

The Highway-Landscape Nexus

JOSEPH C. FEDERICK, District Engineer, New York State Department of Public Works

•THE dominant physiographic feature of New York State is the L-shaped valley belt consisting of the Hudson River valley stretching northward from the Atlantic Ocean and New York City to Albany and then westward across the central area encompassing the Mohawk Valley to Lake Erie. Approximately 85 percent of the population lives in this band which contains 15 percent of the area of the State. The early availability of water, rail, and highway transportation has resulted in the intense development of this valley belt.

In contrast, the growth of the communities along the southern boundary lagged because of topographic barriers which discouraged both east-west and north-south travel. This deficiency in the highway network is being remedied. Interstate 81 will provide north-south travel from Scranton, Pa., to Binghamton, N. Y., and thence to Syracuse, Watertown, and the Thousand Islands at the Canadian border. To provide for east-west highway communication, the New York Department of Public Works is constructing an interregional highway, through the southern tier counties, which links four of the ten "great development regions" envisaged by the State Office of Regional Development. A unique feature of these regions is the proposal to make them an integral part of the political structure of the State government. This modern Route 17 is designed to Interstate highway standards, although it is an element of the primary highway network.

PARADE SCENIC HIGHWAY COMPETITION

A section of Route 17 designated as the Hales Eddy-Deposit-McClure project was selected by a panel of judges as America's prizewinning highway for 1964 in The Parade Magazine Scenic Highway competition.

Criteria for Nomination

The following standards were specified for nomination in the competition.

1. It must be a highway for general use, not a special route for sightseers only.
2. It must "drive well" with gentle curves, easy grades and wide lanes.
3. It must be well planned, with good use of land, minimum destruction of property and neighborhood.
4. It must look good and be designed to take advantage of natural terrain and scenic attractiveness.

Parade Magazine Observations

Edward Kiester, Jr., Managing Editor of Parade Magazine, made the following observations relative to what was desired from highways by their correspondents.

"First, scenery. They talk in terms of farm fields, of groves of trees and little brooks and cows and sheep. All they seem to ask is that you get the maximum out of what you have to work with.

"Second, Landscaping. Many people equate highway scenery with flowers and fall foliage.

"Third, variety. I can't say most of the nominees put this thought into so many words, but some state it in reverse: they find highways, even in scenic areas, boring. A few say that they like so and so highway because there is always something to look at.

"Fourth, fitting the highway into landscape. All the highways that have so far received the Parade award have achieved this goal beautifully.

"Fifth, careful thought. Most of the nominators don't expect overwhelming results but they like to know that some one is trying.

"Most of our readers seem to say that what they want are highways that are interesting to look at as well as drive along. That's what we, sponsoring the Parade Scenic Highway Contest, are striving for too, and I think that's what you want as well."

LOCATION DETERMINANTS

Initially the residents of the Village of Deposit were opposed to removing Route 17, a State highway, from the village center. Studies were made which showed the tremendous property damage that would result by maintaining the existing general location. The local officials realized that the community would be better served by a modern expressway so located that connections could be made to each end of the village.

Fixed termini, bridge sites, ridge-line saddles, railroad overpass location, southern slope exposure, maintenance of highway and railroad traffic, the preservation of the unity of open space and amenities were control elements in the location analysis. Photogrammetric maps at a scale of 1 in. = 200 ft and with 5-ft contour intervals were used in the initial location study. Overlapping aerial photographs were used for stereoscopic viewing at critical points and for land form study. This was essentially a systems analysis, in which both specialists and generalist participated during each stage of the design phase (soils, landscape, materials, construction, maintenance, right-of-way, planning, and traffic).

At its eastern extremity, the existing two-lane highway was transversely restricted between a steep hill and the Erie-Lackawanna Railroad. The West Branch of the Delaware River borders the railroad for some distance. To obtain sufficient width of right-of-way to site the new arteries the river had to be moved, the railroad shifted and realigned, and side-hill rock cut made. The river bends away from the railroad so that there is a wide expanse of open space between them as they approach the outskirts of the village. The railroad gradually converges toward the river and crosses it near the village boundary. The new highway utilized the original roadbed of the existing route until it reached a point of divergence that afforded a sufficient approach distance so that a curvilinear alignment would bridge the railroad with adequate clearance. The sweeping curve was continued, crossing the river on a high-level bridge, cutting the ridge line in a rock cut to reach the valley slope beyond.

