

highway system carry a great amount of traffic and the people demand as much on these roads as they do on those of the state system. Such roads are under county supervision and I believe that the low cost asphalt road can be utilized by the counties and that its use will be found both advantageous and economical.

We do believe that liquid asphalt roads will provide desirable and economical surfacing on secondary roads with light traffic and provide all the surfacing needed for such roads. On higher traffic roads this type of construction might be considered as super-maintenance, and can be justified where the first cost plus maintenance cost of liquid asphalt surfacing over a period of years does not exceed the cost of the proper maintenance of the road as a gravel surface for the same number of years plus an arbitrary factor of the cost justified by the additional comfort and safety of the dustless surface.

A REVIEW OF OUR STREET PAVING AND RESURFACING PROGRAM

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On June 13, 1933, the 73rd Congress passed the National Industrial Recovery Act. This law was enacted for the purpose of "encouraging national industrial recovery, to foster fair competition, and to provide for the construction of certain useful public works."

Title 11 of this law pertained to public works and construction projects, while Section 204 under Title 11 provided for emergency construction of public highways and related projects. The President was empowered to make grants to the highway departments of the various states to an amount of *not less than* \$400,000,000, to be expended in accordance with the provisions of the National Highway Act, approved November, 1921, with certain exceptions as provided for in Title 11, which were as follows:

(1) For expenditures in emergency construction on the Federal Highway System and extensions thereof into and through municipalities.

(2) For expenditures in emergency construction of feeder roads to be agreed upon between the state highway departments and the Secretary of Agriculture.

Section 204 further provided for the establishing of minimum wages by each state highway department and of the method of apportioning the amounts designated by the President, and provided for the maximum hours of labor engaged on projects performed under the National Industrial Recovery Act.

Under date of June 23, 1933, the rules and regulations for carrying out the provisions of Title 11 of the National Industrial Recovery Act were promulgated by the Secretary of Agriculture, and on the same date from the same federal office a notice was sent out giving the apportionment to each of the several states. The appropriation made by the President was the minimum amount of \$400,000,000 and Indiana's allotment amounted to \$10,037,843, which was to be available after June 30, 1933.

The rules and regulations promulgated by the Secretary of Agriculture consisted of 25 sections, but as we are only interested in the NRM (National Recovery Municipal) projects please allow me to quote Sections 4, 5, and 6, which pertain to these projects:

"Section 4. *Not more than 50 per cent of the funds apportioned to any state under this Act shall be applied to projects on the Federal Aid highway system outside of the corporate limits of municipalities; not less than 25 per cent of such funds shall be applied to projects on extensions of the Federal Aid highway system into and through municipalities; and not more than 25 per cent of such funds shall be applied to secondary or feeder roads until provisions have been made for the satisfactory completion of at least 90 per cent of the initial limiting Federal Aid highway system in such state. Upon a proper showing by any state that either all needed improvements on extensions of the Federal Aid highway system into and through municipalities can be completed with an expenditure of less than 25 per cent of the state's apportionment, or that municipal authorities are unable or unwilling to obtain the necessary rights-of-way for needed improvements, or for other reasons, the Secretary of Agriculture may revise the above percentages with reference to such state. The reconstruction of existing facilities that are adequate for traffic shall not be considered needed improvements.*

"Section 5. Each state highway department shall submit for approval to the Secretary of Agriculture and through him to the Special Board of Public Works a preliminary statement showing the proposed assignment of the state's apportionment to (1) the Federal Aid highway system outside of municipalities, (2) extensions of the Federal Aid highway system into and through municipalities, and (3) secondary or feeder roads. This statement shall list the counties or political subdivisions in which projects to be submitted will be located. A project or projects of one or more of the defined classifications shall be provided in at least 75 per cent of all counties of the state, unless it be shown either (1) that the number of counties in which need of employment exists constitutes a smaller percentage of the total; or (2) that needed and suitable road construction projects cannot be found in that percentage of the total number of counties. In selecting counties in which projects are to be located, consideration shall be given to the relative need for employment in such counties.

