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THE SUPERHIGHWAY OF
WOODWARD AVENUE

THESIS FOR THE DEGREE OF C. E.

James B. Baynes

1930

THESIS

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THE SUPERHIGHWAY OF WOODWARD AVENUE

A report submitted to the Faculty of
the Michigan State College in partial fulfillment
of the requirements for the professional degree of
Civil Engineer by

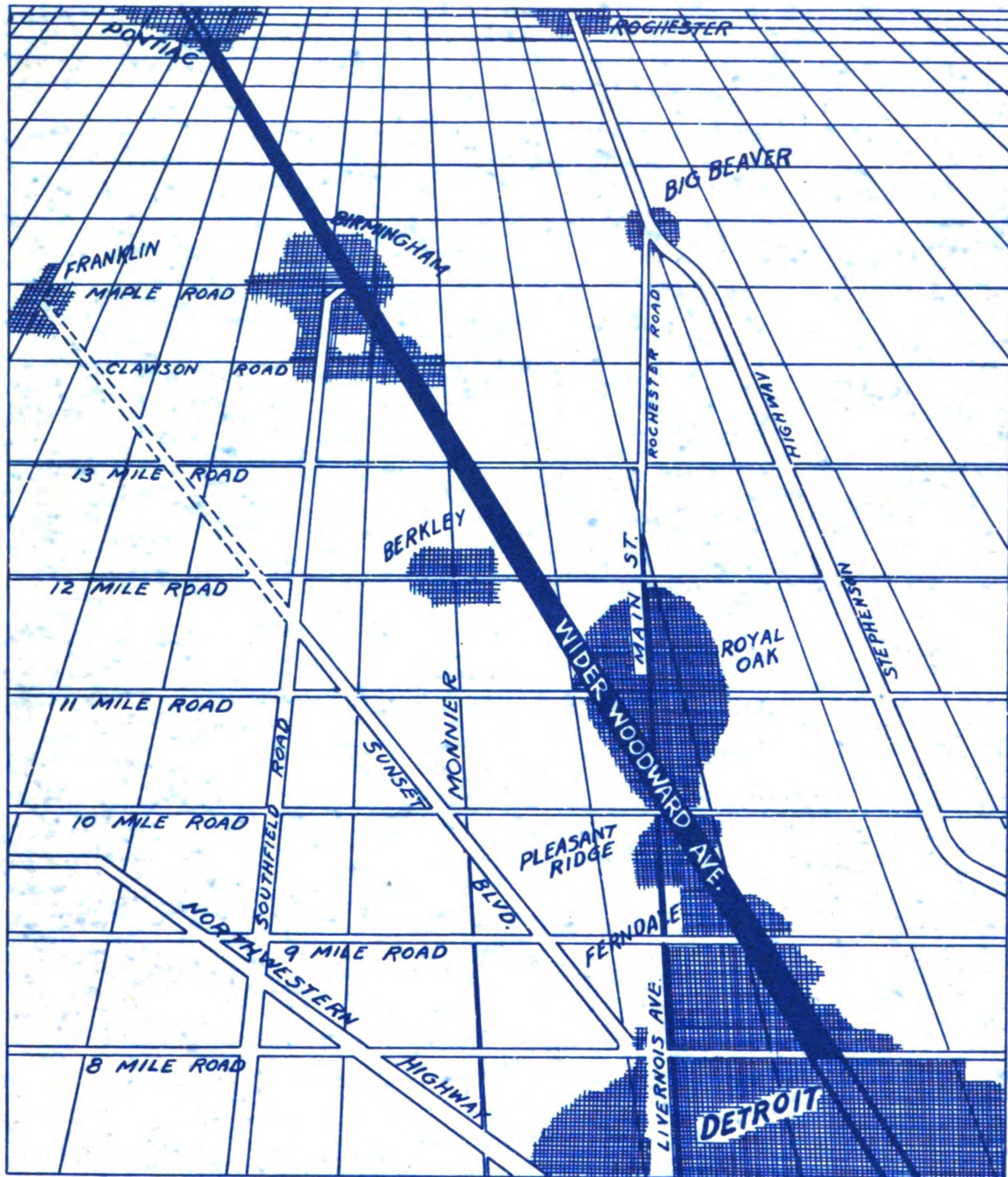
James B. Baynes

June 1930

THESIS

THE SUPERHIGHWAY OF WOODWARD AVENUE.

- I. Introduction and location of the road.
- II. The necessity for a change in type of road at this location.
 - A. Traffic
 - 1. Pleasure
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 - B. Street car at this location
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LOCATION SKETCH

THE SUPERHIGHWAY OF WOODWARD AVENUE

A highway that is designed and built to carry all types of traffic, from the fast moving pleasure cars to the ponderous slow moving commercial vehicles, large volumes of each class, and carries all with equal safety and facility, may well be termed a superhighway. Such a highway is that portion of State Trunk Line No. 10, lying between the cities of Pontiac and Detroit, in Oakland County. This highway, commonly called Woodward Avenue, had been the source of considerable discussion and some criticism by the traveling public.

Woodward Avenue had its birth in 1817, when Messers Mack and Conant of Detroit built a road from Grand Circus Park to the Six Mile Road, under government contract. This road was constructed of large logs, laid closely together and piled with small timber, brush, sand and clay. Pontiac was founded in 1819 and at that time it required two days to make the trip from that point to Detroit. A survey was made in 1819 for a road between these two cities, but it was not until 1848 that a really passable road was constructed.

The General Plank Act made possible the improving of the main highways, and Woodward Avenue was among the first to benefit from its provisions. Along this new road of planks, which were sixteen feet long and three inches thick, three toll stations were placed. Toll was charged from the city of Detroit. The fee was one cent a mile for a one or two

horse drawn vehicle, and three-quarters of a cent a mile for each additional animal. It is also interesting to know that anyone attempting to run the toll gates was fined twenty-five dollars.

