LOUISIANA HIGHWAYS - THEIR HISTORY, CONSTRUCTION AND MAINTENANCE

A Thesis
Submitted for the Degree of
CIVIL ENGINEER

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Georgia School of Technology
MAP OF LOUISIANA
SHOWING SYSTEM OF STATE HIGHWAYS
BY ROUTES
DESIGNATED IN
ACT No. 95 OF 1921 AND ACT No. 330 OF 1926
AND PROGRESS OF CONSTRUCTION
PREPARED UNDER THE DIRECTION OF
Louisiana Highway Commissioner
APPROVED BY LOUISIANA HIGHWAY COMMISSION
Scale 01' MILES 19
LEGEND
State Highways Constructed to date.
State Highways Under Construction.
State Highways to be Constructed.
State Route Numbers.
Parish Schools.
Other Towns.
Corrections to last date
APRIL 1927
Introductory History.

Although there has been a central State body in Louisiana whose duty it was to supervise the construction and maintenance of state highways, since the passage of Act No. 49 by the State Legislature in 1910, no strong centralized State control of highway work was accomplished until January 1st, 1922. This was the time at which Act No. 95 of the State Legislature of 1921 became effective which created the Louisiana Highway Commission.

During the period between 1910 and 1922 the State Agency which had authority in state highway matters, was the State Highway Department, but that department had small funds for expenditure, and was, therefore, able only to exert its influence in the way of supervising the construction of highways, which the several parishes were able to finance. The State Highway Department necessarily had a small organization, which was kept busily engaged in supervising the work financed by the parishes.

Act No. 95 of 1921 cleared the way for a great increase in State Highway activities by creating the Louisiana Highway Commission to take over this work. Also, by providing state revenues with which to finance the construction and maintenance of the State Highway System.

As a result of the passage of Act No. 95 and subsequent amendments thereto by the Legislature, annual revenues for state highway work derived from auto license tax, chauffeurs' license tax and gasoline tax increased from year to year. Naturally this increase of revenues would occur as the number of vehicles operating within the State increased. This is as it should be, but, as is generally the case in public improvement, the needs of the public increase faster than the revenues for supplying the needs, increase. In this important phase of furnishing the public with transportation lines, it has been found that the demands are
increasing by leaps and bounds each year, so much, that the constructing and maintaining of the System is a task of enormous proportion.

Calcasieu River Bridge at Lake Charles, La., showing damage done by steamer.
Road just after construction

Same road after six months maintenance

Some two mile tangents in Louisiana.
Creation of Louisiana Highway Commission.

The following extract is taken from "Highway Laws of Louisiana and the Federal Highway Act."

Louisiana Highway Commission Created; Terms of Members
Bond $10,000

SECTION 1: Be it enacted by the Legislature of Louisiana, that there is hereby created a Commission which shall be known as the Louisiana Highway Commission, and shall consist of three members who shall be duly qualified electors of the State of Louisiana to be appointed by the Governor on or before January 1, 1922. Of the members of said Commission first appointed one shall serve for two years, one for four years, and one for six years, from January 1, 1922 and the term of each member first appointed shall be designated by the Governor at the time of making the appointment. Thereafter the term of each member of the Commission shall be six years. The Governor shall designate one member of said Commission who shall be chairman thereof, but after the expiration of said chairman's term, the Board shall name its own chairman. Each member of said Commission shall take the oath of office required by the Constitution before entering upon his duties and shall give bond to the Governor of the State of Louisiana in the sum of Ten Thousand ($10,000) Dollars, conditioned upon the faithful performance of his duties, said bond to be approved by the Governor and filed with the Secretary of State.

VACANCIES.

