

GRADE SEPARATION AT NEW CARLISLE, IND.

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In the summer of 1912, the Lincoln Highway Association laid out and established the route of the Lincoln Highway across St. Joseph county. The route chosen was over the old Vistula Road from the east county line into South Bend and from South Bend west through New Carlisle to the west county line over the old Michigan Road.

Soon after the road was established, the question of paving was agitated and a petition was filed with the county commissioners December 15, 1913, asking for the paving of the section west of South Bend. At that time we had only the three mile road act under which roads could be constructed and as there were over three miles in two of the townships affected an election was called which resulted in a large majority favoring the construction of the road. A contract for the improvement was awarded September 14, 1914.

Near the east town limits of New Carlisle this section of the Lincoln Highway crossed at grade the Chicago, South Bend and Northern Indiana Railway; the Chicago, Lake Shore and South Bend Railway; and the New York Central Railroad in a distance of less than 600 feet.

The sharp angle made by the Lincoln Highway and the New York Central Railroad, the rather steep approach on the highway to the crossing and the high speed trains run over this section of the railroad, made this a very dangerous crossing. A number of disastrous accidents had occurred here resulting in loss of life and property. Knowing that paving this road as a part of a transcontinental route would greatly increase the traffic and thereby increase the hazard, it was evident to every one that something should be done to eliminate the danger.

On May 22, 1916 the board of county commissioners of St. Joseph County passed a resolution relative to the needs of a grade separation at this place which would include all the railroads. A petition was filed with the state public service commission asking for a hearing before that body on the question.

The hearing was held in South Bend and an order was issued by the public service commission for the construction of a subway along the line of the Lincoln Highway under the tracks of the three railroads, this being the location desired by the St. Joseph county commissioners. This order was issued July 8, 1916 and work was to begin on or before January 1, 1917.

Due to the excessive cost of constructing the subway along the line of the Lincoln Highway, the angle of the crossing being about 24 degrees, the railroad companies petitioned the state public service commission for a modification of its order, permitting the construction of the subway at a point about 343 feet east of the point indicated in the first order and at an angle of about 52 degrees. This new location would mean a saving in construction costs of \$65,760. The St. Joseph county commissioners opposed this change and their opposition was sustained by the public service commission.

The railroad companies then sued the public service commission of Indiana to set aside, modify or amend its order in the St. Joseph county circuit court. Thinking they would not get a fair trial in St. Joseph county the railroad companies took a change of venue to the LaPorte circuit court where the order of the public service commission was sustained. The Chicago, Lake Shore and South Bend Railway then appealed from the decision of the LaPorte circuit court to the state supreme court.

The state supreme court sustained the decision of the lower court and the public service commission issued a supplemental order on April 30, 1919, fixing a time when the work of the subway should begin.

The railroads applied for an injunction in the St. Joseph county circuit court restraining the public service commission from enforcing their order.

While the case was pending, the state highway commission took over the Lincoln Highway as a state road, thus bringing to a close all litigations between the railroads and the county over the grade separation problems at New Carlisle for the time. Nothing was done by the state highway commission towards the separation of grades but surveys were made for the purpose of changing the location of the highway and thus avoid the crossing entirely.

At about this time the people of New Carlisle becoming exasperated over the delay and the prospects of losing the state road, passed an ordinance requiring all trains passing through their town to slow down to 12 miles per hour. This seemed to have the desired effect, for two of the railroad companies showed a willingness to open negotiations looking towards the separation of grades. The third however, held out because the state highway commission was not considered in the negotiations.

At about this time the state returned Lincoln Highway to the county having decided to follow the new Division St. location.

Through the influence of Mark L. Brummitt, one of the county commissioners and a citizen of New Carlisle, negotiations were put under way looking towards the construction

of a combination subway connecting the X Road, (an improved county road running north and south and crossing the Lincoln Highway on Race Street in New Carlisle) and the Lincoln Highway in one subway, thus eliminating a dangerous crossing of the railroads on Race Street.

These negotiations finally culminated in the calling of a meeting in South Bend of legal and engineering representatives of all parties interested. This meeting was held in January, 1925, and resulted in the working out of an agreement satisfactory to all parties. A joint petition was then sent to the state public service commission praying that the commissions previous orders be vacated and rescinded and that a modified order be issued conforming to the agreement.

A hearing was soon afterwards held by the public service commission in South Bend and the desired modified order issued.

Agreement Finally Reached

An agreement between the five different parties interested was signed February 2, 1925, eight and one-half years after the order was issued by the public service commission.

The parties interested in this agreement are as follows:

The New York Central Railroad Company.

The Chicago, Lake Shore and South Bend Railway Company.

The Chicago, South Bend and Northern Indiana Railway Company.