Later the task of improving the highways was taken over by the State. The first paving on Woodward Avenue began in 1915, and was completed in 1917. This was a sixteen-foot one course concrete slab, with an eight inch center and six inch sides. The proportions were $1:1\frac{1}{2}:3$; that is: one part of cement, one and one-half parts of sand, and three parts of coarse aggregate. This sixteen-foot pavement was the much needed connecting link between Detroit and Pontiac, and at that time it was considered quite sufficient for a long period to come. No one could foresee the tremendous development that was soon to ensue along this particular highway.

Oakland County is located directly north-west of Detroit, and is one of the beauty spots of Michigan. In this county there are four hundred fifty lakes and eleven parks. Across the northern half of this county, there is a range of hills some of which are among the highest in the state. These, together with the natural scenic beauty of the section, call thousands of people from the city of Detroit to this playground over week ends. Here they have a chance for relaxation and recreation. Practically the only way that these people can come and go to this playground from Detroit is by way of Woodward Avenue.



Old Woodward Avenue,
The Narrow Sixteen Foot Pavement

Due to the fact that Woodward Avenue runs in a north-westerly direction from Detroit, all north and south roads and all minor roads in this county connect with this great arterial highway sooner or later, leaving it up to this road to care for the traffic. Woodward Avenue may aptly be likened to some great river, fed by countless hundreds of tributaries, all with the same ultimate destination. Traffic counts kept at various points on Woodward Avenue have shown as high as twenty-one thousand vehicles passing in a single twenty-four hour period, and daily average of fourteen thousand. Picture this amount of traffic week after week on a sixteen-foot pavement. It was next to impossible for traffic to cross Woodward Avenue, expecially on Saturdays or Sundays.

Distance between cities has always been measured by the length of time required to travel from the one to the other. Many people have complained that it required more than three hours to travel from Pontiac to the city limits of Detroit, then the Eight Mile Road, on the old sixteen-foot pavement. Even after reaching the city limits, they felt highly elated if no serious accident had befallen them, as it was very hazardous to drive in that traffic.

Not all the traffic going to and from Detroit was pleasure traffic. Hundreds of factory workers could not afford to live in Detroit; they lived in the suburbs, and in the surrounding country. They had to get to and from their work in the city in as short a time as possible. Delays on the road were

costly, especially traffic delays. Many times a team of horses on the sixteen-foot pavement would cause a line of automobiles three miles long. It was extremely discouraging to these men, working in the city, trying to earn an honest living, to meet traffic jams like this day after day, week in and week out.

Trucks were being built much larger and longer, and were carrying heavier loads. They were also increasing in number. In addition to the hazard of the narrow sixteen-foot pavement, the pavement was slowly going to pieces under loads which it was not originally designed to carry.

Along the east side of the old pavement the Detroit United Railroad had a double system of tracks. It extended from Detroit to Pontiac, and took care of those people who did not have any other method of transportation, known generally as commuters. In places this track was very close to the pavement, adding to the danger of automobile traffic. This service was a necessity and had to be maintained not only for the passengers' service but also for the freight service which was carried on between the two cities.

The last decade has witnessed an amazing and unparalled growth in the City of Detroit, both in population and manufacturing concerns. This is due in a large measure to the tremendous impetus given to the manufacture and sale of automobiles and the allied industries. The natural trend of this expansion was in a northerly direction, along Woodward Avenue.

Many suburbs sprung up because it was much cheaper for the factory workers to live outside Detroit, and work in town. It was quite essential that these people have a chance to go and come from their work without unnecessary delays. It was impossible for all workers to live immediately adjacent to their work.

The sixteen-foot pavement could carry no more traffic; it was now overloaded, overcrowded, and very dangerous. The saturation point had been reached. In addition to this, it was practically worn out. Something had to be done to relieve the congestion of this highway. It became apparent that some type of road would have to be developed which would care for the various types of traffic, fit in with the rapidly developing conditions and be built for permanency. The street car system was one of the real problems to be considered in the final determination of the design and construction.

Woodward Avenue connects Pontiac with Detroit in practically a straight line, hence, it was deemed quite impracticable to built another highway parallel to Woodward Avenue. Traffic always takes the shortest and most direct route. The physical character of the land was another factor which was against a parallel road.

The plan finally decided upon was to have a two hundred-foot right of way, with the street car tracks centrally located, flanked by a forty-foot strip of pavement on either side. By this plan the future subway or rapid transit system

can be brought to the surface and vehicular traffic can move alongside at will and safety. When a subway is brought to the surface, approximately eighty feet in width is required. This, with the width of one hundred twenty feet required for vehicular traffic over a heavily congested roadway, takes care of the two hundred-foot right of way. The general line of old Woodward Avenue was not changed; that is, the original width was used in the present right of way.

Woodward Avenue, in Wayne County, at the Eight Mile Road, had a right of way of one hundred twenty feet with an eighty-foot pavement which included the street car tracks. By a small change in alignment and a reverse curve, the two types of designs were connected so that there was no inconvenience in the transition.

The Wider Woodward Avenue Association was formed to give impetus to the immense highway plan of widening the road. This was an organization consisting of real estate men, city, village and township officials, and private citizens. This organization made the acquiring of the right of way much easier because of the meetings given by its different branches which aroused enthusiasm and interest among abutting property owners. It also showed the State that the people were behind the movement and were willing to do their share.

Woodward Avenue was originally laid out to be one hundred feet wide. Encroachments by property owners and other conditions had reduced this considerably. In some places

not more than sixty-six feet remained of the original dedication. On this right of way was the double track inter-urban trolley system, numerous wire lines on poles and the sixteen-foot pavement.