The successive points of crossing were carefully selected to preserve the visual unity of the large open space bordering the river, to site the highway on the valley wall which afforded a southern exposure, and to provide a protective green belt between the village and the artery. The green belt concept, first advanced by Ebenezer Howard in 1898, envisages an area of open space devoted to agricultural, reforestation, park, or similar purposes. It is to be kept in a natural open state. It is not a reservation for future community expansion.

DESIGN ELEMENTS

The highway ribbon was designed to the current standards for the Interstate highway system, but design standards alone do not insure an artery of pleasing appearance. The highway must be fitted into the landscape so as to utilize natural scenic values effectively. A field inventory of the aesthetic assets of the selected alignment was made using sketches and photographs to obtain a continuous sequential visualization. Dominant points and foci of interest were noted, such as chimneys, streams and bridges, tree clusters, open spaces, picturesque farm buildings, greenery, and the distant background of skyline.

PROJECT DETAILS

The Hales Eddy-Deposit Route 17 project is located 150 miles west of New York City. The project length is 6.70 miles. It includes 5.75 miles of access roads. The pavement ribbon consists of two 24-ft arteries with a dividing mall of varying width. The pavement structure is a 9-in. reinforced concrete slab of uniform thickness. Thirteen bridges were constructed, including railroad grade separation structures, interchange structures, stream and river bridges. The construction contractor was S. J. Groves Company. The project cost was \$10,050,000. Construction started on January 29, 1962. It was completed on July 22, 1964, two months ahead of schedule.

THE PRE-CONSTRUCTION CONFERENCE

Before the start of construction, it is the D. P. W. District 9 practice to hold a pre-construction conference with the contractor. This conference is an effective communication mechanism for establishing an agreeable working relationship between the contractor's representatives and the State personnel.

The district engineer conducts these conferences as a normal procedure. Participating for the district are the construction supervisor, the project engineer and his first assistant, and the staff services (soils, materials, landscape, right-of-way and utility engineers).

The contractor is asked to have a principal of the company present, his project manager and any other personnel he wishes to invite.

Bureau of Public Roads representatives are also participants.

When utility relocations are involved, the companies affected are asked to attend.

Features that need emphasizing are reviewed at this time. The Department of Public Works specifications include a provision that all borrow pits within 300 ft of the right-of-way must be approved by the District Engineer. The purpose of this requirement is to protect the landscape from being desecrated by borrow pit location and method of operation.

The pre-construction conference is an invaluable aid in establishing the proper lines of internal communication between the contractor's on-site project manager and the State project engineer. Project goals other than the physical construction can be discussed and methods of achievement indicated.

CONSTRUCTION OPERATIONS

A number of our contractors have adopted the Critical Path Method for project analysis, operation, and control. There is no magic in a GANTT, PERT, ASTA or Precedence diagram. Capable men, quality materials, proper machines, modern construction methods, and knowledgeable direction are the essential ingredients necessary for the efficient and economical construction of a highway project.

The construction phase of this project was not considered difficult as all Route 17 projects involve deep cuts, high embankments, rugged terrain, river crossings, interchanges, connections, and preservation of amenities. There are some features, however, that are of interest. A mile of the West Branch of the Delaware River had to be relocated. Seventy-two hundred feet of the Erie-Lackawanna Railroad was shifted to the original bed of the river, with a consequent improvement in alignment. The eastbound lanes of the expressway were placed on the original railroad embankment. This was followed by the removal of old Route 17 and the construction of the westbound lanes of the expressway.

Work sequencing and scheduling were of extreme importance on these operations as both railroad and highway traffic had to be maintained without interruption. A critical path analysis was used by contractor in the scheduling process.

Railroad Embankment

The new railroad embankment had a stone fill on the river side. This consisted of a rock trapezoid 8 ft wide on the top surface, 4 ft thick, side slopes 1 on 1 $\frac{3}{4}$, and variable in height. This rock face consisted of stone, 50 percent of which weighed over 1,000 lb and the other 50 percent varied between 100 to 1,000 lb.