St. Joseph county.

The Town of New Carlisle.

Under the terms of this agreement the following items were specified:

1. The separation of grades was to be accomplished by means of three separate subways under the tracks of each of the three railroads and at right angles to and at the point where the center line of the Lincoln Highway intersects the center line of the west bound main track of the New York Central Railroad.

2. The present grade of the N. Y. C. R. R. not to be changed. The grade of the C., L. S. and So. Bend Ry. to be raised about 8 feet and the C., S. B. and N. I. Ry. raised about 11 feet.

3. The Lincoln Highway to be diverted and a new segment of highway to be opened in a northwesterly direction from near the end of the old concrete pavement on Lincoln Highway, then changing to a southwesterly direction passing under the tracks of the three railroad companies, then turning to the right, finally connecting with the Old Lincoln Highway near Race Street in the town of New Carlisle. Also a segment of new highway connecting the first described segment with the

X road. The highway approaches on each side of the subways to have a grade of not more than 4%.

4. The highway depression of said subways to be drained by a 12-inch vitrified pipe sewer which was to empty into an existing 12-inch drain tile laid east from the subway on the south side of Lincoln Highway. This drain tile was laid to drain the proposed subway at the time the pavement on Lincoln Highway was constructed.

5. The new highway was to be paved not less than 18 feet wide with suitable widened curves.

6. The overhead clearance to be at least 13 feet for each of the three subways.

7. The horizontal clearance to be not less than 30 feet nor more than 33 feet between abutments.

8. The width of the pavement through the subways and the intervening property to be 30 feet wide.

9. The subway structures for the interurban companies to be of the open floor girder type.

10. The structure for the N. Y. C. R. R. to be for 4 tracks and of the ballast floor steel girder type.

11. The grading on the right of way acquired between the interurban railways and the paving and drainage from the north right of way line of the C. S. B. and N. I. Ry. and the south right of way line of the N.Y. C. R. R. to be done by St. Joseph county, but paid for by the railroad companies. Each paying $\frac{1}{3}$ of the total cost.

12. The subway structures to be completed before March 26, 1926, and the pavement by July 1, 1926.

The county commissioners decided to do the county's part of the work under a county unit petition and a petition was immediately circulated. The preparation of plans and specifications for the county's part of the work was turned over to the county engineer about the middle of February, 1925. (See Fig. 1.)

Preliminary Survey

In making the preliminary survey a center line of the Lincoln Highway was first established and the distance from the end of the old concrete pavement east of the proposed subway to the center of X road was accurately chained. The intersection of this center line of Lincoln Highway and the center line of the west bound main track of the N. Y. C. R. R. was accurately located and its distance from the end of the old concrete pavement recorded. The angle at this point of intersection between the established center line of Lincoln Highway and the center line of the west bound main track of the N. Y. C. Ry. was carefully measured as well as the angle between Lincoln Highway and X Road. The tracks and right of way lines of the railroads were then located with refer-

