2.0 HISTORICAL OVERVIEW: SMALL STRUCTURES ON MARYLAND'S ROADWAYS

Introduction

P.A.C. Spero's 1995 report, *Historic Highway Bridges in Maryland: 1631-1960: Historic Context Report* (Spero 1995) prepared for the Maryland State Highway Administration (SHA), includes a detailed discussion of the development of Maryland's roadway network and the history of the state's bridge building activities. This chapter builds upon the discussions contained in that report, to focus on the development of small structures on Maryland's roadways. While many of the existing significant bridges discussed in the Spero report are complex in design and were built almost entirely by the State of Maryland, the remaining smaller bridge structures covered by this report are uncomplicated and could have been constructed by relatively unskilled labor using locally available materials.

Historically, as people needed to cross streams and rivers for commercial or personal endeavors, they devised some type of bridge according to the materials and skills at hand. The earliest bridges were probably crude and simple spans over the narrowest stretch of water. These early bridges most likely consisted of trees cut to fall across streams or stone or wood slabs laid across piles of rocks. As technology improved, bridge design and construction became more sophisticated, longer spans were feasible, and crossings were placed in more convenient locations for travelers. The second half of the nineteenth century and the and early twentieth century saw tremendous advances in the technology of bridge building, with the evolution of more durable materials, the development of standard plans for simple spans, and the growth of a cadre of specialized bridge engineers and highway departments at both the state and local level.

The design of small structures has benefited from the technological advances of the nineteenth and early twentieth centuries, in particular the introduction of reinforced concrete. Early in the twentieth century, Maryland's State Roads Commission developed a series of standardized designs (Standard Plans) for small structures such as box culverts and concrete slabs for use on state highways. These plans were also available to counties and cities for their use, and there are examples of small structures based on the Standard Plans found on roads throughout the state. Up through the end of the 1940s, however, the design and construction of small structures on county and local roads continued to be less regimented than those on state road projects. In general, county and city road departments were constrained by limited budgets, which in turn affected the designs and types of materials that could be used for the structures. The State Roads Commission Report for 1947 and 1948 noted that "in the design of county road projects, the aforementioned policies and desirable standards are tempered with good judgment in order to arrive at a structure within the budget of the county and which will be consistent with the traffic expected to use the facility" (Maryland State Roads Commission 1949: 62).

The significance of roadway structures, in particular small structures, is not in what they are, but in what they do. They are a part of an extensive transportation network that permits people to move between home, jobs, school, medical and social activities and myriad other purposes. They may be described as "work horse" structures, with the materials or design rarely deviating from the common practice, thus saving time and

money. They are not “large expensive sculptures erected primarily for aesthetic purposes, [rather] they are important because of their usefulness within larger systems that support social, cultural and economic development. At the root, bridges . . . are built to serve practical utilitarian functions, and usefulness is the essence of their existence” (Jackson 1988: Preface).

This chapter examines several historical themes in the development of the road system and the role of small structures in Maryland from the colonial era to the immediate post-World War II era, when the state geared up for a massive overhaul of its roads and bridges. The influence of the state’s geography and topography are briefly reviewed, followed by an examination of the historical development of the road system with particular emphasis on small structures. Topics discussed are the influences of colonial and state legislation affecting road building; the era of internal improvements and the Good Roads Movement, the rise of state-level highway organizations in the 1890s and early twentieth century, the influence of standard plans and the use of relief and prison labor for construction of state and local road projects.

Geography and Topography

Maryland’s diverse geography has played a significant role in the development of the state’s transportation network. The state extends from the Delmarva Peninsula on the Eastern Shore to the Appalachian Mountains in the west. It can be divided into three physiographic regions: the Coastal Plain, the Piedmont Plateau and the Appalachian Region (Figure 2.1). Within the Coastal Plain are two major divisions: the Eastern Shore and the Western Shore. The Eastern Shore is characterized by flat terrain and wide river channels that drain into the extensive marshes of the Chesapeake Bay. The Western Shore features sharp variations in terrain, ranging between 100 and 280 feet, with deep stream channels and sharp divides. The major watersheds draining the Western Shore are the Potomac, Patuxent, Patapsco and Gunpowder Rivers with their tributary streams. The traditional course of highway construction on the Western Shore, at least to the early part of the twentieth century, was along the major divides of the watersheds in order to minimize construction grading.

The Piedmont Plateau, extending from the Coastal Plain to the beginning of the Appalachian Mountains, is divided by Parr’s Ridge, which is the nominal headwaters of the Gunpowder, Patapsco and Patuxent Rivers. East of Parr’s Ridge, these swift rivers cut through broad, fertile valleys. The Monocacy River Valley dominates the western division of the plateau region. Roads in the Piedmont have traditionally been influenced by the topography of the region. In the eastern division, roads traditionally ran along the divides, through the broad valleys and at the bottom of the river channels. Roads in the western division either followed the divide or cut across the valley.

