CLARENCE N. CROCKER AND GEORGIA'S

TWENTIETH-CENTURY HISTORIC BRIDGES

by

KRISTIN L. LOCKERMAN

(Under the Direction of Wayde Brown)

ABSTRACT

This thesis examines the career of Clarence N. Crocker (1894-1995), the work of the Georgia Bridge Department during his twenty-three-year tenure as State Bridge Engineer, and the challenge of preserving his legacy, and the legacy of these feats of engineering. First, a brief analysis of the preservation efforts of other states is discussed. Analyses of Georgia's transportation heritage and Crocker's life follow in order to fully address the problems involving twentieth-century bridges, as well as their engineer. Next are three discussions examining preservation concerns particular to bridges: the first bridge has been altered, the second is being replaced, and the third is currently in use. This thesis concludes with recommendations for preserving legacies of civil engineers through rehabilitation, reuse, the creation of archives, and public involvement and education.

INDEX WORDS: Historic bridges, Preservation, Rehabilitation, Clarence N. Crocker, Georgia Department of Transportation

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CHAPTER 1

Introduction

Georgia's historic bridges built under the supervision of Clarence N. Crocker (1894-1995) (Figure 1.1), the state's second and longest-serving state bridge engineer, face several preservation challenges. Encompassing a quarter century, the bridges constructed under Crocker are an important component of Georgia's twentieth-century transportation history. Unfortunately, Crocker's long tenure of twenty-three years as State Bridge Engineer did not influence the Georgia Department of Transportation (GDOT) to establish an archive of material related to their civil engineers. Living on only through the legacy of their works, it is engineers like Crocker whose complete biographies are difficult to compile. Furthermore, the bridges left behind by these civil engineers, while standing for years, were designed as impermanent structures. Loads and traffic increase over time, and civil engineers, anticipating such change, understand the fragility of their legacies in the overall framework of the built heritage of communities. With the continuous need for reconstruction of Georgia's infrastructure, bridges erected during the period in which Crocker led the Georgia Bridge Department are quickly disappearing from the state's numerous landscapes and cityscapes.

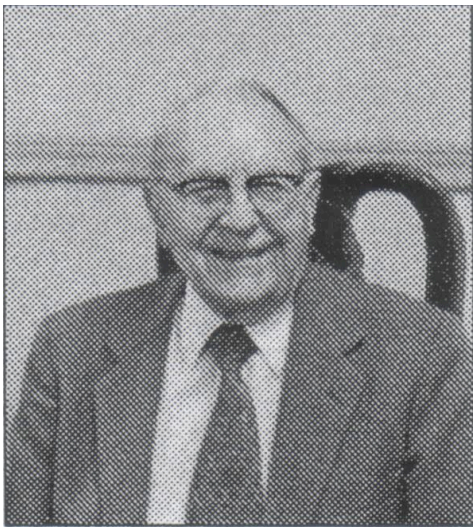

Figure 1.1: Clarence N. Crocker in 1990

Industrial Heritage

The Nizhny Tagil Charter for the Industrial Heritage, written by The International Committee for the Conservation of the Industrial Heritage (TICCIH), defines Industrial Heritage as

> the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education.[1]

The "infrastructure" mentioned in the charter includes the bridges and other engineering structures present throughout the state of Georgia. The infrastructure of Georgia and its

[1] The International Committee for the Conservation of the Industrial Heritage, The Nizhny Tagil Charter for the Industrial Heritage, July 2003.

preservation displays the legacy of civil engineering and the "evidence of activities which had and continue to have profound historical consequences."[2]

In the 1980s, the World Heritage Committee listed two such structures representative of the industrial heritage on the World Heritage List: Le Pont du Gard (listed in 1985) and Ironbridge (listed in 1986). Constructed circa 19 BC, the Pont du Gard is a massive aqueduct constructed by the Roman Empire in the south of France (Figure 1.2). Constructed on three levels, the aqueduct stands 49 meters in height, covers a total span of 275 meters and displays the mastery of Roman engineering. The structure, while remarkable in appearance, was primarily constructed as one of the most magnificent achievements for the transport of water from natural water sources to population centers.[3]

Figure 1.2: Le Pont du Gard, erected c. 19 BC

Erected in 1779, Ironbridge has become the symbol of the Industrial Revolution (Figure 1.3). Beginning in 18th-century England, the Industrial Revolution is represented in the World Heritage Site of Ironbridge Gorge. Comprised of five areas of interest, the

[2] Ibid.
[3] International Committee on Monuments and Sites. Report on Le Pont du Gard. World Heritage List No. 344, December 20, 1984.

Ironbridge Gorge World Heritage Site is highlighted by the 'Ironbridge' itself.[4] Spanning the River Severn, Britain's longest river, Ironbridge is credited as the world's first iron bridge. After developing the first coke iron production in 1709 in nearby Coalbrookdale, Quaker ironmaster Abraham Darby set the standard for all following mass-production useable, load-bearing iron. For the next seventy years, the Coalbrookdale area along the Severn, and the Coalbrookdale Company in particular, became world-renowned for both its production of iron and its discovery for new uses of iron. This zest for experimentation led to the ultimate display of the company's goods: the creation of a single-span bridge across the narrowest point of the Severn.[5]

Figure 1.3: Ironbridge over the River Severn

With projects such as Le Pont du Gard and Ironbridge, the historical importance of the world's industrial heritage is made clearly evident. However, with time, that industrial heritage has changed and is primarily displayed by structures of the recent past, as well as those erected in the present, through the mass-production of standardized forms. Nonetheless, these structures will need to be examined and

[4] International Committee on Monuments and Sites. Report on Ironbridge Gorge. World Heritage List No. 371, December 23, 1985.
[5] Neil Cossons, "Ironbridge Gorge." UNESCO Courier 50, no. 11, November 1997, p. 44; Dennis Karwatka, "Technology's Past: The First All-Metal Bridge," Tech Directions, August 2001, p. 10.

preserved in some form in order to ensure a more complete understanding of the development of the industrial heritage through time.

Makeup of a Bridge

In order to more fully understand the need for preserving these works of engineering, a basic comprehension of the parts of a bridge is essential. Each bridge can be described in its most basic form in three sections: substructure, superstructure, and deck (Figure 1.4).

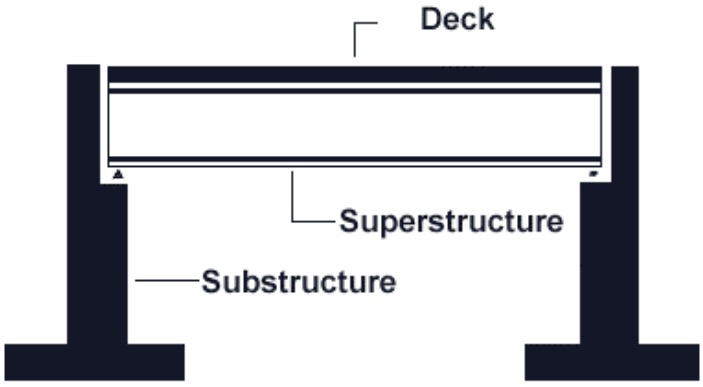

Figure 1.4: Basic Parts of a Bridge

The substructure is set below the superstructure and supports and transfers loads to the ground or bedrock.[6] Abutments and piers, or bents, make up the structural units of the substructure. Abutments serve to support the ends of the bridge superstructure and the approach roadway at embankments. Piers are solid supports featured in between the abutments that take on superstructure loads. Bents serve the same purpose with two or more columns connected by a cap beam.

[6] Some bridges such as truss or suspension bridges include elements atop the superstructure that aid in support and transfer of load weight. For the purposes of this thesis, most bridges discussed will not be of these types.

Although superstructure defines type, the number of spans of which a bridge is comprised further identifies its form. A span is the distance between two supports (piers or bents) that carry the superstructure. Where a span rests alone on two end supports and the load does not affect the stresses in adjoining spans, such a span is defined as "simple." In contrast, a "continuous" span reaches over more than two substructure elements without joints, thus distributing loads over several spans and supports. The economy of using continuous spans extends from the use of smaller beams to distribute loads over several spans instead of one. The number of expansion joints is also reduced, yet another cost-effective reason to use continuous-span construction. Furthermore, reducing joist presence can also increase the lifespan of a bridge due to the deterioration associated with such structural members. Cantilevered deck sections or beam lengths are defined as extending beyond substructure supports.

The deck is the structural element on which live load (temporary loads such as moving vehicles or pedestrians traveling over the bridge, or wind and rain) moves across. Dead load refers to any permanent, static load, including elements such as the deck itself, the superstructure, sidewalks, or balustrades. A wearing surface is applied to the deck for roadway usage.

The superstructure serves to take on and support traffic loads and transfer such loads onto the substructure. The creation of this center structural element defines the bridge type, such as slab, stringer, or T-beam.

Historic Bridge Happenings

Throughout the United States, departments of transportation and communities alike have begun to address issues related to historic bridges. Although much of the preservation efforts thus far relate to bridges dating to the nineteenth century or before,

the methods through which such structures have been saved from demolition are relevant to the preservation of Crocker's and all previous and future bridges.

Walnut Street Bridge

Completed in 1891, the Walnut Street Bridge was built to link Chattanooga, Tennessee's downtown with the North Shore of the Tennessee River (Figure 1.5). The large truss bridge carried the African American work force from the community formerly known as Hill City to the predominantly white city center on the river's south banks. The first non-military highway bridge to span the Tennessee River, the Walnut Street Bridge designed by Edwin Thacher, a renowned bridge engineer, constructed by Smith Bridge Company of Toledo, Ohio. A Pennsylvania truss[7] with metal-pinned connections, the six-span bridge is an impressive sight.[8]

Figure 1.5: 1905 Postcard Showing Walnut Street Bridge

In 1978, highway use of the bridge was discontinued and remained dormant for over two decades. With a superstructure rivaling many others of its type, the Walnut

[7] Pennsylvania truss bridges include inclined top chords with the addition of sub-struts through which stresses can be resisted and transmitted.
[8] Kay Gaston, Walnut Street Bridge, Historic American Engineering Record, No. TN-11, 1979.

Street Bridge is both the largest and the oldest truss bridge in the south.[9] These two reasons alone were more than enough to encourage citizens of Chattanooga to rise up in protest when the bridge was slated for demolition shortly after its official closing in November 1978. Organized as Chattanooga Venture and setting goals through several public meetings entitled Vision 2000, the organization of approximately 1,700 citizens convinced city officials to place 1.5 million dollars in funds originally set aside for bridge demolition to the revitalization of the bridge as a pedestrian and bicyclist destination.[10] The bridge has been open since 1993 as a prime destination and transportation artery for walkers, runners, and bicyclists alike. Now owned by the city of Chattanooga, the bridge is maintained as a public space by taxpayer dollars.

North Carolina Bridge Reuse Program

In North Carolina, the Department of Transportation established the Bridge Relocation and Reuse Program in 1978. Working in cooperation with the North Carolina Department of Cultural Resources (Division of Archives and History), the North Carolina Department of Transportation (NCDOT) first completed a statewide inventory and evaluation of metal truss bridges as the commencement of the program. By actively searching out alternatives to demolition and replacement of such bridges, the program has enacted several strategies for preservation over the last thirty years:

I. Donations of bridges to new owners;
II. Assistance with disassembly and relocation;
III. Storage in a bridge yard until a new owner can be identified; and
IV. Preservation in place.

[9] Ibid.
[10] Jack Neely, "Urban Ascension: What can we learn from Chattanooga's downtown revival?," Metro Pulse. July 2, 1997; Martha Carver, Tennessee's Survey Report for Historic Highway Bridges, Nashville: Ambrose Printing Company, 2008.

While many such truss bridges have been deemed “functionally obsolete” and not suitable for rehabilitation for regular vehicular use by NCDOT, the growing popularity of the preservation of this bridge type has ensured the lifespan and utility of numerous truss bridges throughout the state of North Carolina. As they become available for purchase and/or relocation, the bridges are listed with photographs at the NCDOT website as available (Figure 1.6), under contract (Figure 1.7), and recipient identified (Figure 1.8).[11] By creating a website for parties interested in obtaining a historic truss bridge, NCDOT can help preserve these structures by matching individuals and organizations with bridges that will meet specific requirements for use.

Figure 1.6: National Register-eligible ‘camelback truss’ bridge (built 1917) currently listed as “available” by the NCDOT

[11] “The North Carolina Department of Transportation Bridge Reuse Program.” Available at http://www.ncdot.org/doh/PRECONSTRUCT/pe/ohe/histarchi/BridgeReuse.html. Accessed February 25, 2009.

Figure 1.7: National Register-eligible ‘Pratt through-truss’ bridge (built 1910) currently listed as “under contract” by the NCDOT

Figure 1.8: National Register-eligible ‘pony truss’ bridge, shown ready for relocation, currently listed as “recipient identified” by the NCDOT

Bridge Relocation

By advertising the availability of a truss bridge in Craig, Montana, the Montana Department of Transportation (MDT) was able to come to an agreement with the Bridgeworks Conservancy to have the 1903 bridge relocated to just west of Helena, sixty miles away. Mark and Scott Nelson of the Bridgeworks Conservancy worked with MDT to save the Craig Bridge from its original destination of a scrap yard. With support from local citizens and a highly publicized storyline, the tale of the Craig Bridge relocation brought a new recognition of historic preservation to the state of Montana. Moving the 500-foot-long bridge was a feat that not only the Nelsons, but the general public will be able to appreciate in the near future, when the bridge opens at its new home spanning Ten Mile Creek at the State Nursery outside of Helena (Figure 1.9).[12]

Figure 1.9: Craig Bridge during its relocation to
Ten Mile Creek at the State Nursery in 2006

[12] Kidston, Martin J. "Company faces super-sized move in historic Craig Bridge," Helena Independent Record. March 1, 2006.

While such fervor for preservation remains strong amongst those most appreciative of the historic truss bridge, other historic bridge types have gone unnoticed when slated for demolition and replacement. A report from a workshop conducted on the preservation issues of historic bridges highlights that possibly more than half of the United States' historic bridges have been destroyed in the past twenty years, despite the growing attention paid to the preservation of historic transportation structures. It is likely that many of these historic bridges, while noteworthy in their own right, did not display the grandeur, nor generate the nostalgia that many truss bridges evoke. The superstructure, ever-noticeable in the truss bridge, can, in many cases, overshadow even the most intricately engineered and designed substructure of a T-Beam or slab bridge. However, preservation of such inconspicuous bridge types is necessary to demonstrate important changes in transportation history. With the rise of automobile use in the twentieth century, most vehicular bridges became more utilitarian in design. The necessity of rapid construction and inexpensive building materials forever altered the highway bridge's mark upon the country's landscape, making preservation-worthy feats of engineering disappear into the substructure, invisible under asphalt decks and lines of commuters.

In the following chapters, this thesis will address the preservation concerns relating to early- and mid-twentieth-century bridges constructed under the lead of Clarence N. Crocker. A discussion of Georgia's transportation history and of the life of Crocker will be followed by an analysis of three bridges. Each of these bridges faces its own preservation concern: alteration, replacement, and active use. These analyses will be followed by recommendations for the preservation of Crocker's bridges and Georgia's twentieth-century built transportation heritage.

CHAPTER 2

Georgia's Transportation Heritage

In order to fully understand the historical framework for Crocker's bridges, these structures must be recognized as part of Georgia's rich history of transportation. Georgia's first roads and bridges helped create a strong basis for construction projects through centuries. Attention previously given to railroads and wagon trails turned to turnpikes and bridges as Georgia embraced the Good Roads Movement and the popularity of the automobile. Twentieth-century politics created governing bodies and new programs born from an increasing demand for roads and bridges. The Great Depression and periods of war brought about a need for both labor and security and thus the need for road improvements and accessibility, including increased bridge construction.

Transportation Systems in Early Georgia

Georgia's first constructed road is also regarded as one of the very first national defense highways. In 1735, Yamacraw Chief Tomo-Chi-Chi laid out a roadway between Savannah and Fort King George (now Darien, Georgia) at the request of General James

Edward Oglethorpe. Oglethorpe commissioned the passage to ensure that troops could easily travel between Savannah and the fort.[13]

As more Georgia roads were constructed for defense, farming, business, and personal travel needs, their quality also improved. In 1755, Georgia passed the "Statutory Method" legislation requiring that all males of "road age" (16 to 60 years old) pay a tax for road repairs. These men were also required to work at least twelve days of each year, using their own tools, on the maintenance of Georgia's roads. The Statutory Method remained in effect until 1829, when the state acquired $70,000 to fund slave-performed roadwork. Following the Civil War, the Statutory Method was reenacted for twenty-five years. As a result, during the years 1886-1891, road maintenance waned dramatically.[14] Following the state of Georgia's investment in slave labor for building and repairing roads, private corporations began to take over construction of locally controlled turnpikes. To maintain these privately built roads, companies placed toll collection points at key locations. Tolls collected from road users payed for necessary upkeep and the building of other roads by the associated company. Until the Civil War, construction of such turnpikes was the main goal of road builders throughout the state. Charters for turnpikes were not renewed following the Civil War, and the Statutory Method recommenced at that time.

