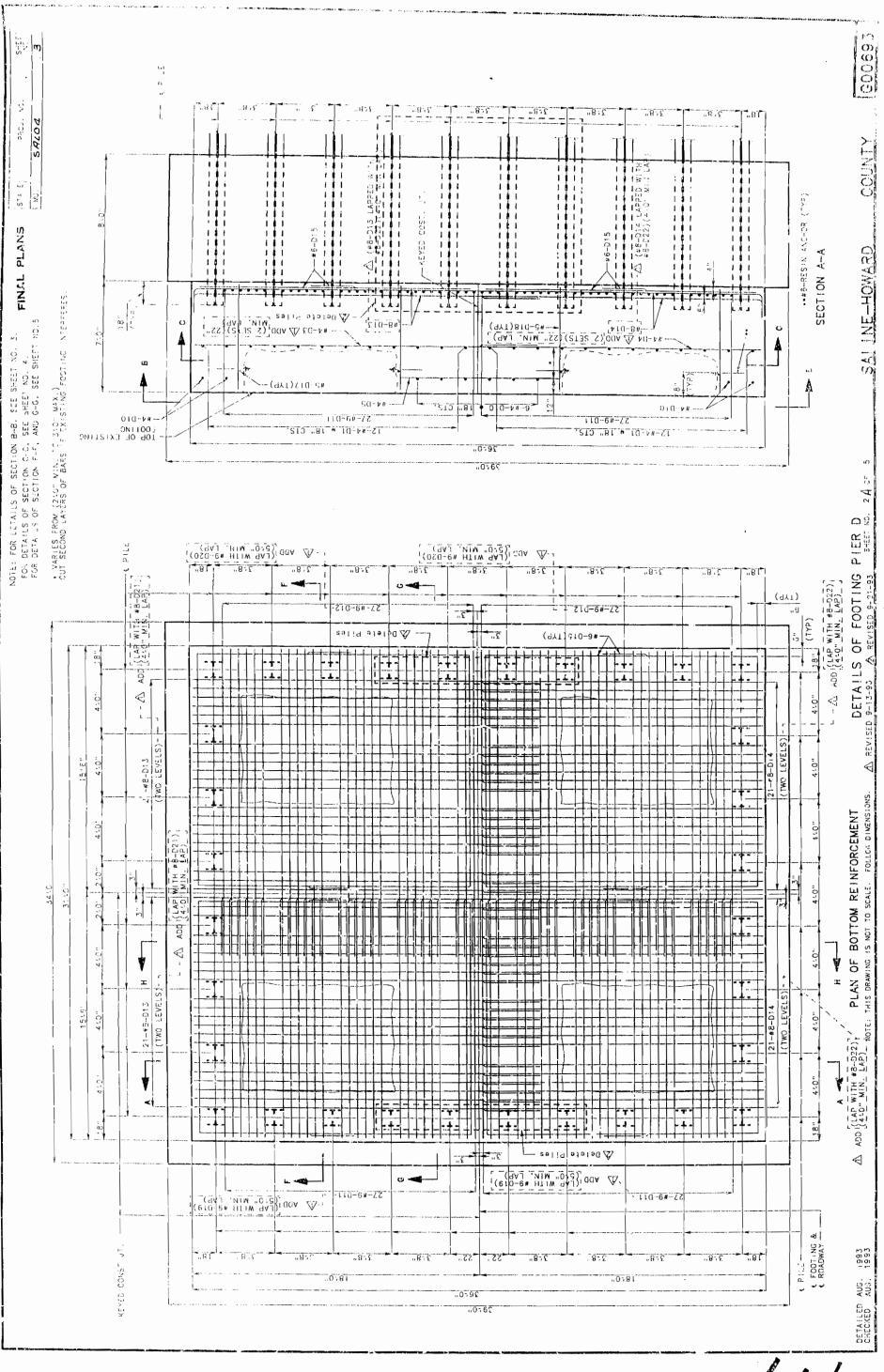
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N S SALINE-HOKAR COUNTY 600695 365 N. SEC./SUR. 3 TH2.51N PRCU NO. - VERTICAL LEG SHAPE 19 STATE Э 8 SHAPE 10 SHAPE 20 FINAL PLANS m #EIGHT 7342 - 63,543 USE - 83,54 LBS. 23,54 2600 ( **0**0 3177 2691 2916 :59 2111 401 974 2430 307 287 501 2341 6 19 1351 273 142 75 16 101 20 14-A F.