

Landscape Design and Its Relation to the Modern Highway

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Landscape Design and Its Relation to the Modern Highway

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Wilbur H. Simonson was Chief of the Bureau of Public Roads' Roadside Branch from 1932 until his retirement on December 30, 1965. His service with the agency began in 1929 as a landscape architect on the Mount Vernon Memorial Highway in Virginia. His retirement notice in "The News in Public Roads" stated: "His far-sighted contribution to roadside development and highway location-design brought about a closer understanding and cooperation between engineers and landscape architects."

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This is an anniversary year in the history of highway landscape development.It was just two decades ago--in 1932--that the Federal Government first demonstrated that it was possible to conserve and protect the present and future values of public investment in modern arterial highways. This historic demonstration was the opening of the Mount Vernon Memorial Highway from the Nation's Capital to Mount Vernon on the Potomac in time for the bicentennial celebration of the birth of George Washington.

Since then we have heard a good deal about modern highway development. But most of what we have heard and remember has had something to do with the materials of construction and engineering of the roadbed for traffic. We haven't heard nearly so much about the design of the roadside for the protection of that traffic.

This is understandable but unfortunate, it seems to me, for the long-term significance of sound highway engineering practice lies in the equal recognition and balanced application- of the principles of landscape design in the coordinated development of roadway and roadside. Economic development of a modern highway, parkway, or expressway, for the fullest public service, requires that most careful consideration be given the amenities of its environment. These considerations are essential for the purpose of better fitting the highway structure into the surroundings and at the same time protecting the improvement from undesirable encroachments of any kind.

The Growth of a New Concept: The Complete Highway

In a basic way, the acceleration of the concept of the complete highway and of engineering progress toward greater realization of the growing importance of roadside conservation and development has already begun. During the past year, for example, we saw three important milestones reached:

1. **The Ohio State University and Ohio Department of Highways** sponsored a joint session of the 1951 Ohio Highway Engineering Conference-and the Tenth Short Course on Roadside Development on the concept of the complete highway. "Roadside Development As It is Viewed by the Landscape Architect" may be read on pages 122 to 131 of the anniversary report for April, 1951. You will find a complete bibliography on roadside development included in this report for student reference.
2. **The American Automobile Association** for many years aware of the importance of protecting the highway roadsides, published its complete booklet on *Roadside Protection - A study of the Problem and Suggested Approaches to Betterment*. (American Automobile Association, Pennsylvania Avenue at 17th Street, Washington, D.C. Price \$1.50 per copy.)
3. **American Association of State Highway Officials**, 37th Annual Meeting, Omaha, Nebraska, October 26, 1951, at which the problem of *Coordination of Water Resources Projects and Highway Development* was presented before a Joint Meeting of the Committee on Bridges and Structures with the Subcommittee on Legal Affairs. This is a comprehensive examination of the need for close coordination of highway and related developments in the public interest. (AASHO, 917 National Press Building, Washington 4, D.C.).

All of these steps are significant and timely in pointing up the lag in legislation, and necessary safeguards to fill this gap, in the field of highway conservation and protection. The energetic leader in whose name, this series of lectures is given foresaw the need for enabling legislation in New Jersey **before** the modern parkways now being enjoyed in New Jersey could be built.

The types of highways and their specific needs did not just spring forth; they have been evolving a long time. But flashing across your mind may be these questions:

- Where and how did highway landscape design get its start?
- Through what steps or stages of highway construction has it evolved?
- Why is landscape design essential in highway engineering?

In order to envision the modern parkway and expressway types of highway development, we must know what has gone on in the past and **feel** what is coming in the future. Therefore, in this opening lecture of the 1952 series on highway design, I shall trace the growth of the modern highway as a complete structure, a relatively new concept in highway engineering. In this way you may get a better grasp of how landscape design may help in solving some of today's highway problems. Following presentation of this background review of landscape design in modern highway development, a selected series of slides will picture to you the evolution of highway cross-sections over the past 25-year period, after which some beautiful kodachrome illustrations of complete development of the Blue Ridge Parkway will be shown.