Three railroad companies can be credited with gaining the earliest charters in Georgia in late December 1833. The Central Railroad Company completed construction of a line from Savannah to Macon in 1843. The Georgia Railroad Company opened a

[13] By Land, Sea and Air: Georgians on the Move. On file at Georgia Department of Transportation.
[14] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939 (Division of Highway Planning of the State Highway Board of Georgia, May 8, 1939), p. 1.

line in 1845 from Augusta to interior towns, and the Monroe Railroad Company established a line from Macon to Forsyth in 1838.[15]

Three years after the first private charters were recognized, the Georgia General Assembly created the first state-owned railroad: the Western & Atlantic. From this time until 1861, both private contractors and public officials aimed at constructing both railroads and turnpikes to meet Georgia's transportation needs. At the onset of the Civil War, Georgia boasted approximately 1,200 miles of railroad.[16]

During Sherman's campaign of 1864, much of Georgia's railroad system was destroyed, yet popularity of rail transportation did not decrease, and Georgia created the nation's first state railroad commission in 1877. Rail travel remained widely prevalent for a number of years, reaching its height just after World War II, when an average of 152 trains per day traveled into and out of Atlanta.[17]

These many miles of rails also meant the construction of railroad trestles, bridges, and trestle-bridge combinations throughout the state. Railroad trestles can be found in several different forms throughout the state. The first trestles, constructed of wood, are called timber bent trestles, and were built from the 1830s through the 1940s. Following World War I, treated timber became the most common material used for such construction. Many of these trestles are still in use today.[18]

Standard bridge types were also constructed throughout the state for the crossing of railroads over small and large spans alike. Most railroad bridges are simple in form, using the I-beam bridge type for spans supported by basic abutments and iron I-beams. The I-beam bridge was constructed primarily after the early twentieth century as steel became a more common building material. The truss bridge was also of common

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[15] By Land, Sea and Air: Georgians on the Move.
[16] Ibid.
[17] Ibid.
[18] Alexandra C. de Kok. The Statewide Railroad Industry Context. September 1991. On file, Georgia Department of Transportation.

use throughout the state for railroad spans. This type was erected beginning in the 1880s and consisted of the use of abutments and various truss types. The swivel bridge, rare in the state of Georgia, was also constructed during the late nineteenth and early twentieth centuries. These bridges include a central pivot point on which the bridge can rotate to allow for the passage of boats. At times, a combination trestle-bridge was constructed with the use of bridge supports built of stone or concrete and a trestle portion built of wood.[19]

In 1866, the General Assembly also approved the corporate charter of the Atlanta Street Railroad Company. However, the streetcar did not become active until 1871. Inman Park, Atlanta's first residential suburb, was also home to Atlanta's first electric transit line beginning in 1875. Several other street rail systems were established throughout Georgia following Atlanta's success. The streetcar system would help to centralize Georgia cities like Macon, Athens, Rome, Savannah, Columbus and Augusta; transporting people into business districts for jobs, goods and services (Figure 2.1).

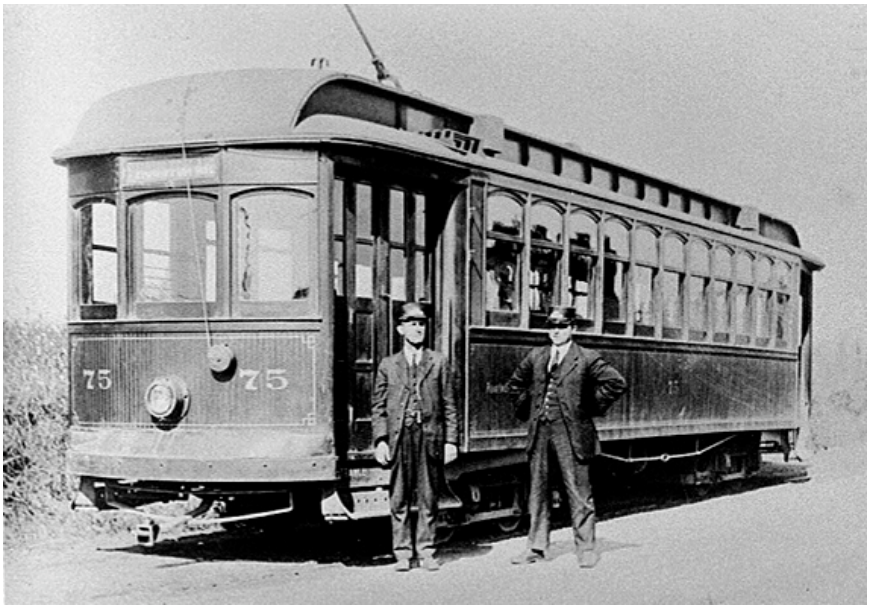

Figure 2.1: Macon's Houston Avenue streetcar, c. 1900

[19] de Kok.

Good Roads Movement, 1880s-1920s

Railroads provided the initial motivation for large-scale bridge building in the nineteenth century. This movement was soon followed by the need for bridges for vehicular traffic as well. The development was tied to the growing demand in the late 1800s for better roads that could supplement the transportation network already provided by the nation's rail lines. Initially, this advancement was spurred not by the automobile, which was barely in its infancy, but by the bicycle, which had attained its modern form by the 1890s. By the turn of the century, the bicycle had gained immense popularity throughout the country and the southeast (Figure 2.2).

Figure 2.2: Griffin Bicycle Club, c. 1890

The bicyclist organization, the League of American Wheelmen, was the most influential group in organizing the Good Roads Movement in the late nineteenth century.

Despite the bicycle's extreme popularity in all areas of the nation, only 2.3 percent of league members were based in the South as of 1897, and almost no league-sponsored tours were held in southern states.[20] In Atlanta, the bicycle had nonetheless earned an early professional status that was best displayed in the conversion of Piedmont Park's Coliseum to an indoor bicycle-racing track in the late 1890s.[21] In 1900, it was also estimated that at least 3,000 residents of the southern city of Columbia, South Carolina used bicycles daily to commute to work.[22]

In Georgia, significant advances in the Good Roads Movement came in 1891, when the Georgia General Assembly authorized county officials to impose a special gasoline tariff of 2 mills per taxable dollar for road building. Each county was also given the authority to purchase mules and equipment and to pay daily workers' wages in order to meet road-building goals.[23]

In 1898, another legislative action led to an increased statewide interest in the Good Roads Movement: the establishment of the State Prison Commission. Under the direction of this board, convict labor could be leased to private corporations or individuals for industrial needs. Legislation abolished this system ten years later, but still authorized counties and municipalities to use prisoner labor in public building projects, including those involving the construction of roads and bridges.[24]

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[20] Philip Parker Mason, "The League of American Wheelmen and the Good Roads Movement," Ph.D. diss., University of Michigan, 1957, chaps. 3 and 4, p. 50n, referenced in Howard Lawrence Preston, Dirt Roads to Dixie: Accessibility and Modernization in the South, 1885-1935. Knoxville: The University of Tennessee Press, 1991,p. 12.

[21] Augusta Wiley King, "Evolution of the Wheel or The Perils of Early Bicycling in Atlanta," AHB, XXXII, December 1947, pp. 2-8, referenced in Franklin M. Garrett, Atlanta and Environs: A Chronicle of Its People and Events, Volume II, Reprint, University of Georgia Press, Athens, Georgia: 1969, p. 178.

[22] John Hammond Moore, The South Carolina Highway Department, 1917-1987, Columbia: University of South Carolina Press, 1987, pp. 23-28, referenced in Mark Swanson, Salkehatchie Bridge, Historic American Engineering Record, May 2001, p. 4.

[23] By Land, Sea and Air: Georgians on the Move.

[24] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, p. 3.

At the national level, the Good Roads Movement of the 1890s led to the first Federal Road Act, dating to 1893, whereby Congress gave the U.S. Department of Agriculture $10,000 to investigate new road-building techniques. The act provided funding for "object lesson" roads, where short stretches of roads were finished with local materials under federal supervision, to serve as spurs to local road construction. The measure also established the "Office of Public Road Inquiries." By 1916, this office had become the Bureau of Public Roads (BPR).[25]

In 1899, automobiles were brought to both Savannah and Athens, Georgia, but Atlanta would not be home to the car until 1901.[26] In December of that year, Georgia's interest in the Good Road Movement was made official with the creation of the Georgia State Good Roads Association in Atlanta.[27] This undertaking most likely arose from the appearance of Georgia's first automobiles. In the same year that Georgia formally recognized the Good Roads Movement, William Dawson Alexander, a bicycle dealer, brought Atlanta its first automobiles: three Stanley Steamers.[28]

Shortly following the arrival of the automobile to Georgia, residents of the state began becoming increasingly interested in Good Roads activities. For instance, in 1908, the first federally funded paving project for the state took place in Piedmont Park at a celebration dubbed "Good Roads Day." Although the paving demonstration only covered a small, one-eighth-mile strip, the observance of such an act proved Georgia's receptive stance towards road improvement.[29]

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[25] Moore, The South Carolina Highway Department, 1917-1987, p. 39.
[26] Steve Gurr, "Toy, Tool, and Token: Views of Early Automobility in Georgia [Georgia History in Pictures]" The Georgia Historical Quarterly, Vol. LXXVII, No. 2, Summer 1993, p. 388, referenced in Robert M. Craig, "The Archaeology of Atlanta's First Automobile Age" Atlanta History: A Journal of Georgia and the South, Vol. XLIV, No. 3, Atlanta: Atlanta Historical Society, Inc., 2000, p. 7.
[27] Howard Lawrence Preston, Dirt Roads to Dixie: Accessibility and Modernization in the South, 1885-1935, Knoxville: The University of Tennessee Press, 1991, p. 29.
[28] Gurr, "Toy, Tool, and Token: Views of Early Automobility in Georgia [Georgia History in Pictures]," p. 388.
[29] By Land, Sea and Air: Georgians on the Move.

The 1911 Glidden Tour also provided Georgians with a chance to show their support of the Good Roads Movement. This grand road tour featured competing travelers sponsored by Boston millionaire Charles J. Glidden as they journeyed along the National Road from New York City to Atlanta, then on to the finish in Jacksonville, Florida. Among the contenders in this nationwide event were 9 competing teams from Georgia, or half of the total number of challengers (Figure 2.3). Notable drivers hailing from Georgia included Governor Hoke Smith, Asa Candler of Coca-Cola, and Roberta Smith, an Athens native and perhaps the best of several women drivers in the race (Figure 2.4).[30]

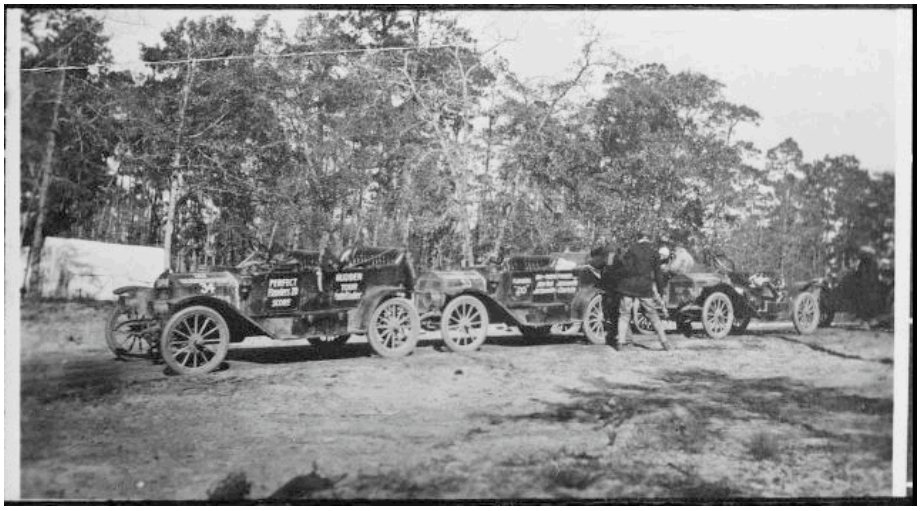

Figure 2.3: Glidden Tour in Georgia

[30] Preston, Dirt Roads to Dixie: Accessibility and Modernization in the South, 1885-1915, pp. 48-49; By Land, Sea and Air: Georgians on the Move.

Figure 2.4: Regina Rambo, Glidden Tour contender from Georgia

The United States Congressional approval of the Federal Aid Road Act of 1916 was the culmination of years of awareness-raising events and actions of the Good Roads Movement. This monumental act not only authorized states to provide matching funds in order to build and improve roads, but also enabled each state to form its own agency to regulate and oversee such projects. In order to comply with the new act and to gain access to federal funds, the Georgia General Assembly met in Extraordinary Session that same year. Here, the first State Highway Commission was formed comprised of the State Geologist, members of the Prison Commission of Georgia, Dean of the College of Civil Engineering at the University of Georgia, and the Professor of Highway Engineering at the Georgia School of Technology.[31]

Despite the enthusiasm for new transportation alternatives, road-building progress was slow in Georgia. Thoroughfare construction remained a prerogative of the counties that was jealously guarded throughout the nineteenth century and well into the

[31] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, p. 3.

twentieth.[32] By the 1920s, however, this county right was under attack. Individual counties simply did not have the resources to maintain the sort of road networks demanded by the rapid rise of the automobile in the 1910s and 1920s.

State Highway Commission and Bridge Department

In its first three years, the newly formed Highway Commission succeeded in obtaining 75 Federal Aid projects in 64 different Georgia counties, totaling 555 miles of new or improved road surfaces, including 41 bridges.[33] In its third year, in compliance with the State Highway Act of 1919, the commission became the State Highway Board governed by a three-man, governor-appointed panel. This board is credited with creating the first state highway system of Georgia, which connected county seats to one another and measured 4,800 miles.[34] Mandated in the State Highway Act were the creation of the State Highway Maintenance Department and the appointment of 12 division engineers, one for each Congressional District.

The year 1919 included the passage of the Motor Fuel Tax Act in the Georgia State Legislature. This act enabled highway drivers to pay for much-needed road repairs and the construction of new highways.[35] The Motor Fuel Tax Act, combined with the four-year-old Motor Vehicle Act, provided the state of Georgia with a base of funds to enable such transportation projects. By May 22, 1920, the state had accrued $1.72 million from recent legislative changes for use on road projects.[36]

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[32] Carolina Highways, April-May 1977, 60th Anniversary, p.5, referenced in Mark Swanson, Salkehatchie Bridge Historic American Engineering Record, May 2001, p. 4.
[33] Ibid., p. 5.
[34] Ibid., p. 6; By Land, Sea and Air: Georgians on the Move.
[35] By Land, Sea and Air: Georgians on the Move.
[36] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, p. 8.

W.R. Neel, State Highway Engineer in the early 1920s, believed that the construction of "permanent" bridges throughout Georgia was paramount. In the past, rivers running through Georgia's landscapes were in many cases barriers to prevent, not promote, automobile travel. Searcy B. Slack was selected by Neel in 1920 to carry out the task of promoting the construction of river-spanning bridges throughout the state. These "permanent" bridges were to be built of lasting and easily available materials like reinforced concrete, and would take the form of T-beam, slab, and arch. Through the promotion of standardized design and reinforced concrete construction, Slack oversaw the construction of 217 bridges by the close of 1922.[37]

In the 1920s, amendments to the Highway Act and changes in State Highway Board regulations gave state transportation officials a heightened authority over bridge-specific projects. For instance, in 1922, the State Highway Department began to regulate the weight of traffic traveling over state-funded bridges. At this time, the Highway Department was also charged with constructing and maintaining any State Aid roads running within and through municipalities with populations of 2,500 or less.[38] This authority and responsibility was extended to include bridges as well as roads in 1924.[39] In 1929, this power was once again altered with the passing of the Traylor-Neill Act. This law gave the Highway Department the legal right to designate State Aid Roads, but relieved the department from maintenance responsibilities until roads were officially designated as such. The Traylor-Neill Act also gave the Highway Department the right to make additions to the state highway system at its discretion, but only at a rate of 500 miles at a time.[40]

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[37] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, June 2001, p. 44.
[38] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, p. 10.
[39] Ibid., p. 13.
[40] Ibid., p. 16.

Despite the establishment of several enabling legislative acts and record funding during the 1920s, political discord prevented road construction from reaching its maximum potential during this decade. By this time, the State Highway Board had become one of the most powerful entities in Georgia in regards to obtaining funding. Governors soon desired this power and sought to appoint their own associates as chairs in order to expedite personal and political agendas. Governor Thomas W. Hardwick replaced Dr. C.M. Strahan, an original member of the 1916 Highway Commission and later chairman of the State Highway Board, with John N. Holder in 1922. Holder would prove to hold powerful political ties, allowing him to retain his position despite numerous replacement attempts by following governors Clifford Walker and Lamartine Hardman. Such conflict led to the slowed pace of highway construction efforts during the 1920s.[41]

At this time of delayed road improvement and construction, Slack's Bridge Department had become widely interested in the most efficient and cost-effective form of bridge building techniques. Function was of slightly more importance than low cost, and was highly valued over elaborate, and thus more costly, form. While road improvement lagged behind on a national level, Georgia opted to spend most of its federal aid dollars constructing permanent bridges instead of funding permanent paved roads. As a result, Georgia constructed a total of 23 miles of bridges from 1919 to 1926, 19 percent of the length of all federal aid bridges built at that time.[42]

While the number of bridges constructed during this period remains impressive, other issues arose during the 1920s that would overshadow this feat. For instance, a 1922 inventory of bridges carrying state highway system roads uncovered the existence of over 1,400 county-built bridges previously inherited by the state of Georgia. Over

[41] Kenneth Coleman, ed. A History of Georgia. 2d ed., Athens: The University of Georgia Press, 1991, pp. 310-311.
[42] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, p. 45.

1,100 of these bridges had been constructed of wood, an almost obsolete method of building, incapable of meeting growing load requirements for automobile traffic. Although the inventory results were the catalyst for new legislation requiring load-bearing regulations for state-owned bridges, maintenance costs to repair existing structures would overshadow such forward-thinking measures.

Maintenance concerns were not only limited to older wooden bridges, but also to recently constructed reinforced concrete bridges. Many of these bridges, while displaying the innovative standardization of bridge design and construction, would need to be replaced despite being, in many cases, younger than 12 years old.[43] These bridges were not constructed with widths and alignments necessary to serve newer, larger automobiles. Although much of the nation was experiencing unexpected bridge obsolescence, Georgia would face particular funding problems due to the Highway Department's previous decision to focus such a large amount of federal aid on what were originally believed to be permanent bridges.

Left with an overwhelming number of outdated bridges, the State Bridge Department, led by Searcy Slack, reinvented Georgia's original set of bridge standards to accommodate new requirements of motor vehicles. In the late 1920s and early 1930s, roadway widths were increased from between 16' and 18' to between 20' and 22'. Furthermore, steel stringer, or rolled beam, bridges were now just as acceptable as reinforced concrete as a standardized building type. Like concrete, steel was becoming more readily available and falling in overall cost.

While Georgia's twentieth-century transportation built heritage is the primary concern of this thesis, a discussion of the state's rich past was necessary in order to create a broad context in which to analyze more recent past structures. From the building of its first defense roads traveled on by early white settlers to the construction of

[43] Ibid., p. 46.

railways throughout the state to the planning for new highways to get the state “out of the mud,” the state of Georgia had already experienced a bountiful history of building for transportation purposes by the early 1930s. By this period, Searcy Slack had established the first post of State Bridge Engineer, setting standards and providing leadership for the man who would take his place in 1933 and lead the Bridge Department for twenty-three years.