Any member of the Commission may be removed by the Governor for inefficiency, malfeasance or neglect of duty. Any vacancy occurring in the membership of said Commission shall be filled by the Governor, but where a vacancy occurs other than by expiration of the term, such appointment shall be for the unexpired term only.
SECTION 2: That on or before January 1, 1922, or as soon thereafter as possible, the Commission shall meet at the State Capitol and organize by electing one of its members chairman one vice-chairman and another to be Secretary, and employing necessary clerical help, and, as soon as practicable, shall employ a State Highway Engineer. The said State Highway Engineer shall be a competent civil engineer of recognized ability and standing, experienced in highway construction and maintenance, and shall, before entering upon the duties of his office qualify under Act 242 of the Legislature of 1920 to practice civil engineering in the State of Louisiana. He shall receive an annual salary to be fixed by the Commission, which shall be payable monthly out of the General Highway Fund. He shall hold office during the pleasure of the Commission; and shall give his whole time to the duties of his office. He shall, before entering upon the duties of his office, take the prescribed oath and give bond to the Governor of the State of Louisiana in the sum of Ten Thousand ($10,000) Dollars conditioned upon the faithful performance of his duties, said bond to be approved by the Governor and filed with the Secretary of State. No member of the Commission shall be eligible for appointment as State Highway Engineer for a period of one year after he shall cease to be a member of the Commission.

QUORUM.

Two members of the Commission shall constitute a quorum for the transaction of any business that may come before the Commission.

DOMICILE.

SECTION 5: That the Commission shall be domiciled at the State Capitol and maintain suitable offices conveniently and properly furnished which shall be the repository of all records of the Commission.

The Commission shall be a body corporate and as such may sue and be sued,
plead and be impleaded, in any court of justice.

DAMAGE CAUSED BY HIGH WATER.
I might here state that the office of Maintenance Engineer which has since been created, is likewise filled by the Commission in exactly the same way and under the same conditions as that of State Highway Engineer.

With the completion of practically all of the proposed routes the question of maintenance has indeed become a large item. Within the past three years the traffic on the main thoroughfares has so increased that the gravel roads are carrying more than double the number of vehicles that they could be expected to carry under the best construction and maintenance conditions. How these roads will be maintained a few years from now is still a matter to be solved, as so far the available funds have fallen far short. Louisiana at present has a two cent gas tax which is used for maintenance. The past Legislature approved a four cent tax but the people did not ratify it.

The original idea of the first Commission was to connect all parish seats with improved gravel roads. This has already been accomplished and it is now possible to travel practically anywhere in Louisiana without leaving the gravel.

Louisiana ranks second as the foremost road building state in the South.

Discussion:

As can be seen by the paragraph taken from the "Highway Act" the Louisiana Highway Commission is a political organization. It is readily seen that the Governor can "make" and "break" anyone he sees fit. However, it has been demonstrated in the past, the members of the Commission, though some have not been engineers, are nevertheless capable and efficient business men.
Types of equipment used in constructing roads and cleaning ditches in Louisiana. A 10 ton "Holt" tractor pulling a 12 ft. "Adams" grader with backsloper attached.
Upon the death of our late Governor, Hon. Henry L. Fuqua who had appointed a new Commission, the present Governor, Hon. O. H. Simpson re-appointed the old previous Commission with one exception (and even he was retained in a new capacity) thus showing the confidence and appreciation of the people in their work. Although the Commission itself may be changed, with few exceptions, the man who "works for a living" is seldom molested. So the employee who knows how and conscientiously does his work may amount to something if he applied himself.

It is to be hoped that eventually politics will not play a part with the Louisiana Highway Commission although the present outlook is not bright.
LOCATION:

Of the 7000 miles in the State Highway System, 2800 miles are in the Federal Highway System, and are eligible to receive Federal Aid not in excess of $15,000.00 per mile. At the present time a total of some 3700 miles of the State's System have been constructed, of which 2765 miles are in the Federal Highway System, leaving only about 125 miles to be built on that System.

I think it is not improper nor unfair to the various State Highway Departments to say that the requirements of the Federal Government in the location and construction of Federal Aid Highways, have tended to improve conditions. To say the least, in Louisiana our practices have been very much improved and it has been found advantageous to follow government requirements on our State Projects, as well as on Federal Aid Projects. This plan of course, makes for uniformity as well as for efficiency.