Evolution of Landscape Design in Modern Highway Development

The history of landscape design in relation to park roads and parkways may be divided into two periods. The first period occupies the latter half of the 19th century when carriage roads were built in the parks **before** the automobile came into the picture. The second period occupies the first half of the 20th century when motor roads were developed as parkways, paralleling the growth of the automobile.

Here is a rounded picture of a number of historic examples woven into an orderly and consistent continuity to show how landscape design has evolved in the concept of the complete highway. Since there is not time to go into any detailed description, selected special references are cited for your convenience in further reading if desired:

I. Period of Roads in Parks (1858 - 1906)

1859 - Central Park. - First comprehensive design for a complete public park in America. The roads were generally located along or near the park boundaries to fit the dominant control of the park design. The 1858 plan for Central Park provided underpasses for vehicular cross traffic, cutting the roadbed through rock. But this early employment of the underpass had no real influence at the time. It was not until AFTER the coming of the automobile a half century later when traffic confusion of recent times forced its adoption. Incidentally, on page 378 of *Forty Years of Landscape Architecture*, Frederick Law Olmsted, Sr., Central Park, 1853-1895, you will find an interesting perspective sketch by Mr. Gilmore D. Clarke showing the scheme of grade separations at the South End of Central Park.. The illustration brings out the fact that "The value of these grade separations lies not so much in the greater safety to pedestrians, and still less in the speeding up or continuity of flow of traffic attainable, but chiefly in the freedom from distraction and in the greater comfort for people who have come to the park for its enjoyment."

1893 - Boston Metropolitan Parks. - First comprehensively planned complete park system in America. It was primarily necessary to get from the centers of population to the beaches, the parks, the reservations, and the open country. Private property abutting upon the right of way has generally the right of light and air and of access to some road in the so-called parkway. Driveways, walks, and other means of access may be opened from and connected to the parkway right-of-way. In other words, many of these pleasure roads are not "parkways" in the legal sense. (*Parkways and Land Values*, Nolen and Hubbard, Harvard City Planning Studies XI, p.. 2 - 1937.)

The era of public parks movement in many cities of the United States developed **before** the automobile came on the scene. The influence of the motor vehicle on road characteristics was reflected in modern parkway development **after** the turn of the century.

II. Period of Modern Parkway Development (1906 - 1952)

1906 - Bronx River Parkway Commission - Built the first motor parkway in America, setting the pattern for development of the complete highway. The parkway for passenger cars was the dominant feature in the design. In the earlier public park designs, however, the carriage road was but a secondary feature of the park development.

1922 - Westchester County Park Commission. - First complete parkway system in America comprehensively planned. The owners of abutting property do not have the right of access directly by means of drives, lanes, or other types of private roadway. In this respect the right-of-way resembles that of a railroad or other type of fixed transportation facility, making possible unobstructed freedom of movement. The land for the parkway has often been carried to an existing street, so that a bordering road parallels the parkway. Actual entrance to the parkway is provided at reasonable and convenient intervals, usually in a manner that does not interrupt the continuous flow of traffic on the roadways of the parkway reservation. The boundaries of the right-of-way are not fenced unless an abutting property owner so desires, and then at the expense of the owner.

The roadway is usually placed near the center of the right-of-way. Such location allows balanced recreational use and landscape development, and blankets the abutting property from the NOISE **and** FUMES of passing traffic. The alignment and grades of the roadways have been carefully studied for free flow of traffic and for esthetic results.

Much variety and beauty in design has been achieved in the bridges. Some 100 grade separation structures have been built by the Westchester County Park Commission. The complete organization for the design and construction of the parkways included landscape architects, engineers, and architects. The care with which the planting of the protecting strips on either side of the parkways has been done has introduced a pleasant rural roadside atmosphere throughout the system. In some cases the streets have been widened to form lakes and ponds and can be enjoyed in both summer and winter.