“Section 6. Upon approval of the preliminary statement in whole or in part each state highway department shall prepare and submit detailed programs of proposed construction of each of the three classes of projects enumerated in the foregoing section, indicating the termini, the character of the work, the estimated cost, and the amount of Federal funds desired. The three programs may be submitted independently and may be so approved in whole or in part. In the selection of projects to be included in these programs priority shall be given to (a) the closing of gaps in the Federal Aid highway system; (b) the appropriate landscaping of parkways or roadsides on a reasonably extensive mileage; (c) the correlating and supplementing of existing transportation facilities by road, rail, and water, and providing of service to freight-receiving stations, air ports, and emergency landing fields; (d) reconstruction designed to reduce maintenance cost and decrease future state and local highway expenditures; (e) providing a large number of small projects designed to employ the maximum of human labor; and (f) the elimination of hazards to highway traffic, such as the separation of grades at crossings, the reconstruction of existing railroad grade-crossing structures, the relocations of highways to eliminate railroad crossings, the widening of narrow bridges and roadways, the building of footpaths, the replacement of unsafe bridges, the construction of routes to avoid congested areas, and the construction of facilities to improve accessibility and the free flow of traffic.

“The secretary of the board reserves the right to require the construction of roads desired by the U. S. Railroad Co-ordinator to provide adequate year-round highway service in replacement of branch-line railroad service proposed to be abandoned.”

PROCEDURE IN INDIANA

The Highway Commission of Indiana immediately started planning for the carrying out of the provisions of the rules and regulations governing the expenditure of funds apportioned under the Recovery Act.

The first requirement was set out under Section 4 and discussions were entered into at once between the three highway commissioners and their engineers to determine the best division of funds to the three types of projects—National Recovery Highway (NRH) projects, National Recovery Municipal (NRM) projects, and National Recovery Secondary (NRS) projects.

Indiana's state highway act provides that in cities having a population of 3,500 or more no state funds may be expended to improve the streets over which state roads are routed. It thus becomes the duty of the municipalities to take care of the streets traversed by state highway routes, but the burden during the last few years had become so heavy that little or no maintenance had been carried out by the cities. Under these circumstances the roughest riding parts of our state highways lay within the borders of cities and towns

above 3,500 population. After careful study of conditions existing in Indiana it was decided by the Commission to assign to NRH projects 47 per cent, to NRM projects 48 per cent, and to NRS projects 5 per cent. The projects selected were located in 68 of the 92 counties of the state, which complied with the regulations requiring the work to be distributed in at least 75 per cent of the counties.

The detailed program for NRH projects was submitted to the federal authorities on July 20, 1933, and approved by the Public Works Administration on August 2, 1933. The detailed program on NRM projects was submitted in sections, the first submission being made on August 14 and the last on September 2. Approval for all projects was given on September 9, 1933.

In preparing the NRM program the district engineer in each of the six districts was asked to recommend the projects in his district which he deemed the most necessary for improving the federal aid routes through these cities, all of which were to be in cities having a population of 3,500 or more. In submitting these recommendations the report gave the type of existing pavement, the recommended improvement, the existing width of the pavement between curbs, general remarks on the condition of the present improvement, and the limits of the improvement proposed.

These recommendations were then given a field inspection by a member of the Commission accompanied by an engineer from the central office. Each of the three commissioners visited the cities of two districts and the district engineer's recommended programs were cut to come within the assigned 48 per cent of the grant, which amounted to \$4,818,164.

When the field inspection of proposed projects was carried out by members of the Commission, an effort was made to meet the officials of the cities and towns, so that a complete understanding was arrived at as to what improvements would be constructed by the State Highway Commission of Indiana and the conditions under which the work was to be carried out.

The Bureau of Public Roads regulations required that the cities and towns execute an agreement with the Highway Commission, which provided that the Commission would submit certain paving projects to the Federal Government and recommend their approval, provided that the municipalities agreed to request the project to be constructed and also agreed to appropriate yearly the necessary funds for the maintenance of the pavement and to carry out such maintenance.

In addition the Highway Commission required that an ordinance be passed embodying the above requirements as well as additional provisions which gave the Commission some authority over the parking regulations, maintenance of "stop and go" lights, cutting into the improved pavement, and

establishing of gasoline pumps, signs, etc., in the sidewalks along the line of the improvement.