The Appalachian Region, in the westernmost portion of the state, consists of a series of parallel mountain ranges with deep valleys, bisected by the Potomac River. The mountain ranges, running in essentially a north-south direction, have affected the location of transportation routes. Most of the important early land routes followed the

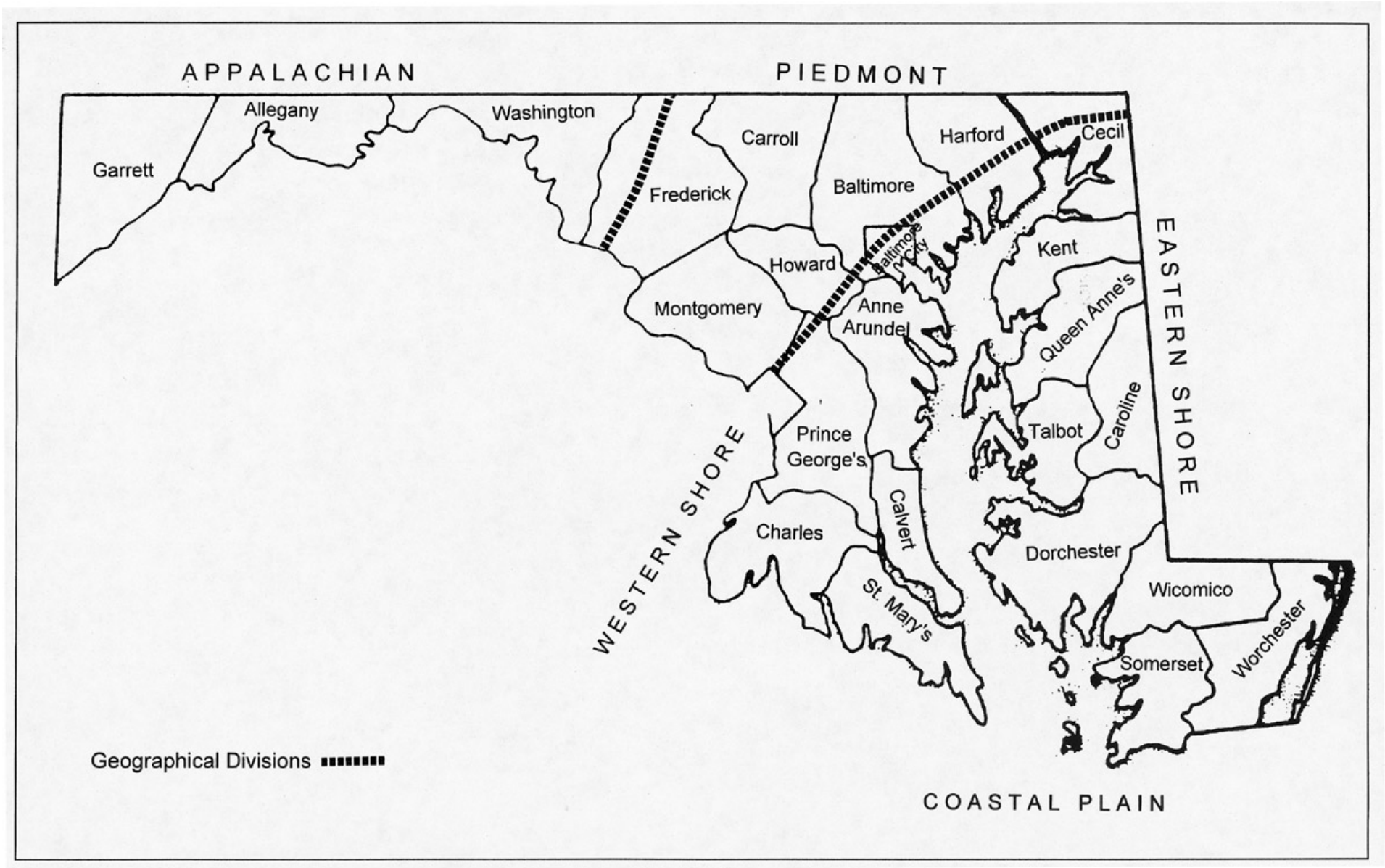

Figure 2.1. Map of Maryland showing geographical divisions and counties.

river valleys, thus in a north-south direction. The National Road, however, was built to serve as an east-west connector, running across the mountain ridges and into the western portion of the state. Other, less important, east-west roads crossed the mountains through the low divides or along the major waterways that flowed through the Appalachian Mountains of Maryland.

Maryland's landscape is dissected by countless small streams and rivers and, since the colonial period of settlement, this feature has necessitated the construction of numerous large and small structures to facilitate overland travel. In general, the geography and topography of each section of the state has historically influenced the choice of materials used for the foundations and superstructures of bridges and small structures: stone structures with foundations on rock were more prevalent in the Appalachian and Piedmont divisions, while timber structures with predominately timber piles were typical on the Coastal Plain (Spero 1995: 8). Since the early years of the twentieth century, however, with the advent of modern materials such as reinforced concrete and steel and the implementation of standard plans for small structures, geography has been less of an influence on types of construction and appearances of small structures.

For more detailed discussions of the topography and geology of the state and its relation to road-building activity, please refer to P.A.C. *Spero's Historic Highway Bridges of Maryland: 1631-1960, Historic Context Report* (Spero 1995: 3-8), and to the essay by Arthur Johnson in the *Report of the Highways of Maryland*, produced by the Maryland Geological Survey in 1899 (Johnson 1899: 192-196).

Early Transportation Networks 1631 to 1800

The earliest routes of travel in Maryland followed the courses of least topographic resistance. The many navigable rivers and streams of the vast Chesapeake watershed were known to the native Americans prior to European settlement and constituted the primary means of access into most parts of Maryland below the fall line during the settlement and early colonial eras (Spero 1995: 8). Indian trails for overland travel between the heads of streams and rivers were also used by early settlers, and have formed the basis of several modern transportation routes.