For details of administrative organizations, parkway design and traffic regulation, cost of parkways, and methods of acquisition, financing, and assessment, and economic effects of parkways on property, see *Parkways and Land Values*, Hubbard and Nolen, Harvard City Planning Studies XI, 1937.

1927 - Mount Vernon Memorial Highway. - This first comprehensive demonstration by the National Government of modern arterial highway development was dedicated in 1932. This 15-mile section was the first constructed portion of the George Washington Memorial Parkway along the Potomac from Mount Vernon to Great Falls in Virginia.

Except through Alexandria, the right-of-way has a minimum width of 200 feet, with a pavement 40 feet wide, except where flared or widened and divided roadways have been introduced, the better to serve traffic and to provide parking spaces at particularly attractive spots.

The highway has been so designed that acquisitions of areas on either side of the right-of-way form a protective barrier against encroachment of undesirable structures of all kinds.

To care expeditiously for traffic at Mount Vernon, the highway terminates at a circle around which motor vehicles flow easily and naturally to the loading and unloading platforms, and then to designated parking spaces on either side of the approach road. Through the planned design of roadway and planting of area, the approach to Mount Vernon captures the quiet charm of the estate beyond the entrance gates.

Parkway Features of Interest to the Engineer

Outstanding Parkway Features are summarized in *Public Roads Journal*, April, 1929, Volume 10, No. 2, pages 21 to 27 and. page 32, briefly as follows:

- a. The parkway is developed from the interior outward rather than from the margins inward. This is fundamentally important.
- b. Intersections at grade with other traffic lines of all kinds are eliminated.
- c. Access or approach roads, ramps, and border roads are brought into the parkway sparingly. The parkway is not intended to be just another local road or street,
- d.
- e.
- f. Landscaping, finishing, planting, and opening to the public follow as rapidly as construction conditions permit. Completed sections are built from the rough in two seasons.
- g. All formal and studied landscaping is avoided. (Native plant species in the locality are used.)

- h. Local stone is used in structures to a great extent, and unevenness of texture, color, and coursing, rather than evenness and regularity, are sought.
- i. Bridge and structure designs are rustic and unsymmetrical and made to fit the situation.
- j. The flat arch has been developed satisfactorily and attractively, and has been used in the solution of many difficult grade separation problems.
- k. Watercourses are cleaned, cleared, and controlled by judicious dredging and filling and by the use of small, inexpensive weirs.
- l. Tangents are avoided in the pavement layouts.
- m. Deep cuts are avoided and grades follow the surface. Earth necessary for fills is obtained by widening cuts and flattening slopes in cut. To reduce fills curvature is introduced.

The final points, (1) and (m), relating to tangents, curvature, and grading are important in their application to parkway construction. It requires no expert qualities to determine that long, unbroken tangents are ugly and undesirable except on an intended speedway. They are to be avoided rather than sought, and where used should be relieved by some vistas that convert them into attractions.

The widening of cuts excessively to get earth, instead of deepening them and of reducing fills by curvature, has the general effect of leaving the land largely unmarred and enables the landscape forces to disguise and conceal construction. lines. Reducing the gradient of side slopes to angles below that of repose largely prevents slipping, washing, and weathering, and planting and growth of vegetation are facilitated.

The design of the Mount Vernon Memorial Highway took advantage of all of the Westchester County Parkway experience. The coordination of engineering **and** landscape design functions initiated in the organization of the Westchester County Park Commission was continued with full integration of the two in improved methods and techniques on an organized engineering basis. For example, aerial photography and photographic enlargements were used to the utmost advantage in reconnaissance and planning stages of the development, in the determination of areas of right-of-way to be acquired, and in other ways. The "spline-line" method of location to fit established controls formed the basis for computations of curves with spiral easements computed and recorded on the plans. Machine methods of grading simplified the conservation objectives of the work. Out of this Federal experience grew the ration-wide program for roadside improvement in every State.

