

Paving the Way for STEM in History Museums Using Visual Storytelling to Add STEM to History Exhibits

The Development of Highways in Texas: A Historic Context of the Bankhead Highway and Other Historic Named Highways

APPENDIX A. PHYSICAL EVOLUTION OF NAMED HIGHWAYS IN TEXAS (full context [here](#))

COUNTY ROADS AND THE GOOD ROADS MOVEMENT: 1880–1916

The period between 1880 and 1916 on Texas roads marked the transition from rudimentary transportation on cleared paths to the emergence of the engineered roadway. At the center of this transition was the widespread implementation of a primary tenet of modern roadway engineering: proper drainage. Also during this time period, culvert and bridge construction throughout the state began a slow progression from locally available materials (particularly wood) to materials that were manufactured and transported to water crossings. Largely through the efforts of the Office of Road Inquiry, the road associations, and universities, a burgeoning group of college-trained engineers established the foundation of professional design and construction of roads, bridges, and culverts. These efforts, along with the availability of new construction materials, changed the face of road transportation in Texas.

INNOVATIVE CONSTRUCTION METHODS AND ENGINEERING DESIGNS

At the close of the 1870s, the majority of Texas roads were often cleared swaths of right-of-way where little if any work was done to construct a roadway. As a result, roadways were often difficult to traverse in dry conditions and virtually unusable in wet weather. Additionally, roads sometimes had sharp curves and right-angles to follow the natural topography of the landscape and, in some cases, to follow property lines. During the 1880–1916 period, county control of highway development meant that local entities had to establish an internal organizational structure to handle road and bridge construction and maintenance. The commissioners' court determined which roads were built and upgraded in the county, and they established road and bridge departments to complete construction projects. As the Good Roads Association report "Treatment of the Gravel and Macadam Roads of Texas" noted, many of the county road departments were highly political entities, and roads were "built without regard to line, to grade or to permanence...and many so-called roads are not roads, but trails and in many instances hardly passable trails." Around the turn of the twentieth century, some local entities gained an appreciation and understanding of how all-weather roadways could help farmers and local industries. Dictated by limited funds and lack of education about proper construction techniques, attempts to construct roads, bridges, and culverts without consulting an engineer occurred often. As noted by one Office of Road Inquiry engineer working in the Wichita Falls area, "Good construction is often sacrificed in favor of more mileage." Furthermore, after construction, maintenance of these poorly constructed facilities exhausted county road funds.

At the heart of the problem of most non-engineered roadways in Texas was the lack of proper grading and adequate drainage. Engineers advocated two solutions to these problems: building a bowed surface, or a "crown" in the road surface, and the construction of ditches on either side

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of the roadway. The slightly convex surface of the crown would allow water to run off the roadway and into the ditches, which eliminated water from settling on the road itself. When water sat on roads, it led to muddy earthen roadways and loose, dislodged gravel roadways. With proper drainage, even earthen (or dirt) roads were recommended by the Office of Road Inquiry engineers.

According to the U.S. Geological Survey's Map of Road Types in the United States, there appear to be three main groups of road materials in use by 1916. The first and poorest quality group included earth, sand-clay, and gravel. The intermediate type of road materials included macadam roads, and the highest quality type of materials were brick, concrete, and bituminous concrete. The lowest grade materials were the least expensive, and they made up the majority of roadway types in Texas in the 1910s, as shown in Figure A-1. This data also corresponds to the American Highway Association records in December 1914, which show that Texas had a total of 10,527 miles of road with improved, gravel, sand-clay, and other unimproved surfaces. Of that amount, only 703 miles had hard-surface roads including macadam (511 miles), bituminous macadam (181 miles), and concrete (11 miles) roads, although historic documentation does not specify where in Texas these roads were located. The lowest grade roads were constructed with the following types of materials: earth, sand-clay, and gravel (including rock and shell). As the name infers, earthen roads were dirt roads. These were sometimes graded and improved with drainage ditches in the late nineteenth and early twentieth centuries, but mostly they were simple dirt roads that were impassable during wet weather such as the road shown in Figure A-2. One Office of Road Inquiry engineer observed the San Antonio to Corpus Christi Road in 1910 and noted that "in several places [the road] is yet simply a wagon trail through pastureland, and for one-fourth of the distance no improvement has been made except to clear and fence the roadway." When graded and drained, some earthen roads (particularly in the Panhandle and western part of the state) provided a sufficient driving surface except during heavy rain events. Sand-clay roads included a combination of sand and clay with the ideal mixture of 75 percent sand and 25 percent clay. Working together, the clay acted as a binder within packed sand. If good quality aggregate was available nearby, gravel roads were preferable over earthen and sand-clay roads.