The earliest European settlements in Maryland were along the Atlantic coastal areas and the settlers, like the Indians before them, depended upon horses and canoes for travel. This initial dependence on waterborne transportation prevented the immediate development of crossroads settlements. Horse-drawn wheeled vehicles came to prominence once colonists began to settle away from the water's edge. The transition from packhorses to wheeled vehicles necessitated the construction of permanent river and stream crossings in the form of ferries and bridges.

<u>Early Road Acts</u>

As early as 1637, Maryland's Colonial Assembly acted to facilitate transportation among the many farms and towns, beginning with an act for public ports, that Lord Baltimore refused to approve (Spero 1995: 9). Most of the earliest transportation acts related to ferries and waterborne transportation, but while navigation remained an important aspect of travel in Maryland, the patterns of settlement increased the need for official regulation of road-building activity. The Colonial Assembly passed Maryland's first

comprehensive general road law in 1666. This act delegated to the County Courts or Commissioners the responsibility to lay out a highway system that would make the heads of rivers and creeks "passable for horse and foot." The Act also provided for the appointment of overseers by each county to build and maintain the roads, a tax against the colonial inhabitants that could be paid in tobacco or in labor, fines for non-performance and a system of marking the roads. Thus, Maryland's road law of 1666 established the policy of the individual counties being responsible for building and maintaining all roads within their borders, a policy that generally continued to the early twentieth century. A system of roads paid for entirely by the state was not developed until after the establishment of the State Roads Commission in 1908 (Leviness 1958: 2-3).

A new general road law was passed in 1696. In addition to setting up a province-wide system of road marking and requiring for the first time that public roads be cleared and grubbed to a 20-foot wide travelway, the 1696 colonial law required that "good and substantial bridges" be constructed over the heads of rivers, creeks, branches and swamps, at the discretion of the county justices of the peace (Spero 1995: 9-10). This law, repassed in 1704 and subsequently amended, became the basic road act of colonial and early post-colonial Maryland. Leviness, author of the *1958 History of Road Building in Maryland* noted that this law appeared not to consider travel by wheeled vehicles as a viable mode at that time (Leviness 1958: 3).

There is little evidence of the construction methods or materials of these "good and substantial" bridges, although it seems safe to assume that most were of timber. Strong evidence concerning the prevalence of simple timber beam bridges in early eighteenth century Maryland comes from a 1724 colonial Maryland law that gave the county road overseers the right to use any suitable trees on adjacent lands in order to build or repair any bridge maintained at a public or county expense; the use of trees fit for making clapboards or cooper's timber was, however, excluded (Souissat 1899: 121). The Act noted that "the several bridges that have been heretofore over the heads of rivers, creeks, branches, swamps, and other low and miry places, are very much broken and out of repair, and several new bridges are still wanting" (Spero 1995: 11). The heads of such waterways were generally the narrowest location at which a crossing could be made, thus, it can be assumed that many of these bridges were probably small structures. Not until 1795 did the State of Maryland agree to provide compensation to the adjacent land owners for the confiscation of timber used in building and repairing public bridges.

In 1794, the General Assembly of the new state of Maryland revised the general road law of the state, leaving most of the road work in the hands of the counties, but setting up a system of County Levy Courts to govern specifically the construction of public roads and bridges. According to this law, bridge repairs were to be performed by laborers hired by the courts, except in cases involving "framed or arched bridges exceeding fifteen feet in length" (Kilty 1808: November 1794 Session, Chapter 25). Spero observes that this legislation is an early recognition that the construction and maintenance of longer or more complicated bridges might involve more expertise than the average laborer would possess (Spero 1995: 15). The average laborers at this time consisted of both free men and slaves. It can be implied from the wording of the law that small structures under 15 feet were generally built using laborers hired by the

county courts. The wording also seems to imply that many structures were fairly small, 15 feet or less in length.

The 1794 act also permitted County Levy Court justices to raise taxes for new bridge construction (up to 100 pounds) or repair (up to 30 pounds annually for a single bridge). The law also required cooperation between adjoining counties for building or repairing bridges over county lines; such bridge work was to be contracted out to workmen through a process of bidding and receipt of proposals (Spero 1995: 15).

Other legislation pertaining to Maryland's transportation network at the end of the eighteenth century consisted of legislative chartering of private bridge companies and canals. Over the course of the century personal and commercial travel modes in Maryland had evolved from primarily horses and foot travel prior to the Revolutionary War to include substantial volumes of wheeled traffic after the war. The need for improved avenues of travel was apparent.

Transportation Improvements in the Nineteenth Century

In the post-colonial era, a wider variety of travel modes and routes helped to open up the new country. Spero has described the primary themes in the transformation of travel in the nineteenth century and their affect on bridge building in Maryland: private toll roads or turnpikes, the National Road, canals and railroads, and the Good Roads Movement.

Turnpikes

Turnpikes were quite simply roads on which a toll was required for passage; the term comes from the bar or gate that was suspended over the road. Durrenberger observed that the feature that differentiated turnpikes from other roads was the directness between destinations (Durrenberger 1931: 84-85). Spero explains that "turnpiking" a road meant either straightening, rebedding or resurfacing an old dirt road with some combination of gravel or stone or surveying and laying out a new road in order to take advantage of the terrain (Spero 1995: 16). The innovative practices of stone surfacing and road drainage, as developed by British engineers Thomas Telford and James McAdam, were first applied in this country to the construction of turnpikes (Spero 1995: 16).