Roadside Improvement and Development

A demonstration program for roadside improvement was initiated by Mr. Thomas H. MacDonald, Commissioner of Public Roads, the year following the opening of the Mount Vernon Memorial Highway.

On June 30, 1933, he addressed a memorandum to district engineers of the Bureau of Public Roads covering roadside improvements on the Federal-aid highway system. The purpose was to bring about in all States a number of demonstrations of the possibility of pleasing roadside treatment at moderate cost and to develop methods and organizations necessary to carry on similar work on an extensive mileage in the future. The objective policy was to further cooperative conservation and development practices with highway authorities, and, through the States, broaden cooperation with individuals, organizations, and local communities interested in roadside development.

During war time in the early forties, landscape grading, drainage and erosion control were basic requirements on primary highway construction projects. Following the end of the war period, on March 22, 1946, a memorandum was issued to division engineers covering the integration of all roadside improvement items of work in the plans, specifications, and estimates of Federal-aid projects. Under this procedure, sound conservation practices are encouraged in every region of the nation, and are being applied to the degree possible in each of the several States. Paralleling these policy developments have been outstanding contributions by the cooperating State agencies.

In 1930 the American Association of State Highway Officials and the Highway Research Board of the National Research Council appointed a Joint Committee on Roadside Development. The objectives of this Joint Committee were to plan and conduct research in all phases of roadside design, construction, and maintenance that would more fully promote the essential qualities of complete highway engineering-Utility,Safety, Beauty, and Economy. Not only did this Committee study the landscape, construction, and maintenance elements, but took into consideration the off-highway aspects of zoning, border control, and land-use measures. One of the chief objectives was to fit the highway more appropriately into the general landscape of the area traversed.

The many interrelated factors to be considered in the building of a complete highway may be combined under four basic requirements, as set forth in the 1943 *Report of the Highway Research Board Committee On Roadside Development*:

UTILITY is most important, for unless a highway is serving completely in a useful capacity, its value is limited. In the broader sense, utility means service, and as such includes provision for the handling of all types of traffic, with adequate safety-turnouts, waysides, parking facilities for school and commercial buses, service areas for the distribution of mail, gasoline, milk, and farm products, as well as elements that result in the enhancement of land values. Complete highway service and enhanced land values go together.

Safety means orderly movement of vehicular and pedestrian traffic. The complete highway design should eliminate present and potential traffic hazards by keeping sight distance open on curves and at intersections, by flattening slopes so that traffic may leave the traveled way quickly and safely in emergencies, and by preventing erosion from forming gullies or deepening ditches into veritable traps for motor vehicles. These and other hazards may be avoided by demonstrated roadside development methods.

Beauty, an essential part of the complete highway, requires the harmonious integration of engineering, architectural, and landscape techniques. Conservation of stream shores, fine trees, weathered rock ledges, and similar natural features is essential to the attainment of beauty in the finished highway. A well-located highway with a streamlined, erosion-proof cross-section, and with well designed structures in relation, has pleasing and long-lasting qualities which appeal to both the land owner and the motoring public.

Economy is the quality of providing maximum vehicular and driver service combined with safety design and pleasing appearance, at relatively low construction and maintenance costs. Since the unit costs of annual highway maintenance may be decreased through the integration of the basic principles of landscape design and practice, it is obvious that developed roadsides are an economy.

In referring to the COMPLETE HIGHWAY, attention is not focused on the superhighway, the freeway, or the parkway, for the same basic qualities should be integrated into the design and construction of every road, whether it be local, county, State, interregional, or international.

New Columbia River Highway Begun in 1935

This is the Northwest's most modern example of the complete highway concept. The Oregon State Highway Commission has developed a well planned parking area for tourists at the beautiful Multnomah Falls along the Columbia River west of Bonneville Dam.