A survey was prepared in 1922 and 1923 in anticipation of the expansion of the road. In order to widen the road on the two hundred-foot basis, some legislation was necessary and it was not until 1923 that the "Wider Woodward Avenue" Bill was passed. This bill provided that the expense incurred by the State Highway Commissioner in acquiring the necessary land for widening or improving the road, and in the construction of the road should be paid for as follows: "Fifty percent of the cost shall be paid by the State and the remainder shall be raised by assessments upon lands and against counties, townships, cities and villages benefitted by the improvement."

When the alignment was finally decided upon, it was found that for nine miles the Grand Trunk Railroad was in the proposed right of way, and had to be moved to some other location. Also, two or three cemeteries would be in the way. Before the highway could be built, the necessary width for the project had to be obtained. Practically all the land between Pontiac and Detroit had been subdivided on the sixty-six-foot right of way basis. And, in as much as the proposed plan called for a two hundred-foot right of way, this necessitated the acquisition of an additional sixty-seven

feet on either side of the surveyed center line.

There were three ways by which the State could obtain the property: by the property owners giving it outright to the State, by the property owners selling it to the State, or by the State acquiring it through condemnation proceedings. The acquiring of the necessary width of right of way for such a contemplated highway was one of the first big problems to be met. Whole subdivisions had to be rearranged to fit in with this undertaking. The State started to buy from the property owners enough land to make the necessary width. However, real estate dealers and unscrupulous owners tried to exploit their holdings and make a fortune from a small parcel of land. The State Highway Department could not afford to pay exorbitant prices for this land, as they were only building a road and not developing real estate.

The Department appraised all the land between Pontiac and Detroit which was required for the highway. Land owners who refused these figures were required to appear before a commission and file their objections. In a good many cases the objectors were right because very often one man's property would be damaged much more than another, and there were some merits to their objections. This idea of appraising the land had very good results, as all property owners were dealt with on an equal basis, according to their respective locations. It also prevented speculation at the State's expense.

During the process of construction, it was necessary either to move or rebuild four churches, twenty-five business places and thirty residences. After much debating the four churches were removed to a new location. One minister was quoted as saying that moving a church or tearing it down for right of way purposes was little short of vandalism.

The business places were either torn down and rebuilt on the new property line or were moved to a different location. It is interesting to know that several two story buildings were moved both along the Avenue and at right angles at a forty percent replacement cost. It was only fair to those whose business places had to be moved that they be compensated for the loss in business during the moving process. This was taken care of either by a certain compensation or an agreement was made between the owner and the contract mover, whereby business transactions would not be interrupted.

All the houses which had to be removed were bought outright by the State. They were moved to a new location, redecorated and then resold.

The total cost of acquiring the right of way was \$2,500,000.00. Yet out of this sum, salvaged land has saved the State approximately \$1,000,000.00.

The right of way crossed two cemeteries, in which were a large number of graves. The owners of cemeteries, especially those controlled by religious bodies, certainly offered

a new and difficult problem. It is generally an easy matter to deal with one or two people. But, when it comes to dealing with an organization consisting of many individuals, each of whom has a very definite and decided opinion, it requires considerably more tact, diplomacy and an occasional display of force, to successfully cope with the situation. Moving graves for highway construction purposes was certainly a stumbling block and the only solution to this problem was to move the cemetery bodily along with fences, shrubbery and other embellishments. In one cemetery, over four hundred graves were moved. This was successfully accomplished to the satisfaction of all parties concerned.

Between the Eleven Mile Road and a mile north of Birmingham, a distance of approximately six miles, the Grand Trunk Railroad ran parallel to Woodward Avenue, and was in the right of way. It was so located that both pavements could not be placed, without first moving the track. This factor presented a two-fold problem. First, an agreement had to be made with the railroad officials, whereby they would move their line to a new location and give up their present location. The other problem to contend with in this connection, if the railroad officials did reach an agreement with the State, was the acquiring of a right of way for the new location of the road bed.

The original charter granted to the railroad, contained provisions for the payment of \$25,000.00 a year in taxes by

the railroad and the State's right to buy the railroad at any future time if any change in the charter could not be agreed upon by both of the contracting parties. To induce the railroad to move its tracks to a new location, the State Legislature passed a bill giving the Governor of Michigan the power to buy the railroad. This authority was never exercised because a contract was finally agreed upon by the State and the railroad to move its right of way. The State agreed to obtain the new right of way and construct the new road bed for a four track system, and the railroad would repay the State over a period of ten years. At the end of this time, the railroad was to give up its privilege of paying only \$25,000.00 a year in taxes and thereafter it would be taxed like other railroads, which would mean that it would have to pay approximately \$225,000.00 a year in taxes.

So the State gained from the railroad the old right of way and the increase in taxes, while the railroad profited by having a more direct route, a more uniform grade, and a right of way one hundred feet wide.

Obtaining the right of way for this relocation was a difficult problem. Much of the land had been subdivided and many homes and estates had been built up, through which this new route lay. Naturally these owners were opposed to having a railroad run through their property, and some bitter legal battles and some humorous incidents resulted

from the plan, which is still in litigation at this date. Practically all the land for the railroad right of way had to be condemned. Much of the grading has been done for the road-bed, but construction is now at a stand still, due to lack of right of way.

Several important roads crossed the new alignment and, to insure safety for the public, grade separations were demanded by county and city officials. Grade separations are of two types: the subway, by which the traffic runs under the railroad, and the through railroad bridge, by which the traffic is taken over the railroad. The minimum clearance for a grade separation subway is a height of fourteen feet. The roadway is either forty or sixty feet in width. If no sidewalk is provided, a curb of two feet six inches in width is required, and, if a sidewalk is provided, a curb of one foot six inches in width is required. The minimum width for a single track through a railroad bridge is seventeen feet and for each additional track, fourteen feet is added. The minimum height of this structure is twenty-two feet six inches. Grade separations together with the heavy cuts and fills make a railroad a very disagreeable thing to have adjoining or in proximity to one's property.