Since state highway funds could not be used within the limits of cities and since the NRA grant specifically provided that right-of-ways could not be purchased from federal funds, it had to be thoroughly understood that the municipalities necessarily had to provide all needed right-of-ways.

THE FINAL PROGRAM

The NRM program, as submitted and approved by the Federal Government, provided for the construction of one hundred and fourteen projects, located in sixty cities and distributed among forty-seven of the counties of the state. The one hundred and fourteen projects consisted of six grade separations, seven separate contract bridges, and one hundred and one paving projects. The total estimated cost of the program was \$4,506,474. More than half of the NRM appropriation was programmed for four of the largest cities of the state and for the cities of Lake County. This estimated apportionment was made as follows:

Indianapolis	\$586,117	
South Bend	350,000	
Ft. Wayne	297,500	
Evansville	107,850	
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		\$1,341,467

Lake County

Hammond	142,000	
Gary	245,100	
Schererville	200,000	
Crown Point (Figs. 1 to 4)	38,750	
East Chicago	104,200	
Indianapolis Blvd. (East Chicago, Whiting, Hammond)	376,000	
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		\$1,106,050

\$2,447,517

The projects in these cities were contracted at the following prices:

Indianapolis	\$507,985.20	
South Bend	344,096.51	
Ft. Wayne	221,945.73	
Evansville	66,268.83	
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		\$1,140,296.27

Projects in all Lake County cities were contracted at	962,377.39
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\$2,102,673.66



Fig. 1. State Route 55 through Crown Point. A typical view of sidewalk and curb conditions before repaving.

One contract yet remains for letting
 in South Bend, estimated to cost.....\$100,000
 One grade separation contract is yet
 to be let in Ft. Wayne, estimated to cost.. 90,000

\$190,000.00

\$2,292,673.66

It was necessary to eliminate two projects in Evansville because of the inability of the city to obtain a right-of-way on one and to induce the street railway company to rehabilitate its tracks on the other.



Fig. 2. State Route 55 through Crown Point. Same view as Fig. 1 after paving with reinforced concrete using combination curb and gutter.



Fig. 3. State Route 55 through Crown Point. Looking southward from station 21+00 before repaving old bituminous concrete street.

In constructing the NRM projects, 34.65 miles of streets were paved with concrete, 30.47 miles with bituminous surfacing, and 9.52 miles with a combination of concrete and bituminous paving, making a total of 74.64 miles of streets improved in the program.

In carrying out the program the following quantities of paving, with curbs and gutters, were constructed:

Unreinforced concrete pavement.....	147,513 sq. yds.
Reinforced concrete pavement.....	601,132 sq. yds.
Rock asphalt pavement.....	523,783 sq. yds.



Fig. 4. State Route 55 through Crown Point. Looking southward from station 22+00 after removal of car tracks and construction of 36-foot reinforced concrete pavement.

Bituminous concrete pavement.....	127,260 sq. yds.
Bituminous coated aggregate.....	21,242 sq. yds.
Asphaltic macadam pavement.....	18,736 sq. yds.
Processed rock asphalt pavement.....	10,496 sq. yds.
Brick surfaces relaid.....	5,174 sq. yds.

Total of new and relaid surface.....1,455,366 sq. yds.

New concrete base.....	88,815 sq. yds.
Waterbound macadam.....	9,431 sq. yds.

Total base courses..... 98,246 sq. yds.

Type B curb constructed.....	206,098 lin. ft.
Special concrete curb.....	19,353 lin. ft.
Concrete step curb.....	664 lin. ft.
Integral curb.....	103 lin. ft.

226,218 lin. ft.
or 42.8 miles

Curb reset and reconditioned.....	17,510 lin. ft. or 3.3 miles
Concrete gutter constructed.....	77,988 lin. ft. or 14.8 miles
Combined curb and gutter.....	85,648 lin. ft. or 16.2 miles

Total of all types of curb built.....407,364 lin. ft. or 77.1 miles

Eighty-five per cent of the resurfacing was placed on old brick pavements. (Figs. 5 and 6). A majority of the resurfacing projects required widening, which in most cases was done with concrete.