Railroad forces placed ballast, ties, rails, and signals on the prepared fill. Railroad representatives were present during all construction activities affecting their lines. Most of the material from the channel relocation was utilized in the roadway embankment. The remainder, which was wet silt, was placed in mall areas at interchanges, graded to drain.

Approach Embankment River Bridge

The subsoil of the east approach to the river bridge consisted of approximately 25 ft of sand and gravel underlain by about 70 ft of compressible silt with a trace of clay. Below this was glacial till to the depth explored (102 ft \pm).

The embankment, including the bridge abutment pad, for the first 30 ft was made with no restriction.

Settlement platforms, regular piezometers, and special air piezometers were installed. Rate of placement of the final additional 10 ft of the embankment was controlled by the readings on the control elements to allow soil consolidation and an increase in shear strength of the soil to insure against a shear failure.

An additional four months waiting period was required following completion of the embankment prior to the construction of the abutments. This was the initial use of the air piezometers by the Department of Public Works. Results were good compared to those obtained on the regular piezometers.

A sonic-type pile driver was tried on the abutment piles but was unsuccessful in driving through the bridge pad of selected granular material. A conventional Vulcan No. 1 pile driver was no more successful. It was finally determined that the piles could be omitted.

Paving Operations

The contractor elected to use two 34E dual-drum pavers at the paving site rather than a central-mix type of operation. The pavement was placed in 24-ft widths sawed longitudinal and transverse contraction joints spaced 60 ft apart. A neoprene joint sealant was used.

The close cooperation of the railroad, utility, contractor, and State personnel was the key to the expeditious progression of the contract and the excellent results achieved.

THE ROLE OF AESTHETICS

A highway may be constructed to the highest engineering standards of workmanship and yet lack the inherent quality of fitness that is associated with things beautiful. Nor are there masses of data that can be fed into a computer which will automatically create the perfect landscape design, for the quality of beauty is from the human imagination. Until the development of a bio-electronic mechanism endowed with imagination, aesthetic design, which is all design of quality, will remain an art.

Highways have become syncretistic—they have a use function and a social value. The highway engineer, whether he realizes it or not, or wishes it or not, has been elevated from the role of a craftsman to the ranks of the intellectual, for he is a progenitor of the arts.

The Museum of Modern Art has recognized the changing social pattern with a traveling art exhibit of highway geometry as the new abstraction. The Museum has also published a book, *Twentieth Century Engineering*, which illustrates the exciting art forms created by the engineer.

We are now in the era of instant culture. To talk of beauty is no longer suspect. The highway engineering profession, under Presidential leadership, has been issued a mandate to build beautiful highways.

THE MEANING OF BEAUTY

The meaning of beauty has been the subject of philosophic discussion for more than 2,000 years. Various theories of beauty have been advanced—the hedonistic-moral

theory of Plato, the realistic-typical theory of Aristotle, the intellectualist theory of Kant, the expressionist theory of Croce, and others. Garritt hoped to show that the divergent systems are all intelligible attempts to state the same experience.

Santayana states, "Beauty is value positive, intrinsic, and objectified," or in less technical language, "Beauty is pleasure regarded as the quality of a thing."

Vernon Lee states, "The word beautiful implies the satisfaction derived from the contemplation not of things but of shapes which are only aspects of them."

A Gallup poll released July 7, 1965, associated beauty with cleanliness, the planting of trees and flowers, and the elimination of junk yards and billboards. A percentage of those polled had no opinion or were satisfied with things as they are. There is an appreciation gap to be bridged.

The average motorist riding along a highway will perceive the representative side of the landscape—the physical objects in it. But its aesthetic qualities—the unity and harmony, the shifting play of light and dark, the rhythmic flow of line, its intrinsic values, are unseen.

The appreciation of beauty involves the making of value judgments. However, individual awareness of the quality of beauty depends on the range and character of one's personal aesthetic experience. It is within this context that the landscape architect exercises the influence of his art. His is the art of organizing space into pleasing relationships. To do so the basic principles of landscape design—unity, harmony, balance, proportion and scale, accent, rhythm and dominance—are utilized. These principles have been termed "forms and order," for everything that is beautiful is orderly, although everything orderly is not beautiful.