Interstate Highways and Expressways

The Federal-aid Highway Act of 1944 provided for designation of the National System of Interstate Highways, not exceeding 40,000 miles in extent. Currently the system comprises 37,800 miles of highways of highest importance to the National interests in peace or war. This trunk-line highway net connects all of the largest cities and most of the larger ones. On its rural sections it carries 20 per cent of all rural traffic, and the proportion of all city traffic carried on its urban sections will approach this ratio when the system is selected and improved.

For the urban transcity connections of the nation-wide system of interstate highways, depressed highways found favor because they permitted dense traffic to flow rapidly and continuously without interruption at street crossings. Among the important expressways started in previous years, and on which work continued during the year in the improvement of urban highways, are the John C. Lodge and Edsel Ford Expressways in Detroit, the Congress Street Expressway in Chicago, the Hollywood Freeway in Los Angeles,, and the Major Deegan Expressway in New York City. Expressways are being constructed in many other cities, including Boston, Providence, Trenton, Atlanta, Cincinnati, New Orleans, Houston, Kansas City, Denver, San Francisco, Seattle, New Haven, and Pittsburgh.

Control of Access

There has been a growing recognition of the many benefits and the long-range economy of control of access on major routes in cities and suburban approaches. Where there is no control of access, and roadside businesses developed along the highway, interferences between through traffic and the roadside becomes of major importance, reducing the capacity of the highway and increasing accident frequency. As traffic increases, the roadside businesses become more profitable and increase in number, still further increasing interference, lowering capacity, and increasing hazard. Congestion develops, and attempts to correct the deficiency by widening are prevented by the high value of the very businesses which produced the obstructions. Obsolescence grows and authorities are ultimately forced to relocate the highway. This is a wasteful procedure which may be avoided by control of access from the beginning of highway right-of-way acquisition and development.

Summary and Conclusion

This is the one hundredth anniversary of the profession of engineering. This year engineering reaches its age of maturity in the centennial celebrations throughout the country, because 100 years ago, the formation of the American Society of Civil Engineers created a forum for the profession of engineering. As our understanding of the LAWS OF NATURE has improved, our capacity for the improvement of facilities for man's enjoyment and fullness of life, has increased. As engineers, our responsibilities must include the conservation of the results of our efforts, as well as the character of our works.

In the twenty years since the completion of the Mount Vernon Memorial Highway, the concepts of conservation have been translated into everyday highway engineering procedures. Plans, specifications and estimates have been revised in a cooperative effort with the States to further the integration of landscape design in regular highway procedures and practices.

The COMPLETE HIGHWAY concept is one of triple conservation: (1) material resources of soil, water, etc; (2) economic resources; and (3) human resources. Landscape design for all three of these dimensions should have regular application to all highways in America, in proportion to their economic importance.

It is understood that later lectures in this series will discuss some of the principles and basic techniques of landscape grading and drainage, and of erosion control and. planting design in terms of complete highway development. In summing up these objectives, let me leave with you the following statement from the 1944 report on Interregional Highways:

Highway design, in the broadest sense, rests upon landscape principles as well as upon the more commonly recognized engineering principles of alignment; profile, grade cross-section, roadway and right-of-way width, drainage, and structural strength and durability. A balanced agreement with the two sets of principles characterizes the best design If engineering principles require a certain monotony of smoothness and attention-lulling security in the roadway design, the appropriate application of landscape principles can relieve the monotony and promote the safety of traffic by reawakening the interest and attention of drivers. All these things may be done in complete consistency with the utilitarian functions of the expressways. And, so treated, these new arterial ways may be made---not the unsightly and obstructive gashes feared by some--but rather elongated parks bringing to the inner city a welcome addition of beauty, grace, and green open space.

The concept of the complete highway has evolved from the principles of landscape design basic to parkway development. The outgrowth of the parkway has been the modern arterial highway known as the expressway, embodying the same general principles of design.