CHAPTER 3

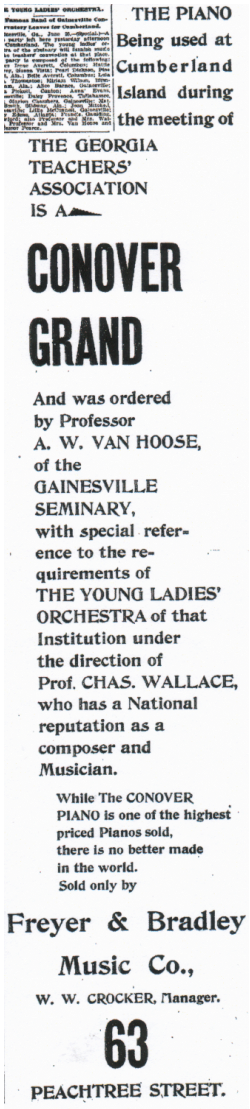
Profile of an Engineer: Clarence N. Crocker

Under-recognized and barely documented, bridge engineers often leave only their work behind as a record of their lives and accomplishments. Ironically, this "record" is often short-lived, as bridges must often be replaced when larger, stronger structures are needed. Engineers know that their creations will not last forever, but nevertheless continue to make important breakthroughs in design and functionality. The engineer behind a large number of twentieth-century bridges humbly regarded his constructions as semi-permanent, welcomed their replacement when needed, and did not worry that his work may not live on as a tangible example of his engineering accomplishments.

A Quiet Life

Born February 10, 1894, Atlanta native and University of Georgia engineering graduate, Clarence Newell Crocker was the second and longest-serving State Bridge Engineer in Georgia history. Born to William W. and Helen A. Crocker of New York, Crocker was raised in the Atlanta area in a musical household. His father is identified as manager of Freyer & Bradley Music Co. in articles and ads from the 1895 The Atlanta

Constitution and as a traveling piano salesman in an article from 1990 (Figure 3.1).[44] On March 7, 1912, The Atlanta Constitution reported that young Crocker would play second violin in an upcoming concert given by the members of the Junior Philharmonic Orchestra of the Atlanta Musical Association.[45] [46]


THE PIANO
Being used at
Cumberland
Island during
the meeting of
THE GEORGIA
TEACHERS'
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IS A

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And was ordered
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A. W. VAN HOOSE,
of the
GAINESVILLE
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with special refer-
ence to the re-
quirements of
THE YOUNG LADIES'
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While The CONOVER
PIANO is one of the highest
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63
PEACHTREE STREET.

Figure 3.1: Advertisement featuring Crocker's father, W.W. Crocker

[44] "A Great Pianist: Mr. L.M. Mayer Surprises His Most Ardent Admirers Last Night," The Atlanta Constitution. May 3, 1895, p. 9; Freyer & Bradley Music Co. advertisement, The Atlanta Constitution. June 27, 1895, p. 4; Cordell, Actor. "Boys' High of 1912 nothing like schools of today, alumnus says," Atlanta Journal-Constitution Intown Extra. August 26, 1990, p. 4E.
[45] "Public School Concert," The Atlanta Constitution. Atlanta, GA. March 7, 1912, p. 14.

During his years at Boys' High School in Atlanta, Crocker was known by the moniker "Nat" according to his yearbook The Alciphonian. Here, the quote "A man of few words is best" aims to describe young Crocker during his final year in his Classical Course of Study at the school. At Boys' High, Crocker was active in both the track team and German Club. In an article written about Crocker in his later years, the former engineer describes one of his most memorable teenage moments as hiking up Stone Mountain in 1910, where he and his friends watched the return of Halley's Comet.[47]

After graduating from Boys' High in June 1912, Crocker continued with his education at the University of Georgia. There, Crocker enrolled in the College of Civil Engineering, earning a Bachelor of Science degree, and continued practicing violin as a member of the Glee and Mandolin Club (Figure 3.2). Crocker also joined the Engineering Society, 'Sine and Tangent' (Figure 3.3), and played pushball during his spare time (Figure 3.4). As his senior yearbook quote, Crocker chose William Drummond's "What sweet delight a quiet life affords."[48] However, with titles such as "Dams and Their Construction" and "The History of Sewage Systems," Crocker revealed a strong, forceful voice for engineering in his contributions to The Engineering Annual, a publication of papers and lectures produced by University of Georgia students.[49]

[47] Cordell, Actor. "Boys' High of 1912 nothing like schools of today, alumnus says," Atlanta Journal-Constitution Intown Extra. August 26, 1990, p. 4E.
[48] Pandora, Athens, Georgia: University of Georgia, 1913-1915.
[49] C.N. Crocker, "Dams and Their Construction," The Engineering Annual: Hydraulic Engineering Number 1913-1914, pp. 50-53; C.N. Crocker, "The History of Sewage Systems," The Engineering Annual, 1915: Containing the Proceedings of The Water Supply and Sewerage Conference, April 19-20, 1915, pp.142-145.

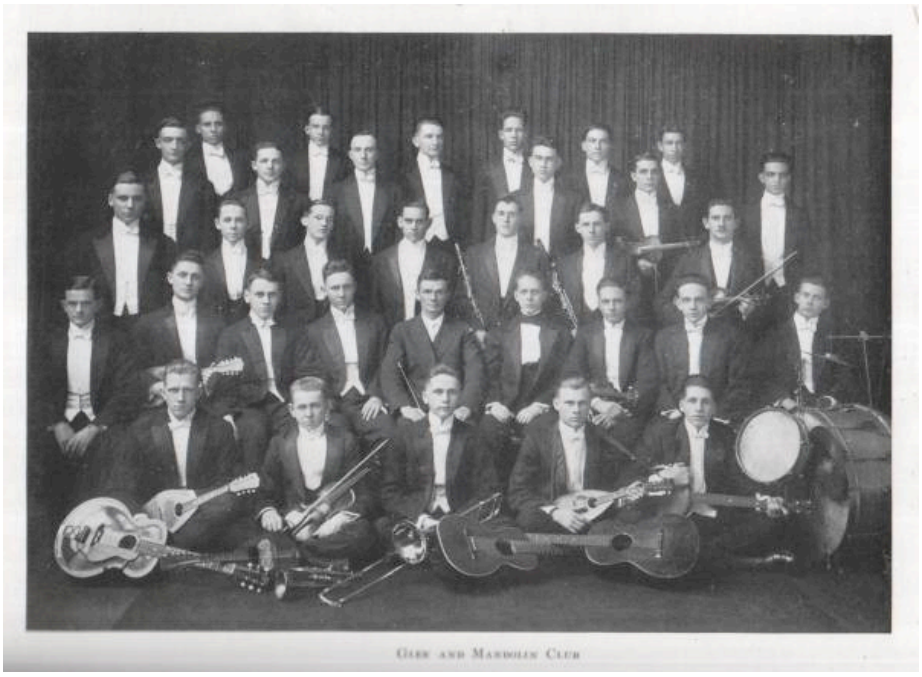

Figure 3.2: Crocker (standing second from right, second row)
in the Glee & Mandolin Club

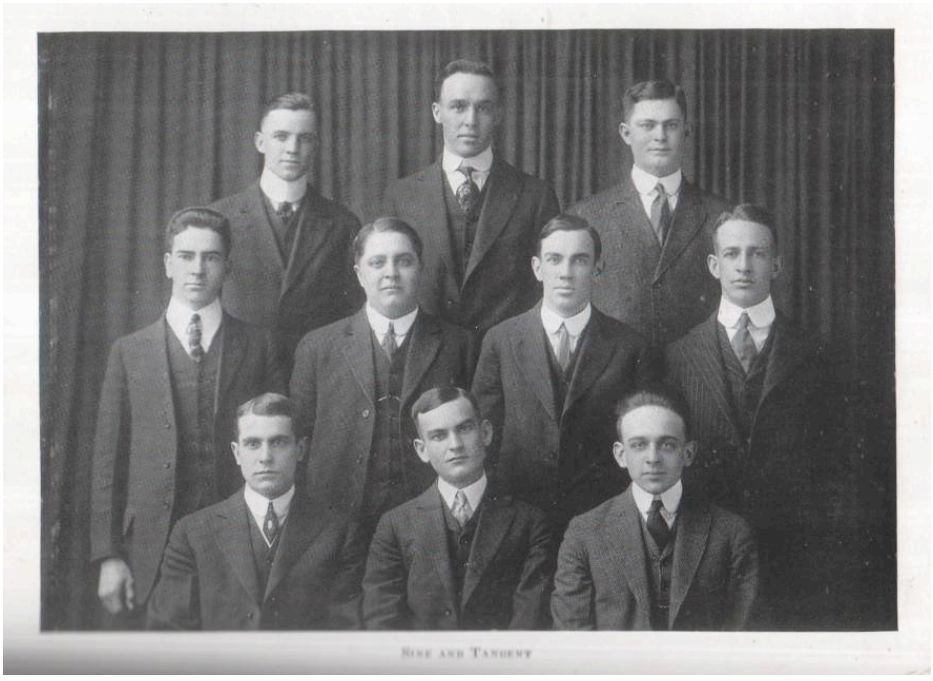

Figure 3.3: Crocker (seated first, bottom row) in Sine and Tangent

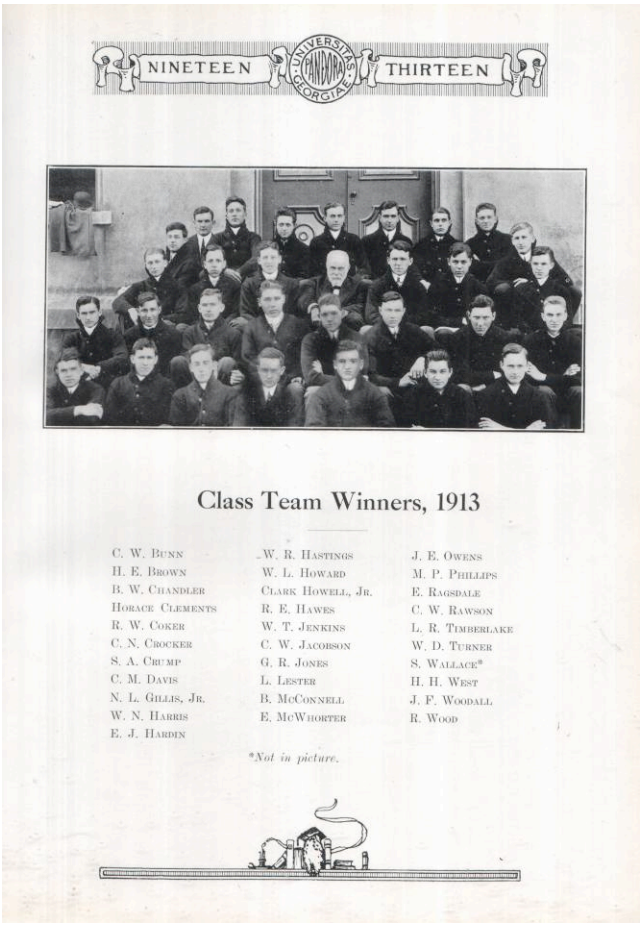

Figure 3.4: 1913 Pushball Team (Crocker seated second from right, top row)

According to World War I registration records, Crocker attempted to join the military two years after his college graduation in 1917. On this document, Crocker is described as a "Civil Engineer" working for an unknown government employer in Chattanooga, Tennessee. However, on the same document, Crocker claims a home address in College Park, Georgia. No other record was found stating Crocker's employment in Chattanooga. At 23, Crocker described himself as unmarried in the record (Figure 3.5),[50] however, at a Baptist church social, he met Elsie Barton, a Girls'

[50] World War I Draft Registration Card A. No. 133. May 26, 1917, United States, Selective Service System. World War I Selective Service System Draft Registration Cards, 1917-1918. Washington, D.C.: National Archives and Records Administration. M1509, 4,582 rolls.

High School graduate and Peeples Street Grammar School first grade teacher. They were married four years later, in September 1921.[51]

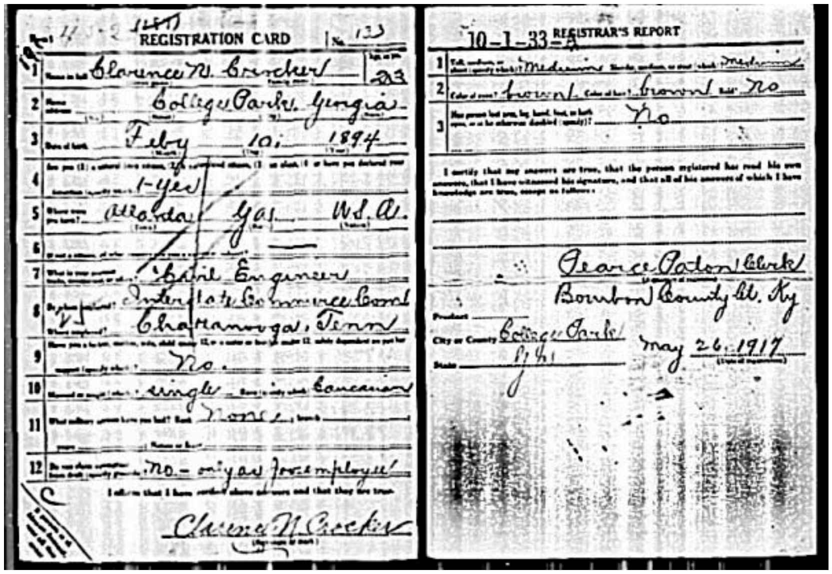

Figure 3.5: Crocker's Registration Card

A New Leader

Crocker did not enlist into the United States Armed Forces; a heart murmur prevented his recruitment, which made Crocker available for engineering work during wartime.[52] Almost since its founding, the Georgia State Highway Department employed Crocker as a civil engineer in the department's Bridge Section. During the 1920s, Crocker was one of no more than twelve people employed at the State Highway Department. Only three of those held positions in the Bridge Section. Crocker became assistant bridge design engineer in 1927, and in 1933 took Searcy Slack's place as State Bridge Engineer, upon Governor Eugene Talmadge's re-staffing of the Highway Department.[53] Crocker and

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[51] Cordell, p. 4E; "Barton-Crocker," The Atlanta Constitution. August 21, 1921; "Battle Over Teachers Fought Before Board; Miss Riordan Dropped," The Atlanta Constitution. June 11, 1921. pp. 1, 7.
[52] New South Associates, Conveying History: Bomber Plant Bridge, February 25, 2008, p. 20.
[53] "We Say Farewell to a Founding Father," Georgia Milepost, Second Quarter 1995, p. 15.

Slack remained friends following the Highway Department's upheaval, and continued to work closely with one another throughout their careers.[54]

Although Talmadge questioned enacting New Deal programs to alleviate the strains of the Great Depression, Crocker instituted bridge plans that would aid a struggling public. In an article recalling Crocker's contribution as a 'Founding Father' of the Bridge Department, Crocker explains the department's issues during periods of low funding:

> The trouble was mainly money. They kept hollering we'd design one for concrete and they'd want it cheaper. We'd have to tell them 'There's no such thing as a cheap bridge, but there's a cheaper bridge.' And that's what we build mainly—just to get them out of the mud and a way across the creek.[55]

Under Crocker's leadership, the bridge department focused its attention on designs that would maximize manual labor while minimizing the use of expensive heavy equipment and excessive materials needed to "get Georgia out of the mud." Following Crocker's new guidelines, the bridge department constructed over 680 bridges between 1936 and 1940.[56]

Crocker's leadership skills were honed early in his career with the implementation of new standards of bridge building across the United States. In 1931, the American Association of State Highway Officials (AASHO) published detailed minimum standards for bridge design. Included were guidelines for live load specifications based on 20-, 15-, and 10-ton two-axle trucks. The bridge standardizations were found to be so useful that most bridges built after 1931 across the country utilized the AASHO-recommended methods of construction, thus resulting in the

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[54] New South Associates, p. 20.
[55] "We Say Farewell to a Founding Father," Georgia Milepost, Second Quarter 1995, p. 15.
[56] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, p. 54.

overwhelmingly similar appearance of newly built bridges throughout the United States. With Crocker paying close attention to the AASHO standardizations, the process of upgrading Georgia's bridges to meet national standards commenced in 1935.

An Introduction to Crocker's Bridges

Serving as State Bridge Engineer for twenty-three years, with time spent under Searcy Slack's guidance prior to leading the Bridge Department, Crocker filled his resume with some of the most important bridge projects in Georgia's history.

Veterans' Memorial Bridge

Spanning the Flint River in Albany, Georgia is one of the many noteworthy bridges associated with Crocker: Veterans' Memorial Bridge (Figure 3.6). This open-spandrel, reinforced-concrete bridge was constructed during Searcy Slack's period as State Bridge Engineer, when Crocker was working as an associate in the Bridge Department. This 11-span, 777-foot structure gained recognition over 70 years after its original construction, when it was the first bridge in Albany to be reopened during the floods of July 1994. Paul Liles, current State Bridge Engineer recalled placing a telephone call to then-100-year-old Crocker to inform him that a bridge he had worked on so long ago was the first to reopen to stranded and separated Albany residents after several days of rising river waters:

> …Albany was cut off from one side to the other. It was really desperate times down there. The people could not talk to each other; the phones were all flooded out. Nobody knew if their relatives were well or not on the other side of the river. It was really, like I say, a desperate time. So they had been using the bridge for emergency personnel. And it was so desperate that you would come

to the bridge – we didn't allow vehicles on it – and they would issue you a life preserver. And you could walk across to the other side, and you would take the life preserver off and put it in a box. Because they didn't know if the bridge was going to wash away or not. That was all the bridges in Albany. They were underwater, and it was a mess… We said "We've got to get the people where they can cross from one side to the other." So we opened up that bridge… I called Clarence up and told him we had opened the bridge – his was the first one opened.[57]

Figure 3.6: Memorial Bridge Spanning the Flint River

Lula Bridge

Light steel trusses, a wood floor, and a narrow width made up the bridge previously located along State Road 52 between Lula and Brookton in Hall County, Georgia. Spanning the Chattahoochee River, the bridge was replaced in 1954 to accommodate an H-15 load rating with its construction materials of concrete piers supporting steel beams and a concrete deck (Figure 3.7). The roadway of the new bridge was designed to support larger vehicles, along with the increased load rating, with a width of twenty-four feet. Officially titled, Project S-1238(4), the Lula Bridge, as it is now called, has a

[57] New South Associates, p. 21.

length totaling 385 feet.[58] Although Lula Bridge currently remains standing at its original location, it is in the process of being replaced.