Leviness explained in his 1958 *History of Road Building in Maryland* that the turnpikes filled a void at the time when stone roads were needed to promote commerce in the new nation but the citizens were not yet ready to appropriate the money needed to build high quality roads (Leviness 1958: 29). Thus various state legislatures chartered a number of private companies to build hard roads and maintain them by charging tolls. The charters often specified how the road was to be laid out, specifying, for example, that no bridges and culverts should be less than 20 feet wide. The companies were directed to build "good and sufficient bridges" where necessary on the turnpikes (Durrenberger 1931: 85, 91). In 1818 Maryland's Governor Goldsborough prepared a progress report on the status of the turnpikes chartered by the Maryland General Assembly, which provides some insights into the types of bridges that were built. Spero notes that the governor's report documented the use of simple timber beam structures as well as stone arch bridges (Spero 1995: 18). The stone bridges were built primarily in the

Appalachian and Piedmont regions, reflecting "a growing popular demand in those areas for sturdy structures able to withstand the pressures of frequent wagon traffic as well as the force of water, ice, and flood debris along streams and rivers with moderate or high slopes" (Spero 1995: 19). Conversely, the preferred building material for turnpike bridges in the Coastal Plain was timber. The geographical preference for building material was based on the availability of local materials and environmental factors (i.e. stone was readily available in the western areas of the state where the soils were thin and rocks were near the surface, and timber was preferable in the east where the clay soils were very thick and wet).

National Road

The National Road was the first federally built highway in the United States. Its original purpose was to connect Cumberland, Maryland with the new state of Ohio, although the State of Maryland encouraged the construction of turnpikes to link the National Road with Baltimore via Hagerstown and Frederick. The National Road was originally built between 1811 and 1818, under the supervision of US Army topographic engineers (the Corps of Engineers), and was maintained by the Federal government from 1818 to 1835, when the State of Maryland assumed control over its portion of the road in 1835. By 1878, when the Legislature transferred ownership over to Allegany and Garrett Counties, the National Road had been relegated to a secondary transportation route because of its poor condition and the increasing role of the railroad for commercial traffic.

Spero notes that the preferred bridge types on the National Road were semicircular stone masonry arches and culverts (Spero 1995: 20). This supports the observation above that stone bridges were most common in the Appalachian and Piedmont sections of the state.

Canals and Railroads

In the early nineteenth century two new transportation modes came to prominence in Maryland: canals and railroads. Although neither mode carried highway traffic, their use of civil engineers and innovative construction methods and materials influenced the improvements in construction methods for highway bridges and small structures in the late nineteenth and early twentieth centuries. Canals were constructed in the 1820s to serve as artificial commercial water routes; private canal companies were chartered by the state to construct and maintain the canals. The Chesapeake and Ohio (C&O) Canal connected Washington D.C. and Cumberland in the western portion of Maryland, and the Chesapeake and Delaware (C&D) Canal linked the Chesapeake and Delaware Bays in the eastern portion of the state. Bridges were integral parts of the canal system, but as Spero explains, the types differed for the two canals as a result of their geographic locations. Along the C&O, the canal was "spanned by dressed stone masonry arch bridges and was occasionally carried (as at the Monocacy River) by stone aqueducts" (Spero 1995: 21-22). Some surviving small bridges associated with lock complexes have been documented and recorded, although it is unlikely that these would fall under the definition of a small structure because of the canal width required for commercial water traffic. Along the C&D in the eastern part of the state, covered timber bridges spanned the canal. Probably few, if any, of the C&D bridges were small structures because of the wide river channels and estuaries in that part of the state.

In the 1830s railroads began to challenge canals for commercial traffic, and quickly outpaced them. The railroads provided a training ground for American civil engineers and led the way in the application of new bridge types and standard plans, and in the use of modern materials (metal) for bridge construction. Spero notes the Baltimore and Ohio Railroad demonstrated to the public that stone viaducts and then iron truss bridges would work if properly engineered (Spero 1995: 22).

State Oversight of Road Building

Throughout the 1800s, Maryland's General Assembly passed a variety of legislation affecting public and private roads and bridges, but the power and responsibility of public roads remained primarily with the counties. In 1818, the county courts were authorized to appoint on a regular basis three-person panels of viewers to inspect potential or proposed road and bridge locations and to examine whether "the public convenience requires it" (Sioussat 1899: 154). That law, amended and revised several times between 1853 and 1888, governed the counties' administration of public roads and bridges through the end of the century.

Although railroads dominated inter-regional and national travel and transportation through the end of the nineteenth century, Spero notes that the state's basic system of public county roads and private roads built to access farms or factory sites slowly expanded during the century under the patronage of the Legislature and county officials (Spero 1995: 25). By the end of the century, however, despite the advances made in materials and trained engineers, the majority of county roads in Maryland were largely unimproved dirt routes, which meant mud in wet weather and dust in dry weather, and most county bridges were one-lane wide and in need of repair (Leviness 1958: 39).

The Good Roads Movement

The last decade of the nineteenth century was a time of transportation reform efforts throughout the nation. The national Good Roads Movement, beginning in the 1890s, was an effort to improve the condition of local roads. It began essentially as a grass roots movement in rural areas of the country, where farmers and their families desired better roads for getting their products to market and for social interaction in general. The popularity of bicycling gave further impetus to the Good Roads Movement, as bicycling aficionados joined with the farmers in an unlikely alliance to demand smooth, all-weather roads.