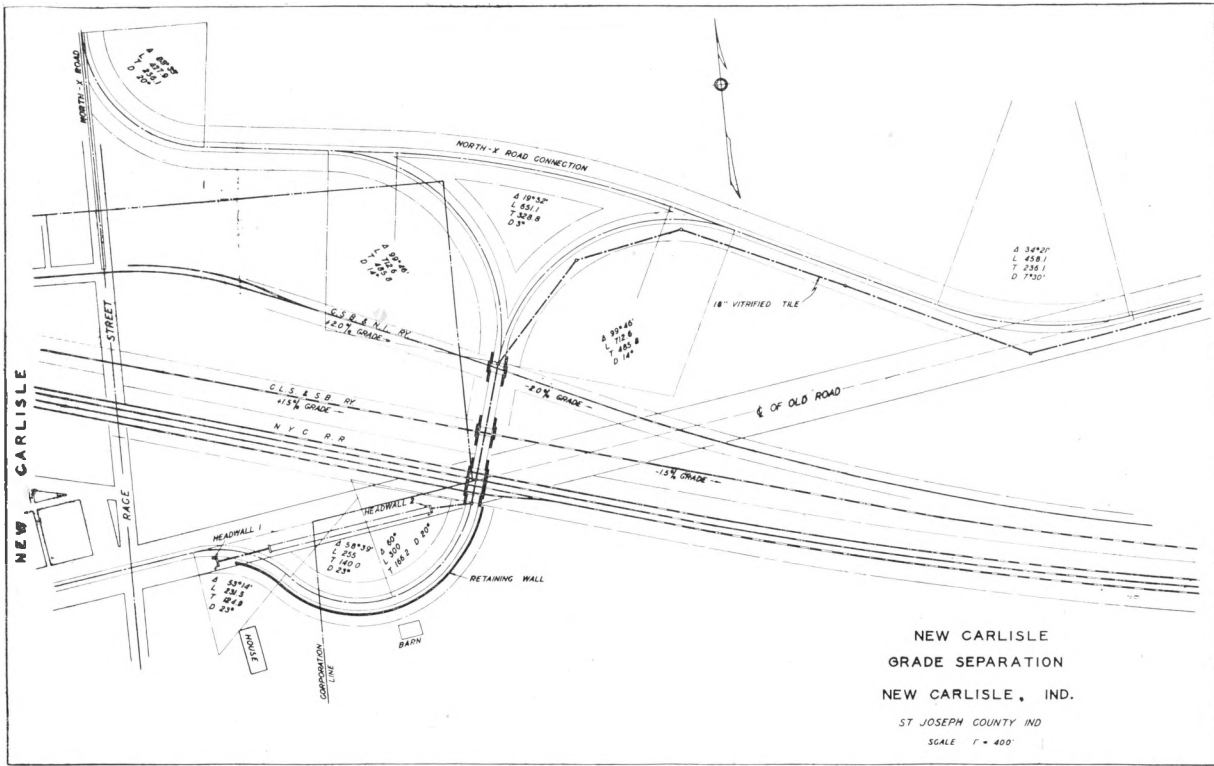


Fig. 1. New Carlisle Grade Separation.

ence to this center line. All this information was platted to a scale of 50 feet to one inch and a complete paper layout of the project made.

The estimated cost of the entire project was placed at \$200,000. The expenditure of this large sum of money was to eliminate a death trap and the idea uppermost in the engineer's mind was to construct the approaches to this crossing so that it would be safe to the traveling public for years to come. The engineer of today who is intrusted with the location and construction of public highways, if he functions rightly, must be at least ten years ahead of public opinion. He must have some vision of public demands of the future. If there is as much change in public opinion regarding highways in the next ten years as in the past ten years, many of the roads constructed today will either be reconstructed or replaced, due to excessive grades and sharp curves.

When this work was turned over to the engineer he was given to understand that his hands were free to make this an absolutely safe crossing, but he had not proceeded very far until he found his hands decidedly tied. *It is remarkable how much engineering talent is going to waste around small country towns.* It may seem that the opinion of such citizens would have little weight, but I find that in county work it is a force to be reckoned with. The plans submitted by the N. Y. C. Ry. engineers and indirectly made a part of the agreement, did not seem to give much assurance of making this the crossing desired, so it was followed only in a general way.

At the north entrance to the subway where two lines of traffic would be entering and leaving, it was desired to construct curves of such radius as to give at least 300 feet clear view. Some opposition was met with on this part of the project.

The approach curves were established as 14 degree curves or curves with a radius of 410 feet. The intersection angles were made equal, thus making the approach curves symmetrical. The approach grades on this part of the work were made 0.80% instead of 4% as indicated in the agreement. The remainder of the alignment on the north side of the subway was worked out to conform to the approach curves in a measure.

In locating the approach curve at the south approach to the subway many obstacles were encountered. The subway is located at the foot of the hill upon which New Carlisle is located and the ground rises rather abruptly from the subway to a height of about 30 feet above subway pavement in a distance of approximately 400 feet. On the crest of this ridge is located a group of old farm buildings with a lawn and valuable shade trees in front of the residence, that extends down to the Lincoln Highway.

A trial alignment was run from near the entrance of the subway to a connection with the old Lincoln Highway near Race St. using two 20-degree curves reversed with a short piece of tangent between. This alignment cut into this lawn and would make it necessary to remove some of the shade trees. The 100-foot right of way would also be very close to the barn and other farm buildings. It was soon evident that this alignment could not be used due to the objections of the people of New Carlisle and the attitude of the commissioners.

Then an alignment around these buildings coming into the Lincoln Highway in New Carlisle from the south was considered but this was abandoned because it would have required two right angle turns in the town of New Carlisle.

A third alignment was then run by compounding the 20-degree curve at a point 300 feet from the south entrance of the subway with a 23-degree curve and then with a short piece of tangent between reversing to a 23-degree curve and finally connecting with the old Lincoln Highway east of Race Street. This alignment was finally used in the construction of this approach.

Practically all the new right of way required for this project was owned by one party and, as often happens, the value of this land went up quite suddenly. The damage was placed by the owner at \$25,000. The necessary property was condemned by the commissioners and the appraisers awarded the owner \$3,250. The landowner then appealed to the circuit court to test the utility of the project.

All this was holding up the ultimate completion of the work and the people of New Carlisle were becoming very impatient. Finally the landowner suggested that he would take the award if the south approach were moved 50 feet farther from his barn. The engineer objected strenuously to this and suggested as a compromise that a retaining wall be constructed along the south side of this approach with the face of the wall 21 feet from the located center line of the approach and that the face of the wall be made the south right of way line. This proposal was agreed to by the landowner and commissioners.