It was decided at the beginning of the program that no paving would be constructed on streets having a width of less than 36 feet. This minimum width of 36 feet would pro-



Fig. 5. U. S. Route 12 through Michigan City. Resurfacing old brick pavement with a binder course of asphaltic concrete and a wearing course of rock asphalt.

vide two traveling lanes of ten feet each and allow parking space on each side of the street. In several cities widths of less than 36 feet were paved, but only on the condition that parking ordinances be passed preventing parking on one side.

In three cities the bituminous-coated binder courses over old brick were bid to use tar. These three jobs were in Plymouth, Lebanon, and Rochester, where a total of 94,822 sq. yds. of tar binder with rock asphalt wearing surface were constructed.

In South Bend the city officials requested that their allotment be used on one project, the separation of the Western Avenue crossing and the main line of the New York Central Railroad. This project had long been a dream of the city and a contract between the city and the railway company had been in existence for a number of years, but the project had never



Fig. 6. U. S. Route 12 through Michigan City. Placing rock asphalt on binder course with an Adnun Finishing Machine. The three stages of the resurfacing work are clearly shown.

been put under construction because of lack of funds. The railway company had prepared a design for an underpass and had purchased the superstructure steel, which was in storage in their South Bend yards. The city had purchased all the necessary right-of-way, and buildings had been moved for the construction of this underpass. The highway department agreed to proceed with the project and work is now under construction.

INDIANAPOLIS IMPROVEMENTS

The city officials of Indianapolis submitted to the Commission a number of projects they desired built, but listed as preferred projects the improvement of Northwestern Avenue, West Street, and Daisy Street from the intersection of Northwestern Avenue and 38th Street south to the Daisy Street intersection with State Road 37 coming into Indianapolis from the south, a total distance of 5.05 miles. The second project selected was the paving of 16th Street from the

canal west to the Emerichsville Bridge and of Cold Springs Road from Speedway Avenue to the north city limits.

These projects provided a new entrance for State Road 37 into the city over Daisy Street and West Street to Washington Street, thereby relieving South Meridian Street of State Road 37 traffic, a new entrance for State Road 29 from the north city limits over Northwestern Avenue and West Street to Washington Street, and a new entrance for State Roads 52 and 34 over West 16th Street and West Street to Washington Street.

Cold Springs Road was unpaved, and the improvement consists of a new 56-foot concrete pavement with curb and gutter from the north city limits to Speedway Avenue; from Emerichsville Bridge to Gent Avenue a new 40-foot concrete pavement; from Gent Avenue to Fall Creek a 56-foot concrete pavement with curb and gutter; and from Fall Creek to the canal a 40-foot concrete pavement. From the canal to Delaware Street the city had improved 16th Street several years ago with a new 56-foot concrete pavement. The West 16th Street improvement also provided a new concrete structure over Fall Creek and the canal. West 16th Street and West Street intersect in the center of the canal, so that this structure serves both projects. The West 16th Street and Cold Springs Road improvements involved the laying of 49,233 sq. yds. of concrete pavement and of 6,826 lin. ft. of curb, with sewers and accessories, costing \$140,734.33. The Fall Creek bridge consists of four 72-foot concrete arches and was built at a cost of \$88,872.22. The new canal bridge consists of four 11 feet three-inch square concrete boxes and was built at a cost of \$87,880.52.

The improvement of Northwestern Avenue and West Street from 38th Street to Washington Street was designed with different types to fit the existing conditions. From 38th Street to 36th Street the existing 24-foot pavement was widened with concrete to give a width of 30 feet. From 36th Street to 21st Street the existing car tracks were removed and a new 50-foot concrete pavement with concrete curbs was constructed to Fall Creek. From Fall Creek Boulevard to 21st Street the car tracks were removed and this area was paved with concrete and joined to the sheet asphalt pavement existent on each side. From 21st Street to 17th Street the brick pavement was widened and resurfaced with bituminous concrete. From 15th Street to Indiana Avenue and from New York Street to Washington Street the double car tracks were removed and that area paved with concrete. The removal of all car tracks north of Washington Street was made possible by the Indianapolis Street Railway's abandoning the use of street cars and substituting trackless trolleys over these lines.