The Maryland Road League (Road League), one of the numerous blue ribbon panels of civic leaders established during the reform period at the end of the nineteenth century, advocated for good roads and bridges in the state. Spero notes that the Road League recommended the establishment of a state engineering department that would assist the counties with the intention that each county eventually establish an engineer's office of its own to handle road and bridge matters (Spero 1995: 26). Along with the extraordinary coalition of farmers and bicyclists, the Road League lobbied the General Assembly for a study on the economic value of good roads.

The Maryland General Assembly had established in 1896 a small agency, the Maryland Geological Survey (Geological Survey), to investigate and report on the various types of

geological material found in the state. With the demands of the Road League and the proponents of the Good Roads Movement, in 1898 the General Assembly instructed the Geological Survey to investigate and report back on "the question of road construction in this State" (Leviness 1958: 42). Thus the Geological Survey was designated as the agency responsible for state supervision of road-building activity. A Highway Division within the Geological Survey was created, and the office of Highway Engineer was established. The first State Highway Engineer was Arthur N. Johnson, who was previously on the staff of the Board of Highway Commissioners for Massachusetts and later became the dean of the School of Engineering at the University of Maryland (Leviness 1958: 42).

Pursuant to the 1898 legislative order, the Geological Society prepared and published in December 1899 the *Report of the Highways of Maryland*. This seminal report contained a comprehensive survey of road conditions in the state (by county) and a discussion of the relationship of topography, climate and geology to road building in the state. The portion of the report that was authored by Arthur Johnson provided insight into the method of construction and condition of the state's small structures. His report explained that "under the head of bridges is included not only bridges proper, but also culverts and smaller drains" (Johnson 1899: 205). He noted that bridges:

> *may be divided into three classes---wooden, iron and stone. The majority of the small bridges, with spans of up to 30 feet, culverts and drains are of wood. The shortest spans are a simple beam to which is nailed the flooring and rails. For spans from 10 to 30 feet, a simple triangular frame with a central tension rod or post forms the supporting truss [king-post or queen-post]. They are in various stages of repair varying from newly-built to those over which it is unsafe to ride* (Johnson 1899: 205-206).

According to Johnson's report, short iron bridges were rapidly replacing wooden spans, "some of which are of a flimsy construction" and that there were comparatively few I-beam bridges, which were "one of the cheapest and best forms for spans less than 25 to 30 feet" (Johnson 1899: 206). The report recommended as the most durable method of construction for small spans "the combination of masonry and I-beams, between which are transverse arches of brick, the whole covered with concrete, over which is laid the roadway" (Johnson 1899: 206). Spero observed that this recommendation constitutes the state's first official endorsement of concrete in bridge building, although there are no extant examples of the unreinforced concrete, composite arch and beam bridge as recommended in the 1899 report (Spero 1995: 26-27).

In addition to producing the report on road conditions as requested by the proponents of the Good Roads Movement, the Highway Division of the Geological Survey instituted a campaign to instruct county road supervisors in the fundamentals of proper grading and drainage and hammered hard at the economic advantages of good roads. The Geological Survey recommended a ten-year program of building all-weather roads, with the cost to be shared equally by the state and the counties. It also recommended the creation of a state highway commission as a mechanism to supervise the program (Leviness 1958: 44-46). Maryland did not adopt the concept of a state highway commission until 1908, and for the ten years between 1898 and 1908, the Geological Survey's Highway Division conducted a "considerable amount of testing and demonstration work and offered the services of a highway engineering organization to

counties, cities and towns" (Maryland State Roads Commission 1930a: 10). Leviness asserted that the Geological Survey's main value was educational; through studies, press releases and building of model roads, it conducted a vigorous public relations campaign to promote good roads (Leviness 1958: 49).

Modern Transportation 1900-1948

Several trends in the first half of the twentieth century resulted in a dramatic improvement of Maryland's roads by the mid-century mark. The Geological Society and its successor, the State Roads Commission, promoted the concept of all-weather roads, a system of state-maintained roads, standardization of structural plans and roadway design and method of construction, and increasing specialization and professionalization of state and county road engineers. During this period, old roads and structures along the routes were widened and upgraded, and new roads, bridges and culverts were constructed.

The Good Roads Movement continued in Maryland into the early decades of the twentieth century. In 1904, the General Assembly passed the first significant statute that provided for financial aid and state supervision of road- and bridge-building activities. The Maryland State Aid for Highways Act is commonly referred to as the Shoemaker Act, in honor of Samuel M. Shoemaker of Baltimore County, who was instrumental in leading the march to "get Maryland out of the mud" (Leviness 1958: 46-47). The statute established an annual appropriation of $200,000 to build and upgrade county roads in order to create a system of modern macadam roads across the state. Counties would receive a share of the total appropriation in proportion to their public road mileage provided that they matched the state money on a fifty-fifty basis. This law thus doubled the amount of money each county could spend on road repairs without any additional tax levy for county residents.