And finally, let me say that the citizens of New Jersey have a right to feel proud of their fine system of highways, parkways, and expressways. This 1952 series of lectures is a most fitting tribute to one who has done so much to further the objectives of true conservation through complete highway engineering. New Jersey's parkways especially exemplify complete highway design at its best.

In furthering your own engineering career, study these excellent examples with care and be guided by theme. I urge you to follow their path as far as you can go. It will repay you in countless ways. It will give you not only a deeper UNDERSTANDING of the "relation" of Highways and Safety of Human LIFE, but a clearer VISION of better Highways for Better Living, of Healthy Highways free of the ills of deteriorating roadsides and resultant economic loss both to the efficiency of the Highway and to the assets of the local community. STUDY of your own fine examples of the Highway looked at as a whole structure in a whole environment will give you a clearer VISION OF COMPLETE HIGHWAY DESIGN as a WAY OF LIFE-an American WAY bright with the PROMISE OF OPPORTUNITY TO SERVE your fellowmen in the years to come

End Note: Mimeographed copies of the following reference information were distributed to the students attending Lecture No, 1:

1. Department of Commerce, Bureau of Public Roads, GAM No. 333 - Supplement No. 1, April 6, 1950, covering HIGHWAY DEFINITIONS - Parts I and II - Types of Highways, adopted by the American Association of Highway Officials and accepted for application on Federal-aid highways and other highways constructed or improved under the supervision or control of Public Roads.
2. Department of Commerce, Bureau of Public Roads, March 22, 1946, memorandum to Division Engineers covering Roadside Improvement on Federal-Aid Projects.

Suggested Reading:

1. Hewes, Lawrence Ilsley, HIGHWAY LANDSCAPE. (In American Highway Practice, Vol, 1, 1942 pp.195-255. Right-of-Way Widths and the Landscape, p, 201; Highway Alignment and the, Landscape, p. 206; The Highway Cross Section and the Landscape, p. 211; Highway Structures and the Landscape, p. 220; Roadside Planting, p. 233; Summary and Bibliography, p. 251.)

2. Nichols, A. R., HIGHWAY DESIGN: ITS RELATION TO LANDSCAPE OBJECTIVES. (In Highway Research Board, Washington, D.C. PROCEEDINGS, 17th Annual Meeting, 1937, pp, 269-278.)

3. Simonson, Wilbur H., ADVANCEMENT IN HIGHWAY CROSS SECTION DESIGN. (In Ohio Tenth Short Course on Roadside Development, Columbus, Ohio, 1951, pp. 97-112.)

4. Simonson, Wilbur H., WHY ROADSIDE DEVELOPMENT? (In Road School Purdue University, Lafayette, Ind,, Proceedings, 32d., 1946, pp. 34-42) (Extension Series No. 61.)

5. Simonson Wilbur H., THE DESIGN OF THE HIGHWAY CROSS-SECTION. (In Highway Research Board PROCEEDINGS, 17th Annual Meeting, 1937, pp. 255-268.)

6. Neale, H. J., THE HIGHWAY AS A PARKWAY. (In *Highways in our National Life*, 1950, pp. 318-325.) (Princeton.)

7. Clarke, Gilmore D., THE DESIGN OF MOTORWAYS. (In *Highways in Our National Life*, 1950, pp. 299-308.) (Princeton.)

8. MERRITT PATHWAY SPEED STUDY, 1947, (Traffic Engineering Section, Connecticut State Highway Department, Hartford, Conn.)

9. COMPARISON OF PARKWAY AND POST ROAD ACCIDENTS, 1940, 1946. (In March, 1948, Division of Highway Control, Connecticut State Highway Department Report.)

10. Giedion, S., THE PARKWAY. (In *Space, Time and Architecture, The New Scale in City Planning*, 1949, pp. 614-623.) (The Harvard University Press, Cambridge.)

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