It was quite essential that the interurban system be kept in operation during the construction of the highway. The location of the tracks had to be changed, both as to



Construction

alignment and to grade. This was accomplished by single track cut-overs. Through a location where the right of way had been obtained, a cut-over to the single track was made. The new track bed was made in the right location and to the right grade and then the new tracks were placed. The cut-over was then made the other way, using the new track bed, and then the other track bed was made. This process was repeated in the next location. This changing of the interurban was not only difficult, due to the grading operations, but also dangerous because of the shifting of the power line.

It was not possible to obtain all the right of way along Woodward Avenue at one time. In fact very little had been obtained when construction actually began, so that operations often ceased, due to lack of width to work in. This lack of right of way was a serious hindrance, both to the construction operation and to moving of the interurban line.

Both the Detroit Edison and the Bell Telephone Companies had their service lines along Woodward Avenue, very close to the old pavement. These poles had to be changed to a new and permanent location to fit in with the standard typical cross-section of this proposed project. Service had to be maintained during the shifting of these lines. Sometimes the poles had to be shifted three times, due to the lack of right of way, grade of new project not sufficiently completed and other obstacles.

The Bell Telephone Company had their service lines in

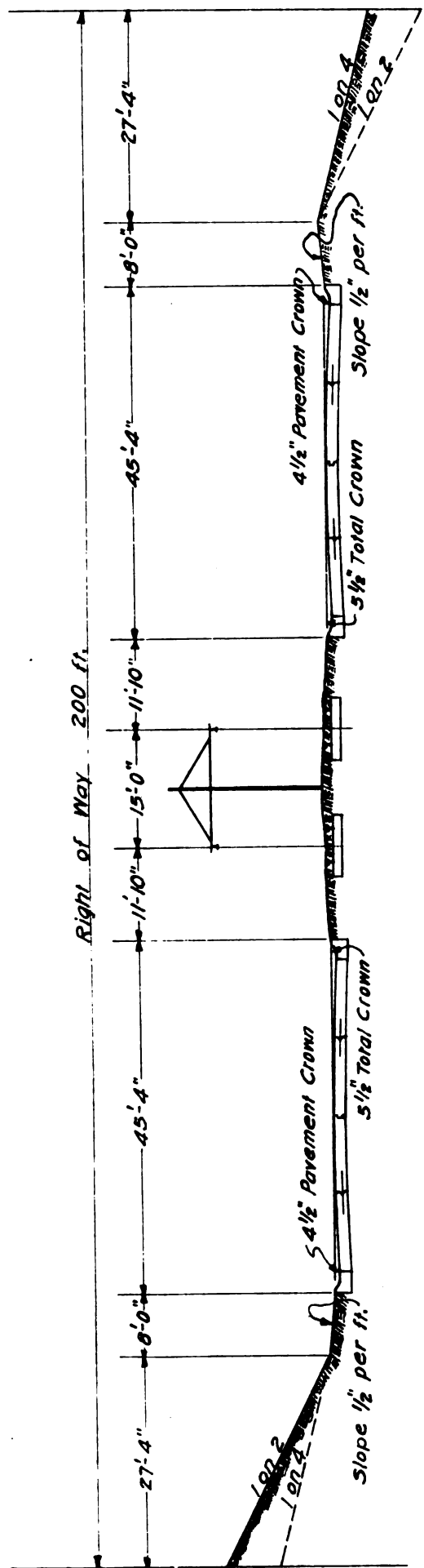
conduits. This was a serious problem to contend with due to the fact that it was not placed at a depth to be satisfactory. An earth cushion of one foot between the top of the conduit and the bottom of the pavement was deemed sufficient to protect the conduit from breaking from the pounding of traffic on the pavement. Much of the conduit had to be relocated due to running along the edge of the curbs and being in the way of the drainage structures.

In the re-construction or improvement of a highway, detours are necessary. When this highway was being built, there were no connecting pavements to Woodward Avenue. The traffic could not be sent around the old country roads which were only wide enough for horse drawn vehicles. It was also impracticable to send that volume of traffic on a complete detour from Pontiac to Detroit, as it would have been too long and too hazardous. It is interesting to know that during the entire rebuilding of Woodward Avenue, traffic was only detoured for a period of three months between Birmingham and the Eleven Mile Road, a distance of four miles. The purpose of this detour was to speed up the work in completing this portion of the project. The presence of the old pavement, the lack of detours, and the interurban tracks forced the building of the pavement in sections along a considerable portion of the project. The traffic was allowed to run on the old pavement until these sections of the new pavement were completed, then the old pavement was removed in this

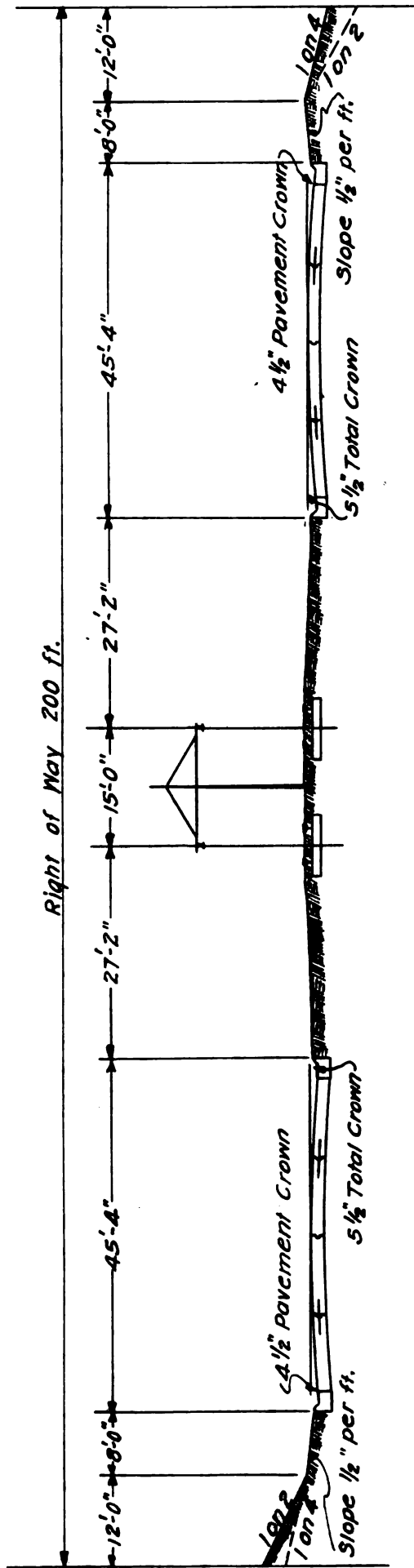
location, and the sections were then completed according to the standard plan.