Under the Shoemaker Act, each county selected the roads to be improved subject to the approval of the Geological Survey. Upon approval, the Highway Division conducted surveys, drew up plans and specifications, advertised for bids, awarded the contract to the lowest bidder and supervised the construction work. Upon satisfactory completion the road was accepted by the County Commission as a county road and the County Commissioners were required to maintain it in good repair. This is a significant step in the movement toward direct state supervision of roads in Maryland, but the counties continued to be the principal authority for building and maintaining the roadway network in Maryland. In 1906, however, the General Assembly enacted a law providing for the building of a state road, independently of the counties, the Baltimore-Washington Highway (State Road 1); this measure reflected a growing sentiment that some main thoroughfares in the state should be built by the state alone, while the counties could continue to build the less important roads (Crosby 1908: 33).

In the 1906 report on the State Highway Construction Program, Chief Highway Engineer Walter Crosby reported that the bridges on the roads that were being improved under the Shoemaker Act were found "in most cases to be in a very unsatisfactory condition" (Crosby 1906: 378). He explained that practically every wooden bridge had to be reconstructed so that it could safely support not only regular traffic but the steam roller used to improve the road. According to Crosby, the general plan was to do away with these "unsatisfactory and expensively maintained wooden structures" and replace them

with pipe culverts or concrete bridges so as to reduce future expenses for maintenance. He noted that the Highway Division preferred these materials, although it had on two occasions approved the use of a steel bridge with wooden floors (Crosby 1906: 379).

State Roads System and the State Roads Commission

The proponents of the Good Roads Movement maintained the pressure for creation of a state highway commission that would have greater powers over roads and bridges. In 1908, Governor Austin L. Crothers, who has been called the father of the Maryland state roads system, came into office on a Good Roads platform. In that year, under his supervision, the General Assembly passed the State Road Act, providing for the selection of a comprehensive state-wide system of roads connecting all of the county seats, to be built and maintained at the sole expense of the state. The law also created the State Roads Commission to select the state road system and administer a $5 million, seven-year improvement program to construct and maintain the system (Leviness 1958: 51). This program marked the beginning of the shift in responsibility for road building from the counties to the state. The State Roads Commission and the Maryland Geological Survey operated in tandem for two years, from 1908 to 1910, at which time all highway functions of the Geological Survey were transferred entirely to the State Roads Commission.

The State Roads Commission assumed the charge toward greater professionalism in the design and construction of roads and structures in Maryland. In 1912, the State Roads Commission implemented the practice of placing district engineer offices in eight subdivisions or "residencies" across the state. A District Engineer was appointed to live at a central point within each district and to be responsible for overseeing the state road and bridge work in that district (Leviness 1958: 60). Throughout the first half of the twentieth century the State Roads Commission and its various divisions evolved to fulfill the purpose of creating a modern road system in Maryland. While the state's system of roads was evolving, county road departments continued to bear substantial responsibility for building, repairing and maintaining roads, bridges and culverts on the local roads, which comprised the majority of the mileage in the state.

By 1915 the state road system envisioned in 1908 was completed, with a system of 1,304 miles of hard surfaced roads that were passable twelve months of the year and connected all county seats. This system was comprised of newly constructed roads as well as previously constructed county roads and former toll roads or turnpikes (Maryland State Roads Commission 1930a: 11-12). Then came World War I, during which the heavy-load traffic passing through the state to the numerous shipbuilding yards, proving grounds and military centers on the East Coast caused substantial damage to the state's roads and bridges.

Standard Plans

By 1912, the concept of standard plans for bridges and culverts had taken hold in Maryland. At that time the Department of Surveys under the State Roads Commission prepared standard plans for bridges with spans up to 36 feet in length. The theory was that the District Engineer would investigate the proposed bridge location, then refer to the standard plans and select the type of foundation that would fit the location and conditions. Plans were developed for box culverts and for bridges as small as a 6-foot

span, and for spans increasing in size by two-foot increments up to 36 feet. These standardized plans greatly simplified the work of engineers on smaller roadway structures (Maryland State Roads Commission 1916: 79).

The standard plans were revised in 1919, 1924, 1928, 1930, 1931 and 1933, each with notable differences such as the width of the roadway and the type of rail. (The 1912-1933 Standard Plans for small structures are in the Appendix to this report). No further standard plans were developed after 1933. There is no evidence, however, to indicate that the latest plans were not used through the 1940s, by either the state or the counties for small structures, particularly during the war years when skilled labor and structural materials (e.g. steel) were scarce.

By the end of the 1940s, the design of county road projects continued to be less regimented than state road projects. The State Roads Commission's biennial report for 1947-48 admonished that the application of the standards and policies promoted and used by the state highway department to individual county road projects must consider the county's available funding and the volume and type of traffic expected to use the facility. Although more modern materials had been proven more efficient and durable, the report noted that timber structures continued to be widely used in bridges on purely county or local highways (Maryland State Roads Commission 1949: 46).

State Programs of the 1920s and 1930s

Following World War I, the state proceeded vigorously to rebuild the roads and structures that had been damaged by defense-related traffic. A general re-appraisal of Maryland's bridge system found most bridges and small structures, like most roads at the time, to be too narrow and weak for the increasing traffic resulting from the greater availability of personal vehicles. To respond to those problems, the State Roads Commission developed a long-range program of bridge replacement and reconstruction. This program was carried out through the 1920s and 1930s.