In order to keep up with location work it is necessary to keep several parties in the field. The first step in locating a designated highway is to make a reconnaissance of the route. As a result of this reconnaissance or preliminary survey which necessarily takes into account stream, railroad crossings, etc., a route map is prepared. If a Federal Aid Project, a route map on a scale of about one inch to one mile, showing in a very general way the topography of the country, all streams, towns, railroads, etc., is submitted to the Federal Bureau for approval. Next the detailed location survey is made, establishing on the ground the location to be followed and furnishing to the head office of the Commission at Baton Rouge, full and complete field notes. From these field notes plans and estimates are made and the project advertised for construction.

The field notes include transit alignment with topography sketches in detail; level cross section notes and field profile. This profile is
Steel forms for concrete piers on Bayou Boeuf Bridge.

Overhead bridge to prevent crossing railroad at "grade".

Driving piling with steam hammer.

Prof. Thibodeaux, a one time Civil Engineer.
plotted in roll form on scales of one inch to one hundred feet horizontal and one inch to ten feet vertical. The field notes are then transmitted to the Baton Rouge office, where detailed plans and estimates are made, so that the project may be advertised for bids. However, before the plans are finally completed, a set of blue prints are made and are taken into the field by an assistant engineer of the head office, whose duties are confined to a certain subdivision of the State. The state is divided into three such districts, each one of which is under the supervision of an Assistant Engineer. The Assistant Engineer goes over the project with plans in hand and checks the various engineering features on the ground. He notes and checks the size and type of drainage structures proposed; indicates on drawing the grade line which, in his opinion, should be adopted; notes the alignment at stream, crossings, railroad crossings, etc., with a view to making any change which might be desirable, and in short, makes a final engineering inspection of the entire project. This is done so as to improve the plans in every way possible. These plans are then returned to the office and the final plans are prepared therefrom, so that the project may be advertised. If it happens to be a Federal Aid Project, a project statement together with a map somewhat more in detail than the route map, is submitted to the Government for approval. The statement gives a fair, accurate estimate of the cost of the job.

In the final preparation of plans, careful thought and attention is given to the grade line, which, in hilly sections, is balanced in cut and fill by means of the mass diagram. In flat country, the grade line is placed above high watermark in order to avoid overflow; and is also placed with a view to the selection of the most suitable types of drainage structures. In the selection of the proper type of drainage structures, consideration is given to foundation conditions. Small bridges and culverts are included in road plans, but invariably large bridges, whether
built of timber, concrete or steel, are handled as separate projects. These bridge projects are advertised separately from the road project proper.

Where bridges are to be constructed across navigable streams, it is essential to have approval of the War Department before the bridge is built. Plans are therefore submitted to the War Department, showing the location, type and general dimensions of the proposed structure. After approval is received, detailed plans and specifications are then prepared.

Many of Louisiana's larger streams, in fact, most of them, are such as to require extensive investigations before plans can be made for bridging same. It is, therefore, often necessary to make special bridge surveys including investigations as to the foundation conditions. This work includes taking borings and soundings at the bridge site.

For Federal Aid Projects, upon completion of the plans, they are then forwarded to the United States Bureau of Public Roads for approval, and after approval has been received, the project is advertised for a period of time. This period is generally thirty days in length.

CONSTRUCTION:

The first problem encountered in constructing a highway is the acquisition of necessary right of way for same. This work is left to the authority of the parish in which the project is to be built. (I might here state that this is a poor arrangement, as the average Police Juryman has no sense of legal forms, permits, etc., thus causing disputes many years after the road has been completed. Very often a man claims he never gave permission for a "right of way" and moves his fence over or else builds a filling station on the "right of way". This, however, does not concern the Construction Department as they are only interested in getting the road completed. The Maintenance Department is the one left "holding the sack".)

One of the provisions of the Construction contract which always
Temporary bridge over Calcasieu River at Lake Charles.