Wider Woodward Avenue is thirteen and two-tenths miles in length, exclusive of the section through the village of Birmingham. It has a two hundred-foot right of way through which runs the two strips of pavement. Between the Eight Mile Road and the Ten Mile Road these pavements are sixty-nine and three-tenths feet between curbs, while north of the Ten Mile Road, the distance between curbs is thirty-eight and seven-tenths feet, with an area of twenty feet allowed for sidewalks. The Detroit United Railway Company's tracks are located in the center between the pavements. The poles for the electric transmission and service lines were placed directly on the center line, serving jointly for lighting purposes and for center pole construction for the trolley line. All telephone lines which were not all ready in conduits, were either placed in conduits or placed on the poles in the center.

Extreme care was used in planning the finished cross-section of the job, as the drawing of the typical cross-section shows. All open ditches were eliminated by a system of storm sewers and drainage structures. The street car tracks were set two inches above the top of the curb. The ground was then sloped uniformly between the back of the curb and the street car tracks. An eight-foot shoulder, with a slope of one-half inch per foot, was provided at the out-



Typical Cross-section of Woodward Ave.
(North of Ten Mile Road)



Typical Cross-section of Woodward Ave.
(South of Ten Mile Road)

side of the curbs. All of the back slopes of the cuts were kept at a minimum of two on one. However, most of the slopes on the cut-sections were flattened out as much as possible. The slope on fill-sections was made four on one. Seeding was placed on the shoulders, between the car tracks and the curbs, and on the fill and cut-sections. Sodded slopes and shoulders not only add to the beauty of a road, but also prevents undermining of the pavement from rains.

Long straight grades were established, having for the minimum grade 0.25 percent and for the maximum grade 4.80 percent. These grades not only fitted the general contour of the land, but are ideal for traffic in almost any weather condition. The roads in this locality are often subjected to much ice and snow. It is impossible for truck traffic to move on some roads due to the steep grades. Except under an extreme condition, traffic is not held up on Wider Woodward Avenue due to ice and snow. There are only three maximum grades on the highway and when they become covered with ice, sand is sprinkled at these places, making them passable under the most adverse weather conditions. The minimum grade was established to insure proper drainage of the surface water.

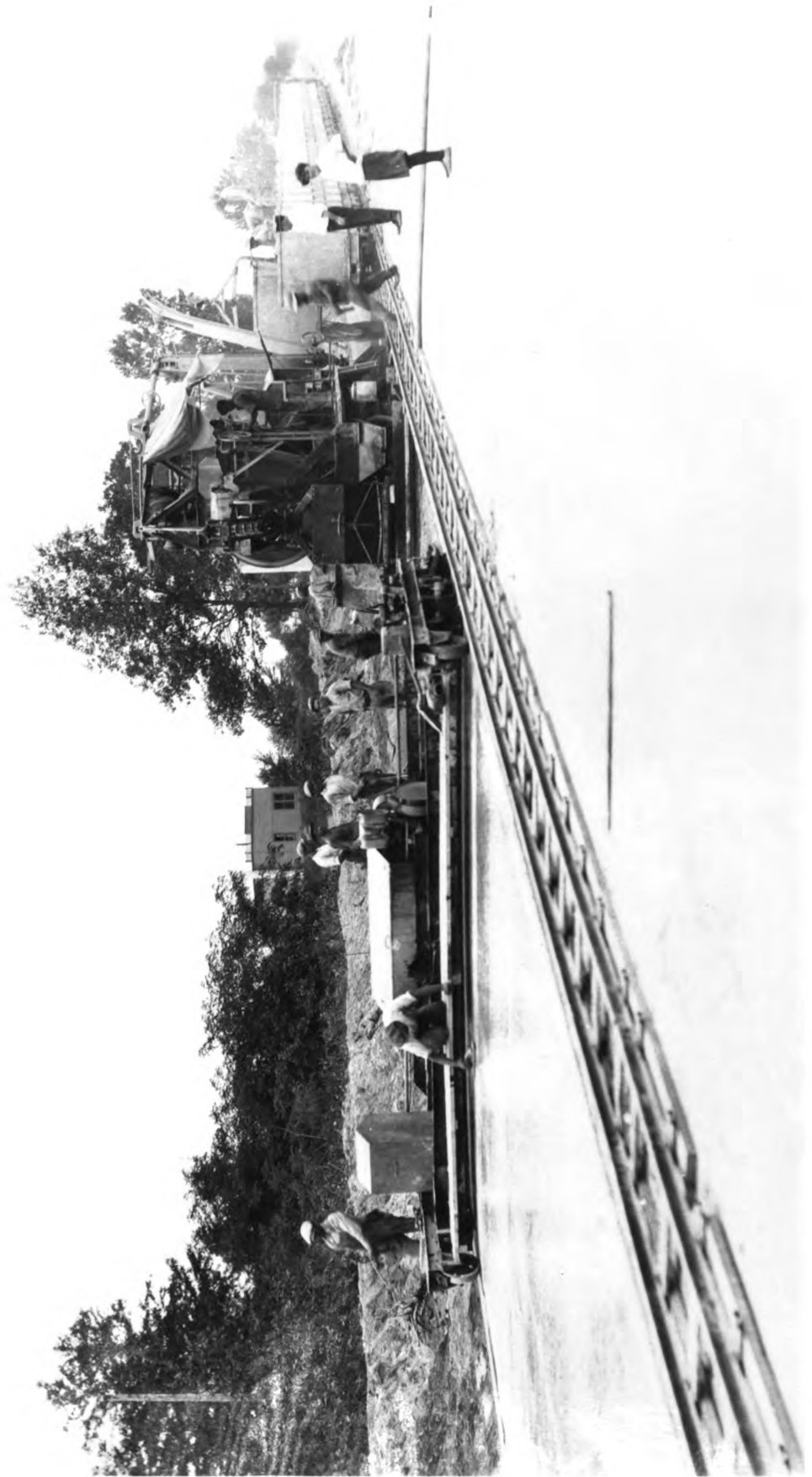
Changes in grades are taken care of by long parabolic vertical curves. Where abrupt changes in grade were encountered, long vertical curves were used, and where the change was less abrupt, shorter ones were used. The maximum vertical curve used was one thousand feet and the shortest