Figure 3.7: Lula Bridge over the Chattahoochee River

Apalachee River Bridge at Oconee-Walton Counties

The open-spandrel, reinforced-concrete bridge spanning the Apalachee River at the Oconee-Walton County line was erected in 1938 (Figure 3.8). In the 1970s, the widening of US 78 brought attention to the bridge as surveyors and historians alike began analyzing this area closely for effects to historic resources. Martin Stupich described the bridge during an architectural survey on August 5, 1976 as "very fine" and most likely soon to be demolished.[59]

[58] C.N. Crocker, "Division of Bridges," Twenty-Fifth Report of the State Highway Department of Georgia to the Governor and General Assembly of the State of Georgia for the Fiscal Years Ending June 30, 1953 and June 30, 1954, p. 101.
[59] Martin Stupich. OC-226, Architectural Survey of Oconee County, on file at the State Historic Preservation Office, Atlanta, Georgia.

Figure 3.8: View of the balustrade of the bridge spanning the Apalachee River at Oconee-Walton Counties

A few months later, David Sherman, of the Georgia Department of Natural Resources, listed this bridge as one of five in the state that he believed should be added to the National Register of Historic Places (NRHP).[60] In 1981, seven years prior to the bridge reaching fifty years of age, Lichtenstein Consulting Engineers, Inc. regarded it as eligible for listing on the NRHP during a survey of Georgia's historic bridges.[61]

Currently carrying US Highway 78 (Westbound), the bridge now serves as part of a busy commuter route between Clarke and Oconee Counties towards the metropolitan-Atlanta area. Spanning a length of 418 feet, the bridge still meets requirements for covering the river below; however, the bridge has been found deficient by the Georgia Department of Transportation due to its width and marginally satisfactory substructure condition. While strengthening the substructure could be accomplished by enclosing the spandrel columns within reinforcement collars and/or replacing the bridge deck with one of much lighter weight, the department of transportation has determined raising standards to such levels to be neither prudent nor feasible (Figure 3.9). Furthermore,

[60] David Sherman, Georgia Department of Natural Resources, Memorandum to Floyd Hardy, October 6, 1976, on file at the State Historic Preservation Office, Atlanta, Georgia.
[61] Georgia Department of Transportation, "Serial #297-0007-0," Historic Bridge Inventory Report, November 1994.

widening the dual 12-foot travel lanes to current standards would end in the complete removal of the balustrade.[62]

Figure 3.9: Substructure of the bridge carrying
US Highway 78 (Westbound) above the Apalachee River

Influence

Throughout his time at the Bridge Department, and thereafter, Crocker contributed several articles to professional journals such as Engineering News-Record. In an article for the Portland Cement Association, Crocker's description of the engineering and construction of Bomber Plant Bridge caught the attention of Delaware State Bridge Engineer Victor A. Jost.[63] Being a wartime construction project, Bomber Plant Bridge needed to be an economical undertaking, using as little steel as possible. Utilizing

[62] New South Associates, Inc., Assessment of Effects, GDOT Project BRST-061-1(110), Oconee-Walton Counties, February 17, 2009.
[63] Crocker, "Continuous Concrete Girder Bridge Spans Chattahoochee," R/C: Modern Developments in Reinforced Concrete, no. 14, 1945.

techniques first practiced under Searcy Slack's direction, Crocker refined the reinforced concrete T-beam to display an aesthetically pleasing continuous-span design. Both the design and low costs appealed to Jost, who contacted Crocker for advice on constructing what appears as a smaller version of Bomber Plant Bridge spanning the St. Jones River (Figure 3.10).[64]

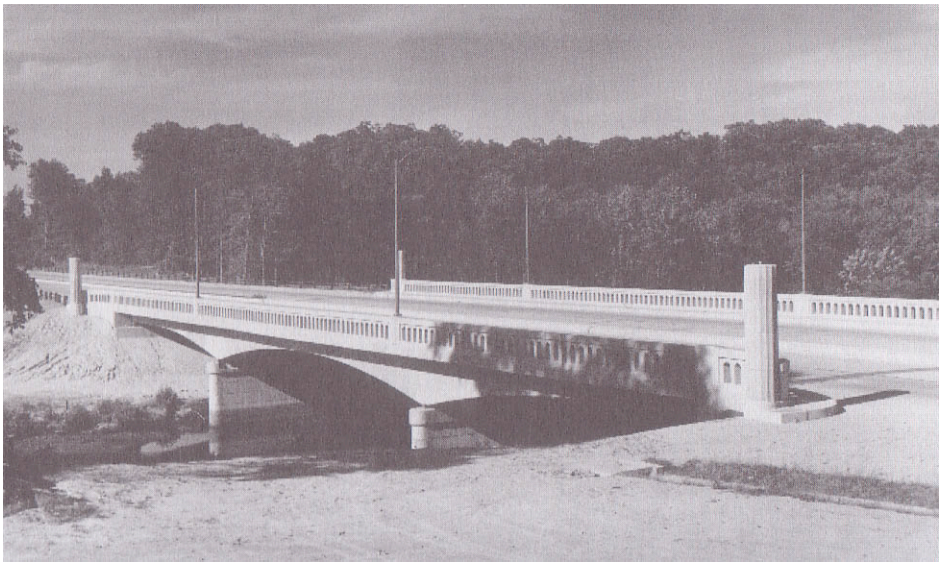

Figure 3.10: Delaware's version of Bomber Plant Bridge, erected 1951

An Engineer Never Forgets His Bridges

Crocker lived to be 101 years old, but for over 35 years after leaving the Bridge Department, he was often called upon to give advice on existing bridges and their rehabilitation (Figure 3.9). Like many engineers, Crocker understood that much of what he once helped to construct would eventually need to be replaced. When Paul Liles was faced with replacing a Crocker bridge at Darien, he recalled informing Crocker of the

[64] Lichtenstein Consulting Engineers, Inc. Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads, pp. 219-221.

decision. Upon hearing the news, Crocker's reaction was typical. He understood that his legacy was in the technology of the bridge design, not in the structure itself.[65]

[65] New South Associates, p. 26.

CHAPTER 4

Alteration

The onset of the depression led the Bridge Department of Georgia to more standardization and better planning by leaders for the production of roads and bridges using maximum manpower and minimum, economical materials. The hardscrabble times of the Great Depression led to new ideas in increasing bridge widths to allow for greater numbers of automobiles, higher bridges to allow for the passing of larger boats and ships in navigable rivers, and more streamlined, stronger designs that would lengthen spans while using less materials.

Depression-Era Transportation Politics

The stock market crash in October 1929 would make the following decade one of cautious growth. Georgia's gubernatorial elections and the resulting effect of Talmadge's political inclinations on the state's transportation issues became vitally important during the Great Depression. The *Federal Aid Highway Program*, directed by President Herbert Hoover and the Bureau of Public Roads was one of the few existing government aid programs to remain intact after the crash. Although funds remained

available for highway projects, intergovernmental cooperation was critical for road progress.

New federal assistance programs enacted after President Franklin D. Roosevelt's inauguration in 1932 required nationwide cooperation, furthering the importance of state elections at this time. Ten candidates entered the race for governor of Georgia after Richard B. Russell left the post to become a United States Senator on January 1, 1933.[66] The victor was Eugene Talmadge, Commissioner of Agriculture, farmer, and lawyer.

Under Talmadge's first term as governor from 1933 to 1937, Georgia's State Highway Department faced its most powerful hurdle since its founding. The new governor's primary focus upon his election was to establish a $3.00 automobile tag, reduce utility rates, and to abolish the *ad valorem*[67] tax altogether. Implementing executive power in his decision-making, Talmadge ignored judgments of the state legislature and enacted his own programs despite widespread opposition. Furthermore, when refusing to lower utility rates, members of the Public Service Commission were forced from office.[68] This type of hasty action became common during Talmadge's career as governor.

Shortly after his swearing in, Talmadge began to replace top state officials from several different agencies with his own appointees. Among those to lose his position was Georgia's first State Bridge Engineer, Searcy Slack. Upon Slack's removal, Talmadge selected Clarence N. Crocker to take his place. Crocker continued to serve as State Bridge Engineer until 1956.[69]

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[66] Coleman, A History of Georgia, p. 311.
[67] This tax is based on the assessed value of a motor vehicle multiplied by the millage rate set by the local county government.
[68] Ibid., pp. 312-313.
[69] Lichtenstein Consulting Engineers, Inc. Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads, p. 221.

In 1933, the State Highway Department addressed concerns to Talmadge about its new operating budget, which would be miniscule if the governor did indeed enact his proposed tax sanctions. Suggesting that the reduction of the much-needed automobile taxes would harm the productivity of road building and maintenance in the state, the highway department found itself at odds with Talmadge. The new governor, opposing the department's proposals, refused to approve the requests. When employing his right of executive power in order to force the reduction of the Motor Vehicle Tag Tax, Talmadge also exhibited his authority as governor by dismissing five chief engineers from the State Highway Department. In order to ensure that his directives were endorsed, Talmadge went so far as to call in the National Guard to forcibly remove then-State Highway Department Chairman Barnett and member Bereen on June 19, 1933. Third board member Jud P. Wilhoit was placed in control of all Highway Department activities at that time.[70]

The conflicts Talmadge created between himself and several state agencies led to diminished available resources for many state-funded programs including those relating to highway construction and maintenance. However, the relief programs launched by Roosevelt in 1933 kept Georgia's improvement projects intact for the next seven years. The New Deal had succeeded in bringing more road construction and improvements to Georgia despite Talmadge's opposition to federal public works programs. Also in 1933 was the passage by the Georgia General Assembly of an act requiring the State Highway Board to purchase all right-of-way property for highway construction or improvements. Until this time, each Georgia county was held responsible for purchasing these properties.

[70] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, pp.19-20.

In the following two years, the Highway Department experienced little funding and combative leadership. Governor Talmadge, unsupportive of President Roosevelt's New Deal, refused to enlarge the Highway Department staff and found the federally regulated pay scales associated with the department to be incongruent with localized needs. In order to diminish federal labor laws in Georgia, Talmadge agreed to compromise with Roosevelt by adding more qualified staff to the Highway Department's existing miniscule employee base. As a result of this staffing boost, the Highway Department was able to increase construction to a pace similar to that in place prior to Talmadge's election. Furthermore, over 24,800 linear feet of bridges were placed under construction during the 1935-36 years due to this governing change.[71]

State Bridge Engineer Clarence N. Crocker led his department through Great Depression burdens with new and better construction plans that both followed New Deal principles, and saved the state much-needed money. Although Governor Talmadge rejected the New Deal, Crocker adopted work plans that incorporated some of Roosevelt's ideals, such as maximizing the use of available manpower. Thus, much like Roosevelt's multiple New Deal programs, many of Crocker's bridge projects were carried out in such a way as to create as many jobs as possible to meet the needs of an overwhelmingly unemployed public. By using less expensive materials and simpler, more straightforward design methods, Crocker was also able to lessen the costs of expensive bridge construction projects, yet another important feat during the Depression era.

Bridge standardizations set by the American Association of State Highway Officials (AASHO) in 1931 also altered the way bridge building was conducted in the

[71] Sixteenth Report of the State Highway Department of Georgia to the Governor and General Assembly of the State of Georgia for the Fiscal Years Ending June 30, 1935, and June 30, 1936, p. 34.

state of Georgia during Depression years. Specifications for heavyweight vehicles were vital in new construction projects, which led to a great quantity of similar-looking new bridges built across the country. Crocker directed Georgia's Bridge Department to such standardization, upgrading structures to meet AASHO guidelines beginning in 1935. As a result of these measures, which gave guidance to departments for the use of specific materials and building methods in order to maximize building with minimum funding, over 680 bridge projects were completed between 1936 and 1940 (Figure 4.1).[72]

In 1937, the first year of Governor Eurith Rivers' term in office, the Post Roads Division of the State Highway Department was established. The General Assembly began this branch to enable the state of Georgia to participate in a funding program sanctioned by an act of Congress on June 16, 1936 that sought to improve upon secondary feeder roads throughout the country.[73] Rivers' pro-New Deal platform had helped him defeat the now notorious Eugene Talmadge in the 1936 election. Upon his inauguration, Rivers proceeded yet again to reorganize the State Highway Department, dismissing many Talmadge-appointed officials.

[72] Eighteenth Report of the State Highway Department of Georgia to the Governor and General Assembly of the State of Georgia for the Fiscal Years Ending June 30, 1939, and June 30, 1940, p. 44.
[73] History of Highway Construction in the State of Georgia and of the State Highway Board, 1916-1939, p. 21, 23.

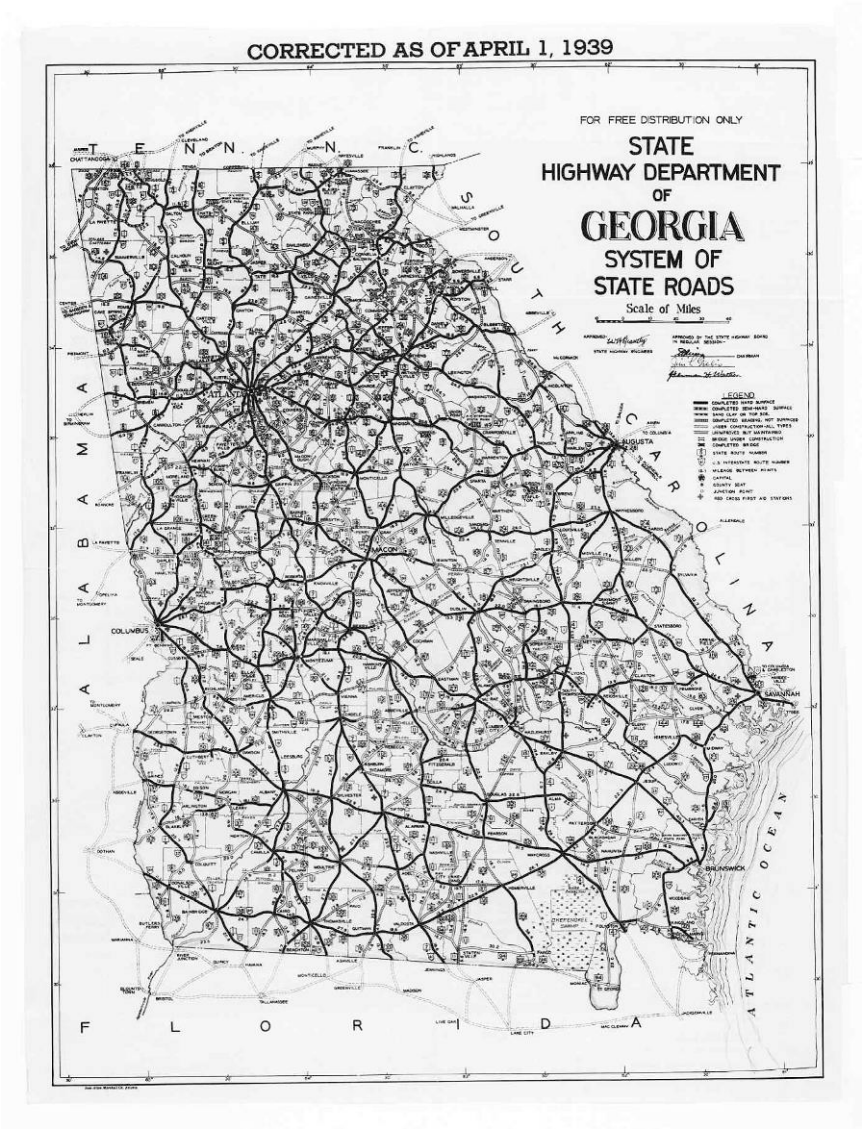

Figure 4.1: System of Roads, State Highway Department of Georgia, 1939

1930s Bridges

The State Highway Department continued expanding and improving Georgia's roads during Rivers' governorship, relieving counties of unnecessary expenditures by taking over, and thereby paying for, several rural roads. Although not groundbreaking nationwide, the upgrade of the Atlanta-Marietta Highway was the first of its kind in

Georgia when constructed in 1937 (Figure 4.2). Constructed on a new right-of-way from a point on Northside Drive in northwest Atlanta, to a point north of Marietta, where it connected with SR 3, the dualized highway, the road and its associated bridge, promoted safety along one of the area's more heavily traveled routes with its four lanes and central dividing strip.

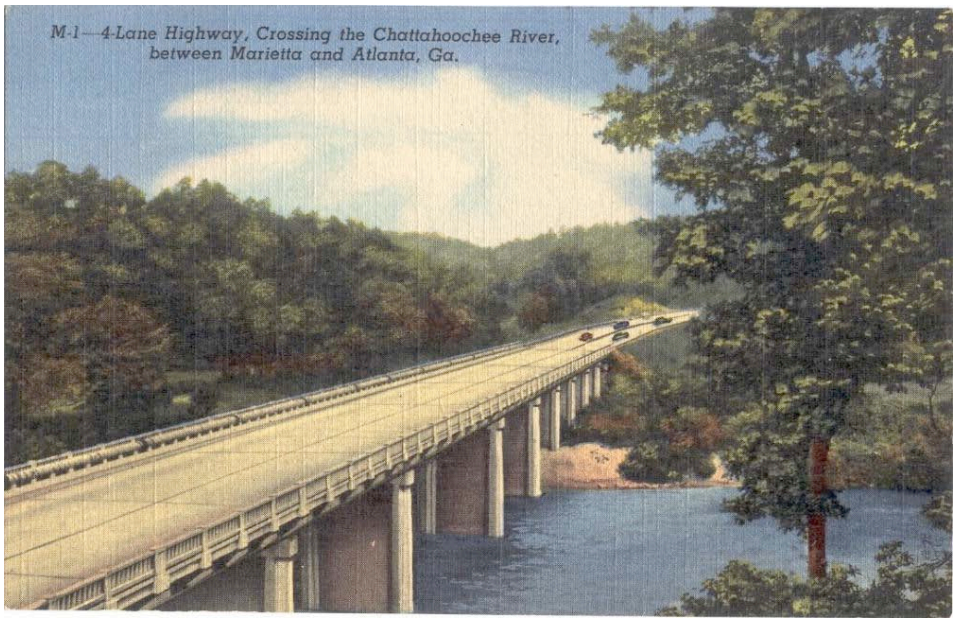

Figure 4.2: State Road 3, Spanning the Chattahoochee River

Although not constructed in the 1930s, the Darien River bridge on US 17/SR 25 between Glynn and Macintosh counties is another impressive design from this period. The bridge is an early example of the high-level bridge type designed to eliminate the moveable span while providing enough vertical clearance for maintaining successful river navigation. Featuring a cantilevered deck girder suspended unit of 150 feet in length, the 1939-40 design was placed on hold until the 1940s due to the onset of World War II.[74]

[74] Clarence N. Crocker. "Coastal Highway Spans Cross Georgia Delta," Civil Engineering, August 1944, pp. 347-350.