Bayou Lacassine Bridge near Welsh, La.
is signed by the Commission, contractors and the President of the police jury of the parish in which the work is to be done, is that all "right of way" shall be procured by the police jury of said parish and furnished to the Commission free of charge. In ordinary road projects 60 feet is the standard width of "right of way" required. This is also the minimum amount which is acceptable to the Government for Federal Aid Projects.

However, in fact sections of the State where the highwater mark required a high embankment, it is often necessary to provide a much greater width of "right of way", sometimes as great as 200 feet.

ORGANIZATION OF FIELD FORCES.

To each road or bridge project is assigned a resident engineer who has full charge of construction in the field. He, in turn, is under an assistant engineer from the Baton Rouge office, who visits the project from time to time. In spite of the great care exercised in making surveys, designing and planning the projects, it is often found necessary during the course of construction to make changes. Such changes are called "field changes" and are made on recommendation of the Resident Engineer, Assistant Engineer and the approval of the State Highway Engineer. On Federal Aid Projects approval must also be secured from government authorities.

It is important to note in connection with the improvement in highway construction now under way, that only a few years ago what would be now termed a poor dirt road, was considered a first class artery of traffic.

Even the gravelled surface highway which five years ago was an excellent highway, is now fast outliving its usefulness, and must, in many places, soon be replaced by higher type surfaces. A small mileage of the highest type of concrete and asphalt pavement has already been built in some of the larger parishes. In these parishes, the congestion
of population and commercial activities have caused vehicular traffic to increase so greatly as to make the old gravel-surfcaced highways unserviceable. At the present time it is impracticable for the State to finance high type pavement construction work, except where such type of pavement is absolutely essential. Even then it can finance it only with the assistance of the Parish where the work is being done. The result is, that most of our work for some time to come will undoubtedly be of a gravel type sur-
face. This type of surfacing is entirely suitable for those highways on which the traffic has not increased beyond seven or eight hundred vehicles per day.
Logs on shoulder of road. Insufficient "right of way"
Maintenance of Highways as Practiced by the Louisiana Highway Commission.

ORGANIZATION AND REVENUES.

The Maintenance Department was organized and began to function in March 1922, only 42 years ago. Many of the roads accepted at that time were of a construction not comparable with those being built today. There had been no systematic upkeep, consequently much effort was required to restore a large percentage of this mileage to a satisfactory condition. Even to this day the cost of maintenance is higher on some of these roads than it ordinarily should be.

The Legislature of 1921 provided a tax of one cent per gallon on gasoline, the revenue from which was applicable solely for maintenance purposes. On account of the inadequacy of this fund the Legislature of 1925 provided a two cent tax on gasoline which was effective August 1st, 1924. This amounted to $2,322,220.58. This amount of money was used on 3,958 miles of highway then being maintained by the department. The two cent gasoline tax is the sole revenue for the operation of the Maintenance Department.

If the amount of material annually worn off the 4,158 miles of highway now under maintenance were replaced, this alone would require approximately three-quarters of the entire revenue available at present. Practically nothing would be left for the purchase of new equipment to maintain the added mileage constructed each year, or to repair the present equipment and make replacements as needed.

The funds would also be inadequate to carry on the ordinary routine field operations which are so necessary to keep roads in good condition. Consequently, resurfacing can only be done on a limited scale and is necessarily confined to the older and more heavily travelled highways.

The highways of Louisiana are maintained today at a cost of $559.41 per mile per year. This covers everything, including administration, field forces, equipment and materials.
ARRANGEMENT AND FUNCTIONING OF DISTRICTS:

The State is divided into fifteen districts for the purpose of maintenance. The mileage in each varies from 300 to 400 miles at the present time; based on the geography and facility of supervision. A patrol, which ordinarily maintains from 20 to 35 miles, consists of either a heavy truck, or tractors, for pulling one, or two graders. An extra truck is assigned for miscellaneous hauling. Sometimes, however, additional power is required when cleaning ditches. One-man motor-graders are used, but their operation is restricted chiefly to surface work.