one was one hundred feet. Vertical curves on this type of road should not be too long where the change in grade at a valley is small on account of drainage.

Unobstructed vision is an asset to any road, especially where the traffic is heavy and fast. This can be brought about by having long grades, long vertical curves, long horizontal curves and no obstacles. The maximum horizontal curve allowed was one degree, one curve being nineteen hundred feet long.

Important street intersections are at grade with the new pavement. Some future time it may be necessary to separate grades at important intersections, but this is not contemplated at present. Cross-overs between the two strips are provided for at approximately every third intersection, and all streets have an opening on the new pavement, adjacent to the intersections. Where more than one street intersects Woodward Avenue at a given point, traffic islands are provided and the traffic moves in a rotary fashion in passing on and off the highway.

In the last analysis, the Wider Woodward Avenue project was the fulfillment of a vision, the realization of a dream. The greatest single factor in the ultimate realization of it was probably the influence and interest of Governor Alex. J. Grosbeck. He it was who rode rough-shod over the selfish interests of some few self-centered and egotistical individuals. It was his far-sighted and futuristic vision that



Laying Concrete

finally made the completion of the project possible.

It was not strange then, that an undertaking of this magnitude should be given serious deliberation and study, both from adaptability of the design, and perfection of actual construction. Here was a gigantic task the progress of which would be watched with breathless interest. The eyes of the middle west were focussed here. The feasibility and success of super highway construction hung in the balance. Recognizing this fact, engineers watched carefully each detail of construction, Rigid inspection and strict supervision was the watch-word. It was their sincere wish that the finished project was to consist of long stretches of well graded and properly drained pavement, built of the best materials possible, and placed as nearly perfect as skilled labor and modern equipment could do it under precise engineering and rigid mechanical inspection. It was indeed their plan to make "Highways Happy Ways".

The result of all this, was to make the requirements of the aggregate which went into the pavement of exceedingly high quality. The coarse aggregate consisted of two classes, Class A, and Class B, both having the same requirements except as to size. The Class A was used in the pavement, and the Class B was used for curb and culvert construction. This coarse aggregate consisted of clean, hard, durable particles of stone, free from lumps of clay and organic matter. Not more than one per cent by weight of clay and sand was per-

mitted and not more than three percent by weight of soft and non-durable particles was permitted. Each class of aggregates, when tested by the laboratory screens and sieves, met the following grading requirements:

Class A, coarse aggregate (two inch)

Passed	$2\frac{1}{2}$ inch screen	----	100%
"	2 "	" "	90-100%
"	1 "	" "	30-70%
"	$\frac{1}{2}$ "	" "	10-40%
"	$\frac{1}{4}$ "	" "	0-10%
"	8-mesh sieve		0-5%

Class B, coarse aggregate (one and one-half inch)

Passed	2 inch screen	-----	100%
"	$1\frac{1}{2}$ "	" "	85-100%
"	1 "	" "	50-85%
"	$\frac{1}{2}$ "	" "	20-45%
"	$\frac{1}{4}$ "	" "	0-15%