- Physic Revised 9-13-93 0 N 0 4 0 FT.IN. 60 01 01 0 4 N 9  $\sim$ 0 ພ σ ÷ ው ---0 0 ψ 1 **LENGTH** ŝ 3 5 17 ŝ ----4 7 ũ 12 M σ σ ŝ Q ъ 0 ŝ ጮ ö 0 างกาวง FT.IN. 0 ĝ 8 0  $\hat{\sigma}$ \$ O 0 60 N ເດ N **c**0 Ç 1-4 ٩ Unσ 0 0 HTON.C 0 o 0 17 4 2 33 თ 2 9 5 17 ß 4 TANTHON ۰۳ \_.. 0 <u>cu</u> <u>رم</u> <u>c</u> MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION z ¥ FT. Ľ 7 Ē. Ľ. Ц Ŀ. REINFORCING STEEL DIMENSIONS NI ш FT. NOTE: THIS DRAWING IS NOT TO SCALE. FOLLOW DIMENSIONS. . ци. ۵  $\Box$ ť. 4 Ь IN. BILL 0 7 0 σ ပ 51. 2 0 0 0 N Ä 16 0 0 16 80 0 20 0 \_  $\sim$ 0 J 0 0 • 4 2 Q, 9 മ j. . U ' 0 ы <u>c</u>i ŵ 2 N. 0 σ 0, 0 6 2 2 ß **a**) Ē NO' EVCH (A) SELEN

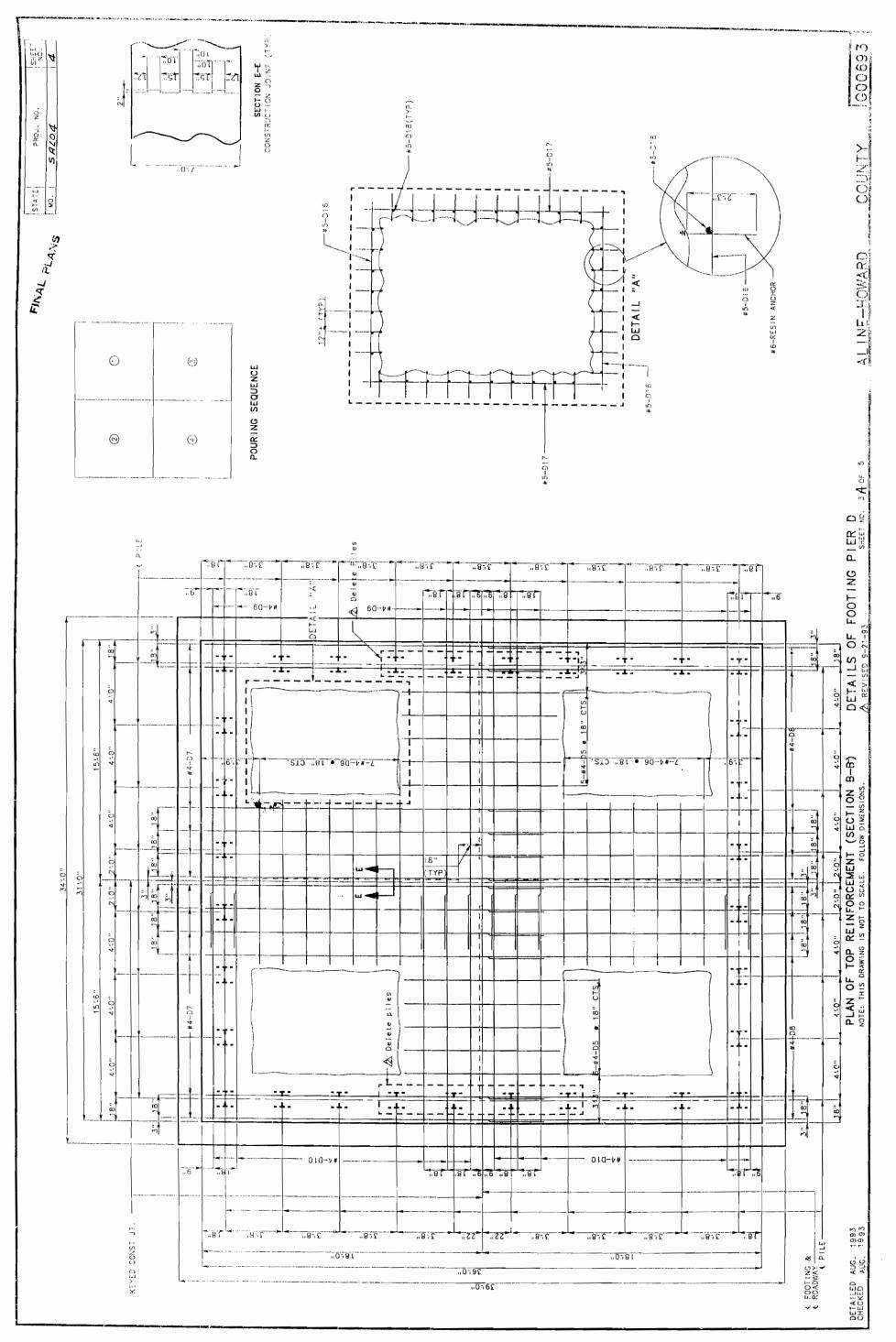
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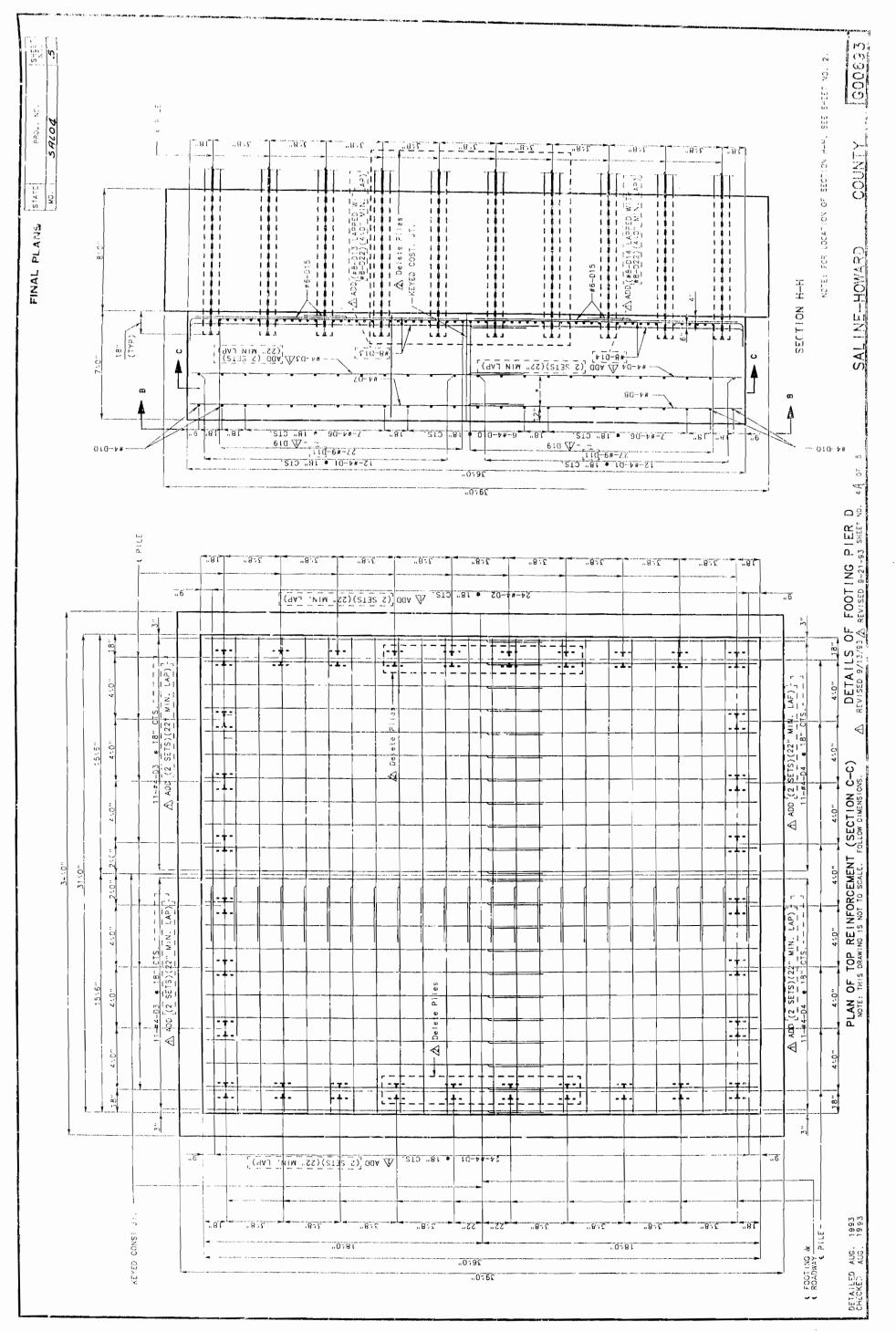