Tallulah Falls Bridge

The most exceptional product of the 1930s Bridge Department was the Tallulah Falls Bridge. Financed as a regular federal aid project, the bridge was equally funded by the state of Georgia and Roosevelt's federal project resources. At the commencement of the project, the state highway board of Georgia planned to construct one of the longest plate girder spans in the country. At 220-ft., the length of the bridge's center span was an impressive engineering feat, helping Georgia's bridge department to establish equal standing amongst the nation's leading state bridge sections.

Just southwest of the bridge lies an earlier engineering feat: Tallulah Falls Dam (Figure 4.3). The construction of the dam included a 12-foot-wide roadway atop the structure that would serve not only dam-related maintenance vehicles, but also private traffic as well.[75] Completed in 1913 by the Georgia Railway and Power Company, the dam was one of six plants set along the Tugaloo and Tallulah Rivers.

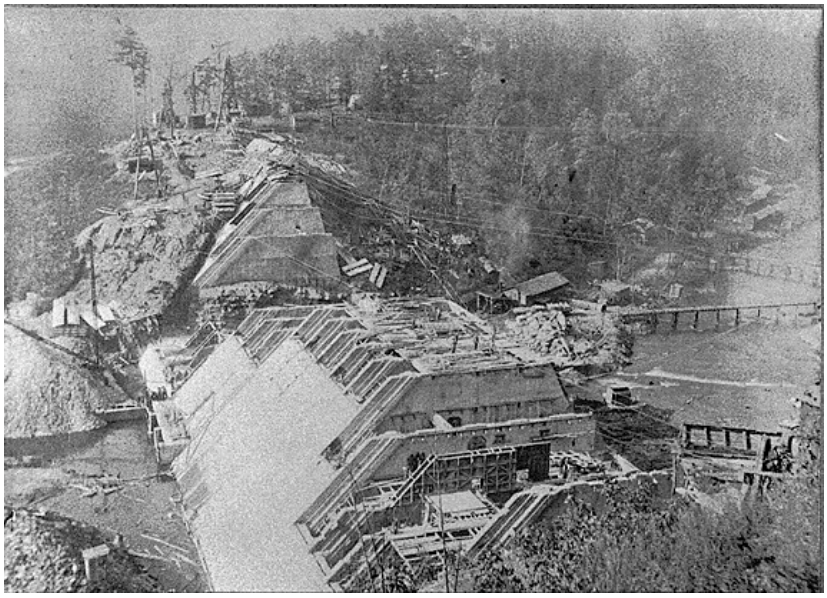

Figure 4.3: Construction of Dam, between 1910 and 1913

[75] James E. Brittain. Inventory of Historic Ind. & Engr. Sites in Ga., 1974-75. Georgia Tech. 6/17/75. On file at the State Historic Preservation Office, Atlanta, Georgia.

A 1975 Historic American Engineering Record (HAER) study conducted on the dam concluded that it was the most impressive of all six.[76] The roadway atop Tallulah Falls Dam quickly became obsolete as the dependence on the automobile strengthened (Figure 4.4). During the 1930s, congestion along the dam road reached a maximum and the Bridge Department was called upon to design and construct a new structure to span Tallulah Gorge.[77]

Figure 4.4: Tallulah Falls Dam, 1920s

The 500-foot length of the new bridge was made substantially impressive by the placement of only two cellular piers. Crocker described the piers in a 1939 article for Engineering News-Record as built of "reinforced concrete construction, each consisting of two 14x16-ft. columns resting on a common 20x50-ft. base and rising some 90 ft. from rock line to top of cap."[78]

[76] Tallulah Falls Dam, Historic American Engineering Record, No. GA-152, 1990.
[77] Letter, Hal Cole to Richard Cloues, September 30, 1986, On file at the State Historic Preservation Office, Atlanta, Georgia.
[78] C.N. Crocker. "Georgia Builds 220-Ft. Span Girder," Engineering News-Record. March 16, 1939. Volume 122, no. 11, pp. 54-55.

Reinforced Concrete

Developed in Europe during the middle nineteenth century, a new method of strengthening the seemingly indestructible building material, concrete, had found its way into the plans of experimental American engineers by the end of the century. Inquisitive engineers tested reinforcing plain concrete with internal metal rods or mesh. First known as “ferro-concrete,” “concrete-steel,” or “armed-concrete,” the versatility of this method of construction was not fully recognized by Americans until around 1900. Shortly following, the somewhat new building method became known simply as “reinforced concrete” construction.

By 1910, reinforced concrete construction was not only popular throughout the United States, but had also become a widespread building phenomenon. Standardization methods were continually being reworked and rewritten to include twisted or textured metal bars to strengthen concrete structures. Such standards were sent to county and city governments all across the United States, where civil engineers quickly learned how to construct economical, short-span highway bridges.

Reinforced concrete bridges are usually cast in place. A specific sequence of actions is then followed: first abutments are cast, followed by the placement of temporary structures, called falsework, used to maintain form until building material is strong enough to support itself, then reinforcing bars are set in place. Once the bars are properly situated, concrete is poured into falsework. Although short spans can be finished with a single pour, long spans are poured in sections. Concrete curing is complete after approximately 28 days. At that time, the formwork is gradually released. Once the formwork is removed, the concrete is “finished.” This step involves adding any aesthetic details such as texturing or smoothing the concrete or applying veneers.

Alteration Versus Preserving Feeling

In the 1980s, it became apparent to the Georgia Department of Transportation that the one-time reliever of bottleneck traffic over Tallulah Gorge had become a bottleneck itself. In 1986, Hal Cole expressed in a letter to Richard Cloues, Georgia's current Deputy State Historic Preservation Officer, reservations concerning GDOT's proposal to widen US Route 441, an action that would include widening Crocker's Tallulah Falls Bridge. Cole's apprehensions were not, however, with the effect such a drastic change would have on the bridge itself. The possibility of the project impacting the Tallulah Falls Dam appeared to be of much greater concern to Cole.[79]

In response to Cole, Cloues was careful to address the issues facing not only the dam, but also the bridge. He provided technical assistance with several points about both structures:

> 1. The highway bridge over the river appears eligible for the National Register.
> 2. The dam just upstream from the bridge appears eligible for the National Register.
> 3. The dam is part of a larger historic hydroelectric facility including the power lake, intake ports, pentstocks, and generating plant, all set within the natural setting of Tallulah gorge. Boundaries for this potentially eligible hydroelectric facility are not clear; however, because the river gorge made possible the development of this hydroelectric facility and, in a sense, dictated its location, and also serves as its historic setting, some portion of the natural setting of the facility would need to be included in the boundary of the National Register eligible property.
> 4. The bridge and the dam are visually related to each other and their natural setting, if for no other reason than proximity, and they share a historical relationship since the bridge was built to alleviate

[79] Letter, Hal Cole to Richard Cloues, Georgia Department of Natural Resources, September 30, 1986, on file at the State Historic Preservation Office, Atlanta, Georgia.

traffic problems caused by the narrow roadway over the dam.

5. As defined by the Advisory Council regulations, both the bridge and the dam, as well as some portion of the natural setting of both, appear to be in the area of potential environmental impact of a bridge-widening project, because of their visual and historical relationships and proximity.
6. The bridge-widening project may not in fact have an adverse effect on the dam itself, especially if widening is done on the downstream side, but it will likely affect the visual qualities and immediate setting of the dam.
7. The design of the bridge is characterized by tall, narrow proportions and a "soaring" feeling (Figure 4.5). Changing these proportions by widening the bridge could have a dramatic adverse effect on the structure. Adverse effect to the bridge itself could be avoided by building a new bridge downstream.[80]

Figure 4.5: Tallulah Falls Dam and Bridge, 1950s

The department of transportation opted not to build an additional bridge downstream. It was decided that the superstructure of the bridge must be widened. In this case, the bridge was spared demolition and replacement, but much of its original design has been heavily altered. Leaving the original caps barely recognizable, much of

[80] Letter, Richard Cloues, Georgia Department of Natural Resources, to Hal Cole, October 20, 1986, on file at the State Historic Preservation Office, Atlanta, Georgia.

the “soaring” feeling relating to the first design of Tallulah Falls Bridge has been lost. The distinguishing cellular piers, however, remain in what was primarily their initial form, carrying on the legacy of Crocker’s late-1930s bridge department (Figure 4.6).

Figure 4.6: Tallulah Falls Bridge after deck replacement

In this case, alteration was used as a method of preserving this bridge. However, the rate of preservation is debatable. Constructing another bridge downstream from the existing structure was most likely not an option for the department due to material and relocation costs alone. The department of transportation regarded the bridge as important enough not to replace and its cellular piers strong enough to carry ever-growing loads of vehicular traffic. However, the historic integrity of the design of Tallulah Falls Bridge has been altered in ways that has ended in the original design intent becoming forever lost. While the purist may see the modern, altered version of Tallulah Falls Bridge as a loss to the historic engineering fabric of Georgia, the mere use of the structure as a vehicular bridge in modern times is something of a victory for historic preservation. While the original construction of Tallulah Falls Bridge is no longer present for view and experience by today’s travelers and tourists, its maintaining of

original use is a triumph for those who wish to preserve Crocker and his bridge department's purpose for constructing this feat.

The construction of 1930s bridges is a direct result of the changing needs relating to the Great Depression. These times led to the need for higher employment by government agencies as well as a more wary approach to types and amounts of materials used and how such structures could be best erected to maximize transportation requirements. Transportation needs led to these changes in the past, just as they do now and will in the future. These needs have extended to the preservation of our bridges through alteration, despite losses in historic design integrity.

CHAPTER 5

Replacement

The first half of the twentieth century was marked by an increased awareness of defense needs due to World War I and the inevitable entry into World War II. Planning for war meant planning for the transportation of troops, materiel, and war-related service workers. New ideas for roads included needs for bridges spanning rivers, streams, and ravines throughout the state of Georgia. These bridges needed to be constructed quickly, with attention paid to use of specific materials and higher live- and dead-load capacities. The capacity to meet such load requirements has continued into the twenty-first century, in the construction of all bridges for defense and non-defense purposes. Increases in vehicular weights have led to the need for bridge replacements throughout the state, including several constructed to meet the very highest load requirements of the 1940s.

Preparing for War

After World War I, the United States government and armed forces began to recognize the overdue need for a congruent defense highway system. General John J. Pershing led the movement towards the creation of such a system. Following his distinguished

service in the First World War, Pershing became Chief of Staff of the United States Army in 1921. It was at this time that the first nationwide proposed network of military and civilian highways was composed by Pershing himself. General Pershing believed that the United States was in need of a solid network of good roads running throughout the country, not wide transcontinental highways.

The Pershing Map would be the first model for a nationwide civilian highway system as well as the first map for planning roadways that could be used to easily transport troops, heavy vehicles, and supplies in time of war. All highways included on the Pershing Map were eventually incorporated into the federal aid highway system.[81] General Pershing's map may also have strongly contributed to the framework of the Interstate Highway System, instituted in 1956.

Mostly ignored during post-World War I years despite plans like the Pershing Map, major interconnecting-highway improvements had begun to be reevaluated by the BPR and the War Department yet again beginning in 1935. The United States Army also began to standardize military equipment to stay within the limits of AASHO bridge loadings in this year. Bridges meeting H-15 loading standards would easily carry all military sundries besides 50-ton tanks. In order to transport such tanks, particular safety measures involving speed and spacing would ensure safe movement of the vehicles.[82]

In August 1939, just before the German invasion of Poland, the United States Congress appropriated $2 billion for defense purposes in order to properly prepare for conflict.[83] At this time, the War Department revisited its strategic highway plan, adding routes and denoting roads of both immediate and increasing importance. State and county cooperation was imperative to the construction of access roads to defense sites.

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[81] United States Federal Highway Administration, "Roads for National Defense," America's Highways, 1776-1976, Washington, DC: Department of Transportation, 1977, p. 142.
[82] Ibid., p. 142.
[83] Ibid., p. 142.

Unfortunately, many access roads included in the Army's strategic road plan were not on the federal aid or state highway systems and were consequently ineligible to receive federal or state funds. Most counties, still recovering from the Great Depression, were unable to assist in the construction or improvement of access roads without such federal or state aid.[84]

During the late 1930s and 1940s, the Works Progress Administration (also known as the Works Projects Administration or WPA) was established to aid the whole of the United States by creating employment opportunities through public improvement programs. Many of these opportunities came in the form of road maintenance and construction projects. In Georgia, these projects led to a total of 2,084 miles of new roadways, including 300 bridges, constructed under the WPA.[85] As a result of improved transportation and accessibility, the popularity of the automobile had significantly increased by the 1940s. In 1916, Georgia boasted 46,025 motor vehicles, but with the rise of road improvement and affordability of the automobile, that total rose to 502,603 by 1940.[86]

The WPA was decidedly the only federal agency with sufficient funds and the ability to assume the vital task of defense construction at this time both efficiently and effectively. In the summer of 1940, the agency began undertaking priority defense projects, giving precedence to 73 specific tasks determined as most important by the United States Army and Navy. WPA defense projects, using approximately a quarter of the agency's appropriated funds, would consist of priority jobs such as improvements to or construction of military and municipal airfields, but would not exclude smaller

[84] Ibid., p. 143.
[85] By Land, Sea and Air: Georgians on the Move.
[86] Coleman, A History of Georgia, p. 274.

supporting projects like facility and transportation improvements to accommodate the growing armed services.[87]

As a result of the growing need for defense-related transportation funding, the Federal Highway Act was once again rewritten and approved by Congress in 1940. In an effort to increase the number of defense projects underway nationwide, the act granted the Commissioner of Public Roads express authority to prioritize defense projects above all others when approving federal aid highway projects. The act came just one month after the rejection of the $5 million federal aid program in Oklahoma after the state disregarded a strategic plan for its roads and sought approval for a more disjointed, scattered road arrangement.[88]

According to the 1942 BPR Annual Report, new federal aid road projects noticeably decreased during the early 1940s. In 1941, 12,936 miles of all classes of roads were completed throughout the United States. Completed miles fell to 10,178 in fiscal year 1942 and to 8,445 miles in 1943.[89] Most new road construction after 1942 had been reserved for defense-specific projects only. One such project, associated with the new Bell Bomber Plant in Marietta, Georgia would come to be known as Bomber Plant Bridge.

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[87] "WPA Mobilization for Defense Starts," Engineering News-Record, Vol. 124, No. 24, June 13, 1940, p. 829.
[88] "PRA Demands Defense Priority For Federal-Aid Work," Engineering News-Record, Vol. 125, No. 10, Sept. 5, 1940, p. 307.
[89] Bureau of Public Roads Annual Report, 1942, p. 25, referenced in United States Federal Highway Administration, "Roads for National Defense," America's Highways, 1776-1976, Washington, DC: Department of Transportation, 1977, p. 147.

Careful Planning

Along with the slowed pace of highway construction during World War II came an increased awareness of diminishing building materials. In response to shortages, the Office of Defense Mobilization made the decision to prioritize all types of new construction by creating a scale consisting of ratings A-1 through A-10 in June 1941. The A-1 rating was reserved exclusively for defense-related projects such as access roads, which would be erected to promote smooth travel to and from military bases and defense sites. By April 1942, only projects boasting an A-1 title could acquire track-laying tractors and other construction equipment. It was also impossible to obtain steel without a rating of A-3 or better. If bridge projects were situated on primary, strategic-network highways, they were rated an A-2 priority. If on secondary roads, bridges received an A-7 priority rating.[90] According to Steel Delivery Records certified by the Army in March 1943, the rating assigned to AW-FAS 270-A(1), the number of the construction project that would become Bomber Plant Road, was A-1.[91] Constructed to carry this strategic network highway, Bomber Plant Bridge received a rating of A-2.

In the 1940s, it became common to separate the work for roads and bridges. Each had its own surveys and plans and each had separate contractors. In the Highway Department's annual reports, the two are tallied separately. Not only were bridges more costly than roadways, but they were also high-profile constructions. A bridge failure was much more expensive and dangerous than a washout on an open stretch of road. Despite the possibility of such issues arising, both road and bridge construction projects abounded across the state of Georgia in the 1940s. Between 1939 and 1944, a total of

[90] "Construction Machinery Purchases to be Placed on A-1 Priority Basis by WPB." Engineering News-Record, Vol. 128, No. 16, April 16, 1942, p. 581.
[91] Steel Delivery Requirements, March 31, 1943. Department of Transportation Subject Files, RG. 027-10-029, Georgia Archives.

469 bridges were built under the auspices of the State Highway Department.[92] However, these totals fell drastically as World War II altered transportation systems and plans, reaching to only 28 bridges placed under construction in 1943 and a mere 18 in the following year.[93]

The aggregate length of the bridges placed under construction from 1943 to 1944 came to over 11,000 feet. Most of these bridges (8,024 feet) were constructed of reinforced concrete, generally considered the cheapest and most accessible material during wartime. A relatively small number (2,526 feet) of timber-constructed bridges were also begun at this time. However, with growing load and materials needs, all bridge projects undertaken with federal aid funds in 1944 were built of concrete.[94]

Such reinforced concrete bridges would quickly prove to be the most versatile and widespread of twentieth-century bridge types. One feature that made concrete so popular was the flexibility it allowed bridge engineers in creating standardized designs. Although many standardized bridge types that were already gaining popularity in the 1930s and 1940s can be attributed to Georgia's first State Bridge Engineer, Searcy B. Slack, the impressively large T-beam design of Bomber Plant Bridge can be credited to Slack's successor, Clarence N. Crocker.

Constructing the Bridge

[92] Eighteenth Report of the State Highway Board of Georgia to the Governor and General Assembly of the State of Georgia, for the Fiscal Years Ending June 30, 1939 and June 30, 1940, p. 27; Nineteenth Report of the State Highway Board of Georgia to the Governor and General Assembly of the State of Georgia, for the Fiscal Years Ending June 30, 1941 and June 30, 1942, p. 25, 29; Twentieth Report of the State Highway Board of Georgia to the Governor and General Assembly of the State of Georgia, for the Fiscal Years Ending June 30, 1943 and June 30, 1944, p. 36, 39.
[93] Ibid., p. 36, 39.
[94] Ibid., p. 36, 39.