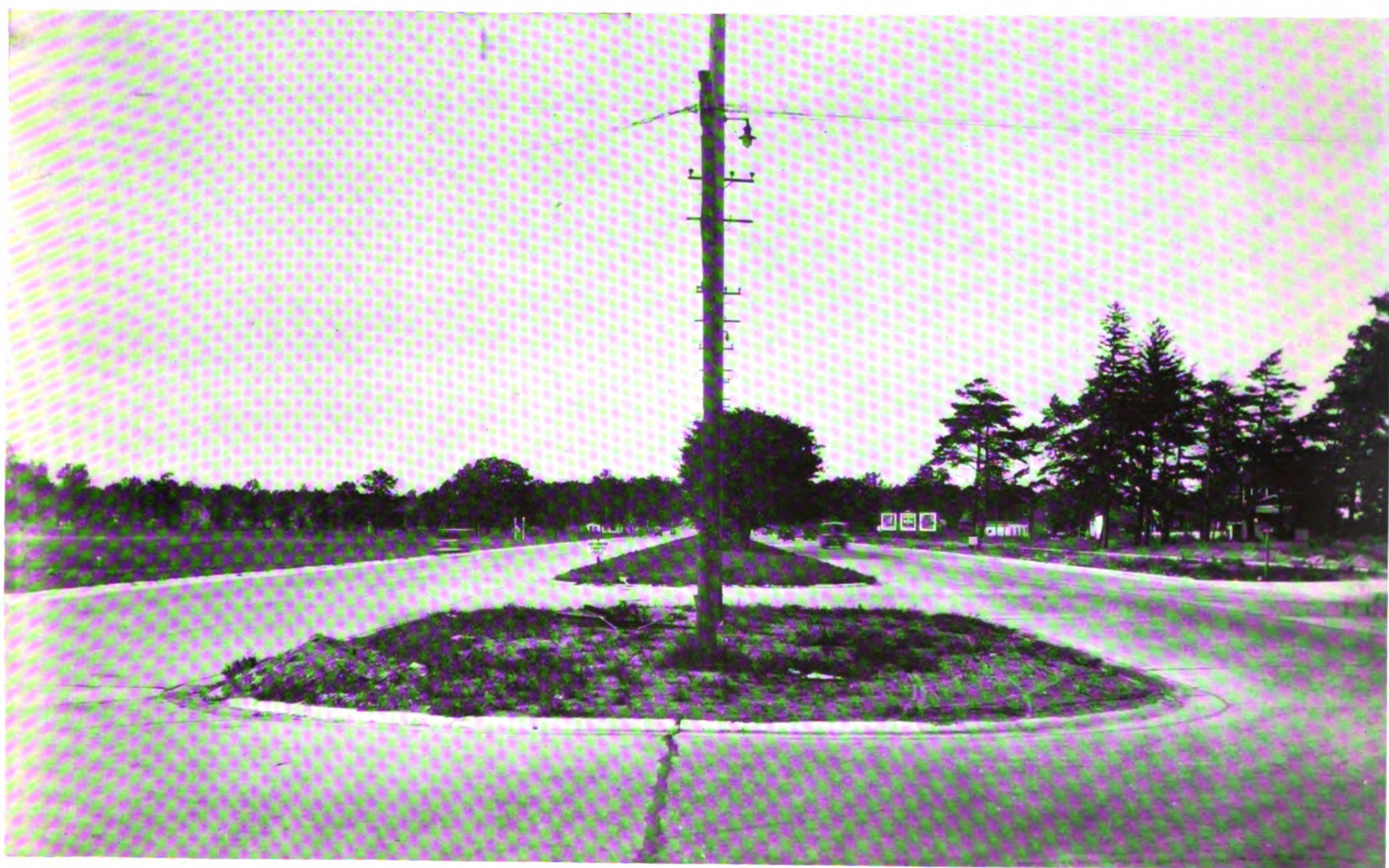
The fine aggregate consisted of clean, hard, durable particles of sand, having not more than two and one-half percent of clay and silt. This material was uniformly graded from coarse to fine, and when tested by the laboratory screens and sieves, after removing the clay and silt, passed the following grading requirements:

Passed	$\frac{3}{8}$ inch screen	----	100%
"	$\frac{1}{4}$ "	" "	90-100%
"	10-mesh sieve		60-90%
"	20-mesh sieve		25-65%
"	50-mesh sieve		7-25%
"	100-mesh sieve		0-5%

All cement used for this project conformed to the requirements of the "Specifications and Tests for Portland Cement" as provided by the American Society for Testing Materials. The cement was sampled and tested at the mill



Woodward Avenue Living Up To Expectations



Woodward Super Highway Between Ten and Eleven Mile Roads

before being sent to the job. However, it was given a visual inspection after it arrived on the job, either by the field engineer or his assistant.

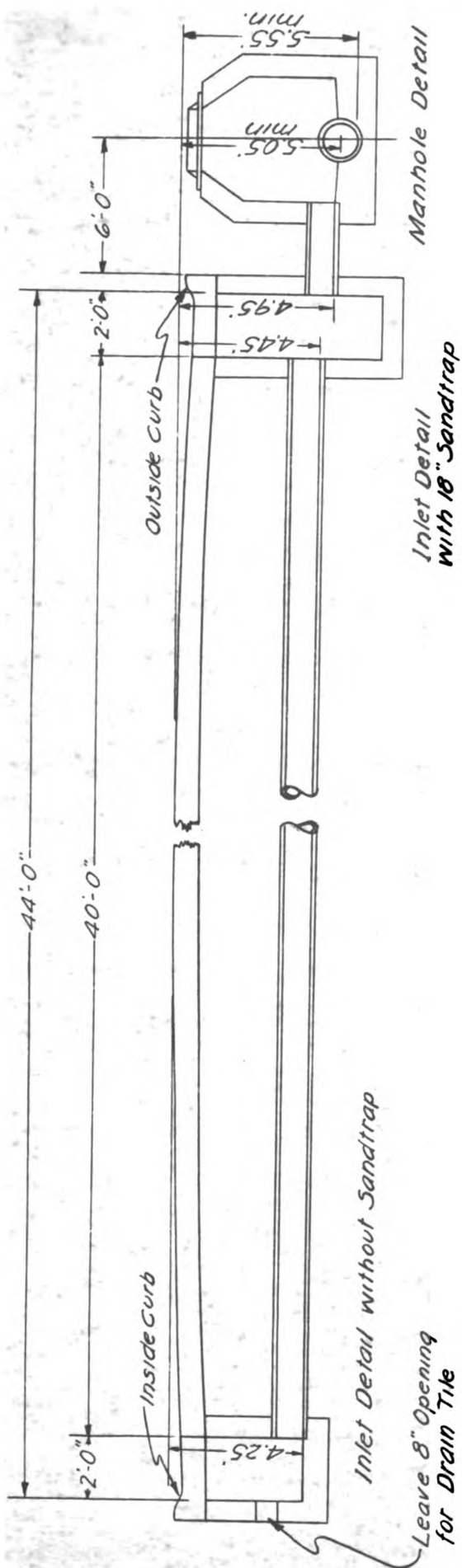
Each strip of pavement is forty feet wide and has a uniform thickness of nine inches. The concrete used was a 1:2:3½ mix. The parabolic crown of the pavement is four and one-half inches, this with the drop in the gutter, makes the total crown five and one-half inches, measured from its centerline to the bottom of the gutter. Longitudinal joints mark off each strip into four ten-foot traffic lanes.