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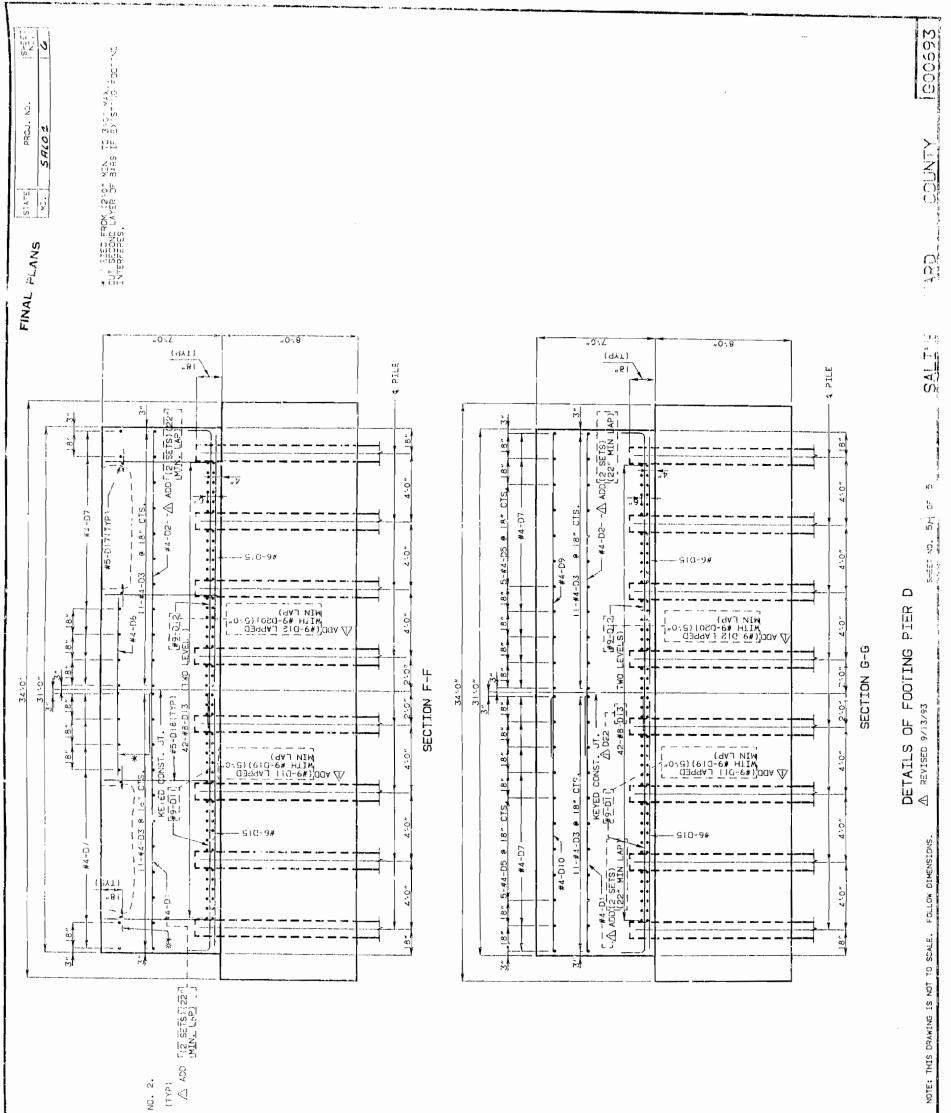


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## **Glasgow Bridge**

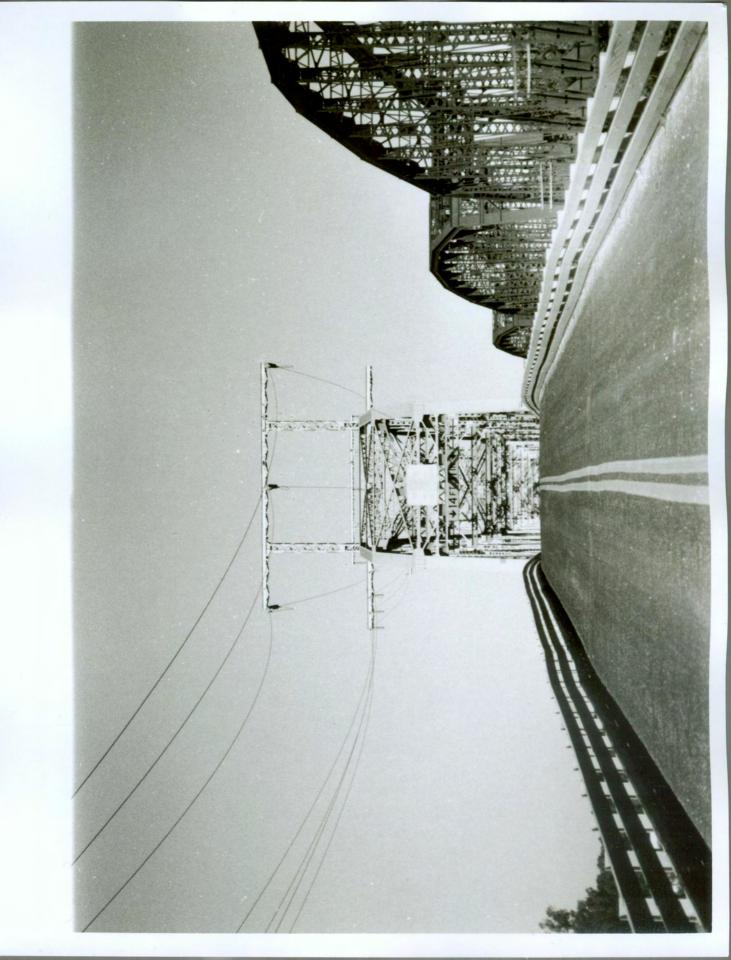
Bridge No. G00693 Saline County, State Route 240

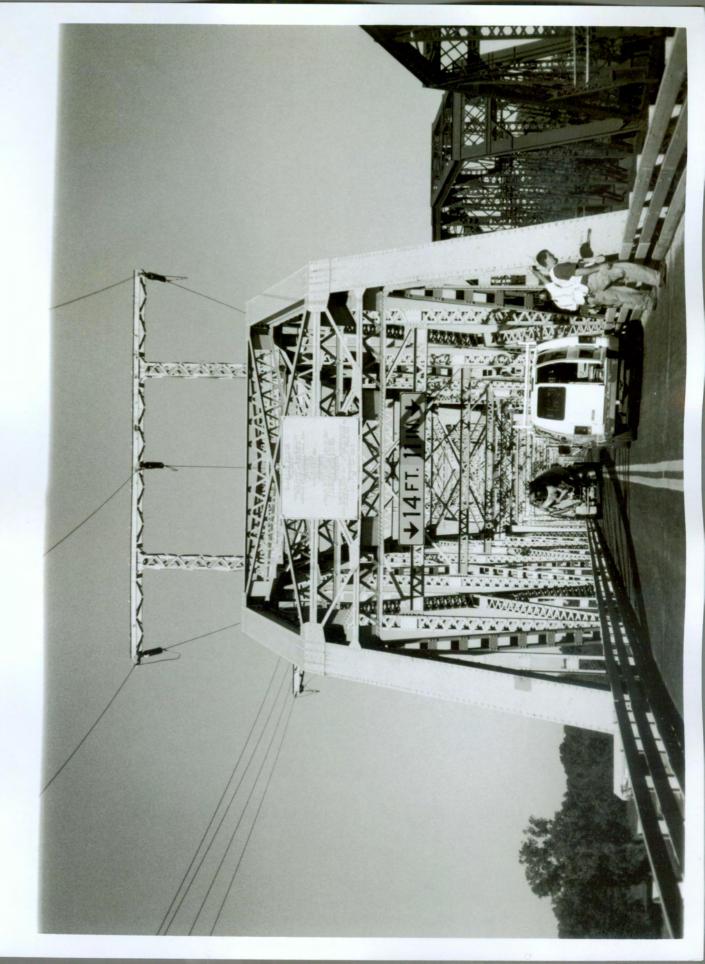
Photographed: September 2007 Photographer: Randall Dawdy

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SUPERSTRUCTURE MT.VERNON ERIDGE CO. MT.VERNON, DHIO D MIGGOURI GTATE MIGHWAY DEPARTMENT B.H.PIEPMEIER, CHIEF ENGINEER L.J.GVERDRUP, BRIDGE ENGINEER HOWARD COUNTY, SALINE COUNTY FEDERAL AND AFFROPRIATED BY ALGSOURI STRITE HIGHWAY COMMISSION DESIGNED BY F. W. ALDGATTE CONSULTING ENGINEER CONSULTING ENGINEER しのとう CONTRACTORS SUBSTRUCTURE UNION ERIDGE & CONST. CO. WT. KANSAS CITY, MO SUPERVISED BY VI DEDNANTE NOBDALD . 2 NOD >