The Highway Commission received a considerable amount of surplus war supplies from the Government. This included trucks, tractors, replacement parts and a general supply of miscellaneous material. To date, of all the equipment received, the three-ton army truck has proven most valuable. It is used almost exclusively, in the heavier work and is reliable and economical.

Its general utility appeals to one engaged in the work and it is available as a power unit as well as for hauling. A three-ton truck pulls two graders at the rate of three or four miles per hour and will completely drag from shoulder to shoulder, on an average of from 12 to 15 miles of road a day. A few yards of gravel are carried along at the same time, the material being shoveled off into the pot-holes as they go along.

Each district has a superintendent who directs the work through foremen or patrol leaders. This work is done by parishes, a foreman being in charge if there is sufficient mileage to warrant it. Otherwise, two and sometimes three parishes are under his supervision. When this arrangement is not feasible, a leaderman, usually the truck driver or a graderman, carries out the instructions of the superintendent. At the headquarters of each district there is a shop with mechanics to keep the equipment in proper condition. A small stock of supplies is kept for emergencies.
All purchases are made by the Commission on the recommendations of the Maintenance Engineer. The District Superintendent submits to the Maintenance Engineer a requisition for all supplies. This centralizes and controls the buying of materials.

The men in the field are paid by check, thus rendering a certificate of their work and time, and insuring to a great extent the accuracy of the payrolls. About 1200 men are employed and payment by this system is effected without delay.

METHODS OF MAINTENANCE:

The methods of maintenance of gravel roads are seasonal. During the long dry periods considerable difficulty is experienced in keeping the surface from becoming loose. The binder dries out, pulverizes, and is blown away rapidly on the highly traveled roads. The patrols are kept busy at these times supplying additional clay binder required to keep the gravel set. This explains the muddy and sometimes slippery condition of the highways after rains. When this occurs the excess binder is bladed off the surfacing to the shoulders of the road for future use.

Since drainage is at all times a very important factor in the upkeep of a road, ditches and culverts must be kept open to give quick and restricted run-off.

Roads are built 24 feet wide, with usually one foot of surfacing according to the present standards. The tendency in maintaining them is to widen them. This work is often handicapped by insufficient "right of way". The Project requirement is a minimum of 60 feet.

The blading or drainage of a road is governed by three factors, namely, the amount of traffic, the weather conditions and the type of road. It has been observed that when traffic exceeds 600 vehicles per day, more effort is required to maintain a smooth surface. Dry weather speeds up the above fact and corrugations begin to appear, especially in the sandy roads. If there is an excess of clay binder, pot-holes result. The wash
Gravel type of road has proven to be satisfactory in localities where the proper kind of binder is available.

The corrugations are more easily bladed out in wet weather. The type of equipment used, is the ordinary road grader with a flat drag blade or else the regular cutting blade. The drag blade is of high carbon steel, usually $\frac{5}{8} \times 8" \times 10'$ and besides costing less and outlasting the other for dragging purposes, the same results may be obtained. Shaping up of the roadway and clearing out of ditches however, requires the use of the cutting type.

TRAFFIC EFFECTS:

Traffic over the high ways has increased 300% since 1922, and as a result the dust nuisance has also increased. This is minimized to some extent by the use of good clay binder in many cases. Dust blown from the road represents a loss of binder, besides being offensive to the traveling public and to the forces that maintain the roads. In some states Calcium Chloride and light oil are used as palliatives. The cost of Calcium Chloride is approximately $400.00 per mile, however, light oils may be applied for less.

Gravel roads are wearing at the rate of $\frac{1}{4}''$ to $\frac{3}{8}''$ yearly. In some instances on heavily travelled roads the wear is nearer $1''$. The cost of a $\frac{3}{8}''$ replacement on the 41,568 miles now being maintained is conservatively placed at $1,260,000.00.