Historically identified as Bomber Plant Road or Access Highway, State Road 280 was constructed in three sections by companies W.L. Florence Construction and M.R. Woodall. In January 1943, Florence Company was the low bidder for two sections of Bomber Plant Road totaling 2.398 and 3.333 miles each. Woodall Company was chosen to construct the remaining 1.349 miles of road with the low bid of $75,327.24. Meeting qualification criteria, both Florence and Woodall agreed to conclude construction of the 7.08-mile road in 120 days (Figure 5.1).[95]

Figure 5.1: Aerial view of the construction process of Bomber Plant Bridge

Over 70 parties were named in The Marietta Journal on February 25, 1943 as having interest in or owning property that would be either affected by or condemned due to the new road's construction. In order to begin constructing the defense highway as soon as possible, condemnation was immediate within the 200-foot right-of-way. The

[95] "Access Highway Contract Awarded Florence Company: Woodall Company of Atlanta Gets One Section of New Cobb Road." The Marietta Journal. Vol. 77, No. 16, January 22, 1943, p. 1. "Final Contracts Let for Access Highway: Bell Bomber Plant Road to be Finished in 120 Days." The Marietta Journal. Vol. 77, No. 36, February 24, 1943, p. 1.

United States Government's Procurement Division followed the condemnation with negotiations regarding property values with each owner.[96]

On April 1, 1943, The Marietta Journal reported that the last section of Bomber Plant Road had begun, signaling the construction project's forthcoming completion. In this article, details of the construction are described as including "clearing and grubbing 140 acres; excavating 315,000 cubic yards of dirt; laying 3,500 lineal feet of concrete pipes; and pouring 15,000 cubic yards of concrete of drainage culverts."[97] The highway was officially opened to the public in December 1943, creating a third thoroughfare linking Marietta and Atlanta and alleviating some of the traffic congestion created by commuters traveling from southwest Atlanta to the west entrance of the Bell Bomber facility (Figure 5.2).[98]

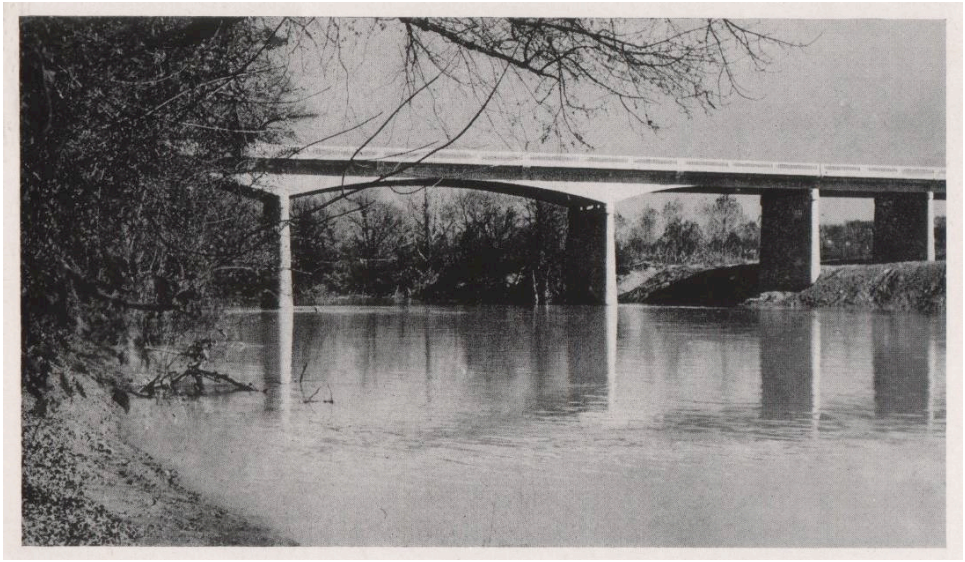

Figure 5.2: Bomber Plant Bridge soon after completion of construction

[96] "Final Contracts Let for Access Highway: Bell Bomber Plant Road to be Finished in 120 Days." The Marietta Journal. Vol. 77, No. 36, February 24, 1943, p. 1. "Cobb Land Condemned for Bomber Plant Road: All Right-of-Way Effected for Immediate Possession, Work." The Marietta Journal. Vol. 77, No. 37, February 25, 1943, p. 1.

[97] "Bell Plant Access Highway Moves to Completion." The Marietta Journal. Vol. 77, No. 62, April 1, 1943, p. 1.

[98] "New Highway Opens Third Atlanta Road to Bell Plant." The Marietta Journal. Vol. 77, No. 225, December 6, 1943, p. 1.

In choosing the material make-up of Bomber Plant Bridge, Georgia Bridge Engineer Clarence N. Crocker and his department selected a most inexpensive and widely available product in reinforced concrete. The selection of the bridge type to be comprised of this material was undoubtedly simple. By choosing the newly popular T-beam type, the bridge could be constructed at the lowest possible cost, military weight mandates could be met, and the project could be concluded in a timely manner.

The T-Beam Bridge Type

Composed of cast-in-place, reinforced concrete beams with flanking integral monolithic deck sections, T-beam bridges first appeared in the United States around 1905. It was at this time that engineers began to realize the efficiency of such a structure over the popular slab type for spans over 25' long. The T-beam bridge proportions deck thickness and longitudinal beam size and spacing for a lighter, stronger, and more economical bridge section. Most T-beam bridges constructed after 1920 include four or more longitudinal beams. Reinforcing steel is placed longitudinally in the bottom of the beam stem while deck reinforcement runs perpendicular to the stem.

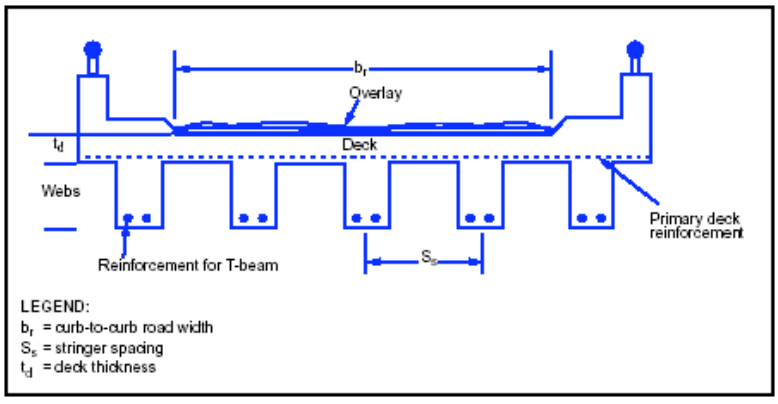

Figure 5.3: Reinforced Concrete T-Beam Bridge

Just five years after its American arrival, engineers understood the design and construction of the T-beam and actively began to use its cost-effective benefits in new construction projects. From 1910 to 1940, the number of T-beam bridges constructed in the United States grew substantially. By World War II, engineers had strengthened the popularity of the T-beam and developed much longer, continuous-span structures than in previous years. With this new technology, engineers found a more simplified, economical approach to constructing much-needed highway bridges throughout America during wartime and the following interstate construction boom.

Crocker's T-Beam

In 1943, State Bridge Engineer Clarence Crocker sought to push the reinforced concrete, T-beam bridge to its limits in constructing the 15-span, 701-foot, cantilevered Bomber Plant Bridge. In his 1944 annual Bridge Department report, Crocker gives four considerations addressed by the department with every bridge plan:

1. Sufficient length and height to safely pass the highest flood on record,
2. Roadway widths safe for anticipated volumes of high-speed traffic,
3. Load-carrying capacity that will support the occasional extra-heavy vehicles without serious overstress, and
4. Lines and details of finish that present pleasing appearance.[99]

Since 1935, the AASHO and the military had been working together to create a standard system of bridge load capacity based on military equipment. The plans for Bomber Plant Bridge, or Federal Aid Project No. 270-A(1), confirm that the newest

[99] Twentieth Report of the State Highway Board of Georgia to the Governor and General Assembly of the State of Georgia, for the Fiscal Years Ending June 30, 1943 and June 30, 1944, p. 30.

loading standard, H-20, was applied to the bridge in order to meet requirements for military and other large vehicles (Figure 5.3). When constructed, Bomber Plant Bridge was one of the largest T-beam bridges in the state of Georgia.

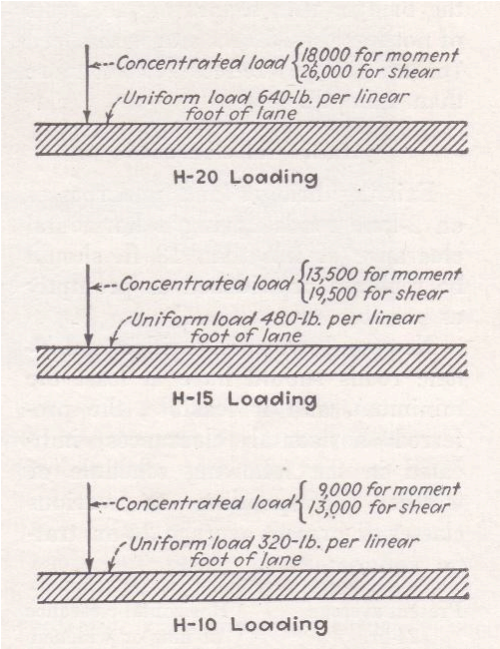

Figure 5.3: Explanation of H Loads by Engineering News-Record, 1941

Costing $201,466, using 50% federal funding, [100] Bomber Plant Bridge was constructed by G.L. Strickler, an Austell, Georgia contractor and builder of bridges throughout Cobb County. The bridge features 12 approach spans measuring 40' each, and three central spans. These main spans measure at 65'-90'-65,' allowing for utmost depth over the piers where negative space is the greatest, as well as a striking design. The length of the central spans is made possible through use of continuous-span construction. Not only did the design help to minimize construction costs, but the negative space created by the lengthy spans also gives the structure a dramatic, fluid appearance. The bullnosed piers, resting on low pedestal bearings, boast cement scoring as minimalist adornment for this elegant structure; while moderne balustrades flank the two-lane roadway and northeasterly sidewalk.

[100] Ibid., p. 33.

The breakthrough, economical design caught the attention of Delaware State Bridge Engineer Victor A. Jost eight years later. Impressed with a journal article written by Crocker about Bomber Plant Bridge, Jost sought the advice of the Georgia engineer in constructing a bridge in his own state. Advising Jost on stress analysis, falsework, and concrete pouring sequences, Crocker aided the Delaware engineer in creating the extant St. Jones River Bridge, a small version of Bomber Plant Bridge located along US Route 13 (Dover Bypass/S Dupont Hwy) over the St. Jones River in Dover, Delaware.

The Bomber Plant Bridge's T-beam type, discreet moderne details, and reinforced concrete material combine to create the quintessential mid-twentieth century bridge. It's functional elements met wartime requirements while its understated design details provided the landscape with a dramatically graceful structure of timeless beauty.

Safety Issues

In August 2007, the Bomber Plant Bridge gained unexpected notoriety following a deadly bridge collapse in Minneapolis, Minnesota. The highly publicized failure, which took place during a busy rush hour commute, led to the close examination of bridges by transportation officials and media sources throughout the country. In order to comply with standards set by the Federal Highway Administration in 23 CFR 650, state departments of transportation apply "sufficiency ratings" to bridge assessments on an annual or bi-annual basis. The Atlanta Journal-Constitution (AJC) revealed that metro-Atlanta area Bomber Plant Bridge had one of the worst sufficiency ratings in the state at 3.3 out of 100 (Figure 5.4).[101]

[101] "Metro Atlanta's 18 Worst Bridges," Atlanta Journal-Constitution. August 4, 2007, p. A1; A7.

Figure 5.4: Bomber Plant Bridge meets controversy in 2007

Everyday travelers over the bridge expressed their concern at the rating, and relayed their worry of a similar collapse to the newspaper. However, 23 CFR 650 defines such a rating on multiple factors not only associated with a bridge's "structural adequacy and safety," but also with its "essentiality for public use, and its serviceability and functional obsolescence."[102] Defending the Bomber Plant Bridge rating, Crystal Paulk-Buchanan, a spokeswoman for the Georgia Department of Transportation (GDOT) exclaimed that the 3.3 rating "means that it is really, really important that we get funding to replace the bridge, but it doesn't mean the bridge is about to fall down."[103] A positive aspect of a lower rating is that if a bridge receives a rating of 50 or less, it is eligible for federal funding.

The rating term, "structurally deficient," has also been attached to the Bomber Plant Bridge. According to the Federal Highway Administration, structurally deficient bridges are defined "by deteriorated conditions of significant bridge elements and reduced load-carrying capacity."[104] In Future Mobility in Georgia: Meeting the State's Need for Safe and Efficient Mobility, "a bridge is structurally deficient if there is

[102] FHWA, Title 23, Code of Federal Regulations (CFR), Highways, Sec. 650.403, 1994.
[103] "Metro Atlanta's 18 Worst Bridges," Atlanta Journal-Constitution. August 4, 2007, p. A1; A7.
[104] FHWA, 2006 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance, Systems Conditions: Highways and Bridges.

significant deterioration in the deck, supports or other major components."[105] When attention was given to Georgia's bridge ratings following the Minnesota failure, GDOT was already aware of the inadequacies of Bomber Plant Bridge, keeping it in line for swift replacement (Figure 5.5).

Figure 5.5: Bomber Plant Bridge

Noting its history in the metropolitan-Atlanta area, GDOT decided to reach beyond a simple replacement of the historic bridge. In 2006, the department of transportation began mitigation for the bridge replacement using a three-pronged approach to preserving the memory of the bridge. First, by funding a HAER document, the bridge and its history would be preserved in perpetuity at the Library of Congress. Second, a popular history of the bridge was begun, complete with oral history interviews by local residents and bridge engineers. Third, the process of creating an educational kit for teachers began in order to educate children about this and other bridges throughout the state through history and engineering activities.

[105] TRIP. Future Mobility in Georgia: Meeting the State's Need for Safe and Efficient Mobility, Washington, D.C.: TRIP, 2007, p. 11.

The replacement of Bomber Plant Bridge is the result of a constant increase in transportation requirements. Like the requirements resulting in the construction of the bridge, new increases in loads and needs for stronger, wider spans for use by rising automobile weights and numbers of vehicles have led to the replacement of innumerable bridges throughout the country. With regard to historic bridges, departments of transportation are beginning to take notice of twentieth-century bridges meeting National Register eligibility requirements by practicing several forms of mitigation when replacement is unavoidable.

CHAPTER 6

In Use

Following World War II, an increase in person automobile usage along with a marked movement towards inhabiting suburban communities led to new needs in highway and bridge construction. Due to striking increases in automobile ownership, massive transportation construction projects were necessary throughout the state. Increased standardization of bridge types and highway roadways amplified building opportunities throughout the state, transforming once small local main streets into major highway arteries to accommodate increased traffic flows. The enhancement of such highways led to the construction of numerous bridges throughout the state using the concrete slab form. It is through these constructions that many of Georgia's small historic towns have been forever altered to include yet another layer of history. These bridges, constructed during the mid-twentieth century, now face preservationist and transportation officials alike, creating new quandaries for how and if they can remain in use.

Post-War Standardization

Despite benchmarks like the influential Bomber Plant Bridge project, Georgia's Highway Department continued to experience marked setbacks due to gubernatorial control

issues during this time and through the 1940s. All newly appointed governors would seek ultimate power over the State Highway Department, replacing the department head and many staff members with each election. Even more strain would be placed upon the State Highway Department with every incoming governor due to increased, late-term, deliberate, and excessive spending by outgoing elected officials.

The Rivers administration departed with a $12 million State Highway Department deficit due to shortages in state revenue stemming from Rivers' inability to persuade voters to increase the tax base. This weakness left public schools on the brink of closure in 1939, forcing Governor Rivers to "borrow" funds from the State Highway Department fund in order to keep educational facilities open. As a result, Georgia's Highway Department was unable to meet matching federal funds during late 1940 and was forced to cease work on many projects for several months.[106]

Just prior to and during World War II, road and bridge building was reserved for defense projects only. However, planning for postwar transportation became paramount for federal, state, and local officials. Initiating the planning process from the nation's capital was BPR Chief Thomas McDonald. According to McDonald and other officials, a vital construction boom would need to take place following the Second World War in order to ensure economic recovery throughout the country. As a result of McDonald's efforts, the Federal Highway Act of 1944 provided $125 million to urban centers for right-of-way purchases and, most importantly, for the planning, design, and construction of major expressways. This act officially turned the country away from a rural road focus, and set it on the pathway to future landmark interstate legislation.

In response to the 1944 act, the State of Georgia requested funding to prepare plans for over 1,700 miles of roads that very same year. Studies for road placement were conducted throughout the state in and surrounding several cities and towns such

[106] Coleman, A History of Georgia, pp. 317-318.

as Macon, Waycross, Columbus, Athens, Augusta, Brunswick, and Savannah. In Athens, for example, the Division of Highway Planning analyzed traffic data in 1954 and proposed changes based on a thirty year plan that would include the widening of several major roads and the addition of bypass roads surrounding the city.[107] A comprehensive plan for the metro-Atlanta area was also included in the statewide transportation plan.

To prepare for the expected influx of bridge projects throughout the state, the Georgia Bridge Department began updating standard designs and drawings for both T-beam and steel stringer bridges. Postwar highway expansion projects needed bigger, better bridges that included wider roadways and greater load capacities for anticipated increases in vehicular traffic and automobile size.[108]

The preparation for changes brought about by the Federal Aid Highway Act of 1944 was put to task in October of 1945, when Congress officially lifted the ban on non-war-related transportation spending. Receiving approximately 11.5 million federal dollars per year from 1946 to 1948, the State of Georgia was able to begin major transportation projects. Record-high gas tax revenues added to the state's budget for such projects, making large undertakings previously considered during planning years available for serious consideration. Urban traffic areas (accommodating over 800 cars per hour) received new highways with roadways expanded from two to four lanes, and heavier bridge design loadings. While during 1946, inflation stalled the construction process of many transportation highway projects in the state, 1947 and 1948 saw the number of highway miles placed under contract jump to 2,340, including 251 bridges and over $600,000.00 in bridge maintenance and repair projects.[109]

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[107] State Highway Department of Georgia Division of Highway Planning in cooperation with U.S. Department of Commerce Bureau of Public Roads, Report of the Origin-Destination Traffic Survey at Athens, Georgia 1954, pp. 25-27.
[108] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, pp. 57-58.
[109] Ibid., pp. 58-59.