Drainage

Adequate drainage for the subway required considerable thought. As has been said before, the subway is located at the foot of a hill. To the east and north lies Terre Coupee prairie, a very flat, level country. Levels were run north along the X Road and east along Lincoln Highway. About one mile east of the subway on the south side of Lincoln Highway is an open drainage ditch, a tributary to the Kankakee River. It was found that by keeping the drainage pipe under the pavement in the subway as high as possible, a fall of 0.125 foot in 100 feet could be obtained, so this was the outlet used.

The runoff from the pavement on Lincoln Highway in New Carlisle and from a good portion of the town itself flows along the gutters of the Lincoln Highway and previous to the construction of the subway followed an open ditch along the south side of the New York Central Railroad. Due to the sandy nature of the soil in the approach cut at the south entrance to the subway and the possibility of washing, it was decided that it would be best to prevent any water from running into this cut.

The runoff from New Carlisle was carried along each side of Lincoln Highway as formerly, using an 18-inch reinforced concrete pipe culvert with a grate cover and concrete intake headwalls to carry the water on the south side under the new pavement. At a point about 200 feet from the subway, the water from the north side of Lincoln Highway is brought across the old highway through an 18-inch pipe culvert. At this point the water from both sides empties into a concrete catch basin and from there the water passes through another concrete intake headwall with a grate into an 18-inch reinforced concrete pipe which carries it to a concrete manhole under the pavement near the south end of the subway with a drop of over 13 feet. The water passes from this manhole through an 18-inch reinforced concrete pipe under the center of the pavement to a second manhole under the pavement near the north end of the subway. From this point the drain passed out from under the pavement and followed along the south side of the new and old highway to the open ditch outlet using 18-inch vitrified sewer tile with cemented joints. Concrete manholes, 4 by 4 feet with standard covers, were placed at all angles and at intervals of about 500 feet on tangents.

Intake basins with standard grates were placed in the gutter line on each side of the manholes in the subway. These were connected with the manholes by 12-inch reinforced concrete pipe.

Provisions were made for taking care of the runoff from the hill back of the retaining wall by installing a 10-inch farm tile just back of and 4 feet below the top of the wall with three concrete intakes. This drain pipe was connected with the manhole at the south end of the subway. Along the house lawn at the west end, a concrete gutter was used. The water from this gutter was carried into the main drainage system.

There were 27,000 cubic yards of excavation in the project, most of which was waste. After a vain attempt to reach an agreement with the two interurban railway companies looking towards use of this material in their approach fills or obtaining permission to waste it on the New York Central right of way, it was finally turned over to the contractor to worry

about. He was able to effect an agreement with the interurban companies and the waste was used in making their approach fills.

The pavement is a uniform 8 inch concrete slab with 2-inch crown, 20 feet wide on tangents and on the 3-degree curve. On curves over 3 degrees the pavement is widened from 20 feet at the ends to 28 feet at the middle and superelevated. On tangents and the 3-degree curves, the pavement was finished with a finishing machine and on curves over 3 degrees the entire width of the pavement was laid at one time, struck off with a heavy straight edge and finished by hand.

A 16 gauge, $7\frac{1}{2}$ -inch corrugated, metal strip with $\frac{1}{2}$ inch round deformed tie bars was placed in the pavement on the center line. Throughout the entire job $\frac{3}{4}$ inch round deformed bars placed 6 inches from each edge and on the neutral axis of the slab were used.

A 1 inch preformed transverse expansion joint was used every 100 feet with $\frac{1}{2}$ inch round deformed bars placed transversely in the center of the pavement on each side and 4 inches from the joint.

The curve intersections were laid one-half at a time, the two halves being tied together with $\frac{1}{2}$ inch round, deformed bars.

The retaining wall is 680 feet long and ranges from 6 to 15 feet high. It is of reinforced concrete of the cantilever type design, constructed in 50-foot sections.

The contract for the county's part of this work was awarded to the Highways Improvement Company at a lump sum of \$69,860.79. The contractor at all times showed a desire to use the best materials and to do first class work and I believe as far as material and workmanship is concerned it is as good a piece of construction work as can be found.

GRAVEL AS A ROAD SURFACING MATERIAL

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The three principal, natural products used in the construction of our highways are gravel, stone and sand. Almost every type of highway which has been devised utilizes one or more of these materials for the greater portion of the pavement. But, the material must be brought to certain specific requirements for each of these various types of construction.

In many sections of the country, local gravel is the only available material suitable for road building and perhaps no other has so wide a range of uses in construction work.