A separate Bridge Division within the State Roads Commission was established in 1920 to oversee the expanded bridge program. One of the top priorities was the replacement of the many narrow, timber structures built in the nineteenth century; these single-lane bridges and small structures were so narrow that vehicles could not pass each other on them (Leviness 1958: 129-132). Among the "one-way and dangerous bridges" that the State Roads Commission reported as being replaced during the period from 1924 to 1926 was a 9-foot reinforced concrete slab bridge over Ballenger Creek on Jefferson Pike in Frederick County (Maryland State Roads Commission 1927: 61). It was through this program that many of the state's pre-twentieth century small structures and culverts were either torn down and replaced or repaired beyond recognition of their original form. An explanation of the state's policy toward the older structures was provided in the 1927-1930 Report as follows:

> *Until recently it has been the natural and appropriate policy of the State Roads Commission to embody the old bridges [on former county roads] as part of the State Roads System, as these bridges were, until recent years, fully adequate for the needs of traffic. With the rapid increase in automobile traffic and the increasing loading of trucks and buses, a*

> *number of these bridges each year have become inadequate for the present day traffic* (Maryland State Roads Commission 1930a: 61).

In 1933, the General Assembly passed the County Road Act, which gave counties the option to maintain their roads from local tax levies or to turn over such roads to the State Roads Commission for maintenance (Maryland State Roads Commission 1934: 68). Twenty of the state's 23 counties opted to take advantage of this opportunity to reduce their local tax rates. In the first two years of the County Roads Maintenance Program, "several hundred wooden structures, both bridges and culverts," were rebuilt or replaced at state expense; other roadway activities conducted under this program were the replacement of small wooden bridges by corrugated metal pipes, ordinary repairs and maintenance to bridges, clearing inlet and outlet ditches, construction of drainage structures and the scraping and painting of steel bridges (Maryland State Roads Commission 1934: 68-72).

Included in the activities reported by the State Roads Commission during the 1937-38 period were the construction of several county bridges in Frederick and Allegany County using steel beams and timber floors, and design of numerous small slab bridges and box culverts of varying sizes on the state roadway system (Maryland State Roads Commission 1939: 84). Since the final set of Standard Plans were issued only four years earlier in 1933, it is quite likely that the bridges and small structures referenced in the 1937-38 Report were constructed according to the Standard Plans. One configuration in the 1933 Standard Plans for structures up to 20 feet in length specified a timber structure for secondary roads only, which included most county roads. The discussion on the County Road Maintenance Program in the 1937-38 State Roads Commission Report also notes that the program has been one of the commission's most unsatisfactory functions, because of the method of allocating the funding to the several counties and the fact that the public frequently criticized the work, often comparing what was done in one county to what has been done in another (Maryland State Roads Commission 1939: 22).

Labor Sources for Road Building

In the 1930s and 1940s, two somewhat unusual sources of labor were used for road-building activities in Maryland: convicts and relief workers. Projects undertaken by these laborers included relatively simple tasks such as widening and paving, clearing out ditches and most likely construction of culverts and other small structures. These two sources of labor are discussed below.

Convict Labor

During World War I, because of a shortage of labor, the State of Maryland revived briefly an eighteenth century tradition of using convict labor to perform construction and maintenance activities on public roads and bridges. Although it is difficult, if not impossible, to determine which roadway structures were built by convict labor, it can be assumed that some small structures were included in the construction and maintenance activities. Prisoners were put to work on road maintenance activities that required little skill, in particular oiling the macadam road surfaces. After the war, this system of labor was abandoned.

In the late 1930s, however, the use of prison labor was reinstituted as a means of relieving "idleness of inmates in the Penal institutions of the State" while helping with highway housekeeping (Maryland State Roads Commission 1943: 57). In 1937, the State Roads Commission was authorized to spend $100,000 a year to employ prisoners on reconstruction and maintenance of road facilities. This pool of generally unskilled labor was put to work on such jobs as stabilizing shoulders, installing and lengthening drainage culverts, widening cuts and fills, building earth shoulders and cleaning out ditches. Subsequent General Assemblies through 1948 continued and even increased the authorization (Maryland State Roads Commission 1949: 17).

During and immediately after World War II, prison labor was used extensively for maintenance activities on state and county roads, while federally subsidized relief labor (discussed below) was used to construct new defense access highways. In some instances prison camps were constructed to house the male prisoners in the areas too far removed from the penal institutions to permit daily transportation. The 1947-48 State Roads Commission Report stated that a prison camp was "recently" established in Montgomery County to make penal labor available for work in Montgomery and adjacent counties: "These counties, due to their proximity to Washington and the high wages paid by private industries, have been unable to secure labor requirements for maintenance operations. As a consequence, roads in these areas have suffered from lack of maintenance" (Maryland State Roads Commission 1949: 20). That report also noted that prison camps formerly located at Leonardtown and Elkton had been abandoned.

Relief Labor

During the 1930s, Federal emergency funds were available for the relief of unemployment resulting from the Great Depression. Many states took advantage of these sources of funding to help with road construction during a time when there was pressure to reprogram state road user revenues for other purposes.

The Public Works Administration (PWA), a New Deal agency created in 1933, distributed nearly $6 billion for construction of roads, bridges, tunnels, dams, public buildings, municipal water and sewage systems and railroad equipment and facilities upgrading throughout the nation during the 1930s. Its primary purpose was to provide jobs for unemployed persons and stimulate an economic recovery during the Great Depression. The Works Progress Administration, created in 1935 and renamed the Works Projects Administration (WPA) in 1939, assumed many of the functions of the PWA. Between 1935 and 1943, WPA-funded projects nationwide employed more than 3.3 million people. As employment opportunities increased within the private sector with the onset of World War II, WPA projects withered, and the program was liquidated in 1943 (Olson 1985: 398-399; 548-551).