DEPENDABILITY OF MAINTENANCE:

The dependability of organized maintenance is best observed during emergencies. In November, 1925 a cloud burst occurred in a northwestern portion of the State causing considerable damage.

Route 4, Dixie-Overland Highway, was washed out in many places between Minden and Monroe. Train service between Shreveport and points east were interrupted for several days. This highway was opened for traffic twenty-four hours after the storm. Route 5, from Winnfield to the Arkansas
Temporary bridge erected over washout on "Pershing Highway" Route 5, Louisiana.

Road washout in distance after heavy rains.
State line, Pershing Highway, suffered heavily. Large washouts of the embankment were numerous. It was necessary to build two bridges and several culverts of standard design in washouts which should not be closed. A two-panel, forty-foot concrete bridge south of Athens on Route 12 was undermined, which necessitates its replacement with a larger structure. Many other roads as far south as Alexandria suffered heavily. The highways were immediately restored by maintenance forces at a cost of approximately $55,000.00.

DISCUSSION:

Adequate maintenance and construction of highways are prime requisites to economical and satisfactory transportation in the business world, not to mention the service rendered in the social welfare of the State. The automobile, and the highway have made us, not citizens of one town or locality, but citizens of the State wherein those of North Louisiana are neighbors of those in New Orleans.
CONCLUSION:

In conclusion I could not neglect to mention the project I was recently on as Assistant Engineer. It was a steel bridge construction project over Bayou Boeuf, St. Mary Parish -- home of "Evangeline."

Though this Thesis deals with engineering, it would be almost a sacrilege to fail to speak of the beauty of the surrounding country. Beauty, I think, is a prime factor in engineering anyway, and it would be unfair to Dr. Perry and the English Department at "Tech", to leave this unmentioned.

One has only to drive a few miles to see some of the old "Cajun" homes and to encounter the beautiful "Bayou Teche".

The sun is sinking for the day is done. Evening drops softly on the Bayou. You remember Longfellow described how the sun like a magician, extends his wand over the landscape. How the twinkling vapors arose on that far away day when the Acadian girl sought her lover along these waters. Now the sky and earth seem to melt and mingle together, then twilight comes, heralded by a mocking bird's revel of song? Well, it's the same transformation scene today, and the same spell of distance and brooding mystery comes with the dusky shadows.

Through the delicate lace of cypress trees, the sun casts long splinters of light that touch and transform the bayou into a yellow light. Then the grey mist closes in, and day is gone. The shadows of evening come bringing with them the quiet of night in the country. Across the fields the plowman sits sideways on his lazy mule, making his way homeward. The herds of cows are grouped around the stables.

Even the busiest individual gets to dreaming at such a time. The man who can sit in a boat and float silently down "Bayou Teche" on a moonlight night and feel no poetry trying to push off the lid of his soul, has no business being an engineer anyway. It is best, however, that this
Bayou Lacassine.

Old "cajun" grave, Catholic cemetery, St. Martinville.

Grave of "Evangeline". St. Martinville, La.

One of the moss covered trees on the banks of "Bayou Teche". New Iberia, La.
engineer cannot write poetry, for Longfellow has said all to be said about
the stream a great deal more effectively than I could hope to.

You haven't thought of it for years, yet sitting here in the
still beauty of those quiet waters that gleam in the moonlight like a sea of
molten silver, unconsciously, the lines from "Evangeline" float through the
mind and repeat their own beauty amid the spots that inspired them.

"Beautiful was the night behind the black wall of the forest.
Tipping its summit with silver, arose the moon on the river.
Fell here and there through the branches, a tremendous gleam,
of moonlight
Like the sweet thoughts of love on a darkened and devious spirit."

What's the rest of it? For the lines suddenly stop but the scene
remains. Evangeline walks in the moonlight on the banks of Bayou Teche;
walks under the oaks as in those days of long ago. In the calm and magical
moonlight, you will see her sitting under the tree, dreaming of her lover.

The End.