The central joint of each forty-foot strip was made by a bulkhead construction joint, as it was only possible to place and handle twenty feet of concrete at one operation. The other joints were made by placing center steel in the concrete ten feet each way from the center joint, the entire length of the project. The center joint consists of a strip of steel ten feet long, eight and one-half inches in depth and of fourteen gauge in thickness. It is so designed that dowel pins are driven through it into the ground, thereby holding it in an upright position and in a straight line. Transverse rods, one-half inch in diameter and five feet long are placed every twenty inches through the center of the steel, tying the strips of pavement together. This center steel is kept one-fourth of an inch below the top of the pavement. As soon as the pavement gets its final set, it cracks directly above the top of the center steel. Later

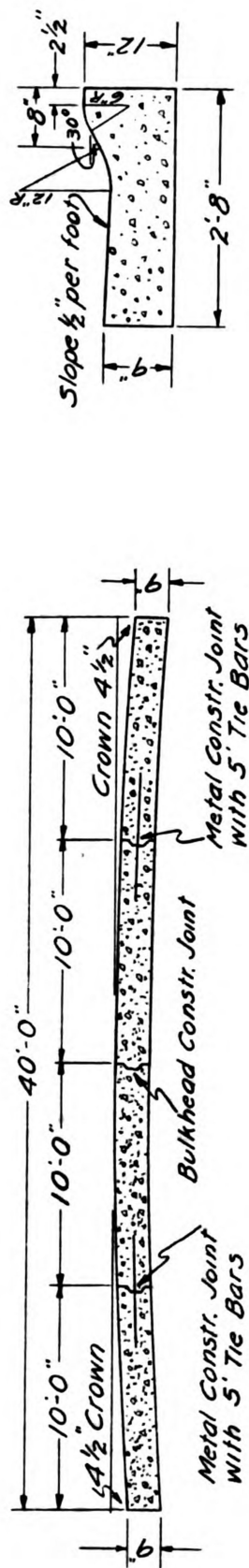
the maintenance crew tars these joints and the traffic lanes are thus marked off. Transverse expansion joints, one inch wide were placed every one hundred feet. This joint consisted of bituminous premoulded joint material, of the dimensions shown on the plans, and was an asphaltic composition of approved material. It was of such character that it was not deformed by ordinary handling during hot weather, nor did it become brittle in cold weather.

The pavement has a combined curb and gutter section on either side. This curb and gutter section is thirty-two inches wide, with a curb four inches in height, eight inches thick at the top and twelve inches deep at the back, and the gutter section is nine inches in thickness. Concrete used in this construction was a 1:2:3 mix. This was placed with an open joint every twenty-five feet except a one inch expansion placed opposite the expansion joints in the pavement. The curb is so designed to allow easy passage to and from the parking sections.

Drainage is provided for by means of storm sewer with catch basins and manholes. The catch basins were especially moulded to fit the curb design, thus eliminating unsightly and hazardous ditches. The storm sewer was of double strength vitrified clay pipe, without warps or cracks, thoroughly burnt and fully glazed. Although each strip of pavement has a complete drainage system, each was built to the same standards and specifications.



Typical Section Showing Relation of Drainage Structures



Detail for 40 foot Concrete Pavement

Detail of Outside & Inside Curb

The main sewer was built along the outside curbs, and was placed approximately six feet back of them. Catch basins were placed in the curb lines and the water was taken from these to the main sewer by cross-lead tile. Manholes were placed wherever a lead entered the sewer, or a change in size of tile. Care was used in the spacing of the catch basins. This was necessary due to the crown and grade of the pavement. It is quite essential to traffic that a rapid run-off takes place. The spacing varied from two hundred to five hundred feet, the maximum distance allowed. To date, these catch basins have removed the water fast enough from the pavement during the heaviest rains, so that none runs over the four inch curb, even on the flattest grades of the highway.

These sewers were designed to care for the storm or surface water over the area of the two hundred-foot right of way. Proposed county drains, present sewers, and the general water courses were assumed to care for the surface water outside of the highway. The grades were to be such that the sewer would be self-cleaning, and the minimum size tile was to be twelve inch.

From a study of records for rainfall for this locality, all computations were based on a 2.15 inch rainfall per hour. An eighty-five percent run-off factor was used for the impervious surfaces, and a fifteen percent run-off factor was



Wider Woodward Avenue

used for the pervious surfaces. These run-off factors were based on losing water by evaporation, through cracks, and by absorption.

Viewed in perspective, the successful completion of Wider Woodward Avenue has marked another important milestone in the history of highway construction. It is true that, as the years roll on, the inevitable imperfections of design and construction will become more apparent, but they will be attributed largely to the lack of experience rather than mechanical failures. It is my sincere belief that the completion of this tremendous achievement represents the conscientious application of the very best and most modern methods of design and construction available at the time it finally was built. To that small group of men who made this master-piece possible, society, industry and individuals owe an ever-mounting debt of gratitude.

It is, however, important to note at this time, that the cessation of construction activity does not end the problems which it was originally intended to solve. As in the case of anything built by human hands, it must be maintained or it would rapidly fall into decadence. By maintenance, I mean that drainage structures must be kept clean, that cracks in the pavement resulting from the fierce pounding occasioned by the immense traffic loads must be repaired, that slabs broken by the settlement of fills combined with the variations in temperatures and over-



Wider Woodward Avenue From The Air

loaded vehicles must be replaced. In other words, eternal vigilance is the price of longevity and durability.

Crossroad traffic should be given maximum consideration commensurate with its importance. At present there are entirely too many signal lights turned for too long a period against the vast traffic which the very nature of the project was designed to facilitate.

But, all in all, it has surpassed the fondest dream of the most enthusiastic. It is epochal, dynamic and functions on the whole in the way it was intended to, and this, after all, is the yardstick by which one measures the success of an undertaking. You ask, "Does it work?" The answer is without qualification or condition, "It does, even better than we had hoped for."

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