The high increase in automobile purchases throughout the nation and the state of Georgia helped fuel the influence behind much of the highway department's construction and design projects. Motor vehicle registration in Georgia jumped from 523,000 in 1945 to over 1,069,000 in 1953.[110]

Postwar boom times were also met with an increased interest in automobile-based tourism. Commercialization of roadways and rapid suburbanization were a result of the new phenomenon of vehicular touring throughout the state, and through Georgia on the way to the popular vacation destination of Florida.[111]

In the late 1940s and early 1950s, Atlanta began playing its role as a commercial trucking hub, which also created immense changes within the highway department and on Georgia's roadways. As interest in transporting goods via truck increased throughout the country, Georgia's highway and bridge departments began to recognize the newfound daily strains of their roads and bridges. Traveling highways and byways throughout the state, heavy trucks created increased weight needs not only in the metropolitan Atlanta area, but also throughout the entire state.[112]

With the automobile and vehicular transportation becoming an increasingly important issue to even the smallest Georgia communities, the early 1950s saw major surges in funding for the highway and bridge departments. Operating with funding of 19 to 30 million dollars per year from state gasoline and motor vehicle license fees alone, the departments found themselves with a new support base for construction and improvements throughout the state. In 1952, Georgia voters agreed that vehicular license fees should be solely for the improvement of the state's roads, leading to the

[110] Twenty-Sixth Report of the State Highway Department of Georgia to the Governor and General Assembly of the State of Georgia for the Fiscal Years Ending June 30, 1955, and June 30, 1956, p. 72.
[111] Ibid., p. 60.
[112] Ibid., p. 60.

increase of Georgia's highway system to total more than 15,000 miles of roads by 1953 (Figure 6.1).[113]

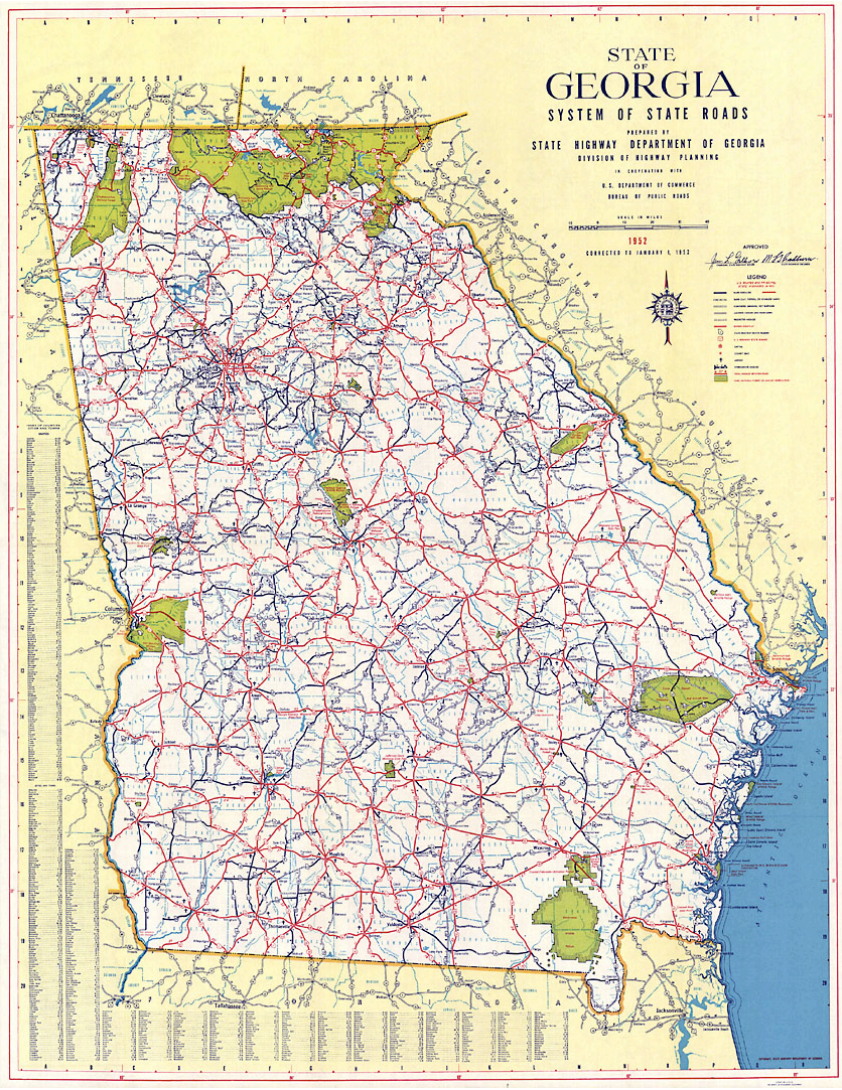

Figure 6.1: State Highway Map of Georgia, 1952

In 1953, the bridge department received a boost specific to its needs by the state legislature's creation of the State Bridge Building Authority, which issued bonds in the amount of 30 million dollars to be used only for the construction of bridges in the state of

[113] Twenty-Fifth Report of the State Highway Department of Georgia to the Governor and General Assembly of the State of Georgia for the Fiscal Years Ending June 30, 1953, and June 30, 1954, p. 58.

Georgia. With state bonds, Georgia constructed more than 230 bridges between the years of 1953 and 1955.

Adaptation was the key to successful bridge maintenance and construction following World War II. Prices and supply levels of construction materials were in constant change due to conflict during the mid-twentieth century. The Second World War had depleted the nation's timber reserves, while the Korean War saw the rationing of steel in the early 1950s. It was the responsibility of Crocker and his bridge department employees to plan accordingly and remain flexible in new bridge projects and existing bridge upkeep.[114]

Reinforced concrete was the answer to the low level of timber and steel supplies. Crocker directed his staff to update standards to reflect low-cost designs that would use this widespread material. As a result, the bridge department began using more concrete piles for construction, and expanded its construction of the T-beam and continuous slab bridge types. For secondary roads, the continuous slab deck was most prominent, with slab construction often taking place at one site, then transferring pieces via railway to a bridge's permanent location. Standard bridge types like T-beam, steel stringer, and continuous slab that had been constructed throughout the state since the 1920s and before were being updated yet again in the 1950s to adapt to modern load capacities.[115]

Big Sandy Creek Bridge

Completed at the end of Crocker's nearly thirty years at the State of Georgia Bridge Department, Big Sandy Creek Bridge is typical of the standardization and mass-production led by Crocker's team of engineers during the 1950s (Figure 6.2). Carrying

[114] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, p. 61.
[115] Ibid., p. 61.

State Road 42/US Highway 23 through the small village of Indian Springs in Butts County, Georgia, the bridge spanning Big Sandy Creek was constructed in 1955 and is still in use today. Comprised of a reinforced concrete, cast-in-place, continuous-slab superstructure, the bridge is typical of 1950s and 1960s urban bridge design. The moderne balustrade design of this type, while prevalent in larger cities and towns, was an interesting choice for use in this small, rural village. Consisting of five spans, the bridge is 201 feet long, with two approach spans measuring thirty-six feet and three center spans measuring forty-three feet each.[116]

Figure 6.2: Big Sandy Creek Bridge

While this now-historic bridge remains standing and is even now used for its original purpose, the neighborhood in which it was set changed forever due to its placement in the Indian Springs village center. Spanning Big Sandy Creek, which runs into Indian Springs State Park, the bridge is tied to the rich layers of history associated with this small, ever-changing community. The park, established in the 1930s and constructed by the Civilian Conservation Corps, is home to Indian Spring, a popular destination used for religious, medicinal, and relaxation purposes for thousands of years

[116] Georgia Department of Transportation, "Serial #035-0011-0," Historic Bridge Inventory Report, Draft copy, September 19, 2008.

by Native Americans and settlers alike. The draw of the spring led to the building of a resort-based community consisting of grand lodges and hotels, as well as bathhouses and casinos. During the nineteenth century, the town previously called “McIntosh” (after General McIntosh who signed the Treaty of Indian Springs in 1825 at a hotel just southeast of the bridge) became home to hospitality entrepreneurs as well as owners of businesses of various sorts.[117]

One such entrepreneur was Colonel H.J. Lamar, who opened a gristmill alongside Big Sandy Creek in 1873 (Figure 6.3). Named in memory of Lamar’s youngest daughter, Alberta Mills not only provided the service of grinding grain of local farmers, but also pumped water from the famed spring to sulphur bathhouses used by tourists and visitors. While the bathhouses were demolished during the 1890s for the erection of a large casino hotel, the Wigwam, the mill remained alongside the stream.[118]

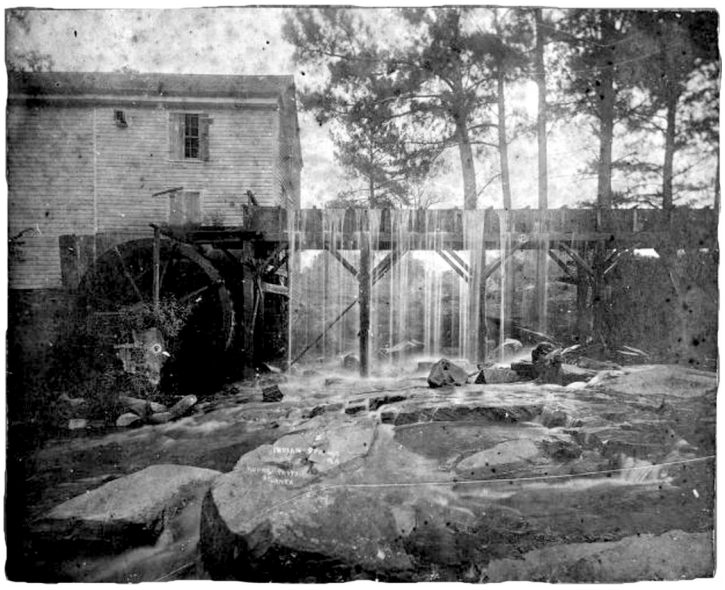

Figure 6.3: Grist Mill at Big Sandy Creek

[117] New South Associates, Inc., Cultural Resources Survey of Flovilla and Indian Springs, March 2008, pp. 10-11.
[118] Ibid., p. 15.

The “Old Mill,” as it was called in the twentieth century, was later purchased by W.W. Jamerson, who used the mill as a tourist shop associated with his own motor court motel until 1953 (Figure 6.4).

Figure 6.4: The “Old Mill” Gift Shop and State Road 42/US Highway 23

It was at that time that the highway department, seeing a need for a faster transportation corridor through the frequently toured town, began to widen the road traveling through Indian Springs. The mill was razed to make way for the new bridge that would provide locals and tourists alike better access into and through the small town.[119] It was with this widening of roadway to 58 feet that the two-lane bridge now spanning Big Sandy Creek replaced one layer of history and became building the next layer for Indian Springs.

The Continuous-Slab Bridge Type

Lichtenstein Consulting Engineers describe the slab bridge as a structure that “concentrates reinforcing steel, in the form of twisted or deformed rods, in the lower

[119] Ibid., p. 15.

portion of the slab where tensile forces are greatest, and at the ends where shear is maximum."[120] This technology, arriving in cast-in-place, reinforced concrete form, appeared in the United States as early as 1905.[121] Becoming widespread throughout the nation by the 1910s, the reinforced concrete slab was first commonly produced by railroad companies.[122]

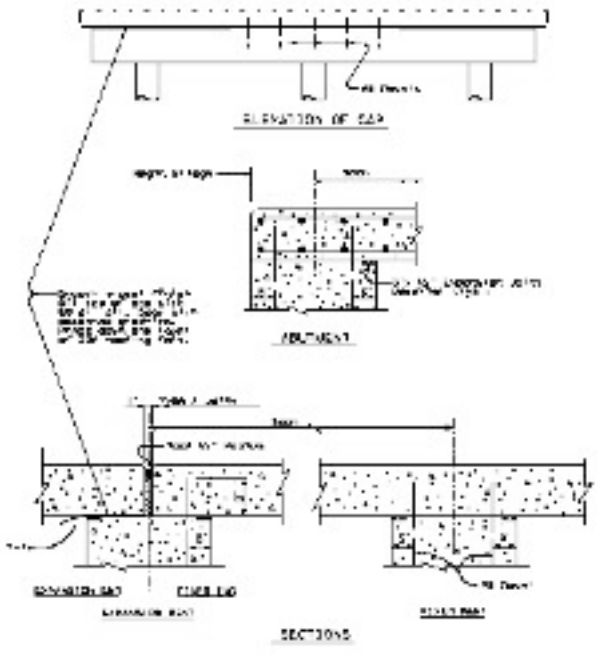

Figure 6.5: Reinforced Concrete Slab

Due to major touting by national engineering publications and technical pamphlets distributed by the Office of Public Roads (OPR), the reinforced concrete slab type reached basic standardization across the United States at an early date.[123] Prior to World War I, the slab bridge type was popular for use in spans of up to twenty feet;

[120] Lichtenstein Consulting Engineers, Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads, 2nd Edition, Revised. Lichtenstein Consulting Engineers: Paramus, New Jersey, 2000, p. 189.
[121] Ibid., p. 189.
[122] Georgia Department of Transportation, "Serial #035-0011-0," Historic Bridge Inventory Report, Draft copy, September 19, 2008.
[123] Lichtenstein Consulting Engineers, Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads, 2nd Edition, Revised. Lichtenstein Consulting Engineers: Paramus, New Jersey, 2000, p. 189.

however, following the First World War, advances in reinforcing steel made possible the standardization of slab bridges with spans of thirty-five feet, on average.[124] The bridge over Big Sandy Creek, one of seven extant late slabs throughout the state of Georgia, built between 1951 and 1955, is notable for its longer-than-average continuous slab spans.[125] The cast-in-place slab type is not altogether rare in the state of Georgia, however; over 30 built before 1930 remain in use and have been preserved to their fullest extent.[126]

Continuing the Historic Fabric

Set between a natural resource visited by pilgrims of diverse backgrounds for thousands of years, and small commercial and residential buildings dating from 1725 to the present, the bridge carrying US Highway 23/State Road 42 through Indian Springs has become an important part of the area's layers upon layers of natural and manmade history. While its future could find alteration or replacement inevitable, this Indian Springs bridge continues to provide the community with an important, tangible historic resource which reflects the constant change and lasting historical value found throughout this area.

Up to the present time, the Big Sandy Creek Bridge has been able to support the mild vehicular traffic coming to and going through the small town of Indian Springs (Figure 6.6). However, as Butts County slowly becomes a suburb of the metropolitan-Atlanta, that traffic is sure to increase. The small, two-lane bridge has sustained increases in automobile traffic and load expectancies for over 50 years. While it

[124]Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, p. 77.
[125] Georgia Department of Transportation, "Serial #035-0011-0," Historic Bridge Inventory Report, Draft copy, September 19, 2008.
[126] Lichtenstein Consulting Engineers, Georgia Department of Transportation Office of Environmental Location Historic Bridge Inventory Update Historic Contexts, p. 78.

continues to withstand growth and change in its little community, it is unknown if future growth will lead to the alteration or replacement of Big Sandy Creek Bridge.

Figure 6.6: Balustrade end, displaying date of construction of Big Sandy Creek Bridge

Mid-twentieth-century bridges have become equivalent to the ranch house in the world of preservation. Constructed in staggering numbers in forms almost identical to one another, problems concerning National Register eligibility and decreased interest in preservation have already begun to take place. The bridge over Big Sandy Creek in Indian Springs will face such issues as age and transportation needs change in this area. While the bridge represents yet another layer of the town's years of history, it is likely to be overlooked due not only to its close proximity to buildings and structures of more increased age, but also due to its standardized construction matching hundreds of bridges throughout the state of Georgia.

CHAPTER 7

Conclusion

In analyzing bridges constructed under the leadership of Clarence N. Crocker, it becomes clear that no bridge shall remain preserved in its original state forever. Each bridge will have to change, be replaced, or risk the chance of failure. With countless bridges becoming structurally deficient throughout the state of Georgia, it will be necessary for historic preservationists to become more involved in bridge alteration and replacement projects. Methods of preservation will continue to range from adaptive reuse, sensitive alteration, and extensive documentation.

Due to legislation enacted by Congress in 1987, funding for historic bridge projects is no longer as daunting an issue as in previous years. At that time, it was declared that the preservation and rehabilitation of significant and historic bridges throughout the United States was in the national interest. As a follow-up to this declaration, Congress passed the Intermodal Surface Transportation and Efficiency Act (ISTEA) in 1991. This act required state officials to involve the public in transportation projects and funded "enhancements," in projects that included constructing pedestrian and bike trails, planting wild flowers, and preserving historic bridges. Renewed as the Transportation Equity Act for the Twenty-First Century (TEA-21), this legislation has

become one of the largest funding measures in transportation history and continues to persuade officials on state and local levels to rehabilitate historic bridges.[127]

Survey

The first step in preservation is proper survey. Legislation enacted in the Surface Transportation and Uniform Relocation Assistance Act of 1987, Public Law 100-17, Section 123(f) requires each state highway department

> to complete an inventory of bridges both on and off the Federal-aid to determine the historic significance of the bridges… The Offices of Engineering and Environmental Policy will monitor historic bridge inventory activity to promote reasonable progress towards completing historic bridge inventories.[128]

This legislation does not, however, place deadlines on state highway departments for completion of such inventories. Thus, state and local preservation entities on both public and private levels must continue to survey historic bridges throughout the state of Georgia with high levels of frequency and attention to transportation needs and population growth.

Furthermore, the Natural, Archaeological, and Historic Resource Geographic Information System (NAHRGIS) database for the state of Georgia should be updated with information gleaned from each such survey. Placing this information in the database will make survey data available for officials and entities conducting future

[127] Eric DeLony, "Bridging the Past for the Future," Pennsylvania Heritage. Winter 2000. Reprinted by the Pennsylvania Historical & Museum Commission at http://www.portal.state.pa.us/portal/server.pt?open=512&objID=5137&&level=2&parentid=1592&css=L2&mode=2&in_hi_userid=2&cached=true. Accessed February 24, 2009.

[128] Memorandum, from R.A. Barnhart, Federal Highway Administrator, to Regional Federal Highway Administrators, Regions 1-10, Direct Federal Program Administrator. July 22, 1987. Available at http://environment.fhwa.dot.gov/guidebook/vol2/doc10i.pdf. Accessed February 22, 2009.

surveys for transportation-related projects. This information should also be made available to the State Historic Preservation Office (SHPO), where it can be placed in county site files for future use by historians and other researchers.