West Street from Washington south to Morris Street required no construction. From Morris Street south to Wiscon-

sin Street the existing 30-foot pavement was widened to 36 feet and resurfaced with bituminous concrete, and from Wisconsin Street south to Daisy Street and thence to Bluff Road was improved with a new 20-foot concrete pavement.

This improvement required the construction of 78,827 sq. yds. of reinforced concrete pavement, 8,835 sq. yds. of bituminous concrete resurfacing, and 19,115 lin. ft. of curb at a total cost of \$366,644.37.

IMPROVEMENTS IN CALUMET DISTRICT

In the Calumet District the largest project provided for the resurfacing and rebuilding of Indianapolis Boulevard through East Chicago, Whiting, and Hammond, a distance of 5.406 miles. This involved the construction of 72,894 sq. yds. of concrete pavement and 53,411 sq. yds. of bituminous concrete resurface over brick and 37,545 lin. ft. of curb. Approximately three miles of storm sewers were constructed on this project. The total cost of this improvement was \$345,846.67.

The first of the NRM contracts was let in November, 1933, and weekly lettings followed throughout the winter and spring months. Some few of the contracts were delayed throughout the year because of the right-of-ways not being delivered by the cities and the inability of municipal authorities to get an agreement from the street railway lines for rehabilitation of their tracks. The existing financial condition of most of the street railway companies delayed the projects in the Calumet District and other cities so that the completion dates had to be advanced several months. In the Calumet District the delay was most serious, as the work necessary to be carried out by the railway had to be paid for by the fares collected daily. This amounted to less than \$500 daily and the track work dragged along throughout the summer.

The NRA program combined with the state construction threw a heavier load on the department of operations than it had ever been called on to handle. It became necessary to expand the road design department, which was done by renting additional quarters and equipping an overflow office. The construction department confronted by the large program had to expand its field supervising forces practically overnight, but this was accomplished in a praiseworthy manner. Experienced engineers and inspectors to supervise bituminous resurfacing work on the NRM program were difficult to employ. A field supervising engineer trained in bituminous work was assigned to the bituminous contracts and it was found necessary to train the larger part of the engineers and inspectors for this class of work. This was accomplished by much hard work and long hours and the personnel of the highway department feel that a high standard has been set for bituminous and concrete street paving work.

The hearty co-operation of our Indiana contractors was necessary for the carrying out of our NRA program, and not only was this co-operation evidenced on the construction but on design problems as well.

The engineers of the highway department had little municipal experience to assist them on a program as extensive as the NRM work, but by the combined effort of the complete personnel the program was carried out in a satisfactory manner.

THE RELATION OF THE STATE BOARD OF ACCOUNTS TO COUNTY ROAD WORK

By Wm. P. Cosgrove, State Examiner, Indiana State Board of
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There are many subjects such as partition fences, cemeteries, sewers, garbage, health, etc., which at first glance would seem foreign to the examination and supervision of public offices. Wherever the public treasury is concerned in the receipt and disbursement of public moneys the State Board of Accounts is required to exercise its power of examination and supervision in the interests of the general tax paying public.

One might casually inquire, "What does accounting have to do with road work?" Well, we wouldn't have any road work if we had no funds set aside for that purpose, and we would have less money and consequently less roads, less road mileage, and less proper maintenance and upkeep if there were not some supervision over highway accounts, receipt of revenues, appropriations of highway funds, and the prevention of illegal and extravagant or wasteful expenditures.

The subject which you have assigned to me for discussion may, at first glance, seem limited. However, when one takes into consideration that it includes, from an accounting standpoint, certain kindred items connected with it, such as legal of the proceeds of motor vehicle licenses and gas tax collections, contracts for construction, repair and purchase of materials, employment of services, fees and salaries, drains and sewers, bridges and culverts, and forms and records of accounting, together with all the laws bearing upon this subject, I must confess that a large volume could be written upon the subject.

In my discussion, however, I will limit myself more particularly to highway maintenance, as I take it that is the subject with which this gathering is most concerned.

The statutes, as you are well aware, provide that there shall be collected a license upon motor vehicles and a tax upon