In Maryland, the relief labor provided by the WPA was used by the State Roads Commission and the various counties to improve county and state roads, including a Farm-to-Market Roads Program to improve county roads, implemented in the 1935-36 reporting period (Maryland State Roads Commission 1937: 5). Prior to World War II, the WPA laborers were used for such tasks as constructing shoulders, grading and surfacing roads, constructing concrete pipe drainage and installing erosion control. These were tasks that were relatively simple, requiring minimal oversight. The 1939-40

State Roads Commission Report noted that "this type of work has been particularly active in the western counties and on the Eastern Shore, where a large mileage of county roads have been improved by this method" (Maryland State Roads Commission 1940: 65). The 1941-42 State Roads Commission Report listed, by county, projects conducted with WPA labor, including among others the construction of a timber bridge over Jenkins Creek in Somerset County and the installation of 472 linear feet of concrete pipe at Cardiff (Maryland State Roads Commission 1943: 52-53). Most likely, the construction of drainage culverts was one of the uses the state and counties had for WPA workers.

The value of the WPA labor program to the state is summed up by the following statement: "While labor furnished for these projects by the W.P.A. is not considered 100% efficient, the utilization of these men in the construction of the above projects has resulted in a considerable saving to the State over their cost had they been constructed under contract or by our regular maintenance forces" (Maryland State Roads Commission 1940: 68).

With the onset of World War II, WPA labor was used almost exclusively on highway construction and other state improvement projects leading to Army Posts while convict labor was used to maintain state and county roads less critical to the war effort (Maryland State Roads Commission 1943: 3).

Road Programs During and After World War II

During World War II, the State Roads Commission attempted to continue its program of upgrading state and county roads, but found it necessary to eliminate as much as possible the use of materials that were critical to the war effort, which meant that steel would not be used as the main structural component in new or repaired structures. According to the 1940-42 State Roads Commission Report, timber and reinforced concrete construction were used in many locations where structural steel would ordinarily have been used. In the case of reinforced concrete construction, "the members have been so proportioned that the amount of reinforcing steel has been kept to a minimum" (Maryland State Roads Commission 1943: 42).

As an emergency wartime measure, the state halted new construction of county roads in 1943 (Maryland State Roads Commission 1945: 3). The use of prison labor on general maintenance work and urgently needed improvements helped to relieve to some extent the critical labor shortage. Most of the work related to small structures and culverts during the war years was for repair and maintenance, the type of work that could be performed by the available, untrained laborers, using materials at hand such as timber, stone, brick and concrete. The use of less sophisticated materials continued to be used in the period immediately after the war, especially on less strategic roads. The 1947-48 State Roads Commission Report claimed that timber structures continued to be built on purely county or local highways (Maryland State Roads Commission 1949: 63).

As early as 1940, the Bridge Division of the State Roads Commission began developing designs and plans for an extensive construction and repair program for the post-war years. The 1943-44 State Roads Commission Report noted that existing bridges had experienced rapid deterioration during the war years because of the lack of maintenance (Maryland State Roads Commission 1943: 46, 49). Wartime restrictions,

scarcity of materials and a dearth of skilled laborers and engineers resulted in an extensive backlog of road and bridge projects by the late 1940s. Up through 1947, the extensive plans prepared during the war years for the improvement of the state's roads and structures remained on the shelf, awaiting the availability once more of construction materials and skilled labor and engineers.

Leviness reported in his *History of Road Building in Maryland* that 1948 marked the launch of the state's greatest road-building program, which "laid the groundwork for the major construction of the Fifties" (Leviness 1958: 157). Thus 1948 was a watershed year for Maryland's transportation history. Beginning in 1948 and extending over the next four years, the State Roads Commission implemented a plan to build or rebuild 757 miles of state roads, planned and commenced construction of the state's expressway system and initiated work on the Chesapeake Bay Bridge (Leviness 1958: 157).

Summary

The historical context for Maryland's small structures parallels that of the state's bridges. Both types of structures fit within the larger context of the development of the state's roadways. Two specific periods, however, are significant in the specific historical context of small structures:

1. The first half of the nineteenth century (ca. 1800 to 1850), and

2. The first half of the twentieth century (ca. 1900 to 1947).

The earlier period of significance, generally between 1800 and 1850, relates to the extensive road-building activity in the state during the early nineteenth century, in particular the construction of the National Road and the numerous turnpikes or toll roads. There are no known small structures that date to an earlier period than this.

The later period of significance for small structures is generally between 1900 and 1947. It may actually be further divided into two periods. The first is the period between 1900 and 1911, when concrete was promoted as a "permanent" construction material for small structures and reinforced concrete was introduced (around 1903). The second era extends from 1912 to 1947, during which time the state issued and promoted extensively the use of Standard Plans for small structures (and bridges).

Small structures on Maryland's roadways are also associated with other historical contexts that are interesting (e.g. the Good Roads Movement, rise of state-level highway organizations, influence of professional engineers, and labor sources). Such contexts, however, are not particularly significant for small structures. For example, structures that fit within the context of "Labor Sources for Road Building" are generally associated with roadway maintenance activities. These structures would be hard to identify and would be, as a rule, pipes and box culverts that are unimportant from an engineering standpoint. For the traditional contexts such as significant engineering technologies and historical events, larger structures (i.e. bridges) generally provide better representative examples than do small structures.