Rehabilitation

Once a transportation project has been deemed to inevitably effect major change in an historic bridge, several options can serve as possible preservation techniques. Rehabilitation, or improvement by sensitive alteration, should be considered the first alternative to bridge demolition or replacement. Under Section 4(f) of the Department of Transportation Act of 1966, the Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges creates standards for the rehabilitation of historic bridges that will maintain the historic integrity of the structure, "to the greatest extent possible, consistent with unavoidable transportation needs, safety, and load requirements."[129]

To ensure successful compliance with these requirements, many states have created their own additional guidelines for the preservation of historic bridges. For example, the Texas Department of Transportation (TxDOT) released an updated Historic Bridge Manual to address concerns and techniques particular to its own state in dealing with these historic structures. Bridges are address in terms of both on-system and off-system structures. On-system bridge projects, in this case, are those that are part of the designated state highway system. According to TxDOT, an historic bridge that is in need of rehabilitation or replacement "may remain in regular vehicular service only when it is rehabilitated or improved to meet applicable design standards or a design exception

[129] Department of Transportation Act of 1966, Section 4(f), Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges, available at http://www.environment.fhwa.dot.gov/projdev/4fbridge.asp. Accessed February 23, 2009.

is approved for the deficiency while maintaining its historic integrity to the greatest extent possible."[130]

For off-system bridges, TxDOT uses a table of criteria that must be analyzed on a case-by-case basis in order to figure the feasibility and cost effectiveness of rehabilitating an historic bridge for vehicular use:

Current Average Daily Traffic (ADT)	Minimum Clear Roadway Width		Minimum Load-Carrying Capacity (Operating Rating)	
	One-Lane, Two-Way Operations	Two-Lane, Two-Way Operations	Alternate Route Available	Alternate Route Not Available
ADT 50 or less	10 feet (3.0 m)	18 feet (5.4 m)	HS 5	HS 12
ADT 51 to 250	10 feet (3.0 m)	18 feet (5.4 m)	HS 8	HS 12
ADT greater than 250	Not applicable	Not applicable	HS 15	HS 15

In this instance, a load value of HS 12 was selected in the event that no alternate route is available "because it represents a typical minimum value for vehicles essential for educational, medical, and fire suppression services."[131] In addition to these criteria, Texas also evaluates such bridges for possible clearance issues due to the presence of such elements as trusses and bracing that may be integral to maintaining the historic integrity of a bridge.

In order to successfully preserve and seek rehabilitation of historic bridges, state departments of transportation should incorporate detailed manuals for addressing such issues. At this time, it does not appear that the state of Georgia has introduced thorough guidelines necessary for proper rehabilitation of its historic bridges.

[130] Texas Department of Transportation, "Preservation Options," from Historic Bridge Manual. Updated April 1, 2006. Available at http://onlinemanuals.txdot.gov/txdotmanuals/his/preservation_options.htm. Accessed February 23, 2009.
[131] Ibid.

Furthermore, guidelines such as these should be applied to all bridges of historic or future historic importance in order to prevent losses like that associated with the soaring qualities of the Tallulah Falls Bridge. At the time of the widening of Tallulah Falls Bridge, it had not yet reached fifty years of age; however, its importance in the Georgia's transportation and civil engineering history was evident even prior to its construction. Lack of proper guidelines for sensitively altering historic bridges led to an immense loss in the historic fabric of Rabun County, Georgia, and the southeast.

Light-Load Reuse

Although the first preference for the preservation of any structure or building is to rehabilitate the resource to its historic use, the next best opportunity for saving such a structure or building is adaptive reuse. In the cases of Tallulah Falls Bridge and Bomber Plant Bridge, reusing the structures for pedestrian or bicyclist transportation would have been a better way to preserve the historic integrity of each.

In Texas, the same Historic Bridge Manual dealing with bridge rehabilitation addresses reuse as a practical option for bridges whose replacements can be realigned within reason to bypass the historic bridge.[132] At the University of Massachusetts at Amherst, historic bridges have been given new life by a project aiming at preserving such structures for use as part of extensive biking/walking/jogging paths throughout the campus (Figure 7.1).[133]

[132] Ibid.
[133] Alan J. Lutenegger, "Preservation of Historic Iron Bridges: Adaptive Use Bridge Project, University of Massachusetts—Amherst," Historic Bridges: Evaluation, Preservation, and Management. Boca Raton: CRC Press, 2008, p. 206.

Figure 7.1: 1906 Bridge from southern Vermont after reconstruction on University of Massachusetts at Amherst campus

In Indiana, the department of transportation has made advances in "marketing" bridges where bypassing an historic bridge is not a feasible or prudent alternative to preservation. Much like programs in North Carolina, Montana, or Pennsylvania, this department of transportation project offers historic bridges to groups or individuals who wish to take ownership of the structure and either manage it at its historic location or relocate the bridge for use elsewhere.[134]

[134] "Historic Bridge Marketing Program," http://www.in.gov/indot/6742.htm. Accessed February 24, 2009.

Figure 7.2: Parker through truss, erected 1935, available through Indiana's Historic Bridge Marketing Program

Public Involvement and Education

In order to ensure the success of an historic bridge project of any kind, public involvement is paramount. Several states have been working for years to develop Historic Bridge Teams and/or Programs that specifically address public concerns in historic bridge-related projects. In Indiana, a website with updates of historic bridge issues and opportunities has been developed with the help of the Federal Highway Administration. Here, Indiana has made available a "Public Involvement Plan" for view by interested individuals and groups. By clearly outlining measures for activating the community and providing information on bridges available for ownership or "adoption," Indiana has strengthened an awareness of historic bridges and opportunities for preserving these fast-disappearing structures.[135]

The activity by the Indiana Department of Transportation (INDOT) has influenced other state transportation departments with the rise of projects requiring the involvement

[135] FHWA Indiana Division, "Indiana's Historic Bridge Program Public Involvement Plan," November 6, 2003. Available at http://www.fhwa.dot.gov/indiv/smfpipln.htm. Accessed February 25, 2009.

of bordering states to work in cooperation with INDOT. For instance, the Ohio River Bridges project involves both INDOT and the Kentucky Transportation Cabinet (KYTC) working together to provide their river communities with chances for input on the long-term goals for the Ohio River historic bridges (Figure 7.3).

Figure 7.3: Three of the Ohio River bridges in the Kentucky-Indiana Project

Through both states, public involvement continues to take place using a multi-faceted approach consisting of the following elements:

Regional Advisory Committee: This team, consisting of representatives of key government, civic and community groups on both sides of the river, reviews project work and ensures that regional needs are addressed.

Area Advisory Teams: These four groups, corresponding to each of the four areas where a bridge approach will be built, meet with the project team and provide feedback on design and aesthetic plans with the specific needs of their communities in mind. The diverse organizations on groups include environmental organizations, government agencies, neighborhood associations and preservation groups.

Historic Preservation Advisory Teams: The definition and formation of the Historic Preservation Advisory Teams

> (HPATs) is detailed in the Section 106 Memorandum of Agreement for the Project. The HPATs were organized to ensure that the Project is designed in a manner that respects the historic qualities, landscapes, buildings and features within the Alternative—Specific Area of Potential Effect. The role of the members is to review and comment on project design details, thereby assisting the Bi-State Historic Consultation Team and the Bi-State Management Team implement the stipulations of the MOA.
>
> **Public Meetings:** Throughout the design process, the project team will present information to the public about design concepts, bridge types and aesthetics and offer the community an opportunity to provide feedback. Notification of public meetings will be posted to this Web site, e-mailed to the project database and distributed to the media.
>
> **Newsletter:** A project newsletter will be issued periodically to provide the community with project updates including concepts for bridge types, historic preservation and upcoming events.
>
> **Mail and e-mail database:** The project database is used to share information about major project developments, distribute the newsletter and announce upcoming events…
>
> **Web site:** The project Web site, www.kyinbridges.com, is an up-to-date source of project information. On this site, you can access project maps, schedule information and an on-line contact form.[136]

This approach to public involvement is a good example for most historic bridge projects. While it appears as though most, if not all, of the historic bridges along this project corridor will eventually need to be fully replaced, the opinions of the public will greatly impact the outcomes of the dual-state project.

Overall, perhaps the most important area of education should consist of educating civil engineers themselves. While Crocker believed that even his own bridges would eventually face demolition, ongoing advancements in engineering and structural materials could mean otherwise. Furthermore, educating civil engineers in the efforts of historic preservation, the importance of their historic structures, and the possibilities of

[136] "Public Involvement Overview," Ohio River Bridges. Available at http://www.kyinbridges.com/public-involvement/overview.aspx. Accessed February 18, 2009.

sustained or adaptive could open a much-needed dialogue between preservationist and engineer.

State Transportation Archive

At this time, there is no archive for the works of Georgia's civil engineers. While some blueprints and drawings are available through the Georgia Department of Transportation, information on many projects, both historic and non-historic, are long lost. The Georgia Archives provide some sense of Georgia's civil engineers and their accomplishments through state highway and department of transportation records, but most of these holdings are comprised of countless memorandums that give only the slightest outlook on the lives and achievements of these engineers.

An archive should be created through the department of transportation to preserve the legacy of the state's civil engineers and their staff. All drawings, blueprints, and plans should be kept for historic research and analysis for future use, alteration, or replacement. Oral history interviews should be recorded with current and former Bridge Department staff in order to ensure the preservation of the massive feats of engineering, if only through memories alone.

Where possible, the works and life stories of these civil engineers should be made available to the general public. Whether through museum exhibits, outdoor interpretive signage, or small displays in public areas, the communities of Georgia should be aware of these people, the structures they built, and their trials in building such edifices.

Other Efforts

Through non-profit entities and other state-funded programs, preservation activists have found outlets and guidance for concerns about historic bridges. For example, the state of Washington's department of Transportation now features a full inventory of historic bridges constructed prior to 1961 that have been deemed eligible for listing on the National Register of Historic Places on its WSDOT website.[137] While this inventory shows Washington's efforts to preserve its structural heritage, it lacks in addressing those bridges not viewed as eligible for the National Register. Many bridges, whether found eligible for National Register listing or not, may be found significant enough for preservation by local community members and/or departments of transportation. A bridge lacking in integrity, such as Tallulah Falls Bridges, may no longer be seen as eligible for a National Register listing, but should nonetheless be viewed as worthy of preservation.

One of the most comprehensive historic bridge programs enacted by a state entity can be found in Vermont. By promoting rehabilitation, historic bridge preservation easements, and adaptive reuse, Vermont has created an extensive program aimed at preserving its transportation history. An extensive Programmatic Agreement was written in 1998 to provide focus for dealing with Vermont's historic bridges that involves several levels of governing bodies: Federal Highway Administration, Advisory Council on Historic Preservation, Vermont Agency of Transportation, Vermont State Historic Preservation Officer, Vermont Agency of Natural Resources, and Vermont Agency of Commerce and Community Development. By involving all of these bodies, the state of Vermont has

[137] Inventory available at http://www.wsdot.wa.gov/environment/culres/bridges.htm. Accessed March 14, 2009.

officially stated its interest in and need for preserving its historic bridges and has stated measures by which this program shall be enacted.[138]

While many states seems to have made substantial advances towards twentieth-century historic bridge preservation, providing nationwide guidance for the preservation of these structures. The National Historic Preservation Act of 1966 and the National Register of Historic Places each provide a backdrop for analyzing these bridges. However, the original purpose of these was based on the ideals of preserving historic architecture, not necessarily historic transportation structures.

Websites like www.BridgeHunter.com have become not only homes to databases for historic bridges, but also provide new guidance, updates, and community forums dedicated to the efforts of bridge preservation across the United States. The Historic Bridge Foundation has a website filled with news and issues concerning historic bridges throughout the United States. Through their efforts, the foundation supplies anyone interested in the preservation of historic bridges with support through:

> Serv[e] as a clearinghouse for information on the preservation of historic bridges via a website, electronic newsletters of alerts, and a directory of consultants;
>
> Identification of and communication with individuals and groups interested in the preservation of historic bridges;
>
> Consultation with public officials to devise reasonable alternatives to demolishing or adversely affecting historic bridges;
>
> Development of educational programs to promote awareness of historic bridge[s].[139]

Begun in 1999 as a resource tool related to the biennial conference, Preserving Historic Roads in America, the website www.HistoricRoads.org provides another hub for

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[138] Vermont Historic Bridge Program. Available at http://www.aot.state.vt.us/ProgDev/Sections/Structures/VermontHistoricBridgeProgram/HBP00vermonthistoricbridgeprogram.htm. Accessed March 13, 2009.

[139] From Historic Bridge Foundation. Available at http://www.historicbridgefoundation.com/joomla/home. Accessed March 14, 2009.

information concerning the transportation arteries of the United States, as well as the bridges associated with these highways. This website provides visitors with information needed to identify, preserve, and aid in the management of historic roads. Combining bibliographies and other resources with related websites, this easily navigable site includes information important to the budding historic road and bridge enthusiast as well as the experienced historian. Its "Current Events/News" section on the home page is clearly updated regularly, as evidenced by the recent addition of Eric DeLony's letter to the Obama Administration expressing interest in the future of historic bridges.[140]

Since August 10, 2005, President George W. Bush's signing of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) has included text detrimental to the preservation of historic bridges:

> Costs incurred by the State to preserve the historic bridge, including funds made available to the State, locality, or private entity to enable it to accept the bridge, shall be eligible as reimbursable project costs under this chapter up to an amount not to exceed the cost of demolition. Any bridge preserved pursuant to this paragraph shall thereafter not be eligible for any other funds authorized pursuant to this title.[141]

Historic bridge activists such as Nathan Holth of Historic Bridges of Michigan and Elsewhere have noted problems with this legislation concerning the verbiage particular to the costs of preservation not exceeding the costs of demolition.[142]

Prior to the signing of SAFETEA-LU, the SRI Foundation conducted a two-day workshop led by Eric DeLony in which specific recommendations were made as to how the legislation should be worded instead by

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[140] DeLony's "A Request to the Obama Administration for Historic Bridges" available at http://historicroads.org/index.htm. Accessed March 17, 2009.
[141] Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Title 23, Section 144(o). Full text available at http://uscode.house.gov/download/pls/23C1.txt. Accessed March 17, 2009.
[142] Holth provides recommendations for new legislation wording at http://www.historicbridges.org/info/tide/changes.htm. Accessed March 17, 2009.

> "…adding the words '200 percent' after 'amount not to exceed,' and replaces the word 'title' with the limited section reference. This corrects a conflict with the use of transportation enhancement funds for bridge preservation and increases the allowable limits under the Historic Bridge Program."[143]

This workshop also included several other recommendations important to the preservation of historic bridges including:

1. Mandate the Development of Historic Bridge Management Plans.
2. Create a National Historic Bridge Task Force.
3. Develop a National cooperative Highway Research Program (NCHRP) synthesis.
4. Task Force would work to increase and enhance funding for historic bridge management and preservation, partnering with advocacy groups.
5. Develop a national glossary for historic bridges that would be posted on a clearing house web site.
6. Develop a National Context on Historic Bridges.

   Information Management.
7. Develop a Web Site on the management and preservation of historic bridges.
8. Improve State DOT management and tracking of the status of historic bridges.
9. Collection and distribution of technical guidance on historic bridge rehabilitation and maintenance.[144]

Recommendations such as these, as well as others highlighted by Holth and DeLony should be closely considered at the present time. An increase in the interest of rebuilding the nation's infrastructure has received new attention as efforts by the Obama Administration in 2009 suggest an increase in transportation projects to supply maximum employment. Recession planning has begun with proposals for new work across the country relating to reconstructing and enhancing roads and bridges. While such projects

[143] Eric DeLony and Terry H. Klein. Historic Bridges: A Heritage at Risk. Report on Workshop on the Preservation and Management of Historic Bridges, Washington, D.C., December 3-4, 2003.
[144] Ibid.

may provide much-needed employment and meet urgent transportation needs, preservation of historic roads and bridges could be overlooked.

According to Holth's website, "The government has openly declared that it will not increase and expand historic bridge preservation funding until it is aware of a public interest."[145] Identifying the call to action "A Campaign For Change: A Future For Historic Bridges," Holth provides step-by-step instructions on how regular citizens can become involved in changing the legislation affecting historic bridges. Through "Turning the Tide" by contacting legislators and expressing interest,[146] those concerned that the carrying out of transportation rebuilding and/or enhancement will adversely affect historic bridges may be able to alter SAFETEA-LU to better serve the preservation of these resources.

Summary of Recommendations

- Continuous and Updated Survey
- Rehabilitation Maintaining Historic Purpose
- Light-Load Reuse, at historic location or relocated
- Public Involvement and Education
- State Transportation Archive
- Nationwide Guidance
- Advocacy Groups and Websites

[145] "An Overview: The Problem And How You Can Help." Available at http://www.historicbridges.org/info/tide/index.htm. Accessed March 15, 2009.
[146] Information on Holth's "Campaign for Change" and "Turning the Tide" available at http://www.historicbridges.org/info/tide/help.htm. Accessed March 17, 2009.

Moving On

While alteration, and even replacement, is sometimes inevitable due to safety concerns and/or funding, the preservation of the legacy of these bridges and their builders should be given higher regard in the state of Georgia. Measures should be taken to ensure rehabilitation of historic bridges where possible, and adaptive reuse or proper pre-demolition documentation on all other occasions. The public should be involved on all levels of historic bridge projects, whether through volunteer survey, public meetings, web forums, the creation of displays, or in any other way possible.

With automobile traffic continually on the rise, bridge needs are constantly being analyzed and reanalyzed. The spike in bridge construction during the 1950s and 1960s is creating a problem for preservationists and engineers alike. These structures, much like the prolific ranch house, have been previously altogether overlooked. State civil engineers have been often disregarded as state contractors rather than the designers of miles of twentieth-century historic fabric. Neglected as generations of populations drive at high speeds pass and above the substructures and superstructures of well-designed and time-tested forms, the historic bridges of Clarence N. Crocker, Searcy Slack, and later Georgia State Bridge Engineers are in need of recognition and preservation.

Growing populations and rising vehicular weights make the engineering of bridges a task of regular redevelopment. Civil engineers, with rationalism and modesty guiding their work, appear to realize the futility in preserving their works in perpetuity. When discussing what Crocker would think of bridge replacements, current State Bridge Engineer Paul V. Liles gave the following explanation:

> He said that bridges are replaced. He said they wear out, they get old, and you build bigger and better bridges. He said that. He wasn't at all attached to them from a memory standpoint. Not at all. He said that traffic increases, and

you move on. He was pretty strong about that. I thought that was very admirable.[147]

[147] New South Associates, Conveying History: Bomber Plant Bridge. February 25, 2008, p. 46.

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